

Chapter 1 - General Information

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¹Also see chapter 5 Figure 5-13

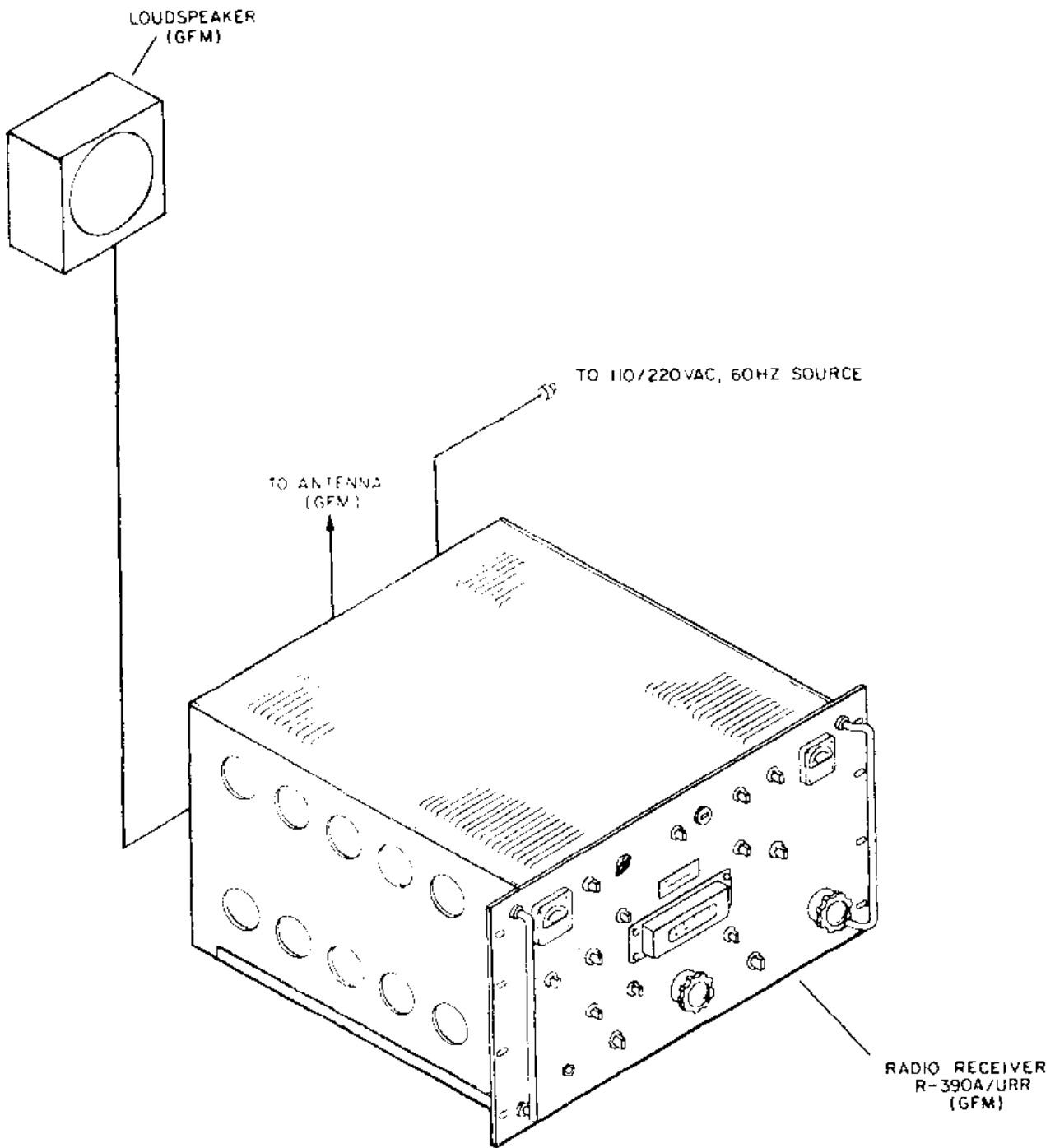


Figure 1-1. Radio Receiver R-390A/URR

1.1 PURPOSE.

1.1.1

Radio Receiver R-390A/URR (figure 1-1) is a general purpose receiver for use in both shore based or shipboard installations. It covers the frequency range of 0.5 to 32 MHz, and is especially adaptable for single-sideband, multi-channel radio-teletypewriter reception with terminal equipment.

