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 - proof of purchase (your sales receipt or other documents showing the date of purchase)

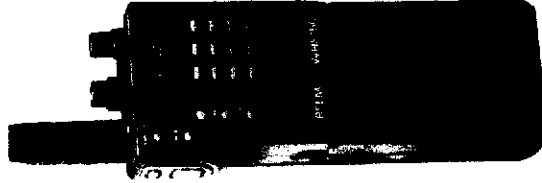
Costs of transportation, removal, reinstallation or similar costs must be paid by the purchaser.

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 - Neglect or accident
 - Improper use or installation of the product
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9. This written warranty constitutes the final, complete and exclusive statement of warranty terms and no person is authorized to make any other warranties or representations on behalf of RELM.

WHS SERIES PORTABLE FM TRANSCIEVERS

WHS150 and WHS450

Instruction Manual



RELM Communications, Inc.

7001-2027-300

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7-84

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RELM: The Choice of Professionals

Welcome to the RELM Communications family of professional two-way radios and systems, and thank you for purchasing one of our fine products. We are confident that you will be pleased with this product and that it will provide you many years of dependable, trouble-free communications.

About Our Company

Formerly known as Regency Electronics, Inc., RELM Communications, Inc., is a U.S. manufacturer of two-way FM radio products. We are backed by more than 40 years of experience in the electronic communications industry and have earned a worldwide reputation for providing dependable, hard working products at a fair price.

You may remember us as Symmetrics, or Wilson, or as Regency Land Mobile. Your first experience with us may have been with crystal based mobile and portable radios. We were pioneers in the development of synthesized radios, incorporating built-in tone signaling options such as CTCSS, DCS and Two-Tone Sequential and a host of user friendly operational features, like scanning and keyboard control. Our innovation in commercial radio continues today with the introduction of an *INSTANT PRIORITY™* button, a reversible display and area grouping of channels.

We are truly a commercial communications company with a dedicated commitment to two-way radio design, manufacturing, sales and service. We have selected a new name — a name which bolsters our position as a communications company and symbolizes our steadfast commitment to the land mobile industry.



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PACKING LIST

- 1 - Transceiver Unit with Belt Clip
- 1 - Flexible, Helical-wound Antenna (See p. 22 for details.)
- 1 - BP007 (700mAh) 10.8V Rechargeable Battery
- 1 - WCWHS Battery Charger
- 1 - Instruction Manual (P/N 7001-2027-300)

IMPORTANT

Please read all instructions thoroughly before operating the Unit.

INDEX

Introduction	2
Installation	3
Battery Installation and Removal	3
Antenna Installation and Removal	3
Transceiver Details - Display, Keys and Controls	4
Operation	9
Turning Unit On	9
Receiver Operation	9
Manual Mode	10
Scan Mode	10
Adding/Deleting Channels to Scan List	10
Reviewing Scan List	11
Scan Operation	11
Priority Function	11
Activating or Deactivating Priority	11
Priority Channel Selection	11
Priority Operation	12
Tone Mode	12
CTCSS Operation	12
Selective Calling Operation	13
Busy Channel Lockout	14
Transmitter Operation	14
Procedure	14
High/Low Power Selection	14
DTMF Operation	15
Time Out Timer	15
Other User-Selectable Features	16
Key Pad Lock	16
Beep	16
Battery Information	16
General Information	16
	1

INDEX (Continued)

Power Save Function	17
For Longest Battery Life and Best Performance	17
Maintenance	18
Troubleshooting	18
Summary of Dealer's Programming Options	19
Specifications	21 & 22
Unit's Program Information (Blank Form)	23
Notes (Blank Form)	24
Warranty	Rear Cover

INTRODUCTION

NOTE: In this manual, the words Transceiver, Radio and Unit are used interchangeably.

WHS150 and WHS450 are 16-channel, state-of-the-art, synthesized portable FM Transceivers. The WHS150 operates in the 148-174 MHz VHF band. WHS450 operates in the 450-512 MHz UHF band. Each Unit has a non-volatile memory that requires no battery to maintain its Dealer-programmed information.

Two RF power outputs are available - Low: 1 Watt; High : 5 Watts for WHS150; 4 Watts for WHS450.

Each Unit features a Priority function which periodically samples a User-selectable channel for activity. It also features a built-in DTMF Key Pad.

A Liquid Crystal Display (LCD) provides useful information such as Channel Number and Status, Priority Channel and Status, Output Power Level Status, etc. See page 5 for details.

The Radio can be programmed by a Factory-authorized Service Dealer to provide any number of channels from 1 to 16, CTCSS tone frequencies, DTMF and Selective Calling operation and other features to meet various User requirements. See pages 19 and 20 for details.

