

**FIELD AND DEPOT
MAINTENANCE MANUAL**

**RADIO SETS AN/VRC-24
AND AN/TRC-68**

This copy is a reprint which includes current
pages from Changes 1 through 6.

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RADIO SETS AN/VRC-24 AND AN/TRC-68

C H A P T E R 1 .	BLOCK DIAGRAM THEORY		
Section I.	General	1, 2	2
II.	Block diagram of radio sets	3-7	2
C H A P T E R 2 .	RECEIVER THEORY		2-4
Section I.	Receiving signal path	8, 9	5
II.	Directional coupler and rf input stages	10-16	5-7
III.	Uhf injection subunit	17-24	8-11
IV.	First if. stages, second receiver mixer and second oscillator	25-28	12-15
V.	Third receiver mixer and third oscillator section	29-33	16-18
VI.	Audio amplifier subunit and 500-kc if	34-41	19,20
VII.	Squelch and audio output section	42-45	20-24
C H A P T E R 3 .	TRANSMITTER THEORY		25-29
Section I.	Transmitter signal path	46, 47	30
II.	Low-level stages	48-54	30-34
III.	High-level rf and modulator stages	55-61	32-35
C H A P T E R 4 .	THEORY OF BROADBAND, CONTROL METERING, POWER DISTRIBUTION, AND FREQUENCY SELECTION STAGES		35-39 40
Section I.	Broadband reception and transmission	62-65	40,41
II.	Metering circuits	66-76	41-45
III.	B+ and bias distribution	77-79	46-48
IV.	Power control circuits	80, 81	48-51
V.	Control and frequency selection circuits.	82-86	51-60
VI.	Power supplies and minor components	87-91	60-69
C H A P T E R 5 .	TROUBLESHOOTING		70
Section I.	General troubleshooting procedures	92-94	70,71
II.	System application troubleshooting	95, 96	71-75
III.	Unit troubleshooting	97-105	75-130
C H A P T E R 6 .	REPAIRS AND ALIGNMENT		131
Section I.	Removal and replacement of subunits	106-120	131-136
II.	Repairs	121-127	136-169
III.	Alignment	128-137	170-179
IV.	Adjustments	138-141	179-181
C H A P T E R 7 .	FINAL TESTING		182
Section I.	Introduction	142,143	182
II.	Tests	144-161	181-207
A P P E N D I X	REFERENCES		208
I N D E X			209

CHAPTER 1

BLOCK DIAGRAM THEORY

Section I. GENERAL

1. Scope

a. This manual covers field and depot maintenance for Radio Sets AN/VRC-24 and AN/TRC-68. It includes instructions appropriate to third, fourth, and fifth echelons for troubleshooting, testing, aligning, and repairing the equipment, replacing maintenance parts, and repairing specified maintenance parts. The manual also lists tools, materials, and test equipment for third, fourth, and fifth echelon maintenance. Detailed functions of the components are covered in the theory chapter.

b. The complete set of technical manuals for this equipment includes TM 11-5820-222-10, TM 11-5820-222-20, TM 11-5820-222-20P, and TM 11-5820-222-35P.

c. Forward comments concerning this manual direct to the Commanding Officer, U.S. Army Signal Materiel Support Agency, ATTN: SIGMS-PA2d, Fort Monmouth, N.J.

d. For applicable forms and records, see paragraph 2, TM 11-5820-222-10.

2. System Applications

a. *Retransmission Communications System.* Radio Set AN/VRC-24 can be used with Radio Sets AN/GRC-3 through -8 as a retransmission device. In this system, amplitude-modulated (am.) signals within

the 225.0 to 399.9-megacycles (mc) frequency range are received by Receiver-Transmitter RT-323/VRC-24 and retransmitted as frequency-modulated (fm) signals in the frequency range of 20 to 55 mc by Radio Set AN/GRC-3 through -8. Fm signals are received by Radio Sets AN/GRC-3 through -8 and retransmitted as am. signals by Receiver-Transmitter RT-323/VRC-24. Figure 3, in TM 11-5820-222-10 illustrates the necessary cable connections for system operation. Installation details are provided in paragraph 5 of TM 11-5820-222-20.

b. *Broadband Applications.* Both Radio Set AN/VRC-24 and AN/TRC-68 can be used with broadband encoding and decoding equipment to transmit and receive encoded am. radiotelephone signals. The radio sets can be connected to the broadband equipment through the BROADBAND jack on the front panel of either Receiver-Transmitter RT-323/VRC-24 or RT-441/TRC-68. When the broadband encoding equipment is used, audio is coupled from the radio set to the broadband equipment, encoded, and returned to the radio set for transmission. Received encoded signals are detected by the radio set, coupled to the broadband equipment, decoded, and returned to the radio set audio output circuits.

