



# Professional Two-Way DMR/Analog Base Radio

## RBS-477DMR Base Radio User Manual



- DMR Digital, Conventional Analog
- Narrow Band Capable
- 20 DMR or Analog Channels
- 2.5 Watt Transmit Power
- 1 Watt Audio Output

**NOTICE:** The RBS-DMR-PCPK PC programming software kit is required to program channel frequencies and other settings. Please contact your Authorized Ritron Reseller.

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Ritron Pub. 14500106 Rev. A 12/22

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Dear Valued Ritron Customer,

Thank you for your purchase of the RBS-477DMR DMR/Analog base radio. Each radio comes pre-programmed with the 2 factory default channels listed below. Channel programming can be changed via the RBS-DMR-PCPS PC programming software and cable.

If your company currently has an FCC license on frequencies different from the default frequencies, the radio can be PC programmed to custom frequencies using optional Ritron RBS-DMR-PCPS PC programming software, other settings can also be configured. Please contact your Ritron Reseller for information on "custom" radio programming services.

**Please be advised that operation on the factory default frequencies require that you obtain an FCC Operator License BEFORE USE.**

**FACTORY DEFAULT FREQUENCIES AND SETTINGS**

**RBS-477DMR Factory Default Frequency Settings – Operating Band 450-470 MHz**

<u>Channel</u>	<u>Channel Type</u>	<u>TX/RX Frequency (Table)</u>	<u>Color Code/ Tone Freq.</u>	<u>RX Group ID</u>	<u>Destination ID/ TX Contact</u>	<u>TX Power</u>
CHAN 1	Analog	467.850 MHz (26)	No Tone	-	-	2.5 Watts
CHAN 2	DMR	467.850 MHz (26)	Color Code 1	1001 - Group 16777215 – All Call	1001 - Group	2.5 Watts

Analog = Narrow Band (12.5 KHz)  
DMR Radio ID (SUID) = 1

**OPTIONAL REPLACEMENT ACCESSORIES**

**TO ORDER CALL 800-USA-I-USA**

**AFB-1545** .... Molded Flex, Dual-band Replacement Antenna  
**RAM-I545** .... Magnet-mounted, Dual-band Antenna w / BNC

**RPS-IB** ..... Replacement 110 VAC Power Supply  
**CCL-M** ..... 12 VDC, Cigarette Lighter Adaptor  
**JBSK-I2** ..... 12 VDC, Adaptor Kit

**RHD-4X** ..... Dual Ear Headset  
**RHD-6X** ..... Lightweight Behind-the-head Earset w / In-line PTT  
**RHD-8X** ..... Lightweight Earbud w / mic and In-line PTT

**RSM-3XA** .... Remote Speaker Microphone  
**RM-7** ..... Hand Microphone & Hang-up Bracket

**RSP-5** ..... External Speaker w / 5 Watt Audio Capability

**JBS-MMK**.... Mobile Mounting Kit  
(Does not include screws to mount bracket to wall or vehicle)

**Call RITRON for a complete listing.**



**JBSK-12**  
**12-Volt Adapter Kit**



**RHD-6X**  
**Behind the Ear Headset**



**RHD-8X**  
**Single Earbud**



**RAM-1545**  
**Magnet-Mounted Dual-band Antenna**



**RSP-5**  
**5-Watt External Speaker**



**RM-7**  
**Hand Microphone**

## BASIC FEATURES

This manual covers Ritron RBS-477DMR DMR/Analog base radio. A rugged, programmable two-way desktop base radio designed to operate in a professional FM communications band. Each radio is equipped with these features:

- **Analog and DMR Digital Mode Operation.** The RBS-477DMR DMR/Analog base radio can operate in Analog and DMR Digital mode within the 450-470 MHz frequency band.
- **Push-button Operating Controls.** The Push-To-Talk (PTT), Channel, On / Volume Up, Volume Down / Off; and the special feature P1 and P2 button controls are conveniently located on the face of the radio.
- **16 Character LCD Display.** A backlit, 2-line x 8-character, LCD display will show the channel, volume, and many current operating conditions.
- **20-Channel Capability.** Up to 20 channels can be programmed to contain a unique set of operating frequencies and options. Each channel can be programmed for Analog or DMR Digital operation; and can be given an 8-character name that will be shown on the top line of the LCD display.
- **QC (Quiet Call) and DQC (Digital Quiet Call) Interference Eliminator Codes.** Each Analog channel can be programmed from a list of 50 QC sub-audible or 104 DQC digital privacy codes.
- **48 DMR Contacts.** The base radio can be programmed with up to 48 DMR Group or Individual contacts. Each DMR channel can be programmed to receive any number of the Group contacts, and the P1 button can be assigned any number of the Group or Individual contacts for transmit. Each DMR Contact can be given an 8-character name that will be shown on the bottom line of the LCD display when received, or when selecting with the P1 button for transmit.
- **20 DMR RX Groups.** Each DMR channel can be programmed to receive any number of Group Contacts from the 48 DMR Contacts, and can therefore be considered an RX Group.
- **10 Analog Contacts.** The base radio can be programmed with up to 10 Analog 2-Tone, DTMF or Selcall contacts. Each Analog channel can be assigned any number of the Analog Contacts, which are selected by the P1 button for transmit. Each Analog Contact can be given an 8-character name that will be shown on the bottom line of the LCD display when selecting with the P1 button for transmit.
- **Channel Scanning.** Channel Scan allows scanning of all 20 channels programmed into the radio. Each channel can be removed from the scan list through PC programming. Scan operation has many features, including Priority Scanning and Busy Channel Blocking.
- **P1 Button.** The P1 Button is used to select DMR Contacts for transmission on DMR channels, and to select Analog Contacts for transmission on Analog channels. The Contacts available for P1 selection are programmed on a per channel basis.
- **P2 Button.** The P2 Button can be programmed to initiate Channel Scan, Monitor the channel, go to the last channel that received a signal, or send a Call Tone. It can also be set to send a 2-Tone, DTMF or Selcall ANI on Analog channels, and send a DMR contact on DMR channels.
- **2-Tone, DTMF or Selcall Decode.** Each Analog channel can be programmed for 2-Tone paging decode within a frequency range of 300-1500 Hz, or for a 3-9 digit DTMF or Selcall decode. Additional paging decode features include Group Call, All Call, automatic reset, and transpond alert.
- **DTMF or Selcall ANI.** Each Analog channel can be programmed to transmit a unique DTMF or Selcall ANI string on each transmission.
- **Alert Tones.** Each channel is programmable for a variety of alert tones that include RX courtesy beep, TX clear to talk beep, busy channel lockout alert, last active channel marker, and channel scanning indicator.
- **Always On Operation.** The radio can be set to automatically turn-on any time power is applied to the radio.



