

TECHNICAL MANUAL

DESCRIPTION, OPERATION AND MAINTENANCE

RADIO SET AN/URC-9 ()

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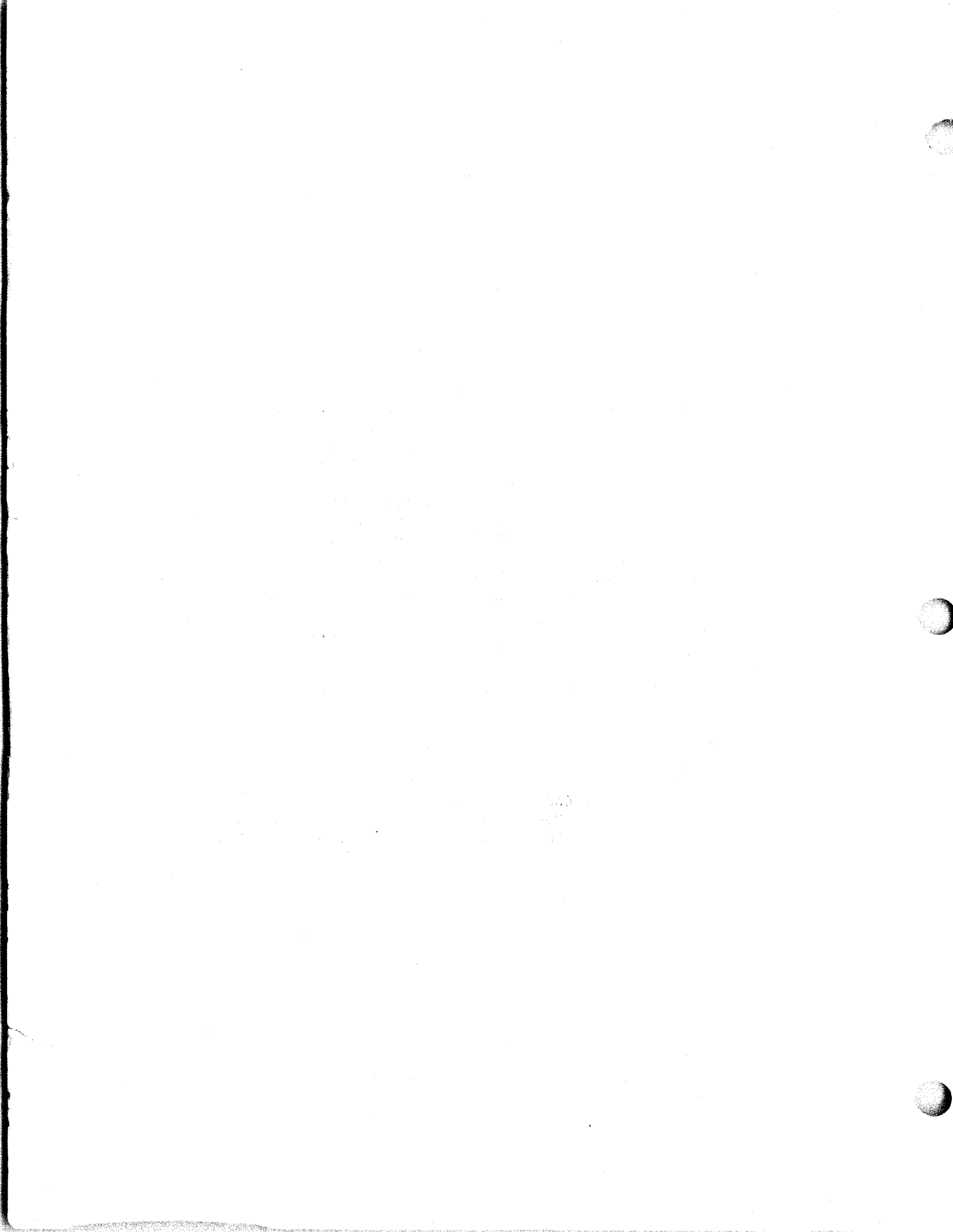