1.2 PHYSICAL DESCRIPTION.

1.2.1

The R-390A/URR is an integrally constructed receiver designed for mounting in a standard 19-inch rack or in a table top cabinet. All operating controls, indicators, and a PHONES jack are located on the front panel (figure 2-1). Two handles are provided to aid in removal of the receiver from rack or cabinet. Antenna connections, operating and spare fuses, power cord, IF OUTPUT, OVEN switch, terminal boards, and special tools are mounted on the rear panel (figure 2-2). Cutouts are provided for access to internal controls.

Note: A modified rear panel for shipboard installation is shown in figure 2-3.

1.3 OPERATIONAL DESCRIPTION.

1.3.1

The R-390A/URR provides reception of continuous-wave (CW), modulated-continuous-wave (MCW), frequency-shift keyed (FSK), and single-sideband (SSB) signals. A double sideband signal, either AM or phase-modulated (PM), occupying up to a total of 12 kHz of spectrum for voice transmission may also be received.

1.3.2

The receiver furnishes audio frequency output power to a local loudspeaker and headset or a balanced line output for connection to a remote amplifier and speaker. An intermediate-frequency output is also provided so that teletype or facsimile signals may be applied to appropriate converters or terminal equipment which further process the signals for application to teletypewriters or facsimile recorders (figure 1-2). A single-sideband converter is used to process SSB signals but is not required for common AM reception. The teletype terminal equipment might include a frequency-shift converter or multiplex equipment.

1.4 FUNCTIONAL DESCRIPTION.

1.4.1

Radio Receiver R-390A/URR is a superheterodyne type with multiple frequency conversion covering a frequency range of 0.5 to 32 MHz. Double conversion is used when operating from 8.0 to 32 MHz, and triple conversion when operating from 0.5 to 8.0 MHz. Linear tuning provides constant frequency spread throughout the entire range. Tuning is accomplished by positioning powdered-iron cores in the RF and IF coils, at a rate controlled by a mechanical arrangement of gears, shafts, and cams. The operating frequency is read from a counter-type indicator. A built-in crystal-controlled oscillator provides frequency calibration. An output is taken from between the third and fourth IF stages to provide a 455 kHz output for Sideband Converter CV-591/URR. The output of the LOCAL AUDIO provides either 500 mW power to a 600 ohm load or 1 mW for a headset, while the output of the LINE AUDIO provides a 10 mW output into a 600 ohm balanced line. A BREAK-IN relay is also provided to disconnect the antenna when an associated transmitter is keyed.

