

ComLink BCR-40U/50V/220 Owner's Manual



By BridgeCom Systems, Inc.

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CHAPTER 1: INTRODUCTION

Welcome

Thank you for purchasing the ComLink BCR REPEATER FM Repeater System. As part of the ComLink series, the BCR REPEATER has been developed to provide many of the features you, the communications user, have requested. The BCR REPEATER gives you a feature rich scalable repeater platform to grow as your system needs grow. The BCR REPEATER integrates the RF power of a dual fan-cooled 40-watt repeater with a high capacity 'tone panel' and a 16 channel base station. The BCR REPEATER also provides a D-SUB 25pin accessory connector allowing for ease in interfacing your favorite external peripheral such as a Tone/DC Remote, Telephone Interconnect, SCADA, or Telemetry fixture. We would also like to say The BCR REPEATER repeater is 100% LTR compatible and can be used with your favorite LTR trunking controller. This means the BCR REPEATER provides DC access from the receiver to the controller and from the controller all the way to the RF transmitter without causing sub-audible signal degradation.

Features

- **High Performance Specs:** Temperature Compensation Oscillator (TCXO) ensures frequency stability and accuracy during ambient temperature changes.
- **Modular Design:** The modular design of the BCR-40U/50V allows for ease and quick replacement of the internal electronics at the site.
- **Rack style design:** The galvanized steel chassis construction provides for a Heavy Duty housing that can be mounted in a standard 19" rack or desktop configuration taking up 3.5" of rack space. Standard equipped rack handles provide for ease during 19" rack installation.
- **Internal duplexer (optional):** The design of the BCR-40U/50V's chassis allows for an internal duplexer to be installed.
- **Front panel display and controls:** The front panel of the BCR-40U/50V includes a LCD display and four LED status indicators. Front panel controls include a four-button keypad, speaker volume control knob, and select control knob.
- **Windows-based programmer:** The BCR-40U/50V can be setup and maintained using the optional BCR programming software. Programming is simple and easy – the ACC-8025 cable connects your PC to the BCR-40U/50V, no other interface modules are needed.
- **Signaling capability:** Built-in High capacity 'tone panel' that supports up to 24 users per channel with 38 CTCSS tones and 83 DCS codes available per channel. Cross tone/code encoding is available as well.
- **Battery Backup:** The BCR-40U/50V/220 can be powered from a 12V battery and also provides a charging circuit for maintenance free operation.
- **External Speaker Out:** Operate a high-powered external speaker by turning it on from the front panel.
- **Built In Channel ID update:** Sends station ID in programmable intervals. Select Morse send rate of 10-25 WPM.
- **Integrated High-Efficiency Power Supply:** The BCR REPEATER includes an internal 150W power supply with MosFet-based switch-mode technology for high reliability, high efficiency and minimum size and weight. It also provides 13.8V output for powering external controllers, thus saving valuable site resources.
- **Dual Cooling Fans:** The BCR REPEATER incorporates two cooling fans that can be programmed for continuous operation or transmit only.
- **Variable channel spacing:** Each channel can be individually programmed to use 12.5 kHz or 25 kHz spacing making the BCR-40U/50V useful for years to come.
- **Remote Programming via DTMF tones:** In order to save a time consuming trip to the site, the BCR-40U/50V provides for remote programming and maintenance.
- **Accessory Connector and AUX Feature:** The internal controller can be disabled and the repeater placed in an auxiliary mode where it can be used as a slave to an external controller.
- **Air-Time Logging:** The BCR-40U/50V automatically logs cumulative airtime on a per use basis. The airtime is recorded in minutes and seconds and is accumulated on per second basis. The air-time data is then retrieved using the BCR programming software.

This Owner's Manual will acquaint you with the features and specifications of the BCR-40U/50V/220. Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, please note that one of the many features of the BCR-40U/50V/220 includes upgradable firmware. Firmware upgrades may modify existing features and/or introduce new features not available at the time of this manual's publication. Please read the accompanying documentation with any firmware upgrade for any changes to this manual's content.

CHAPTER 2: SPECIFICATIONS

General	<u>BCR-40UA / BCR-40UB</u>	<u>BCR-50V</u>	<u>BCR-220</u>
Number of Channels:	16		
Operating Voltage:	11 V DC Min / 13.8 V DC Nominal / 15 V DC Max		
Channel Spacing:	25kHz/12.5kHz	20 kHz/12.5 kHz	
Rated Current Drain:	11.2A Max		
Weight:	18 lbs.		
Weight w/ duplexer:	20 lbs.	N/A	
Frequency Range:	400-470 MHz / 450-520 MHz	136-174 MHz	222.0 – 224.995 MHz
Dimensions (W x H x D):	19.0" x 3.5" x 13.5"		
Frequency Stability:	+/- 1.5 ppm		
Operating Temperature:	-22° F to +140° F (-30° C to +60° C)		
RECEIVER			
Local Oscillator:	Low-side injection		
Sensitivity	0.25 μ V 12dB SINAD 0.22 μ V 10dB SINAD		
Squelch Threshold:	Open 12dB SINAD/Close 8dB SINAD		
Selectivity:	65dB @ 12.5kHz 70dB @ 25.0kHz		
Spurious Rejection:	70dB		
Intermod Rejection:	72dB @ 12.5kHz 72dB @ 25.0kHz		
Antenna Connector:	N-Type		
Antenna Impedance:	50 Ω		
TRANSMITTER			
RF Output (w/o duplexer): Programmable	400-470/ 450-520 0-40W Adjustable	136-174 @ 0- 50W Adjustable	222.0 – 224.995 0-30 W Adjustable
Modulation:	160K0F3E, 11K0F3E		
Maximum Deviation:	+/- 5kHz (25 kHz) +/- 2.5 kHz (12.5 kHz)		
FM Hum and Noise	40dB @ 12.5kHz 45dB @ 25.0kHz		
Antenna Connector:	N-Type		
Antenna Impedance:	50 Ω		

Specifications per EIA standards. In our on-going commitment to quality specifications are subject to change without notice.

CHAPTER 3: INSTALLATION

Upon opening the shipping carton, the following items should be present and undamaged:

- BCR FM Repeater System (UHF, VHF, or 220 Version)
- Detachable AC-line cord
- One strip of four rubber feet
- DC Power cord for battery connection

The BCR repeater is capable of producing HIGH-powered RF signals that require proper termination into a suitable load. It is highly recommended the BCR Repeater be installed by a qualified technician with experience installing FM repeaters and controller equipment.

Installation

The BCR repeater provides 4 slots for installation into a 19" rack or 4 rubber feet for placement in a desktop configuration. If installing the repeater in a 19" rack, use 4 rack screws (not supplied) to securely fasten the repeater's front panel flush with the rack's rails. If placed in a desktop configuration, it is recommended the rubber feet be placed close to the four corners of the bottom of the chassis.

Optional accessories include a base station microphone, internal duplexer, and the BCR Repeater Windows based programmer. Please check with your dealer for more information about these optional accessories.

