

RLC-2 Software Version 4.24

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Chapter 1: Getting Started

This chapter deals with the information needed in getting the controller rolling and on the air. Read the sections carefully and familiarize yourself with the operations of the controller. Read through the sections on setting up events to allow ID's and enable messages.

Technical Support:

Link Communications, Inc. provides technical support to all users of Links products. We can try to answer your questions to our best ability. There may be some questions that we can not answer while on the telephone. We will do our best to locate a satisfactory response to your question. We can not, however, answer every question. Questions on equipment other than Link Communications, Inc. equipment will be handled on an individual basis. To help us in answering your questions do some preparations before calling us.

- Have the model number of your controller (RLC-1,2,3,4,5,club)
- Have your controllers serial number. This is very important
- Have the software version before you call. This is available using Command 048, slot 00
- Read your manual
- Write down your questions before hand and have the programming **that you have tried** with each question
- Have any errors you received noted
- Before you call check the errors you received with the errors in the manual and verify the data you entered to try to determine how you received that error
- **Technical support is only handled at the following number (406) 482-7515**
- No technical support will be provided on the '800 sales number.

Remember that we receive hundreds of technical support calls every week. Please keep your calls short and to the point so we can provide all Link Communications, Inc. easy technical support.

You can also fax us your questions at: +(406) 482-7547
Email access: support@link-comm.com

World wide web access to latest software releases and manuals:
<http://www.link-comm.com/linkcomm>

Introduction:

Congratulations, you have purchased a very powerful tool for your group's repeater. The RLC-2 may seem complicated and intimidating at first, but don't worry. Setting it up and programming it are easy and straightforward, once you have read the manual. Please take the time to read it before you try to start programming. This will save you a lot of confusion and frustration, as it should answer most of your questions.

The RLC-2 repeater controller consists of one repeater port, two linking ports, four analog voltage inputs, four logical (dry contact) inputs, and eight MOSFET output drivers. The repeater port and each of the linking ports can be configured to require one of several combinations of COR and PL inputs for access. The RLC-2 has a single DTMF decoder that scans between the three receiver ports, thereby supporting DTMF control from all ports of the controller. Synthesized voice prompts the users in the programming of the controller's variables, provides voice ID's and alarms based on the inputs, etc.

This manual consists of three main sections: setup and interfacing, programming and commands, and the appendices with commonly referenced tables and charts. A glossary has also been included at the end to explain some of the terms and abbreviations that are used throughout the manual.

We have attempted to explain everything in a way that is easy to understand, but some questions are inevitable. If you have carefully read the manual and still have questions, call or us at (406) 482-7515 or Fax us at (406) 482-7547 or Email us at support@link-comm.com

Link Communications Inc.
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Limited Warranty

Coverage:

Link Communications warrants that its products will be free from defects in materials and workmanship for a period of one year from the date of shipment. During this time, Link Communications will cover parts, labor and return shipping. If failure is caused by instances other than manufacturing defects, Link Communications will repair the product and bill the customer for parts and labor. Contact Link Communications for more information.

What Link Communications will not cover:

1. Too much voltage to the controller. The RLC-2 operates at +11V to +15V, negative ground.
2. Damage to the controller by lightning, accident, or incorrect power hook-up.
3. Incorrect unit installation.
4. Damage caused by shipment (damage claims are handled by the carrier).
6. Repairs by other than Link Communications Inc.

THIS WARRANTY HOLDS ONLY TO THE ORIGINAL PURCHASER

How to get service

Please contact Link Communications for servicing information and authorization.

Software

Link Communications holds the copyright on the RLC-2's software and hardware. Changes to the software, copying of the software, and use of the voice code is prohibited without the written consent of Link Communications.

Software updates

Link Communications will provide FREE Software updates for 6 months from the date of purchase. The owner must return replaced software chips to Link Communications in order to obtain further software updates. Software updates will cost \$25.00 after the update warranty expires. Manual inserts and shipping are additional.

User Survey (Optional)

A knowledge of the user base will allow us to better serve you in the future by helping us develop more specialized software and hardware. Please take a few minutes and fill out this questionnaire.

RLC-2 Serial Number _____

RLC-2 Purchase Date _____

Application: (Circle All That Apply)

Ownership:

- 1 - Privately Owned Repeater
- 2 - Club Owned Repeater
- 3 - Group Owned Repeater
- 4 - Commercial Business Repeater
- 5 - Other _____

Installation:

- 1 - Wide Coverage Repeater with Chain Links
 - Port to Port Linking
- 2 - Full Duplex Links
- 3 - Half Duplex Links
- 4 - VHF Repeater: Power _____ Make _____
- 5 - UHF Repeater: Power _____ Make _____
- 6 - Link Ports Used as Repeater Ports: Yes No
- 7 - Serial Data Used to Control Repeater: Yes No
- 8 - Other Amateur Repeaters At the Site: Yes No
- 9 - Other Link Communication Products Used: Yes No

Misc:

- 1 - User Base: Technical Rag Chew Personal
- 2 - Autopatch used on the System: Yes No
- 3 - Frequency Adjustable Remotes: Yes No
- 4 - Linking to Other Repeaters: Yes No
- 5 - Linking Closed Access: Yes No
- 6 - PL Required on Main Repeater: Yes No Varies
- 7 - PL Required on Linking System: Yes No Varies

Please Return to: Link Communications Inc.

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Comments:

Re-Initialization the Controller

When the RLC-2 powers up, a warm reset is processed. This reset will load the most recent variables into the controller. The variables are stored in the nonvolatile RAM chip located on the controller board. If the variables in the SRAM get scrambled somehow, a cold boot will be needed. This cold boot resets all of the RLC-2's variables to the preprogrammed values. This cold boot is accomplished by pressing and holding the initialize switch and pushing the reset switch. Another easier method of re-initializing the controller is to hold the initialization switch down and applying power to the controller. You must hold the initialize switch down for at least 5 seconds after you either reset the controller or apply power to the controller. Once the controller has been initialized, the reset switch must be pushed again.

You know if the controller has been re-initialized if the voice speaks the message:

"This Is The RLC-2 Repeater And Link Controller V 4.XX"

*** Caution, Initialization will clear all user programmed variables ***

1. Depress the "Initialize (INIT)" switch and hold
2. Depress and Release the Reset Switch while continuing to hold the Initialize switch or while the Initialize (INIT) switch is depressed apply power to the controller.
3. After 5 seconds let go of the "Initialize" switch
4. Depress and Release the Reset switch to Initialize the RLC-2

Resetting the Controller

Resetting the controller is as easy as pressing the Reset switch on the controllers board. The same function is possible by powering off the controller and powering it back on. Software access to a remote reset is possible by executing Command 245. All of these processes will soft boot the controller. When the controller has a soft boot, variables from the internal Non-Volatile SRAM chip will be loaded and used for the controllers operation. A reset will not effect the settings of these variables. Only a re-initialization will change the settings of the internal user programmed variables.

Troubleshooting the Controller

No LED's when the RLC-2 is powered up

- Check for +12 Volts at Power Connector
- Check for bad or blown fuse
- Make sure that the +12 Volts is connected correctly
 - Center of Plug is (+), Shield is (-)

Only Some of the LED's are lit

- Cross-Point Board is not plugged in correctly (RLC-2 Rev. A,B)
- Short on that specific power supply
 - Call Link Communications Inc. if this occurs

No Audio at Test Bus

- Check for main system power (All LED's lit)
- Is there a valid COR signal present on the receiver: (Default: Active Low)

Have audio at the test bus, but not on the transmitter

- Are the output audio pots adjusted correctly
- Is the transmitter connected to the controllers audio output: Pin 4 on the DB-09
- Is the PTT connected to the controller: Pin 3 (Low on Transmit)

The Voice Synthesizer seems muffled

- Turn down the pot marked 'Voice'

When I connect my COR, the RLC-2 will not accept it

- My COR is set for active Low, does the COR go to ground when active
- My COR is set for active High, does the COR go to ground when inactive
 - Can the COR sink (2mA) when active
 - Does the 5V pull-up resistor conflict with your radio
 - Motorola R-100 Repeaters are susceptible to this
 - Open collector the driver on R-100 repeaters

When I connect my serial terminal, I do not get any data

- Is your terminals baud rate set to 9600,N,8,1
- Are you wired to the correct connector: Serial/Resistor
- Are all the RS-232 TX and RX and ground wires connected
- The controller requires all RS-232 signals (TX/RX/Ground) to be connected

***** Getting On The Air Quickly *****

Follow the steps below to get your RLC-2 operational and on the air quickly.

- 1) Read the entire manual or go to step 2
- 2) Read the 'Setup and Interfacing' section to make sure you have all of the needed parts
 - This section describes how to adjust your controller
- 3) Wire up your power cord to +12 Volts DC. Center pin is positive, shield is ground.
- 4) Wire up your radio or audio amp.
 - pin 5 is your audio input (from your receiver audio out)
 - pin 4 is your audio output (to your mike jack or amp audio input)
 - pin 7 is your COR line (active low COR required (Goes to ground when active))
 - pin 3 is your PTT input (active low on PTT (Goes to ground when active))
 - pin 2 is your PL detect input (active low on detect (Goes to ground when active))
- 5) Once you have your radio connected adjust your audio (See step 2)
- 6) Programming your controller
 - Command 048 recalls your Voice/CW messages
 - Command 049 programs your Voice/CW messages
 - Command 064 assigns what slot to use for the ID's, courtesy beeps etc...
- 7) If using an RS-232 port refer to 'Serial Port Interfacing' to get your RS-232 cable built
 - The RLC-2's serial port is not a standard DB-9 serial wiring
 - You must have both RX and TX wired for the serial port to work
 - You must have your grounds connected between the computer and RLC-2 ports
- 8) Once your serial is connected, press the reset button to see the RLC-2 copyright message
 - If you don't see the reset message check the following conditions
 - Is your Baud rate 9600 N 8 1
 - Do you have your RX and TX leads swapped (Very Common)
 - Are your grounds tied together
 - Is your computer on the correct serial port
- 9) Now you can DTMF or RS-232 control the RLC-2
- 10) The serial port does not use command names, only command numbers that range from 000..245.
- 11) Call Link Communications Inc. for more help after
 - You have read the entire manual
 - Specific questions about the controller operation

Setup and Interfacing

This section of the manual contains everything you should need to know to get your repeater controller up and running. The numbered steps cover the basics, through connecting your radios and adjusting the RLC-2. After that there is information concerning the other input and output features of the RLC-2: the serial interface, the logical output and input lines, and the analog input lines.

Step #1: Check the Packing List

Your package should contain the following items:

- (1) RLC-2 Repeater Controller
- (1) 2.50mm Power Connector
- (1) DB-9 Female Solder Connector
- (5) DB-9 Male Solder Connectors
- (1) RLC-2 Manual

If any of these parts are missing, contact Link Communications Inc.

Step #2: Connect Power

- The RLC-2 is designed to run off of 12V DC. 11V to 14V should work fine.

- Locate the 2.50mm power connector included in your parts bag.

- Unscrew the plastic outer shield and thread your power and ground wires through it (20 gauge suggested).

- Solder the +12V wire to the center pin of the 2.50mm connector.

- Solder the ground wire to the shield of the 2.50mm power connector.

- Screw on the plastic outer shield.

- When power is applied to the RLC-2 controller, the 5 LED's on the RLC-2 controller should light, indicating proper board operation. **If all of the LED's do not light, turn off the power immediately.**

Step #3: Connecting Your Receivers to the RLC-2

The main repeater and each of the links connect to the RLC-2 using a male DB-9 connector (included). The control receiver connects to the same DB-9 as the main repeater. The pin-outs are listed below.

Port 1 (Repeater Port)

Pin #	Signal Name	Default Condition
1	Control RX COR	Active Low
2	PL Decoder Input	Active Low
3	Transmitter PTT	Always Active Low
4	Transmitter Audio	Audio Output, 600 Ω
5	Receiver Audio	Audio Input, 10K Ω
6	Control Receiver Audio	Audio Input, 10K Ω
7	Receiver COR Input	Active Low
8	Ground Available	....
9	Ground Available	....

