

# **System 800**

## **Wireless Intercom System**

### **Operating Instructions**

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**HM ELECTRONICS, INC.**

# INTRODUCTION

The HME System 800 is a UHF wireless intercom system which provides hands-free (full-duplex) communication with up to four belt-pac COMMUNICATOR<sup>®</sup>s, or push-to-talk (half-duplex) communication with an unlimited number of Communicators. In combination, up to three Communicators can be used in the full-duplex mode, with an unlimited number in the half-duplex mode. Its control center, the RW800 Base Station, has inputs which allows a 2, 3 or 4-wire cabled intercom to be interfaced with the wireless system, as well as an auxiliary input for a mixer or other audio equipment. Three base stations can be connected together for operation of up to twelve Communicators in the full-duplex mode, or a combination of up to eleven in full-duplex with an unlimited number in the half-duplex mode.

The System 800 was designed for use in television broadcasting, theaters, churches, concerts and industrial environments.

This manual describes the setup and operation of the HME System 800. Read and follow these instructions carefully before setting up your System 800 equipment. Pay particular attention to items in **bold** or *italicized* print.

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**The System 800 is a wireless radio system, type-accepted under Part 74 and Part 90 of the Federal Communications Commission (FCC) Code of Federal Regulations governing general purpose applications. The system requires an FCC station license if operated within the United States or its possessions. Because licensing depends on the system's application, it is the user's responsibility to apply for a license from the Federal Communications Commission.**

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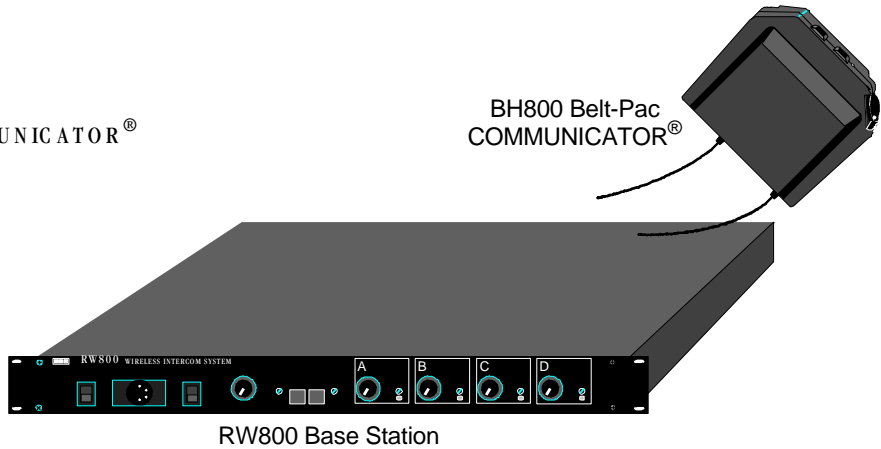
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## I. SYSTEM DESCRIPTION

### A. Model Designations

<u>Model</u>	<u>Description</u>
RW800	Base Station
BH800	Belt-Pac COMMUNICATOR®



### B. General Description

The HME System 800 is a UHF Wireless Intercom System which provides hands-free (full-duplex) communication with up to four belt-pacs, or push-to-talk (half-duplex) communication with an unlimited number of belt-pacs. Combining full and half-duplex, up to three wireless belt-pacs can be operated in the full-duplex mode with an unlimited number in the half-duplex mode. The BH800 Belt-Pac COMMUNICATOR®s transmit to and receive communication from the RW800 Base Station. An auxiliary input on the RW800 Base Station allows everyone using the System 800 to hear cues from a mixer or other sound equipment. A cabled intercom can also be connected to the base station, and can be operated in combination with the wireless system. The RW800's modular construction simplifies service and expansion of the system.

