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TECHNICAL MANUAL

OPERATION INSTRUCTIONS

RADIO SET AN/WRC-1B
AND
ANTENNA COUPLER CU-937/UR

PUBLISHED BY DIRECTION OF COMMANDER, NAVAL ELECTRONIC SYSTEMS COMMAND

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2-1. FUNCTIONAL OPERATION.

2-2. GENERAL. Radio Set AN/WRC-1B (hereafter referred to as the radio set or AN/WRC-1B) is a multimode system capable of transmitting on any one of 280,000 channels, spaced in 0.1-kilohertz increments in the 2.0- to 29.999-megahertz frequency range. Intelligence may be transmitted in continuous wave (CW), compatible amplitude modulation (compatible AMO, frequency shift keyed (FSK), upper sideband (USB), lower sideband (LSB), independent sideband (ISB), and ISB/FSK modes. The ISB mode permits two different types of intelligence to be transmitted simultaneously. The FSK mode can be obtained using suitable ancillary teletypewriter equipment. Tone-modulated continuous wave (MCW), facsimile, and standard amplitude modulation (AM) transmissions can also be made with the AN/WRC-1B. The AN/WRC-1B is also capable of receiving such transmissions. The major electronic components of the AN/WRC-1B are Radio Transmitter T-827B/URT (hereafter also referred to as the Transmitter or T-827B/URT), Radio Frequency Amplifier AM-3007/URT (hereafter also referred to as the AM-3007/URT), Antenna Coupler CU-937/UR (hereafter also referred to as the CU-937/UR), Radio Receiver R-1051B/URR (hereafter also referred to as the J-1265/U).

2-3. TRANSMITTING FUNCTION. When the AN/WRC-1B is operating in the transmit mode, audio signals from the handset are applied to the Transmitter Audio Amplifier Electronic Assemblies 2A2A2 and 2A2A3. The signals are amplified and coupled to the balanced modulator in the Transmitter Mode Selector Electronic Assembly 2A2A1, where the audio signals are translated into if. signals.

2-4. When compatible AM or CW transmission is used, the carrier is reinserted into the signal path in the Transmitter IF. Amplifier Electronic Assembly 2A2A2. The output from this assembly is applied to the RF Translator Electronic Subassembly 2A2A6A6 where it is translated to the desired rf output by mixing it with three injection frequencies in a triple conversion process. The RF Amplifier Electronic Assembly 2A2A4, which provides the final stages of the transmitter, is digitally tuned and provides a nominal 0.1-watt output to the AM-3007/URT.

2-5. When FSK transmission is used, the FSK Tone Generator Electronic Assembly 2A2A9 is turned on. Loop current from the ancillary teletype (tty) equipment produces a frequency shift output, which is centered on one of two selectable center frequencies, depending on the ancillary equipment used. The output is applied to the Transmitter Audio Amplifier Electronic Assemblies 2A2A2 and 2A2A3, and from that point, the process is the same as described above.

2-6. The T-827B/URT is tuned by setting the MCS and KCS controls and the CPS switch on the front panel to the desired frequency. An internal power supply converts the nominal 115-Vac input to the necessary dc operating voltage.

2-7. The AM-3007/URT increases the rf output from the T-827B/URT to 100 watts peak envelope power (PEP, SSB), 25 watts AM carrier, or 50 watts CW or FSK. Average power and peak power control signals are developed in the AM-3007/URT and applied to the T-827B/URT. These control signals limit the average and peak power output from the T-827B/URT to levels that are safe for use in the AM-3007/URT.

The output and interstage circuits for the two amplifier tubes are tuned by means of a code generated in the T-827B/URT.

2-8. RECEIVING FUNCTION. When the AN/WRC-1B is operating in the receive mode, the signal from the antenna is applied directly through the CU-937/UR and the AM-3007/URT to the R-1051B/URR. The signal passes through an overload protection circuit in the R-1051B/URR to the RF Amplifier Electronic Assembly 1A2A4. The output from the two stages of rf amplification and digitally-tuned circuits is an amplified rf signal in the 2- to 30-MHz range. The rf signal is triple-converted to a 500-kHz if. signal.

2-9. The desired if. signal passes through the Receiver Mode Selector Electronic Assembly 1A2A1, and depending on the mode of operation, is applied to one of two Receiver IF./Audio Amplifier Electronic Assemblies 1A2A2 and 1A2A3. Any undesired signals are suppressed by the assembly. In the CW, AM, FSK, and USB modes, the if. signal passes through IF./Audio Amplifier Electronic Assembly 1A2A2, and in the LSB mode, the if. signal passes through IF./Audio Amplifier Electronic Assembly 1A2A3; in the ISB mode, both assemblies are in operation. The if. signals are amplified and detected, and the resultant audio signals are again amplified and applied to the audio output transformers. Multiple outputs of the transformers provide a 600-ohm balanced or unbalanced output for remote listening and a local output for the headset. Overall gain is controlled by an automatic gain control (agc) voltage developed in the if./audio amplifier assemblies.

2-10. The R-1051B/URR is tuned by setting the MCS and KCS controls and the CPS switch on the front panel at the desired frequency. An internal power supply converts the nominal 115-Vac input to the necessary dc operating voltage.

2-11. OPERATING PROCEDURES.

2-12. DESCRIPTION OF OPERATING CONTROLS, INDICATORS, AND CONNECTORS. All controls and indicators required for normal operation of the AN/WRC-1B system are located on the front panels of the T-827B/URT (figure 2-1), the R-1051B/URR (figure 2-2), and the AM-3007/URT (figure 2-3), and are listed in tables 2-1 through 2-3, respectively.

2-13. TRANSMIT MODE OF OPERATION. Operating procedures for the transmit mode of operation are as follows:

NOTE

Since the AN/WRC-1B is intended for use with a nominal 115-Vac power source, the AM-3007/URT PRIMARY POWER selector switch (figure 2-3) should be set at AC/INT BAT position at time of initial system installation and should not be reset thereafter.

a. Set AM-3007/URT PRIMARY POWER circuit breaker at ON and set T-827B/URT Mode Selector switch (figure 2-1) at STD BY. Set these switches prior to operation to allow T-827B/URT frequency standard to come up to temperature. Allow a 20-minute warmup period of general operation and at least a 60-minute warmup period for optimum frequency stability.

b. Check line voltage indication on AM-3007/URT AMPLIFIER meter. Notify technician if voltage is consistently high.

c. Hold AMPLIFIER meter switch at DR CATH position. AMPLIFIER meter should indicate at DRIVER SET mark. Hold AMPLIFIER meter switch at PA PL position. AMPLIFIER meter should indicate at PA SET mark. If either indication is incorrect, proceed as follows:

1. Disconnect cable W8 from connector J8 on rear of AM-3007/URT and connect Electrical Dummy Load DA-91A/U in its place. Loosen screws on front panel and slide chassis fully out from case. Defeat chassis interlock.