Optional Accessories:

- BCWHS Drop-in Rapid Charger
- SMWHS External Speaker/Microphone

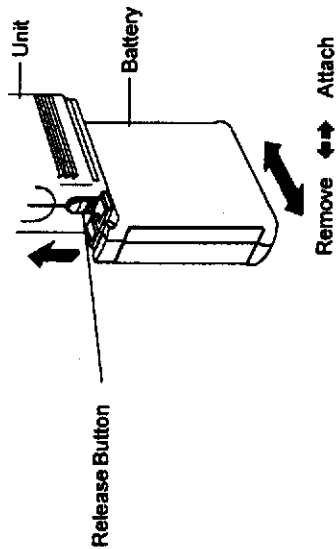
INSTALLATION

BATTERY INSTALLATION AND REMOVAL

- A. To attach the battery, align the grooves on the battery case with those on the Unit and slide it into place until a "snap" is heard.

NOTE: If the the Unit is turned on and the display starts "flashing", the battery is low and needs to be charged. See pages 7 and 16 for details.

- B. To remove the battery, press UP on the Release Button and slowly pull the battery OFF.

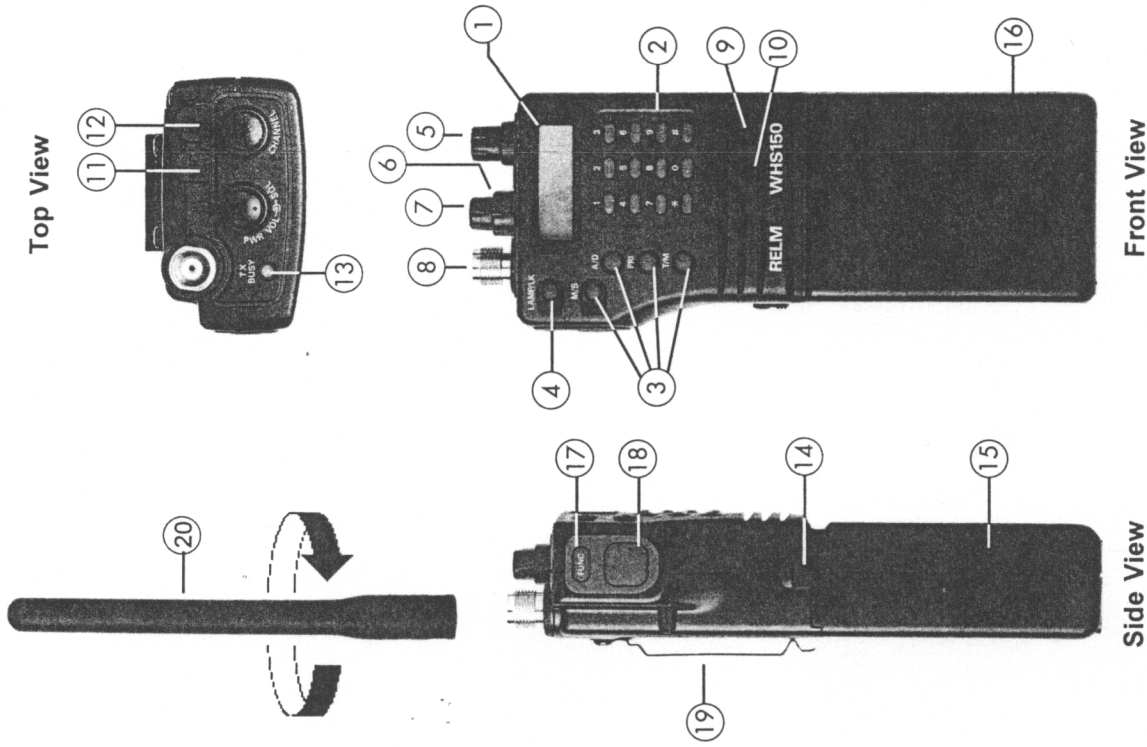


ANTENNA INSTALLATION AND REMOVAL

See Side View on page 4 for details. WHS150 uses a RD150 antenna. WHS450B uses a RD450B (450-480 MHz) antenna and WHS450C uses a RD450C (480-512 MHz) antenna. The RD450C has a green colored base (interior). The RD150 and RD450B are not color coded.

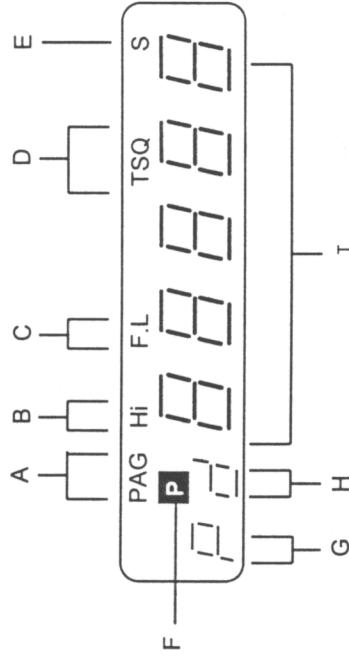
- A. To install the antenna, carefully place it on the TNC type antenna connector located on the LEFT side of the Unit. Turn the antenna clockwise until it is firmly attached.
- B. To remove the antenna, turn the antenna counter-clockwise until it can be lifted away from the Unit.

