

Chapter 2 - Operation

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2.1 INTRODUCTION.

2.1.1

Radio Receiver R-390A/URR is a general purpose receiver that is designed to receive continuous-wave (CW), tone modulated CW (MCW), amplitude-modulated (AM), frequency-shift keyed (FSK), and, in conjunction with a converter, single-sideband (SSB) transmissions in the 0.5 to 32 MHz range. The receiver furnishes AF output power to a local loudspeaker and headset or a balanced line in all modes.

2.1.2

A single-sideband converter may be used with the receiver for the reception of single-sideband (SSB) signals. This permits reception of SSB signals with a 3.5 kHz bandwidth. A double sideband, either AM or phase-modulated (PM), occupying up to a total bandwidth of 3.5 kHz also can be received. This mode is used primarily for the reception of multi-channel radio-teletypewriter transmissions.

2.1.3

Operator maintenance consists of those checks and tests that can be done by equipment controls or by visual observation. Technician maintenance consists of alignment and troubleshooting procedures usually requiring the use of test equipment. Refer to figure 2-1 for location and identification of operating controls and indicators.

2.2 CONTROLS AND INDICATORS.

2.2.1

All controls, indicators, and connectors required for normal use are located on the front panel (figure 2-1).

2.2.2

Fuses and other connectors are located on the back of the receiver (figures 2-2 and 2-3).

