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UNCLASSIFIED

TECHNICAL MANUAL

for

COMMUNICATIONS RECEIVER

MODEL GPR-90RXDS



THE TECHNICAL MATERIEL CORPORATION
MAMARONECK, N.Y.

OTTAWA, ONTARIO

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THE TECHNICAL MATERIEL CORPORATION

NOTICE

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THIS INSTRUCTION MANUAL IS PROPRIETARY
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THE TECHNICAL MATERIEL CORPORATION

C O M M U N I C A T I O N S E N G I N E E R S

700 FENIMORE ROAD

MAMARONECK, N. Y.

Warranty

The Technical Materiel Corporation, hereinafter referred to as TMC, warrants the equipment (except electron tubes,* fuses, lamps, batteries and articles made of glass or other fragile or other expendable materials) purchased hereunder to be free from defect in materials and workmanship under normal use and service, when used for the purposes for which the same is designed, for a period of one year from the date of delivery F.O.B. factory. TMC further warrants that the equipment will perform in a manner equal to or better than published technical specifications as amended by any additions or corrections thereto accompanying the formal equipment offer.

TMC will replace or repair any such defective items, F.O.B. factory, which may fail within the stated warranty period, PROVIDED:

1. That any claim of defect under this warranty is made within sixty (60) days after discovery thereof and that inspection by TMC, if required, indicates the validity of such claim to TMC's satisfaction.
2. That the defect is not the result of damage incurred in shipment from or to the factory.
3. That the equipment has not been altered in any way either as to design or use whether by replacement parts not supplied or approved by TMC, or otherwise.
4. That any equipment or accessories furnished but not manufactured by TMC, or not of TMC design shall be subject only to such adjustments as TMC may obtain from the supplier thereof.

Electron tubes* furnished by TMC, but manufactured by others, bear only the warranty given by such other manufacturers. Electron tube warranty claims should be made directly to the manufacturer of such tubes.

TMC's obligation under this warranty is limited to the repair or replacement of defective parts with the exceptions noted above.

At TMC's option any defective part or equipment which fails within the warranty period shall be returned to TMC's factory for inspection, properly packed with shipping charges prepaid. No parts or equipment shall be returned to TMC, unless a return authorization is issued by TMC.

No warranties, express or implied, other than those specifically set forth herein shall be applicable to any equipment manufactured or furnished by TMC and the foregoing warranty shall constitute the Buyers sole right and remedy. In no event does TMC assume any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of TMC Products, or any inability to use them either separately or in combination with other equipment or materials or from any other cause.

*Electron tubes also include semi-conductor devices.

PROCEDURE FOR RETURN OF MATERIAL OR EQUIPMENT

Should it be necessary to return equipment or material for repair or replacement, whether within warranty or otherwise, a return authorization must be obtained from TMC prior to shipment. The request for return authorization should include the following information:

1. Model Number of Equipment.
2. Serial Number of Equipment.
3. TMC Part Number.
4. Nature of defect or cause of failure.
5. The contract or purchase order under which equipment was delivered.

PROCEDURE FOR ORDERING REPLACEMENT PARTS

When ordering replacement parts, the following information must be included in the order as applicable:

1. Quantity Required.
2. TMC Part Number.
3. Equipment in which used by TMC or Military Model Number.
4. Brief Description of the Item.
5. The *Crystal Frequency* if the order includes crystals.

PROCEDURE IN THE EVENT OF DAMAGE INCURRED IN SHIPMENT

TMC's Warranty specifically excludes damage incurred in shipment to or from the factory. In the event equipment is received in damaged condition, the carrier should be notified immediately. Claims for such damage should be filed with the carrier involved and not with TMC.

All correspondence pertaining to Warranty Claims, return, repair, or replacement and all material or equipment returned for repair or replacement, within Warranty or otherwise, should be addressed as follows:

THE TECHNICAL MATERIEL CORPORATION
Engineering Services Department
700 Fenimore Road
Mamaroneck, New York

CHANGE NO. 1



INSTRUCTION BOOK CHANGE NOTICE

Date May 1, 1967

Manual affected: GPR-90RXDS IN 3005S

The following changes are to be incorporated into Table of Contents.

Paragraph 4-2 Functional Analysis
Change page number to read 4-0

The following changes are to be incorporated into the List of Tables.

Table 5-5
Change to read 5-2.

The following additions are to be incorporated into Section 2 Installation.

Page 2-3 Figure title should read
Figure 2-4 Typical Packaging Diagram.

The following changes are to be incorporated into Section 4 Principles of Operation.

Page 4-2 Paragraph 4-2h omit (See figure 4-8) and (See figure 4-7
Paragraph 4-2K omit the statement (with the connections shown in
Figure 8-1).

The following additions should be incorporated into section 7 Schematic Diagrams.

Sheet 1 of 2 should have page number 7-2/7-3

Sheet 2 of 2 should have page number 7-4/7-5.

The following change should be incorporated into Section 5 Maintenance

Page 5-4 Table 5-5.
Change to Read Table 5-2.

SHOULD ADDITIONAL COPIES OF THIS CHANGE NOTICE BE REQUIRED, PLEASE CONTACT:

THE TECHNICAL MATERIEL CORP., 700 Fenimore Road, Mamaroneck, New York

Attn.: Director of Eng. Services.

RECORD OF CORRECTIONS MADE

[illegible]

CHANGE NO. #2



INSTRUCTION BOOK CHANGE NOTICE

Date October 13, 1967

Manual affected: GPR-90RXDS IN 3005S

The value of R124 on Figure 7-1 (Sheet 2 of 2), located near power transformer T10, should be changed to 250 ohm 10 watt.

SHOULD ADDITIONAL COPIES OF THIS CHANGE NOTICE BE REQUIRED, PLEASE CONTACT:

THE TECHNICAL MATERIEL CORP., 700 Fenimore Road, Mamar neck, New York

Attn.: Director of Eng. Services.

CHANGE NO. #3



INSTRUCTION BOOK CHANGE NOTICE

Date July 8, 1968

Manual affected: GPR-90XDS IN 3005S

Section 3

Change paragraph C, the first sub-paragraph of SSB RECEPTION TO READ, AS FOLLOWS:

To place the GPR in operation for the reception of single-sideband signals, set the controls at the positions indicated in the table 3-1 for AM operations except that BFO switch (14) is set at on.

SHOULD ADDITIONAL COPIES OF THIS CHANGE NOTICE BE REQUIRED, PLEASE CONTACT

THE TECHNICAL MATERIEL CORP., 700 Fenimore Road, Mamaroneck, New York

Attn.: Director of Eng. Services.

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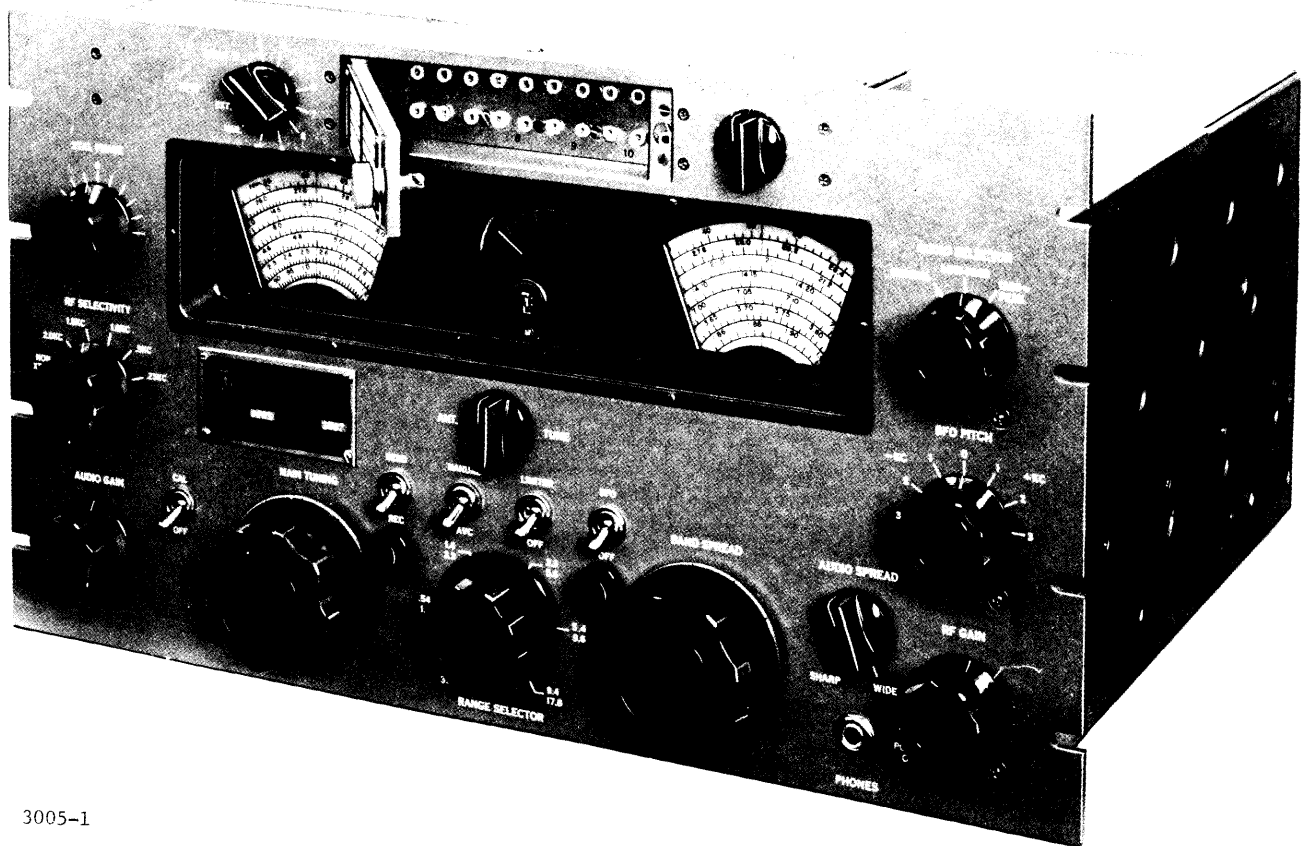
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3005-1

Figure 1-1. Communications Receiver GPR-90RXDS

SECTION 1

GENERAL INFORMATION

1-1. INTRODUCTION.

COMMUNICATIONS RECEIVER, Model GPR-90RXDS (Refer to figure 1-1), is a general coverage communications receiver with a frequency range of 0.54- to 31.5-megacycles distributed over six bands. The GPR is capable of receiving SSB, AM, CW, MCW and FSK signals.

Tuning is provided with full electrical bandspread, and a 100-kc crystal-controlled calibrator provides 100-kc markers throughout the tuning range.

The 16-tube circuit of the GPR provides a sensitivity that averages better than one microvolt for a 10-db signal-to-noise ratio. Dual conversion is employed in bands, 4, 5, and 6 for improved image rejection. The input provides for a 75-ohm unbalanced antenna and the output may be terminated in 4-, 8-, 16-, or 600-ohm voice coils or headphones. A front panel S-meter indicates relative signal strength and also permits accurate tuning.

The RF SELECTIVITY switch provides six steps of i-f selectivity: 0.25- to 2-kc crystal filter, and 7 kc at 6 db down in noncrystal operation. Audio selectivity is controlled by a three

position (NORMAL, LOW-PASS, and 1200-cps PEAK) switch. When set to 1200-cps PEAK, the audio bandwidth at 10 db down from 600- to 1600-cps by means of the AUDIO SPREAD control.

In addition to the normal local oscillator, the GPR permits the use of 10 precisely adjustable crystal positions available from the front panel plus a rear deck input for an external high stability control oscillator or synthesizer. A series type noise limiter is employed to effectively reduce ignition or other pulse type noise. The limiter can be turned on by a front panel limiter switch.

The frequency of the beat frequency oscillator is controlled by the BFO PITCH control which varies the audio beat note on CW signals from zero to ± 3 kc. The high stability of this BFO makes it possible to receive SSB signals.

Table 1-1 is a list of the electron tube and diode complement of the GPR. Table 1-2 lists the front panel controls.

The receiver operates on 115- and 230-volt, 60-cycle AC power although provision is made for operation from an external power supply or batteries for emergency service in areas where AC power is not available.

1-2. TECHNICAL SPECIFICATIONS.

Frequency range.	0.54- to 31.5-mc in six bands.
Type of reception.	AM, CW, MCW, FSK, and SSB.
Tuning system.	Accurately calibrated main tuning dial plus full electrical bandspread.
Input impedance.	75 ohms unbalanced.
Output impedance.	4-, 8-, 16-, and 600-ohms plus headphones.
Output level.	2-watt high quality audio output.
Sensitivity.	Better than 1-microvolt for 10-db signal-to-noise ratio.
Noise figure.	Better than 6-db.
Image ratio.	Averages 85-db.
Selectivity.	Variable in six steps, 5 crystal and 1 noncrystal position. GPR-90RXDS 250-cps to 7-kc.
AVC characteristic.	With an 80-db change in the input signal, the output remains constant within 12-db.
Audio selectivity.	Specially designed audio selectivity control with variable bandwidth.
Noise limiter.	A highly effective series type noise limiter is provided.
Metering.	Calibrated S-meter.
VFO stability.	Better than 0.002 percent on first three bands and 0.003 percent on three bands.
Crystal stability.	Dependent upon crystal being used.
Crystal calibrator.	Provides 100-kc markers throughout tuning range.
BFO circuit.	Variable frequency BFO.
Hum level.	Better than 60-db.
Primary power.	115- or 230-volts, 50- or 60-cycles, approximately 90-watts.

TABLE 1-1. ELECTRON TUBE AND DIODE COMPLEMENT

REF SYM	TUBE TYPE	FUNCTION
V1	6DC6	1st RF Amplifier
V2	6BA6	2nd RF Amplifier
V3	6AU6	1st Converter
V4	6BE6	2nd Converter and Oscillator
V5	6BA6	Buffer
V6	6BA6	1st IF Amplifier
V7	6BA6	2nd IF Amplifier
V8	6BA6	3rd IF Amplifier
V9	12AT7	Detector and IF Buffer
V10	12AX7	AVC and 1st Audio Amplifier
V11	6V6	2nd Audio Amplifier
V12	6AG5	Oscillator
V13	6BE6	BFO
V15	0A2	Voltage Regulator
V16	6CB6	100KC Oscillator
V17	6AG5	XTAL Osc. Amplifier
CR1	IN34A	Electronic switch
CR2	IN463	Limiter
CR3	IN463	Limiter
CR4	IN2484	Rectifier
CR5	IN2484	Rectifier

TABLE 1-2. FRONT PANEL CONTROLS

CONTROL	FUNCTION
HFO switch	Selects local oscillator mode.
XTAL PHASE control	Adjusts center frequency of crystal filter.
RF SELECTIVITY switch	Adjusts bandpass width of crystal filter.
AUDIO GAIN control	Adjusts audio output level.
CAL switch	Applies power to 100-kc oscillator.
MAIN TUNING control	Tunes receiver to desired frequencies.
SEND-REC switch	Applies B+ to receiver circuits.

TABLE 1-2. FRONT PANEL CONTROLS (CONT.)

CONTROL	FUNCTION
MANUAL-AVC switch	Permits application of AVC voltage to appropriate circuits.
ANT. TUNE control	Tunes receiver input to antenna.
RANGE SELECTOR switch	Selects tuning range.
LIMITER switch	Permits reduction of impulse-type noise.
BFO switch	Applies power to beat frequency oscillator.
BAND SPREAD control	Permits fine tuning of receiver.
AUDIO SPREAD control	Adjusts audio bandwidth when AUDIO SELECTOR switch is in 1200 PEAK position.
RF GAIN control	Adjusts gain of RF and IF amplifiers.
Power switch (part of RF GAIN control)	Applies primary power to receiver.
BFO PITCH control	Varies frequency of beat frequency oscillator.
AUDIO SELECTOR switch	Adjusts audio bandwidth.
XTAL ADJ. control	Adjusts crystal frequencies in local crystal oscillator.
S-meter	Indicates relative signal strength of carrier signals.
PHONES jack	Permits headphones monitoring of audio signal.

SECTION 2 INSTALLATION

2-1. INITIAL INSPECTION.

Each GPR has been calibrated and tested at the factory before shipment. Upon arrival at the operating site, inspect the packing case and its contents immediately for possible damage. Unpack the equipment carefully. Inspect all packing material for parts which may have been shipped as "loose items".

With respect to damage to the equipment for which the carrier is liable, The Technical Materiel Corporation will assist in describing methods of repair and the furnishing of replacement parts.

The equipment is shipped with all tubes and other plug-in components installed. Check that all such components are properly seated in their sockets.

A TYPICAL PACKAGING DIAGRAM, figure 2-4, has been included to assist in the unpacking and repackaging the GPR.

2-2. MECHANICAL INSTALLATION.

The GPR is equipped with a standard 19 inch

rack panel, which can be mounted in any standard equipment rack. Provision has been made for mounting of chassis slides if desired. Refer to figure 2-2 for the GPR outline dimensions.