TRANSCEIVER DETAILS



1 The LCD Display

- A. Displayed when the SELECTIVE CALLING Mode is enabled.
- B. Displayed when the transmitter's output power is *High*.
- C. Displayed when the Key Pad and Channel Selector are locked.
- D. Displayed when the CTCSS TONE Mode or Busy Channel Lockout is enabled.
- E. Displayed when the SCAN Mode is operating.
- F. Displayed when the Priority Function is enabled.
- G. Displayed when the channel being shown is the Priority Channel.
- H. Displayed when the channel being shown is deleted from the Scan List.
- I. Indicates the channel number.



2 Key Pad

The Key Pad is used to select channels, DTMF tones and special User-selectable functions or features.

3 Operation Keys

These four keys (or buttons) permit the User to control or to select the basic operation of the Unit.

The **M/S** Key provides for selecting either **MANUAL** or **SCAN** Mode. It also is an "A" for DTMF encoding purposes.

The **A/D** Key is used to Add or Delete a channel from the User's Scan List. It also is a "B" for DTMF encoding purposes.

The **PRI** Key is used to enable/disable the Priority Function and to select the Priority Channel. It also is a "C" for DTMF encoding purposes.

The **T/M** Key provides for enabling/disabling the CTCSS or Selective Calling (DTMF) TONE Mode. When either TONE Mode is disabled, the Unit is in the MONITOR Mode. It also is a "D" for DTMF encoding purposes.

4 LAMP/LK Key

Pressing this key turns the LCD illumination ON and OFF. The illumination is turned OFF automatically if the Unit is not operated for more than 5 seconds. See page 8 for more details.

5 CHANNEL (Channel Selector)

This control is used to change the channel number. Turning this control also takes the Unit out of the SCAN Mode.

6 SQL (Squelch Control)

This control is used to eliminate speaker noise and reduce battery drain while not receiving a transmission. The Unit must be squelched (turn control clockwise) for proper SCAN operation.

7 PWR VOL (Power Switch/Volume Control)

Turning this control in the clockwise direction turns the Unit ON. Turning it further in the clockwise direction increases the volume.

8 Antenna Connector

The supplied helical antenna (RD150, VHF; RD450, UHF) is installed on this type TNC connector.

9 Speaker

This is the Transceiver's built-in speaker.

10 Microphone

This is the Transceiver's built-in condenser type microphone.

11 MIC (External Microphone Jack)

This 2.5MM jack is used to connect an external microphone to the Transceiver. Keep the protective plug in place when the jack is not used.

12 SP (External Speaker Jack)

This 3.5MM jack can be used to connect an 8 Ohm external speaker or ear phones. No sound is available from the built-in speaker when a plug is installed in this jack. Keep the protective plug in place when the jack is not used.

NOTE: The optional SMWHS External Speaker/Microphone utilizes both jacks (2.5MM and 3.5MM).

13 TX/BUSY (Transmitting/Busy Indicator)

This indicator lights RED when transmitting and lights GREEN when a signal is being received. It also lights GREEN when the Unit is unsquelched. This is a helpful guide in setting the Squelch Control.

14 Release Button

The battery is held in place by this button.

15 Battery

This is a rechargeable Nickel-Cadmium type battery. The BP007 (included with the Unit) is a 10.8V, 700mAh battery.

16 Nickel-Cadmium Battery Recharge Terminal

This terminal is used to recharge the BP007 Nickel-Cadmium battery. The WCWHS Battery Charger (also included) will fully charge the BP007 in approximately 14 to 16 hours if either the Unit is turned off or the battery is removed from the Unit. Be sure to re-install the protective plug when the Charger is disconnected.

17) FUNC (Function Button)

Holding down the FUNC button while certain keys are pressed enables these keys' second function, which are:

- **FUNC + LAMP/LK**

Pressing the LAMP/LK Key turns the LCD illumination on until either the Unit is switched OFF or the LAMP/LK Key is pressed again while holding down the FUNC button.

- **FUNC + PRI**

Pressing the PRI Key programs the channel being displayed as the Priority Channel, if the PRIORITY Function is deactivated.

- **FUNC + T/M**

Pressing the T/M Key toggles the SELECTIVE CALLING Tone Mode from enabled to disabled and vice versa.

- **FUNC + 1**

Pressing the 1 Key toggles the Unit's Power Level from Hi (4 Watts UHF or 5 Watts VHF) to 1 Watt and vice versa.