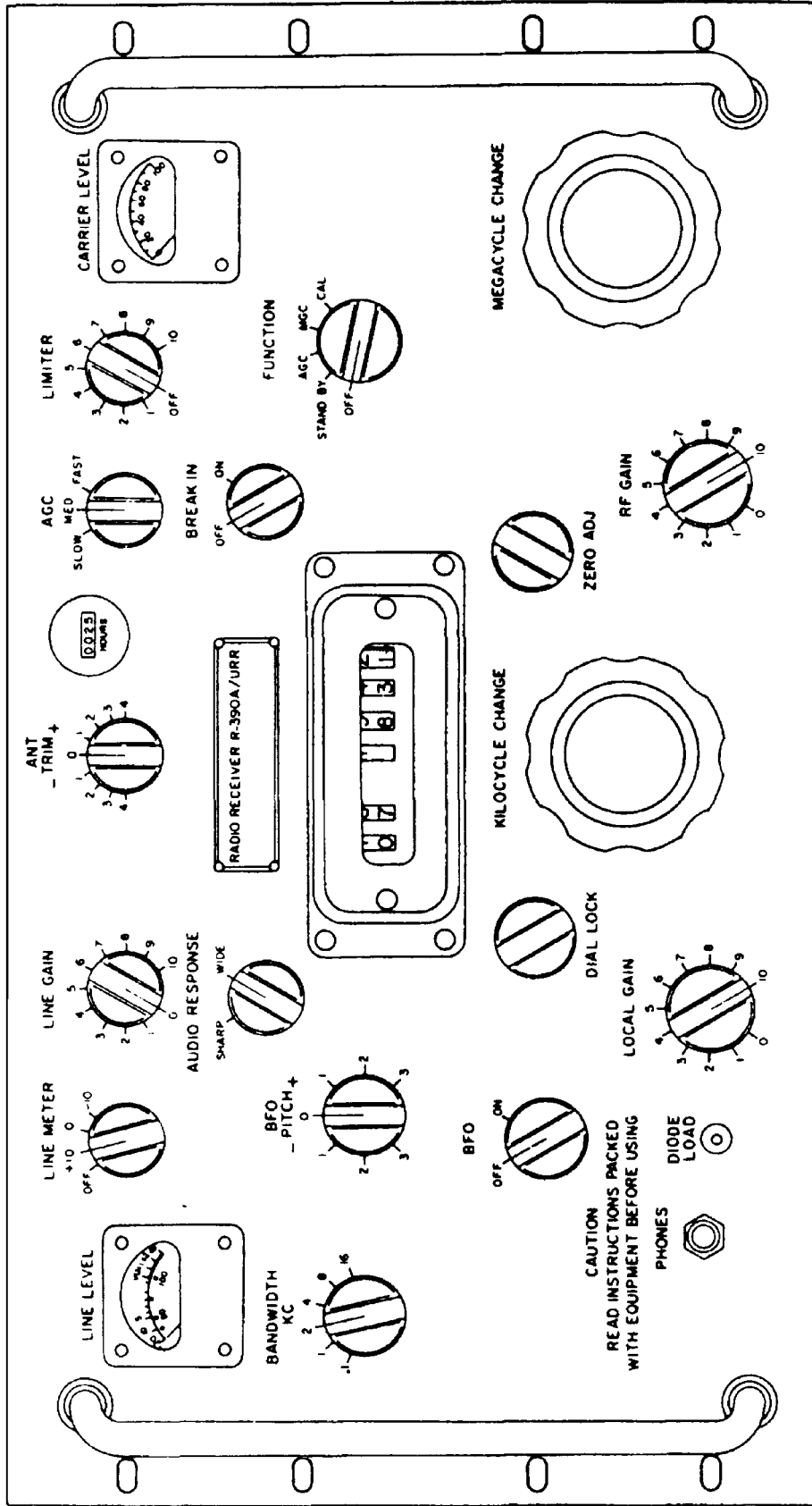