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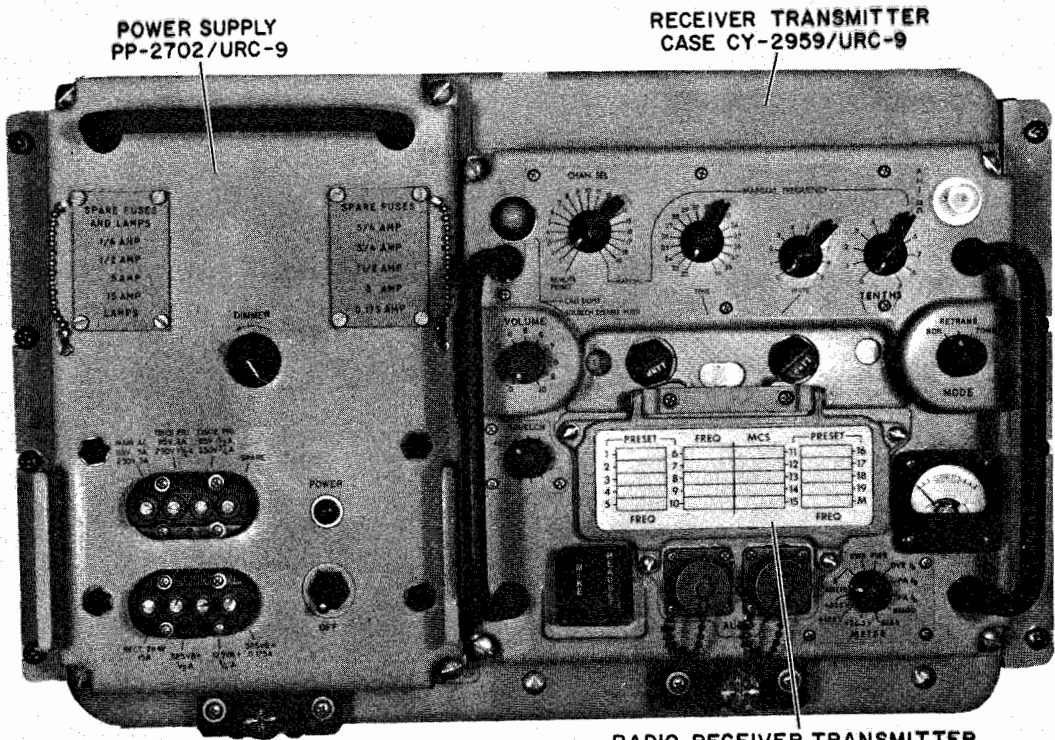
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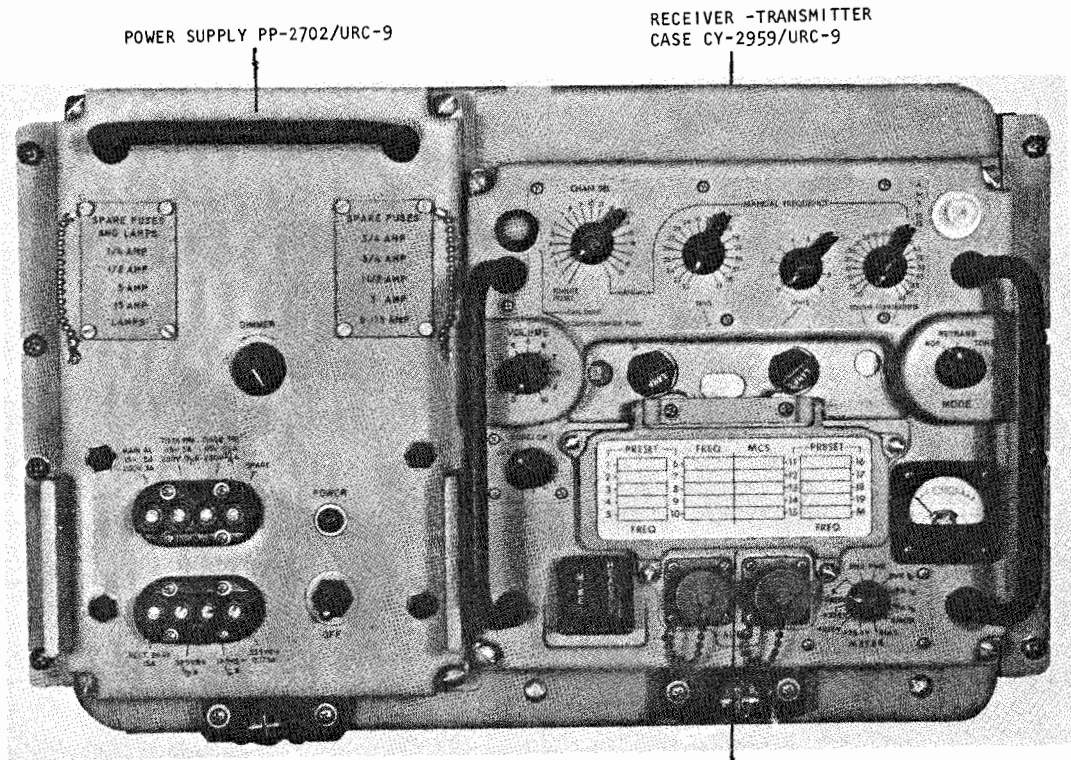
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RADIO RECEIVER TRANSMITTER RT-581/URC-9

A - RADIO SET AN/URC-9



RADIO RECEIVER-TRANSMITTER RT-581A/URC-9

B - Radio Set AN/URC-9A

Figure 1-1. Radio Set AN/URC-9 () (Sheet 1 of 2)

CHAPTER 1

GENERAL INFORMATION

1-1. SCOPE.

1-2. This technical manual contains installation and operating instructions, operating principles, maintenance procedures, and a parts list for Radio Sets AN/URC-9, 9A, 9Y, and 9AY. This manual is effective upon receipt. Extracts from this publication may be made to facilitate the preparation of other Department of Defense publications.

NOTE

All references to Radio Set AN/URC-9 are applicable to Radio Sets AN/URC-9A, AN/URC-9Y, and AN/URC-9AY except where noted.

1-3. GENERAL DESCRIPTION.

1-4. Radio Set AN/URC-9 (figure 1-2) is a transceiver designed for shipboard or fixed-station operation. The radio set provides transmission and reception of amplitude modulation (AM) voice and tone modulation (on MCW keying) on any of 3500 channels (AN/URC-9A) or 1750 channels (AN/URC-9, 9Y and 9AY). Nineteen of the channels can be preset for automatic frequency selection. Complete control of the radio set, including selection of the preset channels, can be exercised locally or from a remote control point. In addition, circuits are incorporated in the radio set to permit the connection of two AN/URC-9 equipments for two-way automatic retransmission. Broadband transmit and receive operation is also selectable from the transceiver.