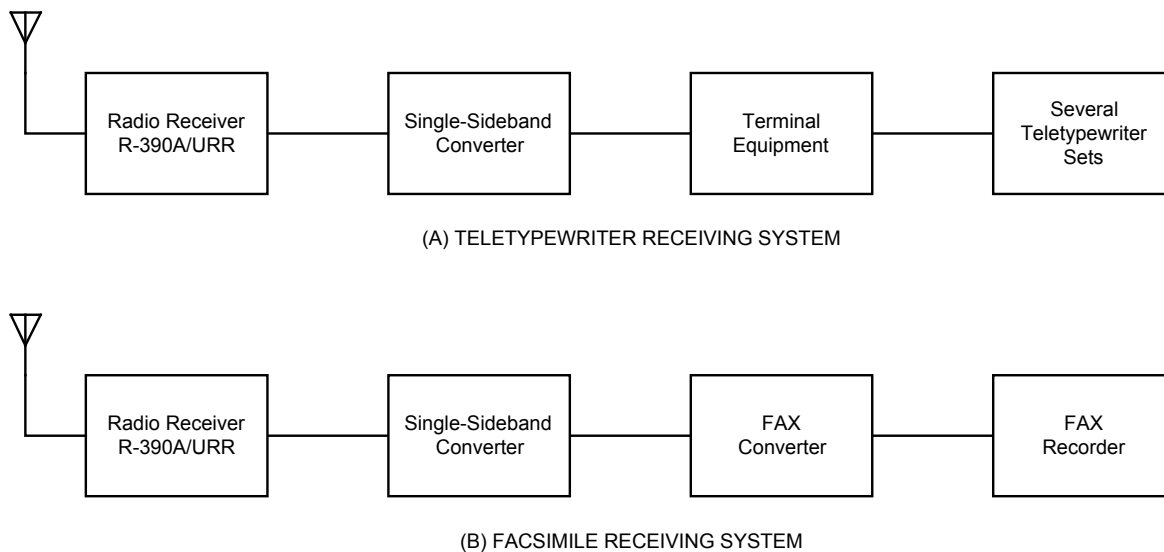


Figure 1-2. System Applications for Teletypewriter and Facsimile Equipment¹

¹ Drawing courtesy Al Tirevold, WAØHQQ

1.5 EQUIPMENT CHARACTERISTICS.

1.5.1

Information relating to equipment capabilities, input requirements, output signals, internal signals, equipment supplied and required, reference data, and field change is contained in tables 1-1 through 1-8.

Table 1-1. Equipment Characteristics

Capability	Parameters
Frequency range	0.5 to 32 MHz
Types of signals received	CW, MCW, FSK, SSB, and AM
Frequency indication	Read from digital Indicator
Method of calibration	Built-In crystal-controlled oscillator
Calibration accuracy	Less Than 300 Hz Calibration points Every 100 kHz
Sensitivity (signal plus noise to noise ratio)	
AM sensitivity	5 μ V at 10dB rise
CW sensitivity	1 μ V at 10dB rise
Ambient temperature range:	
Operating	-40 to +75°C
Storage	-62 to +75°C
Ambient humidity	0 to 95%
VFO stability vs. temperature:	+40 to +60°C, not to exceed 500 Hz; change must be positive. +60 to +75°C, not to exceed 500 Hz; change must be negative + 20 to +40°C, not to exceed 750 Hz, - 40 to -20°C, not to exceed 400 Hz.
Overall stability	-40 to +65°C, not to exceed 300 Hz.

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Table 1-2. Input Requirements

Input	Requirements
Power source	115 or 230 volts AC $\pm 10\%$, 48 to 62 Hz.
Power input	250 watts total; 140 watts with OVENS switch turned to OFF.
Antenna Inputs: Unbalanced Balanced	Whip or single-wire antennas. 125 ohm terminating impedance: matches 50 to 200 ohm balanced, or unbalanced transmission line by use of adapters.

Table 1-3. Equipment Outputs

Output	Requirements
Local audio	1 mw into a headset. 500 mW into a 600 ohm load.
Line audio	10 mW into a 600 ohm balanced line for remote stations.
IF output	455 kHz at 180-220 mV, 50 ohm impedance match.
Diode load	Audio output voltage for test purpose.

Table 1-4. Major Internal Signals

Signal	Characteristics
Calibration signal	100 KHz markers and harmonics.
First crystal oscillator	17 MHz
Resultant sum frequency from first mixer	17.5 to 25 MHz (first variable IF)
Second crystal oscillator	11 to 34 MHz
Resultant difference frequency from second mixer.	3 to 2 MHz (second variable IF)
Variable frequency oscillator	3.455 to 2.455 kHz
Resultant frequency from third mixer.	455 kHz (fixed and final IF)
Beat frequency oscillator	452 to 458 kHz
Resultant beat frequency	from audio detector 0 to 3000 Hz, adjustable

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Table 1-5. Reference Data

Name	Nomenclature
Technical Manual	NAVSHIPS
Maintenance Standards Book	NAVSHIPS 93053.42A