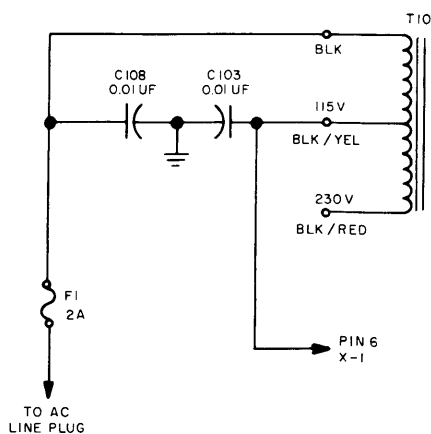
2-3. ELECTRICAL INSTALLATION.

Power is applied to the GPR immediately upon connection of the power cord to any suitable power source and setting the front panel POWER switch at ON position. The GPR is factory wired for 115-volt operation. For conversion to 230-volt operation, refer to figure 2-1.

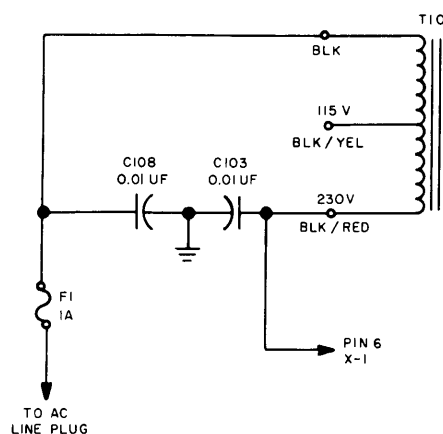
Table 2-1, used in conjunction with figure 2-3, indicates the interconnections, input connections and output connections for the GPR.

2-4. INITIAL ADJUSTMENT.

Before any GPR is shipped, it is aligned and thoroughly checked against the manufacturer's specifications. Therefore, no initial adjustments are necessary other than the connection to a suitable antenna, connection to a speaker and connection to a suitable primary power source.



115 VOLT OPERATION



230 VOLT OPERATION

3005-2

Figure 2-1. Power Supply Changeover Connections

TABLE 2-1. REAR PANEL CONTROLS AND CONNECTIONS

ITEM	FUNCTION
LINE CORD, 2 conductor power cable.	W1 - Connects the required AC operating voltage (Ref. Table 1-1) from the external power source to the GPR.
AC LINE, power receptacle.	J3 - Convenience outlet providing AC line voltage.
FUSE, 2A.	F1 - 2 amp cartridge line fuse.
E1, 4 connector terminal board.	Connector 1 - For external AVC, remove, Connector 2 - jumper wire. Connector 3 - No connection, Connector 4 - Ground connection.
RELAY, 2 prong, polarized connector receptacle.	J4 - Connects to transmitter enabling the receiver to be disabled by the transmitter when keying.
AUXILIARY POWER IN, 8 pin socket.	X1 - Accepts power from external power supply or batteries. When the GPR receives normal power at plug P2, the AC plug PL1 must be placed in AUXILIARY POWER socket X1.
ANT 75 OHM, connector receptacle, BNC type.	J6 - Antenna input connector, 75 ohms.
S METER ADJ, potentiometer screw-driver adjust control.	R50 - Signal strength meter (M1) adjustment control.
ACCESSORY POWER OUT, 8 pin socket.	X2 - Accessory outlet providing DC filament and B+ voltages.
EXT, connector BNC type.	J5 - External synthesizer input connector.
BFO IN, connector receptacle, BNC type.	J7 - External Beat Frequency Oscillator input connector.
E2, 5 connector terminal board.	Audio output speaker connections.
E3, 4 connector terminal board.	Connector 1 - Diode load connections. Connector 2 - For external AVC, remove jumper wires. Connector 3 - Ground. Connector 4 - External AVC input connection and AVC output connection.
IFO IN, connector receptacle, BNC type.	J8 - External IFO input connector.
IF GAIN, potentiometer screwdriver adjust control.	R106 - IF gain control.
Lo Σ i-f out, dual contact phono type connector.	J1A - Low impedance i-f output jack.
PHONO, dual contact phono type connector.	J1B - Phono input jack.
RADIO-PHONO, slide switch.	S6 - Radio or phono operation selector switch.
SSB, slide switch.	S7 - Single Sideband ON-OFF selector switch.
HI Σ i-f out dual contact phono type connector.	J9 - High impedance i-f output jack.

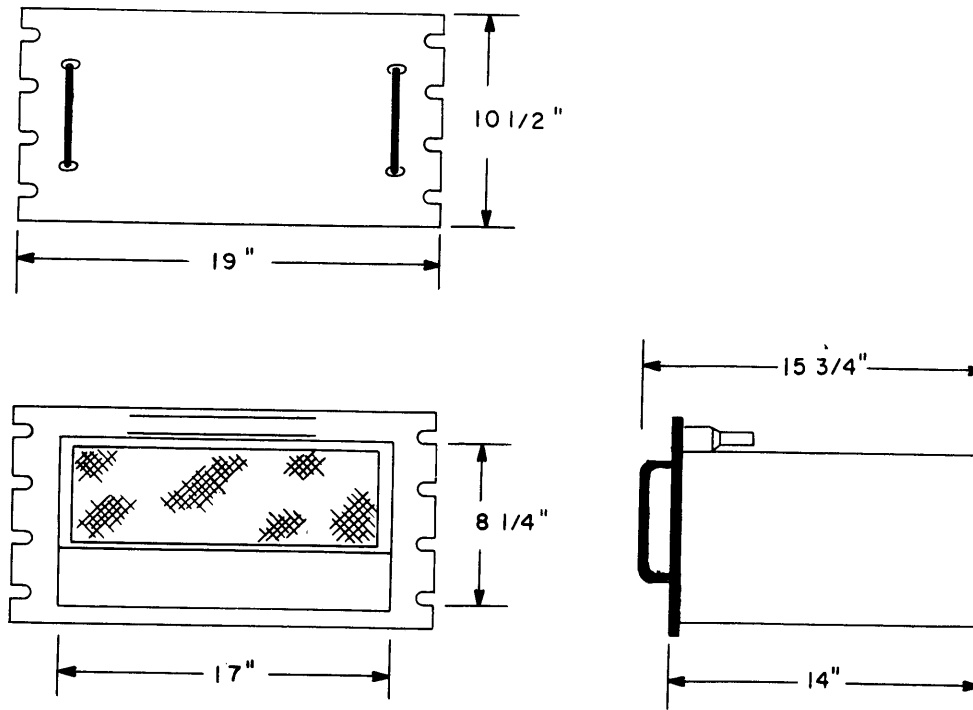


Figure 2-2. Outline Dimensional Drawing

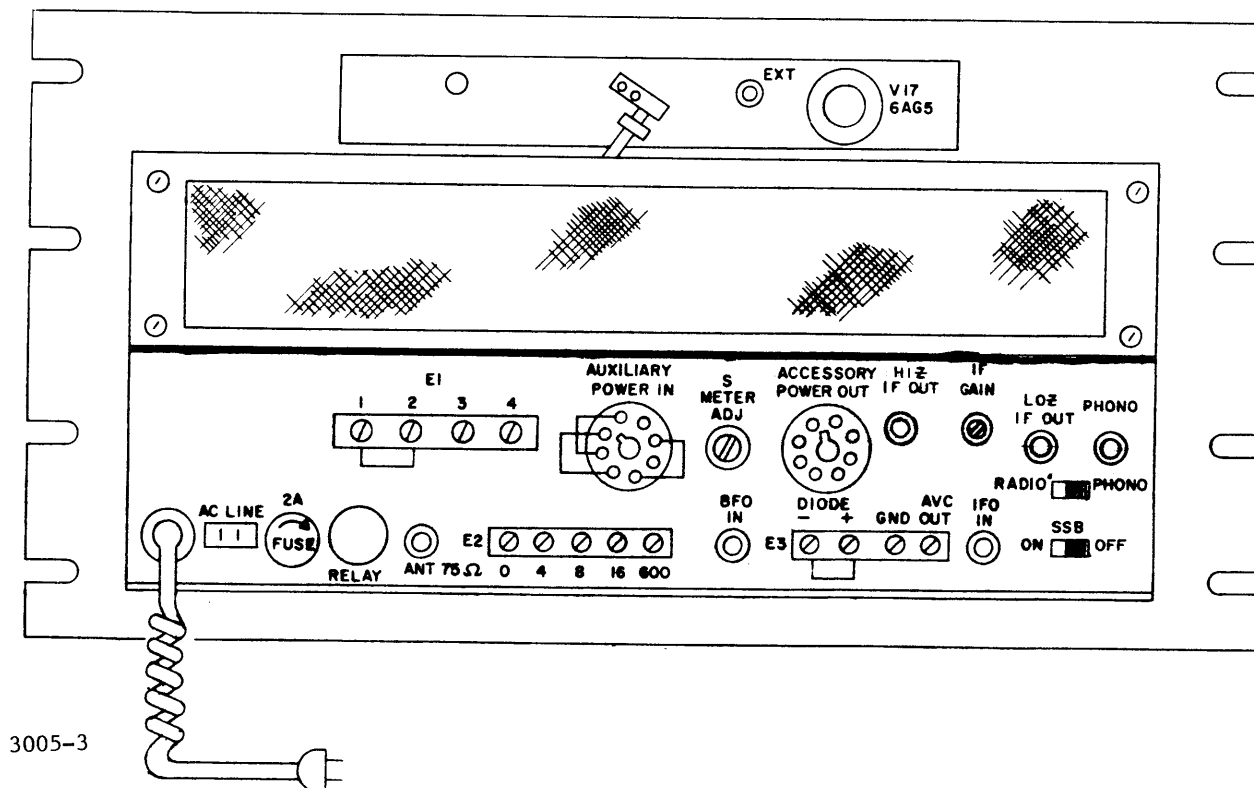
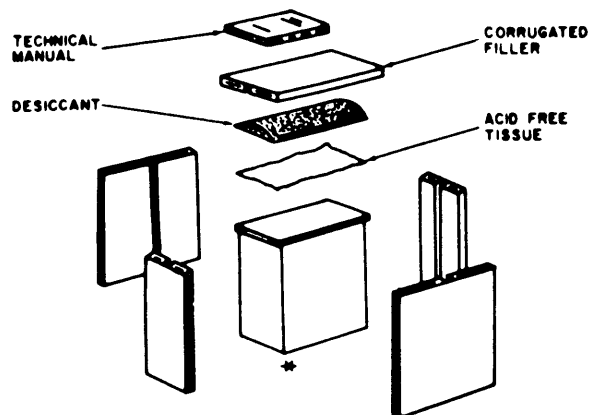
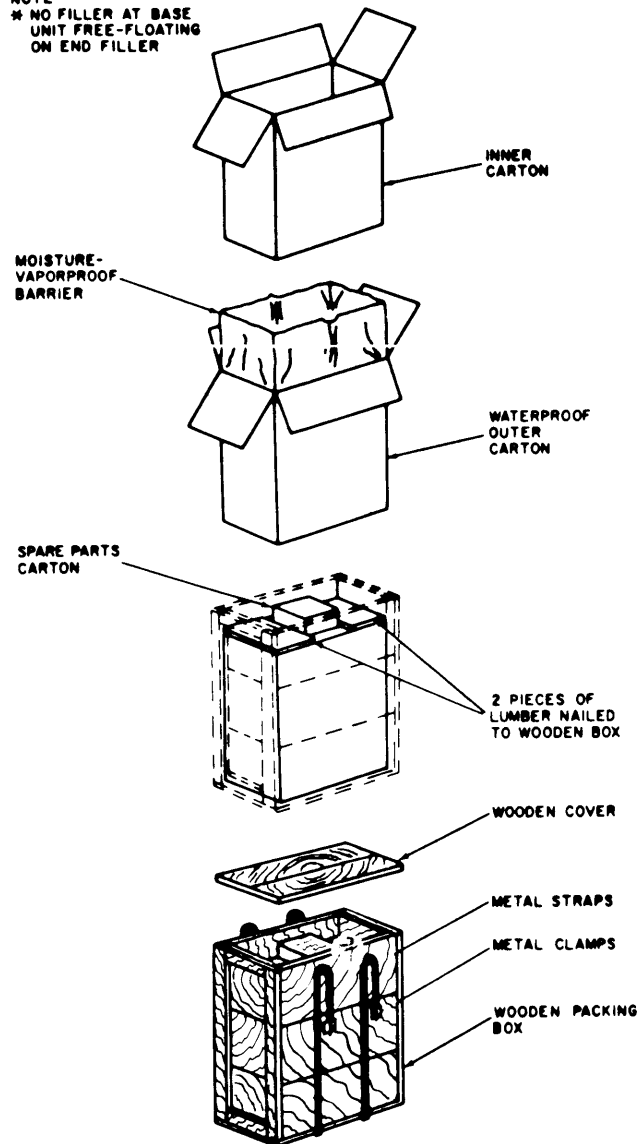


Figure 2-3. Rear Panel Controls and Connections



NOTE
* NO FILLER AT BASE
UNIT FREE-FLOATING
ON END FILLER



3005-4

SECTION 3 OPERATOR'S SECTION

3-1. MODES OF RECEPTION.

a. AM RECEPTION. - When the received signal is accompanied by excessive background noise (other than ignition or pulse type), increasing the r-f selectivity of the GPR will improve the signal-to-noise ratio. The selectivity should be increased up to the point where a phone signal becomes unintelligible. An almost obliterated signal can sometimes be pulled through the noise hash and received perfectly by the combined use of the RF and audio selectivity controls.

If the signal being received is interfered with or heterodynes with an adjacent carrier, adjust XTAL PHASE control 1 to reduce the interference.

Turning HFO switch 2 in any of the 10-crystal positions permits the GPR to receive 10-channels, utilizing a crystal-controlled local oscillator to produce the intermediate frequency. If it is desired to obtain reception on frequencies not covered by the 10-crystals, turn HFO switch 2 to EXT and connect an external synthesizer to EXT jack J5.

b. CW RECEPTION. - To place the GPR in operation for the reception of CW signals, the controls and switches are set to the same positions as those outlined in paragraph 3-1a for AM reception except that BFO switch 14 is set to ON.

After turning on the BFO, tune in a CW signal. Adjust the BFO PITCH control 18 for a pleasing tone.

NOTE

CW reception may be accomplished with the AVC switch in the ON or OFF positions. However, best reception is usually obtained by turning the AVC off, retarding the RF gain and increasing the audio gain.

c. SSB RECEPTION. - To place the GPR in operation for the reception of single-sideband signals, the controls and switches are set to the same positions as those outlined in table 3-1 for AM reception except that BFO switch 14 and SINGLE

TABLE 3-1. OPERATION CHART

STEP	OPERATION	PURPOSE
1	Set SEND-REC switch 10 to REC.	Applies B+ power to unit.
2	Set RF SELECTIVITY switch 6 to NON XTAL.	Selects widest i-f response.
3	Set MANUAL-AVC switch 11 to AVC.	Permits AVC operation.
4	Set BFO switch 14 to OFF.	Disables BFO.
5	Set CAL switch 8 to OFF.	Disables 100-kc oscillator.
6	Set RANGE SELECTOR switch 12 to desired band.	Selects appropriate tuning range.
7	Set HFO switch 2 to VAR.	Selects local oscillator, within the unit to beat against the incoming RF to produce the i-f.
8	Adjust RF GAIN control 17 fully clockwise.	Applies primary power to the unit and adjusts r-f gain to maximum.
9	Set RADIO-PHONO switch (on the rear apron) to Radio.	Connects audio amplifier to detector.
10	Set SSB switch (on the rear apron) to OFF.	Permits normal operation of detector.

SIDEBAND switch S9 (on rear apron) are each set to the ON position.

Single sideband signals are characterized by the lack of a carrier, unintelligibility, and fluctuations of the S-meter. To obtain proper reception, the carrier must be reinserted by turning on the BFO.

Tune in the single sideband signal for maximum S-meter deflection. Turn the RF GAIN control down until the signal is barely audible. Turn on the BFO and tune the BFO PITCH control very slowly until the reception becomes intelligible. If intelligibility cannot be attained, rotate the BFO PITCH control in the opposite direction. The direction of rotation is dependent upon which sideband the transmitting station is utilizing. In all cases, the BFO PITCH control should be turned very slowly.

NOTE

Because of the slow tuning rate on the BANDSPREAD dial, it is often possible to tune SSB signals by retarding the r-f gain, boosting the audio and setting the BFO pitch to zero. Rotating the BANDSPREAD dial slowly will then bring in the station.

d. EXTERNAL OPERATION. - A stable external oscillator of 75-ohms output impedance with a minimum of 1-volt output is connected through a cable (consisting of RG-59/U with a RG-260/U connector) to J5, located adjacent to V17 on the amplifier crystal oscillator chassis.

The frequency of the external oscillator is determined as follows:

(1) Where the signal frequency lies between .54-Mc and 5.6-Mc.

The external oscillator frequency is:

$$F_o = F_s + 0.455\text{-Mc}$$

where: F_o = Oscillator frequency

F_s = Signal frequency

Example: For a 1 Mc signal the oscillator frequency would be:

$$F_o = 1.000 + 0.455\text{-Mc} = 1.455\text{-Mc}$$

(2) Where the signal frequency lies between 5.6-Mc and 31.5-Mc.

The external oscillator frequency is:

$$F_o = F_s + 3.955\text{-Mc}$$

Example: For a 25-Mc signal the oscillator frequency would be:

$$F_o = 25.000 + 3.955 = 28.955$$

NOTE

The external oscillator should be turned "OFF" or disconnected from the receiver when not in external operation.

e. XTAL OPERATION. - For crystal operation of the GPR it is necessary to insert the proper crystals into the front panel crystal holder. The ten position crystal holder in the GPR accepts CR-18/U crystals for operation in the frequency range of 0.54- to 31.5-Mc.

