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OPERATOR MANUAL
HF/SSB RADIO SET
PRC-2200

AUGUST 1992

OPERATOR MANUAL
FOR
HF/SSB RADIO SET PRC-2200

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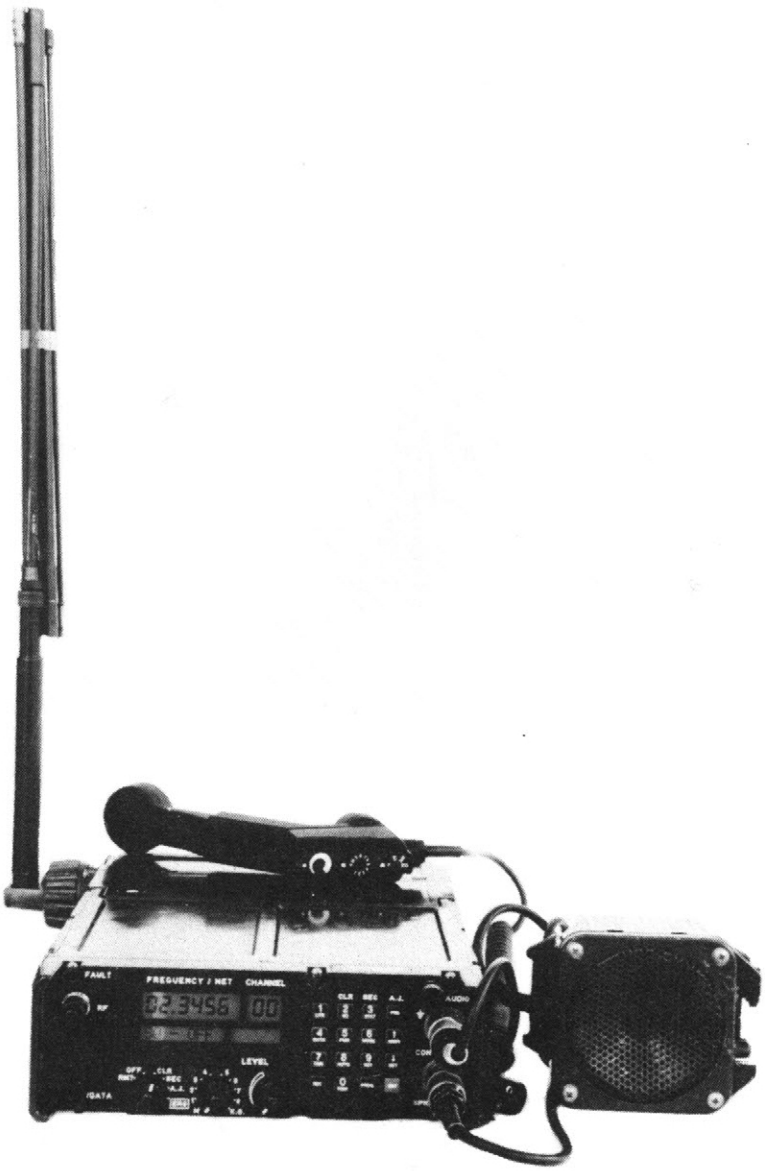

Figure 1-1. PRC-2200, General View

CHAPTER 1

INTRODUCTION

1-1. SCOPE

This manual describes HF/SSB Radio Set PRC-2200 (figure 1-1) and covers its installation and operation. The following features are integrated in the basic HF-2000 system:
AUTO-CALL, DUAL, SQ SYLAB, SEL.C, DCW.
The following features are optional: AM, NCW, CCW, AJ, FLASH, MONITOR and INT MODEM.

1-2. PURPOSE AND USE

HF/SSB Radio Set PRC-2200 is a manpack-portable high-frequency (HF) single-sideband (SSB) radio receiving/transmitting set. PRC-2200 provides 285,000 RF channels at 100-Hz spacing in the 1.5000-to-29.9999-MHz range.

Advanced design techniques provide high quality, secure and reliable HF communication and immunity to electronic warfare.

The main features of the PRC-2200 include:

* Integral AUTO-CALL function (automatic link establishment with selection of the quietest free channel that can support communication), brings the main advantages of sophisticated frequency management to the manpack radio.

* Advanced active squelch silences audio output when no useful signal is received (passive syllabic squelch is also provided, for compatibility with older radio sets).

* Powerful selective call function, including group calling and broadcasting for general and emergency calls, mutes audio output when signals not addressed to your radio are received.

* Integral encryption and frequency hopping (optional) module using digital signal processing.

* Integral 50/75/150 baud synchronous/asynchronous modem (optional) with forward error correction (FEC) and interface to external modem for data rates up to 2400 baud.

* FLASH capability, for fast and short numerical messages.

* DUAL capability, for separated transmit/receive frequencies.

* Full microprocessor control.

* Full remote control capability.

* Control handset allows channel, function and volume control.

* Operating convenience and simplicity achieved by simple operating procedure and a friendly operator interface that clearly displays radio status and guides the operator in performing the various tasks.

* Operating parameters are stored in a battery-protected memory, and are retained while radio set is not connected to an external power source and can be erased in an emergency.

* Conversion to vehicular radio set by installation into vehicular mounting.

1-3. HF-2000 FAMILY

The PRC-2200 is part of the HF-2000 family of tactical HF/SSB radio sets that provide solutions to the challenges of communications and command on the modern battlefield. The basic equipment included in this family comprises:

* 20W manpack radio set PRC-2200
* 20W vehicular radio set VRC-2020
* 100W vehicular radio set VRC-2100
* 400W vehicular and shipborne radio set VRC-2300

The HF-2000 family is characterized by high commonality of components and modularity, for increased reliability and simpler maintenance: all HF-2000 configurations use the same Receiver/Transmitter Unit, RT-2001 and hence have a large number of common characteristics.

Among the main system features of the HF-2000 family are all the features listed in para. 1-2 above.

Additional features are:

* Remote control interface, provides full control over all equipment functions.

* Frequency management unit, available for vehicular and stationary station use.

* Compatibility with other existing HF equipment.

* Compact Data Loader G-10 allows loading of all parameters required for radio set operation.

* High quality audio transmission even in the secure and anti-jamming modes, obtained by fully-digital signal processing.

* Comprehensive self-test function.

* High reliability, achieved by advanced design.

* Ease of maintenance.

1-4. BASIC ITEMS (figures 1-2, 1-3)

The basic items comprising Radio Set PRC-2200 are listed in Table 1-1. Optional accessories are listed in Table 1-2.

Table 1-1. PRC-2200, Basic Items

ITEM	DESCRIPTION	MFG. CAT. NO.	QTY
1	Receiver/Transmitter RT-2001	2187-09010-XX *	1
2	Antenna Coupler, CP-2003	2187-09100-00	1
3	Handset, H-250/U	2090-09250-00	1
4	Antenna Whip Kit, AT-1741H The kit includs: Base, Antenna, AB-591 Antenna, Collapsible, AT-271A Belt, Safety Adapter, Antenna, AB-10H	2187-09315-00 2090-09016-00 2090-09015-00 2187-09390-00 2187-09320-00	 1 1 1 1
5	Carrying Harness, ST-2243	2187-09450-00	1
6	Battery, Rechargeable, NiCd, TNC-2188	2051-09215-00	1

* The last two digits are according to customer requirements.

Figure 1-2. PRC-2200 Components

Table 1-2. PRC-2200, Optional Items

ITEM	DESCRIPTION	MFG. CAT. NO.	QTY
1	Dipole Antenna Kit AT-1742 The kit includs: Wire, Antenna, W-198 Dipole Feed, F-198/T (7 meter) Dacron Cord, C-198	2124-09401-00 2124-09420-00 2124-09409-00 2124-09410-00	 2 1 2
2	Loudspeaker, LSA-108M	2052-09222-00	1
3	Battery, Lithium, BT-5791	2187-09385-00	1
4	Handset, Control, H-739/GR	2187-09310-00	1
5	Key, Telegraph, KY-116/U	2125-09024-00	1
6	Cable Assy, Key, CX-1852S (1.8 meter)	2020-09126-00	1
7	Microphone, Dynamic, M-80/U	2125-09027-00	1
8	Headset, H-140A/U	2125-09028-00	1
9	Headset, H-174	2054-09131-00	1
10	Bag, Accessories, CW-1	2187-09465-00	1
11	Generator, Handcrank, HCG-2044	2187-09330-00	1
12	Cable Assy, Power, CX-2044	2187-09201-00	1
13	Tripod, Generator, TP-174	2124-09358-00	1
14	Battery Charger, BCT-80/BC-2500	2051-09016-00	1
15	Carrying Harness, ST-2043	2187-09250-00	1
16	Ground Spike, CX-1740A	2124-09366-00	1
17	Data Loading from PRC-2200 to PRC-2200, CX-8708	2020-09518-00	1
18	Data Loading From PC to PRC-2200, CX-8709	2020-09519-00	1
19	TTY Adapter, AD-2165	2187-09230-00	1

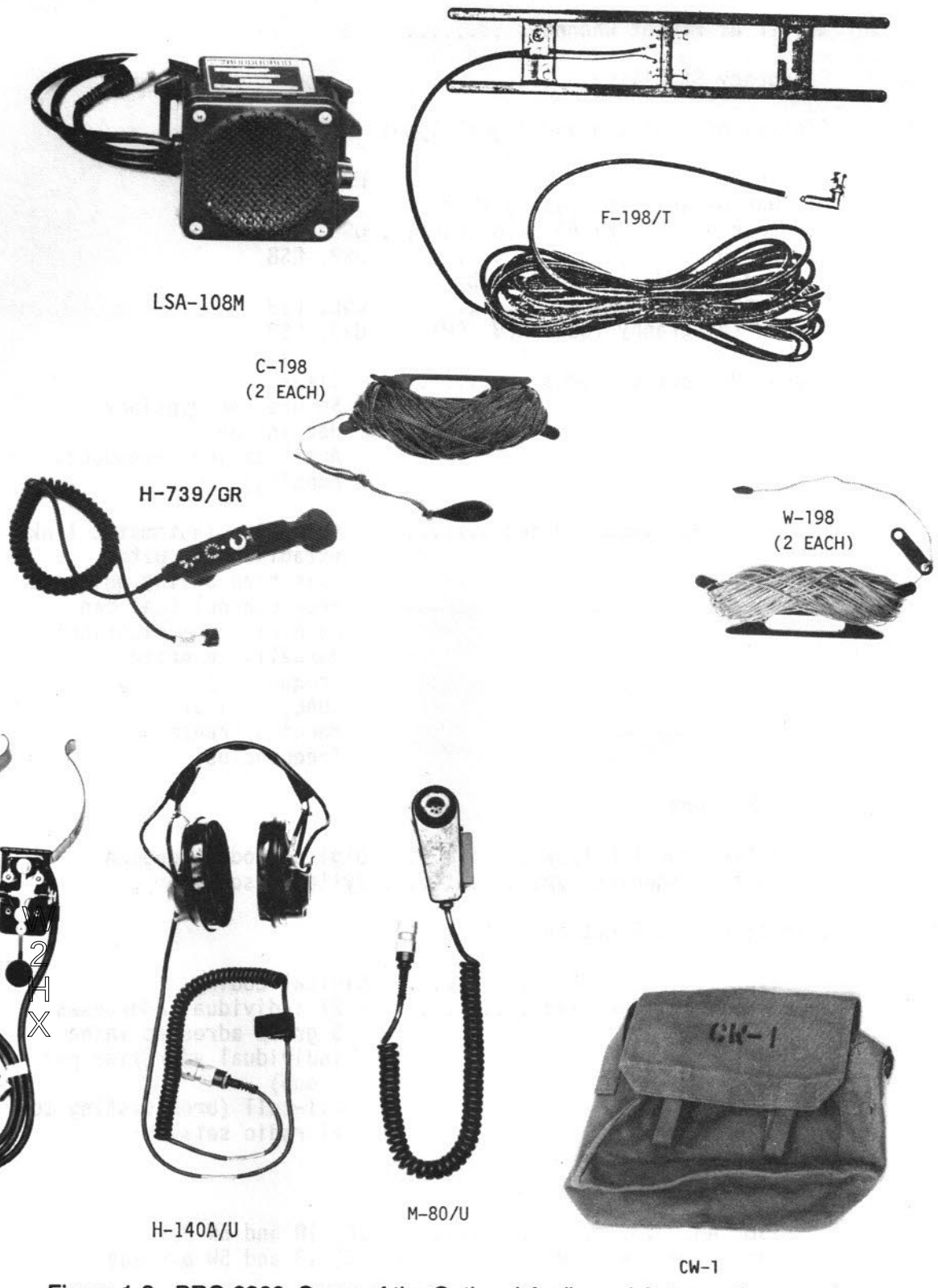

Figure 1-3. PRC-2200, Some of the Optional Audio and Antenna Accessories

1-5. MAIN PRC-2200 PERFORMANCE DATA

Frequency Range ..... 1.5000 to 29.9999 MHz

Number of RF Channels/Spacing ..... 285,000/100 Hz

Number of Preset Channels 20

Frequency Stability ..... ±1 ppm

Classes of Emission and Signal Types

Voice	USB, LSB, AM
Narrowband data (using the internal 50/75/150 baud modem)	USB, LSB
FLASH	USB, LSB
Wideband data (provided by external modem)	USB, LSB
CW telegraphy (CCW, NCW, CW)	USB, LSB

Signal Protection Modes .....
- Clear
- Secure (encryption/ decryption)
- Anti-jamming (frequency hopping)

Frequency Management Modes .....
- AUTO-CALL (automatic link establishment with selection of the quietest free channel that can maintain communication)
- Manually-selected frequencies
- DUAL, Separated receive/transmit frequencies

Squelch Types

Active squelch type	Digital coded squelch
Passive squelch type	Syllabic squelch

Selective Call Function

Type	Digital coding
Available addresses	- 27 individual addresses - 3 group adresses (nine individual addresses per group) - All-call (broadcasting to al radio sets)

RF Output Power

SSB, AM	20, 10 and 5W PEP
Data, NCW, CW, CCW	20, 10 and 5W average

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Receiver Sensitivity

Voice, CW, CCW, data	0.7 μV at 10 dB SINAD
NCW	0.3 μV at 10 dB SINAD
AM	3.5 μV at 10 dB SINAD

Audio Characteristics

Audio input	Suitable for standard audio accessories: Headset H-140 A/U Handsets H-250/GR, H-189/U and H-739/GR
Audio output power	10mW across 600ohms/180mW across 50ohms
Voice signal processing	- Digital compresssor
External modem	0 dBm across 600 ohms

Antenna Characteristics

Antenna types	- 9 ft (2.7 m) whip - 15 ft (4.5m) whip - Wire antenna (resonant or broadband dipole, slant-wire or long-wire antenna)
Tuning method	Automatic

Supply Characteristics

Input voltage range	10.5 to 14.5 VDC
Battery types	Lithium Battery, BT-5791 Rechargeable NiCd Battery, TNC-2188
Operating Temperature Range	- 40°C to +65°C (-40°F to +150°F)

1-6. COMMUNICATION SERVICES PROVIDED BY PRC-2200

1-6.1 Signal Modes Three selections are provided:

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a. VOICE - for speech and modem signals.
b. CW - CW telegraphy using normal receiver bandwidth.
c. NCW - CW telegraphy using narrow receiver bandwidth for increasing range, and reducing interference.
d. CCW - CW telegraphy using carrier frequency.

The selection of a mode instructs the radio set to use the optimum parameters for the selected mode.

1-6.2 Data Transmission Two basic selections are provided:

a. External modem - for any data rate, as the data rate depends on modem characteristics. Usually the maximum rate is 2400 baud. Encryption/decryption must then also be provided by external equipment.

b. Internal modem (optional) - for 50, 75 or 150 baud synchronous or asynchronous operation. The interface is RS-232C. This permits transmission of teletypewriter or data terminal signals without additional equipment, while providing the protection of secure and anti-jamming operation.

c. FLASH - Fast short message communication.
FLASH enables to transmit messages of 3 decimal digits, and to get an acknowledge of this message in a simple way.

FLASH process:
Initiation station: Send the FLASH message.
Receiving station : Send the ACK response.

The radio can save up to first 16 messages or ACK responses. During operation in fixed frequency mode the FLASH message is transmitted immediately.

If operated from SCAN mode, the transmission will first perform the LEARN process (if not activated yet), then establish the link, then activate the FLASH transmission.

1-6.3 Signal Protection Function. Three selections are provided:

a. Clear - (CLR) radio transmits the clear input signals on a fixed frequency that does not change during the transmission. See para. 1-6.7 for clear operation using AUTO-CALL.

b. Secure - radio encrypts the transmitted signal with a (CLR) pseudo-random bit stream based on a key selected by the operator and decrypts the received signals, provided they were encrypted with the same key.

Transmissions take place on a fixed frequency that does not change during the transmission. The operator can select one of ten different keys that can be loaded and stored in the PRC-2200.
In the SEC mode, the PRC-2200 can protect, as an option, not only voice communication, but also CW telegraphy. See para. 1-6.7 for secure operation using AUTO-CALL.

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c. Anti-jamning "frequency hopping" technique in which the transmission rapidly changes according to a (AJ) pseudo-random bit stream based on an operator-selected hopping key.

In the HF frequency range, propagation conditions interfere with free selection of hopping frequencies; even when frequencies are not used by friendly forces, they may not maintain long-range communication, or may be disturbed by high-power stations.

Thus, tables that contain "good" frequencies must be used to instruct the radio which frequencies are allowed for hopping. PRC-2200 provides flexibility in this respect by having three types of "hopping frequency tables":

* Up to eight sequential tables. The frequencies contained in each table are calculated by the PRC-2200 according to three parameters loaded by the operator: the lowest frequency, the number of frequencies (up to 150) and the step size (the difference between adjacent frequencies, in kHz - up to 99 kHz). The resulting upper frequency must not exceed 29.9999 MHz.
  Each sequential frequency table can contain up to five forbidden frequencies that are excluded from the hopping pattern (e.g., frequencies used by friendly forces for fixed frequency communications).

* One manual frequency table that can contain up to 150 operator loaded random frequencies.

* One central frequency table: when this table is selected, the radio frequency hops randomly around the preset channel fixed frequency. The operator need not specify parameters for this table.

NOTE

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Fixed frequency (CLR or SEC) transmissions can not be received in the AJ mode: receivers operating on fixed frequency cannot receive AJ transmissions.
However, a PRC-2200 operating in the SEC mode will reproduce CLR transmissions on its receiving frequency, and a PRC-2200 operating in the CLR mode will signal the operator that a SEC transmission using the proper key is received on its frequency.

1-6.4 Selective Calling. PRC-2200 uses digital selective calling, which means that the radio transmits an address (a digital identification code) simultaneously with each transmission; each radio that receives the transmission checks the code against its receive address, and allows the received audio signal to pass to the output only when the codes match. Each address has two digits, and the operator selects both the transmitted address and its receive address.

There are a total of 30 addresses: 27 individual, three group and one broadcast address.

- The transmission of an individual address (01-09, 11-19, 21-29) enables only the receiver loaded with that address to pass the received message.

- The transmission of a group address (00, 10 or 20) enables the receivers pertaining to that group (receivers with receive addresses starting with the same tens digit) to pass the received message.

- The transmission of the broadcast address enables all receivers to pass the message.

The use of selective calling permits frequency reuse, greatly reduces operator fatigue (because the receiver output is muted at all times, except when receiving a message addressed to that particular receiver) and is very useful for implementing automatic retransmission stations. When using CW telegraphy, selective calling is the only way to mute audio output when undesired signals are received.

1-6.5 Speech Processing. The PRC-2200 provides a digital processing to increase the average transmit power.

1-6.6. Squelch Types. The PRC-2200 provides two types of squelch:

a. Active squelch, using digital coding. This squelch is very reliable and can be used together with selective calling.

b. Passive squelch, that is used for compatibility with other existing HF radio equipment. The passive squelch is a syllabic squelch circuit that can be activated in the voice mode. The squelch circuit recognizes the syllabic structure of speech, and allows only voice messages pass to the audio outputs; other types of signals are blocked, thereby significantly reducing background noise.

Both types of squelch circuits can be turned off.

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1-6.7 Frequency Management - AUTO-CALL Function. The AUTO-CALL function is used in the CLR and SEC modes to automatically establish a link on the quietest free channel that can maintain communication. This ensures that communication always takes place on the frequency that under the given conditions yields the best communication quality. The operating frequency is selected from the frequencies stored in the selected table, (one of the two tables).