### C. Special Features

- Loop-around sidetones are designed into the system to assist in maintaining reliable communication among belt-pac stations. The sidetones ensure that your own voice, as you hear it in the headset, is being received at the base station and heard by other belt-pac users. If you do not hear your own voice in your headset, no one else can hear it.
- The system is companderized to ensure clean, low-noise operation.
- Two System 800s can be linked to provide up to eight wireless belt-pacs in the full-duplex operating mode. Three System 800s provide up to twelve wireless belt-pacs.
- Subaudible-tone coding is utilized in both transmission directions to prevent outside interference.
- A two-way belt clip has been designed to allow the user to either place the belt clip in the **down** position and secure it with two screws for normal-clip operation, or place the belt clip in the **up** position and secure it with two screws for use with a webbed belt or equivalent.
- Electret or dynamic microphone headsets can be used with the belt-pacs and/or base stations.

## II. SPECIFICATIONS

### A. System 800

RF Frequency:	450 - 470MHz (Part 90); 470 - 500MHz (Part 74)
Emission:	25K6F3E (United States) 16K0F3E (Canada)
Frequency Deviation:	±5kHz maximum
Occupied Bandwidth:	25kHz
Audio Frequency Response:	250Hz - 3.5kHz minimum ±3dB
Distortion:	5% maximum
Tone Coding:	subaudible
Operating Temperature Range:	base station --- 0 - 50°C COMMUNICATOR® --- 0 - 40°C
Noise Reduction System:	NE570 compandor (or equivalent)
Range:	up to 1500ft (456.12m) line of sight, typical

### B. RW800 Base Station

Transmit Power:	80 - 120mW
Frequency Stability:	±5PPM
Spurious Emissions:	50dBC minimum
Receiver Sensitivity:	1µV for 12dB SINAD, typical
30dB Quieting:	1.5µV maximum
Adjacent Channel Rejection:	35dB minimum at ±12.5kHz
RF Squelch Sensitivity:	unsquelched to 25µV minimum
Image Frequency Rejection:	first IF --- 21.4MHz, 60dB minimum second IF --- 455KHz, 45dB minimum
Cabled System Interface:	input impedance --- 10KΩ receive level --- 0dBm maximum send level --- -20dBm connectors --- 1 male 3-pin XLR 1 female 3-pin XLR pin 1 - ground pin 2 - power (32Vdc maximum) (and audio for 2-wire) pin 3 - cable audio
Auxiliary Input:	impedance --- 600Ω balanced receive level --- -20dBm typical connector --- 1 female 3-pin XLR pin 1 - ground pin 2 - audio + pin 3 - audio -
4-Wire Interface:	input impedance --- 20KΩ balanced receive level --- 5dBm maximum send level --- 0dBm into 600Ω connector --- 1 female 4-pin XLR pin 1 - balanced audio input pin 2 - balanced audio input pin 3 - balanced audio output pin 4 - balanced audio output
Power Requirement:	external 11 - 30VDC, 600mA, 115V/50 - 60Hz with adapter
Size:	rack mount --- 19" x 1.72" x 11.50" (48.26 x 4.37 x 29.21cm)
Weight:	13 lbs (5.89kg)

Operating Frequencies:

## Part 90

Primary RW800 Base Station		
	HME Designator	Frequency
Transmitter	U 1	457.5375MHz
Receiver A	U 7	468.4875MHz
Receiver B	U 9	468.8375MHz
Receiver C	U 11	469.4625MHz
Receiver D	U 13	469.6625MHz

Secondary RW800 Base Station		
	HME Designator	Frequency
Transmitter	U 2	457.5875MHz
Receiver A	U 8	468.7625MHz
Receiver B	U 10	469.1375MHz
Receiver C	U 12	469.6375MHz
Receiver D	U 14	469.8875MHz

Auxiliary RW800 Base Receiver for use with Primary Base Station		
	HME Designator	Frequency
Receiver A	U 3	467.7625MHz
Receiver B	U 4	467.8125MHz
Receiver C	U 5	467.9125MHz
Receiver D	U 6	468.3625MHz