**EXPOSURE TO RADIO FREQUENCY ENERGY**

These products generate radio frequency (RF) energy when the PTT button on the front of the unit is depressed. The product has been evaluated for compliance with the maximum permissible exposure limits for RF energy at the maximum power rating of the unit when using antennas available from RITRON. Antennas other than those mentioned below have not been tested for compliance and may or may not meet the exposure limits at the distances given. Higher gain antennas are capable of generating higher fields in the strongest part of their field and would, therefore, require a greater separation from the antenna.

AFB-1545 (included with radio)	-2 dBi gain
RAM-1545 (optional magnet-mount antenna)	2 dBi gain

**RBS-477DMR:**

Using the AFB-1545 antenna (included with the product) in a vertical orientation at the 20 cm (7.9 inches) minimum expected separation distance and greater, the maximum RF exposure is well below the General Population/Uncontrolled limits. When using the RAM-1545 (optional magnet-mount antenna with 25' cable) in a vertical orientation a 29.4 cm separation distance is required. Antennas other than those available from RITRON have not been tested for compliance and may or may not meet the exposure limits at the distances given. Higher gain antennas are capable of generating higher fields in the strongest part of their field and would, therefore, require a greater separation from the antenna. This product is not to be used by the general public in an uncontrolled environment unless compliance with the Uncontrolled/General Population limits for RF exposure can be assured.

En utilisant l'antenne AFB-1545 (fournie avec le produit) dans une orientation verticale à la distance de séparation minimale prévue de 20 cm (7.9 pouces) et plus, l'exposition RF maximale est bien inférieure aux limites de la population générale / non contrôlées. Lors de l'utilisation de la RAM-1545 (antenne optionnelle à montage magnétique avec câble de 25 pi) dans une orientation verticale, une distance de séparation de 29.4 cm est requise. Les antennes autres que celles disponibles chez RITRON n'ont pas été testées pour leur conformité et peuvent ou non respecter les limites d'exposition aux distances indiquées. Les antennes à gain plus élevé sont capables de générer des champs plus élevés dans la partie la plus forte de leur champ et nécessiteraient donc une plus grande séparation de l'antenne. Ce produit ne doit pas être utilisé par le grand public dans un environnement non contrôlé, à moins que le respect des limites d'exposition aux RF pour la population non contrôlée / générale ne puisse être assuré.

To limit exposure to RF energy to levels below the limit, please observe the following:

- Use only the antenna(s) available from RITRON for these models. DO NOT operate the radio without an antenna.
- DO NOT transmit more than 50% of the time.
- When transmitting, make certain that the distance limits for the particular model in use are observed.
- DO NOT allow children to operate the radio.

When used as directed, this series of radios is designed to comply with the FCC and IC RF exposure limits for "Uncontrolled/General Population". In addition, they are designed to comply with the following Standards and Guidelines:

- United States Federal Communications Commission, Code of Federal Regulations; 47 CFR §§ 2 sub-part J.
- American National Standards Institute (ANSI) / Institute of Electrical and Electronic Engineers (IEEE) C95. 1-1992.
- Institute of Electrical and Electronic Engineers (IEEE) C95.1-1999 Edition.

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**OBSERVE CAUTION IN THE FOLLOWING ENVIRONMENTS TO MAXIMIZE THE LIFE OF YOUR RADIO EQUIPMENT**

**LOCATION:** Be aware that this radio and / or antenna may create interference with, or be interfered with, by nearby electronic equipment such as computers, monitors, keyboards, electronic telephones and other sensitive devices. Either move the equipment or use a remote antenna to separate components sufficiently to stop or reduce interference.

**MOISTURE:** Ritron base radios are not waterproof. DO NOT directly expose them to rain or excessive moisture.

**CHEMICALS:** Detergents, alcohol, aerosol sprays or petroleum products can damage the radio case. DO NOT use petroleum solvents of any kind; use a soft cloth moistened with water to clean the case.

**EXTREME HEAT:** High temperatures can damage the radio and its components. DO NOT expose the units to extreme heat or leave them in direct sunlight.

**EXCESSIVE TRANSMISSIONS:** DO NOT hold the Push-To-Talk switch down longer than necessary during transmission intervals.

**VIBRATION / SHOCK:** Although your Ritron base radio is designed to be rugged, it will not survive excessive abuse. Avoid dropping the radio.

## RADIO CONTROLS AND CONNECTORS

### 1 ANTENNA

The flexible antenna radiates and receives radio signals. The antenna connects to a BNC type connector located on the top end of the radio.

NOTE: The AFB-1545 antenna included with the radio will work with VHF and UHF radios.

### 2 VOLUME DOWN / OFF BUTTON

Press and release the Volume Down / Off button to decrease volume. The channel display will indicate the volume level when the Volume Down / Off button is pressed. To turn Off the unit decrease the volume level to "0", then press an additional time to turn off. The speaker will sound a double beep.

### 3 ON / VOLUME UP BUTTON

To turn the unit On, press and release the On / Volume Up button; the speaker will sound the Channel Beep. Once the radio is On, press and release this button to increase volume. The channel display will indicate the volume level when the On / Volume Up button is pressed.

### 4 PUSH-TO-TALK (PTT) BUTTON

Press and hold the PTT when transmitting; release it to receive.

### 5 AUDIO ACCESSORY JACK

The audio accessory jack is used to plug in earphone options and, in conjunction with the microphone jack, to connect an optional remote speaker / microphone or a single-ear or dual-ear headset.

### 6 MICROPHONE JACK

The microphone jack is used to connect optional external microphones and, in conjunction with the audio accessory jack, to connect an optional remote speaker / microphone, or a single-ear or dual-ear headset.

### 7 USB PROGRAMMING JACK

USB Mini B jack used for radio programming.

### 8 CHANNEL SELECTOR BUTTON

Press the Channel Selector button and the radio will advance the channel. The Channel Beep will be heard any time Channel 1 is selected.

### 9 P1 BUTTON - PROGRAMMABLE SOFT KEY

The P1 Button is used for selective signaling. Use the P1 button to step through DMR or Analog contacts for selective calling or control signaling.

### 10 P2 BUTTON - PROGRAMMABLE SOFT KEY

The P2 Button is capable of performing a variety of functions. Function options: Channel Scan, Weather Channel, Monitor, Send 2-Tone Code, Send Call Tone, Send DTMF or Selcall ANI. Refer to the [P2 Button](#) section of this manual for details.