Ports 2 and 3 (Link or Repeater Ports)

Pin #	Signal Name	Default Condition
1	Ground Available	....
2	PL Decoder Input	Active Low
3	Transmitter PTT	Always Active Low
4	Transmitter Audio	Audio Output, 600 Ω
5	Receiver Audio	Audio Input, 10K Ω
6	Ground Available	....
7	Receiver COR Input	Active Low
8	Ground Available	....
9	Ground Available	....

Connecting the Receiver COR

- The first step in connecting your receiver is to locate the receivers COR signal. The RLC-2 will accept either active low or active high COR signals. The default COR is set to **Low**. The signal must be able to sink 4mA to ground. The input impedance of the RLC-2 COR input is 10K Ω and it is diode clamped with internal pull-up resistors. This allows it to handle input voltages of up to 15 volts without damage to the controller. **The COR input must not go below 0V (ground); this would damage the 82C55 IC.** Using one of the supplied DB-9 Male connectors, connect your COR signal to pin #7 (or pin #1 for the control receiver). Refer to Commands 024 and 025 to change your ports COR and PL polarity.

Connecting a PL Input (optional)

- If you wish to use a PL (CTCSS) decoder on any of the receivers, it can be connected to pin #2 of the appropriate connector in the same fashion as the COR input. This signal can be either an active low or active high signal. Refer to Commands 024 and 025 to change your ports COR and PL polarity.

Connecting the Receiver Audio

- 2 types of audio can be used on the RLC-2 controller:

Type 1: De-emphasized audio (Speaker Audio)

Type 2: Discriminator audio (Raw Unsquashed Audio)

- If type 1 audio is used, remove the appropriate jumper on the controller. This removes the de-emphasis filter from the circuit. As the controller comes shipped, all ports are set up for type 2 audio.

Receiver De-emphasis Jumpers

J1 - Port 1 Receiver De-emphasis Jumper

J2 - Port 2 Receiver De-emphasis Jumper

J3 - Port 3 Receiver De-emphasis Jumper

J4 - Control Receiver De-emphasis Jumper (J8 on Rev. A,B Boards)

- If type 2 audio is used, place the appropriate jumper in circuit (over both pins). This will place a - 6dB/octave de-emphasis filter into the circuit. Some discriminators can not directly drive the 10K Ω input impedance. If this is the case, a pre-driver or different audio access point will be required. The filter will not allow PL to pass through the controller. Contact Link Communications Inc. if your needs require PL to pass through the controller.

- The audio input is connected to pin #5 of the male DB-9 connector (pin #6 for the control receiver).

- The audio adjustments will be described in Step #4.

How the DTMF Decoder Works

- The RLC-2's DTMF decoding circuit uses a scanner that enables the controller to receive tones from all the ports, without mixing the three receiver's audio together. This allows the receivers to have total control of the DTMF decoder when its COR is active. If the control receiver is active, and the control receiver is configured for priority control, then the DTMF decoder is locked to the control receiver's port until its COR goes away. Once the decoder has detected a tone on one of the ports, it stops scanning and waits up to three seconds for the next digit. It is reset at the beginning of each DTMF digit. If any of the DTMF digits are held for longer than 5 seconds or there is a pause of 5 seconds between digits, the DTMF scanner will resume scanning and all digits entered up to that point are lost.

Step #4: Connecting Your Transmitters to the RLC-2

Transmitter PTT

- The RLC-2 produces an active low PTT signal (ground when PTT is active). This output is buffered with an open collector type driver capable of sinking 150mA. There is a built in 30V zener clamping diode to protect the PTT MOSFET from the high voltage spikes that can be caused by interfacing to a PTT relay coil. Your transmitter PTT input should be connected to pin #3 of the DB-9 connector.

Transmitter Audio

- The RLC-2 provides a 10K Ω output impedance to your transmitter audio input.
 - The transmitter audio is connected to pin #4 of the DB-9 connector.
 - If it is not already, the DB-9 plug can now be plugged into the appropriate jack on the main board. The main repeater goes to the jack nearest the power jack, Port 2 is right next to it, and Port 3 is the third from the left (with the DB-9s toward you).

Step #5: Adjusting the RLC-2 Controller

- Locate connector JP1 on the RLC-2 (It is the 10 pin female connector). This test bus will provide the signals that we need to adjust the inputs on the RLC-2. In order to maintain audio deviation during channel switching, all of the receiver inputs to the Cross-Point Board must be set to the same level. These signals can be measured with an oscilloscope or a true RMS AC voltmeter. In order to obtain an audio signal on JP1, a valid COR or PL must be received. Once a valid access signal is received, the RLC-2 will un-squelch the audio and be present on JP1.

Repeater (Port 1) Receiver Adjustment:

- Execute Command 000 12 and 000 13 to enable Port 1-Port 2, and Port 1 - Port 3

Port 1 Receiver: Transmitter Port Adjustment:

- Present a stable Tone or DTMF tone to Port 1 RX.
 - Adjust the 'Main RX' pot so that the signal on pin 1 of JP1 is 1 volt peak-to-peak.
 - Adjust the 'Main TX' pot to obtain the desired deviation.

Port 2 Transmitter Port Adjustment:

- Adjust the 'Link 1 TX' pot to obtain the same deviation as the Main TX is.

Port 3 Transmitter Port Adjustment:

- Adjust the 'Link 2 TX' pot to obtain the same deviation as the Main TX is.

Port 2 Receiver Port Adjustment:

- Present the same Tone or DTMF signal used in Port 1 receiver: transmitter port adjustment step. While watching the Port 1 TX audio, adjust 'Link 1 RX' pot for the same deviation that was present on the Port 1's TX.

Port 3 Receiver Port Adjustment:

- Present the same Tone or DTMF signal used in Port 1 receiver: transmitter port adjustment step. While watching the Port 1 TX audio, adjust 'Link 2 RX' pot for the same deviation that was present on the Port 1's TX.

Voice Level Adjustment:

- Use Keypad Test (047) to generate Voice Data.
- Adjust 'Voice' pot to 2.0 KHz deviation or until it "sounds" good, this adjustment is for all transmitters.

Tone Generators Adjustment:

- Adjust 'Tone 1' to 1.5 KHz deviation, Adjust 'Tone 2' to 1.5 KHz deviation
- This adjustment is for all transmitters.

Control Receiver Adjustment

- Present a stable Tone or DTMF Tone to Control RX.
-- Use Command 000 15 to route the control receiver audio to Port 1's TX port
- Adjust 'CON RX' pot to match the deviation used earlier

Serial Port Interfacing

The RLC-2 has a serial terminal port for interfacing to any serial device, i.e. packet and serial terminal. This allows the user to monitor, control, and program all facets of the controller. The serial terminal carries highest priority for access and programming of the RLC-2.

RS-232 Signals and Interfacing

The RLC-2 output is the RS-232 standard, $\pm 12V$. The serial terminal port also contains the I/O pins for the software controlled resistors. (See the Software Resistor Section for interfacing programming information).

Pin-Out Serial P6 Connector

Pin Number	DB-09 Computer	DB-25 Computer	Signal Definition
4	3	2	RS-232 Input
5	5	7	Ground
9	2	3	RS-232 Output

Pin-Out Software Resistors P6 Connector

Pin Number	Definition
1	Wiper Resistor #2
2	Low Side Resistor #2
3	Wiper Resistor #1
6	High Side Resistor #2
7	Low Side Resistor #1
8	High Side Resistor #1

Local Terminal Interfacing

When using a local ASCII terminal at the RLC-2's location, an ASCII terminal can be used to communicate with the programming features of the RLC-2. The terminal's communication parameters must be set to:

Baud (Default).... 9600, Start Bits.... 1, Stop Bits1, Parity N, Word Length 8

These parameters will allow communication with the RLC-2. For system operations, see the next section "Operation and Programming Over the Serial Port".

Configuration of the Serial Port

- Command 244 is provided to configure the serial port baud rate.
- Baud rate: Allows baud rate changes from 300,600,1200,2400,4800, and 9600 baud.

Operation and Programming Over the Serial Port

- The RLC-2's serial port gives the controller the ability to communicate with the world over a digital radio link.

Serial Command Structures:

- Upper or Lower case digits may be used for the DTMF digits 'ABCD'
- All commands entered must be the commands 3 digit number that ranges from 000..245
- Spaces, Tabs, and backspaces can be used over the serial port
- Comments must begin with the ';' colon digit first. Any data following the ';' will be ignored.

Example: 000 11 ; This command convert port 1 into a repeater port

The example shows the command number as '000' with additional data of '11' and a comment that begins with the ';' digit.

- The command sequence can be entered with either the <ENTER> key or the forced execution digit. This digit defaults to the 'D' key.

Serial Response:

- Voice words are printed in 2 styles
 - When the word is a number between 0..9 and/or the word is a letter of the alphabet
The word is printed [X] where 'X' is the information
 - When the word is other than the above listed conditions
The word is printed (###) where '###' is the word number

System Wide Errors

The controller has several error messages that can be spoken if an error occurs during programming. These errors indicate that the format of the command requested does not match the data that you entered. If you get errors other than the errors listed in this section, refer to the command that you were trying to execute for more specifics.

Error 1..5 - These errors are not system wide errors. Refer to the command you are executing if you get one of these errors.

Error 6 - The command you requested is not allowed to be executed from this radio port. The command is DTMF masked off. Either change the DTMF mask (See Command 030,031) or try another radio port.

Error 7 - The command you requested is locked. You must unlock the controller using Command 005 or Command 026 before this command will be executed.

Error 8 - The command that you requested is above the requested command names. You should never get this command. If this command is spoken execute Command 244 and serially view the command names for any problems or contact Link Communications Inc.

Error 9 - The command you are trying requires more or less additional data before it can be executed. Verify the format of the command and the amount of additional data that the command requires before trying to execute it again. If the command requires 5 digits of additional data then 5 digits must be entered

Example: Command 127 sets up the out going autopatch. This command requires 5 fields of data be entered for the command to execute correctly. If you enter less than 5 variables, then controller will speak 'Error 9'. Check your data and then check the command and enter everything required.

001: Monitor one Port from another Port

This command allows you to monitor one radio port from another radio port.

```
<001> x y
```

Parameters:

- X is the port doing the monitoring of port Y
- Y is the port being monitored

Ports range from 1..5

- 1 - Port 1
- 2 - Port 2
- 3 - Port 3
- 4 - Autopatch Port
- 5 - Control Receiver Port

Defaults:

- Port 2,3 default as links, Port 1 defaults as a repeater

Error Codes:

E1 - Invalid port requested

(System wide errors are listed in front of the manual)

Example 1:

Monitor Port 3 by Port 1

```
001 13 D or unkey
```

Response:

"X Y Connect Monitor"

014: Port Supervisory PTT Control

This command allows the user to command off the system PTT for a selective port. Only the transmitter PTT is controlled. To control receiver access see Command 12

```
<014> x y
```

Parameters:

X is the port. This number ranges from 1..5

Y is the control information.

- 1 - Enable Supervisory PTT control (Kills Transmitter)
- 0 - Disable Supervisory PTT control (Enables Transmitter)

Defaults:

All ports transmitter enabled

Error Codes:

E1 - Invalid port. Port must range from 1..5

E2 - Invalid access mode. Modes are listed above.

(System wide errors are listed in front of the manual)

Example 1:

I need to shut off port 1's transmitter PTT because of some noise

```
014 1 1 D or unkey
```

Response:

"Port is <ON/OFF>"

007: Set Up the System's Audio Routing Variables

This command allows the user to set-up the system audio routing variables. These variables tell the controller where to route messages when commands are executed. This allows the user to totally control where CW and Voice messages are routed.

```
<007> xx yy
```

Parameters:

XX is the audio routing slots

YY is the audio routing variable calculated below

Device that Executed the Commands (XX)	Audio Routing Variable
00: Internal Audio Routing Variable	01: Route to Port 1
01: RS-232 port	01: Route to Port 1
02: Not Used	01: Route to Port 1
03: Port 1	01: Route to Port 1
04: Port 2	02: Route to Port 2
05: Port 3	04: Route to Port 3
06: Autopatch	08: Route to Port 4
07: Control Receiver	01: Route to Port 1
08: Event Table	00: Use the routing variable in the event

Calculation of the audio routing variable:

The audio routing variable is calculated by adding up a number that corresponds to the port you want the response to be routed to. This number ranges from 00..31.