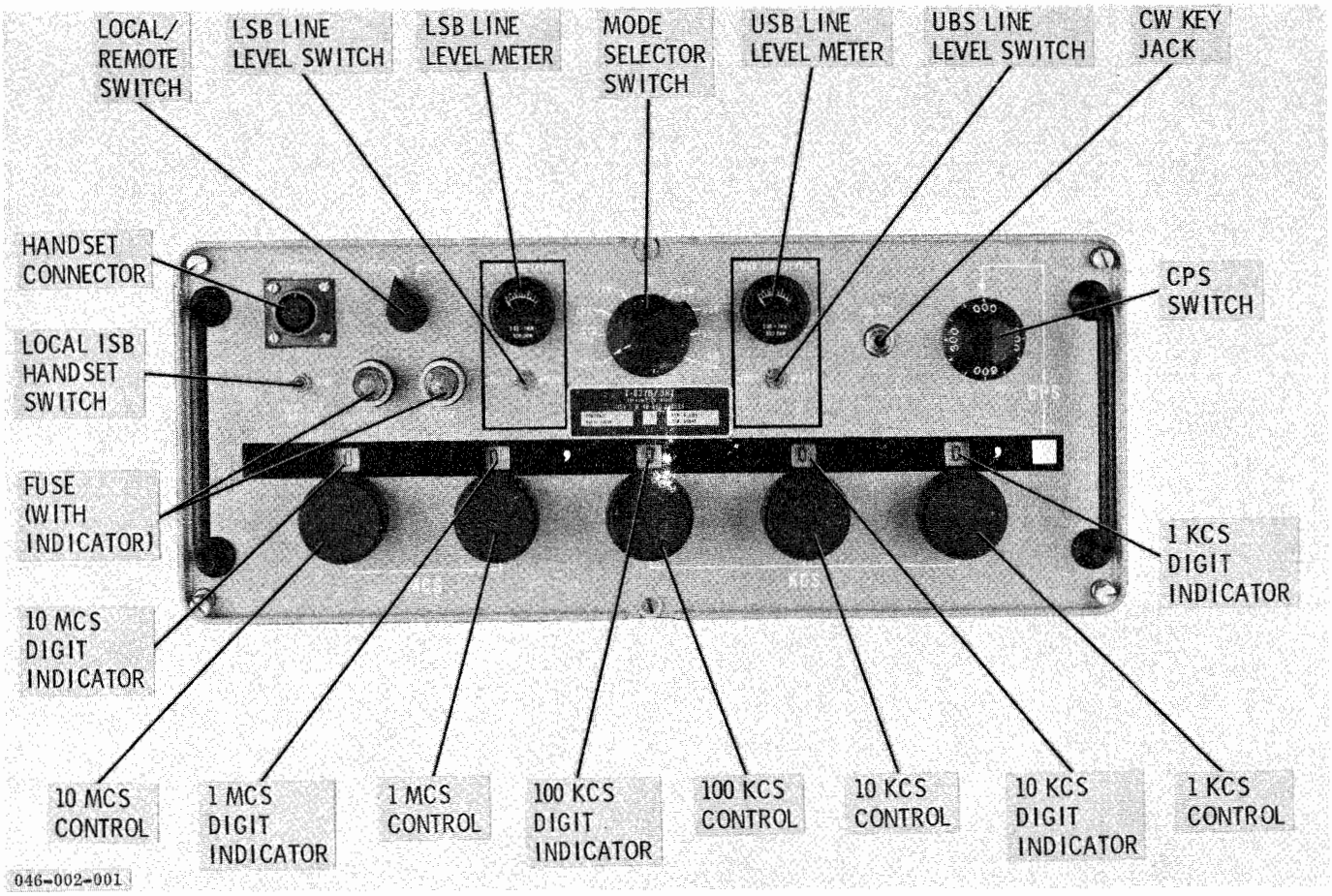

Figure 2-1. Radio Transmitter T-827B/URT, Operating Controls, Indicators, and Connectors

WARNING

High voltages are present in the AM-3007/URT when operated with chassis out of case.

2. Set T-827B/URT Mode Selector switch at USB. Set LOCAL/REMOTE switch at LOCAL position. Key the T-827B/URT with the handset.

3. Hold AM-3007/URT AMPLIFIER meter switch at DR CATH position. Adjust DRVR BIAS potentiometer on DC-to-DC Converter Electronic Assembly 3A2A5 until AMPLIFIER meter indicates at DRIVER SET mark.

4. Hold AMPLIFIER meter switch at PA PL position. Adjust AM/SSB BIAS potentiometer on DC-to-DC Converter Electronic Assembly 3A2A5 until AMPLIFIER meter indicates at PA SET mark.

5. Disconnect cable W6 from J6 on the AM-3007/URT. Set T-827B/URT Mode Selector switch at CW position. Insert CW handkey or shorting plug in CW KEY jack on front panel of T-827B/URT and key the T-827B/URT.

6. Hold AM-3007/URT AMPLIFIER meter switch at PA PL position. AMPLIFIER meter should indicate at two small (minor) divisions. If necessary, adjust CW/FSK BIAS potentiometer for this indication.

