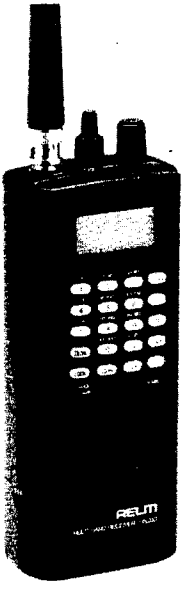
HS200 PORTABLE AM/FM SCANNER

Instruction Manual



RELM Communications, Inc.
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Printed in the Philippines

RELM: The Choice of Professionals

Welcome to the RELM Communications family of professional monitors, 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 one-way (monitors) and 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 signalling 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 monitors and 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.

RELM
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QUALITY PRODUCTS • SERVICE • DELIVERY

Our nationwide network of authorized dealers assures that you will receive prompt, high quality service for all your RELM products. For more information about our products or how we can meet your special applications, please call us at 1-800-821-2900.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

PACKING LIST

1 – HS200 Scanner Unit
1 – RDHS Flexible Antenna
1 – WCHS AC Adapter
1 – EPHS Earphone
1 – CLHS Belt Clip
1 – CSHS Carrying Strap
1 – Instruction Manual (P/N 7001-2240-500)

IMPORTANT
Please read all instructions thoroughly before operating the Unit.

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INTRODUCTION

The HS200 is a hand held, programmable, 200 channel, multi-band AM/FM scanning monitor receiver. It is a double-conversion, superheterodyne type receiver that is microprocessor controlled and designed to cover: CB band; Aircraft Communications band; 10M, 6M, 2M and 70 cm Amateur (Ham) bands; Low and High VHF, Standard and Extended UHF public safety and business bands; High VHF and UHF Government bands; 800 MHz band (Cellular telephone frequencies are not included).

The CB and Aircraft Communications bands use Amplitude Modulation (AM) while the other bands covered use Frequency Modulation (FM). The Unit automatically recognizes the proper type of modulation used based upon the frequency selected.

Any combination of two to 20 channels within a bank and up to 10 banks of channels can be scanned automatically. In the Manual Mode, any single channel can be monitored continuously. In addition, all of the Weather channels can be monitored by the press of a single button (key).

A search function helps locate unknown frequencies within any of the included bands. Search Hold or Delay can be selected for holding or delaying the resumption of searching after an active frequency is found.

Other features include: Priority Channel per Bank, Scan Delay, Channel Lockout, Birdie Lockout, Keypad Lock, Tone (CTCSS and DCS) Decode, Battery Saver (in MANUAL Mode only) and Direct Channel Access.

A Liquid Crystal Display (LCD) provides useful information such as Mode, Channel Number, Channel Frequency, Bank(s) selected for scanning, Signal Strength, etc. See page 7 for details.

Illumination or backlighting of the Display and the keypad is available for night time viewing.

The Scanner can be operated on internal batteries (4 AA pencells) or on 120 VAC using the wall-mounted AC Adapter. The batteries can be either a regular type such as Alkaline or a rechargeable type. The Unit has a non-volatile memory that does not require a battery to maintain the information programmed in by the user.

NOTE: In this Manual, the words Scanner, Radio and Unit are used interchangeably.

SPECIFICATIONS (Subject to change without notice)

Number of Channels	200
Number of Banks	10; 20 Channels per Bank
Band's Frequency Range	
CB (AM)	26.000 – 28.995 MHz
10 M Amateur	29.000 – 29.700 MHz
Low VHF	29.700 – 50.000 MHz
6 M Amateur	50.000 – 54.000 MHz
Aircraft Communications (AM)	118.000 – 136.000 MHz
Government (Military)	136.005 – 144.000 MHz
2 M Amateur	144.000 – 148.000 MHz
High VHF	148.000 – 174.000 MHz
UHF Government	406.000 – 420.000 MHz
70 cm Amateur	420.000 – 450.000 MHz
UHF – Standard	450.000 – 470.000 MHz
UHF – Extended	470.000 – 520.000 MHz
800 MHz	806.000 – 824.0375 MHz
	848.975 – 869.0375 MHz
	893.975 – 960.0000 MHz
Sensitivity (12 dB SINAD)	
26.0 – 29.0 MHz	0.5 µV, Max. (10 dB S/N)
29.0 – 54.0 MHz	0.5 µV, Max.
118.0 – 136.0 MHz	0.7 µV, Max. (10 dB S/N)
136.0 – 174.0 MHz	0.5 µV, Max.
406.0 – 520.0 MHz	0.5 µV, Max.
806.0 – 960.0 MHz	0.5 µV, Max.
Selectivity (Adjacent Channel)	-50 dB, Min.
Audio Output @ 10% THD	300 mW, Min.; w/Batteries
	450 mW, Min.; w/Adapter
Scan Speed	Up to 100 Chan./Sec.
Search Speed	100 Increments/Sec.
Search Lockouts	100 Frequencies
Priority Sampling Rate	Once every two seconds
Earphone Impedance	8 Ohms, Min.
Antenna Impedance	50 Ohms; BNC Connector
Power Requirements	
Internal	6 VDC; 4 AA pencell batteries
External	12 VDC; AC Adapter
Current – Standby (w/o BATT Saver)	65 mA; Typically; w/Batteries
– Standby (w/BATT Saver)	38 mA; Typically; w/Batteries
– Max. Audio	170 mA; Typically; w/Batteries
– Charge (for Ni-Cd only)	60 mA; Typically; w/Adapter
FCC Certified	Part 15

PREPARATION FOR USE

Before operating the Unit, read the following directions carefully.

UNPACKING

Unpack the Unit from the carton and check for damage. If the Unit is damaged, contact the place of purchase as required by the Warranty.

CAUTION: Do NOT operate a damaged Unit.