In order to allow the HFO trimmer on the receiver to operate in mid-scale, to vary the crystal frequency slightly in either direction, a factor of .005% must be added to the frequency of the crystal.

For bands 1, 2, and 3, the GPR is a single conversion superheterodyne receiver with an i-f frequency of 455-kc. For bands 4, 5, and 6 however, it employs dual conversion, with the first i-f frequency at 3.5-Mc and the second i-f frequency remaining at 455-kc.

Therefore, in order to select the proper crystals for operation throughout the GPR frequency range, the following formulas should be used.

LEGEND

F_x = Crystal frequency

F_s = RF Signal frequency or
Operating frequency

To determine the required crystal frequency for operation in the range of 0.54- to 5.6-mc, (Bands 1, 2, and 3,) the following formula applies:

$$F_x = (F_s + 0.455) \times 1.00005\text{-Mc}$$

To determine the required crystal frequency for operation in the range of 5.4- to 17.8-Mc, (Bands 4 and 5) the following formula applies:

$$F_x = (F_s + 3.955) \times 1.00005\text{-Mc}$$

In the frequency range of 17.8- to 31.5-Mc (Band 6) frequency doubling takes place in the HFO and High Frequency Oscillator circuit. Therefore, the following formula applies:

$$F_x = \frac{F_s + 3.955}{2} \times 1.00005\text{-Mc}$$

NOTE

When ordering crystals, indicate crystal frequency and operating frequency. In this way, you will be assured that the proper crystal will be furnished.

f. BANDSPREAD CONTROL - The BANDSPREAD control acts as a vernier or fine tuning for the MAIN TUNING control of the GPR. Calibrated markings on the BANDSPREAD dial are set up in 6 bands (10-11, 15, 20, 40, 80 and 160 Meter) and a LOG scale at the top. Although the calibrated markings are presented for convenience in tuning in the amateur bands, the BANDSPREAD control may be used over the entire range of the receiver.

Example #1: To tune in a frequency of 27.1-megacycles:

(1) Set the MAIN TUNING control to 10-11 M on MAIN TUNING LOG scale.

(2) Set BANDSPREAD control to 30.0 on BANDSPREAD 10-11 M scale.

(3) Tune BANDSPREAD reading down to 27.1 on 10-11 M scale.

Example #2: To tune in a frequency of 116-megacycles:

(1) Set MAIN TUNING control to 16.3-Mc* on MAIN TUNING 9.4-17.8-scale.

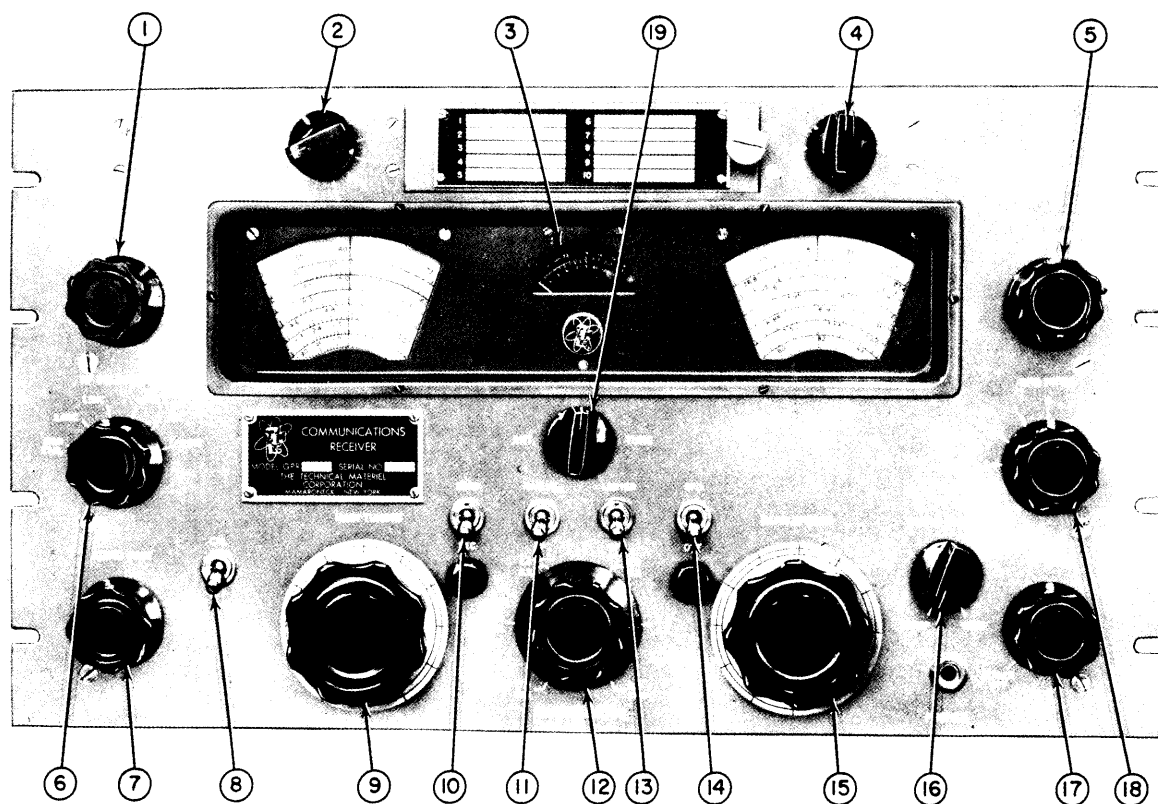
(2) Set BANDSPREAD control to 100 on BANDSPREAD LOG scale.

(3) Using a headset or speaker as a monitor, slowly decrease BANDSPREAD LOG scale reading until desired frequency is obtained.

Once a station has been tuned in, the operator may record the MAIN TUNING and BANDSPREAD LOG scale readings for future tuning to that frequency.

*By referring to the band calibrations on the BANDSPREAD dial, the nearest band to 16-Mc is the 20-M band (13.9- to 14.5-Mc) which affords in adjustment range of 0.6-Mc. Placing the MAIN TUNING dial at 16.3 and the BANDSPREAD at the high end of the range should place 16-Mc approximately in the middle of the total BANDSPREAD adjustment.

g. S-METER. - The S-meter performs a dual func-



3005-5

Figure 3-1. Operating Controls

TABLE 3-2. TABLE OF EQUIVALENT CONTROL DESIGNATIONS.

SERIAL DESIGNATION (SEE FIGURE 3-1)	PANEL DESIGNATION (SEE FIGURE 3-1)	COMPONENT DESIGNATION ON OVERALL SCHEMATIC DIAGRAM
COMMUNICATIONS RECEIVER GPR-90RXDS		
1	XTAL PHASE	Knob capacitor C42
2	HFO	Knob (12-position) selector switch S12)
3	S-meter (No designation)	Meter M1
4	XTAL ADJ.	Knob capacitor C149
5	AUDIO SELECTOR	Knob (3-position) selector switch S5
6	RF SELECTIVITY	Knob (6-position) selector switch S2
7	AUDIO GAIN	Knob potentiometer R68
8	CAL	Toggle switch S11
9	MAIN TUNING	Knob capacitor C9
10	SEND-REC	Toggle switch S9
11	MANUAL-AVC	Toggle switch S3
12	RANGE SELECTOR	Knob (6-position) selector switch S1
13	LIMITER	Toggle switch S4
14	BFO	Toggle switch S8
15	BAND SPREAD	Knob capacitor C8
16	AUDIO SPREAD	Knob variable resistor R71
17	RF GAIN	Knob potentiometer R81
18	BFO PITCH	Knob capacitor C99
19	ANT. TUNE	Knob capacitor C140

tion; it provides a visual means of accurately tuning the GPR to the incoming signal and it indicates the relative signal strength. The AVC/MANUAL toggle switch must be in the AVC position in order for the S-meter to operate properly.

3-2. OPERATOR'S MAINTENANCE.

a. COMMUNICATIONS RECEIVER GPR-90RXDS. - There are several maintenance operations which can be performed on the GPR by the operator when trouble is encountered. If normal operating procedures produce unsatisfactory results, the operator should proceed as follows:

(1) Check the power supply by noting whether dial lamp is on, indicating whether power is being applied to the GPR.

CAUTION

Never replace a fuse with one of higher rating. If a fuse burns out immediately after replacement. DO NOT replace it a second time until the cause has been corrected.

(2) If no power is evident, check fuse on rear apron. Replace blown fuse with fuse of equal value.

(3) Check the tubes since the most common cause of operational failure is usually tube failure. Checking the tubes will often save many hours of unnecessary troubleshooting. The location of tubes in the GPR is shown in figure 5-2.

Table 3-2 lists the equivalent control designations to be used in conjunction with figure 3-1.

SECTION 4

PRINCIPLES OF OPERATION

4-1. GENERAL.

This section covers the principles of operation of the GPR. Although the GPR has many inherent features, its operation and versatility can be enhanced by combining it with any of TMC's accessory units such as Single Sideband Converter MSR-6, Automatic Frequency Control Unit AFC-1, and the Variable Frequency Oscillator, VOX-5. A description of such combinations is further explained in the system operating manuals when applicable.

4-2. FUNCTIONAL ANALYSIS.

a. INTRODUCTION. - (See figure 4-1.) - The GPR is capable of receiving AM, CW, MCW, FS, and SSB signals over a 0.54- to 31.5-mc range in six bands. The RF signal, derived from either a 75-ohm unbalanced antenna or an antenna coupler, is applied to two-stage RF amplifier V1 and V2. The RF gain of these stages is controlled by the setting of RF GAIN control R81, the cathode bias resistor for i-f amplifier V6. Thereafter, the amplified r-f signal is converted by V3 and V4 to a 455-kc intermediate frequency. For improved image rejection, double conversion is used on the upper three bands.

Three methods of producing the intermediate frequency are available. Local oscillator, V12 maybe used in conventional fashion. Second, 10 channels maybe received with 10 precisely adjustable crystals controlling a second local oscillator, V17. Finally, provision is made for the use of an external high stability control oscillator, or synthesizer.

The 455-kc i-f signal developed as a result of either single or double conversion passes through an i-f crystal filter which permits variation of the bandwidth from 250-cps to 7-kc. XTAL PHASE control C42, used in conjunction with this circuit, reduces heterodyne and interfering signals.

When AM type of reception is desired, the 455-kc signal from i-f transformer T8 is applied to grid of detector V9A where it is demodulated. The signal also passes through i-f buffer V9B and AVC detector V10A. The demodulated signal from V9A is applied to audio gain control R68 which increases or decreases limiting action depending upon the amount of gain desired. The diode limiter CR2 and CR3 reduces any noise before reaching the final stage of audio amplification in V10B and power amplifier V11.

For CW and SSB reception, V13 is used as a BFO

and product detector. By turning on BFO switch S8, you apply +150 vdc to the plates V13 and at the same time, AM detector V9A is made inoperative by the application of +150 vdc to its cathode. A Hartley type BFO is used for detection of CW signals and then passed on to the limiter and audio amplifier stages of the receiver.

For SSB reception, the 455-kc signal of i-f transformer T8 is applied to the product detector V13 where it is mixed with the 455-kc oscillator frequency of the BFO. The detected difference frequency is then applied to the limiter and audio amplifier stages.

The detector output is amplified by an audio amplifier consisting of voltage amplifier V10B and power amplifier V11.

The audio output circuit provides the means for matching voice coil impedances of 4, 8, 16, and 600-ohms, as well as headphones. The AUDIO SELECTOR and AUDIO SPREAD controls provide variation of the audio response of the audio amplifier. The response may be varied between one which is essentially flat to one whose bandwidth is 1200-cps at a center frequency of approximately 1100-cps.

For calibrating the GPR, the output of 100-kc calibration oscillator V16 is injected at the GPR input. The harmonic output of the oscillator permits calibration of the GPR throughout its frequency bands.

The power supply consists of a solidstate full-wave rectifier, the output of which is heavily filtered by a pi-type filter for effective hum reduction. Hum produced by the filament supply is minimized by a hum balancing potentiometer. Voltage regulator V15 provides 150-volt regulated DC power.

b. RF AMPLIFIERS. (See figure 7-1) - The RF voltage delivered by the antenna is inductively coupled to first r-f amplifier V1 via r-f transformers L28 through L33 and wafers S1AA and S1A of the RANGE SELECTOR switch. ANT. TUNE control C140 peaks the RF input circuit to the particular antenna used with the GPR. The r-f output of V1 is coupled to V2 via separate coupling networks (depending on the band selected) and wafers S1B and S1C of the RANGE SELECTOR switch. Inductive coupling is used in bands 1 through 3; RC coupling is used for bands 4 through 6. The amplified output of V2 is applied through coupling networks and wafers S1D and S1E of the RANGE

SELECTOR switch to first converter V3.

The gain of both RF stages is controlled by RF GAIN control R81 in the common cathode return circuit. The RF amplifiers are tuned by MAIN TUNING capacitor C9, sections of which are connected across the selected tuned circuits by the RANGE SELECTOR switch. BAND SPREAD control C8 provides electrical bandspread for the r-f circuits.

c. HIGH FREQUENCY OSCILLATOR. - Oscillator V12 is a Hartley type which provides an r-f signal 455-kc above that of the incoming signal. (See figure 7-1).

When switch S13 is turned to position 4 and HFO switch S12 is turned to VAR, oscillator V12 receives 150-volt plate voltage and is tuned by two sections of MAIN TUNING capacitor C9. The tank circuits for the oscillator are selected by RANGE SELECTOR switch S1. This is accomplished simultaneously with the selection of the coupling circuits used in the RF amplifiers. Figure 4-2 is a simplified schematic diagram which shows the HFO circuit elements arranged for band 1 operation. As shown in this figure, the bandspread feature of the GPR is not used in band 1 operation. The HFO circuit elements in figure 4-3B are arranged for band 2 operation and typify the circuit arrangement for the next four bands: 3, 4, 5, and 6. The circuit and its function is identical with band 2 operation except for the addition of BAND SPREAD capacitor C8, component values, and contact position of RANGE SELECTOR switch S1.

Crystal oscillator/amplifier V17 is used when the GPR is tuned for operation in 1 of the 10 crystal-controlled channels or when an external synthesizer supplies the HFO input. (See figure 7-1).

When operating with a crystal-controlled channel, switch S13 is also turned to position 4 while HFO switch S12 is turned to the desired crystal position. The frequency generated by the selected crystal can be slightly adjusted by rotating XTAL ADJ. control C149.

d. FIRST AND SECOND CONVERTERS. (See figure 7-1). - The signal output from r-f amplifier V2 is applied to the control grid of first converter V3, and the output of the local oscillator in use (V12 or V17) is applied to the cathode of V3. These signals mix to produce an i-f signal, the frequency of which is dependent upon the band in use. When operating in bands 1, 2, or 3, and i-f signal is 455-kc. This signal is applied through buffer i-f amplifier V5 and IF transformer T5 to i-f amplifier V6 through a crystal filter. When the GPR is operated in these bands, single conversion is used. The gain is extremely high at this time since second converter V4 is not used. (Second converter V4 is a pentagrid converter, the gain of which is usually less than unity.) Since the attenuating property of the second converter is not available during single conversion, the gain of the first converter is substantially reduced by injecting a positive voltage into the

cathode circuit of V3. In this way, the gain of the GPR is kept fairly constant on all bands and stability is assured on the lower three bands.

In the three higher bands, double conversion is used. In this case, the frequency of the i-f produced in first converter V3 is 3.955-mc. First converter V3 is permitted to operate at high gain for operation in these bands. The output of V3 is mixed with a 3.5-mc-voltage developed in second converter oscillator V4. The oscillator portion of V4 is crystal controlled. The output of this tube is a 455-kc voltage which is applied to first i-f transformer T5.

When the GPR is used as a dual-diversity receiver (as in the DDR-6E), an external oscillator is connected to EXTERNAL IFO INPUT jack J8. This action ensures that the oscillator portion of the second converter and oscillator of the GPR is synchronized at 3.5-mc. At this time the crystal oscillator portion of V4 is disabled by permitting diode CR1 in the cathode circuit of V4 to conduct.

e. IF AMPLIFIERS. (See figure 7-1) - The output of first i-f transformer T5 is applied to a crystal filter. RF SELECTIVITY switch S2 determines the selectivity of the i-f amplifier. In NON XTAL position, crystal Y1 is shorted out. In the remaining positions, crystal Y1 is utilized. As RF SELECTIVITY switch S2 is rotated clockwise, more and more resistance is put in series with the crystal bridge circuit. This action effectively raised the Q of the circuit, producing a more selective filter response. XTAL PHASE control C42 is used to eliminate or reduce the effects of heterodyne or interfering signals.

The i-f amplifier consists of three transformer coupled stages: V6, V7, and V8. The gain of the amplifier may be varied by two controls; IF GAIN control R106 and RF GAIN control R81. When RF GAIN control R81 is varied, the r-f amplifier is also affected. IF GAIN control R106 is left undisturbed after the desired IF gain is achieved.