DTMF Executing the Command	Number that corresponds to the device
Port 1	+1
Port 2	+2
Port 3	+4
Autopatch	+8
Control Receiver	+16

(YY) Audio routing variable = (port1)+(port2)+(port3)+(autopatch)+(control rx)

039: *Change the Internal Audio Routing Variable*

This command allows the user to change where messages are routed that are called from internal execution sources. Internal execution sources include macros and internal generated messages and errors.

<039> xx

Parameters:

XX is the audio routing variable. This number must range from 00..43

DTMF Allowed Execution of the Command	Number that corresponds to the device
Port 1	+1
Port 2	+2
Port 3	+4
Autopatch	+8
Control Receiver	+16

(XX) Audio routing variable = (port1)+(port2)+(port3)+(autopatch)+(control rx)

Defaults:

Internal audio routing variable is port 1 (XX=01)

Error Codes:

E1 - Invalid audio routing variable

Example 1:

I want all internal responses to be routed to port 2, not port 1.

039 02 D or unkey

Response:

There is no response for this command.

- To check your programming execute Command 008 00.

Variable 08 defines execution from the event table. This variable is a master variable that overrides the audio routing variables that are entered with every event. When this variable is set to 00, the audio routing information that is part of the event will be used. If you change this audio routing variable to something other than 00, the value entered with Command 007 will contain the routing information. It defaults to 00, use the audio routing information from the event tables events.

Variable 09..11 are not used

Event table audio routing definitions:

The event tables audio routing variables work similar to Command 007's variables with a few exceptions.

Exception 1:

If the audio routing variable entered for an event is 00, the audio is routed to the source that executed the command. If the serial port executes a command with a routing variable of 00, the response is routed out only the serial port. If a DTMF channel executes the same command, the response will be routed out the DTMF's channel.

Exception 2:

If Command 039 is present in the event tables execution. This command can change the routing of messages to selected ports thus bypassing all preset audio routing variables.

Conclusion:

Normal audio routing variables route to radio ports. Event audio routing is the same except you can assign three special cases that give more flexible routing to commands.

004: Setting Up the Master System Unlock Codes

The controller supports 2 types of password system.

- Type 1: Fixed password length from 1..15 digits
 Passwords length is determined by the number of digits you enter with Command 004. If you want a 4 digit password, simply enter 4 additional digits when programming. The limits to this style of access is if someone figures out your password they can access the controller. Fixed password access is available with Command 026
- Type 2: Challenged password with 4 digits entered from a table of 16 digits
 Password length is fixed to 4 digits. These 4 digits are requested by the controller when executing Command 005. The controller will speak "Please Enter Code X X X X". 'X' corresponds to a number in the table of user entered numbers. Command 004 is used to enter these user defined digits.
- When the user requests access to certain commands, and the controller speaks "Error 7", this indicates the need to unlock the controller before execution of the command is allowed. The user must execute Command 005 (Challenged Passwords) or Command 026 (Fixed Passwords) in order to unlock the controller. These codes are programmed with this command.

<004> (See Below for challenged Passwords)

or...

<004> x..x (Fixed Passwords)

Parameters:

Fixed Passwords:

X..X is the fixed password that ranges from 1 to 15 digits

Challenged Passwords:

The user must enter 16 digits from the DTMF pad. The digits can be any valid DTMF digit. It is very important to remember these codes for they access the master unlock command. If you forget the digits, and try to access a locked command, then re-initialization of the controller is the only way to access the command.

Challenged Password Look-up Table:

Requested Digits	Default Digits	User Entered Digits
0	1	
1	2	
2	3	
3	4	
4	5	
5	6	
6	7	
7	8	
8	9	
9	#	
10	#	
11	1	
12	2	
13	3	
14	4	
15	5	

Error Codes:

(System wide errors are listed in front of the manual)

Example 1:

I want to change the access codes to my own codes

004 ABC*1234###94123

Response:

The controller will not speak back the codes for security.

"System Lock Codes O K"

005: Unlocking the Controller with Challenged Passwords

This command allows the user to unlock the controller for accessing locked commands. This command only works if you have set-up the system for challenged passwords. The user will execute Command 005 and the controller will request unlock codes. These codes can be embedded with garbage codes for added security. The controller only requires the 4 requested codes to be entered in the requested sequence. Refer to Command 004 to program the access password.

User: Request password

<005>

Controllers voice: " Please enter code # # # #"

User enters the password to unlock the controller

<005>...PPPP...

**Controllers voice: "System Lock On" If the wrong password entered
or
Controllers voice: "System Lock Off" If the correct password entered**

Parameters:

...PPPP... is the password information. The '.' indicate garbage data can be entered before and after the group of password data is entered.

Defaults:

The password defaults are listed in Command 004's table.

Notes:

- Please note the password if you change it. Serial can bypass the unlock sequence if specified. If you do not note the password table, the serial may be able to change the table if Command 004 is not locked on the serial port.

Error Codes:

(System wide errors are listed in front of the manual)

Example 1:

The user enters Command 005 to get a password and the controller states codes 1,3,5,9 are needed. The user enters the following.

005 34512 1 3 5 9 #AB1239

The data '34512' and '#AB1239' is garbage data. The codes '1 3 5 9' is the correct password. The controller responds 'Controller Lock Off' indicating the lock is now disabled.

Response:

"Controller Lock Off" or "Controller Lock On" or "Please enter Code # # # #"

026: Unlocking the Controller with Fixed Passwords

This command allows the user to unlock the controller for accessing locked commands. This command only works if you have set-up the system for fixed passwords. The user will execute Command 026 followed by the fixed password that was entered with Command 004. Refer to Command 004 to program the access password.

User enters the password to unlock the controller

<026> P..P

**Controllers voice: "System Lock On" If the wrong password entered
or
Controllers voice: "System Lock Off" If the correct password entered**

Parameters:

P..P is the password information. This password can range from 1..15 digits depending on what the user entered with Command 004.

Defaults:

The password system is set-up for challenged passwords.

Notes:

- Please note the password if you change it. Serial can bypass the unlock sequence if specified. If you do not note the password table, the serial may be able to change the table if Command 004 is not locked on the serial port.

Error Codes:

(System wide errors are listed in front of the manual)

Response:

"Controller Lock Off" or "Controller Lock On"

006: Locking the Controller

This command locks the controllers access. Once the controller is locked the unlock sequence must be re-entered in order to gain access to locked commands.

<006>

Parameters:

There are no parameters for this command.

Defaults:

the controller defaults locked

Error Codes:

(System wide errors are listed in front of the manual)

Example 1:

The user is finished with programming and wants to re-lock the controller.

006 D or unkey

Response:

"Controller Lock On"

027: *Rename DTMF Command Name*

This command allows the user to rename commands using the 3 digit command number as the look-up indicator.

```
<027> xxx y.y
```

Parameters:

XXX is the command number that ranges from 000..245

Y..Y is the 1-6 digit command name

The command name can contain any of the 16 DTMF digits.

The command names can be up to 6 digits in length

Defaults:

The command names correspond to the command numbers.

Notes:

- It is important not to name 2 different command names the same name. If you do this the first command name matched will be executed. The controller scans from command number 000 to find a matching command name. If you rename 2 command names the same simply rename the later command name to a different name.

- The controller scans for name matches beginning with 6 digits down to single digit matches. When the controller finds a possible name match it compares the additional data that is present with the command name to what the controller expects that command names additional data needs. This matching sequence allows command names that are similar to be executed separately.

For example: A command name '#' and '#12 with data 13 14' will be executed differently. The controller will match '#' because it does not need additional data and will match '#12' with its command name because it needs 4 digits of additional data.

Error Codes:

E1 - Invalid command number. Number ranges from 000..245

E2 - Not enough data present

(System wide errors are listed in front of the manual)

Example 1:

I want to rename my autopatch hangup to '#'

```
027 146 # D or unkey
```

Response:

"Command Number is <Command Name>"

028: Command Read Back by Command Number

This command allows the user to recall a command name using the command number as the look-up source. This is handy when the command name is not known. The command number never changes so it is therefore a constant that can always be used as a reference.

```
<028> xxx
```

Parameters:

XXX is the command number that ranges from 000..245

Defaults:

The command names correspond to the command numbers.

Error Codes:

E1 - Invalid command number. Number ranges from 000..245

E2 - Not enough data present

(System wide errors are listed in front of the manual)

Example 1:

I need to recall what I named my autopatch hang-up code. The command number is 146.

```
028 146 D or unkey
```

Response:

"Command Number is <Command Name>"

029: Command Name Compare to Find Command Number

This command allows the user to recall a command number using the command name as the look-up source. This is handy when the command number is not know. The command number never changes so it is therefore a constant that can always be used as a reference.

```
<029> x..x
```

Parameters:

X..X is the command name

Defaults:

The command names correspond to the command numbers.

Error Codes:

E1 - Invalid command name.

(System wide errors are listed in front of the manual)

Example 1:

I need to recall what the command number is for my autopatch hang-up.

```
029 # D or unkey
```

Response:

"Command Number is <Command Name>"

030: Change First,Second,Third Command Name Digits

This command allows the user to change the first, second, and third digits of a group of command names. This command is used when a group of commands names needs a common part of the command name changed. This will not effect the command numbers (first 3 digits of the command name).

```
<030> xxx yyy z..z
```

Parameters:

XXX is the beginning command number that ranges from 000..245

YYY is the ending command number that ranges from 000..245

Z..Z is the digits to assigned to the group of commands.

Defaults:

The first 3 digits of these command names are not defined. All command names are 3 digits in length referenced by the command number.

Error Codes:

(System wide errors are listed in front of the manual)

Example 1:

I want to make all my commands begin with the DTMF digit 'C'

```
030 000 245 C D or unkey
```

Response:

"First command number is <Command Addition>, Second command number is <Command Addition>"

031: Group Assign DTMF Command Mask Assign

This command allows the user to assign a DTMF execution mask to a group of commands. Use of this command allows the control operator the ability to keep certain ports from executing certain commands and/or all commands.

```
<031> xxx yyy zz
```

Parameters:

XXX is the beginning command number ranging from 000..245

YYY is the ending command number ranging from 000..245

ZZ is the audio routing variable used to allow access to certain commands

DTMF Allowed Execution of the Command	Number that corresponds to the device
Port 1	+1
Port 2	+2
Port 3	+4
Autopatch	+8
Control Receiver	+16

(ZZ) Audio routing variable = (port1)+(port2)+(port3)+(autopatch)+(control rx)

Defaults:

All ports can execute all commands (ZZ=31)

Error Codes:

E1 - Digit Counters do not match. Check the number of digits entered for this command.

E2 - Invalid command number. Command numbers range from 000..245

E3 - Invalid audio routing variable. Variables range from 00..31

(System wide errors are listed in front of the manual)

Example 1:

I have a remote base on port 3..I do not want this radio to execute any DTMF commands.

(ZZ) Audio routing variable = 1(port1)+2(port2)+0(port3)+8(autopatch)+16(control rx)

```
031 000 245 27 D or unkey
```

Response:

"First command number is <DTMF Mask>, Second command number is <DTMF Mask>"

032: Command Checks Value of DTMF Execution Register

This command checks the results of Command 31 on individual command numbers.

<032> xxx

Parameters:

XXX is the command number ranging from 000..245

Defaults:

All ports can execute all commands (ZZ=31)

Error Codes:

E1 - Invalid command number. Command numbers range from 000..245
(System wide errors are listed in front of the manual)

Example 1:

I can not execute the "Check cross-point" command 009. I need to see if I am enabled to execute that command.