## Part 74

Operates within UHF TV Channels 14 & 17	Primary RW800 Base Station (Group 1)		
		HME Designator	Frequency
	Transmitter	U 15	470.0500MHz
	Receiver A	U 19	491.8000MHz
	Receiver B	U 20	491.8500MHz
	Receiver C	U 21	491.9500MHz
	Receiver D	U 22	492.4000MHz
	Primary RW800 Base Station (Group 2)		
		HME Designator	Frequency
	Transmitter	U 16	470.1000MHz
	Receiver A	U 23	492.5250MHz
	Receiver B	U 24	492.8000MHz
	Receiver C	U 25	492.8750MHz
	Receiver D	U 26	493.1750MHz
	Auxiliary RW800 Base Receiver for use with Primary Base Station		
		HME Designator	Frequency
	Receiver A	U 27	493.5000MHz
	Receiver B	U 28	493.6750MHz
	Receiver C	U 29	493.7000MHz
	Receiver D	U 30	493.9250MHz

Operates within UHF TV Channels 15 & 18	Secondary RW800 Base Station (Group 1)		
		HME Designator	Frequency
	Transmitter	U 17	476.0500MHz
	Receiver A	U 31	497.8000MHz
	Receiver B	U 32	497.8500MHz
	Receiver C	U 33	497.9500MHz
	Receiver D	U 34	498.4000MHz
	Secondary RW800 Base Station (Group 2)		
		HME Designator	Frequency
	Transmitter	U 18	476.1000MHz
	Receiver A	U 35	498.5250MHz
	Receiver B	U 36	498.8000MHz
	Receiver C	U 37	498.8750MHz
	Receiver D	U 38	499.1750MHz
	Auxiliary RW800 Base Receiver for use with Secondary Base Station		
		HME Designator	Frequency
	Receiver A	U 39	499.5000MHz
	Receiver B	U 40	499.6750MHz
	Receiver C	U 41	499.7000MHz
	Receiver D	U 42	499.9250MHz

## C. BH800 Belt-Pac COMMUNICATOR®

Audio Frequency Response:	250Hz - 3.5kHz minimum ±3dB		
Operating Frequency:	450 - 470MHz (Part 90); 470 - 500MHz (Part 74)		
Distortion:	5% maximum		
Transmit Power:	50mW typical at 5VDC		
	10mW minimum at 4.5VDC		
Frequency Stability:	±10PPM		
Receiver Sensitivity:	1µV for 12dB SINAD, typical		
Adjacent Channel Selectivity:	35dB minimum at ±12.5kHz		
RF Squelch Sensitivity:	Factory set to 1µV		
	(internally adjustable from unsquelched to 25µV minimum)		
Audio:	Test signal input --- 30µV RF input, ±3.5kHz deviation, 1kHz tone		
	Headphone Impedance Range --- 33 - 200Ω		
	Power output --- 20mW minimum across 200Ω		
	Maximum SPL level into HME HS3 Headset --- 122dBA		
	Subaudible rejection --- 50dB minimum		
Headset Connector:	4-pin XLR		
	pin 1 - microphone low		
	pin 2 - microphone high		
	pin 3 - earphone low		
	pin 4 - earphone high		
Battery Requirements:		<u>NiCad</u>	<u>Alkaline</u>
	Full-duplex only ---	4 hours	9 hours
	Typical use ---	10 hours	15 hours
	standby 15%		
	receive 80%		
	full-duplex 5%		
	Battery types ---	NiCad - HME P/N K05645, 600mAH	
		rechargeable battery-pac	
		Alkaline - 4 "AA" cells	
		with battery holder provided	
Size:	4.6" x 4.0" x 1.6" (11.68 x 10.16 x 4.06cm)		
Weight:	13oz (369g)		

### III. EQUIPMENT LIST

#### A. Basic System

- 1 ea, BH800 Belt-Pac COMMUNICATOR<sup>®</sup>, with 1 ea battery-pac for 4 "AA" alkaline batteries
- 1 ea, RW800 Base Station, which includes the following:

Description	Quantity
Whip antennas with BNC connectors	2 ea.
AC power adapter (option 115 or 230VAC)	1 ea.
Screws for rack mounting	4 ea.
Transmitter Module	1 ea.
Receiver Module	1 ea.
Antenna Distribution Module	1 ea.

