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TECHNICAL MANUAL

for

GENERAL PURPOSE RECEIVER

MODEL DDR-7H

THE TECHNICAL MATERIEL CORPORATION
MAMARONECK, N.Y. OTTAWA, ONTARIO

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THE TECHNICAL MATERIEL CORPORATION
COMMUNICATIONS ENGINEERS
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

RECORD OF CORRECTIONS MADE

Change No.	Date of Change	Date Entered	Entered By

FOREWORD

TMC's General Purpose Receiver, Model DDR-7H, consists of three major units, as follows:

(1) Communications Receiver, GPR-90RXD

(1) Mode Selector, Receiving, MSR-4

(1) Loudspeaker Panel, LSP-4

A manual for each unit is prepared, and the manuals are then combined for the specific receiver system. The DDR-7H system manual is made up of unit manuals as described in Table of Contents of General Purpose Receiver, Model DDR-7H.

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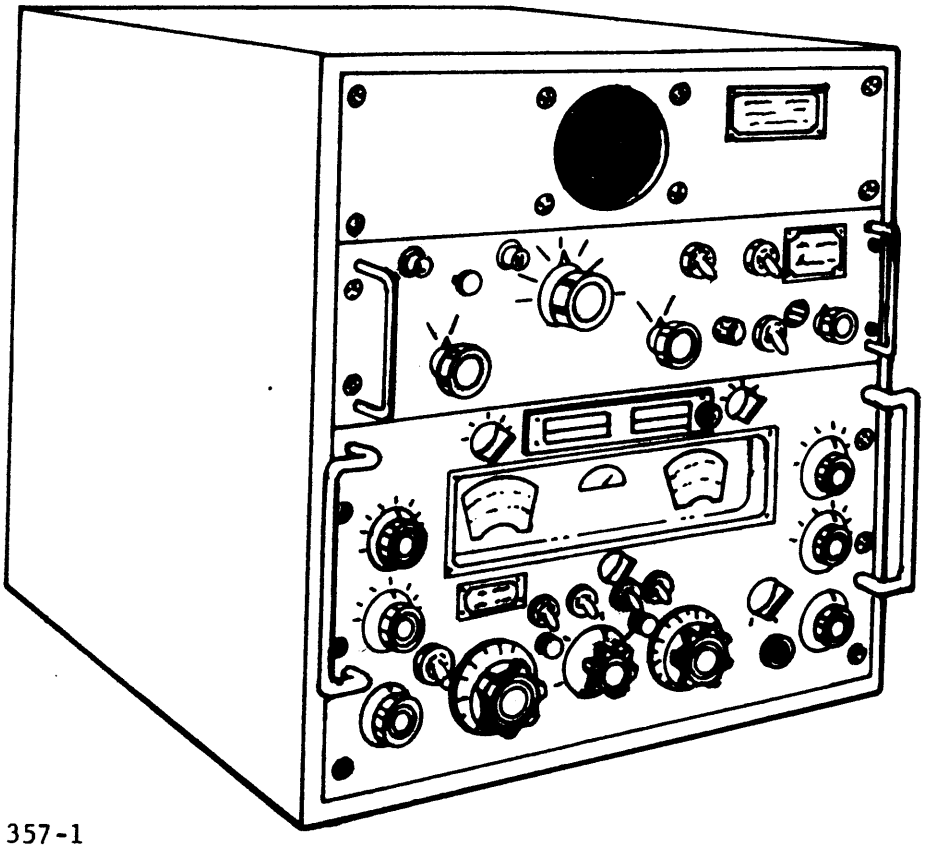

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Figure 1-1. General Purpose Receiver, Model DDR-7H

SECTION 1
GENERAL INFORMATION

1-1 DESCRIPTION

General Purpose Receiver, Model DDR-7H (figure 1-1), is a double-, or triple-conversion super heterodyne communication receiver. The DDR-7H covers the frequency range of .54- to 31.5-megacycles. A flexible filtering and detection system provides for the reception of AM, SSB, CW, MCW, and (with appropriate external converters) FSK and FAX signals. Output facilities include a loud speaker, and a set of 8-ohm and 600-ohm connections.

The first conversion oscillator (HFO) and the final conversion oscillator may be either crystal-controlled, or manually tuneable, as the operator desires. Alternately, an external high-stability oscillator, TMC's Model VOX-5 (1 part in 10^6 per day) or Model CPO-1 (1 part in 10^8 per day), may be used for the receiver's HFO.

Tuning is provided with full electrical bandspread in the r-f and i-f sections. A 100-kc crystal-controlled calibrator provides 100-kc markers throughout the tuning range for absolute frequency identity.

As shown in figure 1-1, the DDR-7H contains the following units:

Loudspeaker Panel,	Model LSP-4
Mode Selector, Receiving,	Model MSR-4
Communications Receiver,	Model GPR-90RXD

The GPR-90RXD is used for tuning in the r-f stage and amplifying the r-f and first i-f stages. The MSR-4 is used for selecting one sideband and/or carrier for audio detection. The LSP-4 is used for audio output.

The complete DDR-7 system is mounted in a single steel rack, and weighs approximately 135 pounds. The rigid-mounted type rack (as shown in figure 1-1) is 21-1/2 inches wide, 19-3/4 inches deep, and 23 inches high. For shipping weights and other particulars, see Appendix section of this manual.

TABLE 1-1. ELECTRICAL CHARACTERISTICS, DDR-7H

Frequency Range	0.54 - 31.5 megacycles is six bands: Band: Range (mc) 1: 0.54 - 1.4 2: 1.4 - 3.3 3: 3.2 - 5.6 4: 5.4 - 9.6 5: 9.4 - 17.8 6: 17.3 - 31.5
Types of Reception:	AM, SSB, CW, and MCW (FSK-external audio frequency converter required)
Sensitivity:	Better than 1 microvolt from 1.4 to 31.5 mc; intentionally desensitized to 5 microvolts from .54 to 1.4 mc.
Noise factor:	Better than 6 db.
Stability:	Better than .002% for .54 to 5.6 mc and .003% for 5.6 to 31.5 mc. These figures are after warm-up at a normal ambient temperature and will hold for usual operating periods.
Image ratio:	Average 80 db.
IF rejection:	455 kc - Average 85 db 3.955 mc - Average 100 db
AGC characteristics:	MCW, AM: Compensates for 80-db change in input signal. CW, SSB: Compensates for 40-db change in input signal.

TABLE 1-1. ELECTRICAL CHARACTERISTICS, DDR-7H (CONT)

Antenna input connection:	Type BNC jack for a nominal 70-ohm unbalanced transmission line.
Outputs:	Audio (for AM, SSB, CW, MCW): a. 1-mw output at terminal block for 600-ohm telephone line. b. 8-ohm speaker (at top of rack) c. 2W/150 mw output for 600-ohm line or 2W/150 mw output for 8-ohm load at MS3102A-14S-2P receptacle. d. Type JJ-034 jack for high or low impedance headset.
Tuning:	Continuously variable or (for crystal-controlled HFO) 10 front panel selectable frequencies available with 10 type CR-18/U plug-in HFO crystals (supplied as specified on order). Front panel controls: ANT TUNE, r-f RANGE SELECTOR, r-f MAIN TUNING, r-f BANDSPREAD, i-f BANSPREAD, i-f SIDEBAND selector.
Filtering:	a. r-f, selectable in 6-kc bandwidth or the following 5 bandwidths through a crystal filter: .25-, .5-, 1.0-, 1.5-, and 2.0-kc. b. i-f, 17-kc stage, 3.5-kc wide B.P. filter.
Audio distortion:	Less than 5%.
Hum level:	At least 50 db down from full audio output.
Power Requirements:	110 or 230 volts, 50 or 60 cps.

SECTION 2
INSTALLATION

2-1. INTRODUCTION

Each DDR-7H General Purpose Receiver has been tested at the factory as a complete system before shipment; for shipment it is disassembled and packaged in two crates. Unpack and reassemble the equipment as outlined in the following paragraphs; recalibration of the individual modular units is not necessary.

2-2. INITIAL INSPECTION

When the equipment is delivered at the operating site, inspect the packing cases and contents immediately for possible damage that might have occurred during transit. Unpack the equipment carefully and inspect all packaging material for parts that 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.

2-3. RACK INSTALLATION

No special procedures are required for installation of the rack. Since there is no rear door, the DDR-7H may be positioned in any suitable area.