BATTERY INSTALLATION

The Radio can be operated with four AA size rechargeable or non-rechargeable batteries installed internally. For non-rechargeable batteries, it is highly recommended that Alkaline type be used for they provide the longest operating life.

The batteries' holder is accessible when the battery compartment's door, located on the Unit's left side, is slid downward and then swung up. Remove the battery holder by carefully pulling on the tab located on the end of the holder.

Install the 4 batteries in the holder, carefully observing their proper polarity in each cell location. Slide the holder into the compartment. The holder will go into the compartment only one way. This is to ensure proper contact with the Unit's internal battery connections. Swing the door down and then slide up until it locks in place.

Replace or recharge the batteries when the Unit's low battery annunciator BATT appears in the display. Do not leave discharged batteries in the Scanner for any great length of time as battery leakage may occur and damage it. See page 18 for additional battery information.

AC ADAPTER USE

The supplied WCHS AC Adapter provides the necessary 12 VDC with a coaxial type DC power plug that properly mates with the Unit's external power jack located on the right side. The internal batteries are automatically charged when the AC Adapter is plugged in the Radio.

WARNING: Do **NOT** plug the AC Adapter into the Unit unless Ni-Cd rechargeable batteries (such as RELM's optional accessory battery pack **BPHS**) or NO batteries are installed. Regular batteries, such as Zinc-carbon or Alkaline, may EXPLODE if recharging is attempted.

ANTENNA CONNECTION

To install the antenna, place it on the Unit's antenna connector and turn its base clockwise until it locks in place.

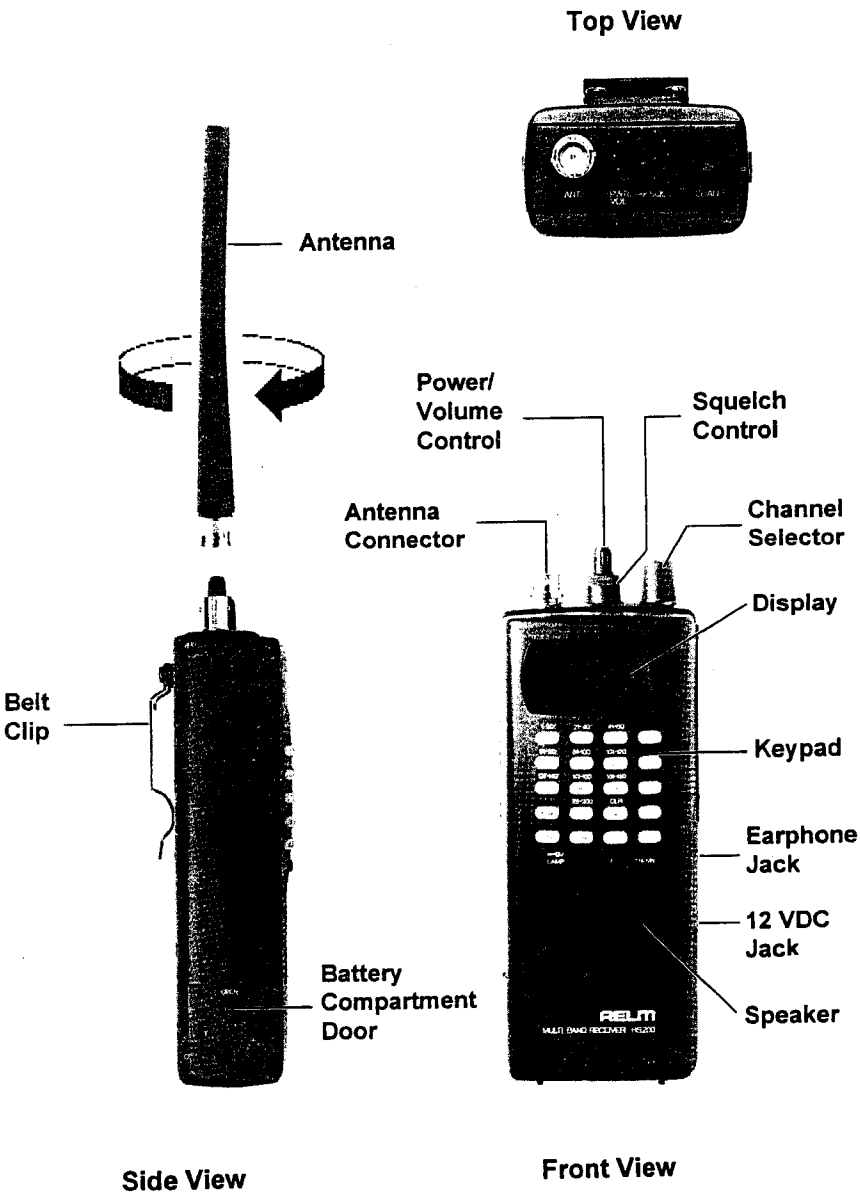
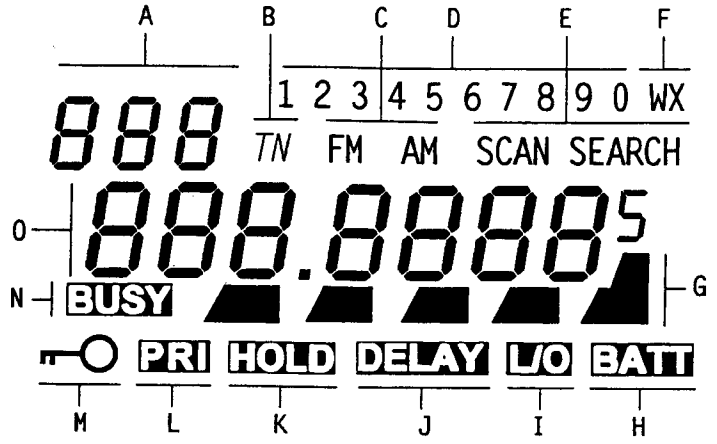


Figure 1. Scanner Views.