#### B. Optional Equipment

- Additional BH800 Belt-Pac COMMUNICATOR<sup>®</sup>s **for primary base station**
- Kits for additional channels **for primary base station**, include receiver module with mounting hardware and BH800 Belt-Pac COMMUNICATOR<sup>®</sup>
- **Secondary RW800 Base Station** with transmitter, receiver modules and Communicators to extend the system for operation of up to eight full-duplex, wireless belt-pac Communicators

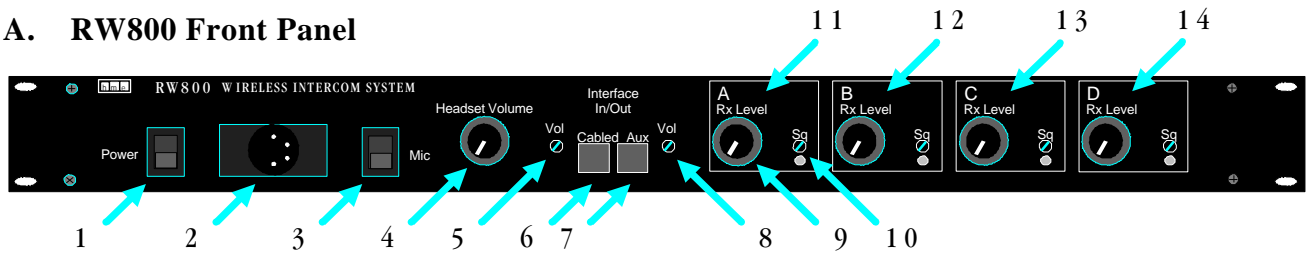
##### Number of Channels

- one (Channel A)
- two (Channels A & B)
- three (Channels A, B & C)
- four (Channels A, B, C & D)

- Additional BH800 Belt-Pac COMMUNICATOR<sup>®</sup>s **for secondary base station**
- Kits for additional channels **for secondary base station**, include receiver module with mounting hardware and BH800 Belt-Pac COMMUNICATOR<sup>®</sup>
- AC Adapter for RW800 Base Station (115 volt)  
(230 volt)
- AC2000 Battery Charger (6 battery ports, 10 hour charging time)  
(115 volt)  
(230 volt)
- AC2010 Quick Battery Charger (3 battery ports, 3 hour charging time)  
(115 volt)  
(230 volt)
- HS3 Lightweight Headset
- NiCad battery (charged)
- Webbed belt, 46" adjustable, black
- Cable with 3-pin XLR connectors, to interface two RW800 Base Stations  
25 ft. length  
50 ft. length

