INSTRUCTION BOOK

RECEIVER, RADIO
AN/GRR-23
and
AN/GRR-24

VOLUME I

EQUIPMENT CONTRACTOR
INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION
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INSTRUCTION BOOK NO. **TI 6620.2A**

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Chap 356			1/28/83						
6500.1		Chg 394		– Vol 2 only					
Chap 377			3/7/88						
6500.1		Chg 413							
Chap 391			1/18/90						
6500.1		Chg 418							
Chap 391R			10/9/90						
6500.1		Chg 416							
Chap 394			2/6/90						
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3	Figure 3-1	5/13/77		
7	7.14.4, 7.14.4.1, 7.14.4.2	5/13/77		
8	Table 8-1: 1A1(M), 2A1(M)	5/13/77		
10	Figure 10-3	5/13/77		
11	Figures 11-15, 11-31, 11-32, 11-33, 11-34, 11-37,			
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VALIDATING OFFICER

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SAFETY NOTICE

* The attention of operating and maintenance personnel is directed to FAA Order 6000.15, "General Maintenance Handbook for Airway Facilities," for instructions on the subject of safety precautions to * be observed, and FAA Order 3900.9, "Accident Prevention Handbook for Airway Facility Personnel." This equipment employs voltages which are dangerous and may be fatal if contacted by operating personnel. Extreme caution shall be exercised when working with equipment. While every practicable safety precaution has been incorporated in this equipment, the following rules must be strictly observed:

KEEP AWAY FROM LIVE CIRCUITS

Operating and maintenance personnel must at all times observe all safety regulations. Do not change plug-in components or make adjustments inside equipment with high voltage supply on. Under certain conditions, dangerous potentials may exist in circuits with power controls in the off position due to charges retained by capacitors. To avoid casualties, always remove power, then discharge and ground by use of grounding rod, prior to touching any parts.

RESUSCITATION

Maintenance personnel should familiarize themselves with the technique for resuscitation found in the manual of first aid instructions.

PRECAUTIONARY NOTICE

SEMICONDUCTOR DEVICES/INTEGRATED CIRCUITS

This equipment contains semiconductors and integrated circuits. These components are reliable but require care in handling. Their destruction can occur in a small fraction of a second. Observe the following precautions before attempting to service these items.

AVOID ELECTRICAL TRANSIENTS

Never unsolder or remove devices from their socket without first de-energizing sources of voltage.

Never reverse polarity, even momentarily; this also applies to ohmmeter testing on high ranges.

Always observe manufacturer's input/output limitations when testing.

Be careful when using an ohmmeter for signal tracing or testing; ohmmeters typically produce relatively high currents on low ranges and high voltages on high ranges.

When installing insulated gate field effect transistors, keep their safety wires in place, if so equipped, and ground the soldering iron tip to the chassis if possible.

AVOID ACCIDENTALLY GROUNDING HEAT SINKS

Heat sinks are often not at chassis potential.

AVOID PROLONGED HEATING OF SEMICONDUCTOR DEVICE LEADS

Heat-sink leads with needle nose pliers, if possible, during soldering operations, and complete soldering within a few seconds.

WHEN REPLACING COMPONENTS, REMOVE SOLDER FROM PCB PADS WITH SUCTION DEVICE WHEN POSSIBLE, ALTERNATIVELY, WITH WICKING.

FUNCTIONAL INDEX

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FUNCTIONAL INDEX (con.)

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1A7	Antenna Coupler (UHF)	2-1				7-14	8-62	10-21	N/A
2A7	Antenna Coupler (VHF)	2-1				7-13	8-62	10-21	N/A
FL1	Crystal Filter	2-1				7-31	8-64	10-21	N/A
1FL2	Tunable Filter (UHF)	2-1				7-16	8-64	10-21	N/A
2FL2	Tunable Filter (VHF)	2-1				7-15	8-64	10-21	N/A
1PS1 or 2PS1	Power Supply	2-3		7-75		7-30	8-65	10-19	11-74
* 1Z1	Impedance Matching Network	(See Appendix C) *							

CIRCUIT IDENTIFIER CODES

CATEGORY	DEFINITION
C	Composite circuit (one which is sub-functionalized); composite functional entities containing one or more of the functional entities (N, Q, V, or X) given in this list are preceded by C.
L	Used in logic diagrams only to identify lowest level of functional grouping of logic circuits.
M	Microwave components (duplexers, attenuators, etc.).
N	Linear networks; functional entities containing several linear components (resistors, capacitors, etc.) arranged in a network or containing a single element used as network are preceded by N.
Q	Circuits containing one or more non-linear elements which may be either active or passive; functional entities containing transistors are preceded by Q.
V	Circuits containing one or more non-linear elements which may be either active or passive; functional entities containing vacuum tubes are preceded by V.
X	Circuits containing one or more non-linear elements which may be either active or passive; functional entities containing semiconductor diodes are preceded by X.

CODE	DEFINITION
AGC	Automatic gain control
ALC	Audio level control
AMP	Amplifier
ANC	Antenna coupler
AT	Attenuator
AUA	Audio amplifier
AUO	Audio oscillator
BCG	Battery charging
BUF	Buffer
CA	Control amplifier
CGT	Compression gate
CMP	Compression
CMR	Comparator
CTR	Counter
CPR	Clipper
DET	Detector
* DFA	Differential amplifier
DG	Diode gate
DL	Delay line
EF	Emitter follower
FDR	Frequency doubler
FDV	Frequency divider
FL	Filter
FQD	Frequency quadrupler
GAT	Gating
HTR	Heater
LA	Lamp (indicating)
LIM	Limiter, limiting
LO	Local oscillator
LS	Level shifter
LVC	Level control circuit
MIC	Microphone
MIX	Mixer
MMV	Monostable multivibrator
MOD	Modulator
MON	Monitor
MTC	Matches
MTG	Matching
OSC	Oscillator
PS	Power supply
RCT	Rectifier
REG	Regulator
RFA	Radio frequency amplifier
RLY	Relay
SW	Switch
TB	Terminal board
TFR	Transformer
TR	Transmit-receive
VD	Voltage divider
VDR	Voltage doubler
VR	Voltage regulator

SECTION 1

GENERAL INFORMATION AND REQUIREMENTS

1.1 INTRODUCTION

1.1.1 Purpose.- This instruction book provides the information necessary for the proper installation, operation, maintenance, and parts support of the Receiver, Radio, AN/GRR-23 and -24. Sufficient information, supplemented by relevant drawings and data, is presented to enable the technician to obtain optimum performance of the equipment.

1.1.2 Scope.- Section 1 of this instruction book describes the function, capabilities, limitations, and principal characteristics of the equipment. A discussion of how the unit operates is presented in section 2. Section 3 deals with operating instructions and procedures. Section 4 presents the essential equipment parameters, standard values, and tolerances. Section 5 lists maintenance and performance checks, which are described in section 6. Fault diagnosis, troubleshooting, and repair are covered in section 7. Section 8 is the equipment parts list. Section 9 describes installation procedures. Section 10 consists of photographs, mechanical drawings, and part location diagrams to support section 8.
* Appendix A has been deleted. Appendix B furnishes data for procuring quartz crystals used in the equipment. * Section 11 (volume 2) provides precise access and blocked schematic diagrams with associated keyed text, and schematic diagrams of the modules.

1.1.3 Applicability.- This manual is applicable to the Receiver, Radio, AN/GRR-23 and -24.

1.2 EQUIPMENT DESCRIPTION

1.2.1 Functional Description.- The AN/GRR-23 (vhf) receiver and the AN/GRR-24 (uhf) receiver (figure 1-1) are each designed for worldwide deployment in air-traffic control service and provide ground-to-air and point-to-point voice communication in an air-traffic control environment.

1.2.1.1.- The vhf receiver is a solid-state, single-channel, crystal-controlled, single-conversion, superheterodyne assembly that operates in the amplitude modulation (AM) mode. It is capable of receiving on any one of 680 channels spaced 50 kHz apart between 116.00 MHz and 149.95 MHz as determined by the operating frequency of the crystal used. The receiver may be modified for 25-kHz channel spacing by interchangeable modules, thus doubling the number of available channels. It is capable of secure voice operation with suitable interface equipment.

1.2.1.2.- The uhf receiver is a solid-state, single-channel, crystal-controlled, single-conversion, superheterodyne assembly that operates in the amplitude modulation (AM) mode. It is capable of receiving on any one of 3,500 channels spaced 50 kHz apart between 225.00 MHz and 399.95 MHz as determined by the operating frequency of the crystal used. The uhf receiver configuration is normally obtained by substituting uhf modules for the comparable vhf frequency determining and controlling modules. These modules are the A7 antenna coupler, FL2 tunable filter, and A2 mixer multiplier. The receiver may also be modified for 25-kHz channel spacing by interchangeable modules, thus doubling the number of available channels.

1.2.1.3.- The vhf and uhf receivers have provisions for use of an external precision frequency source
* or an optional frequency synthesizer which is interchangeable with the oscillator-multiplier module (A1). * The synthesizer provides for direct dialing of the mixer multiplier frequency (see paragraph 9.5.1). Each receiver has an integral power supply.

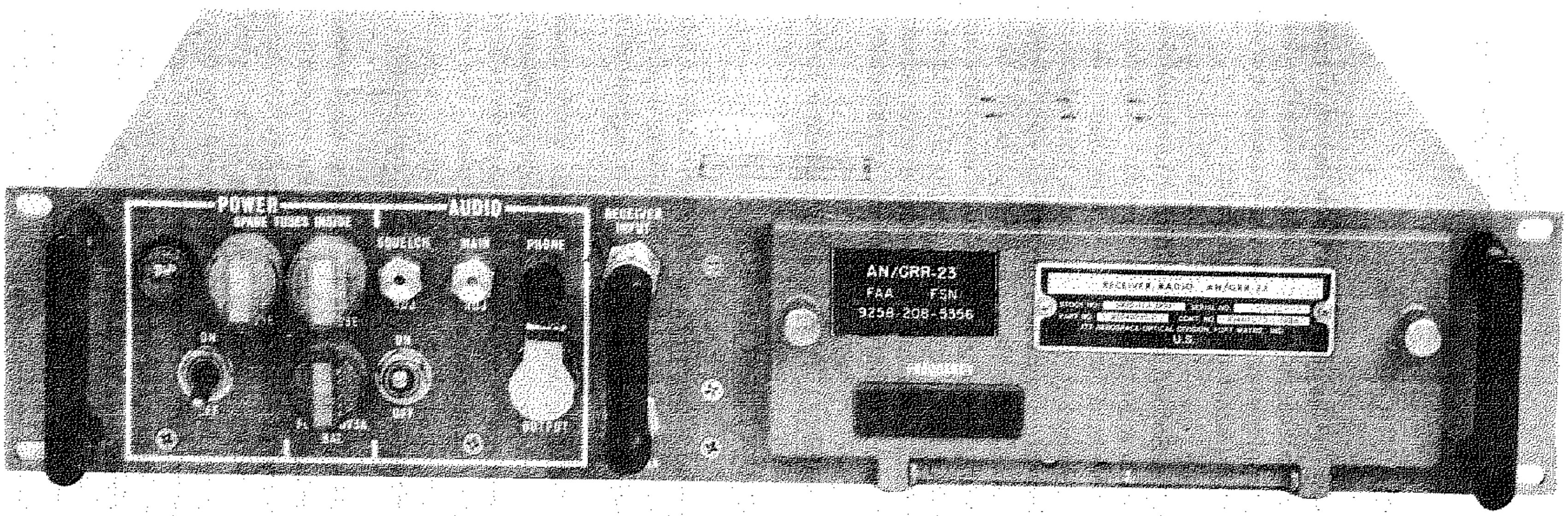

Figure 1-1. Receiver, AN/GRR-23 and AN/GRR-24

1.2.2 Physical Description.- Refer to section 9 for the physical characteristics of the units.

1.3 REFERENCE DATA.- Table 1-1 lists the reference data on the receivers.

Table 1-1. Reference Data, Radio Receiver, AN/GRR-23 and -24

Characteristic	Requirement
PHYSICAL (vhf or uhf unit)	
Dimensions	3-1/2 inches high, 19 inches wide, 12-1/4 inches deep (standard 19-inch rack or cabinet mounting).
Weight	22 pounds
Cable requirements	Power cables and a mating plug for J2 supplied with equipment. Antenna and other interconnection cabling supplied by FAA.
ELECTRICAL	
Primary input power	105, 120, 210, or 240 volts ±10%, single phase, 47 Hz to 240 Hz, 50 watts maximum. If a.c. power fails, a 24-volt lead-acid battery (when supplied) is automatically switched in to provide emergency power for a minimum period of 15 minutes.
FUNCTIONAL	
* Vhf frequency range	116.00 MHz to 149.95 MHz with 680 channels spaced 50 kHz apart or 116.00 MHz to 149.975 MHz with 1,360 channels spaced 25 kHz apart. *
Uhf frequency range	225.00 MHz to 399.95 MHz with 3,500 channels spaced 50 kHz apart or 225.00 MHz to 399.975 MHz with 7,000 channels spaced 25 kHz apart.
*	*
Frequency accuracy, vhf/uhf (8009546G1 oscillator-multiplier module)	Crystal controlled; oven not used. No more than ±0.001% drift from operating frequency. Warmup not required.
Frequency accuracy, vhf/uhf, (oscillator-synthesizer module)	No more than ±0.0005% drift from operating frequency after 5-minute warmup.
Sensitivity (vhf/uhf)	With a 3.0-microvolt signal 30% ±5% modulated at 1 kHz applied to antenna input from a 50-ohm source, an output of 100 milliwatts into a 600-ohm lead with a 10:1 signal-plus-noise-to-noise ratio is obtained.

Table 1-1. Reference Data, Radio Receiver, AN/GRR-23 and -24 (con.)

Characteristic	Requirement		
Selectivity (25 kHz and 50 kHz channel spacing)	Attenuation	25 kHz Bandwidth	50 kHz Bandwidth
	6 dB	20 kHz min	36 kHz min
*	40 dB	38 kHz max	62 kHz max
	60 dB	44 kHz max	70 kHz max *
	80 dB	50 kHz max	80 kHz max
IF output	With a 3.0-microvolt signal 30% modulated, produces a nominal output of 125 mV a.c.		
Audio output	Two separate transformer outputs, each providing 100 milliwatts into a 600-ohm resistive load.		
Audio frequency response	Not more than +1 dB or -2 dB from 300 Hz to 3000 Hz.		
Automatic gain control	Receiver output shall not vary more than 3 dB as a 6-microvolt input signal modulated 30% ±5% increases to 1 volt.		
Automatic gain control time constant	100-millisecond attack, 100-millisecond decay maximum.		
Squelch	Receiver output muted, pending carrier application of not greater than 3.0 microvolts with squelch sensitivity at maximum setting, * and not less than 50 microvolts with squelch at minimum setting.*		
Buffer amplifier	Provides impedance matching and isolation of the crystal filter (FL-1) from the mixer multiplier (A2).		
Secure voice capability	Provides compatibility with the TSEC/KY-8, -28, and -38 speech security equipment when wide bandwidth crystal filter is used. Output is available at J2-G on receiver rear apron.		
ENVIRONMENTAL			
Operating	Relative humidity: 5% to 95% (±5%) Altitude: 0 to 10,000 ft m.s.l.		
Non-operating and storage	Ambient temperature: -62° C to +71° C Relative humidity: 5% to 95% Barometric pressure: 3.4 to 31 inches Hg		
WARMUP TIME	30 minutes maximum using crystal oscillator; none using oscillator-multiplier; 5 minutes with oscillator-synthesizer.		
IF FREQUENCY	20.6 MHz.		
CRYSTALS (see appendixes)	Type depends upon oscillator used.		

1.4 EQUIPMENT AND ACCESSORIES SUPPLIED.- The equipment making up the vhf and uhf receivers is listed in table 1-2

Table 1-2. Equipment Supplied

Quantity	Item	Dimensions (inches) Height	Width	Depth	Unpacked Weight	Volume	Packed Weight	Volume
1	Receiver, Radio, AN/GRR-23 or -24	3-1/2	21	12-1/4	22 lb	0.52 cu ft	38 lb	3.0 cu ft
* 1	Connector, Multiple Pin (MS3108A18-8S)							
1	Clamp (MS3057-10A)							
1	Power cable, 8006147G1 (included in above assembly)							
1	Antenna strap, 8006125-1 (included in above assembly)							
Strap connects antenna to receiver.								

1.5 EQUIPMENT REQUIRED BUT NOT SUPPLIED.- The equipment required but not supplied for the receivers is listed in table 1-3.

Table 1-3. Equipment Required But Not Supplied

Item	Maker/part number	Quantity
* Communications service monitor	Singer CSM-1 or equivalent	1 *
Digital multimeter	Fluke 8000A or equivalent	1
VOM	Triplett 801 or equivalent	1
Function generator (audio oscillator)	Clarke-Hess 748 or equivalent	1
Oscilloscope	Ballantine 1010 or equivalent	1
Audio power output meter	GR 1840B or equivalent	1
* *Signal generator	Hewlett-Packard 608E or 8640B or equivalent	1 *

*If available at site

Table 1-3. Equipment Required But Not Supplied (con.)

Item	Maker/part number	Quantity
* *RF meter with 50 ohm probe	Boonton 91C or equivalent	1
Extension cable set	ITT 8004810G1 or equivalent, NSN 5995-00-253-3994	1
600 ohm dummy load (5 W)		1
10 dB RF attenuator (50 ohms)		1
20 dB RF attenuator (50 ohms)	Singer RFA-20 (74868 UG88C/U)	
Adapter, BNC (male) to UG-1466/U (male)	NSN 5935-00-913-2925	2
Adapter, BNC (male) to UG-1468/U (male)	NSN 5935-00-947-8049	2
Adapter, BNC (male) to UG-1465/U (female)	NSN 5935-00-018-9742	2
Adapter, BNC (male) to UG-1464/U (female)	NSN 5935-00-913-7196	2
600 ohm headset	NT49985A or equivalent	1
Plug	PL55 or equivalent	1
Battery, storage, lead-acid, 24 V		1
Crystal, quartz (see appendix B)	Type depends upon oscillator used.	1
Rack mounting brackets	See paragraph 9.3.1.	4

*

SECTION 2

TECHNICAL DESCRIPTION

2.1 GENERAL DESCRIPTION.- The vhf and uhf receivers are identical except for their frequency determining elements. These elements and those that are common to both receivers are described in the following paragraphs.

2.2 FUNCTIONAL DESCRIPTION.- The vhf and uhf receivers are single-conversion, crystal-controlled, superheterodyne receivers. They are identical in physical configuration but differ electrically in the antenna coupler, the tunable filter, and the mixer-multiplier modules. In addition to these modules, the receivers have in common a local oscillator, buffer amplifier, crystal filter, an IF amplifier and detector, a preamplifier with automatic gain control (agc) and squelch circuits, an audio amplifier, and a power supply (see figure 2-1).

2.2.1 Antenna Coupler A7.- The antenna input is fed to the antenna coupler A7, which provides the capability of operating two receivers from a single antenna. It is an impedance transforming device that allows two receivers to operate from the same antenna with a maximum of 2.5 dB reduction in sensitivity when receivers are operating 3.0 MHz or greater apart.

2.2.2 Tunable Filter FL2.- The tunable filter FL2 provides two tuned cavity sections for preselection of the operating frequency.

* 2.2.3 Crystal Oscillator A1.- The 8009546 unit employs a fundamental frequency crystal operating in an oscillator-multiplier (X 5) circuit; temperature control is not necessary to achieve the required frequency stability. *

2.2.4 Mixer-Multiplier A2.- The mixer-multiplier stage doubles (vhf) or quadruples (uhf) the oscillator frequency and heterodynes the resultant signal with the received signal to produce a 20.6-MHz intermediate frequency.

2.2.5 Buffer Amplifier (or Noise Limiter) A5.- The buffer amplifier isolates the crystal filter from the mixer multiplier. Center frequency is 20.6 MHz, bandwidth 4 MHz, unity gain. Some systems use an interchangeable noise limiter for the buffer amplifier.

2.2.6 Crystal Filter FL1.- The signal from the buffer amplifier is fed to a 20.6-MHz crystal filter which establishes the receiver selectivity at 50 kHz or 25 kHz. (See 7.14.12, figure 6-10, and figure 6-11 for more details.)

2.2.7 IF Amplifier and Detector A6.- The intermediate frequency amplifier provides a minimum of 94 dB of IF amplification. This signal is then demodulated to provide an audio output.

2.2.8 Preamplifier, AF/AGC-Squelch A3.- The detected IF (audio) signal is amplified by the preamplifier, and the audio output terminates at two audio volume controls. The agc is obtained by sampling the detected carrier level voltage, amplifying it, and applying this voltage to the mixer-multiplier and IF amplifiers. The agc voltage is also fed to the squelch stage to quiet the receiver in the absence of a received signal.

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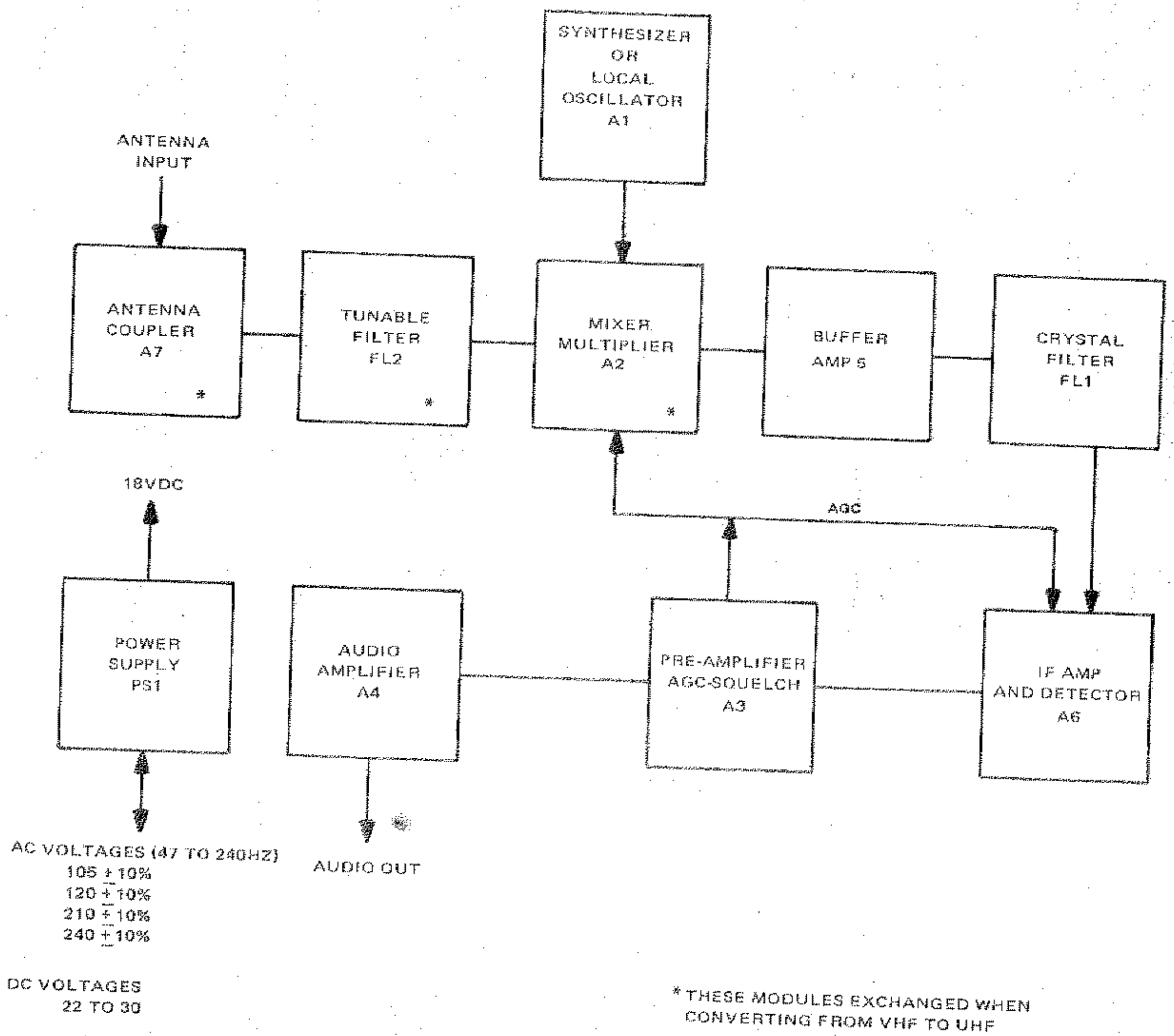


Figure 2-1. VHF and UHF Receivers, Block Diagram

2.2.9 Audio Amplifier A4.- The audio amplifier has two channels, each having 90 milliwatts output, one to the phone jack, the other for remote speaker operation.

2.2.10 Power Supply PS1.- The receiver power supply converts the 47 to 420 Hz a.c. primary power into regulated and unregulated d.c. voltages to operate the receiver circuits. When the a.c. primary input is interrupted, automatic switchover is accomplished to d.c. input from an external 24-volt storage battery if such a battery is used. These batteries are not supplied at FAA sites, except that low activity ATCTs use batteries as primary power.

2.3 OPTIONAL CAPABILITIES.- Several options to the basic receiver configuration are available.

2.3.1 Oscillator-Multiplier.- This paragraph deleted.

2.3.2 Oscillator-Synthesizer.- The oscillator-synthesizer is a substitute for any version of the crystal-controlled oscillator or the oscillator-multiplier, when a channel frequency crystal is not available or is not operable. Thumbwheel switches accessible behind the front access panel are used to select the desired channel frequency.

2.3.3 Crystal Filter.- The 20.6-MHz crystal filter (FL1) used for 50-kHz channel spacing may be exchanged for a narrow bandwidth unit intended for 25-kHz channel spacing.

* 2.3.4 Impedance Matching Network.- The impedance matching network (1Z1) is a configuration option to improve audio quality when the receivers are used in conjunction with FAA/telco equipment. (See Appendix C.) *

2.4 DETAILED DESCRIPTION (VOLUME 2, SECTION 11).- Circuit operation of the vhf and uhf receivers is illustrated and discussed in section 11 (volume 2) in (1) functionally oriented blocked diagrams and associated texts and (2) functionally oriented blocked schematic diagrams and blocked texts.

SECTION 3

OPERATION

3.1 INTRODUCTION.- This section contains information and instructions for operating the vhf and uhf receivers. All operational information is identical for both receivers. The functions of all controls and indicators are described. Instructions include procedures for starting, operating, operating from common antenna, stopping, and emergency operation. For tuning and checkout procedures see section 9.

3.2 CONTROLS AND INDICATORS.- Controls and indicators are listed and defined in table 3-1 and illustrated in figure 3-1. No interlocks are used in the receivers.

Table 3-1. VHF/UHF Controls and Indicators

Control or indicator	Ref des	Function
POWER		
ON-OFF		
Toggle switch	S2	When placed in ON position, provides primary input power to receiver.
Indicator lamp	DS1	Illuminates when POWER ON-OFF switch is in the ON position. Indicates presence of regulated +20 V d.c. power. *
FUSES		
AC FUSE (left)	F1	Single 1-ampere fuse in 105 to 120 V a.c. line. Indicating fuse holder glows when fuse is blown.
AC FUSE (right)	F2	Two 0.5-ampere fuses used for 210 to 240 V a.c. operation. Indicating fuse holder glows when fuse is blown. This fuse is strapped out for 105 to 120 V operation (see EEM Chapter 227R, AFP 6500.1, CHG 178).
BATTERY FUSE	F3	Single 3-ampere fuse in positive side of battery input. Indicating fuse holder glows when fuse is blown.
AUDIO		
SQUELCH ADJ		
Screwdriver adjust	R1	Sets squelch threshold level.
SQUELCH ON-OFF		
Toggle switch	S1	When ON-OFF switch is in ON position, squelch is operative. With switch in OFF position, squelch is disabled.
MAIN ADJ		
Screwdriver adjust	R2	Adjusts level of audio output at rear panel connector.

Table 3-1. VHF/UHF Controls and Indicators (con.)

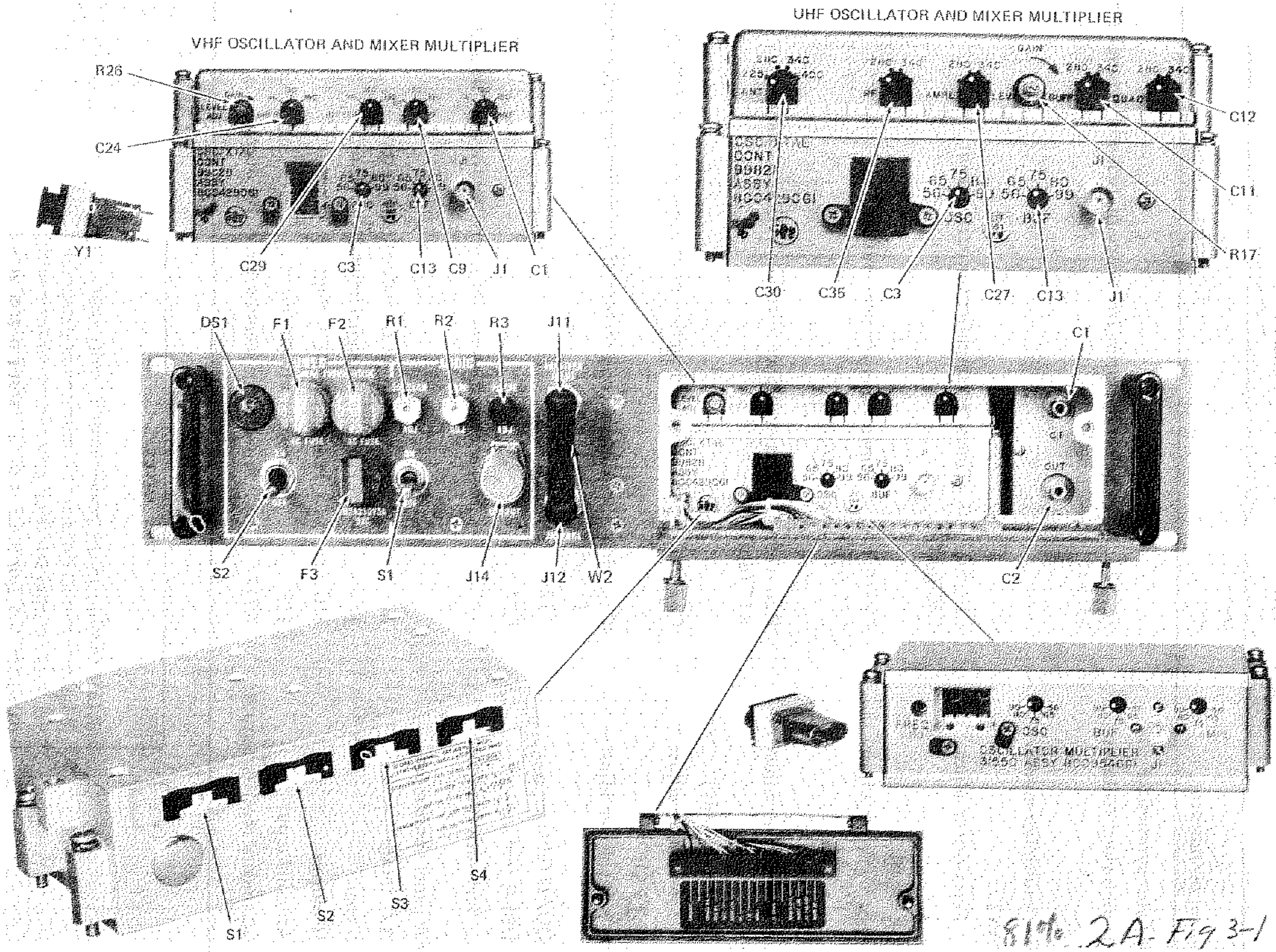
Control or indicator	Ref des	Function
PHONE ADJ		
Knob adjust	R3	Adjusts level of audio at front panel OUTPUT jack (J14).
OUTPUT	J14	Provides audio output for headphone monitoring.
RECEIVER INPUT	J11	Provides front panel access for signal generator input when tuning receiver. J12 patched to J11 in normal operation (see the antenna strap in figure 3-1).
* ANTENNA	J12	
The following controls are behind the front panel access door.		
Tunable filter module		
IN		
Screwdriver adjust	C1	Tunes input cavity for peak output.
OUT		
Screwdriver adjust	C2	Tunes output cavity for peak output.
Oscillator-multiplier (8009546G1)		
FREQ ADJ		
Screwdriver adjust	C3	Frequency fine tune.
OSC		
Screwdriver adjust	C10	Frequency tune.
BUF		
Screwdriver adjust	C16	Frequency tune.
AMPL		
Screwdriver adjust	C21	Frequency tune.
J1	J1	Provides for external oscillator input in lieu of crystal. *

Table 3-1. VHF/UHF Controls and Indicators (con.)

Control or indicator	Ref des	Function
Oscillator-synthesizer		
Thumbwheel switches	S1, S2, S3, S4	Select operating frequency of oscillator-synthesizer.
Mixer/multiplier module		
ANT		
Screwdriver adjust	C1 (vhf) C30 (uhf)	Tunes RF amplifier for peak output.
RF		
Screwdriver adjust	C9 (vhf) C35 (uhf)	Tunes mixer for peak output.
LEVEL ADJ		
Screwdriver adjust	R26 (vhf) R17 (uhf)	Sets multiplier injection level into mixer.
AMPL (uhf only)		
Screwdriver adjust	C27	Tunes third section of multiplier for peak output.
BUFFER		
Screwdriver adjust	C29 (vhf) C11 (uhf)	Tunes second section of multiplier for peak output.
QUAD (uhf)	C12	
DBLR (vhf)	C24	
Screwdriver adjust		Tunes first section of multiplier for peak output.
Rear panel connectors		
A.C. input	J1	Provides input for a.c. voltage to receiver.
Signal	J2	Provides for signal input and output.
IF output	J10	Provides for IF output.
Antenna input	J13	Provides antenna input.
Secondary receiver output	A7J2	Provides for secondary receiver output.

NOTE

Before turning on the power switch, verify that (1) power connections are as indicated in paragraph 9.3.3, (2) crystal selection procedures conform with paragraph 9.5.2 or 9.5.3, and (3) tuning procedures have been complied with in accordance with paragraphs 9.4, 9.5, and 9.5.5.



81Mo 2A- Fig 3-1

Figure 3-1. VHF/UHF Receiver Controls and Indicators

3.3 STARTING AND OPERATING PROCEDURE.- To turn on either of the receivers, place the POWER ON-OFF switch on the receiver front panel in the ON position and observe the following:

a. The POWER indicator lamp illuminates.

* b. After a 5 minute warmup period during which the frequency controlling elements stabilize, the receiver is ready for operation, provided the tuning procedure has been completed for the operating frequency desired. *

c. If the tuning procedure has not been completed for the operating frequency desired, perform the applicable procedure for the vhf or uhf receiver as described in section 9, paragraph 9.5.5 or 9.5.4.

3.4 OPERATING TWO RECEIVERS FROM COMMON ANTENNA.- When it is desired to operate two receivers from a common antenna proceed as follows:

a. Tune the two receivers using the tuning procedure indicated in section 9, paragraph 9.5 The frequencies of the two receivers must be separated by 1.0 MHz or more if they are vhf receivers, and 3.0 MHz or more if they are uhf receivers.

b. Connect the two receivers as shown in figure 3-2. The proper length of cable between the two receivers must be used. The cable length is determined by the frequency of the primary receiver (see figure 3-2). See figure 3-3 or 3-4 for the proper cable length. Where more than one length is given, either may be used. At the higher frequencies, cable lengths become more critical for optimum receiver performance. Length is to be measured to the end of the center pin of the coaxial line. Total length * should include any adapters used when the cable is not terminated with type N connectors. Retain antenna strap at station. *

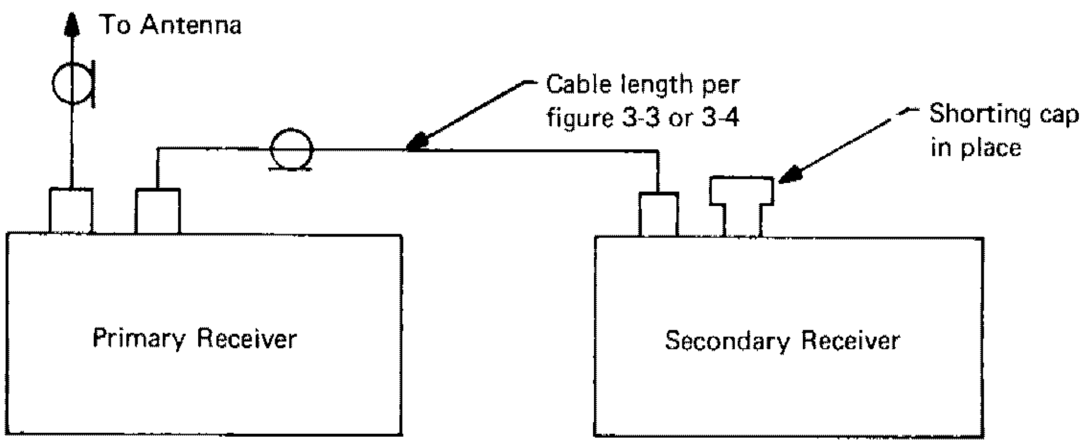


Figure 3-2. Connection for Two Receivers Operating From Common Antenna

> **NOTE**
>
> Approximately 2.5 dB degradation in sensitivity will be experienced with two receivers connected for operation from a common antenna.

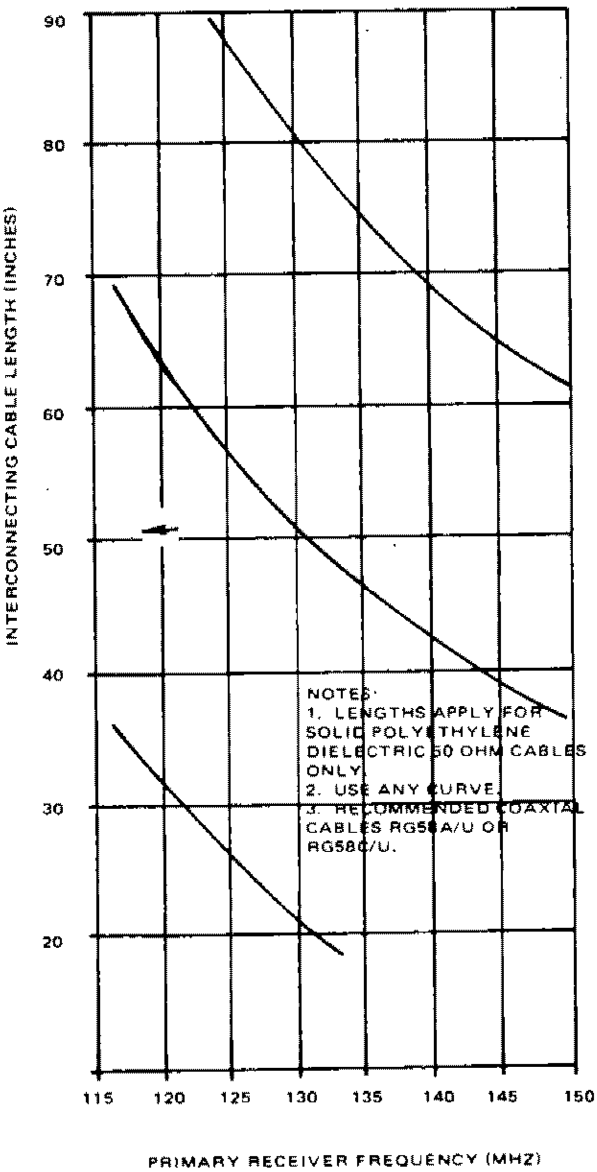


Figure 3-3. VHF Interconnecting Cable Length vs. Frequency

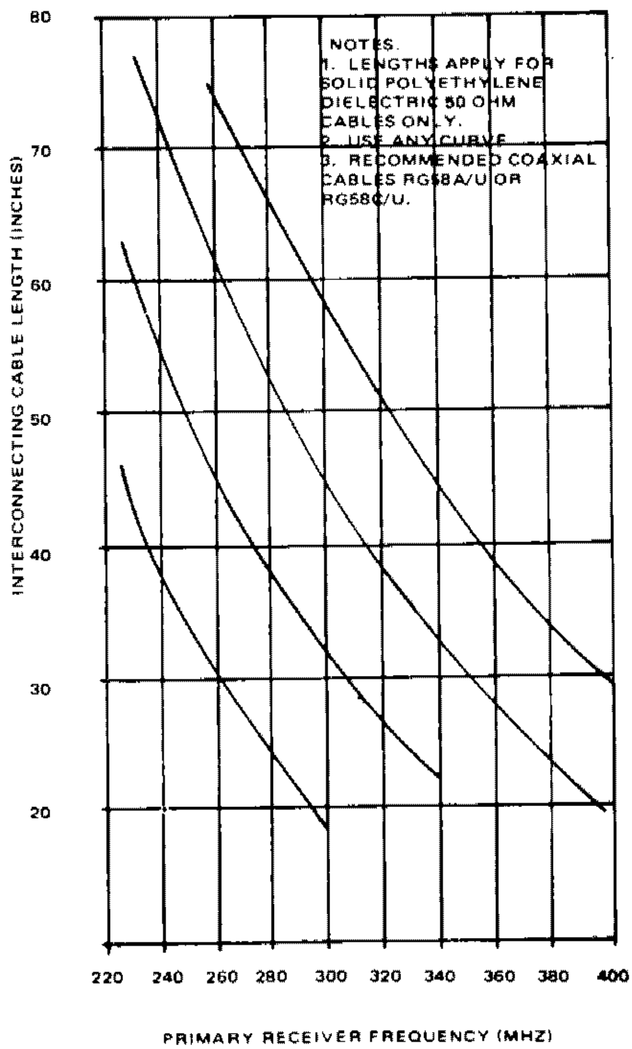


Figure 3-4. UHF Interconnecting Cable Length vs. Frequency

3.5 STOPPING PROCEDURE.- To turn off either of the receivers, place the POWER ON-OFF switch on receiver front panel in the OFF position. This completely deactivates the receivers.

3.6 EMERGENCY OPERATION.- Emergency operation of the uhf or vhf receivers is limited to two conditions:

a. Crystal not available

b. A.C. power failure

3.6.1 Crystal Not Available.- If a crystal of the desired operating frequency is not available, perform the following:

* a. Remove crystal from holder.

b. Connect output of an external RF generator, set to CW, to J1 on the oscillator-multiplier module. See table 9-4 to determine setting of RF generator frequency for proper channel operating frequency. Set the RF generator to the module output frequency. This is 5 times the crystal frequency of the 8009546G1 oscillator-multiplier.

c. Adjust RF generator to provide from 1 to 2 V output when terminated in a 50-ohm load (± 2 ohms) when the oscillator-multiplier is used. *

> NOTE
>
> RF generator must be a stable frequency source, ±0.001%, to assure optimum receiver performance. Continued monitoring of frequency is required.

d. Proceed with normal tuning procedures (paragraph 9.4).

3.6.2 A.C. Power Failure.- If a 24-volt battery is already properly connected to the receiver, and an a.c. power failure occurs, switchover to the battery is automatic. If a battery is not connected, proceed as follows:

a. Place receiver POWER ON-OFF switch to OFF.

b. Connect 24-volt battery to rear panel connector J2, positive terminal to pin A, and negative terminal to pin B or H.

c. Place receiver POWER ON-OFF switch to ON. Normal operation will be restored for a minimum period of 15 hours from a fully charged lead-acid storage battery.

SECTION 4

STANDARDS AND TOLERANCES

* **4.1 INTRODUCTION.**- This section lists the standards and tolerances for the vhf/uhf receivers, as defined and described in FAA Order 6600.22. All performance parameters and inspection elements are identified in tables 4-1 and 4-2 for the vhf and uhf receivers, respectively. When these are in conflict with 6600.22, the standards and tolerances in the FAA Order shall prevail. *

Table 4-1. VHF Receiver Standards and Tolerances

Parameter	Reference paragraph (performance check)	Standard	Tolerance/limit Initial	Tolerance/limit Operating
* AGC threshold	9.7.2.5	5 μV (-93 dBm)	6 μV (-91 dBm)	8 μV (-89 dBm)
AGC level control	9.7.2.5 9.7.2.6	Shall not vary more than 3 dB from 3.0 μV to 50,000 μV (-98 dBm to -13 dBm)	Same as standard	Shall not vary more than 4 dB from 3.0 μV to 50,000 μV
Squelch action/adjust	6.5			
Open		1.5 μV max to open (-103 dBm)	1.5 to 4.0 μV (-103 to -95 dBm)	5.0 μV max to open (-93 dBm) *
Closed		Approximately 2/3 of open value to close	Same as standard	Same as standard
Audio frequency response	6.9	Within 3 dB from 300 to 3000 Hz, continually decreasing above 3000 Hz and below 300 Hz	Same as standard	Within 4 dB from 300 to 3000 Hz, continually decreasing above 3000 Hz and below 300 Hz
Power output	6.6	100 mW min	100 mW min	90 mW min
Sensitivity	6.7	3.0 μV (-98 dBm) max for 90 mW into 600 ohms	Same as standard	5.0 μV max for 90 mW into 600 ohms
Selectivity (50 kHz channel spacing)	6.11			
* 6 dB		36 kHz min	35 kHz min	34 kHz min
60 dB		70 kHz max	70 kHz max	70 kHz max *
Non-symmetry 60 dB		15% max	15% max	20% max

Table 4-1. VHF Receiver Standards and Tolerances (con.)

Parameter	Reference paragraph (performance check)	Standard	Tolerance/limit Initial	Tolerance/limit Operating
Selectivity (25 kHz channel spacing)	6.11			
6 dB		20 kHz min	16 kHz min	14 kHz min
* 60 dB		44 kHz max	44 kHz max	44 kHz max
Nonsymmetry 60 dB points		15% max	15% max	15% max
Oscillator frequency	6.4			
50 kHz channel spacing		±0.001%	±0.001%	±0.001% *
25 kHz channel spacing		±0.001%	±0.001%	±0.001%

Table 4-2. UHF Receiver Standards and Tolerances

Parameter	Reference paragraph (performance check)	Standard	Tolerance/limit Initial	Tolerance/limit Operating
* AGC threshold	9.7.2.5	5 µV (-93 dBm)	6 µV (-89 dBm)	8 µV (-91 dBm)
AGC level control	9.7.2.6	Shall not vary more than 3 dB from 3 µV to 50,000 µV (-98 dBm to -13 dBm)	Same as standard	Shall not vary more than 4 dB from 3 µV to 50,000 µV
Squelch action/adjust	6.5			
Open		1.5 µV max to open (-103 dBm)	1.5 to 4.0 V (-103 to -95 dBm)	5.0 µV max to open (-93 dBm) *
Closed		Approximately 2/3 of open value to close	Same as standard	Same as standard
Audio frequency response	6.9	Within 3 dB from 300 to 3000 Hz, continually decreasing above 3000 Hz and below 300 Hz	Same as standard	Within 4 dB from 300 to 3000 Hz, continually decreasing above 3000 Hz and below 300 Hz
Power output	6.6	100 mW min	100 mW min	90 mW min
Sensitivity	6.7	3.0 µV max for 100 mW into 600 ohms	Same as standard	5.0 µV max for 90 mW into 600 ohms

Table 4-2. UHF Receiver Standards and Tolerances (con.)

Parameter	Reference paragraph (performance check)	Standard	Tolerance/limit Initial	Tolerance/limit Operating
Selectivity (50 kHz channel spacing)	6.11			
* 6 dB		36 kHz min	31 kHz min	30 kHz min
60 dB		70 kHz max	70 kHz max	70 kHz max
Non-symmetry 60 dB		60% max	60% max	60% max
Selectivity (25 kHz channel spacing)	6.11			
6 dB		20 kHz min	16 kHz min	14 kHz min
60 dB		44 kHz max	44 kHz max	44 kHz max
Local oscillator frequency	6.4			
50 kHz channel spacing		±0.001%	±0.001%	±0.001% *
25 kHz channel spacing		±0.001%	±0.001%	±0.001%

SECTION 5

PERIODIC MAINTENANCE

5.1 INTRODUCTION.- This section lists essential maintenance activities required for the vhf and uhf receivers on a recurring basis, and the schedules for their accomplishment. Refer to FAA Handbook 6000.15, Maintenance of Airways Facilities, for general guidance and to FAA Order 6600.22, Maintenance of Point-to-Point and Air-Ground Communication Transmitting and Receiving Equipment, which contains additional information on prevention maintenance schedules and procedures for vhf and uhf receivers. Also refer to FAA Orders 6470.29, Maintenance of En Route Air-Ground Communication Facilities; 6480.6, Maintenance of Terminal Air-Ground Communication Facilities; and 6490.1, Maintenance of Flight Service Station (FSS) Air-Ground Communication Facilities.

5.2 PERFORMANCE CHECKS.- Table 5-1 lists the regularly required performance checks necessary to ensure operation within established tolerances and limits, and provides a schedule for their accomplishment. Cross reference is made in the table to the pertinent procedures in section 6, Maintenance Procedures.

Table 5-1. Periodic Performance Checks

Period*	Performance check	Reference check
Monthly	Voice quality check	6.2
Bimonthly	Squelch action and adjustment	6.5
	Maximum power output	6.6
	Sensitivity	6.7
	Final check	6.8
	AGC action, AGC threshold	9.7.2.5, 9.7.2.6
Annually	Front panel test indications	6.3
	Oscillator frequency check	6.4
	Audio frequency response	6.9
	Selectivity:	6.11
	a. 6 dB	
	b. 60 dB	
	c. Symmetry	

*Preventive maintenance schedules are established in FAA Order 6600.22. When the above schedules are in conflict with the schedules published in Order 6600.22, the schedules in the Order shall take precedence.

5.3 OTHER MAINTENANCE TASKS.- Table 5-2 lists irregular recurring tasks required to maintain reliable operation of the equipment. See section 7, Corrective Maintenance, and section 9, Installation and Integration. Additional maintenance tasks required to prevent deterioration of the equipment, such as housekeeping, shall be performed on an as-required basis.

5.3.1 Exterior Cleaning.- To clean the unit exterior use a clean lint-free cloth moistened in a solution of mild household detergent and warm water. Follow this with a cloth moistened in clear water, then wipe dry. Never use harsh detergents, chemical cleaning agents, abrasive compounds, or bristle brushes to clean the unit, for these may permanently mar the finish.

5.3.2 Component Cleaning.- Internal assemblies and printed circuit cards should not need cleaning unless exposed to areas of highly polluted air or long periods of extended use.

Table 5-2. Unscheduled Performance Checks

Unscheduled performance check	Reference paragraph
Tuning	9.4, 9.5
Alignment	9.4, 9.5
* Crystal filter response	7.14.10 *

SECTION 6

MAINTENANCE PROCEDURES

6.1 INTRODUCTION.- This section contains the procedures for making the periodic performance checks listed in section 5. Test equipment required is listed and test setup block diagrams are provided, along with detailed instructions for performing the procedures. References are made to applicable sections to be consulted if the required parameters cannot be met. Complete records should be maintained of receiver characteristics as measured during the accomplishment of these routines and re-
* corded on FAA Form 6600.22 (figure 9-10). These data provide indications of any pattern of general deterioration of receiver performance over a period of time. *

6.2 VOICE QUALITY CHECK.- A voice quality check is made by listening to aircraft voice transmissions and making a subjective assessment of receiver performance. Results will indicate any appreciable changes in receiver performance that may require receiver adjustment or servicing. In addition to the scheduled voice quality check specified in table 5-1, a voice quality check on the operating frequency should also be performed using the FAA transmitter and, if possible, aircraft calls as a final checkout procedure after a major adjustment or repair procedure before returning the equipment to operational status.

6.3 FRONT PANEL TEST POINT INDICATIONS.- The purpose of this procedure is to determine if key operating test point indications are within tolerance. Figure 6-1 shows the test setup.

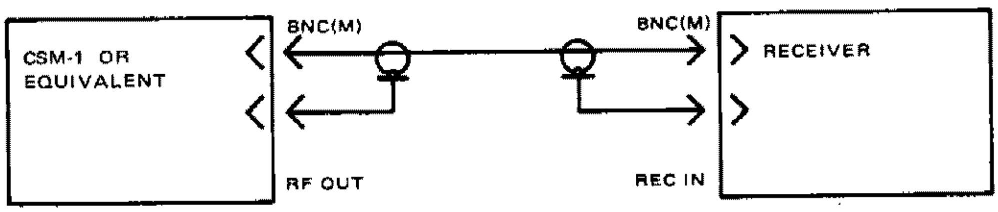
*  *

Figure 6-1. Test Setup for Front Panel Test Point Indications

6.3.1 Test equipment

* CSM-1 communications service monitor or equivalent. *

VTVM or DMM

6.3.2 Procedure.- Connect signal generator to RECEIVER INPUT jack. Set frequency switches to channel frequency. Set output of -98.0 dBm. Proceed as follows:

(1) With VTVM or DMM, measure and record readings obtained at specified test points in accordance with table 6-1.

(2) Consult table 7-3 for probable cause of any abnormal readings obtained.

Table 6-1. Normal Front Panel Test Point Indications

Step	Test point	Function	Signal input	Indication	Comments
1	UNREG B+	Measures output voltage of power supply full wave rectifier	Any	a. 27 V d.c. to 40 V d.c.	When primary power is a.c. voltage varies with line voltage.
				b. 21.5 V d.c. to 29.5 V d.c.	When primary power is a 24 volt battery.
2	REG B+	Measures output voltage of power supply regulator	Any	17.01 V d.c. to 18.00 V d.c.	This voltage is set with a voltmeter more accurate than is commonly found at the installation. If a voltmeter of this required accuracy is not available and the meter in the field has an accuracy of ±2 percent of full scale on a 30 volt scale the B+ should be regarded as correct if it reads 17.4 volts to 18.6 volts.
3	AGC	Measures output voltage on agc bus	a. No signal (SQUELCH switch ON)	1.5 V d.c. to 2.5 V d.c.	
			b. No signal (SQUELCH switch OFF)	2.6 V d.c. to 3.2 V d.c.	
			c. -120 dBm	2.9 V d.c. ±0.3 V d.c.	
			d. -102 dBm	5 V d.c. minimum	
			e. 0 dBm	9 V d.c. to 10 V d.c.	
4	SQUELCH	Measures squelch control voltage	a. No signal (SQUELCH switch OFF)	8.0 V d.c. to 10.0 V d.c.	
			b. No signal (SQUELCH switch ON)	Less than 1 V d.c.	

Table 6-1. Normal Front Panel Test Point Indications (con.)

Step	Test point	Function	Signal input	Indication	Comments

> NOTE
>
> Unless otherwise specified , during the remaining tests SQUELCH switch should be in OFF position.

Step	Test point	Function	Signal input	Indication	Comments
5	IF	Measures a.c. and d.c. voltage at output of detector stage	a. No signal	2.5 V d.c. to 4.0 V d.c.	
			b. Any level from -98 dBM to 0 dBm	3.0 V d.c. to 5.0 V d.c.	As the generator power level is increased from -120 dBm to -97 dBm, this voltage will rise to some value within the indicated range. From -97 dBm to 0 dBm the voltage will be almost constant, increasing only about 0.1 volt.
			c. -98 dBm to 0 dBm modulated 30 percent @ 1 kHz	50 mV a.c. to 300 mV a.c.	
6	LO	Measures rectified RF output of oscillator module	Any	0.25 V d.c. to 0.8 V d.c.	
7	MULT	Measures rectified RF output of multiplier	Any		
			a. VHF	9.05 V d.c. to 1.07 V d.c. (See table 9-6 for exact level)	Exact level is set during tuning. With LEVEL ADJ potentiometer maximum clockwise during tuning, indicator will be 1.3 V to 2.0 V.

Table 6-1. Normal Front Panel Test Point Indications (con.)

Step	Test point	Function	Signal input	Indication	Comments
7 (con.)	MULT		b. UHF	2.0 V d.c. to 4.0 V d.c. (See table 9-5 for exact level)	Exact level is set during tuning. With LEVEL ADJ potentiometer maximum clockwise during tuning, indicator will be 5.5 V to 20 V.
8	This step deleted.				
9	MIXER OUT (uhf and vhf)	Measures rectified IF voltage at output of mixer	0 dBm (see comments)	0.2 V d.c. or greater	Adjust the generator frequency slightly off-channel for maximum indication.

Table 6-1. Normal Front Panel Test Point Indications (con.)

Step	Test point	Function	Signal input	Indication	Comments
9 (con.)	MIXER OUT (uhf and vhf)				(This disables the agc and permits a usable indication.)
10	NOISE LIM	Measures rectified IF voltage at output of buffer amplifier	0 dBm (see comments)	0.2 V d.c. or greater	Adjust the generator frequency slightly off-channel for maximum indication. (This disables the agc and permits a usable indication.)
11	AF PRE-AMP	Measures a.c. voltage at output of af preamplifier	-98.0 dBm to 0 dBm, 30 percent modulation at 1 kHz; AUDIO MAIN ADJ potentiometer maximum counterclockwise	0.3 V a.c. to 1.0 V a.c. typical	Actual level varies with setting of R32 on AGC/squelch module.
12	MAIN AF	Measures sample of a.c. voltage at output of main audio amplifier	-98.0 dBm to 0 dBm, 30 percent modulation at 1 kHz; AUDIO MAIN ADJ potentiometer maximum clockwise	1.5 V a.c. to 2.5 V a.c.	See paragraph 6.8

* **6.4 LOCAL OSCILLATOR FREQUENCY CHECK**.- The purpose of this procedure is to determine if the frequency is within tolerance (±0.001 for 25 kHz and 50 kHz spacing). Figure 6-2 shows the test setup block diagram.