LCD DISPLAY DETAILS



A. Indicates Channel Number (1-200), Tone Code (0-154) or Search Limit (Lo or Hi).

B. Displayed when TONE (CTCSS or DCS) Decode is selected.

C. Indicates whether a Channel is an FM or AM type frequency.

D. Indicates what Bank(s) is activated in SCAN Mode.

E. Indicates if SCAN or SEARCH Mode has been selected.

F. Displayed when Weather (WX) Scan is selected.

G. Indicates relative (maximum is 5 bars) Signal Strength.

H. Displayed when battery voltage is LOW.

I. Indicates channel is Locked Out from SCAN Mode.

J. Displayed when SCAN or SEARCH Delay is selected.

K. Displayed when SEARCH Hold is selected.

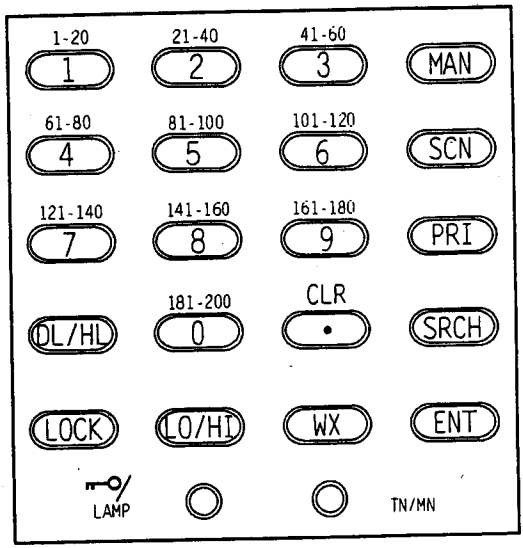
L. Displayed when PRIORITY Feature is enabled.

M. Displayed when the KEYPAD is locked (keys disabled).

N. Indicates displayed channel is receiving a signal.

O. Displays Channel or Search Frequencies, Tone Frequencies or DCS Codes and various messages such as *SCAN*, *PSCAN*, etc.

KEYPAD DETAILS



Mode Keys – **MAN** (Manual), **SCN** (Scan), **SRCH** (Search) and **WX** (Weather Scan)

Feature Keys – **PRI** (Priority), **TN/MN** (Tone/Monitor) and **⌐O/LAMP** (Keypad Lock/Display backlight)

Function Keys – **LOCK** (Channel Lockout) and **DL/HL** (Delay/Hold)

Program Keys – **ENT** (Enter) and **LO/HI** (Low/High Search Limits)

Number Keys – Channel Number (001-200), Bank Number (1-9, 0), Frequency (26.00000-960.00000 MHz) and Tone Code (000-154)

Other Key – **•/CLR** (Decimal Point/Clear)

NOTE: The small numbers (such as 1-20, 21-40, etc.) just above the Number Keys refer to the channels included in the Bank that the respective Number Key selects. For example, the Number Key **4** selects Bank 4, which includes Channels 61 through 80.

CONTROLS AND CONNECTORS

OFF/VOLUME CONTROL (PWR/VOL)

Turning this control clockwise turns the Unit ON and increases the audio's volume level at the speaker or ear jack.

SQUELCH CONTROL (SQL)

This control is used to eliminate background noise and reduce battery drain while not receiving a signal. The Unit must be squelched (turn control counter-clockwise until no noise is heard) for proper SCAN, WX SCAN or SEARCH operation. Turning the control fully counter-clockwise will help eliminate very weak or intermittently received signals.

CHANNEL SELECTOR (CHAN)

This rotary control can be used to select Channels or Tone Codes. If turned while the Unit is in the SCAN, WX SCAN or SEARCH Mode, it puts the Unit in the MANUAL Mode.

ANTENNA CONNECTOR (ANT)

Although the supplied flexible antenna is normally used, other antennas, external perhaps, may be used as long as they are 50 ohms and have a BNC type connector. The other antenna(s) should cover all of the bands of interest.

EARPHONE JACK (EAR)

This 3.5mm jack can be used for connecting to an earphone (supplied) or external speaker. The impedance of the earphone or external speaker can be 8 ohms or greater. The internal speaker is disconnected when this jack is used.

12 VDC JACK (DC 12V)

This coaxial DC power jack can be used with the supplied AC Adapter or any external 12 VDC source capable of supplying 200 milliamperes. The polarity of the mating connector must be properly observed or damage to the Unit will probably occur. As noted above the jack, the inner conductor is positive (+) and the outer conductor is negative (–).

> **REMINDER:** If non-rechargeable type batteries are installed, do **NOT** plug in the AC Adapter or any other external 12 VDC source unless the batteries are first removed. Only batteries clearly marked rechargeable Nickel-Cadmium (Ni-Cd) can be left in the Unit when the 12 VDC Jack is used.

PROGRAMMING

The HS200 has 200 channels available for your personal choice of frequencies. The microprocessor-controlled circuitry eliminates the need for crystals and allows easy touch entry of all data. Programming is done while in the MANUAL Mode. The Unit will emit a tone (referred to as a "Beep") each time a key is pressed, indicating proper key operation.

ASSIGNING A FREQUENCY TO A CHANNEL

1. Press **MAN** if Unit is not already in the MANUAL Mode.
2. Press the number keys corresponding to the desired frequency. For example, press **465.75** for the frequency of 465.7500 MHz.
   a. The decimal point does not have to be pressed if 3 digits have already been selected before it is required.
   b. If the frequency is not within one of the specified band ranges, it will be forced to the nearest band's limit.
   c. If an error has been made while entering the frequency, press **CLR** *twice* and start over.
3. Press **ENT** (Enter). A small segment (bar) in upper left corner will be blinking, which indicates a channel number is to be selected.