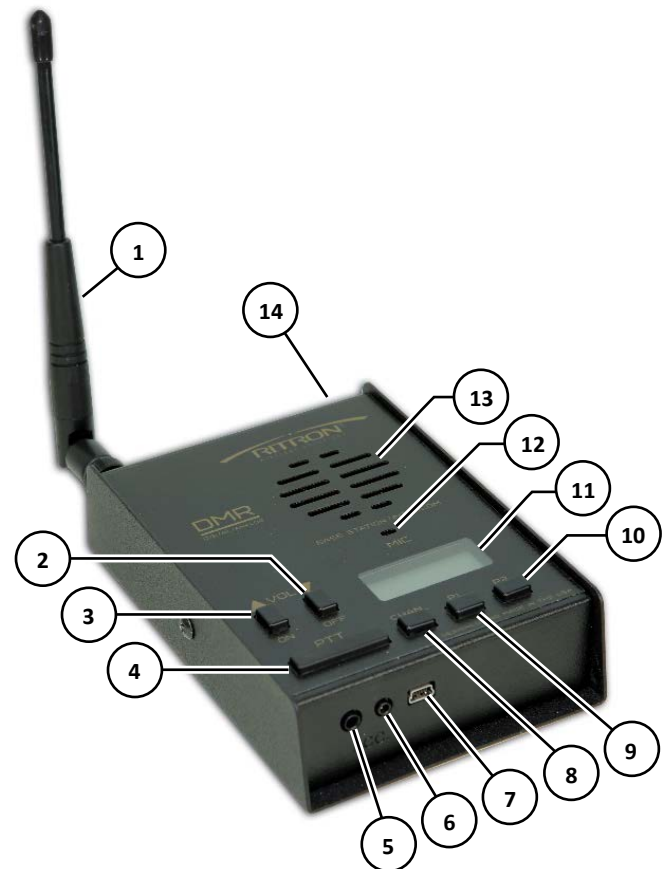


FIG-1: RADIO CONTROLS & CONNECTORS

### 11 CHANNEL DISPLAY

The 2-line x 8-character channel display will indicate the current operating channel when in standby. The display will also indicate current operating conditions such as volume, caller ID, DMR/Analog channel type, busy channel, etc.

### 12 MICROPHONE

The microphone allows your voice to be heard in transmissions to other radios. Speak in a normal tone; shouting does not improve your listeners' reception. With an optional headset or hand mic plugged into the Microphone Jack this front panel microphone is disabled.

### 13 SPEAKER

The speaker allows you to hear calls on your channel. With an optional headset or hand mic plugged into the Audio Accessory Jack this front panel speaker is disabled.

### 14 POWER CONNECTOR (TOP END OF CASE)

The power connector on the top end of the radio is used to connect power to the unit, either an external 12 VDC supply or the RPS-1B cube power supply included with the radio.

**ON-OFF VOLUME ADJUST**

R	a	d	i	o		O	n
S	t	a	r	t	i	n	g

**To turn on the radio** – press and release the **ON / VOLUME UP** button.

- “Radio On Starting” will appear on the display.
- The radio will sound the Channel Beep.
- The radio will turn on to the channel that was selected when it was last turned off, or can be programmed to “Turn on to Channel 1”.
- If the radio is programmed for “Always On” operation it will turn on automatically any time power is applied.

V	o	l		↑		1	
---	---	---	--	---	--	---	--

**To increase the volume** – press and release the **ON / VOLUME UP** button until you reach the desired level.

- The display will show the volume level on a 0-10 scale when the volume button is pressed and you will hear any received broadcasts on the channel.

V	o	l		↓		1	0
---	---	---	--	---	--	---	---

**To decrease the volume** – press and release the **VOLUME DOWN / OFF** button until you reach the desired level.

- The display will show the volume level on a 10-0 scale when the volume button is pressed and you will hear any received broadcasts on the channel.

R	a	d	i	o			
O	f	f					

**To turn off the radio** - press and release the **VOLUME DOWN / OFF** button until level “0” is reached. Press and release an additional time, a “turn-off” beep is heard and the radio turns off.

- The radio volume will step down to level 0 before turning off.
- “Radio Off” will appear on the display and the radio will turn off.
- For instant turn-off, press the **PUSH-TO-TALK (PTT)** button while holding the **VOLUME DOWN / OFF** button.
- If the radio is programmed for “Always On” operation it cannot be turned off.

**CHANNEL SELECTION**

C	H	A	N		1		
							D

**To change channels** - press and release the **CHANNEL SELECTOR** button.

- The radio will increment the channel, and the display will show the programmed “Channel Name”. By default, the Channel Name will be “CHAN” followed by the channel number. The Channel Name can be changed to any 8-character name using the PC Programmer.
- A single character on the lower right corner of the display will indicate channel type (D=DMR, A=Analog, M=Mixed Mode).
- Channels programmed with channel type OFF cannot be selected with the **CHANNEL SELECTOR**.
- If the last channel is selected and you press the **CHANNEL SELECTOR** button, the radio resets to channel 1 and the Channel Beep is heard on the speaker.

**To scan all channels** - Press and release the **P2 BUTTON** until “Scan” appears on the display, then hold the P2 Button until “Scanning” appears on the display. See the [P2 Button](#) section of this manual for details.

## P2 BUTTON

The **P2 BUTTON** can be programmed for a number of functions. Press and release the **P2 BUTTON** to step through the programmed functions. Stop on the desired function and hold the button for 2 seconds until a double beep is heard on the speaker.

### Scan

The base radio can scan all channels that have been flagged for Scan.

S	c	a	n				
---	---	---	---	--	--	--	--

- Press and hold the **P2 BUTTON** when “Scan” appears on the display. Release the button after the double beep is heard on the speaker.

S	c	a	n	n	i	n	g
---	---	---	---	---	---	---	---

- The base radio sounds the Scan Beep, and then repeatedly checks each channel in the scan list. The channel display will show “Scanning” as they are scanned.

C	H	A	N	1			
B	u	s	y				D

- When a call is received while scanning, the base radio will stop scanning to let you hear communications on that channel. The display will indicate the Channel Name and “Busy” will appear on the 2<sup>nd</sup> line.

After the incoming transmission has ended the base radio will pause before it resumes scanning to allow you time to respond.

C	H	A	N	1			
T	X						D

- When transmitting from the Scan channel, the base radio will go to the last channel on which a signal was received, then transmit. After you release the **PTT BUTTON** the base radio will pause to allow time for a response, and then resume scanning.

If the radio is programmed for “Jump to Priority on PTT”, pressing the **PTT BUTTON** will transmit on the assigned Priority Channel.

S	c	a	n				
B	l	o	c	k			

- If a call is received while scanning and you would like to temporarily remove the channel from the scan list, Press and hold the **P2 BUTTON** when “Scan Block” appears on the display. Release the button after the double beep is heard on the speaker and the channel will be removed from the scan list. The channel can be added back to the scan list by selecting “Scan” with the **P2 BUTTON**.

S	c	a	n				
O	f	f					

- To disable the Scan function press and hold the **P2 BUTTON** when “Scan Off” appears on the display. Release the button after the double beep is heard on the speaker.

Pressing the **CHANNEL SELECTOR** button to select a radio channel will also disable the Scan function.