7. Remove CW handkey or shorting plug from CW KEY jack. Set transmitter Mode Selector switch at STD BY position.

8. Reconnect cable W6. Release slide lock, slide AM-3007/URT chassis

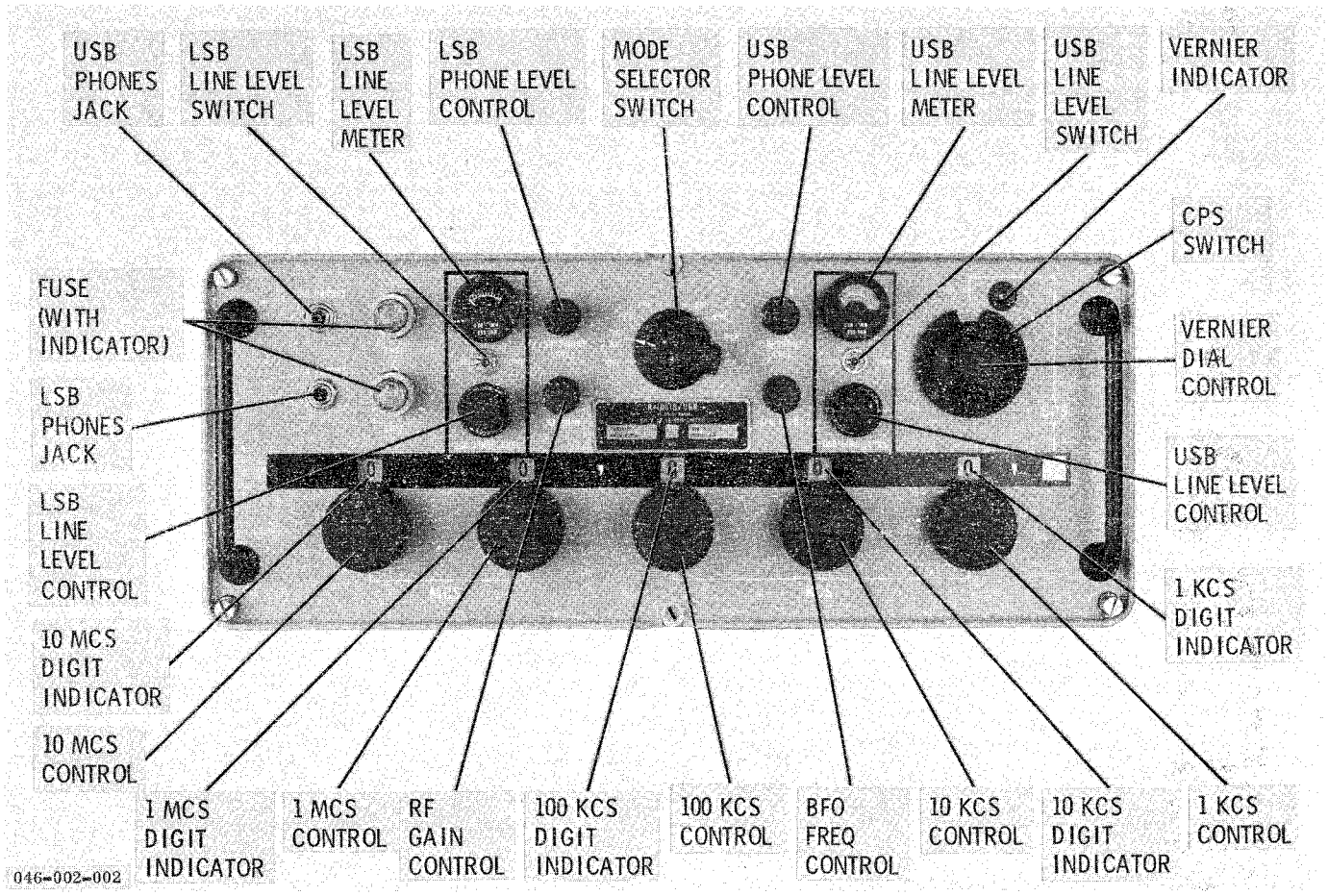

Figure 2-2. Radio Receiver R-1051B/URR, Operating Controls, Indicators, and Connectors

into case, and tighten screws on front panel. Disconnect dummy load and reconnect cable W8 to connector J8 on rear of AM-3007/URT.

d. Set AM-3007/URT ANT CPLR BYPASS switch at position desired. When switch is set at BYPASS, CU-937/UR tuning elements are bypassed in receive mode. When switch set set at NORMAL, CU-937/UR tuning elements are inserted between T-827B/URT and antenna.

e. Set T-827B/URT Mode Selector switch at USB, LSB, or AM position for voice transmission.

f. Using MCS controls, KCS controls, and CPS switch on front panel of T-827B/URT, select desired operating frequency.

NOTE

If operating in duplex mode, R-1051B/URR and T-827B/URT frequencies must be displaced by at least 15 percent. For example, if one unit is tuned to 06.010 MHz, the other unit should be tuned to a frequency at least 00.901 MHz above or below this 06.010 MHz. Therefore, the other unit can be operated on any frequency from 02.000 to 05.109 MHz, and from 06.911 to 29.999 MHz, but not between 05.109 and 06.911 MHz.

When the selected operating frequency differs sufficiently from the previous frequency used, the

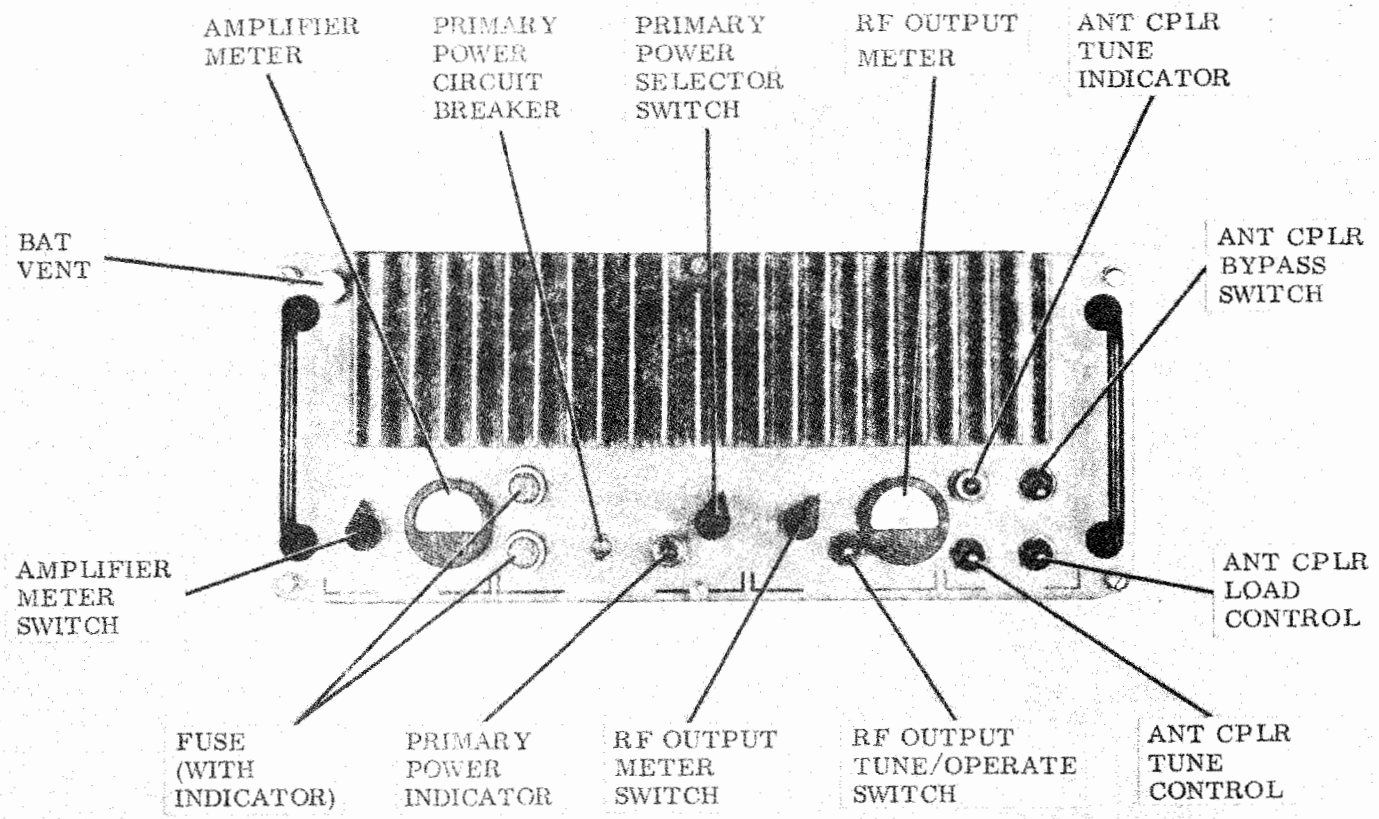

Figure 2-3. Radio Frequency Amplifier AM-3007/URT, Operating Controls and Indicators

AM-3007/URT will be retuned and CU-937/UR will be rough-tuned to the new frequency automatically. The AM-3007/URT ANT CPLR TUNE indicator will go out when this reprogramming is completed.

g. Fine tune the CU-937/UR to the selected operating frequency as follows:

NOTE

Until operator becomes proficient at fine tuning procedure, complete CU-937/UR tuning cycle should be performed for any frequency change of 100 kHz or more. The tuning cycle is initiated by rotating transmitter 10 MCS control (figure 2-1) one position. When the ANT CPLR TUNE indicator extinguishes then start fine tuning procedure below.