Each table can contain up to 10 operator-selected frequencies. During AUTO-CALL operation, the calling and called stations are identified by their selective call addresses. When a call to an individual address (01-09, 11-19, 21-29) is made, the following sequence establishes the AUTO-CALL function:

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a. The radio set continuously scans the frequencies in the selected table, and evaluates their quality. The radio set displays:
SCAN b-XY, where b is the AUTO table number, XY is the SELT.T code.

b. When a transmission is started, the initiating radio set (with receive address AB) automatically selects the best free frequency. On this frequency, the initiating radio set transmits the address of the called radio set (with receive address XY). During this period, the message CALL XY and the transmission frequency are displayed in the initiating radio set.

c. When the called radio set detects this transmission, it stops scanning, and automatically transmits an acknowledgement to the calling station after its transmission ends. When this happens, the called radio set displays the message REPLY AB, where AB is the SEL R. of the initiating radio.

d. Based on this acknowledgement, the calling radio set transmits the final acknowledgement. Now both radios display the message READY together with the selected frequency, and the operator can start the transmission. The initiating radio set will display READY XY and the called radio set will display READY AB.

e. The radio sets continue to use the frequency selected as long as it is usable. If the communication quality degrades, the operator can choose the best operational frequency and continue the conversation.
To perform this operation, press FRQ key. REPLACE message will then appear. Press ENT to confirm.

f. The link is maintained as long as there is traffic between the stations: about 40 seconds after traffic stops, the radio sets start scanning again. The operator can also press the RST key to break the link at any time and start scanning again. This action is accompanied by the message DISCONNECT on the displays of both radio sets, so that the other operator is also notified.

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g. If the link cannot be established on any of the frequencies contained in the frequency table, the operator of the calling radio set sees NO COM XY on the display.

When making a group or a broadcast call, the AUTO-CALL process is similar, except that after the address transmission ends, the calling radio set does not wait for an acknowledgement before displaying: READY XY.

1-6.8 DUAL - transmit/receive different channels.

The DUAL purpose is to enable RECEIVE on one frequency/channel and TRANSMIT on another one, but still in half duplex.

Dual has all other features of a fixed frequency operation.

Operating on different transmit/receive frequencies has several advantages:

- Enables communication between two stations while one frequency is good for one of the stations and bad for the other, for e.g., when local noise exists.

- Enables some security in communication.

- Enables re-transmit communication.

1-6.9 Automatic Antenna Tuning. The PRC-2200 always performs optimal antenna tuning, to achieve maximum sensitivity and transmit power:

* During fixed frequency operation the tuning process starts at the first PTT pressing. On subsequent transmissions, tuning is checked again and corrected if necessary. If antenna cannot be tuned (because of physical damage, or because the antenna selector on the CP-2003 shifted to an incorrect position), an alarm tone is generated and the message NO MATCH is displayed on the RT-2001.

* When using frequency tables, such as during AJ or AUTO-CALL, a special tuning process, called "learning" is performed. Learning process starts with the first PTT action, for every entrance to AUTO-CALL or AJ modes, every change from the actual frequency table, or each time a frequency change is made in the relevant frequency table.
The tuning is performed by the PRC-2200 without operator intervention, by transmitting on each frequency and "learning" the correct tuning for each one. The tuning interval is very short. The operator sees LEARN ON. In case the learning is successful, the radio returns to the SCAN mode. If the learning failed, a LRN FAIL message appears and then the radio returns to the SCAN mode. In this case, check the antenna, the antenna selector and the frequency table.

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CHAPTER 2

INSTALLATION

Section I. PREPARATION FOR OPERATION

2-1. UNPACKING

A preliminary inspection of the equipment containers should be made prior to, and also immediately after unpacking. Evidence of damage, or any missing items or discrepancies with respect to the accompanying packing slip (or the appropriate list of items given in the equipment manual) should be noted and reported immediately to proper authorities.

Fold and store the containers and packing materials in accordance with standard procedures.

2-2. ASSEMBLY OF RT-2001 AND CP-2003 (figure 2-1)

In case the RT-2001 and CP-2003 are not assembled, proceed as follows:

1. Set the function selector of the RT-2001 to OFF.
2. Check the connectors located at the rear of the RT-2001 and at the CP-2003 for shell damage or bent pins. Do not attempt to mate the units if either connector is damaged.
3. Remove dirt and foreign matter from the connectors with a soft brush.
4. Position the two units and press together to mate the connectors. If resistance is felt before connectors are fully engaged, check and remedy the cause, then repeat the procedure.
5. Fasten the CP-2003 to the RT-2001 with the two clamps provided.
6. If necessary, attach the AB-10H whip Antenna Adapter on the CP-2003.

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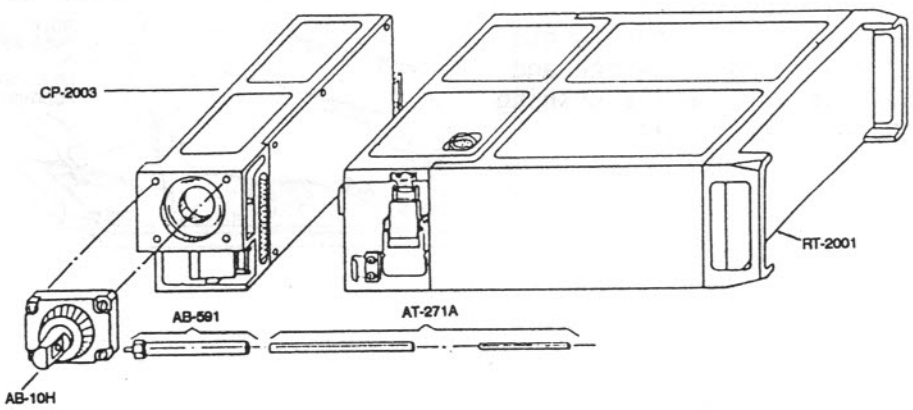


Figure 2-1. Radio Set Assembly

2-3. INSTALLATION OF BATTERY

WARNING

Lithium batteries contain dangerous chemicals. Handle and dispose of lithium batteries according to the prescribed safety regulations.

1. Do not short-circuit lithium batteries.
2. Do not damage the battery case and do not tamper with the battery in any other way.
3. Do not try to recharge the battery.
4. Do not dispose used lithium batteries by burning.

The RT-2001 has provisions for charging TNC-2188 type NiCd batteries, when an external power source is connected to the radio set. For the portable radio set, this source is usually a handcrank generator connected to the RMT/DATA connector.

To install the battery proceed as follows:

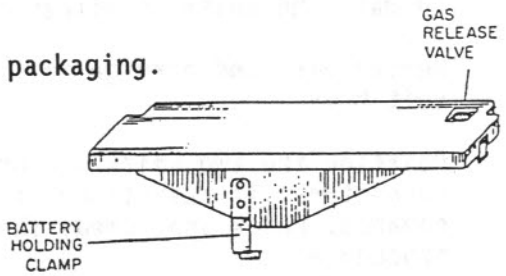
1. Set the function selector of the RT-2001 to OFF.

2. Open the two clamps fastening the battery compartment cover and remove the cover.

3. If necessary, pull the old battery out. To release the battery, push the holding clamp aside.

4. Take a new battery, and remove its packaging.

5. Check that the gas release valve on the cover of the battery compartment is clean.



6. Insert the new battery with its connector pointing upwards and towards the connectors located on the cover. Note orientation in the figures below:

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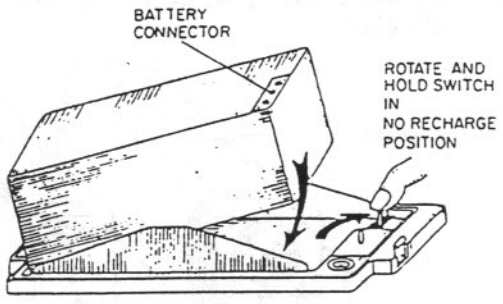
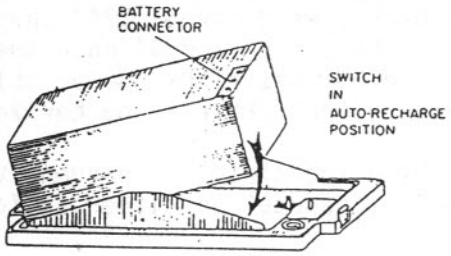
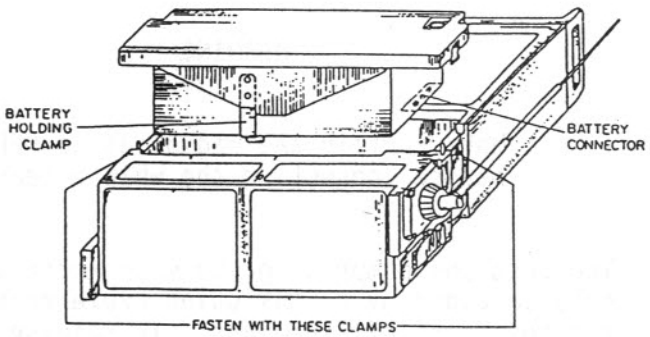
a. When recharging is not in process, rotate the tongue of the charging switch and hold it aside while pushing the battery in place.



b. When recharging is required, just push the battery in place; its charging receptacle will automatically mate with the charging connection



7. Position the cover in place and fasten it with the two clamps.



2-4. INSTALLATION ON THE CARRYING HARNESS

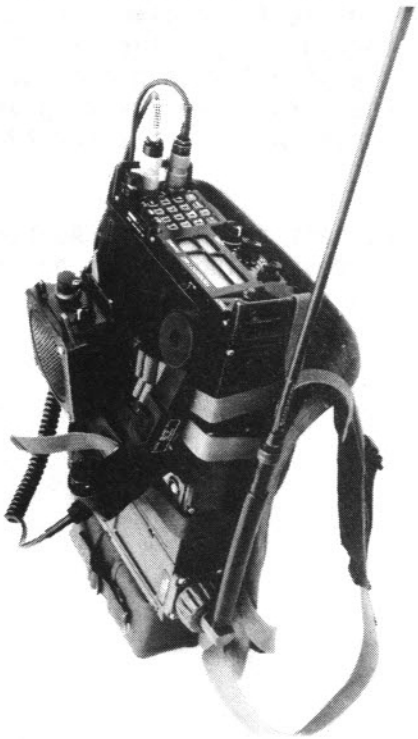
1. Put in place the upper and lower portions of the carrying Harness ST-2243 shoulder straps.

2. Position the harness on a level surface, with the harness shoulder straps facing away.

3. Put the radio set on the metal stave with the whip antenna adapter to the right-hand side.

4. If Loudspeaker LSA-108M is used, attach it to the upper left-hand strap and position it against the upper side wall of the RT-2001.

5. Fasten the radio set with the five straps:
three straps in the front, and two in the upper left and right side.



6. Secure ST-2243 to operator's back as follows:
   With back toward the ST-2243 shoulder straps, insert arms through traps. Lift the ST-2243 onto the back and adjust the shoulder straps so that the harness rides comfortably. Secure the waist-level belt and adjust so that there is no horizontal movement of the carrying harness:

   - Tighten the straps to prevent vertical movement of the ST-2243.
   - Connect handset to either audio connector.

2-5. INSTALLATION OF WHIP ANTENNA

WARNING

Make certain the radio set is OFF
before connecting the whip antenna!

1. The sections comprising the whip antenna assembly are held in place by a tensioning cable running through the inside of all sections. To release them, carefully whip the antenna outwards and mate the individual sections by hand. Always start with the top section to prevent damage to the tensioning wire.

2. Connect the whip antenna to the antenna Base AB-591. The lower section of the whip antenna, as in the Antenna Base AB-591, consists in a threaded metalic parts in which a plastic protuberance exists.

   When the whip antenna is connected to the Antenna Base for the first time, it is necessary to apply force to thread the plastic protuberance. This may cause the use of a 3/4 inch open head wrench. The same applies the first time the whip antenna assembled is connected to the Antenna Adapter AB-10H. (See Para. 4 below).

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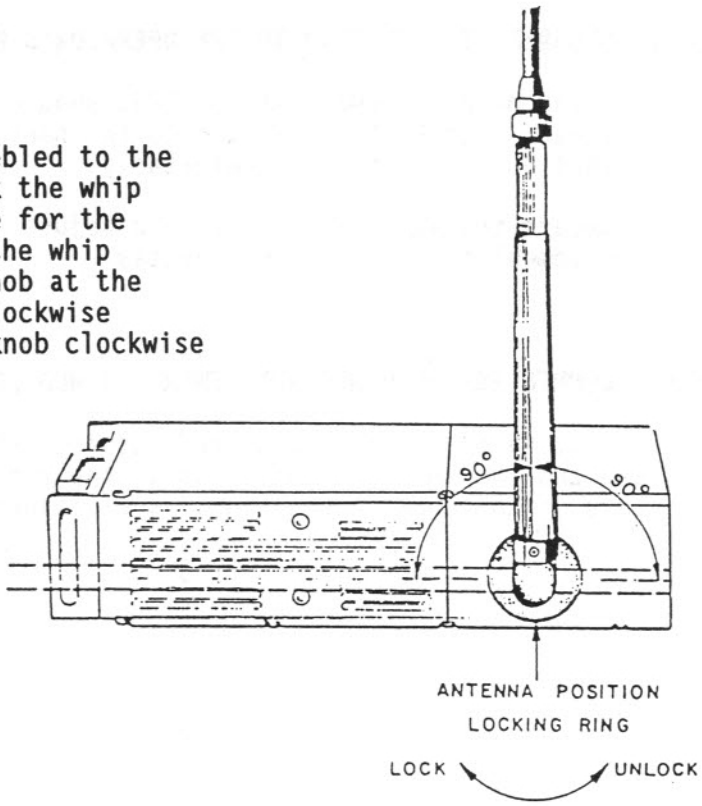
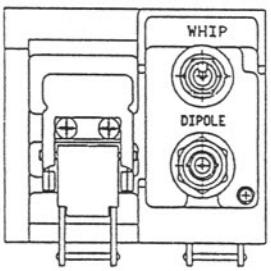
3. Connect the Antenna Adapter AB-10H to the corresponding socket on the CP-2003 left side, and tight the four screws.

4. Connect the whip antenna assebled to the Antenna Adapter AB-10H. Lock the whip antenna at a convenient angle for the intended operation. To turn the whip antenna, release the large knob at the antenna base using counter-clockwise rotation; to lock, turn the knob clockwise and tighten by hand.

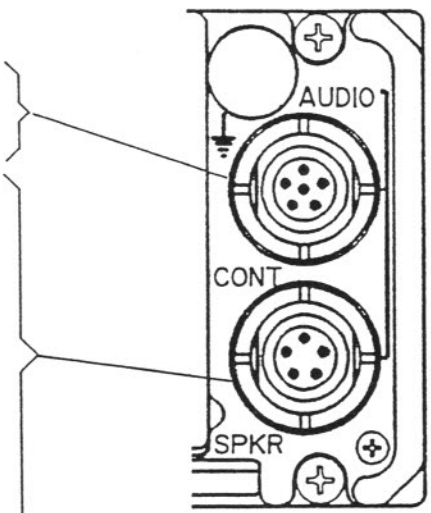


5. Set the antenna selector on the CP-2003 to WHIP.



2-6. CONNECTION OF AUDIO ACCESSORIES

1. Connect the handset or headset to the AUDIO CONT connector.
2. If a loudspeaker is installed, connect it to the AUDIO SPKR connector.



NOTE

If a loudspeaker is not used, another handset or headset may be connected to the AUDIO SPKR connector. The H-739/GR handset must always be connected to the six-pin AUDIO CONT connector.

2-7. SECURING THE ST-2243 TO THE OPERATOR'S BACK

1. With the back toward the ST-2243 shoulder straps, insert arms through straps. Lift the ST-2243 onto the back and adjust the shoulder straps so that the harness sits comfortably.

2. Secure the waist-level belt and adjust it so that there is no horizontal movement of the carrying harness.

2-8. CONNECTION OF HANDCRANK GENERATOR HCG-2044

When battery charging is required, connect the CX-2044 cable between the HCG-2044 and the RMT/DATA connector in the radio set. Check that the charging switch is in the correct position, as explained in paragraph 2-3.6.

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Section II. ANTENNA SELECTION AND INSTALLATION

2-9. RADIO FREQUENCY PROPAGATION CONSIDERATIONS

To obtain optimal performance from the radio set, the propagation factors must be taken into consideration. These factors determine the choice of frequency, antenna and propagation mode as well as the siting location.

Communication in the HF frequency range can be carried out using either ground-wave or sky-wave propagation. The main factors influencing the communication mode and quality are the operating frequency and the antenna type:

- For ground-wave communication, either whip or dipole antennas may be used.
- For sky-wave (ionospheric refraction) communication, use dipole antennas for best results.

Both types of antennas are supplied with the radio set:

1. The 9-foot (2.7 meter) Whip Antenna AT-1741H for short-range ground-wave communication.
2. The Wire Antenna Kit AT-1742 (optional), which may be used as a:
   - Dipole antenna in various configurations
   - Slant-wire antenna

The dipole is the most effective antenna for medium-range sky-wave communication (beyond the skip zone). It should be used whenever time and tactical circumstances permit. One or two supports are required to erect the antenna.

The slant-wire antenna is used when a greater range is required than that provided by the whip antenna but time and physical situations do not permit the erection of a dipole. The slant-wire antenna requires the use of one dipole antenna wire and a single antenna support.

2-10. DIPOLE ANTENNA INSTALLATION

The most effective propagation direction of the dipole antenna, for both transmit and receive modes, is broadside to the wire. If two suitable supports are not available or cannot be erected, a dipole with a single support, or a slant-wire antenna may be used.

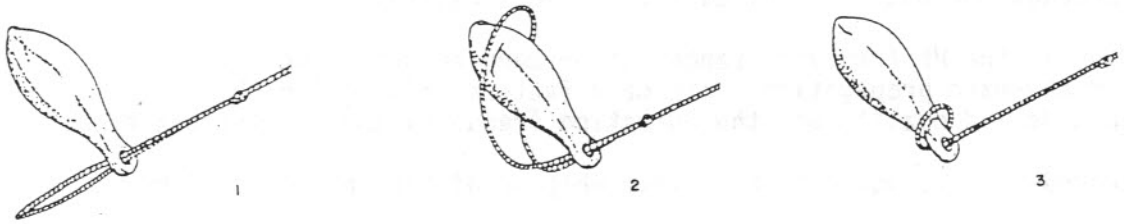
To erect the dipole antenna, proceed as follows:

1. Unwind the feedline from the dipole fixture.

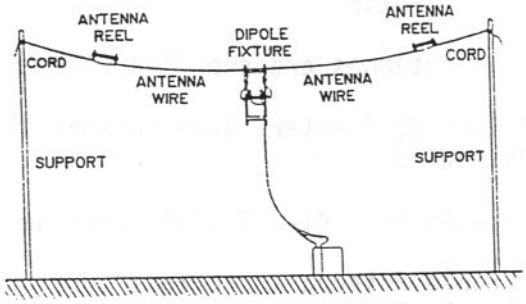
2. Mount one end of each dipole wire on the dipole fixture; use strain relief loops when connecting the wires.

3. Determine the length needed for one of the dipole legs, unwind equal lengths of wire from the two reels and fasten the wire to the notch in the reel.

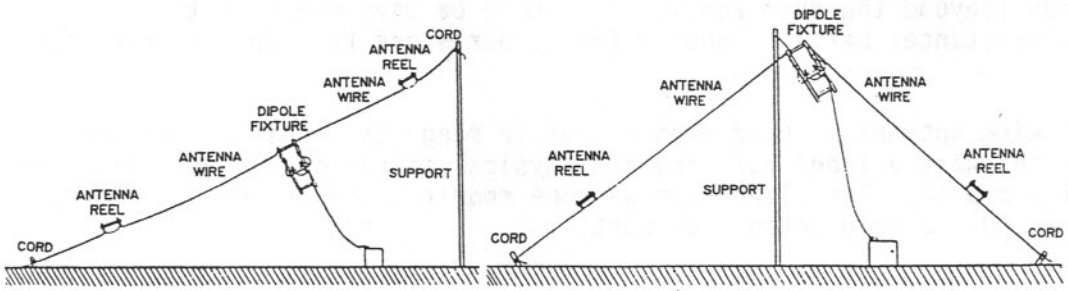
4. Unwind the two dacron cords. Attach one end of each cord to a weight and throw each weight over a support.



5. Use the dacron cords to hoist the antenna wires. If two antenna supports are available, erect the antenna as shown in this figure.



6. If only one support is available, use a sloping dipole or an inverted-V dipole configuration.



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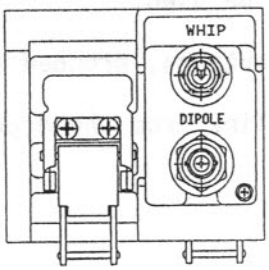
7. After hoisting, anchor the cords, connect the antenna feed cable to the BNC connector located on the CP-2003 and set the antenna selector to DIPOLE.