- **FUNC + 2**

Pressing the 2 Key toggles the Lock feature for the Key Pad and Channel Selector from *Unlocked* to *Locked* and vice versa.

- **FUNC + 3**

Pressing the 3 Key toggles the Beep status from enabled to disabled and vice versa. ALL beeps are affected by this selection.

18) PTT (PTT Button)

This button is used to switch between transmission and reception. To transmit, hold in this button. Releasing this button will return the Transceiver to the reception mode.

19) Belt Clip

When not using the belt clip, install the mounting screws in order to help ensure water resistance.

20) Antenna

The antenna has a TNC connector-type helical wound antenna.

OPERATION

Each time the Unit changes mode or a key is pressed, a *beep* is heard. This feature can be disabled by the User (see Beep Feature, page 16), but in this Manual it is assumed to be enabled.

TURNING UNIT ON

1. Rotate the **PWR VOL** knob clockwise to turn power ON. The display will show the last operating mode.
2. Adjust the audio's volume by turning the **PWR VOL** knob clockwise to increase the audio output, or *counter-clockwise* to decrease it. If necessary, first turn the Squelch (**SQL**) Control *counter-clockwise* until noise is heard. Then set the Volume Control to the desired level.
3. Turn the Squelch Control (**SQL**) clockwise until "noise" is no longer heard (squelched). Battery life is maximized if the Unit is squelched when not receiving a signal. While in the SCAN Mode, the Squelch Control may require being turned slightly more clockwise to a setting that permits proper scanning operation.

If the Unit has been programmed for *Busy Channel Lockout* (see page 14 for details), "noise" may not be heard. If this is the case, put the Unit in the SCAN Mode (press the **M/S** Key) and turn the Squelch Control until the channel number in the display starts incrementing or changing.

If the **SELECTIVE CALLING** Tone Mode is enabled (see page 13), "noise" will not be heard. In this case, turn the Squelch Control clockwise until the **BUSY** LED is off.

RECEIVER OPERATION

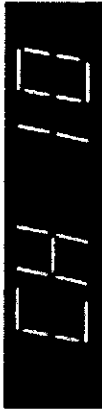
The Receiver operates in one of two basic modes: **MANUAL** or **SCAN**. In either mode, a particular channel may be User selected for being sampled on a Priority basis. See page 11 for details.

MANUAL Mode

In this mode, the Unit monitors activity on the displayed channel. To put the Unit in the MANUAL Mode, if it is in the SCAN Mode, either:

1. Press the **M/S** Key, or
2. Turn the Channel Selector knob, or
3. Press the desired channel's number (two digits; 01 - 16).

To select a particular channel, either turn the Channel Selector until the desired channel is displayed or key in the channel's two-digit number. The display will show, for example:



SCAN Mode

To put the Unit in the SCAN Mode, if it is in the MANUAL Mode, press the **M/S** Key. A small "s" should appear in the upper right corner of the display.

REMINDER: The Squelch Control must be set for proper scanning operation. See page 9 for details.

In this mode, only channels in the Scan List will be scanned for activity. The User can select which channels are to be included (added) or excluded (deleted) from the List.

ADDING/DELETING CHANNELS TO THE SCAN LIST

Put the Unit in the MANUAL Mode. Press the desired channel's number (01-16), or turn the Channel Selector knob until the desired channel is in the display. Pressing the **A/D** Key toggles the channel's Scan List status. If a small "d" appears at the left side, the channel is now deleted from the List. If the small "d" disappears, the channel is added to the List. For a deleted channel, the display will show, for example:



REVIEWING SCAN LIST

To review the Scan List, put the Unit in the MANUAL Mode and then slowly turn the Channel Selector knob until all channels have been observed. Any channel without the small "d" is included in the Scan List.

NOTE: If the Scan List has no channels, a low tone (error beep) will be heard when the **M/S** Key is pressed. Also, the small "s" will not appear in the display. At least one channel must be in the Scan List for the Unit to be put in the SCAN Mode.

SCAN OPERATION

When in the SCAN Mode, the Unit will scan only those channels in the User-selected Scan List. The display will show the two-digit channel numbers rapidly changing, which indicates that the Unit is actively "scanning" the selected channels.

When a proper signal is received on a channel, the scanning action will stop and the channel's audio will be heard. After activity ceases on the channel, the Unit will delay (or stay) on that channel for 0 to 4 seconds and then resume scanning.

NOTE: The delay, often referred to as Scan Delay, is Dealer-programmable. See Option No. 7 on page 20 for details.

If the **PTT** switch is pressed while the Unit is scanning, the Priority Channel is immediately accessed for the transmission. After the **PTT** switch is released, the Unit will stay on the Priority Channel for at least two seconds to wait for a response. If there is no activity (or signal), the Unit will then resume scanning.