The BCR repeater is shipped with or without an internal duplexer. If the unit is not equipped with an internal duplexer, there will be an N-type female connector for RX and another for TX located on the rear of the unit. If the unit is shipped with an internal duplexer, there will be one N-type female connector at the TX/Duplexer Out port.

The internal power supply of the BCR Repeater is factory pre-set for 120V AC 60HZ operation to deliver 13.8 Volts. If the repeater did not come with a duplexer installed, connect the received signal to the RX antenna port and connect the TX antenna port's output to where the powered signal is to be transmitted. If the repeater came installed with a duplexer, attach the antenna cable to the duplexer out port on the rear of the unit.

If the unit is to use an external speaker for monitoring received audio a 1/8" mono jack is located on the back of the unit next to the 25-pin accessory connector.

The RJ-45 connector next to the Ext Speaker jack is for USB connection and future expansion.

Power Up

To power the unit, simply plug the detachable AC-line cord into the receptacle located on the back of the unit and then plug it into an AC line source. Pressing the power switch to the up position turns on the unit. The display will illuminate indicating the unit is on. The BCR repeater will cycle through a power-up sequence illuminating the LCD and the LED's. The model name will be displayed for approximately two seconds followed by the version of firmware. If the unit was ordered without being custom programmed, the default personality will be loaded and HIGH POWER will be displayed for approximately 2 seconds and then dashed lines. If the unit was ordered custom programmed, the name given to the first channel will be displayed instead of HIGH POWER. If the unit was ordered without being custom-programmed, you will have to purchase the BCR repeater programmer to customize the unit to your frequency license. Keep this in mind prior to attaching the repeater to a service monitor. Depending on your test equipment, you may need to reduce the output power or pad the TX output so as not to damage your test equipment.

CHAPTER 4: OPERATION

Operating Modes

The BCR Repeater has four different modes of operation: repeater mode, base station mode, and auxiliary(AUX) mode. By default, the unit operates in repeater mode unless you explicitly change modes. This chapter will give you a brief overview of each of the modes. The individual modes are covered in detail in the chapters that follow. Also in each of the various operating modes an external peripheral can be connected to the accessory connector located on the rear of the unit. Through programming, the external peripheral can be made to work in conjunction with the repeater. The BCR repeater will 'remember' the mode it was in prior to power down. When powered back up, the unit will revert to the previous mode.

Repeater Mode: The BCR repeater is a full-featured community repeater with programmable settings for channel spacing, TX Timeout, and CW-ID broadcasting preferences. In repeater mode, the BCR Repeater will listen for calls from any user that belongs to the currently selected channel. If it detects a CTCSS tone or DCS code of a valid user, it will repeat the call with the appropriate CTCSS/DCS encoding. While in repeater mode, the BCR Repeater can also be remotely programmed using a two-way radio capable of generating DTMF tones. For more information on repeater mode, see "Chapter 5: Repeater Mode". For more information on remote programming, see "Chapter 8: Remote Programming".

If an external peripheral such as a phone patch is used in conjunction with repeater Mode, the external peripheral will gain control of the transmitter upon engaging the external PTT line. When the external PTT line is engaged, the circuit is designed to break the connection between the RX Module and the TX Module so that the external peripheral has control. **The transmit options of the user in Slot 1 will be utilized.** If necessary, the repeater supports a programmable COS output on pin 17 to be interfaced with the peripheral.

Base Station Mode: The BCR repeater is a full-featured base station. By attaching an optional microphone, the BCR Repeater can communicate as any user on the selected channel. For more information, see "Chapter 6: Base Station Mode." If an external peripheral such as a DC Remote is used in base mode the **transmit options of the user in Slot 1 will be utilized when the external PTT line is engaged.**

Auxiliary Mode: AUX mode can serve many purposes. Placing the BCR repeater in AUX mode disables the internal controller and allows for the unit to be **totally controlled** by an external peripheral. For more information, see "Chapter 7: Auxiliary Mode".

Channel and User Database

You may program up to 16 channels for the BCR repeater to use. At any time, only one channel is active. You can select which channel you would like activated by scrolling through the list of channels using the SELECT knob on the unit's front panel. Each of the 16 channels has unique settings for broadcast ID, broadcast interval, Morse code rate, receiver frequency, transmitter frequency, channel spacing, power, and TX Timeout time. Each channel can support up to 24 users. Each user has unique settings for user name, status, RX signaling, TX signaling, courtesy tone, TX hold time, and tone-in-tail. In addition, base station settings are determined on a per channel basis and utilize the operating parameters programmed on a per user basis. Each user is assigned a particular slot within the channel. User slots are numbered sequentially from 0 to 23. Slot 0 is the System Operator, which is the only user with remote programming privileges. The remaining slots (1 through 23) are for common users, and no preference is given to users based on their order within the slots.

CHAPTER 5: REPEATER MODE

Overview

In repeater mode, each of the BCR Repeater's 16 channels is capable of supporting 24 individual users. Each user may have one of 38 possible CTCSS tones or one of 83 possible DCS codes as well as inversions. While in repeater mode, the unit can be placed in remote programming mode. This allows for the selected channel's properties and user database to be changed using transmitted DTMF tone command sequences.

Operation

To place the repeater on a programmed channel, simply rotate the SELECT knob on the front panel. This will cycle through the possible channels displaying the channel name for approximately one second. The LCD will then revert to displaying dashed lines. At this point the BCR repeater is in an idle state waiting to validate and repeat incoming calls. Upon receipt of carrier, the yellow RX LED will illuminate. When a valid user's signaling is decoded, the green VALID LED will illuminate and the user's name will be displayed on the LCD. The transmitter will then power up and repeat the call. The red TX LED will illuminate and the cooling fans will engage. When the call expires, the green VALID LED will go off and if carrier is no longer present, the yellow RX LED will go off as well. The Transmitter may remain keyed for a programmed hang time. When done transmitting, the red TX LED will go off, and the cooling fan may stop depending on programming. At any point in time, the repeater audio traffic may be monitored. Pressing-and-releasing the MON button will sequence through the possible speaker output options. The sequence is thus: Internal Speaker, External Speaker, Both Internal and External, and both off. The NOTE icon will be visible to indicate internal, and the ~ icon will be visible to indicate external.

Channel Settings

Channel and user settings are either pre-programmed by your dealer or by you using the BCR programmer. The following lists all of the channel settings.

Channel Name: The Channel Name is an 16 character name. Legal characters are uppercase letters and numbers. It is also the name that appears in the BCR Repeater's LCD display when that channel is active.

Broadcast ID: The Broadcast ID is an eight-character name consisting of uppercase letters and numbers. The Broadcast ID is transmitted in Morse code at specified intervals to identify the repeater on the air. (10-25 Word Per Minute)

Broadcast Interval: The Broadcast Interval specifies how often the Broadcast ID will be transmitted. It has a range of 0 to 999 minutes. '0' disables this feature and the Broadcast ID will not be transmitted.