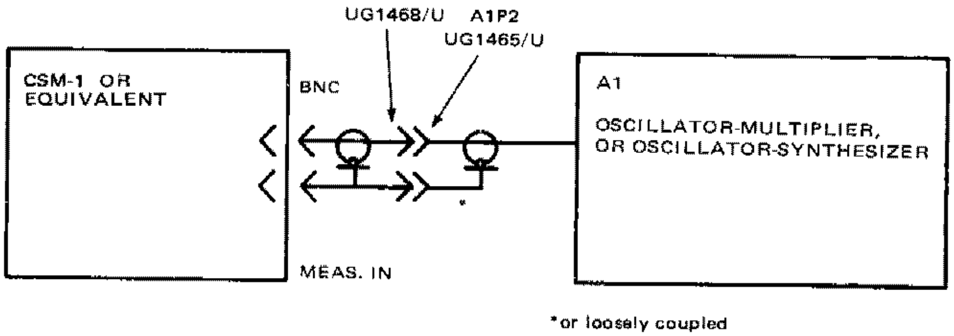


Figure 6-2. Test Setup for Local Oscillator Frequency Check

6.4.1 Test Equipment

* CSM-1 communications service monitor or equivalent.

6.4.2 Procedure.- Remove receiver top cover. Disconnect module A1 cable A1P2 from J1 on mixer/multiplier module and connect test equipment as shown in figure 6-2 or loosely couple. Proceed as follows:

(1) Set SWEEP WIDTH (Δf) to OFF.

(2) Set FUNCTION switch to measure 2 to 60 μV.
lights.

(3) Set AUDIO MODE switch to BEAT.

(4) Set frequency switches and 0-100 Hz control to oscillator frequency.

(5) Set VOLUME control to maximum clockwise.

(6) Set AGC/MANUAL switch to AGC.

(7) Adjust the CSM-1 frequency switches for a zero beat indication from the speaker. As zero beat condition is approached, the BEAT indicator will flash at the beat frequency. Continue adjusting the CSM-1 frequency to the minimum flashing rate. The frequency on the dial is the local oscillator frequency. Record this frequency.

(8) If the above requirements cannot be met, consult paragraphs 7.12.5 and 7.14.3. If requirements are met see 6.8.

* 6.5 SQUELCH ACTION AND ADJUSTMENT.- The purpose of this procedure is to determine the quietness of the receiver in the absence of received signals. Figure 6-3 shows the test setup.

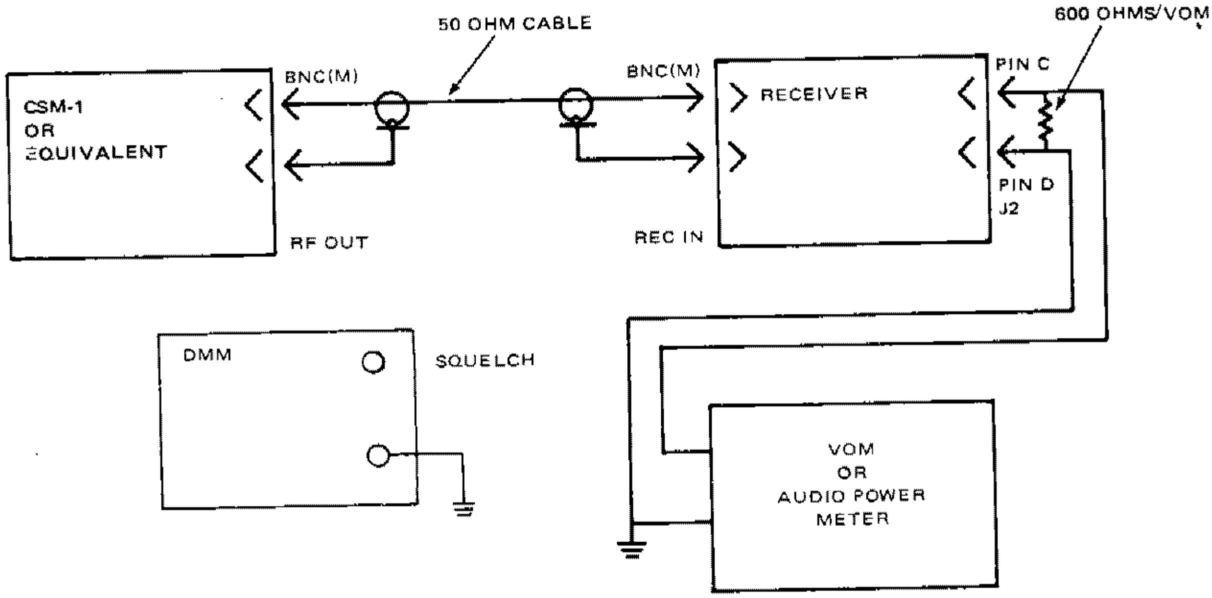


Figure 6-3. Test Setup for Squelch Action and Adjustment

6.5.1 Test Equipment

CSM-1 communications service monitor or equivalent.

Audio power meter GR 1840 or equivalent, or VOM with 600-ohm load

VTVM or DMM

6.5.2 Procedure.- Connect CSM-1 RF output to input of receiver. Proceed as follows:

(1) Place squelch switch on front panel in OFF position.

(2) Set frequency dials of CSM-1 to indicated channel frequency, modulation OFF. Set RF power level to -98.0 dBm, FUNCTION switch to GENERATE, and SWEEP WIDTH (Δf) switch to OFF.

(3) Set the voltmeter to the 30 volt d.c. scale and connect between SQUELCH and GROUND test points on back of front panel door.

(4) Place the SQUELCH switch in the ON position.

(5) Set the AUDIO SQUELCH ADJUST potentiometer on front of receiver to maximum clockwise position. The receiver will be squelched and the voltmeter should indicate less than 1.0 V d.c.

(6) Slowly turn AUDIO SQUELCH ADJUST potentiometer counterclockwise until voltmeter suddenly increases to approximately 9.0 V d.c. ±1 V d.c. This is the squelch threshold.

* (7) Place AMPLITUDE MODULATION switch on generator to ON position. Set VERT MODE switch to GEN 30% AM position. Set TONE FREQUENCY switch to 1 kHz. Vary the VERT POS, FOCUS, INTENSITY, HORIZ POS, and HORIZ GAIN controls to place trace on VERTICAL SET line. Set the VERT MODE switch to CARRIER SET. Vary the CARRIER LEVEL control to position trace on the CARRIER SET line. Vary TONE LEVEL for 30% modulation. *

(8) Connect power meter to receiver audio output.

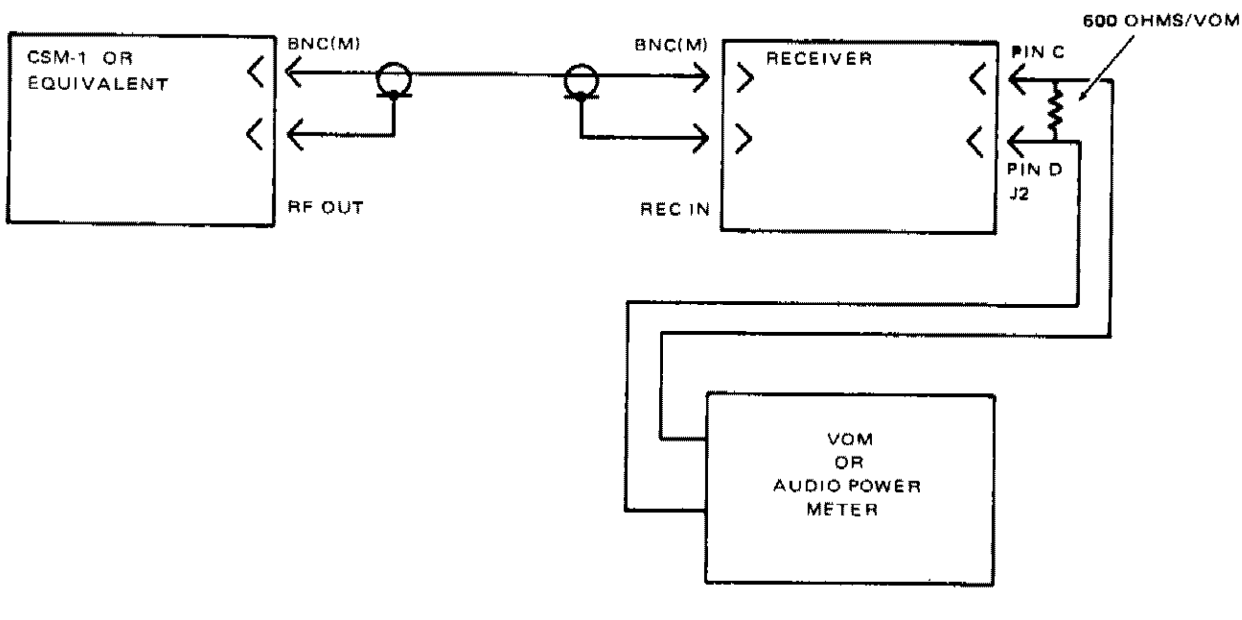
(9) Reduce the generator output and note the voltage (dBm) required to deactivate the squelch.

(10) Increase the generator output until squelch operates. The ratio of this voltage to voltage noted in step (9) is the squelch differential (see tables 4-1, 4-2).

(11) Place SQUELCH switch in OFF position. This completes the test. If above requirements cannot be met, consult paragraphs 7.12.10 and 7.14.9. See 6.8 before restoring equipment to service.

6.6 POWER OUTPUT.- The purpose of this procedure is to determine if the receiver is capable of delivering maximum power output (100 mW) for which it was designed. Figure 6-4 shows the test setup.

*



*

Figure 6-4. Test Setup for Power Output

6.6.1 Test Equipment.

* CSM-1 communications service monitor or equivalent. *

Audio power meter, GR 1840 or equivalent, or VOM with 600-ohm load

> **NOTE**
>
> It should be determined that the receiver local oscillator is on frequency prior to this test.

6.6.2 Procedure.- Set mainframe frequency switches to channel frequency and proceed as follows:

* (1) Set FUNCTION switch to GENERATE position.

(2) Set AMPLITUDE MODULATION switch to ON position. Set SWEEP WIDTH (Δf) to OFF.

(3) Set VERT MODE switch to VERT SET position.

(4) Adjust VERT POS, FOCUS, INTENSITY, HORIZ POS, and HORIZ GAIN controls to position trace on VERTICAL SET line of graticule.

(5) Set VERT MOD switch to CARR SET. Set TONE FREQUENCY to 1 kHz. *

(6) Adjust CARRIER LEVEL control to position trace on CARRIER SET line of graticule.

* (7) Set VERT MODE switch to GEN 30% AM.

(8) This step deleted.

(9) This step deleted.

(10) Set af gain control on receiver to maximum clockwise position. *

(11) Increase signal generator output gradually until maximum power is obtained from the receiver.

(12) Observe and record the maximum power output obtained on output meter.

(13) If the above requirements cannot be met, see table 7-2. If requirements are met see 6.8.

6.7 SENSITIVITY.- The purpose of this procedure is to ensure that the receiver will respond to an incoming signal level of 3.0 microvolts (vhf and uhf), 30% modulated at 1 kHz, as applied to the antenna input, for a 90 mW output into a 600-ohm load with a 10 dB (minimum) signal-plus-noise-to-noise ratio. Figure 6-5 shows the test setup.

6.7.1 Test Equipment.- Test equipment required includes the following:

* CSM-1 communications service monitor, or equivalent *

Audio power meter GR 1840 or equivalent, or VOM with 600-ohm load

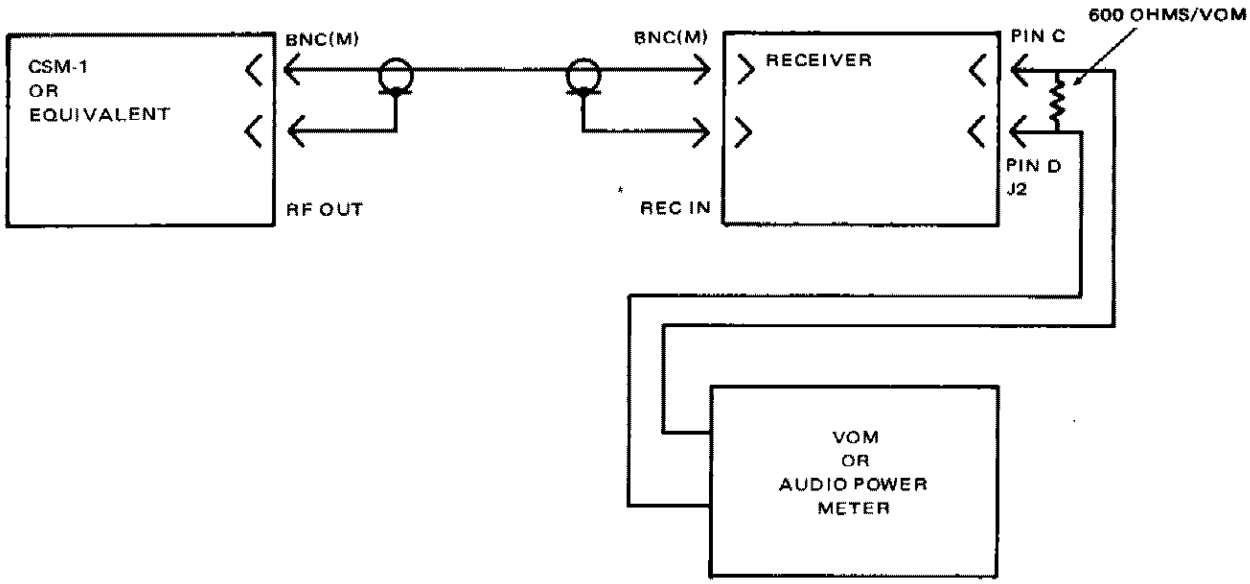


Figure 6-5. Test Setup for Sensitivity

6.7.2 Procedure.- Proceed as follows:

* (1) Connect the output of the CSM-1 to the input jack of receiver as shown in figure 6-5.

(2) Turn on receiver; allow 5 minutes for proper warmup.

(3) Set receiver controls as follows:

AF Gain	Maximum (clockwise)
SQUELCH	Off

(4) Connect test equipment as shown in figure 6-5.

* (5) Set CSM-1 frequency switches to channel frequency.

(6) Set FUNCTION switch to GENERATE position.

(7) Set AMPLITUDE MODULATION switch to ON position and set SWEEP WIDTH (Δf) to OFF.

(8) Set VERT MODE switch to VERT SET position, and set TONE FREQUENCY to 1 kHz.

(9) Adjust VERT POS, FOCUS, INTENSITY, HORIZ POS, and HORIZ GAIN controls to position trace on VERTICAL SET line of graticule. *

(10) Set VERT MODE switch to CARR SET.

(11) Adjust CARRIER LEVEL control to position trace on CARRIER SET line of graticule.

* (12) Set VERT MODE switch to GEN 30% AM.

* (13) This step deleted.

(14) This step deleted.

(15) This step deleted. *

(16) With modulation ON, increase attenuator until receiver output caused by signal voltage exceeds noise level by at least 50 mW.

(17) Adjust antenna trimmer for maximum receiver output.

(18) Set generator attenuator to -98.0 dBm.

(19) Set AF gain control for power output of 90 mW.

* (20) Remove modulation from CSM-1 by putting AMPLITUDE MODULATION switch to OFF position.

(21) Without changing the af gain control, vary CSM-1 output until a power ratio of 10:1 (10 dB) is obtained when modulation is turned on and off. *

(22) The sensitivity of the receiver is the voltage (dBm) level required to obtain a signal-plus-noise (modulation on) to noise alone (modulation off) ratio of 10 (corresponding voltage ratio is 3.16).

(23) If requirements of this procedure cannot be met, consult table 7-2. If requirements are met see 6.8.

6.8 FINAL CHECKOUT.- After a repair or performance procedure has been made, the following procedure should be performed before restoring the equipment to service. Figure 6-6 shows the test setup.

*

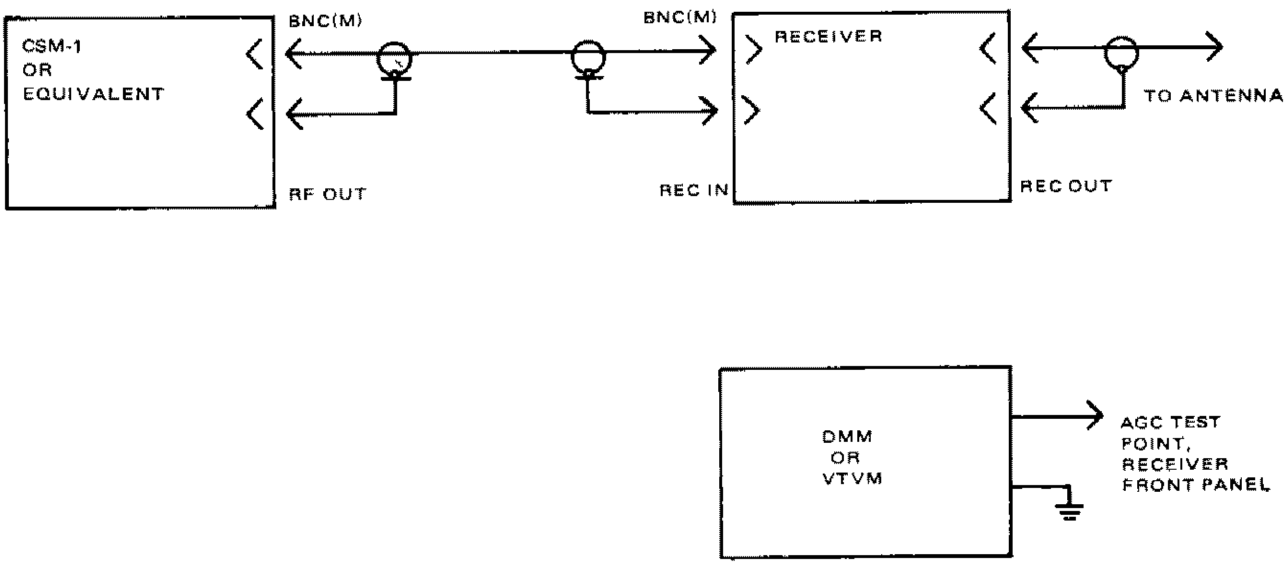


Figure 6-6. Test Setup for Final Checkout

6.8.1 Test Equipment

* CSM-1 communications service monitor or equivalent *

VTVM or DMM

6.8.2 Procedure.- With the receiver antenna connected, insert the VTVM or DMM between the AGC test jack (located behind front panel access door) and ground. Proceed as follows:

(1) Set the af gain control to maximum clockwise position. Using a test signal obtained during an aircraft transmission (or some other source of carrier signal on the receiver channel frequency) adjust the antenna trimmer on the mixer multiplier module behind the front panel door for a maximum reading on the VTVM.

NOTE

Step (2) below requires radiating a carrier signal on an operational channel that could introduce possible interference problems. Special care and advance coordination with air traffic control personnel should be obtained before proceeding. Each period of carrier radiation should be limited to the absolute minimum needed to make the adjustment.

(2) If no transmission signal is available, connect the signal generator to a spare or unused antenna (see figure 6-9). Set the frequency dials to the receiver channel frequency, set output level to -98.0 dBm modulated at 1 kHz, 30% ±10%, and adjust the antenna trimmer for maximum on the VTVM or DMM.

6.9 AUDIO FREQUENCY RESPONSE.- The purpose of this procedure is to determine if the audio frequency response of the receiver is within tolerance (see section 4). Figure 6-7 shows the test setup.

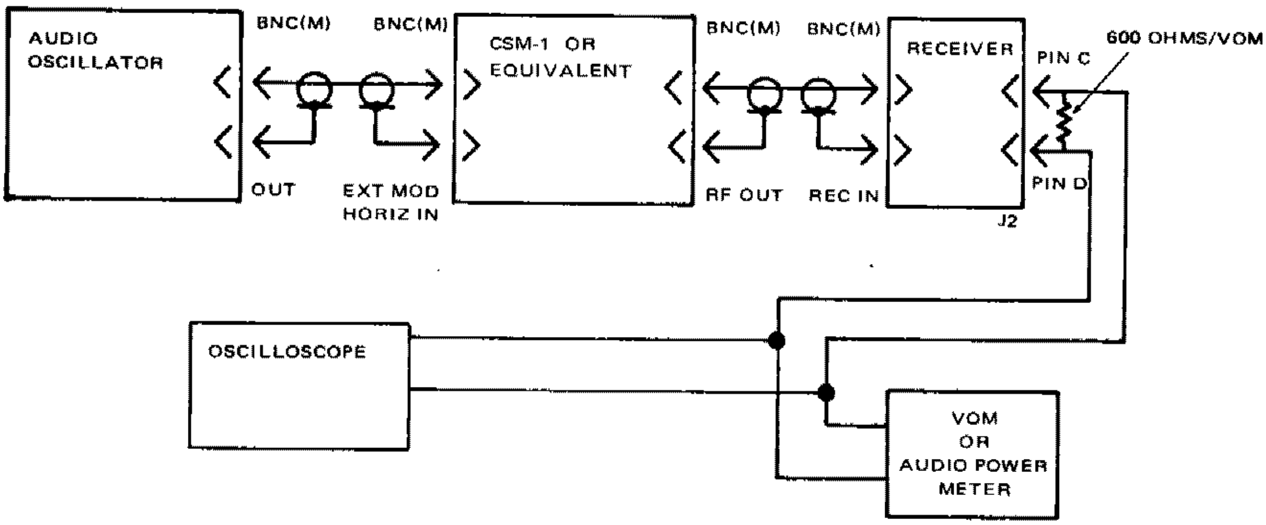
*  *

Figure 6-7. Test Setup for Audio Frequency Response

6.9.1 Test Equipment

* CSM-1 communications service monitor or equivalent *

Audio power meter GR 1840 or equivalent, or VOM with 600-ohm load

Audio oscillator (function generator, Clarke-Hess type 748 or equivalent)

Oscilloscope (Ballentine 1010 or equivalent)

* 6.9.2 Procedure.- Connect external modulating source to the CSM-1 AM INPUT connector. *

(1) Set frequency switches to channel frequency.

* (2) Set FUNCTION switch to GENERATE position.

(3) Set AMPLITUDE MODULATION switch to ON position and set SWEEP WIDTH (Δf) to OFF.

(4) Set VERT MODE switch to VERT SET position.

(5) Adjust VERT POS, FOCUS, INTENSITY, HORIZ POS, and HORIZ GAIN controls to position trace on VERTICAL SET line of graticule. *

(6) Set VERT MODE switch to CARR SET position.

(7) Adjust CARRIER LEVEL control to position trace on CARRIER SET line of graticule.

* (8) Set VERT MODE switch to GEN 30% AM position.

(9) This step deleted.

(10) This step deleted. *

(11) Set level of external modulating source for 30% modulation full scale.

*

> NOTE
>
> External modulating source of 0.6 V rms is required for 30% modulation with TONE LEVEL control at maximum cw. The CSM-1 is externally modulated at the percentage set in step (11) ±10% for any frequency set by the frequency controls of the CSM-1.

(12) Set signal generator output to 50 microvolts (-73 dBm). Verify that the audio oscillator is at 30% modulation at 1000 Hz. *

(13) Set receiver af gain control for an output of 90 mW as indicated on the audio power level indicator.

(14) Adjust the audio oscillator frequency control from 100 Hz to 3000 Hz in 100-Hz steps and record output meter reading for each step (should be within 3 dB from 300 to 3000 Hz and continually * decrease above 3000 Hz and below 300 Hz. Connect scope across VOM or audio power meter, and observe audio trace on scope for distortion. *

(15) If the above requirements cannot be met, consult 7.12.11 and 7.14.10. If requirements are met see 6.11.

6.10 IF AMPLIFIER AND CRYSTAL FILTER BANDPASS.- The purpose of this procedure is to determine bandpass characteristics of the IF amplifier and crystal filter.

6.10.1 Test Equipment

* CSM-1 communications service monitor or equivalent. *

RF voltmeter with 50 ohm probe

Cable, BNC to BNC

Cable, BNC to UG-1465/U

BNC tee connector

* *

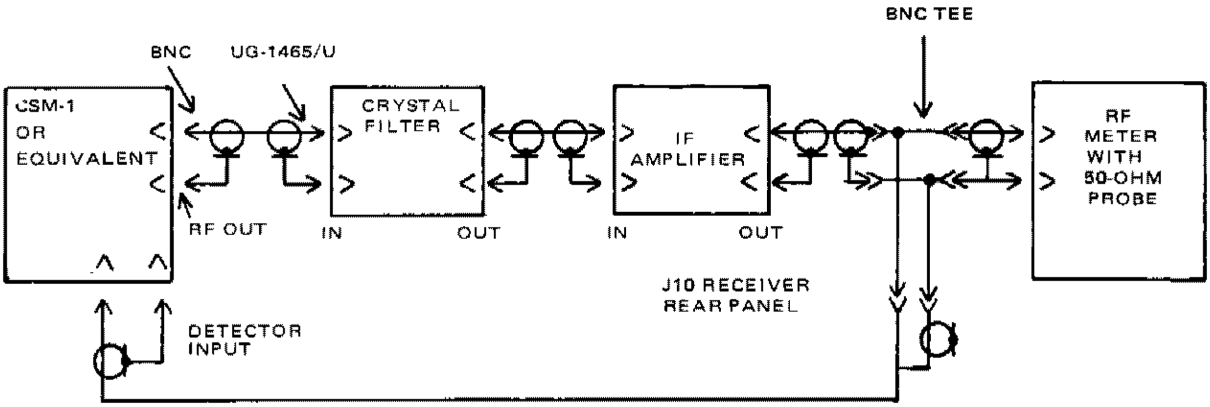


Figure 6-8. Test Setup for IF Amplifier and Crystal Filter

* 6.10.2 Procedure.- Set frequency dials of CSM-1 to 20.6 MHz. Set output level to -98 dB unmodulated.

(1) Set FUNCTION switch to GENERATE position.

(2) Set VERT MODE switch to DETECTOR.

(3) Set SWEEP WIDTH (Δf) control to fully clockwise.

(4) Set AMPLITUDE MODULATION to OFF position and disconnect the input cable to crystal filter.

(5) Vary the VERT POS, FOCUS, INTENSITY, HORIZ POS, and HORIZ GAIN controls to produce a trace on the VERTICAL SET line on the CRT graticule and for full scale deflection in horizontal. *

(6) Connect test equipment as shown in figure 6-8.

* (7) Set the 100 kHz frequency knob in the "V" position and set SWEEP MODE switch to LO position.

(8) Turn SWEEP WIDTH (Δf) control to ON position and adjust the 0-100 Hz control to center the waveform. Adjust the SWEEP RATE, HORIZONTAL SIZE, and VERT POS controls for desired display. Observe waveform for flatness and rolloff. *

* (9) Vary the RF OUTPUT LEVEL switches to obtain the desired display amplitude.

(10) Turn SWEEP WIDTH (Δf) control to OFF position.

(11) Shift the frequency up and down using the 0-100 Hz control while observing the trace position. When it is at the highest position, the frequency switches and 0-100 Hz control will indicate the frequency of the peak response. Record the trace position as reference.

(12) Increase the generator level by 6 dB.

(13) Adjust frequency controls above and below center frequency until line of graticule returns to the peak response reference line. Record both frequencies.

(14) Compute the bandwidth at the 6 dB point by taking the difference between the upper and lower frequencies recorded in step (13). See figures 6-10 and 6-11 and tables 4-1 and 4-2.

(15) Repeat steps 13 and 14 for 60 dB below peak response reference and record bandwidth. See figures 6-10 and 6-11, and tables 4-1 and 4-2.

(16) This completes test. If the above requirements cannot be met check IF amplifier in accordance with 7.14.7; if OK replace filter. Perform tuning procedures 9.5.4 or 9.5.5 and 6.8 before restoring equipment to service. *

6.11 SELECTIVITY.- The purpose of this procedure is to determine the ability of the receiver to reject unwanted signals at the receiver operating frequency. Figure 6-9 shows the test setup. Figures 6-10 and 6-11 show the bandpass characteristic curves for the 50 kHz and 25 kHz filters, respectively. Refer to section 4 for standards and tolerances.

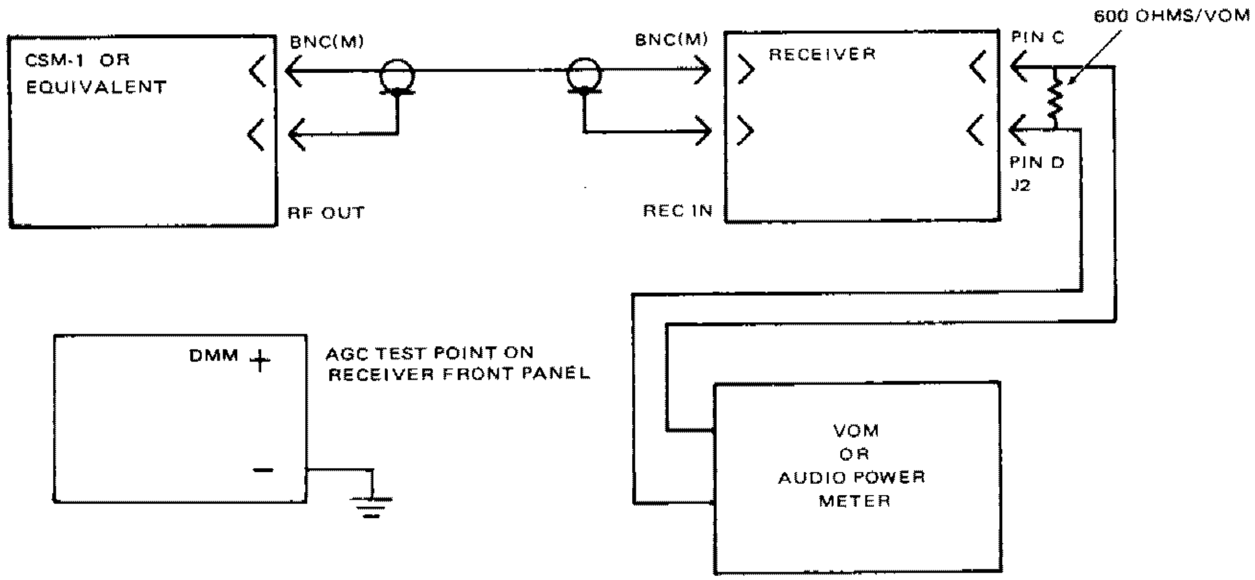
* 

Figure 6-9. Test Setup for Selectivity

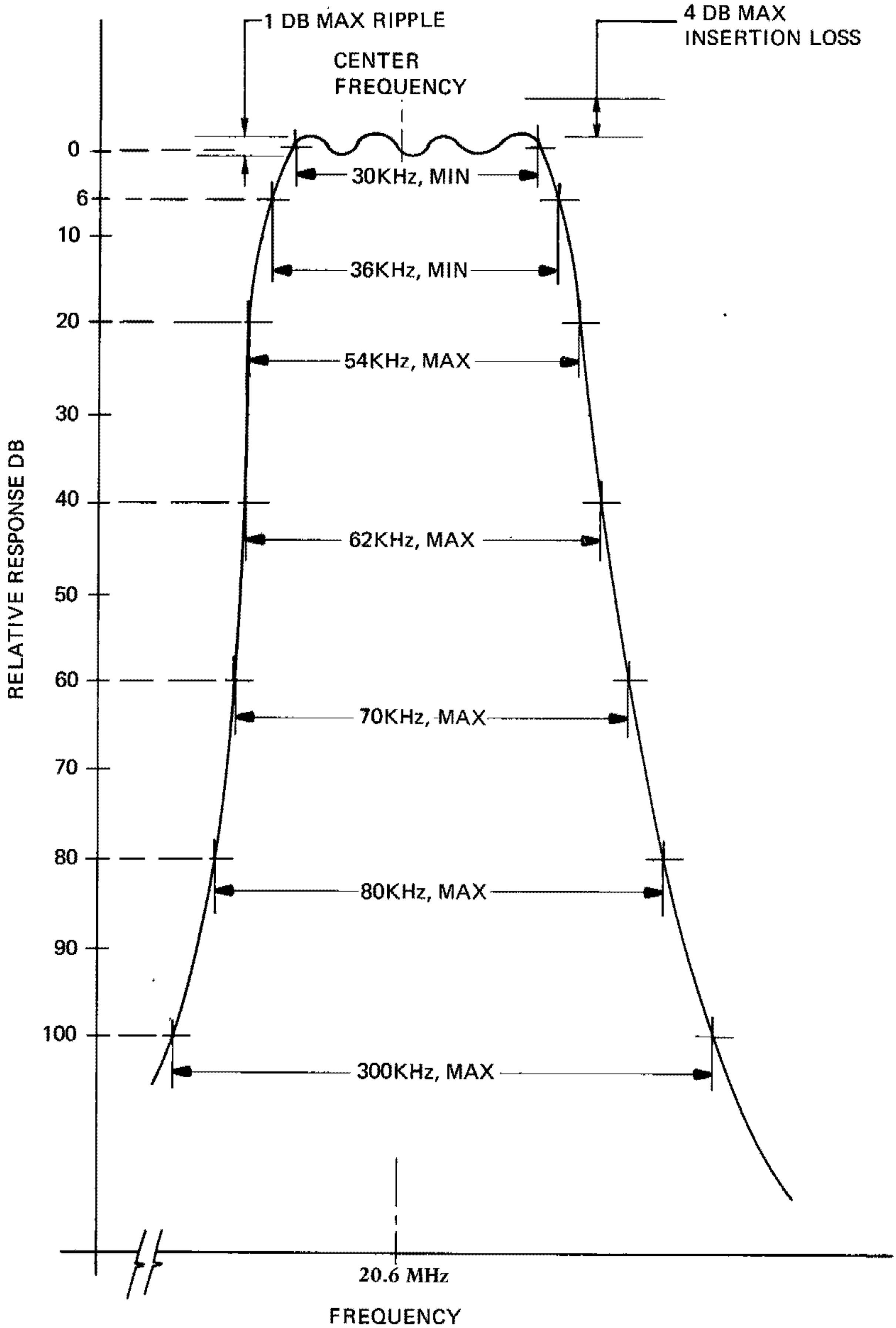


Figure 6-10. Bandpass Characteristics, 50 KHz Filter

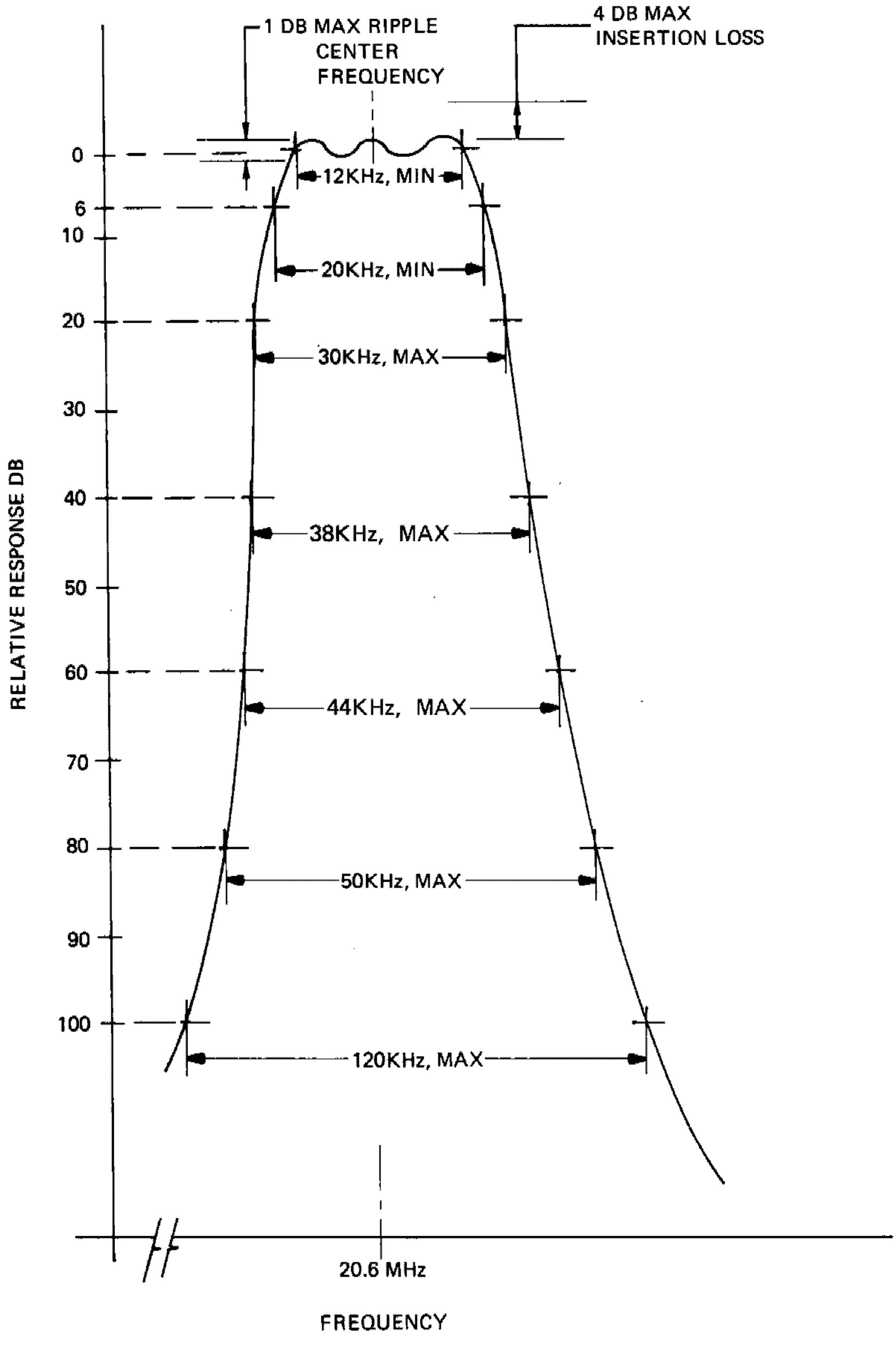


Figure 6-11. Bandpass Characteristics, 25 KHz Filter

6.11.1 Test Equipment

* CSM-1 communications service monitor or equivalent *

Audio power meter or DMM with 600-ohm load

6.11.2 Procedure.- Perform oscillator frequency check in accordance with paragraph 6.4 and proceed as follows:

* (1) With modulation turned off, adjust frequency controls of CSM-1 for exact channel frequency. Connect DMM to AGC test jack on back of front panel door on the 20 volt d.c. scale.

(2) Adjust output level of CSM-1 until agc action just starts as observed on DMM and record the voltage for a reference level for the following steps. Note the dB level obtained on CSM-1 *

NOTE
Do not drive agc above 6 volts for this measurement.

(3) Increase output of signal generator from the value obtained in step (2) above by 6 dB.

(4) Tune signal generator above channel frequency by switching the 10 kHz control one division at a time until agc reference voltage found in step (2) is obtained. (When searching for reference level agc voltage, always use small frequency increments.)

(5) Tune signal generator below channel frequency by changing the 100 kHz control one division down and increasing the 10 kHz control to the 9 position. From this point decrease the frequency in small increments until the agc reference voltage found in step (2) is obtained. Record this frequency.

* (6) Compute the bandwidth at the 6 dB point by taking the difference of the two frequencies obtained in steps (4) and (5). (See tables 1-1, 4-1, and 4-2, and Figures 6-10 and 6-11.) *

(7) Increase output of the generator from the value found in step (2) by 60 dB.

(8) Repeat step (5) and record frequency.

(9) Repeat step (6) and record frequency.

* (10) Compute the bandwidth at 60 dB point by taking the difference of the two frequencies obtained in steps (8) and (9). (See tables 1-1, 4-1, and 4-2, and Figures 6-10 and 6-11) *

NOTE

Crystal frequency must be within tolerance (0.001%) to compute non-symmetry at 60 dB point. Particular combinations of receiver bandwidth and measurement frequency may present difficulty in reaching the reference level in step (10) due to generator and/or receiver spurious responses. If this is suspected, the measurement may be facilitated by switching the 100 kHz decade switch to V and using the 0-100 Hz dial in the continuously variable "search" mode (spurious output is reduced when the 100 kHz decade is in the V position). Once the approximate tuning point has been found, successively move the V to the right until it is in the 100 Hz decade. If the 60 dB point still cannot be reached by tuning carefully down the steep skirt of the selectivity curve (see figures 6-10 and 6-11) as described then it may be necessary to perform the measurement at -50 dB or -40 dB and record it as such.

(11) Compute the non-symmetry at the 60-dB point.

% Non-symmetry = $(\Delta f_1/\Delta f_2) - 1 \times 100$

Where Δf_1 = difference between channel frequency and the frequency below channel frequency at which 60-dB attenuation occurs.

Δf_2 = difference between channel frequency and the frequency above channel frequency at which 60-dB attenuation occurs.

If Δf_2 is larger than Δf_1 use:

% Non-symmetry = $(\Delta f_2/\Delta f_1) - 1 \times 100$

NOTE

Symmetry tolerance as measured by this procedure is primarily determined by the receiver crystal oscillator frequency. Therefore, the crystal must be measured and be within tolerance to obtain a within-tolerance symmetry reading.

(12) If the above requirements cannot be obtained, consult section 9 for tuning and alignment procedures. See section 7 for fault indications. If requirements are met see 6.8.

SECTION 7

CORRECTIVE MAINTENANCE

7.1 INTRODUCTION.- This section contains information and step-by-step instructions to effectively diagnose, troubleshoot, and isolate malfunctions in the receiver. Detailed instructions are given for isolating faults to the module level, then to the stage or circuit level, and finally to a component or group of components.

7.2 TEST EQUIPMENT.- Table 7-1 contains a listing of all maintenance test equipment required to ensure optimum maintenance of the receivers.

Table 7-1. Test Equipment Required

Item	Maker/part number	Quantity
* Communications service monitor	Singer CSM-1 or equivalent	1 *
Digital multimeter	Fluke 8000A or equivalent	2
VOM	Triplett 801 or equivalent	1
Function generator (audio oscillator)	Clarke-Hess 748 or equivalent	1
Oscilloscope	Ballantine 1010 or equivalent	1
Audio power output meter	GR 1840B or equivalent	1
* Signal generator	Hewlett-Packard 608E or 8640B or equivalent	1 *
*RF meter with 50 ohm probe	Boonton 91C or equivalent	1
*Vector impedance meter	HP 4815A or equivalent	1
Extension cable set	ITT 8004810G1 or equivalent	1
600 ohm dummy load (5 W)		1
50 ohm dummy load (50 W)		1
10 dB RF attenuator (50 ohms)		1
* Adapter, BNC (male) to SMC (male)	NSN 5935-00-229-3593	2
Adapter, BNC (male) to SMC (female)	NSN 5935-00-865-0679	2
Adapter, BNC (male) to SMC (female)	NSN 5935-00-909-6169	2
Adapter, BNC (male) to SMC (male)	NSN 5935-00-920-6183	2 *
600 ohm headset	NT49985A or equivalent	1
Plug	PL55	1
Battery, storage, lead-acid, 24 V		1
* Crystal, quartz	See appendix B.	1 *

*If available at site

PRECAUTIONARY NOTICE

SEMICONDUCTOR DEVICES/INTEGRATED CIRCUITS

This equipment contains semiconductors and integrated circuits. These components are reliable but require care in handling. Their destruction can occur in a small fraction of a second. Observe the following precautions before attempting to service.

AVOID ELECTRICAL TRANSIENTS

Never unsolder or remove devices from their sockets without first deenergizing sources of voltage.

Never reverse polarity, even momentarily; this also applies to ohmmeter testing on high ranges.

Always observe manufacturer's input/output limitations when testing.

Be careful when using an ohmmeter for signal tracing or testing; ohmmeters typically produce relatively high currents on low ranges and high voltages on high ranges.

When installing insulated gate field effect transistors, keep their safety wires in place, if so equipped, and ground the soldering iron tip to chassis if possible.

AVOID ACCIDENTALLY GROUNDING HEAT SINKS

Heat sinks are often not at chassis potential.

AVOID PROLONGED HEATING OF SEMICONDUCTOR DEVICE LEADS

Heat-sink leads with needle nose pliers, if possible, during soldering operations, and complete soldering within a few seconds.

WHEN REPLACING COMPONENTS, REMOVE SOLDER FROM PCB PADS WITH SUCTION DEVICE WHEN POSSIBLE; ALTERNATIVELY, WITH WICKING.

WARNING

Heat sinks are often at above-chassis-ground potential, hence precautions should be taken to avoid shock and possible short circuits. Do not introduce obstructions to air flow in the vicinity of heat sinks; loss of cooling capacity can result in overheating with resultant failure of semiconductor devices mounted on the heat sink. Never remove or insert any pcb or module with system power on.

7.3 FAULT DIAGNOSIS.- The following preliminary steps should be taken before any attempt at actual fault diagnosis is made.

a. Make a thorough visual check for loose or broken connections, dirt, corrosion, and mechanical defects.

> **NOTE**
>
> No adjustments should be made with undiagnosed faults present in the receiver.

b. Plug headset into AUDIO OUTPUT. Listen to an aircraft call and compare quality of audio reception with that of a good receiver. (It may be necessary to check receiver main output to confirm.)

c. Confirm if possible that the reported fault actually exists (see table 7-2). Consult table 6-1 for normal meter readings.

d. For probable cause based on abnormal readings obtained, consult table 7-3.

e. When a module is suspected of being faulty on the basis of one test point reading, verify all other related test point readings which would support that conclusion.

Table 7-2. Receiver Fault Isolation Indications

Symptom	Probable cause/reference paragraph
* No signal, only background noise	Oscillator multiplier (7.14.3) or mixer/multiplier (7.14.6)
Degraded sensitivity, medium background noise	IF amplifier (7.14.8)
Degraded sensitivity, low background noise	IF amplifier (7.14.8) or agc/squelch (7.14.9)
No signal, no noise	Power supply (7.14.11), audio amplifier (7.14.10), or agc/squelch (7.14.9)
Distorted audio	Audio amplifier (7.14.10), agc/squelch (7.14.9), or IF amplifier (7.14.8)
A.C. hum in audio	Power supply (7.14.11)
Excessively high audio, with distortion	AGC/squelch (7.14.9) or audio amplifier (7.14.10)
No main af output (phone)	Audio amplifier (7.14.10) or agc/squelch (7.14.9)
No phone audio output; main af output OK	Audio amplifier (7.14.10) or agc/squelch (7.14.9)
* Receiver off frequency; LO OK	Crystal (7.14.4, 7.14.5)
Receiver off frequency; LO low	Oscillator multiplier (7.14.4, 7.14.5)
Receiver off frequency; LO OK	Oscillator multiplier (7.14.4, 7.14.5)

Table 7-3. Abnormal Test Point Indications

Reg B+	AGC	Squelch	IF	LO	Mult	Mixer Out	Noise Lim	AF Preamp	Main AF	Head-phones	Probable cause/ reference paragraph
Low											Power supply (7.14.11)
High											Power supply (7.14.11)
* OK	Low			Low							Local oscilator (7.14.4, 7.14.5) *
OK	Low			OK	Low						Mixer/multiplier (7.14.6)
OK	Low				OK	Low					Mixer/multiplier (7.14.6)
OK	Low				OK	High	Low				
OK	Low		OK		OK	High	High	Low			IF (7.14.8)
OK	Low		Low		OK	High	High	Low			IF (7.14.8)
OK	Low		High		OK	High	High	High		Distortion	AGC/squelch (7.14.9)
OK	High		Low		OK			Low			AGC/squelch (7.14.9)
OK	OK	Low			OK			Low			AGC/squelch (7.14.9)
OK	OK	OK	OK		OK			Low			AGC/squelch (7.14.9)
OK	OK				OK			OK	Low		Audio amplifier (7.14.10)
OK	OK				OK				OK	Hum	Power supply (7.14.11)

7.4 POWER SUPPLY.- When fault diagnosis indicates that a fault exists in the power supply module, and replacement of the module or the correction of the problem as determined by the satisfactory operation by the performance test of 7.14.10 does not correct the fault, refer to table 7-4.

7.5 RF CIRCUITS.- When fault diagnosis indicates a loss of sensitivity in the mixer/multiplier module (abnormally low test point readings of the mixer output), the LO injection into the mixer is normal (normal MULT test point reading), and replacement of the mixer multiplier modules or elimination of problems in the unit does not correct the condition, refer to table 7-5.

7.6 BUFFER AMPLIFIER.- When initial fault diagnosis indicates that a fault exists in the buffer amplifier (high MIXER OUT test point readings) and replacement of the module does not correct the fault, the fault may be a shorted signal path in a component following the buffer amplifier. Disconnect the coaxial cable at the output of the buffer amplifier. If the test point now indicates a reading equal to or somewhat higher than its normal value for agc disabled conditions, reconnect the coaxial cable; refer to table 7-6.

7.7 IF AND CRYSTAL FILTER.- When fault diagnosis indicates that a fault exists in the IF amplifier module involving sensitivity, and module replacement does not correct the fault, refer to table 7-7.

7.8 AGC.- When fault diagnosis indicates that the agc is very low and not responsive to high signal levels, with excessively high test point readings at MIXER OUT and NOISE LIM together with receiver overload and distorted audio, and replacement of the agc/squelch module does not correct the fault, the fault may be a shorted agc bus in an external module. Replace the IF amplifier module or correct trouble in that unit. If this does not correct the faulty condition replace the mixer/multiplier module. If this does not correct the condition, check for a possible agc bus wire short. If agc voltage, as read at the AGC test point, is abnormally high but other test point readings indicate excessive signal, overload and distortion, the fault may be an open agc bus wire to the IF amplifier and/or mixer/multiplier module.

7.9 AUDIO CIRCUITS.- Most of the probable faults in the audio system will be in the af amplifier, or the agc/squelch modules. This includes loss or degradation of audio in either main or phone outputs, or excessive audio together with distortion or high audio levels due to a fault in the audio compression circuits. If replacement of the module or elimination of trouble in that unit indicated as the most probable cause does not correct the fault, replace the other module. If the fault is still present, refer to paragraph 7.11.

7.10 WIDE-BAND DATA OUTPUT AND IF OUTPUT FUNCTIONS.- Failures of the wide-band data output and IF output functions of the receiver (when all other receiver functions are normal) are caused only by the IF amplifier or external wiring.

7.11 INTERCONNECTING WIRING.- The failures contributed by broken or shorted wires are negligible. However, if fault diagnosis by means of the procedures in the preceding paragraphs is not successful, and a discontinuity or short in chassis wiring is suspected, disconnect the affected modules as required, and make the necessary continuity and short tests, utilizing the applicable circuit diagrams.

Table 7-4. Power Supply Fault Analysis

Type Operation	REG B+	UNREG B+	Power ON light	Blown-fuse light	A.C. voltage at fuses	A.C. line voltage on input cable	Battery voltage	Battery terminal voltage	Probable cause
A.C. only	Low	Low	On	Off	Low				Low A.C. line voltage
A.C. only	Low	Low	Off	Off	Low				Low A.C. line voltage
A.C. only	Zero	Zero	Off	On					A.C. line fuse (1)
A.C. only	Zero	Zero	Off	Off	OK (2)				Power ON-OFF switch or Power supply
A.C. only	Zero	Zero	Off	Off	Zero	OK (3)			A.C. line filter
* A.C. only	OK	OK	On					Low (4)	Power supply (5)
Battery only	Zero	Zero	Off			OK (6)			Power ON-OFF switch
Battery only	Zero	Zero	Off			Zero		OK (4)	D.C. line filter
Battery only	Low	Low	On			Low			Low battery voltage
A.C. and Battery	Low	Low	On		Low	Low			Both inputs low (5)
A.C. or Battery	Zero	OK	Off						Short on REG B+ distribution bus in some module, (7) *

NOTES:

(1) If a fuse is blown it is likely that the power supply module which was in use has an internal fault.

(2) A.C. line voltage may be measured at the fuseholder with caps and fuse removed; however, if other equipments in the installation are served by the same a.c. line and the basic line voltage is known to be correct, a quick check for the presence of a.c. voltage may be made by removing the fuse and reinstalling the fuse cap. Its indicating light will illuminate if a.c. voltage is present and the other fuse is intact.

(3) Measured on a.c. input cable disconnected from rear of chassis.

Table 7-4. Power Supply Fault Analysis (cont.)

NOTES (con.)

(4) Measured on battery terminals of main cable disconnected from rear of chassis.

*

*

(6) Measured on battery input filter at inside rear of chassis.

(7) With a short on BEG B+ distribution line in some external module, power supply goes into "over-current protection" mode and will remain there indefinitely until short is cleared and regulator is reset by turning power off for approximately 20 seconds then turning power on. Disconnect modules, one at a time, with power off at least 20 seconds, until the short is cleared and REG B+ returns to normal. Replace the faulty module.

Table 7-5. RF Circuits Fault Analysis

Step	Procedure	Coaxial adapter required	Mixer output test point reading (1)	Further diagnosis required	Probable cause
1	Bypass the antenna jack and the front-panel coaxial link by connecting antenna or signal directly to the receiver input on front panel.	Type N to type BNC	OK	None	Antenna jack, or cable from antenna jack to coax link, or coax link
			Low	Proceed to step 2	
2	Bypass the antenna coupler by connecting antenna or signal source directly to tunable filter input.	Type N to UG-1464/U	OK	None	Antenna coupler, or cable from front panel to antenna coupler
			Low	Proceed to step 3	
3	Bypass the tunable filter by connecting antenna or signal source directly to mixer RF input.	Type N to UG-1464/U	High (2)	None	Tunable filter
			Low	See par. 7.11	

Table 7-5. RF Circuits Fault Analysis (con.)

Notes:

(1) Mixer output test point reading approximates the value given in table 6-1 with signal source slightly off frequency, thereby disabling age.

(2) The tunable filter normally has approximately 5 dB insertion loss at its center frequency. Bypassing the tunable filter in a normal receiver will result in a higher-than-normal reading at the mixer output test point. See 7.14.2

Table 7-6. Buffer Amplifier Output Fault Analysis

Step	Procedure	Test point readings	Further diagnosis required	Probable cause
1	Set signal input at 0 dBm at receiver input connector; all signal path connections made; set signal generator frequency slightly off channel to disable agc.	Mixer high; buffer amplifier low	Proceed to step 2	
2	Disconnect signal cable input of IF amplifier	All normal for this condition	None	IF amplifier (see 7.14.8)
		Unchanged	Proceed to step 3	
3	Disconnect crystal filter output cable.	All nonnal for this condition	None	Cable
		Unchanged	Proceed to step 4	
4	Disconnect crystal filter input cable.	All normal for this condition	None	Crystal filter (7.14.8)
		Unchanged	Proceed to step 5	
5	Disconnect cable from output of buffer amplifier module	All normal for this condition	None	Cable

Table 7-7. IF and Crystal Fault Analysis

Step	Procedure	Test point readings	Further diagnosis required	Probable cause
1	Set signal at 0 dBm at receiver input connector; receiver in normal configuration	AGC less then 9.0 volts, with IF gain low or normal	Proceed to step 2	
2	Bypass the crystal filter with another crystal filter	All normal	None	Crystal filter (see 7.14.12)
		Unchanged	Proceed to step 3	
3	Bypass crystal filter by connecting the output of the buffer amplifier directly to the input of the IF amplifier	All normal	None	Coaxial cable between buffer amplifier and crystal filter, or between crystal filter and IF amplifier
		Unchanged	See par. 7.12	

*

7.12 MODULE REMOVAL AND REPLACEMENT.- See figure 7-1.

*

> **NOTE**
> The power indicator light indicates the presence of regulated +20 V d.c. only. Observe that POWER ON-OFF switch is in the OFF position and disconnect a.c. and/or d.c. power connectors at rear of chassis.

*

7.12.1 Top Cover.- To remove the top cover from the receiver, loosen the six captive 6-32 flathead Phillips head retaining screws. Replacement is the reverse of removal. Push top edges of cover down to avoid RF interference.

> **CAUTION**
>
> When disconnecting and reconnecting coaxial cables to modules, use two 1/4-inch open-end wrenches. Do not apply excessive pressure to connectors when reconnecting to module.

7.12.2 Tunable Filter (UHF, 8004242G1) (VHF, 8004243G1).- To remove the tunable filter from the receiver disconnect the two cables using two 1/4-inch open-end wrenches. Loosen the captive 6-32 Phillips head screw holding the filter to the bottom of chassis and the two 8-32 Phillips head screws from the right side panel. The tunable filter module can then be lifted directly upward. Replacement is the reverse of removal.