032 009 D or unkey

Response:

DTMF Allowed Execution of the Command	Number that corresponds to the device
Port 1	+1
Port 2	+2
Port 3	+4
Autopatch	+8
Control Receiver	+16

(ZZ) Audio routing variable = (port1)+(port2)+(port3)+(autopatch)+(control rx)

033: Group Assign Master Unlock Requirement for DTMF

This command allows the user to assign lock code requirements for a group of commands. This only effects the DTMF lock/unlock assignment. Serial lock assignments are programmed starting with Command 036.

To gain access to a locked command the controller must be unlocked. See Command 004,005, and 006 for unlock control.

```
<033> xxx yyy z
```

Parameters:

XXX is the beginning command number ranging from 000..245

YYY is the ending command number ranging from 000..245

Z is the control function

1 - requires an unlock before execution

0 - does not require an unlock before execution

Defaults:

All commands are unlocked

Notes:

- Command 005, the unlock command can never be locked. If it could be locked access to the controller could never be possible.

Error Codes:

E1 - Invalid command number. Command numbers range from 000..245

E2 - Invalid control variable. Variables range from 0..1

(System wide errors are listed in front of the manual)

Example 1:

I want all programming commands except macros, to require the unlock code entered.

```
033 000 170 1 D or unkey
```

Response:

"First command number is <ON/OFF>, Second command number is <ON/OFF>"

034: Individually Assign Unlock Requirement for DTMF

This command allows the user to assign lock code requirements for individual commands. This only effects the DTMF lock/unlock assignment. Serial lock assignments are programmed starting with Command 036.

To gain access to a locked command the controller must be unlocked. See Command 004,005, and 006 for unlock control.

```
<034> xxx y
```

Parameters:

XXX is the command number ranging from 000..245

Z is the control function

- 1 - requires an unlock before execution
- 0 - does not require an unlock before execution

Defaults:

All commands are unlocked

Notes:

- Command 005, the unlock command can never be locked. If it could be locked access to the controller could never be possible.

Error Codes:

E1 - Invalid command number. Command numbers range from 000..245

E2 - Invalid control variable. Variables range from 0..1

(System wide errors are listed in front of the manual)

Example 1:

I want to allow execution of 'Time-of-Day Reading'

```
034 055 0 D or unkey
```

Response:

"Command number is <ON/OFF>"

035: Recall DTMF Unlock Requirements on a Command

This command checks the results of Commands 33,34.

```
<035> xxx
```

Parameters:

XXX is the command number ranging from 000..245

Defaults:

All commands are unlocked

Notes:

- Command 005, the unlock command can never be locked. If it could be locked access to the controller could never be possible.

Error Codes:

E1 - Invalid command number. Command numbers range from 000..245
(System wide errors are listed in front of the manual)

Example 1:

I keep getting an Error 7 when I try to read the time-of-day clock, Command 055. Why??

```
035 055 D or unkey
```

The lock is enabled for this command. Execute Command 005 to unlock the controller then try to execute the command.

Response:

"Command number is <ON/OFF>"

036: Group Assign Master Unlock Requirement for Serial

This command allows the user to assign lock code requirements for a group of commands. This only effects the Serial lock/unlock assignment. DTMF lock assignments are programmed starting with Command 033.

To gain access to a locked command the controller must be unlocked. See Command 004,005, and 006 for unlock control.

```
<036> xxx yyy z
```

Parameters:

XXX is the beginning command number ranging from 000..245

YYY is the ending command number ranging from 000..245

Z is the control function

1 - requires an unlock before execution

0 - does not require an unlock before execution

Defaults:

All commands are unlocked

Notes:

- Command 005, the unlock command can never be locked. If it could be locked access to the controller could never be possible.

Error Codes:

E1 - Invalid command number. Command numbers range from 000..245

E2 - Invalid control variable. Variables range from 0..1

(System wide errors are listed in front of the manual)

Example 1:

I want all programming commands except macros, to require the unlock code entered.

```
036 000 170 1 D or unkey
```

Response:

"First command number is <ON/OFF>, Second command number is <ON/OFF>"

037: Individually Assign Unlock Requirement for Serial

This command allows the user to assign lock code requirements for individual commands. This only effects the Serial lock/unlock assignment. DTMF lock assignments are programmed starting with Command 036.

To gain access to a locked command the controller must be unlocked. See Command 004,005, and 006 for unlock control.

```
<037> xxx y
```

Parameters:

XXX is the command number ranging from 000..245

Z is the control function

- 1 - requires an unlock before execution
- 0 - does not require an unlock before execution

Defaults:

All commands are unlocked

Notes:

- Command 005, the unlock command can never be locked. If it could be locked access to the controller could never be possible.

Error Codes:

E1 - Invalid command number. Command numbers range from 000..245

E2 - Invalid control variable. Variables range from 0..1

(System wide errors are listed in front of the manual)

Example 1:

I want to allow execution of 'Time-of-Day Reading'

```
037 055 0 D or unkey
```

Response:

"Command number is <ON/OFF>"

038: Recall Serial Unlock Requirements on a Command

This command checks the results of Commands 33,34.

```
<038> xxx
```

Parameters:

XXX is the command number ranging from 000..245

Defaults:

All commands are unlocked

Notes:

- Command 005, the unlock command can never be locked. If it could be locked access to the controller could never be possible.

Error Codes:

E1 - Invalid command number. Command numbers range from 000..245
(System wide errors are listed in front of the manual)

Example 1:

I keep getting an Error 7 when I try to read the time-of-day clock, Command 055. Why??

```
037 055 D or unkey
```

The lock is enabled for this command. Execute Command 005 to unlock the controller then try to execute the command.

Response:

"Command number is <ON/OFF>"

040: User Forced Execution Digit Change

This command allows the changing of the forced execution digit. This digit forces the execution of the commands entered before the receiver drops. Uses of this digit is the shut-off a receiver when the COR is stuck open, a jammer needs to be shut-off, quicker access to commands, and the list goes on.

```
<040> x
```

Parameters:

X is the new DTMF forced execution digit

Defaults:

The forced execution digit is the 'D'

Notes:

- It is important not to define the forced execution digit to a commonly used DTMF digit. Once the DTMF digit is defined as being the forced execution digit, it can no longer be used for system wide applications. Typical DTMF digits used are '* A B C D'.

Error Codes:

(System wide errors are listed in front of the manual)

Example 1:

I need the EOF digit to be a '*' so I can use the 'D' in command names.

```
040 * D or unkey
```

Response:

"Condition Entered With A <Forced Execution Digit>"

041: Check the Forced Execution Digit

This command checks the current setting of the forced execution digit.

```
<041>
```

Parameters:

There are no parameters for this command

Defaults:

The forced execution digit defaults to a 'D'

Error Codes:

(System wide errors are listed in front of the manual)

Example 1:

I need to check the forced execution digit before I begin programming

```
041 D or unkey
```

* Note: The 'D' in the above example is the forced execution digit. If the digit is actually a '*' then the command entry would look like.

```
041 * or unkey
```

Response:

"Condition Entered With A <Forced Execution Digit>"

115: Assign the DTMF Decoder Priority

This command gives the controller the ability to assign highest priority to the DTMF decoder. When a port is assigned as highest priority, its activity determines where the DTMF decoder will be located for code input. Normally this port is "Port 5" the control receiver. This command is not discriminate. When the priority port is active, the decoder is changed to this port, regardless of data entry on the currently active port

<115> x

Parameters:

X is the radio port priority

DTMF Allowed Execution of the Command	Number that corresponds to the device
No Priority	0
Port 1	1
Port 2	2
Port 3	3
Autopatch	4
Control Receiver	5

Defaults:

(X) is set for the control receiver

Error Codes:

E1 - Invalid radio port. Number must range between 1..5
(System wide errors are listed in front of the manual)

Example 1:

I want Port 3 to become DTMF priority.

115 3 D or unkey

Response:

"Radio Select <Radio Port>"

Chapter 4 Examples

Example 4-1: Accessing Locked Commands when in Challenged Password Mode

The controller has a high security lock-out mode that keeps unwanted users from accessing certain commands. When the controller is un-locked, all commands can be accessed without security. This opens the programming of the controller up to anyone. Therefore the controller has the feature of locking access to any or all of the controllers commands. The only way to access these commands is by entering the correct unlock codes. Once the controller is unlocked open programming is again possible.

How to tell the controller to unlock:

The controllers unlock command is a challenging unlock code. When the user wants access to the locked commands, simply enter Command 005. This command will respond with the unlock code request. The voice message is 'Please Enter Code X X X X'. 'X X X X' refers to the numbers entered into the access code table (See Command 004). In order to unlock the controller the user must re-enter Command 005 followed by 'X X X X'. If the controller locates these codes correctly it will unlock the controller by speaking 'System Lock Off'. If the codes requested by the controller are incorrect, the controller will respond with the response 'System Lock On'. If you mess-up entering the codes simply execute Command 005 again and the controller will request another set of codes. The controller will never request the same codes twice in a row, and the code numbers will never be the same in the request. For example the controller will never request '1, 4, 4, 15' because there are 2-4's in the-4's in the same request.

For security the user can embed the requested unlock code in a string of garbage data up to 100 DTMF digits in length. If the controller requests the unlock code '1 5 A 3' the user can enter the sequence '1 5 A 3' or '1 2 8 5 4 1 5 A 3 4 6 1 2' and the controller will unlock programming. If you notice the correct unlock code is present in the 13 digit sequence, but surrounded by garbage digits.

Once programming is complete, the user can lock the controller using Command 006. If the user forgets to lock the controller, the System Un-Lock timer (See Command 050,051,052) will automatically lock the controller. The lock timer is reset after every command is executed without any errors.

Example 4-2: Renaming Commonly Used Commands

In order for the controller to handle your system existing codes, the RLC-2 has the ability of renaming the command names from 1..6 digits. The command names can contain any of the 16 DTMF digits except the forced execution digit. This digit defaults to the 'D' key. All command names default to their command number. Command numbers range from 000..245. All internal programming that handle any command names uses the command number as the command request. This insures the controller does not need to busy itself by handling the command name that can be as big as 6 digits.

For example:

In a macro I need to recall a voice message (Command 045). I have renamed this command name to 1234AA. Inside the macro I will use the command number (045) not the name of 1234AA.

Rules to follow when deciphering the command name maze:

- 1) Use the 3 digit command numbers when the controller executes the command
- 2) Use the DTMF command name when executing from any of the radio\patch ports.
- 3) When executing from the serial port, use the command numbers, not the command names

Default Command Names:

All command names are initialized to their command number out of initialization. For example to execute Command 045 you enter 045 out of initialization. All of the manual pages that describe the commands functions begin with the commands command number.

Exceptions:

- 1) Autopatch dial command:
 - Command number = 143
 - Default command name = '*'
 - Format: '*' followed by the phone number
- 2) Autopatch hang-up command:
 - Command number = 146
 - Default command name = '#'
 - Format: '#' hangs the phone up
- 3) Autopatch last number entered redialed:
 - Command number = 148
 - Default command name = '**'
 - Format: '**' redials the last number entered
- 4) Autopatch reset time-out timer:
 - Command number = 149
 - Default command name = '**3'
 - Format: '**3' will restart the patch time-out timer to its entered value

Example 4-3: Renaming Commands

In order for the controller to handle your system existing codes, the RLC-2 has the ability of renaming the command names from 1..6 digits. The command names can contain any of the 16 DTMF digits except the forced execution digit. This digit defaults to the 'D' key. All command names default to their command number. Command numbers range from 000..245. All internal programming that handle any command names uses the command number as the command request. This insures the controller does not need to busy itself by handling the command name that can be as big as 6 digits.

Renaming commands using Command 027:

Command 027 allows the user to rename any command number to a unique command name.

The format of the command:

027 XXX #.# D or unkey

Where 027 is the default command name of command 027

XXX is the command number needing the new command name

#.# is the new command name that ranges from 1 to 6 digits

Example: I want to recall my controller time using the code #83

1) Recall the time uses command number 055

2) Execute command 027

The format of the command:

027 055 #83 D or unkey

Where 027 is the default command name of command 027

055 is the recall time command

#83 is the new command name

Exceptions:

1) Command names can not contain the forced execution digit.

Forced execution digit defaults to the 'D' key

If you need to change the forced execution digit, do it before you name any commands that will contain the new forced execution digit.