PRIORITY Function ACTIVATING OR DEACTIVATING PRIORITY

To activate (or deactivate) Priority, press the **PRI** Key. When the Priority Function is activated, "p" will appear in the display. For example:



PRIORITY CHANNEL SELECTION

First, put the Radio in the MANUAL Mode and deactivate the Priority Function. Second, select the desired channel either by pressing the channel's two-digit number or by turning the Channel Selector knob. Third, press and hold down the FUNC button and then press the PRI Key.

Priority Operation in MANUAL Mode

When a channel other than the Priority Channel is manually selected, the Unit will sample the Priority Channel approximately every two seconds. If any activity is found on the Priority Channel, the Radio will stay on the Priority Channel and monitor the transmission. After the transmission is completed, the Unit will remain on the Priority Channel for approximately 2 seconds and then return to the non-priority channel.

Priority Operation in SCAN Mode

When the Radio has stopped on an active non-priority channel, it will periodically look at the Priority Channel. If the Priority Channel has activity, the Radio will then stay on the Priority Channel. After the activity is completed and the Priority Channel has timed out, the Radio will return to the non-priority channel.

If the Priority Channel is NOT active, the Radio will quickly return to the (non-priority) channel that was interrupted. When activity on the non-priority channel is completed, the Unit will resume scanning after the Scan Delay has timed out.

TSQ

TONE Mode

CTCSS OPERATION
To enable the built-in CTCSS tone decoder (see Option No. 3, page 19), press the T/M Key. A small "TSQ" will appear in the display, as shown in the following example:



NOTE: The Unit can be programmed by the Dealer for CTCSS tones. Each channel may be programmed for non-tone, for the same tone, or for a different tone. In other words, each channel can have its own unique tone set-up.

If a signal with an improper or non-matching CTCSS tone is received, the BUSY LED will light, but the squelch will not open and no audio will be heard. Press the T/M Key to disable the TONE Mode and then the signal's audio can be heard, unless Busy Channel Lockout is enabled.

SELECTIVE CALLING OPERATION

SELECTIVE CALLING Tone Mode operation is available only in the MANUAL Mode and Priority is disabled. To enable the built-in DTMF decoder (see Option No. 4, page 19), press the T/M Key while holding down the FUNC button. A small "PAG" will appear in the display, as shown in the following example:



If a signal with proper or matching DTMF tones is received, the squelch will open and audio will be heard.

NOTE: The Unit can be programmed by the Dealer for DTMF tones. Each channel can have its own unique set of DTMF tones.

For proper two-way communications, while in the SELECTIVE CALLING Tone Mode, the DTMF tones must be sent on every press of the PTT switch in order to open the receiving Unit's squelch on each transmission. See Option No. 5 on page 19 for more details.

If SELECTIVE CALLING is enabled, CTCSS or BCL operation is overridden. Thus, if "TSQ" and "PAG" are both in the display, audio can be heard only if a signal with the proper DTMF tones is received.

The SELECTIVE CALLING Tone Mode is disabled if:

- A different channel is selected, or
- The Unit is put into the SCAN Mode, or
- The PRI Key is pressed, or
- The T/M Key is pressed while the FUNC button is held down.

BUSY CHANNEL LOCKOUT

Busy Channel Lockout (BCL) is a special TONE Mode feature, when enabled by the Dealer, that prohibits monitoring (listening to) or transmitting on a channel that is receiving a signal with an *improper* CTCSS tone. No matter where the Squelch Control is set, audio will NOT be heard unless the signal has the proper tone. The **BUSY LED** (green) will be on, but audio may not be heard. The **T/M** Key will be disabled and thus, the Unit can not be put into the **MONITOR Mode**.

TRANSMITTER OPERATION

WARNING: An FCC license is required on all transmit channels. Do NOT transmit on unlicensed channels.

WARNING: Do NOT operate this Unit close to electrical blasting caps or in an explosive atmosphere such as fuel or solvent vapors, dust, etc.

Procedure

1. Select the desired channel. Monitor the channel for activity before transmitting to avoid interfering with communications already in progress. If the **BUSY LED** is ON and no audio is heard, the signal probably has a different tone than what is programmed for the channel.
2. Press and hold in the Push-to-Talk (PTT) switch located on the left side of the Unit. The Red TX LED will light and stay on as long as the PTT switch is held in.
 - a. If BCL is enabled and the channel is receiving an incorrect tone, a series of beeps will be heard and the Unit will NOT transmit (TX LED stays off).
 - b. Also, if the channel is Receive Only, a series of beeps will be heard and the Unit will NOT transmit (TX LED stays off).