> **NOTE:** If a Channel number is displayed, the frequency has already been programmed for that channel.

4. Press 1, 2 or 3 number keys to select the desired Channel (1-200).

> **NOTE:** The first Channel in all Banks is a Priority Channel. Channel 1 (of Bank 1) is the highest Priority Channel. See p. 13 for more details.

5. Press **ENT**. The keyed in frequency is now entered into the selected channel and it can receive a signal at this time.
6. a. If a Tone Code is to be selected, go to Step 7 below.
   b. If the channel does not require a Tone Code (CTCSS or DCS), go to Step 10 on page 11. Tone Code 000 requires no tone.
7. Press **ENT** again. A small digit (usually a 0) will be blinking in the display's upper left corner.
8. Press 1, 2 or 3 number keys to select the Tone Code (1-154).
   a. The Channel Selector can be used also to select the Tone Code. Rotate it clockwise (or counter-clockwise) until the desired Code and/or Tone Frequency or DCS Code is displayed.
   b. See Tables 1 and 2 starting on page 19 for Tone Codes versus Tone Frequencies and DCS Codes.
   c. Your local RELM Dealer can assist you in finding what Tones or DCS Codes may be used on the various frequencies active in the area.

9. Press **ENT**. The keyed in frequency and its associated Tone Code is now entered into the selected channel.
10. To program another channel, go to Step 2.

It is recommended that frequencies with the same purpose, such as police or fire, be entered in to channels that are in the same Bank. For example: Channels 1 through 20 (Bank 1) be used for police frequencies; Channels 21 through 40 (Bank 2) be used for emergency or fire frequencies. Thus, a group (Bank) of related frequencies can readily be scanned by itself.

The blank form on page 22 may be used (or copied) to plan and/or record the Unit's channel information.

OPERATION

GENERAL

After you have programmed the channels with frequencies of your choice, the Unit is ready for operation in one of its two major Modes, MANUAL or SCAN.

Adjust the audio's volume by turning the OFF/VOLUME Control knob clockwise to increase the audio output. Turn the knob counter-clockwise to decrease it. If necessary, first turn the SQUELCH Control knob clockwise until "noise" is heard. Then set the VOLUME Control to the desired listening level.

Turn the SQUELCH Control knob counter-clockwise until "noise" is no longer heard. The Unit is now squelched. Battery life is maximized if the Unit is squelched when not actually receiving a signal. While in the SCAN or SEARCH Mode, the SQUELCH Control may require being turned slightly more counter-clockwise to a setting that permits proper scanning or searching operation.

Tone Decoder

To enable the built-in CTCSS and DCS Decoder, press **TN/MN**. A small TN will appear in the display when the Decoder is enabled. The Tone Decoder is operational only in MANUAL and SCAN Modes.

When the Unit has Tone Decode enabled, no audio will be heard if a signal with a non-matching or improper tone (CTCSS or DCS) is received. In MANUAL Mode, even though the Signal Strength indicator shows any or all bars and BUSY is displayed, no audio will be heard unless the correct tone is on the signal. To hear the audio, press the **TN/MN** key again to disable the Tone Decoder. A channel with Tone Code 000 does not require a tone for proper reception at any time.

In SCAN Mode, the Unit will not stop on the frequency (or channel) unless the proper tone is on the signal.

Lamp Function
Press and release the **O/LAMP** key to illuminate the display and keypad. Each time this key is pressed, the illumination will remain on for approximately 3 seconds. If any other key is pressed during this time, the 3 second duration starts again.

Keypad Lock Function
Press and Hold the **O/LAMP** key for approximately 2 seconds until two Beeps are heard. The display will show a small "**O**", indicating the keypad is now locked. In other words, there will be no response (no beeps) when any of the keys are pressed. Thus, with only one exception, no changes can be made to the Unit's current operational status.

If the Unit is in the SCAN Mode, it can be placed in the MANUAL Mode by turning the Channel Selector. If the Selector is turned only one detent position, the Unit will remain on the channel that the scanner has stopped on. If it is turned several or more positions, the displayed channel will be some channel in sequence after the scan channel.

If the Unit is in the SEARCH Mode and stopped on a frequency, it can be made to resume searching by turning the Channel Selector clockwise one or more detent positions. It will resume searching, starting at the next frequency, if the Selector is turned only one position. If the Selector is turned counter-clockwise, searching will resume at a frequency LOWER than what is displayed.

If the Unit is in the SEARCH Mode and searching, it can be placed in the MANUAL Mode by turning the Channel Selector clockwise or counter-clockwise.

If the Unit is in WEATHER SCAN, it can be put in the MANUAL Mode by turning the Channel Selector clockwise or counter-clockwise.

To return to the original Mode (SCAN, SEARCH or WX SCAN), press and hold the **O/LAMP** key until 2 beeps are heard. The Keypad is now unlocked and the desired Mode can be selected.

MANUAL MODE

General
If at any time you want to monitor one channel continuously, press **MAN**. The desired channel can then be selected by: repeatedly pressing **MAN**, by turning the Channel Selector until the channel's Number (and frequency) appears in the display, or by entering the channel's Number and then pressing **MAN** again.

A channel selected in MANUAL Mode that had been previously locked out during SCAN operation will show L/O in the display, If desired, press **LOCK** to change its status for later SCAN operation.

Delete A Channel
To delete (remove or erase from memory) a channel, select the channel while in the MANUAL Mode and then press **CLR**. The display will show "dEL. chP" for approximately one (1) second. During this time, press **ENT** (YES) and the channel will then be deleted from the Unit's memory.