1-5. Complete control of the radio set from a remote station requires connection be made to auxiliary equipment Radio Set Control C-2383/URC-9. The transmit-receive functions may be controlled from up to five remote stations through the standard 12-wire system using Control

Adaptor MX-8430/URC-9 and Radio Set Control C-1138/UR or C-1207/UR.

1-6. RADIO SET AN/URC-9. Radio Set AN/URC-9 operates on any of 1750 channels spaced at 0.1 MHz intervals within the 225.0 to 399.9 MHz frequency range. Frequency selection is determined by the position of the CHAN SEL switch, which has 19 preset channel positions, a MANUAL position and a REMOTE PRESET position. The 19 preset channel frequencies can be set to any one of the 1750 available channels on a memory drum, accessible through a door in the front panel. When the CHAN SEL switch is in the MANUAL position, any one of the 1750 channels can be selected using the MANUAL FREQUENCY TENS, UNITS, and TENTHS controls on the front panel of the AN/URC-9. When the CHAN SEL switch is in REMOTE PRESET, channel selection is exercised from a fixed remote control station.

1-7. RADIO SET AN/URC-9A. Radio Set AN/URC-9A is functionally identical to the AN/URC-9 except that 3500 crystal-controlled channels spaced at 0.05 MHz intervals in the 225.00 to 399.95 MHz frequency range are provided.

1-8. RADIO SETS AN/URC-9Y AND AN/URC-9AY. Radio sets AN/URC-9Y and AN/URC-9AY are functionally identical to the AN/URC-9 differing only in the internal power supply (PP-4706 and PP-4706A, respectively) and in primary power requirements (24 vdc rather than 115 vac).

1-9. DESCRIPTION OF MAJOR ASSEMBLIES.

1-10. Radio Set AN/URC-9() is comprised of the assemblies listed in table 1-1.

1-11. RECEIVER-TRANSMITTER RT-581/URC-9. Receiver-Transmitter RT-581/URC-9 (which is commonly called the receiver-

transmitter) performs the dual functions of a receiver and a transmitter. The receiver-transmitter operates in the frequency range of 225.0 to 399.9 MHz range spaced at 0.1 MHz intervals. During the non-transmitting intervals, the unit functions as a triple-conversion, super-heterodyne receiver; when the microphone press-to-talk switch is actuated, the unit converts to a transmitter. Crystal-controlled oscillators provide stable RF and IF frequencies in both the transmit and receive sequences.

1-12. The receiver-transmitter consists of a main chassis upon which are mounted 14 subassemblies which make up the electronics of the unit. With the exception of the front panel, all assemblies may be removed at an early stage in troubleshooting either for repair or replacement.

1-13. RECEIVER-TRANSMITTER RT-581A/URC-9. Receiver-Transmitter RT-581A/URC-9 is functionally identical to RT-581/URC-9 except that 3500 crystal-controlled channels spaced at 0.05 MHz intervals in the 225.00 to 399.95 MHz frequency range are provided. The assemblies differ physically in that circuits and switching provide a hundredths position to the frequency spectrum.

1-14. POWER SUPPLY PP-2702/URC-9. Power Supply PP-2702/URC-9 provides all operating voltages required by the receiver-transmitter of Radio Sets AN/URC-9 and AN/URC-9A. The power supply operates on 115 or 230 volts, 50 or 60 cycle ac and provides outputs of +26.5, +325, +275, +125 and -11 volts dc. The power supply also provides 115 volts ac to blowers within Receiver-Transmitter Case CY-2959/URC-9 and the Receiver-Transmitter RT-581 ()/URC-9.

1-15. POWER SUPPLY PP-4706/URC-9Y. Power Supply PP-4706/URC-9Y (commonly called the power supply) provides the operating voltages required by the receiver-transmitter of Radio Set AN/URC-9Y. The power supply operates from a nominal 24-volt dc supply and provides outputs of

115 volts ac, 6.7 volts ac, +26.5 volts dc, -11 volts dc, +125 volts dc, +325 volts dc, and +275 volts dc. The power supply is cooled by means of an internal centrifugal fan which circulates cooling air through louvered ports in the front panel. Plates, normally stored above the power transformer within the power supply, are used to seal the ports to make the radio set immersion-proof during storage and transmit.

1-16. POWER SUPPLY PP-4706A/URC-9Y. Power Supply PP-4706A/URC-9Y (commonly called the power supply) provides the operating voltages required by the receiver-transmitter of RADIO Set AN/URC-9AY. The power supply operates from a nominal 24-volt dc supply and provides outputs of 115 volts ac, -6.3 volts dc, +26.5 volts dc, -11 volts dc, +125 volts dc, +325 volts dc, and +275 volts dc. The power supply is cooled by means of an internal centrifugal fan which circulates cooling air through louvered ports in the front panel. Plates installed over the ports may be reversed to seal the ports to make the radio set immersion-proof during storage and transit.

1-17. RECEIVER-TRANSMITTER CASE CY-2959/URC-9. Receiver-Transmitter CY-2959/URC-9 (commonly called the radio case) provides the mounting facilities for the receiver-transmitter and the power supply. Cooling of the receiver-transmitter is accomplished by means of centrifugal fans within the case and the receiver-transmitter. Air to the Radio Set enters and exits through louvered ports at each side of the case. During transit, the ports are sealed with plates that make the radio set immersion-proof. When set up for operation, the plates are stored on the side of the radio case above the ports. The rear of the radio case provides mounting facilities for cable connectors, PLAIN-BROADBAND switch S1401, and pneumatic and safety relief valves.

1-18. REFERENCE DATA.