CHAPTER 3

OPERATING INSTRUCTIONS

3-1. RADIO SET CONTROLS, CONNECTORS AND INDICATORS

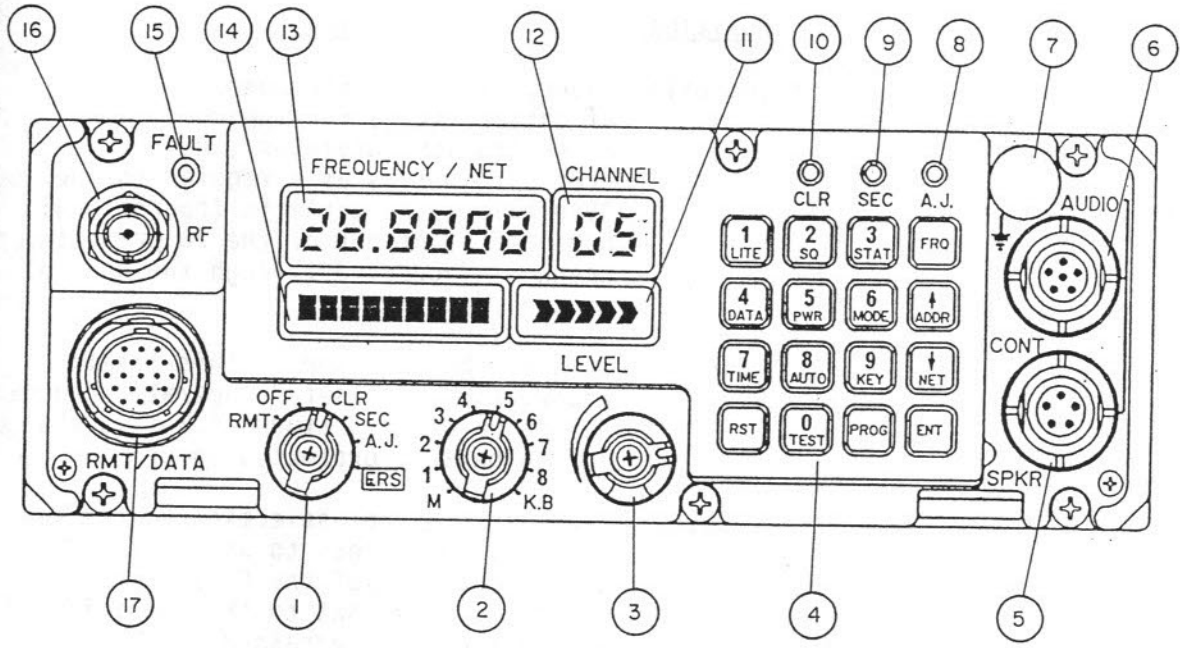


Table 3-1. RT-2001, Controls, Connectors and Indicators

NO.	CONTROL, CONNECTOR OR INDICATOR	FUNCTION
1	Function selector	Control radio set operation. Position — Action RMT — Turns on DC power: radio set operates under remote control. OFF — Turns off DC power CLR — Clear operation SEC — Encryption/decryption operation AJ — Operation in anti-jamming mode ERS (pull out to move knob into this position) — Radio set operation inhibited; when the ENT key is pressed, the contents of the battery-protected memory are erased

Table 3-1. RT-2001, Controls, Connectors and Indicators (Cont'd)

NO.	CONTROL, CONNECTOR OR INDICATOR	FUNCTION
2	Channel selector	Selects a preset channel. Position — Action M (manual) — Channel intended for manual entry of data, temporary changing of communication parameters, etc; otherwise serves as a regular channel 00. Also allows the contents (operational parameters) of one of the 20 presettable channels (accessed through the keypad) to be copied into it. 1 thru 8 — Setting the selector to this position allows the radio set to operate according to the parameters stored for this channel in the battery-protected memory KB — Transfers channel selection to the keypad. Allows access to any of the 20 preset channels of the RT-2001. When the selector is set to this position, the last channel accessed with the keypad is selected and displayed.
3	Volume control	Controls the audio volume in the accessories connected to the AUDIO connectors.
4	Keypad	Controls radio set operation and allows entry of all numerical parameters.
5	AUDIO SPKR connector	Connection for loudspeaker, standard handset, headset or telegraph key.
6	AUDIO CONT connector	Connection for control (H-739/GR) or standard handset, headset or telegraph key.
7	Ground terminal	Ground connection point.
8	AJ indicator	Lights during anti-jamming operation, provided lighting is on. Lighting interval is limited to six seconds from last keyboard operation.

Table 3-1. RT-2001, Controls, Connectors and Indicators (Cont'd)

NO.	CONTROL, CONNECTOR OR INDICATOR	FUNCTION
9	SEC indicator	1. Lights during secure operation, provided lighting is on. 2. Flashes during clear operation when a secure transmission is received, provided lighting is on. Lighting interval is limited to six seconds from last keyboard operation.
10	CLR indicator	1. Lights during clear operation, provided lighting is on. 2. Flashes during secure operation when a clear transmission is received, provided lighting is on. Lighting interval is limited to six seconds from last keyboard operation.
11	LEVEL display	Displays the relative value of the transmitter power, received signal strength or battery condition.
12	CHANNEL display	Two-digit display, indicates the number of the operating channel.
13	FREQUENCY/NET display	Displays operating frequency or anti-jamming parameters (frequency table, key and net) - according to operating mode.
14	Message display	Displays messages indicating selected functions and other operator information .
15	FAULT indicator	Lights when a malfunction is detected, provided lighting is on.
16	RF connector	Connection to VA-2132 for VRC configuration.
17	RMT/DATA connector	Connection to remote control device, Handcrank Generator HCG-2044, external modem, Data Loader G-10, or other external equipment.

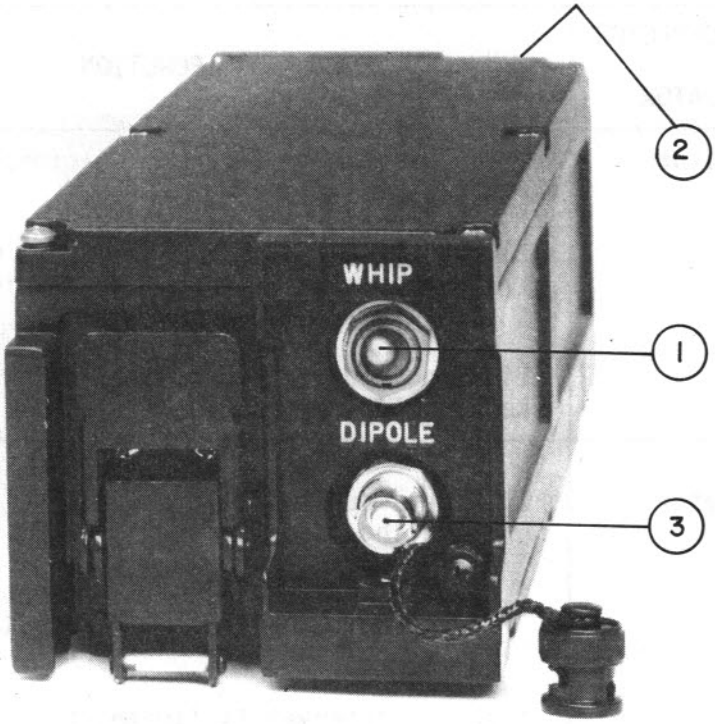


Table 3-2. CP-2003, Controls and Connectors

NO.	CONTROL OR CONNECTOR	FUNCTION
1	Antenna selector	Selects antenna type Position — Action WHIP — Coupler adapted to 9-foot whip antenna AT-1741H (or 15-foot whip antenna AT-1715 in vehicle installation) DIPOLE — Coupler adapted to dipole, slant-wire antenna.
2	WHIP connector	Connection for whip antenna
3	DIPOLE connector	Connection for dipole, slant-wire or long wire antenna

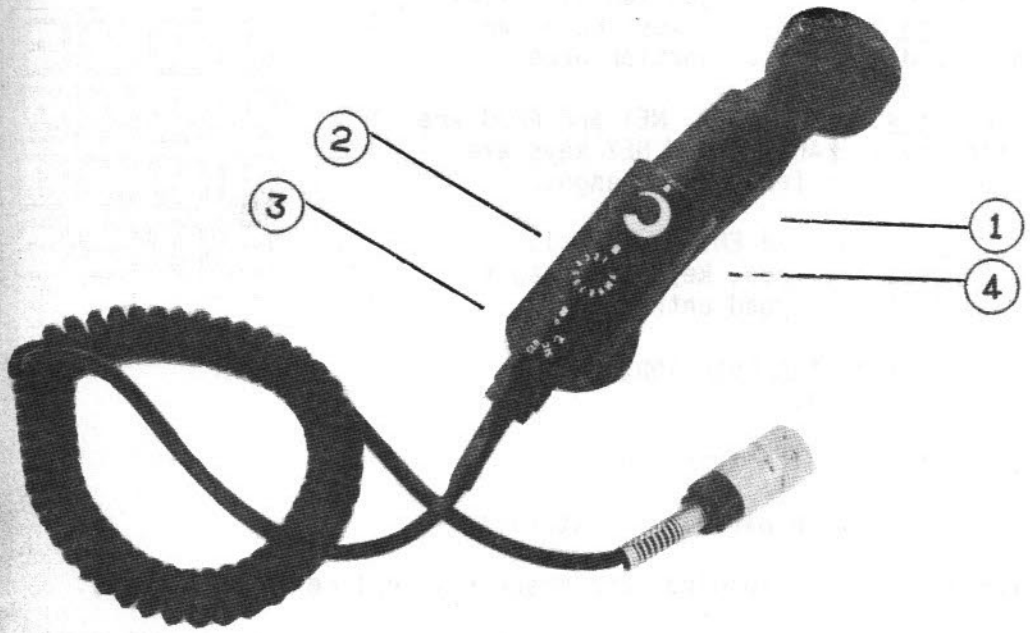


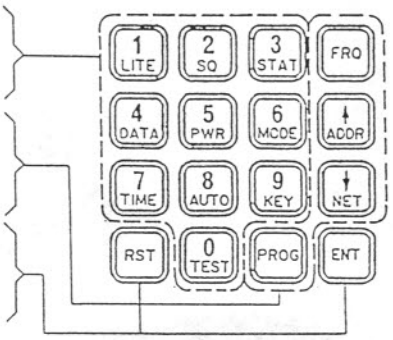
Table 3-3. H-739/GR Handset, Controls

NO.	CONTROL	FUNCTION
1	Volume control	Controls the audio volume.
2	Channel selector W 2 H X	Controls channel selection. Position — Action 1 thru 10 — Selects one of the preset channels. PNL — Returns control for channel selection to the front-panel channel control.
3	Function selector	Selects between CLR, SEC and AJ, instead of the front-panel function selector. A fourth position, PNL, returns the control to the front panel function control.
4	Push-to-Talk (PTT) Switch	When pressed, enables radio transmission.

3-2. FAMILIARIZATION WITH PRC-2200 KEYPAD

The keypad has 16 keys and is organized as follows:

* Dual-function keys. These keys have two markings: a digit and a function name.
* Dedicated keys. FRQ, ADDR, NET and PROG are dedicated keys. ↑ADDR and ↓NET keys are also used for 1kHz frequency changes.
* Editing keys. RST and ENT are editing keys. In general, these keys are used to cancel or confirm keypad entries.



3-2.1 Description of Button Functions.

1/LITE Controls lighting.

2/SQ Controls the squelch function.

3/STAT Displays operating parameters (status).

FRQ Controls frequency loading (and frequency replace in AUTO CALL).

4/DATA Selects between internal and external modem and together with PROG, selects the parameters of the selected modem.

5/PWR Selects the transmit power output.

6/MODE Selects between the voice or telegraph (CW, CCW) mode of operation.

↑ADDR Used to display and enter selective calling addresses. Increases operating frequency by 1 kHz steps.

7/TIME Used to display and enter time-of-day and, together with PROG, to enter the date.

8/AUTO Activates AUTO-CALL function; used together with PROG to manually load the frequency tables used in AUTO-CALL operation.

9/KEY Selects the encryption key; used, together with PROG, to manually load the encryption keys used in SEC operation.

↓NET Controls the frequency table, key selection and net for anti-jamming operation; used together with PROG to manually load frequency tables and anti-jamming keys. Decreases operating frequency by 1 kHz steps.

RST Cancels all preceding key entries in the current sequence and returns radio set to the condition existing before those key entries. In AJ or AUTO-CALL used for link disconnection.

0/TEST Used to check battery condition and to operate the self-test (BIT).

PROG Used to display and select various functions and parameters.

ENT Indicates the end of a key entry sequence.

3-2.2 Use of Dual-Function Keys. When pressed as the first key in a sequence, the dual-function key responds as a function key: the function name marked on it and its current selection appear in the display. When pressed as the second, third, etc... key in a sequence, the digit marked on it appears in the FREQUENCY/NET display.

3-2.3 Use of Dedicated Keys. Dedicated keys are used to select among several functional alternatives: For example, repeatedly pressing the PROG key will display the modulation mode, then the channel, etc.

The display is cyclical, that is, after the last function, the display shows the first one again. Once the desired function is displayed, it can be selected for further processing by pressing ENT.

3-2.4 General Instructions for Keypad Entries.

* Do not wait more than 6 seconds between successive key pressings: if no key is pressed within 6 seconds of the previous pressing, the current sequence of entries is cancelled, the radio set returns to its previous state, and the steady-state display returns.

* To cancel a sequence of key entries, press RST.

* To indicate the end of a sequence of key entries, press ENT.

* To perform the end of a sequence of key entries, press ENT.

* To select the function brought to display after pressing a dedicated key, press ENT.

* The currently-used function/parameter value is steadily displayed, whereas alternative functions/newly entered values flash. When the displayed value is selected, its display becomes steady.

* When the first digit of a numerical parameter is entered, the FREQUENCY/NET display changes:
  - Previous digits are replaced by lines to mark the field to be filled.
  - The entered digit appears at the left.
  - The line to the right of the entered digit flashes.
  - When the field is completed the number flashes until ENT is pressed.

* When entering an erroneous number, you may either:
  - Abort the operation by pressing RST.
  - Continue to enter digits until the field is completed, then continue to enter the correct digits again. The digits entered after the field was first completed appear in the display from left to right (note position of flashing digit), therefore the error will be corrected. When the correct number is displayed, press ENT.

* If, while entering a number, a non-numbered key is pressed (e.g FRQ instead of 3), you will see INV KEY for 2 seconds, then you can continue to press the correct digits. Of course, this does not apply to RST and ENT.

* After entering a number followed by ENT, the entered value is checked. If found invalid, the erroneous value is rejected, the display shows INV PARM for 2 seconds, and the radio returns to its normal state. Pressing another key will start a new keypad operation.

3-3. PREPARING THE PRC-2200 FOR OPERATION

To prepare the PRC-2200 for operation, first load it with the required parameters, e.g., channel frequencies, encryption and anti-jamming keys, etc.

Loading is usually carried out using the G-10 data loader, and is made before the PRC-2200 is handed to the operator; however, these parameters can also be loaded from the keypad using the procedures given in para. 3-12 and 3-13.

After the PRC-2200 is loaded with the necessary information according to the required mode of operation, use the procedures given below:

1. Voice communication - para. 3-4.
2. Telegraph communication - para. 3-5.
3. Data communication - para. 3-6.
4. Squelch and selective calling - para. 3-7.
5. AUTO-CALL communication - para. 3-8.
6. DUAL communication - para. 3-9.

A NOTE ABOUT LIGHTING

When using the PRC-2200 under tactical conditions, you should know how to control the lighting of its panel. Lighting is controlled by the LITE key. These are your options:

* LITE OFF - Nothing lights.
* LITE ON - Indicators light and displays are backlit, but only for six seconds after last keypad operation, except for RST and ENT buttons.
* LITE LED - Indicators light only.

During transmission or reception of any information, the relevant LED indicator lights if LITE is activated.
Change lighting options by repeatedly pressing LITE until your choice is displayed, and then ENT.

3-4. OPERATING INSTRUCTIONS - VOICE COMMUNICATION

3-4.1 Preliminary Settings.

a. On the CP-2003, set the antenna selector to WHIP if you use the whip, or to DIPOLE for dipole or long-wire antennas.

b. On the RT-2001, set the channel selector to the required number. If the required number is 9 thru 19, set the selector to KB and see para. 3-4.2.b below. Set the volume control to midrange.

c. If you have a control handset H-739/GR, set its channel and function selectors to PNL, and turn its volume control fully clockwise.

3-4.2 Turn-on and Initial Selection of Operational Parameters. After turn-on, you can use the STAT key to view the operating parameters of the radio and determine whether they correspond to your operational needs.

a. Set the function selector to CLR. The operating frequency appears in the FREQUENCY/NET display and the channel number in the CHANNEL display. Turn lighting on the CLR indicator will light. The squelch mode is shown in the message display: it is assumed that the squelch corresponds to the communication instructions, but you can also refer to para. 1-6.4, 1-6.5 and 1-6.6 and determine whether this is the best selection for your application. Concise instructions for changing the selection are given in para. 3-7.

b. To select a channel between 9 and 19, set the channel selector to KB, press the PROG key three times, the message channel is displayed, then press ENT. Now enter the number of the desired channel and press ENT.

c. To change the frequency of the displayed channel, press FRQ, enter the six frequency digits and press ENT; you can also increase or decrease the frequency in 1-kHz steps by pressing the ADDR or NET keys, respectively, before pressing ENT.

d. Select the transmit power by pressing the PWR key several times until the required power is displayed (20W, 10W, 5W or RCV-ONLY), then press ENT.

e. Select the modulation (USB or LSB):

* Press the PROG key twice, the message SSB PARM is displayed, then press ENT.
* The current modulation is shown in the message display: to change it, press PROG several times until the required modulation is displayed, then press ENT.

f. Select the VOICE mode by pressing the MODE key several times until the required mode is displayed, then press ENT.

g. Select SQ-SEL.C (selective calling) by pressing the SQ key several times until this message is displayed, then press ENT.
Now press ADDR until SEL.T-ALL appears (broadcasting to be heard by all network members) or SEL.T (two-digit address for a specific network member) as listed in your communication instructions, and then press ENT.
Set your receiver address by pressing ADDR key several times until the message SEL.R is displayed. Now enter the two digit address as listed in your communication instructions and then press ENT.

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3-4.3 Clear Operation.

a. To transmit, press the PTT and talk into the microphone. The relative transmit power level is shown in the LEVEL display. Release the PTT to hear the answer. During reception, the LEVEL display shows the relative received signal strength. Adjust the volume control for a comfortable listening level.

b. When a secure transmission encrypted with the key selected for this channel is received, you will hear a tone, but the message cannot be heard unless the function selector is set to SEC. With lighting on, the SEC indicator will flash.

c. To control the channel and/or the function from the H-739/GR controls, move the handset controls from the PNL position to the desired position.
Set the front-panel volume control fully clockwise and adjust volume with the handset volume control. To return control to front panel, set both handset controls to PNL.

3-4.4 Operating Instructions - Secure Operation.

a. Set the function selector to SEC: if lighting is on, you will see that the SEC indicator lights, and the CLR indicator extinguishes.

In the secure mode, SSB modulation and selective calling are automatically selected, this change is reversed as soon as you return to CLR. That means the radio returns to the original parameters selected for Clear mode of operation.

b. To transmit, press the PTT. You will then hear a short tone that indicates the radio set performs synchronization. After the tone ends, talk into the microphone.
To hear a reply, release the PTT.

c. When a clear message is received, you will hear it. If lighting is on, the CLR indicator will flash.

d. When you have to select the encryption key, press the KEY key, enter the number (0 thru 9) of the new key, then press ENT. You will see the message SEC-KEY during this process.

3-4.5 Operating Instructions - Anti-jamming Mode (When available)

a. Set the function selector to AJ: with lighting on, you will see that the AJ indicator lights, and the CLR or SEC indicator extinguishes.

The FREQUENCY/NET display now shows EE XYZ, where EE indicates anti-jamming operation and XYZ is the net code. The message display shows SCAN and the SEL.T code.

SSB modulation and selective calling are automatically selected, this this change is reversed as soon as you return to CLR.

b. To select the anti-jamming key, the net number and/or the frequency table, press the NET key; you will see the message NET and a three-digit number - the current net code. Enter the new code, then press ENT.

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NOTE

The first left digit of the net code is the frequency table number.

The second digit is the anti-jamming key number.

The third digit is the net number.

c. Check TIME and DATE, if they are not identical to those on the other radio equipment, no link can be established. TIME can be within ±3 minutes to establish an AJ link.

d. It is required to perform a "LEARN" procedure by momentarily pressing the handset PTT. This procedure should be performed each time the transceiver is turned on and when a new frequency table is programmed or selected.

To call a station after learning, press PTT. The PTT causes a "handshake" process between the two stations when using an individual address. The message CALL and the SEL.T code are shown.
After a few seconds the message READY and the SEL.T code are shown and several fast beeps are heard. The AJ link is now established.