2) Duplicate command names are not allowed

If you duplicate command names the controller will execute the first name that it comes to. The second instance will never be executed except by the serial port, and internal commands. If you accidentally name two commands the same name simply rename the duplicate command to another name using command 027.

Recalling command names is accomplished using commands 028 and 029

028 recalls the command name using the command number as the key

028 XXX D or unkey ; recalls command name of command number 'XXX'

029 recalls the command number using the command name as the key

029 #.# D or unkey ; recalls command number of command name '#.#'

Example 4-4: Assigning DTMF, Un-Lock codes, Serial masks

The RLC-2 supports assignment of several user options to determine who can execute commands and from what source. The 3 types of masks:

- **DTMF execution mask:** This mask is used to determine what ports can execute what commands. If you do not want certain ports from executing commands. Command 031 is provided to assign DTMF masks to a group of command numbers. All commands default to execution from all ports.

Format: Assign DTMF mask

031 XXX YYY ## D or unkey

Where 'XXX' is the first command number

'YYY' is the second command number

'##' is the execution mask (See Command 031)

If you only want to assign a DTMF mask to 1 command, then enter that command number for both 'XXX' and 'YYY'.

Example: I want port 3 no DTMF access to any commands

1) Calculate the mask (See Command 031)

- The mask value calculated: $1 + 2 + 0 + 8 + 16 = 27$

2) Execute command 031:

- 031 000 245 27 D or unkey ; Allows DTMF execution from all ports except port 3

To check what DTMF execution mask is assigned to a command, see command 032.

- **Unlock codes for DTMF access:** This mask is used to determine what commands executed from DTMF can access programming commands only when the controller is unlocked. When the unlock code is assigned, the user must execute Command 005 before these commands can be executed. All commands default unlocked (No command 005 needed).

Format: Assign Unlock code for a group of DTMF accessed commands

033 XXX YYY # D or unkey

Where 'XXX' is the first command number

'YYY' is the second command number

'#' is the lock mask 1=lock, 0=unlock

Format: Assign Unlock code for an individual DTMF accessed command

034 XXX # D or unkey

Where 'XXX' is the command number

'#' is the lock mask 1=lock, 0=unlock

To check what unlock code is assigned to a command, see command 035.

Example: I want all commands from 000..142, 144,145 and 150..170 to require the unlock code be entered before accessing those commands

- 1) Execute command 033 for commands 000..142:
- 033 000 142 1 D or unkey ; Require unlock code
- 2) Execute command 034 for commands 143
- 034 143 0 D or unkey ; Command unlocked
- 3) Execute command 033 for commands 144..145:
- 033 144 145 1 D or unkey ; Require unlock code
- 4) Execute command 033 for commands 146..149:
- 033 146 149 0 D or unkey ; Commands unlocked
- 5) Execute command 033 for commands 150..170:
- 033 150 170 1 D or unkey ; Require unlock code

This batch of commands only allows certain commands to be executed by the user. All other commands require the unlock code entered. Command 005 can never be locked. If this command were locked, the controller could never be unlocked.

- Unlock codes for serial port access: This mask is used to determine what commands executed only from the serial port can access programming commands only when the controller is unlocked.

Format: Assign Unlock code for a group of serial port accessed commands

036 XXX YYY # D or unkey

Where 'XXX' is the first command number

'YYY' is the second command number

'#' is the lock mask 1=lock, 0=unlock

Format: Assign Unlock code for an individual serial accessed command

037 XXX # D or unkey

Where 'XXX' is the command number

'#' is the lock mask 1=lock, 0=unlock

To check what serial unlock code is assigned to a command, see command 038.

Example: I want all commands execute from the serial port to require the unlock code be entered before accessing those commands

- 1) Execute command 036 for commands 000..245:
- 036 000 245 1 D or unkey ; Require unlock code

This batch of commands only allows certain commands to be executed by the user. All other commands require the unlock code entered. Command 005 can never be locked. If this command were locked, the controller could never be locked.

Example 4-5: Changing the <Forced Execution> Digit

The controller supports a special DTMF digit called the forced execution digit. This digit is special in the case that it forces the controller to execute the entered digits when this digit is entered. The controller has 3 ways of causing commands to be executed.

- 1) Receiver drops and causes the DTMF digits, if any, to be executed
- 2) Timed execution. After the DTMF digits are entered, and if the receiver does not unkey before the timer assigned to the timed execution expires, the DTMF data is executed.
- 3) Forced execution digit is received. Upon receipt of this digit, the controller will execute the entered digits.

The forced execution digit defaults to the 'D' key. Because of the command executer the controller supports, and because the 'D' digit is not used very often, this digit as the enter digit. Other controllers, and earlier versions of software for this controller used the '*' as the forced execution digit. With the new executer on the controller, the '*' is defined for other purposes on the controller. Autopatch access begins with the '*'.

'D' can not be used in any functions on the controller except in the pre-access system.

When choosing the forced execution digit, the user must keep in mind that the digit can not be used for any other function in the controller. If you are use to the '*' as this digit, simply include the '*' in your command name.

Reverse autopatch access can not use the 'D' unless you have a 16 digit phone system. If you do not then see Command 023 to enable timed execution. This seems to work well with the phone system.

Changing the forced execution digit.

- 1) Verify you do not use this digit in existing command names
- 2) Execute Command 040 followed by the new Forced digit
 040 X D or unkey
 Where 'X' is you new forced execution digit
 Response "Command Entered With A 'X' "

The controller defaults the forced execution digit as a 'D'

043: Generate a CW Message Out Selected Ports

This command generates the CW messages used by the controller.

<043> xx..xx

Parameters:

XX..XX is the CW code table

CW	XX	.	CW	XX	.	CW	XX	.	CW	XX	.	CW	XX
0	0	.	A	10	.	K	20	.	U	30	.	SPACE	40
1	1	.	B	11	.	L	21	.	V	31	.	PAUSE	41
2	2	.	C	12	.	M	22	.	W	32	.		
3	3	.	D	13	.	N	23	.	X	33	.		
4	4	.	E	14	.	O	24	.	Y	34	.		
5	5	.	F	15	.	P	25	.	Z	35	.		
6	6	.	G	16	.	Q	26	.	/	36	.		
7	7	.	H	17	.	R	27	.	0	37	.		
8	8	.	I	18	.	S	28	.	?	38	.		
9	9	.	J	19	.	T	29	.	AR	39	.		

Defaults:

CW speed defaults to 20 WPM

CW Frequency defaults to 1000HZ and 1500HZ

Error Codes:

E1 - To much CW data

E2 - Invalid CW Character

(System wide errors are listed in front of the manual)

Example 1:

I want to generate a CW message 'KF7FW/R'

043 20 15 07 15 32 36 27 D or unkey

Response:

There is no voice response for this command

045: *Generate a Voice Message*

This command allows the generation of voice messages. These messages can be either impolite (Can not be interrupted), polite (Can be interrupted and the message is canceled) or polite with a message sent (Can be interrupted and the message is canceled, when the message is canceled an event in the event table is requested. This event can then generate a CW message or another voice message if needed). See Appendix C for the voice word table.

<045> xxx..xxx

Parameters:

XXX..XXX are the voice words for speaking.

Notes:

There two special words that effect how a voice message is spoken.

- Word 733: Indicates a polite message that when interrupted will cancel the voice message
- Word 734: Is the same as word 733 except when it is interrupted it requests an event from the event table. The user could send a CW message when the voice is interrupted.

Error Codes:

E1 - To much or to little data entered

E2 - Incorrect voice word. See Appendix C for voice words
(System wide errors are listed in front of the manual)

Example 1:

I want to speak the message

"At <Male Time> You Are On The Repeater, <Good MAE>"

AT	077
<Male Time>	701
You	480
Are	047
On	310
The	421
Repeater	361
Pause	528
<Good MAF>	700

045 077 701 480 047 310 421 361 528 700 D or unkey

Response:

Response is what you typed in.

046: Delete a Message Slot

This command allows the deletion of certain message slots. This is useful when a message is no longer needed. When the message is deleted, there will be no key-ups or delays when the controller requests that message.

```
<046> xx
```

Parameters:

XX is the message slot number. This number ranges from 01..33

Notes:

- Once a message is deleted you must re-program the message. There is no way to undelete the message slot once it is deleted.

Error Codes:

E1 - Invalid message slot

(System wide errors are listed in front of the manual)

Example 1:

I need to delete message slot 15. It is no longer used

```
046 15 D or unkey
```

Response:

"Cancel <Message slot number>"

047: DTMF Keypad Message Generate

This command allows the user to generate a voice message as a keypad test. Up to 20 keys can be entered to generate a voice message. The controller will respond with a voice message that is equivalent to the DTMF entered.

```
<047> x..x
```

Parameters:

X..X are the DTMF digits entered

Defaults:

There are no defaults for this command

Notes:

- The "Forced Execution Digit" will never be spoken. All other 15 digits will be spoken

Error Codes:

E1 - Too much or too little data entered

(System wide errors are listed in front of the manual)

Example 1:

I want to test my keypad's DTMF digits

```
047 1 2 3 4 5 6 7 8 9 0 A B C D # D or unkey
```

Response:

"<DTMF Digits Entered>"

048: Recall a Message Slot 00..33

This command allows the recalling of pre-programmed voice or cw messages. If the slot is empty you will get an error.

```
<048> xx
```

Parameters:

XX is the message slot number. This number ranges from 01..33

Defaults:

All message slots are empty

Error Codes:

E1 - Invalid message slot

E2 - Message slot is empty

(System wide errors are listed in front of the manual)

Example 1:

I want to check message slot 14 for its contents

```
048 14 D or unkey
```

Response:

"Voice or CW data if the message is programmed otherwise Error 2"

049: Program a Message Slot

This command allows you to program the message slots with voice or cw messages. Slots 51..58 are special analog faceplate slots but can be used for small messages if not used in the analog application.

```
<049> xx y zzz..zzz
```

Parameters:

XX is the message slot number. This number ranges from 01..33

Message Slot	Length	Description
00	...	Software Version
01..25	20 words	User Message Slots
26..33	4 words	Analog Faceplate Slots

Y is the message type variable:

- 0 - CW Message
- 1 - Voice Message
- 2 - Imploite Large Digital Voice Recorder Message, Messages
- 3 - Polite Large Digital Voice Recorder Message, Messages
 - Cancels the message only
- 4 - Polite Large Digital Voice Recorder Message, Messages
 - Cancels the message and calls event 101 (See Command 064)

- ZZ are the CW characters from the Code Table (See Page 5-4) if message type 0
- ZZZ are the voice/small DVR words from the Word Table (See Appendix C) if message type 1
- ZZZ are the Large Digital Voice Recorder message slots if message type 2, 3 or 4

Defaults:

All message slots are empty

Error Codes:

E1 - To much or to little data

E2 - Invalid message type. Number must be between 0..2

E3 - Invalid message slot

(System wide errors are listed in front of the manual)

Example 1:

I want to store the voice message in slot 01

"At <Male Time> You Are On The Repeater, <Good MAE>"

```
AT 077 <Time> 701 You 480 Are 047 On 310
The 421 Repeater 361 Pause 528 <Good MAF> 700
```

```
049 01 1 077 701 480 047 310 421 361 528 700 D or unkey
```

Response:

Response is what you typed in.

Example 5-1: Generating a Custom Courtesy Beep

A courtesy beep on the controller is an event that is requested after certain timers have expired. Once these timers have expired the controller fetches the courtesy beep event for the port that requested it. A courtesy beep event does not always have to be a tone sequence. The event can be anything from a command executed to a digital voice recorded message. Most users simply will use either the pre-programmed beep sequences (See Command 042). If one of the pre-programmed beeps does not meet your needs, then you can develop your own sequence. This involves calling a macro command from the event table.

The event table contains the events that are assigned to the courtesy beeps. Events 016..020 are the events for all 5 ports courtesy beeps.