1-19. Detailed reference data are given in tables 1-2 and 1-3.

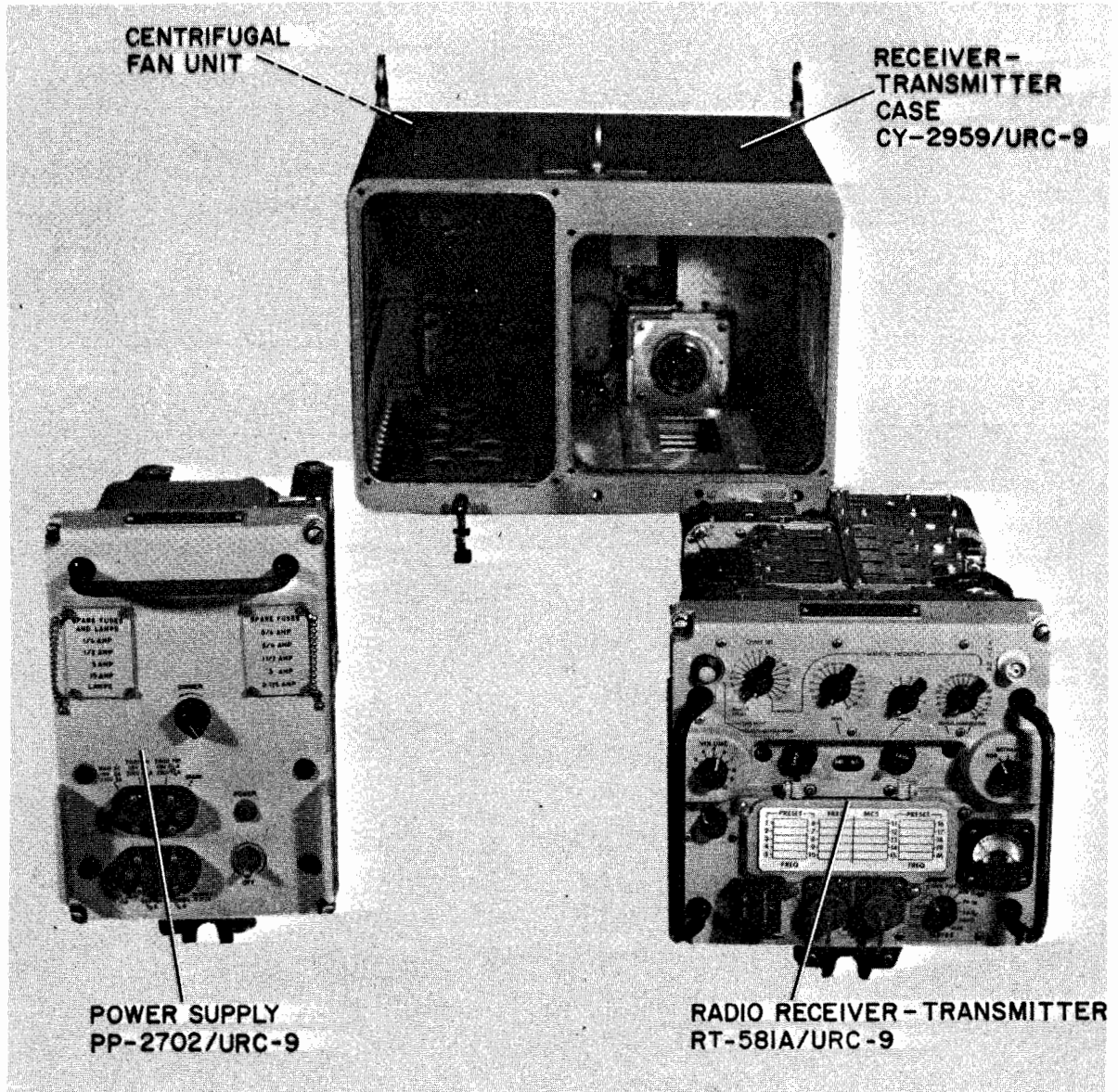


Figure 1-2. Units of Radio Set AN/URC-9(), Typical

Table 1-1. Radio Set AN/URC-9(), Major Assemblies

UNIT	RADIO SET AN/URC-9	RADIO SET AN/URC-9A	RADIO SET AN/URC-9Y	RADIO SET AN/URC-9AY
RECEIVER-TRANSMITTER	RT-581/URC-9	RT-581A/URC-9	RT-581/URC-9	RT-581/URC-9
POWER SUPPLY	PP-2702/URC-9	PP-2702/URC-9	PP-4706/URC-9Y	PP-4706A/URC-9Y
CASE	CY-2959/URC-9	CY-2959/URC-9	CY-2959/URC-9	CY-2959/URC-9