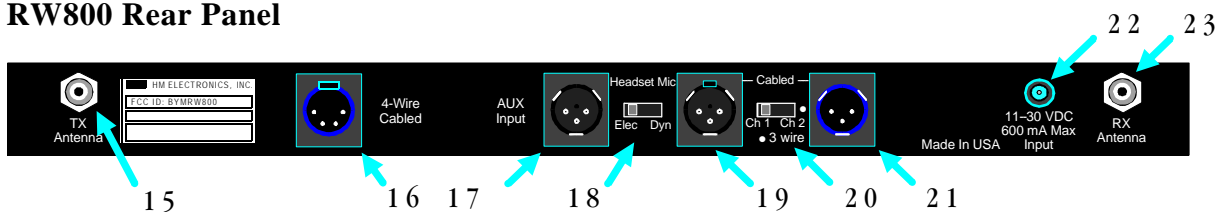
## IV. SYSTEM 800 CONTROLS / CONNECTORS

### A. RW800 Front Panel



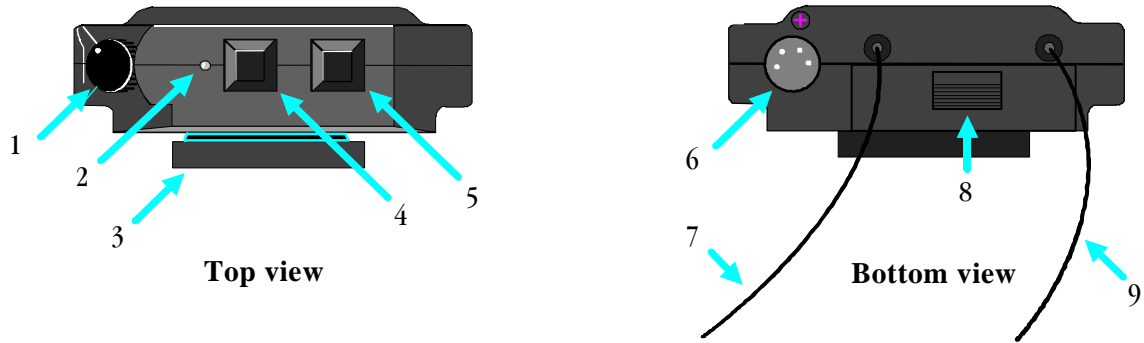
- 1 **Power switch** --- turns on AC power when top of switch is pressed, off when bottom is pressed; LED on switch lights when power is on.
- 2 **Headset connector** --- provides 4-pin XLR connection for 33 - 200 ohm headset with electret or dynamic microphone.
- 3 **Microphone switch** --- turns base-station headset microphone on when top of switch is pressed, off when bottom is pressed; LED on switch lights when microphone is on.
- 4 **Headset volume control** --- adjusts volume in base-station headset.
- 5 **Volume control** --- adjusts volume of input audio from cabled intercom.
- 6 **Interface In/Out Cabled switch** --- activates 2 or 3-wire cabled intercom interface with base station when pushed in, deactivates when out; switch shows green in the "In" position. A 4-wire cabled intercom is **not** affected by the Interface In/Out Cabled switch.
- 7 **Interface In/Out Aux switch** --- activates auxiliary audio input to base station when pushed in, deactivates when out; switch shows green in the "In" position.
- 8 **Volume control** --- adjusts volume of auxiliary audio input.
- 9 **Rx Level control** --- adjusts volume of receiver for channel A (same for channels B thru D).
- 10 **Sq control** --- adjusts RF squelch threshold level for channel A; turning clockwise increases squelch (same for channels B thru D).
- 11 - 14 **Channel A thru D control centers** --- contain adjustments for up to four individual belt-pac channels, A thru D.

### B. RW800 Rear Panel



- 15 **TX Antenna connector** --- BNC connector for transmitting antenna.
- 16 **4-Wire Cabled Intercom connector** --- female 4-pin XLR connector for 4-wire cabled intercom.
- 17 **AUX Input connector** --- female 3-pin XLR connector for auxiliary audio input.
- 18 **Headset Mic switch** --- must be matched with electret or dynamic microphone in base station headset.
- 19 & 21 **Cabled Intercom connectors** --- female and male 3-pin XLR connectors for interfacing cabled intercom with wireless intercom System 800.
- 20 **Cabled Intercom Channels 1 & 2 switch** --- selects either channel 1 or channel 2 of a 2-wire cabled intercom connected to the wireless system.
- 22 **11-30VDC, 600mA Max Input connector** --- input for DC power adapter.
- 23 **RX Antenna connector** --- BNC connector for receiving antenna.

### C. BH800 Belt-Pac COMMUNICATOR®



- 1 **On/Off/Volume control** — turns Communicator on and off, and adjusts listening level in headset.
- 2 **Power LED** — lights green when power goes on, and remains lit until battery needs replacing or Communicator is turned off; changes to red when either transmit button (PTT or LOCK) is pushed, indicating transmitter is on.
- 3 **Adjustable belt clip** — when attached to the Communicator in the down position, allows the Communicator to be clipped onto the user's belt; when attached to the Communicator in the up position, locks closed for permanent use with webbed, uniform belt.
- 4 **LOCK button** — when pushed once, electronically locks the Communicator into an open channel of communication for hands-free talking and listening; when pushed again, Communicator reverts to listen-only mode.
- 5 **PTT button** — allows open, two-way communication when pushed and held; when button is released, user can listen only.
- 6 **4-pin XLR connector** — male connector provides headset hookup capability.
- 7 **Receive antenna** — receives signal from base station.
- 8 **Battery compartment cover** — slides and lifts open for battery removal and replacement; provides access to dynamic/electret microphone switch.
- 9 **Transmit antenna** — transmits signal to base station.