1. If a 15-foot whip antenna is used, refer to table 2-4 (table 2-5 for 25-foot antenna; table 2-6 for 35-foot antenna) and locate frequency closest to selected operating frequency.

2. Hold AM-3007/URT ANT CPLR LOAD switch at LO for required number of flashes of ANT CPLR TUNE indicator listed in LOAD column of table.

3. Hold ANT CPLR TUNE switch at position indicated in TUNE column of table for the listed number of flashes of ANT CPLR TUNE indicator.

4. Set RF OUTPUT meter switch at 100 W REFL.

5. Hold RF OUTPUT TUNE/OPERATE switch at TUNE and minimize indication on RF OUTPUT meter by adjusting

ANT CPLR TUNE control (HI and LO) and ANT CPLR LOAD control (HI and LO). Alternately adjust both controls until indication on RF OUTPUT meter nulls.

NOTE

When specific frequencies are to be used often, and to permit tuning under radio silence conditions, time and effort can be saved by developing the logging chart shown in figure 2-4. This is accomplished by noting exact number of light flashes and direction of tuning in appropriate columns for each switch as nulling procedure is performed. Place a copy of the logging chart near the AM-3007/URT for reference.

6. Set RF OUTPUT meter switch at 30 W REFL.

7. Repeat step 5 until meter pointer rests in small black area at left of meter scale.

8. Set RF OUTPUT TUNE/OPERATE switch at OPERATE.

h. Connect handset to HANDSET connector on front panel of T-827B/URT.

i. To transmit, depress push-to-talk switch on handset.

j. For independent sideband transmission, set Mode Selector switch at ISB and set LOCAL ISB HANDSET switch at LSB or USB according to channel desired.

k. For CW transmission, set Mode Selector switch at CW, connect key to CW KEY jack on front panel of T-827B/URT, and operate key.

l. For FSK transmission with local teletype equipment, set Mode Selector switch at FSK and connect teletypewriter loop and key lines to LOCAL FSK IN connector (J7) on rear of T-827B/URT. (For remote operation, LOCAL/REMOTE switch is set at REMOTE and these connections are made through the J-1265/U.) When these procedures are completed, proceed as follows:

1. Loosen screws on front panel of T-827B/URT and pull chassis out fully on slides.

2. Set CTR FREQ switch on top of FSK Tone Generator Electronic Assembly 2A2A9 at desired center frequency (2000 or 2550 Hz). This assembly is located just left of center at rear of chassis.

3. Release slide locks, slide chassis back into case, and secure.

m. To transmit FSK and voice simultaneously, set Mode Selector switch at ISB/FSK (FSK will be on USB; voice, on LSB).

n. To transmit two simultaneous voice or other audio transmissions from a remote location, set Mode Selector switch at ISB. One voice transmission will be on USB; the other voice transmission will be on LSB.

o. To transmit voice on different channels locally, set Mode Selector switch at ISB and alternate LOCAL ISB HANDSET switch between USB and LSB as desired to change channels.

2-14. REMOTE OPERATION. Remote operation of the AN/WRC-1B is accomplished as follows:

a. Set LOCAL/REMOTE switch (figure 2-1) at REMOTE, and follow procedures outlined in paragraphs 2-12 and 2-13.

b. Set both Mode Selector switches at desired mode of operation.

c. Notify remote operator that the AN/WRC-1B is ready for remote operation.

TABLE 2-1. RADIO TRANSMITTER T-827B/URT, OPERATING CONTROLS, INDICATORS, AND CONNECTORS
(See Figure 2-1)

CONTROL, INDICATOR, OR CONNECTOR	REFERENCE DESIGNATION	FUNCTION
LOCAL ISB HANDSET switch	2A2S9	Selects channel of handset audio input and output in ISB and ISB/FSK mode Switch Position — Equipment Response LSB — Applies handset audio microphone and earphone to LSB channel USB — Applies handset audio microphone and earphone to USB channel
HANDSET connector	2A2J1	Used to connect handset to T-827B/URT
FUSE (with indicator)	2A2F1, 2A2DS1	Protects T-827B/URT against overload; indicator lights when fuse is open
FUSE (with indicator)	2A2F2, 2A2DS2	Protects T-827B/URT against overload; indicator lights when fuse is open
LOCAL/REMOTE switch	2A2S1	Selects local or remote key and input to T-827B/URT Switch Position — Equipment Response LOCAL — T-827B/URT keying and input accomplished locally by operator REMOTE — T-827B/URT keying and input accomplished from remote location

TABLE 2-1. RADIO TRANSMITTER T-827B/URT, OPERATING CONTROLS, INDICATORS AND CONNECTORS (Cont)
(See Figure 2-1)

CONTROLS, INDICATOR, OR CONNECTOR	REFERENCE DESIGNATION	FUNCTION
Mode Selector switch	2A2S2	Selects T-827B/URT mode of operation Switch Position — Equipment Response OFF — No power is applied STD BY — Energizes frequency standard and tube filaments LSB — T-827B/URT operates in LSB mode FSK — T-827B/URT operates in FSK mode AM — T-827B/URT operates in compatible AM mode (USB modulation plus carrier) CW — T-827B/URT operates in CW mode; transmitted frequency is at front-panel frequency setting USB — T-827B/URT operates in USB mode ISB — T-827B/URT operates in ISB mode; simultaneous transmissions on LSB and USB ISB/FSK — T-827B/URT transmits FSK on USB and voice on LSB simultaneously

TABLE 2-1. RADIO TRANSMITTER T-827B/URT, OPERATING CONTROLS, INDICATORS AND CONNECTORS (Cont)
(See Figure 2-1)