7.12.3 Antenna Coupler (UHF, 8004747G1) (VHF, 8004503G1).- The antenna coupler is mounted to the inside of the receiver rear apron. To remove it from the receiver, disconnect the coaxial cable or terminator from the type N connector of the antenna coupler which extends through the receiver rear apron toward the back. Disconnect the one cable from the tunable filter and the remaining cable from the antenna coupler, using two 1/4-inch open-end wrenches. Loosen the four 4-40 pan head Phillips head mounting screws holding the antenna coupler to the rear panel. Loosen one captive 8-32 Phillips head screw at the right end of the IF amplifier module, slide to the right, and lift out antenna coupler. Replacement is the reverse of removal.

7.12.4 Mixer/Multiplier and Local Oscillator.- The mixer/multiplier module is mounted to the top of the local oscillator and can be removed alone. The local oscillator cannot be removed alone, however, without first removing the mixer/multiplier module. The two modules may also be removed together as a unit from the chassis. To remove the mixer/multiplier module disconnect the three coaxial cables, using two 1/4-inch open-end wrenches, and the connector at J7 by loosening the two captive 4-40 screws on the plug. Loosen the two 8-32 captive Phillips head screws at the ends of the module, that hold it down to the module beneath. Replacement is the reverse of removal.

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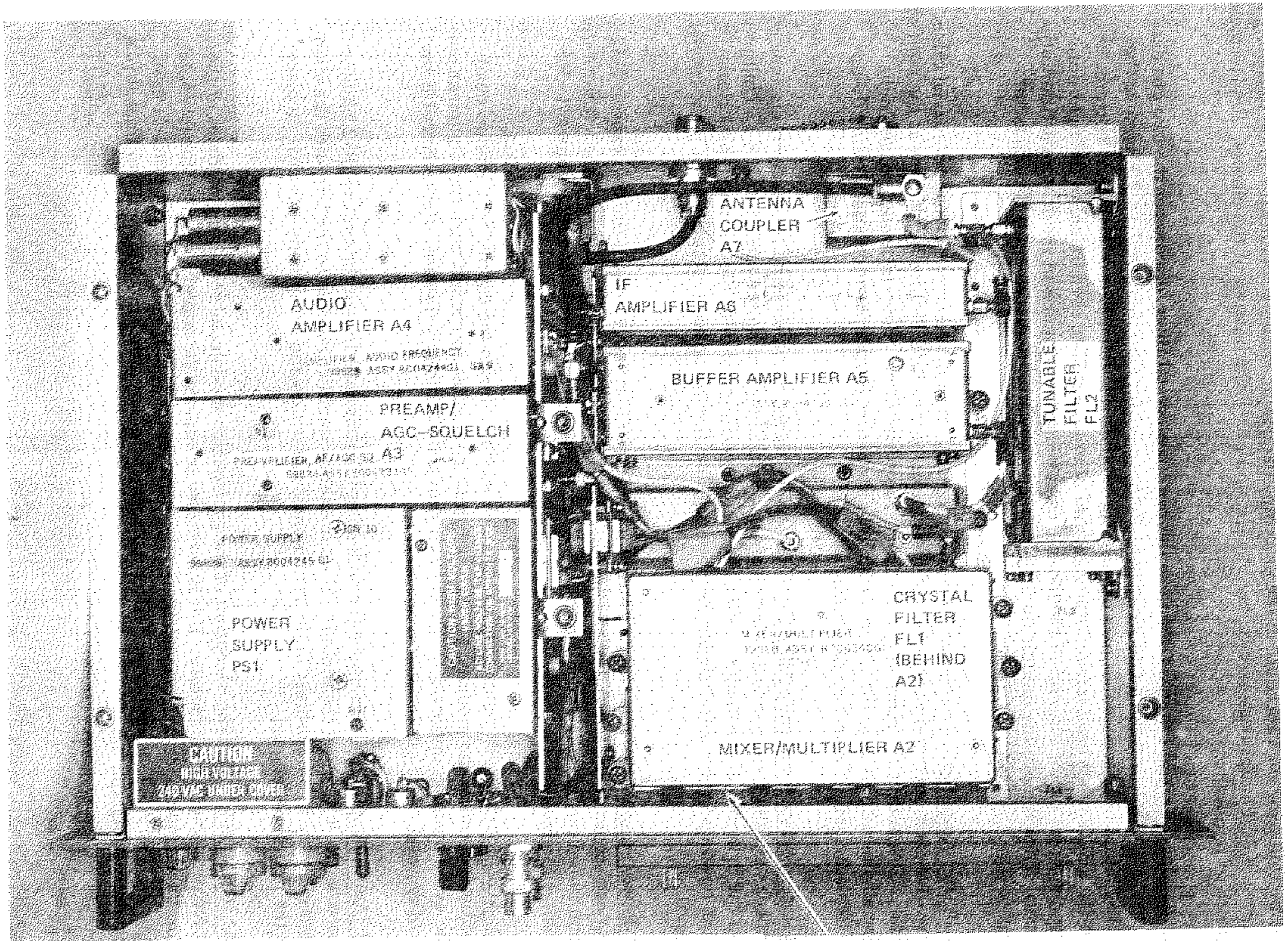


Figure 7-1. Module Location and Identification

7.12.5 Local Oscillator.- To remove the local oscillator from the receiver, remove the mixer/multiplier module by following the procedure in the preceding paragraph. Remove connector J6 by loosening the four captive 8-32 Phillips head screws, holding the module to the bottom of the chassis. Replacement is the reverse of removal.

7.12.6 Bandpass Crystal Filter.- To remove the bandpass crystal filter, disconnect the two coaxial cables, using two 1/4-inch open-end wrenches. Remove buffer amplifier per 7.12.7. Remove the four 6-32 Phillips head screws that pass through the module side flanges into the chassis bottom. Loosen the 8-32 Phillips head screw at the right end of module. Slide the module to the right until the alignment pins on the left end of the module clear the nylon bushings in the center partition of the chassis. Then remove the module by lifting directly upward. Replacement is the reverse of removal.

7.12.7 Buffer Amplifier.- To remove the buffer amplifier from the receiver, disconnect coaxial cable, using two 1/4-inch open-end wrenches, and loosen one captive 8-32 Phillips head screw at the right end of module. Disconnect the remaining cable from the crystal filter. Slide the module to the right until the alignment pins clear the nylon bushings in the center chassis partition and lift directly upward. Replacement is the reverse of removal.

7.12.8 Intermediate Frequency Amplifier.- To remove the IF amplifier from the receiver, disconnect the two coaxial cables, using two 1/4-inch open-end wrenches, and loosen one captive 8-32 Phillips head screw at the right end of the module. Slide the module to the right until the alignment pins clear the nylon bushings in the center chassis partition and lift directly upward. Replacement is the reverse of removal.

7.12.9 Power Supply.- To remove the power supply from the receiver, loosen the two captive 8-32 Phillips head screws at the left end of the module. Slide the power supply module to the left until the alignment pins clear the nylon bushings in the center chassis partition and lift directly upward. Replacement is the reverse of removal.

7.12.10 AGC/Squelch.- To remove the agc/squelch module, loosen the captive 6-32 Phillips head screw at the left end of the module. Slide the agc/squelch module to the left until the alignment pins clear the nylon bushings in the center chassis partition and lift directly upward. Replacement is the reverse of removal.

7.12.11 Audio Amplifier.- To remove the audio amplifier module, loosen the captive 8-32 Phillips head screw at the left end of the module. Slide the audio amplifier module to the left until the alignment pins clear the nylon bushings in the center chassis partition and lift directly upward. Replacement is the reverse of removal.

7.13. ALIGNMENT.- With the exception of the agc/squelch module, all remaining modules of the receiver are prealigned at the factory. If it is necessary to replace the antenna coupler, tunable filter, oscillator, mixer/multiplier, or agc/squelch modules perform the tuning and checkout procedures of paragraph 9.5.5 or 9.5.4, as applicable. After replacement of any other module, perform final checkout procedure, paragraph 6.8.

7.14 DIAGNOSTIC MAINTENANCE.- The following procedures enable the technician to test, align, or troubleshoot individual modules through the use of extension test cable assemblies. They are to be used in conjunction with the test point and measurement point locations that are entered on the schematic diagrams (see section 11), of the applicable modules to facilitate troubleshooting to the component level. The test cable assembly allows the technician to inject input signals to the individual module and measure the required output level, using the unit operating voltages when possible. After repair, replacement, or alignment of any module, an overall performance check of the receiver should be made in accordance with 6.8 before restoring the receiver to service.

7.14.1 Antenna Coupler A7 Performance Test.- Figure 7-2 shows the test setup.

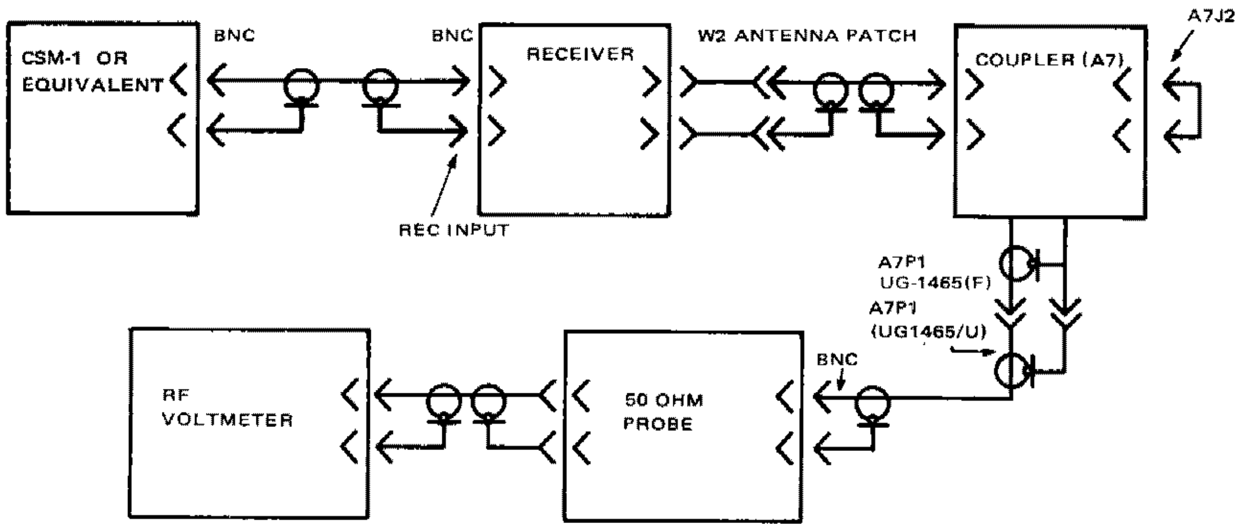


Figure 7-2. Test Setup for Antenna Coupler A7

7.14.1.1 Test Equipment

* CSM-1 communications service monitor or equivalent *
RF voltmeter with 50-ohm probe
Quick-disconnect type N shorting connector (A7J2 shorting cap)
Test cables, BNC (male) to UG-1468/U

7.14.1.2 Procedure (VHF).- Connect equipment as shown in figure 7-2 and proceed as follows:

* (1) Set frequency of CSM-1 at 116 MHz.

(2) Connect output of CSM-1 to RF voltmeter. *

(3) Set output of signal generator at 0 dBm. Observe reading on RF meter and record as a reference level.

* (4) Remove CSM-1 from RF meter and connect to RECEIVER INPUT connector on front panel.

(5) Disconnect A7P1 from tunable filter and connect to RF voltmeter. *

(6) Connect shorting connector to auxiliary output of coupler (A7J2).

(7) Read and record insertion loss from RF meter (1.0 dB max).

(8) Repeat steps (1) through (7) for 130 MHz (1.0 dB max).

(9) Repeat steps (1) through (7) for 150 MHz (1.0 dB max).

(10) Remove shorting plug from auxiliary output.

(11) Read and record loss from RF meter (10 dB min).

(12) Reconnect shorting connector to auxiliary output. Disconnect RF meter. Reconnect A7P1 to to tunable filter.

(13) This completes the test; remove all connections to antenna coupler. If the above requirements cannot be met, replace the antenna coupler. Perform procedure 6.8 before restoring equipment to service.

<u>7.14.1.3 Procedure (UHF)</u>.- Connect test equipment as shown in figure 7-2 and proceed as follows:

* (1) Set frequency of CSM-1 to 225 MHz.

(2) Connect output of CSM-1 to RF voltmeter.

(3) Set output of CSM-1 at 0 dBm. Observe reading on RF meter and record as a reference level.

(4) Remove output of CSM-1 from RF voltmeter and connect to RECEIVER INPUT connector on front panel. *

(5) Disconnect A7P1 from tunable filter and connect to RF voltmeter.

(6) Connect shorting connector to auxiliary output of coupler (A7J2).

(7) Read and record insertion loss from RF meter (1.0 dB max).

(8) Repeat steps (1) through (7) for 300 MHz (1.0 dB max).

(9) Repeat steps (1) through (7) for 400 MHz (1.0 dB max).

(10) Remove shorting connector from auxiliary output.

(11) Read and record loss from RF meter (7 dB min).

(12) Reconnect shorting connector to auxiliary output. Disconnect RF meter. Reconnect A7P1 to tunable filter.

(13) This completes the test; remove all connections from antenna coupler. If above requirements cannot be met, replace coupler. Perform procedure described in 6.8 before restoring equipment to service.

7.14.2 Tunable Filter FL2 Frequency Response Check.- Figure 7-3 shows the test setup.

*

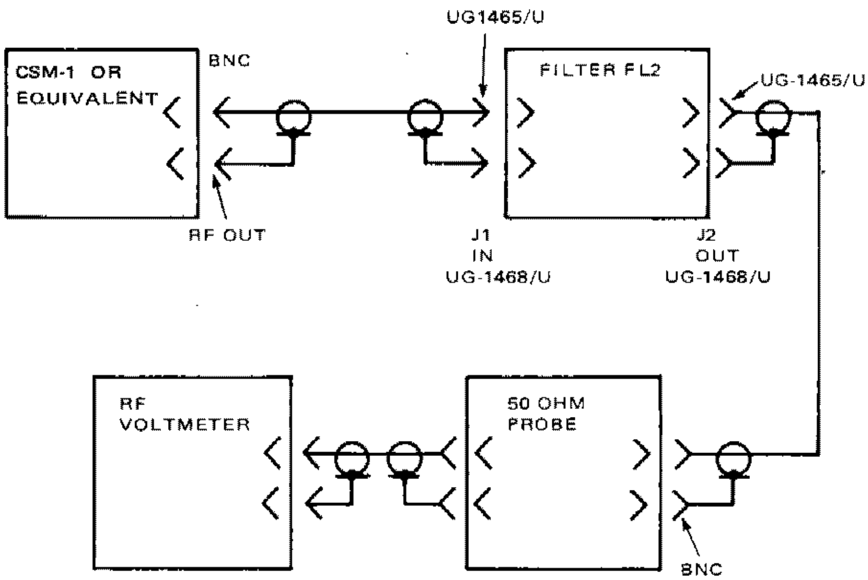


Figure 7-3. Test Setup for Tunable Filter FL2

7.14.2.1 Test Equipment

* CSM-1 communications service monitor or equivalent
RF voltmeter with 50-ohm probe
Test cables, BNC (male) to UG-1465/U (2).

7.14.2.2 Procedure (VHF).- Connect test equipment as shown in figure 7-3 and proceed as follows:

NOTE
For each freuqency change, the output amplitude of the generator should be held constant.

(1) Set frequency of generator at 117 MHz.

(2) Connect output of generator to RF meter. Set output level to obtain reading on the RF meter .03V scale (-40 dB). Record reading.

(3) Remove output of generator from RF meter; connect to input filter.

(4) Connect RF voltmeter to output of filter.

(5) Tune filter for maximum output on RF meter. Record insertion loss (6 dB max).

(6) Increase the frequency of generator until RF meter reads -49 dB. Record reading (117.6 MHz max).

(7) Decrease the frequency of generator until RF meter reads -49 dB. Record the frequency reading (116.4 MHz min). The bandwidth is the difference between frequencies recorded in steps (6) and (7), and should be 1.2 MHz maximum.

(8) Increase the frequency of generator until RF meter reads -70 dB. Record reading (118.6 MHz max).

(9) Decrease frequency of generator until RF meter reads -70 dB. Record reading (115.4 min). The bandwidth is the difference between frequencies recorded in steps (8) and (9) and should be 3.2 MHz maximum.

(10) Set generator at 120 MHz; repeat steps (2) through (9). The results should indicate the same bandwidth characteristics.

(11) Set generator at 150 MHz. Repeat steps (2) through (9). The results should indicate the same bandwidth characteristics.

(12) This completes test. Remove all connections to filter and retune filter to operating frequency. If above requirements cannot be met, replace filter (non-reparable). Perform procedure 6.8 before restoring equipment to service.

7.14.2.3 Procedure (UHF).- Connect test equipment as shown in figure 7-3 and proceed as follows:

NOTE
For each frequency change the output amplitude of the generator should be held constant.

(1) Set frequency of generator at 225 MHz.

(2) Connect generator output to RF voltmeter. Set output level to obtain reading on RF meter .03V scale (-40 dB).

(3) Remove output of generator from RF meter; connect to input filter.

(4) Connect RF voltmeter to output of filter.

(5) Tune filter for maximum output on RF meter. Record insertion loss (7 dB max).

(6) Increase the frequency of generator until RF meter reads -50 dB. Record reading (226.5 MHz max).

(7) Decrease the frequency of generator until RF meter reads -50 dB. Record reading (223.5 MHz min). The bandwidth is the difference between frequencies recorded in steps (6) and (7), and should be 3.0 MHz maximum.

(8) Increase frequency of generator until RF meter reads -70 dB. Record reading (228.5 MHz max).

(9) Decrease the frequency of generator until RF meter reads -70 dB (221.5 MHz min). The bandwidth is the difference between frequencies recorded in steps (8) and (9) and should be 7 MHz maximum.

(10) Set generator to 300 MHz; repeat steps (2) through (9). The results should indicate the same bandwidth characteristics.

(11) Set generator to 400 MHz; repeat steps (2) through (9). The results should indicate the same bandwidth characteristics.

(12) This completes test. Remove all connections to filter and retune filter to operating frequency. If above requirements cannot be met, replace filter (non-reparable). Perform procedure described in 6.8 before restoring equipment to service.

* 7.14.3 Crystal Oscillator A1 Alignment. This paragraph deleted.

This figure deleted.

Figure 7-4. Test Setup for Crystal Oscillator A1

7.14.4 Oscillator-Multiplier A1(M) Alignment.- Figure 7-5 shows the test setup. See figures 10-3 and 11-15 for test point and measuring point locations. *

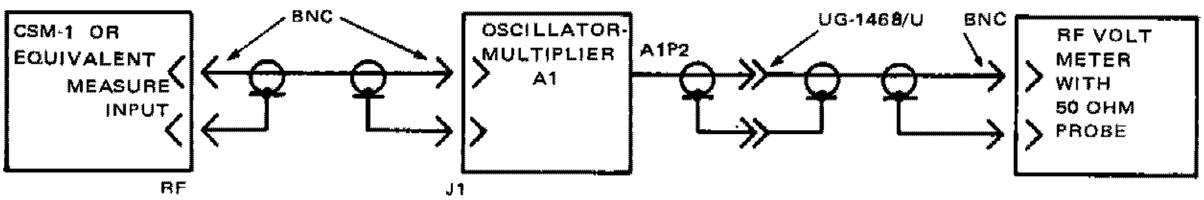


Figure 7-5. Test Setup for Oscillator-Multiplier A1(M)

7.14.4.1 Test Equipment

* CSM-1 communications service monitor or equivalent *

RF voltmeter with 50-ohm probe

Test cable, BNC to UG-1468/U

DMM or VTVM

7.14.4.2 Procedure.- Place the POWER ON-OFF switch in OFF position. Connect test equipment as shown in figure 7-5. Since the oscillator-multiplier does not have provision for injecting an external signal, crystals must be used in carrying out the alignment procedure. Proceed as follows:

(1) Install a crystal of approximately 15.6 MHz into the module.

(2) Set FREQ ADJ (C3) to midrange (17.5 turns clockwise from counterclockwise stop); position dots on the OSC, BUF, and AMP controls to 78 on their dial scales.

(3) Place the POWER ON-OFF switch in the ON position.

(4) Adjust OSC, BUF, AMPL controls for maximum output on the RF voltmeter.

(5) Adjust C25 to give an output of 5 times that on the crystal case, ±10 Hz, as measured with the * CSM-1 *

(6) If maximum output does not occur at settings of 78 of the OSC, BUF, and AMPL controls, carefully adjust the turn spacing of L2 so that maximum output does occur when OSC is set to 78. Similarly, adjust L4 when BUF is set at 78, and L5 when AMPL is set at 78. Place POWER ON-OFF switch in OFF position while adjusting turns on coils. Leave shield covers in place on the module while adjusting the OSC, BUF, and AMPL controls.

(7) Set C25 to its adjustment limits, with shield covers in place, and measure the frequency pulling * limits, using the CSM-1, about the frequency to which it was set in step (5) (±25 ppm minimum). Return C25 adjustment to midrange. *

(8) Read and record output voltage on the RF voltmeter (0.53 to 1.07 V rms) with shield covers in place. Turn off the power.

(9) If output voltage measured in (8) is not met, adjust taps on L2, L4, and L5. If adjustment is made, repeat steps (3), (4), (6), and (8).

(10) Measure the amplitudes of the spurious responses arrayed about the desired output frequency and relative to it (at least 55 dB below the desired output frequency). Note particularly the crystal frequency fourth and sixth harmonics. Turn off the power and remove the crystal.

(11) Install crystal of approximately 11.2 MHz and set OSC, BUF, and AMPL controls to 56.

(12) Turn on the power, and repeat steps (2) through (10), using setting of 56 whenever 78 is called for. Turn off the power.

(13) Install a crystal of approximately 20 MHz and set OSC, BUF, and AMPL controls to 99.

(14) Turn on the power, and repeat steps (2) through (10), using a setting of 99 whenever 78 is called for. Turn off the power.

* (15) Disconnect the CMS-1 from J1, and the RF voltmeter from P2. Connect CSM-1 to P2. Install channel frequency crystal and perform procedure as described in 9.5. *

7.14.5 Oscillator-Synthesizer A1(S) Alignment.- The only adjustment which may be required is that of the reference oscillator freuqency trimming capacitor. To gain access, remove the snap-on hole plug on the synthesizer left front, and the sealed-screw cover directly beneath it, exposing the adjustment. The synthesizer must have been on for at least 10 minutes and be at approximately room temperature before the adjustment is made. See figure 7-4 for the test setup, and table 9-3 for actual versus dialed * output frequency. Special maintenance instructions for the replacement of U1 in the synthesizer switching regulator is covered in figure 11-20A *

7.14.6 Mixer/Multiplier A2 Alignment.- (This is normally a depot level alignment.) Figure 7-6 shows the test setup. See figures 10-7, 10-8, 11-23, and 11-24 (vhf) or figures 10-9, 10-10, 11-21, and 11-22 (uhf) for test point and measurement point locations.

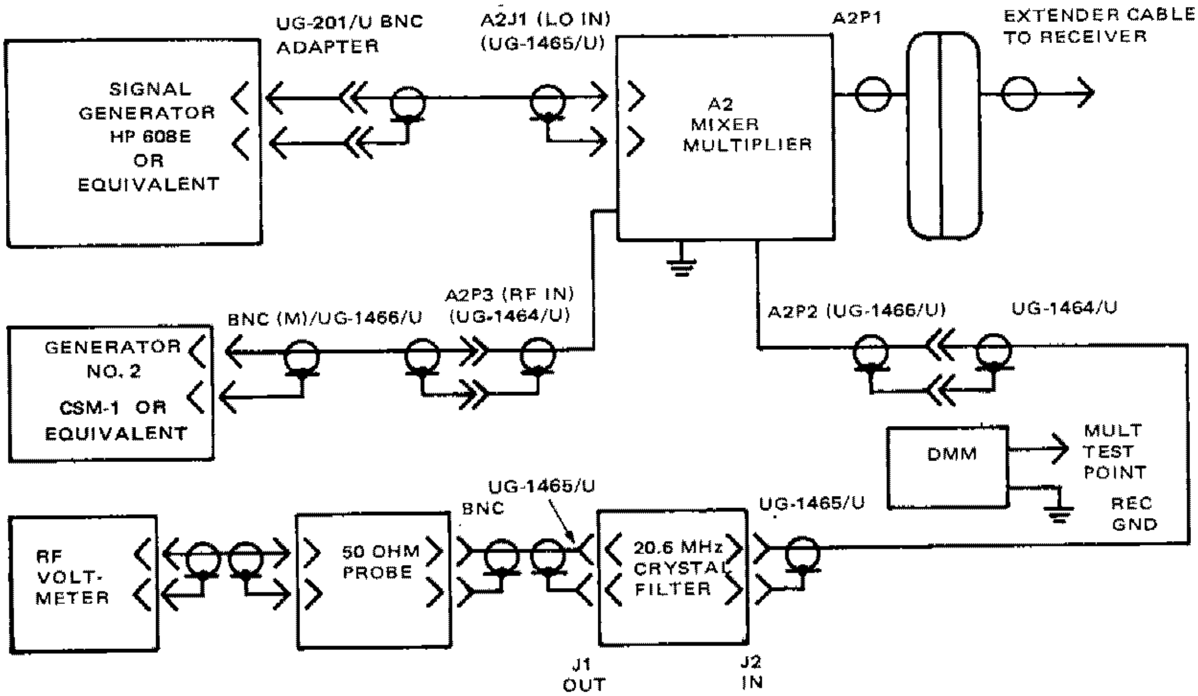


Figure 7-6. Test Setup for Mixer/Multiplier A2

7.14.6 1 Test Equipment

Signal generator, HP 608E or equivalent
* CSM-1 communications service monitor or equivalent *
20.6 kHz crystal filter
RF voltmeter with 50-ohm probe
Extender test cable
DMM or VTVM
Test cable, BNC (male) to UG-1465/U and BNC (male) to UG-1464/U
Adapter, BNC to UG-1464/U
Adapter, UG-201/U, N to BNC
Test cable UG-1464/U to UG-1465/U

7.14.6.2 Procedure (UHF).- Connect test equipment as shown in figure 7-6 and proceed as follows:

(1) Set generator number 1 for 94.85 MHz, power level to +13 dBm, and modulation to cw.

* (2) Set CSM-1 for 400 MHz, power level to -30 dBm, and modulation to cw. *

(3) Set QUAD, BUFFER, RF, and ANT capacitors in the 400 position.

(4) Set the LEVEL ADJUST pot to maximum clockwise.

(5) Adjust the QUAD, BUFFER, and AMPL controls for maximum reading on the DMM or VTVM. Repeat adjustments until maximum reading is obtained.

(6) Adjust the RF and ANT controls and C39 (internal control) for maximum reading on the RF voltmeter. Repeat adjustments until maximum is obtained. Adjust frequency of generator number 2 for peak indication before the last round of adjustments are made.

(7) Adjust the frequency of generator number 2 for peak indication on the RF voltmeter.

(8) Set LEVEL ADJUST for 5.0 volts on DMM or VTVM.

(9) Connect the VTVM or DMM (10-volt scale) between AGC and ground. Set AGC pot (R-7) on AGC squelch module maximum counterclockwise.

(10) Adjust the frequency of generator number 2 for peak indication on RF voltmeter if it has drifted.

(11) Adjust the power level of generator number 2 for 80 millivolts (-9 dBm) on the RF voltmeter.

> **NOTE**
>
> When one or more of the observed readings in steps (12), (19), and (46) read below 90 mV, tailor the position that C54 ties into L12 by moving the tap further away from the ground end of L12. When the observed reading is above 225 mV, move the tap toward the ground end of L12. In either case do not move the tap more than 3/16 inch. Recheck gain at 225, 300, and 400 MHz; gain variation at these three frequencies must not exceed 3 dB. The standard value of 2.2 kΩ for R46 may be changed to 1.5 kΩ or 4.7 kΩ to compensate for transistor gain variations.

(12) Adjust the AGC pot for 6.0 V d.c. on the VTVM or DMM and record reading (75 mV min) on RF voltmeter.

(13) Adjust the AGC pot for 7.5 V d.c. on the VTVM or DMM and record reading (20 mV min) on RF voltmeter.

(14) Adjust the AGC pot for 10.0 V d.c. on the VTVM and DMM and record reading (2.5 mV max).

(15) Disconnect the crystal filter.

(16) Connect the RF voltmeter to the output of generator number 2.

(17) Adjust the power level of generator number 2 for a reading of 7 mV on meter.

(18) Reconnect generator number 2 to P3 on the module and the RF voltmeter to P2.

(19) Peak/record RF voltmeter reading (90 to 225 mV) by varying generator number 2 frequency.

(20) Set generator number 2 for 0 dBm output.

(21) Connect VTVM or DMM to IF OUT and record reading (0.1 V d.c. min).

(22) Set VTVM or DMM to 3-volt scale and connect to MULT test point on front panel (J15).

(23) Disconnect generator number 2 from P3.

(24) Disconnect the RF voltmeter from P2 and connect it to P3. Record reading (9 mV max).

(25) Reconnect the RF voltmeter to P2. Reconnect generator number 2 to P3.

(26) Set generator number 1 for 80.15 MHz, power level to +10 dBm.

(27) Set generator number 2 for 300 MHz, power level to -30 dBm.

(28) Set the QUAD BUFFER, AMPL, RF, and ANT capacitors to the 300 position.

(29) Set LEVEL ADJUST pot maximum clockwise.

(30) Adjust the QUAD, BUFFER,and AMPL controls for maximum reading on the DMM. Repeat adjustments until maximum reading is obtained.

(31) Set LEVEL ADJUST for 2.0 V on the VTVM or DMM.

(32) Adjust the RF and ANT controls for maximum reading on RF voltmeter.

(33) Alternately adjust the frequency of generator number 2, the RF, and ANT controls for maximum reading on RF voltmeter.

(34) Connect the RF voltmeter to output of generator number 2 and adjust the power level of generator for a reading of 7 mV on RF voltmeter.

(35) Reconnect generator number 2 to P3 and RF voltmeter to P2.

(36) Peak/record RF voltmeter reading (90 to 225 mV) by varying generator number 2 frequency.

(37) Set generator number 1 for 61.4 MHz, power level to +10 dBm.

(38) Set generator number 2 to 225 MHz, power level to -30 dBm. Set QUAD, BUFFER, AMPL, RF, and ANT capacitors to 225 position.

(39) Set LEVEL ADJUST pot maximum clockwise.

(40) Adjust the QUAD, BUFFER, and AMPL controls for maximum reading on VTVM or DMM.

(41) Set LEVEL ADJUST for 2.5 V on the VTVM or DMM.

(42) Adjust the RF and ANT controls for maximum reading on the RF voltmeter.

(43) Alternately adjust the frequency of generator number 2, the RF, and ANT controls for maximum reading on the RF voltmeter.

(44) Connect the RF voltmeter to the output of generator number 2 and adjust the power level of generator for a reading of 7 mV on RF voltmeter.

(45) Reconnect generator number 2 to P3 and the RF voltmeter to P2.

(46) Adjust the frequency of generator number 2 for peak readings and record RF voltmeter reading (90 to 225 mV). This completes test. Perform procedures described in 9.5.4 and 6.8 before restoring equipment to service.

7.14.6.3 Procedure (VHF).- Connect test equipment as shown in figure 7-6 and proceed as follows:

(1) Set generator number 1 for 85.3 MHz. Set power level to +13 dBm, and modulation to cw.

(2) Set generator number 2 for 150 MHz, power level to -30 dBm, and modulation to cw.

(3) Set DOUBLER, BUFFER, RF, and ANT capacitors in the 150 position.

(4) Set the LEVEL ADJUST pot to maximum clockwise.

(5) Adjust the DOUBLER and BUFFER controls for maximum reading on the VTVM or DMM.

(6) Set LEVEL ADJUST for 1.06 volts on VTVM or DMM.

(7) Adjust the frequency of generator number 2 for peak indication on the RF voltmeter.

(8) Adjust the RF and ANT controls and C41 (internal control) on module for maximum reading on the RF voltmeter. Repeat adjustments until maximum is obtained. Adjust frequency of generator number 2 for peak indication before the last adjustments are made.

(9) Connect the VTVM or DMM (10 volt scale) between AGC and ground. Set AGC pot R7 on AGC squelch module maximum counterclockwise.

(10) Adjust the frequency of generator number 2 for peak indication on RF voltmeter if it has drifted.

(11) Adjust the power level of generator number 2 for 80 millivolts on the RF voltmeter.

NOTE

When one or more of the observed readings in steps (12), (19), and (46) read below 70 mV, tailor the position that C10 ties into L3 by moving the tap from the 1T position to the 2T position. Additional gain bandwidth adjustment can be made by positioning R40 on coil L3. Recheck gain at 116 MHz, 133 MHz, and 150 MHz. The standard value of 30 ohms for R38 may be changed to 10 ohms, 20 ohms, or 39 ohms to compensate for transistor gain variations.

(12) Adjust the AGC pot for 6.0 V d.c. on the VTVM or DMM and record reading on RF meter (75 mV min).

(13) Adjust the AGC pot for 7.5 V d.c. on the VTVM or DMM and record reading on RF meter (9 to 25 mV).

(14) Adjust the AGC pot for 10.0 V d.c. on the VTVM or DMM and record RF voltmeter reading (0.8 mV max).

(15) Disconnect the crystal filter.

(16) Connect the RF voltmeter to the output of generator number 2.

(17) Adjust the power level of generator number 2 for a reading of 7 mV on meter.

(18) Reconnect generator number 2 to P3 on the module and the RF voltmeter to P2. Set AGC pot maximum counterclockwise.

(19) Adjust frequency of generator number 2 for peak reading and record RF voltmeter reading (70 mV min).

(20) Set generator number 2 for 0 dBm output.

(21) Connect VTVM or DMM to IF OUT, and record reading (0.1 V d.c. min).

(22) Set VTVM or DMM to 3 volt scale and connect to multiplier test point on front panel (J15).

(23) Disconnect generator number 2 from P3.

(24) Disconnect the RF voltmeter from P2 and connect to P3. Record LO radiation (9 mV max).

(25) Reconnect the RF voltmeter to P2. Reconnect generator number 2 to P3.

(26) Set generator number 1 for 76.8 MHz, power level to +13 dBm.

(27) Set generator number 2 for 133 MHz, power level to -30 dBm.

(28) Set the DOUBLER, BUFFER, RF, and ANT capacitors to the 133 position.

(29) Set LEVEL ADJUST pot maximum clockwise.

(30) Adjust the DOUBLER and BUFFER controls for maximum reading on the DMM or VTVM at MULT test point. Repeat adjustments until maximum reading is obtained.

(31) Set LEVEL ADJUST for 1.0 V on the VTVM or DMM.

(32) Adjust the RF and ANT controls for maximum reading on RF meter.

(33) Alternately adjust the frequency of generator number 2, the RF, and ANT controls for maximum reading on RF voltmeter.

(34) Connect the RF voltmeter to the output of generator number 2 and adjust the power level of generator for a reading of 7 mV on RF voltmeter.

(35) Reconnect generator number 2 to P3 and RF voltmeter to P2.

(36) Adjust frequency of generator number 2 for peak reading and record reading (90 mV min).

(37) Set generator number 1 for 68.3 MHz, power level to +13 dBm.

(38) Set generator number 2 to 116 MHz, power level to -30 dBm.

(39) Set LEVEL ADJUST pot maximum clockwise.

(40) Adjust the DOUBLER and BUFFER controls for maximum reading on VTVM or DMM at MULT Test point. Repeat adjustments until maximum reading is obtained.

(41) Set LEVEL ADJUST for 0.94 V on the VTVM or DMM.

(42) Adjust the RF and ANT controls for maximum reading on the RF voltmeter.

(43) Alternately adjust the frequency of generator number 2, the RF, and ANT controls for maximum reading on the RF voltmeter.

(44) Connect the RF voltmeter to the output of generator number 2 and adjust the power level of generator for a reading of 7 mV on RF voltmeter.

(45) Reconnect generator number 2 to P3 and the RF voltmeter to P2.

(46) Adjust the frequency of generator number 2 for peak reading and record RF voltmeter reading (70 mV min). This completes test. Perform procedures described in 9.5.5, 9.6 and 6.8 before restoring equipment to service.

7.14.7 Buffer Amplifier A5 Alignment.- Figure 7-7 shows the test setup. See figures 10-13 and 11-27 for test point and measurement point locations.

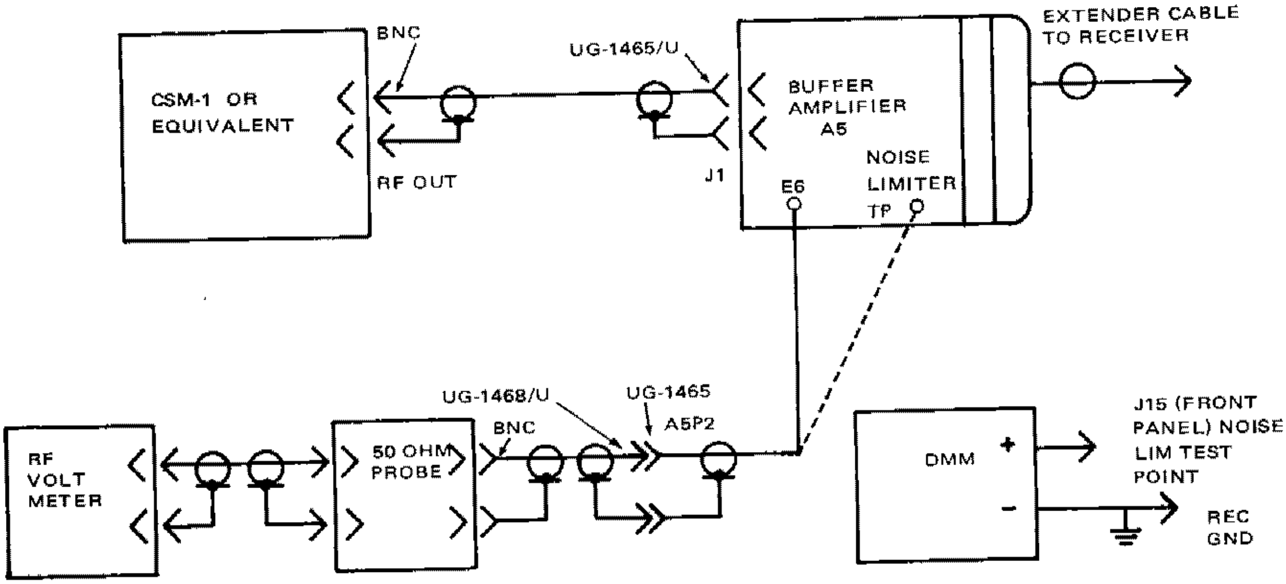


Figure 7-7. Test Setup for Buffer Amplifier A5

7.14.7.1 Test Equipment

RF voltmeter with 50-ohm probe
CSM-1 communications service monitor or equivalent
DMM or VTVM
Test cables, BNC (male) to UG-1468/U and BNC (male) to UG-1465/U

7.14.7.2 Procedure.- Set the signal generator for 20.6 MHz at a power level of -10 dBm.

(1) Connect RF voltmeter to the signal generator and record reading as a reference level.

(2) Connect test equipment as shown in figure 7-7.

(3) Carefully adjust C2 (internal control) for maximum output on the RF voltmeter and record reading (-1.0 to +1.5 dB of step (1)).

(4) Set the signal generator for an output of 0 dBm and record reading on DMM at noise limiter test point on front panel (60 mV min).

(5) This completes test. Disconnect all equipment, replace module in receiver, perform procedures described in 9.5.4 or 9.5.5 and 6.8 before restoring equipment to service.

7.14.8 IF Amplifier A6 Alignment.- Figure 7-8 shows the test setup. See figures 10-14 and 11-29 for test point and measurement point locations.

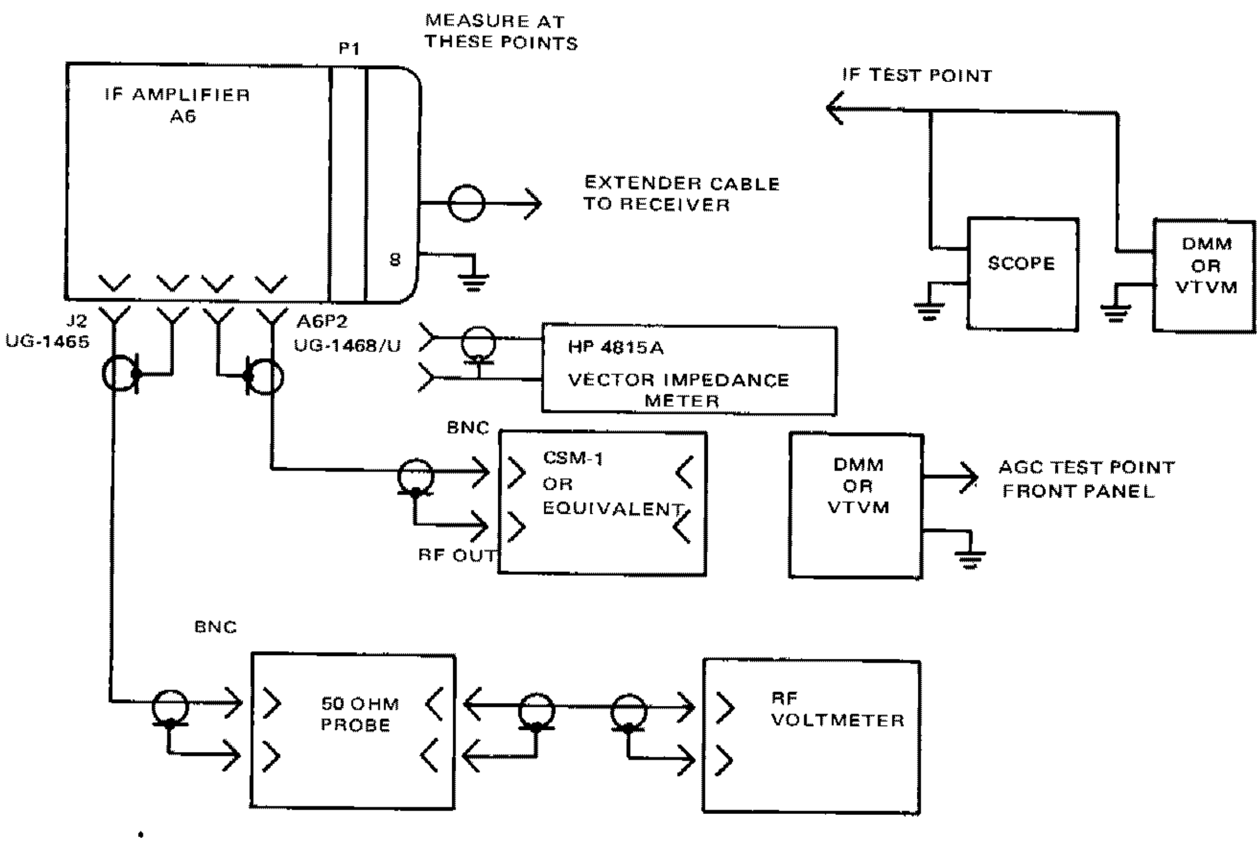


Figure 7-8. Test Setup for IF Amplifier A6

7.14.8.1 Test Equipment

RF voltmeter with 50-ohm probe
Oscilloscope
Audio oscillator
VTVM or DMM
* CSM-1 communications service monitor or equivalent *
RF vector impedance meter HP 4815A or equivalent
Crystal filter (20.6 MHz)
Capacitor (220-pF)
Test cables BNC (male) to UG-1468/U and BNC (male) to UG-1465/U

7.14.8.2 Procedure.- Set agc adjust (R7) on agc module (A3) to 6.0 V d.c. and proceed as follows:

(1) Connect 220-pF capacitor across R22.

(2) Connect test equipment as shown in figure 7-8.

(3) Set generator for 20.6 MHz, modulated 30% at 1 kHz. Set attenuator to read 80 millivolts rms on VTVM or DMM at IF test point on front panel.

(4) Tune C9, C14, C19, and C32 for maximum output on DMM.

> NOTE
>
> Maintain a reading of 80 millivolts rms on VTVM or DMM by increasing attenuation on signal generator.

(5) Repeat step (4) at least three times.

> NOTE
>
> Step (6) is normally a depot level adjustment.

(6) Disconnect generator from J1. Connect RF vector impedance meter to J1. Set frequency to 20.6 MHz and tune C2 and C3 for 50 ohms, zero reactance.

(7) Disconnect impedance meter, reconnect generator to J1, and adjust for 50 mV on VTVM or DMM.

(8) The generator attenuator must read from -100 to -102 dBm. If the attenuator reads from -102 to -104 dBm, adjust C14 to obtain the required reading. If the attenuator reads -104 dBm or less (i.e. -105 dBm) both C14 and C32 must be adjusted as follows:

a. Determine difference between -102 dBm and attenuator setting required to obtain 50 mV output. Example, -102 - (-105) = 3 dB.

b. Set the attenuator halfway between -102 dBm and the setting required to obtain 50 mV. Example, -102 - (1.5) = -103.5 dBm.

(9) Adjust C14 for 50 mV output.

(10) Set attenuator for -102 dBm and adjust C32 for 50 mV output.

(11) Slowly increase the generator output while observing the VTVM or DMM. Note the point that the audio output stops increasing as it starts to distort (a scope must be connected, as shown in figure 7-8, to the audio output to determine if output is not distorted). This must exceed 250 mV. If it does not, readjust C32 for 300 mV. If 300 mV cannot be obtained, any level greater than 250 mV is acceptable.

(12) Set generator attenuator for -102 dBm and readjust C14 for 50 mV output.

(13) Set DMM at IF test point to d.c. scale.

(14) Set the generator attenuator for maximum attenuation. Record voltage at IF test point (2.5 to 3.5 V d.c.).

(15) Change DMM to a.c. scale and decrease the generator power until the VTVM or DMM reads 80 mV rms.

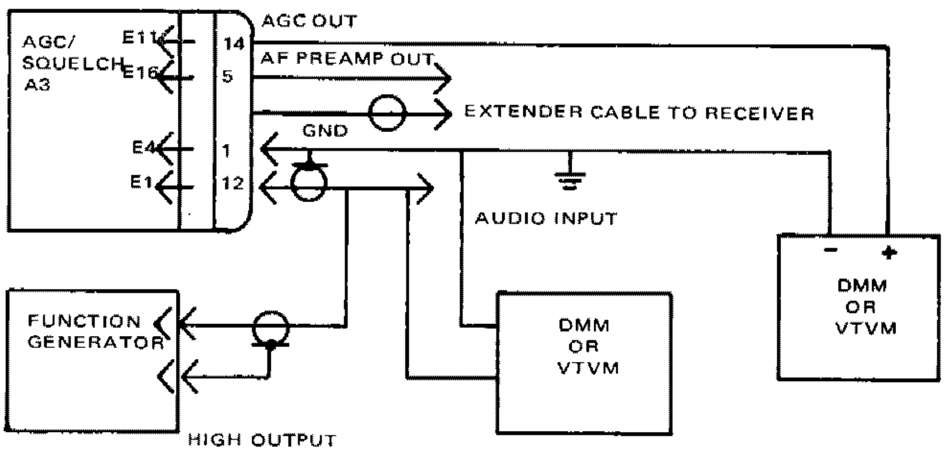
(16) Connect d.c. meter to AGC test point on front panel door and set AGC to read 5.5 V d.c. Record VTVM or DMM reading at IF test point (65 mV min).

(17) Set AGC pot to read 7.0 V d.c. Record VTVM or DMM reading at IF test point (30 mV max).

(18) Set AGC pot to read 12 V d.c. and increase the generator power to -15 dBm. Record VTVM or DMM reading at IF test point (2.5 mV max).

(19) This completes test. Perform procedures described in 9.5.4 or 9.5.5 and 6.8 before restoring equipment to service.

7.14.9 AGC/Squelch A3 Alignment.- Figure 7-9 shows the test setup. See figures 10-11 and 11-25 for test point and measurement point locations.



* Figure 7-9 Test Setup for AGC/Squelch A3 *

7.14.9.1 Test Equipment

* CSM-1 communications service monitor or equivalent *
Function generator
DMM or VTVM (2 ea)

7.14.9.2 Procedure.- Place AC POWER ON-OFF switch in OFF position. Remove the IF amplifier (A6) module, connect test equipment as shown in figure 7-9 and proceed as follows:

(1) Set frequency of function generator to 1 kHz. Set output for 0.2 V a.c.

(2) Place DMM to d.c. scale and adjust the offset control for 3.1 V d.c.

(3) Set AGC control (R7) on module for 6.0 V d.c. at E11 (pin 14).

(4) Increase the audio signal from 0.2 V a.c. and observe that the AGC output voltage at E11 decreases.

(5) Reset audio output to 0.20 V a.c. Set agc control (R7) fully counterclockwise. Increase the offset voltage and observe that the agc voltage at E11 increased. Reset offset to 3.1 V d.c. and reset R7 for 6.0 V d.c.

(6) Set offset voltage to 3.35 V d.c. and observe reading at E11 ($>$ 12.0 V d.c.).

(7) Place the SQUELCH ON-OFF switch on receiver front panel in the ON position.

(8) Set SQUELCH ADJUST control on receiver front panel in fully counterclockwise position. Adjust the offset control on generator for 8.0 V d.c. at E11.

(9) Connect DMM or VTVM to SQUELCH test point (behind receiver front panel door). Adjust SQUELCH ADJUST control for fully clockwise position. Observe reading on DMM at squelch test point ($<$ 1.0 V d.c.).

(10) Slowly adjust SQUELCH ADJUST control counterclockwise until voltage jumps and record reading (> 8.0 V d.c.). Place SQUELCH switch in OFF position.

(11) Set frequency of generator to 300 Hz, switch output from HIGH to -30 dB jack and set output for 35 mV. Connect DMM to E16 and adjust R41 on module fully counterclockwise. Adjust R32 fully clockwise. Record reading (approx. 0.35 V rms).

(13) Adjust R41 fully clockwise and record reading (approx. 0.6 V rms). Set R41 for 0.31 V rms.

(13) Set frequency of generator to 100 Hz and record reading at E16 (135 mV max).

(14) Set frequency of generator to 3 KHz and record reading (0.27 to 0.34 V rms).

(15) Set frequency of generator to 12 KHz and record reading (98 mV max).

(16) This completes the test. Place AC ON-OFF switch in OFF position, disconnect test equipment, and reinsert A3 and A6 modules. Perform procedures as described in 9.5.4 or 9.5.5 and 6.8 before restoring equipment to service.

7.14.10 Audio Amplifier A4 Audio Response check.- Figure 7-10 shows the test setup. See figures 10-12 and 11-26 for test point and measurement point locations.

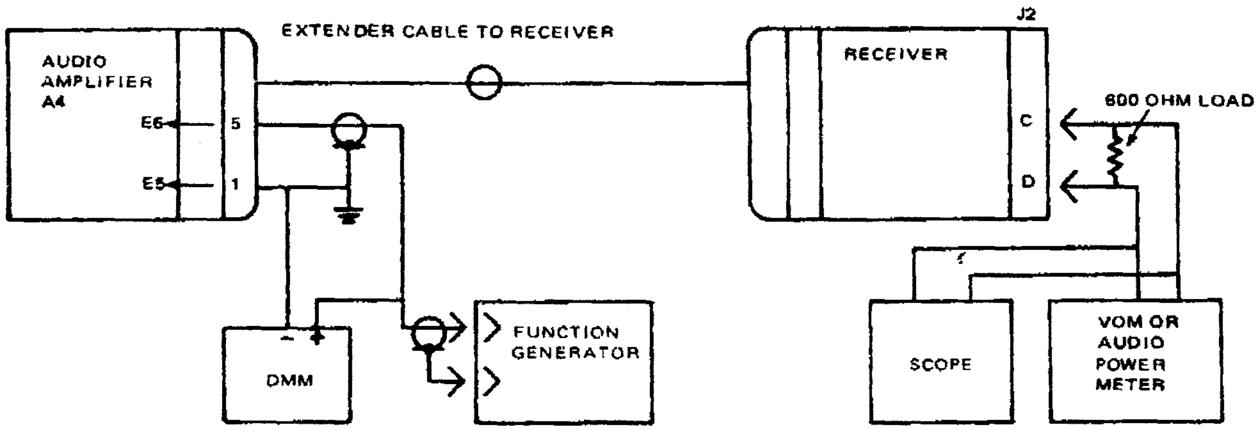


Figure 7-10. Test Setup for Audio Amplifier A4

7.14.10.1 Test Equipment
Function generator, Clark-Hess 748 or equivalent
VOM with 600-ohm load or audio power meter
DMM or VTVM
* CSM-1 communications service monitor or equivalent *
Phone plug (terminated into 600-ohm load)

7.14.10.2 Procedure.- Connect test equipment as shown in figure 7-10. Set MAIN ADJ and PHONE ADJ controls on front panel to maximum clockwise position and proceed as follows:

(1) Remove AF module (A4) from receiver. Set function generator for 1 kHz and adjust output to read 7.8 bolts on VOM or +20 dBm on power meter. Record reading on DMM (300 to 350 mV).

(2) Adjust function generator to 300 Hz while holding output voltage on DMM constant. Record reading on VOM (694 to 8.27 volts) or +19 dBm to 20.5 dBm on power meter

(3) Adjust function generator to 3 kHz while holding output voltage constant on the DMM. Record reading on the VOM (6.94 to 8.27 volts or +19 dBm to 20.5 dBm on power meter).

(4) Increase output of function generator until output as observed on scope just begins to limit (approx. 30 V p-p). Observe reading on VOM (approx. 10.5 V rms or +23 dBm on power meter).

(5) Reset function generator to 1 kHz with output to 7.8 volts on the VOM or +20 dBm on power meter.

(6) Remove VOM from 32 pins (C and D) and connect between E4 and ground. Record compression output (6.24 to 9.1 V rms).

(7) Remove VOM from E4 and connect between E2 and ground. Record main audio output (1.42 to 2.38 V rms).

(8) Remove 600 ohm load from 32 (pins C and D) and connect across phone plug on receiver front panel. Connect VOM and scope across 600 ohm resistor. Connect function generator and DMM between E14 and E5 (gnd).

(9) Repeat steps (1) through (6).

(10) Record secondary audio output (7.7 V rms or +20 dBm minimum).

(11) This completes test. Perform procedures described in 6.8 before restoring equipment to service.

7.14.11 Power Supply PS1 Alignment.- See figures 10-15, 10-16, and 11-30 for test point and measurement point locations.

7.14.11.1 Test Equipment

Oscilloscope
Digital voltmeter
Ammeter
A.C. voltmeter
DMM or VTVM

7.14.11.2 Procedure.- Place AC POWER ON-OFF switch in ON position and proceed as follows, for nominal line voltage of 115 V a.c.

(1) Connect DMM to REG B+ test point on J15 (located behind door on receiver front panel). Adjust R17 on power supply module to read 18.0 ± 0.1 V d.c. on DMM.

(2) Connect scope to REG B+ test point, read and record ripple voltage (20 mV max).

* *

(4) Connect DMM to UNREG B+ test point on front panel. Read and record unregulated voltage (26.0 to 34.0 V d.c.).

(5) With 120 V a.c. input and 30 V d.c. battery input, the following procedures apply:

a. Connect DMM to REG B+ test point. Record reading (18.0 ± 0.1 V d.c.).

b. Connect scope to REG B+ test point. Record ripple voltage (50 mV max).

c. Connect DMM to UNREG B+ test point. Record reading (29.0 to 31.0 V d.c.).

(6) With no a.c. input and a battery input of +22.0 V d.c., the following procedures apply:

a. Connect DMM to REG B+ test point on front panel. Record reading (18.0 ± 0.1 V d.c.).

b. Connect scope to REG B+ test point on front panel. Record ripple voltage (40 mV max).

c. Connect DMM to UNREG B+ test point. Record reading (20.5 to 22.0 V d.c.).

(7) With no a.c. input and a battery input of +20.0 V d.c., the following procedures apply:

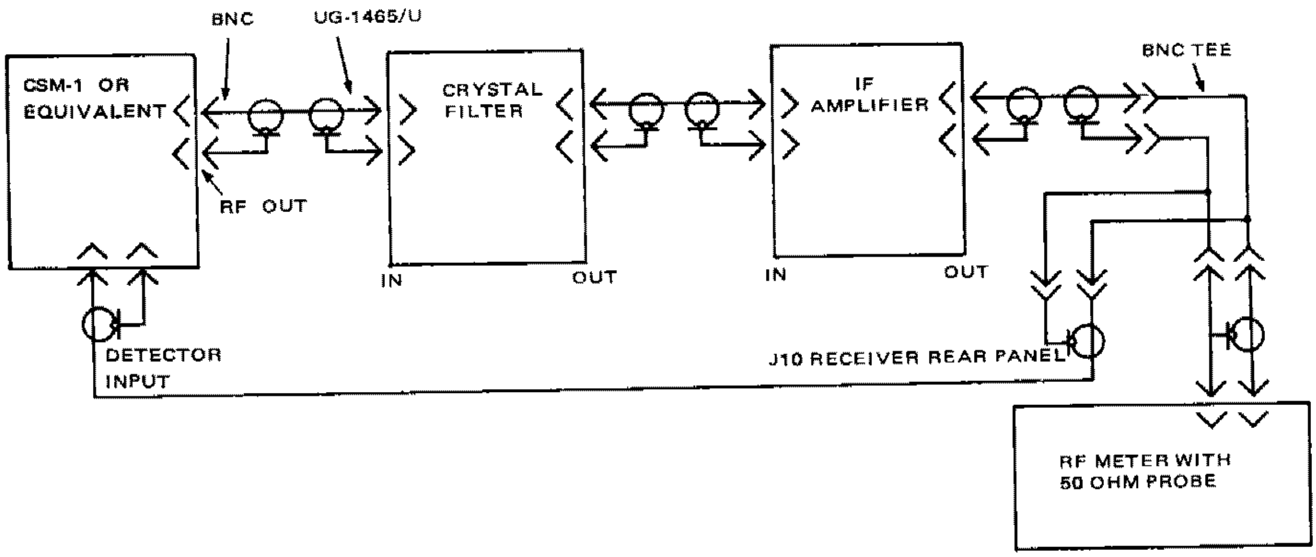
a. Connect DMM to REG B+ test point on front panel. Record reading (18.0 ± 0.1 V d.c.).

b. Connect scope to REG B+ test point on front panel. Record ripple voltage (50 mV max).

c. Connect DMM to UNREG B+ test point on front panel. Record reading (29.0 to 31.0 V d.c.).