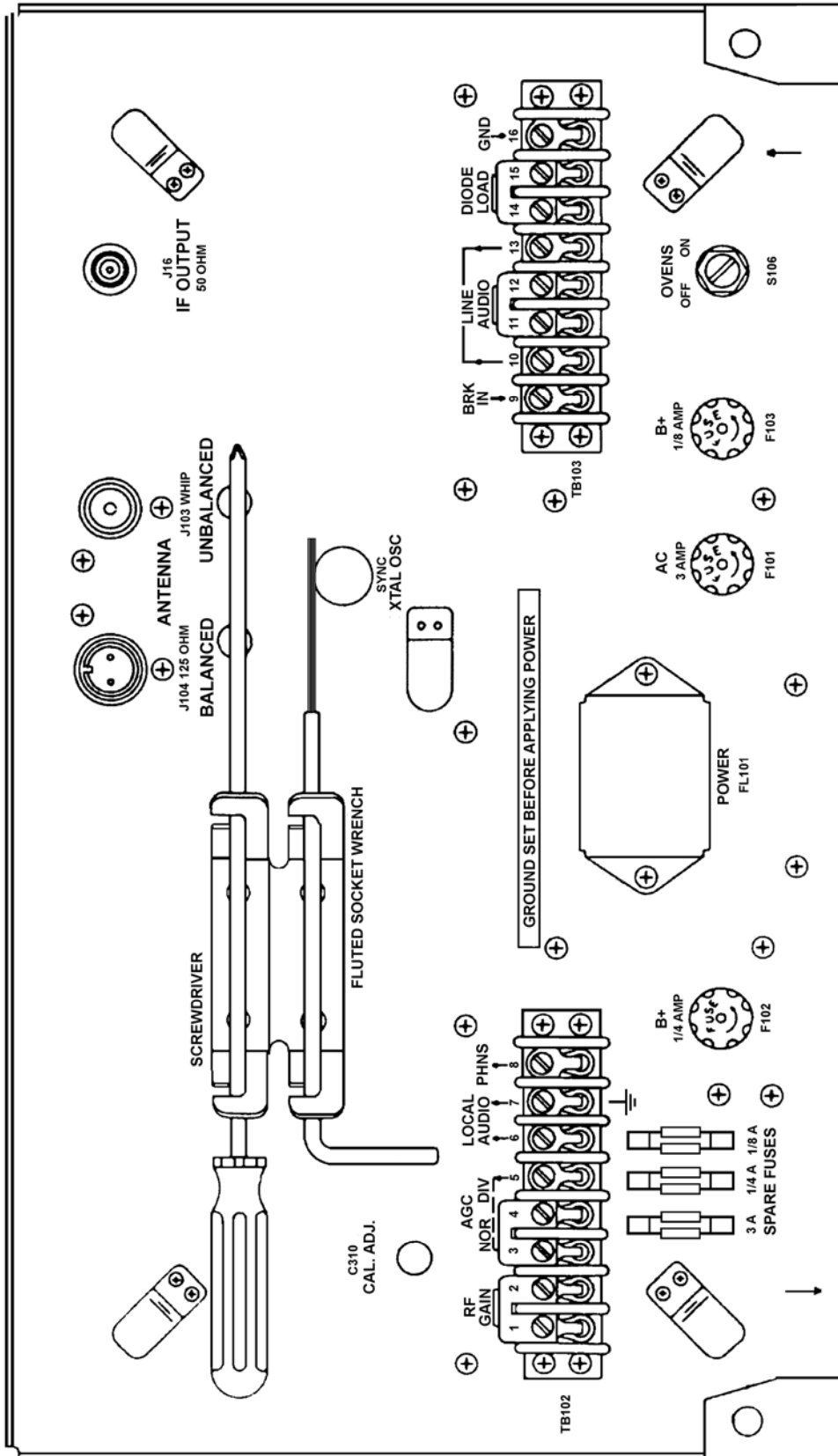