Table 1-2. Reference Data for Radio Set AN/URC-9

CHARACTERISTIC	NUMBER, RANGE, AND/OR VALUE
FREQUENCY: Range Selection	225.0 to 399.9 MHz 1750 automatically selectable channels spaced 0.1 MHz apart for AN/URC-9, 9Y, 9AY 225.00 to 399.95 MHz 3500 automatically selectable channels spaced 0.05 MHz apart for AN/URC-9A
CHANNEL PRESETTING	19 preset channels available on local or remote control, manual frequency selection on local control.
ACCURACY	At 150°F, <u>+12</u> kHz at 100°F, <u>+10</u> kHz at ambient temperature, <u>+10</u> kHz at -40°F, <u>+15</u> kHz at -65°F, <u>+20</u> kHz
CRYSTAL CONTROL: First IF Amplifier; crystal designation	Type CR-55/U
type of cut	AT-cut
frequency range of crystal circuit	17.0 to 26.0 MHz
oscillation frequency	(See table 1-3)
temperature coefficient	Classed as 0
operating temperature	-55°C to +105°C (-67°F to +221°F)
accuracy	<u>+0.005%</u>
stability	<u>+0.0005%</u> over temperature range
Second IF Amplifier; crystal designation	Type CR-18A/U for AN/URC-9, 9Y, 9AY Similar to type CR-18A/U, with two crystal circuits in each mounting for AN/URC-9A
type of cut	AT-cut
frequency range of crystal channel	3.0 to 3.9 MHz for AN/URC-9, 0Y, 9AY 3.00 to 3.95 MHz for AN/URC-9A
oscillation frequency	(See table 1-3)
temperature coefficient	Classed as 0
operating temperature	-55°C to +105°C (-67°F to +221°F)

Table 1-2. Reference Data for Radio Set AN/URC-9 (Continued)

CHARACTERISTIC	NUMBER, RANGE, AND/OR VALUE
Second IF Amplifier (cont)	
accuracy	$\pm 0.005\%$
stability	$\pm 0.0005\%$ over temperature range
Frequency Multiplier Oscillator; crystal designation	Type CR-76/U
type of cut	AT-cut
Frequency range of crystal circuit	31.1 to 45.0 MHz
oscillation frequency	(See table 1-3)
temperature coefficient	Classed as 0
operating temperature	-55°C to $+105^{\circ}\text{C}$ (-67°F to $+221^{\circ}\text{F}$)
accuracy	$\pm 0.0025\%$
stability	$\pm 0.0005\%$
RECEIVER CHARACTERISTICS:	
Type	Triple-conversion superheterodyne, with automatic noise limiting and carrier-operated squelch relay circuits
Input impedance	50 ohms
Sensitivity	6 uv or less for 10-db signal-plus-noise to noise ratio
Selectivity (third IF bandwidth)	80 Hz minimum at 6-db attenuation, 150 Hz maximum at 60-db attenuation
Intermediate frequencies	20.0 to 29.9 MHz (variable), 3.0 to 3.9 MHz (variable), 500 kHz (fixed) for AN/URC-9, 9Y, 9AY 20.00 to 29.95 MHz (variable), 3.00 to 3.95 MHz (variable), 500 kHz (fixed) for AN/URC-9A
AVC characteristics	Audio output constant within ± 2 db from 10 uv to 0.25 v with 100 uv, modulated 30% at 1000 Hz 500 mw audio output level as reference
Frequency response; normal	300 Hz: ± 5 db; 500 Hz: ± 4 db; 1000 Hz: 0 db; 3500 Hz: ± 4 db

Table 1-2. Reference Data for Radio Set AN/URC-9 (Continued)

CHARACTERISTIC	NUMBER, RANGE, AND/OR VALUE
Frequency response (cont) broadband	Within -3 db at 100 Hz to -7 db at 25,000 Hz 1000 Hz reference
Audio outputs; local output	2 watts, 600 ohms
remote output	2 watts, 600 ohms
audio distortion	10% maximum
Squelch; S+N/N squelch	3 db signal-plus-noise to noise ratio
carrier squelch	3 uv carrier level
TRANSMITTER CHARACTERISTICS:	
Power output	16 watts minimum into 50 ohm resistive load
Modulation	Amplitude modulation
Frequency response; normal	Within <u>+3</u> db from 300 to 3500 Hz, 1000 Hz reference
broadband	300 Hz = +0.0 to -3.0 db 1000 Hz = 0.0 (ref) 10,000 Hz = 1 <u>+1.0</u> db 25,000 Hz = +0 to -6 db
audio distortion	Less than 7.5 percent at 3 db below 80% modulation
broadband sidetone	175 mw, 300 to 3000 Hz into 600 ohms
Spurious radiation	All spurious radiation suppressed 60 db below carrier level from 245.0 to 380.0 MHz. On any frequency outside this range, not more than one spurious radiation which must be at least 30 db below carrier
Operating temperature	-54°C to +65°C (-67°F to +149°F)
Types of emission	Radio telephone (A3); tone (A2)
Audio inputs; microphone	0.08 volt, 82 ohms
retransmission	0.31 volt
broadband	1.55 volts peak-to-peak

Table 1-2. Reference Data for Radio Set AN/URC-9 (Continued)

CHARACTERISTIC	NUMBER, RANGE, AND/OR VALUE
Sidetone output	175 mw, 300 to 3500 Hz, from 600 ohm receiver audio output
Fidelity	Within ± 3 db from 300 to 3500 Hz, 100 Hz reference
Duty cycle	Continuous transmission with 80% modulation at $+65^{\circ}\text{C}$ ($+149^{\circ}\text{F}$)
PRIMARY VOLTAGE REQUIREMENTS	115 vac 50/60 Hz single phase or 230 vac 50/60 Hz single phase for AN/URC-9, 9A 24 vdc for AN/URC-9Y, 9AY
POWER REQUIREMENTS	210 watts on receive for AN/URC-9, 9A 260 watts on receive for AN/URC-9Y, 9AY 360 watts on transmit