Receiver/Transmitter Frequency: You must specify a receive and transmit frequency. 400 to 470 MHz for the BCR-40U, 136 to 174 MHz for the BCR-50V, and 222 to 225 for the BCR-220.

Channel Spacing: Each channel can be programmed for either narrow (12.5kHz) or wide (25kHz) band. This setting is applied to both the transmitter and the receiver.

Power Setting: Each channel can be programmed from 0 Watts to its rated power (40W for the UHF, 50W for the VHF, and 30W for the BCR-220). The TX power is adjusted from the alignment menu. It can also be preset using the BCR Programming software.

COS Setting: The COS (Carrier Operated Switch) output is an open-drain output that functions ACTIVE LOW. It can be made to toggle when carrier is present or when valid signaling is determined.

Cooling FAN Operation: The cooling fans can be made to operate continuously or only during transmit.

CSQ Repeat: Selecting this option will cause the repeater to repeat every instance of valid carrier. The TX options transmitted will be that of those programmed in for Slot 1 of the User Settings.

Tx Timeout: TX Timeout controls how long the BCR Repeater will continuously transmit before the RF Power Amp (RF PA) is automatically shut off. The maximum value of the TX Timeout feature is 999 seconds. To disable the TX Timeout feature, enter 0 in the TX Timeout field.

TX Pre-Emphasis: Checking this box pre-emphasizes the TX Audio.

Courtesy Tone Delay (ms): Once call is over, this delay is started prior to emitting the courtesy tone.

Remote Access Code: The System Operator can remotely manage the BCR Repeater by using DTMF tone sequences. The Remote Access Code is a four-digit number that you specify on a per channel basis. Before making any modifications, the System Operator must enter the Remote Access Code to gain access to the system. All four-digit numbers are valid, except "5555". To disable the Remote Access feature, simply leave the SYSOP Operator slot empty.

User Settings

User ID: The User ID is an eight-character name that will be displayed in the BCR Repeater's LCD while that user's call is being repeated. Legal characters in the User ID include uppercase letters, numbers, dashes, and periods. By default, users are assigned the name "USER" plus a two digit number corresponding to the slot of that user. For example, the user in slot #8 will be assigned the name USER08 by default. The user in slot 0 is assigned the name "SYS-OP" to reflect its special role as the System Operator, but you can change its User ID as well if you prefer.

Status: Each user has a status of "Active" or "Inactive". By default, all users are "Active". If you mark a user as "Inactive", their calls will not be repeated, although all their information will still be retained in the system. This option is useful if you want to suspend the repeater privileges of a user, without deleting that user entirely.

RX/TX Signaling: Each user must be assigned an Rx Signal and a TX Signal. You may specify either a CTCSS tone or a DCS code. If you select a CTCSS tone, you must also specify one of 38 tones ranging from 67.0 to 250.3 Hz. If you select DCS code, you must also specify one of 83 three-digit codes, inverted or non-inverted. The Rx Signal and TX Signal are selected separately. The per user TX signaling setting can also be made to transmit carrier only (CSQ). The BCR Repeater is capable of cross tone/code encoding. For example, if the BCR REPEATER detects that it has received a transmit request with a 179.9 Hz CTCSS tone, it can then repeat the call with a 162.2 Hz CTCSS tone, or even with a DCS code. Cross tone/code encoding can be useful when setting up multiple repeaters at different locations that share the same frequency.

Courtesy Tone: When a user has finished transmitting, the BCR Repeater can emit a courtesy tone. The courtesy tone can be set for 500 Hz, 1000 Hz, 1500 Hz, or no courtesy tone. The duration of the courtesy tone is fixed at 75 milliseconds.

TX Hold Time: After a user has finished transmitting, the repeater can continue to transmit for a programmed amount of hold time. TX Hold Time has a range of 0 to 65,535 ms. However, during remote programming, the max number that can be entered is 9,999 ms. If the user has a courtesy tone, it is recommended that you set the TX Hold Time to be at least 250 ms.

Tone-in-Tail: With Tone-In-Tail enabled, the BCR Repeater will encode the user's CTCSS tone or DCS code during the TX Hold Time.

Error Alerts

PLL Lock Error: The BCR Repeater monitors the status of the PLL/VCO circuitry in both the Receive and Transmit modules. In the event the receiver's PLL is unable to lock due to a hardware failure, the BCR Repeater will display RX PLL ERROR. If the transmitter's PLL circuitry should fail, TX PLL ERROR will be displayed. Upon detecting a PLL error, the BCR Repeater will enter an error state. While in error state, repeater operation will be suspended. The user may try to reprogram the channel by rotating the SELECT knob. In the event the problem is unsolvable, the repeater may require servicing. Please contact your dealer or BridgeCom Systems, Inc. technical support.

CHAPTER 6: BASE STATION MODE

Overview

In addition to its repeater features, the BCR repeater can be operated as a base station. While in base station mode, the system operator is able to communicate with any user on the selected channel.

Operation

To switch from repeater mode to base station mode, simply press and release the BASE button on the front panel. The BASE LED will illuminate. The BASE LED will stay lit during base station operating mode. The first time that base station mode is entered, the unit will default to the user in Slot 1. Any subsequent time that base station mode is entered, the user that was active the last time that the BCR repeater was in base station mode will be selected. The front or external speaker can be turned on and the received audio volume adjusted. **THE RX, VALID, AND TX LEDs ARE DISABLED IN BASE MODE.** However, the LCD display will illuminate the current status of a call. If the unit is receiving, 'RX' will be displayed next to the user name. If the unit is performing a valid decode, 'RX VALID' will be displayed next to the user name. When the microphone is keyed, 'TX!' is displayed next to the user name. When the base station operator initiates a transmission, it will be on the selected users transmit squelch option. Different users on the channel may be selected by rotating the SELECT knob. During Base Station mode, it is permissible to transmit using a deactivated user's tone/code. In order to exit base station mode, simply press the RPTR or AUX button.

Base Station Settings

Remote mode cannot be entered during Base station mode. All selected user receive and transmit options (courtesy tone, hang time, and Tone-in-Tail) are inherited when transmitting to that user.

CHAPTER 7: AUXILIARY MODE

Overview

By entering auxiliary (AUX) mode, the repeater's internal controller is disabled and the BCR-40U/50V may be controlled by an external peripheral. In addition, while in AUX mode enable/disable the speaker settings.