NOTE

The rack is shipped with the LSP unit installed. Cable CA1184 is attached to the speaker. Refer to figure 2-1.

2-4. 230V LINE VOLTAGE MODIFICATION

a. GENERAL - The DDR-7H is factory wired for 115 VAC 50/60 cycle, single phase line voltage, unless specified otherwise on order. If line voltage is 230 VAC 50/60 cycle, single phase, refer

to paragraphs 2-4b and 2-4c for modification of DDR-7H wired for 115 VAC.

b. GPR - Refer to GPR technical manual. Disconnect black-and yellow wire lead from T10 transformer at C103 capacitor and tape off end of lead. Attach black-and-red wire lead from T10 transformer to C103. Replace 2-amp fuse (F1) cartridge with 1-amp fuse cartridge (TMC part number FU-100-1).

c. MSR - Refer to MSR technical manual. Remove switch lead from terminal 2 of T5 transformer and connect it to terminal 3. Replace 3-amp fuse (F1) cartridge with a 1.5-amp fuse cartridge (TMC part number FU-100-1.5).

2-5. INSTALLATION OF GPR AND MSR

Refer to table A (Shipping List for DDR-7H) in Appendix of this manual for parts and their functions. Install the GPR and MSR in the rack as shown in figure 1-1; fasten the front panels to the rack with screws.

2-6. CONNECTION OF EXTERNAL EQUIPMENT

a. GENERAL - Figure 2-1 illustrates the interconnections of DDR-7H units and external equipment connections.

b. ANTENNA INPUT - The input impedance at J6 antenna jack on the GPR chassis rear has been designed to match an unbalanced 70-ohm transmission line.

c. HEADSET OUTPUT - A headset output is available through a PHONES jack on the front panel of the MSR. The PHONES jack, type JJ-034, will take a high or low impedance headset. Plugging into the PHONE jack will not disconnect the loudspeaker.

d. AUXILIARY 600/8-OHM AUDIO OUTPUTS - On the rear of the MSR

chassis is an MS3102A-14S-2P receptacle furnished with mating MS3106-14S-2S plug. As shown in figure 2-1, the plug may be wired for any or all of the following auxiliary outputs with the MSR top chassis OUTPUT LEVEL switch in the following positions:

Output	OUTPUT LEVEL switch position
600-ohm, 2 watt	HIGH
600-ohm, 150 mw	LOW
600-ohm, 1 mw (for telephone line)	LOW
8-ohm, 2 watt	HIGH
8-ohm, 150 mw	LOW

NOTE

Normally, the MSR OUTPUT LEVEL switch is set in the LOW position for audio outputs to the headset. When speaker operation is required, it is switched to HIGH, in which case the headset phone line output is not used. HIGH and LOW outputs may not be used simultaneously from the MSR.

e. LINE VOLTAGE INPUT - 115//230 VAC, 50/60 cps, single phase line voltage is connected to the GPR, as shown in figure 2-1.

2-7. INITIAL ADJUSTMENTS

The DDR-7H has been factory tested and adjusted before disassembly for crating. No initial adjustments are necessary.

2-8. CRYSTAL INSTALLATION

a. HFO CRYSTALS - For crystal-controlled HFO operation, the DDR-7H requires one plug-in crystal in the HFO circuit for each frequency to be received. Unless specified on order, crystals will not be included in the DDR-7H shipment. Ten HFO crystal sockets are located in a compartment in the top of the GPR control panel, accessible by opening the hinged door adjacent to the HFO selector

switch; each socket is numbered to correspond with HFO switch position numbers 1 through 10. A chart, mounted on the outside of the door, is provided for recording available carrier frequencies vs. switch positions.

b. HFO CRYSTAL SELECTION - 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:

$$Fx \text{ (crystal freq.)} = (Fs \text{ (signal freq.)} + 0.455) \times 1.00005 \text{ mc}$$

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:

$$Fx = (Fs + 3.955) \times 1.00005 \text{ mc.}$$

In the frequency range of 17.8 to 31.5 mc (Band 6), frequency doubling takes place in the HFO. Therefore, the following formula applies:

$$Fx = \frac{Fs + 3.955}{2} \times 1.00005 \text{ mc}$$

c. IFO CRYSTALS - For crystal-controlled IFO operation, the DDR-7H requires two plug-in crystals, one for each sideband, in the MSR unit. Unless specified otherwise on order, the DDR-7H is shipped with a 438-kc lower sideband crystal in XY1 socket and a 472-kc upper sideband crystal in XY2 socket in the MSR unit. The following crystals are required for the following types of reception (use type CR-46/U quartz crystals with parallel resonant frequencies and HC-6/U holders):

	MSR Crystal Frequencies in sockets:	
Reception	XY1	XY2
CW, MCW, AM, SSB.	436-kc	474-kc

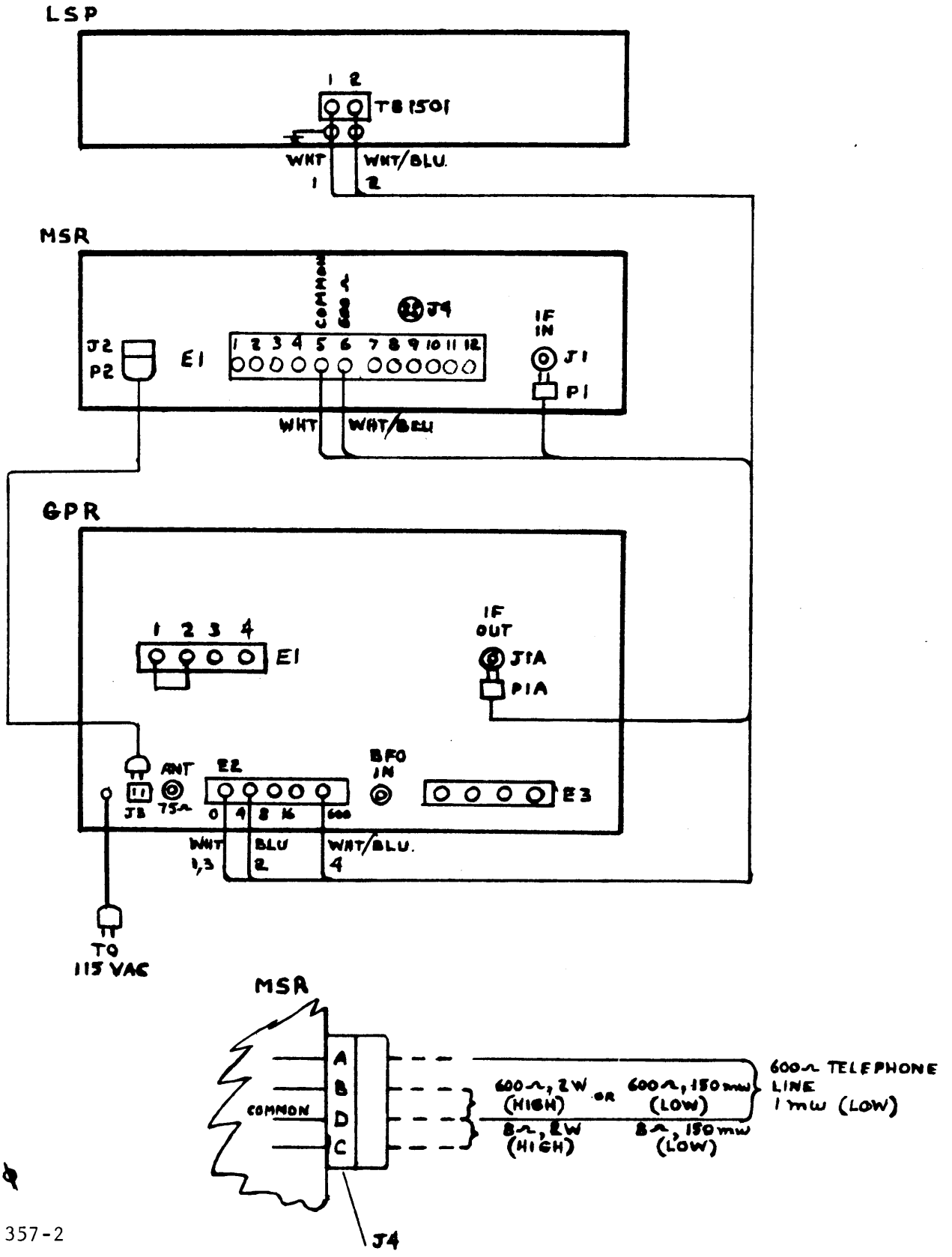

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Figure 2-1. Connection Diagram, DDR-7H