CONTROLS, INDICATOR, OR CONNECTOR	REFERENCE DESIGNATION	FUNCTION
LSB LINE LEVEL switch	2A2S10	Selects range for LSB LINE LEVEL meter Switch Position — Equipment Response -10DB — 10 dB is subtracted from LSB LINE LEVEL meter indication +10DB — 10 dB is added to LSB LINE LEVEL meter indication
LSB LINE LEVEL meter	2A2M1	Indicates LSB audio input line level
USB LINE LEVEL switch	2A2S11	Selects range for USB LINE LEVEL meter Switch Position — Equipment Response -10DB — 10 dB is subtracted from USB LINE LEVEL meter indication +10DB — 10 dB is added to USB LINE LEVEL meter indication
USB LINE LEVEL meter	2A2M2	Indicates USB audio input line level
CW KEY jack	2A2J2	Used to connect local CW hand key to T-827B/URT
CPS switch	2A2S6	Increases T-827B/URT tuning capabilities Switch Position — Equipment Response 000 — T-827B/URT is tuned to frequency indicated by MCS and KCS digit indicators

TABLE 2-1. RADIO TRANSMITTER T-827B/URT, OPERATING CONTROLS, INDICATORS AND CONNECTORS (Cont)
(See Figure 2-1)

CONTROLS, INDICATOR, OR CONNECTOR	REFERENCE DESIGNATION	FUNCTION
CPS switch (Cont)		Switch Position: 100-900 — Equipment Response: T-827B/URT is tuned 100 to 900 Hz above frequency indicated by MCS and KCS digit indicators
MCS controls:		
10 MCS		Selects 10-MHz digit of desired operating frequency; digit selected will be displayed in window above control
1 MCS		Selects 1-MHz digit of desired operating frequency; digit selected will be displayed in window above control
KCS controls:		
100 KCS		Selects 100-kHz digit of desired operating frequency; digit selected will be displayed in window above control
10 KCS		Selects 10-kHz digit of desired operating frequency; digit selected will be displayed in window above control
1 KCS		Selects 1-kHz digit of desired operating frequency; digit selected will be displayed in window above control

TABLE 2-1. RADIO TRANSMITTER T-827B/URT, OPERATING CONTROLS, INDICATORS AND CONNECTORS (Cont)
(See Figure 2-1)

CONTROLS, INDICATOR, OR CONNECTOR	REFERENCE DESIGNATION	FUNCTION
CARRIER REINSERTION switch *	2A2A1S1	Selects pilot carrier used to frequency-lock associated receiver to T-827B/URT in LSB, ISB, and USB modes Switch Position — Equipment Response 0 — Maximum pilot carrier output provided -10 — Pilot carrier output -10 dB ±2 dB down from maximum -20 — Pilot carrier output -20 dB ±2 dB down from maximum ∞ — Pilot carrier output fully suppressed
CTR FREQ switch *	2A2A9S1	Selects center frequency for FSK mode of operation Switch Position — Equipment Response 2000 — Provides center frequency of 2000 Hz for FSK mode 2550 — Provides center frequency of 2550 Hz for FSK mode
Interlock switch *	2A2S8	Disconnects 115-Vac power from T-827B/URT when chassis is pulled from case. Defeat by pulling up and back
AUX/NORM switch *	2A2S7	Selects 115-Vac primary power from AN/WRC-1B system (NORM); or from an auxiliary source (AUX)

*Located on top of chassis

TABLE 2-2. RADIO RECEIVER R-1051B/URR, OPERATING CONTROLS, INDICATORS, AND CONNECTORS
(See Figure 2-2)

CONTROL, INDICATOR, OR CONNECTOR	REFERENCE DESIGNATION	FUNCTION
LSB PHONES jack	1A2J1	Used to connect headset to LSB receiver output
USB PHONES jack	1A2J2	Used to connect headset to USB receiver output
FUSE (with indicator)	1A2F1	Protects R-1051B/URR against overload; indicator lights when fuse is open
FUSE (with indicator)	1A2F2	Protects R-1051B/URR against overload; indicator lights when fuse is open
LSB LINE LEVEL control	1A2R1, 1A2R11	Used to adjust volume of remote audio for LSB and ISB (LSB) operation
LSB LINE LEVEL switch	1A2S1	Selects range for LSB LINE LEVEL meter Switch Position — Equipment Response 0 DB — Reading of LSB LINE LEVEL meter is taken directly +20 DB — 20 dB is added to indication of LSB LINE LEVEL meter
LSB LINE LEVEL meter	1A2M1	Indicates level of audio supplied to LSB remote lines
RF GAIN control	1A2R3	Used to control gain of rf and if. amplifiers
LSB PHONE LEVEL control	1A2R4	Used to adjust volume of audio applied to headphone in LSB and ISB (LSB) operation

TABLE 2-2. RADIO RECEIVER R-1051B/URR, OPERATING CONTROLS, INDICATORS AND CONNECTORS (Cont)
(See Figure 2-2)

CONTROL, INDICATOR, OR CONNECTOR	REFERENCE DESIGNATION	FUNCTION
Mode Selector switch	1A2S2	Selects R-1051B/URR mode of operation Switch Position — Equipment Response OFF — No power is applied STD BY — Energizes tube filaments only LSB — R-1051B/URR operates in LSB mode FSK — R-1051B/URR operates in FSK mode AM — R-1051B/URR operates in AM mode CW — R-1051B/URR operates in CW mode USB — R-1051B/URR operates in USB mode ISB — R-1051B/URR operates in ISB mode
BFO FREQ control	1A2R6	Used to adjust pitch of audio output tone when receiving CW
USB PHONE LEVEL control	1A2R5	Used to adjust volume of audio applied to phones in USB, ISB (LSB), FSK, CW, and AM operation
USB LINE LEVEL control	1A2R2, 1A2R12	Used to adjust volume of remote audio for USB, ISB (USB), FSK, CW, and AM operation
USB LINE LEVEL switch	1A2S5	Selects range for USB LINE LEVEL meter Switch Position — Equipment Response 0 DB — Reading of USB LINE LEVEL meter is taken directly

TABLE 2-2. RADIO RECEIVER R-1051B/URR, OPERATING CONTROLS, INDICATORS AND CONNECTORS (Cont)
(See Figure 2-2)

CONTROL, INDICATOR, OR CONNECTOR	REFERENCE DESIGNATION	FUNCTION
USB LINE LEVEL switch (Cont)		Switch Position: +20 DB — Equipment Response: 20 dB is added to indication of USB LINE LEVEL meter
USB LINE LEVEL meter	1A2M2	Indicates level of audio applied to USB remote lines
CPS switch	1A2S6	Increases R-1051B/URR tuning capabilities in 0.1-kHz increments from 000 to 900 Hz Switch Position: 000 to 900 — Equipment Response: R-1051B/URR is tuned above frequency indicated by MCS and KCS digit indicators Switch Position: V — Equipment Response: R-1051B/URR may be tuned continuously (with vernier control) between 0 and 1000 Hz
Vernier control	1A2R7	Used to provide continuous tuning between 0 and 1000 Hz
Vernier indicator	1A2DS5	Indicator flashes to indicate that CPS switch is in vernier position
MCS controls:		
10 MCS		Selects 10-MHz digit of desired operating frequency; digit selected will be displayed in window above control
1 MCS		Selects 1-MHz digit of desired operating frequency; digit selected will be displayed in window above control

TABLE 2-2. RADIO RECEIVER R-1051B/URR, OPERATING CONTROLS, INDICATORS AND CONNECTORS (Cont)
(See Figure 2-2)