S-meter M1 is connected in the screen grid circuit of the second i-f amplifier. This meter responds to changes in signal level, as controlled by the AVC input to i-f amplifier V6. The meter may be adjusted by varying S-METER ADJ control R50.

f. ENVELOPE DETECTOR, IF BUFFER, AND AUTOMATIC VOLUME CONTROL. - The envelope detector V9A is a triode connected in a diode type of configuration. (See figure 7-1). The 455-kc signal from i-f transformer T8 is applied to the grid of V9A where it is detected, the resulting audio signal is passed on to the limiter and audio stages for amplification.

For high and low impedance, i-f outputs an i-f buffer stage is employed. The 455-kc signal from i-f transformer T8 is applied to the grid of cathode follower V9B where the signal coming off the cathode is applied to low impedance jack J1A. A high impedance i-f signal is developed on the plate

and is applied to high impedance jack J9. (When SSB switch S7 is set to the ON position, the audio component is shorted to ground and the i-f signal applied to jacks J1A or J9 may be utilized by an external single sideband converter, TMC Model MSR-6) The AVC detector is also a triode connected in the diode configuration. The 455-kc i-f signal is applied to the plate of AVC detector J10A. The intermediate frequency is rectified and the resulting dc voltage, which is proportional to signal strength is the AVC signal. This signal is fed back to the grids of the r-f and i-f amplifiers. Variations in signal strength thus cause the gain of these stages to vary, stabilizing the output of the GPR.

g. BEAT FREQUENCY OSCILLATOR AND PRODUCT DETECTOR. (See figure 7-1).—The reception of CW or SSB is controlled by one tube V13. The BFO and detector stage V13 is made operable by applying +150 volts dc to the plate and screen circuits with BFO switch S8 in the ON position. The BFO is centered at 455 Kc and may be varied ± 3 kc by adjusting BFO pitch control C99. The 455 Kc input from i-f transformer T8 is applied to pin 7 of V13 where it is beat with the 455-kc BFO frequency on the audio level. The detected signals are then passed on to the limiter and audio amplifier stages.

An external BFO may be inserted at external BFO input Jack J7.

h. NOISE LIMITER AND AUDIO AMPLIFIERS. (See figure 7-1).—The noise limiter circuit is comprised of two diodes CR2 and CR3. They clip off the positive and negative noise impulses, of the demodulated signal from the envelope detector V9B in the AM mode, or the signal from the product detector V13 in the SSB mode. If no limiting is needed switch S4 placed in the ON position bypasses the signal around the limiter stage and applies it directly to the grid of the first audio amplifier. Triode V10B is the first audio amplifier. Three inputs may be applied to the grid of this amplifier. With RADIO-PHONO switch S6 in the PHONO position, the output of a high impedance phonograph cartridge may be connected to PHONO INPUT jack J1 and the audio amplifier may be utilized. (See figure 4-8.) For full output, 0.15 volt is required. When RADIO-PHONO switch S6 is set to the RADIO position, the GPR will operate normally. When SSB switch S7

is set to the ON position, the audio output of the detector is shorted to ground. (For SSB operation, audio signals can be supplied by a TMC Model MSR-6, Single Sideband Converter.)

By means of AUDIO SELECTOR switch S5 and AUDIO SPREAD control R71, the response of the audio amplifier may be controlled from an essentially flat response to a 1200-cps wide response (at-10-db) at a center frequency of approximately 1100-cps. (See figure 4-9).

Volume is controlled by rotating AUDIO GAIN control R68. The output of V10B is applied to second audio amplifier V11, a power pentode. This amplifier is capable of delivering 2 watts of audio to 4-, 8-, 16-, or 600-ohm voice coils. Provision is also made for the use of headphones at PHONES jack J2. When headphones are used, the speaker is disabled.

i. 100-KC CALIBRATOR. (See figure 7-1).—The GPR may be calibrated with the crystal-controlled 100-kc oscillator V16. When CAL switch S11 is set to ON, power is applied to the oscillator. At this time, the oscillator output applies 100-kc harmonics to the GPR input. The output of the oscillator is of sufficient amplitude to provide 100-kc markers throughout the entire tuning range of the GPR.

k. POWER SUPPLY. (See figure 7-1) — The power supply is a heavily filtered full-wave rectifier which supplies 250 volts of unregulated power and 150 volts of regulated power to the various GPR circuits. The 150-volt regulator, V15, is a gas tube.

Provision is made for the use of external DC power by placing a battery plug (with the connections shown in figure 8-1) into AUXILIARY POWER socket X1. When the GPR is to be used with the normal 115-volt, 60-cps power at plug P2, AC plug P11 must be placed in AUXILIARY POWER socket X1.

When external DC power is used, the requirements are 180 to 300 volts DC at 100 milliamperes and 6 volts at 5 amperes. Power for external accessories is available at ACCESSORY POWER SOCKET X2 (250 volts DC at 10 milliamperes and 6.3 volts AC at 0.6 amperes).

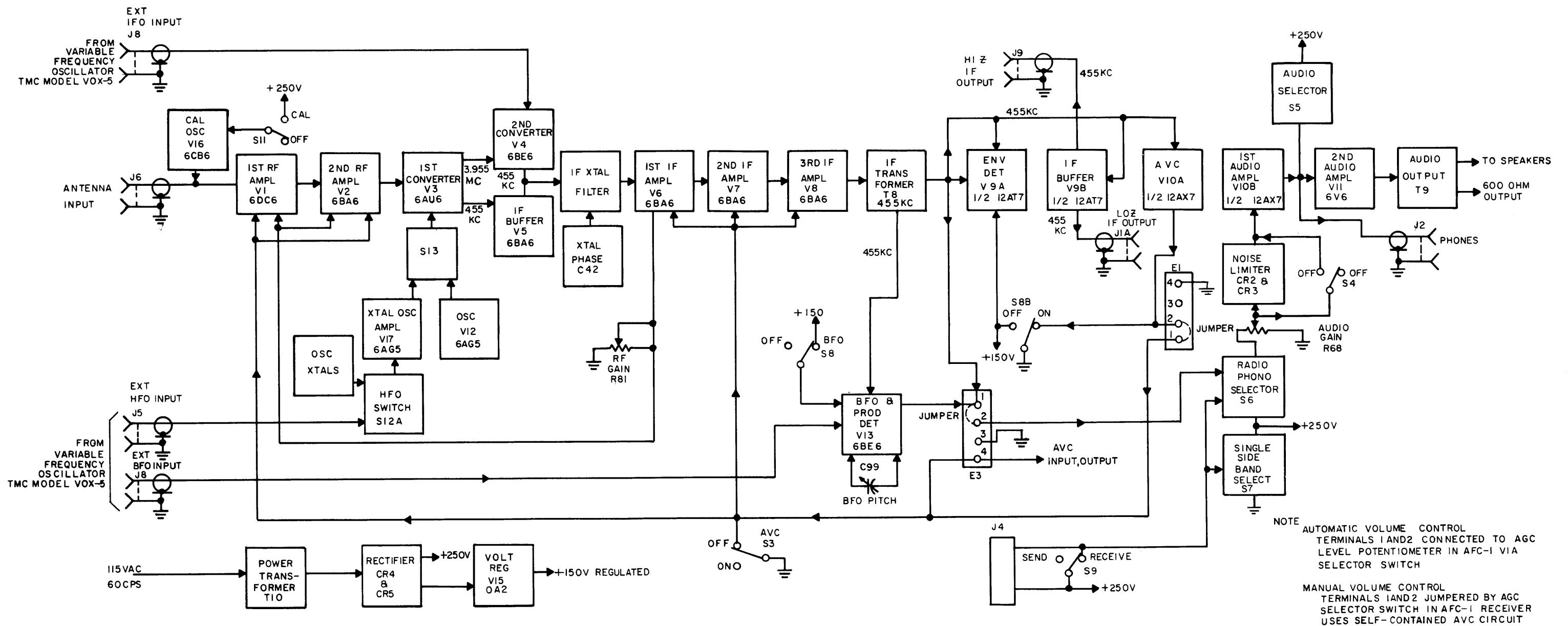
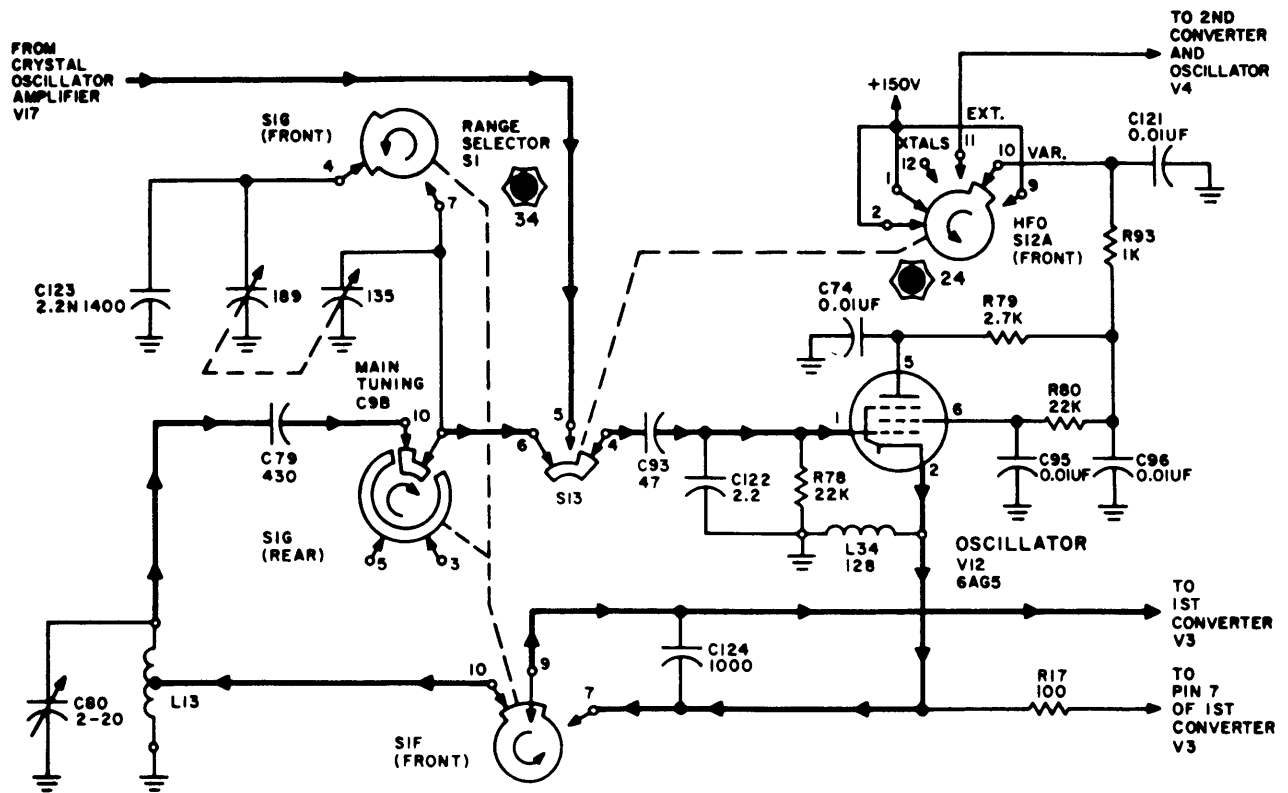
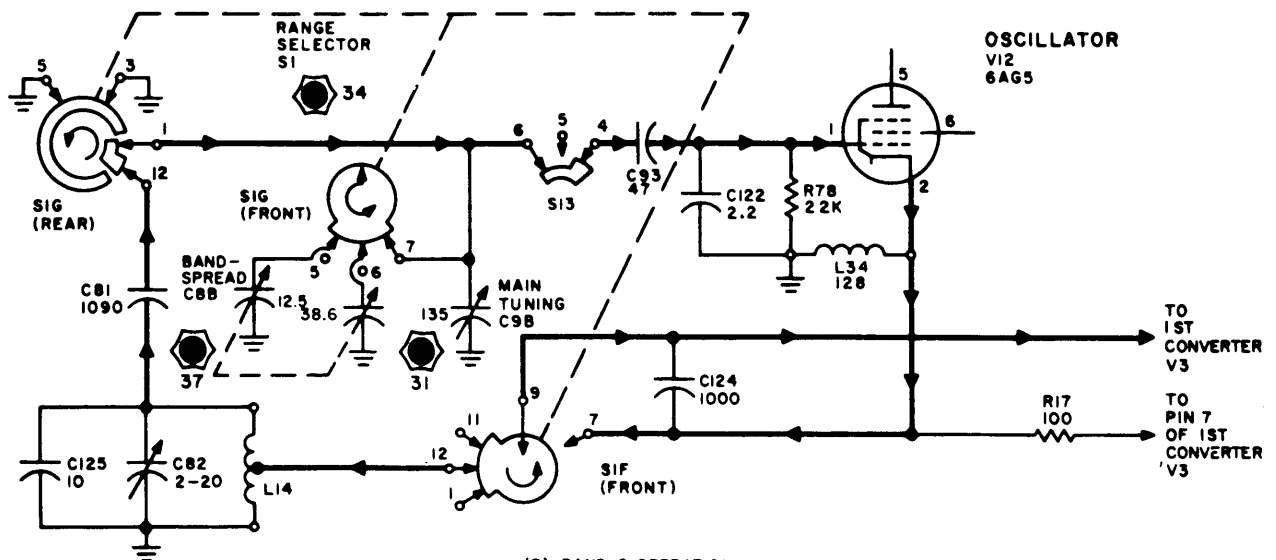


FIGURE 4-1. BLOCK DIAGRAM



(A) BAND 1 OPERATION



(B) BAND 2 OPERATION

NOTES:

1. UNLESS OTHERWISE SPECIFIED, ALL RESISTANCE VALUES ARE IN OHMS; ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS; ALL INDUCTANCE VALUES ARE IN MICROHENRIES.
2. SWITCH S13
 - A. S13 IS IN POSITION 4 WHEN HFO SWITCH S12 IS IN POSITION VAR.
 - B. S13 IS IN POSITION 5 WHEN HFO SWITCH S12 IS IN POSITION EXT. AND XTALS.
3. KNOB CONTROL.

3005-7

Figure 4-2 Schematic Diagram,
GPR-90RXDS, HFO

SECTION 5

MAINTENANCE

5-1. GENERAL.

Troubleshooting is the method of locating and diagnosing equipment troubles and maladjustments; the information necessary to remedy the equipment troubles and maladjustments is reserved for Section 6 of the manual under the heading "Maintenance."

Troubleshooting tools may, for convenience, be divided into the following six categories:

- a. Accurate schematic diagrams.
- b. Tables of voltage and resistance; waveform data.
- c. Location data (photographs with callouts of the major electronic equipment elements).
- d. Troubleshooting techniques.
- e. Troubleshooting charts based on operating procedures.
- f. Troubleshooting procedures based on circuit sectionalization.

Troubleshooting techniques are about the same for all types of electronic equipment and are covered briefly in the following paragraph.

5-2. TROUBLESHOOTING TECHNIQUES.

a. GENERAL CONSIDERATION.— When a piece of equipment has been working satisfactorily and suddenly fails, the cause of failure may be apparent either because of circumstances occurring at the time of failure or because of symptoms analogous to past failures. In this case, it is unnecessary to follow a lengthy and orderly course of troubleshooting in order to localize and isolate the faulty part.

A second shortcut in troubleshooting is to ascertain that all tubes and fuses are in proper working order and that the equipment receives proper supply voltages. Many times this method will eliminate further investigation.

A third shortcut is to examine the equipment, section by section, for burned out elements, charring, corrosion, arcing, excessive heat, dirt, dampness, etc.

It is important to recognize that defective elements may have become defective due to their

own weakness or to some contributing cause beyond their control.

b. TROUBLESHOOTING CHARTS BASED ON OPERATING PROCEDURES. — The general purpose of these charts is to narrow the area of trouble to one or more sections of the equipment in order to minimize the labor of locating the source of trouble. These charts present a prescribed order "to turn on" the equipment, indicate what to expect as each step is taken, and give clues as to possible "troubled areas" when some expectation is not realized.

c. TABLES OF VOLTAGE AND RESISTANCE; WAVEFORM DATA. — These tables gave nominal values of voltage-to-frame and resistance-to-frame, generally at tube elements and sometimes at connectors and terminal board elements. Large deviations from the nominal values should be carefully investigated. During this process, accurate schematic diagrams and location data are highly essential. Schematic diagrams of the equipment covered in this manual are contained in Section 8.

A good oscilloscope is a good troubleshooting tool. It may be connected to a number of critical points along a circuit to detect extraneous voltages, distorted waveforms and other symptoms of trouble.

d. TROUBLESHOOTING PROCEDURES BASED ON CIRCUIT SECTIONALIZATION. — Equipments usually consist of a number of subassemblies or sections. It is frequently helpful to treat these subassemblies on sections as independent entities. In so doing, however, they must be properly powered. Observations may then be made with VTVMs, CROs, or other test equipment at selected points under given type and magnitudes of injection voltages. Again, the subassemblies or sections may be examined for rated performance, according to specification, for the presence of extraneous grounds, for opens, or unusual voltages.

5-3. SERVICING TECHNIQUES.

WARNING

Extreme care should be exercised when measuring voltages. Voltages as high as 250-volts are present in the unit.

(1) Careless replacement of parts often makes new faults inevitable. Note the following points:

(2) Before a part is unsoldered, note the positions of the leads. If the part, such as a transformer or switch, has a number of connections, tag each of the leads.