SECTION 3
OPERATOR'S SECTION

3-1. INTRODUCTION

a. GENERAL - Before tuning up the DDR-7H for the first time, it is advisable that the operator become familiar with the following characteristics and capabilities of the equipment:

(1) Functions of units

(2) Functions of controls

(3) Modes of reception

(4) HFO and IFO selection

(5) Types of output

b. FUNCTIONS OF UNITS - Refer to figure 4-1 for functional block diagram of the DDR-7H receiver system. Technical Materiel modular units are designed to be compatible in many different systems. The function of each module may vary from system to system due to the particular interconnection of modules in each system. The a-f section of the GPR receiver is not used. After i-f amplification in the GPR, the signal is routed to the MSR unit for sideband selection and i-f bandspread, and through the MSR a-f amplifier section, to the LSP.

c. FUNCTIONS OF CONTROLS - DDR-7H panel controls and indicators are shown in figure 3-1, with control numbers referenced to "tune-up" tables 3-1 through 3-3. Refer to section 3 of each unit technical manual for functions of controls. A "purpose" column is also included in tables 3-1 through 3-3 of this manual to familiarize the operator with control functions.

d. MODES OF RECEPTION - The DDR-7H Receiver System provides four main modes of reception:

(1) CW (keyed carrier)

(2) MCW (Keyed modulated carrier)

(3) AM* (amplitude modulation)

(4) SSB (single sideband) with suppressed or partial carrier

Tuning procedures for the above four conventional modes are described in tables 3-1 through 3-3.

e. HFO and IFO SECTION - Tables 3-1 through 3-3 outline the required steps for using both fixed (crystal) and variable (non-crystal) oscillators for HFO (high frequency oscillator) and IFO (intermediate frequency oscillator) operation. Where greater receiver stability (.002% to .003%) is required, crystal oscillators are used; however, in this case, a fairly stable incoming signal is required, since very little adjustment of the fixed oscillators is possible. Specifically, with both HFO and IFO on crystal control, this adjustment (XTL ADJ knob on the GPR) for the two extremes of the receiver's frequency range is as follows:

Incoming Frequency	XTL ADJ Compensation
0.54 mc	125 cps
31.5 mc	8 kc

The "XTAL ADJ Compensation" as stated above is the compensation for the combined effect of receiver and transmitted signal drift.

f. TYPES OF OUTPUT - The DDR-7H Receiver System provides the following 3 main** types of output:

(1) Loudspeaker output from MSR

(2) PHONES headset output from MSR

(3) Telephone line output from MSR

* Single Sideband reception from a transmitted AM signal.
** Additional outputs are available at J4 receptacle at the rear of the MSR unit (see paragraph 2-6d).

An OUTPUT LEVEL switch, located on the topside of the MSR chassis at the rear, has 2 positions with corresponding output levels:

Switch Position	Output Level
LOW	150 mw
HIGH	2 watts

To provide audio for the loudspeaker, the MSR must be switched to HIGH; for PHONES or telephone line output it is switched to LOW; therefore, loudspeaker output cannot be used simultaneously with PHONES or telephone output from the MSR unit.

Tables 3-1 through 3-3 describe tune-up procedures in terms of an output normal for the listed modes of reception.

3-2. TUNING PROCEDURES

a. TUNING TABLES - Tables 3-1 through 3-3 describe tuning procedures of the DDR-7H for the 4 main modes of reception (CW, MCW, AM, and SSB).

b. RF BANDSPREAD - Bandspread of the r-f stage is accomplished with the GPR BANDSPREAD knob and movable dial. This control acts as a vernier adjustment for the GPR MAIN TUNING control. Calibration markings on the BANDSPREAD dial are set up in the following 6 amateur bands:

Band (meters)	Frequency Range (mc)
10-11	26.8 - 30.0
15	20.5 - 21.8
20	13.9 - 14.5
40	6.85 - 7.40
80	3.45 - 4.10
160	1.80 - 2.00

Although the calibration 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 an amateur frequency of 27.1 megacycles:

(1) Set BANSPREAD control to "100" on BANDSPREAD LOG scale.

(2) Set MAIN TUNING control to "10-11M" mark on MAIN TUNING LOG scale.

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

Example 2: To tune in a frequency of 17 megacycles:

(1) Set BANDSPREAD control to "100" on BANDSPREAD LOG scale.

(2) Set MAIN TUNING control to "17.5 mc"* on MAIN TUNING 9.4 - 17.8 scale.

(3) Using headset as a monitor, slowly decrease BANDSPREAD reading to area around "50" on LOG scale for the best reception.

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

c. IF BANDSPREAD - The i-f BANDSPREAD control on the MSR unit is used to move the received signal either up or down on the frequency spectrum in order to fit the desired portion of it through the narrow bandpass filter in the MSR. Specific procedure for this adjustment is outlined in each of the tune-up tables.

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* By referring to the amateur band calibrations on the BANDSPREAD dial, it is seen that 17 mc falls between the 20-meter (13.9 - 14.5 mc) and 15-meter (20.5 - 21.8 mc) bands. Since the 20-meter adjustment gives an 0.6-mc adjustment and the 15-meter gives a 1.3-mc adjustment, by interpolation, the BANDSPREAD control will give approximately 0.9 mc of adjustment in the 17-mc area. Therefore, placing the MAIN TUNING dial at 17.45 (or 17.5) and the BANDSPREAD at the high end of the range should place 17 mc approximately in the middle of the total BANDSPREAD adjustment.

TABLE 3-1. TUNE-UP PROCEDURE FOR CW AND MCW

STEP	CONTROL NUMBER (See Figure 3-1)	OPERATION	PURPOSE
1	35,17,18,19	Turn RF GAIN knob (35) fully clockwise. Dials (17),(18), and (19) will light up.	Supplies GPR with tube filament and oven element voltages. Turns up r-f stage gain to maximums.
2	10,5,4	POWER lamp (10) will light and either L lamp (5) or U lamp (4) will light.	Supplies MSR with filament and plate voltages.
3		If either crystal HFO or IFO is to be used, allow 24-hour warm-up period.	Allows GPR oven temperatures to stabilize.
4	24	Set SEND/REC switch (24) to REC.	Supplies GPR with plate voltages.
5	22	Set ANT TUNE knob (22) to vertical position.	Sets ANT TUNE control at mid-position.
6	29	Set CAL/OFF switch (29) to OFF.	Disables 100-kc marker oscillator
7	15	For fariable HFO: Set HFO knob (15) to VAR.	Sets up HFO for variable control with MAIN TUNING and BANDSPREAD knobs.
	15,14,16	For crystal HFO: Set HFO knob (15) to position 1-10 indicated for carrier frequency desired as shown on chart (14). Set XTAL ADJ knob (16) to 0 position.	Sets up HFO for fixed (crystal controlled) operation.
8	28	Set RF SELECTIVITY knob (28) to NON XTAL position.	Selects widest i-f response.

TABLE 3-1. TUNE-UP PROCEDURE FOR CW AND MCW (CONT)

STEP	CONTROL NUMBER (See Figure 3-1)	OPERATION	PURPOSE
9	23	CW Mode: Set MANUAL/AVC switch (23) to MANUAL. MCW Mode: Set MANUAL/AVC switch (23) to AVC	(CW) Shuts off AVC r-f and i-f stages in GPR. (MCW) Turns on AVC in r-f and i-f stages in GPR.
10	13	Set AUDIO GAIN knob (13) to approximately mid-position.	Turns up a-f gain adjustment for tuning purposes.
11	2,3	CW Mode: Set AVC ON/OFF switch (2) to ON. Set AVC FAST/SLOW switch (3) to SLOW. MCW Mode: Set AVC ON/OFF switch (2) to ON. Set AVC FAST/SLOW switch (3) to FAST.	(CW) Sets i-f stage AVC to speed suitable for CW reception. (MCW) Sets i-f stage AVC to speed suitable for MCW reception.
12	8	CW Mode: Set BFO switch (8) to ON. MCW Mode: Set BFO switch (8) to OFF.	(CW) Turns on BFO (17-kc) oscillator in MSR to produce audio tone from second mixer.
13	9	For variable IFO: (1) Set MANUAL/XTAL knob (9) to MANUAL	Sets up 1st injection oscillator in MSR for subsequent i-f BANDSPREAD adjustment.