External Controllers

When in AUX mode the BCR REPEATER's internal tone panel is disabled and total control of the repeater is surrendered to an external peripheral such as an LTR controller or another tone panel. Please refer to Appendix A: for the pin-out description of the BCR REPEATER to help you make your custom cable. **When AUX mode is entered, the circuit path is set up to where the DATA or Composite output of the external controller has DC access to the transmitter. The BCR REPEATER requires the DC input of the DATA or Composite output be centered at 1.5 V DC otherwise the external peripheral could cause a DC shift to make the BCR REPEATER transmit off frequency. To help achieve the 1.5 V DC input requirement, the BCR REPEATER incorporates a DC level shifting Trim Pot (P1) on the internal accessory board. Open the unit to access the accessory board. This is the board the accessory connector is on. With your external controller connected, use a DC voltmeter to measure the DC input voltage on TP1. While the controller is sending data, Adjust P1 until 1.5 Volts DC is achieved.**

CHAPTER 8: ALIGNMENT

Overview

The BCR Repeater is designed to operate in a wide range of the RF spectrum and the repeater is factory aligned to work at any frequency within that spectrum. However, because the repeater operates on a single transmit frequency at a time, you will likely want to optimize performance for that frequency. The BCR Repeater is equipped with the ability to fine-tune the repeater's operation at a specific transmit frequency.

If you ordered the BCR Repeater with custom programming, then it should already be aligned to operate at its programmed frequency. If you ordered the BCR Repeater without custom programming, then it is advised that you follow the alignment procedures in this section.

Parameters

During the alignment process, you will have the opportunity to fine-tune all of the listed parameters below. The heading of each bullet is the name of the parameter that you will see in the BCR Repeater's display during the alignment process.

- **SQUELCH:** 1-9 (Approx 0.15 μ V -0.35 μ V)
- **RX VOICE INPUT GAIN:** 0-7 (0, 3.2dB, 6.4dB, 9.6dB, 12.8dB, 16.0dB, 19.2dB, 22.4dB)
- **RX SUB INPUT GAIN:** 0-7 (0, 3.2dB, 6.4dB, 9.6dB, 12.8dB, 16.0dB, 19.2dB, 22.4dB)
- **PHASE REVERSAL DETECT:** ON or OFF
- **RF POWER:** (0-995) – This value is representation of the RF Output Power – 0 being least power and 995 being max power. Keep in mind, this value is an arbitrary value that represents a digital to analog voltage that is applied to the gate of the MOSFET Power Amplifier Module. This values does not represent a specific Wattage.
- **TX VOICE DEV:** (0-7) This parameter controls the TX Voice deviation. 0 being < 40dB, 1-7 adjusts in 2dB increments from -12dB to 0dB.
- **TX VOICE FT DEV** (0-255): Used in conjunction with TX VOICE DEV this parameter allows for the fine-tuning of TX Voice. Once the TX VOICE DEV is set, this value works in tandem by allowing for adjustment from 0 HZ to when soft limiter kicks in.
- **TX SUB DEV:** (0-7) This parameter controls the TX sub-audible tone/code output deviation. 0 being < 40dB, 1-7 in 2dB increments from -12dB to 0dB.
- **TX SUB FT DEV** (0-255): Used in conjunction with TX SUB DEV, this parameter allows for fine-tuning the sub-audible signal deviation. Once the TX SUB DEV is set, this value works in tandem by allowing for adjustment from 0 HZ to when soft limiter kicks in.
- **TX FREQ:** This parameter fine-tines the DC voltage applied to the temperature-controlled crystal oscillator (TCXO). The TCXO is adjusted at the factory to work across the repeater's RF operating range. You can adjust the TX FREQ parameter to fine-tune the TCXO voltage for the selected frequency.
- **STATION ID DEV:** This parameter sets the Station ID CW Tone deviation for Morse code operation. Prior to adjusting the Station ID Deviation, ensure the TX VOICE Deviation is properly tuned.

Alignment Procedure

For this process, a service monitor capable of duplex operation is required and a hand held two-way radio. Follow the steps below:

1) Start the alignment procedure

Once the repeater has powered up select the channel to adjust. Press-and-hold the RPTR button for approximately two seconds. The LCD will display SQUELCH and squelch value below. To cycle through the available alignment parameters, rotate the SELECT knob.

2) Set up the service monitor and adjust SQUELCH

Program the service monitor to generate on the RX frequency at a signal strength ranging from approximately 0.30uV to 0.22uV. To adjust the squelch, press-and-release the SELECT knob. Rotate the SELECT knob until RX light goes out. When comfortable with the setting, press-and-release the SELECT knob to store the value. Repeat and adjust accordingly until results are satisfactory for the environment.

3) RX VOICE and RX SUB GAIN – The RX VOICE adjust affects the overall receive volume and BASE Station TX Volume. It does not affect adjustment to the Transmitter when used as repeater. The RX Sub Gain affects how small of a signal the decoder will decode. Ideal setting for RX Voice is 1-2 and RX Sub Gain is 2-3.

4) PHASE Reversal DET: Turns on/off the ability of the decoder to detect phase reversal of sub-tone. Good for eliminating squelch tail when radios use reverse burst upon key-down.

5) Adjust the RF POWER parameter

Make sure the TX output is connected to a 50-ohm load. Rotate the SELECT knob to the RF POWER parameter in the alignment menu. Press-and-release the SELECT knob to engage the RF power amp. Using the service monitor, observe the output power level. Rotate the SELECT knob until the desired RF power is achieved. Press-and-release the SELECT knob to store the value. The unit will cease transmitting.

6) Adjust the TX SUB DEV and TX SUB FT DEV parameter

Rotate the SELECT knob to the TX SUB DEV parameter in the alignment menu. Using the service monitor programmed to receive on the TX frequency, press-and-release the SELECT knob. A 100Hz tone will be transmitted. Adjust the deviation to 6 by rotating the SELECT knob. To store the level, press-and-release the SELECT knob. The unit will cease transmitting. Then select the TX SUB FT DEV parameter. Rotate the SELECT knob until the proper sub-audible deviation is reached.

7) Adjust the TX VOICE DEV and TX VOICE FT DEV parameter

Put the repeater in repeater mode. Use a service monitor in duplex mode. Program the service monitor to transmit on the unit's RX frequency and receive on the unit's TX frequency. Inject a 1 kHz tone at rated deviation along with the channel's programmed sub-audible tone or code. Once the repeater has decoded the sub-audible and the transmitter is engaged, press-and-hold the repeater button to put the unit in alignment mode. Rotate the SELECT knob to the TX VOICE DEV parameter. Press-and-release the SELECT knob. Rotate the SELECT knob until it hits 7. Press-and-release the SELECT knob. Then select the TX VOICE FT DEV parameter and rotate until around 240-250 range. Store the setting by pressing SELECT. It is recommended you test the

settings by using a hand portable or mobile to communicate through the repeater. If necessary, repeat the above steps to achieve the best performance.

8) STATION ID DEV:

Select the STATION ID DEV parameter. Press-and-release the SELECT knob. The unit should begin transmitting with the STATION ID tone. Rotate the SELECT knob increasing the value until the desired tone deviation is seen on the service monitor. 1 kHz is typical. To store the value, press-and-release the SELECT knob.

9) Adjust the TX-FREQ parameter

Select TX FREQ in the alignment menu. With the receiver quiet, place the service monitor on the transmit frequency. Adjust the TCXO voltage by pressing the up and down buttons to the point where the transmitter is on frequency as close as possible. **NOTE:** The sub-audible/broadband input from the accessory connector has direct connection to the TCXO. Adjusting **P1** on the accessory board will adjust the TX FREQ also.