Review A Channel's Tone Code
To review the Tone Code (CTCSS or DCS) programmed for a channel, select the desired channel while in the MANUAL Mode. Press **ENT** and the channel's Tone Code and actual CTCSS Tone or DCS Code will be displayed. Press **ENT** again, or **MAN**, to return the display to showing the channel's Number and Frequency.

Priority Feature Enabled
To enable the Priority Feature, press **PRI**. The display should show PRI. When a channel other than a Priority Channel is manually selected (in MANUAL Mode), the Unit will sample the Priority Channels approximately every two (2) seconds. If any activity is found on a Priority Channel, the Radio will stay on that channel and monitor its 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.

Battery Saver Feature
With the Unit in the MANUAL Mode and not receiving a signal, Battery Saver conserves battery power by reducing the normal Standby 65 mA current drain for a certain period of time. Out of every 600 milliseconds, the current is automatically reduced to 11 mA for 300 milliseconds. Thus, the average current drain is reduced to approximately 38 mA.

SCAN MODE

General
To put the Unit in the SCAN Mode, press **SCN**. The display should show SCAN (small letters) and " SCAN " until an active channel is found. If ALL channels in All Banks are locked out, the display will momentarily show " no CHn " and then the last channel selected in MANUAL Mode. The Unit will NOT scan unless at least one channel is enabled or not locked out.

To select the Bank(s) to be scanned, press its respective number key after **SCN** is pressed. A Bank may also be de-selected at this time. It should be noted that if all Banks are de-selected, Bank 1 will automatically remain enabled (selected).

A channel may be locked out while the Unit is in the SCAN Mode whenever a signal is found on the channel and scanning has stopped. Press **LOCK** and the scanning will instantly resume scanning and bypass the channel thereafter.

To unlock or restore a channel into the scanning sequence, press **MAN**. Either repeatedly press **MAN** or turn the Channel Selector until the desired channel is in the display, or enter the channel's Number and press **MAN** again. Press **LOCK** and then **SCN** to return to the SCAN Mode.

The SCAN List (Channels programmed and not locked out) can be reviewed by two methods. One method is to turn the Channel Selector slowly and observe if L/O is displayed or not. Another method is to open squelch (turn SQUELCH Control fully clockwise) and observe what channels are displayed as **SCN** is repeatedly pressed.

Delay
When a proper signal is received on a channel, the scanning will stop and the channel's audio will be heard. After activity ceases (signal no longer present) on the channel, the Unit will delay (stay) on that channel for approximately 1/2 second, or 2 seconds if Delay is selected, and then resume scanning. Press **DL/HL** to enable SCAN Delay. The display should then show DELAY. To disable SCAN Delay, press **DL/HL** while the Unit is in the SCAN Mode.

Priority Feature Enabled
To enable the Priority Feature, press **PRI**. The display should show PRI. While scanning, "PSCAN" will be displayed.

Channel 1, even if locked out, will always be included in the SCAN List if Priority is enabled and will be sampled for a signal approximately every 2 seconds whenever the Scanner has stopped on another channel. The first channel in the other 9 Banks are also considered as a Priority Channel, but only as a lower priority. In other words, Channel 1 is the highest priority and will override the other Priority Channels (21, 41, 61, 81, etc.) if it becomes active (signal present).

The other Priority Channels can be locked out from the SCAN List and thus also from Priority Sampling. In addition, if their respective Bank is not selected for scanning, they will not be sampled even though not locked out as a channel. Thus, they are to be considered only as a secondary type priority channel. Therefore, if there is a Channel (frequency) that

must be checked periodically for a signal, use Channel 1 and enable Priority by pressing **PRI**.

The sequence of sampling the Priority Channels always starts with Channel 1. If there is no signal there, then Channel 21 is checked for a signal. If none is on Channel 21, then Channel 41 is checked and so on, providing their Banks are being scanned. This sequence continues until the current Bank's first channel is checked. At this time, if no signals are found, the Scanner returns to the non-priority channel it had stopped on.

WEATHER (WX) SCAN MODE

General

The National Weather Service (NWS) provides a continuous or 24-hour broadcast of local and area weather conditions. These weather messages are repeated until the next updated report is issued. The NWS has broadcast facilities in most areas of the country, especially around metropolitan areas.

The Radio has a set of 8 pre-programmed channels (frequencies) reserved exclusively for scanning for these weather messages. The Canadian Weather frequency (161.650 MHz) is also included. To have the Unit automatically scan the National Weather Service's frequencies, press **WX**. The display will show "SCAN" and WX (small letters) in the upper right corner.

The Scanning action will stop at every WX frequency that is strong enough in your area. In some areas of the country, perhaps 2 of the 8 possible frequencies may be received. Press **WX** again to see if the Scanner stops on a different frequency.

In this case, you should determine which frequency is the closest to your location. The number of relative Signal Strength bars displayed (5 maximum) should indicate which signal is strongest and therefore the nearest facility. For example, a signal that has 3 bars displayed is not as strong as one with 4 or 5 bars displayed. Note the frequency of the stronger signal for future reference.

NOTE: The WX frequencies can not be locked out, which is why it is important to note the frequency of the nearest facility if more than one can be received. If you are still uncertain as to which frequency covers or relates to your area, the local RELM Dealer can provide the information.

Priority Feature Enabled

To enable the Priority Feature, press **PRI**. The display should show PRI. The Radio will sample the Priority Channel approximately every 2 seconds. If activity (signal present) is found, the Radio will stay on the Priority Channel until 2 seconds after the activity ceases and then return to WX SCAN.

SEARCH MODE

General

The Unit includes a SEARCH function that enables the user to find new frequencies in addition to those already known. It can locate active frequencies anywhere within a band. These active frequencies, if desired, can then be readily assigned to a regular channel for MANUAL or SCAN operation.