(3) Be careful not to damage other leads by pulling or pushing them out of the way.

(4) Do not allow drops of solder to fall into the set. They may cause short circuits.

(5) A carelessly soldered connection may create a new fault. It is important to make well-soldered joints, since a poorly soldered joint is one of the most difficult faults to find.

5-4. CIRCUIT AND VOLTAGE CHECKS.

a. VOLTAGE AND RESISTANCE DIAGRAMS. - Figure 5-1 shows the voltage-to-chassis and resistance-to-chassis measurements at the vacuum tube pins in the GPR under the conditions stated.

b. LOCATION DATA. - Figures 5-2 and 5-3 locate the major electronic elements of the GPR.

c. TROUBLESHOOTING CHART BASED ON OPERATING PROCEDURES. - Refer to table 3-1 for interpretation of control designations. Refer to table 5-1.

d. TROUBLESHOOTING PROCEDURES BASED ON CIRCUIT SECTIONALIZATION. - The following paragraphs present troubleshooting procedures which are keyed to functional sections of the GPR.

(1) POWER SUPPLY. - If the dial lamp fails to go on with power switch S10 (mounted on RF GAIN control R81) in the on position, check fuse F1. If no DC power appears in the chassis, check rectifier CR3 and CR4, power supply filter network (C104 and L23), and SEND-REC switch S9. Inspect the power supply for any signs of discoloration due to arcing and loose connections. Any one of the above symptoms mentioned could cause the GPR to be inoperative. (See figure 5-1.) Check the tube pin socket voltages with a reliable 20,000 ohms-per-voltmeter.

Check the voltage across voltage regulator V15 for 150 volts. V15 could short and prevent the chassis from receiving full voltage output. A faulty voltage regulator would cause the various oscillators to malfunction.

(2) CHASSIS. - If, after the power supply has been checked out the GPR still does not operate correctly, inspect all the tubes and see that the filaments are glowing, replacing any tubes as necessary. If the filaments are good, note the operation of the S-meter. If the S-meter operates correctly, the fault is probably in V8, V9, V10, or V11. If not, check the r-f and i-f circuits first. The quickest method of locating the trouble is to utilize the voltage and resistance diagram, figure 5-1.

5-5. ALIGNMENT AND ADJUSTMENTS.

a. PREVENTIVE MAINTENANCE

(1) In order to prevent actual failure of the GPR it is suggested that a schedule of preventive maintenance be set up and adhered to.

(2) At periodic intervals (at least every six months) the GPR should be removed from the cabinet for cleaning and inspection. The chassis wiring should be inspected for dirt, corrosion, charring, discoloring or grease; in particular, the tube socket should be carefully inspected for evidence of deterioration. Dust may be removed with a soft brush or a vacuum cleaner if one is available. Remove dirt or grease from electrical parts with trichlorethylene or ethylenedichloride. Remove dirt or grease from other parts with any good dry cleaning fluid.

WARNING

Carbon tetrachloride (CCl₄) may be used only if great care is exercised because it is a toxic substance. Do not inhale its fumes. Avoid contact with skin.

(3) Test each tube, one at a time, in a reliable tube tester, replacing tube in socket from which it was removed if its measured characteristics are within the manufacturer's tolerances (usually ± 20 percent from tube manual values). Replace only those tubes which are found to be below par; recommended procedure is once every three months.

(4) When replacing the GPR in the cabinet, ensure that all terminal screw connections at the rear of the GPR are tight.

b. CORRECTIVE MAINTENANCE.

(1) GENERAL. - Corrective maintenance of the GPR is limited to alignment of their tank circuits, S-meters, and hum balance adjustments. The circuits of the GPR have been carefully aligned by factory personnel. Realignment of the GPR should not be attempted until all other causes of faulty operation have been investigated. Alignment should not be required unless the GPR has been tampered with or some component part replaced in the stages containing tuned circuits. Alignment should be made only by personnel familiar with GPR and experienced with their alignment.

(2) IF ALIGNMENT. - The low frequency should be aligned first. Remove the dust cover over the tuning capacitor shield compartment by removing the knurled nuts. Couple the signal generator to the lug of the middle section of the main tuning capacitor. (See figure 5-2.) Connect the oscillator return to ground by means of a short wire with alligator clips on each end. Connect

TABLE 5-1. TROUBLESHOOTING CHART

STEP	CONTROL OPERATED	NORMAL INDICATION	REMEDY
1	Set GPR controls and switches for AM reception. RF GAIN control R81 should be adjusted fully clockwise. After a 1-minute warm-up period, tune the GPR through band 2, observe the S-meter, and listen to the audio, adjusting AUDIO GAIN control R68 as required.	S-meter M1 should deflect each time a station is tuned as indicated by the audio output. Front panel lamps glow.	If none of the normal indications are present, check fuse F1 and replace if necessary. Repeat step 1. If the fuse opens, check diode CR3 and CR4 and V15 and their associated circuits. If S-meter M1 fluctuates as the GPR is tuned and no audio is heard, check tubes V11, V10, V9, and V8 in that order. If S-meter M1 fluctuates very weakly, check tubes V7, V6, V5, and V3. If S-meter M1 does not deflect at all, check tubes V12, V7, V6, V5, V3, V2, and V1.
2	Turn RANGE SELECTOR switch S1 to 9.4-17.8.	S-meter M1 should deflect each time a station is tuned.	If S-meter M1 fluctuates very weakly or not at all, check tube V4.
3	Set CAL switch S11 to the ON position.	S-meter M1 should deflect at 100-kc intervals.	Check tube V16 and its associated circuit.
4	Set GPR controls and switches for CW reception. Tune the GPR over any band.	Audio beats should be heard each time a carrier is tuned.	Check tube V13 and its associated circuit.
5	Set GPR controls and switches for SSB reception. Tune in an SSB station.	Nondistorted audio should be heard.	Check tube V13 and its associated circuit.
6	Set GPR controls for AM reception; turn HFO switch S12 to any of the 10 crystal positions and switch S13 to position 5. Tune in the particular channel as determined by the crystal chosen.	Normal AM reception should be heard.	Tune to a different channel. Check tube V17 and switches S12 and S13.

the 600-ohm, 10-watt load and the AC voltmeter across the 600-ohm speaker terminals. Set the following controls and switches as follows:

RANGE SELECTOR switch	.54- 1.4
AVC switch	MANUAL

LIMITER switch	OFF
BFO switch	OFF
SEND-REC switch	REC
AUDIO SELECTOR switch	NORMAL
RF GAIN control	Fully clockwise
AUDIO GAIN control	Fully clockwise
MAIN TUNING control	Half capacity
XTAL PHASE control	0

(3) 455 KC. - Turn the RF SELECTIVITY to the NON XTAL position and the signal generator frequency to 455-kc, modulated 30 percent at 400-cycles. A pair of headphones may be used for monitoring purposes. Adjust the signal generator output until some deflection is noted on the output meter. Peak i-f transformers T8, T7, T6, (top and bottom), and T4 (top) for maximum output. (See figures 5-2 and 5-3 for the location of these adjustments. During alignment, the signal generator output should be progressively reduced to prevent GPR overload. Turn the RF SELECTIVITY control to the 2.0 KC position and adjust the signal generator frequency for maximum meter deflection. In this way the signal generator frequency is made to coincide with the 455-kc crystal frequency in the GPR IF. The frequency of the generator should not be disturbed for the remainder of the 45-kc IF and BFO alignment. Again peak transformers T8, T7, T6, and T5 (top and bottom), T4 (top), and coil L20 for maximum output.

(4) BFO. - Turn off the signal generator modulation and set the BFO PITCH control to zero. Turn the BFO switch to the on position and adjust coil L22 for a zero beat.

(5) 3.955 MC. - Turn the RANGE SELECTOR switch to the 5.4- 9.6 position. Set the signal generator to 3.955-mc, modulated 30 percent at 1000-cycles. Adjust second converter coil, L19, until an output is indicated. Since adjustment of L19 permits the 3.5-mc crystal-controlled oscillator to operate over a small frequency range, it must be set approximately in the middle of this range for stable operation. To determine stable oscillator operation, momentarily turn the GPR off and on. If the GPR continues to operate after interruption, L19 is set correctly. When the oscillator coil is adjusted to 3.5-mc, adjust transformers T3 (bottom) and T2 (top and bottom) for maximum output.

During this test, use sufficient generator output, but not enough to overload the GPR. This completes the i-f alignment. Remove the signal generator leads from the tuning capacitor and the oscillator ground. Replace the dust

cover over the tuning capacitor compartment.

(6) RF ALIGNMENT. - The frequencies for the r-f alignment and the location of these adjustments are shown in figure 5-3. The lowest frequency band is aligned first, followed by the next higher band. The alignment procedure for the broadcast band will be described so that the remaining band can be aligned in a similar manner. The signal generator is coupled to the antenna jack.

NOTE

The generator output impedance should be subtracted from 75 ohms to obtain the proper antenna dummy resistor. The same GPR control settings should be used as in the case of i-f alignment, except that the RF SELECTIVITY control is set to the NON XTAL position and the BAND SPREAD dial is locked to 100 on the logging calibration.

Set the MAIN TUNING dial and the signal generator frequency to 0.56-mc. The signal generator should be modulated 30 percent at 400-cycles and the output meter connected across the output terminals. Adjust oscillator slug L13 first, using sufficient signal generator output to obtain meter deflection, followed by coils L7 and L1 to obtain maximum output. The signal generator output should be progressively decreased as GPR sensitivity increases with each tuned circuit. Set the GPR and signal generator dials to 1.4-mc and adjust capacitors C80 and C18 in that order for maximum output. Repeat the above procedure very carefully and until there is no further improvement in sensitivity and frequency calibration. The remaining stages are aligned in a similar manner and are listed in table 6-1. The image frequency listed for each signal frequency should be checked to ascertain that the oscillator, V12, is operating above the signal frequency.

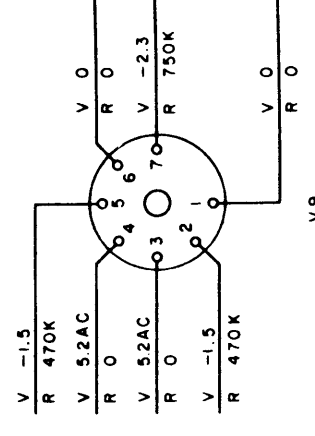
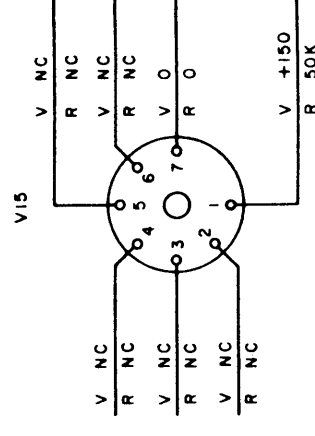
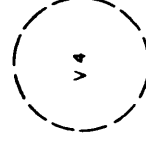
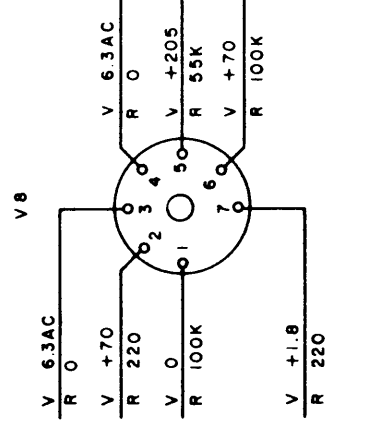
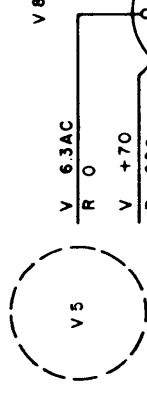
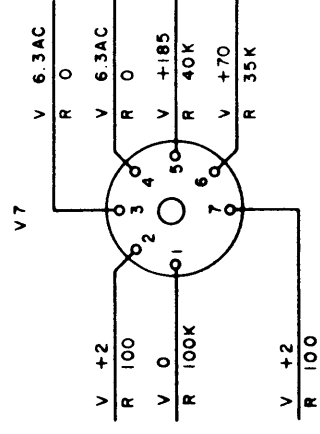
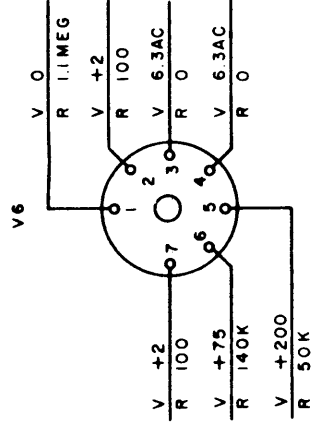
(7) S-METER CALIBRATION. - Turn the RANGE SELECTOR switch to 5.4 - 9.6, AVC switch to on, RF SELECTIVITY switch to NON XTAL, RF GAIN control to maximum, signal generator and GPR MAIN TUNING control to 14 mc. Apply 50-microvolts to the GPR antenna terminals; tune the GPR to the signal; and adjust resistor R50, R106, and the ANT. TUNE control for an S-9 reading on the S-meter.

(8) HUM BALANCE ADJUSTMENT. - Connect a high impedance AC voltmeter with a 3-millivolt range or a sensitive oscilloscope across the 600-ohms audio output load. Ground the GPR to an external ground. Adjust the RF GAIN and AUDIO GAIN controls to their maximum settings. Adjust hum balance control R94 for minimum meter or oscilloscope deflection.

TABLE 5-5. ALIGNMENT DATA

BAND	SIGNAL GENERATOR AND RECEIVER DIAL SETTING	ADJUST FOR MAXIMUM OUT- PUT IN ORDER GIVEN			IMAGE FREQUENCY APPEARS ON SIGNAL GENERATOR DIAL*
		OSC	MIXER	RF	
1	.56 mc	L13	L7	L1	1.47 mc
	1.4 mc	C80	C18	Ant. Tune	2.31 mc
2	1.5 mc	L14	L8	L2	2.41 mc
	3.2 mc	C82	C19	Ant. Tune	4.11 mc
3	3.3 mc	L15	L9	L3	4.21 mc
	5.5 mc	C84	C20	Ant. Tune	6.41 mc
4	5.6 mc	L16	L10	L4	13.51 mc
	9.5 mc	C87	C21	Ant. Tune	17.41 mc
5	9.8 mc	L17	L11	L5	17.71 mc
	17.5 mc	C89	C22	Ant. Tune	25.41 mc
6	18.0 mc	L18	L12	L6	25.91 mc
	31.0 mc	C90	C23	Ant. Tune	38.91 mc

*Use sufficient signal generator output.