### Last Channel

The base radio can be quickly set to the last channel that received a call while scanning.

L	a	s	t				
C	h	a	n	n	e	l	

- Press and hold the **P2 BUTTON** when “Last Channel” appears on the display. Release the button after the double beep is heard on the speaker.

- The radio will stop scanning and go to the channel on which the most recent call was received.

### Monitor

The base radio can be temporarily set to receive all on-frequency signals on Analog channels.

M	o	n	i	t	o	r	
---	---	---	---	---	---	---	--

- Press and hold the **P2 BUTTON** when “Monitor” appears on the display. Release the button after the double beep is heard on the speaker.

C	H	A	N	1			
M	o	n					A

- The display will indicate the Channel Name and “Mon” will appear on the 2<sup>nd</sup> line. All activity on the channel’s radio frequency will be heard on the radio speaker.

If you are unable to activate the Monitor function, the channel has been programmed for “Monitor Lockout”.

M	o	n	i	t	o	r	
O	f	f					

- To disable the Monitor function, press and hold the **P2 BUTTON** when “Monitor Off” appears on the display. Release the button after the double beep is heard on the speaker.

Changing the radio channel will automatically disable the Monitor function.

- This feature is only available on Analog channels.

### Send Call Tone

The base radio can transmit a Call Tone to alert radio users of an incoming call.

S	e	n	d				
C	a	l	l	t	o	n	e

- Press and hold the **P2 BUTTON** when “Send Calltone” appears on the display. Release the button after the double beep is heard on the speaker.

- The radio transmits a Call Tone on the channel currently selected.

- The Call Tone will be heard on the radio speaker as it is being sent.

- Sending the Call Tone is a one-time occurrence, to resend the Call Tone it must again be selected with the **P2 BUTTON**.

- This feature is helpful when the receiving radios are in a high noise environment and may not hear a voice transmission.

**Paging Reset**

Reset the base radio for Paging Decode on Analog channels.

After a Paging Code has been successfully decoded on an Analog channel it will not be required for subsequent received signals until it has been reset. This can be done by programming a timed automatic reset, or by resetting with the **P2 BUTTON**.

P	a	g	i	n	g		
R	e	s	e	t			

- Press and hold the **P2 BUTTON** when "Paging Reset" appears on the display. Release the button after the double beep is heard on the speaker.
- The base radio must now receive the Paging Code before receiving voice transmissions from other radios.
- The selected radio channel must be programmed for Paging Decode for this feature to have any effect.
- This feature is only available on Analog channels.

**Send Contact (Analog)**

The base radio can transmit an Analog Contact code to selectively signal other radios or radio operated devices.

The **P2 BUTTON** can transmit up to two 2-Tone, DTMF or Selcall codes that have been pre-programmed into the radio's Analog Contacts list. The Contact Name will appear on the 2<sup>nd</sup> line of the display. In this example the Contact Name is "Cont 1".

S	e	n	d				
C	o	n	t	1			

- Press and hold the **P2 BUTTON** when "Send Cont 1" appears on the display. Release the button after the double beep is heard on the speaker.
- The radio transmits the 2-Tone, DTMF or Selcall code on the analog channel currently selected.
- The 2-Tone, DTMF or Selcall code will be heard on the radio speaker as it is being sent.
- Sending the 2-Tone, DTMF or Selcall code is a one-time occurrence, to resend the code it must again be selected with the **P2 BUTTON**.
- This feature is only available on Analog channels.

**Send Contact (DMR)**

The base radio can transmit a DMR Contact code to selectively signal other radios or radio operated devices.

The **P2 BUTTON** can transmit up to two DMR Group or Individual ID codes that have been pre-programmed into the radio's DMR Contacts list. The Contact Name will appear on the 2<sup>nd</sup> line of the display. In this example the Contact Name is "Cont 2".

S	e	n	d				
C	o	n	t	2			

- Press and hold the **P2 BUTTON** when "Send Cont 2" appears on the display. Release the button after the double beep is heard on the speaker.
- The radio transmits the Group or Individual ID on the DMR channel currently selected.
- Sending the DMR Contact code is a one-time occurrence, to resend it must again be selected with the **P2 BUTTON**.
- This feature is only available on DMR channels.



## CHANNEL SCAN OPERATION

Channel scanning allows you to listen for broadcasts on all of your radio channels. The RBS-477DMR base radio can scan all channels programmed into the radio. Be aware that the more channels the radio must scan the longer it takes to check each channel.

### How Scanning Works

Using the **P2 BUTTON**, select "Scan". The base radio sounds a double beep, the Scan Beep, and the radio then repeatedly checks each channel in the scan list. "Scanning" appears on the display.

When receiving a call on a channel being scanned, the base radio will stop scanning to let you hear communications on that channel. After the transmission has ended the base radio will pause before it resumes scanning to allow you time to respond.

When transmitting from the Scan channel, the base radio will go to the last channel on which a signal was received, then transmit. After you release the PTT the base radio will pause to allow time for a response, and then resume scanning.

### Temporary Busy Channel Blocking

If one of the channels in the scan list is very busy you want to temporarily block it out. While the base radio is stopped on the channel to be blocked, press the **P2 BUTTON** until "Scan Block" appears on the display and hold it until scanning resumes. The blocked channel will now be skipped in the scan list.

The blocked channel will be returned to the scan list if "Scan" or "Scan Off" is selected with the **P2 BUTTON**, or the **CHANNEL SELECTOR** button is pressed.

### Last Channel Scanned Alert Tone

When changing channels with the **CHANNEL SELECTOR** button, an alert tone will sound to indicate the last channel that received a message when the radio was scanning. This will identify the channel on which the last message was received, and allow uninterrupted transmission on that channel without the constraints of scanning.

### Last Channel Received

The base radio can be quickly set to the last channel that received a call while scanning. Press and hold the **P2 BUTTON** when "Last Channel" appears on the display. Release the button after the double beep is heard on the speaker.

The radio will stop scanning and go to the channel on which the most recent call was received.

### Priority Scanning (Optional)

The base radio can be optionally programmed for priority scanning. Priority Scan allows you to periodically monitor a Priority Channel, even if the base radio has stopped on another channel. This will prevent missed calls on the primary operating channel when in scan mode.

With Priority Scan enabled:

- The radio checks the Priority Channel every two seconds to check for activity. This time is programmable and can be set for 1 - 8 seconds.
- The base radio can be programmed to transmit only on the Priority Channel when scanning.
- The base radio can be programmed to sound a Priority Channel Beep whenever the base radio receives on the Priority Channel when scanning.

See your Ritron dealer or contact Ritron directly for PC programming of this option.

**RECEIVE – ANALOG CHANNELS**

The radio can only receive broadcasts while the Push-To-Talk button is not being pressed. Whether or not you hear these broadcasts depends upon the squelch settings.