9) Exit

Pressing-and-holding the RPTR button for approximately two second will exit the alignment mode and restore the BCR Repeater to repeater mode. The new settings should be tested to the satisfaction of the system operator.

CHAPTER 9: REMOTE PROGRAMMING

Overview

Many settings of the BCR Repeater can be remotely programmed using DTMF tone sequences. You can add and delete users, as well as modify all individual user settings, such as TX/RX squelch options and courtesy tones. In addition, many channel settings can be modified remotely as well, such as the broadcast ID interval and the TX Timeout timer.

Before You Begin

Before you begin using the remote programming features, please go through the following checklist to make sure that you meet all the requirements for remote programming.

- ✓ Some basic channel settings, such as the channel ID, remote access PIN, RX/TX frequencies must be set up by your dealer or by using the BCR programmer.
- ✓ A four-digit remote access PIN must be entered in order to access the remote program mode. Make sure that you know the PIN for the channel that you wish to modify before you begin.
- ✓ You must have a handheld or mobile radio that can generate CTCSS tones / DCS codes and DTMF tones simultaneously. The handheld or mobile must generate each DTMF tone for at least 40ms and the duration between DTMF tones must be at least 40 ms.
- ✓ Every user belongs to a particular "slot". There are 24 slots, numbered from 0 to 23. Whenever you modify an individual user's settings, you must enter their slot number. If you want to add users remotely, you must know which slots are free. Try to keep an updated list of all the slots and their corresponding users. A blank template is provided in Appendix D of this manual for this purpose. You can also export a list of users and their settings for printing using the BCR programmer.
- ✓ The user in Slot 0 is the designated System Operator. Only the System Operator may remotely program the BCR repeater, so make sure that you have a user in Slot 0. In order to remote program the unit, Slot 0 settings must be programmed.
- ✓ You'll want to try to keep remote programming sessions as short as possible. While in remote programming mode, all other users are locked out of the system, so you'll want to minimize the repeater's downtime. Another consideration is that the repeater will automatically exit remote programming mode without saving the changes if it doesn't receive a DTMF tone for 60 seconds. It is recommended you write down all the command sequences you would like to enter before you begin.

Accessing remote program mode

To access remote program mode, the System Operator must key the remote access PIN, followed by the pound (#) symbol. Not just any user can enter the PIN – the repeater must also detect the presence of the System Operator’s CTCSS tone / DCS code. If the System Operator’s tone/code is detected, then the repeater will not repeat the call, so don’t worry about the PIN being transmitted to other users.

Once you enter the PIN and press the # key, the repeater will transmit 3 –1500 Hz tones to indicate that remote mode was entered. The LCD will also display REMOTE.

Commands

Each commands is composed of a sequence of DTMF tones containing a two-digit command prefix, followed by a series of command parameters, followed by the # key. The commands are executed once the # key is received and the calling party de-keys their radio.

De-keying after each command is necessary so that the repeater can respond to each command with a series if either success or failure tones. A response of four 1500 Hz tones indicates the operation was a success. A response of four 500 Hz tones indicates the operation failed.

The table below is a list of the available tasks followed by their 2-digit command prefix:

Command	Prefix
ENTER REMOTE MODE	N/A
ADD USER	01
DELETE USER	02
ACTIVATE USER	03
DEACTIVATE USER	04
MODIFY USER TX SQUELCH OPTION	05
MODIFY USER RX SQUELCH OPTION	06
MODIFY USER TX DCS POLARITY	07
MODIFY USER RX DCS POLARITY	08
MODIFY USER TX HOLD TIME	09
MODIFY USER TONE IN TAIL	10
MODIFY USER COURTESY TONE	11
MODIFY CHANNEL ID INTERVAL	12
MODIFY CHANNEL MORSE RATE	13
MODIFY CHANNEL TX TIMEOUT	14
EXIT WITHOUT SAVE	98
SAVE AND EXIT	99
REBOOT	5555
REPEATER DISABLE	7777
CSQ Repeat toggle ON/OFF	9999

The following pages contain a description of all the available commands. Throughout the descriptions, [0] through [9] denotes a particular digit that must entered. [N] denotes a single digit that must be entered, the value of which depends on your choice of settings. A [#] key must be entered after each command sequence for the system to process the command.

Please note that for all multi-digit settings, you must enter the required number of digits, using zeroes as placeholders where necessary. For example, if [N][N][N] is required and you want to enter 12, you must enter 012.

ENTER REMOTE MODE:

Field	Digits
1) Remote access PIN	[N] [N] [N] [N]

- The remote access PIN is preprogrammed on a per channel basis. You must know it before you begin.
- Only the System Operator may access remote programming mode.
- The four-digit code "5555" is reserved for the REBOOT command and "7777" is reserved for REPEATER DISABLE.
- If you have successfully entered remote programming mode, you'll hear three 1500 Hz tones. If you weren't successful, you won't hear any response.

ADD USER:

Field	Digits	Remarks
1) Command	[0] [1]	
2) User Slot	[N] [N]	00 < NN < 23
3) Tone/Code	[N] [N] [N]	200 < NNN < 239

- See "Appendix C" for a table of available tones/codes and their corresponding index.
- You can only add/modify CTCSS
- If you attempt to add a user to a slot that is already occupied (active or not), then this command will fail. You must first delete the existing user.
- By default, the same tone/code will be used for both the TX and RX squelch options. After adding the user, you can modify the TX and RX squelch options individually by using the MODIFY TX SQUELCH OPTION or MODIFY RX SQUELCH OPTION commands.

DELETE USER:

Field	Digits	Remarks
1) Command	[0] [2]	
2) User Slot	[N] [N]	00 < NN < 23

- This command will delete the user's profile entirely and the slot will be considered empty. If you want to temporarily disable a user while preserving their profile, try using the DEACTIVATE USER command instead.
- You can not delete the user in Slot 0 (System Operator) or Slot 1. These users can only be deleted by using the BCR programmer.

ACTIVATE USER:

Field	Digits	Remarks
1) Command	[0] [3]	
2) User Slot	[N] [N]	00 < NN < 23

- All users are active by default. This command is used only to reactivate a user that has been previously deactivated.

DEACTIVATE USER: Deactivate an active user.

Field	Digits	Remarks
1) Command	[0] [4]	
2) User Slot	[N] [N]	00 < NN < 23

- DEACTIVATE USER is a good alternative to DELETE USER when you want to temporarily prevent a user from accessing the repeater without deleting their profile.

MODIFY USER TX SQUELCH OPTION:

Field	Digits	Remarks
1) Command	[0] [5]	
2) User Slot	[N] [N]	00 < NN < 23
3) Tone/Code	[N] [N] [N]	000 < NNN < 084 200 < NNN < 239

- CTCSS tones are numbered from 201-238 and DCS codes are numbered from 001-083. See "Appendix C:" for a complete table of available tones/codes and their corresponding index.