Example: Develop a 3 beep sequence for Port 1's courtesy beep

1) Use Macro #01 for this example

2) Decide what each beep sequence will sound like

- Beep sequence 1: Tone 1:1000hz, 1200hz, 120mS long, 10mS delay
- Beep sequence 2: Tone 1:1200hz, 1400hz, 80mS long, 10mS delay
- Beep sequence 3: Tone 1:0600hz, 0800hz, 80mS long, 10mS delay

3) Look-up the frequency to counts conversion

- 1000hz = 0999, 1200hz = 0832
- 1200hz = 0832, 1400hz = 0713
- 0600hz = 1665, 0800hz = 1249

4) The format of Command 042

- 042 (tone count 1)(tone count 2)(length of tone 10mS)(length of delay 10mS)
- lengths: tone counts are 4 digits, lengths are 3 digits

5) Erase macro #01 using Command 165

- 165 01 D or unkey

6) Program macro #01 using Command 168

- 168 01 042 0999 0832 012 001 D or unkey ; Programs Beep sequence 1
- 168 01 042 0832 0713 008 001 D or unkey ; Programs Beep sequence 2
- 168 01 042 1665 1249 008 001 D or unkey ; Programs Beep sequence 3

7) Assign courtesy beep for port 1 (Event 016) to call macro #01 (Command 171)

- 064 016 2 171 37 D or unkey

This command assigns event (016) execute a command type (2) executes command number (171) and routes the response to all connected repeater ports. Once the event is programmed the controller enables execution of the sequence.

052: Program a Timer Slot

This command allows the programming of the system timer slots. Each timer slot can accept 3 digits of user input ranging from 000..999. Each timer has its own resolution which is listed in the timer table in Command 050.

```
<052> xx yyy
```

Parameters:

XX is the timer slot number listed in Command 050.

YYY is the timer value that ranges from 000..999.

- Timer resolution is listed in Command 050.

Defaults:

Defaults are listed in Command 050.

Error Codes:

E1 - Invalid timer slot

(System wide errors are listed in front of the manual)

Notes:

- After you program a timer slot the old value is still in the timer system. You need to re-start the timer using Command 051 in order for the new value to take place.

Example 1:

I need to program the time-out timer on Port 1 to 3 minutes from 10 minutes.

```
052 05 018 D or unkey
```

Response:

Voice '<Slot Number> is <Time in the slot>'

066: Start a User Timer

This command allows the user to start a user timer when an event occurs. This command is usually used in conjunction with the event tables. This user timer value is programmed using Command 050,051,052.

```
<066> x..x
```

Parameters:

X..X are the user timers. These numbers must be between 1..5

- You can start several timers at once by entering all the timers in 1 sequence

Defaults:

All timers are off

Notes:

- Refer to the event table for user timer events to be executed when the timers expire

Error Codes:

E1 - Invalid user timer slot

(System wide errors are listed in front of the manual)

Example 1:

I want to start user timer 1,3,5.

```
066 1 3 5 D or unkey
```

Response:

"Timer <Timer Number> Start"

067: Stop a User Timer

This command allows the user to stop a user timer when an event occurs. This command is usually used in conjunction with the event tables. This user timer value is programmed using Command 050,051,052.

```
<067> x..x
```

Parameters:

X..X are the user timers. These numbers must be between 1..5

- You can stop several timers at once by entering all the timers in 1 sequence

Defaults:

All timers are off

Notes:

- Refer to the event table for user timer events to be executed when the timers expire

Error Codes:

E1 - Invalid user timer slot

(System wide errors are listed in front of the manual)

Example 1:

I want to stop user timer 2,4.

```
067 2 4 D or unkey
```

Response:

"Timer <Timer Number> Stop"

063: Recall an Event

This command allows the user to recall an event entry. These events are the most important function of the RLC-2 controller. With the events most functions of the controller can be controlled, handled, or spoken.

```
<063> xxx
```

Parameters:

XXX is the event table slot. This number ranges from 000..107

Defaults:

All event are off

Error Codes:

E1 - Invalid event slot

(System wide errors are listed in front of the manual)

Example 1:

I want to see if my courtesy beep event is enabled for Port 1

```
063 016 D or unkey
```

Response:

"<Slot Number> is <Message Type>, <Slot Number> is <ON/OFF>, Route is <Audio Routing Variable>"

064: Program an Event

This command program an event table entry. These events are the most important function of the RLC-2 controller. With the events most functions of the controller can be controlled, handled, or spoken.

```
<064> sss t xxx rr
```

Parameters:

SSS is the event table slot. This number ranges from 000..105

Slot Number	Description
000	Controller Reset just occurred
001	Port 1 Initial ID
002	Port 1 Rotating ID 1
003	Port 1 Rotating ID 2
004	Port 1 Rotating ID 3
005	Port 1 Forced ID
006	Port 2 Initial ID
007	Port 2 Rotating ID 1
008	Port 2 Rotating ID 2
009	Port 2 Rotating ID 3
010	Port 2 Forced ID
011	Port 3 Initial ID
012	Port 3 Rotating ID 1
013	Port 3 Rotating ID 2
014	Port 3 Rotating ID 3
015	Port 3 Forced ID
016	Port 1 Courtesy Beep Requested
017	Port 2 Courtesy Beep Requested
018	Port 3 Courtesy Beep Requested
019	Port 4 Courtesy Beep Requested (Autopatch)
020	Port 5 Courtesy Beep Requested (Control Receiver)

Slot Number	Description
021	Port 1 Drop-out Message 1
022	Port 1 Drop-out Message 2
023	Port 2 Drop-out Message 1
024	Port 2 Drop-out Message 2
025	Port 3 Drop-out Message 1
026	Port 3 Drop-out Message 2
027	Port 1 Time-Out Message
028	Port 2 Time-Out Message
029	Port 3 Time-Out Message
030	Scheduler Event 01
031	Scheduler Event 02
032	Scheduler Event 03
033	Scheduler Event 04
034	Scheduler Event 05
035	Scheduler Event 06
036	Scheduler Event 07
037	Scheduler Event 08
038	Scheduler Event 09
039	Scheduler Event 10
040	Scheduler Event 11
041	Scheduler Event 12
042	Scheduler Event 13
043	Scheduler Event 14
044	Scheduler Event 15 or Pre-Access Port 1 just went active
045	Scheduler Event 16 or Pre-Access Port 2 just went active
046	Scheduler Event 17 or Pre-Access Port 3 just went active
047	Scheduler Event 18 or Pre-Access Port 1 just went inactive

Slot Number	Description
048	Scheduler Event 19 or Pre-Access Port 2 just went inactive
049	Scheduler Event 20 or Pre-Access Port 3 just went inactive
050	Port 1 PTT Just Went Active
051	Port 2 PTT Just Went Active
052	Port 3 PTT Just Went Active
053	LTZ (Long Tone Zero) Event requested
054	Port 1 Receiver just went Active
055	Port 2 Receiver just went Active
056	Port 3 Receiver just went Active
057	Port 4 Receiver just went Active
058	Port 5 Receiver just went Active
059	Port 1 Receiver just went Inactive
060	Port 2 Receiver just went Inactive
061	Port 3 Receiver just went Inactive
062	Port 4 Receiver just went Inactive
063	Port 5 Receiver just went Inactive
064	Analog 1 just went into High Alarm
065	Analog 2 just went into High Alarm
066	Analog 3 just went into High Alarm
067	Analog 4 just went into High Alarm
068	Analog 1 just went into Low Alarm
069	Analog 2 just went into Low Alarm
070	Analog 3 just went into Low Alarm
071	Analog 4 just went into Low Alarm
072	Analog 1 just came out of Alarm
073	Analog 2 just came out of Alarm
074	Analog 3 just came out of Alarm

Slot Number	Description
075	Analog 4 just came out of Alarm
076	Input 1 just went Low
077	Input 2 just went Low
078	Input 3 just went Low
079	Input 4 just went Low
080	Input 1 just went High
081	Input 2 just went High
082	Input 3 just went High
083	Input 4 just went High
084	DTMF Decoder just went Active
085	DTMF Decoder just went Inactive
086	Port 1 PTT just went Inactive
087	Port 2 PTT just went Inactive
088	Port 3 PTT just went Inactive
089	User Timer 1 just Expired
090	User Timer 2 just Expired
091	User Timer 3 just Expired
092	User Timer 4 just Expired
093	User Timer 5 just Expired
094	Autopatch just went Active before Dialing
095	Autopatch just Started Dialing
096	Autopatch just went On-Hook (Hung-up)
097	Manual Autopatch just went Active
098	Reverse Autopatch just Answered
099	Reverse Autopatch is just about to Hang-up
100	Port 1 voice message was interrupted (See Command 045)
101	DVR Message was just interrupted (See Command 045)

Slot Number	Description
102	Autopatch Time-out Message
103	Control Receiver Message
104	Autopatch Memory Dial Message
105	AutoPatch Direct Dial Message
106	Port 2 voice message was interrupted (See Command 045)
107	Port 3 voice message was interrupted (See Command 045)

T is the event type

Event Number	Event Type
0	No Event, Same as Disabling the Event
1	Request a message from the Message Slot Storage (Command 048 and 049)
2	Request a Command be executed. Commands can not contain any additional data
3	Request a Pre-Programmed Courtesy Beep Slot (Command 042)
4	Request an internal, pre-programmed message

XXX is the message number

If your event type (T) is 1	XXX = Message Slot Number Slot 01 = 001
If your event type (T) is 2	XXX = Command Number to be Executed Command 055 = 055
If your event type (T) is 3	XXX = Pre-Programmed Courtesy Beep Beep 04 = 004 (See Command 042)
If your event type (T) is 4	XXX = Pre-Programmed internal message Message 03 = 003 (See Below)

RR is the audio routing variable

DTMF Allowed Execution of the Command	Number that corresponds to the device
Port 1	+1
Port 2	+2
Port 3	+4
Autopatch	+8
Control Receiver	+16

(RR) Audio routing variable = (port1)+(port2)+(port3)+(autopatch)+(control rx)

Special routing variables are provided to allow routing of messages to connected ports.

Audio Routing Number	Definition
32	Route responses to all ports connected to Port 1
33	Route responses to all ports connected to Port 2
34	Route responses to all ports connected to Port 3
35	Route responses to all ports connected to Port 4
36	Route responses to all ports connected to Port 5
37	Route responses to all ports that are repeaters connected to Port 1
38	Route responses to all ports that are repeaters connected to Port 2
39	Route responses to all ports that are repeaters connected to Port 3
40	Route responses to all ports that are repeaters connected to Port 4
41	Route responses to all ports that are repeaters connected to Port 5
42	Route responses to all ports that are connected to the port that is controlling with DTMF, including the DTMF'ing port
43	Route responses to all ports that are repeaters connected to the port that is controlling with DTMF, including the DTMF'ing port

Defaults:

Event #	Message Definition
000	Reset Message: Defaults to Internal Message 00
001	Port 1, Initial ID: Defaults to Internal Message 06
002	Port 1, Rotating ID 1: Defaults to Internal Message 07
003	Port 1, Rotating ID 2: Defaults to Internal Message 08
004	Port 1, Rotating ID 3: Defaults to Internal Message 09
005	Port 1, Forced ID: Defaults to Internal Message 10
016	Port 1 Courtesy Beep: Defaults to Preset beep 06
017	Port 2 Courtesy Beep: Defaults to Preset beep 07
018	Port 3 Courtesy Beep: Defaults to Preset beep 08
027	Port 1 Time-Out Message: Defaults to Internal Message 02
096	Autopatch Hang-up Message: Defaults to Internal Message 04
098	Reverse Autopatch Just Answered: Defaults to Internal Message 05
104	Autopatch Memory Dial Message: Defaults to Internal Message 11
105	Autopatch Direct Dial Message: Defaults to Internal Message 12

Internal Messages:

Message #	Message Contents:
00	Controller Ready
01	Autopatch
02	Repeater Time-Out
03	Link Time-Out
04	Autopatch Off At <Male Time>, Good <Morning, Afternoon, Evening>
05	Welcome To The Repeater, Please Enter Code Immediately
06	Welcome To The Repeater Identify 1
07	Welcome To The Repeater Identify 2
08	Welcome To The Repeater Intentify 3
09	Welcome To The Repeater Intentify 4
10	Welcome To The Repeater Intentify 5
11	Auto Dial
12	Auto Patch
13	The Door is Open
14	The Door is Closed

Error Codes:

E1 - Invalid event slot number. Number must range from 000..107

E2 - Invalid event type. Number must range from 0..4

(System wide errors are listed in front of the manual)

Example:

I need to assign a pre-programmed courtesy beep to port 1

064 016 3 006 01 D or unkey

Response:

"<Slot Number> is <Message Type>, <Slot Number> is <ON/OFF>, Route is <Audio Routing Variable>"

065: Enable/Disable an Event

This command enables and disables an event slot. This does the same as setting the event to a '0' type, but does not require the complete re-programming of that event. Therefore other events can enable/disable events without affecting their contents.

```
<065> xxx y
```

Parameters:

XXX is the event table slot. This number ranges from 000..107

Y is the control variable

1 - Enables the event

0 - Disables the event

Defaults:

All event are off

Error Codes:

E1 - Invalid event slot

(System wide errors are listed in front of the manual)

Example 1:

I want to disable Port 1's courtesy beep.

```
065 016 0 D or unkey
```

Response:

"<Event Number> is <ON/OFF>"

Example 8-1: How to have a Voice ID revert to a CW ID

A commonly asked question is how to cause a Voice ID to change to a CW ID when interrupted. This term is called a polite voice ID. There are 3 steps in making an ID polite.