(8) This completes test. Perform procedure 6.8 before restoring equipment to service.

7.14.12 IF Amplifier A6 and Crystal Filter FL1 Bandpass Characteristics.- Figure 7-11 shows the test setup.

* 

*

Figure 7-11. Test Setup for IF Amplifier A6 and Crystal Filter FL1

7.14.12.1 Test Equipment *

* CSM-1 communications service monitor or equivalent
RF voltmeter with 50 ohm probe
Cable, BNC to BNC
Cable, BNC to UG-1465/U
BNC tee connector

*

7.14.12.2 Procedure.- Set frequency dials of CSM-1 to 20.6 MHz. Set output level to -98 dB unmodulated.

(1) Set FUNCTION switch to GENERATE position. *

* (2) Set VERT MODE switch to DETECTOR.

(3) Set SWEEP WIDTH (Δf) control to fully clockwise.

(4) Set AMPLITUDE MODULATION switch to OFF, and disconnect the input cable to crystal filter.

(5) Vary the VERT POS, FOCUS, INTENSITY, HORIZ POS, and HORIZ GAIN controls to produce a trace on the VERT SET line on the CRT graticule and full scale deflection in the horizontal.

(6) Connect test equipment as shown in figure 7-10.

(7) Set the 100 kHz frequency knob in the "V" position, and SWEEP MODE switch to LO position.

(8) Turn mainframe SWEEP WIDTH (Δf) control to ON position and adjust the 0-100 Hz control to center the waveform. Adjust the SWEEP RATE, HORIZONTAL SIZE, and VERT POS controls for desired display. Observe waveform for flatness and rolloff.

(9) Vary the RF OUTPUT LEVEL switches to obtain the desired display amplitude.

(10) Turn SWEEP WIDTH (Δf) control to OFF position.

(11) Shift the frequency up and down using the 0-100 Hz control while observing the trace position. When it is at the highest position the frequency switches and 0-100 Hz control will indicate the frequency of the peak response. Record the trace position as reference.

(12) Increase output level of CSM-1 by 6 dB.

(13) Adjust frequency controls above and below center frequency until line of graticule returns to the peak response reference line set in step (11). Record both frequencies.

(14) Compute the bandwidth at the 6 dB point by taking the difference between the upper and lower frequencies recorded in step (13). (See tables 4-1 and 4-2 and figures 6-10 and 6-11.)

(15) Repeat steps (13) and (14) for 60 dB record bandwidth. (See tables 4-1 and 4-2 and figures 6-10 and 6-11.)

(16) This completes test. Perform procedure 6.8 before restoring equipment to service. *

SECTION 8

PARTS LIST

8.1 INTRODUCTION.- This section contains part identification, location, and replacement information for Receiver, Radio AN/GRR-23 and -24. The tables making up the parts list and list of manufacturers are explained in the following paragraphs.

8.2 PARTS LIST.- Table 8-1 lists items in major assembly groups with subassemblies and parts listed under each group in alphanumeric order of reference designations. The six columns of the parts list are as follows:

8.2.1 Reference Designation.- This column lists in alphanumeric order the reference designation of each item indicated on the schematic diagrams in section 11 (volume 2). The vhf and uhf versions of the receiver are identified by numeric prefixes as follows:

Prefix	Equipment
1	uhf receiver
2	vhf receiver

* The oscillator-multiplier is designated "A1(M)." Likewise, a frequency synthesizer, directly interchangeable with the oscillator-multiplier, is sometimes used; it is designated "A1(S)." *

8.2.2 Indent Code Letter.- Each code letter in this column identifies the item listed according to its structure level in the receiver. The code letters used are identified as follows:

A	Receiver (complete assembly)
B	Major assembly or part on main frame
C	Subassembly or part on major assembly
D	Sub-subassembly or part on subassembly
E	Part on sub-subassembly

8.2.3 Name of Part and Description.- This column shows the name and description of each item listed. When the item is identical to an item previously listed, although not necessarily performing the same function, this entry will be SAME AS (followed by the reference designation of the first component of this kind previously listed). For an item listed for a particular module but not used in that module, the entry is NOT USED.

8.2.4 Manufacturer's Code Number.- This column lists the Federal Supply Code number of the manufacturer.

8.2.5 JAN/MIL/Manufacturer's Part Number.- This column lists the JAN/MIL type designation assigned to the part or the manufacturer's part number.

8.2.6 Notes.- This column is for FAA use.

8.3 LIST OF MANUFACTURERS AND CODE NUMBERS.- Table 8-2 lists the name, address, and Federal Supply Code number of each manufacturer from whom parts are procured. This list is in numerical order of Federal Supply Code numbers.

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1	A	RECEIVER, RADIO, UHF, AN/GRR-24	31550	8004203G1	
2	A	RECEIVER, RADIO, VHF, AN/GRR-23	31550	8004203G2	
1A1(M) or 2A1(M)		OSCILLATOR-MULTIPLIER	31550	8009546G1	
C1	D	CAPACITOR, CERAMIC, 1000 pF ±10%, 1 kV		CK60AW102M	
C2	D	CAPACITOR, MICA, 33 pF ±5%, 500 V		CM15CD330J03	
C3	D	CAPACITOR, VARIABLE, 1 to 38 pF, 750 V		PC50H380	
C4	D	CAPACITOR, MICA, 100 pF ±5%, 500 V		CM15CD101J03	
C5	D	SAME AS C4			
C6	D	CAPACITOR, CERAMIC, 0.1 μF ±5%, 100 V		CK06BX104K	
C7	D	SAME AS C1			
C8	D	SAME AS C6			
C9	D	CAPACITOR, CERAMIC, 2.2 pF ±10%, 1000 V		CK60BX2R2K	
C10	D	CAPACITOR, VARIABLE, 3.2 to 50 pF, 375 V	31550	501185-4	
C11	D	CAPACITOR, CERAMIC, 10 pF ±10%, 1000 V		CK60BX100K	
C12	D	SAME AS C1			

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A1(M) or 2A1(M) con.					
C13	D	SAME AS C6			
C14	D	SAME AS C1			
C15	D	SAME AS C11			
C16	D	SAME AS C10			
C17	D	SAME AS C1			
C18	D	SAME AS C6			
C19	D	SAME AS C1			
C20	D	SAME AS C11			
C21	D	SAME AS C10			
C22	D	CAPACITOR, CERAMIC, 0.01 μF, ±10%, 200 V		M39014-02-1218	
C23	D	SAME AS C1			
C24	D	SAME AS C1			
* C25	D	CAPACITOR, VARIABLE, 7 to 25 pF, 350 V		CV31B250	*
CR1	D	DIODE, SILICON, 75 prv, 10 mA		JAN1N4148	
J1	D	CONNECTOR, BNC	31550	8009558-1	
L1	D	COIL, RF, 15 μH		MS75101-9	
L2	D	COIL, RF	31550	8004343-2	

Table 8-1. VHF/UHF Receiver Parts List (con.)					
Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A1(M) or 2A1(M) con.					
L3	D	COIL, RF, 22 μH		MS75101-11	
L4	D	SAME AS L2			
L5	D	SAME AS L2			
L6	D	COIL, RF, 2.2 μH		MS75008-32	
P1	C	CONNECTOR, RECEPTACLE, 9 CONTACTS	71468	DEC9PFO	
P2	C	CONNECTOR, PLUG, 1 CONTACT		UG-1465/U	
Q1	D	TRANSISTOR, NPN	31550	515351-1	
Q2	D	SAME AS Q1			
Q3	D	SAME AS Q1			
R1	D	RESISTOR, COMPOSITION, 750 ohms ±5%, 1/4 W		RCR07G751JS	
R2	D	RESISTOR, COMPOSITION, 1 kΩ ±5%, 1/4 W		RCR07G102JS	
R3	D	RESISTOR, COMPOSITION, 47 kΩ ±5%, 1/4 W		RCR07G473JS	
R4	D	RESISTOR, COMPOSITION, 10 kΩ ±5%, 1/4 W		RCR07G103JS	
R5	D	SAME AS R2			
R6	D	RESISTOR, COMPOSITION, 10 ohms ±5%, 1/4 W		RCR07G100JS	
R7	D	SAME AS R2			
R8	D	RESISTOR, COMPOSITION, 100 ohms ±5%, 1/4 W		RCR07G101JS	

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A1(M) or 2A1(M) con.					
R9	D	RESISTOR, COMPOSITION, 56 kΩ ±5%, 1/4 W		RCR07G563JS	
R10	D	RESISTOR, COMPOSITION, 82 kΩ ±5%, 1/4 W		RCR07G823JS	
R11	D	SAME AS R2			
R12	D	RESISTOR, COMPOSITION, 39 kΩ ±5%, 1/4 W		RCR07G393JS	
R13	D	RESISTOR, COMPOSITION, 30 kΩ ±5%, 1/4 W		RCR07G303JS	
R14	D	SAME AS R8			
R15	D	RESISTOR, COMPOSITION, 39 ohms ±5%, 1/4 W		RCR07G390JS	
R16	D	RESISTOR, COMPOSITION, 820 ohms ±5%, 1/4 W		RCR07G821JS	
R17	D	RESISTOR, COMPOSITION, 120 ohms ±5%, 1/4 W		RCR07G121JS	
R18	D	SAME AS R6			
R19	D	RESISTOR, COMPOSITION, 300 ohms ±5%, 1/4 W		RCR07G301JS	
VR1	D	DIODE, ZENER, 12 V ±5%, 0.4 W		JAN1N759A	
XY1	D	SOCKET, CRYSTAL	31550	512396-1	
Y1	E	CRYSTAL (See appendix B)			

Table 8-1. VHF/UHF Receiver Parts List (con.)					
Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A1(S) or 2A1(S)	B	OSCILLATOR-SYNTHESIZER	31550	8008619G1	
1A1A1(S) or 2A1A1(S)	C	DIVIDER/CONTROL	31550	8008621G1	
C1	D	CAPACITOR, CERAMIC, 1000 pF ±20%, 1 kV		CK60AW102M	
C2	D	CAPACITOR, CERAMIC, 0.01 μF ±10%, 200 V		CK06BX103K	
C3	D	SAME AS C1			
C4	D	CAPACITOR, CERAMIC, 0.033 μF ±10%, 100 V		CK06BX333K	
C5	D	SAME AS C1			
C6	D	SAME AS C1			
C7	D	SAME AS C2			
C8	D	CAPACITOR, TANTALUM, 39 μF ±10%, 10 V		M39003-01-2259	
C9	D	SAME AS C8			
C10	D	SAME AS C2			

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A1A1(S) or 2A1A1(S) (con.)					
* C11	D	CAPACITOR, CERAMIC, 1.0μF ±10%, 200 V		CK06BX105K	*
C12	D	SAME AS C2			
CR1	D	DIODE, SILICON		JAN1N4148	
CR2	D	SAME AS CR1			
* CR3	D	DIODE, SILICON, HOT CARRIER	28480	5082-8906	(511785-4) *
L1	D	CHOKE, RF, 10 μH		MS75008-40	
L2	D	SAME AS L1			
Q1	D	TRANSISTOR, SILICON, PNP, SWITCHING	04713	2N4208	
Q2	D	SAME AS Q1			
Q3	D	TRANSISTOR, SILICON, NPN		JAN2N2857	
Q4	D	SAME AS Q3			
R1	D	RESISTOR, COMPOSITION, 200 ohms ±5%, 1/4 W		RCR07G201JS	
R2	D	RESISTOR, COMPOSITION, 200 ohms ±5%, 1/8 W		RCR05G201JS	
R3	D	SAME AS R2			
R4	D	SAME AS R1			
R5	D	RESISTOR, COMPOSITION, 270 ohms ±5%, 1/8 W		RCR05G271JS	
R6	D	RESISTOR, COMPOSITION, 1 kΩ ±5%, 1/4 W		RCR07G102JS	
R7	D	RESISTOR, COMPOSITION, 3 kΩ ±5%, 1/4 W		RCR07G302JS	

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A1A1(S) or 2A1A1(S) (con.)					
R8	D	RESISTOR, COMPOSITION, 150 ohms ±5%, 1/8 W		RCR05G151JS	
R9	D	SAME AS R8			
R10	D	RESISTOR, COMPOSITION, 300 ohms ±5%, 1/8 W		RCR05G301JS	
R11	D	RESISTOR, COMPOSITION, 470 ohms ±5%, 1/8 W		RCR 05G471JS	
R12	D	RESISTOR, COMPOSITION, 1 kΩ ±5%, 1/8 W		RCR05G102JS	
R13	D	SAME AS R12			
R14	D	SAME AS R11			
R15	D	RESISTOR, COMPOSITION, 22 ohms ±5%, 1/4 W		RCR07G220JS	
R16	D	RESISTOR, COMPOSITION, 33 ohms ±5%, 1/4 W		RCR07G330JS	
R17	D	RESISTOR, COMPOSITION, 2.2 kΩ ±5%, 1/8 W		RCR05G222JS	
R18	D	RESISTOR, COMPOSITION, 1.8 kΩ ±5%, 1/8 W		RCR05G182JS	
R19	D	SAME AS R2			
R20	D	RESISTOR, COMPOSITION, 220 ohms ±5%, 1/8 W		RCR05G221JS	
* R21	D	RESISTOR, COMPOSITION, 10 ohms ±5%, 1/8 W		RCR05G100JS	*
S1	D	SWITCH, THUMBWHEEL	31550	512999-1	
S2	D	SWITCH, THUMBWHEEL	31550	512999-2	
S3	D	SWITCH, THUMBWHEEL	31550	512999-3	
S4	D	SWITCH, THUMBWHEEL	31550	512999-4	

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A1A1(S) or 2A1A1(S) (con.)					
U1	D	INTEGRATED CIRCUIT, POSITIVE AND GATE	01295	SN54H11J00	
U2	D	INTEGRATED CIRCUIT, HIGH SPEED COUNTER	01295	SN54196J00	
U3	D	SAME AS U2			
U4	D	SAME AS U2			
U5	D	INTEGRATED CIRCUIT, HIGH SPEED COUNTER	01295	SN54197J00	
U6	D	INTEGRATED CIRCUIT, J-K FLIP-FLOP	01295	SN54H102J00	
U7	D	INTEGRATED CIRCUIT, LOGIC NAND GATE	01295	SN54H00J00	
U8	D	INTEGRATED CIRCUIT, DUAL MASTER SLAVED FLIP-FLOP	04713	MC10531L	
Z1	D	RESISTOR NETWORK, FIXED	31550	509435-1	
1A1A2(S) or 2A1A2(S)	C	RF GENERATOR	31550	8008624G1	
C1	D	CAPACITOR, TANTALUM, 15 μF ±10%, 20 V		M39003-01-2289	
C2	D	CAPACITOR, CERAMIC, 1000 pF ±20%, 1 kV		CK60AW102M	
C3	D	SAME AS C2			
C4	D	CAPACITOR, CERAMIC, 47 pF ±10%, 1 kV		CK60BX470K	
C5	D	SAME AS C4			

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A1A2(S) or 2A1A2(S) (con.)					
C6	D	CAPACITOR, CERAMIC, 0.1 μF ±10%, 100 V		CK06BX104K	
C7	D	CAPACITOR, CERAMIC, 0.01 μF ±10%, 200 V		CK06BX103K	
C8	D	SAME AS C1			
C9	D	SAME AS C2			
C10	D	SAME AS C1			
C11	D	CAPACITOR, VARIABLE, 5.5 to 18 pF, 350 V d.c.		CV31A180	
C12	D	CAPACITOR, CERAMIC, 15 pF ±10%, 1 kV		CK60BX150K	
C13	D	SAME AS C2			
C14	D	CAPACITOR, CERAMIC, 22 pF ±10%, 1 kV		CK60BX220K	
C15	D	SAME AS C2			
C16	D	CAPACITOR, CERAMIC, 47 pF ±10%, 1 kV		CK60BX470K	
C17	D	SAME AS C11			
C18	D	SAME AS C12			
C19	D	SAME AS C2			
C20	D	SAME AS C2			
C21	D	SAME AS C2			
C22	D	CAPACITOR, CERAMIC, 6800 pF ±10%, 200 V		CK06BX682K	
C23	D	SAME AS C7			

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A1A2(S) or 2A1A2(S) (con.)					
C24	D	SAME AS C7			
C25	D	SAME AS C2			
C26	D	SAME AS C1			
C27	D	SAME AS C7			
C28	D	CAPACITOR, CERAMIC, 6.8 pF ±10%, 1 kV		CK60BX6R8K	
CR1	D	DIODE, SILICON	04713	MV1405	
CR2	D	SAME AS CR1			
CR3	D	DIODE, SILICON		JAN1N4148	
CR4	D	DIODE, SILICON, HOT CARRIER	28480	5082-8906	
CR5	D	SAME AS CR4			
CR6	D	SAME AS CR4			
CR7	D	SAME AS CR4			
L1	D	COIL, RF, tapped at two points	31550	8009305G1	
L2	D	COIL, RF, center tapped, 6 turns	31550	8008636G1	
L3	D	COIL, RF, 0.15 μH		MS18130-1	
L4	D	SAME AS L3			
L5	D	COIL, RF, center tapped	31550	8008637G1	
L6	D	SAME AS L5			

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A1A2(S) or 2A1A2(S) (con.)					
L7	D	COIL, RF, 0.07 mH ±10%, 1000 V rms 1740 mA max	99800	1703-9	
L8	D	COIL, RF 0.56 μH		MS18130-5	
L9	D	COIL, RF, 0.47 μH		MS18130-4	
L10	D	SAME AS L5			
Q1	D	TRANSISTOR, FET	17856	U311	
Q2	D	TRANSISTOR, NPN, SELECTED 2N5109	31550	515387-1	
Q3	D	SAME AS Q3			
Q4	D	TRANSISTOR, SILICON, NPN		JAN2N2222A	
Q5	D	SAME AS Q4			
R1	D	RESISTOR, COMPOSITION, 270 ohms ±5%, 1/4 W		RCR07G271JS	
R2	D	RESISTOR, COMPOSITION, 390 ohms ±5%, 1/4 W		RCR07G391JS	
R3	D	RESISTOR, COMPOSITION, 430 ohms ±5%, 1/4 W		RCR07G431JS	
R4	D	RESISTOR, COMPOSITION, 200 ohms ±5%, 1/4 W		RCR07G201JS	
R5	D	SAME AS R4			
R6	D	RESISTOR, COMPOSITION, 1 kΩ ±5%, 1/8 W		RCR05G102JS	
R7	D	RESISTOR, COMPOSITION, 4.7 kΩ ±5%, 1/8 W		RCR05G472JS	
R8	D	RESISTOR, COMPOSITION, 5.6 kΩ ±5%, 1/8 W		RCR05G562JS	
R9	D	RESISTOR, COMPOSITION, 330 ohms ±5%, 1 W		RCR32G331JS	

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A1A2(S) or 2A1A2(S) (con.)					
R10	D	RESISTOR, COMPOSITION, 20 kΩ ±5%, 1/4 W		RCR07G203JS	
R11	D	RESISTOR, COMPOSITION, 110 ohms ±5%, 1/4 W		RCR07G111JS	
R12	D	RESISTOR, COMPOSITION, 56 ohms ±5%, 1/4 W		RCR07G560JS	
R13	D	SAME AS R11			
R14	D	RESISTOR, COMPOSITION, 100 ohms ±5%, 1/4 W		RCR07G101JS	
R15	D	RESISTOR, COMPOSITION, 51 ohms ±5%, 1/4 W		RCR07G510JS	
R16	D	RESISTOR, COMPOSITION, 24 kΩ ±5%, 1/8 W		RCR05G243JS	
R17	D	SAME AS R9			
R18	D	RESISTOR, COMPOSITION, 20 kΩ ±5%, 1/4 W		RCR07G203JS	
R19	D	RESISTOR, COMPOSITION, 36 ohms ±5%, 1/4 W		RCR07G360JS	
R20	D	RESISTOR, COMPOSITION, 150 ohms ±5%, 1/4 W		RCR07G151JS	
R21	D	SAME AS R20			
R22	D	RESISTOR, COMPOSITION, 120 ohms ±5%, 1/4 W		RCR07G121JS	
R23	D	RESISTOR, COMPOSITION, 56 kΩ ±5%, 1/4 W		RCR07G563JS	
R24	D	RESISTOR, COMPOSITION, 30 kΩ ±5%, 1/4 W		RCR07G303JS	
R25	D	RESISTOR, FILM, 1 kΩ ±1%, 1/8 W		RN55D1001F	
R26	D	RESISTOR, FILM, 1.21 kΩ ±1%, 1/8 W		RN55D1211F	
R27	D	RESISTOR, FILM, 2.21 kΩ ±1%, 1/8 W		RN55D2211F	

Table 8-1. VHF/UHF Receiver Parts List (con.)					
Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A1A2(S) or 2A1A2(S) (con.)					
R28	D	RESISTOR, FILM, 825 ohms ±1%, 1/8 W		RN55D8250F	
R29	D	RESISTOR, COMPOSITION, 8.2 kΩ ±5%, 1/4 W		RCR079822JS	
R30	D	RESISTOR, FILM, 1.82 kΩ ±1%, 1/8 W		RN55D1821F	
R31	D	RESISTOR, FILM, 931 ohms ±1%, 1/8 W		RN55D9310F	
R32	D	RESISTOR, FILM, 681 ohms ±1%, 1/8 W		RN55D6810F	
R33	D	SAME AS R32			
R34	D	RESISTOR, VARIABLE, 2kΩ ±10%		RJ50CP202	
R35	D	RESISTOR, COMPOSITION, 470 kΩ ±5%, 1/4 W		RCR07G474JS	
R36	D	RESISTOR, COMPOSITION, 3.9 kΩ ±5%, 1/4 W		RCR07G392JS	
R37	D	RESISTOR, COMPOSITION, 10 kΩ ±5%, 1/4 W		RCR07G103JS	
R38	D	RESISTOR, COMPOSITION, 2.4 kΩ ±5%, 1/4 W		RCR07G242JS	
R39	D	RESISTOR, COMPOSITION, 7.5 kΩ ±5%, 1/4 W		RCR07G752JS	
R40	D	SAME AS R39			
R41	D	SAME AS R38			
R42	D	RESISTOR, COMPOSITION, 91 ohms ±5%, 1/4 W		RCR07G910JS	
R43	D	RESISTOR, COMPOSITION, 1.5 kΩ ±5%, 1/8 W		RCR05G152JS	
U1	D	INTEGRATED CIRCUIT, TRANSISTOR ARRAY	86684	CA3118T	
VR1	D	DIODE, ZENER	04713	1N5525B	

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A1A3(S) or 2A1A3(S)	C	PHASE COMPARATOR		8008627G1	
C1	D	CAPACITOR, CERAMIC, 2200 pF ±10%, 200 V		CK06BX222K	
C2	D	CAPACITOR, 0.047 μF ±10%, 100 V		CK06BX473K	
C3	D	SAME AS C2			
C4	D	CAPACITOR, TANTALUM, 2.2 μF ±10%, 50 V		M39003-01-2362	
C5	D	CAPACITOR, TANTALUM, 15 μF ±10%, 20 V		M39003-01-2289	
C6	D	SAME AS C5			
C7	D	SAME AS C5			
C8	D	CAPACITOR, CERAMIC, 0.1 μF ±10%, 100 V		CK06BX104K	
C9	D	CAPACITOR, TANTALUM, 6.8 μF ±10%, 35 V		M39003-01-2304	
C10	D	SAME AS C2			
C11	D	CAPACITOR, CERAMIC, 100 pF ±10%, 1 kV		CK60BX101K	
C12	D	CAPACITOR, CERAMIC, 0.01 μF ±10%, 200 V		CK06BX103K	
C13		NOT USED			
C14	D	CAPACITOR, CERAMIC, 0.15 μF ±10%, 50 V		CK06BX154K	
C15	D	CAPACITOR, CERAMIC, 0.1 μF ±10%, 100 V		CK06BX104K	
C16	D	SAME AS C5			
C17	D	CAPACITOR, CERAMIC, 47 pF ±10%, 1 kV		CK60BX470K	
C18	D	CAPACITOR, CERAMIC, 0.22 μF ±10%, 50 V		CK06BX224K	
CR1	D	DIODE, SILICON, 75 prv, 10 mA		JAN1N4148	

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A1A3(S) or 2A1A3(S) (con.)					
CR2	D	SAME AS CR1			
CR3	D	SAME AS CR1			
CR4	D	SAME AS CR1			
L1	D	COIL, RF, 15 μH		MS18130-22	
Q1	D	TRANSISTOR, SILICON, NPN		JAN2N2222A	
Q2	D	SAME AS Q1			
Q3	D	SAME AS Q1			
Q4	D	NOT USED			
Q5	D	TRANSISTOR, SILICON, PNP		JAN2N2907A	
Q6	D	TRANSISTOR, SILICON, FET, N CHANNEL	22229	2N4393	
R1	D	RESISTOR, COMPOSITION, 510 ohms ±5%, 1/4 W		RCR07G511JS	
R2	D	RESISTOR, COMPOSITION, 4.7 kΩ ±5%, 1/4 W		RCR07G472JS	
R3	D	RESISTOR, COMPOSITION, 100 ohms ±5%, 1/4 W		RCR07G101JS	
R4	D	RESISTOR, COMPOSITION, 5.6 kΩ ±5%, 1/4 W		RCR07G562JS	
R5	D	RESISTOR, COMPOSITION, 10 kΩ ±5%, 1/4 W		RCR07G103JS	
R6	D	SAME AS R3			
R7	D	RESISTOR, COMPOSITION, 18 kΩ ±5%, 1/4 W		RCR07G183JS	
R8	D	RESISTOR, COMPOSITION, 2.2 kΩ ±5%, 1/4 W		RCR07G222JS	

Table 8-1. VHF/UHF Receiver Parts List (con.)

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A1A3(S) or 2A1A3(S) (con.)					
R9	D	SAME AS R3			
R10	D	NOT USED			
R11	D	SAME AS R2			
R12	D	RESISTOR, COMPOSITION, 680 ohms ±5%, 1/4 W		RCR07G681JS	
R13	D	SAME AS R3			
R14	D	SAME AS R2			
R15	D	SAME AS R1			
R16	D	RESISTOR, COMPOSITION, 1 kΩ ±5%, 1/4 W		RCR07G102JS	
R17	D	RESISTOR, COMPOSITION, 10 MΩ ±5%, 1/4 W		RCR07G106JS	
R18	D	RESISTOR, COMPOSITION, 2.4 kΩ ±5%, 1/4 W		RCR07G242JS	
R19	D	RESISTOR, COMPOSITION, 30 kΩ ±5%, 1/4 W		RCR07G303JS	
R20	D	RESISTOR, COMPOSITION, 3 kΩ ±5%, 1/4 W		RCR07G302JS	
R21	D	SAME AS R2			
R22	D	SAME AS R7			
R23	D	SAME AS R7			
R24	D	RESISTOR, COMPOSITION, 2.7 kΩ ±5%, 1/4 W		RCR07G272JS	
R25	D	SAME AS R5			
R26	D	SAME AS R19			

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A1A3(S) or 2A1A3(S) (con.)					
R27	D	RESISTOR, COMPOSITION, 1.2 kΩ ±5%, 1/4 W		RCR07G122JS	
R28	D	RESISTOR, COMPOSITION, 27 ohms ±5%, 1/4 W		RCR07G270JS	
U1	D	INTEGRATED CIRCUIT, AMPLIFIER	12040	LM101AH	
VR1	D	DIODE, ZENER	04713	1N5534B	
VR2	D	DIODE, ZENER, 5.1 V ±5%, 0.4 W	04713	1N5523B	
1A1A4(S) or 2A1A4(S)	C	REFERENCE GENERATOR	31550	508933-5	
1A1A5(S) or 2A1A5(S)	C	SWITCHING REGULATOR	31550	8008638G1	
C1	D	CAPACITOR, TANTALUM, 5.6 μF ±10%, 50 V		M39003-01-2370	
C2	D	CAPACITOR, CERAMIC, 1 μF ±10%, 50 V		CK06BX105K	
C3	D	CAPACITOR, CERAMIC, 0.1 μF ±10%, 100 V		CK06BX104K	
C4	D	CAPACITOR, TANTALUM, 22 μF ±10%, 15 V	31550	501236-1	
C5	D	SAME AS C4			

Table 8-1. VHF/UHF Receiver Parts List (con.)

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Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A1A5(S) or 2A1A5(S) (con.)					
L1	D	COIL, RF, 0.7 mH	31550	8008593G1	
L2	D	COIL, RF, 10 μH		MS75008-40	
L3	D	COIL, RF, 330 μH		MS75053-4	
R1	D	NOT USED			
* R2	D	RESISTOR, COMPOSITION, 1.3 MΩ ±5%, 1/8 W		RCR05G135JS	*
R3	D	RESISTOR, COMPOSITION, 10 ohms ±5%, 1/8 W		RCR05G100JS	
R4	D	RESISTOR, FILM, 8.25 kΩ ±1%, 1/8 W		RN55D8251F	
R5	D	RESISTOR, VARIABLE, 2 kΩ ±10%		RJ50CP202	
R6	D	RESISTOR, FILM, 3.01 kΩ ±1%, 1/8 W		RN55D3011F	
*					
U1	D	INTEGRATED CIRCUIT, VOLTAGE REGULATOR	12040	LM105	Replaces SG105J *
1A1(S) or 2A1(S)					
L1	C	FILTER, EMI FEED-THROUGH, 1500 pF, 200 WV d.c.	33095	51712011	
L2	C	SAME AS L1			
L3	C	SAME AS L1			

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A1(S) or 2A1(S) (con.)					
L4	C	SAME AS L1			
L5	C	SAME AS L1			
L6	C	SAME AS L1			
P1	C	CONNECTOR	71468	DEC9PF0	
P2	C	CONNECTOR, COAX		UG-1465/U	
U1	C	INTEGRATED CIRCUIT, REGULATOR	12969	PIC600	
1A2	B	MIXER/MULTIPLIER, UHF	31550	8004240G1, G2	
*	C	CKT CARD ASSY, MIXER MULTIPLIER, UHF	31550	8004350G1	
**	C	CKT CARD ASSY, MIXER MULTIPLIER, UHF	31550	8006164G1	
C1	D	CAPACITOR, CERAMIC, 470 pF ±10%, 1 kV		CK60AX471K	
C2	C	CAPACITOR, CERAMIC, 1000 pF ±20%, 1 kV		CK60AW102M	
C3	D	SAME AS C2			
C4	D	CAPACITOR, CERAMIC, STANDOFF, 1000 pF +100% -0%, 500 V	00656	5601-1	

*Applies to G1 Mixer/multiplier configuration
**Applies to G2 Mixer/multiplier configuration

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A2 (con.)					
C5	C	CAPACITOR, CERAMIC, FEED-THROUGH, 1000 pF +150% -0%, 500 V	00656	5801-0050	
C6	D	CAPACITOR, CERAMIC, 0.1 μF ±10%, 100 V	51642	300-100W5R104K	
C7	D	SAME AS C2			
C8	D	SAME AS C2			
C9	D	SAME AS C2			
C10	D	SAME AS C4			
C11	E	CAPACITOR, VARIABLE, AIR, 2.0 to 27 pF, 375 V	74970	193-0008-001	
C12	D	SAME AS C11			
C13	D	SAME AS C4			
C14	D	SAME AS C4			
C15	D	SAME AS C2			
C16	D	SAME AS C1			
C17	D	SAME AS C1			
C18	D	SAME AS C4			
C19		NOT USED			
* C20	D	CAPACITOR, CERAMIC, 1.0μF ±10%, 50 V		CK06BX105K	*
C21	D	SAME AS C2			
C22	D	SAME AS C4			
C23	D	SAME AS C1			

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A2 (con.)					
* C24	D	CAPACITOR, CERAMIC, 1.0μF ±10%, 50 V			CK06BX105K *
C25	D	SAME AS C2			
C26		NOT USED			
C27	E	SAME AS C11			
C28	D	CAPACITOR, CERAMIC, WAFER CHIP, 470 pF ±10%	95275	VK11CX471K	
C29	D	SAME AS C5			
C30	E	CAPACITOR, VARIABLE, AIR, 2.2 to 34 pF, 375 V	74970	193-0010-001	
C31	D	CAPACITOR, CERAMIC, 100 pF ±10%, 1 kV		CK60BX101K	
C32	D	SAME AS C2			
C33	D	CAPACITOR, MODIFIED, 1000 pF ±100%, -0%, 500 V	31550	8006108-1	
C34	D	SAME AS C2			
C35	E	SAME AS C11			
C36	D	CAPACITOR, CERAMIC, 22 pF ±10%, 1 kV		CK60BX220K	
C37	D	SAME AS C33			
C38	D	CAPACITOR, MICA, 10 pF ±5%, 500 V		CM05CD100J03	
C39	D	CAPACITOR, VARIABLE, AIR, 1.7 to 11.0 pF, 375 V	74970	189-505-5	
C40	D	CAPACITOR, MICA, 100 pF ±5%, 500 V		CM05FD101J03	
C41	D	SAME AS C2			
C42	D	SAME AS C2			
C43	D	SAME AS C2			

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A2 (con.)					
C44	D	SAME AS C5			
C45		NOT USED			
C46	D	SAME AS C5			
C47		NOT USED			
C48		NOT USED			
C49	D	SAME AS C31			
C50	D	SAME AS C33			
C51	D	SAME AS C33			
C52	D	CAPACITOR, CERAMIC, 0.01 μF ±10%, 200 V		CK06BX103K	
C53	D	SAME AS C52			
*C54	D	CAPACITOR, CERAMIC, 100 pF ±10%, 1 kV		CK60BX101K	
**C54	D	CAPACITOR, CERAMIC, 15 pF ±10%, 1 kV		CK60BX150K	
C55	D	SAME AS C28			
C56	D	CAPACITOR, TANTALUM, 2.2 μF ±10%, 50 V		M39003-01-2362	
CR1	D	DIODE, HOT CARRIER	28480	5082-8906	
CR2		NOT USED			

*Applies to G1 Mixer/multiplier configuration
**Applies to G2 Mixer/multiplier configuration

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A2 (con.)					
CR3		NOT USED			
CR4	D	SAME AS CR1			
CR5	D	DIODE, PIN	28480	5082-8697	
J1	C	CONNECTOR, COAX		UG-1468/U	
L1	E	COIL, RF, tapped	31550	8004960-1	
L2		NOT USED			
L3	D	CHOKE, RF, 1 μH ±10%, 0.93 A		MS75008-28	
L4	D	SAME AS L3			
L5	E	COIL, RF, tapped	31550	8004960-2	
L6	D	COIL, RF. 0.33 μH ±20%, 2 A		MS75008-23	
L7	D	SAME AS L3			
L8	E	COIL, RF	31550	8004814-1	
L9	D	SAME AS L3			
*L10	E	COIL, RF, tapped	31550	8004920-1	
**L10	E	COIL, RF, tapped	31550	8004920-2	
L11	D	SAME AS L3			

*Applies to G1 Mixer/multiplier configuration
**Applies to G2 Mixer/multiplier configuration

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A2 (con.)					
L12	E	COIL, RF, tapped	31550	8004919-1	
L13	D	COIL, RF, 2.7 μH ±10%, 0.46 A		MS75008-33	
L14	D	COIL, RF, 22 μH ±10%, 0.24 A		MS75008-44	
L15	D	SAME AS L3			
L16	D	SHIELD, RFI	02114	56-490-65-48	
L17	D	SAME AS L16			
L18	D	SAME AS L16			
P1	C	CONNECTOR, ELECTRICAL, 15-pin	71468	DAC15PF0	
P2	C	CONNECTOR, COAX		UG-1466/U	
P3	C	CONNECTOR, COAX		UG-1466/U	
Q1	D	TRANSISTOR, NPN		2N3866	
Q2	D	SAME AS Q1			
Q3	D	SAME AS Q1			
Q4	D	TRANSISTOR, NPN		JAN2N2222A	
Q5	D	TRANSISTOR, NPN		JAN2N697	
Q6	D	SAME AS Q4			
*Q7	D	TRANSISTOR, DUAL GATE, FET, N-CHANNEL	31550	511830-2	
**Q7	D	TRANSISTOR, DUAL GATE, FET, N-CHANNEL	31550	FC-5538	

*Applies to G1 mixer/multiplier configuration
**Applies to G2 mixer/multiplier configuration

Table 8-1. VHF/UHF Receiver Parts List (con.)					
Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A2 (con.)					
*Q8	D	SAME AS Q7			
**Q8	D	SAME AS Q7			
R1	D	RESISTOR, COMPOSITION, 360 ohms ±5%, 1/4 W		RCR07G361JR	
R2	D	RESISTOR, COMPOSITION, 3.9 kΩ ±5%, 1/4 W		RCR07G392JR	
R3	D	RESISTOR, COMPOSITION, 10 ohms ±5%, 1/4 W		RCR07G100JR	
R4	D	RESISTOR, COMPOSITION, 510 ohms ±5%, 1/4 W		RCR07G511JR	
R5	D	RESISTOR, COMPOSITION, 20k ±5%, 1/4 W		RCR07G203JR	
R6	D	RESISTOR, COMPOSITION, 220 ohms ±5%, 1/4 W		RCR07G203JR	
R7	D	RESISTOR, COMPOSITION, 10 kΩ ±5%, 1/4 W		RCR07G103JR	
R8	D	SAME AS R3			
R9	D	RESISTOR, COMPOSITION, 1.5 kΩ ±5%, 1/4 W		RCR07G152JR	
R10	D	RESISTOR, COMPOSITION, 130 ohms ±5%, 1/4 W		RCR07G131JR	
R11	D	SAME AS R1			
R12	D	RESISTOR, COMPOSITION, 8.2 kΩ ±5%, 1/4 W		RCR07G822JR	
R13	D	SAME AS R3			
R14		NOT USED			

*Applies to G1 mixer/multiplier configuration
**Applies to G2 mixer/multiplier configuration

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A2 (con.)					
R15	D	RESISTOR, COMPOSITION, 2 kΩ ±5%, 1/4 W		RCR07G202JR	
R16	D	SAME AS R15			
R17	D	RESISTOR, VARIABLE, COMPOSITION, 10 kΩ ±10%, 2 W		RV6LAYSA103A	
R18	D	RESISTOR, COMPOSITION, 5.6 kΩ ±5%, 1/4 W		RCR07G562JR	
R19	D	SAME AS R18			
R20	D	RESISTOR, COMPOSITION, 100 kΩ ±5%, 1/4 W		RCR07G104JR	
*R21	D	RESISTOR, COMPOSITION, 100 ohms ±5%, 1/4 W		RCR07G101JR	
**R21	D	SAME AS R20			
R22	D	RESISTOR, COMPOSITION, 330 kΩ ±5%, 1/4 W		RCR07G334JR	
*R23	D	SAME AS R20			
**R23	D	RESISTOR, COMPOSITION, 390 ohms ±5%, 1/4 W		RCR07G391JR	
*R24	D	SAME AS R6			
**R24	D	RESISTOR, COMPOSITION, 47 kΩ ±5%, 1/4 W		RCR07G473JR	
R25	D	RESISTOR, COMPOSITION, 1 kΩ ±5%, 1/4 W		RCR07G102JR	
R26	D	RESISTOR, COMPOSITION, 3.3 kΩ ±5%, 1/4 W		RCR07G332JR	

*Applies to G1 mixer/multiplier configuration
**Applies to G2 mixer/multiplier configuration

Table 8-1. VHF/UHF Receiver Parts List (con.)					
Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A2 (con.)					
*R27	D	RESISTOR, COMPOSITION, 10 kΩ ±5%, 1/4 W		RCR07G103JR	
**R27	D	RESISTOR, COMPOSITION, 15 kΩ ±5%, 1/4 W		RCR07G153JR	
R28	D	SAME AS R18			
R29	D	RESISTOR, COMPOSITION, 100 ohms ±5%, 1/4 W		RCR07G101JR	
**R30	D	RESISTOR, COMPOSITION, 1 MΩ ±5%, 1/4 W		RCR07G105JR	
**R31	D	RESISTOR, COMPOSITION, 33 kΩ ±5%, 1/4 W		RCR07G333JR	
R32	D	RESISTOR, COMPOSITION, 62 kΩ ±5%, 1/4 W		RCR07G623JR	
R33	D	RESISTOR, COMPOSITION, 470 ohms ±5%, 1/4 W		RCR07G471JR	
R34	D	RESISTOR, COMPOSITION, 390 kΩ ±5%, 1/4 W		RCR07G394JR	
R35	D	SAME AS R29			
R36	D	RESISTOR, COMPOSITION, 22 kΩ ±5%, 1/4 W		RCR07G223JR	
R37	D	SAME AS R36			
R38	D	RESISTOR, FILM, 357 ohms ±1%, 1/4 W		RN65D3570F	
R39	D	RESISTOR, FILM, 191 ohms ±1%, 1/4 W		RN65D1910F	
R40	D	SAME AS R25			
R41		NOT USED			

*Applies to G1 mixer/multiplier configuration
**Applies to G2 mixer/multiplier configuration

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A2 (con.)					
R42	D	SAME AS R20			
R43	D	SAME AS R20			
R44	D	SAME AS R29			
R45	D	RESISTOR, COMPOSITION, 150 ohms ±5%, 1/4 W		RCR07G151JR	
* **R46	D	RESISTOR, COMPOSITION, 2.2 kΩ ±5%, 1/4 W		RCR07G222JR	Selected at test 1.5 kΩ, 2.2 kΩ, or 4.7 kΩ *
RT1	D	RESISTOR, THERMAL, 27 ohms nom, 0.8 W	12930	4DB270S	
VR1	D	DIODE, ZENER, 3.3 V ±5%, 0.4 W		JAN1N746A	
VR2	D	DIODE, ZENER, 6.2 V ±5%, 0.4 W		JAN1N753A	
2A2	B	MIXER/MULTIPLIER, VHF	31550	3004241G1,G2	
*	C	CKT CARD ASSY, MIXER/MULTIPLIER, VHF	31550	8004351G1	
**	C	CKT CARD ASSY, MIXER/MULTIPLIER, VHF	31550	8006777G1	
C1	D	CAPACITOR, VARIABLE, AIR, 2.2 to 27 pF, 375 V	74970	193-0008-001	
C2	D	CAPACITOR, CERAMIC, 470 pF ±10%, 1 kV		CK60AX471K	
C3	D	CAPACITOR, CERAMIC, 1000 pF ±20%, 1 kV		CK60AW102M	
C4	D	SAME AS C3			
C5	D	SAME AS C3			

*Applies to G1 mixer/multiplier configuration
**Applies to G2 mixer/multiplier configuration

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
2A2 (con.)					
C6	D	CAPACITOR, CERAMIC, 0.01 μF ±20%, 1 kV		CK63W103M	
C7	D	SAME AS C2			
C8	D	SAME AS C3			
C9	D	CAPACITOR, VARIABLE, AIR, 1.7 to 20 pF, 375 V	74970	193-0006-001	
C10	D	CAPACITOR, CERAMIC, 100 pF ±10%, 1 kV		CK60BX101K	
C11	D	SAME AS C10			
C12	D	SAME AS C10			
C13	D	SAME AS C6			
C14		NOT USED			
C15	D	SAME AS C3			
C16		NOT USED			
C17	D	SAME AS C3			
C18	D	CAPACITOR, MICA, 33 pF ±5%, 500 V		CM05ED330J03	
C19		NOT USED			
C20	D	CAPACITOR, CERAMIC, 2200 pF ±10%, 1 kV		CK61AW222M	
C21	D	SAME AS C2			
C22	D	SAME AS C2			
C23	D	SAME AS C2			
C24	D	SAME AS C9			
C25	D	SAME AS C2			

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
2A2 (con.)					
C26	D	SAME AS C2			
C27	D	SAME AS C3			
C28	D	SAME AS C2			
C29	D	SAME AS C9			
C30	D	SAME AS C20			
C31	D	CAPACITOR, CERAMIC, WAFER, 1000 pF ±10%	95275	VK11CX102K	
C32	D	SAME AS C3			
C33	D	SAME AS C10			
C34	D	CAPACITOR, CERAMIC, 0.01 μF ±10%, 200 V		CK06BX103K	
C35	D	SAME AS C31			
C36	D	SAME AS C3			
C37	D	SAME AS C3			
C38	D	SAME AS C3			
C39	D	SAME AS C34			
C40	D	SAME AS C3			
C41	D	CAPACITOR, VARIABLE, CERAMIC, MINIATURE, 5.5 to 18 pF, 350 V	72982	538-011-5-5-18PFA	
C42	D	CAPACITOR, MICA, 330 pF ±5%, 500 V		CM05FD331J03	
C43	D	SAME AS C34			
C44	D	SAME AS C10			

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
2A2 (con.)					
CR1	D	DIODE, HOT CARRIER	28480	5082-8916	
CR2	D	DIODE, SILICON, 100 prv, 100 mA		JAN1N914	
CR3	D	SAME AS CR1			
CR4	D	DIODE, PIN	28480	5082-8697	
J1	D	CONNECTOR, COAX		UG-1468/U	
L1	D	COIL, RF, 4 turns, 16 ga wire, 1/4" dia	31550	8006107-1	
*L2	D	COIL, RF, 2.2 μH ±10%, 0.24 A		MS75008-44	
**L2	D	COIL, RF, 2.2 μH ±10%, 0.505 A		MS75008-32	
L3	D	COIL, RF, tapped, 5-1/2 turns, 14 ga, 9/32" dia	31550	8006106-1	
L4	D	COIL, RF		MS75053-1	
L5	D	COIL, RF, 22 μH ±10%, 0.24 A		MS75008-44	
L6		NOT USED			
L7		NOT USED			
L8	D	CHOKE, RF, 2.2 μH ±10%, 0.505 A		MS75008-32	
L9	D	COIL, RF, 3-1/4 turns, 16 ga, 9/32" dia	31550	8004830-1	

*Applies to G1 mixer/multiplier configuration
**Applies to G2 mixer/multiplier configuration

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
2A2 (con.)					
L10	D	COIL, RF, 1/2 turn, 16 ga, 9/32" dia	31550	8004830-1	
L11	D	SAME AS L8			
L12	D	COIL, RF, tapped, 2.2 μH, 2-1/2 turns, 16 ga, 9/32" dia	31550	8004829-1	
L13	D	SAME AS L8			
L14		NOT USED			
L15	D	COIL, RF, 10 μH ±10%, 0.44 A		MS75008-40	
L16	D	COIL, RF, 1.5 μH ±10%, 0.7 A		MS75008-30	
**L17	D	CHOKE, RF, 1 μH ±10%, 0.93 A		MS75008-28	
P1	D	CONNECTOR, ELECTRICAL, 15 pin	71468	DAC15PF0	
P2	D	CONNECTOR, COAX		UG-1466/U	
P3	D	SAME AS P2			
*Q1	D	TRANSISTOR, DUAL GATE, FET, N-CHANNEL	01295	511830-2	
**Q1	D	TRANSISTOR, DUAL GATE, FET, N-CHANNEL	01295	SFC6570	
*Q2	D	TRANSISTOR, DUAL GATE, FET, N-CHANNEL	02735	511830-1 3N140	
**Q2	D	SAME AS Q1			
Q3	D	TRANSISTOR, SILICON, NPN		JAN2N2222A	

*Applies to G1 mixer/multiplier configuration
**Applies to G2 mixer/multiplier configuration

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
2A2 (con.)					
Q4	D	TRANSISTOR, SILICON, NPN, RF AMPLIFIER	04713	2N4072	
Q5	D	TRANSISTOR, SILICON, NPN, RF POWER AMPLIFIER	04713	2N3866	
Q6	D	SAME AS Q3			
R1	D	RESISTOR, COMPOSITION, 5.6 kΩ ±5%, 1/4 W		RCR07G562JR	
R2	D	SAME AS R1			
R3		NOT USED			
R4		NOT USED			
*R5	D	SAME AS R1			
**R5	D	RESISTOR, COMPOSITION, 13 kΩ ±5%, 1/4 W		RCR07G133JR	
R6	D	RESISTOR, COMPOSITION, 100 kΩ ±5%, 1/4 W		RCR07G104JR	
*R7	D	RESISTOR, COMPOSITION, 200 ohms ±5%, 1/4 W		RCR07G201JR	
**R7	D	RESISTOR, COMPOSITION, 390 ohms ±5%, 1/4 W		RCR07G391JR	
*R8	D	RESISTOR, COMPOSITION, 100 ohms ±5%, 1/4 W		RCR07G101JR	
**R8	D	RESISTOR, COMPOSITION, 680 ±5%, 1/4 W		RCR07G684JR	
R9	D	RESISTOR, COMPOSITION, 3 kΩ ±5%, 1/4 W		RCR07G302JR	
R10	D	RESISTOR, COMPOSITION, 15 kΩ ±5%, 1/4 W		RCR07G153JR	

*Applies to G1 mixer/multiplier configuration
**Applies to G2 mixer/multiplier configuration

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
2A2 (con.)					
R11	D	RESISTOR, COMPOSITION, 150 kΩ ±5%, 1/4 W		RCR07G154JR	
R12	D	RESISTOR, COMPOSITION, 20 kΩ ±5%, 1/4 W		RCR07G203JR	
R13	D	RESISTOR, COMPOSITION, 300 ohms ±5%, 1/4 W		RCR07G301JR	
R14		NOT USED			
R15	D	RESISTOR, COMPOSITION, 1 kΩ ±5%, 1/4 W		RCR07G102JR	
R16	D	RESISTOR, COMPOSITION, 2.2 kΩ ±5%, 1/4 W		RCR07G222JR	
R17	D	RESISTOR, COMPOSITION, 4.7 kΩ ±5%, 1/4 W		RCR07G472JR	
R18	D	RESISTOR, COMPOSITION, 6.8 kΩ ±5%, 1/4 W		RCR07G682 JR	
R19	D	RESISTOR, COMPOSITION, 10 kΩ ±5%, 1/4 W		RCR07G103JR	
R20	D	RESISTOR, COMPOSITION, 150 ohms ±5%, 1/4 W		RCR07G151JR	
R21	D	RESISTOR, COMPOSITION, 270 ohms ±5%, 1/4 W		RCR07G1271JR	
R22	D	SAME AS R12			
R23	D	RESISTOR, COMPOSITION, 18 ohms ±5%, 1/4 W		RCR07G180JR	
R24	D	SAME AS R12			
R25		NOT USED			
R26	D	RESISTOR, VARIABLE, 10 kΩ ±10%, 2 W		RV6LAYSA103A	
R27	D	RESISTOR, COMPOSITION, 510 ohms ±5%, 1/4 W		RCR07G511JR	
R28	D	SAME AS R19			

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
2A2 (con.)					
*R29	D	RESISTOR, FILM, 402 ohms ±1%, 1/4 W		RN65D4020F	
**R29	D	RESISTOR, FILM, 374 ohms ±1%, 1/4 W		RN65D3740F	
R30	D	RESISTOR, FILM, 191 ohms ±1%, 1/4 W		RN65D1910F	
R31	D	RESISTOR, COMPOSITION, 100 ohms ±5%, 1/4 W		RCR07G101JR	
R32	D	SAME AS R23			
R33		NOT USED			
*R34	D	RESISTOR, COMPOSITION, 390 ohms ±5%, 1/4 W		RCR07G391JR	
**R34	D	RESISTOR, COMPOSITION, 680 ohms ±5%, 1/4 W		RCR07G681JR	
R35	D	RESISTOR, COMPOSITION, 330 kΩ ±5%, 1/4 W		RCR07G334JR	
R36	D	RESISTOR, COMPOSITION, 30 ohms ±5%, 1/4 W		RCR07G300JR	
R37	D	SAME AS R15			
* **R38	D	RESISTOR, COMPOSITION, 10 ohms ±5%, 1/4 W		RCR07G100JR	Selected at test, may be 10Ω, 20Ω, or 39Ω. *
**R39	D	SAME AS R31			
**R40	D	SAME AS R34			
RT1		NOT USED			
RT2	D	RESISTOR, THERMAL, 0.2 W max	15801	JB32J12	

Table 8-1. VHF/UHF Receiver Parts List (con.)