## **V. MODES OF OPERATION**

### **A. Full-Duplex**

Full-duplex operation provides continuous two-way communication between the base station and BH800 Belt-Pac COMMUNICATOR<sup>®</sup>s. The Communicators each transmit to the base station on independent frequencies, represented by channels A thru D on the base station.

### **B. Half-Duplex**

Half-duplex operation provides push-to-talk (PTT) communication between the base station and an unlimited number of Communicators. The Communicators typically all transmit to the base station on the same channel/frequency. Since only one Communicator can transmit at a time, an unlimited number of Communicators can be set up on any of the channels for this type operation. However, if one operator pushes the PTT button on his/her Communicator while the PTT button on another Communicator on the same channel is being pushed, interference will occur.

### **C. Combined Full and Half-Duplex**

Combined operation permits use with any number of belt-pacs in the half-duplex mode, and up to three belt-pacs in full-duplex. In combined use, one channel is designated for half-duplex, and the three remaining channels are used for full-duplex operation. All of the RW800 Base Station functions still apply, and the sidetone capability is maintained.

## **VI. INSTALLATION AND OPERATION**

### **A. Precautions**

For the protection of your equipment and for maximum operating efficiency, the following precautions must be understood and observed.

- Do not turn on the RW800 Base Station without antennas installed.
- Turn off Communicator before replacing batteries.
- If other than HME headset is used, be certain its impedance is between 33 and 200 ohms.

## B. Installation

### 1. RW800 Base Station

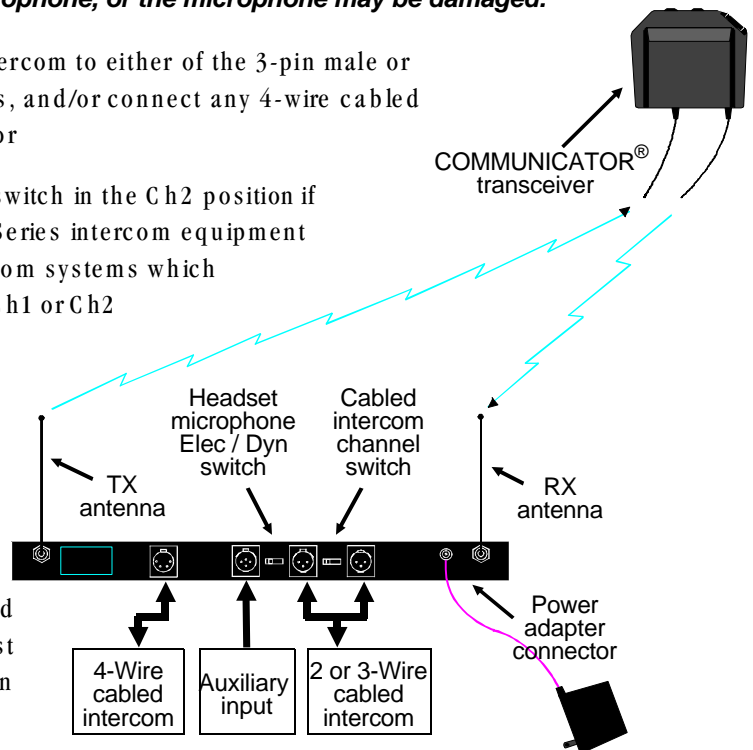
The base station can be set up on a table top, or mounted in an audio equipment rack. Four screws are provided for rack mounting. After setting up the RW 800 in the desired location, connect all associated hardware and components to it as follows. Refer to the illustration below.