Table 1-6. Equipment Supplied

Item	Height (in.)	Depth (in.)	Width (in.)	Unit Weight (lb.)
Radio Receiver R-390A/URR	10-15/32	16-19/32	19	75

Table 1-7. Equipment Required but Not Supplied

Item	Nomenclature
Doublet antenna or whip antenna or single-wire antenna	
Headset	
Sideband Converter	CV-591A/URR

Table 1-8. Field Change Data

Change	Authorization	Applicability	Identification
No. 1 ²	EIB 526 EIB 551A	All	Lead connected between pins 2 and 7 of tube socket XV603.
No. 2 ³	EIB 542	Shipboard only	Two soldered jumper leads on TB-101.
No. 3	EIB 702	Shipboard only	“AN” type connectors for terminating audio and AC power cables on the rear panel.
No. 4 ⁴	EIB 655 EIB 661 EIB 876	Shipboard only	Diode load test jack located on front panel.
No. 5	EIB 664	Shipboard only	Shorting plug connected to J104 on rear panel.
No. 6 ⁵	EIB 702	Shipboard only	Rectifier tubes V801 and V802 have been removed.
No. 7 ⁶	EIMB See EIB-911	Shipboard installations in Supplementary Radio Spaces only.	Decals located on VFO assembly and RF amplifier chassis “Modified by FC7”.
No. 8	EIMB	Selected ships only	Elapsed time indicator mounted on front panel.

²Field Change 1 is further described in NAVSEA 0976-LP-063-2060.

³Field Change 2 is further described in NAVSEA 0967-LP-063-2070.

⁴Field Changes 4 and 5 are further described in NAVSHIPS 0967-063-2140.

⁵Field Change 6 is further described in NAVSHIPS 0967-063-2110.

⁶Field Change 7 is further described in NAVSEA 0967-LP-063-2120. (NOT recommended for general use)

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1.5.2

Production Changes. During production of the receiver, several changes were made in the equipment (table 1-9). Each of these changes is shown on the receiver by means of a modification number stamped on the affected sub-chassis. A MOD number higher than 1 indicates that all earlier modifications have also been performed. Some receivers may have a MOD number stamped on a part rather than a sub-chassis. This indicates that a modification has been made to the part and it is not a sub-chassis modification.

Table 1-9. Production Modifications⁷

Modifications (See note b.)	Sub-chassis or part bearing MOD No	Mod. Numbers	
		Order No. 14214- Phila-51, 375- Phila-54, and 08719-Phila- 55	Order No. 363- Phila-54
Pin 7, V201, connected to ground instead of to pin 2.	RF	2	1
C275 changed from 5,000 pF. to .033 μ F.	RF	2	1
C612, 68 pF., added in parallel with R601.	AF	1	1
C257, 47 pF., added in parallel with C227.	RF	4	2
Series network of C256, 0.1 uf., and R235, 47 ohms, inserted between terminal 1 of HR202 and ground.	RF	3	2
C232 - 1 and C232 - 2 changed from 2,400 pF. to 1,500 pF.	Z201-1, Z201-2	1	3
Suppressor E213 added between contact 9 of S204 front and junction of E208, R233, and C255.	RF	5	2
C507 and C516 changed from selected value to 51 pF.	IF		1
C508 through C510 and C513 through C515 changed from selected values to 82 pf.	IF		1
Trimmer capacitors C564 through C571 added (fig. 3-6 and See note c.)	IF	2	1
R504 changed from 1, 000 to 560 ohms.	IF	2	1
IF transformers T502 through T503 stagger-tuned at factory (See note a.)	IF	2	1
B+ fuses (See note d.).			

⁷ Figure 5-13 has schematics of the individual production modifications.