*Applies to G1 mixer/multiplier configuration
**Applies to G2 mixer/multiplier configuration

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
2A2 (con.)					
RT3	D	RESISTOR, THERMAL, 27 ohms, 0.8 W max	12930	4DB270S	
VR1	D	DIODE, ZENER, 3.3 V ±5%, 0.4 W		JAN1N746A	
VR2	D	DIODE, ZENER, 6.2 V ±5%, 0.4 W		JAN1N753A	
1A3 or 2A3	B	PREAMPLIFIER, AF/AGC-SQUELCH	31550	8008586G1	
	C	CIRCUIT CARD ASSY, PREAMPLIFIER	31550	8008595G1	
	C	CIRCUIT CARD ASSY, AGC-SQUELCH	31550	8008596G1	
C1	D	CAPACITOR, 0.1 μF ±10%, 100 V		CP09A1KB104K3	
C2	D	CAPACITOR, 10 μF ±10%, 20 V		M39003-01-2286	
C3	D	CAPACITOR, 0.1 μF ±10%, 100 V	51642	300-100W5R104K	
C4	D	CAPACITOR, 2.2 μF ±10%, 50 V		M39003-01-2362	
C5	D	SAME AS C4			
C6	D	SAME AS C4			
C7	D	SAME AS C4			
C8	D	SAME AS C4			
C9	D	SAME AS C4			
C10	D	SAME AS C4			
C11	D	SAME AS C2			
C12	D	SAME AS C4			
C13	D	SAME AS C4			

Table 8-1. VHF/UHF Receiver Parts List (con.)					
Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A3 or 2A3 (con.)					
C14	D	SAME AS C4			
C15	D	CAPACITOR, 0.01 μF ±10%, 100 V		CK13BX103K	
C16	D	SAME AS C15			
C17	D	CAPACITOR, 2200 pF ±5%, 300 V		CM20CC222J03	
* C18	D	CAPACITOR, 0.022μF ±10%, 100 V		CK13BX223K	*
C19	D	SAME AS C15			
C20	D	SAME AS C15			
C21	D	SAME AS C4			
C22	D	CAPACITOR, CERAMIC, 0.1 μF, ±10%, 100 V		CK06BX104K	
C23	D	CAPACITOR, CERAMIC, 1000 pF, 1 kV		CK60AW102M	
CR1	D	DIODE, SILICON, 100 prv, 110 mA		JAN1N914	
CR2	D	SAME AS CR1			
CR3	D	SAME AS CR1			
CR4	D	SAME AS CR1			
CR5	D	SAME AS CR1			
CR6	D	DIODE, SILICON, HOT CARRIER	28480	5082-8906	
CR7	D	SAME AS CR6			
CR8	D	SAME AS CR1			
CR9	D	DIODE, SILICON, 75 prv, 10 mA		JAN1N4148	

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A3 or 2A3 (con.)					
P1	D	CONNECTOR, ELECTRICAL, 15 pins	71468	DAC15PF0	
Q1	D	TRANSISTOR, SILICON, NPN		JAN2N2222A	
Q2	D	SAME AS Q1			
Q3	D	TRANSISTOR, SILICON, PNP		JAN2N2904A	
Q4	D	TRANSISTOR, SILICON, NPN		JAN2N1613	
Q5	D	SAME AS Q3			
Q6	D	SAME AS Q1			
Q7	D	TRANSISTOR, FET, N-CHANNEL	17856	FN3495	
Q8	D	SAME AS Q1			
Q9	D	SAME AS Q1			
Q10	D	SAME AS Q1			
Q11	D	TRANSISTOR, FET, N-CHANNEL	04713	2N4222	
Q12	D	SAME AS Q1			
Q13	D	SAME AS Q1			
Q14	D	SAME AS Q1			
R1	D	RESISTOR, FILM, 7.15 kΩ ±1%, 1/8 W		RN55D7151F	
R2	D	RESISTOR, FILM, 4.32 kΩ ±1%, 1/8 W		RN55D4321F	
R3	D	RESISTOR, FILM, 243 ohms ±1%, 1/8 W		RN55D2430F	
R4	D	SAME AS R1			

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A3 or 2A3 (con.)					
R5	D	SAME AS R2			
R6	D	RESISTOR, FILM, 2.80 kΩ ±1%, 1/8 W		RN55D2801F	
R7	D	RESISTOR, VARIABLE, 2.5 kΩ ±10%, 2 W		RV6NAYSL252A	
R8	D	RESISTOR, FILM, 3.32 kΩ ±1%, 1/8 W		RN55D3321F	
R9	D	RESISTOR, FILM, 825 ohms ±1%, 1/8 W		RN55D8250F	
R10	D	RESISTOR, FILM, 60.4 ohms ±1%, 1/8 W		RN55D60R4F	
R11	D	RESISTOR, FILM, 210 ohms ±1%, 1/8 W		RN55D2100F	
R12	D	RESISTOR, COMPOSITION, 6.2 kΩ ±5%, 1/4 W		RCR07G622JS	
R13	D	RESISTOR, COMPOSITION, 330 ohms ±5%, 1/2 W		RCR20G331JS	
R14	D	RESISTOR, COMPOSITION, 2.4 kΩ ±5%, 1/4 W		RCR07G242JS	
R15	D	RESISTOR, FILM, 1 kΩ ±1%, 1/8 W		RN55D1001F	
R16	D	RESISTOR, COMPOSITION, 47 ohms ±5%, 1/4 W		RCR07G470JS	
R17	D	RESISTOR, FILM, 6.04 kΩ ±1%, 1/8 W		RN55D6041F	
R18	D	RESISTOR, COMPOSITION, 1 kΩ ±5%, 1/4 W		RCR07G102JS	
* R19	D	RESISTOR, COMPOSITION, 22 ohms ±5%, 1/4 W		RCR07G220JS	*
R20	D	RESISTOR, FILM, 51.1 kΩ ±1%, 1/8 W		RN55D5112F	
R21	D	RESISTOR, FILM, 22.1 kΩ ±1%, 1/8 W		RN55D2212F	
R22	D	RESISTOR, COMPOSITION, 680 kΩ ±5%, 1/4 W		RCR07G684JS	
R23	D	RESISTOR, COMPOSITION, 2.2 kΩ ±5%, 1/4 W		RCR07G222JS	

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A3 or 2A3 (con.)					
R24	D	RESISTOR, COMPOSITION, 100 kΩ ±5%, 1/4 W		RC07G104JS	
R25	D	SAME AS R12			
R26	D	SAME AS R24			
R27	D	SAME AS R18			
R28	D	RESISTOR, COMPOSITION, 3.9 kΩ ±5%, 1/4 W		RCR07G392JS	
R29	D	RESISTOR, COMPOSITION, 2 kΩ ±5%, 1/4 W		RCR07G202JS	
R30	D	RESISTOR, FILM, 10 kΩ ±1%, 1/8 W		RN55D1002F	
R31	D	RESISTOR, COMPOSITION, 3.3 kΩ ±5%, 1/4 W		RCR07G332JS	
R32	D	RESISTOR, VARIABLE, 25 kΩ ±10%, 2 W		RV6NAYSL253A	
R33	D	RESISTOR, COMPOSITION, 150 kΩ ±5%, 1/4 W		RCR07G154JS	
R34	D	RESISTOR, COMPOSITION, 10 kΩ ±5%, 1/4 W		RCR07G103JS	
R35	D	RESISTOR, COMPOSITION, 1 MΩ ±5%, 1/4 W		RCR07G105JS	
R36	D	RESISTOR, FILM, 6.81 kΩ ±1%, 1/8 W		RN55D6811F	
R37	D	SAME AS R36			
R38	D	RESISTOR, COMPOSITION, 120 kΩ ±5%, 1/4 W		RCR07G124JS	
R39	D	SAME AS R34			
R40	D	SAME AS R21			
R41	D	SAME AS R32			
R42	D	RESISTOR, FILM, 30.1 kΩ ±1%, 1/8 W		RN55D3012F	

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A3 or 2A3 (con.)					
R43	D	RESISTOR, COMPOSITION, 4.7 kΩ ±5%, 1/4 W		RCR07G472JS	
R44	D	RESISTOR, COMPOSITION, 510 ohms ±5%, 1/4 W		RCR07G511JS	
R45	D	SAME AS R43			
R46	D	RESISTOR, COMPOSITION, 470 ohms ±5%, 1/4 W		RCR07G471JS	
R47	D	RESISTOR, FILM, 40.2 kΩ ±1%, 1/8 W		RN55D4022F	
R48	D	RESISTOR, FILM, 9.31 kΩ ±1%, 1/8 W		RN55D9311F	
R49	D	SAME AS R24			
R50	D	RESISTOR, COMPOSITION, 12 kΩ ±5%, 1/4 W		RCR07G123JS	
R51	D	RESISTOR, FILM, 5.62 kΩ ±1%, 1/8 W		RN55D5621F	
R52	D	RESISTOR, COMPOSITION, 220 ohms ±5%, 1/4 W		RCR07G221JS	
R53	D	RESISTOR, COMPOSITION, 1.6 kΩ ±5%, 1/4 W		RCR07G162JS	
R54	D	RESISTOR, COMPOSITION, 18 kΩ ±5%, 1/4 W		RCR07G183JS	
R55	D	RESISTOR, COMPOSITION, 470 kΩ ±5%, 1/4 W		RCR07G474JS	
R56	D	RESISTOR, COMPOSITION, 220 kΩ ±5%, 1/4 W		RCR07G224JS	
R57	D	SAME AS R42			
R58	D	RESISTOR, FILM, 34 kΩ ±1%, 1/8 W		RN55D3402F	
R59	D	SAME AS R34			
R60	D	RESISTOR, FILM, 3.01 kΩ ±1%, 1/8 W		RN55D3011F	
R61	D	RESISTOR, FILM, 8.25 kΩ ±1%, 1/8 W		RN55D8251F	

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A3 or 2A3 (con.)					
R62	D	RESISTOR, FILM, 6.04 kΩ ±1%, 1/8 W		RN55D6041F	
R63	D	SAME AS R18			
R64	D	RESISTOR, COMPOSITION, 68 kΩ ±5%, 1/4 W		RCR07G683JS	
R65	D	RESISTOR, FILM, 182 kΩ ±1%, 1/8 W		RN55D1823F	
R66	D	SAME AS R47			
R67	D	RESISTOR, FILM, 392 kΩ ±1%, 1/8 W		RN60D3923F	
R68	D	SAME AS R67			
R69	D	SAME AS R46			
R70	D	SAME AS R24			
R71	D	SAME AS R16			
R72	D	SAME AS R18			
R73	D	SAME AS R34			
RT1	D	RESISTOR, THERMAL, 0.2 W max	12930	15DB301S	
U1	D	INTEGRATED CIRCUIT, AMPLIFIER	13715	U5B7741312	
U2	D	SAME AS U1			
VR1	D	DIODE, ZENER, 6.2 V ±5%, 0.4 W		JAN1N753A	
VR2	D	DIODE, ZENER, 12 V ±5%, 0.4 W		JAN1N759A	
VR3	D	DIODE, ZENER, 5.1 V ±5%, 0.4 W		JAN1N751A	

Table 8-1. VHF/UHF Receiver Parts List (con.)					
Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A4 or 2A4	B	AUDIO AMPLIFIER	31550	8004244G1	
	C	CIRCUIT CARD ASSY, AUDIO, NO. 1	31550	8004353G1	
	C	CIRCUIT CARD ASSY, AUDIO, NO. 2	31550	8004354G1	
C1	D	CAPACITOR, TANTALUM, 10 μF ±10%, 20 V		M39003-01-2286	
C2	D	SAME AS C1			
C3	D	SAME AS C1			
C4	D	CAPACITOR, CERAMIC, 0.01 μF ±20%, 1k V		CK63AW103M	
C5	D	SAME AS C4			
C6	D	SAME AS C1			
C7	D	SAME AS C1			
C8	D	SAME AS C4			
C9	D	SAME AS C4			
C10	D	CAPACITOR, TANTALUM, 47 μF ±10%, 35 V		M39003-01-2312	
C11	D	CAPACITOR, TANTALUM, 10 μF ±10%, 50 V		M39003-01-2374	
C12	D	SAME AS C10			
C13	D	SAME AS C1			
C14	D	SAME AS C11			
C15	D	CAPACITOR, TANTALUM, 150 μF ±10%, 30 V		CL65BH151KPE	
C16	D	SAME AS C11			
C17	D	SAME AS C4			

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A4 or 2A4 (con.)					
C18	D	SAME AS C10			
C19	D	SAME AS C1			
C20	D	SAME AS C4			
C21	D	CAPACITOR, TANTALUM, 1.5 μF ±10%, 50 V		M39003-01-2359	
C22	D	SAME AS C11			
C23	D	SAME AS C4			
C24	D	SAME AS C1			
CR1	D	DIODE, SILICON, 100 prv, 0.11 A		JAN1N914	
CR2	D	SAME AS CR1			
CR3	D	SAME AS CR1			
P1	D	CONNECTOR, ELECTRICAL, 15 PIN	71468	DAC15PFO	
Q1	D	TRANSISTOR, SILICON, NPN		JAN2N1613	
Q2	D	SAME AS Q1			
Q3	D	SAME AS Q1			
Q4	D	SAME AS Q1			
Q5	D	SAME AS Q1			
Q6	D	SAME AS Q1			
Q7	D	SAME AS Q1			
Q8	D	SAME AS Q1			

Table 8-1. VHF/UHF Receiver Parts List (con.)					
Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A4 or 2A4 (con.)					
Q9	D	SAME AS Q1			
Q10	D	SAME AS Q1			
R1	D	RESISTOR, COMPOSITION, 15 kΩ ±5%, 1/4 W		RCR07G153JR	
R2	D	RESISTOR, COMPOSITION, 10 kΩ ±5%, 1/4 W		RCR07G103JR	
R3	D	SAME AS R2			
R4	D	RESISTOR, COMPOSITION, 390 ohms ±5%, 1/4 W		RCR07G391JR	
R5	D	RESISTOR, COMPOSITION, 47 ohms ±5%, 1/4 W		RCR07G470JR	
R6	D	RESISTOR, COMPOSITION, 1 kΩ ±5%, 1/4 W		RCR07G102JR	
R7	D	SAME AS R1			
R8	D	SAME AS R6			
R9	D	SAME AS R6			
R10	D	SAME AS R6			
R11	D	RESISTOR, COMPOSITION, 15 ohms ±5%, 1/2 W		RCR20G150JR	
R12	D	SAME AS R11			
R13	D	RESISTOR, COMPOSITION, 270 ohms ±5%, 1/4 W		RCR07G271JR	
R14	D	RESISTOR, COMPOSITION, 27 ohms ±5%, 1/2 W		RCR20G270JR	
R15	D	SAME AS R13			
R16	D	SAME AS R6			
R17	D	RESISTOR, COMPOSITION, 3.3 kΩ ±5%, 1/4 W		RCR07G332JR	

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A4 or 2A4 (con.)					
R18	D	RESISTOR, COMPOSITION, 2.2 kΩ ±5%, 1/4 W		RCR07G222JR	
R19	D	RESISTOR, COMPOSITION, 100 ohms ±5%, 1/4 W		RCR07G101JR	
R20		NOT USED			
R21	D	RESISTOR, COMPOSITION, 330 ohms ±5%, 1/4 W		RCR07G331JR	
R22	D	SAME AS R2			
R23	D	SAME AS R4			
R24	D	RESISTOR, COMPOSITION, 27 kΩ ±5%, 1/4 W		RCR07G273JR	
R25	D	SAME AS R6			
R26	D	SAME AS R24			
R27	D	SAME AS R2			
R28	D	RESISTOR, COMPOSITION, 1.8 kΩ ±5%, 1/4 W		RCR07G182JR	
R29	D	RESISTOR, COMPOSITION, 22 kΩ ±5%, 1/4 W		RCR07G223JR	
R30	D	SAME AS R4			
R31	D	RESISTOR, COMPOSITION, 12 kΩ ±5%, 1/4 W		RCR07G123JR	
R32	D	RESISTOR, COMPOSITION, 820 ohms ±5%, 1/4 W		RCR07G821JR	
R33	D	SAME AS R11			
R34	D	SAME AS R19			
R35	D	SAME AS R5			
R36	D	RESISTOR, COMPOSITION, 220 ohms ±5%, 1/4 W		RCR07G221JR	

Table 8-1. VHF/UHF Receiver Parts List (con.)					
Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A4 or 2A4 (con.)					
R37	D	SAME AS R19			
R38	D	SAME AS R32			
R39	D	SAME AS R11			
R40	D	RESISTOR, COMPOSITION, 4.7 kΩ ±5%, 1/4 W		RCR07G472JS	
R41	D	SAME AS R32			
R42	D	SAME AS R2			
R43	D	SAME AS R4			
R44	D	SAME AS R31			
R45	D	SAME AS R19			
R46	D	SAME AS R17			
R47	D	SAME AS R6			
TI	D	TRANSFORMER, AF, 100 Hz to 10 kHz, 1 W	43543	52834	
T2	D	SAME AS T1			
VR1	D	DIODE, ZENER, 43 V ±5%, 0.4 W		JAN1N976B	
VR2	D	SAME AS VR1			
VR3	D	SAME AS VR1			
VR4	D	SAME AS VR1			

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A5 or 2A5	B	BUFFER AMPLIFIER*	31550	8116765G1	
	C	CIRCUIT CARD ASSY, BUFFER AMPLIFIER	31550	8006766G1	
C2	D	CAPACITOR, VARIABLE, CERAMIC, 15 to 60 pF, 200 V	72982	538-011-15-60	
C3		NOT USED			
C4	D	CAPACITOR, CERAMIC, 2200 pF ±20%, 1 kV		CK61AW222M	
C5	D	SAME AS C4			
C6	D	CAPACITOR, CERAMIC, 1000 pF ±20%, 1kV		CK60AW102M	
C7	D	SAME AS C4			
C8	D	CAPACITOR, TANTALUM, 47 μF ±10%, 20 V		M39003-01-2295	
C9	D	NOT USED			
C10	D	CAPACITOR, MICA, 68 pF ±5%, 500 V		CM05ED680J03	
C11	D	CAPACITOR, CERAMIC, 1000 pF, ±10%, 1 kV		CK60AW102K	
CR1	D	SEMICONDUCTOR, HOT CARRIER DIODE	28480	5082-8906	
J1	C	CONNECTOR, COAX		UG-1468/U	
L1	D	CHOKE		MS75008-33	
L2	D	CHOKE		MS75008-37	
L3	D	SAME AS L2			
L4	D	CHOKE		MS75008-25	
L5	D	SAME AS L2			
P1	D	CONNECTOR, RECEPTACLE, ELECTRICAL, 9 pins	71468	DEC9PFO	
P2	D	CONNECTOR, COAX		UG-1465/U	

*Some equipments use a noise limiter for 1A5/2A5 (see 8-71).

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A5 or 2A5 (con.)					
Q1	D	TRANSISTOR, NPN, LOW NOISE, SMALL SIGNAL	86684	2N5109	
R1	D	RESISTOR, COMPOSITION, 5.6 kΩ ±5%, 1/4 W		RCR07G562JR	
R2	D	RESISTOR, COMPOSITION, 1.5 kΩ ±5%, 1/4 W		RCR07G152JR	
R3	D	RESISTOR, COMPOSITION, 1 kΩ ±5%, 1/4 W		RCR07G102JR	
R4	D	RESISTOR, COMPOSITION, 39 ohms ±5%, 1/4 W		RCR07G390JR	
R5	D	RESISTOR, COMPOSITION, 120 ohms ±5%, 1/4 W		RCR07G121JR	
R6	D	RESISTOR, COMPOSITION, 47 ohms ±5%, 1/4 W		RCR07G470JR	
R7	D	SAME AS R5			
R8	D	RESISTOR, COMPOSITION, 2.2 kΩ ±5%, 1/4 W		RCR07G222JR	
R9	D	RESISTOR, COMPOSITION, 100 ohms ±5%, 1/4 W		RCR07G101JR	
R10	D	RESISTOR, COMPOSITION, 10 ohms ±5%, 1/4 W		RCR07G100JR	
VR1	D	DIODE, ZENER, 6.2 V ±10%, 0.4 W		JAN1N753A	
1A6 or 2A6	B	IF AMPLIFIER AND DETECTOR	31550	8004247G1	
	C	CIRCUIT CARD ASSY, AMPL., IF, NO. 1	31550	8004352G1	
	C	CIRCUIT CARD ASSY, AMPL., IF, NO. 2	31550	8004743G1	
* C1	D	CAPACITOR, MICA, 22 pF ±5%, 500 V		CMR05F220J0DM	*
C2	D	CAPACITOR, VARIABLE, CERAMIC, 15 to 60 pF, 200 V	72982	538-011-15-60PFF	
C3	D	SAME AS C2			

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A6 or 2A6					
C4	D	CAPACITOR, CERAMIC, 0.01 μF ±20%, 1 kV		CK63AQ103M	
C5	D	CAPACITOR, CERAMIC, 1000 pF ±20%, 1 kV		CK60AW102M	
C6	D	SAME AS C4			
C7	D	SAME AS C4			
C8	D	CAPACITOR, TANTALUM, 1.5 μF ±10%, 20 V		M39003-01-2980	
C9	D	SAME AS C2			
C10	D	SAME AS C5			
C11	C	CAPACITOR, CERAMIC, 0.01 μF ±10%, 200 V		CK06BX103K	
C12	D	SAME AS C4			
C13	D	SAME AS C8			
C14	D	SAME AS C2			
C15	D	SAME AS C5			
C16	D	SAME AS C4			
C17	D	SAME AS C4			
C18	D	SAME AS C8			
C19	D	SAME AS C2			
C20	D	SAME AS C4			
C21	D	SAME AS C4			
C22	D	SAME AS C5			

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A6 or 2A6 (con.)					
C23	D	SAME AS C4			
C24	E	CAPACITOR, CERAMIC, FEED-THROUGH, 1000 pF +150%, -0%	00656	5801-0050	
C25	E	SAME AS C24			
C26	D	CAPACITOR, CERAMIC, 0.1 μF ±10%, 100 V	51642	300-100W5R104K	
C27		NOT USED			
C28	D	SAME AS C4			
C29	D	SAME AS C4			
C30	D	SAME AS C4			
C31	D	CAPACITOR, CERAMIC, 15 pF ±10%, 1 kV		CK60BX150K	
C32	D	SAME AS C2			
C33		NOT USED			
C34		NOT USED			
C35	D	SAME AS C5			
C36	D	SAME AS C5			
C37	D	SAME AS C4			
C38	D	CAPACITOR, CERAMIC, 4700 pF ±10%, 200 V		CK06BX472K	
C39	D	CAPACITOR, TANTALUM, 6.8 μF ±10%, 35 V		M39003-01-2304	
C40	D	SAME AS C39			

Table: Table 8-1. VHF/UHF Receiver Parts List (con.)

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A6 or 2A6 (con.)					
C41	D	CAPACITOR, TANTALUM, 22 μF ±10%, 15 V		M39003-01-2271	
C42	D	CAPACITOR, TANTALUM, 22 μF ±10%, 35 V		M39003-01-2306	
C43	D	CAPACITOR, CERAMIC, 0.0022 μF ±10%, 100 V	51642	M39014-02-1206	
C44	D	SAME AS C11			
C45	D	SAME AS C11			
C46	D	CAPACITOR, CERAMIC, 100 pF ±10%, 1 kV		CK60BX101K	
C47		NOT USED			
C48		NOT USED			
C49	D	SAME AS C11			
C50	D	SAME AS C11			
C51	D	SAME AS C11			
CR1	D	DIODE, SILICON, 100 prv, 0.11 A		JAN1N914	
CR2	D	SAME AS CR1			
CR3	D	SAME AS CR1			
CR4	D	SAME AS CR1			
J1	C	CONNECTOR, COAX		UG-1465/U	
J2	C	CONNECTOR, COAX		UG-1468/U	
L1	D	COIL, RF, 0.56 μH ±10%, 1.5 A		MS75008-25	
L2	D	COIL, RF, 10 μH ±10%, 0.44 A		MS75008-40	

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A6 or 2A6 (con.)					
L3	D	COIL, RF, 18 turns, 24 ga, tapped at 12 T, wound on 620-ohm 1/2-W resistor	31550	8004819G1	
L4	D	SAME AS L2			
L5	D	COIL, RF, 18 turns, 24 ga, tapped at 12 T, wound on 300-ohm 1/2-W resistor	31550	8004819G2	
L6	D	SAME AS L2			
L7	D	COIL, RF, 15 turns, 24 ga, tapped at 6 T, wound on 620-ohm 1/2-W resistor	31550	8004819G2	
L8	D	SAME AS L2			
L9	D	SAME AS L2			
L10	D	SAME AS L2			
L11	D	SAME AS L2			
L12	D	SAME AS L2			
L13	D	SAME AS L2			
L14	D	SAME AS L2			
L15	D	SAME AS L2			
L16	D	SAME AS L5			
L17	D	SAME AS L2			
P1	D	CONNECTOR, ELECTRICAL, 9 PIN	71468	DEC9PF0	
Q1	D	TRANSISTOR, NPN, RF	73445	A2892	

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A6 or 2A6 (con.)					
Q2	D	TRANSISTOR, SILICON, NPN	31550	515341-1	
Q3	D	SAME AS Q2			
Q4	D	SAME AS Q2			
Q5	D	TRANSISTOR, SILICON, NPN		JAN2N918	
Q6	D	SAME AS Q5			
Q7	D	TRANSISTOR, SILICON, NPN		* JAN2N2222A	
R1	D	RESISTOR, COMPOSITION, 12 kΩ ±5%, 1/4 W		RCR07G123JR	
R2	D	RESISTOR, COMPOSITION, 2.2 kΩ ±5%, 1/4 W		RCR07G222JR	
* R3	D	RESISTOR, COMPOSITION, 1.8 kΩ ±5%, 1/4 W		RCR07G182JR	
R4	D	RESISTOR, COMPOSITION, 2.4 kΩ ±5%, 1/4 W		RCR07G242JR	
R5	D	SAME AS R2			
R6	D	RESISTOR, COMPOSITION, 510 ohms ±5%, 1/4 W		RCR07G511JR	
R7	D	SAME AS R2			
R8	D	RESISTOR, COMPOSITION, 100 ohms ±5%, 1/4 W		RCR07G101JR	
R9	D	SAME AS R2			
R10	D	SAME AS R2			
R11	D	SAME AS R2			
R12	D	RESISTOR, COMPOSITION, 330 ohms ±5%, 1/4 W		RCR07G331JR	
R13	D	SAME AS R8			

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A6 or 2A6 (con.)					
R14	D	SAME AS R2			
R15	D	SAME AS R6			
R16	D	RESISTOR, COMPOSITION, 820 ohms ±5%, 1/4 W		RCR07G821JR	
R17	D	SAME AS R2			
R18	D	SAME AS R16			
R19	D	SAME AS R8			
R20	D	RESISTOR, COMPOSITION, 1.8 kΩ ±5%, 1/4 W		RCR07G182JR	
R21	D	SAME AS R2			
R22	D	RESISTOR, COMPOSITION, 1.2 kΩ ±5%, 1/4 W		RCR07G122JR	
R23	D	RESISTOR, COMPOSITION, 68 ohms ±5%, 1/4 W		RCR07G680JR	
R24	D	RESISTOR, COMPOSITION, 10 ohms ±5%, 1/4 W		RCR07G100JR	
R25	D	RESISTOR, COMPOSITION, 51 ohms ±5%, 1/4 W		RCR07G510JR	
R26	D	RESISTOR, COMPOSITION, 560 ohms ±5%, 1/4 W		RCR07G561JR	
R27	D	SAME AS R8			
R28	D	RESISTOR, FILM, 5.62 kΩ ±1%, 0.1 W		RN55D5621F	
R29	D	SAME AS R8			
R30	D	RESISTOR, COMPOSITION, 7.5 kΩ ±5%, 1/4 W		RCR07G752JR	
R31	D	RESISTOR, COMPOSITION, 750 ohms ±5%, 1/4 W		RCR07G751JR	
R32	D	RESISTOR, FILM, 3.01 kΩ ±1%, 0.1 W		RN55D3011F	

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A6 or 2A6 (con.)					
R33	D	RESISTOR, COMPOSITION, 1 kΩ ±5%, 1/4 W		RCR07G102JR	
R34	D	RESISTOR, COMPOSITION, 2.7 kΩ ±5%, 1/4 W		RCR07G272JR	
R35	D	RESISTOR, COMPOSITION, 47 ohms ±5%, 1/4 W		RCR07G470JR	
R36	D	SAME AS R31			
R37	D	SAME AS R2			
R38	D	RESISTOR, COMPOSITION, 3.9 kΩ ±5%, 1/4 W		RCR07G392JR	
R39		NOT USED			
R40	D	RESISTOR, COMPOSITION, 1.6 kΩ ±5%, 1/4 W		RCR07G162JR	
RT1	D	RESISTOR, THERMAL, 0.4 W max	12930	208750S	
RT2	D	RESISTOR, THERMAL, 0.2 W max	15801	JB32JR	
VR1	D	DIODE, ZENER, 5.1 V ±5%, 0.4 W		JAN1N751A	
VR2	D	SAME AS VR1			
1A7	B	COUPLER, ANTENNA, UHF	31550	8004747G1	
2A7	B	COUPLER, ANTENNA, VHF	31550	8004503G1	
1 or 2	B	MAIN FRAME ASSEMBLY, VHF/UHF	31550	8004206G1/G2	
C1	D	CAPACITOR, CERAMIC, FEED-THROUGH, 1000 pF +150% -0% 500 V	00656	5801-0050	
C2	D	SAME AS C1			

Table 8-1. VHF/UHF Receiver Parts List (con.)					
Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1 or 2 (con.)					
C3	D	SAME AS C1			
C4	D	SAME AS C1			
C5	D	SAME AS C1			
C6	C	CAPACITOR, RFI FILTER, FEED-THROUGH, 0.1 μF ±10% , 600 V	14655	NFT3H6PIL10-10	
C7	C	SAME AS C6			
C8	C	CAPACITOR, RFI FILTER, FEED-THROUGH, 0.47 μF ±10% , 600 V	14655	NFT3H1P47L10-10	
C9	C	CAPACITOR, CERAMIC, 470 pF ±10%, 1 kV		CK60AX471K	
C10	B	SAME AS C9			
C11	B	SAME AS C9			
C12	B	SAME AS C9			
C13	B	SAME AS C9			
C14	B	SAME AS C9			
* DS1	B	LAMP, INCANDESCENT	08806	757	*
E1	D	PROTECTOR, VOLTAGE, TRANSIENT, 90 V ±20%	25088	81C90-20	
E2	B	SAME AS E1			
E3		NOT USED			
E4		NOT USED			
E5		NOT USED			
E6		NOT USED			
E7		NOT USED			

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
E8	B	SAME AS E1			
FL1	B	FILTER, BANDPASS, CRYSTAL, center frequency 20.600 MHz, 50 ohms input, complex impedance output, 50 kHz channel spacing, 36 kHz bandwidth	31550	505504-4	
FL1	B	FILTER, BANDPASS, CRYSTAL, center frequency 20.600 MHz, 50 ohms input/output, 25 kHz channel spacing, 20 kHz bandwidth	31550	505564-3	
1FL2	F	FILTER, TUNABLE, UHF	31550	8004242G1	
2FL2	B	FILTER, TUNABLE, VHF	31550	8004243G1	
F1	B	FUSE, 3AG, 1A, 250 V		FO2A250V1A	
F2	B	SAME AS F1			
F3	B	FUSE, 3AG, 3A, 250 V		FO2A250V3A	
J1	C	CONNECTOR, ELECTRICAL	74545	7486G	
J2	C	CONNECTOR, ELECTRICAL		MS3102R18-8P	
J3	B	CONNECTOR, PLUG, ELECTRICAL	71468	DAC15SFO	
J4	B	SAME AS J3			
J5	B	SAME AS J3			
J6	B	CONNECTOR, PLUG, ELECTRICAL	71468	DEC9SF0	
J7	B	SAME AS J3			
J8	B	SAME AS J6			
J9	B	SAME AS J6			
J10		NOT USED			
J11		NOT USED			
J12		NOT USED			

*U.S. GOVERNMENT PRINTING OFFICE:1995-668-016/20010

Table 8-1. VHF/UHF Receiver Parts List (con.)					
Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1 or 2 (con.)					
J13		NOT USED			
J14	B	JACK		JJ034	
J15	B	CONNECTOR, ELECTRICAL	95238	672-17	
1 PS1 or 2PS1	B	POWER SUPPLY	31550	8004245G	
	C	CIRCUIT CARD ASSY, POWER SUPPLY	31550	8004355G1	
C1	C	CAPACITOR, ALUMINUM, ELECTROLYTIC, 1600 μF +100% -10%, 50 V	56289	36D7033	
C2	D	CAPACITOR, TANTALUM, 100 μF ±10%, 20 V		M39003-01-2301	
C3	C	CAPACITOR, TANTALUM, 0.22 μF ±10%, 50 V		M39003-01-2344	
C4	D	CAPACITOR, CERAMIC, 1000 pF ±20%, 1 kV		CK60AW102M	
C5	D	CAPACITOR, TANTALUM, 47 μF ±10%, 35 V		M39003-01-2312	
C6	C	CAPACITOR, CERAMIC, 0.1 μF ±10%, 1 kV		CK60BX104K	
CR1	C	DIODE, SILICON, 200 prv, 5 A		JAN1N1614	
CR2	C	SAME AS CR1			
CR3	C	SAME AS CR1			
CR4	C	SAME AS CR1			
CR5	D	DIODE, SILICON, 100 prv, 110 mA		JAN1N914	
CR6	D	SAME AS CR5			
CR7	D	SAME AS CR5			

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1PS1 or 2PS1 (con.)					
CR8	D	SAME AS CR5			
CR9	D	SAME AS CR5			
P1	C	CONNECTOR, ELECTRICAL	71468	DAC15PG0	
Q1	D	TRANSISTOR, SILICON, NPN		JAN2N2904A	
Q2	D	TRANSISTOR, SILICON		JAN2N1132	
Q3	C	TRANSISTOR, NPN, POWER AMPLIFIER, 150 W	56289	PE6011-1	
Q4	D	TRANSISTOR, SILICON		JAN2N1613	
Q5	D	SAME AS Q4			
Q6	D	SAME AS Q4			
Q7	D	SAME AS Q4			
Q8	D	TRANSISTOR, PNP, POWER, 25 W	04713	JAN2N3741	
Q9	D	SAME AS Q2			
R1	D	RESISTOR, COMPOSITION, 680 ohms ±5%, 1/4 W		RCR07G681JR	
R2	D	RESISTOR, WIREWOUND, 2.2 ohms, 3 W		RW69V2R2	
R3	D	RESISTOR, COMPOSITION, 2.7 k ±5%, 1/4 W		RCR07G272JR	
R4	D	RESISTOR, COMPOSITION, 1 kΩ ±5%, 1/4 W		RCR07G102JR	
R5	D	RESISTOR, COMPOSITION, 10 kΩ ±5%, 1/4 W		RCR07G103JR	
R6	D	RESISTOR, COMPOSITION, 2.2 kΩ ±5%, 1/4 W		RCR07G222JR	
R7	D	RESISTOR, COMPOSITION, 27 kΩ ±5%, 1/4 W		RCR07G273JR	

Table 8-1. VHF/UHF Transmitter Parts List (con.)

Ref. Desig.	Indent	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1PS1 or 2PS1 (con.)					
R8	D	SAME AS R7			
R9	D	RESISTOR, COMPOSITION, 5.6 kΩ ±5%, 1/4 W		RCR07G562JR	
R10	D	RESISTOR, COMPOSITION, 1.8 kΩ ±5%, 1/4 W		RCR07G182JR	
R11	D	RESISTOR, COMPOSITION, 1.3 kΩ ±5%, 1/4 W		RCR07G132JR	
R12	D	SAME AS R10			
R13	D	SAME AS R6			
R14	D	SAME AS R4			
R15	D	RESISTOR, COMPOSITION, 1 kΩ ±5%, 1/4 W		RCR07G102JR	
R16	D	RESISTOR, FILM, 2.8 kΩ ±10%, 9.1 W		RN55D2801F	
R17	D	RESISTOR, VARIABLE, COMPOSITION, 500 ohms ±10%, 2 W		RV6NAVSL501A	
R18	D	RESISTOR, FILM, 1.24 kΩ ±1%, 0.1 W		RN55D1241F	
R20	D	RESISTOR, COMPOSITION, 820 ohms ±5%, 1/4 W		RCR07G811JR	
R21	D	SAME AS R7			
R22	D	RESISTOR, COMPOSITION, 10 ohms ±5%, 1 W		RCR32G100JR	
R23	D	SAME AS R22			
R24	D	RESISTOR, COMPOSITION, 750 ohms ±5%, 1/4 W		RCR07G751JR	
T1	C	TRANSFORMER, POWER, STEPDOWN, pri 105/120/210/240 V ±10% at 47 to 420 Hz; sec 24 V, 1.3 A	86151	9197	

Table 8-1. VHF/UHF Transmitter Parts List (con.)

Ref. Desig.	Indent	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1PS1 or 2PS1 (con.)					
TB1	D	TERMINAL STRIP, 8 terminals		4DTB8	
VR1		NOT USED			
VR2	D	DIODE, ZENER, REFERENCE, 6.2 V		JAN1N825	
1 or 2 (con.)					
R1	B	RESISTOR, VARIABLE, COMPOSITION, 2.5 kΩ ±10%, 2 W		RV6NAYSL252A	
R2	B	RESISTOR, VARIABLE, COMPOSITION, 5 kΩ ±10%, 2 W		RV6NAYSL502C	
R3	B	RESISTOR, VARIABLE, COMPOSITION, 5 kΩ ±10%, 2 W		RV6NAYSD502C	
* R4	B	RESISTOR, COMPOSITION, 470 kΩ ±5%, 1/2 W		RCR20G474JS	*
R5	B	SAME AS R4			
S1	B	SWITCH, TOGGLE, spdt			
S2	B	SWITCH, TOGGLE, 4pst	27192	MS35058-23	
TB1	B	TERMINAL STRIP	31550	7661K6	
W1	B	CABLE ASSEMBLY, SPECIAL PURPOSE	31550	8004815-2	
W1J1		NOT USED		8004928G1	
W1J2		NOT USED			
W1J3		NOT USED			
W1J4		NOT USED			
W1J5		NOT USED			
W1J6		NOT USED			
W1J7		NOT USED			
W1J8		NOT USED			

Table 8-1. VHF/UHF Receiver Parts List (con.)					
Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1 or 2 (con.)					
W1J9		NOT USED			
W1J10		NOT USED			
W1J11		NOT USED			
W1J12	C	CONNECTOR, COAX, BNC		M39012-19-0001	
W1J13	C	CONNECTOR, COAX, UHF		UG-556F/U	
W2		NOT USED			
W3	B	CABLE ASSEMBLY, SPECIAL PURPOSE	31550	8004929G1	
W3J1		NOT USED			
W3J2		NOT USED			
W3J3		NOT USED			
W3J4		NOT USED			
W3J5		NOT USED			
W3J6		NOT USED			
W3J7		NOT USED			
W3J8		NOT USED			
W3J9		NOT USED			
W3J10		NOT USED			
W3J11	B	SAME AS W1J12			
W3P1	C	CONNECTOR, PLUG, ELECTRICAL, 500 V d.c.	98291	50-D11-3141	
W4		NOT USED			

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1 or 2 (con)					
W5	B	CABLE ASSEMBLY, SPECIAL PURPOSE	31550	8004878G1	
W5J1		NOT USED			
W5J2		NOT USED			
W5J3		NOT USED			
W5J4		NOT USED			
W5J5		NOT USED			
W5J6		NOT USED			
W5J7		NOT USED			
W5J8		NOT USED			
W5J9		NOT USED			
W5J10		CONNECTOR, PANEL	94375	02583400375	
W5P1	B	CONNECTOR, COAX		UG-1466/U	
* XDS1	B	LAMPHOLDER	72619	LH76-3	*
XF1	B	FUSEHOLDER	75915	FHL17G2	
XF2	B	SAME AS XF1			
XF3	B	FUSEHOLDER	75915	FHL18G2-2	

Table 8-1. VHF/UHF Receiver Parts List (con.)					
Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A5 or 2A5	B	ELECTRICAL NOISE LIMITER	31550	8004238G1	
C1	D	CAPACITOR, CERAMIC, 47 pF ± 10%, 1 kV		CK60BX470K	
C2	D	CAPACITOR, VARIABLE, CERAMIC, 15-60 pF, 200 V	72982	538-011-15-60PFF	
C3	D	CAPACITOR, CERAMIC, 22 pF ± 10%, 1 kV		CK60BX220K	
C4	D	CAPACITOR, CERAMIC, 0.01 μF ± 20%, 500 V		CK63AW103M	
C5	D	SAME AS C3			
C6	D	CAPACITOR, CERAMIC, 1000 pF ± 20%, 1 kV		CK60AW102M	
C7	D	SAME AS C6			
C8	D	SAME AS C3			
C9	D	SAME AS C1			
C10	D	SAME AS C3			
C11	D	CAPACITOR, TANTALUM, 47 μF ± 10%, 20 V		M39003-01-2295	
C12	D	SAME AS C4			
C13	D	CAPACITOR, 10 μF ± 10%, 20 V		M39003-01-2286	
C14	D	CAPACITOR, CERAMIC, 0.1 μF ± 10%, 100 V	51642	300-100W5R104K	
C15	D	CAPACITOR, CERAMIC, 100 pF ± 10%, 1 kV		CK60BX101K	
C16	D	CAPACITOR, CERAMIC, 0.012 μF ± 10%, 100V	51642	300-100W5R123K	
C17	D	SAME AS C3			
C18	D	CAPACITOR, CERAMIC, 68 pF ± 20%, 1 kV		CK60BX680M	
C19	D	SAME AS C6			

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A5 or 2A5 (con.)					
C20	D	SAME AS C1			
C21	D	NOT USED			
C22	D	SAME AS C3			
C23	D	SAME AS C1			
C24	D	SAME AS C6			
C25	D	SAME AS C13			
C26	D	SAME AS C6			
C27	D	SAME AS C4			
C28	D	CAPACITOR, TANTALUM, 22 μF ± 10%, 35 V		M39003-01-2306	
C29	D	CAPACITOR, CERAMIC, 2200 pF ± 20%, 1 kV		CK61AW222M	
C30	D	SAME AS C4			
C31	D	SAME AS C4			
C32	D	SAME AS C13			
C33	D	CAPACITOR, CERAMIC, 1500 pF ± 20%, 500 V		CK60AW152M	
C34	D	SAME AS C4			
C35	D	SAME AS C4			
C36	D	SAME AS C4			
C37	D	CAPACITOR, MICA, 22 pF ± 5%, 500 V		CM65ED220J03	
C38	D	CAPACITOR, VARIABLE, CERAMIC, 7 to 25 pF, 350 V	72982	538-011-7-25PFB	

Table 8-1. VHF/UHF Receiver Parts List (con.)					
Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A5 or 2A5 (con.)					
C39	D	SAME AS C33			
C40	D	CAPACITOR, TANTALUM, 1.5 μF ± 10%, 20 V		M39005-01-2280	
C41	D	CAPACITOR, CERAMIC, 470 pF ± 10%, 500 V		CK60AX471K	
C42	D	SAME AS C28			
C43	D	SAME AS C13			
C44	D	SAME AS C13			
C45	D	SAME AS C40			
C46	D	SAME AS C40			
C47	D	SAME AS C4			
C48	D	SAME AS C13			
C49	D	SAME AS C28			
C50	D	SAME AS C11			
C51	D	SAME AS C14			
C52	D	SAME AS C6			
C53	D	CAPACITOR, TANTALUM, 10 μF ± 10%, 50 V		M39003-01-2374	
C54	D	CAPACITOR, CERAMIC, 82 pF ± 10%, 1 kV	31550	501202-1	
C55	D	SAME AS C29			
CR1	D	DIODE, SILICON, 100 prv, 0.11A		JAN1N914	
CR2	D	SAME AS CR1			
CR3	D	DIODE, PIN	96341	MA47557	
CR4	D	SAME AS CR3			

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A5 or 2A5 (con.)					
CR5	D	DIODE, SILICON, HOT CARRIER	28480	5082-8906	
CR6	D	SAME AS CR1			
CR7	D	SAME AS CR1			
CR8	D	SAME AS CR1			
CR9	D	SAME AS CR1			
CR10	D	SAME AS CR1			
DL1	D	DELAY LINE, 0.2 μs	31550	504701-3	
J1	C	CONNECTOR, COAX		UG1464U	
L1	D	COIL, RF, 1μH ± 10%, 0.93 A		MS75008-28	
L2	D	COIL, RF, 5.6 μH ± 10%, 0.645 A		MS75008-37	
L3	D	COIL, RF, 2.7 μH ± 10%, 0.46 A		MS75008-33	
L4	D	COIL, RF, 0.56 μH ± 10%		MS75008-25	
L5	D	SAME AS L4			
L6	D	COIL, RF, 4.7 μH ± 10%		MS75008-36	
L7	D	COIL, RF, 18 μH ± 10%		MS75008-43	
L8	D	SAME AS L7			
L9	D	COIL, RF, 1.2 μH ± 10%		MS75008-29	
L10	D	COIL, RF, 0.82 μH ± 10%		MS75008-27	
P1	D	CONNECTOR, RECEPTACLE, ELECTRICAL, 9 pins	71468	DEC9PF0	

Table 8-1. VHF/UHF Receiver Parts List (con.)					
Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A5 or 2A5 (con.)					
P2	D	CONNECTOR, COAX		UG1465U	
Q1	D	TRANSISTOR, NPN, SILICON	86684	2N5109	
Q2	D	TRANSISTOR, NPN, SILICON		JAN2N2222A	
Q3	D	SAME AS Q2			
Q4	D	SAME AS Q2			
Q5	D	TRANSISTOR, NPN, SILICON	31550	515341-1	
Q6	D	SAME AS Q2			
Q7	D	SAME AS Q2			
Q8	D	SAME AS Q2			
Q9	D	SAME AS Q2			
Q10	D	SAME AS Q2			
Q11	D	TRANSISTOR, NPN, SILICON		JAN2N1613	
R1	D	RESISTOR, COMPOSITION, 56 ohms ±5%, 1/4 W		RCR07G560JR	
R2	D	RESISTOR, COMPOSITION, 5.6 kΩ ± 5%, 1/4 W		RCR07G562JR	
R3	D	RESISTOR, COMPOSITION, 1.5 kΩ ± 5%, 1/4 W		RCR07G152JR	
R4	D	RESISTOR, COMPOSITION, 1 kΩ ± 5%, 1/4 W		RCR07G102JR	
R5	D	RESISTOR, COMPOSITION, 39 ohms ±5%, 1/4 W		RCR07G390JR	
R6	D	RESISTOR, COMPOSITION, 100 ohms ±5%, 1/4 W		RCR07G101JR	
R7	D	RESISTOR, COMPOSITION, 22 kΩ ± 5%, 1/4 W		RCR07G223JR	

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A5 or 2A5 (con.)					
R8	D	RESISTOR, COMPOSITION, 3.3 kΩ ±5%, 1/4 W		RCR07G332JR	
R9	D	SAME AS R4			
R10	D	RESISTOR, COMPOSITION, 68 ohms ±5%, 1/4 W		RCR07G680JR	
R11	D	SAME AS R4			
R12	D	RESISTOR, COMPOSITION, 51 ohms ±5%, 1/4 W		RCR07G510JR	
R13	D	RESISTOR, COMPOSITION, 47 kΩ ±5%, 1/4 W		RCR07G473JR	
R14	D	RESISTOR, COMPOSITION, 12 kΩ ±5%, 1/4 W		RCR07G123JR	
R15	D	RESISTOR, COMPOSITION, 1.2 kΩ ±5%, 1/4 W		RCR07G122JR	
R16	D	SAME AS R1			
R17	D	SAME AS R1			
R18	D	RESISTOR, COMPOSITION, 24 ohms ±5%, 1/4 W		RCR07G240JR	
R19	D	RESISTOR, COMPOSITION, 220 ohms ±5%, 1/4 W		RCR07G221JR	
R20	D	SAME AS R19			
R21	D	SAME AS R19			
R22 thru R24		NOT USED			
R25	D	SAME AS R6			
R26	D	RESISTOR, COMPOSITION, 2.2 kΩ ±5%, 1/4 W		RCR07G222JR	
R27	D	RESISTOR, COMPOSITION, 10 ohms ±5%, 1/4 W		RCR07G100JR	

Table 8-1. VHF/UHF Receiver Parts List (con.)					
Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A5 or 2A5 (con.)					
R28	D	RESISTOR, COMPOSITION, 470 ohms ± 5%, 1 W		RCR32G471JR	
R29	D	SAME AS R15			
R30	D	SAME AS R19			
R31	D	SAME AS R12			
R32	D	RESISTOR, COMPOSITION, 2 kΩ ± 5%, 1/4 W		RCR07G202JR	
R33	D	RESISTOR, COMPOSITION, 27 OHMS ± 5%, 1/2 W		RCR20G270JR	
R34	D	SAME AS R15			
R35	D	SAME AS R12			
R36	D	SAME AS R32			
R37	D	SAME AS R6			
R38	D	RESISTOR, COMPOSITION, 39 kΩ ± 5%, 1/4 W		RCR07G393JR	
R39	D	RESISTOR, COMPOSITION, 30 kΩ ± 5%, 1/4 W		RCR07G303JR	
R40	D	SAME AS R12			
R41	D	SAME AS R27			
R42	D	RESISTOR, COMPOSITION, 470 ohms ±5%, 1/4 W		RCR07G471JR	
R43	D	RESISTOR, COMPOSITION, 56 kΩ ± 5%, 1/4 W		RCR07G563JR	
R44	D	RESISTOR, VARIABLE, 1 kΩ ± 10%, 1/2 W	73138	62PAR1K	
R45	D	SAME AS R27			
R46	D	RESISTOR, COMPOSITION, 1 kΩ ± 5%, 1/4 W		RCR07G103JR	

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A5 or 2A5 (cont)					
R47	D	RESISTOR, COMPOSITION, 5.1 kΩ ± 5%, 1/4 W		RCR07G512JR	
R48	D	SAME AS R12			
R49	D	RESISTOR, COMPOSITION, 330 ohms ±5%, 1/4 W		RCR07G331JR	
R50	D	SAME AS R4			
R51	D	RESISTOR, COMPOSITION, 100 kΩ ± 5%, 1/4 W		RCR07G104JR	
R52	D	SAME AS R32			
R53	D	RESISTOR, COMPOSITION, 510 ohms ±5%, 1/4 W		RCR07G511JR	
R54	D	SAME AS R3			
R55	D	RESISTOR, COMPOSITION, 3.9 kΩ ± 5%, 1/4 W		RCR07G392JR	
R56	D	SAME AS R27			
R57	D	SAME AS R55			
R58	D	SAME AS R4			
R59	D	SAME AS R7			
R60	D	SAME AS R32			
R61	D	RESISTOR, COMPOSITION, 15 kΩ ± 5%, 1/4 W		RCR07G153JR	
R62	D	SAME AS R32			
R63	D	SAME AS R32			
R64	D	SAME AS R6			
R65	D	RESISTOR, COMPOSITION, 430 ohms ±5%, 1/4 W		RCR07G431JR	

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1A5 or 2A5 (con.)					
R66	D	RESISTOR, COMPOSITION, 33 kΩ ±5%, 1/4 W		RCR07G333JR	
R67	D	SAME AS R55			
R68	D	SAME AS R5			
R69	D	RESISTOR, COMPOSITION, 270 ohms ±5%, 1/4 W		RCR07G271JR	
R70	D	RESISTOR, COMPOSITION, 1.8 kΩ ±5%, 1/4 W		RCR076182JR	
R71	D	SAME AS R53			
R72	D	SAME AS R4			
R73	D	RESISTOR, COMPOSITION, 560 ohms ±5%, 1/4 W		RCR07G561JR	
R74	D	RESISTOR, COMPOSITION, 4.7 kΩ ±5%, 1/4 W		RCR07G472JR	
R75	D	RESISTOR, COMPOSITION, 6.8 kΩ ±5%, 1/4 W		RCR07G682JR	
R76	D	SAME AS R47			
R77	D	SAME AS R27			
R78	D	SAME AS R4			
VR1	D	DIODE, ZENER, 6.2 V ±5%, 0.4 W		JAN1N753A	
VR2	D	DIODE, ZENER, 12.0 V ±5%, 0.4 W		JAN1N759A	
Z1	D	INTEGRATED CIRCUIT, AMPLIFIER, WIDE BAND	86684	CA3023	
Z2	D	SAME AS Z1			
Z3	D	INTEGRATED CIRCUIT, TRANSISTOR ARRAY	86684	CA3018	

Table 8-1. VHF/UHF Receiver Parts List (con.)

Table 8-1. VHF/UHF Receiver Parts List (con.)

Ref. Desig.	Indent.	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
Interface cable kit					
W1	A	CABLE ASSEMBLY, POWER	31550	8006147G1	
P1	B	CONNECTOR, ELECTRICAL		UP131M	
P2	B	CONNECTOR, RECEPTACLE, ELECTRICAL, 3-wire, twist lock	74545	7484	
	A	CLAMP		MS3057-10A	
	A	CONNECTOR		MS3108A18-8S	
	B	TERMINAL, CRIMP TYPE	98410	BB107-06T	
W2	A	STRAP, ANTENNA	31550	8006125-1	(NSN5935-00-482-5043)
* 1Z1	B	IMPEDANCE MATCHING NETWORK (See Appendix C)			(NSN5915-01-352-5029) *

Table 8-2. Vendor's Codes

Code	Vendor's name and address	Code	Vendor's name and address
00656	Aerovox Corp. 740 Belleville Ave. New Bedford, Mass. 02745	13715	Fairchild Semiconductor, Div. of Fairchild Camera and Instr. Corp. 4300 Redwood Hway. San Rafael, Calif. 94903
01295	Texas Instruments Inc. Components Group P.O. Box 5012 13500 N. Central Expressway Dallas, Texas 75222	15801	Fenwal Electronics Inc. 63 Fountain St. Framingham, Mass. 01701
02114	Ferroxcube Corp. Mt. Marion Rd. Saugerties, N.Y. 12477	17856	Siliconix Inc. 2201 Laurelwood Rd. Santa Clara, Calif. 95054
02735	RCA Corp. Solid State Division Route 202 Somerville, N.J. 08876	22229	Solitron Devices Inc. 8808 Balboa Ave. San Diego, Calif. 92123
04713	Motorola Semiconductor Products Inc. 5005 East McDowell Road Phoenix, Ariz. 85008	25088	Siemens Corp. 186 Wood Ave. Iselin, N.J. 08830
08806	General Electric Co. Miniature Lamp Prod. NELA Park, Cleveland, Ohio 44112	27192	Cutler-Hammer Inc. Industrial Systems Division 4265 N. 30th St. Milwaukee, Wis. 53216
12040	National Semiconductor P.O. Box 443 Commercial Drive Danbury, Conn. 06810	28480	Hewlett-Packard Co. 1501 Page Mill Road Palo Alto, Calif. 94304
12930	Sensitron Inc. 977 N. Interprise Way Orange, Calif. 92667	31550	ITT Aerospace/Optical Division of International Telephone and Telegraph Corp. 3700 East Pontiac St. Fort Wayne, Ind. 46803
12969	Unitrode Corp. 580 Pleasant St. Watertown, Maine 02172	33095	Spectrum Control Inc. 78 Stone Place Fairview, Pa. 16405

Table 8-2. Vendor's Codes (con.)

Code	Vendor's name and address	Code	Vendor's name and address
43543	Nytronics Inc. Transformer Div. 3rd Avenue Alpha, N.J. 08866	86151	Genisco Technology Corp. Illinois Division 9367 William St. Rosemont, Ill. 60018
51642	Centre Engineering Inc. P.O. Box P8 State College, Pa. 16801	86684	RCA Corp. Electronic Components 415 S. 5th St. Harrison, N.J. 07029
56289	Sprague Electric Co. North Adams, Mass. 02138	94375	Plessey Connector Div. Inc. 400 Moreland Road Commack, N.Y. 11725
71468	ITT Cannon Electric Ind. 3208 Humbolt St. Los Angeles, Calif. 90031	95238	Continental Connector Corp. 34 and 63 56th St. Woodside, N.Y. 11377
* 72619	Dialight Corp. 1913 Atlantic Ave. Manasquan, NJ 08736 *	95275	Vitramon Inc. Box 544 Bridgeport, Conn. 06601
72982	Erie Technological Products Inc. 644 W. 12th St. Erie, Pa. 16512	96341	Microwave Associates Inc. South Ave. Burlington, Mass. 01801
73138	Beckman Instruments Inc. Helipot Division 2500 Harbor Blvd. Fullerton, Calif. 92634	98291	Sealectro Corp. 225 Hoyt Mamaroneck, N.Y. 10544
73445	Amperex Electronic Corp. 230 Duffy Ave. Hicksville, Long Island, N.Y. 11801	98410	E.T.C. Inc. 990 E. 67th St. Cleveland, Ohio 44103
74545	Harvey Hubbell Inc. State St. and Bostwick Ave. Bridgeport, Conn. 06602	99800	American Precision Industries Inc. Delevan Div. 270 Quaker Rd. East Aurora, N.Y. 14052
74970	E. F. Johnson Co. 299 10th Ave. S.W. Waseca, Minn. 56093		
75915	Littelfuse Inc. 800 E. Northwest Hwy. Des Plaines, Ill. 60016		

SECTION 9

INSTALLATION, INTEGRATION, AND CHECKOUT

9.1 INTRODUCTION.- Packing information and instructions for installing, checking out, aligning, and integrating the vhf/uhf receivers are included in this section. It is highly desirable to modify, align, and otherwise check out the receiver off-site away from commissioned transmitting and receiving equipment before the new equipment is permanently installed.

9.2 PACKING AND UNPACKING PROCEDURE.- The receivers are each packed in a separate expanded polystyrene foam container. Each container is sealed in a snug fitting barrier pouch. The units are then packed in two cleated 3/8-inch plywood shipping boxes. See table 9-1 for packed and unpacked data. While the equipment is being unpacked, is should be inspected for obvious in-transit damage, such as broken components and connectors on the front and rear of the chassis. Confirm that all cables listed in table 1-2 are included. Retain the shipping containers until the equipment is installed and operating satisfactorily.

Table 9-1. Packed and Unpacked Data

Quantity	Description	Unpacked Dimensions	Packed Dimensions	Unpacked Weight	Packed Weight
1	VHF or UHF Receiver	3-1/2 in. high, 21 in. wide, 12-1/4 in. deep	9-1/2 in. high, 23 in. wide, 24 in. deep	22 lb	38 lb

9.3 INSTALLATION PROCEDURE.- The vhf receiver and the uhf receiver are installed in either open-frame military type MT-686 racks or closed cabinets with the doors removed. Open-frame racks are preferred and shall be used where available. See paragraph 9.3.2 for relay rack cable plug requirements, figure 9-1 for typical relay rack bracket mounting, and figure 9-2 for an outline dimensional drawing of the vhf/uhf receiver. The vhf receiver and the uhf receiver are each provided with a 3-section slide attached to each side of the chassis. The stationary member of each slide has four 3/16-inch holes at one end and three 3/16-inch by 5/16-inch slots at the other end. These holes and slots are used for attaching the slides with machine screws to the corresponding brackets (figure 9-1) in the rack.

9.3.1 Mounting Brackets.- Figure 9-3 shows an outline drawing of a type A bracket required for the CY-597 cabinet mounting and a type B bracket for the MT-686 rack mounting. Four of these brackets are required for a fixed installation. Similar brackets may be fabricated for installation in other equipment enclosures by modifying the type A or type B brackets as appropriate. The mounting brackets are not available from FAA depot stock. The brackets may be fabricated or purchased locally. A supplier for this bracket is Jonathan Manufacturing Corp., 1101 South Acacia Ave., Fullerton, Ca. 92632 (Part Number SP-0466). The slides are listed in the FAA catalog under NSN 5340-01-012-3007 and mounting screws under NSN 5305-00-984-6191.