Table 1-3. Frequency of Control Crystals in Radio Set AN/URC-9

SUBUNIT	CRYSTAL	FREQUENCY (MHz)	
		AN/URC-9A	AN/URC-9
First IF Amplifier 20.00 to 29.95 MHz in AN/URC-9A 20.0 to 29.9 MHz in AN/URC-9, 9Y, 9AY	Y301	17.00	17.0
	Y302	18.00	18.0
	Y303	19.00	19.0
	Y304	20.00	20.0
	Y305	21.00	21.0
	Y306	22.00	22.0
	Y307	23.00	23.0
	Y308	24.00	24.0
	Y309	25.00	25.0
	Y310	26.00	26.0
Second IF Amplifier 3.00 to 3.95 MHz in AN/URC-9A 3.0 to 3.9 MHz in AN/URC-9, 9Y, 9AY	Y401	3.00/3.05	3.0
	Y402	3.10/3.15	3.1
	Y403	3.20/3.25	3.2
	Y404	3.30/3.35	3.3
	Y405	3.40/3.45	3.4
	Y406	3.50/3.55	3.5
	Y407	3.60/3.65	3.6
	Y408	3.70/3.75	3.7
	Y409	3.80/3.85	3.8
	Y410	3.90/3.95	3.9

Table 1-3. Frequency of Control Crystals in Radio Set AN/URC-9 (Continued)

SUBUNIT	CRYSTAL	FREQUENCY (MHz)	
		AN/URC-9A	AN/URC-9
Frequency Multiplier-Oscillator 200 to 370 MHz	Y202	35.00000	35.00000
	Y204	38.33333	38.33333
	Y206	41.66666	41.66666
	Y207	43.33333	43.33333
	Y208	45.00000	45.00000
	Y209	31.11111	31.11111
	Y210	32.22222	32.22222
	Y211	33.33333	33.33333
	Y212	34.44444	34.44444
	Y213	35.55555	35.55555
	Y214	36.66666	36.66666
	Y215	37.77777	37.77777
	Y216	38.88888	38.88888
	Y217	40.00000	40.00000
	Y218	41.11111	41.11111

1-20. EQUIPMENT SUPPLIED.

control equipments are shown in figures 1-3 and 1-4.

1-21. Table 1-4 lists all equipment supplied with Radio Set AN/URC-9().

1-24. FIELD CHANGE INDEX.

1-22. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

1-25. Table 1-6 lists the field changes applicable to Radio Sets AN/URC-9, AN/URC-9A, AN/URC-9Y, and AN/URC-9AY. For the complete field change identification guide index, refer to Section 3 of the Electronics Installation and Maintenance Book (EIMB), NAVSHIPS 0967-000-0100.

1-23. A list of equipment required, but not supplied, for Radio Set AN/URC-9, is given in table 1-5. The major remote

Table 1-4. Equipment Supplied With Radio Set AN/URC-9()

QTY PER EQUIP	NOMENCLATURE		DIMENSIONS (inches)			VOL. (cu. ft.)	WT (lb)
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
1	Radio Set including: Receiver-Transmitter Power Supply Receiver-Transmitter Case Installation Kit	AN/URC-9() RT-581/URC-9 or RT-581A/URC-9 PP-2702/URC-9 PP-4706/URC-9Y or PP-4706A/URC-9Y CY-2959/URC-9 MK-620/UR	13-13/16	19	19-1/2	3.1	157
1	Power Cable (AN/URC-9, 9A)	CX-7258/URC-9			10 ft lg		

Table 1-4. Equipment Supplied With Radio Set AN/URC-9() (Continued)

QTY PER EQUIP	NOMENCLATURE		DIMENSIONS (inches)			VOL. (cu. ft.)	WT (lb)
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
1	Power Cable (AN/URC-9Y, 9AY) Maintenance Cable RT-581/URC-9	CX-10332/URC-9Y CX-7260/URC-9			3ft lg		
1	Maintenance Cable Power Supply	CX-7300/URC-9			3ft lg		
1	Maintenance Cable Relay-Filter Unit	CX-8521/URC-9			2ft lg		
1	Retransmission Cable	CX-7259/URC-9			5ft lg		
2	Technical Manual	NAVELEX 0967- 439-0010	11	8.5	1		
1	Reference Standards Book	NAVELEX 0967- 439-0040	11	8.5	1/4		
1	Performance Standards Sheet	NAVELEX 0967- 439-0030	11	8.5			
1	Operating Instruction Chart	NAVELEX 0967- 439-0020	()	()			

Table 1-5. Equipment Required (Not Supplied)

QTY PER EQUIP	NOMENCLATURE		REQUIRED USE	REQUIRED CHARACTERISTICS
	NAME	DESIGNATION		
1 and 1 or 1	Headset Microphone Handset	NT-49985-A M-58/U H-169/U	Local operation of AN/URC-9	600 ohms Carbon microphone 82 ohms, with push-to-walk button
1 or 1	*Radio Set Control Control Adaptor	C-2383/URC-9 MX-8430/URC-9	Remote Control of AN/URC-9 Remote Adaptor for use with up to 5 Radio Set Controls C-1138/UR or C-1207/UR	Refer to applicable technical manual Refer to applicable technical manual

* NOT USED IN ALL INSTALLATIONS

Table 1-5. Equipment Required (Not Supplied) (Continued)

QTY PER EQUIP	NOMENCLATURE		REQUIRED USE	REQUIRED CHARACTERISTICS
	NAME	DESIGNATION		
1	RF Wattmeter	AN/URM-43()	Power output check	(See table 5-1)
1	Electronic Multimeter	AN/USM-116	Voltage check	
1	Electronic Voltmeter	AN/USM-143	Voltage check	
1	Signal Generator	AN/USM-44A and AN/URM-25D	Signal generation for checking	
1	Audio Oscillator	AN/URM-127	Signal generation for checking	
1	Multimeter	AN/PSM-4	Trouble-shooting	
1	Frequency Counter	AN/USM-207	Trouble-shooting and alignment	
1	Oscilloscope	AN/USM-28	Trouble-shooting	