TABLE 3-1. TUNE-UP PROCEDURE FOR CW AND MCW (CONT)

STEP	CONTROL NUMBER (See Figure 3-1)	OPERATION	PURPOSE
13 (cont)	6,5,4,7	(2) Push SIDEBAND button (6) until L lamp (5) lights; then set BAND-SPREAD knob (7) to -2. or (optional) Push SIDEBAND button (6) until U lamp (4) lights; then set BAND-SPREAD knob (7) to +2.	Detunes 1st injection oscillator in order to pass carrier through narrow band filter.
	9	For Crystal IFO: (1) Set MANUAL/XTAL knob (9) to XTAL.	Sets up 1st injection oscillator in MSR for crystal controlled operation.
	6,5	(2) Push SIDEBAND button (6) until L lamp (5) lights; then insert 436-kc crystal in XY1 socket in MSR.	Detunes 1st injection oscillator in order to pass carrier through narrow band filter. Inserts crystal for greater stability.
	6,4	Push SIDEBAND button (6) until U lamp (4) lights; then insert 474-kc crystal in XY2 socket in MSR.	
14	33	Set RANGE SELECTOR knob (33) to appropriate position for carrier frequency.	Selects bandpass circuit at r-f input.
15	32,19	Adjust MAIN TUNING knob (32) to obtain reading slightly higher* than carrier frequency on dial (19)	Coarse-tunes r-f stage and HFO for carrier frequency.

* See paragraph 3-2b

TABLE 3-1. TUNE-UP PROCEDURE FOR CW AND MCW (CONT)

STEP	CONTROL NUMBER (See Figure 3-1)	OPERATION	PURPOSE
16	38,17	Set BANDSPREAD knob (38) to bring 100 on LOG scale on dial (17)	Sets r-f BAND-SPREAD vernier control at high end of adjustment range.
17	17	Rotate BANDSPREAD knob (17) counter-clockwise until desired signal is received. (Use headset as a monitor.)	Fine-tunes r-f stage and HFO for carrier frequency.
18	13	Adjust AUDIO GAIN knob (13) to obtain suitable volume.	Adjusts audio output level.
19	7	For variable IFO (with fixed or variable HFO): Adjust BANDSPREAD knob (7) until desirable tone is obtained.	Adjust MSR IFO for an agreeable audio tone.
	16	For crystal IFO (with fixed HFO): Adjust XTL ADJ knob (16) until desirable tone is obtained.	Adjusts GPR HFO for an agreeable audio tone.
	38	For crystal IFO (with variable HFO): Adjust BANDSPREAD knob (38) until desirable tone is obtained.	Adjusts GPR HFO for an agreeable audio tone.
20	28,20	If the signal is accompanied by excessive background noise, adjust the RF SELECTIVITY knob (28) to most effectively reduce the interference. In addition, if the signal being received is interfered with or heterodynes with an adjacent carrier, adjust XTAL PHASE knob (20) to reduce interference.	Adjusts i-f bandpass width to eliminate adjacent noise.

TABLE 3-1. TUNE-UP PROCEDURE FOR CW AND MCW (CONT)

STEP	CONTROL NUMBER (See Figure 3-1)	OPERATION	PURPOSE
21	22,18,13	CW Mode: Adjust ANT TUNE knob (22) to obtain peak on meter (18). Then reset AUDIO GAIN knob (13) for suitable volume at LS speaker (1).	Tunes r-f input to antenna characteristics.
	23,22,18, 13,1	MCW Mode: Set MANUAL AVC switch (23) to MANUAL. Adjust ANT TUNE knob (22) to obtain peak on meter (18). Set MANUAL AVC switch (23) to AVC. Readjust AUDIO GAIN knob (13) for suitable volume ax LS speaker (1).	Tunes r-f input to antenna characteristics.
22	35,13	CW Mode only: When keyed signal commences, readjust RF GAIN knob (35) to a low point and AUDIO GAIN knob (13) to a relatively high point to receive the sharpest signals.	Adjusts r-f and a-f gain time constants to best level for intermittent signal.

TABLE 3-2. TUNE-UP PROCEDURE FOR AM

STEP	CONTROL NUMBER (See Figure 3-1)	OPERATION	PURPOSE
1	35,19,18 17	Turn RF GAIN knob (35) fully clockwise. Dials (19), (18), and (17) will light up.	Supplies GPR with tube filament and oven element voltages. Turns up r-f stage gain to maximum.
2	11,10,5,4	Set POWER/OFF switch (11) to POWER. POWER lamp (10) will light and either L lamp (5) or U lamp (4) will light.	Supplies MSR with filament and plate voltages.

TABLE 3-2. TUNE-UP PROCEDURE FOR AM (CONT)

STEP	CONTROL NUMBER (See Figure 3-1)	OPERATION	PURPOSE
3		If either crystal HFO or IFO is to be used, allow 24-hour warm-up period.	Allows GPR oven temperatures to stabilize.
4	24	Set SEND/REC switch (24) to REC.	Supplies GPR with plate voltages.
5	12,1	Set OUTPUT LEVEL switch on MSR unit to HIGH. Disconnect telephone line output at terminals 5 and 6 of rack, if this connection is present. Disconnect headset at PHONES jack (12)	Increases MSR output level for LS speaker (1) operation.
6	22	Set ANT TUNE knob (22) to vertical position.	Sets ANT TUNE control at mid-position.
7	29	Set CAL/OFF switch (29) to OFF.	Disables 100-kc marker oscillator.
8	15	For variable HFO: Set HFO knob (15) to VAR.	Sets up HFO for variable control with MAIN TUNING and BANDSPREAD knobs.
	15,14,16	For crystal HFO: Set HFO knob (15) to position 1-10 indicated for carrier frequency desired as shown on chart (14). Set XTAL ADJ knob (16) to 0 position.	Sets up HFO for fixed (crystal controlled) operation.
9	28	Set RF SELECTIVITY knob (28) to NON XTAL position.	Selects widest i-f response.
10	23	Set MANUAL/AVC switch (23) to MANUAL.	Shuts off AVC in r-f and i-f stages in GPR to obtain RG GAIN control.

TABLE 3-2. TUNE-UP PROCEDURE FOR AM (CONT)

STEP	CONTROL NUMBER (See Fig. 3-1)	OPERATION	PURPOSE
11	13	Set AUDIO GAIN knob (13) to approximately mid-position	Turns up a-f gain adjustment for tuning purposes.
12	2, 3	Set AVC ON/OFF switch (2) to ON. Set AVC FAST/SLOW switch (3) to FAST.	Sets i-f stage AVC (in MSR) to speed suitable for AM reception.
13	8	Set BFO switch (8) to OFF.	BFO not needed in AM reception.
14	33	Set RANGE SELECTOR knob (33) to appropriate position of carrier frequency.	Selects bandpass circuit at r-f input.
15		NOTE: The following procedures, A and B, are for selecting lower and upper sidebands, respectively. Since the same intelligence is present on both sidebands, either sideband may be selected. However, due to adjacent noise, terrain or environmental conditions, it may be found that one sideband gives better results than the other. Procedures A and B are further divided into variable and crystal IFO operation.	Tunes in one sideband and carrier for narrow band reception. Eliminates adjacent interference.
	9, 6, 5, 7, 32, 38, 1	A. Lower Sideband 1. Variable IFO: Set MANUAL XTAL knob (9) to MANUAL. Push SIDEBAND button (6) until L lamp (5) lights. Set BANDSPREAD knob (7) to -2. Tune GPR to point 1.6 kc below carrier frequency using MAIN TUNING knob (32) as a coarse adjustment and BANDSPREAD knob (38) as a vernier adjustment as described in paragraph 3-2b. Then adjust BANDSPREAD	Detunes GPR and MSR to accept lower sideband and carrier only.