9.3.2 Cable Requirements.- Cable kits are provided with the receiver as indicated in table 1-2; however, the following specific cable plugs are required to properly install the receiver in the relay rack.

a. Mating plug to J2, MS3108R-18-8S (preferred)

b. A.C. power plug to J1, Hubbell a.c. twist lock receptacle No. 7484

c. Antenna input plug type N (J13)

* 9.3.2.1 Antenna Cable Assembly Instructions.- Cable connectors UG-21 (male) or UG-23 (female) are the mating connectors that attach to the receiver unit. The antenna cable normally used is RG-8, 9, or 214. Instructions pertaining to the above are given in figure 9-4. *

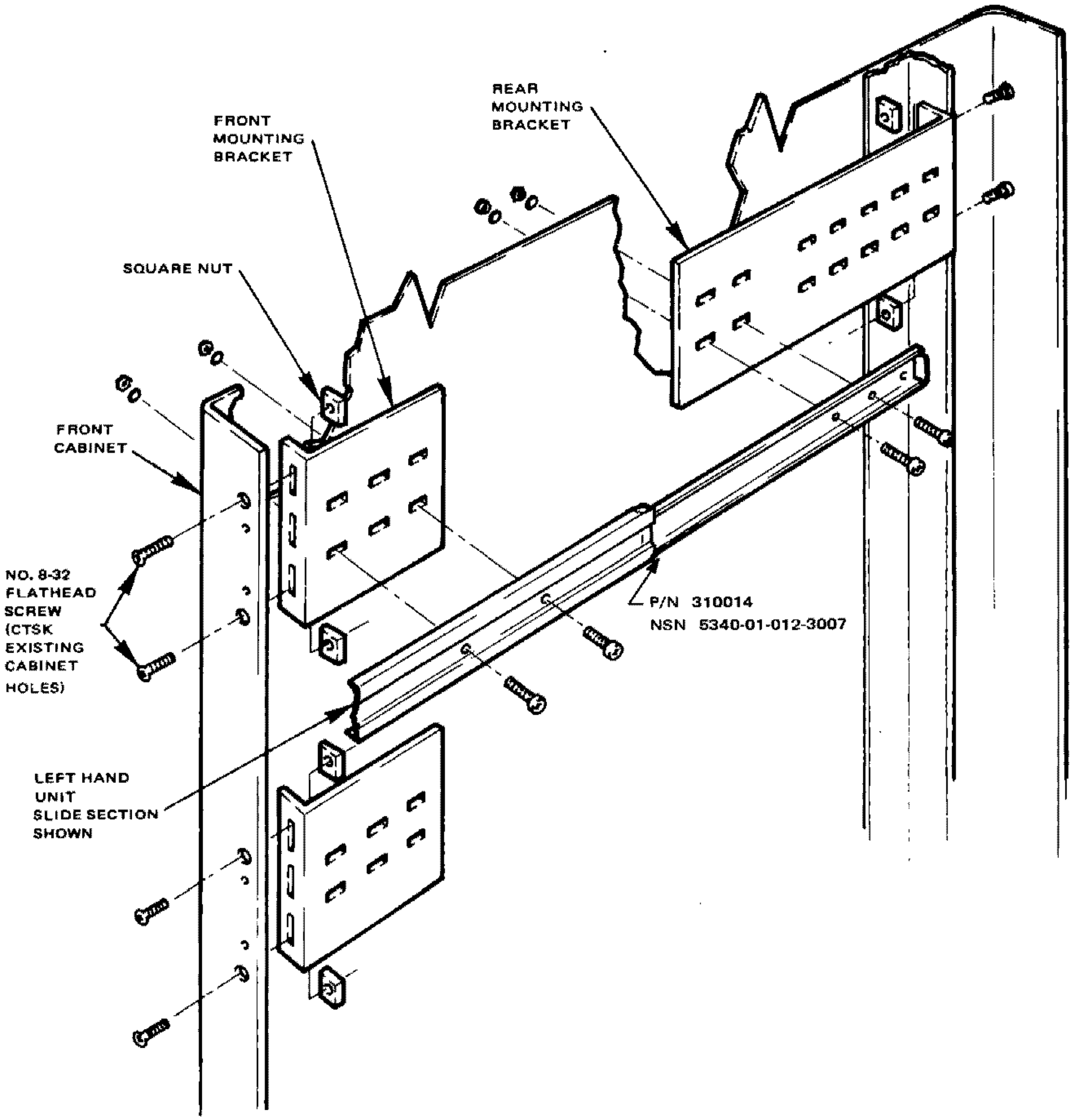


Figure 9-1. Typical View of Relay Rack Mounting Bracket (Left Side)

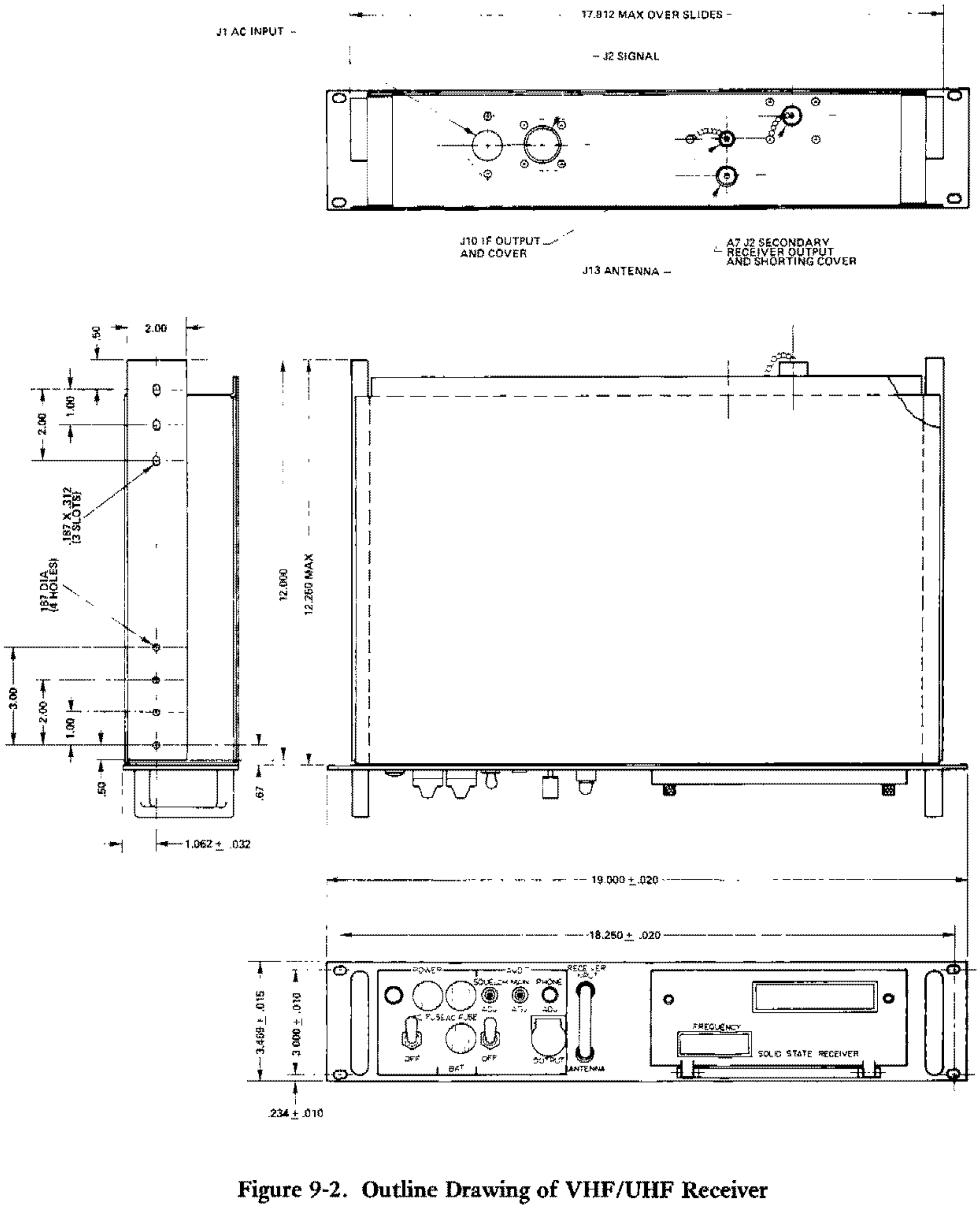


Figure 9-2. Outline Drawing of VHF/UHF Receiver

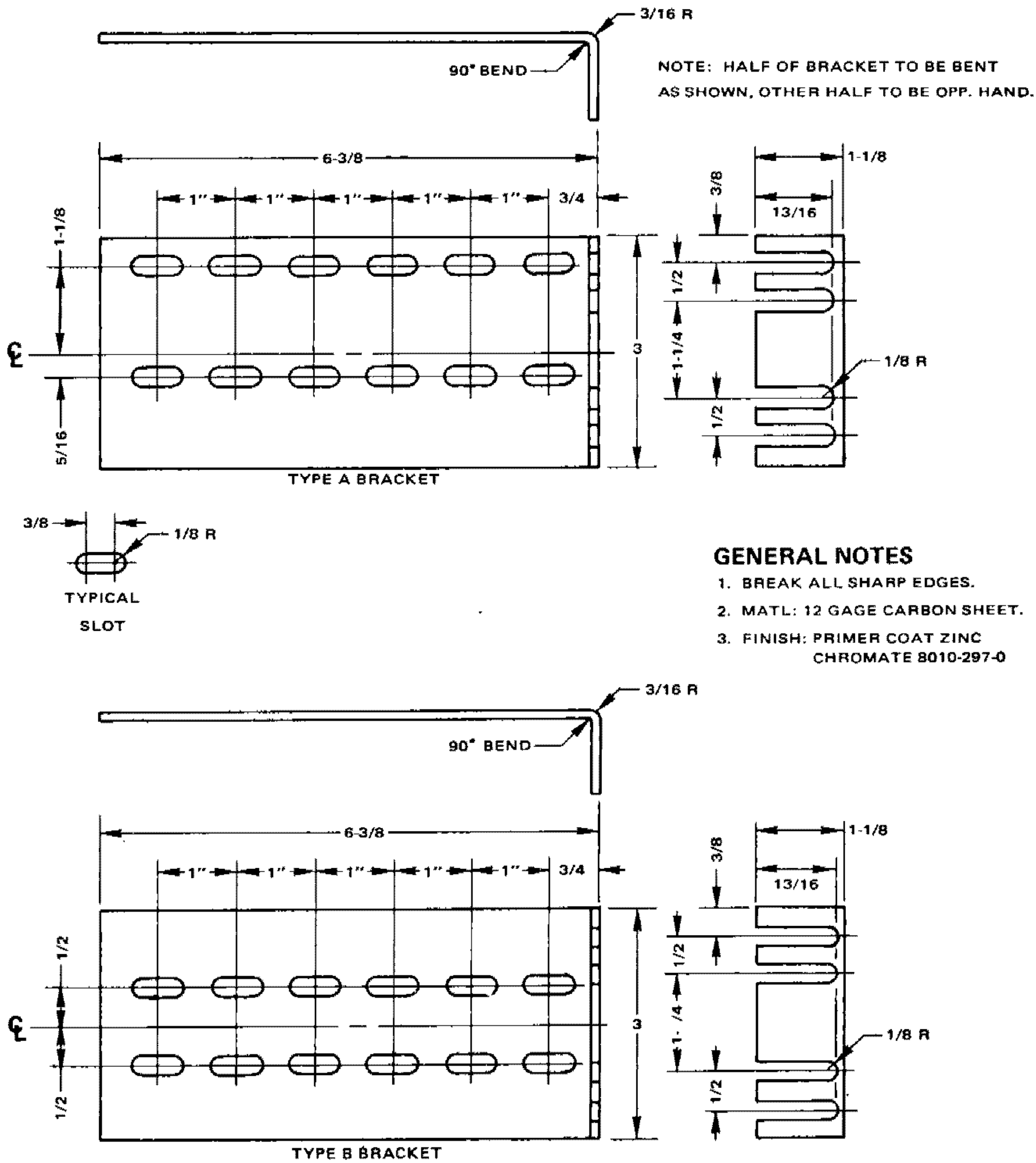
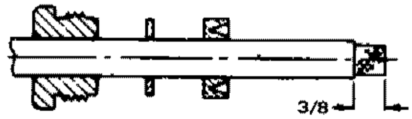


Figure 9-3. Mounting Brackets

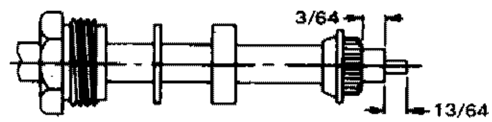
STEP 1

Slide clamp nut, washer and gasket onto cable as shown. Cut off jacket to 3/8 as shown.



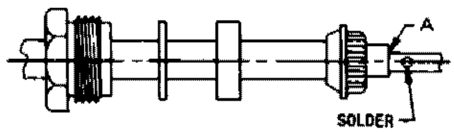
STEP 2

Unbraid and comb out braid wires. Slide braid clamp over braid being certain that the clamp seats squarely against cut end of jacket. Form braid wires smoothly over clamp as shown and trim off excess braid wires. Cut dielectric to 3/64 and conductor to 13/64 as shown.



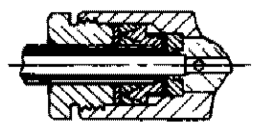
STEP 3

Place dielectric bushing (if supplied) over or into dielectric as necessary. Solder center contact to cable conductor leaving no gap at point A. Remove excess solder from outside of contact.



STEP 4

Insert assembly into connector body, being certain that braid clamp is sealed. Tighten clamp nut with a wrench.



NOTES:

1. USE ONLY PROPER, SHARP TOOLS. RAZOR-EDGED TOOLS ARE BEST FOR FLEXIBLE CABLE JACKETS AND DIELECTRICS. SMALL SHARP SCISSORS ARE EXCELLENT FOR TRIMMING BRAID WIRES.
2. KEEP ALL TRIMS "SQUARE." MAINTAIN A 90° RELATIONSHIP WITH CABLE JACKET O.D. ON ALL CUTS. THIS WILL ASSURE GOOD CABLE/PLUG JUNCTIONS AT ALL POINTS IN THE FINISHED ASSEMBLY AND PRESERVE IMPEDANCE CHARACTERISTICS.
3. DO NOT OVERCUT. USE EXTRA CARE IN JACKET AND DIELECTRIC TRIMS. DO NOT CUT INTO CONDUCTORS.
4. CABLE BRAID PREPARATION. MOST NON-CRIMP TYPE PLUGS REQUIRE THE COMB-OUT AND FOLD-BACK TECHNIQUE. A FILE CARD IS A USEFUL TOOL FOR THE COMBING OPERATION. INDIVIDUAL BRAID WIRES SHOULD NOT BE ALLOWED TO CROSS EACH OTHER AT THE CLAMP FACE DURING THE FOLD-BACK STEP. IF WIRES ARE ALLOWED TO CROSS, CABLE RETENTION AND ELECTRICAL SHIELD CONTINUITY WILL BE IMPAIRED IN THE FINAL ASSEMBLY.
5. FOR SOLDERING CONTACT TO CABLE CENTER CONDUCTOR, 60/40 ALLOY, ROSIN MULTI-CORE SOLDER IS RECOMMENDED. FOR COAXIAL CABLES HAVING STRANDED WIRE CENTER CONDUCTORS IT IS GOOD PRACTICE TO TRIM THE CONDUCTOR BEFORE THE FINAL TRIM CUT. APPLICATION OF HEAT SHOULD NOT BE PROLONGED SINCE SOME DIELECTRICS ARE PRONE TO MELT. IT IS IMPORTANT THAT CONTACT REAR SURFACE BE SNUG AGAINST THE CABLE DIELECTRIC OR SPACER AFTER SOLDERING . EXPOSED CABLE DIELECTRIC SHOULD BE THOROUGHLY CLEANED AFTERWARD TO ELIMINATE METAL CHIPS AND SOLDER FLUX.

Figure 9-4. Antenna Cable Assembly Instructions

CAUTION

1. Strapping arrangements are shown in figure 9-5 and on the back of top cover. The a.c. line must always be connected to pins 1 and 5. This is a factory connection. DO NOT CHANGE.

2. AF P 6500.1, chg 178, Chap 227 requires F2 to be strapped out of the circuit for 105/120 V a.c. operation.

9.3.3 Input Power Connections.- The receivers are shipped from the factory with their input power connections strapped for 120 V a.c. To utilize an input voltage of 105, 210, or 240, it is necessary to change the strapping arrangement on the power supply. Remove the top cover by loosening six captive 6-32 flathead, Phillips-head retaining screws. Remove power supply terminal strip top cover by loosening two 4-40 panhead, Phillips-head screws. Print voltage rating on space provided on receiver top covers, and replace power supply terminal strip cover.

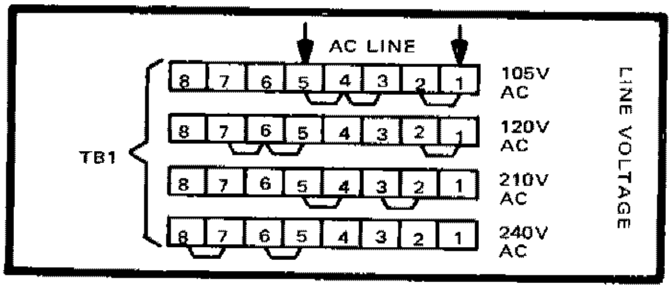


Figure 9-5. Strapping Arrangement

9.3.4 Verification of Modifications.- In addition to the modification order cited above, confirm that the following modification orders of AF P 6500.1 have been implemented into the receiver.

a. Chap 254: Replacement of A3 module with ITT Part No. 8008586G1

b. Chap 315: Replacement of A1 oscillator module with ITT Part No. 8009546G1

c. Chap 343: Power supply stability improvement.

9.3.5 Cable Connections.- After the receiver slides have been firmly attached to the rack rails, connect the cables provided, including the antenna cable, to their corresponding connectors at the rear of the chassis. Make sure the type N shorting connector is in place on A7J2; carefully slide the receiver into the rack, observing that all cables have clearance and are not pinched or damaged. The two slots at each end of the panel allow the entry of hold-down screws into the rack. This completes installation of the receivers.

9.4 TUNEUP AND TEST.- After completing the installation procedure of paragraph 9.3 and assuming the receiver has been properly tuned to the required operating frequency, perform the starting, operating, and stopping procedure of paragraph 3.3, referring to the control and indicator functions of table 3-1. It is necessary to perform a complete tuning procedure for each change of channel or received frequency. Both the vhf receiver and the uhf receiver have been completely aligned at the factory and should require no further alignment; but, if performance is not satisfactory after completing the starting procedure of paragraph 3.3, recheck the tuning procedure of paragraph 9.5. If performance is still not satisfactory refer to the fault isolation and alig .ment procedures of section 7 to locate and correct the trouble.

9.4.1 Operation of Two Receivers from Common Antenna.- When connecting the two receivers for operation from one antenna perform the operating procedure in paragraph 3.4 and refer to figures 3-3 and 3-4 for proper cable length versus frequency.

* 9.5 TUNING PROCEDURE.- The receiver has the optional capability of using an oscillator-synthesizer module or an oscillator-multiplier module. When using the oscillator-synthesizer module, its output frequency is dialed on thumbwheel switches located on the module. To determine the oscillator-synthesizer desired frequency refer to table 9-2. The settings are made in accordance with 9.5.1 below. *

Table 9-2. Oscillator-Synthesizer Frequency Determination

Receiver type	Received frequency	Oscillator-synthesizer frequency
AN/GRR-23	116.00 MHz to 149.9875 MHz	$\frac{\text{Received frequency (MHz)} + 20.6}{2}$
AN/GRR-24	225.00 MHz to 312.00 MHz	$\frac{\text{Received frequency (MHz)} + 20.6}{4}$
AN/GRR-24	312.025 MHz to 399.975 MHz	$\frac{\text{Received frequency (MHz)} - 20.6}{4}$

9.5.1 Oscillator-Synthesizer Dial Setting versus Actual Frequency.- Output frequencies are available in 6.25 kHz increments which provide 12.5 kHz channel increments for the vhf receiver or 25 kHz increments for the uhf receiver. The dial settings make up five-digit number combinations. Five digits are too few in the operating frequency range to give a 6.25 kHz increment, however. The problem is avoided in the design by making the actual output frequency value significant to more digits than displayed, and by limiting the choice of frequencies only to those of actual channels. The last two dial digits are not individually selectable, but are in 16 definite two-number combinations, instead of 100, to achieve this. The exact channel frequency in all cases is then obtained by dialing the first five digits of that desired. Table 9-3 relates a few desired channel frequencies with dialed frequencies and synthesizer actual frequencies. The IF has been taken into account.

Table 9-3. Oscillator-Synthesizer Dial Calibration

Channel frequency (MHz)	Dial frequency (MHz)	Actual frequency (MHz)
118.050	69.325	69.3250
121.500	71.050	71.0500
125.375	72.987	72.9875
131.550	76.075	76.0750
139.925	80.262	80.2625
225.050	61.412	61.4125
243.000	65.900	65.9000

Table 9-3. Oscillator-Synthesizer Dial Calibration (con.)

Channel frequency (MHz)	Dial frequency (MHz)	Actual frequency (MHz)
281.350	75.487	75.4875
311.850	83.112	83.1125
312.600	73.000	73.0000
325.900	76.325	76.3250
370.000	87.350	87.3500
399.650	94.762	94.7625

CAUTION

Care must be exercised when inserting or removing the crystal holder. Be sure pins are properly aligned. Do not twist holder when inserting or removing as bent or misaligned pins may result.

* 9.5.2 VHF Crystal Selection.- The vhf receiver is capable of operation on any of 680 channels spaced at 50 kHz or 1,360 channels spaced at 25 kHz between 116.0 MHz and 150.0 MHz. The oscillator-multiplier crystal frequency for all channels of the vhf receiver is calculated as shown in table 9-4. *

Table 9-4. Output Frequency Determination

Receiver	Receiving frequency	Oscillator-multiplier crystal frequency
AN/GRR-23 VHF	116.00 MHz to 149.95 MHz	$\frac{\text{Rcvg Freq (MHz)} + 20.6}{10}$
AN/GRR-24 UHF	225.00 MHz to 312.00 MHz	$\frac{\text{Rcvg Freq (MHz)} + 20.6}{20}$
AN/GRR-24 UHF	312.05 MHz to 399.95 MHz	$\frac{\text{Rcvg Freq (MHz)} - 20.6}{20}$

9.5.3 UHF Crystal Selection.- The uhf receiver is capable of operation on any one of 3,500 channels spaced at 50 kHz or 7,000 channels spaced at 25 kHz between 225.00 MHz and 399.95 MHz. The oscillator-multiplier crystal frequency for all uhf receiver channels is calculated as shown in table 9-4. *

> NOTE
>
> Before starting the uhf tuning procedure be sure that the shorting cap is on A7J2 on the rear of the receiver (figure 9-2) and that the uhf antenna coupler, tunable filter, and mixer multiplier modules are properly installed in the receiver. See section 7 for module removal and replacement procedures.

9.5.4 UHF Receiver Tuning and Post Tuning Checkout.- After selecting the proper crystal for the desired operating frequency, place it in the crystal holder as shown in figure 3-1 and insert into the oscillator-multiplier module located behind the access door on the receiver front panel. Place POWER ON-OFF switch in the ON position and allow 5 minutes for stabilization, before proceeding as follows:

(1) Line up the oscillator-multiplier module and mixer multiplier module dots with the appropriate frequency markings; the setting of the dots on the oscillator-multiplier module knob is equivalent to 5 times the crystal frequency. *

> NOTE
>
> Careful initial setting of the mixer controls is important to avoid subsequent tuning to a wrong harmonic of the oscillator.

(2) Refer to figure 9 - 6 for setting the tunable filter IN and OUT controls; adjust each as indicated.

> NOTE
>
> Use only a high-impedance voltmeter to prevent circuit loading.

(3) Set voltmeter to the 1.0 V d.c. scale and connect between GROUND and LO test point.

* (4) This step deleted.

(5) On the oscillator-multiplier module, altgernately readjust the OSC, BUF, and AMPL controls for maximum voltmeter reading.

> NOTE
>
> The three controls are very sensitive and must be adjusted slowly to see a deflection on the voltmeter. There is no sequence for adjusting these controls. *

(6) On the mixer-multiplier module, adjust the LEVEL ADJ control fully clockwise.

(7) Set voltmeter to the 10 V d.c. scale and connect between GROUND and MULT test point.

(8) Alternately adjust and readjust the QUAD, BUF, and AMPL controls for maximum voltmeter indication. In some cases it may be necessary to change the voltmeter to the 30 volt scale.

(9) Set LEVEL ADJ counterclockwise for voltage in accordance with table 9-5.

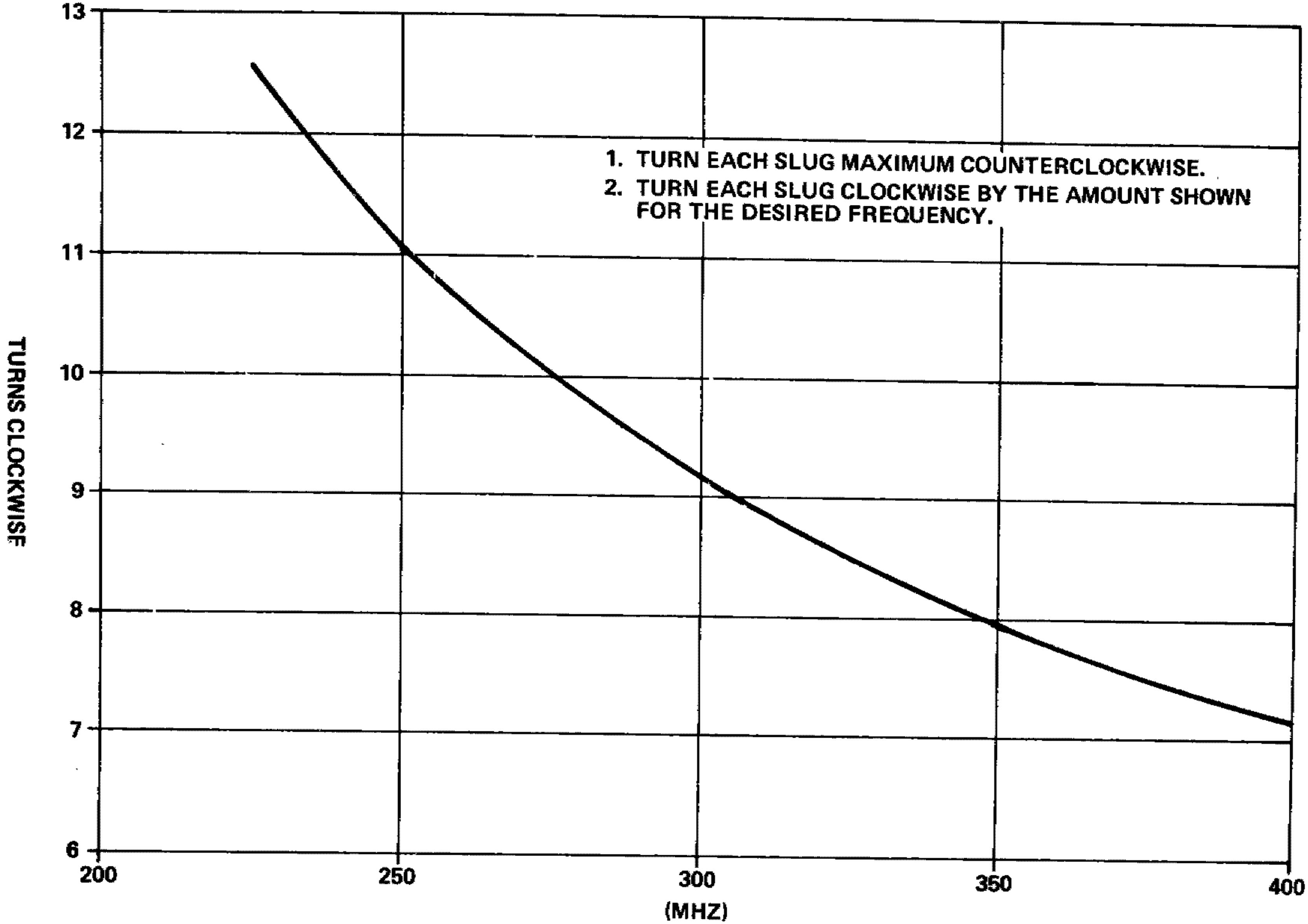


Figure 9-6. UHF Tunable Filter Turns vs. Frequency

Table 9-5. UHF Receiver Multiplier Injection Voltage Levels

Frequency range (MHZ)	Injection level (volts)
225.00 to 260.00	2.5 ± 0.1
260.05 to 320.00	2.0 ± 0.1
320.05 to 340.00	2.5 ± 0.1
340.05 to 360.00	3.0 ± 0.1
360.05 to 380.00	3.5 ± 0.1
380.05 to 400.00	4.0 ± 0.1

(10) Set the voltmeter to the 10 V d.c. scale and connect between GROUND and AGC test point.

(11) Remove the connector on the front panel between ANTENNA and RECEIVER INPUT. Connect test equipment as shown in figure 9-7.

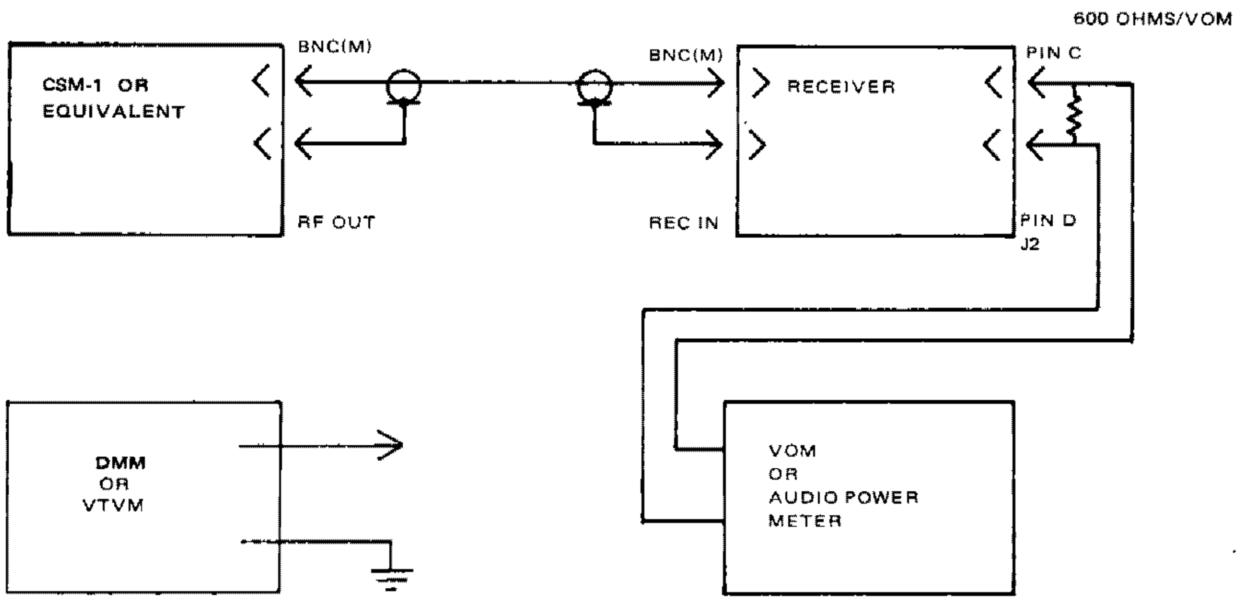


Figure 9-7. Test Setup for Receiver Tuning

(12) Place the SQUELCH switch in the OFF position.

(13) Set generator frequency dials to channel frequency and adjust signal generator for 30% ±1% modulation at 1 kHz ± 10%.

(14) Adjust signal generator for maximum output. Set the signal generator to the desired channel frequency. If AGC ADJUST (accessible through top cover on receiver) happens to be grossly misadjusted, it is possible no indication will be obtained. If this is the case, set AGC ADJUST to maximum counterclockwise, and then turn it slowly clockwise until the agc voltage just starts increasing.

(15) Alternately adjust and readjust the turnable filter IN and OUT controls for maximum voltmeter indication. Reduce the signal generator output to -50 dBm (700 mV) ±0.5 dBm and readjust the IN and OUT controls for maximum voltmeter indication. Keep reducing the signal output and repeating step (14). Make the last adjustment at -98 dBm (3.0μV).

(16) Reduce the signal generator output to -50 dBm (700 μV) ±0.5 dBm.

(17) On the mixer/multiplier module, adjust the RF control for maximum voltmeter indication.

(18) On the mixer/multiplier module, adjust the ANT control for maximum voltmeter indication.

(19) Keep reducing the signal generator output and repeating steps (15), (17), and (18), as required to obtain the absolute maximum voltmeter indication. Make the last round of adjustments at -98 dBm (3.0 μV).

(20) Set the signal generator to -98.0 dBm (3.0 μV) ±0.5 dBm, 30% ±1% modulation at 1 kHz ±10% Set the voltmeter for 300 millivolts a.c. full scale and connect the AC probe between the IF and GROUND test points. Adjust AGC ADJUST on top cover for 125 mV ±5 mV.

(21) Set the voltmeter on the 10 V d.c. scale and reconnect voltmeter to AGC test point. Disconnect the signal generator. The agc voltage should drop to its quiescent value of 2.9 ±0.3 volts. If it does not, * adjust AGC ADJUST through the top cover until the agc voltage just drops to its quiescent state, 2.9 ±0.3 volts. Reconnect signal generator and set the level to -102 dBm (1.78μV) ±1 dBm. The agc voltage should be 5.0 volts or greater. *

(22) Set the signal generator to -98 dBm (3.0 μV) 30% ±1% modulation at 1 kHz ±10%. The 125 millivolt reading in step (20) may now read between 120 and 180 millivolts.

* (23) Remove top cover on module A3 and adjust compression level (R41) control maximum clockwise. *

(24) Set voltmeter to the 3 V a.c. scale and connect between MAIN AF test point and GROUND on back of front panel door. Adjust AUDIO MAIN ADJ level control on front panel of receiver maximum clockwise.

* (25) Adjust AF PREAMPL ADJUST (R32) on module A3 for 2.0 volts ±25 millivolts. *

(26) Adjust AUDIO MAIN ADJ level control on front panel of receiver for 1.6 volts ±25 millivolts.

(27) Adjust PREAMPL ADJUST (R32) for 2.0 volts ±25 millivolts

(28) Adjust compression level (R41) control for 1.95 volts ±10 millivolts.

(29) Increase signal generator percent modulation from 30% to 100%. Test voltage shall remain within 1.75 to 2.45 volts. The audio output as read on power meter normally changes less than 1.0 dB. This completes alignment of the agc/squelch circuit.

NOTE

After initial alignment of agc/squelch circuit has been accomplished and a frequency change is desired, it is not necessary to readjust compression level (R41). Perform the following procedure.

* (30) Observe audio for 1.95 volts ±25 millivolts. If audio is not within required tolerance, adjust AUDIO MAIN ADJ maximum clockwise, and repeat steps (25), (26), and (27). Replace top cover to receive. This completes alignment. *

*

(31) Disconnect voltmeter and signal generator. Reconnect antenna connector between ANTENNA and RECEIVER INPUT on front panel.

(32) This completes the tuning procedure for operation on any one of the uhf channels. *

NOTE

Before starting the vhf tuning procedure, be sure that the shorting cap is on A7J2 on the rear of the receiver (figure 9-2) and that the VHF antenna coupler, tunable filter, and mixer multiplier modules are properly installed in the receiver. See 7.12 for module removal and replacement procedures.

9.5.5 VHF Receiver Tuning and Post Tuning Checkout.- After selecting the proper crystal for the desired operating frequency, place it in the crystal holder as shown in figure 3-1 and insert into the oscillator-multiplier module located behind the access door on the receiver fron panel. Place POWER ON-OFF switch in the ON position. *

(1) Line up the oscillator-multiplier module and mixer/multiplier dots with the appropriate frequency markings. The setting of the dots on the oscillator-multiplier knob is equivalent to 5 times the crystal frequency. *

NOTE

Careful initial setting of the mixer controls is important to avoid subsequent tuning to a wrong harmonic of the oscillator.

(2) Refer to figure 9-8 for setting tunable filter IN and OUT controls; adjust each as indicated.

(3) Set voltmeter to 1.0 V d.c. scale and connect between GROUND and LO test point.

NOTE

Use only a high-impedance voltmeter to prevent circuit loading.

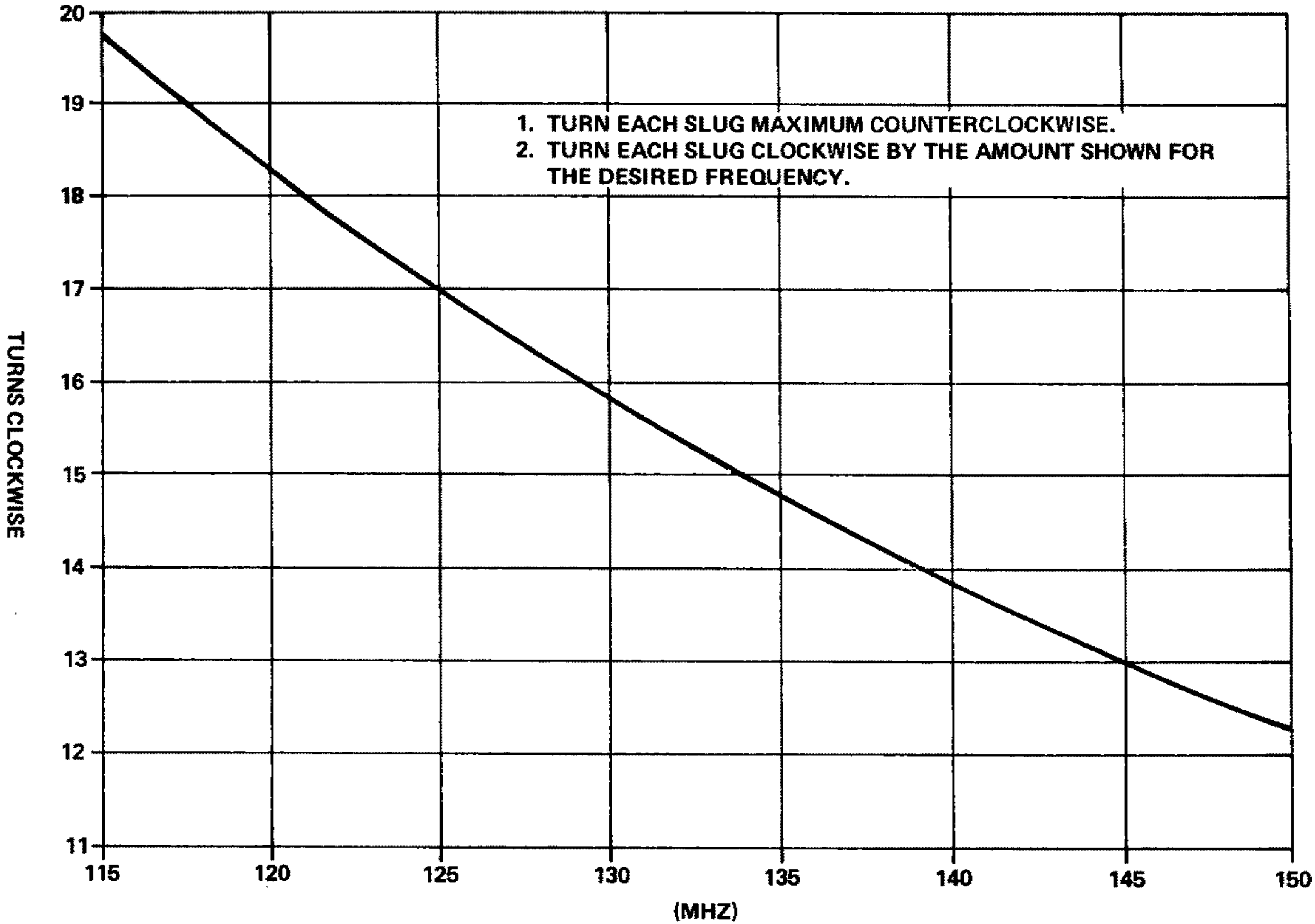


Figure 9-8. VHF Tunable Filter Turns vs. Frequency

* (4) This step deleted.

(5) On the oscillator multiplier module, alternately readjust the OSC, BUF, and AMPL controls for maximum voltmeter reading.

NOTE

These three controls are very sensitive and must be adjusted slowly to see a deflection on the voltmeter. There is no sequence for adjusting these controls. *

(6) On the mixer/multiplier module, adjust the LEVEL ADJ control fully clockwise.

(7) Set voltmeter to the 3 V d.c. scale and connect between GROUND and MULT test point.

(8) Alternately adjust and readjust the DOUBLER and BUF controls for maximum voltmeter indication.

(9) Carefully adjust LEVEL ADJ control counterclockwise until the voltage indicated in table 9-6 is obtained for the desired frequency.

(10) Set the voltmeter to the 10 V d.c. scale and connect between GROUND and AGC test point.

(11) Remove the connector on the front panel between ANTENNA and RECEIVER INPUT. Connect test equipment as shown in figure 9-7.

Table 9-6. VHF Receiver Multiplier Injection Voltage Levels

Frequency range (MHz)	Injection level (volts)
116.00 to 125.00	0.96 ± 0.1
125.05 to 134.00	1.00 ± 0.1
134.05 to 143.00	1.04 ± 0.1
143.05 to 150.00	1.07 ± 0.1

(12) Place the SQUELCH switch in the OFF position.

* (13) Set signal generator frequency dials to channel frequency and adjust signal generator for 30% ±1% modulation at 1 kHz ±10%. *

(14) Adjust signal generator for maximum output.

(15) Set the signal generator to the desired channel frequency. If AGC ADJUST (accessible through top cover on receiver) happens to be grossly misadjusted, it is possible no indication will be obtained. If this is the case, set AGC ADJUST maximum counterclockwise and then turn it slowly clockwise until the agc voltage just starts increasing.

* (16)Alternately adjust and readjust the tunable filter IN and OUT controls for maximum voltmeter indication. Reduce the signal generator output to -50 dBM (700μV) ±0.5 dBm and readjust the IN and OUT controls for maximum voltmeter indication. Keep reducing the signal output and repeating step (15). Make the last adjustment at -98 dBm (3.0μV). *

(17) Reduce the signal generator output to -50 dBm (700 μV) ±0.5 dBm.

(18) On the mixer/multiplier module, adjust the RF control for maximum voltmeter indication.

(19) On the mixer/multiplier module, adjust the ANT control for maximum voltmeter indication.

(20) Keep reducing the signal output and repeating steps (17), (19), and (20) as required to obtain the absolute maximum voltmeter indication. Make the last adjustment at -98 dBm (3.0 μV).

(21) Set the signal generator to -98 dBm (3.0 μV), 30% ±1% modulation at 1 kHz ±10%. Set the voltmeter for 300 millivolts a.c. full scale and connect the AC probe between the IF and GROUND test points. Adjust AGC ADJUST on top cover for 125 ±5 millivolts.

(22) Set the voltmeter on the 10 V d.c. scale and reconnect voltmeter to AGC test point. Remove the signal generator input. The agc voltage should drop to its quiescent value of 2.9 ±0.3 volts. If it does not drop, adjust AGC ADJUST through top cover until agc voltage just drops to its quiescent
* state of 2.9 ±0.3 volts. Reconnect the signal generator and set the level to -102 dBm (1.78μV) ±1 dBm. The agc voltage should be 5.0 volts or greater.

(23) Set signal generator level to -98 dBm (3.0μV) 30% ±1% modulation at 1 kHz ±10%. The 125 ±5 millivolts reading obtained in step (21) may now read between 120 and 180 millivolts.

(24) This step deleted.

(25) Remove top cover on module A3 and adjust compression level (R41) control maximum clockwise. *

(26) Set voltmeter to the 3 V a.c. scale and connect between MAIN AF test point and GROUND on back of front panel door. Adjust AUDIO MAIN ADJ level control on front panel of receiver maximum clockwise.

* (27) Adjust AF PREAMPL ADJUST (R32) on module A3 for 2.0 volts ±25 millivolts. *

(28) Adjust AUDIO MAIN ADJ level control on front panel of receiver for 1.6 volts ±25 millivolts.

(29) Adjust PREAMPL ADJUST (R32) for 2.0 volts ±25 millivolts.

(30) Adjust compression level (R41) control for 1.95 volts ±10 millivolts.

(31) Increase signal generator percent modulation from 30% to 100%. Test voltage shall remain within 1.75 to 2.45 volts. The audio output as read on the power meter normally changes less than 1 dB. This completes alignment of agc/squelch circuit.

*

NOTE

After initial alignment of agc/squelch circuit has been accomplished and a frequency change is desired, it is not necessary to readjust compression level (R41). Perform the following procedures.

(32) Observe audio for 1.95 V ±25*m*V. If audio is not within tolerance, adjust AUDIO MAIN ADJ maximum clockwise and repeat steps (27), (28), and (29). Replace top cover to receiver. This completes alignment.

(33) Disconnect voltmeter and signal generator. Reconnect antenna connector between ANTENNA and RECEIVER INPUT on front panel.

(34) This completes the tuning procedure for operation on any one of the vhf channels.

9.6 SQUELCH CONTROL ADJUSTMENT.- When it is desired to set up the squelch control on the receiver to operate at a given signal input level proceed as follows: *

* (1) Remove the connector on the front panel between ANTENNA and RECEIVER INPUT. Connect signal generator output to RECEIVER INPUT on front panel.

(2) Place the SQUELCH switch in the OFF position.

(3) Set the voltmeter to the 10 V d.c. scale and connect between the AGC and GROUND test points.

(4) Set the signal generator to CW, frequency dial to the indicated channel frequency, and signal generator power level to -98 dBm (3.0μV), 30% modulation at 1 kHz.

(5) Carefully adjust the signal generator frequency controls for maximum AGC voltage.

(6) Set the voltmeter to the 30 V d.c. scale and connect between the SQUELCH test point and GROUND.

(7) Place the SQUELCH switch in the ON position.

(8) Set the signal generator at the desired squelch level.

(9) Set the AUDIO SQUELCH ADJ potentiometer maximum clockwise. The receiver will be squelched and the voltmeter should indicate less than 1 V d.c.

(10) Slowly turn the AUDIO SQUELCH ADJ potentiometer counterclockwise until the voltmeter suddenly increases to approximately 8 V d.c.

(11) Disconnect the signal generator and replace the connector between the ANTENNA and RECEIVER INPUT jacks on the front panel of the receiver.

9.7 ACCEPTANCE CHECKOUT.- The purpose of this procedure is to provide an overall performance check of the key parameters of the receiver. Figure 9-9 shows the test setup block diagram. See section 4 for standards and tolerances. Data obtained from this test shall be recorded on FAA Form 6600-6 (figure 9-10). *

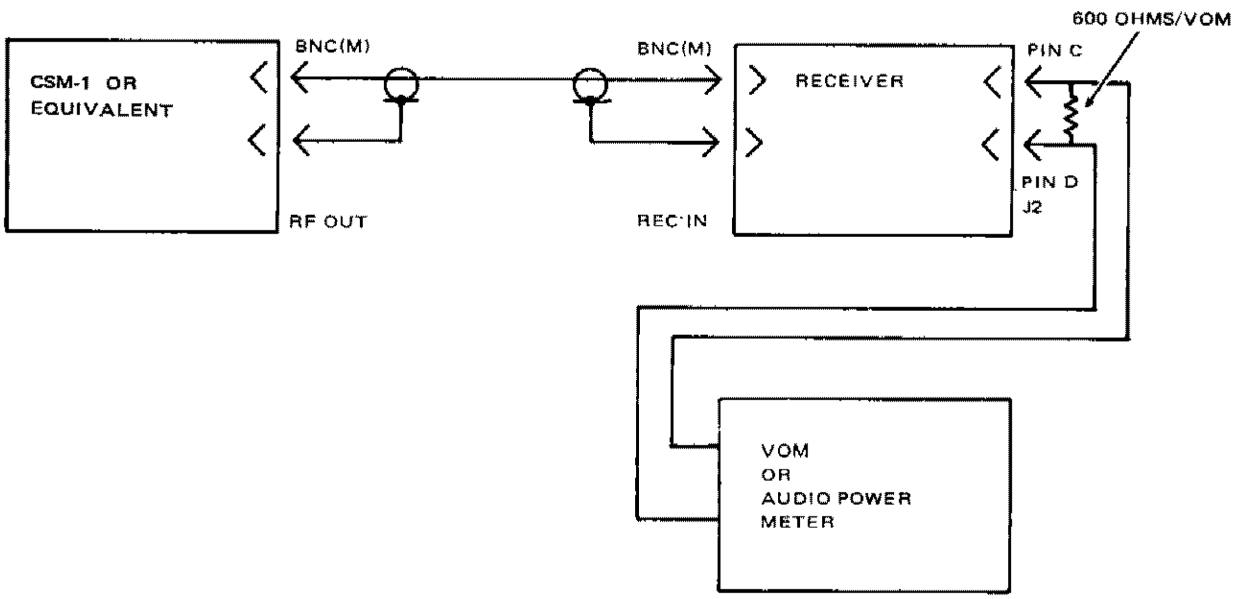


Figure 9-9. Test Setup for Acceptance Checkout

9.7.1 Test Equipment

* CSM-1 Communications Service Monitor or equivalent *

VTVM or DMM with 600-ohm load, or
GR 1840 Power Meter or equivalent

TECHNICAL PERFORMANCE RECORD

VHF/UHF AIR/GROUND RECEIVERS/TRANSMITTERS

FACILITY	LOCATION *(City, State, airport, other)*			DATE *(From—to)*
TYPE RECEIVER	SERIAL NO.	FREQUENCY	TYPE TRANSMITTER	SERIAL NO. / FREQUENCY / SUPERVISOR *(Signature)*

		RECEIVER									TRANSMITTER					
						SELECTIVITY										
DATE	TIME *(GMT)*	SENSITIVITY µV	SQUELCH THRESHOLD µV	AVC LEVEL CONTROL dB	FREQUENCY	6dB BANDWIDTH	60dB BANDWIDTH	NON-SYMMETRY (%)			POWER OUTPUT WATTS*	VSWR*	FREQUENCY	% MODULATION VOICE	REMARKS	INITIALS
NOMINAL																

**Measure at transmitter.*

FAA Form 6600–6 (3–79) Formerly FAA Form 6530–1 (3–76) which will be used

U.S. GOVERNMENT PRINTING OFFICE: 1979—M—671-105/317

Figure 9-10. Specimen FAA Form 6600-6

9.7.2 Procedure.- Connect test equipment as shown in figure 9-9. Set the frequency dials of the CSM-1 to the receiver channel frequency. Set output level to -98 dBm (3 microvolts) modulated 30% at 1 kHz.

9.7.2.1 Power Output.- Record power output at the main audio output of the receiver (90 mV min).

9.7.2.2 Sensitivity.- Perform the following steps:

(1) Record the dB level on the power meter with modulation on.

(2) Place the AMPLITUDE MODULATION switch on the CSM-1 in the OFF position and set signal generator for an output signal-plus-noise-to-noise ratio of 10 dB and record generator level on FAA Form 6600-6.

9.7.2.3 Squelch Threshold and Differential.- Place the squelch ON-OFF switch on front of receiver in the ON position. Reduce the generator output in 1 dB steps until the squelch deactivates (no tone is heard). Record the dB level of the generator. Increase the output level until squelch operates. Record the dB level at which the squelch operates; this is the squelch threshold. The ratio of the two readings is the squelch differential. Place switch in the OFF position.

9.7.2.4 Local Oscillator Frequency Check.- The purpose of this procedure is to determine if the local oscillator frequency is within tolerance ±0.001% for 25 kHz and 50 kHz spacing. Figure 9-11 shows the test setup.

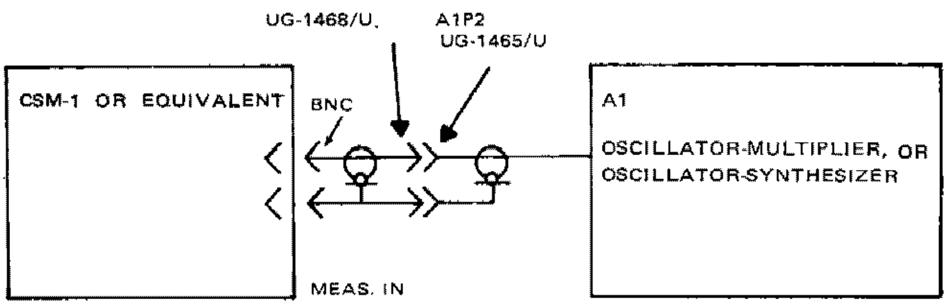


Figure 9-11. Test Setup for Local Oscillator Frequency Check

9.7.2.4.1 Test Equipment Required

CSM-1 communications service monitor or equivalent

9.7.2.4.2 Procedure.- Remove receiver top cover. Disconnect oscillator, oscillator-multiplier, or oscillator-synthesizer cable A1P2 from J1 on mixer/multiplier module and connect test equipment as shown in figure 9-11 or loosely couple. Proceed as follows:

(1) Set SWEEP WIDTH (Δf) to OFF.

(2) Set FUNCTION switch to MEASURE 2 to 60 μV.

(3) Set AUDIO MODE switch to BEAT.

* (4) Set frequency switches and 0-100 Hz control to local oscillator frequency.

(5) Set VOLUME control to maximum clockwise.

(6) Set AGC/MANUAL switch to AGC.

(7) Adjust the CSM-1 frequency switches for a zero beat indication from the speaker. As zero beat condition is approached the BEAT indicator will flash at the beat frequency. Continue adjusting the CSM-1 frequency to the minimum flashing rate. The frequency on the dial is the local oscillator frequency. Record this frequency.

(8) If the above requirements cannot be met, consult paragraphs 7.12.5 and 7.14.3. If requirements are met see 6.8.

9.7.2.5 AGC Threshold.- Increase the signal generator output while observing the audio output level to determine the point at which the agc throttling action starts. This is the point where the output ceases to increase the direct proportion to the input. The dB scale on the signal generator and the power output meter should increase proportionally (dB for dB) until agc throttling action starts. See table 6-1 (step 3).

9.7.2.6 AGC Action.- Vary the signal generator output level from 3.0 μV (-98 dBm) to 50,000 μV (-13 dBm) while observing the receiver audio output level. This audio output level shall not change more than 4 dB.

9.8 INTEGRATION DATA

9.8.1 Output Levels.- Receiver output levels are to be set for installations at various sites as follows:

Site	Level
RCAG	0 dBm
Low activity towers when receiver is used in conjunction with FA-8165 Control Equipment	-20 dBm
RTR	0 dBm

9.8.2 Integration at Other Sites.- At manned sites where FA-8165 control equipment is not in use it will be necessary to route the receiver audio output through a line amplifier in order to operate the neon channel-in-use light.