CONTROL, INDICATOR, OR CONNECTOR	REFERENCE DESIGNATION	FUNCTION
KCS controls:		
100 KCS		Selects 100-kHz digit of desired operating frequency; digit selected will be displayed in window above control
10 KCS		Selects 10-kHz digit of desired operating frequency; digit selected will be displayed in window above control
1 KCS		Selects 1-kHz digit of desired operating frequency; digit selected will be displayed in window above control

TABLE 2-3. RADIO FREQUENCY AMPLIFIER AM-3007/URT, OPERATING CONTROLS AND INDICATORS
(See Figure 2-3)

CONTROL OR INDICATOR	REFERENCE DESIGNATION	FUNCTION
BAT VENT		Provides ventilation, if necessary, when internal battery is used as +28-volt power source
AMPLIFIER meter switch	3A2A1S1	Selects circuits to be monitored by AMPLIFIER meter Switch Position — Equipment Response DR CATH — Meter indicates driver cathode current LINE — Meter indicates input line voltage PA PL — Meter indicates power output stage plate current

TABLE 2-3. RADIO FREQUENCY AMPLIFIER AM-3007/URT, OPERATING CONTROLS AND INDICATORS (Cont)
(See Figure 2-3)

CONTROL OR INDICATOR	REFERENCE DESIGNATION	FUNCTION
AMPLIFIER meter	3A2A1M1	Provides indications of driver cathode current, equipment input line voltage, power output stage plate current, and circuit selected by AMPLIFIER meter switch
PRIMARY POWER 4A, 115V AC fuses (with indicators)	3A2A1F1, XF1 3A2A1F2, XF2	Protects AM-3007/URT against overload; indicator lights when fuse is open; one fuse for each leg of ac input line
PRIMARY POWER ON-OFF circuit breaker	3A2A1CB1	Used to control primary power input of overall communication system Switch Position — Equipment Response OFF — No primary power applied ON — Primary power applied
PRIMARY POWER indicator	3A2A1DS1	Lights to indicate that power is applied to AN/WRC-1B system
PRIMARY POWER selector switch NOTE AN/WRC-1B operates from 115-Vac source only.	3A2A1S2	Selects primary power source for AN/WRC-1B Switch Position — Equipment Response AC/INT. BAT. — AM-3007/URT operates from nominal 115-Vac external power source EXT DC — AM-3007/URT operates from external +28-Vdc power source
RF OUTPUT meter switch	3A2A1S3	Selects range for RF OUTPUT meter Switch Position — Equipment Response 100W REFL — Meter indicates reflected power 100 watts full scale

TABLE 2-3. RADIO FREQUENCY AMPLIFIER AM-3007/URT, OPERATING CONTROLS AND INDICATORS (Cont)
(See Figure 2-3)

CONTROL OR INDICATOR	REFERENCE DESIGNATION	FUNCTION
RF OUTPUT meter switch (Cont)		Switch Position — Equipment Response 30W REFL — Meter indicates reflected power 30 watts full scale 100W FWD — Meter indicates transmitted (forward) power, 100 watts full scale
RF OUTPUT meter	3A2A1M2	Provides indication of transmitted and reflected power output from AM-3007/URT in ranges selected by RF OUTPUT meter switch
RF OUTPUT TUNE-OPERATE switch	3A2A1S4	Controls system keying for tuning of CU-937/UR in AM mode Switch Position — Equipment Response TUNE — AN/WRC-1B system is keyed in AM so that CU-937/UR can be tuned using AM carrier OPERATE — All AM-3007/URT circuits are connected for normal operation
		NOTE T-827B/URT Mode Selector switch 2A2S2 must be in AM before setting the TUNE-OPERATE switch to TUNE to key the AN/WRC-1B.
ANT CPLR TUNE switch	3A2A1S5	Used in conjunction with ANT CPLR LOAD control to fine tune CU-937/UR; activates motor-driven variable inductor
ANT CPLR LOAD switch	3A2A1S6	Used in conjunction with ANT CPLR TUNE control to fine tune CU-937/UR; activates motor-driven variable inductor

TABLE 2-3. RADIO FREQUENCY AMPLIFIER AM-3007/URT, OPERATING CONTROLS AND INDICATORS (Cont)
(See Figure 2-3)

CONTROL OR INDICATOR	REFERENCE DESIGNATION	FUNCTION
ANT CPLR TUNE indicator	3A2A1DS2	Lights while the CU-937/UR is programming; flashes once per revolution of tune coils when 3A2A1S5 is operated; flashes once per revolution of load coils when 3A2A1S6 is operated
ANT CPLR BYPASS/ NORMAL switch	3A2A1S7	Switches the CU-937/UR elements into and out of receiver antenna rf line Switch Position — Equipment Response BYPASS — CU-937/UR elements are bypassed in receive mode NORMAL — CU-937/UR elements are inserted in receiver antenna rf line
ANT INTLK switch*	3A2A1S9	Bypasses +28-volt coupler interlock circuit for testing with the CU-937/UR disconnected Switch Position — Equipment Response NORMAL — Normal system operation OVER-RIDE — Antenna coupler disabled
Overvoltage trip indicator*	3A2A3DS1	Lights when 28 volts from ac power supply electronic assembly is disabled because of overvoltage

*Located on top of chassis

TABLE 2-4. ANTENNA COUPLER CU-937/UR, TUNING CHART FOR 15-FOOT WHIP ANTENNA

FREQ (MHz)	TUNE	LOAD	FREQ (MHz)	TUNE	LOAD
2.00	7 HI	10 LO	14.00	5 HI	16 LO
2.49	5 LO	12 LO	15.00	3 HI	17 LO
2.50	1 HI	12 LO	15.99	1 HI	16 LO
2.99	6 LO	13 LO	16.00	1 HI	16 LO
3.00	9 HI	12 LO	17.00	O	15 LO
3.49	4 HI	13 LO	17.99	O	15 LO
3.50	4 HI	13 LO	18.00	O	15 LO
3.99	1 HI	14 LO	19.00	1 LO	16 LO
4.00	1 HI	14 LO	19.99	1 LO	16 LO
4.99	4 LO	14 LO	20.00	3 HI	5 LO
5.00	4 LO	14 LO	21.00	1 HI	14 LO
5.99	7 LO	14 LO	21.99	O	14 LO
6.00	12 HI	14 LO	22.00	3 LO	17 LO
6.99	6 HI	14 LO	23.00	3 LO	18 LO
7.00	6 HI	14 LO	23.99	3 LO	18 LO
7.99	O	15 LO	24.00	2 LO	16 LO
8.00	O	15 LO	25.00	3 LO	16 LO
9.00	7 LO	15 LO	25.99	4 LO	18 LO
9.99	12 LO	14 LO	26.00	4 LO	18 LO
10.00	1 HI	15 LO	27.00	4 LO	16 LO
11.00	5 LO	14 LO	27.99	5 LO	17 LO
11.99	5 LO	13 LO	28.00	5 LO	17 LO
12.00	9 HI	16 LO	29.00	6 LO	17 LO
13.00	5 HI	15 LO	29.99	6 LO	18 LO
13.99	1 HI	14 LO			