TABLE 3-2. TUNE-UP PROCEDURE FOR AM (CONT)

STEP	CONTROL NUMBER (See Fig. 3-1)	OPERATION	PURPOSE
15 (CONT)	9, 6, 5, 7, 32, 38, 1 (cont)	knob (7) for best reception of high and low tones at LS speaker (1).	
	9, 6, 5, 32 38, 61, 1	2. Crystal IFO: Set MANUAL/ XTAL knob (9) to XTAL. Push SIDEBAND button (6) until L lamp (5) lights. Place 436-kc crystal in XY1 socket in MSR. Tune GPR to point 1.6 kc below carrier frequency using MAIN TUNING knob (32) as a coarse adjustment and BAND-SPREAD knob (38) as a vernier adjustment as described in paragraph 3-2b. Then adjust XTAL ADJ knob (16) (for crystal (HFO) or BANSPREAD knob (38) (for variable HFO) for best reception of high and low tones at LS speaker (1).	Detunes GPR and MSR to accept lower sideband and carrier only. Adds crystal for higher stability.
	9, 6, 4, 7, 32, 38, 1	B. Uper sideband 1. Variable IFO: Set MANUAL/XTAL knob (9) to MANUAL. Push SIDEBAND button (6) until U lamp (4) lights. Set BANDSPREAD knob (7) to +2. Tune GPR to point 1.6 kc above carrier frequency using MAIN TUNING knob (32) as a coarse adjustment and BREADSPREAD knob (38) as a vernier adjustment as described in paragraph 3-2b. Then adjust BREADSPREAD knob (7) for best reception of high and low tones at LS speaker (1).	Detunes GPR and MSR to accept upper sideband and carrier only.
	9, 6, 4, 32 38, 16, 1	2, Crystal IFO: Set MANUAL/XTAL knob (9) to XTAL. Push SIDEBAND button (6) until U lamp (4) lights. Place 474-kc crystal in XY2 socket	Detunes GPR and MSR to accept upper sideband and carrier only. Adds crystal for higher stability.

TABLE 3-2. TUNE-UP PROCEDURE FOR AM (CONT)

STEP	CONTROL NUMBER (See fig. 3-1)	OPERATION	PURPOSE
15 (cont)	9, 6, 4, 32 38, 16, 1	in MSR. Tune GPR to point 1.6 kc above carrier frequency using MAIN TUNING knob (32) as a coarse adjustment and BANDSPREAD knob (38) as a vernier adjustment as described in paragraph 3-2b. Then adjust XTAL ADJ knob (16) (for crystal HFO) or BANDSPREAD knob (38) (for variable HFO) for best reception of high and low tones at LS speaker (1).	
16	22, 19, 1	Adjust ANT TUNE knob (22) to obtain peak on meter (19) and/or greater volume on LS speaker (1).	Tones r-f input to antenna characteristics.
17	23, 13, 1	Set MANUAL/AVC switch (23) to AVC. Then readjust AUDIO GAIN knob (13) for suitable volume on LS speaker (1).	Places r-f stages on AVC.
18	28, 20	If the signal is accompanied by excessive background noise, adjust the RF SELECTIVITY knob (28) to most effectively reduce the interference. In addition, if the signal being received is interfered with or heterodynes with an adjacent carrier, adjust XTAL PHASE knob (20) to reduce interference.	Adjusts i-f bandpass width to eliminate adjacent noise.

TABLE 3-3. TUNE-UP PROCEDURE FOR SSB

STEP	CONTROL NUMBER (See Figure 3-1)	OPERATION	PURPOSE
1	35,17,18, 19	Turn RF GAIN knob (35) fully clockwise. Dials (17), (18), and (19) will light up.	Supplies GPR with tube filament and oven element voltages. Turns up r-f stage gain to maximum.
2	11,10,5,4	Set POWER/OFF switch (11) to POWER. POWER lamp (10) will light and either L lamp (5) or U lamp (4) will light.	Supplies MSR with filament and plate voltages.
3		If either crystal HFO or IFO is to be used, allow 24-hour warm-up period.	Allows GPR oven temperatures to stabilize.
4	24	Set SEND/REC switch (24) to REC.	Supplies GPR with plate voltages.
5	22	Set ANT TUNE knob (22) to vertical position.	Set ANT TUNE control at mid-position.
6	12,1	Set OUTPUT LEVEL switch on MSR unit to HIGH. Disconnect telephone line output at terminals 5 and 6 of rack, if this connection is present. Disconnect headset at PHONES jack (12).	Increases MSR output level for LS speaker (1) operation.
7	29	Set CAL/OFF switch (29) to off.	Disables 100-kc marker oscillator.
8	15	For variables HFO: Set HFO knob (15) to VAR.	Sets up HFO for variable control with MAIN TUNING and BANDSPREAD knobs.
	15,14,16	For crystal HFO: Set HFO knob (15) to pos-	Sets up HFO for fixed (crystal

TABLE 3-3. TUNE-UP PROCEDURE FOR SSB (CONT)

STEP	CONTROL NUMBER (See Figure 3-1)	OPERATION	PURPOSE
8 (Cont)	15, 14, 16	ition 1-10 indicated for carrier frequency desired as shown on chart (14). Set XTAL ADJ knob (16) to 0 position.	Controlled) operation.
9	28	Set RF SELECTIVITY knob (28) to NON XTAL position.	Selects widest i-f response.
10	23	Set MANUAL/AVC switch (23) to MANUAL.	Shuts off AVC in r-f and i-f stages in GPR for SSB reception.
11	13	Set AUDIO GAIN knob (13) to approximately mid-position.	Turns up a-f gain adjustment for tuning purposes.
12	2, 3	Set AVC ON/OFF switch (2) to ON. Set AVC FAST SLOW switch (3) to SLOW	Sets i-f stage AVC (in MSR) to speed suitable for SSB reception.
13	8	Set BFO switch (8) to ON.	BFO injection required for SSB detection.
14	33	Set RANGE SELECTOR knob (33) to appropriate position for carrier frequency.	Selects bandpass circuit at r-f detection.
15		NOTE: The following procedures, A and B, are for tuning in lower and upper sidebands, respectively; they are further divided into variable and crystal IFO operation.	Tunes in one sideband.

TABLE 3-3. TUNE-UP PROCEDURE FOR SSB (CONT)

STEP	CONTROL NUMBER (See Figure 3-1)	OPERATION	PURPOSE
15 (Cont)	9, 6, 5, 7 32, 38, 1	A. Lower Sideband 1. Variable IFO: Set MANUAL/XTAL knob (9) to MANUAL. Push SIDEBAND button (6) until L lamp (5) lights. Set BANDSPREAD knob (7) to -2. Tune GPR to point 2.0 kc below carrier frequency using MAIN TUNING knob (32) as a coarse adjustment and BANDSPREAD knob (38) as a vernier adjustment as described in paragraph 3-2b. Then adjust BANDSPREAD knob (7) for best reception of high and low tones at LS speaker (1).	Detunes GPR and MSR to accept lower sideband.
	9, 6, 5, 32 38, 16, 1	2. Crystal IFO: Set MANUAL/XTAL knob (9) to XTAL. Push SIDEBAND button (6) until L lamp (5) lights. Place 436-kc crystal in XY1 socket in MSR. Tune GPR to point 2.0 kc below carrier frequency using MAIN TUNING knob (32) as a coarse adjustment and BANDSPREAD knob (38) as a vernier adjustment as described in paragraph 3-2b. Then adjust XTAL ADJ knob (16) (for crystal HFO) or BANDSPREAD knob (38) (for variable (HFO) for best reception of high and low tones at LS speaker (1).	Detunes GPR and MSR to accept lower sideband. Adds crystal for higher stability.
	9, 6, 4, 7 32, 38, 1	B. Upper Sideband 1. Variable IFO: Set MANUAL/XTAL knob (9) to MANUAL. Push SIDEBAND button (6) until U lamp (4)	Detunes GPR and MSR to accept upper sideband.

TABLE 3-3. TUNE-UP PROCEDURE FOR SSB (CONT)

STEP	CONTROL NUMBER (See Figure 3-1)	OPERATION	PURPOSE
15 (Cont)	9, 6, 4, 7 32, 38, 1	lights. Set BANDSPREAD knob (7) to +2. Tune GPR to point 2.0 kc above carrier frequency using MAIN TUNING knob (32) as a coarse adjustment and BANDSPREAD knob (38) as a vernier adjustment as described in paragraph 3-2b. Then adjust BANDSPREAD knob (7) for best reception of high and low tones at LS speaker (1).	
	9, 6, 4, 32 38, 16, 1	2. Crystal IFO: Set MANUAL/XTAL knob (9) to XTAL. Push SIDEBAND button (6) until U lamp (4) lights. Place 474-kc crystal in XY2 socket in MSR. Tune GPR to point 2.0 kc above carrier frequency using MAIN TUNING knob (32) as a coarse adjustment and BANDSPREAD knob (38), as a vernier adjustment as described in paragraph 3-2b. Then adjust XTAL ADJ knob (16) (for crystal HFO) or BANDSPREAD knob (38) (for variable HFO) for best reception of high and low tones at LS speaker (1).	Detunes GPR and MSR to accept upper sidebands. Adds crystal for higher stability.
16	22, 18	Adjust ANT TUNE knob (22) to obtain peak on meter (18).	Tunes r-f input to antenna characteristics.