#### Front Panel

- Connect a headset to the 4-pin male XLR connector near the left end of the RW 800 front panel.  
**CAUTION: If other than an HME headset will be used, its impedance must be 33 - 200 ohms.**

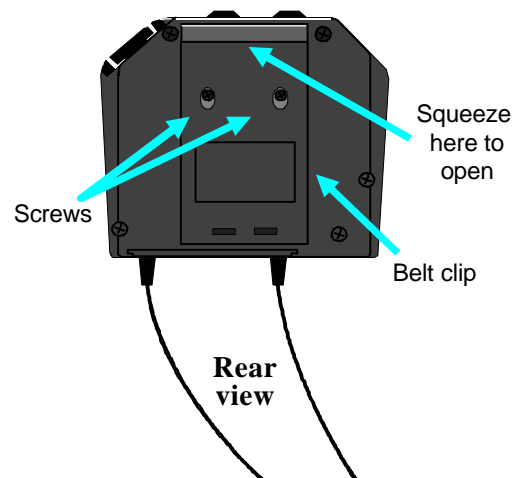
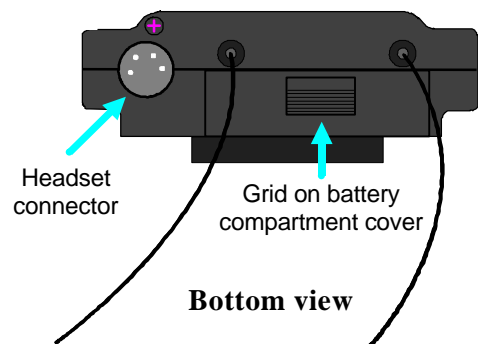
#### Rear Panel (left to right)

- Connect the two antennas to the receptacles marked TX Antenna and RX Antenna at the left and right ends of the base station rear panel. Push each of the bayonette antenna connectors straight into its receptacle, so the notches on the antenna connector fits over the metal tabs on the sides of the base station receptacle. Holding the antenna upright with one hand, twist its connector clockwise with the other hand until it is securely in place.  
**CAUTION: Be certain the antennas are both properly installed before connecting the power adaptor to the base station.**
- Connect any mixer or other audio input equipment to the 3-pin female AUX Input connector.
- Set the Headset Mic switch to the Elec (electret) or Dyn (dynamic) position, depending on which type of microphone is in the headset that will be used with the base station.  
**CAUTION: Do not leave the headset microphone switch on the "electret" position when using a headset with a dynamic microphone, or the microphone may be damaged.**
- Connect any 2 or 3-wire cabled intercom to either of the 3-pin male or female cabled intercom connectors, and/or connect any 4-wire cabled intercom to the 4-pin XLR connector
- Set the Ch1/Ch2 cabled intercom switch in the Ch2 position if 3-wire intercoms or any HME 700 Series intercom equipment is used with the RW800. For intercom systems which have two audio channels, either the Ch1 or Ch2 position can be selected.
- Connect the power adapter cord to the power adapter connector near the right end of the rear panel of the base station. Plug the adapter into an AC electrical outlet.
- If two base stations will be connected together, remove the cover of the first (main unit), and locate jumper J 12 on its circuit board. Move the J 12 shorting bar to position 2-3.



## 2. BH800 Belt-Pac COMMUNICATOR<sup>®</sup>

- Determine whether the headset to be used with the Communicator has an electret or dynamic microphone. Locate the grid on the battery compartment cover on the bottom of the BH800. Open the battery compartment by placing a thumb on the grid and sliding the cover downward to release the catch. Lift the hinged cover and remove the plastic battery holder from the transceiver. Locate the Headset Mic switch at the bottom of the empty battery compartment, and place it in the Elec (electret) or Dyn (dynamic) position, depending on which type of microphone is in the headset.
  - Insert four standard "AA" alkaline batteries into the battery holder, in alternate directions, with the flat end of each battery placed against the spring at the end of one of the battery compartments. Replace the full battery holder in the battery compartment, inserting the two metal connectors in the compartment first. Close the cover over the battery compartment by sliding it inward until it snaps securely into place.
  - Plug the 4-pin female XLR connector of a headset cable into the male connector on the bottom of the BH800.
- NOTE: If other than an HME headset will be used, be certain its impedance is 33 - 200 ohms.**



- If the belt-pac Communicator is going to be worn on a standard uniform or clothing belt, simply squeeze the belt clip at the top to open it, and slide it over the belt. The transceiver can be worn at the left or right hip. If it is going to be fitted permanently onto a webbing belt, clip the transceiver over the belt, and slightly loosen the two screws that can be seen through the two holes on the clamp. **Do not remove the screws.** Slide the clamp upward until it stops, and retighten the two screws. The clamp should be locked into place so that squeezing it at the top will not open it.