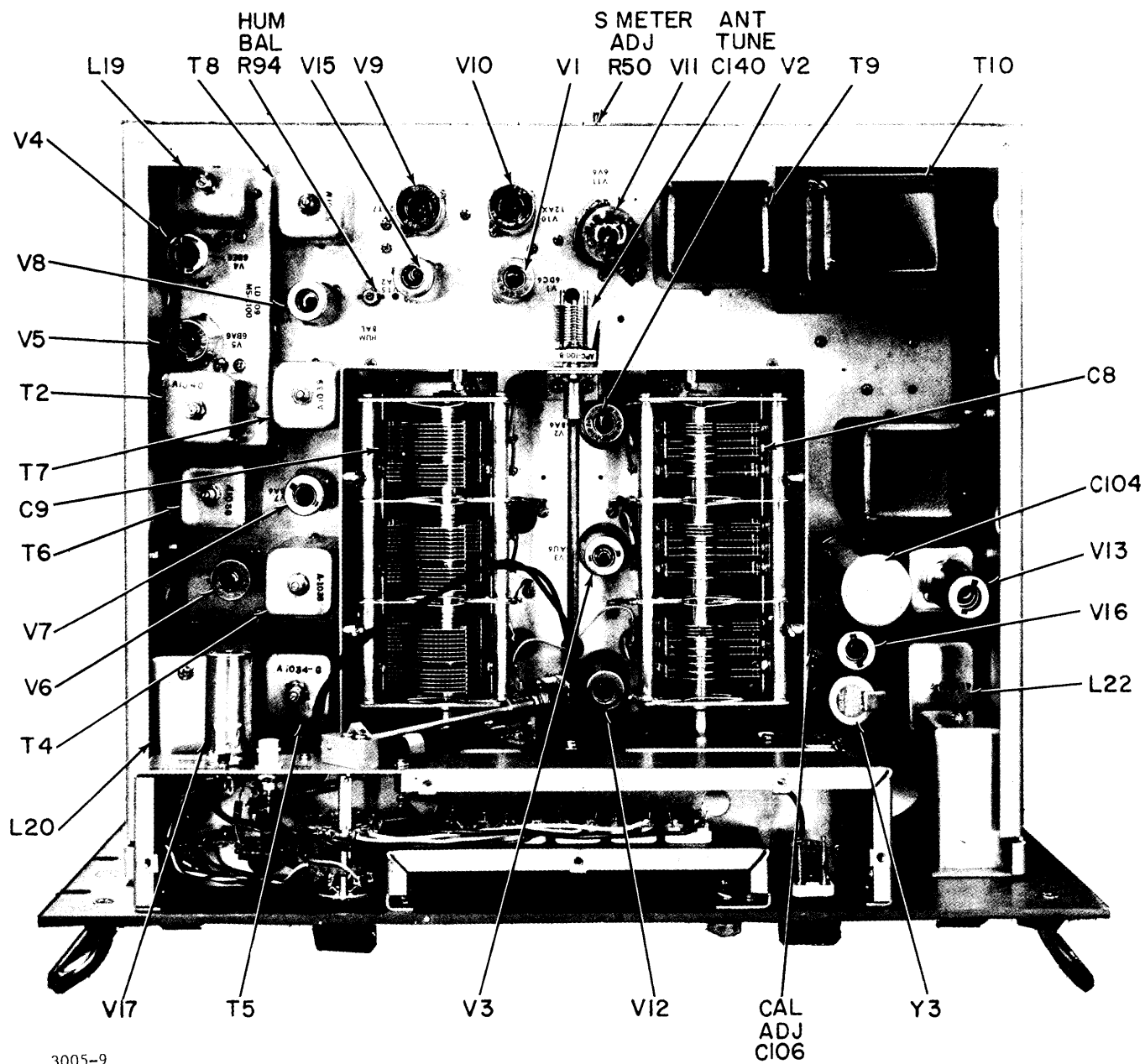
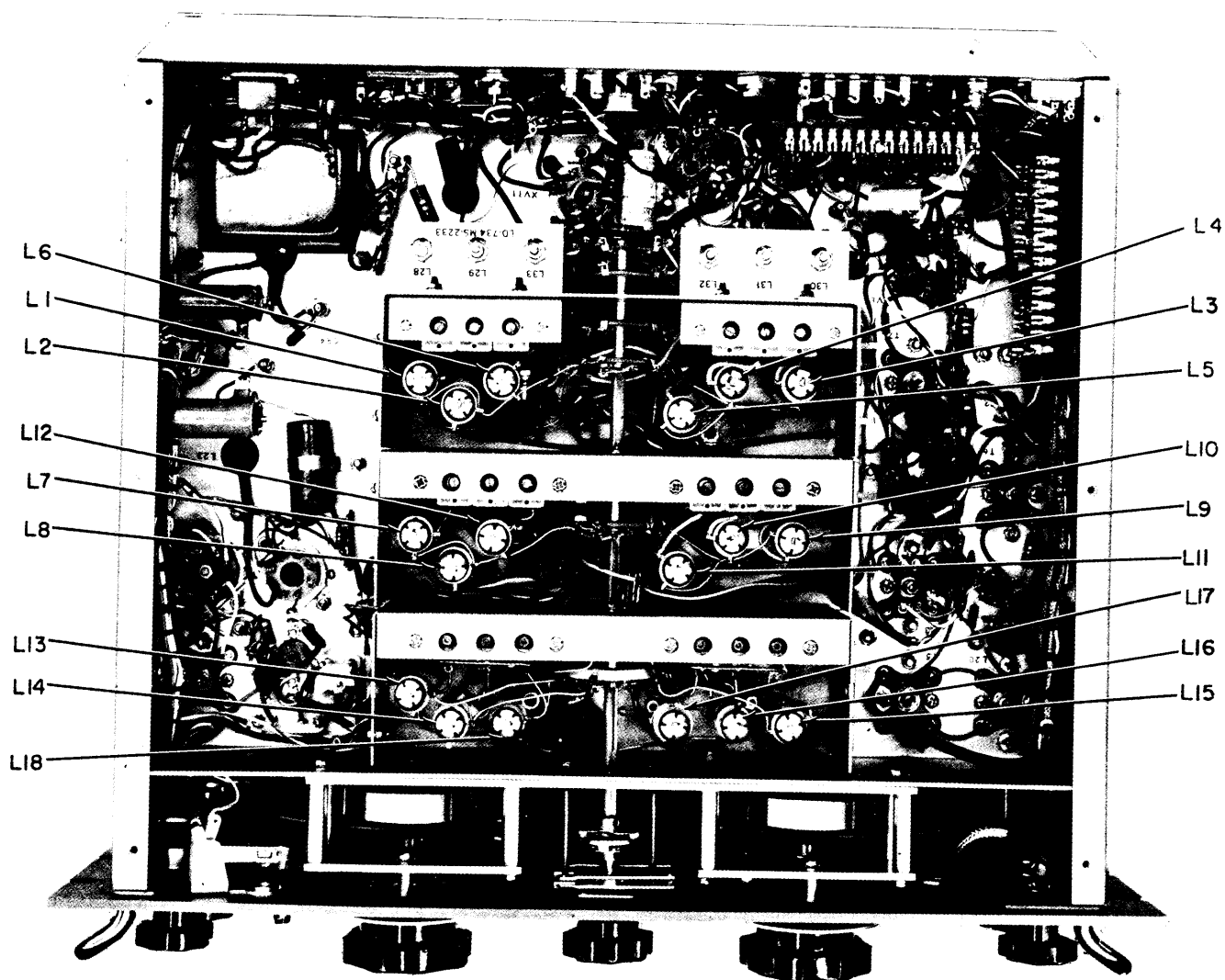


Figure 5-2. Location of Major Electronic Components, Top View



3005-10

673.23-1

Figure 5-3. Location of Major Electronic Components, Bottom View

SECTION 6

PARTS LIST

6-1. INTRODUCTION

The parts list presented in this section is a cross-reference list of parts identified by a reference designation and TMC part number. In most cases, parts appearing on schematic diagrams are assigned reference designations in accordance with MIL-STD-16. Wherever practicable, the reference designation is marked on the equipment, close to the part it identifies. In most cases, mechanical and electro-mechanical parts have TMC part numbers stamped on them.

To expedite delivery when ordering any part, specify the following:

- a. Reference symbol.
- b. Description as indicated in parts list.
- c. TMC part number.
- d. Model and serial numbers of the equipment containing the part being replaced; this can be obtained from the equipment nameplate.

For replacement parts not covered by warranty (refer to warranty sheet in front of manual), address all purchase orders to:

The Technical Materiel Corporation
Attention: Sales Department
700 Fenimore Road
Mamaroneck, New York

PARTS LIST
for
GENERAL PURPOSE RECEIVER, GPR-90RXDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10,000 uuf, GMV; 500 WVDC.	CC100-16
C2	Same as C1.	
C3	CAPACITOR, FIXED, MICA DIELECTRIC: 5 uuf, $\pm 5\%$; 500 WVDC.	CM15C050J03YY
C4	Same as C3.	
C5	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 47 uuf, $\pm 5\%$; 500 WVDC.	CC21SL470J
C6	Same as C1.	
C7	Same as C1.	
C8A,B,C	CAPACITOR, VARIABLE, AIR DIELECTRIC: bandspread 3 sections; Ant.- Mixer sec. (A) 8.0 to 6.3 uuf, (B) 8.6 to 12.9 uuf, (C) 9.7 to 38.5 uuf; oscillator sec. (A) 7.0 to 7.0 uuf, (B) 8.0 to 12.9 uuf, (C) 7.5 to 38.5 uuf.	CB131
C9A,B,C	CAPACITOR, VARIABLE, AIR DIELECTRIC: main tuning 3 sections; six subsections, 3 with 11 plates, 3 with 15 plates; 8.5 to 135 uuf each 11 plate section, 10.5 to 189 uuf, each 15 plate section.	CB130
C10	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 100,000 uuf, $+80\%$ -20% ; 100 WVDC.	CC100-28
C11	Same as C1.	
C12	Same as C1.	
C13	CAPACITOR, FIXED, MICA DIELECTRIC: 1,600 uuf, $\pm 2\%$; 500 WVDC.	CM100-11
C14	CAPACITOR, FIXED, MICA DIELECTRIC: 270 uuf, $\pm 2\%$; 500 WVDC.	CM15F271G03
C15	Same as C3.	
C16	Same as C1.	
C17	Same as C1.	
C18	CAPACITOR, VARIABLE, MICA DIELECTRIC: 3 sections each section 27 to 30 uuf.	CX101

PARTS LIST (CONT)
GENERAL PURPOSE RECEIVER, GPR-90RXDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C19	Non-replaceable item. Part of C18.	
C20	Non-replaceable item. Part of C18.	
C21	Same as C18.	
C22	Non-replaceable item. Part of C21.	
C23	Non-replaceable item. Part of C21.	
C24 thru C26	Same as C1.	
C27	NOT USED	
C28	CAPACITOR, FIXED, MICA DIELECTRIC: 1,000 uuf, $\pm 2\%$; 500 WVDC.	CM20F102G03
C29 thru C31	Same as C1.	CC101-4
C32	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 120 uuf, $\pm 20\%$; 500 WVDC.	
C33	CAPACITOR, FIXED, MICA DIELECTRIC: 220 uuf, $\pm 2\%$; 500 WVDC.	
C34	CAPACITOR, FIXED, MICA DIELECTRIC: 200 uuf, $\pm 2\%$; 500 WVDC.	CM15F201G03
C35	Same as C34.	
C36 thru C38	Same as C1.	
C39	Same as C33.	
C40	Same as C1.	CM30F242G03
C41	CAPACITOR, FIXED, MICA DIELECTRIC: 2,400 uuf, $\pm 2\%$; 500 WVDC.	
C42	CAPACITOR, VARIABLE, AIR DIELECTRIC: 2.8 to 11 uuf; 1 section, 3 plates.	
C43	Same as C3.	CT105-1

PARTS LIST (CONT)
GENERAL PURPOSE RECEIVER, GPR-90RXDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C44	CAPACITOR, FIXED, MICA DIELECTRIC: 300 uuf, $\pm 2\%$; 500 WVDC.	CM15F301G03
C45 thru C48	Same as C1.	
C49	Same as C28.	
C50	Same as C1.	
C51	Same as C28.	
C52 thru C54	Same as C1.	
C55	Same as C28.	
C56	Same as C1.	
C57	Same as C5.	
C58	Same as C28.	
C59	NOT USED	
C60	Same as C1.	
C61	Same as C1.	
C62	Same as C28.	
C63	Same as C1.	
C64	Same as C28.	CC101-3
C65	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 220 uuf, $\pm 10\%$; 500 WVDC.	
C66	Same as C65.	
C67	NOT USED	CC21SL510G
C68	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 51 uuf, $\pm 2\%$; 500 WVDC.	
C69	CAPACITOR, FIXED, PAPER DIELECTRIC: .05 uf, $+40\%$ -20% ; 400 WVDC.	CN100-3

PARTS LIST (CONT)
GENERAL PURPOSE RECEIVER, GPR-90RXDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C70	Same as C1.	
C71	Same as C1.	
C72	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 5,000 uuf, GMV; 500 WVDC.	CC100-15
C73	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 20,000 uuf, +80% -20%; 500 WVDC.	CC100-24
C74	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 30 uuf, $\pm 5\%$; 500 WVDC.	CC26CH300J
C75	Same as C1.	
C76	CAPACITOR, FIXED, ELECTROLYTIC: 25 uf, $\pm 10\%$; 150 WVDC.	CE100
C77	CAPACITOR, FIXED, ELECTROLYTIC: 20 uf; 250 WVDC.	CE103-5
C78	Same as C5.	
C79	CAPACITOR, FIXED, MICA DIELECTRIC: 430 uuf, $\pm 2\%$; 500 WVDC.	CM15F431G03
C80	CAPACITOR, VARIABLE, AIR DIELECTRIC: 2.7 to 19.6 uuf, 1 section, 21 plates.	CB122-4
C81	CAPACITOR, FIXED, PRECISION: 1,090 uuf, $\pm 1\%$; 500 WVDC.	CM200E1090F
C82	Same as C80.	
C83	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 750 uuf, $\pm 5\%$; 500 WVDC.	CC47UJ751J
C84	Same as C80.	
C85	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 91 uuf, $\pm 5\%$; 500 WVDC.	CC35CG910J
C86	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 4.7 uuf, $\pm 25\%$; 500 WVDC.	CC20UJ4R7C
C87	Same as C80.	
C88	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 330 uuf, $\pm 5\%$; 500 WVDC.	CC45SH331J

PARTS LIST (CONT)
GENERAL PURPOSE RECEIVER, GPR-90RXDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C89	Same as C80.	CC45SH391J
C90	Same as C80.	
C91	Same as C86.	
C92	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 390 uuf, $\pm 5\%$; 500 WVDC.	
C93	Same as C5.	
C94 thru C96	Same as C1.	
C97	Same as C69.	CM100-10
C98	CAPACITOR, FIXED, MICA DIELECTRIC: 1,500 uuf, $\pm 2\%$; 500 WVDC.	
C99	CAPACITOR, VARIABLE, AIR DIELECTRIC: 2.9 to 35 uuf, 1 section, 14 plates; 500 WVDC.	
C100	Same as C65.	CT104-4
C101	NOT USED	
C102	NOT USED	
C103	Same as C1.	CE52C350R
C104A,B	CAPACITOR, FIXED, ELECTROLYTIC: dual; 35 uf each section; 450 WVDC.	
C105A,B	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 2 x 10,000 uuf, GMV; 1,000 WVDC.	
C106	CAPACITOR, VARIABLE, AIR DIELECTRIC: 3.2 to 50 uuf, 500 WVDC; 1 section, 19 plates.	CT104-3
C107	Same as C73.	
C108	Same as C1.	
C109	Same as C1.	CC100-11
C110	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 2,200 uuf, GMV; 500 WVDC.	

PARTS LIST (CONT)
GENERAL PURPOSE RECEIVER, GPR-90RXDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C111 thru C113	Same as C1.	
C114	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 6.8 uuf, $\pm 5\%$; 500 WVDC.	CC20UJ6R8D
C115	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 22 uuf, $\pm 10\%$; 500 WVDC.	CC21SL220K
C116	Same as C1.	
C117	Same as C72.	
C118	Same as C72.	
C119	Same as C73.	
C120	Same as C1.	
C121	Same as C1.	
C122	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 2.2 uuf, $\pm 5\%$; 500 WVDC.	CC101-9
C123	Same as C122.	
C124	Same as C28.	
C125	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10 uuf, $\pm 5\%$; 500 WVDC.	CC20UJ100J
C126	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 4.7 uuf, $\pm 5\%$; 500 WVDC.	CC20RH4R7C
C127	Same as C83.	
C128	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 180 uuf, $\pm 5\%$; 500 WVDC.	CC35UJ181J
C129	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 220 uuf, $\pm 5\%$; 500 WVDC.	CC45SH221J
C130	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 100 uuf, $\pm 5\%$; 500 WVDC.	CC32SH101J
C131	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 390 uuf, $\pm 5\%$; 500 WVDC.	CC45TH391J

PARTS LIST (CONT)

GENERAL PURPOSE RECEIVER, GPR-90RXDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C132	Same as C10.	CC101-2
C133	Same as C10.	
C134	Same as C1.	
C135	Same as C1.	
C136	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 150 uuf, $\pm 10\%$; 500 WVDC.	
C137	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 8 uuf, $\pm 2\%$; 500 WVDC.	CC21SL080G
C138	Same as C72.	CB132-100B
C139	Same as C72.	
C140	CAPACITOR, VARIABLE, AIR DIELECTRIC: 100 uuf, 600 V RMS; 27 plates; nom. air gap 0.015".	
C141	Same as C18.	
C142	Non-replaceable item. Part of C141.	
C143	Non-replaceable item. Part of C141.	CT104-1
C144 thru C148	Same as C1.	
C149	CAPACITOR, VARIABLE, AIR DIELECTRIC: 3.2 to 50 uuf, 1section, 19 plates; 500 WVDC.	
C150	Same as C72.	
C151	Same as C1.	
C152	Same as C1.	CM100-9
C153	CAPACITOR, FIXED, MICA DIELECTRIC: 1,300 uuf, $\pm 2\%$; 500 WVDC.	
C154	Same as C72.	
C155	Same as C86.	
C156	Same as C1.	

PARTS LIST (CONT)

GENERAL PURPOSE RECEIVER, GPR-90RXDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C157	Same as C18.	
C158	Non-replaceable item. Part of C157.	
C159	Non-replaceable item. Part of C157.	
C160	CAPACITOR, FIXED, MICA DIELECTRIC: 500 uuf, $\pm 2\%$; 500 WVDC.	CM15E501G03-YY
C161	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1,000 uuf, GMV; 500 WVDC.	CC100-9
C162	Same as C1.	
C163	NOT USED	
C164	NOT USED	
C165	Same as C10.	
C166	Same as C10.	
C167 thru C172	Same as C1.	
C173	Same as C28.	
C174	Same as C28.	
C175	Same as C1. Part of A0120.	
C176	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 100,000 uuf, $+80\%$ -20% ; 300 WVDC. Part of A0120.	CC100-37
C177A,B	Same as C105A,B. Part of A0120.	
C178	CAPACITOR, FIXED, MICA DIELECTRIC: 2,500 uuf, $\pm 2\%$; 500 WVDC. Part of A0120.	CM112F252G5S
C179	CAPACITOR, FIXED, MYLAR DIELECTRIC: 1.00 uf, $\pm 20\%$; 200 WVDC.	CN112A105M2
C180	Same as C1.	
C181	CAPACITOR, FIXED, MICA DIELECTRIC: 10 uuf, $\pm 5\%$; 500 WVDC.	CM15C100J03-YY

PARTS LIST (CONT)
GENERAL PURPOSE RECEIVER, GPR-90RXDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C182	CAPACITOR, FIXED, MICA DIELECTRIC: 30 uuf, $\pm 5\%$; 500 WVDC.	CM15C300J03
C183	CAPACITOR, FIXED, MICA DIELECTRIC: 500 uuf, $\pm 2\%$; 500 WVDC.	CM15F511G03
C184	CAPACITOR, FIXED, MICA DIELECTRIC: 620 uuf, $\pm 2\%$; 500 WVDC.	CM20F621G03
C185	Same as C10.	
C186	CAPACITOR, FIXED, MICA DIELECTRIC: 68 uuf, $\pm 5\%$; 500 WVDC.	CM15C680J03
C187	Same as C1.	
CR1	SEMICONDUCTOR DEVICE, DIODE	1N34A
CR2	SEMICONDUCTOR DEVICE, DIODE	1N463
CR3	Same as CR2.	
CR4	SEMICONDUCTOR DEVICE, DIODE	DD136
CR5	Same as CR4.	
E1	TERMINAL, STRIP: feedthru; four 6-32 thd. binder head machine screws; phenolic body.	TM116-4
E2	TERMINAL, STRIP: feedthru; five 6-32 thd. binder head machine screws; phenolic body.	TM116-5
EV1	SHIELD, ELECTRON TUBE: 1-3/4" high x .930" base dia.	TS102U02P35A
EV2 thru EV8	Same as EV1.	
EV9	SHIELD, ELECTRON TUBE: 1-3/8" high x .930" base dia.	TS102U01P35A
EV10	SHIELD, ELECTRON TUBE: 1-15/15" high x 1.065" base dia.	TS103U02P35A
EV11	NOT USED	
EV12	Same as EV1.	
EV13	Same as EV9. Part of A0120.	