The frequency increments (steps) used in SEARCH Mode are: 5 kHz for 26.0 to 54.0 MHz and for 136.0 to 174.0 MHz; 25 kHz for 118.0 to 136.0 MHz; 12.5 kHz for 406.0 to 520.0 MHz and for 806.0 to 960.0 MHz.

Programming Search Limits

Two frequencies are used in the SEARCH Mode. One frequency is called the Low (or start) Search Limit. The other frequency is the High (or end) Search Limit. The Unit "searches" for any active frequency within these two Limits. The search automatically starts over again after the High Limit is reached. The Limits do not have to be in the same band, but it is highly recommended that they are, so as to reduce the overall search time.

To program the Limits, press **LO/HI**. The Unit can be in MANUAL, SCAN, WX SCAN or SEARCH Mode. The display will show " *Lo* " in the upper left corner. In addition, the display will show a frequency (if previously programmed) or "_ _ _ . _ _ _ _" with the first bar blinking. Key in the Low Limit frequency and press **ENT**, which will store the Low Limit in memory.

Press **LO/HI** again. This time, " *Hi* " will appear in the upper left corner of the display. Key in the High Limit frequency and press **ENT**, to store the High Limit in memory.

> **NOTE:** If the High Limit is lower in frequency than the Low Limit, " *Error* " will appear in the display when **SRCH** is pressed. If this happens, press **LO/HI** *once* and key in a new Low Limit, or press **LO/HI** *twice* and key in a new High Limit. Press **ENT** after either one of these actions to store the new Limit.

Searching

After the Search Limits have been properly programmed, press **SRCH**

and SEARCH (small letters) will appear in the display. The Unit will start to search for any active frequencies within the defined Limits. When an active frequency is found, the Unit will stop searching, display the frequency and reproduce any audio associated with it.

After finding an active frequency, the Unit will resume searching:

1. Any time **SRCH** is pressed again.
2. Approximately 2 seconds after the frequency's activity stops when DELAY is in the display.
3. Only after **SRCH** is pressed when HOLD is in the display.

The Delay/Hold selection can be made anytime while in the SEARCH Mode, except when programming the Limits. Press **DL/HL** to toggle from Delay to Hold or vice versa.

While the Unit has stopped on an active signal, its frequency can be assigned to any one of the 200 possible channels. Press **ENT** and the display will prompt (a blinking bar in upper left corner of the display) for a channel assignment.

> **NOTE:** If a channel number is displayed, the frequency has already been assigned to the channel shown.

Key in the desired channel and press **ENT** again. The Unit will then immediately resume searching, starting with the next frequency in sequence.

Birdies

During Search operation, the Unit may stop on a frequency that does not have any audio, but is almost always present. In most cases, this frequency may be what is commonly referred to as a "birdie". A birdie can be the result of internally generated signals and/or externally generated signals that mix and appear to be a proper signal (but without any modulation). Some sources of externally generated signals are TV stations, TV receivers, home computers and other nearby radios. These frequencies will usually vary from location to location and are therefore impossible to list or predict.

To reduce or eliminate the effect that birdie frequencies have, a special lockout function is provided for the SEARCH Mode. Whenever one of these frequencies is encountered while the Unit is searching, press **LOCK** and that frequency will no longer be part of the current Search sequence. Up to 100 frequencies may be locked out. When the Birdie List or memory is full (100 frequencies locked out), the display will show "FULL" and no more frequencies can be locked out.

It should be noted that proper signals can also be locked out. This can be helpful, for example, if some highly active frequencies keep stopping the search operation, but you have already assigned them to a normal channel or they have been duly noted.

To clear the Birdie List, re-program one of the Search Limits. This will also allow you to perhaps choose a different segment of the Band that does not require locking out very many frequencies.

Priority Feature Enabled

To enable the Priority Feature, press **PRI** and PRI should appear in the display. The Priority Channel will be sampled approximately every 2 seconds for a signal. If activity is found, the Unit will stay on the Priority Channel until 2 seconds after the activity ceases and then it will resume searching.

RECHARGEABLE BATTERY INFORMATION

GENERAL

Rechargeable Ni-Cd batteries (such as RELM's optional BPHS Battery Pack) are usually shipped not fully charged, therefore they should be charged as soon as possible after installation. The AC Adapter, or external 12 VDC Supply, will fully charge the 4 AA cells in 14 to 16 hours.

FOR BEST PERFORMANCE

1. Charge the batteries to full capacity; allow 14 to 16 hours with the WCHS ACAdapter.

2. Use the batteries as soon and as much of their capacity as possible. Typically 3 to 5 charge-discharge cycles are required to bring new batteries up to their rated capacity.

3. Store and charge batteries at a room temperature of 65 to 75°F (18 to 24°C).

4. Reduced capacity of the batteries may result from repeated shallow discharge - full charge cycles. If such a condition is suspected, use the batteries until BATT is displayed, then fully recharge and discharge again. After this cycle is repeated 3 to 5 times, full capacity should then be available.

NOTE: Ni-Cd batteries must be recycled or disposed of properly.

Table 1. Tone Codes *vs.* CTCSS* Tones.

Code #	TONE (Hz)	Code #	TONE (Hz)	Code #	TONE (Hz)
000	No Tone	017	118.8	034	218.1
001	67.0	018	123.0	035	225.7
002	71.9	019	127.3	036	233.6
003	74.4	020	131.8	037	241.8
004	77.0	021	136.5	038	250.3
005	79.7	022	141.3	039	69.4
006	82.5	023	146.2	040	159.8
007	85.4	024	151.4	041	165.5
008	88.5	025	156.7	042	171.3
009	91.5	026	162.2	043	177.3
010	94.8	027	167.9	044	183.5
011	97.4	028	173.8	045	189.9
012	100.0	029	179.9	046	196.6
013	103.5	030	186.2	047	199.5
014	107.2	031	192.8	048	206.5
015	110.9	032	203.5	049	229.1
016	114.8	033	210.7	050	254.1

*CTCSS stands for Continuous Tone Coded Squelch System.