Table 1-6. Field Change Index For Radio Set AN/URC-9()

FIELD CHANGE NO. RADIO SET AN/URC-				PURPOSE
9	9A	9Y	9AY	
3				Allows keying of tone for homing beacon on applicable equipment. (EIB -68 and EIB 682) (Cancelled by EIB 751)
1		1	1	Provides for hardening equipment against shock and vibration. (EIB 703) (EIB 724)
2		2	2	Reduces contact failure of Relay K601 through addition of a resistor & capacitor (EIB 723)
4		3	3	Protects RF and PA Assembly of RT-581/URC-9 from damage due to excessive heat. (Thermal switch) (EIB 749)

Table 1-6. Field Change Index For Radio Set AN/URC-9() (Continued)

FIELD CHANGE NO.				PURPOSE
RADIO SET AN/URC-				
9	9A	9Y	9AY	
5	2			Reduces failure of contacts in Relay K-802 by the suppression of excessive arcing (EIB 756 and EIB 793)
6				Emission Control (not announced in EIB) (AN/SSQ-54 Equipped ships only)
7	2			Wiring Change, Elimination of Potential Safety Hazard (EIB 763)
8		4	4	Removes Voltage Regulator from FMO Oscillator (CR-201); Type II Class A, Routine Action: 1 Man-Hour (EIB 794)
9	2			Reduce coil failures of relay K601 and standardize the grid bias voltage of the power amplifier in the RT-581/URC-9
10	1	5	5	Prevents overheating of RT-581()/URC-9 during operation

1-26. TRANSMISSION RANGE.

1-27. The transmission range of Radio Set AN/URC-9() is a function of the heights of the transmitting and receiving antennas. The monogram in table 1-7 provides the radio-path length and tangential distance for transmission between the transmitting and receiving equipment as a function of the heights of the antennas.

1-28. PREPARATION FOR RESHIPMENT.

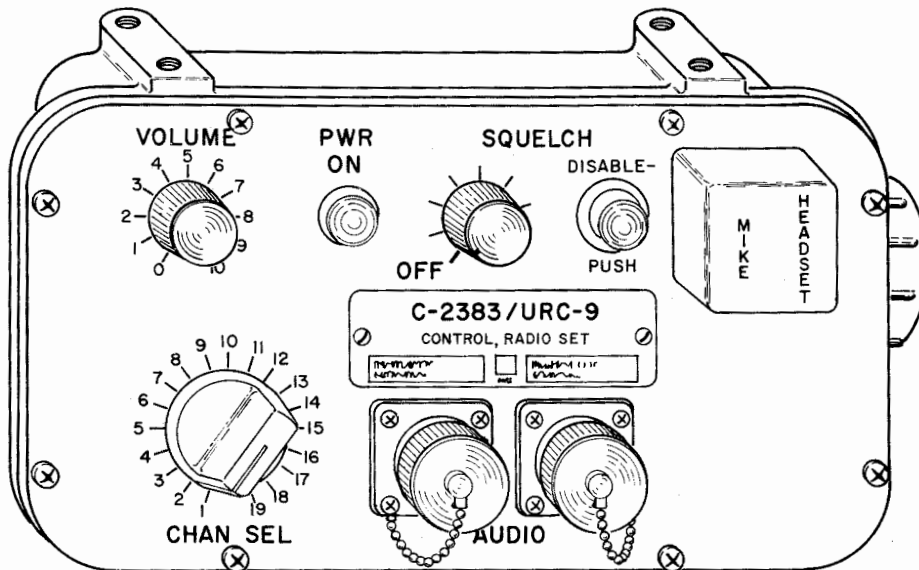
1-29. The reshipment preparation of Radio Set AN/URC-9() does not require any extraordinary precautions. The equipment should be placed in an air-coil padded carton with a sufficient amount of

silica-gel desiccant. This package should then be placed in water-resistant carton and sealed. For final packaging, the equipment is placed in a wooden crate which is nailed closed.

CAUTION

Whenever the radio is removed from service, the air-sealing plates must be placed over the louvers on the front of the power supply and on both sides of the radio case. During operation, the plates for the side ports are stored above the ports against the sides of the case, and the plates for the front panel are stored within the power supply behind the front panel.