PARTS LIST (CONT)
GENERAL PURPOSE RECEIVER, GPR-90RXDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
EV14	NOT USED	
EV15	SHIELD, ELECTRON TUBE: 2-1/4" high x .930" base dia.	TS102U03P35A
EV16	Same as EV1.	
EV17	Same as EV1.	
F1	FUSE, CARTRIDGE: 2 amps; 1-1/4" long x 1/4" dia.; quick acting.	FU100-2
I1	LAMP, INCANDESCENT: 6-8 V; 0.25 amps; bayonet base, T-3-1/4 bulb; frosted glass.	BI101-44AF
I2	Same as I1.	
I3	LAMP, INCANDESCENT: 6-8 V; 0.25 amps; bayonet base, T-3-1/4 bulb.	BI101-44
J1A	CONNECTOR, RECEPTACLE, ELECTRICAL: dual contact, phono type.	JJ144
J1B	Same as J1A.	
J2	JACK, TELEPHONE: normally closed.	JJ132
J3	CONNECTOR, RECEPTACLE, ELECTRICAL: female; current rating 10 amps at 250 V or 15 amps at 125V.	JJ145
J4	CONNECTOR, RECEPTACLE, ELECTRICAL: female; 2 prong contact; polarized.	JJ146
J5	CONNECTOR, RECEPTACLE, ELECTRICAL: female; 52 ohms; BNC type.	UG625*/U
J6	Same as J5.	
J7	CONNECTOR, RECEPTACLE, ELECTRICAL: 1 round female contact, straight type.	JJ172
J8	Same as J5.	
J9	Same as J7.	
L1	TRANSFORMER, RADIO FREQUENCY: tuned; primary 138 uh, secondary 195 uh; frequency 790 Kc.	TT101

PARTS LIST (CONT)
GENERAL PURPOSE RECEIVER, GPR-90RXDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
L2	TRANSFORMER, RADIO FREQUENCY: tuned; primary 32.5 uh, ± 1.6 uh; secondary 27.5 uh, ± 1.4 uh.	A897
L3	TRANSFORMER, RADIO FREQUENCY: tuned; primary 190 uh, ± 9.5 uh; secondary 9.7 uh, $\pm .048$ uh.	A898
L4	COIL, RADIO FREQUENCY: tuned; 3.4 uh, $\pm 5\%$.	A901
L5	COIL, RADIO FREQUENCY: 1.1 uh, $\pm 5\%$.	A900
L6	TRANSFORMER, RADIO FREQUENCY: tuned; 17.3 to 31.5 Mc.	A905
L7	TRANSFORMER, RADIO FREQUENCY: tuned; primary 280 uh, ± 14 uh; secondary 195 uh, ± 10 uh.	A961
L8	TRANSFORMER, RADIO FREQUENCY: tuned; primary 94 uh, secondary 27.5 uh.	TT109
L9	TRANSFORMER, RADIO FREQUENCY: tuned; primary 9.0 uh, secondary 9.7 uh.	TT108
L10	TRANSFORMER, RADIO FREQUENCY: tuned; primary 5 uh, secondary 3.4 uh, $\pm .2$ uh.	A964
L11	COIL, RADIO FREQUENCY: tuned; 1.1 uh, $\pm .05$ uh.	A965
L12	TRANSFORMER, RADIO FREQUENCY: tuned; 17.3 to 31.5 Mc.	A966
L13	TRANSFORMER, RADIO FREQUENCY: tuned; .990 to 1.905 Mc.	A894
L14	TRANSFORMER, RADIO FREQUENCY: tuned; 1.885 to 3.755 Mc.	A896
L15	TRANSFORMER, RADIO FREQUENCY: tuned; 3.655 to 6.055 Mc.	A899
L16	TRANSFORMER, RADIO FREQUENCY: tuned; 9.355 to 13.555 Mc.	A903
L17	TRANSFORMER, RADIO FREQUENCY: tuned; 9.355 to 13.555 MC.	A1356
L18	TRANSFORMER, RADIO FREQUENCY: tuned; 21.255 to 34.455 Mc.	A1355

PARTS LIST (CONT)
GENERAL PURPOSE RECEIVER, GPR-90RXDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
L19	TRANSFORMER, RADIO FREQUENCY: tuned; 7.2 uh, ± 5 uh.	A1041
L20	COIL, RADIO FREQUENCY: tuned; 250 uh, $\pm 10\%$.	A944
L21	COIL, PEAKING: 1200 ohms; DC resistance 60-75 ohms.	CL117
L22	TRANSFORMER, RADIO FREQUENCY: tuned; 75 uh, ± 4 uh.	
L23	REACTOR, FILTER: 125 ma; 250 ohms, insulated for 2,500 V RMS.	TF158
L24	COIL, RADIO FREQUENCY: fixed; 11.0 uh.	CL134-3
L25	COIL, RADIO FREQUENCY: 200 uh.	CL108-6
L26	COIL, RADIO FREQUENCY: 12 uh, $\pm 10\%$; molded case.	CL275-120
L27	Same as L26.	
L28	TRANSFORMER, RADIO FREQUENCY: tuned; primary 10 uh; secondary 340 uh.	TT102
L29	TRANSFORMER, RADIO FREQUENCY: tuned; primary 1.4 uh secondary 75 uh.	TT103
L30	TRANSFORMER, RADIO FREQUENCY: tuned; primary .32 uh secondary 19.0 uh.	TT104
L31	TRANSFORMER, RADIO FREQUENCY: tuned; primary 42 uh, secondary 7.0 uh.	TT105
L32	TRANSFORMER, RADIO FREQUENCY: tuned; primary 0.3 uh secondary 2.5 uh.	TT106
L33	TRANSFORMER, RADIO FREQUENCY: tuned; primary 0.15 uh, $\pm 5\%$; secondary 0.8 uh, $\pm 5\%$.	TT107
L34	Same as L26.	
L35	Same as L24.	
L36	COIL, RADIO FREQUENCY: 16 ohms; 750 uh, $\pm 10\%$.	CL100-5
L37	NOT USED	
L38	NOT USED	

PARTS LIST (CONT)

GENERAL PURPOSE RECEIVER, GPR-90RXDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
L39	COIL, RADIO FREQUENCY: 4 uh, $\pm 10\%$. Part of A0120.	CL105-2
L40	Same as L39. Part of A0120.	
L41	COIL, RADIO FREQUENCY: 100,000 uh, $\pm 20\%$; molded case.	CL275-104
M1	METER, S TYPE: white and red illuminated dial; white pointer; panel mounted.	MR107
P1	CONNECTOR, PLUG, ELECTRICAL: male; 2 prong contact.	PL123
P2	PLUG, TELEPHONE: black molded plastic case.	PJ055B
PL1	CONNECTOR ASSEMBLY: 8 prong.	A1021
R1	RESISTOR, FIXED, COMPOSITION: 220 ohms, $\pm 5\%$; 1/2 watt.	RC20GF221J
R2	RESISTOR, FIXED, COMPOSITION: 100,000 ohms, $\pm 5\%$; watt.	RC20GF104J
R3	RESISTOR, FIXED, COMPOSITION: 4,700 ohms, $\pm 5\%$; 1/2 watt.	RC20GF472J
R4	RESISTOR, FIXED, COMPOSITION: 22,000 ohms, $\pm 5\%$; 1 watt.	RC32GF223J
R5	RESISTOR, FIXED, COMPOSITION: 15,000 ohms, $\pm 5\%$; 1 watt.	RC32GF153J
R6	RESISTOR, FIXED, COMPOSITION: 4,700 ohms, $\pm 5\%$; 1 watt.	RC32GF472J
R7	Same as R2.	
R8	RESISTOR, FIXED, COMPOSITION: 22 ohms, $\pm 5\%$; 1/2 watt.	RC20GF220J
R9	RESISTOR, FIXED, COMPOSITION: 150,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF154J
R10	RESISTOR, FIXED, COMPOSITION: 120 ohms, $\pm 5\%$; 1/2 watt.	RC20GF121J
R11	RESISTOR, FIXED, COMPOSITION: 56,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF563J

PARTS LIST (CONT)

GENERAL PURPOSE RECEIVER, GPR-90RXDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R12	RESISTOR, FIXED, COMPOSITION: 1,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF102J
R13	RESISTOR, FIXED, COMPOSITION: 15,000 ohms, $\pm 5\%$; 2 watts.	RC42GF153J
R14	Same as R3.	
R15	Same as R8.	
R16	Same as R2.	
R17	RESISTOR, FIXED, COMPOSITION: 100 ohms, $\pm 5\%$; 1/2 watt.	RC20GF101J
R18	RESISTOR, FIXED, COMPOSITION: 330 ohms, $\pm 5\%$; 1/2 watt.	RC20GF331J
R19	RESISTOR, FIXED, COMPOSITION: 2,700 ohms, $\pm 5\%$; 1/2 watt.	RC20GF272J
R20	Same as R9.	
R21	Same as R3.	
R22	RESISTOR, FIXED, COMPOSITION: 10,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF103J
R23	RESISTOR, FIXED, COMPOSITION: 47 ohms, $\pm 5\%$; 1/2 watt.	RC20GF470J
R24	RESISTOR, FIXED, COMPOSITION: 150 ohms, $\pm 5\%$; 1/2 watt.	RC20GF151J
R25	RESISTOR, FIXED, COMPOSITION: 15,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF153J
R26	Same as R23.	
R27	RESISTOR, FIXED, COMPOSITION: 510 ohms, $\pm 5\%$; 1/2 watt.	RC20GF511J
R28	Same as R2.	
R29	RESISTOR, FIXED, COMPOSITION: 12,000 ohms, $\pm 5\%$; 1 watt.	RC32GF123J
R30	RESISTOR, FIXED, COMPOSITION: 390,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF394J

PARTS LIST (CONT)

GENERAL PURPOSE RECEIVER, GPR-90RXDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R31	RESISTOR, FIXED, COMPOSITION: 6,800 ohms, $\pm 5\%$; 1/2 watt.	RC20GF682J
R32	RESISTOR, FIXED, COMPOSITION: 10 ohms, $\pm 5\%$; 1/2 watt.	RC20GF100J
R33	Same as R32.	
R34	Same as R8.	
R35	Same as R17.	
R36	Same as R8.	
R37	RESISTOR, FIXED, COMPOSITION: 1 megohm, $\pm 5\%$; 1/2 watt.	RC20GF105J
R38	Same as R2.	
R39	Same as R17.	
R40	RESISTOR, FIXED, COMPOSITION: 56,000 ohms, $\pm 5\%$; 1 watt.	RC32GF563J
R41	Same as R11.	
R42	RESISTOR, FIXED, COMPOSITION: 6,800 ohms, $\pm 5\%$; 1 watt.	RC32GF682J
R43	Same as R2.	
R44	Same as R8.	
R45	Same as R17.	
R46	RESISTOR, FIXED, COMPOSITION: 470 ohms, $\pm 5\%$; 1/2 watt.	RC20GF471J
R47	Same as R40.	
R48	Same as R11.	
R49	RESISTOR, FIXED, COMPOSITION: 27,000 ohms, $\pm 5\%$; 2 watts.	RC42GF273J
R50	RESISTOR, VARIABLE, COMPOSITION: 10,000 ohms, $\pm 10\%$; 2 watts.	RV4LAYS103A

PARTS LIST (CONT)
GENERAL PURPOSE RECEIVER, GPR-90RXDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R51	RESISTOR, FIXED, COMPOSITION: 22,000 ohms, $\pm 5\%$; 2 watts.	RC42GF223J
R52	RESISTOR, FIXED, COMPOSITION: 6,800 ohms, $\pm 5\%$; 2 watts.	RC42GF682J
R53	Same as R8.	
R54	Same as R1.	
R55	Same as R40.	
R56	Same as R11.	
R57	Same as R42.	
R58	RESISTOR, FIXED, COMPOSITION: 47,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF473J
R59 thru R62	NOT USED	
R63	RESISTOR, FIXED, COMPOSITION: 1.2 megohms, $\pm 5\%$; 1/2 watt.	RC20GF125J
R64	Same as R63.	
R65	Same as R3.	
R66	RESISTOR, FIXED, COMPOSITION: 180,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF184J
R67	RESISTOR, FIXED, COMPOSITION: 68,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF683J
R68	RESISTOR, VARIABLE, COMPOSITION: 1 megohm, $\pm 20\%$; 1 watt.	RV4NAYSD105D
R69	Same as R1.	
R70	RESISTOR, FIXED, COMPOSITION: 120,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF124J
R71	RESISTOR, VARIABLE, COMPOSITION: 1,500 ohms, $\pm 5\%$; 2 watts.	RV4NAYSC152- BYY
R72	Same as R4.	

PARTS LIST (CONT)

GENERAL PURPOSE RECEIVER, GPR-90RXDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R73	RESISTOR, FIXED, COMPOSITION: 470,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF474J
R74	RESISTOR, FIXED, COMPOSITION: 300 ohms, $\pm 5\%$; 2 watts.	RC42GF301J
R75	RESISTOR, FIXED, COMPOSITION: 560 ohms, $\pm 5\%$; 2 watts.	RC42GF561J
R76	Same as R11.	
R77	RESISTOR, FIXED, COMPOSITION: 680,000 ohms, $\pm 5\%$; 1/2 watts.	RC20GF684J
R78	RESISTOR, FIXED, COMPOSITION: 22,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF223J
R79	Same as R19.	
R80	Same as R78.	
R81	RESISTOR, VARIABLE, COMPOSITION: 5,000 ohms, $\pm 10\%$; 1 watt.	RV4NBYS502E
R82 thru R84	NOT USED	
R85	Same as R2.	
R86	NOT USED	
R87	RESISTOR, FIXED, WIREWOUND: 5,000 ohms, $\pm 10\%$; 20 watts.	RW110-30
R88	NOT USED.	
R89	Same as R32.	
R90	Same as R32.	
R91	RESISTOR, FIXED, COMPOSITION: 12,000 ohms, $\pm 5\%$; $\frac{1}{2}$ watt.	RC20GF1235
R92	Same as R13.	
R93	Same as R12.	