MODIFY RX SQUELCH OPTION: CTCSS Only

Field	Digits	Remarks
1) Command	[0] [6]	
2) User Slot	[N] [N]	00 < NN < 23
3) Tone/Code	[N] [N] [N]	200 < NN < 239

- CTCSS tones are numbered from 201-238. See "Appendix C" for a complete table of available tones/codes and their corresponding index.

MODIFY USER TX DCS SIGNAL POLARITY:

Field	Digits	Remarks
1) Command	[0] [7]	
2) User Slot	[N] [N]	01 is only option
3) Polarity	[N]	0 = inverted 1 = non-inverted

- This command will fail if the user is not using a DCS Code as the squelch option.

MODIFY USER RX DCS SIGNAL POLARITY:

Field	Digits	Remarks
1) Command	[0] [8]	
2) User Slot	[N] [N]	00 < NN < 23
3) Polarity	[N]	0 = inverted 1 = non-inverted

- This command will fail if the user is not using a DCS Code as the squelch option.

MODIFY USER TX HOLD TIME:

Field	Digits	Remarks
1) Command	[0] [9]	
2) User Slot	[N] [N]	00 < NN < 23
3) Hold Time (ms)	[N]	0000 < NNNN < 9999

- TX Hold Time, measured in milliseconds, determines how long the repeater will continue transmitting after the user has de-keyed.

MODIFY USER TONE IN TAIL:

Field	Digits	Remarks
1) Command	[1] [0]	
2) User Slot	[N] [N]	00 < NN < 23
3) Tone in Tail	[N]	0 = No 1 = Yes

- The Tone in Tail setting determines whether or not the user's CTCSS tone or DCS code is transmitted during the hold time.
- Tone in Tail only has meaning if the TX Hold Time is greater than zero. Although the command won't fail, Tone in Tail has no meaning if the TX Hold Time is set to zero.

MODIFY USER COURTESY TONE:

Field	Digits	Remarks
1) Command	[1] [1]	
2) User Slot	[N] [N]	00 < NN < 23
3) Courtesy Tone	[N]	0 = None 1 = 500 Hz 2 = 1000 Hz 3 = 1500 Hz

- The courtesy tone sounds for 75 milliseconds, after the user de-keys but before the hold time begins.

MODIFY CHANNEL ID INTERVAL:

Field	Digits	Remarks
1) Command	[1] [2]	
2) Interval (minutes)	[N] [N] [N]	000 < NNN < 999

- If you set the broadcast interval to zero, this feature will be disabled.
- The ID will be broadcast if and only if the repeater was in use during the most recent interval.

MODIFY CHANNEL MORSE RATE:

Field	Digits	Remarks
1) Command	[1] [3]	
2) Rate	[N] [N]	10-25 WPM

MODIFY CHANNEL TX TIMEOUT:

Field	Digits	Remarks
1) Command	[1] [4]	
2) Timer (seconds)	[N] [N] [N]	000 < NNN < 999

- If you set the TX Timeout to zero, this feature will be disabled.
- The TX Timeout timer controls the maximum amount of timer that the transmitter will remain keyed.
- This feature is useful to prevent a radio with a "stuck mic" from keeping the repeater transmitted keyed.

EXIT WITHOUT SAVE:

Field	Digits
1) Command	[9] [8]

- Upon exit, the repeater will transmit the exit remote mode alert, which is three consecutive 600 Hz tones.

SAVE AND EXIT:

Field	Digits
1) Command	[9] [9]

- After this command is received, the repeater will begin transmitting a series of tones as it updates its internal memory.
- Upon exit, the repeater will transmit the exit remote mode alert, which is three consecutive 600 Hz tones.

REBOOT:

Field	Digits
1) Command	[5] [5] [5] [5]

- This command remotely reboots the BCR REPEATER as if someone had manually toggled the power switch. Although the BCR REPEATER has been designed to be as robust as possible, this command can save a trip to the site in the rare case that the BCR REPEATER fails to repeat calls or otherwise becomes unresponsive.
- You don't need to be in remote programming mode to issue the reboot command. It can be used at any time. Also, valid signaling is not required to issue a remote reboot command.
- It is not necessary to reboot the BCR REPEATER after making changes using remote programming commands. If you

REPEATER DISABLE:

Field	Digits
1) Command	[7] [7] [7] [7]

- This command remotely disables the repeater
- Reboot 5555# restores repeater operation.

Example 1: Add a new user and modify the user's profile

Before you begin these examples, make sure that you have a two-way radio capable of transmitting DTMF tones, and that this radio is set up to transmit the CTCSS tone / DCS code assigned to the user in Slot 0, the System Operator. Because the System Operator's calls are not repeated, the easiest way to confirm that the System Operator can access the repeater is to have the System Operator press the PTT (push-to-talk) button on their radio. Visually confirm that the repeater's LCD displays the System Operator's ID, which is by default "SYS-OP".

In this example, we will add a user to slot #30 with a DCS code of 223 and then modify its profile's hang time and courtesy tone. If Slot #30 is already occupied on your system, go through this examples using another slot that is empty.

1) Enter remote programming mode

With the repeater turned on and in an idle state, the System Operator should push-to-talk, enter the remote access PIN, press the '#' key, and then release the PTT button. The repeater should respond with the "remote mode entered" alert, which is a series of three 1500 Hz tones.

2) Add a user to slot #3 with CTCSS tone 173.8Hz

To add a user, we need to enter the ADD USER command prefix, the slot number, and the tone/code index. The ADD USER command has a prefix of 01. We want to add the user to slot #3. From the table in Appendix C, "CTCSS Tone / DCS Code tables", we can see that that CTCSS tone 173.8Hz has an index of 228.

In order to add a user, we need to enter the following sequence (without the dashes):

ever do need to remotely reboot, it should only be to relieve an immediate problem.

- This command will not be followed by any type of success or failure alert. After using this command, wait 20-30 seconds for the BCR Repeater to reset and then try using it again.

CSQ REPEAT TOGGLE ON/OFF:

Field	Digits
1) Command	[9] [9] [9] [9]

- This command toggles the current state of the CSQ Repeat function. No SYSOP tone is required. ON / OFF

[0][1]-[0][3]-[2][2][8]-[#]

Upon dekey, the repeater should respond with a success alert, which is a series of four 1500Hz tones. If it failed, you'll hear a failure alert, which is a series of four 500Hz tones. If this process fails, then possible causes for this failure include: Slot #3 is already occupied, CTCSS tone 173.8 is already being used by another user, or the command was entered incorrectly.

3) Turn on tone-in-tail in the user's newly created profile

To turn on a user's tone-in-tail, we need to enter the MODIFY USER TONE IN TAIL command prefix, the user's slot number, and the tone-in-tail preference. The MODIFY USER TONE IN TAIL prefix is 10. We are modifying the user in Slot #3. Because we want tone-in-tail to be on, we need to set the tone-in-tail preference to 1.