There are three standard squelch modes that can be used when on an Analog channel!

<b>Carrier Squelch</b>	Lets you hear all broadcasts on your channel strong enough for the radio to detect, and silences noise.
<b>Tone Squelch</b>	Uses the QC or DQC “tone squelch” format available on the base radio to screen unwanted calls.
<b>Paging Decode</b>	2-Tone, DTMF or Selcall can be used in conjunction with either carrier or tone squelch to block out all calls except those sent specifically to your radio. When the unique paging decode sequence programmed into the radio is decoded, the radio will emit a series of ring tones similar to a telephone.

C H A N	1			
B u s y				A

When receiving a signal with Carrier or Tone Squelch - The display will indicate the Channel Name and “Busy” will appear on the 2<sup>nd</sup> line. The incoming signal will be heard on the radio speaker.

C H A N	1			
C a l l				A

When receiving a signal with a Paging Code - When the base radio decodes an incoming Paging signal it will emit a “ring” tone similar to a telephone, the display will indicate the Channel Name, and “Call” will appear on the 2<sup>nd</sup> line. The incoming signal will be heard on the radio speaker.

C H A N	1			
B u s y				A

When a received signal is present that does not carry the correct QC/DQC and/or Paging Code - The display will indicate the Channel Name and “Busy” will appear on the 2<sup>nd</sup> line. The incoming signal will not be heard on the radio speaker.

To override QC/DQC and/or Paging Decode and hear all received signals – If the P2 button has been programmed for Monitor, the base radio can be set to receive all signals, regardless of QC/DQC and/or Paging Code.

M o n i t o r				
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- Press and hold the **P2 BUTTON** when “Monitor” appears on the display. Release the button after the double beep is heard on the speaker.

C H A N	1			
M o n				A

- The display will indicate the Channel Name and “Mon” will appear on the 2<sup>nd</sup> line. All activity on the channel’s radio frequency will be heard on the radio speaker.

If you are unable to activate the Monitor function, the channel has been programmed for Monitor Lockout.

M o n i t o r				
O f f				

- To disable the Monitor function, press and hold the **P2 BUTTON** when “Monitor Off” appears on the display. Release the button after the double beep is heard on the speaker.

**TRANSMIT – ANALOG CHANNELS**

C H A N	1			
B u s y				A

- Normally, you should monitor the channel before transmitting and talk only when the channel is clear. If “Busy” appears on the 2<sup>nd</sup> line of the radio display the radio channel is in use and you should not transmit until the channel is clear.

- To transmit - hold down the Push-To-Talk button and, with the radio at least 6 inches away, talk into the microphone. Speak in a normal tone, since talking louder will not improve the listener’s reception.

C H A N	1			
T X				A

- The display will indicate the Channel Name and “TX” will appear on the 2<sup>nd</sup> line.
- Keep talk times as short and infrequent as possible to allow others to use the channel.
- Transmitter Time Out - If you hold down the PTT button longer than 60 seconds a low tone followed by a higher-pitched tone will sound on the radio speaker and the transmitter automatically shuts off. Release the PTT button to resume normal operation.

**QC AND DQC TONE CODES – ANALOG CHANNELS**

Tone codes filter out static, noise and reduce unwanted “chatter” on radio channels. When you operate on a frequency with a tone code, you screen out most interference. This allows you to communicate with less interference and to hear only those users in your radio group.

**IMPORTANT!** All radios in the talk group must operate on the same frequency and tone code.

## PAGING DECODE OPERATION – ANALOG CHANNELS

To use Paging Decode an analog base radio channel must be programmed for 2-Tone, DTMF or Selcall Paging Decode. The radio does not operate with Paging Decode as it is received from the factory.

To activate Paging Decode you must first select an analog radio channel that has been programmed for Paging Decode. The factory default setting will automatically activate Paging Decode any time the Paging Decode channel is selected.

C	H	A	N	1		
C	a	l	l			A

- When the base radio decodes an incoming Paging signal it will emit a “Ring” tone similar to a telephone.
- The display will show “Call” to indicate that a call has been received.
- You can now proceed with normal two-way communication until the Paging Decode feature has been reset.
- If the Call is not answered the radio will emit a short reminder “Ring” tone once every minute.
- The “Ring” tone will sound every time a Paging signal is decoded.

P	a	g	i	n	g	
R	e	s	e	t		

- To reset Paging Decode – After a Paging Code has been successfully decoded it will not be required for subsequent received signals until it has been reset.
- Paging Reset can be done by programming a timed automatic reset, or by resetting with the P2 Button.
- Press and Hold the P2 Button when “Paging Reset” appears on the display. Release the button after the double beep is heard on the speaker.

An Analog Paging Decode channel can be programmed to:

- Decode 2-Tone, DTMF or Selcall.
- Emit a “Ring” tone on the speaker whenever a Paging signal is decoded.
- Require correct QC/DQC subtone for Paging Decode.
- Automatically set Paging Decode mode whenever the channel is selected.
- Automatically reset if a Paging Decode is not answered within 15 seconds.
- Send a transpond tone back to the transmitting station to confirm that the Paging signal has been received.
- Decode an All Call page.
- Decode a Group Call page (If set for 2-Tone paging, Group Call is when the first tone is sent for an extended period of time).
- Disable the reminder “Ring” tone.

## P1 OPERATION – ANALOG CHANNELS

The P1 button is used to select Analog Contacts that can be transmitted to selectively signal other radios or radio operated devices. The RBS-477DMR radio can be programmed with 10 2-Tone, DTMF or Selcall Analog Contacts. Any number of the 10 Analog contacts can be assigned to the P1 button on a per-channel basis.

C	o	n	t	1		
						A

- Press and release the **P1 BUTTON** until the desired Analog Contact appears on the display.
- With the Analog Contact name showing on the display, press the **PTT** button and the radio transmits the selected Analog Contact code.
- If you continue to hold the **PTT** button down, the transmitter will remain active and voice communications can be made after the Analog Contact code has been sent.
- The Analog Contact code will be heard on the radio speaker as it is being sent.
- Sending the Analog Contact code is a one-time occurrence, to resend an Analog Contact code it must again be selected with the **P1 BUTTON**.
- This feature is only available on Analog channels.