TABLE 3-3. TUNE-UP PROCEDURE FOR SSB (CONT)

STEP	CONTROL NUMBER (See Figure 3-1)	OPERATION	PURPOSE
17	28,20	If the signal is accompanied by excessive background noise, adjust RF SELECTIVITY knob (28) to most effectively reduce the interference. In addition, if the signal being received is interfered with or heterodynes with an adjacent carrier, adjust XTAL PHASE knob (20) to reduce interference.	Adjusts i-f bandpass width to eliminate adjacent noise.
18	13,1	Readjust AUDIO GAIN knob (13) for suitable volume level at LS speaker (1).	Final adjustment of volume after tuning.

3-3. OPERATING PROCEDURES

a. GENERAL - Operating procedure is defined here as the procedure necessary to maintain the tuned-in signal through subsequent fading conditions and frequency drift.

b. SIGNAL FADE CONTROL

(1) CW, SSB - The "S" meter (20) on GPR receiver gives immediate indication of signal fade as it occurs in the r-f input from the antenna. There is a slow-response AVC (automatic volume control) in the i-f stage in the MSR unit; therefore, if the fade is not sudden, sound reduction will not occur until the r-f signal fades below the limit of the i-f AVC (40db). When this occurs, increase the volume by turning the AUDIO GAIN knob on the MSR clockwise.

(2) MCW, AM - In these modes of reception a rapid-response AVC is used in the r-f stage in the GPR receiver. The limitation of

this AVC is 80 db; as a result, no indication of signal fade will show up either in sound or on the "S" meter (which is in the output of the r-f stage) until the signal has dropped beyond 80 db. An occasional check should be made by switching the GPR MANUAL/AVC switch to MANUAL and observing the "S" meter reading. Should a fade beyond the AVC boundary occur, volume may be increased by tuning the MSR AUDIO GAIN knob clockwise.

c. FREQUENCY DRIFT CONTROL

NOTE

Before making correction for drift, place GPR RF SELECTIVITY switch in NON-XTAL position; after making correction, place switch in best position for clearest signal.

(1) CW - An immediate indication of frequency drift is a tone change at the headset or loudspeaker. When the drift exceeds approximately 1.7 kc, the signal will cut out due to exceeding the passband of the MSR unit. A small drift may be corrected by an adjustment of the MSR BANDSPREAD knob (for variable IFO); for crystal IFO, use GPR XTAL ADJ knob (for crystal HFO), or GPR BANDSPREAD knob (for variable HFO). If the signal has drifted excessively, retuning above or below the original point will be necessary.

(2) MCW - There is no indication of frequency drift in MCW reception. When the drift has exceeded 1.7 kc, however, the signal will be cut out at the headset or loudspeaker, due to the limitations of the MSR passband. If this should occur and if the drift has not continued, the signal will be brought back with an adjustment of MSR BANDSPREAD knob (for variable IFO); for crystal IFO, use GPR XTAL ADJ knob (for crystal HFO), or GPR BANDSPREAD knob (for variable HFO). If the signal has drifted excessively, retuning above or below the original point will be necessary.

(3) AM - Loss of high or low tones on the headset or loudspeaker indicates the beginning of frequency drift. A small drift may be corrected by an adjustment of the MSR BANDSPREAD knob (for variable IFO); for crystal IFO, use GPR XTAL ADJ knob (for crystal HFO), or GPR BANDSPREAD knob (for variable HFO). If the signal has drifted excessively, retuning above or below the original point will be necessary. Tune for a higher point when high tones are lost and tune for a lower point when low tones are lost.

(4) SSB - An immediate indication of frequency drift is a tone change at the headset or loudspeaker. This may be followed by loss of high or low tones as the frequency continues to drift. As the tones go up the scale, the higher tones disappear; conversely as the tones go down the scale, the lower tones disappear. This holds true for upper or lower sideband outputs in SSB reception. For variable IFO operation, a small drift may be corrected by an adjustment of the MSR BANDSPREAD knob. For crystal IFO a small drift may be corrected by adjustment of GPR XTAL ADJ knob (for crystal HFO) or GPR BANDSPREAD knob (for variable HFO). If the signal has drifted excessively, retuning above or below the original point will be necessary.

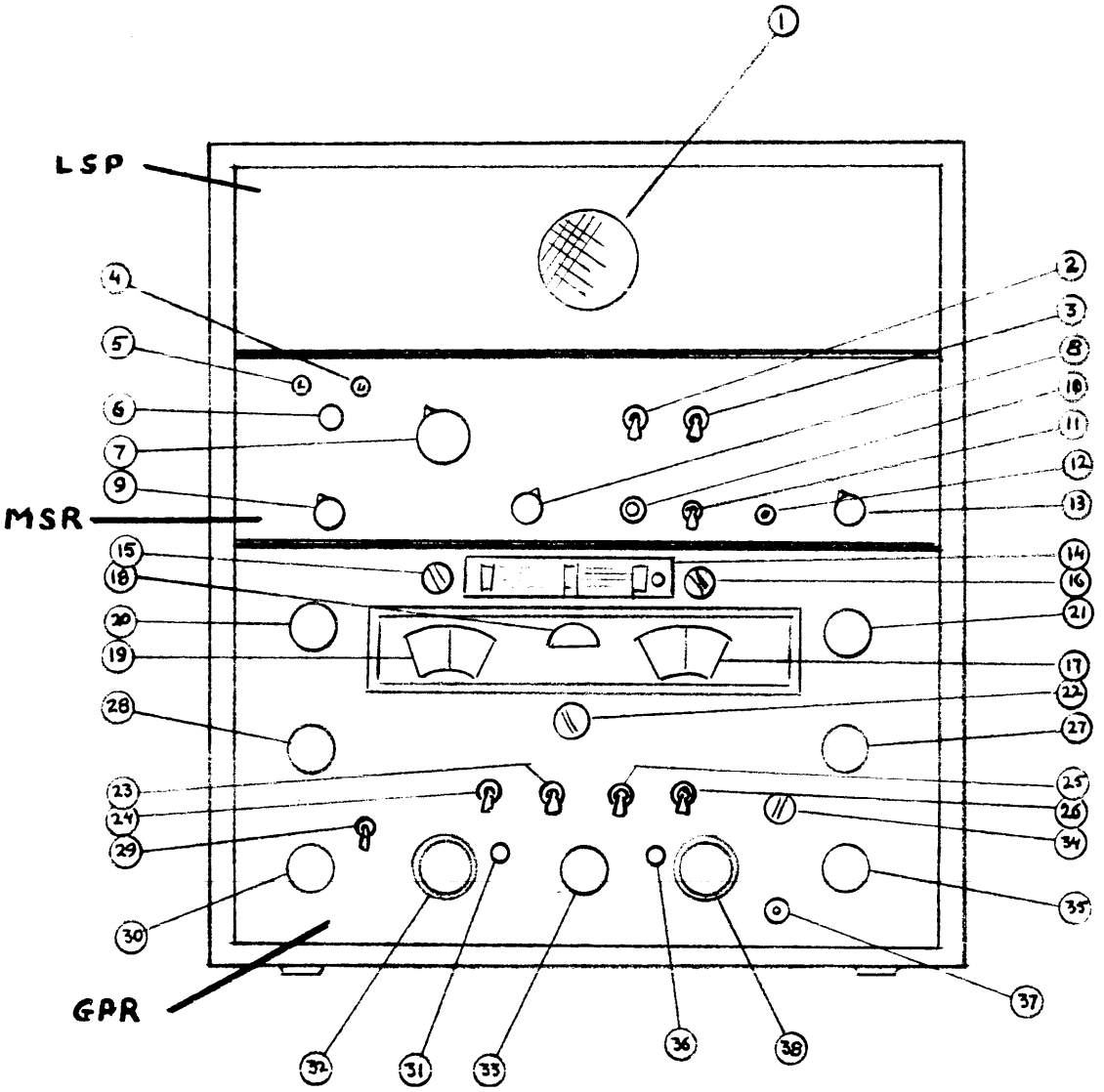

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Figure 3-1. Controls and Indicators, DDR-7H

SECTION 4
PRINCIPLES OF OPERATION

4-1. BLOCK DIAGRAM ANALYSIS. (Refer to figure 4-1)

Signal from the antenna is routed to the GPR. In the GPR the selected r-f signal is amplified by two tuned amplifiers, converted to an i-f at 455 kc, and routed to the MSR. For reception between .54 and 5.6 megacycles, conversion to 455 kc is accomplished in one step; for reception between 5.4 and 31.5 megacycles, conversion to 455 kc is accomplished in two steps. The higher first i-f frequency (3.955 mc), used for reception between 5.4 and 31.5 megacycles, maintains good image rejection. Conversion from 3.955 mc to 455 kc is accomplished with a crystal-controlled oscillator. The first converter uses either a variable oscillator gauged to the main tuning capacitors, a crystal oscillator, or an externally supplied hfo signal.