Figure 2-1 - Front Panel DW Holtman Wb7SSN



NOTE:
 FUSES F102 AND F103 APPEAR ONLY
 IN RECEIVERS BEARING ORDER NO
 14-PHILA-55. SERIAL NUMBERS 2683
 AND ABOVE, AND ORDER NO 14395-
 PHILA-58.

Figure 2-2 - Rear Panel

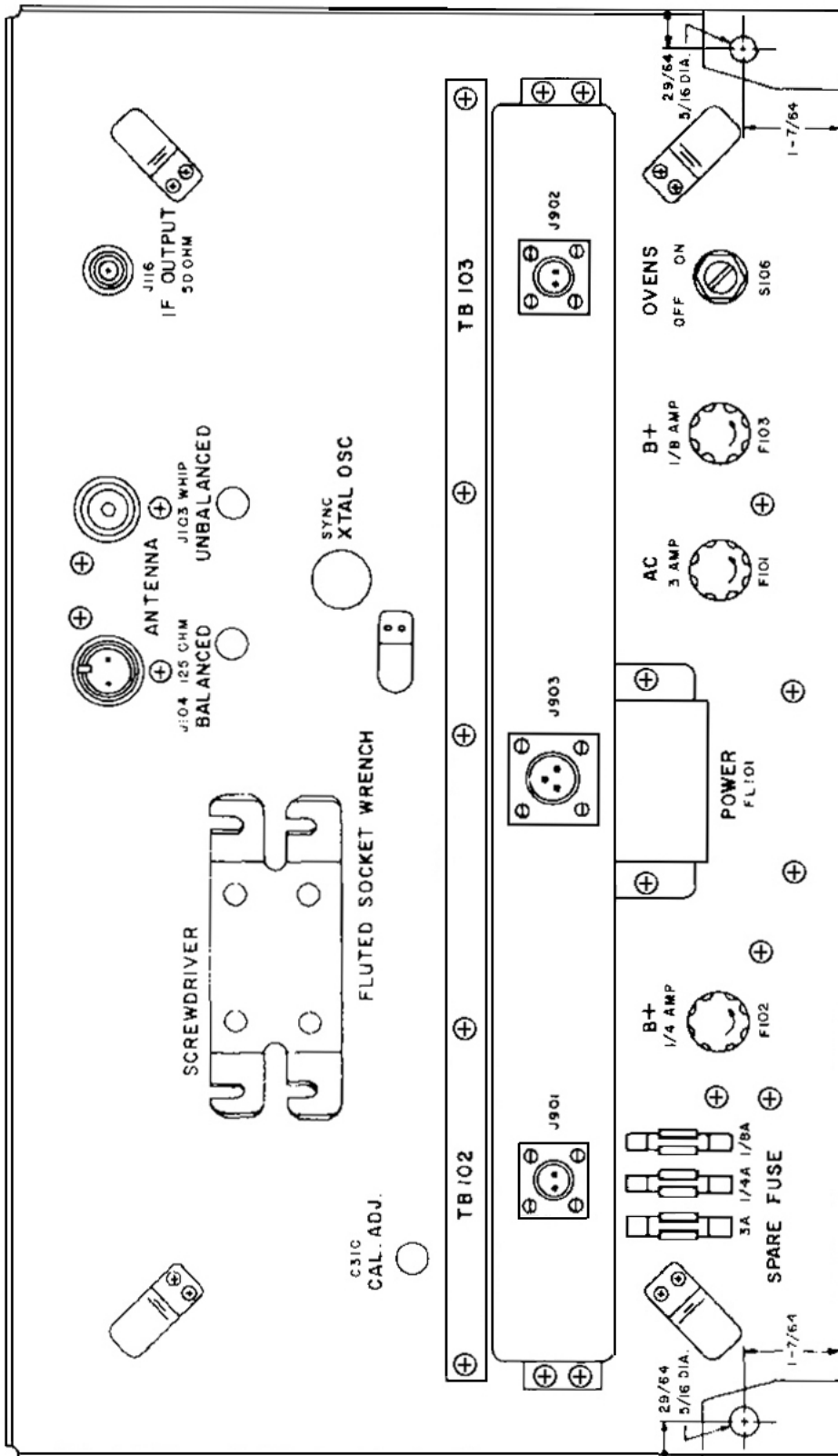


Figure 2-3 - Rear Panel for Shipboard Use

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Table 2-1 - Operating Controls, Indicators and Connectors

Control/Indicator/Connector	Reference Designation	Function	
LINE LEVEL meter	M101	Indicates level of balanced-line audio output.	
LINE METER switch	S105	LINE METER Switch has four positions:	
		Position	Effect
		OFF	Disconnects meter from balanced-line output.
		+10	Adds 10 VU to LINE LEVEL meter VU indication.
		0	Reads LINE LEVEL meter directly.
		-10	Subtracts 10 VU from LINE LEVEL meter indication.
FUNCTION switch	S102	FUNCTION switch has five positions:	
		Position	Effect
		OFF	No power applied.
		STAND BY	Receiver inoperative, filament voltage applied to tubes.
		AGC	Receiver operative, with gain controlled automatically.
		MGC	Receiver operative, with gain controlled by RF GAIN or by an external control.
		CAL	Receiver and internal 100 kHz oscillator operative for calibration checks.
BREAK IN switch	S103	Permits break-in operation with proper connections on rear terminal board.	
<i>LINE GAIN control</i>	R104	Controls level of signal applied to balanced-line audio output terminals.	
AUDIO RESPONSE switch	S104	Position	Effect
		Sharp	800 Hz tone is loudest; used for CW.
		Wide	Most voice frequencies are heard.

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Table 2-1 - Operating Controls, Indicators and Connectors (Cont'd)

Control/Indicator/ Connector	Reference Designation	Function
BANDWIDTH KC switch	S501	Changes the band pass centered on the carrier frequency to the width selected.
BFO PITCH control	L508	Used to adjust pitch of audio output tone when receiving CW.
BFO switch	S101	Turns on beat frequency oscillator by applying plate and screen voltages.
PHONES jack	J102	Used to connect headset to audio output.
DIODE LOAD jack	J904	Used to measure detector voltage.
LOCAL GAIN control	R105	Controls the audio output to phones or local speaker.
DIAL LOCK- control		Mechanical lock on KILOCYCLE CHANGE control.
KILOCYCLE CHANGE control		Gear train Tunes various RF circuits to any frequency within a 1 megacycle band; changes reading of last three digits of frequency indicator
Frequency Indicator Counter		Indicates frequency receiver is tuned to
ZERO ADJ Control		Mechanical clutch Used to calibrate the frequency indicator to a known frequency
RF GAIN control	R103	Manual control of amplification of receiver signal
MEGACYCLE CHANGE control	Gear train	Selects any frequency band from 0.5 to 32 MHz in 1 MHz steps; changes first two digits of frequency indicator

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Table 2-1 - Operating Controls, Indicators and Connectors (Cont'd)

Control/Indicator/ Connector	Reference Designation	Function
CARRIER LEVEL meter	M102	Indication of 0 dB with RF GAIN control at 10 corresponds to an input signal of approximately 2 micro-volts
LIMITER switch and control	R120	Controls static and noise interference
AGC switch	S107	Controls rate of change in gain when signal strength changes
ANT TRIM control	C225	Used for peaking signal
BALANCED ANTENNA connector	J104 (rear panel)	For doublet antenna
UNBALANCED ANTENNA connector	J103 (rear panel)	For long wire or whip antenna
OVENS switch	S106 (rear panel)	Set to ON position when receiver is operated under low temperature or variable-temperature conditions. Set to OFF position when receiver is operated in a temperature regulated building, or when maximum frequency stability is not required.