PARTS LIST (CONT)

GENERAL PURPOSE RECEIVER, GPR-90RXDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R94	RESISTOR, VARIABLE, COMPOSITION: 250 ohms, $\pm 10\%$; $\frac{1}{2}$ watt.	RV106UX8B 251A
R95	RESISTOR, FIXED, COMPOSITION: 270,00 ohms, $\pm 5\%$; $\frac{1}{2}$ watt.	RC20GF274J
R96	Same as R31.	
R97	Same as R73.	
R98	Same as R10.	
R99	Same as R58.	
R100	Same as R23.	
R101	Same as R4.	
R102	Same as R12.	
R103	Same as R78.	
R104	RESISTOR, FIXED, COMPOSITION: 68 ohms, $\pm 5\%$; 2 watts.	RC42GF680J
R105	Same as R17.	
R106	RESISTOR, VARIABLE, COMPOSITION: 500 ohms, $\pm 10\%$; $\frac{1}{2}$ watt.	RV106UX8B 501A
R107	Same as R67.	
R108	Same as R67.	
R109	Same as R22.	
R110	Same as R11.	
R111	RESISTOR, FIXED, COMPOSITION: 68,000 ohms, $\pm 5\%$; 1 watt.	RC32GF683J
R112	Same as R25.	
R113	RESISTOR, FIXED, COMPOSITION: 2.2 meg ohm, $\pm 5\%$; $\frac{1}{2}$ watt.	RC20GF225J
R114	RESISTOR, FIXED, COMPOSITION: 220,000 ohms, $\pm 5\%$; $\frac{1}{2}$ watt.	RC20GF224J

PARTS LIST (CONT)

GENERAL PURPOSE RECEIVER, GPR-90RXDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R115	Same as R113.	
R116	Same as R114.	
R117	Same as R70.	
R118	Same as R70.	
R119	Same as R31. Part of A0120.	
R120	Same as R2. Part of A0120.	
R121	Same as R18. Part of A0120.	
R122	Same as R78. Part of A0120	
R123	Same as R11. Part of A0120.	
R124	RESISTOR, FIXED, WIREWOUND: 250 ohms; current rating 200 ma; 10 watts.	RW109-14
R125	RESISTOR, FIXED, COMPOSITION: 1,200 ohms, $\pm 5\%$; $\frac{1}{2}$ watt.	RC20GF122J
R126	Same as R77.	
R127	Same as R3.	
R128	Same as R25.	
S1AA	WAFER, ROTARY SWITCH: 1 section, 6 positions; shorting type contacts; bakelite wafer insulation.	WS118
S1A	WAFER, ROTARY SWITCH: Shorting type contacts, silver plated brass; bakelite wafer insulation.	WS117
S1B	WAFER, SWITCH: Shorting type contacts, silver plated brass; bakelite wafer insulation.	WS100-6
S1C	WAFER, SWITCH: Shorting type contacts, silver plated brass; bakelite wafer insulation.	WS100-3
S1D	WAFER, SWITCH: Shorting type contacts, silver plated brass; bakelite wafer insulation.	WS100-2
S1E	Same as S1C.	
S1F	WAFER, SWITCH: Shorting type contacts, silver plated brass; ceramic wafer insulation.	WS100-4

PARTS LIST (CONT)

GENERAL PURPOSE RECEIVER, GPR-90RXDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
S1G	WAFER, SWITCH: Shorting type contacts, silver plated brass; ceramic wafer insulation.	WS100-5
S2A,B	SWITCH, ROTARY: 1 section, 6 positions; 30° angle of throw; shorting type contacts, silver plated brass; bakelite wafer insulation.	SW147
S3	SWITCH, TOGGLE: SPST; current rating 3 amps at 250VAC/DC or 6 amps at 125VAC/DC; panel mounting.	ST103-1-62
S4	Same as S3.	
S5	SWITCH, ROTARY: 2 sections, 3 positions; 30° angle of throw; shorting type contacts, silver plated brass; bakelite wafer insulation.	SW156
S6A,B	SWITCH, SLIDING: DPDT; current rating .50 amps at 125VAC/DC; panel mounting.	SW163
S7A,B	Same as S6A,B.	
S8	SWITCH TOGGLE: DPDT; current rating 1 amp at 250VAC/DC or 3 amps at 125VAC/DC; panel mounting.	ST103-16-62
S9	Same as S3.	
S10	Non-replaceable item. Part of R81.	
S11	Same as S3.	
S12A,B	SWITCH, ROTARY: 2 sections, 12 positions; 30° angle of throw; shorting type contacts, silver plated brass; mycalex wafer insulation.	SW273
S13	SWITCH, ROTARY: 2 positions; 30 angle of throw; silver alloy contacts; glass melamine laminate insulation.	SW203
T1	NOT USED.	
T2	TRANSFORMER, RADIO FREQUENCY: Tuned; 3955 Kc.	A1040
T3	TRANSFORMER, RADIO FREQUENCY: Tuned; frequency range 455 Kc/3955 Kc.	A1038
T4	Same as T3.	

PARTS LIST (CONT)

GENERAL PURPOSE RECEIVER, GPR-90RXDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
T5	TRANSFORMER, RADIO FREQUENCY: Tuned; operating frequency 455 Kc.	A1034
T6	TRANSFORMER, RADIO FREQUENCY: Tuned; operating frequency 455 Kc.	A1039
T7	Same as T6.	
T8	Same as T6.	
T9	TRANSFORMER, RADIO FREQUENCY: Output; audio response 100 to 10,000 cps, $\pm$ 3db; primary 5,000 ohms; DC current rating 55 ma; secondary 600 ohms, tapped at 16 and 8 ohms; insulated for 1,000 volts.	TF159
T10	TRANSFORMER, POWER: Primary input 115/230V, 50/60 cps; secondary #1, 5V at 3 amps; secondary #2, 275-0-275V at 110 MADC; secondary #3, 6.3V at 5.65 amps; stud mounted.	TF169
T11	TRANSFORMER, AUTO: Fixed; inductance 128 uh; frequency 790 Kc.	A989
V1	TUBE, ELECTRON: Sharp cutoff pentode; 7 pin miniature.	6DC6
V2	TUBE, ELECTRON: Remote cutoff pentode; 7 pin miniature.	6BA6
V3	TUBE, ELECTRON: Sharp cutoff pentode; 7 pin miniature.	6AU6A
V4	TUBE ELECTRON: Pentagrid converter; 7 pin miniature.	6BE6
V5 thru V8	Same as V2.	
V9	TUBE ELECTRON: High-Mu twin triode; 7 pin miniature.	12AT7
V10	TUBE, ELECTRON: High-Mu twin triode; 9 pin miniature.	12AX7
V11	TUBE, ELECTRON: Beam power tube; 8 pin octal metal type.	6V6GT

PARTS LISTS (CONT)

GENERAL PURPOSE RECEIVER, GPR-90RXDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
V12	TUBE,ELECTRON: Sharp cutoff pentode; 7 pin miniature.	6AG5
V13	Same as V4. Part of A0120.	
V14	NOT USED.	
V15	TUBE,ELECTRON: Voltage regulator; 7 pin miniature.	OA2
V16	TUBE, ELECTRON.	6C86A
V17	Same as V12.	
W1	CABLE ASSEMBLY, ELECTRICAL: Power; 2 conductor; with integral male plug one end.	CA102-2
X1	SOCKET, ELECTRON TUBE.	TS101P01
X2	Same as X1.	
XC100 thru XC103	NOT USED.	
XC104	SOCKET, ELECTRON TUBE: 8 pin contact; molded thermosetting plastic insulation, screw mounting.	TS165P01
XF1	FUSEHOLDER: Extractor post type; accommodates cartridge fuse 1- $\frac{1}{4}$ " long x $\frac{1}{4}$ " dia.	FH100-2
XI1	LAMPHOLDER: For miniature bayonet base, T-3- $\frac{1}{4}$ bulb; steel cadmium plate body.	TS107-2
XI2	Same as XI1.	
XI3	SOCKET, LAMP: Miniature bayonet base, T-3- $\frac{1}{4}$ bulb; 10" leads for insertion into rear of meter.	TS127
XV1	SOCKET, ELECTRON TUBE: 7 pin miniature.	TS102P01
XV2 thru XV8	Same as XV1.	
XV9	SOCKET, ELECTRON TUBE: 9 pin miniature.	TS103P01
XV10	Same as XV9.	

PARTS LIST (CONT)

GENERAL PURPOSE RECEIVER, GPR-90RXDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
XV11	Same as X1.	
XV12	SOCKET, ELECTRON TUBE: 7 pin miniature, ceramic base.	TS102C01
XV13	SOCKET, PLUG-IN: 7 pin miniature; case size 1.37" square x 2.5" high.	P0148-7-2
XV14	Same as X1.	
XV15 thru XV17	Same as XV1.	
XY1	NOT USED.	
XY2	NOT USED.	
XY3	SOCKET, CRYSTAL: 2 female contacts, phosphor bronze silver plated.	TS105-1
XY4	SOCKET, CRYSTAL: 2 female contacts, phosphor bronze, cadmium plated.	TS104-1
XY5 thru XY13	Same as XY4	
Y1	CRYSTAL UNIT, QUARTZ: Operating frequency 455Kc; case type HC-6/U with 1- $\frac{1}{2}$ " wire leads.	CR102
Y2	CRYSTAL UNIT, QUARTZ: Operating frequency 3.5 Mc; 1- $\frac{1}{2}$ " long wire leads.	CR103
Y3	CRYSTAL UNIT, QUARTZ: Operating frequency 100Kc; 2 male contacts, aluminum case.	CR100
Z101	OSCILLATOR ASSEMBLY: Consists of four capacitors C175, C176, C177A,B, C178, three coils L39, L40, L41, five resistors R119, R120, R121, R122, R123, one tube V13.	A0120

SECTION 7

SCHEMATIC DIAGRAMS

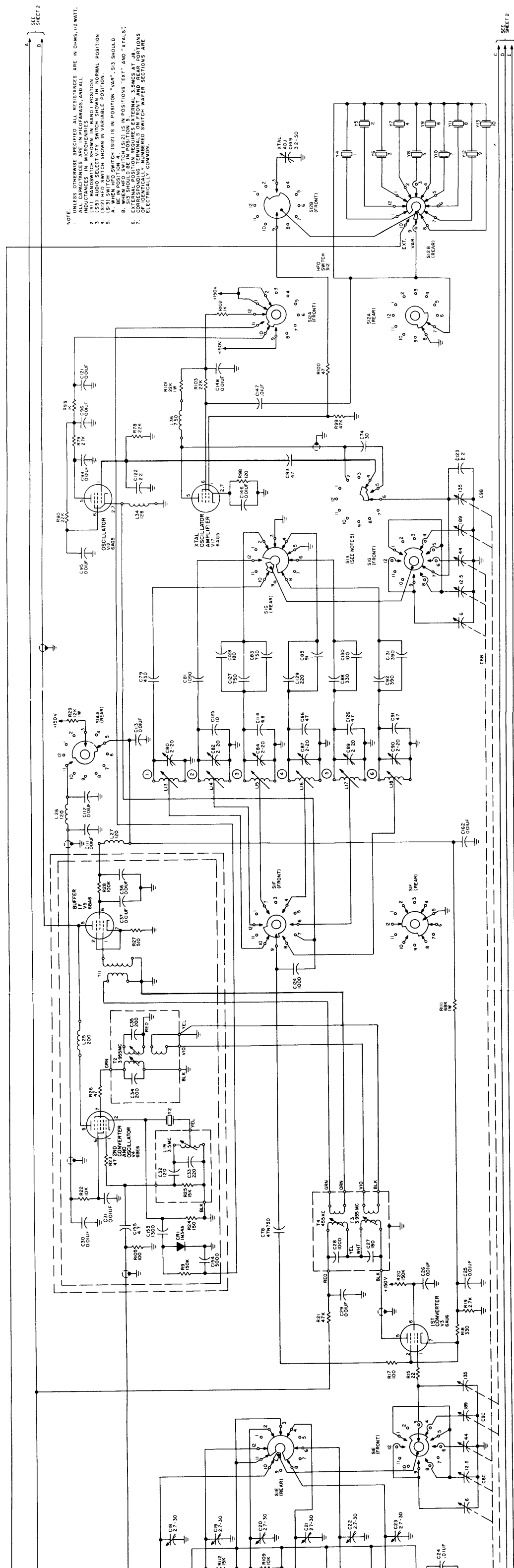
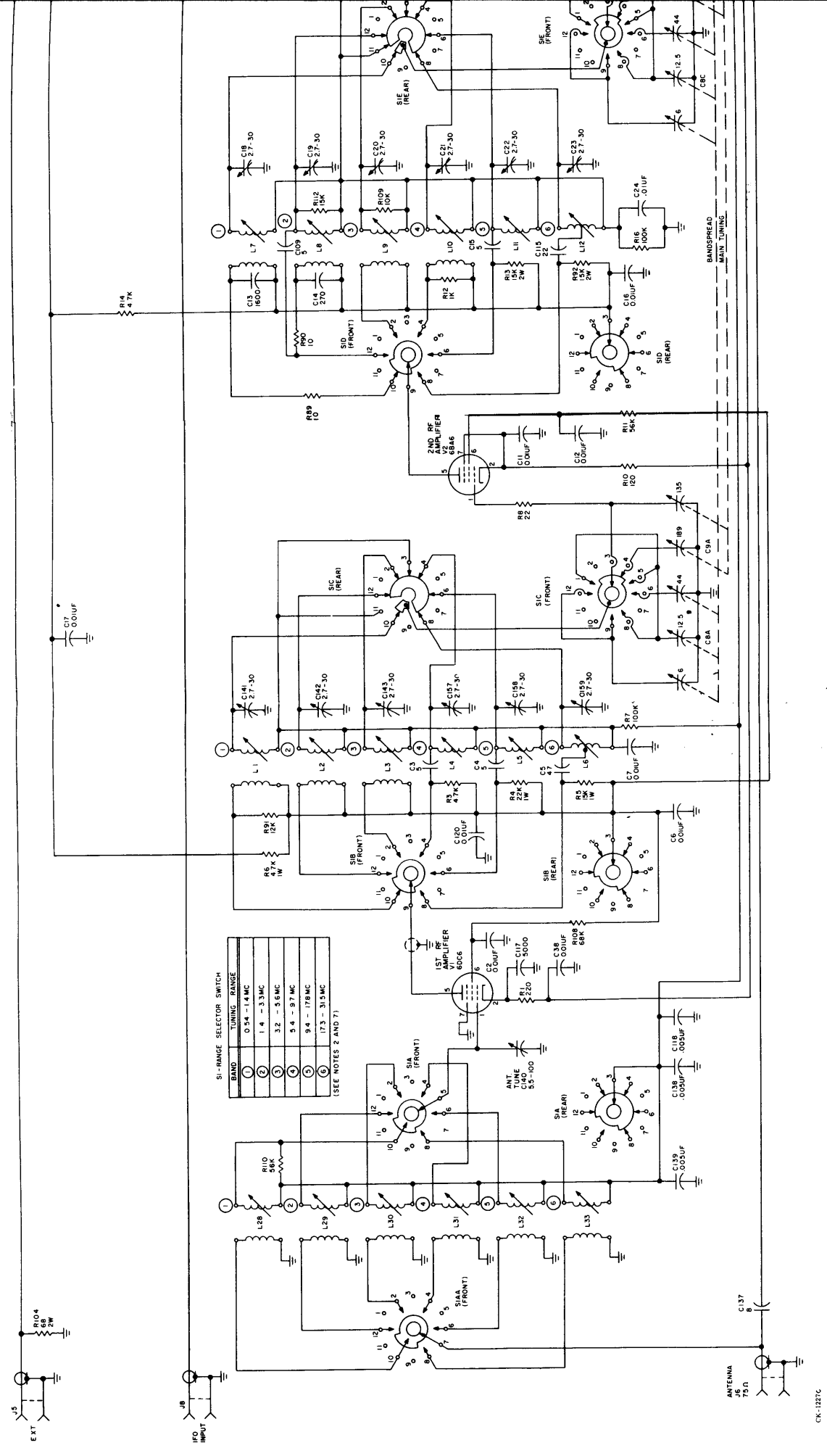


Figure 7-1. Schematic Diagram, Communications Receiver GPR-90RXDS (Sheet 1 of 2)



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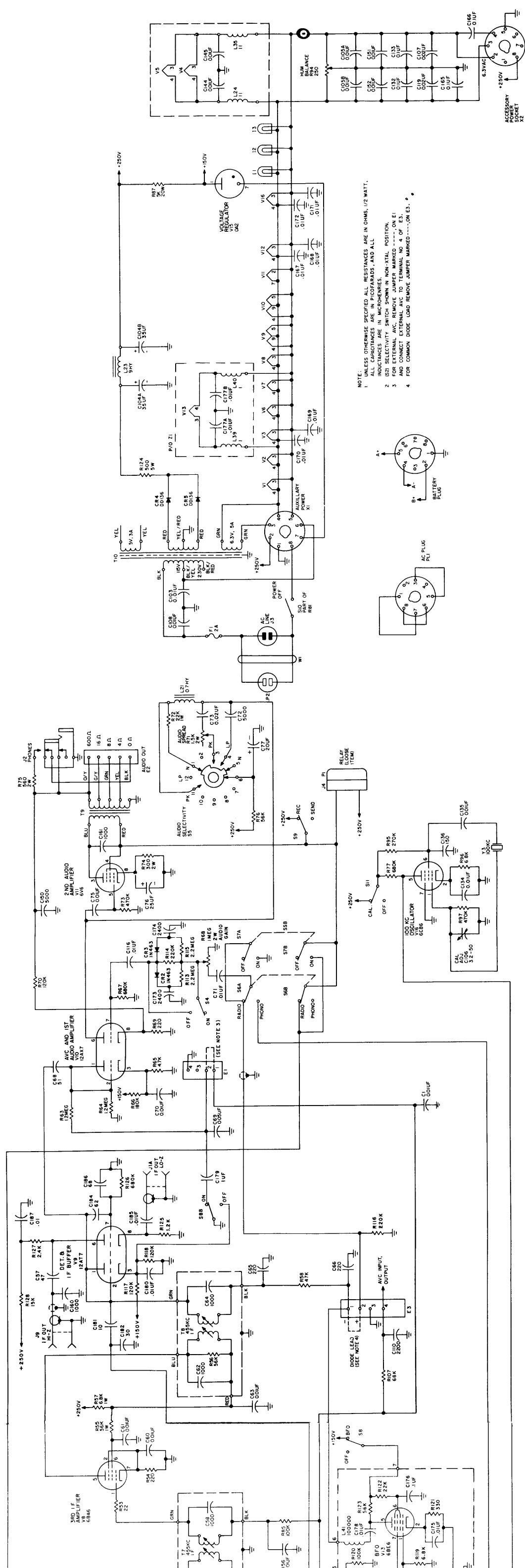


Figure 7-1. Schematic Diagram Communications Receiver GPR-90RXDS (Sheet 2 of 2)