From now on the link is like any other link, but frequency hopping is taking place.

e. To disconnect the radio set from the link, proceed as follows:

* When working with GROUP or SEL.T-ALL address, pressing the RST key of the radio which initiates the actual link will disconnect all the radio sets.
Pressing the RST key of any other radio set in the link will disconnect only this radio set.

* When a link was established between two radio sets using an individual address, pressing the RST key of any one of the radio sets will disconnect both.

* After about 40 seconds of no communication in the link, automatic disconnection always takes place.

f. If the link procedure failed, then the message NO COM and the SEL.T code are displayed. Check parameters.
A link procedure can also fail because of degradation in the propagation conditions or simply because the requiered radio is not set in the adequate position to establish a link.

3-5. OPERATING INSTRUCTIONS - TELEGRAPH (CW) COMMUNICATION

Telegraph communications is carried out in the CCW, NCW or CW mode; the syllabic squelch is automatically set to OFF, since it can only be used with voice signals (however selective calling is available).

Three types of CW communication are available:

a. In SQ-OFF, an ordinary 1-kHz tone is used for old generation communicatin equipment compatibility.

b. CCW, NCW operate only with SQ-OFF, the tone is on the carrier.

c. In SQ-SEL.C or SEC or AJ, a new type of CW is used called DCW. It provides the benefits of all these new generation features.
The DCW enables the receiver to produce an internal "noise-free" CW beeping tone no matter which channel noise is present.

Secure and anti-jamming communication are not possible in the CCW mode.

3-5.1 Preliminary Settings.

a. On the CP-2003: Set the antenna selector to the position corresponding to the antenna in use:

* WHIP - for whip antenna.
* DIPOLE - for dipole antenna or long-wire antennas.

b. On the RT-2001

* Set the channel selector to the required number. If required number is 9 thru 19, set the selector to KB and refer to para. 3-4.2b for further instructions.

* Set the volume control to midrange.

c. Connect a headset and the telegraph key to the AUDIO connectors.

3-5.2 Turn-on and Operation.

a. Set the function selector to CLR. The operating frequency appears in the FREQUENCY/NET display and the channel number in the CHANNEL display. Turn lighting on: the CLR indicator will light. The squelch mode is shown in the message display.

To select a channel between 9 and 19, use the procedure of para. 3-4.2b.

b. Select appropriate type of SSB modulation as follows:

* Press the PROG key twice, the message SSB PARM is displayed, then press ENT.
* The current modulation is shown in the message display: to change it, press PROG several times until the required modulation is displayed, then press ENT.

c. Select the CW (or CCW, as required by the communication instructions) by pressing the MODE key several times to bring the required mode to the display, then press ENT.

In CCW mode only SQ-OFF may be selected.

In CW, SQ-OFF or SQ-SEL.C may be selected.

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d. Select SQ-SEL.C (selective calling) by pressing the SQ key several times until this message is displayed, then press ENT. Now press ADDR until SEL.T-ALL appears (broadcasting - to be heard by all network members), or SEL T. (two-digit address for a specific network member) as listed in your communication instructions, and then press ENT.

You will also need a reception address: for this purpose, press several times ADDR until SEL.R- appears, enter the two-digit address listed in your communication instructions and then press ENT.

e. Adjust the volume control for a comfortable listening level.

f. To transmit, operate the telegraph key. The radio set switches to the receive mode automatically, one second after the key is released.

g. If required, you may switch to the SEC or AJ mode; see para. 3-4.4 or 3-4.5 for further instructions.
NCW or CCW operation are not feasible with these modes. If you selected NCW or CCW, the PRC-2200 automatically switches to CW, this change is reversed as soon as you return to CLR.

3-6. OPERATING INSTRUCTIONS - DATA MODE

For data communications, select between the internal or external modem using the DATA key, and select SSB using the PROG key. If secure or anti-jamming communication is desired, only the internal modem (which is an option) can be selected. Whenever the internal modem is used, its parameters must be selected.

3-6.1 Preliminary Settings.

a. On the CP-2003: Set the antenna selector to the position corresponding to the antenna in use:

* WHIP - for whip antennas.
* DIPOLE - for dipole or long-wire antenna.

b. On the RT-2001:

* Set the channel selector to the required number. If required number is 9 thru 19, set the selector to KB and refer to para. 3-4.2.b for further instructions.
* Set the volume control to midrange.

c. If you have a H-739/GR control handset:

* Set the channel and function selectors to PNL.
* Turn the volume control fully clockwise.

d. Connect the data equipment to the RMT/DATA connector, but do not turn it on at this stage.

3-6.2 Modem Operation.

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a. Establish voice communication in the desired mode with the remote station, and make the necessary arrangements for data transmission.Refer to para. 3-4 above for detailed instructions.

b. After arrangements are completed, select the appropriate data modem using the DATA key: press DATA several times until the appropriate modem type is shown in the message display, then press ENT.

c. To select parameters when using the internal modem, press PROG, then DATA: you will see the message DATA PARM: press ENT, then press PROG several times until the desired modem operation mode is displayed. Press ENT to select the displayed mode. See 3-13.21 for detailed information.

d. Turn the data equipment on. Data transmission can now start.

3-6.3 Modem Interconnections
(Radio interface to modem and data equipment).

3-6.3.1 General

The radio equipment provides several data transmission modes for serving external data sources. The data sources can be connected in one of the three following ways:

a. External modem connected to the AUDIO connectors (AUDIO interface). In this case, the data signal is processed as an ordinary voice signal.

b. External modem connected to the RMT/DATA connector, and selection of the EXT-MODEM mode. In this configuration, the PTT signal is connected to the PTT-D input (pin V), and the audio signal to the TXBB input (pin L) in the RMT/DATA connector.

c. External data equipment connected to the RMT/DATA connector, and selection of the INT-MODEM mode. In this configuration, the radio set interface is RS-232C. This is the recommended configuration, because it enables to use all the operating modes of the radio equipment, and has good performance characteristics. However, this configuration is optional.

3-6.3.2 Interface Description

NOTE:
The following is a more extensive explanation of the process which occurs when activating DATA equipment with the PRC-2200 including a detailed description of the signals involved.

a. Configuration A - Connection to the AUDIO Connectors.
This configuration is not recommended, because the signal (AUDIO) is sampled in the signal processing module and is compressed by an automatic ALC system, having characteristics adapted to the voice signal.

b. Configuration B - Connection to the RMT/DATA Connector, Operation in the EXT-MODEM Mode.
This is the recommended configuration for operation with an external modem.

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This configuration permits management function operation in the Clear (CLR) mode, and enables activation of the frequency (AUTOCALL). However, in the secure (SEC) and anti-jamming (AJ) functions, the EXT-MODEM mode, is not available.

This configuration permits transmission of both VOICE/CW and DATA signals. If the radio is not transmitting or receiving DATA signal, it can be used for "regular" operation using the handset (in this case, all the functions are available).

The AUTO-CALL Operation in this configuration is as follows:

1. The radio set continuously scans the frequency table, and monitors the frequencies included in the table.

2. Upon reception of the PTT-D command (in the EXT-MODEM mode), the radio set establishes a link with the radio set at the receiving end. Link establishment usually takes about 5 to 10 seconds. Under exceptional (worst case) conditions, the time can increase up to 40 seconds.
   If the link can not be established, the NO COM indication is displayed.

3. Upon display of a READY message, if the PTT-D signal is still active, the radio set activates the CTS line and starts transmitting the AUDIO information (from TXBB input).

4. In this configuration, the link established will not break on time-out. The operator can break the link at any time and start scanning again by pressing the RST key.

When using the AUTO-CALL function with the EXT-MODEM mode, establishing a link can be implemented using two methods:

First Method: activate the PTT-D line, and wait until the CTS line is active. This method has the advantage that when the radio is already in the link, the CTS signal will be immediately provided (within less than a second).
If no link is currently established, the radio will establish a link and then provide the CTS signal.

Second Method: separate the link establishment process from actual data transmission. To establish a link, activate the modem for a short time (a short "dummy" message may be sent). This will cause the PTT-D line activation and eventually leads to link establishment.
After link establishment, data transmission can be started just as when operating on a discrete frequency.

c. Configuration C - Connection to the RS-232C Interface and Use of the Internal Modem (optional).
   This configuration uses the internal modem of the radio and permits using all the radio functions (CLR, SEC, AJ and AUTO-CALL).

W2HX When the SEC or AJ functions are activated, the internal modem signals are also encrypted. Therefore, the same SEC keys must be loaded and selected into all the radio sets of the link.

W2HX This configuration also permits using the same radio for both VOICE/CW and DATA operation: if the radio is not transmitting/receiving DATA signals, it can be used for VOICE transmission (using the handset).

Data transmission is initiated by activating one of the PTT-D lines (logic levels or RS-232C level), and information transfer is started upon reception of the CTS indication.

The radio provides two types of interfaces, synchronous or asynchronous, at rates of 50, 75 or 150 baud.

1. Asynchronous interface. This interface is used for operation with teletypewriters (TTY), and uses the BAUDOT format only (1 start bit, 5 data bits and at least 1 stop bit).
The lines used by the asynchronous interface are listed in Table 1 and Table 2 below.

Table 1. Asynchronous Interface, Transmit Lines

No.	Line	Pin	Description	Levels
1	TXBB	L	Transmit data input	RS-232C "0" = +5V "1" = -5V
2	CTS	H	Clear-to-Send indication	RS-232C Active : +5V Non-active: -5V
3	TXD	U	PTT for data transmission	RS-232C Active : +5V Non-active: -5V
4	PTT-D	V	PTT for data transmission	0/+5V Active : 0V Non-active: +5V or OPEN
5	GND	M	Ground	

Table 2. Asynchronous Interface, Receive Lines

No.	Line	Pin	Description	Levels
1	RXBB	K	Received data output	RS-232C "0" = +5V "1" = -5V
2	RXD	P	Data receive indication	RS-232C Active : +5V Non-active: -5V
3	GND	M	Ground	

2. Synchronous interface. This interface is used for operation with data terminals and tactical terminals. For this interface, the source must provide a clock signal or RXBB-CLK line together with the data signal. However, this provides a clock signal at the selected rate during transmission and the data terminal can use this clock signal as a transmit clock.
The transmit clock signal is provided after the activation of the CTS line.

The lines used by the synchronous interface are listed in Tables 3 and 4 below. The RXBB-CLK signal is also provided during reception.

Table 3. Synchronous Interface, Transmit Lines

No.	Line	Pin	Description	Levels
1	TXBB	L	Transmit data input	RS-232C "0" = +5V "1" = -5V
2	TXBB_CLK	F	Input for external clock	RS-232C
3	RXBB_CLK	E	Output of the Internal modem clock	RS-232C
4	CTS	H	Clear to Send indication	RS-232C Active : +5V Non-active: -5V
5	TXD	U	PTT for data transmission	RS-232C Active : +5V Non-active: -5V
6	PTT-D	V	PTT for data transmission	0/+5V Active : 0V Non-active: +5V or OPE
7	GND	M	Ground	

Table 4. Synchronous Interface, Receive Lines

No.	Line	Pin	Description	Levels
1	RXBB	K	Received data output	RS-232C "0" = +5V "1" = -5V
2	RXBB_CLK	E	Output of the Internal clock	RS-232C
3	RXD	P	Data receive indication	RS-232C Active : +5V Non-active : -5V
4	GND	M	Ground	

Operation in the AUTO-CALL and AJ functions is as follows:

1. When one of these functions is activated, the radio continuously scans the frequency table.

2. Upon reception of the PTT-D command, the link establishment process is carried out.

3. After completing the link establishment process, the two radio sets are synchronized and display a READY message to the operator. From this moment, the radio sets continue to use the frequency selected - in case of AUTO-CALL operation, or synchronously perform frequency hopping - in case of AJ operation.

   In the AUTO-CALL mode, the link establishment process usually takes about 5 to 10 seconds, and in the worst case up to 40 seconds.

   In the AJ mode, the link establishment process takes 7 seconds (worst case - 13 seconds).
   If the link can not be established, the NO COM indication is displayed.

4. After link establishment (the radio displays READY), each time the PTT-D line is activated, the radio activates the CTS line and information transfer is started.

The link is maintained as long as there is traffic between the two stations (transmission or reception). About 40 seconds after the traffic stops, the link brakes and radio sets start scanning again. The operator can also break a link at any time and start scanning again by pressing the RST key.

When the link is established, the CTS line is activated immediately (within less than a second), therefore the radio set can start data transmission almost immediately.

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3-6.4 FLASH

FLASH is a special way to communicate using short messages in a short time. The messages are in a format of 3 decimal digits (000-999).

FLASH can be operated on fixed frequency or AUTO, CLR or SEC, or AJ.

FLASH can not be operated on CCW modulation.

All address options are available: selective call, group call or ALL call.

The radio can save up to first 16 FLASH messages received or ACK responses.

FLASH communication session:

On the initiating station.
- Select the requested channel and function with all parameters.
- Select the FLASH option and Enter the 3 digits for the message.
- Press the PTT, the message is transmitted.

On the receiving station.
- The message appears.
- Press the PTT, the ACK is transmitted.

On the initiating station.
- The ACK message appears.
- Delete the ACK answer.

Action	Display	Comments
On the initiating station DATA key	FLASH	Select FLASH operation
ENT key	xyz FLASH ab	Last code entered for FLASH
Numeric + ENT keys	xyz PRESS PTT	Selected FLASH 3 digit code
PTT	xyz SEND ab	Send FLASH
After transmission	Steady state display	
On the receiving station	xyz MSG cd k	The FLASH message is received

(Cont'd)

Action	Display	Comments
	SEC MSG	The FLASH message received on CLR while it is being transmitted on SEC. Turn FUNCTION selector to SEC.
	xyz ACK cd M	Send ACK on the receiving Station
On the initiating station	xyz ACK BY ab	Received ACK on the initiating station

xyz - The FLASH 3 digit code.

ab - The SEL. T address on the initiating transmitting station.

cd - The SEL. R address of the initiating transmitting station.

k - represents a character that will appear, the possibilities are:

1. The type of call used by the initiating station, A for ALL, G for group, no character for selective address.
2. In case the receiver is in MONITOR state (when this optional function is used) and the message is for another address, the character is M.

M - In case the receiver is in MONITOR state and the message is for another address, the character is M, else no character will appear.

Pressing the RST key instead of the PTT action will delete the message and stop the FLASH sequence.
While entering the FLASH code, all keyboard rules apply. After the ENT operation, any valid parameter can be changed. The radio will wait in the PRESS PTT state.
Activating the PTT for FLASH before a LEARN process was performed, will first activate the LEARN, then establish a link, then transmit the message on the link.
Receiving another FLASH message while the previous one is still displayed, will enter the last one to the memory.
After the ACK process or delete with RST key, if another message was received, it will appear now on the display, and so on.
If a receiver is in the SEC, mode, and it receives a message sent on CLR mode, it will return the ACK in the CLR mode.

Example:

Set the function selector to the requested state: CLR, SEC or AJ.
Select the requested channel. For example the SEL.T is 12, SEL.R is 02 on this channel.
The FLASH message to send is 149.

Action	Display	Comments
On the initiating station DATA key	FLASH	Select FLASH operation
ENT key	046 FLASH 12	Last code entered for FLASH
149 + ENT keys	149 PRESS PTT	Selected FLASH 3 digit code
PTT	149 SEND 12	Send FLASH
After transmission	Steady state display	
On the receiving station	149 MSG 02	The FLASH message received
PTT	149 ACK 02	Send ACK on the receiving station
On the initiating station	149 ACK BY 12	Received ACK on the initiating station

W
2
H
X

3-7. SQUELCH AND SELECTIVE CALLING

Para. 1-6.4, 1-6.5 and 1-6.6 explain the characteristics of the squelch, voice processing and selective calling used by the PRC-2200. If no explicit instructions appear in the communication instructions, you can use these explanations to determine the best choice for your application. Concise instructions to make the necessary changes are given below:

3-7.1 Squelch.

a. Press the SQ key several times until the required type is displayed:

* SQ-SEL.C - active squelch with selective calling.
* SQ-SYLAB - passive squelch for voice operation only, compatible with older HF radio sets.
* SQ-OFF - turns the squelch off.

b. Press ENT to load the selection.

3-7.2 Addresses for SQ-SEL.C. When this type of squelch is selected, you must also enter a transmit address, that specifies to whom your transmission is intended, and a receive address - so that your radio set will know which transmissions are permitted to reach the audio output. You may enter different addresses for each of the channels that you may preset on the PRC-2200.

a. Select the channel on which the following addresses will be used, either from the channel selector or the keypad (para. 3-4.2.b).

b. Enter the required address by pressing the ADDR key:

* Press once for broadcasting (SEL.T-ALL), then press ENT.

* Press twice to enter a specific individual address or a group address: when you see the SEL.T-___message, enter two digits between 00 and 29 and press ENT.
  - Address 00 (group call address G0) will be received by radio sets with receive addresses 1 thru 9, address 10 (G1) by radio sets with receive addresses 11 thru 19 and address 20 (G2) by radio sets with receive addresses 21 thru 29.
  - Addresses not ending in zero will be received only by radio sets with Receive the same receive address.

* Press three times to enter your individual receive address (two digits between 00 and 29) and press ENT.

c. This is the address that will be used in this channel.

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3-8. USING AUTO-CALL

AUTO-CALL is explained in detail in para. 1-6.7 and Appendix B. To use AUTO-CALL, you should have addresses for selective calling. Here is how to communicate using AUTO-CALL:

3-8.1 Preliminary Settings. If your radio set is prepared for regular operation in the CLR or SEC modes, has the required receive and transmit addresses and is loaded with the AUTO-CALL frequency tables, it is ready for AUTO-CALL.

3-8.2 Operating Instructions.

NOTE

It is NOT recommended to operate AUTO-CALL in RCV ONLY.

a. AUTO-CALL can be activated by selecting a channel previously programmed for AUTO-CALL or programing AUTO-CALL by pressing the AUTO key repeatedly, until the message AUTO-ON 1 or AUTO-ON 2 is displayed, then press ENT. The digit 1 or 2 is the number of the AUTO-CALL frequency table that will be used and should be obtained from your communication instructions.
To program regular operation (no AUTO-CALL) in the desired channel, repeatedly press the AUTO key until the message AUTO OFF appears, then press ENT.

b. It is required to perform a "LEARN" procedure by momentarily pressing the handset PTT.

This procedure should be done each time the transceiver is turned on or when a new frequency is programmed in the operating table or a new AUTO table is selected.
The operator sees LEARN ON in the display.
In case the LEARN is successful, the radio returns to the SCAN mode.
In case the LEARN failed, a LRN FAIL message appears and then the radio returns to the SCAN mode.
In this case, check the antenna, the antenna selector and the frequency table.

c. Your radio set now waits for AUTO-CALL messages intended for you or your group.

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* When an AUTO-CALL message intended for you is received, you will see READY AB, where AB is the address of the calling radio set, then after a few seconds you will hear the message. The frequency on which the message is received appears in the FREQUENCY/NET display.

* To transmit an answer, press the PTT after the received message ends and speak as usual. The radio set remains on the same frequency as long as there is traffic in either direction. If there is no traffic for approximately 40 seconds, the link will disconnect automatically.

d. To initiate an AUTO-CALL message, select the called radio address, then press the PTT:

* The radio set starts transmitting and displays CALL XY, where XY is the called radio set address. Usually, this address is stored as the transmit address for the channel you are using (its number appears in the message display); if not, use the procedure in para. 3-7.2 above to enter the transmit address.

* Wait for the READY XY display accompanied by short beeps, then start your message. If for some reason (bad propagation conditions, etc..) the link cannot be established on any one of the frequencies in the table, you will see a NO COM XY message, and hear several beeps.

* If at any time you change your mind and do not want to continue the procedure, press RST.

e. Since propagation conditions may worsen or another station may interfere with the operating frequency, you can switch to another frequency while maintaining the link with the other radio set: for this purpose, press the FRQ key, the message REPLACE ? appears, then press ENT. After a short time the link will switch to another frequency. The other radio is, of course, notified automatically. Once the new frequency is displayed, communication can be continued.

f. To disconnect the link at any time, press RST. Both radios will automatically disconnect.

3-9. OPERATING INSTRUCTIONS - DUAL

3-9.1 Validity operation

DUAL operates on CLR or SEC fixed frequency. It can use all modulation types, all MODE types, all DATA types and all SQ types.

DUAL does not operate with AUTO or with AJ.
AJ overrides DUAL and AUTO, meaning turning function selector to AJ forces the radio to this state even if the previous state was either AUTO or DUAL or SING - fixed frequency.

DUAL overrides AUTO, meaning activating DUAL in channels 10-19 will force the radio to DUAL state, even if it was previously in AUTO on that channel.

Activating DUAL will enable this function only after turning to the valid channels 10-19. Activating AUTO on channels with DUAL, will enable AUTO only after turning to SING (single frequency) in this channels (10-19).