- 1) Include the voice special word '734' in the voice message
- 2) Program a CW ID slot
- 3) Assign event 100 (If for port 1) to call your CW ID

Step #1

Store my Initial ID into slot #01 'Welcome to the K F 7 F W Repeater <Pause> Good M/A/E'

- 049 01 1 468 002 421 040 035 007 035 052 361 528 700 **734** D or unkey or <Enter>

** Note the '734' at the end of the sequence indicates a polite ID that calls an event when interrupted.

Step #2

Program a CW ID into slot #05 'K F 7 F W / R '

- 049 05 0 20 15 07 15 22 36 27 D or unkey or <Enter>

Step #3

Assign event 100 (Port 1 voice interrupted event) to call message slot 005

- 064 100 1 005 01 D or unkey or <Enter>

Now to test what you just programmed recall message 01 using Command 048 01 <unkey>, when you key-up in the middle of the message it will switch over to CW.

070: Analog Line Faceplate Assignment

This command allows the assignment of an analog conversion faceplate to any of the analog input lines. These conversion faceplates take the analog input voltage and convert it to a number that corresponds to the analog inputs voltage. This command only converts the input, Command 072 will handle the actual calibration of the converted number.

<070> x yy

Parameters:

X is the analog input to assign the faceplate. This number ranges from 1..4

YY is the requested analog conversion faceplate

Faceplate #	Switch On	Switch Off	Conversion from volts to words
00	0.00-25.00 Volts	0.00-5.00 Volts	0<point>00 - 5<point>00
01	0.0-25.0 Volts	0.00-5.00 Volts	00<point>0 - 16<point>0
02	0.00-25.00 Volts	0.00-5.00 Volts	00<point>0 - 32<point>0
03	0.00-25.00 Volts	0.00-5.00 Volts	00<point>0 - 64<point>0
04	0.00-25.00 Volts	0.00-5.00 Volts	00<point>0 - 128<point>0
05	0.00-25.00 Volts	0.00-5.00 Volts	000 - 255
06	-----	Kelvin Temperature	Low Resolution Fahrenheit
07	-----	Kelvin Temperature	Low Resolution Celsius
08	-----	Special Circuit °F	High Resolution Fahrenheit
09	-----	Special Circuit °C	High Resolution Celsius
10	0.00-25.00 Volts	0.00-5.00 Volts	000 - 100 (Percent)
11	0.00-25.00 Volts	0.00-5.00 Volts	000 - 360 (Wind direction)
12	0.00-25.00 Volts	0.00-5.00 Volts	00<point>0 - 25<point>0
13	0.00-25.00 Volts	0.00-5.00 Volts	Special Faceplate (See Below)
14	0.00-25.00 Volts	0.00-5.00 Volts	S0..S9<plus>60 (Signal Level)

072: Analog Line Calibration

This command allows the user to calibrate an analog input. This feature is required to make an input translate the input voltage to a voice number correctly.

To determine if an input needs to be calibrated:

- 1) Assign the appropriate conversion face
- 2) Read the analog input using Command 075

If the number read differs from the number at the analog input, you need to calibrate

```
<072> x y zz
```

Parameters:

X is the analog input line. This number is between 1..4

Y is control variable

1 - Add the offset

0 - Subtract the offset

ZZ is the calibration number. This number is between 00..99

Defaults:

All analog calibration is plus 00

Notes:

- If you can not calibrate an input, check your switch settings and faceplates

Error Codes:

E1 - Invalid analog line. This number must be between 1..4

(System wide errors are listed in front of the manual)

Example 1:

My temperature sensor on analog input 2 reads high. I need to calibrate is down

```
072 2 0 03 D or unkey
```

Response:

"<Analog Line> is <Calibration Number>"

082: Analog Line Alarm Value Program

This command allows the user to assign both high and low alarm points to the analog inputs. The applications for this command are for monitoring high and low points like temperature, voltage, door alarms, contact closures, and any analog or contact closure condition.

```
<082> w x yyy
```

Parameters:

W is the analog inputs. This number must be between 1..4

X is the alarm indicate programming variable

1 - High alarm programming

0 - Low alarm programming

YYY is the alarm point. This number must be between 000..255

The alarm tables are on the following 2 pages

How to use the tables for alarming:

When choosing an alarm point locate the faceplate that is assigned to the line being alarmed.

Follow the numbers and locate a position that most closely defines the desired alarm point.

Select the number that averages closest to the desired alarm point and enter it for the 'YYY' variable in the command name.

Defaults:

All alarms are disabled

Notes:

- The tables only provide a rough approximation of the alarm point. Once the 3 digit number is entered into the alarm function a formatted number will be spoken for the actual alarm point. If you want your alarm point to be closer simply re-enter a new alarm point number that is slightly different than the previous point. Do this until you achieve the desired alarm point.

Error Codes:

E1 - invalid analog line

E2 - Invalid analog alarm value

(System wide errors are listed in front of the manual)

Example 1:

I want to alarm analog 1 for a high alarm at 135°F. My faceplate is 06

(I located 121°F (205) and 149°F (215). I found the mid-point of 135°F to be 210)

```
082 1 1 210 D or unkey
```

Response:

"<Voltage the alarm point is at>"

084: Check Analog Active Alarms

This command check if an analog line is in alarm. If the line is in alarm it will indicate what alarm condition the line is in.

```
<084> x
```

Parameters:

X is the analog inputs. This number must be between 1..4

Defaults:

All analog alarms are disabled

Error Codes:

E1 - Invalid analog line

(System wide errors are listed in front of the manual)

Example 1:

I need to check if my analog 4 is in alarm.

```
084 1 D or unkey
```

Response:

Either "<High Alarm>, <Low Alarm> or <Not in Alarm>"

Analog Input Telemetry Lines

The RLC-2 offers 4 analog monitoring input lines. This is a nice feature that allows the site owner to monitor analog conditions like temperature, site voltage, forward and reflected power, heat sink temperature, and much more. The RLC-2 comes set up to measure 0-25 Volts with 100mV resolution. For special applications, the input voltage will only vary a few volts. With a clip of a resistor (Revision A boards), the lifting of a jumper (Revision B boards), or a flip of a dip switch (Revision C boards), the RLC-2 will measure 0-5 Volts, giving 20mV resolution. It is important not to apply over 30 volts to the RLC-2 in the 25 Volt range or 7 volts in the 5 volt range. If this voltage threshold is exceeded, damage to the analog op amp will occur.

Pin-Out Analog/Input P1 Connector

Pin Number	Description
1	Ground Available
2	Contact Closure Input #4
3	Contact Closure Input #2
4	Analog Input #4
5	Analog Input #2
6	Contact Closure Input #3
7	Contact Closure Input #1
8	Analog Input #3
9	Analog Input #1

096: Set PL Frequency, Encode On-Off, Decode On-Off

This command controls the setting of the PL information, Encode and Decode controls. Other features like power, memory, frequency are entered in separate commands.

<096> xx y z

Parameters:

XX is the PL frequency information, (XX) TS-64 PL Frequency Table (RLC-ICM Only)

Tone #	Frequency	Tone #	Frequency	Tone #	Frequency
00	250.3	22	156.7	44	177.3
01	233.6	23	146.2	45	183.5
02	218.1	24	136.5	46	189.9
03	203.5	25	127.3	47	196.6
04	186.2	26	118.8	48	199.5
05	173.8	27	110.9	49	206.5
06	162.2	28	103.5	50	229.1
07	151.4	29	94.8	51	254.1
08	141.3	30	82.5	52	44.4
09	131.8	31	71.9	53	39.6
10	123.0	32	63.0	54	37.9
11	114.8	33	58.8	55	36.6
12	107.2	34	56.8	56	35.4
13	100.0	35	54.9	57	33.0
14	88.5	36	53.0	58	97.4
15	77.0	37	51.2	59	91.5
16	241.8	38	49.2	60	85.4
17	225.7	39	47.5	61	79.7
18	210.7	40	69.4	62	74.4
19	192.8	41	159.8	63	67.0
20	179.9	42	165.5	....	....
21	167.9	43	171.3	....	....

(XX) RBI-1 Kenwood Frequency Table (RBI-1 Only)

HF Remote Base Keypad

Keypad Definition

1 Remote in receive only mode or Select HF Mode #	2 Remote in receive and transmit on mode	3 Receive and transmit off. Cancels HF mode	A Bump Up Remote 20HZ
4 Bump Down Remote 100HZ	5 Recall Memory Channel ## 00..99 or Select VFO A	6 Bump Up Remote 100HZ	B Bump Down Remote 20HZ
7 Bump Down Remote 500 HZ or Start Scan #	8 Recall Frequency of current VFO or Select Offset	9 Bump Up Remote 500HZ	C Not Defined
* Frequency <Point> Key .	0 Write Memory Channel ## or Select VFO B	# Force Execution Digit Enter	D Not Defined

Special Definitions:

HF Mode (See Keypad 1):

HF Mode Number	Definition
1	Selects USB Mode
2	Selects LSB Mode
3	Selects AM Mode
4	Selects FM Mode

Start Scan (See Keypad 7)

Scan Number Entered	Scan Mode Requested
1	Scan Down Slow (20HZ Steps)
3	Scan Up Slow (20HZ Steps)
4	Scan Down Medium (100HZ Steps)
6	Scan Up Medium (100HZ Steps)
7	Scan Down Fast (500HZ Steps)
9	Scan Up Fast (500HZ Steps)

HF Prefix:

The HF prefix is a single digit that is configured with Command 105. This digit is always the first digit entered when any HF mode is executed. The reason for the prefix digit is to keep single digit entries from accidentally being entered.

Example: I am in HF mode and need to start the scan function for fast up scanning

Enter: 1 79 '#' or unkey Response: 'Scan 9'

Example: I am in HF mode and need to enter a frequency

Enter: 1 29*600 '#' or unkey Response: '2 9 point 6 0 0 0 0'

Example: I am in HF mode and need to recall memory 15

Enter: 1 515 '#' or unkey Response: 'Look-up 15'

In all these example the format for data entry was:

<HF Prefix> <Command> <Addition Data if Needed> <# or unkey>

HF Frequency Entry:

The frequency is entered immediately following the HF prefix. There is no command to tell the controller to take frequency, simply no command means frequency. The controller will take frequency input from 1 mhz (1*00000) up to 999.99999 mhz (999*99999).