¹ EE125-AB-OMI-010/P610 R390A/URR stated "1 to 32 MHz" - The dial actually indicates from 0 to 31 MHz while the radio tunes from 0.5 to 32 MHz (31.9999)

2.3 OPERATING INSTRUCTIONS AND CONTROL SETTINGS

2.3.1 Pre-operational Settings.

1. Turn the FUNCTION switch to STANDBY and allow receiver to warm up for 20 minutes.
2. Turn DIAL LOCK fully counterclockwise.

2.3.2 Operating Procedures.

2.3.2.1 Calibration

To maintain maximum tuning accuracy, calibrate the frequency indicator at the 100 kHz point nearest the desired frequency. Re-calibrate whenever the MEGACYCLE CHANGE control is turned.

- a) Turn the BANDWIDTH switch to 1 position.
- b) Turn the BFO switch to ON.
- c) Turn the BFO PITCH control to 0.
- d) Turn the FUNCTION switch to CAL.
- e) Turn the MEGACYCLE CHANGE control to the desired band.
- f) Turn the KILOCYCLE CHANGE control to the 100 kHz point nearest the desired frequency.
- g) Turn the ZERO ADJ knob fully clockwise.
- h) Turn RF GAIN control to 10.
- i) Turn LOCAL GAIN control to desired level.
- j) Adjust the KILOCYCLE CHANGE control for a peak indication on the CARRIER LEVEL meter.
- k) Adjust the ANT TRIM knob for a peak indication on the CARRIER LEVEL meter.
- l) Turn the ZERO ADJ fully counterclockwise. The frequency dial is now calibrated.
- m) The BFO PITCH control should produce a zero beat at 0. If not adjusted for zero beat, loosen the knob set screw, set knob to 0 without turning shaft and retighten the knob set screw.

2.3.2.2 AM Reception

1. Set controls as follows:

- a) MEGACYCLE CHANGE control: To desired band.
- b) KILOCYCLE CHANGE control: To desired frequency after calibrating at nearest 100 kHz point.
- c) DIAL LOCK knob: Fully counterclockwise
- d) AGC control: MED
- e) LINE METER switch: 0
- f) RF GAIN control: 10
- g) LOCAL GAIN control: Adjust as required
- h) LINE GAIN control: LINE LEVEL meter indication at the VU mark.
- i) BANDWIDTH switch: 8

1. Adjust the KILOCYCLE CHANGE control and ANT TRIM control for a peak Indication on the CARRIER LEVEL meter.
2. If there is a rapid fade on the signal, turn the AGC control to FAST.
3. To reduce adjacent station Interference turn the BANDWIDTH switch to 4, or 2 if necessary.
4. If the receiver is to be disabled during periods of transmission, turn the BREAK-IN switch to ON. Usually, shore stations only are wired for BREAK-IN operation.
5. Adjust the LIMITER control as needed to reduce excessive noise.

2.3.2.3 MCW or CW Reception.

1. Set controls as follows:

- | | |
|------------------------------|--|
| a) DIAL LOCK knob: | Fully counterclockwise. |
| b) MEGACYCLE CHANGE control: | To desired band. |
| c) KILOCYCLE CHANGE control: | To desired frequency after calibrating at nearest 100 kHz point. |
| d) FUNCTION switch: | MGC |
| e) AGC control: | SLOW |
| f) LIMITER control: | OFF |
| g) BANDWIDTH switch: | 2 |
| h) RF GAIN control: | 10 |
| i) LOCAL GAIN control: | Adjust as desired |
| j) AUDIO RESPONSE switch: | SHARP for CW, WIDE for MCW |
| k) BFO switch: | ON for CW, OFF for MCW |
| l) BFO PITCH control: | 0 |

1. Tune the KILOCYCLE CHANGE control for a zero beat of the desired frequency.
2. Adjust the BFO PITCH control for the desired tone (CW only).
3. To reduce adjacent channel interference turn the BANDWIDTH switch to 1, or .1 if necessary.
4. Adjust RF GAIN control setting to prevent blocking as necessary.