TABLE 2-5. ANTENNA COUPLER CU-937/UR, TUNING CHART FOR 25-FOOT WHIP ANTENNA

FREQ (MHz)	TUNE	LOAD	FREQ (MHz)	TUNE	LOAD
2.00	1 HI	11 LO	14.00	O	15 LO
2.49	7 LO	13 LO	15.00	1 LO	16 LO
2.50	8 HI	12 LO	15.99	1 LO	16 LO
2.99	2 HI	12 LO	16.00	4 HI	15 LO
3.00	2 HI	12 LO	17.00	2 HI	15 LO
3.49	1 LO	13 LO	17.99	1 HI	16 LO
3.50	1 LO	13 LO	18.00	1 HI	16 LO
3.99	5 LO	13 LO	19.00	O	16 LO
4.00	5. LO	13 LO	19.99	O	18 LO
4.99	9 LO	13 LO	20.00	O	18 LO
5.00	9 HI	13 LO	21.00	1 LO	18 LO
5.99	1 LO	11 LO	21.99	2 LO	18 LO
6.00	1 LO	11 LO	22.00	2 LO	18 LO
6.99	9 LO	10 LO	23.00	3 LO	18 LO
7.00	27 HI	14 LO	23.99	4 LO	18 LO
7.99	20 HI	13 LO	24.00	4 LO	18 LO
8.00	13 HI	15 LO	25.00	4 LO	18 LO
9.00	9 HI	14 LO	25.99	6 LO	17 LO
9.99	6 HI	11 LO	26.00	5 HI	18 LO
10.00	6 HI	11 LO	27.00	4 HI	17 LO
11.00	5 HI	11 LO	27.99	3 HI	16 LO
11.99	3 HI	13 LO	28.00	2 HI	18 LO
12.00	3 HI	13 LO	29.00	1 HI	17 LO
13.00	2 HI	15 LO	29.99	1 HI	17 LO
13.99	O	15 LO			

TABLE 2-6. ANTENNA COUPLER CU-937/UR, TUNING CHART FOR 35-FOOT WHIP ANTENNA

FREQ (MHz)	TUNE	LOAD	FREQ (MHz)	TUNE	LOAD
2.00	1 HI	9 LO	14.00	1 HI	16 LO
2.49	5 LO	11 LO	15.00	3 LO	11 LO
2.50	7 HI	10 LO	15.99	3 LO	16 LO
2.99	1 HI	10 LO	16.00	3 LO	16 LO
3.00	1 HI	10 LO	17.00	5 LO	15 LO
3.49	O	10 LO	17.99	6 LO	13 LO
3.50	O	10 LO	18.00	O	17 LO
3.99	5 LO	10 LO	19.00	1 LO	17 LO
4.00	9 HI	10 LO	19.99	2 LO	17 LO
4.99	8 LO	8 LO	20.00	2 LO	17 LO
5.00	3 HI	9 LO	21.00	3 LO	17 LO
5.99	9 LO	6 LO	21.99	3 LO	17 LO
6.00	27 HI	13 LO	22.00	3 LO	17 LO
6.99	19 HI	9 LO	23.00	3 LO	17 LO
7.00	2 HI	11 LO	23.99	4 LO	18 LO
7.99	4 LO	8 LO	24.00	8 LO	14 LO
8.00	4 LO	8 LO	25.00	8 LO	15 LO
9.00	1 HI	9 LO	25.99	9 LO	16 LO
9.99	3 LO	13 LO	26.00	9 LO	16 LO
10.00	12 HI	10 LO	27.00	9 LO	16 LO
11.00	9 HI	15 LO	27.99	10 LO	16 LO
11.99	O	8 LO	28.00	10 LO	16 LO
12.00	O	8 LO	29.00	10 LO	16 LO
13.00	3 HI	16 LO	29.99	10 LO	15 LO
13.99	1 HI	16 LO			

NOTE

Separate Radio Remote Control C-1138/UR (or equivalents) must be connected to USB and LSB remote transmitter audio input and receiver audio output lines at ship's transmitter and receiver switchboards if both USB and LSB remote operation is intended.

2-15. ANTENNA COUPLER CU-937/UR OPERATION. The CU-937/UR is designed to match an antenna to the 50-ohm transmission line from the AM-3007/URT. Digital code information from the AM-3007/URT automatically programs motor-driven switches during initial tuning. Power and control signal connections are made to connectors mounted on one end of the unit. The antenna is connected to the antenna terminal mounted on the other end of the unit. For manual fine-tuning the variable inductors in the CU-937/UR, refer to paragraph 2-13g.

2-16. RECEIVE MODE OF OPERATION. Procedures for the receive mode of operation are as follows:

NOTE

Since the AN/WRC-1B is intended for use with a nominal 115-Vac power source, the AM-3007/URT PRIMARY POWER selector switch (figure 2-3) should be set to AC/INT BAT position at time of initial system installation and should not be reset thereafter.

a. When the AN/WRC-1B is to be operated in duplex mode, loosen fastening screws on front panel of R-1051B/URR, pull chassis out approximately 6 inches, and set SIMPLEX/DUPLEX toggle switch (S9) at left rear of front panel at DUPLEX. Slide chassis into case and tighten front-panel screws. A separate receiving antenna is required for duplex operation, and the sidetone audio lines must be disconnected at TB2 of the J-1265/U

b. Set AM-3007/URT PRIMARY POWER circuit breaker at ON, and set R-1051B/URR Mode Selector switch (figure 2-2) at STD BY. These switches should be set prior to operation to allow frequency standard to come up to temperature. Allow a 20-minute warmup period for general operation and at least a 60-minute warmup period for optimum frequency stability.

c. Check line voltage indication on AM-3007/URT AMPLIFIER meter. Notify technician if voltage is consistently high.

NOTE

When the AN/WRC-1B is used with the CU-937/UR, the system interlock is connected through the CU-937/UR when the AM-3007/URT ANTENNA INTERLOCK switch is in NORMAL position. If the CU-937/UR is not used, ANTENNA INTERLOCK switch must be set at OVERRIDE. This switch is located at right rear of front panel of the AM-3007/URT and is normally set at time of installation.

d. When the CU-937/UR is used, set AM-3007/URT ANT CPLR BYPASS switch at position desired. When switch is set at BYPASS, CU-937/UR tuning elements are bypassed in receive mode. When switch is set at NORMAL, CU-937/UR tuning elements are inserted between antenna and R-1051B/URR. When ANT CPLR BYPASS switch is set to BYPASS position, disregard all following steps referring to CU-937/UR operation in receive mode.