In order to turn on tone-in-tail, enter the following sequence (without the dashes):

[1][0]-[0][3]-[1]-[#]

Once you dekey, you should hear the success alert (four 1500 Hz tones.)

4) Set the user's TX hold time to three seconds

To modify the TX hold time, we need to enter the MODIFY USER TX HOLD TIME command prefix, the user's slot number, and the number of milliseconds of the TX hold time. The MODIFY USER TX HOLD TIME prefix is 09. We are modifying the user in Slot #3. We want to set the TX hold time to 3 seconds, which is 3,000 milliseconds.

In order to set the TX hold time to three seconds, enter the following sequence (without the dashes):

[0][9]-[0][3]-[3][0][0][0]-[#]

Once you dekey, you should hear the success alert (four 1500 Hz tones.)

5) Add a courtesy tone of 1000 Hz to the new user's profile

To modify the courtesy tone preference, we need to enter the MODIFY USER COURTESY TONE command prefix, the user's slot number, and the index of courtesy tone that we would like to select. The MODIFY USER COURTESY TONE prefix is 11, the user's slot number is 3, the index of the 1000 Hz courtesy tone is 2.

In order to add a courtesy tone of 1000 Hz, enter the following sequence (without the dashes):

[1][1]-[0][3]-[2]-[#]

Once you dekey, you should hear the success alert (four 1500 Hz tones.)

6) Save and exit

When you finish making all the above changes, you need to save and exit remote programming mode. To store the settings of the new user, all you need to do is enter the SAVE AND EXIT command prefix. The SAVE AND EXIT prefix is 99.

In order to save and exit, enter the following sequence (without the dashes):

[9][9]-[#]

The repeater will respond with a series of tones as it updates followed by a remote mode exited alert, which is a series of three 600Hz tones.

Example 2: Deactivate an existing user

In this example, we will deactivate an existing user.

1) Enter remote programming mode

With the repeater turned on and in an idle state, the System Operator should push-to-talk, enter the remote access PIN, press the '#' key, and then release the PTT button. The repeater should respond with the "remote mode entered" alert, which is a series of three 1500 Hz tones.

2) Deactivate the user in slot #3

To deactivate a user, we need to enter the DEACTIVATE USER command prefix and the user's slot number. The DEACTIVATE USER prefix is 04 and the user's slot number is 30.

In order to deactivate the user in slot #30, enter the following sequence (without the dashes):

```
[0][4]-[0][3]-[#]
```

Once you dekey, you should hear the success alert (four 1500 Hz tones.)

Upon de-key, the repeater will respond with an OPERATION SUCCESS ALERT.

3) Save and exit

When you finish deactivating the user, you need to save and exit remote programming mode. To store the changes, you need to enter the SAVE AND EXIT command prefix. The SAVE AND EXIT prefix is 99.

In order to save and exit, enter the following sequence (without the dashes):

```
[9][9]-[#]
```

The repeater will respond with a series of tones as it updates followed by a remote mode exited alert, which is a series of three 600Hz tones.

At this point, the user in slot 3 will be deactivated. Attempts to access the repeater with code/tone in slot 3 will be ignored by the repeater. To reactivate the user, go through same exact procedure above, except that you need to use the ACTIVATE USER command prefix of 03 rather than the DEACTIVATE USER prefix.

CHAPTER 10: Keypad Lock

Overview

Many of the operations such as alignment and channel change are carried out using the front panel's keypad, therefore the BCR repeater incorporates a simple keypad lock to prevent unwanted manipulation of the unit's settings during operation at the site. The keypad can be locked and unlocked in any one of the three operating modes.

Procedure

To lock the keypad, simply press-and-hold the SELECT knob until the LOCK icon is displayed on the LCD. The keypad is now locked. You may only change volume and adjust the speaker settings. To unlock the keypad, simply press-and-hold the SELECT knob until the LOCK icon disappears. Normal user input resumes.

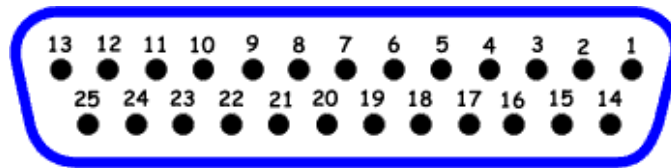
Chapter 11 Battery Backup/External DC In

OVERVIEW

The BCR REPEATER can be battery backed-up by connecting a 12 Volt deep cycle battery to the battery backup/Ext DC In terminals. If the AC Line fails, the internal relay will switch to where the battery can power the unit. When AC power is restored, the internal relay takes the battery out of the circuit and switches to the internal power supply. For convenience, the BCR REPEATER provides a maintenance charge to keep the battery at its optimum level. The internal charging circuit can comfortably provide a charge current up to 1.3 Amps to the battery. As the battery reaches full charge, the charging circuit provides a maintenance charge of around 200 mA. For virtually maintenance free operation, it is recommended that a GEL CELL type deep cycle battery be used.

If it is desired for the BCR REPEATER to be powered from a vehicle or an external 12-13.8V supply, this can be done by connecting the external source to the BCR REPEATER's Battery/Ext DC terminals. When the BCR REPEATER is being powered by an external source other than a battery, **DO NOT** turn on the internal power supply. If an external power supply other than a battery is connected and the internal supply is turned on, the internal supply will attempt to 'charge' the external supply, which could damage the external supply. The internal blocking diode protects the internal power supply from receiving any unwanted voltages or currents from the external supply or battery.

APPENDIX A: ACCESSORY CONNECTOR DESCRIPTION



DB-25 Female

PIN #	Description
1	13.8 Volts out (1A max)
2	
3	
4	
5	BASE STATION AUDIO OUT - Level adjusted with Volume Vontrol
6	
7	Gated Discriminator Audio Out (Deemphasized)
8	RX Discriminator Out - Demodulated received audio
9	RX MODULE - General Purpose Input
10	RSSI - Received Signal Strength Indicator
11	
12	Dedicated COS - Active HI
13	+5 Volts Out
14	TX MODULE - Relay OUT
15	TX MODULE - Relay IN
16	
17	Programmable COS Output - OPEN DRAIN - Active LO Asserted based on CARRIER OR VALID SIGNAL
18	
19	TX Audio Input
20	External PTT Input
21	TX Subaudible Data or BROADBAND/Composite Input
22	REPEATER/BASE Mode OUT
23	Fan2/Fan1 Control Output
24	CTCSS / DCS Encode Disable Input - Active LO
25	GND

APPENDIX B: REMOTE PROGRAMMING QUICK REFERENCE

Each command below must be followed the '#' symbol to execute. After you press '#' and dekey, you'll hear either a success alert (four 1500 Hz tones) or a failure alert (four 500 Hz tones.) When you save and exit, you'll hear a series of tones then three 600 Hz tones to let you know it exited remote programming.