Table 2. Tone Codes *vs.* DCS* Codes.

STD Tone Code	DCS Code		INV Tone Code
	STD	INV	
051	023	047	058
052	025	244	090
053	026	464	127
054	031	627	141
055	032	051	059
056	036	172	082
057	043	445	121
058	047	023	051
059	051	032	055
060	053	452	123
061	054	413	117
062	065	271	100
063	071	306	102
064	072	245	091
065	073	506	131

*DCS stands for Digital Coded Squelch. The frequency may use a Standard (STD) or Inverted (INV) DCS code. Select the appropriate Tone Code as indicated. Table 2 is continued on next page.

Table 2. Tone Codes vs. DCS Codes (Continued).

STD Tone Code	DCS Code		INV Tone Code
	STD	INV	
066	074	174	083
067	114	712	148
068	115	152	077
069	116	754	154
070	122	225	087
071	125	365	113
072	131	364	112
073	132	546	136
074	134	223	086
075	143	412	116
076	145	274	101
077	152	115	068
078	155	731	050
079	156	265	098
080	162	503	130
081	165	251	093
082	172	036	056
083	174	074	066
084	205	263	097
085	212	356	111
086	223	134	074
087	225	122	070
088	226	411	115
089	243	351	110
090	244	025	052
091	245	072	064
092	246	523	133
093	251	165	081
094	252	462	126
095	255	446	122
096	261	732	151
097	263	205	084
098	265	156	079
099	266	454	124
100	271	065	062
101	274	145	076
102	306	071	063
103	311	664	146
104	315	423	118
105	325	526	134
106	331	465	128
107	332	455	125
108	343	532	135
109	346	612	139
110	351	243	089

STD Tone Code	DCS Code		INV Tone Code
	STD	INV	
111	356	212	085
112	364	131	072
113	365	125	071
114	371	734	152
115	411	226	088
116	412	143	075
117	413	054	061
118	423	315	104
119	431	723	149
120	432	516	132
121	445	043	057
122	446	255	095
123	452	053	060
124	454	266	099
125	455	332	107
126	462	252	094
127	464	026	053
128	465	331	106
129	466	662	145
130	503	162	080
131	506	073	065
132	516	432	120
133	523	246	092
134	526	325	105
135	532	343	108
136	546	132	073
137	565	703	147
138	606	631	142
139	612	346	109
140	624	632	143
141	627	031	054
142	631	606	138
143	632	624	140
144	654	743	153
145	662	466	129
146	664	311	103
147	703	565	137
148	712	114	067
149	723	431	119
150	731	155	078
151	732	261	096
152	734	371	114
153	743	654	144
154	754	116	069

TROUBLESHOOTING GUIDE

NOTE: Please perform the simple checks indicated for improper operation before returning the Unit for service.

TROUBLE	CHECK
No display, no sound	PWR/VOL Control should be turned clockwise. Batteries need to be charged or replaced. AC Adapter not plugged in properly.
Display OK, no sound	Volume Control setting — turn clockwise.
No reception (no stations heard)	Check antenna connection. Stations too far away. Incorrect frequencies entered.
Weak or poor reception	Squelch Control setting — turn fully clockwise and then counter-clockwise until the "noise" just disappears. Stations too far away.
Does not SCAN	Squelch Control setting — turn fully clockwise and then counter-clockwise until "SCAN" appears in the display. Channels are locked out?
Does not SEARCH	Squelch Control setting — turn fully clockwise and then counter-clockwise until displayed frequency rapidly increments. Search Limits are incorrect?
SEARCH stops on frequencies without stations	Birdies — See page 17.
Keypad buttons don't work	Disable the Keypad Lock — See page 12.
Unit doesn't operate very long with rechargeable type batteries	Batteries should be charged at least 14 to 16 hours for proper service life — See page 18.

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. _____ Date Purchased

Dealer _____

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

Ch. ____	Frequency ________ Tone or Code ________	Ch. ____	Frequency ________ Tone or Code ________
Ch. ____	Frequency ________ Tone or Code ________	Ch. ____	Frequency ________ Tone or Code ________
Ch. ____	Frequency ________ Tone or Code ________	Ch. ____	Frequency ________ Tone or Code ________
Ch. ____	Frequency ________ Tone or Code ________	Ch. ____	Frequency ________ Tone or Code ________
Ch. ____	Frequency ________ Tone or Code ________	Ch. ____	Frequency ________ Tone or Code ________
Ch. ____	Frequency ________ Tone or Code ________	Ch. ____	Frequency ________ Tone or Code ________
Ch. ____	Frequency ________ Tone or Code ________	Ch. ____	Frequency ________ Tone or Code ________
Ch. ____	Frequency ________ Tone or Code ________	Ch. ____	Frequency ________ Tone or Code ________
Ch. ____	Frequency ________ Tone or Code ________	Ch. ____	Frequency ________ Tone or Code ________
Ch. ____	Frequency ________ Tone or Code ________	Ch. ____	Frequency ________ Tone or Code ________
Ch. ____	Frequency ________ Tone or Code ________	Ch. ____	Frequency ________ Tone or Code ________
Ch. ____	Frequency ________ Tone or Code ________	Ch. ____	Frequency ________ Tone or Code ________
Ch. ____	Frequency ________ Tone or Code ________	Ch. ____	Frequency ________ Tone or Code ________
Ch. ____	Frequency ________ Tone or Code ________	Ch. ____	Frequency ________ Tone or Code ________
Ch. ____	Frequency ________ Tone or Code ________	Ch. ____	Frequency ________ Tone or Code ________
Ch. ____	Frequency ________ Tone or Code ________	Ch. ____	Frequency ________ Tone or Code ________
Ch. ____	Frequency ________ Tone or Code ________	Ch. ____	Frequency ________ Tone or Code ________
Ch. ____	Frequency ________ Tone or Code ________	Ch. ____	Frequency ________ Tone or Code ________

OWNER'S FREQUENCY LIST

NOTE: This space is for the user to make his or her own frequency list.