2.3.2.4 FSK Reception.

1. Set controls as in paragraph 2.3.2.3 for CW reception, after which make the following changes:
 - a) BANDWIDTH switch: Turn to 2, except for filter type (teletype converter) equipment where audio frequencies of 2125 and 2975 Hz are used, turn to 4
1. Adjust the KILOCYCLE CHANGE control slightly until mark and space signals have the same signal strength.
2. Adjust the BFO PITCH control for the best teletypewriter copy.
3. Set the LINE METER switch to 0 and turn the LINE GAIN control to 10. The LINE LEVEL meter needle should deflect fully to the right.
4. Adjust the LIMITER control for a LINE LEVEL meter indication at the VU mark on meter dial.

2.3.2.5 SSB Reception.

1. Set controls as in paragraph 2.3.2.3 for CW reception, after which make the following additions or changes:
 - a) BANDWIDTH switch: Set at 4.
 - b) BFO PITCH control: Set at -2 or +2 for USB or LSB respectively.
 - c) KILOCYCLE CHANGE control: Tune to carrier frequency.
 - d) AUDIO RESPONSE switch: WIDE
1. Adjust the BFO PITCH control slightly for the most intelligible reception. It may also be necessary to adjust the KILOCYCLE CHANGE control slightly for the best reception.
2. If the receiver is used with a single-sideband converter then the procedure given in the converter manual should be used for setting the receiver controls.

2.3.2.6 AM Operation in Jamming Environment.

1. Turn the KILOCYCLE CHANGE control very slowly through several dial markings on either side of the desired signal. Some separation of the desired signal from the jamming signal may be achieved.
2. Turn the BANDWIDTH switch to 4 or 2 and again slowly tune the KILOCYCLE CHANGE control.

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3. Adjust the ANT TRIM control to the point where the desired signal is heard with the least amount of interference.
4. Adjust the LIMITER control if the noise is severe.
5. When the jamming signal is weak, turn the FUNCTION switch to MGC and adjust the RF GAIN control as required. The interfering signal may be reduced enough to permit the desired signal to come through.
6. If these steps do not provide a readable signal, request a change of frequency and call sign.
7. Request the use of CW operation, if permissible.
8. If possible, change the direction, length, and height of the antenna. This may reduce the jamming effectiveness so that some degree of satisfactory reception is obtained.
9. If the jamming prevents communication, report this fact to your immediate superior. Keep the receiver tuned to the desired signal; continue to operate.

2.3.2.7 CW or MCW Operation in Jamming Environment.

1. Turn the KILOCYCLE CHANGE control very slowly through a few dial markings on either side of the desired signal. Some separation of the desired signal from the jamming signal may be achieved.
2. Turn the BANDWIDTH switch to 1 or . 1 and turn the AUDIO RESPONSE switch to SHARP, and again slowly tune the KILOCYCLE CHANGE control.
3. Adjust the BFO PITCH control (CW only); it may be possible to separate the tone of the desired signal from the jamming signal to provide readability.
4. Perform steps 3 through 6, 8, and 9 of procedure 2.3.2.6 for AM/MCW operation.

2.3.2.8 Emergency Turn-Off Procedure.

During an emergency such as fire, smoke, etc., main power should be secured at an external switch.

2.3.2.9 Operators Turn-Off Procedure.

1. When the receiver is not to be used but is to be maintained in a state of readiness, turn the FUNCTION switch to STANDBY.
2. To shut the receiver off, turn the FUNCTION switch to OFF.

2.4 OPERATOR'S MAINTENANCE 2.4.

2.4.1 Visual Inspection.

Visual inspections are operator's preventive maintenance that require no special tools or test equipment. This inspection should be made before the equipment is operated and on a regular scheduled basis. Check all items listed below.

⇒ **WARNING:**

The voltage used in this receiver can be dangerous to human life.