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Production Modification Notes

- a. This was also done to receivers on Order No. 08719-Phila-55 with serial numbers 600 and higher.
- b. Modifications to receivers bearing Order No. 14-Phila-56. All of the modifications listed in table 1-9 were made to receivers bearing Order No. 14-Phila-56; however, MOD numbers were stamped only on tuned-circuit assemblies Z201-1 and Z201-2. For identification, the order number has been stamped on each sub-chassis.
- c. Alternate-type filters in some receivers bearing Order No. 14-Phila-56. Some receivers bearing Order No. 14-Phila-56 have 8- and 16-kHz mechanical filters, FL504 and FL505 (fig. 6-16), that require a decreased amount of tuning capacitance across their inputs and outputs. In these receivers, capacitors C515 (82 pf) and C516 (51 pf) are not connected to the output terminals of the filters; instead, both capacitor leads are attached to ground lugs on the filter mounting screws. In addition, capacitors C507 (51 pf.) and C508 (82 pf.) are not connected to the input terminals of the filters; instead, both capacitor leads are attached to ground lugs on a shield underneath the intermediate frequency (IF) chassis. These capacitors are available when filters requiring the full amount of tuning capacitance are installed in the receiver. Capacitors C564, C565, C570, and C571 remain in the circuits.
- d. B+ Fuses. Receivers bearing Order No. 14-Phila-56, serial numbers 2683 and above, and Order No. 14385-Phila-58 have two additional fuses for B+ circuit protection. Fuse F102 is located in the B+ line between pin 5 of plug P111 and pin 5 of plug P119. Fuse F103 is located in the B+ line leading from pin 2 of plug P119.

1.6 SAFETY REQUIREMENTS

⇒WARNING	<p><u>The voltage used in this receiver can be dangerous to human life.</u></p> <p>To prevent shock hazard to personnel touching outside metal parts of the receiver, connect GND terminal 16 on the rear panel to the same ground as that of the power source.</p> <p>Do not depend on the front panel screws or the antenna transmission line to ground the chassis.</p>
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1.7 LOGISTICS DATA

- 1.7.1 The estimated time required to perform scheduled maintenance is 1-1/2 man hours per quarter. Material required in performing scheduled maintenance is listed in table 1-10, and test equipment required to perform all maintenance tasks is listed in table 1-11.

Table 1-10. Materials Required for Scheduled Maintenance

Item	Purpose
Soft-bristled brush	Remove dust from receiver
Lint-free cloth	Wipe receiver surfaces
Cleaning solvent, Navy type 140-F	Remove grease and smudge from receiver surfaces
Pressurized dry air	Remove lighter sediment from hard to reach areas

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Table 1-11. Test Equipment Required

Category	Recommended	Alternate	Parameters
HF Signal Generator	AN/URM-25D ⁸	AN/URM-25() ⁹	400 kHz to 32 MHz, 0.1 uv. to 0.1 v, 400 Hz modulation
RF Multi-meter	ME-30B/U		455 kHz
Electronic Multi-meter	AN/USM-116()	ME-6D U / ¹⁰	2.5 to 345 VAC, 0 to 300 VDC.
Multi-meter	AN/PSM-4()	CSV-260	0 to inf. (∞) ohms
Audio Oscillator	AN/URM- 127	TS-382/U	425 to 3500 Hz, 100 mV.
Oscilloscope	AN/USM-117()	AN/USM-105	0.2 to 2 VDC/cm.
Frequency Counter	AN/USM-207()	CAQI-524D	425 Hz to 32 MHz, 0.1 V RMS.
Tube Socket Adapter	AN/URM-119	MX-1258/U	

⁸ The Instruction Book for the AN/URM-25D RF Signal Generator is NAVSHIPS 0967-187-5010 (1953-Dec-31) formerly NAVSHIPS 92134(A) and Change #7 - NAVSHIPS 0967-187-5016 (1966-Dec-07)

⁹ The Instruction Book for the AN/URM-25F RF Signal Generator Set is NAVSHIPS 92495 (1955-May-12)

¹⁰ The Instruction Book for the ME-6D/U Electronic Multi-meter is NAVSHIPS 92423 (T.O. 33A1-12-102-1) (1955-Jan-18)