NOTE

Operation with ANT CPLR BYPASS switch set at BYPASS will overcome signal strength loss that might occur if system is operated in simplex mode using different transmitting and receiving frequencies.

e. Set R-1051B/URR Mode Selector switch at desired mode of operation.

f. Using MCS controls, KCS controls, CPS switch, and vernier control on front

panel of R-1051B/URR, select desired operating frequency.

NOTE

When operating in duplex mode, R-1051B/URR and T-827B/URT frequencies must be displaced by at least 15 percent. For example, if one unit is tuned to 06.010 MHz, the other unit should be tuned to a frequency at least 00.901 MHz above or below this 06.010 MHz; therefore, the other unit can be operated on any frequency from 02.000 to 05.009 MHz, and from 06.911 to 29.999 MHz, but not between 05.109 and 06.911 MHz.

g. Fine tune CU-937/UR to the selected operating frequency as follows:

1. If a 15-foot whip antenna is used, refer to table 2-4 (table 2-5 for 25-foot antenna; table 2-6 for 35-foot antenna) and locate frequency closest to selected operating frequency.

2. Hold AM-3007/URT ANT CPLR LOAD control at LO for required number of flashes of ANT CPLR TUNE indicator listed in LOAD column of table.

3. Hold ANT CPLR TUNE control at position indicated in TUNE column of table for the listed number of flashes of ANT CPLR TUNE indicator.

4. Set RF OUTPUT meter switch at 100 W REFL.

5. Hold RF OUTPUT TUNE/OPERATE switch at TUNE and minimize indication on RF OUTPUT meter by adjusting ANT CPLR TUNE control (HI and LO) and ANT CPLR LOAD control (HI and LO). Alternately adjust both controls until indication on RF OUTPUT meter nulls.

NOTE

When specific frequencies are to be used often, and to permit tuning under radio silence conditions, time and effort can be saved by developing the logging chart shown in figure 2-4. This is accomplished by noting exact number of light flashes and direction of tuning in appropriate columns for each switch as nulling procedure is performed. Place a copy of the logging chart near the AM-3007/URT for reference.

6. Set RF OUTPUT meter switch at 30 W REFL.

7. Repeat step 5 until meter pointer rests in small black area at left of meter scale.

8. Set RF OUTPUT TUNE/OPERATE switch at OPERATE.

h. Connect headset to LSB PHONES jack or USB PHONES jack on front panel of R-1051B/URR. Choice of connector depends upon previously selected mode of operation.

i. Adjust LSB LINE LEVEL control or LSB PHONE LEVEL control for desired lower sideband headset volume level.

j. Adjust USB LINE LEVEL control or USB PHONE LEVEL control for desired upper sideband headset volume level.

NOTE

If installation includes provision for remote operation, initially set remote audio line level to required value with USB LINE LEVEL control or LSB LINE LEVEL control. Thereafter, all local headset volume should be adjusted only with USB PHONE LEVEL control or LSB PHONE LEVEL control.

	FREQUENCY (MHZ)	TUNE	LOAD	

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Figure 2-4. Antenna Coupler CU-937/UR, Logging Chart

k. When receiving CW, adjust BFO FREQ control to vary pitch of received signal.

l. Rotate RF GAIN control fully clockwise. When strength of received signal is extremely high, better reception may be achieved by varying RF GAIN control to reduce gain.

NOTE

This will desensitize the R-1051B/URR. Whenever operating channel or frequency is changed, rotate RF GAIN control back to full clockwise position.

m. When receiving a transmitted signal that is not the exact frequency of the R-1051B/URR, use the vernier control to tune in this signal.

n. When FSK ancillary equipment designed for only a 2550-Hz center frequency is used, a special tuning procedure is required if it is necessary to receive FSK transmissions using a 2000-Hz center frequency. In this case, proceed as follows:

1. If FSK transmissions are on LSB channel, use the vernier control to tune the R-1051B/URR 550 Hz above frequency selected with MCS and KCS controls.

2. If FSK transmissions are on USB channel, set 1 KCS control down one digit from assigned frequency; use the vernier control to tune the R-1051B/URR 450 Hz above new frequency.

2-17. SHUTDOWN PROCEDURE.

2-18. Shutdown of the AN/WRC-1B is accomplished as follows:

a. Set both Mode Selector switches (figures 2-1 and 2-2) at OFF.

b. Set AM-3007/URT PRIMARY POWER circuit breaker at OFF.

NOTE

When it is desired to eliminate required warmup period, the PRIMARY POWER circuit breaker must be left at ON and both Mode Selector switches must be left at STD BY.

2-19. OPERATOR'S MAINTENANCE.

2-20. OPERATING CHECKS AND ADJUSTMENTS. When a system malfunction is encountered, the operator should perform the following steps to determine the cause of the trouble:

a. Check to see that T-827B/URT and R-1051B/URR are set at proper frequency.

b. Check to see that power is applied to the system by placing the AM-3007/URT AMPLIFIER meter switch at LINE, and observing the indication on the AMPLIFIER meter.

c. Check to see that the AM-3007/URT PRIMARY POWER indicator is lighted.

d. Check all fuses. If any are open, associated indicator will light. Replace open fuses.

e. Check all cables for breakage and check connectors for proper locations and proper seating.

f. Check indications of AMPLIFIER meter with AMPLIFIER meter switch at DR CATH and then at PA PL. Incorrect readings indicate malfunction in AM-3007/URT.

g. Request a radio check from a party other than the one presently in contact.

h. If operator cannot locate trouble, refer problem to maintenance personnel.

2-21. PREVENTIVE MAINTENANCE. Preventive maintenance that can be performed by the operator is listed in table 2-7.

2-22. EMERGENCY MAINTENANCE. If the system malfunctions while a technician is not available, the operator should perform the following emergency repair procedures.

a. Try another mode of operation.

b. Perform steps a. through g. of paragraph 2-20.

c. Replace any damaged cables.

d. Loosen screws on front panels of the T-827B/URT, R-1051B/URR, and AM-3007/URT, and pull chassis out from cases. Perform following checks:

1. Check all electronic assemblies for proper seating.

2. Check to see that vacuum tube filaments are lighted. If tubes in T-827B/URT or R-1051B/URR RF Amplifier Electronic Assembly 2A2A4 or 1A2A4 should be replaced, remove tube shield and pull tube out with a tube puller, applying a steady, straight-up pressure. The dust cover over the assembly may be removed if necessary. Do not attempt to remove tubes from the AM-3007/URT.

TABLE 2-7. RADIO SET AN/WRC-1B, OPERATOR'S PREVENTIVE MAINTENANCE CHECKS

INSPECT FOR	REMEDY
Dust	Clean exterior with soft, line-free cloth. Clean interior with brush, cloth, or compressed air
Nicks, burrs, dents, scratches, or rust spots	Smooth burrs with a file. Sandpaper corrosion, rust, or scratches, and refinish
Loose handles, mounting screws, or other hardware	Tighten loose hardware
Chain drive binding	Oil lightly
Cable assemblies broken, frayed, or damaged	Repair or replace

ALPHABETICAL INDEX

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