Do not check any item with the power on.

1. Check that all cables, headset cords, and antenna cables are properly connected.
2. Check that no cables or cords are cut, frayed, or broken.
3. Check that the antenna cable is not grounded or open.
4. Check all fuses, replace any that are broken or burned-out (burned-out fuses are usually an indication of other troubles). Refer to table 2-2 for fuse location.
5. After all inspections have been made, check that the primary power cable is attached, and all external power switches are on.

2.4.2 Operational Checks.

The operational checks will assist the operator to determine that the R-390A/URR is functioning normally. Place the receiver in AM reception (paragraph 2.3.2.2). After the equipment has had time to warm up, perform the steps shown in table 2-2 in the order given.

⇒ **Caution:**

If at any step in the operational check, normal indication does not occur, turn the FUNCTION switch to OFF. Make a note at which step the malfunction appeared, and the observed indications. Notify the technical maintenance personnel of the malfunction and the indications received.

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Table 2-2 - Operational Checklist

	Action	Normal Indication
1	Set FUNCTION switch to AGC.	Dial lamps lighted. Rushing noise or signal heard in headset.
2	Turn KILOCYCLE CHANGE control to WWV or other standard.	Desired station is heard.
3	Adjust ANT TRIM control for maximum indication.	Maximum deflection of the CARRIER LEVEL meter should be obtained.
4	Turn the LOCAL GAIN control from minimum to maximum,	Volume at the loudspeaker or headset will increase.
5	Turn the LINE GAIN control from minimum to maximum.	Output level to 600 ohm line and LINE LEVEL meter indication will increase.
6	Turn RF GAIN control from minimum to maximum,	Audio output and CARRIER LEVEL meter indication will increase.
7	Turn FUNCTION switch to MGC ² .	With no signal being received, noise level should increase slightly and CARRIER LEVEL meter should not indicate.
8.	Tune KILOCYCLE CHANGE control to several different signals with FUNCTION switch at AGC.	Output volume nearly constant.
9.	Set up calibration procedure as in paragraph 2.3.2.1. Check for normal receiver gain at upper, center, and lower portion of each band, selected by MEGACYCLE CHANGE control.	CARRIER LEVEL meter should indicate not less than 40dB with minor adjustment of KILOCYCLE CHANGE control.
10.	Turn LIMITER control to the right.	Noise level is reduced in amplitude; audio signal is distorted.
11.	Turn LINE METER switch to 0, and adjust LINE GAIN control.	LINE LEVEL reading at 0 dB (VU mark).
12.	Set LINE METER switch to -10.	LINE LEVEL meter reads completely to the right.
13.	Set LINE METER switch to +10.	LINE LEVEL meter reads -10.
14.	Set LINE METER switch to OFF.	No reading on LINE LEVEL meter.
15.	Turn BFO switch ON.	
16.	Turn KILOCYCLE CHANGE control.	A whistle-like tone is heard as each station is tuned in.
17.	Turn BFO PITCH control.	The pitch of the tone changes.
18.	Turn BANDWIDTH KC switch to each position from 16 to .1.	Selectivity becomes sharper and noise decreases. Only low frequency audio tones are heard in the .1 position.
19.	Turn FUNCTION switch to STANDBY.	No noise or signal is heard, dial lamps remain lighted.
20.	Turn FUNCTION switch to OFF.	Dial lamps go out.

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Table 2-3 - List of Overload Protection Devices

Fuse Symbol	LINE VOLTAGE				FUNCTION
	115 Volts		230 Volts		
	OVENS Switch ON	OVENS Switch OFF	OVENS Switch ON	OVENS Switch OFF	
F-101	3 amp	2 amp	1-1/2 amp	1 amp	Line Fuse
F-102	1/4 amp, 250 v		1/4 amp, 250 v		B+ Line (RF)
F-103	1/8 amp, 250 V		1/8 amp, 250 v		B+ Line (IF)
All Fuses are located on the rear panel					

²EE125-AB-OMI-010/P610 R390A/URR stated “AGC” while TM11-5820-358-10 states “MGC”. “MGC” is consistent with the expected “normal indication”.