HIGH/LOW Power Selection

To change the Unit's Power Output level from *High* (4 or 5 Watts) to *Low* (1 Watt), or vice versa, first put the Unit in the **MANUAL Mode**. Second, press and hold in the **FUNC** button and then press the **1** Key. A small "Hi" will appear in the display to indicate High Power. Low Power is indicated by the absence of "Hi".

if the display is "flashing" (Low Battery indication), the Unit will then automatically revert to Low Power when transmitting in order to help prolong the Battery's service life.

DTMF Operation

The Dealer can program any Channel for DTMF decoding and encoding. Each channel can have 4 DTMF tones (numbers 0 through 9, * and #; A, B, C and D). For encoding purposes, the Dealer can program the Unit so that the DTMF tones are automatically sent upon either the first or every press of the **PTT** switch. See Option No. 5 on page 19. The "first" press of the **PTT** switch is the initial activation of the transmitter on the channel. Subsequent pressings of the **PTT** switch will NOT send the DTMF unless:

- a. The channel's number is entered again by the key pad, or
- b. The Channel Selector is turned off the channel and then back to it, or
- c. The Unit is turned off and then back on, or
- d. A different channel is selected.

Individual DTMF tones can also be sent, while transmitting, by pressing the corresponding button on the Key Pad or one of the four Operational Keys.

NOTE: For DTMF encoding purposes: the **M/S** Key is an **A**, the **A/D** Key is a **B**, the **PRI** Key is a **C** and the **T/M** Key is a **D**.

Time Out Timer

A transmit Time Out Timer is built into the Unit. The Timer can be programmed by the Dealer to automatically shut down the transmitter after 15 seconds (or up to 2 minutes) of operation even if the **PTT** switch is held in continuously. The Dealer can also *disable* the Timer. In which case, the length of any transmission is determined by how long the **PTT** switch is held in.

If the Timer is enabled, a series of beeps will be heard and the TX LED will go out when the **PTT** switch is held in after the Timer has timed out. To resume transmitting, momentarily release the **PTT** switch and then press again.

OTHER USER-SELECTABLE FEATURES

KEY PAD LOCK

The Key Pad and all other buttons (except **FUNC**, **LAMP/LK** and **PTT**) and the Channel Selector can be "LOCKED" or be made inoperative while the Unit is in the Receiver Mode. These buttons can still be used for DTMF encoding while the Unit is in the Transmitter Mode. The Unit can be in either the **MANUAL** or the **SCAN** Mode. Press and hold in the **FUNC** button and then press the **2** Key. A small "F.L." will appear in the display to indicate the **LOCK** function is enabled. Use the same procedure to disable the **LOCK** function.

BEEP

When the Beep feature is enabled, a *beep* can be heard when any button (except **LAMP/LK** and **PTT**) is pressed or when the Channel Selector is turned to Channel 01. To disable this feature, press and hold in the **FUNC** button and then press the **3** Key. No beeps will be heard except for when the **PTT** is pressed and the channel is a Receive Only channel. In this case, a series of *beeps* will be heard until the **PTT** button is released.

BATTERY INFORMATION

GENERAL INFORMATION

Keep the Battery charged. It may be charged without being installed on the Unit. Either the **WCWHS** Wall-mounted Charger supplied with the Unit or the optional accessory **BCWHS** Drop-in Fast Charger may be used.

Do **NOT** use any other charger, or damage to the Battery may occur.

The **WCWHS** Charger will fully charge the **BP007** in approximately 16 hours. The **BCWHS** Drop-in Charger will fully charge the **BP007** in approximately 3 hours. These times are dependent upon the Unit being turned off or the battery is not installed.

NOTE: The **BP007** battery is not fully charged when shipped from the Factory. It should be properly charged before use.

POWER SAVE FUNCTION

A Power Save Timer is built into the Unit. With the Unit in the **MANUAL** Mode and not receiving a signal, the Power Save Function conserves battery power, by reducing the current drain for a selected period of time. The Timer can be programmed by the Dealer to automatically shut down the receiver for 100 (or up to 600) milliseconds and then turn on for 200 milliseconds, or it can be disabled. See Option No. 9 on page 20 for more details.

FOR LONGEST BATTERY LIFE AND BEST PERFORMANCE

1. Charge the Battery to full capacity: 14 to 16 hours with the **WCWHS**; for the **BCWHS** Rapid Charger allow 3 to 3 1/2 hours.
2. Use the Battery as soon and as much of its capacity as possible and practical. A Battery that is charged and discharged completely will maintain the longest operating time capacity. Also, typically 3 to 5 charge-discharge cycles are required to bring a new Battery up to its rated capacity (700 mAh).
3. Store and charge the Battery at a room temperature of 65 to 75°F (18 to 24°C). A Battery that has been stored for over a month should be recharged before being put into service, due to chemical self-discharge which occurs at a rate of approximately 1% per day. Do **NOT** charge a cold battery that is at 32°F (0°C) or below until it is at least above 45°F (7°C).
4. Reduced capacity of the **BP007** may result from repeated identical shallow discharge-full charge cycles. If such a condition is suspected, use the Battery until the Transceiver indicates a Low Battery ("flashing" display), then fully recharge and discharge again. Repeat this cycle 3 to 5 times. Full rated capacity should then be available.