ENTER REMOTE MODE:			EXIT WITHOUT SAVE:		
1) Remote access PIN	[N] [N] [N] [N]		1) Command Prefix	[9] [8]	
ADD USER:			SAVE AND EXIT:		
1) Command Prefix	[0] [1]		1) Command Prefix	[9] [9]	
2) User Slot	[N] [N]	00 < NN < 23	REBOOT:		
3) Tone/Code	[N] [N] [N]	200 < NNN < 239	1) Command Prefix	[5] [5] [5] [5]	
DELETE USER:			REPEATER DISABLE:		
1) Command Prefix	[0] [2]		1) Command Prefix	[7] [7] [7] [7]	
2) User Slot	[N] [N]	00 < NN < 23			
ACTIVATE USER:					
1) Command Prefix	[0] [3]				
2) User Slot	[N] [N]	00 < NN < 23			
DEACTIVATE USER:					
1) Command Prefix	[0] [4]				
2) User Slot	[N] [N]	00 < NN < 23			
MODIFY USER TX SQUELCH OPTION:					
1) Command Prefix	[0] [5]				
2) User Slot	[N] [N]	00 < NN < 23			
3) Tone/Code	[N] [N] [N]	000 < NNN < 083 200 < NNN < 239			
MODIFY USER RX SQUELCH OPTION:					
1) Command Prefix	[0] [6]				
2) User Slot	[N] [N]	00 < NN < 23			
3) Tone/Code	[N] [N] [N]	200 < NN < 239			
MODIFY USER TX DCS SIGNAL POLARITY:					
1) Command Prefix	[0] [7]				
2) User Slot	[N] [N]	00 < NN < 23			
3) Polarity	[N]	0 = inv; 1 = non			
MODIFY USER RX DCS SIGNAL POLARITY:					
1) Command Prefix	[0] [8]				
2) User Slot	[N] [N]	00 < NN < 23			
3) Polarity	[N]	0 = inv; 1 = non			
MODIFY USER TX HOLD TIME:					
1) Command Prefix	[0] [9]				
2) User Slot	[N] [N]	00 < NN < 23			
3) Hold Time (ms)	[N] [N] [N] [N]	0000 < NNNN < 9999			
MODIFY USER TONE IN TAIL:					
1) Command Prefix	[1] [0]				
2) User Slot	[N] [N]	00 < NN < 23			
3) Tone in Tail	[N]	0 = No / 1 = Yes			
MODIFY USER COURTESY TONE:					
1) Command Prefix	[1] [1]				
2) User Slot	[N] [N]	00 < NN < 23			
3) Courtesy Tone (Hz)	[N]	0 = None, 1 = 500, 2 = 1000, 3 = 1500			
MODIFY CHANNEL ID INTERVAL:					
1) Command Prefix	[1] [2]				
2) Interval (minutes)	[N] [N] [N]	000 < NNN < 999			
MODIFY CHANNEL MORSE RATE:					
1) Command Prefix	[1] [3]				
2) Rate	[N] [N]	10 <= NN <= 25			
MODIFY CHANNEL TX TIMEOUT:					
1) Command Prefix	[1] [4]				
2) Timer (seconds)	[N] [N] [N]	000 < NNN < 999			

APPENDIX C: CTCSS TONE/DCS CODE TABLES

CTCSS Tones

Index	Tone	Index	Tone	Index	Tone	Index	Tone	Index	Tone
201	67.0	209	91.5	217	118.8	225	156.7	233	210.7
202	71.9	210	94.8	218	123.0	226	162.2	234	218.1
203	74.4	211	97.4	219	127.3	227	167.9	235	225.7
204	77.0	212	100.0	220	131.8	228	173.8	236	233.6
205	79.7	213	103.5	221	136.5	229	179.9	237	241.8
206	82.5	214	107.2	222	141.3	230	186.2	238	250.3
207	85.4	215	110.9	223	146.2	231	192.8		
208	88.5	216	114.8	224	151.4	232	203.5		

DCS Codes

Index	Code	Index	Code	Index	Code	Index	Code	Index	Code
001	023	018	125	035	245	052	412	069	624
002	025	019	131	036	251	053	413	070	627
003	026	020	132	037	261	054	423	071	631
004	031	021	134	038	263	055	431	072	632
005	032	022	143	039	265	056	432	073	654
006	043	023	152	040	271	057	445	074	662
007	047	024	155	041	306	058	464	075	664
008	051	025	156	042	311	059	465	076	703
009	054	026	162	043	315	060	466	077	712
010	065	027	165	044	331	061	503	078	723
011	071	028	172	045	343	062	506	079	731
012	072	029	174	046	346	063	516	080	732
013	073	030	205	047	351	064	532	081	734
014	074	031	223	048	364	065	546	082	743
015	114	032	226	049	365	066	565	083	754
016	115	033	243	050	371	067	606		
017	116	034	244	051	411	068	612		

APPENDIX D: REPEATER SYSTEM RECORD SHEET

NAME:			
RX Freq:	TX Freq:	Spacing:	Power:
Broadcast ID:	Interval (mins):	Rate (WPM):	
Remote PIN:		Stuck Mic Timeout (secs):	

Slot	User ID	RX Option	TX Option	Courtesy	Hold Time	Tone In Tail
0						
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						

WARRANTY AND SERVICE

Limited Warranty

This product is warranted by BridgeCom Systems, Inc. to be free of defects in materials and workmanship for a period of **two years** from the date of purchase. If a defective part causes this product to operate improperly during the two-year warranty period, we will service it to the original owner free of charge if shipped to BridgeCom Systems at the owner's expense. This warranty does not apply to any parts damaged due to improper use or violation of instructions. It does not extend to damage incurred by misuse or abuse, unauthorized modifications, natural causes such as lightning, fire, floods, and other such catastrophes; nor to damage caused by environmental extremes, such as power surges and/or transients, theft, or accidents.

All warranties must be performed at BridgeCom Systems, Inc. No credit will be given for unauthorized repair work attempted by the customer.

BridgeCom Systems, Inc. will repair or replace the equipment and return to the customer freight pre-paid, within the continental United States. Equipment found not to be defective will be returned at the customer's expense, and it will include the cost to ship, test, and return the equipment.

Equipment returned for repair must have a return merchandise authorization (RMA) number. To obtain an RMA contact our Technical Support Department at (816)-532-8451 or email techsupport@BridgeComSystems.com. All returned equipment must have the RMA number listed on the outside of the shipping container.

Ship all returns to BridgeCom Systems, Inc.
102 NE State Route 92 Hwy
Suite C
Smithville, MO 64089 Attn:Repair

Out of warranty repairs and service charges are billed at the current hourly rate plus parts.

PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE.

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FCC Statements

Warning and Compliance Statement:

Note: The ComLink BCR REPEATERV and BCR REPEATERU has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: --Reorient or relocate the receiving antenna. --Increase the separation between the equipment and receiver. --Connect the equipment into an outlet on a circuit different from that to which the receiver is connected. --Consult the dealer or an experienced radio/TV technician for help.

Caution:

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.