SECTION 10

PHOTOGRAPHS AND MECHANICAL DRAWINGS

* This figure deleted. *

Figure 10-1. Crystal Oscillator

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Figure 10-2. Oven Control Board (A) and Crystal Oscillator Board (B)

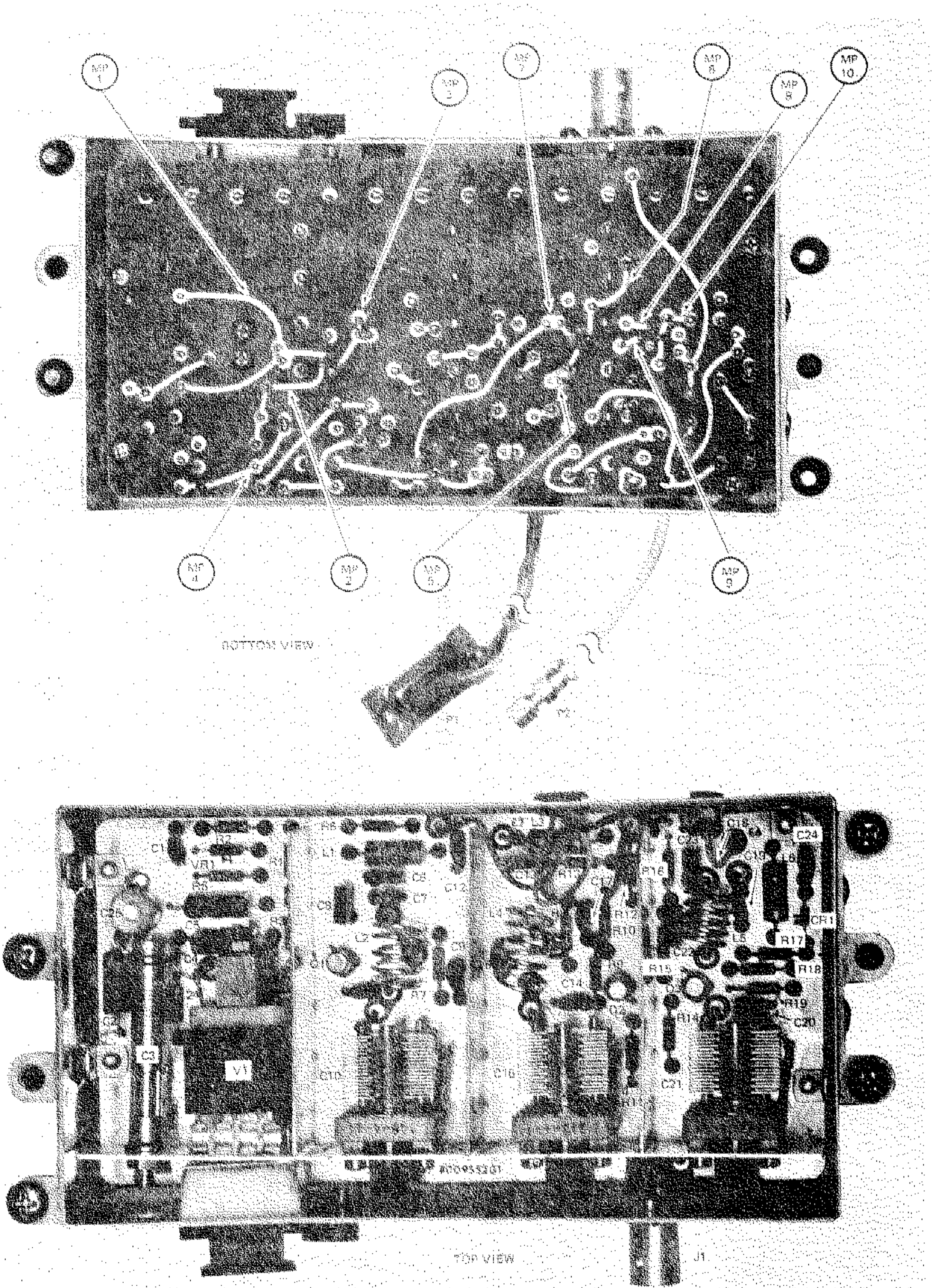

Figure 10-3. Oscillator-Multiplier A1(M)

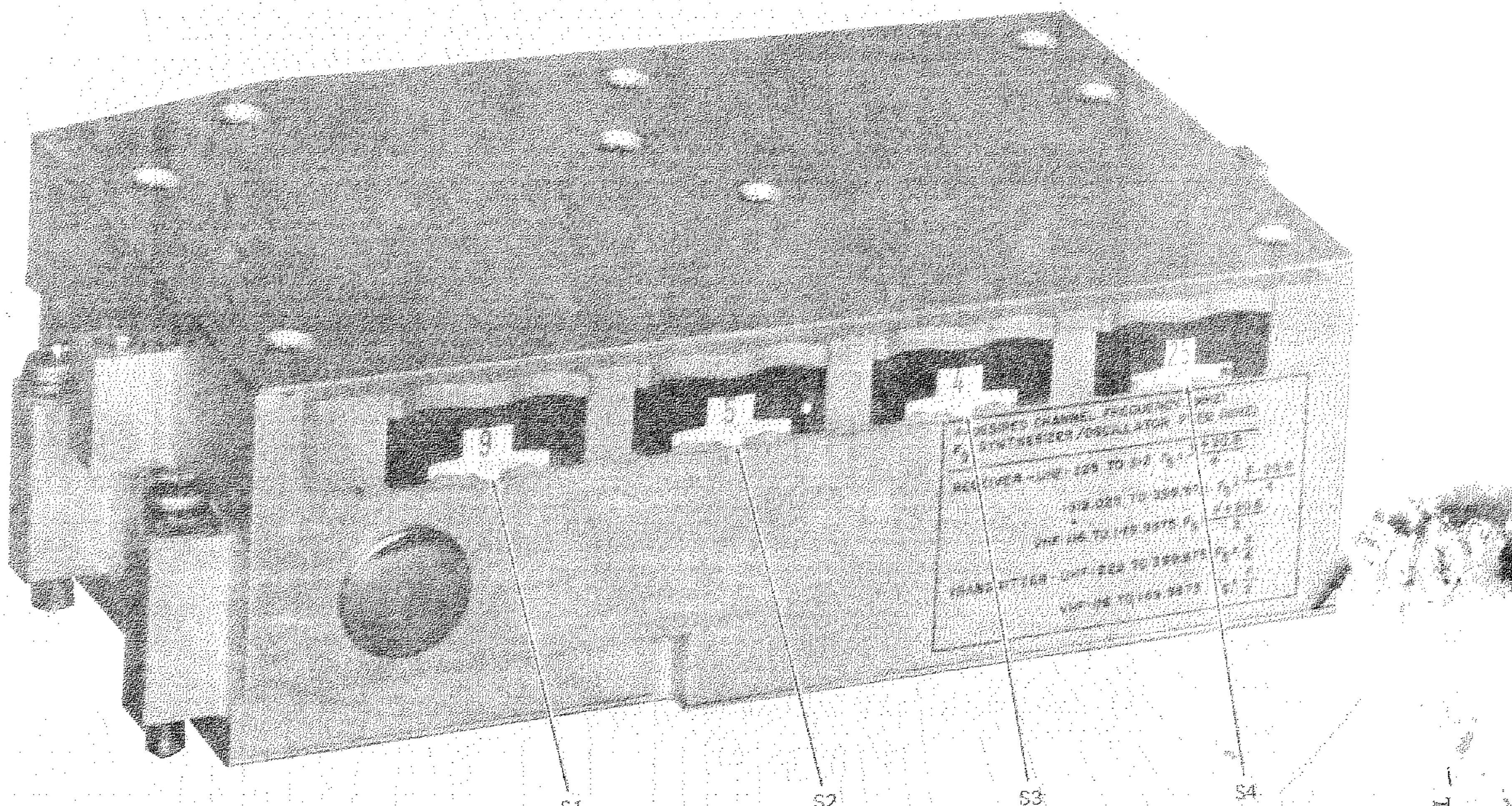

Figure 10-4. Oscillator-Synthesizer A1(S)

TI 6620.2A

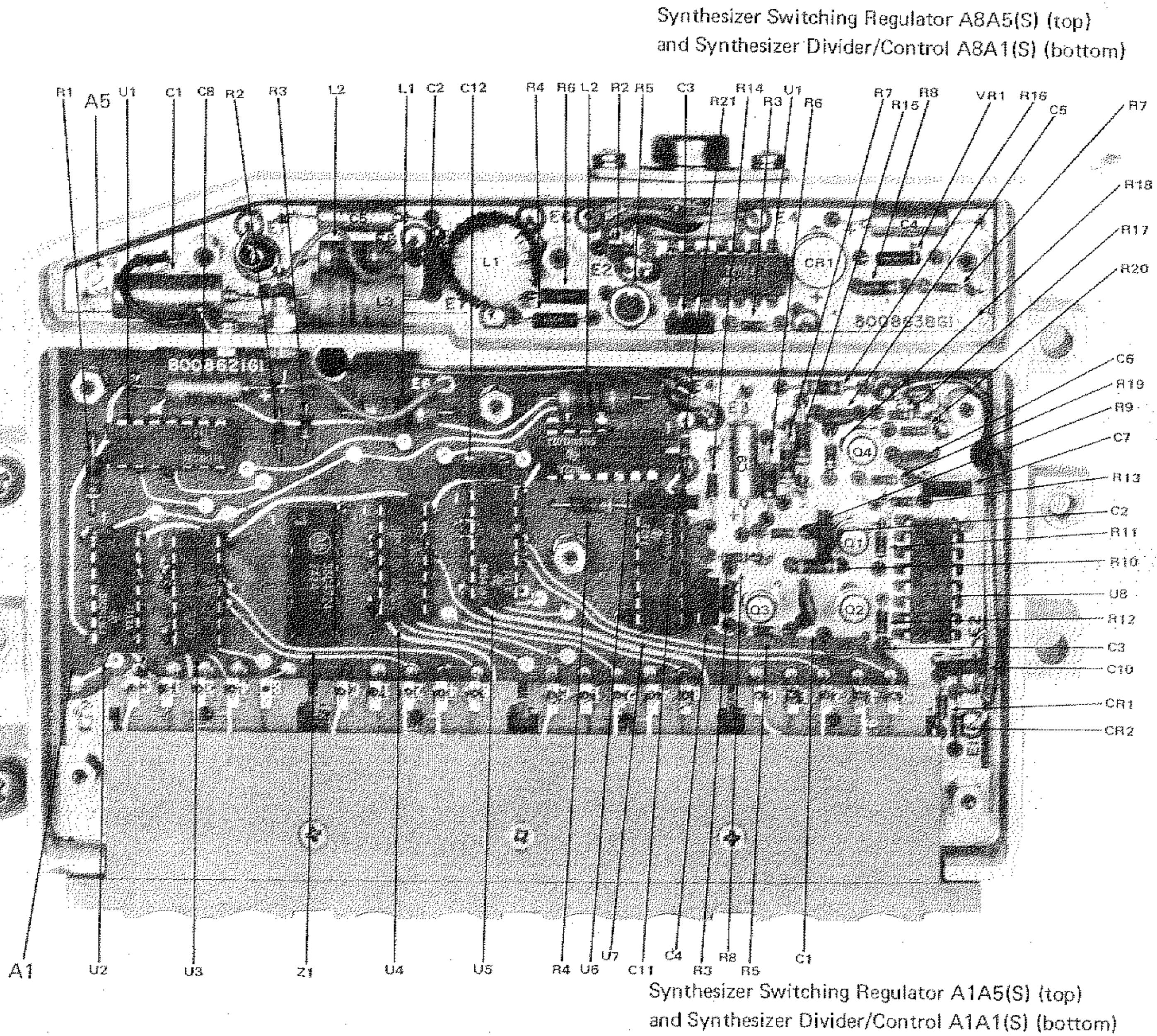

Figure 10-5. Synthesizer Divider/Control A1A1(S) and Switching Regulator A1A5(S)

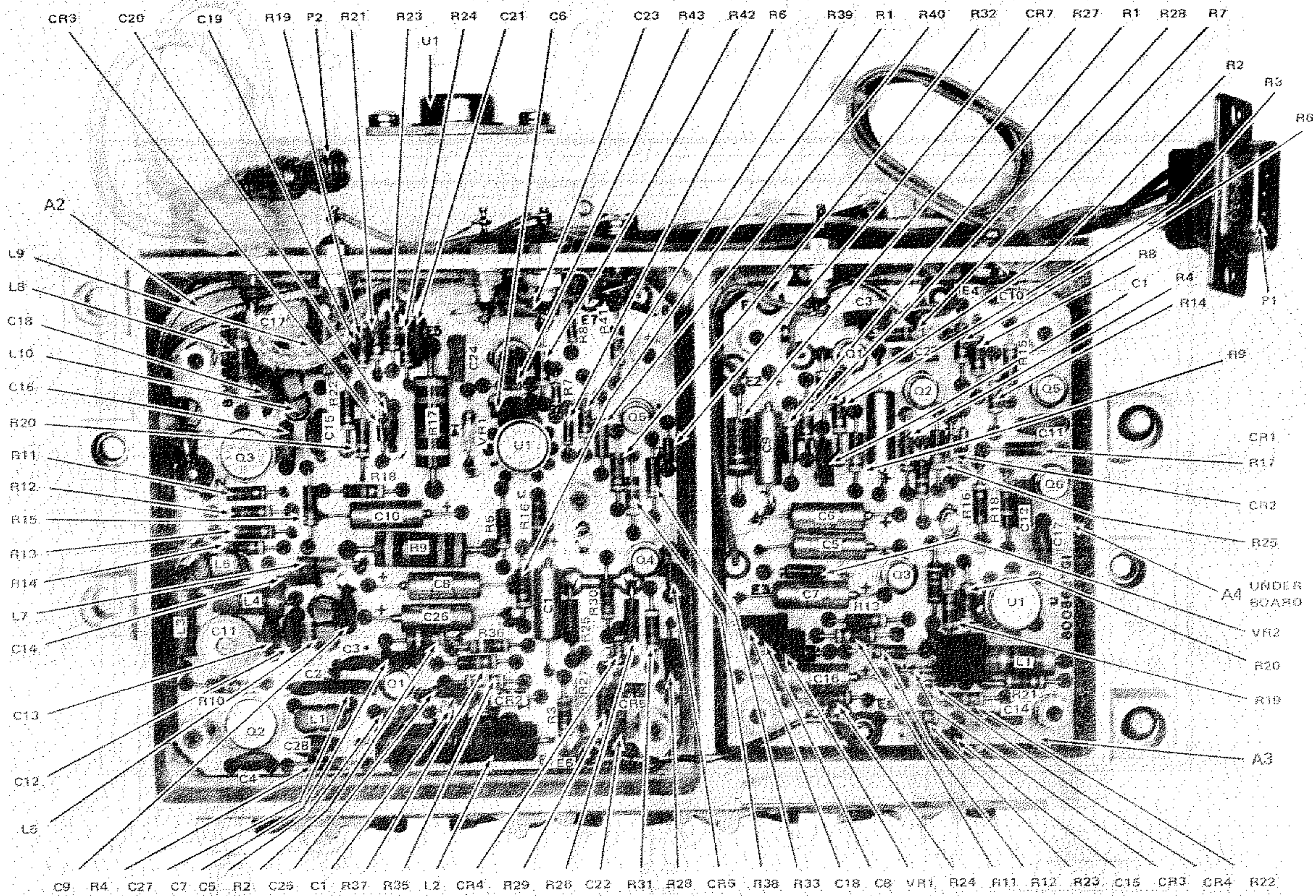

Figure 10-6. Synthesizer Phase Comparator A1A3(S) and RF Generator A1A2(S)

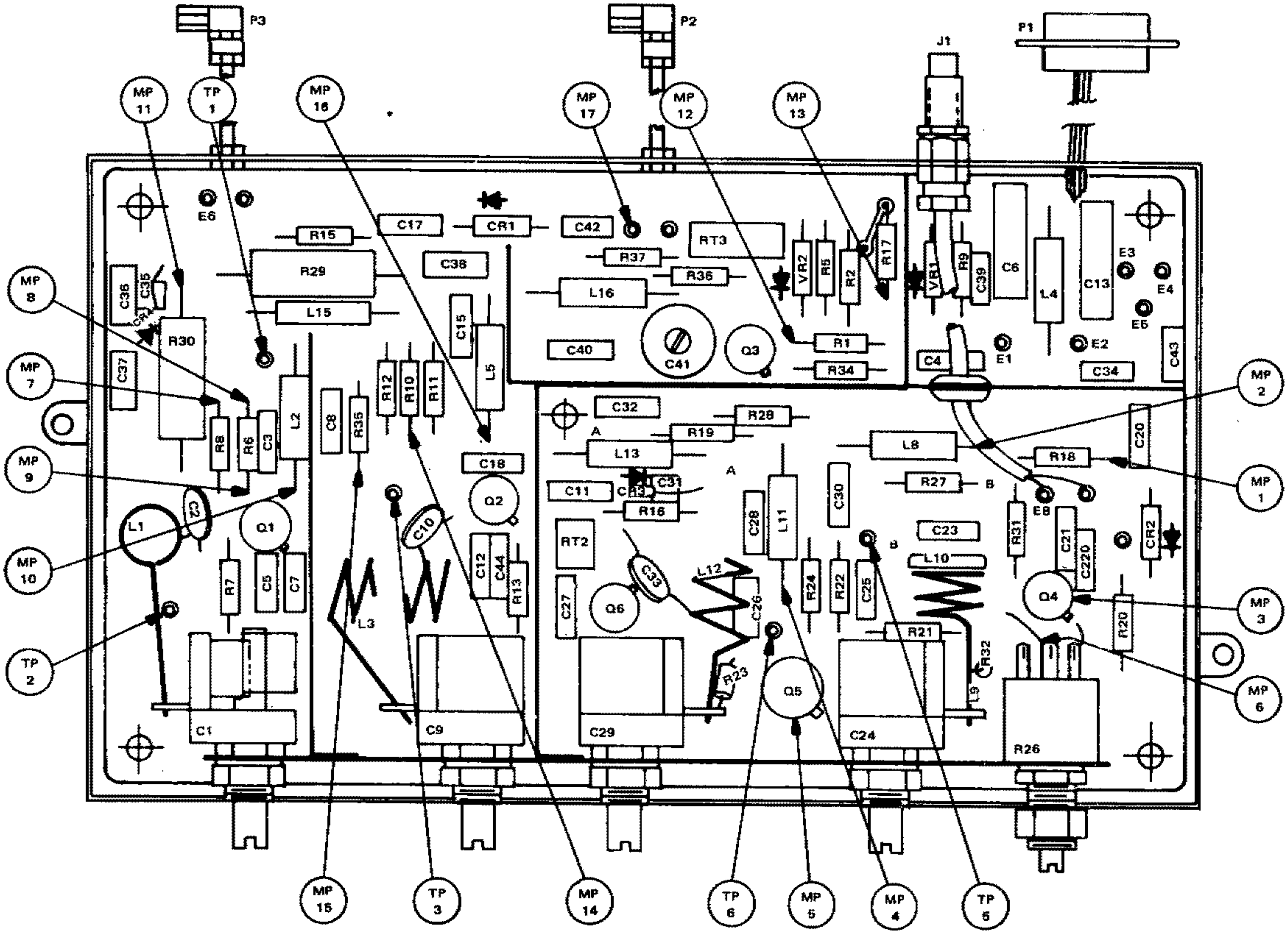

Figure 10-7. Mixer/Multiplier (VHF) G1

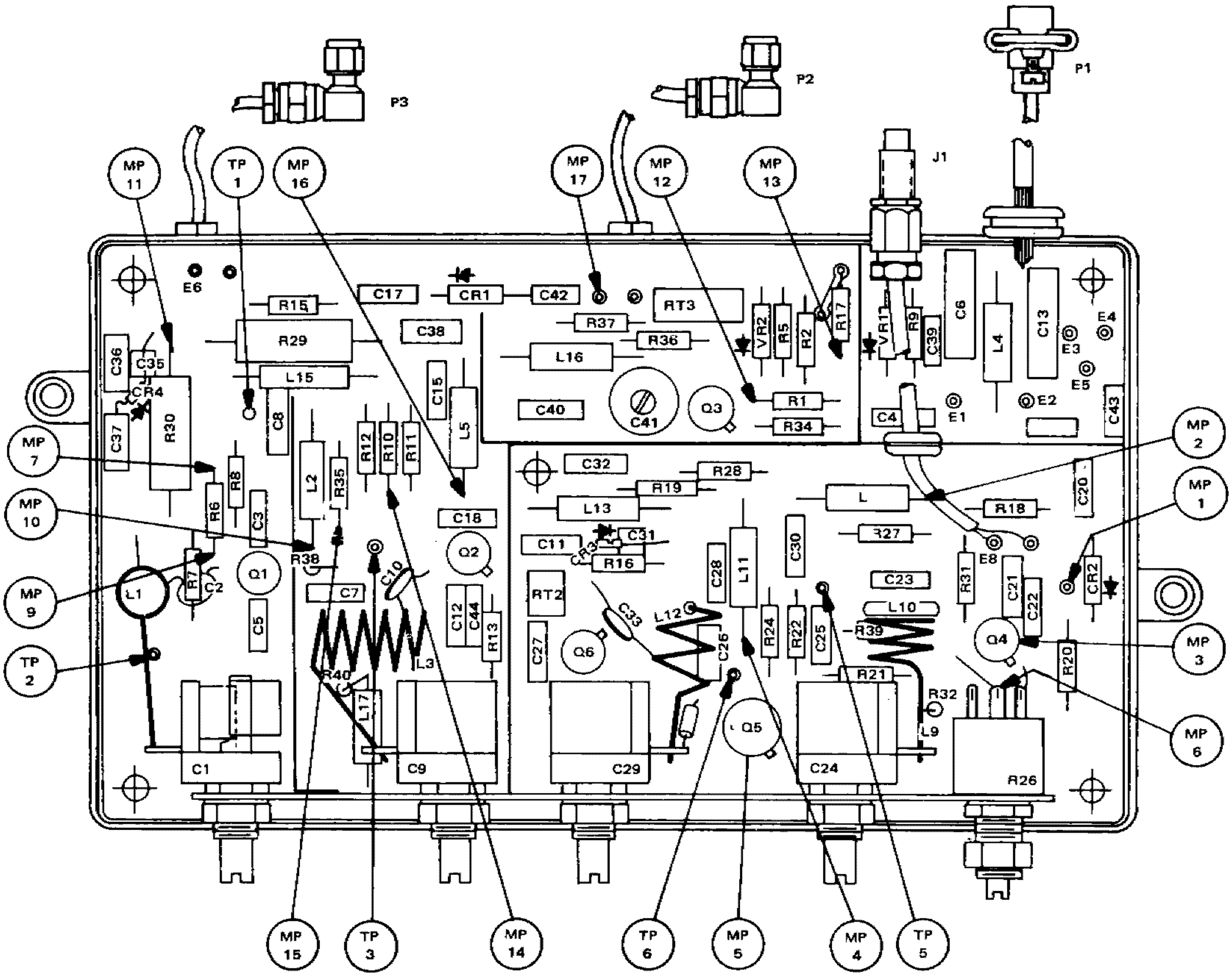

Figure 10-8. Mixer/Multiplier (VHF) G2

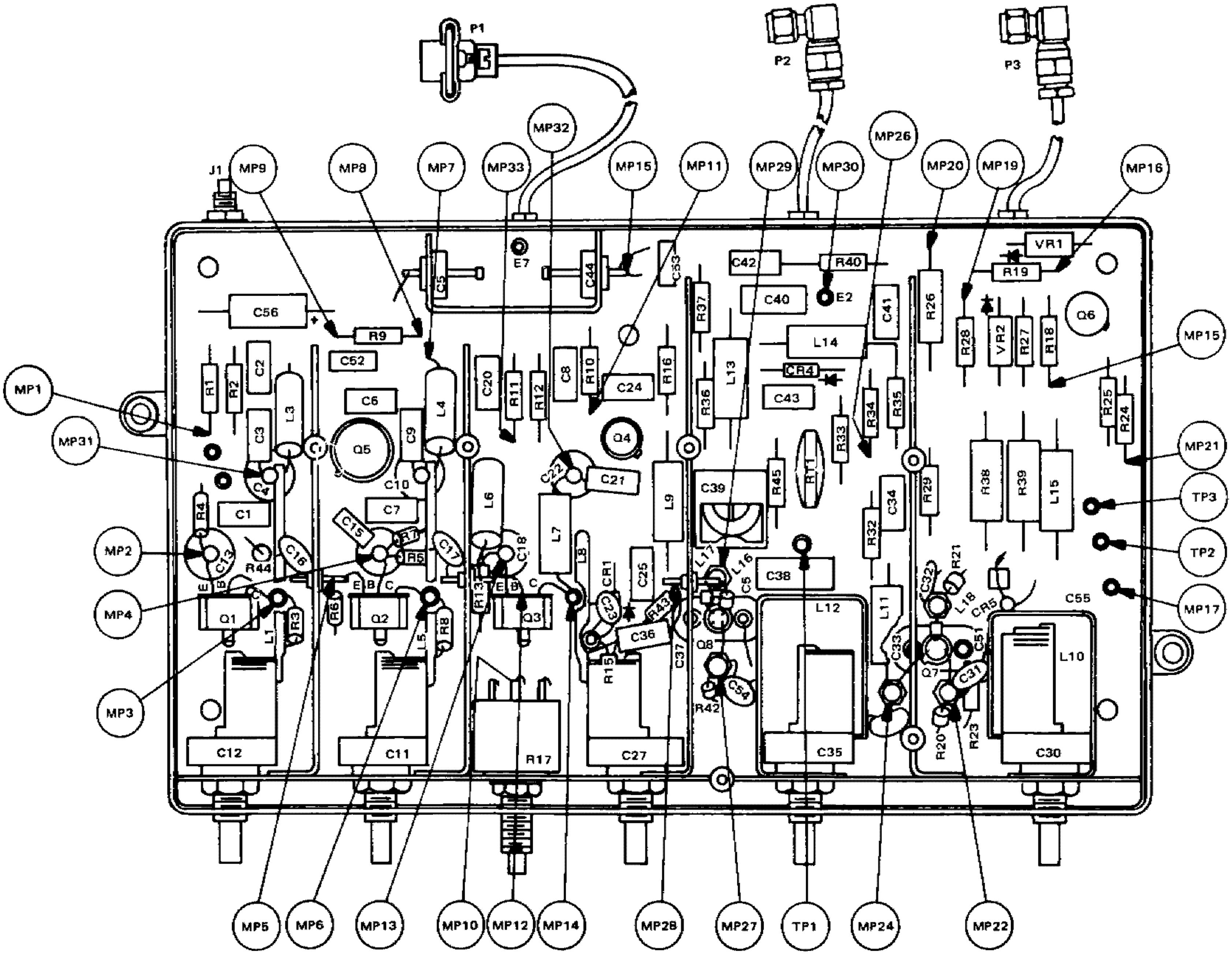

Figure 10-9. Mixer/Multiplier (UHF) G1

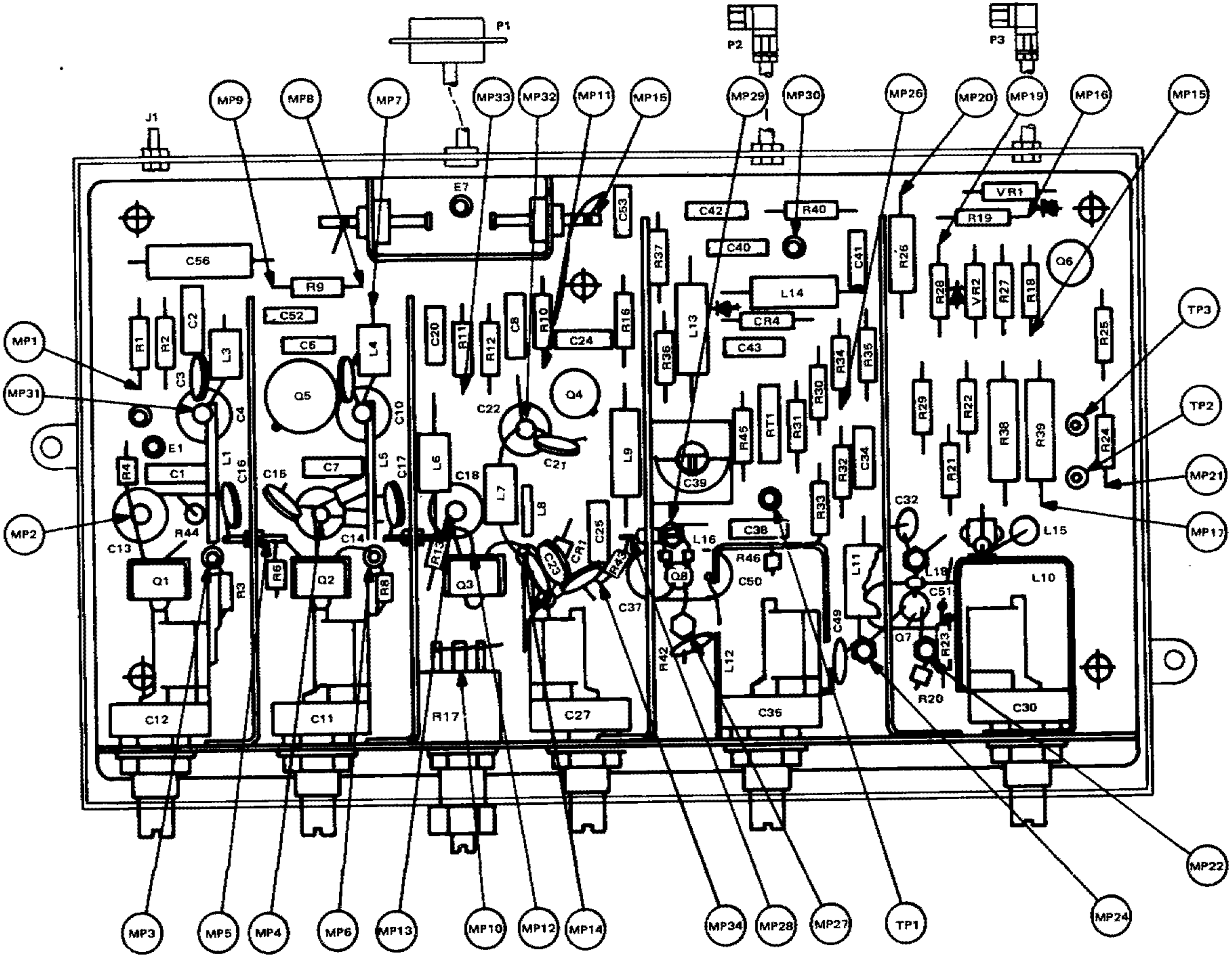

Figure 10-10. Mixer/Multiplier (UHF) G2

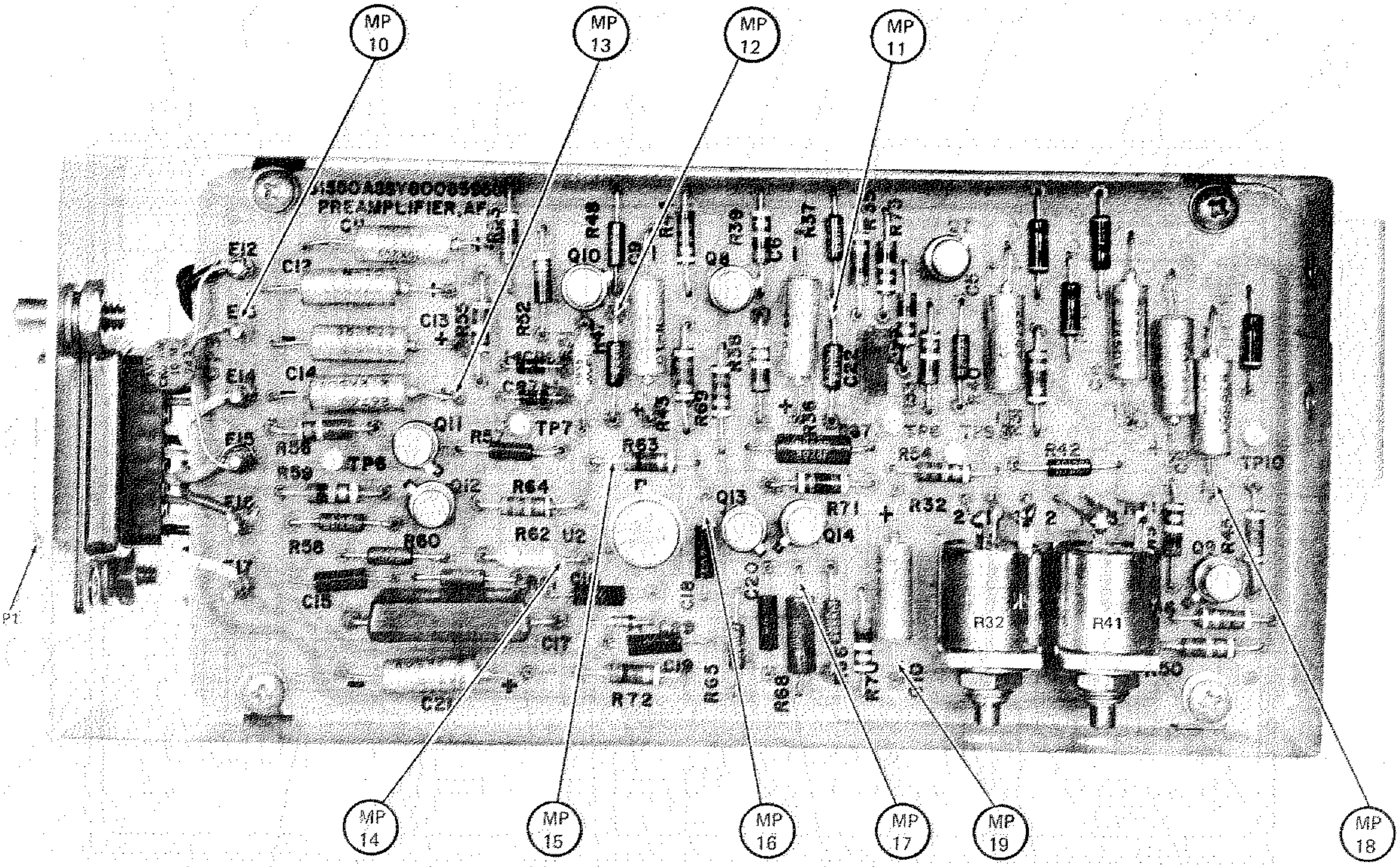

Figure 10-11. Preamplifier, AF/AGC-Squelch (Sheet 1 of 2)

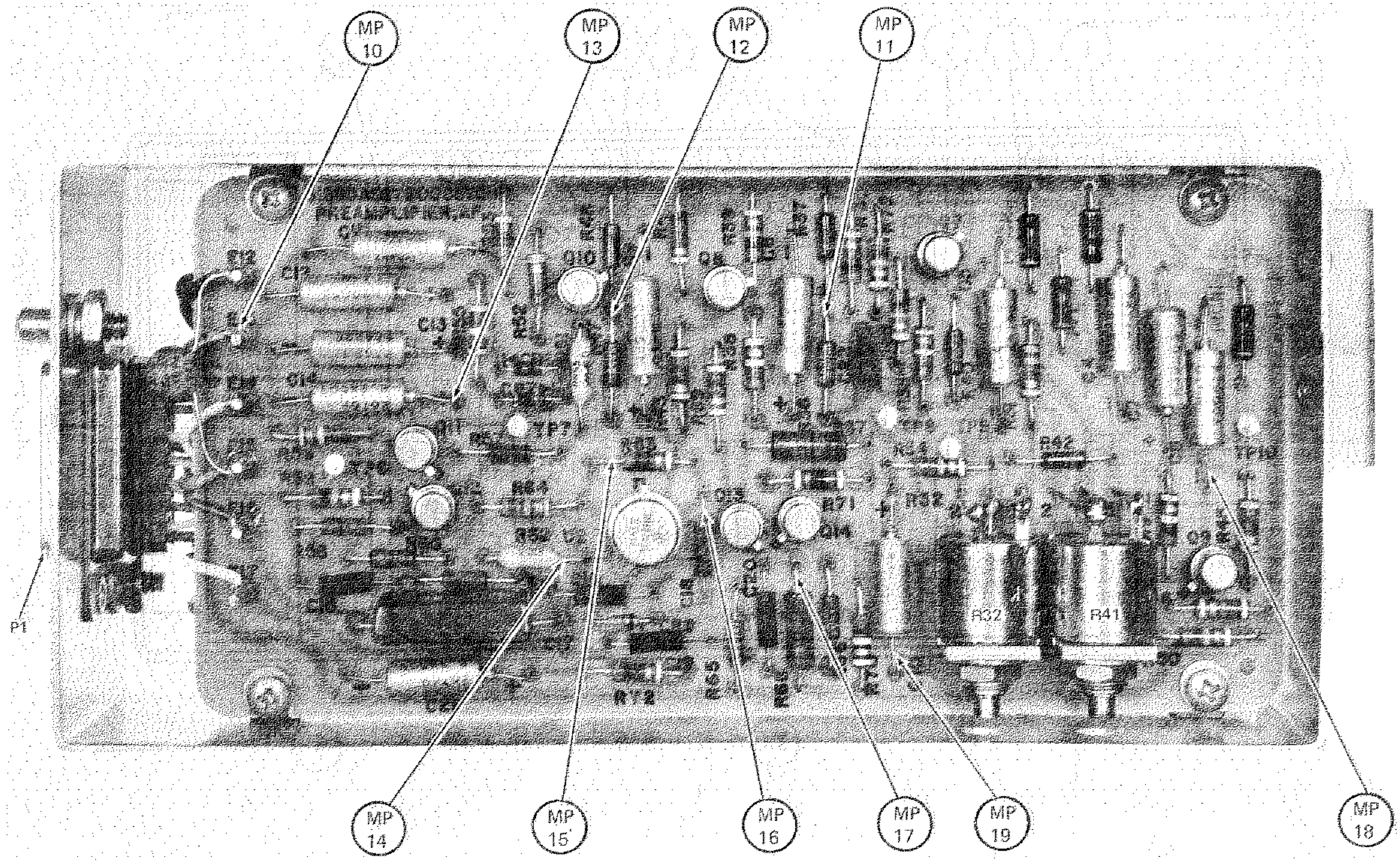

Figure 10-11. Preamplifier, AF/AGC-Squelch (Sheet 2 of 2)

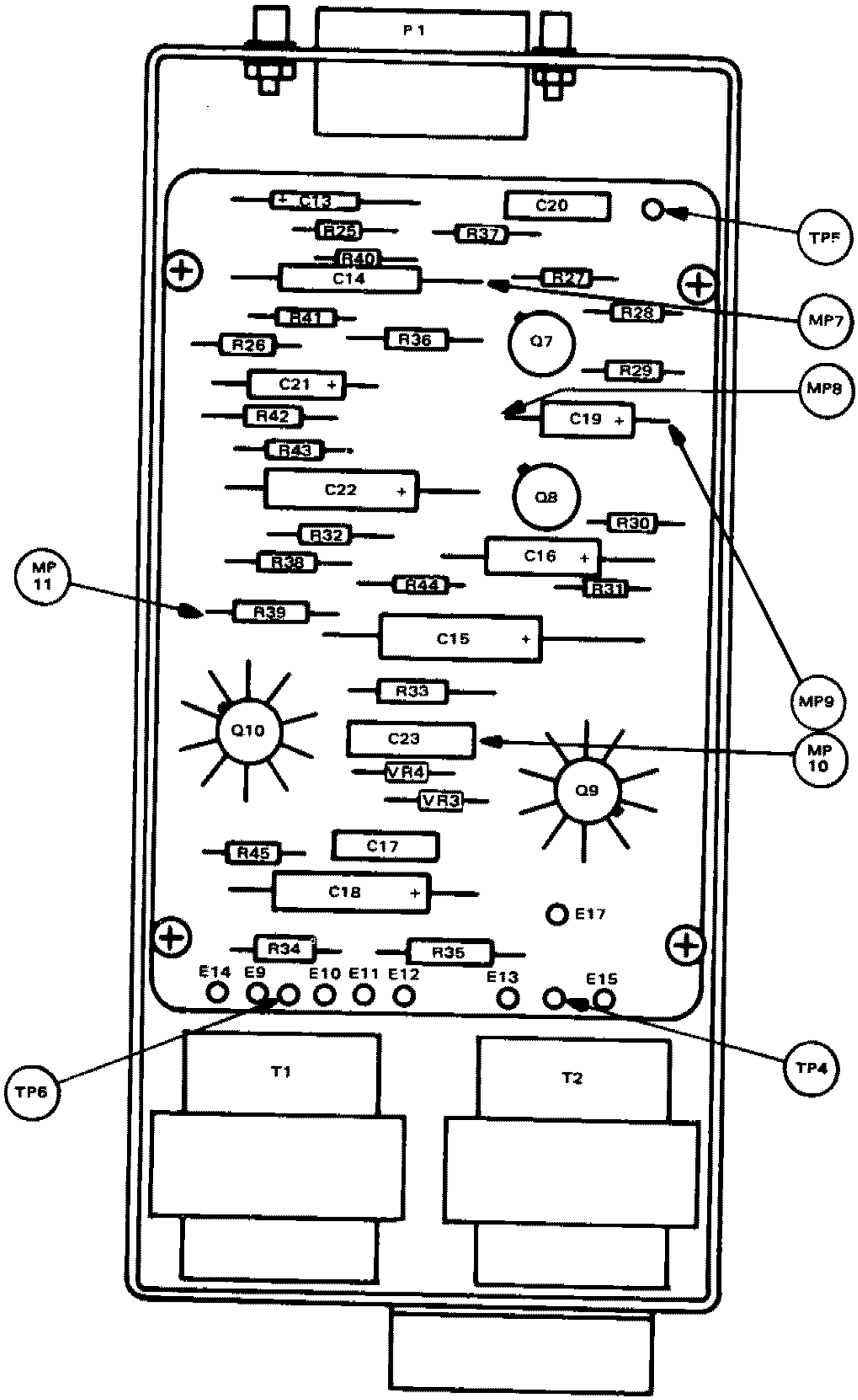

Figure 10-12. Audio Amplifier (Sheet 1 of 2)

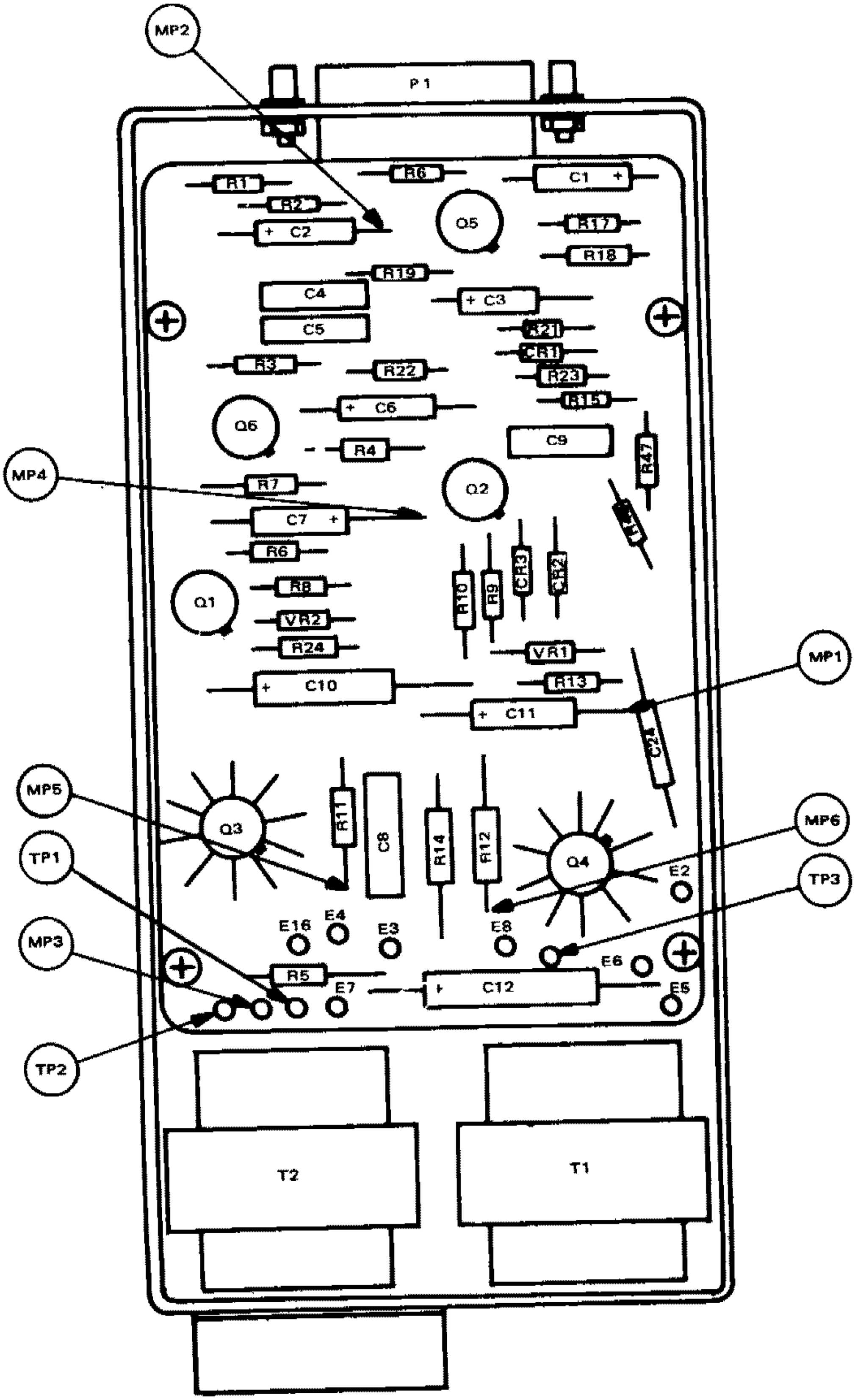

Figure 10-12. Audio Amplifier (Sheet 2 of 2)

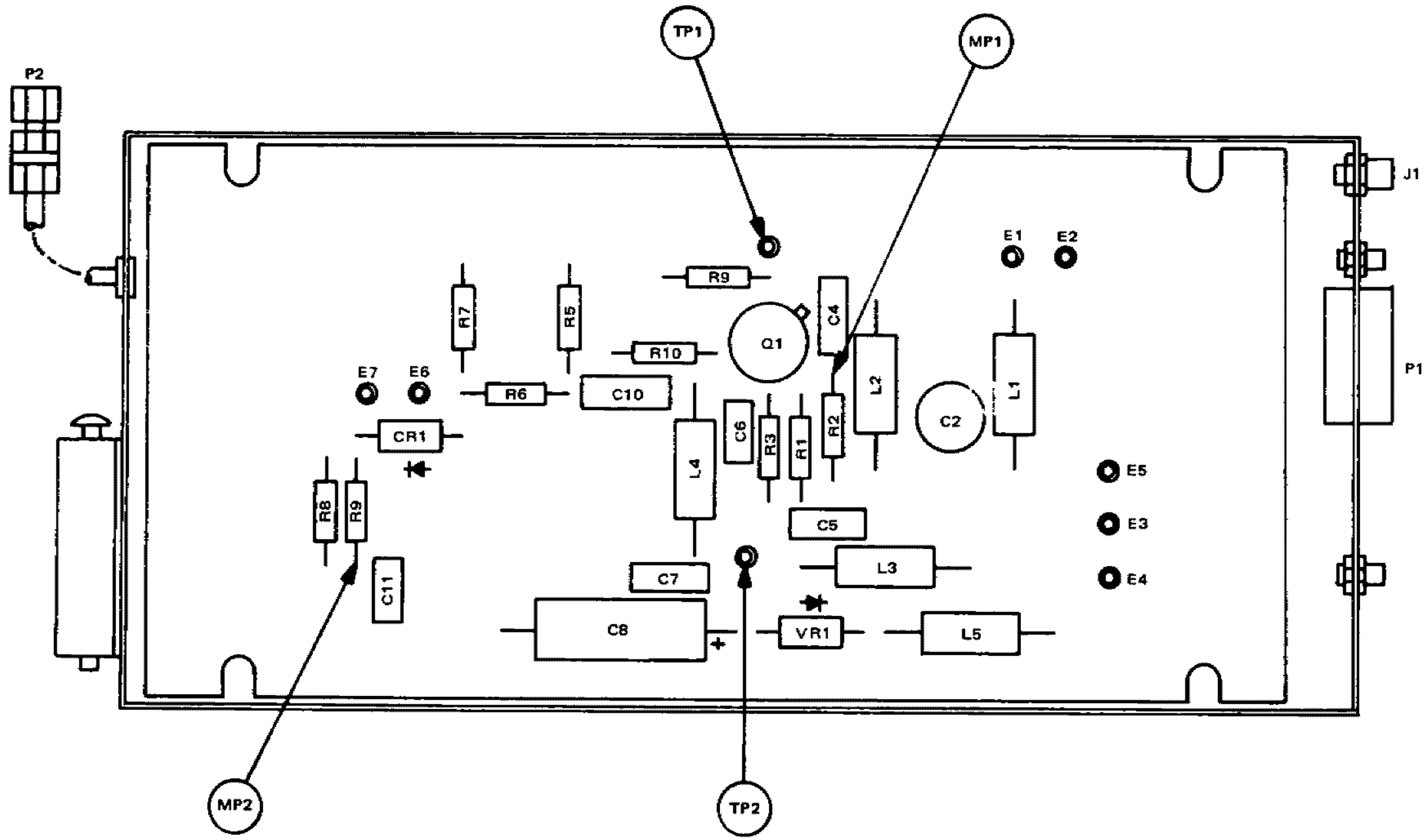

Figure 10-13. Buffer Amplifier

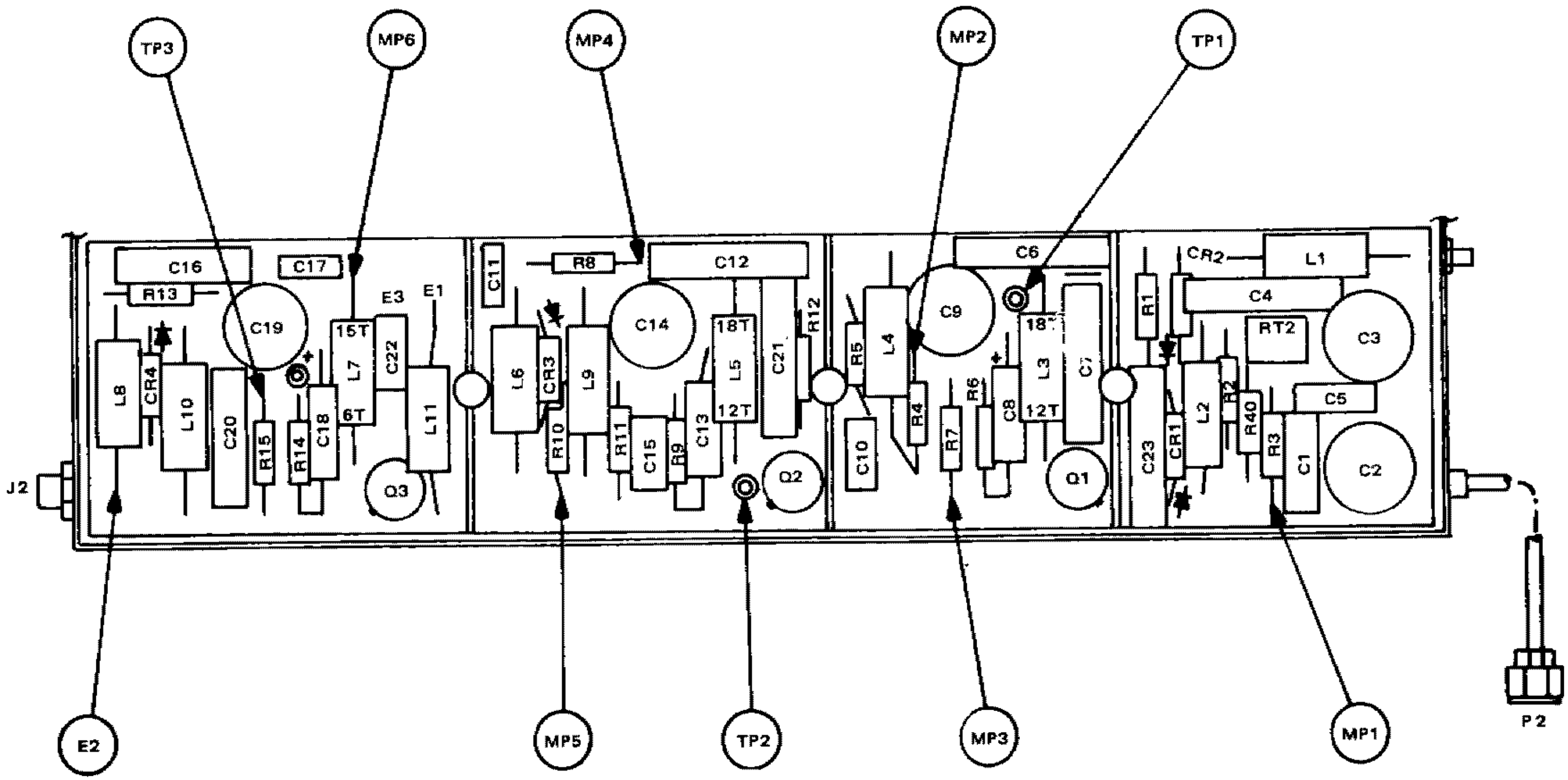

Figure 10-14. IF Amplifier and Detector (Sheet 1 of 2)

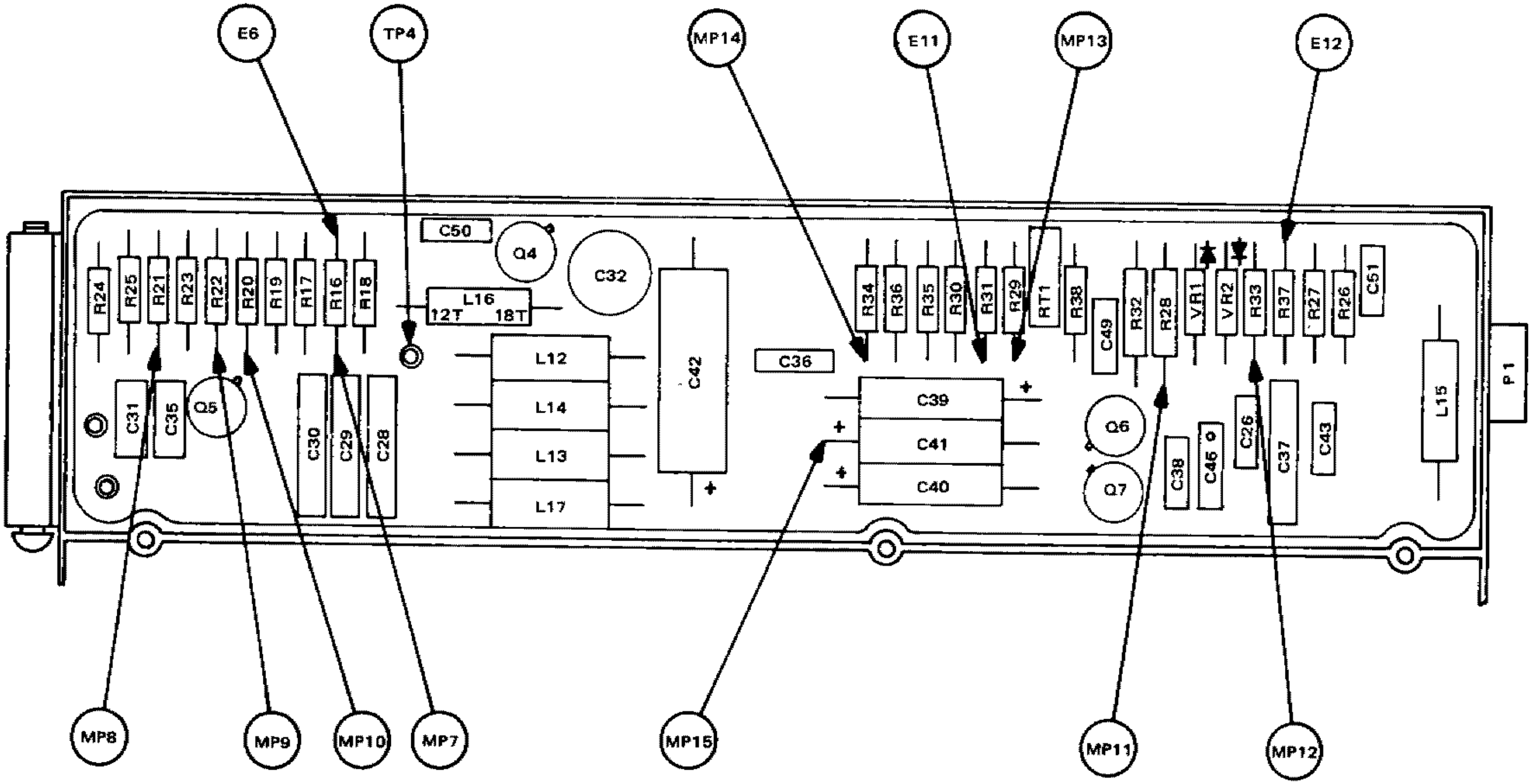

Figure 10-14. IF Amplifier and Detector (Sheet 2 of 2)