FREQUENCY	SERVICE	FREQUENCY	SERVICE

RELM COMMUNICATIONS, INC.
1 YEAR LIMITED WARRANTY

RELM Communications, Inc. and its subsidiaries (hereinafter collectively referred to as "RELM") warrant to the original purchaser that should RELM's products, within the periods specified below, prove to be defective by reason of improper workmanship and/or material, RELM will, at its option, repair or replace any defective product, or refund the purchase price of the product, for a period of one (1) year from the date of purchase as shown on the original purchaser's sales receipt. For the full year of the warranty period, labor to perform warranty service will be provided without charge. Thereafter, the purchaser must pay for labor at the prevailing rates of the Authorized Warranty Repair Center or RELM. Parts necessary to provide warranty service will be provided at no charge for the entire warranty period. Any product that is repaired or replaced under this warranty will be warranted to be free of defects in material and workmanship for the remainder of the original warranty period.

1. To obtain warranty service, bring the following to the retailer from whom you purchased the product:
   - the defective product
   - 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.

2. This warranty does not cover defects caused by:
   - Physical abuse or misuse of the product
   - Neglect or accident
   - Improper use or installation of the product
   - Repair or alteration by unauthorized personnel

3. ANY EXPRESS WARRANTY NOT PROVIDED HEREIN, AND ANY REMEDY FOR BREACH OF CONTRACT WHICH, BUT FOR THIS PROVISION, MIGHT ARISE BY IMPLICATION OR OPERATION OF LAW, IS HEREBY EXCLUDED AND DISCLAIMED.

4. ALL IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND OF FITNESS FOR ANY PARTICULAR PURPOSE, ARE HEREBY EXCLUDED AND DISCLAIMED.

5. UNDER NO CIRCUMSTANCES SHALL RELM BE LIABLE TO PURCHASER OR ANY OTHER PERSON FOR ANY OTHER BREACH OF WARRANTY, BREACH OF CONTRACT, OR OTHERWISE, OR FOR ANY INCIDENTAL, CONSEQUENTIAL, PUNITIVE OR EXEMPLARY DAMAGES.

6. Equipment and accessory items not manufactured by RELM are excluded from this warranty.

7. This warranty applies only to RELM products sold by dealers within the United States and used exclusively in the United States.

8. RELM reserves the right to modify or change the equipment in whole or in part at any time prior to delivery in order to include refinements deemed appropriate by RELM, but without incurring any liability to : (i) modify or change any equipment previously delivered, or (ii) supply new equipment in accordance with earlier specifications.

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.

RELM HS200 "QUICK" INSTRUCTIONS

TO ENTER A FREQUENCY: All programming must be done in the "MANUAL MODE". Press "MAN" to get in the "MANUAL MODE". Type in the frequency and press "ENT" to enter. Type the desired channel number (or car number) and press "ENT".

TO GO TO A SPECIFIC CHANNEL: Press "MAN", then press the desired channel #, then press "MAN" again. Turning the channel selector knob on top of the scanner will also change the channel. You can only go to a channel that has been programmed.

TO SCAN: Press "SCN". MAKE SURE THE BANKS YOU WISH TO SCAN ARE NOT LOCKED OUT!

BANKS: Banks are locked out and unlocked by pressing "SCN" and then pressing the # of that bank. BANKS MUST BE TURNED ON TO BE SCANNED!

TO LOCK OUT A CHANNEL: To remove a channel from your scanning, go to that channel and press "Lock".(The symbol "L/O" will appear below the frequency.) This channel will not be scanned until you unlock it by repeating this procedure. You may still monitor this channel by going to it manually.

TONE CODES: To enter the tone codes for a frequency you must first enter the frequency and channel number as explained above. While in Manual mode, press "ENT". Then type in the tone code number for that channel and frequency and press "ENT". After entering all tone codes, press the "TN/MN" key at the bottom of the keypad. "TN" will appear next to the channel number on the display.(This symbol must be visible for tone codes to be in use.) Tone code use is optional. It will reduce interference problems.

GENERAL INFO: This scanner has 200 channels divided into 10 banks of 20 channels each. Bank #1 is channels 1 thru 20, Bank #2 is channels 21 thru 40, Bank #3 is channels 41 thru 60, etc. To see which banks are in service or "unlocked", look at the top of the display. If the bank number is visible, then it is "unlocked".

"Scanning" means the scanner is checking your programmed channels for radio transmissions.(Example: channels 1-100)

"Searching" means the scanner is searching all the frequencies in a range for radio transmissions.(Example: 450Mhz-460Mhz) Searching is used to find new frequencies. Searching is not necessary at the track since we provide you with accurate frequencies. (Remember to enter the update frequency just like a car, and listen for any updates before and during the race.)

"Priority"(the "PRI" key) should not be used at the race track. It will cause confusion and problems for first-time scanner users.

Delay should be turned on by pressing the "DL/HL" key. The word "Delay" will appear below the frequency. This allows the scanner to wait 2 seconds for a reply before it resumes scanning.

Race cars should be entered by their car #.(Example: car #3 should be on channel #3)

If you enter MRN or other media, they must be "locked out" because they are constant carriers that will prevent you from scanning.

Use the "Racetenna"(the short antenna) at race tracks.(The long antenna may be used at road courses where the cars go out of sight and over hills.

"WX" is for weather stations.

"LO/HI"is used for searching.

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