To operate DUAL, channel selector must be in KB position. When DUAL is activated, it operates only on channels 10-19.
DUAL operates in sequential channels of the radio, from then, the first one is an even number between 10 and 19.

Operator that chooses channel 10, will receive on this channel, but will transmit on channel 11.

Operator that, chooses channel 11, will receive on this channel, but will transmit on channel 10.
The same rules apply for channels 12-19.

3-9.2 Activating DUAL

There are two ways to activate or deactivate DUAL:

a. First way:
Press PROG key, the message "FNC key?" appears, press now on FRQ key, now message "SING/DUAL" appears.

b. Second way:
Press PROG key several times until the message "SING/DUAL" appears. On either way press now ENT key.

One of the messages appears:
"SING FRQ" for SINGLE FREQUENCY.
"DUAL FRQ" for DUAL FREQUENCY.
To change this state, press PROG key for the desired status, then press ENT key. The desired status is now programmed in the radio.

DUAL, like all other parameters, can be changed only during receive state, not during transmission.

3-9.3 Using DUAL

Set function selector to CLR or SEC.
Rotate channel selector to KB position.
Select a channel in the range 10-19 using the PROG key.
(See paragraph 3-13.16 CHANNEL).

The receive frequency and channel appears on the upper displays.
The message display shows one of the following (according to the loaded parameters):

"DUAL FRQ" for DUAL and SQ_OFF.
"DUAL SYLB" for DUAL and SQ_SYLAB.

"DUAL - GO" for DUAL and SQ SEL.C with SEL.T=00.
"DUAL - G1" for DUAL and SQ SEL.C with SEL.T=10.
"DUAL - G2" for DUAL and SQ SEL.C with SEL.T=20.
"DUAL - xy" for DUAL and SQ SEL.C with SEL.T=xy.
"DUAL - ALL" for DUAL and SQ SEL.C with SEL.T=ALL.

On transmission, the upper display changes to the transmit frequency.
The message display shows the same message like on receive.

3-9.4 Loading DUAL Parameters

Rotate channel selector to KB position.
Select a channel in the range 10-19 using the PROG key. (See paragraph 3-13.16 CHANNEL).
Select the receive channel for DUAL and enter all the requested parameters.
Select the transmit channel and enter only the requested transmit frequency.

Actually the only parameter changed during transmit - receive change is the frequency, all other parameters are those of the receive channel.
To enter DUAL parameters to the radio, it is not necessary to be in the DUAL state.

Example 1:

Channels 10 and 11 are selected for DUAL operation.
The channels must operate in the same parameters:
VOICE, USB, SQ-OFF, enter these parameters in the receive channel.
The frequency of channel 10 is 02.0000 MHz.
The frequency of channel 11 is 02.2000 MHz.

Example 2:

Channels 18 and 19 are selected for DUAL operation.
The channels must operate in the same parameters:
VOICE, LSB, SQ-SEL.C, enter these parameters in the receive channel.

Channel 18 specific parameters:
The frequency is 07.6543 MHz.
SEL.T is 01.
SEL.R is 02.

Channel 19 specific parameters:
The frequency is 06.5432 MHz.
SEL.T is 01.
SEL.R is 02.

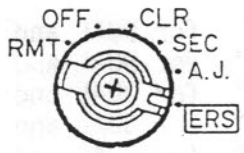
3-10. OFF OR ERASE OPERATIONS.

3.10.1 STOPPING OPERATION

To stop PRC-2200 operation, turn its function selector to OFF. If the radio set will not be used for 24 hours or more, remove the battery pack, and if required, disassemble the equipment.

3-10.2 ERASING The RT-2001 MEMORY

* Rotate function selector to ERS: to reach this position, pull knob out, then turn it to ERS. You will see the message: ERASE ? ENT



Pull out and turn

* To erase the memory, press the ENT key. You will see the message ERASED, and the radio set stops operating.

NOTE

If you want to continue operating the radio set, turn the function selector to OFF, then set it again to CLR. The radio set will now operate using a fixed set of default parameters that were defined by the manufacturer (in fact, you will see the message LOAD PARM). Once turned on again, you can reload other operating parameters as explained in this manual.

3-11. WHAT TO DO IN CASE OF MALFUNCTION

a. Check for low battery voltage: Press the TEST key twice, then press the ENT key. Check the number of arrows in the LEVEL display: you should see at least one arrow, and the message BATT OK. If the message LOW BAT! is displayed, change the battery.

b. When the control handset is connected:

* If you cannot change channel and/or function from the corresponding front-panel controls, then probably handset controls are not in the PNL position. You will then see the message USE H/S, to remind you to use the handset controls, or turn them to PNL, to enable the front-panel controls.
* If the volume in your handset is too low, rotate the front-panel VOLUME control fully clockwise and adjust volume from the handset.

c. If you see the message SILENT while pressing the PTT, this indicates that your radio set is in the RCV ONLY mode and cannot transmit.
If you see this message when switching to AUTO-CALL, this means that the link will not be established, because your radio cannot answer the calling radio set. If transmission is allowed, select the desired transmit power with the PWR key.

d. If you see the message UNLOCK and hear beeps, check the operating frequency and change frequency if it is required.

e. If you see the message NO-MATCH and hear beeps, check the antenna connections and the position of the antenna selector on the CP-2003. When using the AT-1741H whip, it must be set to WHIP. Also check that your antenna does not touch another antenna or other metallic structure.

f. If you see the message LOAD PARM when turning the radio set on, although its memory was not intentionally erased, the memory backup battery is discharged (this happens after many months of use).
To continue operation, load again the operational parameters and replace the backup battery as soon as possible, because without the battery, the operating parameters will be lost each time the RT-2001 is turned off.

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If the malfunction cannot be corrected by the steps described above, or other error message appears (see Appendix A), your radio set needs servicing. Send it to the maintenance organization as soon as possible, and explain the symptoms found.

3-12. PROGRAMMING THE PRC-2200 FOR OPERATION

In the following paragraphs, you will find concise instructions to prepare the PRC-2200 for operation. These include the manual procedures to load operational parameters, instead of loading them using the Data Loader, G-10, or to change the loaded parameters as required.

Loading instructions by means of the Data Loader G-10 appear in the G-10 operator manual: all you need to do is to connect the G-10 storing the required parameters to the RMT/DATA connector, turn on the PRC-2200 and then press the ON key of the G-10, followed by SEND.

Manual loading instructions and explanations regarding the use of each keypad key are given in para. 3-13, and are arranged in the order of the keys on the keypad (1/LITE first, 2/SQ second, and so on up to PROG).

The required parameters depend on the intended operating mode:

* Clear: channel frequencies, transmit power, mode, modulation and squelch type.
* Secure: same as for Clear operation and also encryption keys for use in the secure mode.
* Anti-jamming: same as for clear operation, and also hopping frequency tables, anti-jamming keys and net numbers. Synchronize the time and date.
* Selective CALL: requires selection of your receive address and the calling: destination address.
* AUTO-CALL: requires selective call codes and AUTO-CALL frequency tables.
* Data requires selection of modem (internal or external); if transmission the optional internal modem is used, its parameters must be defined.

The technical characteristics of HF/SSB equipment and other communication considerations limit the selections you have according to the following table.

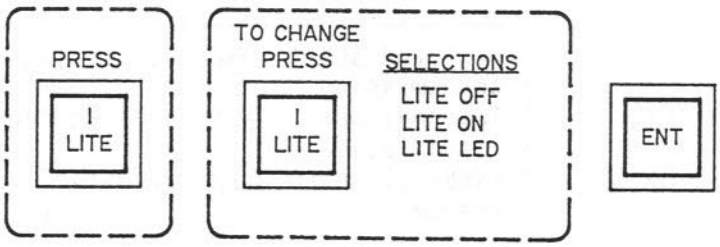
FUNCTION		MODULATION	MODE	DATA MODEM	SQUELCH TYPE
CLR (SING or DUAL)		USB, LSB	VOICE	INT, EXT	OFF, SYLAB, SEL CALL
			CW	INT, EXT	OFF, SEL CALL
		-	NCW, CCW	-	OFF
SEC (SING or DUAL)		USB, LSB	VOICE, CW	INT	SEL CALL
AJ		USB, LSB	VOICE, CW	INT	SEL CALL
AUTO	CLR	USB, LSB	VOICE, CW	INT, EXT	SEL CALL
	SEC	USB, LSB	VOICE, CW	INT	SEL CALL

Note: FLASH is enabled in all places INT (modem) is valid.

3-13. CONCISE INSTRUCTIONS FOR KEYPAD USE

3-13.1 LITE

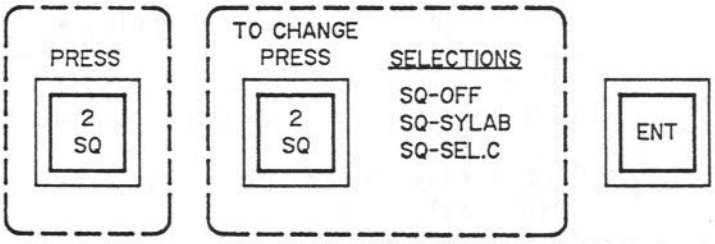
The LITE key is used to turn on and off the backlighting of the displays and keypad and the front-panel indicators.



When on, the lighting turns off automatically six seconds after the last panel operation, and turns on again automatically whenever a key is pressed or change in control setting is made. The respective function LED lights during any transmission or signal reception if the LITE is activated.

3-13.2 SQ

The SQ key controls the squelch function. When SQ-SEL.C is selected, refer to para. 3-13.8 for further instructions.



3-13.3 STAT

To display current status of all parameters, press STAT key repeatedly. To end the display, press RST. The parameters displayed are listed in the following table.

PARAMETER	SELECTIONS	DESCRIPTION
Transmit Power	PWR 20W PWR 10W PWR 5W RCV ONLY	Receive/transmit, 20 W output power. Receive/transmit, 10 W output power. Receive/transmit, 5 W output power. Receive-only operation.
RF DIRECTION ANT-TYPE	FRONT ANT REAR ANT REAR 9FT	For technical USE and for VRC (Vehicular) configuration. CP-2003 switch set to DIPOLE. CP-2003 switch set to WHIP, and using 9FT antenna.

(Cont'd)

PARAMETER	SELECTIONS	DESCRIPTION
	REAR 15	CP-2003 switch set to WHIP, and using 15Ft antenna.
DATA	FLASH	Fast and short numerical message transmission
	INT MODEM *	Internal modem (option) used for data transmission.
	EXT MODEM	External modem used for data transmission.
Squelch	SQ-OFF	Squelch disabled.
	SQ-SYLAB	Syllabic squelch.
	SQ-SEL.C	Active squelch and selective call enabled.
Modulation	USB	SSB, upper sideband operation.
	LSB	SSB, lower sideband operation.
	AM *	Amplitude modulation operation.
MODE	MOD-VOICE	Operation with voice modulation.
	MOD-CW	Telegraphy operation, normal bandwidth.
	MOD-NCW *	Telegraphy operation, narrow bandwidth
	MOD-CCW *	Telegraphy operation, carrying key.
TIME	TIME	Time (Hour, Minute, and Seconds) on a 24 hour clock, as provided by internal clock.
	DATE	Date (Day, Month, Year), as provided by internal clock.
AUTO-CALL	AUTO OFF	AUTO-CALL disabled.
	AUTO ON 1	AUTO-CALL operation on frequency table 1
	AUTO ON 2	AUTO-CALL operation on frequency table 2
key (SECURE)	SEC-key: 0-9	Number of encryption key.
Selective Call Addresses	SEL.T-ALL	Broadcasting: transmission received by all stations.
	SEL.T-	Transmission address (depends on selected channel): transmissions received by stations having same SEL.R address, or included in same group call
	(RANGE: 00-29	

(Cont'd)

PARAMETER	SELECTIONS	DESCRIPTION
	SEL.R- (RANGE: 00-29	Reception address (depends on selected channel): radio receives transmission from radios transmitting the same SEL.T address, the corresponding group address or transmitting a broadcast call.
MONITOR *	MNTR OFF MNTR ON	No monitor activated, regular SEL.R operation. Monitor activated, enables receiving all transmissions of the HF-2000 systems, regardless of the SEL.R.

* When available.

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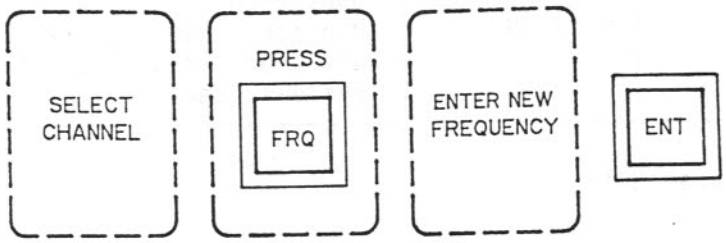
3-13.4 FRQ

The FRQ key is used to determine the operating frequency for the channel whose number is displayed in the CHANNEL display. The range of values that can be loaded for frequency is 1.5000 to 29.9999 MHz (in 100-Hz steps).

Selecting a frequency below 1.5000 MHz or beyond 29.9999 MHz causes the message display to show INV PARM. Within a few seconds, it will return to the previous legal frequency.

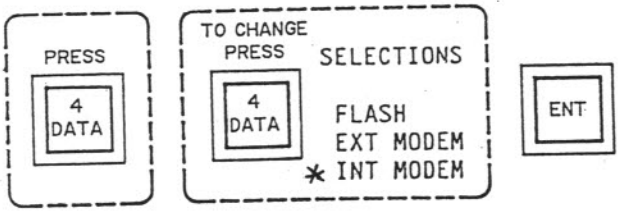


NOTE

Frequency changes of 1 kHz can be made. Press FRQ key and then press ADDR or NET. The displayed frequency is increased or decreased in steps of 1 kHz. In this case, press ENT to store the displayed frequency as the new channel frequency. If ENT is not pressed, the new frequency is cancelled when another channel is selected.

3-13.5 DATA

The DATA key selects the modem types and the FLASH option. FLASH will always be the the first option and blink. For mode details see FLASH, EXT MODEM, INT MODEM paragraphs.



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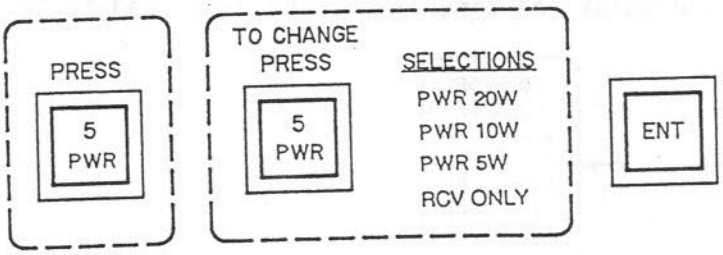
* When available.

NOTE

1. EXT MODEM cannot be selected in the SEC or AJ modes.
2. INT MODEM, FLASH or EXT MODEM cannot operate with CCW mode.

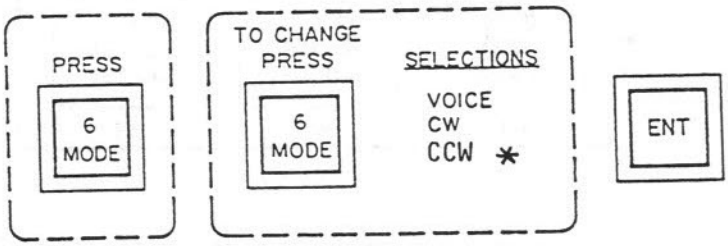
3-13.6 PWR

The PWR key is used to control the transmit power.



3-13.7 MODE

The MODE key controls the signal type for the PRC-2200.



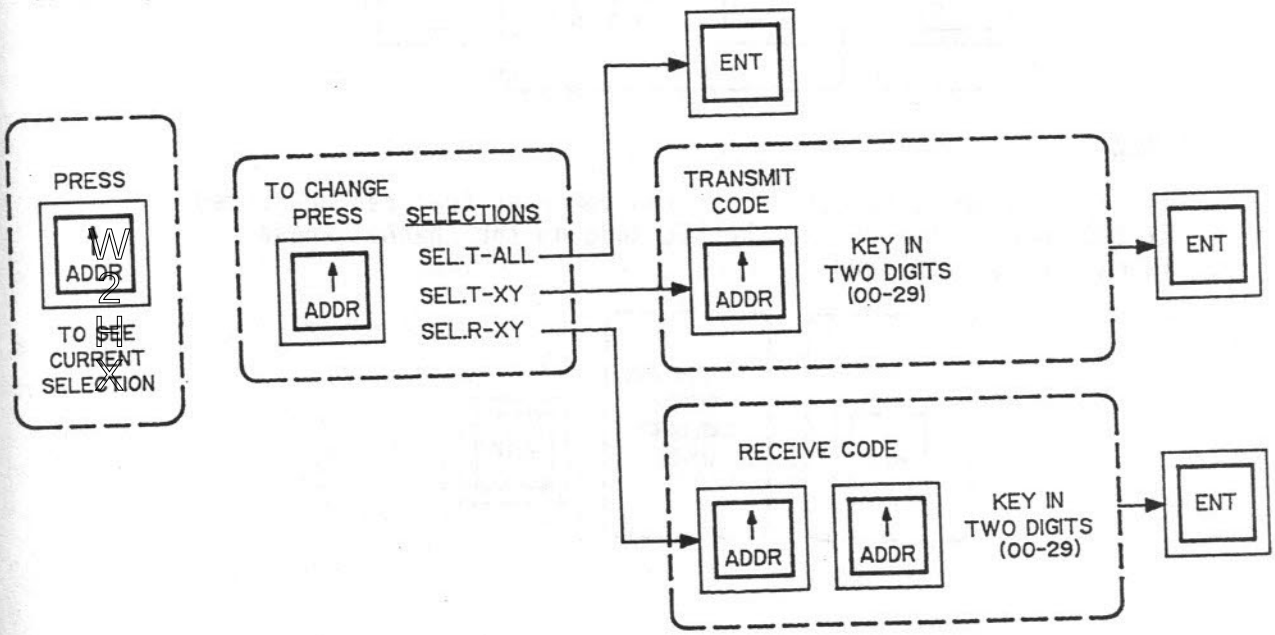
* When available.

NOTE

Voice communication can be heard in the CW mode and visa-versa.

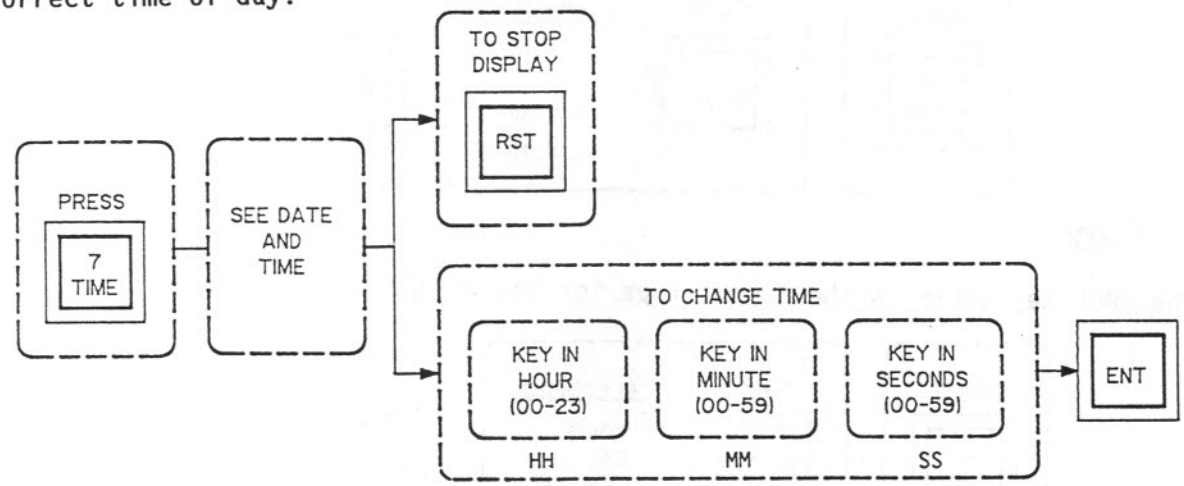
3-13.8 ADDR

With the squelch set to SQ-SEL.C. the ADDR function is used to enter the addresses related to the selective call function.



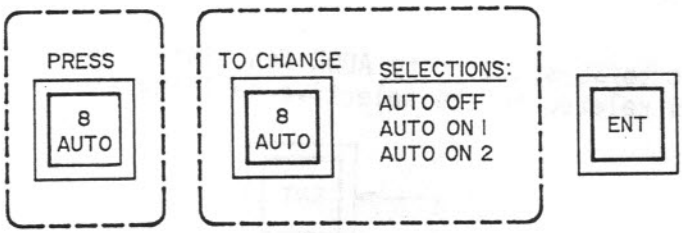
3-13.9 TIME

The TIME key is used to display the time-of-day and date, and to load the correct time-of-day.