**DMR CHANNEL OVERVIEW**

All communication between any two DMR digital radios will include the following four codes:

<b>Color Code</b>	A Color Code from 0 to 15. Color Codes work much like QC/DQC codes in Analog mode, and are often used in conjunction with an Individual ID or Group ID code to screen calls when receiving, and to uniquely identify the radio when transmitting.
<b>SUID</b>	The Subscriber Unit ID Code (from 1 to 16,776,415) is the unique Individual ID of the radio. When an incoming message type is Individual and matches the radio SUID, the message will be received.
<b>Group ID</b>	A Group ID code (from 1 to 16,776,415) determines which call-groups the receiver belongs to. The radio can be programmed to receive up to 48 different Group ID codes on any DMR channel. Group ID codes are stored in the radio as DMR Contacts where an 8-character name can be assigned. The DMR Contact name will appear on the display when the Group ID is received.
<b>Call Type</b>	Call types are Group, Individual or All Call. <ul style="list-style-type: none"> <li>• With a Group call type the radio will transmit and receive Group ID codes that match those programmed into the selected radio channel.</li> <li>• With an Individual call type the radio will transmit a call that match the SUID of the individual radio you intend to contact.</li> <li>• With All Call type the radio receives any Group call, regardless of radio programming.</li> </ul>

**RECEIVE – DMR CHANNELS**

The radio can only receive broadcasts while the Push-To-Talk button is not being pressed. To hear incoming calls the Color Code AND Group Call code, Individual ID code, or the All Call code must match the RX Contacts programmed into the radio channel.

C	H	A	N	1					
									D

When the radio is in standby mode with no incoming signal

- The display will indicate the Channel Name.

C	H	A	N	1					
C	o	n	t	1					

When receiving a valid DMR call with an ID code contained in the DMR RX Contacts list

- The DMR Channel Name will appear on the 1<sup>st</sup> line of the display.
- The Incoming DMR Contact Name will appear on the 2<sup>nd</sup> line of the display.
- The incoming signal will be heard on the radio speaker.
- When the incoming signal has ended the display will continue to show the DMR Contact for the programmed DMR Hold Time to allow a response to the call.

C	H	A	N	1					
1	2	3	4	5	6	7	8		

When receiving a valid Individual DMR call with an ID code not contained in the DMR RX Contacts list

- The DMR Channel Name will appear on the 1<sup>st</sup> line of the display.
- The Incoming DMR Individual SUID code will appear on the 2<sup>nd</sup> line of the display. In this example the caller's SUID is 12345678.
- The incoming signal will be heard on the radio speaker.
- When the incoming signal has ended the display will continue to show the DMR Individual SUID code for the programmed DMR Hold Time to allow an Individual response to the call.

C	H	A	N	1					
B	u	s	y						D

When a received signal is present that does not match channel programming

- The display will indicate the Channel Name and "Busy" will appear on the 2<sup>nd</sup> line.
- The incoming signal will not be heard on the radio speaker.

**TRANSMIT – DMR CHANNELS**

C	H	A	N	1		
B	u	s	y			D

Normally, you should monitor the channel before transmitting and talk only when the channel is clear. If “Busy” appears on the 2<sup>nd</sup> line of the display the radio channel is in use and you should not transmit.

To transmit

C	H	A	N	1		
T	X					D

- Hold down the Push-To-Talk button and, with the radio at least 6 inches away, talk into the microphone. Speak in a normal tone, since talking louder will not improve the listener’s reception.
- The radio will transmit the Primary TX Contact code programmed into the channel. This will normally be a Group call type contained in the DMR Contacts list.
- When transmitting the DMR Channel Name will appear on the 1<sup>st</sup> line of the display and TX will appear on the 2<sup>nd</sup> line.
- Keep talk times as short and infrequent as possible to allow others to use the channel.

**P1 BUTTON – DMR CHANNELS**

The P1 button is used to select DMR Contacts that can be used to communicate with other radio talk groups, or with an individual user. The RBS-477DMR radio can be programmed with 48 Individual or Group Contacts. Any number of the 48 Analog contacts can be assigned to the P1 button on a per-channel basis.

C	H	A	N	1		
C	o	n	t	1		D

- Press and release the **P1 BUTTON** until the desired DMR Contact appears on the 2<sup>nd</sup> line of the display.
- With the DMR Contact name showing on the 2<sup>nd</sup> line of the display, press the **PTT** button and the radio transmits with the selected DMR Contact code.
- This feature is only available on DMR channels.

General	RBS-477DMR
Frequency Range	450-470 MHz
Channel Steps	3.125 kHz
Frequency Stability	+/- 1.5 ppm
FCC ID	AIERIT50-477DMR
Industry Canada ID	1084A-RIT50477DMR
Channels	20 Channels (Analog, DMR or Mixed Mode)
DMR Contacts Capacity	48 Contacts / 20 RX groups / 48 Contacts per RX Group
DMR Signaling	16 Color Codes / Individual ID / Group ID
Analog Contacts	10 (2-Tone, DTMF, Selcall)
Analog Signaling	CTCSS (Quiet Call), Digital Coded Squelch (Digital Quiet Call), DTMF (3-9 digits), Selcall (3-9 Digits), 2-Tone (300-1500 Hz)
Channel Spacing	12.5 kHz (Analog or DMR)
Operating Voltage	+12 VDC
Operating Temperature	-30°C to +60°C
Environmental	Indoor use only
Size	5.598"H (14.2 cm) x 3.786"W (9.6 cm) x 1.387"D (3.5 cm)
Weight	1.41 lb. (with AFB-1545 antenna)
LCD Display, Backlit	2 Line, 16 Character, Alpha Numeric (front panel)
Controls	6 front panel push buttons – PTT, On/Volume Up, Volume Down/Off, Channel, 2 programmable Function buttons (P1/P2)
Programming Connector	USB Mini-B (bottom panel access)
External Audio Accessory Connectors	3.5mm speaker / 2.5mm microphone (end panel access)
DC Power Connector	2.1mm coaxial DC Jack (size M) (rear panel connection)
Antenna Connector	50Ω BNC (rear panel connection)
Antenna	AFB-1545 dual-band (150-170 MHz, 450-470 MHz)
Ritron PC Programmer	RBS-DMR-PCPS

Receiver	RBS-477DMR
Sensitivity (12dB SINAD)	≤ 0.2μV (-121 dBm)
Digital Sensitivity	≤ 0.28μV (-118 dBm)
Adjacent Channel Rejection	-65 dB @ 12.5 kHz
Intermodulation Rejection	63 dB
Conducted Spurious Emission	< 10 μV
Spurious Rejection	> 70 dB
Blocking	88.5 dB
Hum & Noise	40.5 dB
Audio Distortion	4.5 %
Audio Power Output	1W / 8Ω
Channel Scan Rate	120mS per channel
Analog Squelch	Set for 11-14 dB SINAD, Adjustable -126 to -116 dBm

Transmitter	RBS-477DMR
Power Output	2.5W
Analog FM Modulation	11K0F3E (analog)
Hum & Noise Ratio	< 34dB
Spurious Emission	-20 dBm or less
4FSK Digital Modulation	7K60FXD (2 Slot DMR TDMA Data) 7K60FXE (2 Slot DMR TDMA Voice) 7K60FXW (2 Slot DMR TDMA Data & Voice)
Audio Distortion	< 1.4%
DMR FSK Error Rate	< 2.5%