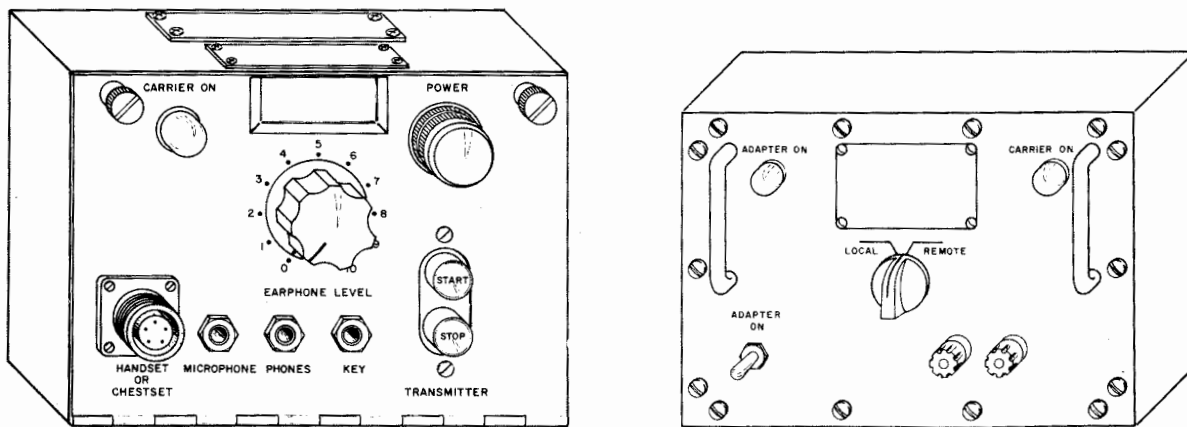
EQUIPMENT NOT SUPPLIED



RADIO SET CONTROL C-2383/URC-9

Figure 1-3. Radio Set Control C-2383/URC-9, Hard Wired Remote Control

EQUIPMENT NOT SUPPLIED

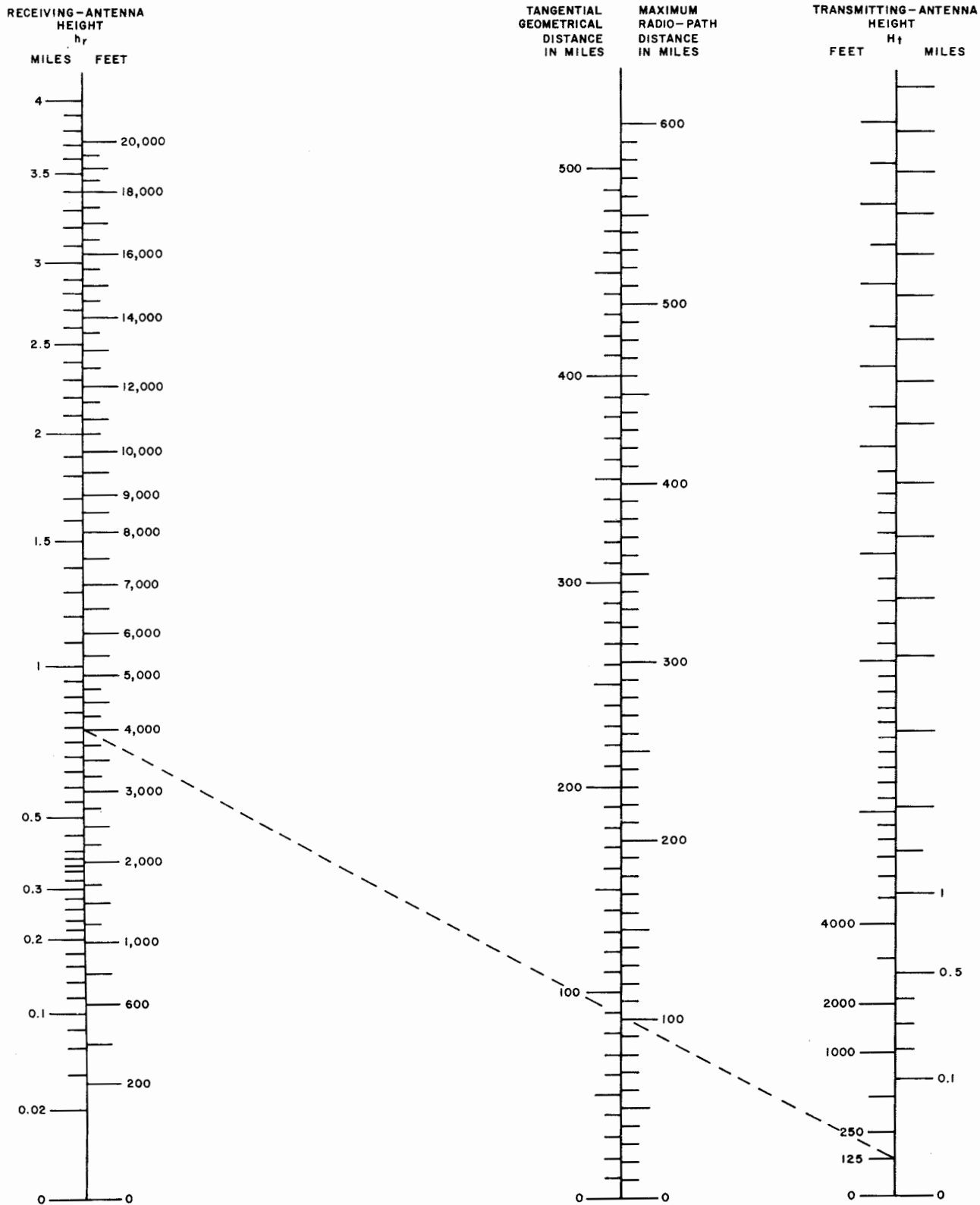


RADIO SET CONTROL C-1138/UR

CONTROL, ADAPTOR MX-8430/URC-9

Figure 1-4. Typical Transmit Receive Control in the Standard 12 Wire Remote Control System

**Table 1-7. Radio-Path Transmission Distance
As a Function of Antenna Height**



EXAMPLE SHOWN: HEIGHT OF RECEIVING-ANTENNA AIRPLANE 4000 FEET (0.76 MILES), HEIGHT OF TRANSMITTING-ANTENNA 125 FEET (0.02);
MAXIMUM RADIO-PATH DISTANCE = 100 MILES.