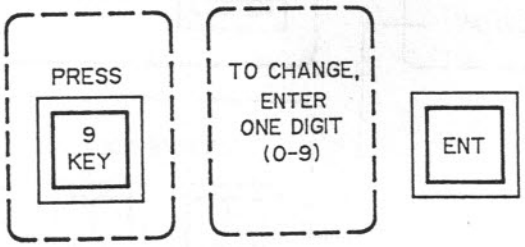
3-13.10 AUTO

The AUTO-CALL key is used for programming, enabling or disabling the AUTO-CALL function for each desired channel and selecting the frequency table. The use of the AUTO-CALL function requires that selective calling be on and the desired addresses be loaded - see para. 3-13.2 and 3-13.8 above.



3-13.11 key

The key key is used to select one of the ten keys that can be stored in the RT-2001 memory for use in the SEC mode on the channel whose number is currently displayed.

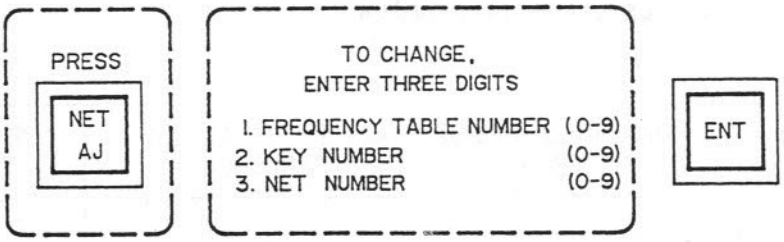


3-13.12 NET

The NET key is used to select the AJ parameters for the channel whose number is currently displayed:

* The frequency table
* The anti-jamming key
* The net number.

The frequency tables and the anti-jamming keys must be loaded into RT-2001 memory.

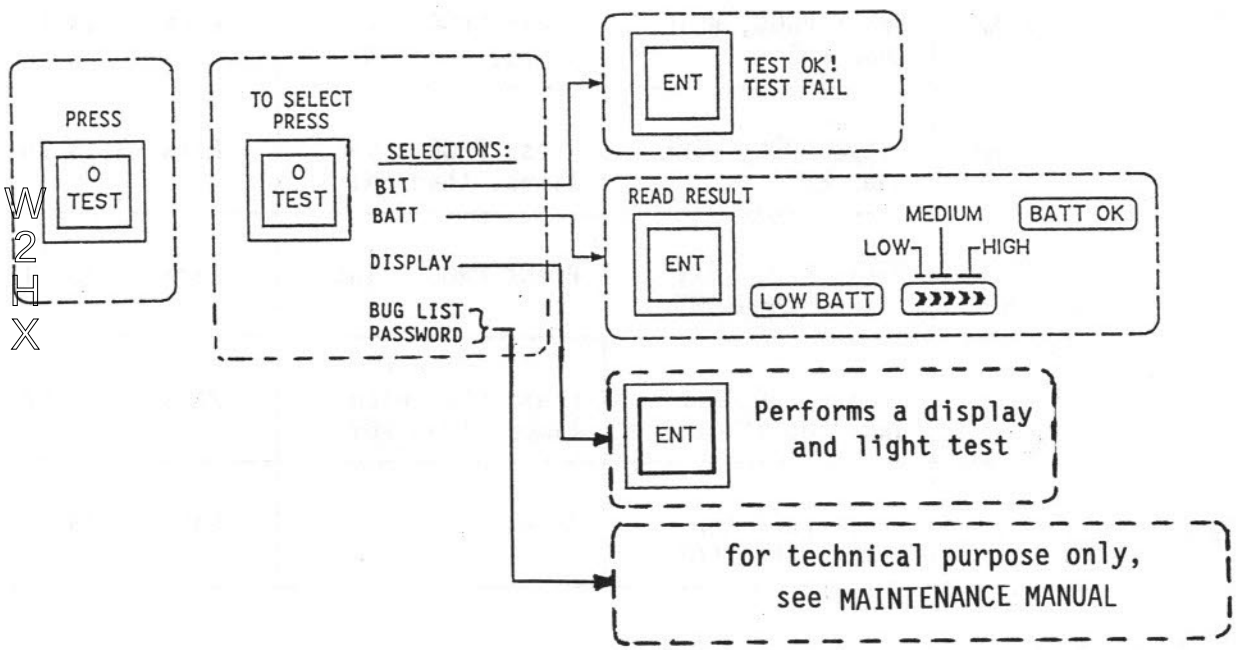


3-13.13 TEST

The TEST key is used to activate a built-in test procedure which checks the radio's operation. In addition, the TEST key enables display of the relative battery voltage (on the LEVEL display) in order to allow the operator to evaluate battery condition.

In case battery voltage is too low for proper operation, the message display shows LOW BATT!, otherwise shows BATT-OK.

The battery voltage is continuously checked automatically. If a low battery condition exists the LOW BATT! alarm is automatically activated.



3-13.14 PROG

The PROG key is used to access additional functions that were not allocated on separate keys. The names of the additional functions can be displayed by repeatedly pressing the PROG key: once the desired function is displayed, it is selected by pressing ENT.

Alternately, some of the functions can be directly accessed by pressing the appropriate function key after the PROG key, while the message display shows "FNC key?".

For convenience, the functions accessed through the PROG key together with the access sequences are listed below.

NO.	FUNCTION	RECOMMENDED ACCESS SEQUENCE	ALTERNATE ACCESS SEQUENCE	INSTRUCTIONS FOR USE
1	SSB PARM	Press PROG twice, then ENT	None	Para. 3-13.15
2	CHANNEL	Press PROG three times, then ENT	None	Para. 3-13.16
3	* AJ PARM	Press PROG, NET, then ENT	Press PROG four times, then ENT	Para. 3-13.17
4	SEC PARM	Press PROG, key, then ENT	Press PROG five times, then ENT	Para. 3-13.18
5	AUTO PARM	Press PROG, AUTO, then ENT	Press PROG six times, then ENT	Para. 3-13.19
6	DATE PARM	Press PROG, TIME, then ENT	Press PROG seven times, then ENT	Para. 3-13.20
7	W 2DATA PARM H then ENT	Press PROG, DATA, times, then ENT	Press PROG eight	Para. 3-13.21
8	X DIRECT	Press PROG, PWR, and then ENT	Press PROG nine times, then ENT	Para. 3-13.22
9	SEND	Press PROG ten times, then ENT	None	Para. 3-13.23

* When available.

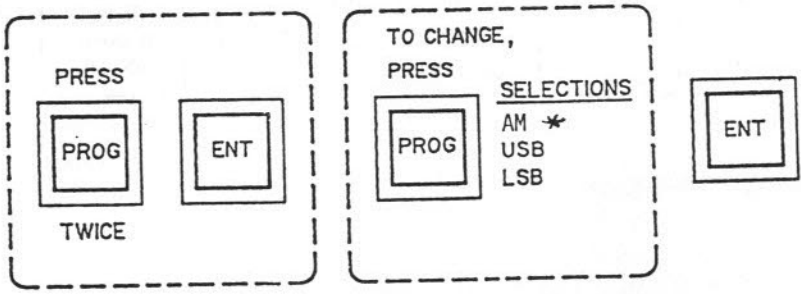
(Cont'd)

NO.	FUNCTION	RECOMMENDED ACCESS SEQUENCE	ALTERNATE ACCESS SEQUENCE	INSTRUCTIONS FOR USE
10	LOAD	Press PROG eleven times, then ENT	None	Para. 3-13.24
11	MONITOR *	Press PROG, ADDR, then ENT	Press PROG twelve times, then ENT	Para. 3-13.25
12	SING/DUAL	Press PROG, FRQ, then ENT	Press PROG thirteen times, then ENT	Para. 3-13.26

* When available.

3-13.15 SSB PARM Function

The SSB PARM function controls the modulation type: AM, USB or LSB.



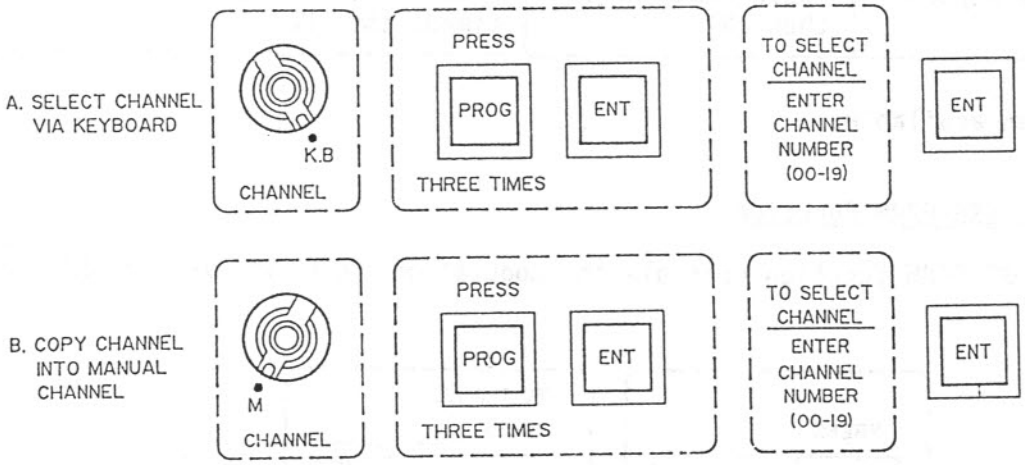
* When available.

W2HX

3-13.16 CHANNEL

Channels can be selected in three ways:

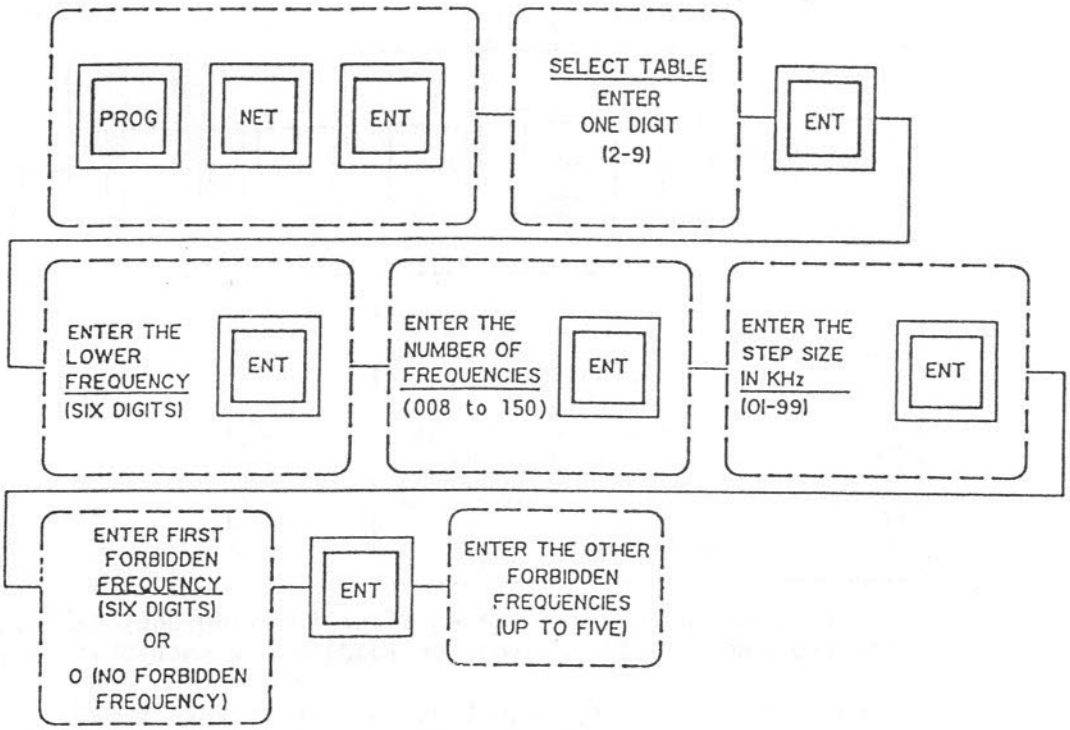
* Directly, using the front-panel channel control. This only applies to channels 0 thru 8 and an additional selected channel in KB position.
* Indirectly, using the keypad with the channel selector in the KB position. This selects the last channel accessed through the keypad whenever the channel selector is set to KB.
* Indirectly, by copying one of the channels to channel M. The channel number will always be 00 in the M position.



W2HX

3-13.17 Loading of Anti-jamming Parameters (When available)

This function is used to manually load frequency tables and keys, for use in the anti-jamming mode, operations that are normally performed automatically, using the Data Loader G-10. The RT-2001 can store ten different frequency tables and ten anti-jamming keys.



Each frequency table consists of up to 150 frequencies that are randomly selected during frequency hopping.

* Eight of the frequency tables (tables 2 thru 9) are sequential tables. The frequencies contained in these tables are defined by three parameters: the lowest frequency, the number of frequencies and the step size (in kHz). The resulting upper frequency is checked for validity because it must not exceed 29.9999 MHz. Each sequential frequency table can contain up to five forbidden frequencies that are excluded from the hopping pattern (e.g frequencies used by friendly forces for fixed frequency communications).

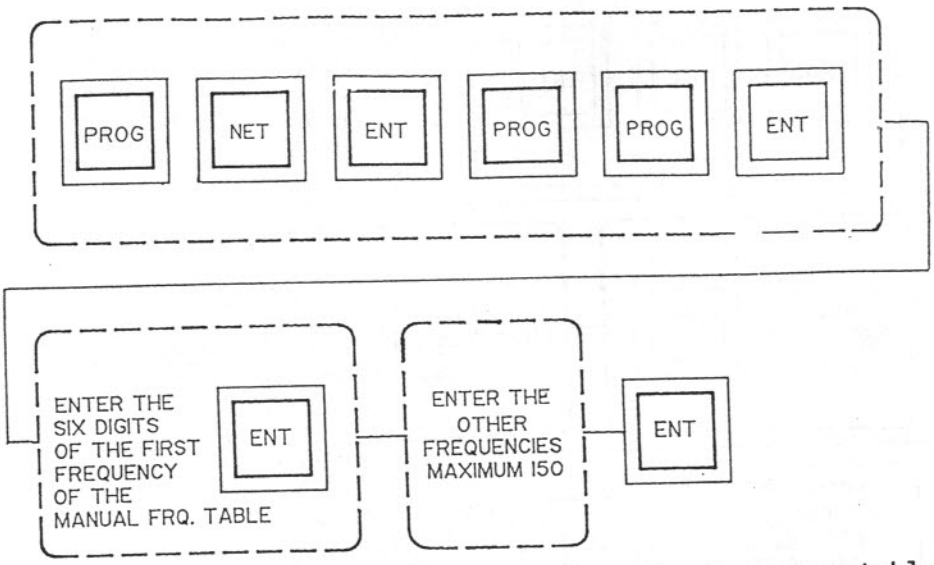
* One manual frequency table (table No. 1), that can contain up to 150 randomly-selected frequencies.

* One central frequency table (table No. 0) contains parameters for hopping around the preset channel frequency. The operator needs no specific additional parameters for this table.

W
2
H
X

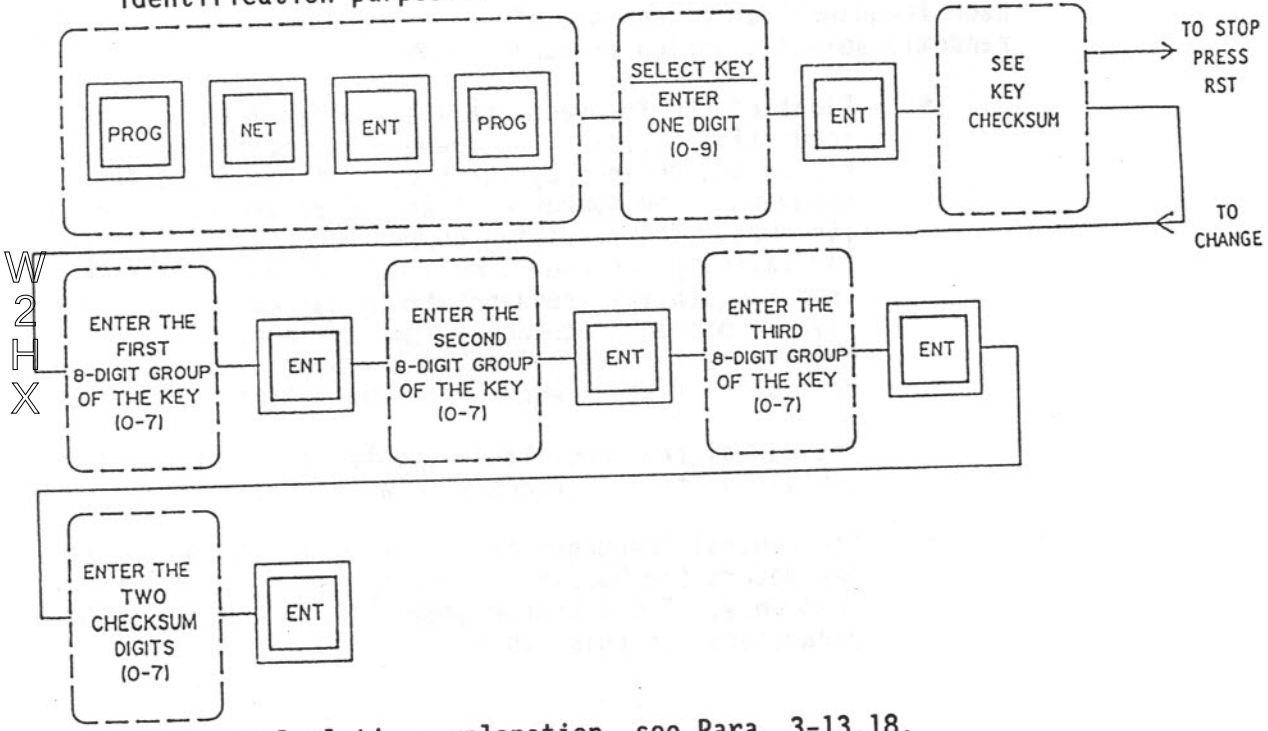
Manual Table No.1: M.-TABL-1.

NOTE
If less than 150 frequencies are used, enter 0 for the last frequency.



The anti-jamming keys are loaded after the frequency tables, using the same procedure used for loading the encryption keys.

The contents of the keys and those of the frequency tables, once loaded, cannot be displayed; only a checksum is displayed, for identification purposes.

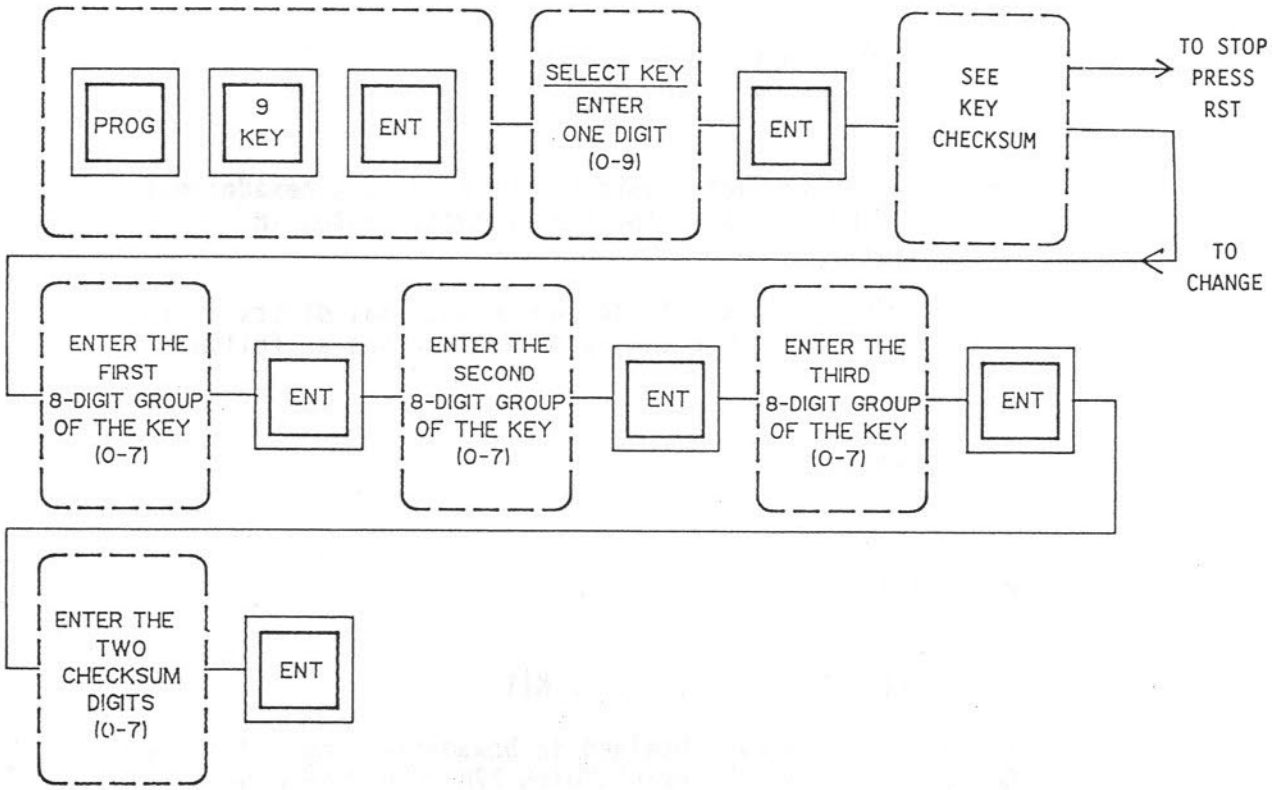


W2HX

For CS Calculation explanation, see Para. 3-13.18.