RPS-1B Power Supply	RBS-477DMR
RPS-1B Physical Dimensions	2.89"L (73.5 mm) x 1.38"W (35 mm) x 2.48"H (63 mm)
RPS-1B Weight	3.5 oz (99 g)
RPS-1B Mounting	Wall-mounted via 120 VAC plug
RPS-1B Connector	2.1mm coaxial DC plug molded to wire, center conductor = positive
RPS-1B Environmental	Indoor use only
RPS-1B Input Voltage	120 VAC, 60 Hz typical (90-264 VAC rated)
RPS-1B Output Voltage	12 VDC, 1.5A

General Features	Default	Description
Turn On Volume	3	The radio can be set for a 0-10 volume level whenever the radio is turned on, otherwise the radio will turn on at the minimum volume level.
Fixed Beep Volume	3	Set the volume of all radio alert beeps to a constant volume level of 0-10, regardless of volume control setting.
Fixed Sidetone Volume	3	Set the sidetone volume to a constant volume level of 0-10, regardless of volume control setting.
Call Tone	Low level 1.5 seconds	A transmitted Call Tone level can be set for low or high, with a duration of 0.5 - 8 seconds.
Power On to Channel 1	Off	The radio will always turn on to Channel 1, otherwise the radio turns on to the channel that was selected when you last turned the radio off.
Always On	Off	The radio can be set to automatically turn-on any time power is applied to the radio.
TX Timeout	60 seconds	A value between 1-255 seconds limits the time the radio can continuously transmit.
DMR Callback Time	10 Seconds	When the base radio receives a valid call on a DMR channel, a 0-30 second DMR Callback Time allows the radio to transmit a return call to the calling Group or Individual. After the DMR Callback Time has expired the radio will transmit on the DMR Channel's Primary TX Contact.
P1 Button	None	The P1 Button is programmed on a per-channel basis for DMR or Analog Contacts, depending on the channel type. On a DMR channel this allows the radio to initiate a call to any number of Group or Individual IDs from the DMR Contacts list.
DMR Contacts	Group 1001 All Call	The radio can be programmed with up to 48 Group or Individual ID Contacts that can be used on any DMR channel. Each DMR Contact can be assigned an 8-character name that will appear on the LCD display when in use.
Analog Contacts	None	The radio can be programmed with up to 10 Analog Contacts that can be used on any Analog channel. Each Analog Contact can be assigned an 8-character name that will appear on the LCD display when in use. Analog Contacts can be DTMF, Selcall or 2-Tone.
P2 Button	Scan Send Call Tone Analog Decode Reset	The P2 Button can be used to initiate a number of features that include Scan, Monitor, Last Channel, Paging Reset, and more. Refer to the P2 Button section of this manual for details.

Channel Features	Default	Description
Channel Name	Chan 1	Each channel can be programmed with a unique 8-character name that appears on the top line of the LCD display when the channel is selected.
TX Beep	Off	The radio will emit a beep when the transmitter is first activated to indicate that is ready for broadcast.
Busy Channel TX Inhibit	Off	The radio is unable to transmit on the channel when a signal is present on the receiver.
RX Beep	Off	The radio will emit a beep each time the radio stops receiving a signal, indicating that the channel is clear to transmit.
Scan Resume Delay	On	When operating on the Scan Channel, if this option is not set the radio will resume scanning immediately after a received signal on this channel goes away.
Monitor Lockout	Off	The radio will not allow the user to monitor the channel, it will only receive signals with the correct QC or DQC code.
Squelch	2	Squelch can be set between 0 and 7 to adjust the receiver carrier squelch setting. A number 0 will set the squelch sensitivity to < .25 $\mu$ V and allow weak, distant signal to be received. A number 7 will set the squelch sensitivity to > 1 $\mu$ V and will block out all but strong, near range signals.
CTCSS/DCS	44 (None)	<b>Analog Only</b> - Select from 52 QC codes (CTCSS) or 103 DQC codes (DCS)
ANI on PTT	None	<b>Analog Only</b> - A DTMF or Selcall encode string can be transmitted each time the radio PTT button is pressed.
2-Tone, DTMF and Selcall Decode	None	<b>Analog Only</b> - The radio can be programmed for 2-Tone, DTMF and Selcall Decode to screen incoming calls for the correct code.
Color Code	10	<b>DMR Only</b> – The Color Code can be set from 0 to 15. The Color Code can be different for transmit and receive.
TX Contact	1001	<b>DMR Only</b> – A DMR channel is set to transmit on one of the 48 DMR Contacts.
RX Group List	1001 All Call	<b>DMR Only</b> – A DMR channel is set to receive any number of Group contacts from the 48 DMR Contacts.
Repeater Mode	Off	<b>DMR Only</b> – When On the repeater time slot and Address can be programmed.
Slot	Slot 1	<b>DMR Only</b> – Sets the TX slot for TDMA Direct Mode.
TDMA Direct Mode	TDMA Off	<b>DMR Only</b> – Sets the radio for TDMA Direct operation.

Analog Paging Decode	Default	Description
2-Tone, DTMF or Selcall Decode	None	The radio can be programmed for 2-Tone, DTMF and Selcall Decode to screen incoming calls for the correct code.
All Call	Off	Can be set to decode an All Call code
Auto Reset	Off	The radio will be set to Paging Decode mode after a period of inactivity greater than the Decode Reset Time.
Group Call	Off	Can be set to decode a Group Call code.
Monitor Trip	Off	The radio will automatically go into carrier squelch mode any time a 2-Tone, DTMF or Selcall code is successfully decoded, and will remain there until the Reset Timer has reset the decoder.
Squelch On Select	On	The radio will be set to Paging Decode mode any time the channel is selected.
Transpond	Off	The radio will transmit a transpond tone after the 2-tone, DTMF or Selcall code has been successfully decoded to let the user sending the code know that it has been received.
Decode with Subtone	Off	The radio cannot decode the 2-Tone, DTMF or Selcall code unless the correct QC or DQC subtone is also decoded. If not checked 2-tone, DTMF or Selcall is decoded regardless of subtone.
Ring Tone	On	A ringing tone will be heard on the radio speaker any time the 2-tone, DTMF or Selcall code has been successfully decoded.
Automatic Reset Time	10 seconds	Sets the length of time the radio can go with no activity before Auto Reset places it into Paging Decode mode. If Monitor Trip is set, the radio will only remain in Monitor mode for the Reset Time if the page is not answered.



## FCC LICENSING

The FCC requires the owners of radios operating on Part 90 frequencies to obtain a station license before using them.

The station licensee is responsible for ensuring that transmitter power, frequency and deviation are within the limits specified by the station license. The station licensee is also responsible for proper operation and maintenance of the radio equipment. This includes checking the transmitter frequency and deviation periodically, using appropriate methods.