Section II. BLOCK DIAGRAM OF RADIO SETS

3. General

The receiving and transmitting signal paths and automatic frequency selection circuits of Receiver-Transmitter Groups OA-2648/VRC-24 and OA-2649/TRC-68 are identical. The different power supplies, fuses, and blowers used with each receiver-transmitter group comprise the basic electrical differences between

Receiver-Transmitter Group OA-2648/VRC-24 and Receiver-Transmitter Group OA-2649/TRC-68.

4. Simplified Receiving Signal Path (fig. 1)

Receiver-Transmitters RT-323/VRC-24 and RT-441/TRC-68 (referred throughout as the rt units) receive am. signals in

the frequency range of 225.0 to 399.9 mc. The input signals are heterodyned with the 200- to 370-mc signal supplied by the ultrahigh frequency (uhf) injection subunit to produce a 20.0 to 29.9-mc first intermediate frequency (if.) signal. The 20.0 to 29.9-mc if. signal is amplified and heterodyned with a 17.0 to 26.0-mc signal in the first if. amplifier subunit to produce a 3.0 to 3.9-mc if. signal. The 3.0- 3.9-mc if. signal is heterodyned again to produce a 500-kilocycle (kc) if. signal. The 500-kc signal is amplified by the 500-kc if. amplifiers and demodulated. The audio signals are amplified in the 500-kc if. amplifier and audio amplifier and modulator subunits and applied to the local, remote, and fixed level outputs or to the broadband equipment. Decoded signals from the broadband equipment are returned to the audio amplifier and modulator for amplification before being applied to local, remote, or fixed level audio outputs.

5. Simplified Transmitting Signal Path (fig. 2)

The rt units transmit am. radiofrequency (rf) signals in the frequency range of 225.0 to 399.9 mc. During transmission, the first and the 3.0- to 3.9-mc if. amplifier subunits function as signal generators. The 3.0- to 3.9-mc signal is heterodyned with a 17.0- to 26.0-mc signal from the first if. amplifier subunit to produce a 20.0- to 29.9-mc signal. This signal is heterodyned with a 200- to 370-mc signal from the uhf injection subunit to produce an rf carrier that can be varied from 225.0 to 399.9 mc. The rf carrier signal is amplitude modulated by audio frequencies from the audio amplifier and modulator subunit and coupled to the uhf antenna.

6. Frequency Selector System

a. General. The frequency range of the rt units is covered by 1,750 crystal-controlled channel frequencies in 0.1-mc steps. Nineteen channels can be preset for automatic selection from the front panel or from the radio set control. A manual system permits selection of any channel frequency within the 225.0- to 399.9-mc

range without disturbing the preset channels.

b. Frequency Selection.

- (1) The frequency selector subunit includes four automatic positioners: a 20-position channel selector; an 18-position, 10-mc selector; a 10-position, 1.0-mc selector; and a 10-position, 0.1-mc selector. The 20-position, channel selector automatic positioner, controlled by the setting of the CHAN SEL selector switch on the front panel to the CHANNEL selector switch on the radio set control, positions a channel selector memory drum to select the desired channel.
- (2) The 10.0-, 1.0-, and 0.1-mc automatic positioners drive seeking switches which select the frequencies preset on the memory drum or on the MANUAL FREQUENCY controls. The 10.0 -,1.0-, and 0.1-mc automatic positioners also drive five tuning shafts through a series of gear trains.
- (3) The frequency selector shafts are coupled to the tuning shafts within the rf and power amplifier, the uhf injection subunit, and the first and 3.0- to 3.9-mc if. amplifier subunits.
- (4) When each seeking switch reaches its proper position, the corresponding automatic positioner stops. When all automatic positioners have stopped, the rt unit is ready for operation on the selected channel frequency.

7. Power Supplies

a. Radio Set AN/VRC-24 Power Supply. The internal power supply of Radio Set AN/VRC-24 consists of Dynamotor DY-151/U and appropriate filters which provide the +125-, +300-, and -30-volt direct current (dc) operating voltages. Dynamotor DY-151/U operates on an input voltage of 26.4-volt dc. Relay and filament voltages are supplied directly from the input voltage.