Three stages of amplification are provided for the 455 kc signal in the GPR. This i-f amplifier chain contains a crystal filter; bandpass is selectable in steps from 250 cps to 7000 cps. The detector and audio stages of the GPR are not used.

Final conversion, detection, and amplification is accomplished in the MSR. The conversion oscillator in the MSR is operable at either 438- or 472 kc, and the final i-f bandpass is centered slightly above 17 kc. The selected final conversion frequency determines what portion of the i-f signal is applied to the detector. When the final conversion frequency is 438 kc, i-f signals between 455.3- and 458.0- kc are heterodyned to the range of 17.3- to 20.0- kc, and applied to the detector. This corresponds to a spectrum between 300- and 3000- cps higher in frequency than that point to which the GPR is tuned.

When the final conversion frequency is 472 kc, i-f signals between 452- and 447.7-kc are heterodyned to the range of 17.3- to 20.0 kc. and applied to the detector. This corresponds to a spectrum between 300- and 3000- cps lower in frequency than that point to which the GPR is tuned. In this manner, either the upper or lower sideband of a signal can be selected at the MSR. In order to receive an AM signal, either the high frequency oscillator in the GPR or the final conversion oscillator in the MSR must be offset approximately 300 cps to place the received carrier and one sideband in the 17.3- to 20.0 kc bandpass of the MSR filter. Similarly, one of these oscillators must be offset in order to receive a CW, FSK, or FAX signal.

For SSB, CW, FSK, or FAX reception, the detector in the MSR operates as a product detector, and the BFO in the MSR is used. For AM or MCW reception, the BFO is disabled, and the detector operates as a plate detector.

4-2. SLOT TUNING

The GPR working with the MSR unit is essentially a "slot tuning" system. The GPR may be regarded as one movable "slot" (or bandpass width) of 6-kc, and the MSR as a movable "slot" of 3.4-kc width. These slots may be moved up and down the frequency spectrum of signals present in the air waves in such a way as to give a high degree of selectivity for the band of frequencies desired. The "slots" are "moved" by changing the frequency outputs of the GPR HFO and MSR IFO, as described in the following paragraphs.

The functional block diagram (figure 4-1) illustrates frequency translations of the GPR and MSR units. A frequency (F_C) in the 0.54- to 31.5-mc range is received from the antenna by the r-f amplifier stage of the GPR and routed to the 1st converter (V3). When operat-

ing with variable HFO, adjustment of the MAIN TUNING and BANDSPREAD knobs varies the output frequency of the HFO (V12) to equal F_c + 455 kc. The F_c +455 kc is routed to the 1st converter where it mixes with F_c to produce the difference frequency of 455 kc. When the RANGE SELECTOR switch is turned to band 1, 2, or 3, the 455 kc is routed directly to the i-f amplifier section. When the RANGE SELECTOR switch is turned to band 4, 5, or 6, 455-kc (3.955 mc) is generated in the 1st converter (V3), and is routed to the 2nd converter (V4) and 3.5-mc oscillator. The 3.5 mc mixes with the 3.955 mc to produce a difference frequency of 455 kc. The second conversion stage for the upper bands performs the function of improving image rejection. The 455 kc is routed from the GPR to the i-f amplifier stage (V2) of the MSR and the 1st mixer (V3). With the MSR BANDSPREAD knob set at 0, and according to the selection made by the SIDEBAND switch, either a 438-kc or 472-kc frequency is injected into the 1st mixer. In either case, a difference frequency of 17 kc is produced when mixed with the 455 kc.

When an audio tone (Fa) is introduced at the transmitter, two sideband frequencies Flsb and Fusb are created. $F_{1}sb = F_c - F_a$ and $F_{usb} = Fc + F_a$.

The course of a sideband frequency tone takes the same route as F_c, which may be now considered as the carrier frequency. At the input of GPR, F_{lsb} ($F_c - F_a$), a lower sideband frequency tone, mixes with F_c + 455 kc from the HFO to produce a difference frequency equal to $F_c + F_a$, becoming momentarily an upper sideband frequency tone. Similarly, an upper sideband frequency tone, F_{usb}, appears at this point as a lower sideband tone. Carrier (F_c) and inverted sidebands are sent to the 1st mixer in the MSR. With the MSR BANDSPREAD

knob set at 0, the LSB IFO produces its center frequency of 438-kc and the USB IFO produces its center frequency of 472-kc, When the SIDEBAND switch is set to LSB, the 1st mixer receives 438 kc and the incoming F_{lsb} (or $F_c + F_a$) and F_c at the input of V3. F_c (455 kc) mixes with the 438-kc to produce 17 kc; $F_c + F_a$ (455 kc + F_a) mixes with the 438-kc to produce 17 kc + F_a. When the SIDEBAND switch is set to USB, the 1st mixer receives 472 kc and the incoming F_{usb} (or $F_c - F_a$) and F_c at the input of V3. F_c (455 kc) mixes with the 472 kc to produce 17 kc; $F_c - F_a$ (455 kc - F_a) mixes with the 472 kc to produce 17 kc + F_a. Therefore, in either condition, LSB or USB, the sideband filter (Z1) receives F_c and $F_c + F_a$. Since the filter passes only frequencies in the 17.4- to 20.8-kc range, the 17-kc F_c is dropped and the sideband frequency (17 kc + F_a) is passed to the detector. By introducing 17-kc from the BFO, the audio frequency, F_a, is obtained.

The above description is for the GPR 6-kc wide "slot" centered on (or tuned to) F_c, with the MSR 3.4-kc wide "slot" offset from F_c by 2.1 kc by the "0" setting of the MSR BANDSPREAD knob. With these settings, setting the SIDEBAND switch to U or L will automatically select upper or lower sideband from a SSB signal. For selecting a sideband and carrier out of an AM or MCW signal, the MSR "slot" may be "moved" over to include the carrier frequency by adjustment of the MSR BANDSPREAD knob. Adjustment of this knob changes the LSB or USB IFO frequency, thereby changing the frequency output of V3 mixer sufficiently to move F_c up the frequency scale from 17 kc to be included in the 17.4 - to 20.8-kc filter passband. Carrier and sideband are now sent to V4 detector, the BFO is set to OFF, and diode

detection takes place. In receiving a CW signal, the GPR "slot" is centered on (or tuned to) F_C and the MSR "slot" is "moved" to center on F_C. This produces approximately a 19 kc tone from V3 which, when mixed with the 17-kc output of the BFO, produces a 2-kc tone from the V4 mixer. The tone may be changed, if desired, by a further adjustment of the MSR BANDSPREAD knob. Adjacent frequencies are removed by narrowing the GPR "slot" from its 6-kc width down to a .25-kc width, by means of the GPR RF SELECTIVITY knob.

In tuning tables 3-1 through 3-2, in certain instances the GPR receiver is slightly detuned in order to center the 6-kc width "slot" on the desired band of frequencies. The MSR "slot" is then set accordingly. Whenever the GPR is thus detuned, the highly stable crystal bandpass filters (selectable in 5 widths: 2.0 kc, 1.5 kc, 1.0 kc, 0.5 kc and 0.25 kc) may be used to narrow the GPR "slot" to the best position for eliminating adjacent noise while allowing the desired intelligence to come through. For example, in SSB reception, the GPR is centered on the sideband frequencies, rather than the carrier, in order to afford filtering at the high and low ends of the sideband.