To get an FCC license for VHF or UHF frequencies, submit FCC application Form 601. Your Ritron dealer can help you with this process.

## HOW TO OBTAIN AN FCC RADIO LICENSE

Because your Ritron radio operates on Private Land Mobile frequencies, it is subject to the Rules and Regulations of the FCC, which requires all operators of these frequencies to obtain a station license before operating their equipment. Make application for your FCC license on FCC Forms 601, Schedules D and H, and Fee Remittance Form 159.

To have forms and instructions faxed to you by the FCC, call the FCC Fax-On-Demand system at **202-418-0177** from your fax machine; request Document numbers 3000159, 3060001, 3060003, and 3060006.

To have Document numbers 3000159, 3060001, 3060003, and 3060006 mailed to you, call the FCC Forms Hotline at **800-418-FORM (800-418-3676)**.

For help with questions concerning the license application, contact the FCC at **888-CALL-FCC (888-225-5322)** or log on at [www.fcc.gov](http://www.fcc.gov)

You must decide which radio frequency(ies) you can operate on before filling out your application.

For help determining your frequencies, call Ritron at **800-USA-1-USA (800-872-1872)**.

## INDUSTRY CANADA REGULATIONS

Industry Canada requires the owners of the radios to obtain a radio license before using them.

Application forms can be obtained from the nearest Industry Canada District office.

1. Fill in the items per the instructions. If you need additional space for any item, use the reverse side of the application.
2. Use a typewriter or print legibly.
3. Make a copy for your files.
4. Prepare a check or money order to "Receiver General for Canada", for the amount listed at <http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf01027.html>. (Licenses are renewed annually on April 1st. Refer to the calculation for application fees for each month.)
5. Mail the completed application, along with your check or money order, to the closest Industry Canada District Office.

Notes: Fees are subject to change without notice.

## SAFETY STANDARDS

The FCC (with its action in General Docket 79-144, March 13, 1985) has adopted a safety standard for human exposure to radio frequency electromagnetic energy emitted by FCC regulated equipment. Ritron observes these guidelines and recommends that you do also:

- DO NOT hold the radio so that the antenna is very close to or touching exposed parts of the body, especially the face or eyes, while transmitting. Keep the radio vertical, eight inches away while talking into the front panel.
- DO NOT press the Push-To-Talk except when you intend to transmit.
- DO NOT operate radio equipment near electrical blasting caps or in an explosive atmosphere.
- DO NOT allow children to play with any radio equipment that contains a transmitting device.
- Repair of Ritron products should be performed only by Ritron authorized personnel.

## SERVICE

Federal law prohibits you from making any internal adjustments to the transmitter, and / or from changing transmit frequencies unless you are specifically designated by the licensee.

If your radio equipment fails to operate properly, or you wish to have the radio programmed, contact your local authorized dealer or Ritron.

U.S. Manufacturer:

RITRON, INC. - Repair Department

505 West Carmel Drive,

Carmel, Indiana 46032 USA

Phone: 317-846-1201

FAX: 317-846-4978

Email: [customer\\_service@ritron.com](mailto:customer_service@ritron.com)

**RITRON, INC. LIMITED WARRANTY****WHAT THIS WARRANTY COVERS:**

RITRON, INC. ("RITRON") provides the following warranty against defects in materials and/or workmanship in **RITRON Radios and Accessories** under normal use and service during the applicable warranty period (as stated below). "Accessories" means antennas, holsters, chargers, earphones, speaker/microphones and items contained in the programming and programming/service kits.

<u>WHAT IS COVERED</u>	<u>FOR HOW LONG</u>	<u>WHAT RITRON WILL DO</u>
Base Radio	1 year*	During the first year after date of purchase, RITRON will repair or replace the defective product, at RITRON's option, parts and labor included at no charge.
Accessories	90 days*	*After date of purchase

**WHAT THIS WARRANTY DOES NOT COVER:**

- Any technical information provided with the covered product or any other RITRON products;
- Installation, maintenance or service of the product, unless this is covered by a separate written agreement with RITRON;
- Any products not furnished by RITRON which are attached or used with the covered product, or defects or damage from the use of the covered product with equipment that is not covered (such as defects or damage from the charging or use of batteries other than with covered product);
- Defects or damage, including broken antennas, resulting from:
  - misuse, abuse, improper maintenance, alteration, modification, neglect, accident or act of God,
  - the use of covered products other than in normal and customary manner or,
  - improper testing or installation;
- Defects or damages from unauthorized disassembly, repair or modification, or where unauthorized disassembly, repair or modification prevents inspection and testing necessary to validate warranty claims;
- Defects or damages in which the serial number has been removed, altered or defaced.
- Batteries if any of the seals are not intact.

**IMPORTANT:** This warranty sets forth the full extent of RITRON's express responsibilities regarding the covered products, and is given in lieu of all other express warranties. What RITRON has agreed to do above is your sole and exclusive remedy. No person is authorized to make any other warranty to you on behalf of RITRON. Warranties implied by state law, such as implied warranties of merchantability and fitness for a particular purpose, are limited to the duration of this limited warranty as it applies to the covered product. Incidental and consequential damages are not recoverable under this warranty (this includes loss of use or time, inconvenience, business interruption, commercial loss, lost profits or savings). Some states do not allow the exclusion or limitation of incidental or consequential damages, or limitation on how long an implied warranty lasts, so the above limitations or exclusions may not apply to you. Because each covered product system is unique, RITRON disclaims liability for range, coverage, or operation of the system as a whole under this warranty.

**WHO IS COVERED BY THIS WARRANTY:** This warranty is given only to the purchaser or lessee of covered products when acquired for use, not resale. This warranty is not assignable or transferable.

**HOW TO GET WARRANTY SERVICE:** To receive warranty service, you must deliver or send the defective product, delivery costs and insurance prepaid, within the applicable warranty period, to **RITRON, INC., 505 West Carmel Drive, Carmel, Indiana 46032, Attention: Warranty Department**. Please point out the nature of the defect in as much detail as you can. You must retain your sales or lease receipt (or other written evidence of the date of purchase) and deliver it along with the product. If RITRON chooses to repair or replace a defective product, RITRON may replace the product or any part or component with reconditioned product, parts or components. Replacements are covered for the balance of the original applicable warranty period. All replaced covered products, parts or components become RITRON's property.

**RIGHTS TO SOFTWARE RETAINED :** Title and all rights or licenses to patents, copyrights, trademarks and trade secrets in any RITRON software contained in covered products are and shall remain in RITRON. RITRON nevertheless grants you a limited non-exclusive, transferable right to use the RITRON software only in conjunction with covered products. No other license or right to the RITRON software is granted or permitted.

**YOUR RIGHTS UNDER STATE LAW:** This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

**WHERE THIS WARRANTY IS VALID:** This warranty is valid only within the United States, the District of Columbia and Puerto Rico.