CAUTION: Do **NOT** short or incinerate the **BP007** Battery.

MAINTENANCE

NOTE: All adjustments affecting transmitter power output, carrier frequency or modulation **MUST** be performed by a qualified electronics technician.

CAUTION: DO NOT attempt any internal adjustments. The use of a screwdriver to adjust internal components may result in damage to the unit.

Service Reminder

Have the Transceiver checked periodically by a qualified electronics technician.

TROUBLESHOOTING

Perform the simple checks indicated below prior to returning the Unit for service.

Trouble	Check
No reception.	Check antenna connection
Does not scan.	Check squelch setting.
No sound.	Volume Control Setting.
No display or "flashing" display.	Low Battery; charge or replace.
Key Pad buttons don't work.	Is "F.L." in the display? Disable the LOCK function (p. 16).
Can't transmit on a selected channel.	Is Channel Receive Only? Is BCL enabled and BUSY LED is ON? If it is, you will hear a series of beeps while PTT is depressed.

For service, in or out of Warranty, send Unit to:
Customer Service Department
RELM Communications, Inc.
7505 Technology Drive
West Melbourne, FL 32904
 For information, contact: 1-800-422-6281

NOTE: For in-Warranty service information, read the Warranty Statement on the back cover of this manual.

For future reference, please record:

Serial No. _____

Dealer _____

Date Purchased _____

SUMMARY OF DEALER'S PROGRAMMING OPTIONS

- Number of Channels – the Unit can be programmed for 1 to 16 channels. Any channel not programmed is *deleted* and can not be accessed by the User.
- Receive Only Channel – the transmit frequency can be *deleted* from any channel, thus making that channel only capable of receiving. This would be very useful for such purposes as monitoring a channel (a National Weather Service Channel for example) that would not require or permit transmitting.
- CTCSS Tones – any one of 39 CTCSS (Continuous Tone-Controlled Squelch System) Tones can be programmed for any channel. The tone used for a channel's decode (receive) frequency can *either* be the same, or different, from that channel's encode (transmit) frequency.
- DTMF Tones – any four DTMF (Dual-Tone Multi-Frequency) Tones, consisting of 0 – 9, * and #, A – D, can be programmed for any channel.
- DTMF Operation – The Unit can be programmed to automatically send the DTMF Tones either after the first press of the PTT switch or for every press of the PTT switch.
 For proper two-way **SELECTIVE CALLING** operation, the DTMF tones must be sent on every press of the PTT switch in order to open the other or receiving Unit's squelch. This is because a Unit's DTMF decoder is always automatically reset after it transmits while in the **SELECTIVE CALLING** Tone Mode. Thus, it needs to receive the DTMF tones again to open squelch.
- Busy Channel Lockout – the Unit can be programmed to prevent listening or transmitting on a channel if that channel is receiving a signal that has a CTCSS Tone or DTMF Tones that do **NOT** match its own Tone or Tones. Thus, it is a *busy* channel and should not be used at this time.

SPECIFICATIONS

(Subject to change without notice)

General	1 - 16
Number of Channels	148 - 174MHz (VHF)
Frequency Range	450 - 480MHz (UHF)
WHS150	480 - 512MHz (UHF)
WHS450B	15MHz (VHF); 20MHz (UHF)
WHS450C	30kHz (VHF); 25kHz (UHF)
Operational Bandwidth	5kHz/6.25kHz (VHF)
Channel Spacing	6.25kHz (UHF)
Channel Increments	2.45" x 1.38" x 6.40"
Size (with BP007: W x D x H)	6.22 x 3.50 x 16.26
Metric (cm)	15.5oz. (0.44 kg)
Weight (with BP007 and Antenna)	10.8V, Nominal
Power Requirements	24mA, Typical @ 200mS.
Battery Voltage	40mA, Max. (VHF)
Current Drain	45mA, Max. (UHF)
Squelched (w/Power Saver)	150mA, Max.
Squelched (w/out Power Saver)	550mA
Rated Audio	700mA
Transmit - 1 Watt (WHS150)	1200mA
1 Watt (WHS450)	1300mA
Transmit - 5 Watts (WHS150)	50 Ohms
4 Watts (WHS450)	8 Ohms
Antenna Impedance	± 5 PPM Max.
Speaker Impedance	-30°C to + 60°C
Frequency Stability	(-22°F to + 140°F)
Operating Temperature	
Receiver	
Sensitivity (12dB SINAD)	0.25µV Max.
Threshold Squelch	0.20µV Max.
Selectivity (Adjacent Channel)	-70dB Min.
Spurious Rejection	-65dB Min.
Intermodulation	-65dB Min.
Hum and Noise Ratio	-40dB Min.
Rated Audio Output	250mW Min.
Audio Distortion @ 0.25W	10% T.H.D. Max.
Scan Rate	10 Ch/Sec.
Priority Sampling Rate	Once every two seconds

7. Scan Delay - the Unit can be programmed to delay (for 0, 1/2, 1, 2 or 4 seconds) the restart of the scanning action after the signal has gone away. This delay gives the User some time to respond to the signal before scanning resumes.