3-13.18 Loading keys for Secure Operation

This function is used to load manually the encryption keys for use in the secure mode operation which is normally performed automatically using the Data Loader G-10. The contents of the keys, once loaded, cannot be displayed; only a checksum is displayed for identification purposes.



W2HX

EXPLANATION OF KEYS CALCULATION AND ITS C.S.

1. The legal digits are octal 0-7.

2. Insert three lines of eight digits in each line as follows:

Line 1	D0, D1	D7
Line 2	D8, D9	D15
Line 3	D16,D17	D23

Note: The last two digits (D22, D23) must be zero.

3. Check Sum - C.S. CALCULATION
Add pairs of digits as follows:

```
         D0   D1
        +
         D2   D3
         :    :
         :    :
        +
         :    :
         :    :
         D22  D23
         --------
  C.S =
```

Each pair is in fact a byte represented as a hexadecimal digit so the result is the sum of twelve bytes in hexadecimal.

In case it is impossible to sum hexadecimal digits it is possible to perform a sum in decimal method as follows:

```
K0 = 16*D0 + D1
+
K1 = 16*D2 + D3
+
:
:
K11 = 16*D22 + D23
------------------

C.S. = K0 + K1 + ..... K11
```

In case the sum was obtained in hexadecimal method a logic AND operation of the result with 77H should be done to get an octal result.
The result obtained is the C.S. needed to be inserted through the keyboard of the radio set.

In case the result was obtained in decimal method then the CHECK SUM should be calculated as follows:

W2HX

X = decimal sum result.
C.S.0 = X mod 8
C.S.1 = [X mod 128] DIV 16

X Mod 8 is the remainder of X/8 and (X mod 128) DIV 16 is the whole quotient of (X mod 128)/16.

The two digits of C.S. are: C.S.1, C.S.0.

Example of entering the keyS

Example key:

line 1 34 12 40 23

line 2 62 44 12 31

line 3 27 36 70 00

	HEX	DEC
	K0 = 34H = 3*16 + 4 =	52
+	K1 = 12H = 1*16 + 2 =	18
+	K2 = 40H = 4*16 + 0 =	64
+	K3 = 23H	35
+	K4 = 62H	98
+	K5 = 44H	68
+	K6 = 12H	18
+	K7 = 31H	49
+	K8 = 27H	39
+	K9 = 36H	54
+	K10 = 70H	112
+	K11 = 00H	00
	= 25FH	607

Calculation of C.S. in hexadecimal method:

25FH AND 77H = 57

C.S. = 57

Calculation of C.S. in decimal method:

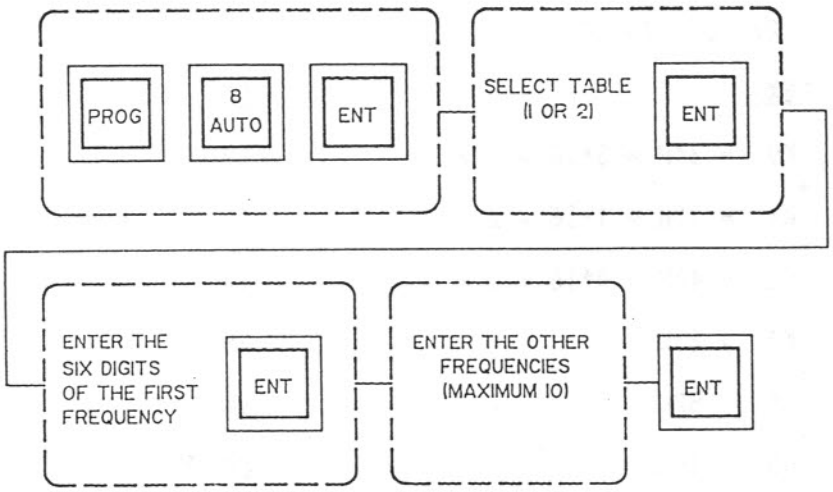
C.S.0=607 mod 8 = 7 (607/8 = 75, remainder 7)
C.S.1=[607 mod 128]DIV 16 = 5 (607/128 = 4, remainder 95,95/16 = 5)

C.S. = 57

W2HX

3-13.19 Loading of AUTO-CALL Frequency Tables

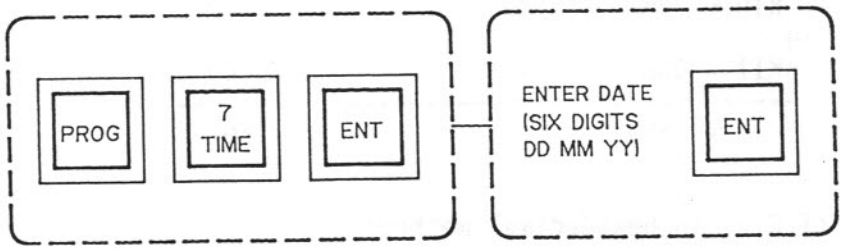
This function is used to manually load frequencies in the two tables used in AUTO-CALL operation. This operation is normally performed using the Data Loader G-10 .



NOTE
If less than 10 frequencies are used, enter 0 for the last frequency.

3-13.20 Loading of Date

This function is used to load the correct date.

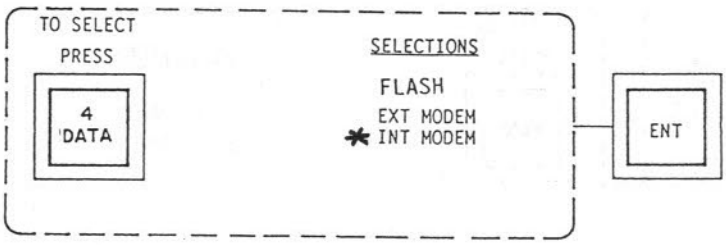


W
2
H
X

DD: DAY 01-31
MM: MONTH 01-12
YY: YEAR 00-99

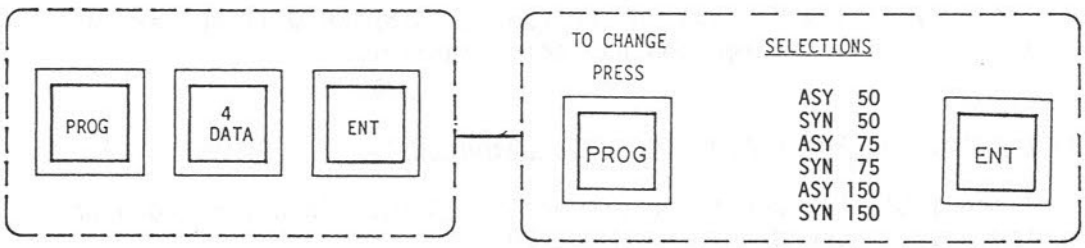
3-13.21 Loading of Modem Parameters

Load Modem Type.



* When available

Internal Modem Parameters.



3-13.22 Loading of RF Direction and WHIP ANT. Selection

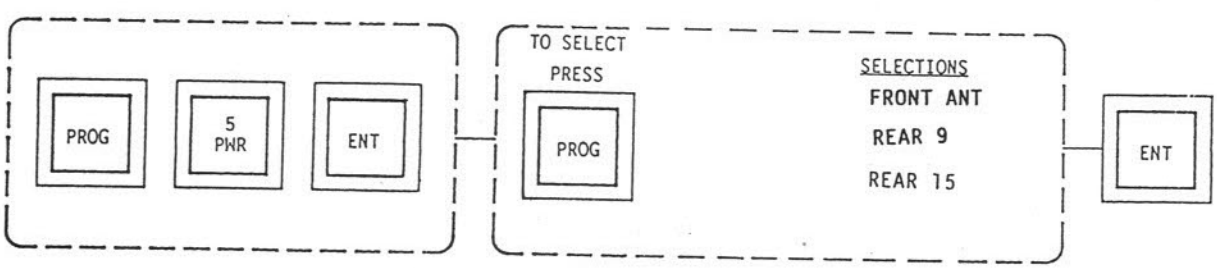
FRONT ANT - enables RF direction to front RF connector, (as an aid for technical personnel)

REAR 9 - Enables RF direction to WHIP connector, with a 9Ft WHIP antenna, while antenna selector is on WHIP possition.

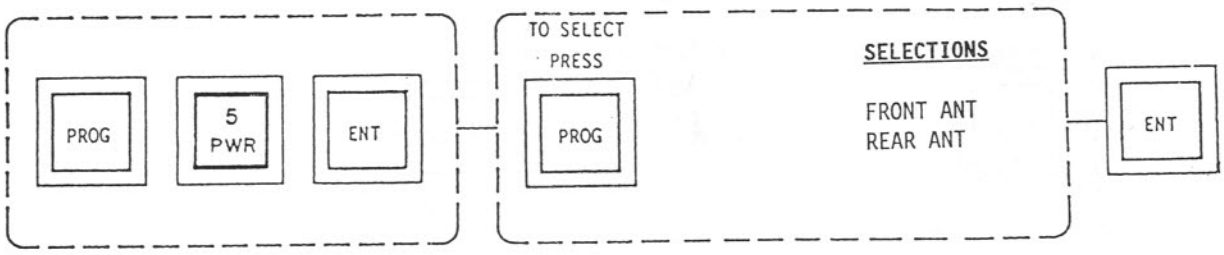
REAR 15 - Enables RF direction to WHIP connector, with a 15Ft whip antenna, while antenna selector is on WHIP possition.
For DIPOLE connection, set antenna selector to DIPOLE possition.

W2HX

* When the DIP/WHIP selector is at WHIP position.



* When the DIP/WHIP selector is at DIPOLE position.



3-13.23 Loading the Data Loader G-10 from the Radio.

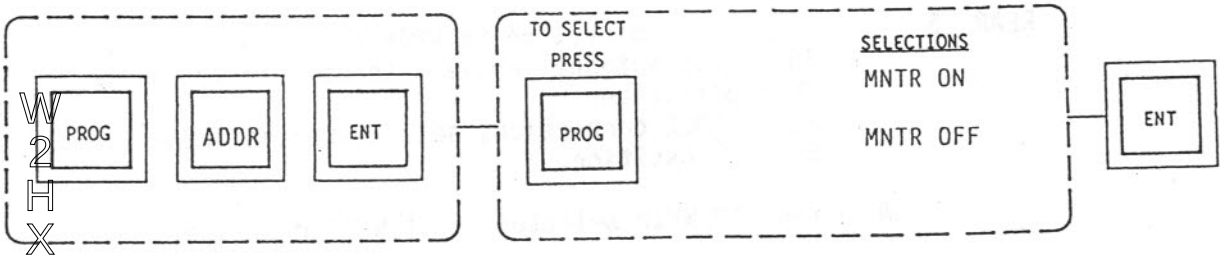
Connect the cable between the radio and the G-10. Turn the radio on. Press the PROG key ten times. SEND will appear on the display. Turn on the G-10. Press the ENT key on the radio. SENDING will appear on the display until all information has been transferred.

3-13.24 Loading the Radio from the Data Loader G-10.

Connect the cable between the radio and the G-10. Turn the radio on. Turn on the G-10. Send data from the G-10.
LOADING will appear on the display until all information has been loaded.

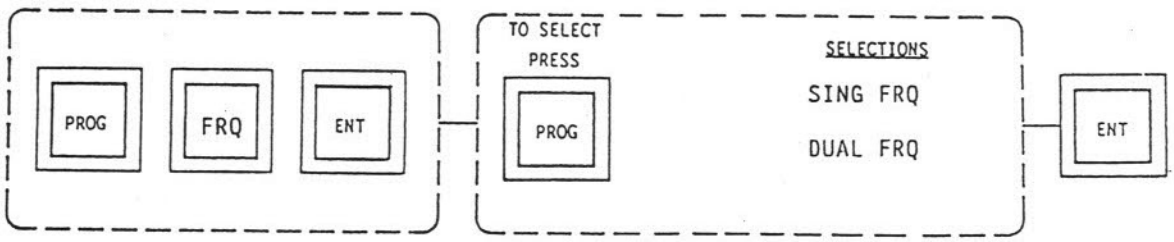
3-13.25 MONITOR (When available)

The MONITOR mode enables the operator to listen to all transmissions, of the HF-2000 systems, on the channel and function selected on the radio, independent of the SEL.R and still using the active squelch feature.



3-13.26 SING/DUAL

The SING mode enables the operator to work on a fixed frequency, the same frequency for transmission and for reception, (regular operation). Choosing DUAL will enable choosing a frequency/channel for transmission and a different one for reception.
For more details see paragraph 3-9, DUAL.



W
2
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X

APPENDIX A. PRC-2200 ALARMS

A-1. INTRODUCTION

The PRC-2200 provides various type of operator alarms to indicate that an improper operation has been performed or that a malfunction has occurred in the radio set. These alarms are indicated by FAULT LED indicator, 1 kHz tone in beeps the handset/loudspeaker and messages appearing on the display. These alarms are divided into three types, namely, Operational Alarms, Receive Alarms and Transmit Alarms. To obtain LED Fault indications the operator must first activate the LITE ON or LITE LED using the LITE key on the keypad.

A-2. OPERATIONAL ALARMS

If the operator has performed an incorrect operation, an Error Message will appear on the display. The FAULT LED indicator will not light since no malfunction has occurred in the radio set. There are six basic Operational Alarm messages:

a. INV PARM (Invalid Parameter): The operator has entered incorrect data into the radio set or has performed an improper operation. For example, a frequency greater than 29.9999 or less than 1.5 MHz has been entered into the set or that SQ OFF has been activated during a SEC operation.

b. INV KY/CS (Invalid key/Checksum): This message indicates that the operator has entered the wrong data for SEC or AJ key and has obtained an incorrect checksum. The data originally entered into the radio set will not be changed.

c. INV key (Invalid key): The operator has activated a wrong key on the keypad to check a given radio set parameter. For example, the parameter FREQUENCY was entered but after this a non-numeric key was pressed or a new keypad operation was started before a previous one had been completed.

d. USE H/S (Use Handset): When Control Handset H-739/GR is connected to the front panel and is not switched to position P (PANEL) this message will be displayed if the operator attempts to control the set from the front panel. For example, the operator switches the Channel Selector on the front panel while Control Handset is set to Channel 5.

W2HX

e. SILENT: This message will appear if the operator attempts to transmit while the radio set is in the RCV ONLY (receive only) mode. All transmissions will be disabled.

f. NOT EXIST: This message indicates that the operator has switched the radio to AJ mode that is not available in the radio set.

A-3. RECEIVE ALARMS

The following message alarms are categorized under Receive Alarms:

a. LOAD PARM (Load Parameter): Usually appears after the ERS (erase) function was activated. Indicates that the operational parameters were lost. If appearing without previously erasing the memory, may indicate a problem with the backup battery, or internal component malfunction.

b. UNLOCK: This indicates the presence of a frequency fault. For example, as a result of a change in the channel or the frequency. In this case, all transmissions are disabled.

c. LOW BATT (Low Battery): This alarm will be activated in the event the battery voltage falls below the minimum value required to operate the radio set. This alarm will disable transmission for any PTT operation. Should this occur, the operator must check the battery voltage and replace the battery if necessary.

d. PWR 0.1W (Power 0.1 Watts): This indicates that a fault in the radio set is present. The radio set activates internal protection circuits that reduces the output power to 0.1W, and in these conditions the radio set is unable to operate.

e. CP FAIL (Coupler Failure): Fault in antenna coupler is indicated. All transmissions are disabled.

f. FATAL FLT (Fatal Fault): This message indicates that a major fault is present which will effect the normal operation of the radio set. All transmissions are disabled.

g. NO LOADER: This indicates that the data loading operation LOAD from another RT-2001 or Data Loader has failed. Check the equipment and the connections between the equipment.

h. NO TARGET: This indicates that the data transfer operation SEND to another RT-2001 or Data Loader has failed. When using the RT-2001 to send. Check the equipment and the connections between the equipment.

A-4. TRANSMIT ALARMS

Every Receive Alarm listed above is also activated during transmit operation. In Addition the following alarms are present:

a. TRNS FAIL (Transmission Failure): This message indicates that a major fault is present which disables normal transmission.

b. NO-MATCH: This indicates that the antenna is not properly matched causing a VSWR > 3:1 to be present. This may be due to the antenna coupler CP-2003 not being matched to the antenna, power output problems or a bad antenna connection. The operator should check the antenna and the radio equipment.

c. This indicates a fail during the Learning process. The Learning process is a special tuning process performed in the AUTO-CALL or AJ modes of operation, to match the CP-2003 to the antenna for every one of the frequencies included in the frequency table in use. If this alarm is activated it may be due to CP-2003 not being matched to the antenna, power output problems or a bad antenna connection. The operator should check the antenna, and the radio equipment.

APPENDIX B. AUTO-CALL OPERATION

B-1. AUTO-CALL - PRINCIPLES OF OPERATION

AUTO-CALL operation is based on two processes that are automatically performed by the net transceivers. The first process comprises the automatic link establishment and link disconnection. The second process comprises the analysis and learning of the qualities of the various frequencies, and selection of the optimal frequency for each individual link.

Link establishment is initiated when the operator at one side of the link requests communication. Using the data base stored with the communication qualities of the various frequencies, the initiating radio set station selects a frequency for link establishment. Using an automatic process that comprises handshake communication with the called radio set, communication is established on the selected frequency (sometimes another frequency is selected during this process, if the initial selection is not satisfactory).

Simultaneously with the execution of various processes involved in link establishment, continuous analysis of quality parameters is performed for all the frequencies and for all the possible stations. The results of this analysis update the data base stored by the radio set and are used in the process of the "optimal" selection during link establishment.

B-2. AUTO-CALL - GENERAL CHARACTERISTICS

The general characteristics of the AUTO-CALL function are specified below:

B-2.1 Frequency Tables.
AUTO-CALL supports two frequency tables. Each table can comprise 1 to 10 frequencies.

B-2.2 Addressing and Communication Types.
The following address types are available:

a. ALL - to all net members.
b. GROUP. Up to three different group addresses are available.
c. LINK. Individual addressing capacity of 27 various stations.

W2HX

B-2.3. Compatibility.
After establishing a link (net), the following operating modes are possible:

a. Operation with active squelch.
b. Clear or secure voice operation.
c. Clear or secure digital CW (DCW).
d. Data transmission using internal modem or external modem.

The selection of an optimal clear or secure frequency is correlated with the type of transmitted information: voice or data.

B-2.4 LQA - On-line link quality management.
Storage of quality data for the two frequency tables and for all the stations (27 stations for each frequency table).

B-2.5 Additional Characteristics.

a. Communication protocol: same frequency in both transmission directions.
b. Fully automatic link establishment.
c. Automatic link disconnection (after no activity is detected during a predetermined time-out period).
d. Identification of busy stations and frequencies.

B-3. LINK ESTABLISHMENT PROCESSES

The link establishment processes are one of the two fundamental components of the AUTO-CALL function.

Automatic link establishment, in an individual link, group or net, is performed by selecting an optimal communication frequency.

This chapter presents a detailed description of the techniques used for link establishment and disconnection. Detailed descriptions of the establishment process for link operation with the recommended operation mode and for other operating modes are included, as well as details on the differences between the various link establishment processes.

B-3.1 Link Operation - Link Establishment and Disconnection

Link establishment is an interactive process in which a handshake process takes place automatically between the two stations (the initiating and the called station). The successful completion of this process leads to the selection of one of the frequencies contained in the AUTO-CALL frequency table for intelligence transmission (single frequency, CLR or SEC transmissions).

The link establishment process is started by the initiating radio set. The first action is the selection of an initial frequency for operation. The initiating radio set transmits an initial transmission that signals to the other stations the start of the link establishment process. When the other stations detect this transmission, they stop frequency scanning and a handshake process communication can start.

During the handshake process, updated information on the quality of the communication is exchanged between the two transmitting stations. According to this information, the initiating station decides whether to confirm link establishment on the current operating frequency or to try another frequency.