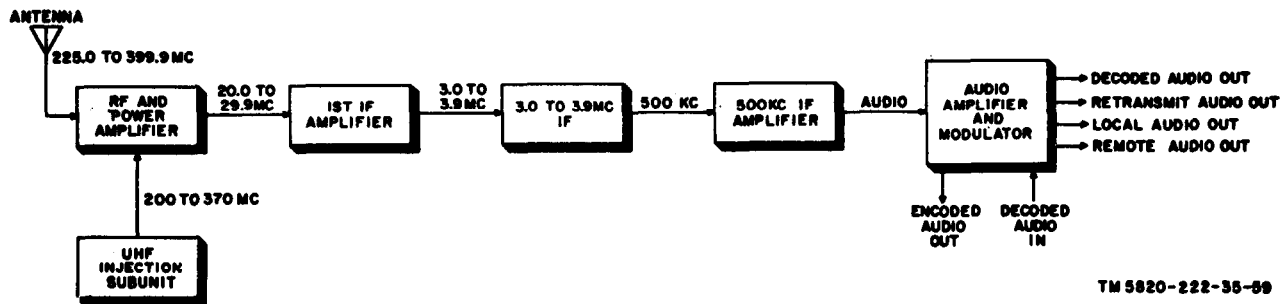


Figure 1. Receiving signal path, simplified block diagram.

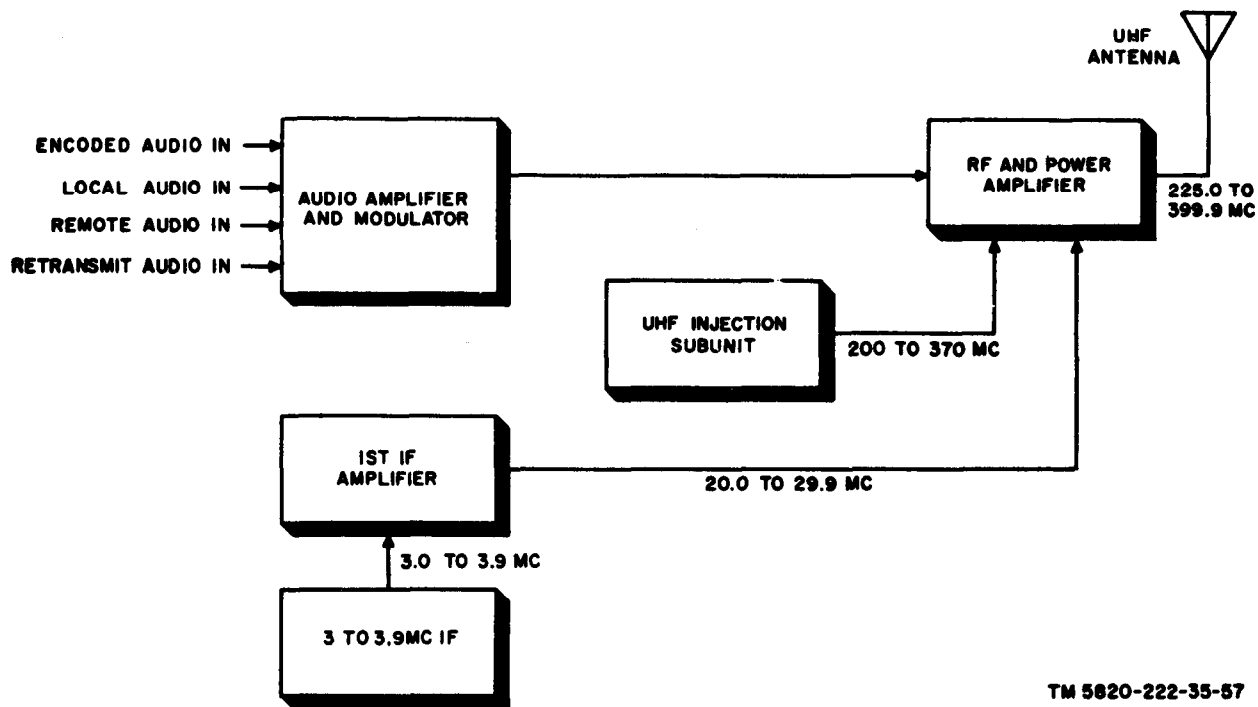


Figure 2. Transmitting signal path, simplified block diagram.

b. *Radio Set AN/TRC-68 Power Supply.* The internal power supply of Radio Set AN/TRC-68 consists of Power Supply PP-1494/U. Power Supply PP-1494/U operates with either external 115- or 230-volt

alternating current (ac), 50/60 cycles per second (cps) input voltages, and supplies +125-volt dc, +300-volt dc and -30-volt dc to the rt unit.