8. Time Out Timer - the Unit's Time Out Timer can either be disabled completely or set to only allow a transmission of 1/4, 1/2, 1 or 2 minutes duration. The Timer is normally used to prevent excessively long transmissions that might be deliberate or caused by an inadvertent or accidental pressing of the PTT switch.

9. Power Save Timer - the Unit's Power Save Timer can either be disabled or set for a duration of 100, 200, 300, 400, 500 or 600 milliseconds (0.1, 0.2, 0.3, 0.4, 0.5 or 0.6 seconds). The Timer is used to help conserve battery power by automatically reducing the current drain during the selected duration while the Unit (in MANUAL Mode) is not receiving a signal.

At the end of the Timer period, 500 milliseconds for example, the receiver is activated again for approximately 200 milliseconds. If a signal is present during this time, it stays activated for 5 seconds after the signal is gone and then the Timer shuts it down again for 500 milliseconds. Pressing any button, or turning the Channel Selector, immediately turns on the receiver for at least 5 seconds.

The current drain is reduced to approximately 10mA during the Timer period. Thus, the average current drain is less for the total cycle time of Power Save duration plus the receiver activation time. For example, if the Timer period is 200 milliseconds, the average current drain is 10mA plus 38mA (squelched audio's typical value) divided by 2, or an average of 24mA for the total cycle time of 400 milliseconds.

SPECIFICATIONS (Continued)

Transmitter	
RF Output Power	5W/1W, ± 1dB
WHS150	4W/1W, ± 1dB
WHS450	-63dBc Min.
Spurious/Harmonic Emissions	± 5kHz
Modulation	-35dB Min.
FM Hum and Noise	5% Max.
Audio Distortion	16K0F3E, 15K0F1D
FCC Emission Designator	16K0F3E, 15K0F1D
WHS150	16K0F3E, 14K8F1D
WHS450B	
WHS450C	
FCC Type Acceptance	Part 22, 90
WHS150	Part 90, 95
WHS450	
Canadian Approval	Canada 491 194 204P
WHS150	
Antenna	
Frequency Range	148-174 MHz (VHF)
RD150	450-480 MHz (UHF)
RD450B	480-512 MHz (UHF)
RD450C	
Color Code (Inside base)	None (clear)
RD150	None (clear)
RD450B	Green
RD450C	

You may use this form to record the Unit's programmed information

Ch. 1	RX Frequency	RX Frequency
	RX Tone(s)	RX Tone(s)
	TX Frequency	TX Frequency
	TX Tone(s)	TX Tone(s)
Ch. 2	RX Frequency	RX Frequency
	RX Tone(s)	RX Tone(s)
	TX Frequency	TX Frequency
	TX Tone(s)	TX Tone(s)
Ch. 3	RX Frequency	RX Frequency
	RX Tone(s)	RX Tone(s)
	TX Frequency	TX Frequency
	TX Tone(s)	TX Tone(s)
Ch. 4	RX Frequency	RX Frequency
	RX Tone(s)	RX Tone(s)
	TX Frequency	TX Frequency
	TX Tone(s)	TX Tone(s)
Ch. 5	RX Frequency	RX Frequency
	RX Tone(s)	RX Tone(s)
	TX Frequency	TX Frequency
	TX Tone(s)	TX Tone(s)
Ch. 6	RX Frequency	RX Frequency
	RX Tone(s)	RX Tone(s)
	TX Frequency	TX Frequency
	TX Tone(s)	TX Tone(s)
Ch. 7	RX Frequency	RX Frequency
	RX Tone(s)	RX Tone(s)
	TX Frequency	TX Frequency
	TX Tone(s)	TX Tone(s)
Ch. 8	RX Frequency	RX Frequency
	RX Tone(s)	RX Tone(s)
	TX Frequency	TX Frequency
	TX Tone(s)	TX Tone(s)

Scan Delay _____ secs. (0 = no delay)
 Power Save Timer _____ secs. (0 = disabled)
 Transmit Time Out Timer _____ secs. (0 = disabled)
 DTMF Encode Operation: _____ (First PTT/Every PTT)
 Busy Channel Lockout: _____ (Yes/No)