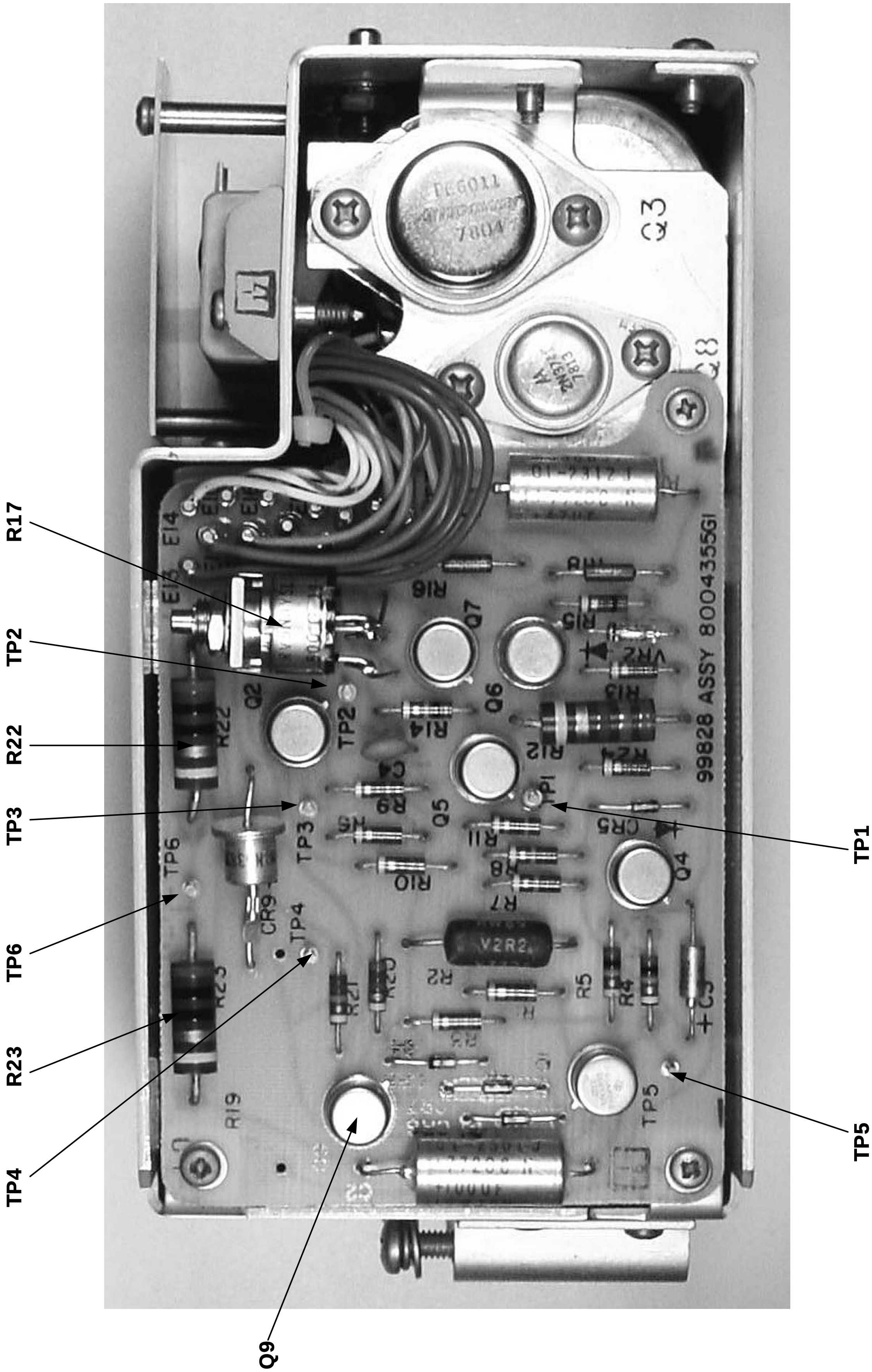

Figure 10-15. Power Supply PS1, Front

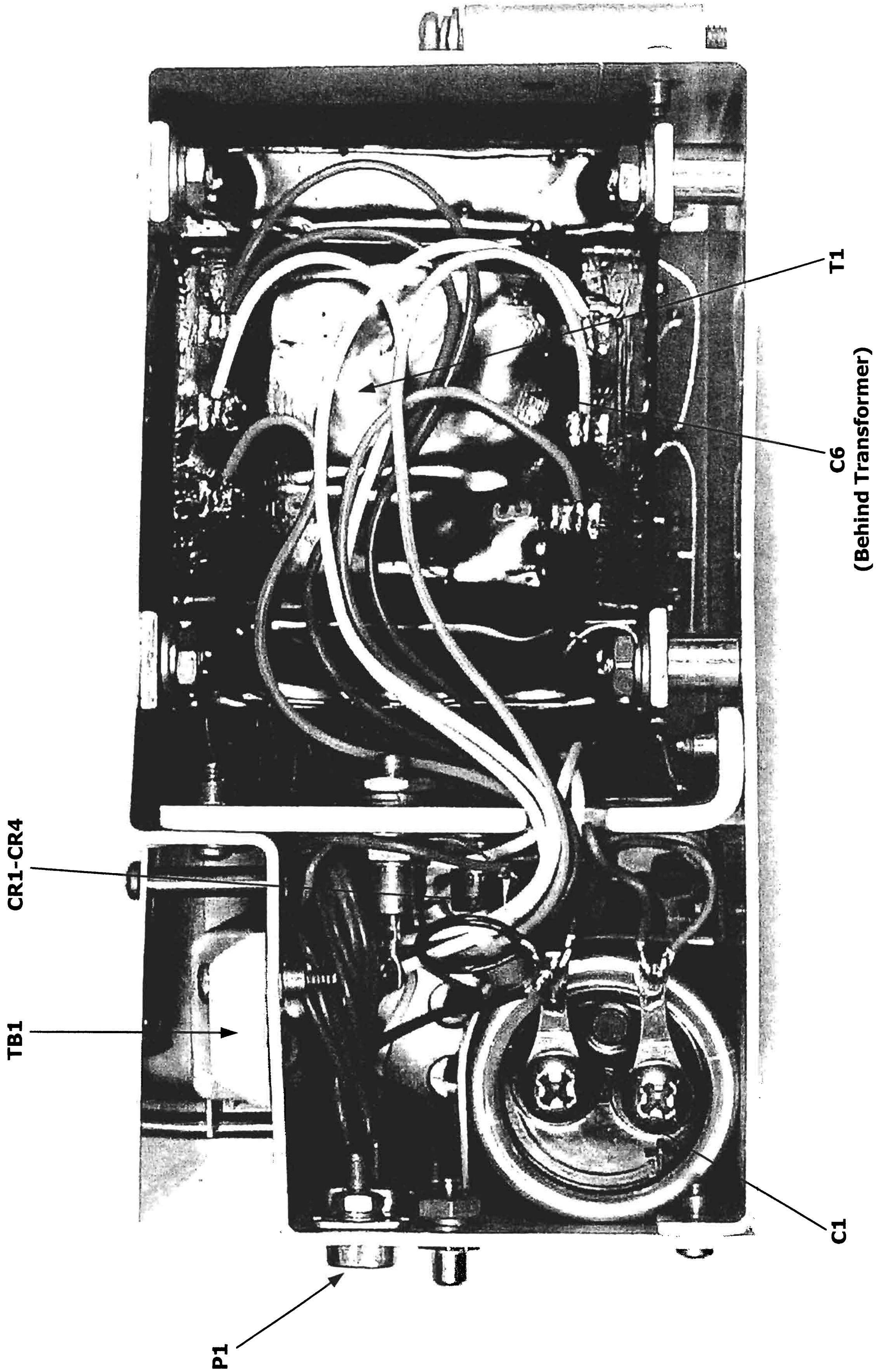

Figure 10-16. Power Supply PS1, Back

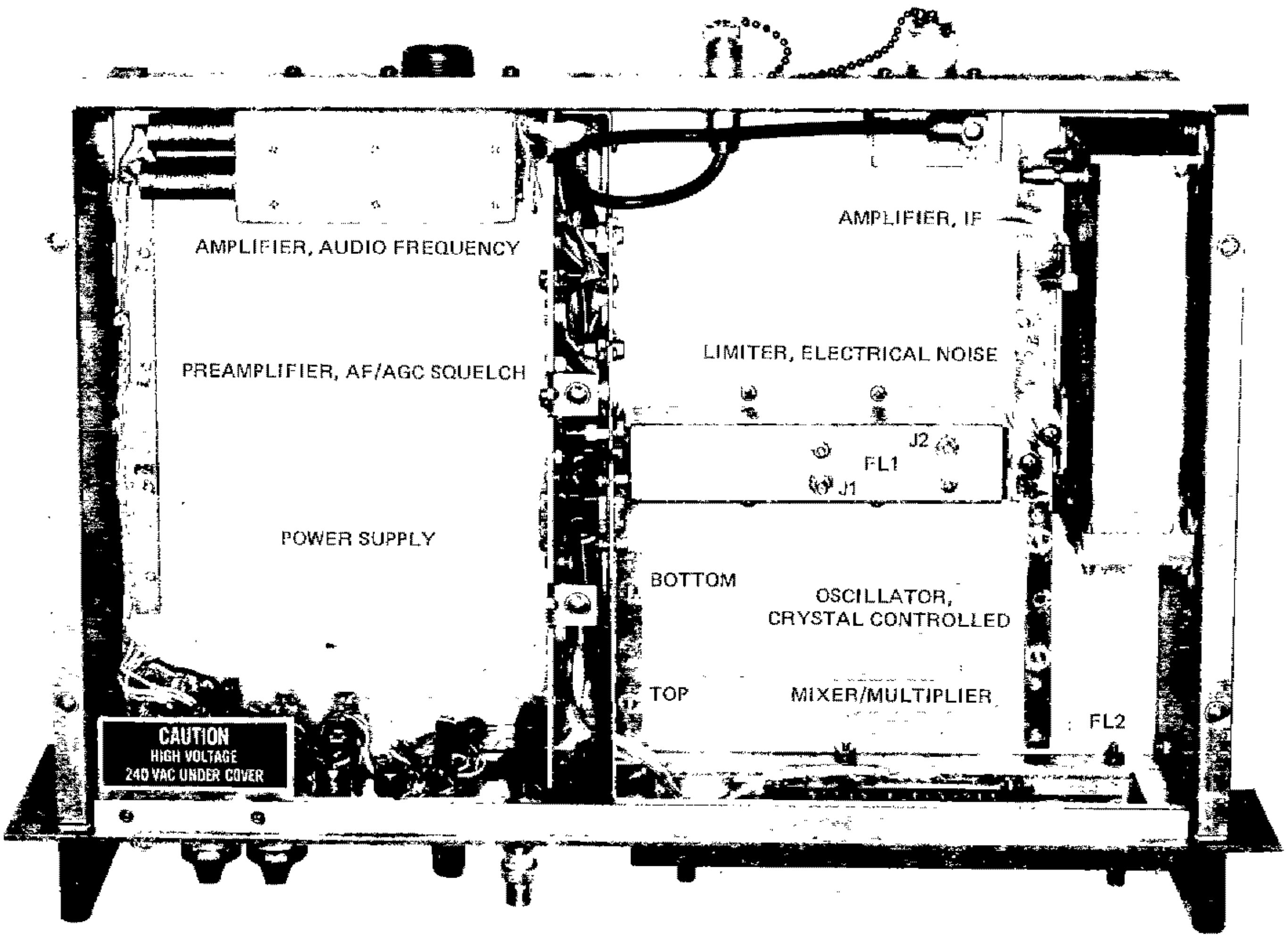

Figure 10-17. Receiver Frame Assembly

APPENDIX A

QUARTZ CRYSTAL (50.0 TO 100.0 MHz) PROCUREMENT DATA

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APPENDIX B

QUARTZ CRYSTAL (10.0 TO 20.0 MHz) PROCUREMENT DATA

1 GENERAL.- This appendix details the requirements for fundamental mode, antiresonant quartz crystal units covering the frequency range of 10.0 MHz to 20.0 MHz.

2 REQUIREMENTS

2.1 Mechanical

a. Holder	HC-6/U per MIL-H-10056/2
b. Marking	Each unit shall be permanently marked in accordance with MIL-C-3098, giving the manufacturer's code designation, his part number, and the nominal frequency in megahertz to eight digits.

2.2 Electrical

a. Oscillation mode	Fundamental
b. Rated drive level	2.0 ±1.0 mW
c. Frequency	As ordered, in the range of 10.0 to 20.0 MHz
d. Frequency stability	Within ±5 parts per million over the range -10° C to +75° C from the reference temperature of +26° C
e. Equivalent resistance at resonance	20 ohms, maximum, at +26° C. Spurious mode resistance shall be at least 3 times that at resonance over the range 1 to 60 MHz
f. Antiresonance load capacitance	32 ±0.5 pF
g. Shunt capacitance	9.0 pF, maximum
h. Frequency tolerance	±10.0 parts per million at +26° C
i. Frequency tuning	The fundamental frequency of the crystal shall vary a minimum of ±25 parts per million about its center frequency for a capacitance variation from 29 to 37 pF; 32 pF is considered to be the center frequency capacitance.
j. Testing	When using a TS-683/TSM, or equivalent, the calibration resistance shall be 10 ohms, resistor voltage drop 0.14 volt, and rated drive level 1-3 mW.

3 VENDORS.- The following vendors are suggested sources of supply.

a. International Crystal Manufacturing Co.
Oklahoma City, Oklahoma

b. Harris Corporation
Crystal Operation
Cincinnati, Ohio

c. R/T Labs, Inc.
4126 Colerain Avenue
Cincinnati, Ohio 48223

d. CTS Knights, Inc.
Sandwich, Illinois

e. Croven, Ltd.
Whitby, Ontario, Canada

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*

APPENDIX C

IMPEDANCE MATCHING NETWORK

1Z1

INSTRUCTION BOOK

TECHNICAL DATA

*

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APPENDIX C

* TABLE OF CONTENTS (con.)

APPENDIX C

LIST OF ILLUSTRATIONS

LIST OF TABLES

*

SECTION 1

GENERAL INFORMATION AND REQUIREMENTS

1.1 INTRODUCTION.- This appendix, when combined with the handbook proper, provides theory of operation, identification information, and installation procedures for the impedance matching network (1Z1).

1.2 EQUIPMENT DESCRIPTION.- The impedance matching network (1Z1) is a self-contained impedance matching network for AN/GRR-23 and AN/GRR-24 radio receivers. The impedance matching network 1Z1 is presented pictorially in figure 10-1. It mounts between the radio receiver audio output connector, J2, and the audio cable routed to FAA/telco equipment.

1.3 EQUIPMENT SUPPLIED.

Table 1-1. Equipment Supplied

Quantity	Item	Dimensions (inches)			Unpacked Weight
		Height	Width	Depth	
1	Impedance Matching Network (1Z1)	2 3/4	3	4	.75 lb

*

*

SECTION 2

TECHNICAL DESCRIPTION

2.1 GENERAL DESCRIPTION.- The impedance matching network (1Z1) is a self-contained impedance matching network for AN/GRR-23 and AN/GRR-24 radio receivers. The impedance matching network 1Z1 is presented pictorially in figure 10-1. It mounts between the radio receiver audio output connector, J2, and the audio cable routed to FAA/telco equipment.

2.2 FUNCTIONAL DESCRIPTION.

2.2.1 Radio receivers AN/GRR-23 and AN/GRR-24 have audio output source impedances of approximately 150 ohms. FAA/telco equipment audio inputs require that the prior audio output source impedance be 600 ohms. When the radio receiver audio outputs are directly connected to the FAA/telco equipment audio inputs, an impedance mismatch occurs. The radio receiver 150-ohm audio output source impedance loads the FAA/telco equipment input where the result is inadequate power transfer between devices. The FAA/telco equipment exhibits degraded audio quality with noise.

2.2.2 The impedance matching network 1Z1 corrects radio receiver audio input loading for FAA/telco equipment audio inputs. It uses a resistive H-pad configuration to provide adequate power transfer between the receiver and external equipment. Using the impedance matching network 1Z1 improves audio quality and noise rejection.

2.3 ASSEMBLY DESCRIPTION.

2.3.1 The impedance matching network 1Z1 consists of a single printed circuit card assembly (1Z1A1) inside a shielded container. The shielded container has two circular connectors externally mounted. One circular connector is an 8-pin female, the other is an 8-pin male. Six of the eight connector pins are wired 1:1 from male to female inside the shielded container. Two of the male and two of the female connector positions are routed to printed circuit card assembly, 1Z1A1.

2.3.2 The schematic for the impedance matching network is presented in figure 11-1. The printed circuit card assembly, 1Z1A1, has 5 resistors installed in an H-pad configuration. When an AN/GRR-23 or -24 radio receiver with an output impedance of 150 ohms is connected between J2S pins C and D, the impedance observed at J2P pins C and D is 600 ohms. This 600-ohm impedance satisfies the requirements for succeeding FAA/telco equipment.

*

* **SECTION 3**

OPERATION

3.1 INTRODUCTION.- The impedance matching network 1Z1 is a configuration attachment for AN/GRR-23 and AN/GRR-24 radio receivers. There are no controls or indicators on the device. No changes to operation and use of the radio receivers occur when the impedance matching network 1Z1 is installed. *

* **SECTION 4**

STANDARDS AND TOLERANCES

4.1 INTRODUCTION.- This section lists the standards and tolerances for the impedance matching network (1Z1), when validation is performed outside of the operating equipment configuration.

Table 4-1. Impedance Matching Network Standards and Tolerances

Parameter	Standard	Tolerance
Input Resistance[1]	172.2 ohms	±2.2 ohms
Output Resistance[2]	684 ohms	±7 ohms
Male to Female Connector Continuity[3]	0.25 ohms	±0.25 ohms
Signal Attenuation[4]	6 dB	±0.25 dB

[1]Input resistance measurement is observed at connector J2S, between pins C and D, with no attachments to connector J2P. See figure 10-1 to identify J2S and J2P.

[2]Output resistance measurement is observed at connector J2P, between pins C and D, with no attachments to connector J2S.

[3]Measuring the resistance between the following connector combinations:

J2S pin A -------- J2P pin A
J2S pin B -------- J2P pin B
J2S pin E -------- J2P pin E
J2S pin F -------- J2P pin F
J2S pin G -------- J2P pin G
J2S pin H -------- J2P pin H

[4]Test Conditions.- Connecting a 1-kilohertz, 500-millivolt rms voltage source with an output impedance of 150 ohms ±5% between pins C and D for connector J2S. Measuring the difference in the no load voltage and the 600-ohm load voltage at connector J2P, between pins C and D. *

* **SECTION 5**

PERIODIC MAINTENANCE

5.1 REQUIREMENTS.- The impedance matching network (1Z1) does not have requirements for periodic maintenance beyond the general requirements outlined in section 5 of volume 1 of the instruction book. *

* **SECTION 6**

MAINTENANCE PROCEDURES

6.1 REQUIREMENTS.- No maintenance procedures are required for the impedance matching network (1Z1). *

*

SECTION 7

CORRECTIVE MAINTENANCE

7.1 INTRODUCTION.- Corrective maintenance should not be required for the impedance matching network (1Z1). However, if problems arise in the AN/GRR-23 or AN/GRR-24 radio receivers and the corrective maintenance outlined in section 7 of the handbook proper does not outline the continued audio problems, the 1Z1 module can be validated.

7.2 TEST EQUIPMENT.

Digital voltmeter (Fluke 8050A or equivalent)

7.3 FUNCTIONAL VALIDATION.- Functional validation of the impedance matching network requires removal of the 1Z1 module from the back of the AN/GRR-23 or AN/GRR-24 radio receiver. The requirements for 1Z1 module removal are the reverse requirements for 1Z1 module installation outlined in section 9. Set a digital voltmeter to a suitable resistance range and perform resistance measurements a through 1. See figure 10-1 to identify J2S and J2P, if necessary.

a. The resistance measurement between J2S pin C and J2S pin D should be 172 ±2.2 ohms.

b. The resistance measurement between J2S pin C and J2P pin C should be 266 ±3 ohms.

c. The resistance measurement between J2S pin D and J2P pin D should be 266 ±3 ohms.

d. By placing a 600-ohm resistor between J2P pins C and D, a resistive measurement of 150 ±10 ohms should be observed at J2S between C and D.

e. The resistive measurement between the following pin pairs should be 0.25 ohms ±0.25 ohms.

J2S Pin		J2P Pin
A	--------------------	A
B	--------------------	B
E	--------------------	E
F	--------------------	F
G	--------------------	G
H	--------------------	H

f. The resistance measurement between the following pin pairs should be greater than 1 megohms. *

* J2S Pin A ------------- J2P Pin B
J2S Pin A ------------- J2P Pin C
J2S Pin A ------------- J2P Pin D
J2S Pin A ------------- J2P Pin E
J2S Pin A ------------- J2P Pin F
J2S Pin A ------------- J2P Pin G
J2S Pin A ------------- J2P Pin H

g. The resistance measurement between the following pin pairs should be greater than 1 megohms.

J2S Pin B ------------- J2P Pin C
J2S Pin B ------------- J2P Pin D
J2S Pin B ------------- J2P Pin E
J2S Pin B ------------- J2P Pin F
J2S Pin B ------------- J2P Pin G
J2S Pin B ------------- J2P Pin H

h. The resistance measurement between the following pin pairs should be greater than 1 megohms.

J2S Pin C ------------- J2P Pin E
J2S Pin C ------------- J2P Pin F
J2S Pin C ------------- J2P Pin G
J2S Pin C ------------- J2P Pin H

i. The resistance measurement between the following pin pairs should be greater than 1 megohms.

J2S Pin D ------------- J2P Pin E
J2S Pin D ------------- J2P Pin F
J2S Pin D ------------- J2P Pin G
J2S Pin D ------------- J2P Pin H

j. The resistance measurement between the following pin pairs should be greater than 1 megohms.

J2S Pin E ------------- J2P Pin F
J2S Pin E ------------- J2P Pin G
J2S Pin E ------------- J2P Pin H

k. The resistance measurement between the following pin pairs should be greater than 1 megohms.

J2S Pin F ------------- J2P Pin G
J2S Pin F ------------- J2P Pin H *

* 1. The resistance measurement between the following pin pairs should be greater than 1 megohms.

J2S Pin G ------------- J2P Pin H

7.4 FAULT ISOLATION.- If any of the measurements listed in section 7.3 do not meet tolerance criteria, use the circuit diagram, figure 11-1, for troubleshooting assistance. *

*

SECTION 8

PARTS LIST

8.1 INTRODUCTION.- This section contains parts identification, location, and replacement information for the impedance matching network, 1Z1. The tables making up the parts list and list of manufacturers are explained in the following paragraphs.

8.2 PARTS LIST.

8.2.1.- Table 8-1 lists the major assembly, the subassembly and subassembly parts. The major assembly and subassembly parts are appendixed to the radio receiver assembly and are listed in alphanumeric order of reference designations as indicated. The reference designations and the indent codes are identical to the structure presented in section 8 of the handbook proper. The impedance matching network is classified as a major assembly or part on the main frame for the radio receiver. Therefore, the indent code begins with the letter B.

8.2.2.- The impedance matching network is an option for AN/GRR-23 and -24 radio receivers. The first number 1 in 1Z1 does not imply that the assembly is to be used only in conjunction with UHF receivers. It is a configuration option for both receivers.

8.3 LIST OF MANUFACTURERS AND CODE NUMBERS.- Table 8-2 lists the name, address, and Federal Supply Code number of each manufacturer from whom parts are procured. This list is in numerical order of the Federal Supply Code numbers. *

Table 8-1. Impedance Matching Network Parts List

Ref. Desig.	In	Name of Part and Description	Mfrs. Code Number	JAN/MIL Mfrs. Part No.	Notes
1Z1	B	IMPEDANCE MATCHING NETWORK[1]	24937	AE-C-0939	
1Z1A1	C	CIRCUIT CARD ASSEMBLY, IMPEDANCE MATCHING	24937	AE-A-0928-1	
R1	D	RESISTOR, CARBON, 5.1 OHMS, ±5%, 1/4 W		RCR07G5R1JS	
R2	D	SAME AS R1			
R3	D	RESISTOR, METAL FILM, 162 OHMS, ±1%, 1/4 W		RN60D1620F	
R4	D	RESISTOR, METAL FILM, 261 OHMS, ±1%, 1/4 W		RN60D2610F	
R5	D	SAME AS R4			
J2P	C	CONNECTOR, PLUG, BOX MOUNTING, SOLDER CONTACT	77820	97-5105-18-8S (206)	
J2S	C	CONNECTOR, RECEPTACLE, BOX MOUNTING, SOLDER CONTACT, AN TYPE		MIL-C-5015G/ MS3102A18-8P	
		[1]To be used with AN/GRR-23 and AN/GRR-24 radio receivers connected to TELCO lines and/or FAA equipment.			

*

* Table 8-2. Vendors' Codes

Code	Vendor's name and address	Code	Vendor's name and address
24937	Federal Aviation Administration Supply Management Branch AAC-480 P.O. Box 25082 Oklahoma City, OK 73125		
77820	Amphenol Corporation Bendix Connector Operations 40-60 Delaware Street Sidney, NY 13838		

*

* SECTION 9

INSTALLATION, INTEGRATION, AND CHECKOUT

9.1 INTRODUCTION.- This section provides the information necessary to install the impedance matching network (1Z1) configuration onto existing AN/GRR-23 and AN/GRR-24 receivers which are in service.

9.2 INSTALLATION/INTEGRATION PROCEDURE.

a. Turn power off for the specific GRR-23 or GRR-24 receiver which is subject for the impedance matching network (1Z1) installation.

b. Obtain access to the GRR-23 or GRR-24 receiver through front rack mount access or from behind the equipment rack.

c. Remove the cable assembly from the back of the GRR-23 or GRR-24 receiver at the J2 position.

d. Place the impedance matching network on the back of the receiver at the J2 connector position. The receiver J2 connector will mate with J2(S) on the impedance matching network.

e. Hand tighten the J2(S) nut onto the receiver J2 connector. Tools are not required to ensure pin and socket continuity.

f. Place the external receiver J2 connector audio output cable on the impedance matching network at J2(P). Hand tighten the J2 cable to the impedance matching network connector.

g. Restore power to the GRR-23 or GRR-24 receiver.

9.3 CHECKOUT.- Verify that the equipment is operational with no change in audible quality. *

* SECTION 10

ELECTRICAL AND MECHANICAL DRAWINGS *

*

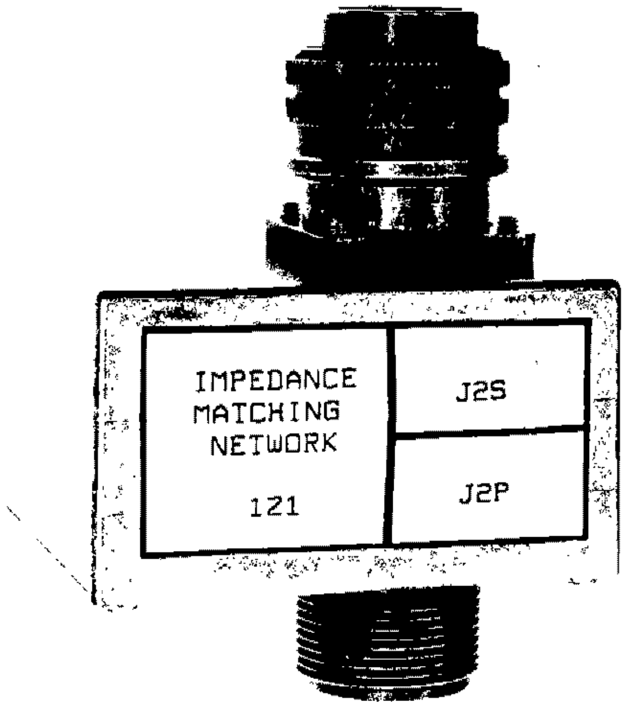

Figure 10-1. Impedance Matching Network 1Z1 *

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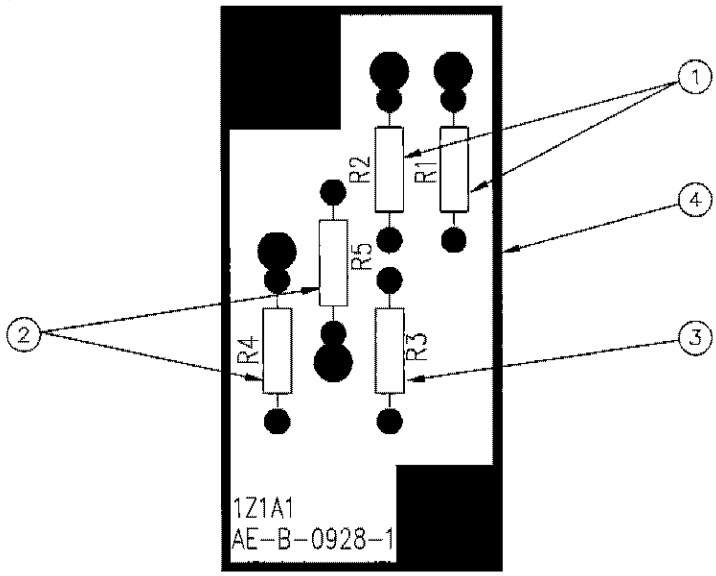

ITEM NO	REF DES	DESCRIPTION	MFR/PART NO	QTY
1	R1, R2	RESISTOR, 5.1 OHMS, ±5%, 1/4 WATT	RCR07G5R1JS	2 EA
2	R4, R5	RESISTOR, 261 OHMS, ±1%, 1/4 WATT	RN60D2610F	2 EA
3	R3	RESISTOR, 162 OHMS, ±1%, 1/4 WATT	RN60D1620F	1 EA
4		PRINTED CIRCUIT CARD	AE-B-0928-8	1 EA

Figure 10-2. Circuit Card Assembly, Impedance Matching *

*

SECTION 11

DIAGRAM AND WIRE LIST

11.1 INTRODUCTION.- This section contains the schematic and the wire list for the impedance matching network.

Table 11-1. Impedance Matching Network Wire List

Wire No.	From Terminal Conn.-Pin (or CCA Res.)	To Terminal Conn.-Pin (or CCA Res.)	Length (Inches)	MIL-W-16878 Type EE Teflon (16 AWG)
1	J2S - A	J2P - A	3.5	Red
2	J2S - B	J2P - B	3.5	Black
3	J2S - C	1A1 - R1	3.5	Brown
4	1A1 - R4	J2P - C	3.0	Brown
5	J2S - D	1A1 - R2	3.5	Orange
6	1A1 - R5	J2P - D	3.0	Orange
7	J2S - E	J2P - E	3.5	Green
8	J2S - F	J2P - F	3.5	Yellow
9	J2S - G	J2P - G	3.5	Blue
Wire No.	**From Terminal Conn.- Pin (or CCA Res.)**	**To Terminal Conn.- Pin (or CCA Res.)**	**Length (Inches)**	**MIL-W-16878 Type C PVC (12 AWG)**
10	J2S - H	J2P - H	3.5	White

*

*

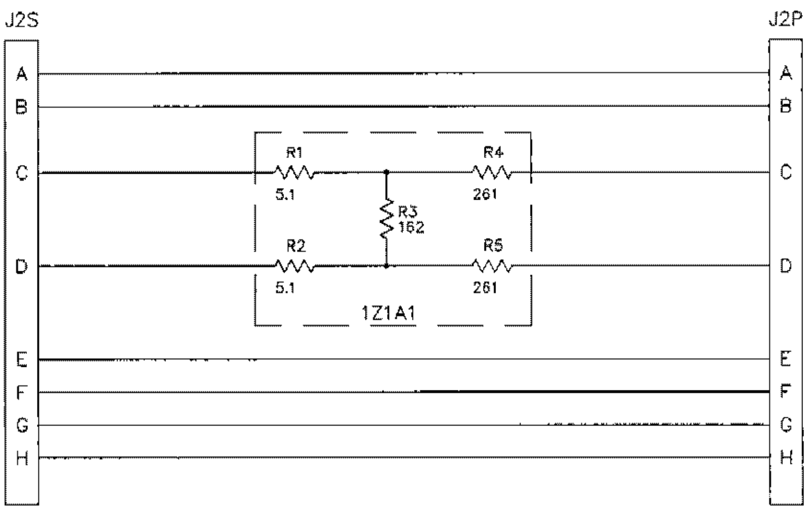

Figure 11-1. Impedance Matching Network 1Z1 *

*U.S. GOVERNMENT PRINTING OFFICE 1993-0-769-016/80007

Addendum 1

AN/GRR-23/24 VHF/UHF Receiver Alignment Procedures

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1 Introduction.

The following procedure details the proper method to align the AN/GRR-23/24 VHF/UHF receiver. To achieve this, the tuning procedures follow these steps:

a. Verify the power supply voltage.

b. Tune the local oscillator to the proper frequency.

c. Tune the cavity filter and mixer/multiplier to the receiver operating frequency.

d. Align the audio levels.

e. Verify the alignment against Order JO 6580.5A, Maintenance of Remote Communications Facility (RCF) Equipments.

Note: It is recommended that these alignment procedures be performed from beginning to end. Failure to complete these procedures from beginning to end may result in an inoperable receiver.

1.1 Module Output Frequency Calculations

a. If aligning a receiver with an installed oscillator-synthesizer module, refer to tables 1 and 2 for equations useful in calculating receiver module frequencies.

Table 1. AN/GRR-23 Oscillator-Synthesizer Frequency Calculations

Operational Frequency (MHz)	Oscillator-Synthesizer Frequency (MHz)	Mixer/Multiplier Frequency (MHz)
$OprFreq$: 116.00-149.975	$(OprFreq + 20.6) \div 2$	$(OscSynth\ \text{X}\ 2) - 20.6$

Table 2. AN/GRR-24 Oscillator-Synthesizer Frequency Calculations

Operational Frequency (MHz)	Oscillator-Synthesizer Frequency (MHz)	Mixer/Multiplier Frequency (MHz)
$OprFreq$: 225.000 – 312.000	$(OprFreq + 20.6) \div 4$	$(OscSynth\ \text{X}\ 4) - 20.6$
$OprFreq$: 312.025 – 399.975	$(OprFreq - 20.6) \div 4$	$(OscSynth\ \text{X}\ 4) + 20.6$

b. If aligning a receiver with an installed oscillator-multiplier module, refer to tables 3 and 4 for equations useful in calculating receiver module frequencies.

Table 3. AN/GRR-23 Oscillator-Multiplier Frequency Calculations

Operational Frequency (MHz)	Crystal Frequency (MHz)	Oscillator-Multiplier Frequency (MHz)	Mixer/Multiplier Frequency (MHz)
$OprFreq$: 116.00-149.975	$(OprFreq + 20.6) \div 10$	$CrystalFreq$ X 5	($OscMultFreq$ X 2) – 20.6

Table 4. AN/GRR-24 Oscillator-Multiplier Frequency Calculations

Operational Frequency (MHz)	Crystal Frequency (MHz)	Oscillator-Multiplier Frequency (MHz)	Mixer/Multiplier Frequency (MHz)
$OprFreq$: 225.000 – 312.000	$(OprFreq + 20.6) \div 20$	$CrystalFreq$ X 5	($OscMultFreq$ X 4) – 20.6
$OprFreq$: 312.025 – 399.975	$(OprFreq - 20.6) \div 20$	$CrystalFreq$ X 5	($OscMultFreq$ X 4) + 20.6

1.2 Tools Required.

To properly align the receiver, the following tools are required:

- Communications Service Monitor (CSM), IFR 2947A or equivalent
- Digital multimeter
- Oscilloscope with BNC (male) to Clips
- Small needle nose pliers
- Phillips head screw driver
- Flat head screw driver
- 3 BNC (male) to BNC (male) cables
- GRR/GRT test cable modification kit (NSN 0000-00-012-1867):
    - 1 BNC (female) to SMC jack cable (or adapter)
    - 2 BNC (female) to SMC plug cables (or adapters)

1.3 Initial Setup and Identification

Note: It is not required that the receiver be removed from the rack for this alignment procedure. However, doing so may make performing the alignment easier and faster.

a. Disconnect power from the receiver.

b. Remove all cables connected to the receiver.

c. Remove the receiver from the rack and place on a workbench.

d. Remove the receiver top cover and open the front panel. Perform a visual inspection of the internal modules. Refer to figures 1 through 4 to become familiar with the location of the following modules, connection points, and test points:

- Tunable Filter Module
- Oscillator-Multiplier with crystal housing or Oscillator-Synthesizer Module
- Mixer / Multiplier Module
- Power Supply
- AGC / Squelch Module
- Crystal Filter
- J1 Connector (AC Input)
- Signal Input Connector
- Front Panel Test Points
- Signal Inputs and Outputs

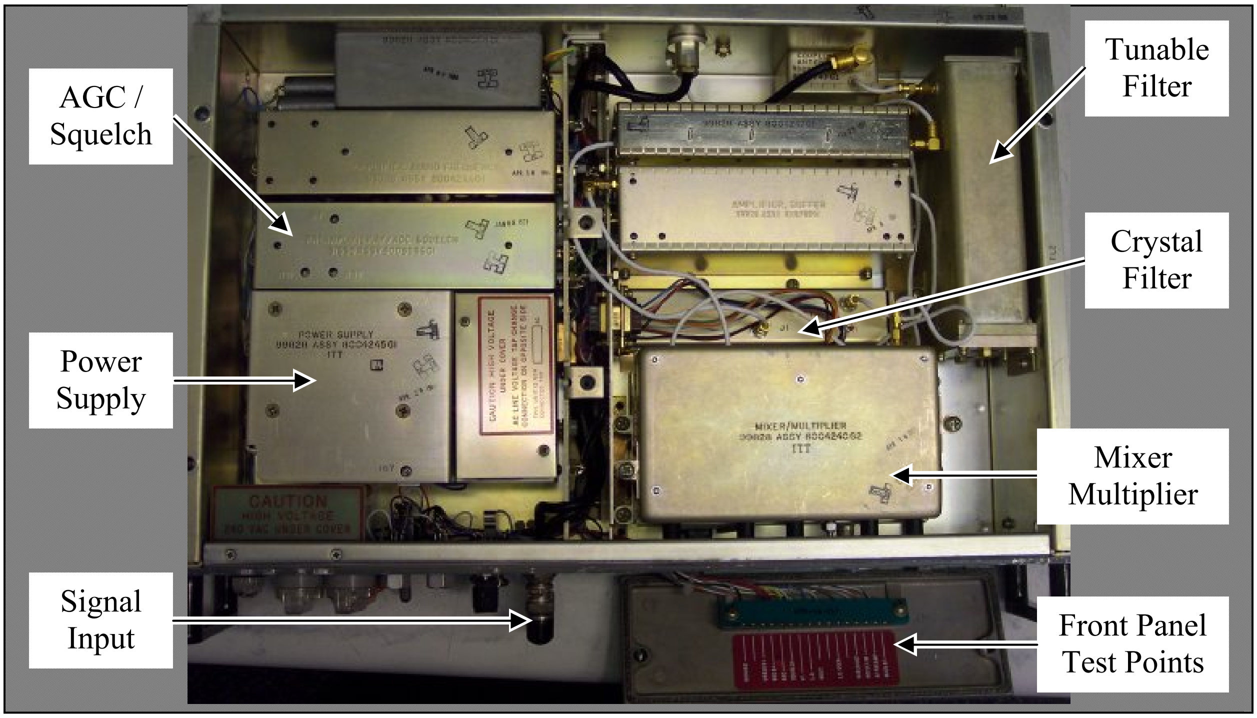

Figure 1. AN/GRR Module Locations – Top

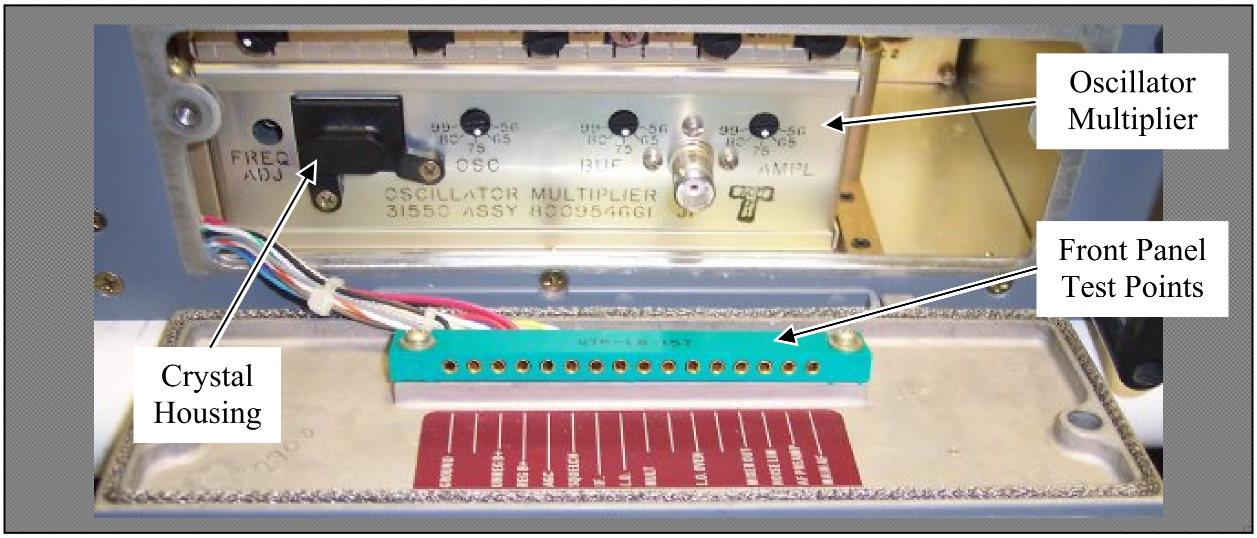

Figure 2. AN/GRR Module Locations – Oscillator-Multiplier

Figure 3. AN/GRR Module Locations – Oscillator-Synthesizer

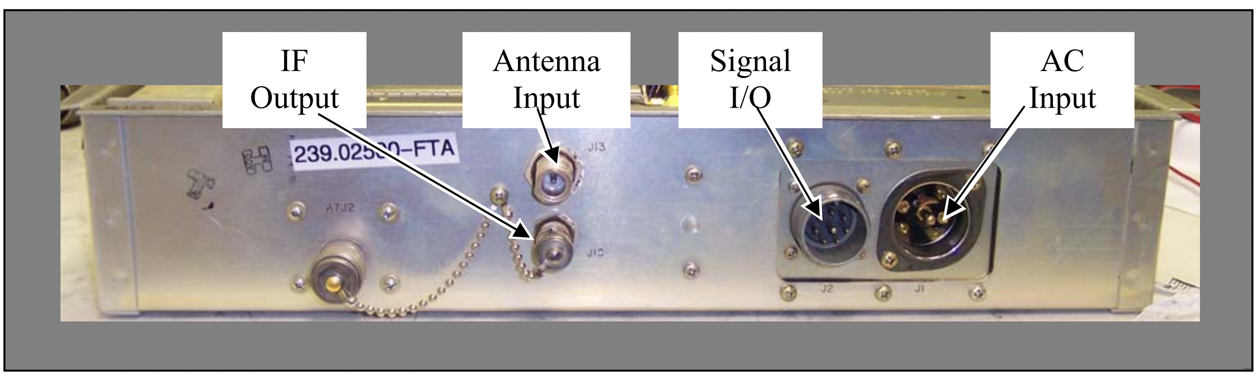

Figure 4. AN/GRR Module Locations – Rear

e. Proceed to paragraph 2.

2 Verify Power Supply Voltage. Follow this procedure to calibrate the receiver power supply direct current voltage (V dc) for 18 V dc.

This procedure requires the following test equipment: Digital multimeter (DMM).

a. If the receiver has been removed from the rack, connect AC power to the unit, if previously removed.

b. Turn the receiver ON.

c. Allow the receiver to warm up for 5 minutes to stabilize all modules.

Note: Allowing less than 5 minutes may produce inaccurate measurements and may lead to an inoperable receiver.

d. Set the DMM to measure direct current voltage (V dc).

e. At the front panel test points, connect the DMM leads between GROUND and REGB+.

f. Adjust R17 on the PS1 power supply to 18 V dc ± 0.1 V dc.

g. Remove the DMM leads.

h. Proceed to paragraph 3.

3 Local Oscillator Alignment. This section provides procedures to properly align either the oscillator-multiplier or oscillator-synthesizer to the proper operating frequency.

a. If aligning an oscillator-multiplier proceed to paragraph 3.1.

b. If aligning an oscillator-synthesizer proceed to paragraph 3.2.

3.1 Oscillator-Multiplier Module. The oscillator-multiplier module is located behind the receiver's front access panel. If the oscillator-multiplier module is not present, proceed to the next procedure to tune the oscillator-synthesizer module.

This procedure requires the following test equipment: CSM, IFR 2947A, or equivalent.

a. Set the oscillator-multiplier module OSC, BUF, and AMPL controls to the appropriate frequency markings.

Note: The oscillator-multiplier frequency is 5 times the crystal frequency.

b. On the front of the oscillator multiplier, connect a BNC to BNC cable between the CSM RF Input port and the oscillator-multiplier test point, J1.

c. Configure the spectrum analyzer to measure the oscillator-multiplier frequency.

d. Adjust the OSC, BUF, and AMPL controls on the oscillator-multiplier module to maximize the waveform on the spectrum analyzer at the proper frequency.

e. Using the RF Analyzer of the CSM, measure and fine tune the oscillator-multiplier frequency to within ±0.0001% by adjusting its FREQ ADJ control.

f. If adjustments made to the FREQ ADJ pot reach the physical operating limit and the frequency of the oscillator-multiplier is not correct, make adjustments to the internal frequency adjuster. Perform the following steps:

(1) Remove the doubler / quadrupler.

(2) Remove the oscillator-multiplier top cover.

(3) Adjust the internal frequency adjuster. Refer to figure 8 to locate the internal frequency adjuster.

(4) Measure and fine tune the oscillator-multiplier frequency to within ±0.0001% by adjusting its FREQ ADJ control.

Caution: Make the adjustment very slowly, the internal frequency adjuster is sensitive; only a slight adjustment is required.

(5) Replace the oscillator-multiplier top cover.

(6) Reinstall the doubler / quadrupler.

Figure 5. Internal Frequency Adjuster

g. Confirm the frequency and then disconnect the cable from connector J1.

h. Proceed to paragraph 4.

3.2 Oscillator-Synthesizer Module. Follow these procedures to properly align the receiver oscillator-synthesizer.

a. Refer to paragraph 1 for frequency calculations based on the operating frequency.

b. Adjust the oscillator-synthesizer dials to the proper frequency.

c. Disconnect the oscillator-synthesizer from the doubler/quadrupler and verify the frequency.

Note: Using the BNC to SMC cables, the frequency can be verified with the CSM.

d. The oscillator-synthesizer is now properly aligned.

e. Proceed to paragraph 4.

4 Mixer and Tunable Filter Alignment. This section aligns the receiver to pass maximum signal at the operating frequency. These procedures will simultaneously align the tunable filter and mixer/multiplier modules.

4.1 Setup. This procedure requires the following test equipment:

- CSM, IFR 2497A or equivalent
- 2X BNC (male) to BNC (male) cable
- BNC to SMC cable (adapter)
- Digital multimeter (DMM)

a. There are two connection points made between the CSM and the receiver detailed in this procedure. The first connection is made between the CSM output and the receiver input. The second connection is made between the CSM input and the crystal filter.

b. On the front of the receiver, remove the jumper from the antenna / receiver input on the front of the unit.

c. Using one BNC to BNC cable, connect the CSM output to the receiver input. This enables direct injection of a RF test signal.

d. Configure the CSM for the RF generator function. Configure the RF test signal according to the following:

- RF Gen Freq ► Receiver operating frequency
- Amplitude ► -20 dBm
- Modulation Freq ► 1004 Hz
  (Test Tone)
- Signal Type ► Amplitude modulated (AM)
- Modulation ► 30%

e. On the Crystal Filter, remove the J1 connection located in the center of the module. Refer to figure 1 (paragraph 1.3) for the Crystal Filter location.

f. Connect the BNC to SMC cable to the Crystal Filter module at J1.

g. Connect a BNC to BNC cable between the CSM input and the BNC to SMC cable.

h. Configure the CSM for the spectrum analyzer function. Configure the spectrum analyzer for the following:

- Center Frequency ► 20.6 MHz
- Reference Level ► -50 dBm (higher/lower as needed)
- Span ► 100 KHz (or less)

Note: 20.6 MHz is the receiver intermediate frequency. A maximum waveform measured at this frequency translates to maximum signal throughput and the best selectivity.

4.2 Maximize Intermediate Frequency. Follow these procedures to simultaneously align the tunable filter and mixer/multiplier modules.

a. Set the mixer/multiplier to the operating frequency. Adjust (all) knobs: ANT, RF, AMPL, BUFF, DBL/QUAD.

b. Set the LEV knob to maximum clockwise.

c. Turn each tunable filter slug maximum counterclockwise.

d. Turn each filter slug the approximate number of turns as required by figure 6 or figure 7.

Note: To ensure that the operating frequency is not passed it would be best if 1-2 less turns are made. This procedure fine tunes the filter so only the approximate number of turns is required.

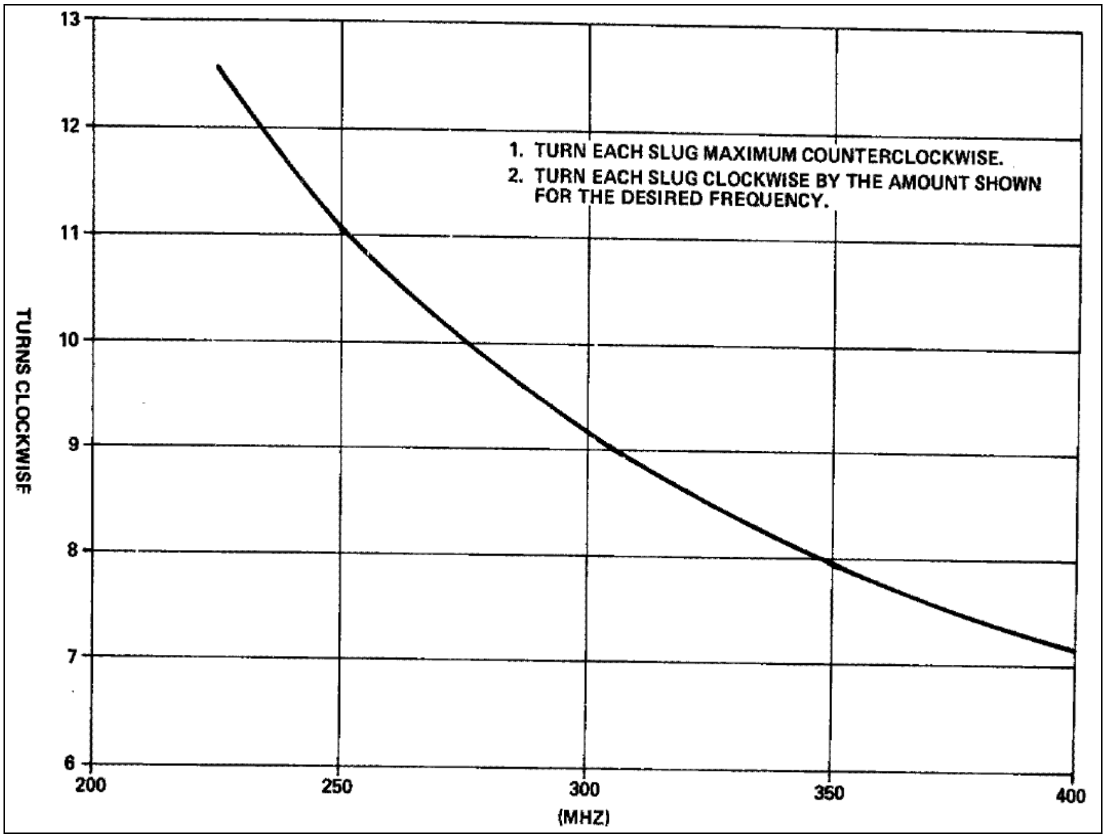

Figure 6. Tunable Filter Slug Turns by Frequency UHF

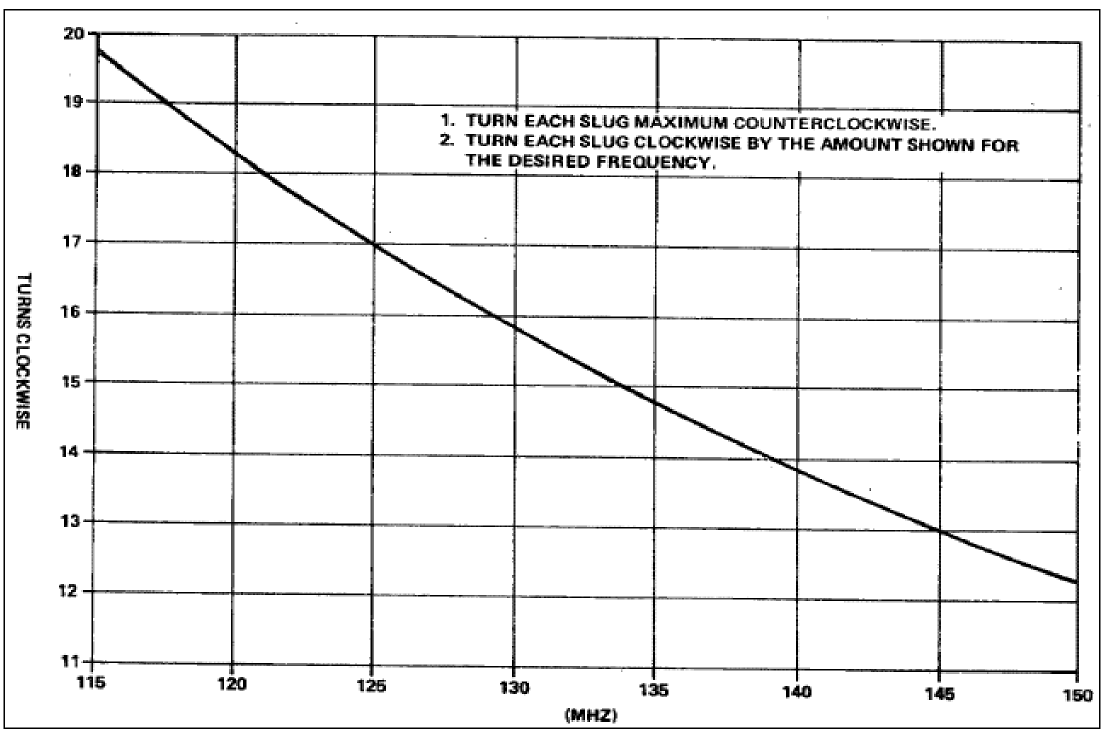

Figure 7. Tunable Filter Slug Turns by Frequency VHF

e. Referring to the waveform display on the CSM, slowly adjust each slug on the tunable filter to attain maximum waveform at the 20.6 MHz frequency.

f. Adjust all knobs on the mixer/multiplier for maximum waveform.

g. Continuously repeat steps e and f above to attain maximum waveform. Adjust the CSM as required to ensure maximum waveform is attained.

Caution: Make Adjustment very slowly, the receiver modules are very sensitive.

h. Connect the DMM between the front panel test points Ground and Mult.

i. Adjust the LEV knob to attain the correct voltage for the given operating frequency. Refer to table 5 for the correct voltage levels.

Table 5. Injection Voltages

GRR TYPE	FREQUENCY RANGE (MHz)	INJECTION LEVEL (volts)
VHF	ALL	1.0 ± .1
UHF	225.00 to 260.00	2.5 ± .1
UHF	260.05 to 320.00	2.0 ± .1
UHF	320.05 to 340.00	2.5 ± .1
UHF	340.05 to 360.00	3.0 ± .1
UHF	360.05 to 380.00	3.5 ± .1
UHF	380.05 to 400	4.0 ± .1

j. For fine tuning, change the CSM RF signal power to -102 dBm and ensure that the waveform is peaked by finely adjusting the tunable filter and mixer/multiplier.

Note: You may have to adjust the spectrum analyzer reference level to see the signal.

k. At this point, the receiver has been tuned to maximum signal throughput and alignment.

l. On the crystal filter, disconnect the test connection made at J1 and reconnect the original cabling.

m. Leave the CSM configured as is, it is used later in this procedure.

4.3 Automatic Gain Control Alignment.

Follow these procedures to calibrate the receiver automatic gain control.

This procedure requires the following test equipment:

- CSM, IFR 2497A or equivalent
- BNC (male) to BNC (male) cable

- Digital multimeter (DMM)

  Note: The test setup has not changed from the previous paragraph, 4.2.

a. Confirm the CSM RF generator function is setup as follows:

• RF Gen Freq	►	Receiver operating frequency
• Amplitude	►	-98 dBm
• Modulation Freq (Test Tone)	►	1004 Hz
• Signal Type (AFGen1)	►	Amplitude modulated (AM)
• Modulation	►	30%

b. Turn the DMM ON.

c. Place the DMM in the mode to measure direct current voltage (V dc).

d. Turn the Squelch switch, located on the receiver front, to OFF.

e. Adjust R7 (AGC ADJUST) on the Squelch/AGC (A3) module for full counterclockwise.

f. At the front panel test points, connect the DMM leads between GROUND and AGC.

g. Turn R7 (AGC ADJUST) slowly clockwise until the DMM reads a voltage just over 6 V dc.

Note: If the DMM already reads over 6 V dc before clockwise adjustment, leave R7 fully counterclockwise.

h. Set the DMM to measure alternating current voltage (V ac).

i. Connect the DMM leads between GROUND and IF.

j. Adjust R7 (AGC ADJUST) on the Squelch/AGC (A3) module until the DMM reads a voltage of 125 mV ac ± 5 mV ac.

k. Set the DMM to measure V dc.

l. Connect the leads between GROUND and AGC.

m. Remove the CSM test signal from the receiver and verify that the voltage drops to below 3.5 V dc.

Note: If the voltage does not drop to below 3.5 volts, slowly adjust R7 (AGC ADJUST) on the Squelch/AGC (A3) module until it does.

n. Configure the CSM test signal for -102 dBm and reconnect the test signal to the receiver.

o. Verify that the AGC voltage is greater than 5 V dc.

p. Configure the CSM test signal for -98 dBm.

4.4 Audio Alignment.

Follow these procedures to calibrate the receiver automatic gain control

This procedure requires the following test equipment:

- CSM, IFR 2497A or equivalent
- BNC (male) to BNC (male) cable
- Digital multimeter (DMM)

Note: The test setup has not changed from the paragraph 4.3.

a. Turn the DMM ON.

b. Turn R41 (compression level) on the Squelch/AGC (A3) module fully clockwise.

c. Turn the AUDIO MAIN ADJ level control, located on the receiver front, fully clockwise.

d. Set the DMM to measure V ac.

e. Connect the DMM leads between GROUND and MAIN AF.

Note: For the remaining steps, it is recommended that any adjustments made get as close as possible to the specified values.

f. Adjust the AF PREAMPL ADJUST (R32) on the Squelch/AGC (A3) module for 2 V ac ± 25 mV ac.

g. Adjust the AUDIO MAIN ADJ level control, located on the receiver front, for 1.6 V ac ± 25 mV ac.

h. Readjust the AF PREAMPL ADJUST (R32) on the Squelch/AGC (A3) module for 2 V ac ± 25 mV ac.

i. Adjust R41 (compression level) on the Squelch/AGC (A3) module for 1.95 V ac ± 50 mV ac.

j. Adjust the CSM test signal for 100% (or 99%) modulation (the current setting should be 30% modulation – it has not changed this entire procedure).

k. Verify that the DMM measures between 1.75 and 2.45 V ac.

l. Disconnect all test equipment.

m. This concludes the alignment procedures.

5 Alignment Verification. Perform these steps to verify that the receiver is properly aligned.

a. Refer to Order JO 6580.5A, Chapter 3, Standards and Tolerances.

Note: While the audio signals have been aligned for operation, the audio output level may be too powerful (too hot) for operation. Any audio adjustments should be performed first.

b. Pending the receiver meets the initial standards and tolerances, replace the unit in the rack (if removed), request a voice check, and return the unit to service.