## C. Operation

### 1. RW800 Base Station

The base station transmits to all COMMUNICATOR<sup>®</sup>s on a single UHF channel. It receives transmission from Communicators on up to four separate channels, A thru D. When the base station receives communication from any of the Communicators, it retransmits the message back to all Communicators, including the one which transmitted the message. To operate the RW800 Base Station, do the following.

- Turn on the power by pressing the power switch at the left end of the RW800 front panel. The top half of the power switch will light when the power is on.
- Adjust the Headset Volume control and the Rx Level (receiver) control for each channel being used, to the quarter-level position. They can be readjusted later, as required. Turn the Rx Level control, for each channel not being used, fully counterclockwise.
- Adjust the squelch (Sq) control for each channel to be used (A thru D on the right of the RW800 front panel), as follows. Be certain all Communicators are off. Turn the squelch control counterclockwise until the red LED light for that channel comes on. Turn the control clockwise, just until the light goes off. If the light flickers dimly, turn the control slightly further clockwise. Turn and leave the squelch control for each channel **not** being used, fully clockwise. Plug a headset into the connector to the right of the power switch.
- Turn on the headset microphone by pressing the microphone switch to the right of the headset connector. The microphone switch will light when the microphone is on.
- Have one of the remote Communicators turned on, and have the Communicator operator speak into his/her headset microphone. Adjust the base-station headset volume control and the receiver level control (corresponding to the Communicator being used) to the desired incoming level.
- If a 2 or 3-wire cabled intercom is hooked up to the base station, push the cabled interface switch in to activate its interface with the base station. The switch should show green when the cabled-intercom interface is activated. Have the cabled-intercom operator speak into his/her microphone. Adjust the volume control, to the left of the cabled-interface switch, to the desired incoming level. To deactivate the cabled intercom interface with the base station, push the cabled interface switch again. The green should disappear from the switch. The 4-wire cabled interface is always enabled.
- If auxiliary sound equipment is hooked up to the base station, push the auxiliary-interface switch (Aux) in to activate its interface with the base station. The switch should show green when the auxiliary interface is activated. Be certain something is being transmitted from the sound equipment to the base station, and adjust the volume control, to the right of the auxiliary-interface switch, to the desired level. To deactivate the auxiliary-sound-equipment interface with the base station, push the auxiliary-interface switch again. The green should disappear from the switch.

## 2. BH800 Belt-Pac COMMUNICATOR<sup>®</sup>

With the belt-pac on your waist and the headset on your head, turn the Communicator on by rotating the On/Off/Volume control clockwise to the mid-level position. Be certain the Power LED lights green when the Communicator is turned on, and red when either of the two buttons (LOCK or PTT) on the Communicator is pushed. ***If the Power LED does not light, or if it goes off during Communicator operation, the battery (or batteries) must be changed.*** Use the LOCK or PTT buttons to operate the Communicator in the full-duplex or half-duplex mode as follows.

- **Full-Duplex**

To initiate full-duplex operation, with the Communicator turned on, press the LOCK button on top of the Communicator once. The Power LED will change to red. Speak into the microphone and listen for your own voice in the headset. Because your voice is retransmitted from the base station back to you (a feature called "loop-around sidetone"), hearing your own voice assures you that the base station is receiving your communication. Adjust the volume control on the transceiver to a comfortable listening level. To discontinue full-duplex operation, push the LOCK button once again.

- **Half-Duplex**

To operate in the half-duplex (push-to-talk) mode, simply push and hold the PTT button on top of the Communicator while talking. Speak into the microphone and listen for your own voice in the headset. Because your voice is retransmitted from the base station back to you (a feature called "loop-around sidetone"), hearing your own voice assures you that the base station is receiving your communication. Adjust the volume control on the transceiver to a comfortable listening level. When you have finished talking, release the button immediately.