If the current transmission fails, or if it was decided to try another frequency, the interactive process starts again, i.e., an additional link establishment message is transmitted on a different frequency. This process continues until one of the following events occurs:

a. Successful completion of the handshake process on one of the frequencies comprised in the table.

b. The process is interrupted before its completion (by RESET in the initiating side).

c. Communication with the called station cannot be established (after testing all frequencies comprised in the table). The NO COMM message is displayed.

The handshake communication used for link establishment in the link comprises the exchange of three messages:

a. An initial start-call message (from the initiating radio set to the called radio set). This message also comprises information about the type of required communication and the addresses of the initiating and called stations.

b. Called station response message (REPLY call). In this message, the called radio set identifies itself (and by this it acknowledges the reception of the initial request), and transmits to the initiating radio set information about the quality of reception.

c. Establishment acknowledge message. This message is transmitted by the initiating station only if an ACK response was received from the called radio set. The initiating station confirms link establishment - on the current frequency (ACK).

   In case of ACK, the handshake communication is ended; otherwise, if a response was not received (NACK=NO ACK transmission), the called radio set returns to the SCAN mode and the initiating station starts again the process on a new frequency.

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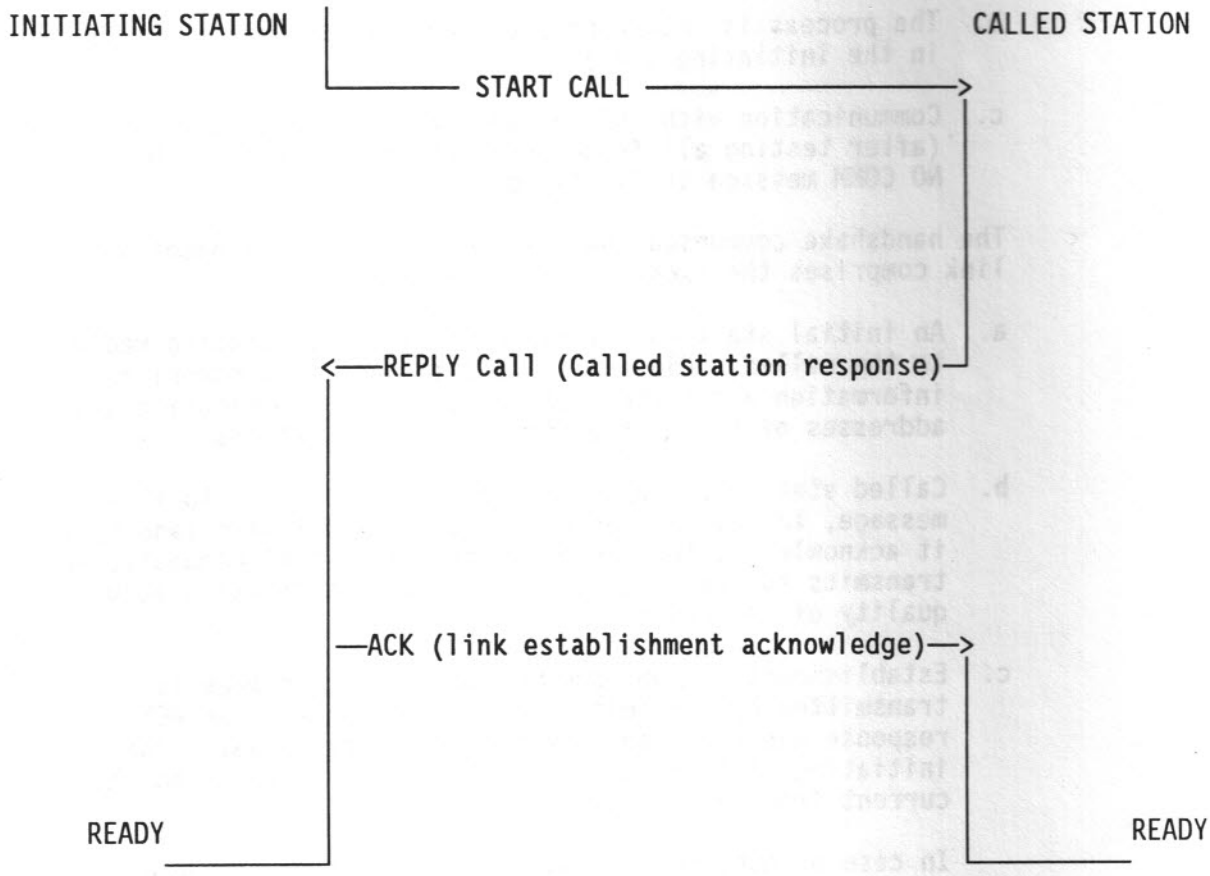

B-3.2 Link Disconnection Process

A station engaged in the READY state can only receive information transmitted on the same frequency. If at the same time, a new handshaking transmission is initiated in the net (generally on another vacant frequency), this station cannot participate in it, and it will even not have any knowledge about its existence. Because of this problem, it is important that a station shall not remain in the READY state when it this is no longer required. Therefore, a disconnect function is provided.

There are two ways to disconnect a link:

a. Automatic time-out activated disconnection, that takes place after traffic stops.

b. Disconnection upon operator request (RESET).

After link disconnection, the station returns to the scanning process (SCAN frequency scanning mode). This enables the station to initiate or participate in a new handshake communication.

B-3.2.1 Automatic Disconnection Upon Time-out (T.O.)

A station in the READY state that did not transmit, nor receive traffic during a certain time, will automatically disconnect the link.

The T.O. time interval depends on the type of the information transmitted (40 seconds in a voice transmission). The time-out mechanism is reset at the end of each transmission or reception.

The automatic disconnection process is not applicable when a link with an external modem is established. In this case, the link will be disconnected only upon operator request.

B-3.2.2 Disconnection on RESET Request

When the radio set is in the READY state, the operator RESET request will disconnect his radio set from the link.

A RESET activated by the operator that has initiated the link (and also by the called station, in case of the individual communication mode), will also disconnect all the other stations participating in the link. This is achieved by automatically transmitting a disconnect message.

At a station participating in an ALL or GROUP call which was not the initiating station of this call, a RESET (link disconnection) command will cause disconnection from the link without disturbing the other stations from continuing the READY state.

Generally, an operator will perform a RESET action when he wants to disconnect from a call that it is not of interest, or to enable him to participate in a new link.

B-3.2.3 REPLACE Process

In principle, the REPLACE process is a process combining a RESET (communication disconnection) with the simultaneous establishment of a new link communication, started on the frequency on which the previous transmission took place. The purpose of this process is to give the operators a certain measure of control on the frequency selection mechanism used by the system.

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During the REPLACE process, the radio set first transmits a disconnect message, and then tries to establish again a link according to the processes specified before, but ignoring the last used frequency. If during the process it appears that the last used frequency is still the best frequency, it will be selected again (however, only after all other frequencies were actually tried).
The REPLACE action can be performed only by the call initiating operator (and by the called operator, on an individual link call). In all other cases, this request is ignored.

B-3.3 Link Establishment and Disconnection in the "NET" Mode

Establishment of the link in the net mode is based on the selection of a optimal frequency by the initiating station, and transmission of an "initial establishment" message (having the same format as the message used to initiate link establishment in the individual link mode), accompanied by the addresses of the requested groups (GROUP or ALL).

This process does not require the active response of the called stations, and is completed by the immediate display of the READY message at the initiating station and at all the called stations that detected the net establishment transmission.

Similar to the link disconnection process in the individual link mode, link disconnection in the net mode is based on a time-out mechanism (lack of traffic during a given time interval), or on the reception of a DISCONNECT or REPLACE message. The difference is that only the initiating operator is permitted to transmit these messages. All other stations can only disconnect themselves from the net by pressing RESET.

In general, the "optimal frequency" selection is based on the principle of the frequency selection that ensures communication with the largest number of addressed stations (depending on the GROUP or ALL number), while compromising with respect to the quality of the established link.

APPENDIX C. OPERATIONAL RECOMMENDATIONS

C-1. AUTO-CALL

C-1.1 LEARN

A LEARN procedure is recommended after changing to AUTO-CALL mode, or after any frequency change in the AUTO tables, or after turning on the radio. A short time PTT for the above cases will perform a LEARN procedure and enable best antenna matching.
A radio set performing a LEARN process without any operator intervention means that another station is calling this radio set.

C-1.2 SCAN

Selecting AUTO-CALL mode, after any frequency change in the AUTO-CALL tables, or after turning on the radio, allows the system to learn the link quality for about 1 minute, prior to link establishment. After a long period in the link state, it is recommended to remain in SCAN mode for about a minute so as to refresh in the radio set, the DATA concerning the noise information in the SCAN frequencies. The same is recommended after the quality of the link changes quality for any reason whatsoever.
Before performing REPLACE, wait about a minute in SCAN mode then attempt to establish a new link. If still unsuccessful, perform REPLACE.

NOTE
The above procedures are only recommendations and are not mandatory upon the operator.

C-1.3 Calling to a Non-existing Station (Sound).

The system may be "taught" the best frequency link in a short period of time. One station, addressed with a non-exsisting SEL.T should start calling. The other stations now measure the frequency noise and the signal level of the transmitting station for each frequency. After calling has stopped, any passive station can now call the transmitting station which performed the call to the non-exsisting station. The system will now establish the best available link.

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C-1.4 GROUP or ALL CALL

It is recommended to use GROUP or ALL CALL after establishing a link using an individual selective call between the stations. After the system has learned the best frequency for each link, it will choose the proper frequency for the GROUP or ALL link. It should be noted that GROUP or ALL link is performed without handshaking.

C-1.5 BUSY

Using AUTO-CALL allows to know that a specific station is now in a AUTO-CALL LINK. For example, with Radio 1 in SCAN mode, Radio 2 calls Radio 3 on AUTO-CALL. Radio 1 "hears" the call and the conversation without its operator hearing it. If the operator of Radio 1 tries to call Radio 2 or Radio 3, a BUSY indication will appear on Radio 1.

NOTE

If no activity is present on that link for about 15 seconds, the Radio 1 station will decide that the link is no longer busy. If the operator of Radio 1 wishes to override this decision, he must press the RST key and then press PTT again.

C-1.6 DATA Link in AUTO-CALL mode

When using DATA link in AUTO-CALL, the DATA PTT will enable a link establishment that will not break. A voice link will always break after no activity lasting 40 seconds. With DATA PTT, only the operator activating the RST key will "disconnect" the link.

C-2. ANTI-JAM (AJ)

C-2.1 LEARN

After changing to AJ mode, after any frequency change in the AJ mode, or after turning on the radio, a LEARN procedure is mandatory. A short time PTT for the above cases will perform a LEARN procedure and enable best antenna matching. A radio set performing a LEARN process without any operator intervention means that another station is calling this radio.

C-2.2 GROUP or ALL CALL

Remember that GROUP or ALL link is performed without handshaking.

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APPENDIX D. SYSTEMS INSTALLATION

D-1. SCOPE

This chapter contain instructions for installation and connection to PRC-2200 in various configurations as described bellow.

D-2. Configurations

D-2.1 General

The radio set has RMT/DATA connector. With this connector it is possible to connect to: REMOTE CONTROL unit, EXTERNAL MODEM, DATA LOADER-G10, TELETYPE-WRITER (TTY), PERSONAL COMPUTER (PC), other RADIO or other external equipment.
Each configuration requires its oun particular accessories.

D-2.2 Operation with DATA LOADER - G-10

Connect the cable CX-4481 between the radio set and G-10, see figure D1 bellow.

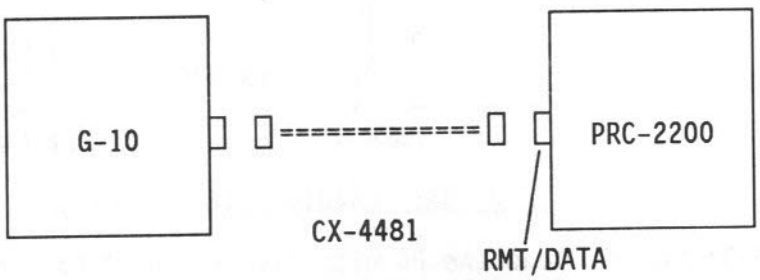

Fig. D1: Operation with G-10

For detailed operation see Para. 3-13.23 and Para. 3-13.24.

For more information about the G-10 see: OPERATOR MANUAL G-10 DATA LOADER OM-2344-09113-00.

D-2.3 Loading Data from other RADIO SET

Connect the Cable CX-8708 between the two Radio sets, see figure D2 bellow.

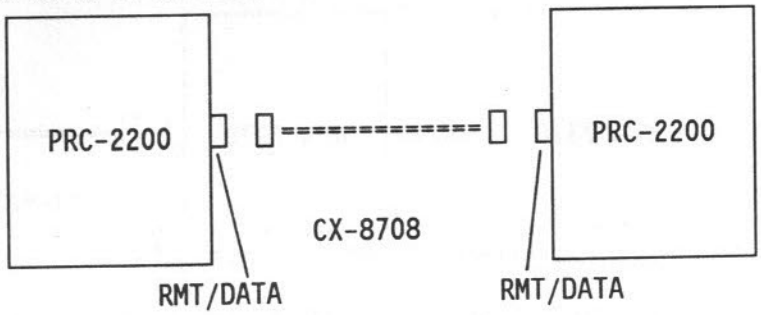

Fig D2: Loading Data from other Radio set

Turn the radio sets to ON (CLR) position. Press the PROG key ten times on the sending radio set. SEND will appear on its display, now press the ENT key. Press the PROG key eleven times on the loading radio. LOAD will appear on its display now press the ENT key. SENDING will appear on the display of the sending radio. LOADING will appear on the display of the loading radio until all the information has been transfer. In case of fault during the loading NO_TARGET will appear on the display of the sending radio and NO LOADER on the display of the loading radio.

D-2.4 Loading Data from a PERSONAL COMPUTER (PC)

Connect the cable CX-8709 between the radio set and a personal Computer-(PC). See. figure D3 bellow.

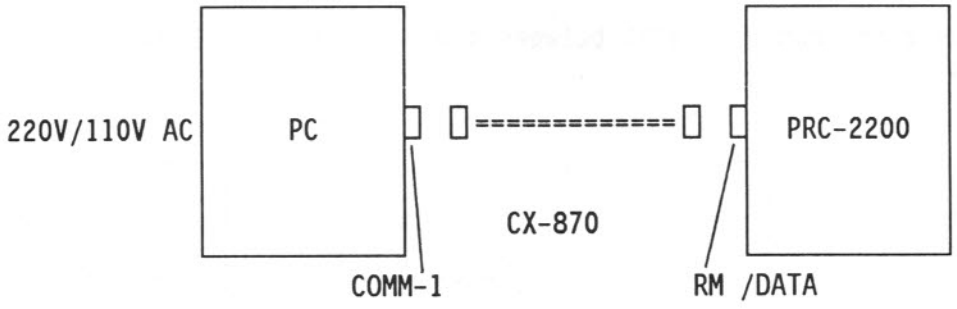

Fig. D3: Loading Data rom a P

Turn ON the PC. Load the PC with diskette G-10 Ca . No. 2187-09075-02. Turn the radio to ON (CLR) position. Use the instructions that appears on the display of personal computer. The personal computer will load the radio with information/data produced in personal computer.

D-2.5 Operation with REMOTE CONTROL GRA-7300

Connect the cable CX-5234 between the rad o set a d the local remote control unit GRA-7320, pay attention to the labeles on the cable that defines the directivity. See figure D4 bel ow.

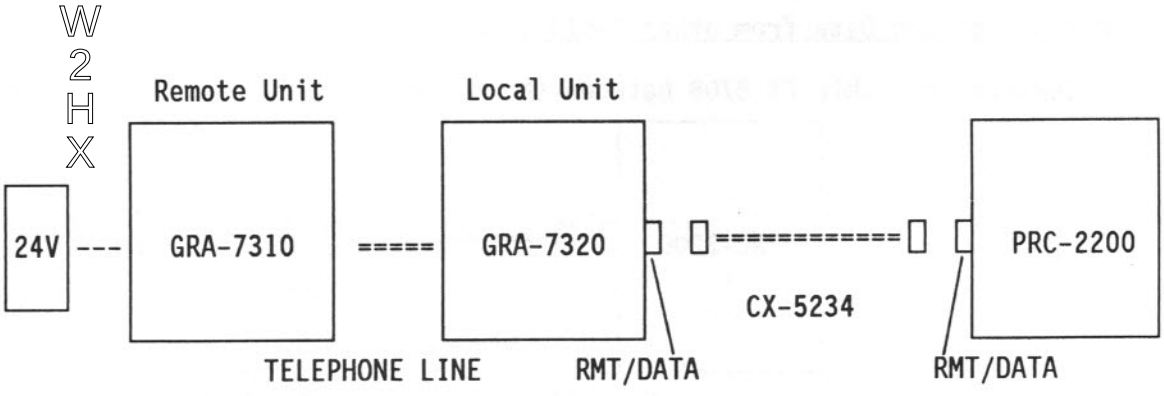

Fig D4: Operation with Remote Control GRA-7300

Turn the radio set to RMT position. Set the operation switch of the local unit to RADIO position (enables transmission and reception from/at the local and remote units). Set the main switch of the remote unit to VOICE position (turns ON the unit and the radio set. VOICE transmission and reception enabled).

For more information see: OPERATOR MANUAL-REMOTE CONTROL SYSTEM GRA-7300 OM-2052-09508-00.

D-2.6 Operation with TELETYPE-WRITER (TTY)

Connect the interface unit AD-2165 between the radio set and the teletypewriter (TTY). See figure D5 bellow.

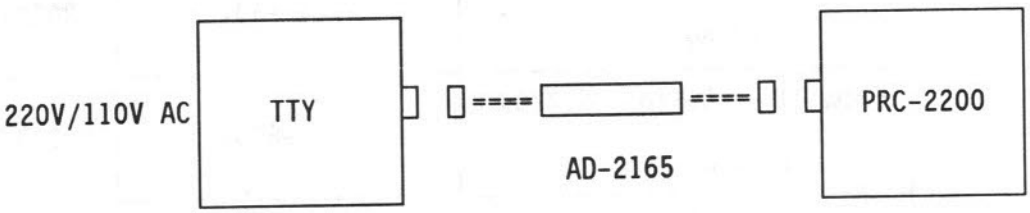

Fig. D5: Operation with TTY

Turn the radio to ON (CLR) position. Check that the PWR led of AD-2165 and the TTY to interface unit AD-2165. Connect and to the power source (220V/110V AC). To operate the TTY use its operator manual. Select internal modem parameters asy 50 or asy 75 or asy 150, see Para 3-13.21. The DATA rate of the radio and the TTY must be identical.

The AD-2165 enables communication between equipment with current loop interface (for example TTY) and devices with RS-232 interface (PRC-2200). The AD-2165 allows active or passive current loop transmissions.

D-2.7 Operation with external Modem MD-1522

Connect the cable CX-2355 between the radio set and the modem, see figure D6 bellow.

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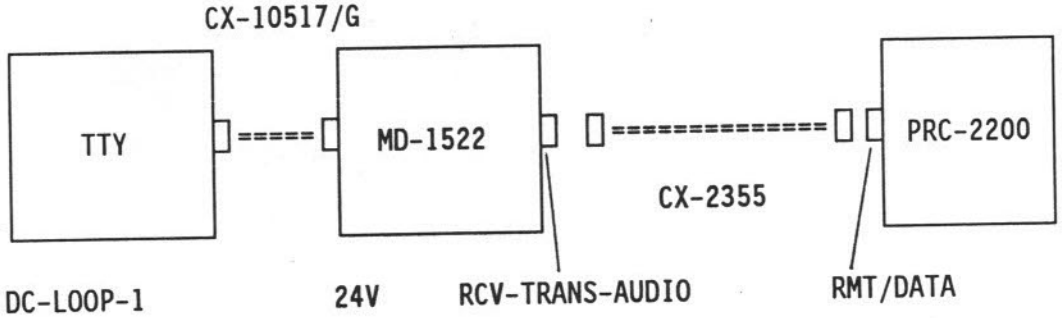

Fig. D6: Operation with external modem MD-1522

Turn the radio set to ON (CLR) position. Turn the power switch of MD-1522 to ON, and verify that POWER LED and TEST LED illuminates. On the radio set select external modem, see Para 3-13.21. For more information see: OPERATOR MANUAL RADIO TELETYPE-WRITER MODEM MD-1522.

D-2.8 List of Cables

CABLE DESCRIPTION	CABLE NAME	CATALOG NO.
From G-10 to PRC-2200 (loading)	CX-4481	2020-09464-00
From PRC-2200 to PRC-2200 (loading)	CX-8708	2020-09518-00
From Personal Computer to PRC-2200	CX-8709	2020-09519-00
From GRA-7300 Remote Control to PRC-2200	CX-5234	2020-09524-00
From MD-1522 to PRC-2200	CX-2355	2020-09181-00

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