The signal flow of the DDR-7H system is illustrated in figure 4-2.

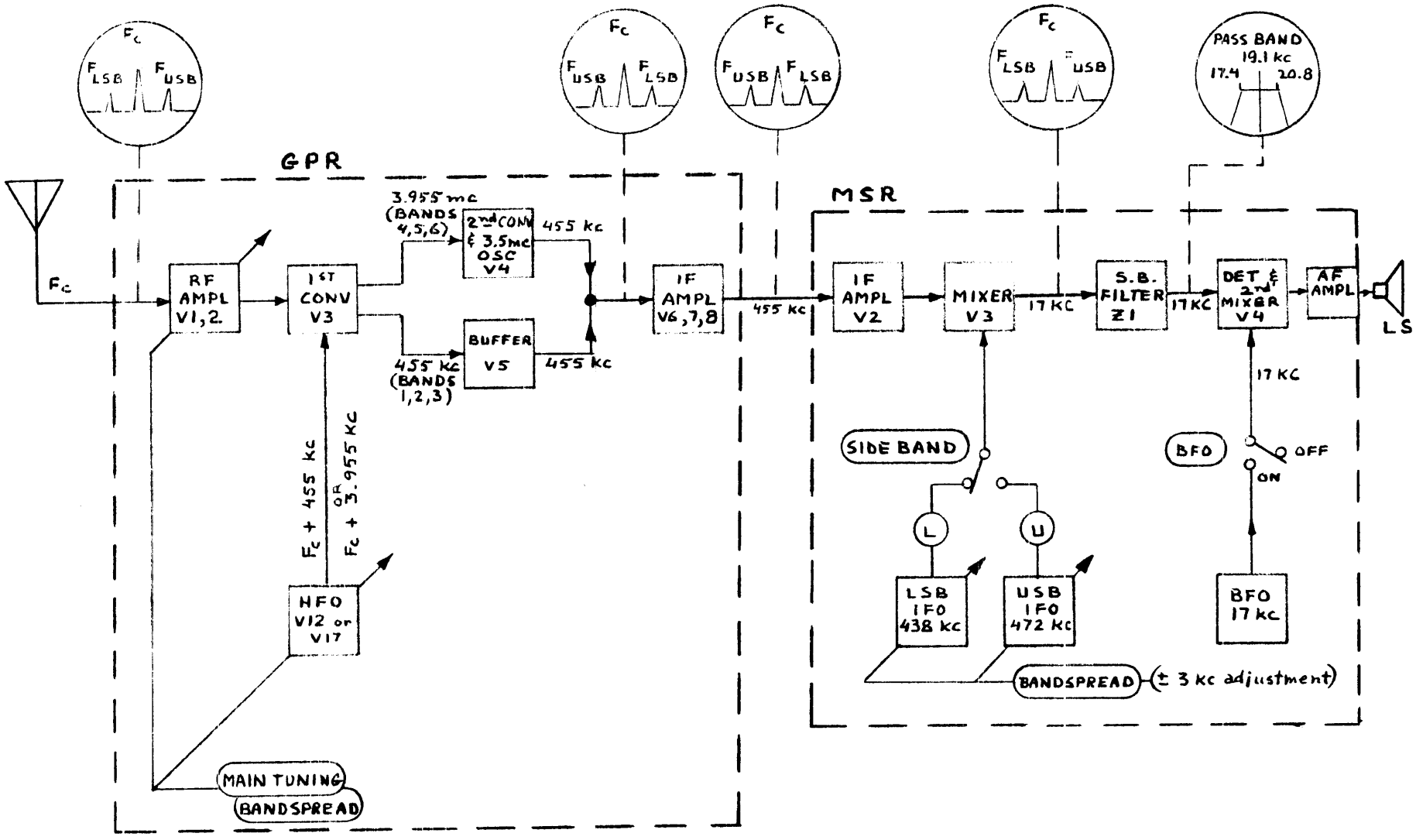

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Figure 4-1. Functional Block Diagram, DDR-7H

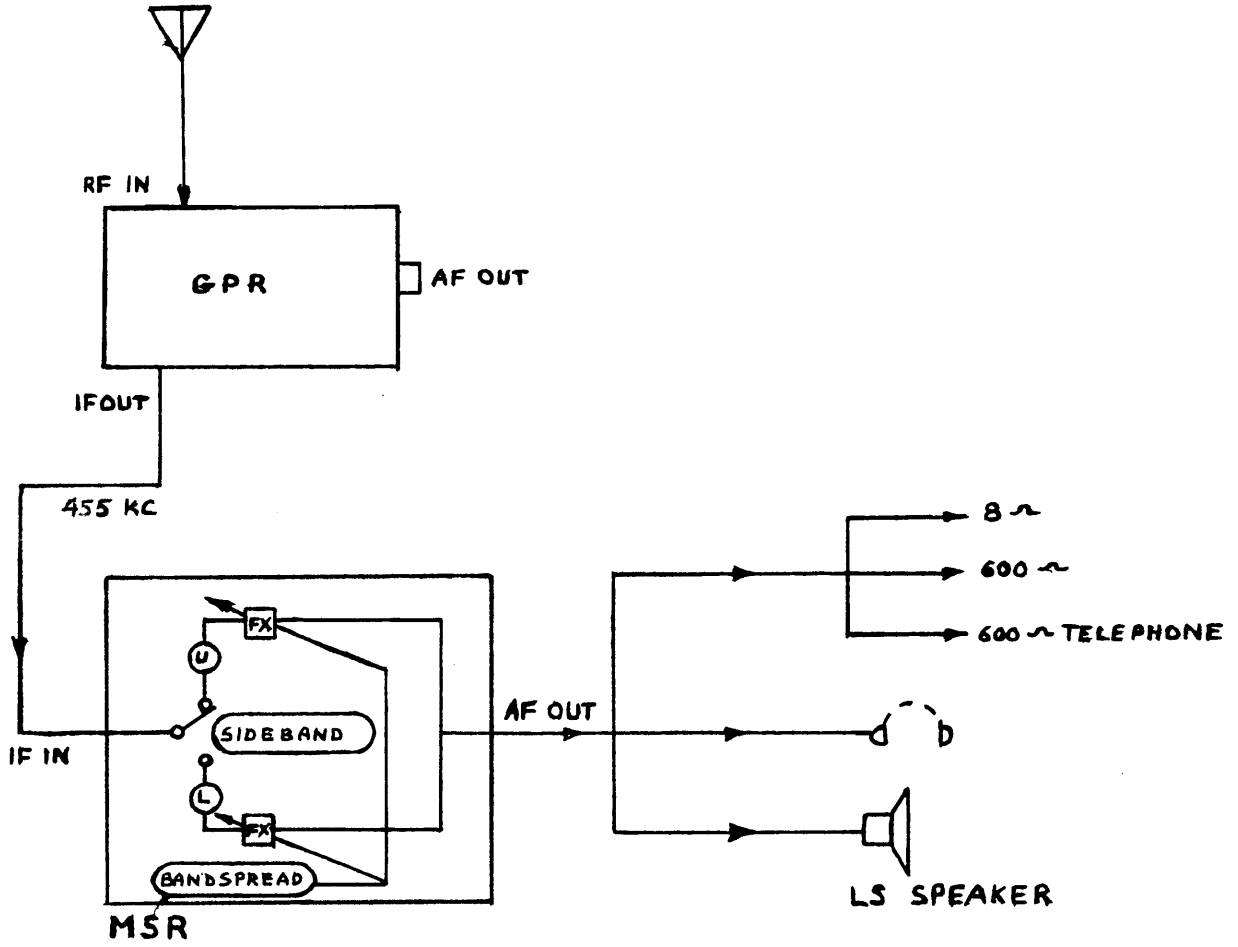

Figure 4-2. Signal Flow Diagram, DDR-7H

SECTION 5
MAINTENANCE

For maintenance of DDR-7H system refer to the individual modular units.

SECTION 6
PARTS LIST

Parts list information for the equipment rack used for the receiver system is contained in the Appendix to this volume.

Parts list information for Communications Receiver GPR, Mode Selector, Receiving MSR, and Loudspeaker Panel LSP is contained in the individual modular-unit manuals.

SECTION 7
SCHEMATIC DIAGRAMS

For schematic diagrams of the individual units employed in the DDR-7H system, refer to the modular-unit manuals.