Typical HF remote base session:

HF Prefix is '1'

- 1) 106 D or unkey ; Enable HF remote mode
- 2) 1 29*68 # or unkey ; Move the HF remote to 29.680 mhz, VFO 'A'
- 3) 1 0 # or unkey ; Select VFO 'B'
- 4) 1 29*58 # or unkey ; Move the HF remote to 29.580 mhz, VFO 'B'
- 5) 1 5 # or unkey ; Select VFO 'A'
- 6) 1 8 1 # or unkey ; Select Split (Repeater Mode)
- 7) 1 2 # or unkey ; Go into transmit and receive mode
- .
- .
- .
- 1 3 # or unkey ; Cancel HF mode after communications are complete

121: Configure Pre-Access on a Port

This command configured how pre-access works on each port. This command controls dial tone generation requirements and the dial tone response frequency for a port.

```
<121> w x yyyy zzzz
```

Parameters:

W is the port number. This number must range from 1..3

X is the dial tone response control

0 - No dial tone generated

1 - Dial tone generated on valid pre-access code receipt

YYYY is the first tone of the dial tone response

ZZZZ is the second tone of the dial tone response

Defaults:

All ports dial tone generation is disabled (off)

Error Codes:

E1 - Invalid port. Number must range between 1..3

E2 - Invalid mode. Mode must be either a 0,1

(System wide errors are listed in front of the manual)

Example 1:

I want my port 3 to generate a dial tone when selected. This means the dial tone will begin when the correct pre-access code is received.

```
121 3 1 2856 2271 D or unkey
```

Response:

"Code Set Up Radio <Port> Dial <ON\OFF>Frequency <Tone1> and <Tone2>"

123: Pre-Access Configure for the Stop Access Mode

This command configured how the pre-access condition is controlled. In order to stop access into the controller certain link groups use different conditions. We have incorporated 3 into the controller.

```
<123> x y z
```

Parameters:

X is the stop access condition when a command is executed correctly

0 - Disables this feature

1 - Enables this feature

Y is the stop access condition when a command is executed and an error is received

0 - Disables this feature

1 - Enables this feature

Z is the stop access condition when the commanding receiver drops

0 - Disables this feature

1 - Enables this feature

Defaults:

X,Y,Z default to disabled

Error Codes:

E1 - Invalid port. Number must be from 1..3

(System wide errors are listed in front of the manual)

Example 1:

I want to enable command execution to stop access.

```
123 100 D or unkey
```

Response:

"Code set as <X Variable> <Y Variable> <Z Variable>"

Example 13-2: Pre-Access Events, Configurations and Uses

Every pre-accessed system is different in its functions and operations. Because of these differences 6 events have been added to the controllers event table (See Command 064) to allow custom configuration of the accessed system. These events can contain custom port-port configurations to match your systems needs

Example #1: I need to disconnect the links from the repeater (Port 1) when port 1 accesses the system and re-connect the links when the repeater un-accesses the system.

- We will use macro #10 for the disconnect macro (Command 181)

```
1) 165 10 D or unkey or <Enter>           ; Delete macro #10
2) 168 10 169 D or unkey or <Enter>       ; Cancel all responses for this macro
3) 168 10 002 12 D or unkey or <Enter>    ; Disconnect Port 1 from Port 2
4) 168 10 002 13 D or unkey or <Enter>    ; Disconnect Port 1 from Port 3
```

- We will use macro #11 for the connect macro (Command 182)

```
5) 165 11 D or unkey or <Enter>           ; Delete macro #11
6) 168 11 169 D or unkey or <Enter>       ; Cancel all responses for this macro
7) 168 11 000 12 D or unkey or <Enter>    ; Connect Port 1 to Port 2
8) 168 11 000 13 D or unkey or <Enter>    ; Connect Port 1 to Port 3
```

- We need to assign events

```
9) 064 044 2 181 01 D or unkey or <Enter>; Assign Command 181 when port 1 starts access
10) 064 047 2 182 01 D or unkey or <Enter>; Assign Command 182 when port 1 stops access
```

When Port 1 enters a correct pre-access code the start access event for port 1 (044) will request macro 181. This macro disconnects ports 2,3 from the repeater port. When the access for port 1 stops for port 1 (047) macro 182 will be requested. This will re-connect port 1 to port 2,3.

135: Program Call Sign Assignment

This command programs the call sign portion of the memory dial slots. In order to have call signs assigned, the user must configure Command 137. When configured the top 100 memory dial slots are erased and configured for call sign readback.

```
<135> ss rr y..y
```

Parameters:

SS is the memory dial slot number. This number ranges between 00..99

RR is the audio routing variable. This number ranges between 00..31 and is only used in the reverse autopatch mode 2 when paging a user. (See command 147)

Y..Y is the call sign data. The word data must be between 000..255. This includes all the alphabet and some other controller words.

Defaults:

Call sign mode is disabled

Notes:

- The user must execute Command 137 to enable/disable call sign mode. When this command is executed, the controller erases the top 100 memory dial slots, or call signs, and re-configured the slots for the selected option. Care must be taken when executing Command 137.

Error Codes:

E1 - Call sign mode not enabled

E2 - To much data entered. Up to 8 words can be programmed per call sign position

E3 - Invalid call sign slot. The call sign numbers are the same as the memory slot number. This number ranges from 00..99

E4 - Invalid word number. The words must be between 000..255

(System wide errors are listed in front of the manual)

Example 1:

I want assign the call sign "KF7FW Home" to memory slot 01, who monitors port 1

```
135 01 01 040 035 007 035 052 215 D or unkey
```

Response:

"Call <Slot> is <Entered Call Sign> Route is <Route>"

143: Patch On-Line with Dialing Table Checking

This command dials an autopatch number with allow and nuisance table checking. From this command all autopatch dialing takes place.

Memory dial recall 0..9

<143> x

Memory dial recall 00..99

<143> xx

Memory dial recall 000..199 and/or 911

External dialing 200..999

<143> xxx

External dialing

<143> xxx..x

Parameters:

X..X are the digits to cause dialing. These digits can only be 0..9

Defaults:

Command 143 defaults to '*' for the command name

Error Codes:

E1 - Number failed the allow table. See Command 128

E2 - Number failed to pass the nuisance number test. See Command 138

E3 - Invalid dialed memory number when call-sign mode active. This number must be between 00..99 when dialing a memory dialed number and in call sign mode.

E4 - Memory dialed number requested is either not programmed or enabled.

(System wide errors are listed in front of the manual)

Example 1:

I want to dial the number 1-800-555-1212. I have allowed all '800 number to dial in Command 128.

* 18005551212 D or unkey

Response:

"Autopatch <Number if enabled (See Command 127 for readback set-up)>"

If the autopatch is being used on another port the response is: "Autopatch is Busy"

The Large Digital Voice Recorder

What the DVR is:

The optional DVR is a device that allows you to record sounds, store them in memory and play them at any time. It can be used to personalize your controller by recording any message or sounds that you want and playing them back for ID messages or in place of most other synthesized voice messages. Some of these messages are played in response to commands that you or the users enter; others are played at certain times, such as for an ID. Both types of messages will be described below.

DVR Tracks:

All DVR recordings are stored in numbered "tracks." Certain tracks have special purposes and are played automatically at certain times. Others are available for you to use in any way you wish. The length of each track is limited only by available memory. Each track uses only as much storage space as is actually needed.

The first 250 tracks (numbered 000..249) have no predetermined use - you may use them for ID messages or anything else you can think of. Tracks 250..260 or so are used for prompting. They are discussed further in the section below titled "Recording the Prompting Tracks". The remaining tracks are not directly accessible by number. They are used to support the mailbox features and are automatically accessed by the mailbox commands.

Public Mailboxes:

The DVR uses special internal tracks to provide two types of mailboxes: public and private. Both types allow you to leave messages for other repeater users. You can leave a message in a public mailbox by simply entering the "Leave Public Mail" command (after setting up the prompting tracks as described below). The DVR will then ask you who the mail is for. You key up and say their name or call sign. The DVR will then ask you to record your message. When you are through, it will tell you that your message has been stored. You can check if there is mail for you by simply entering the "Check Public Mail" command. It will list the names or call signs of the people that there is mail for, or will tell you that there is no mail. If there is mail for you, you can listen to your message by entering the "Retrieve Public Mail" command. Up to nine public mailboxes can be in use at a time.

Private Mailboxes:

Private mailboxes allow you to leave voice mail in someone's private mailbox. To do this you have to know the number of their mailbox. There are 1000 private mailboxes, so everyone in your club can have their own. Each private mailbox can hold up to five messages at a time. You can retrieve or delete the mail in your own mailbox without affecting anyone else's mailbox.

Interfacing:

The DVR can be ordered with or without an optional rack mount cabinet. There is not enough room to mount it inside of the RLC-2 cabinet. Instead, there is a small interface board that plugs into the RLC-2 motherboard's "DVR Connection", near the autopatch connector. This interface board should be installed with the chips and connector towards the edge of the RLC-2 motherboard (and the blank side of the interface circuit board toward the circuit board). A short ribbon cable connects this interface board to a DB-25 female connector that is mounted to the RLC-2a case.

A DB-25 male-male cable (included) plugs into this connector and into the DVR. The only other required connection to the DVR is power (12 volts, center positive, plug included). Optional connections include a backup power plug that can be connected to a battery pack or another power supply (make sure ground is common between the supplies) to preserve the messages stored in the DVR if the main power goes out. The remaining connector can be connected to a computer or serial terminal (more about that later). Note that this serial port is separate from the serial port on the controller.

Memory Installation and Testing:

The DVR supports four different memory configurations, all using 80ns or faster standard 30 pin simms. Either 8 or 9 bit wide simms can be used; the parity bit is ignored. You may be able to find 8 bit wide simms cheaper (they are used in Macs). Each configuration requires a different set of EPROMS in the DVR:

- Two one megabyte simms (2 megabytes total)
- Four one megabyte simms (4 megabytes total)
- Two four megabyte simms (8 megabytes total)
- Four four megabyte simms (16 megabytes total)

If only two simms are installed, they must be in the RAM #1 sockets. Note that all of the simms must be the same size. All of the memory is tested each time the DVR is powered up. If you want to see the results of the memory test, connect a computer or serial terminal to the DVR (it need not be connected to the RLC-2 at this time) and power up the DVR. You should see a printout on the serial screen noting how much memory is expected (based on which version of the EPROMS you have) and then how the memory test is progressing. If the DVR does not run at all, check the power and the serial connection. The DVR will attempt to run even if errors are detected during the memory test. If the memory test indicates that there are many errors, you may have the wrong size or number of simms installed, or the simms may be faulty. If there are only a few errors, you may be able to use the simms with errors in the RAM #2 sockets with only a slight loss of audio quality. Errors in the simms installed in the RAM #1 sockets are likely to cause serious problems.

The memory test performed when the DVR is powered up is very thorough and therefore can take quite a while, especially if you have a lot of memory installed, so you may have to wait for it to finish before testing. With 2, 4, 8 and 16 megabytes of memory, the test takes about 20, 40, 80 and 160 seconds (about 2.5 minutes), respectively. Since you won't be powering up very often, this shouldn't be a problem.

If you have the serial port connected and the serial screen scrolls constantly after the memory test is finished, it is probably because you don't have the DVR connected to the controller, or the controller is not powered up.

Audio Quality/Recording Time:

The audio quality of tracks played with the DVR is nearly identical to the original. You will probably not be able to distinguish between a recording and someone talking "live."

Technically, the DVR samples and plays audio at 8KHz with 8 bit resolution (256 voltage levels). This uses 64000 bits per second, which is 8000 bytes per second. At this rate, each megabyte of memory will hold 131 seconds of recorded audio. A small portion of the memory is used for other purposes, so the actual amount of storage will be slightly less than 131 seconds per megabyte. In a future software version, it may be possible to record with lower quality to extend the recording time.

Adjusting the DVR:

There are only two adjustments on the DVR: record level and playback level. Both are preset before the DVRs are shipped, and should not need to be changed, at least for initial testing. When/if you do decide to adjust the levels, the playback level should be set so that the audio is played back at the same volume it was when it was "live". If you decide to change the record level, the playback level should be adjusted again before any judgement is made as to whether the new record level is better or worse. The record level is important because it affects the quality of the recording. If it is set too low, the full resolution of the digital storage will not be utilized and there will be more background noise in the audio than is necessary. If the record level is set too high, the audio peaks will be clipped off and the audio will sound distorted, especially the loudest parts.

There are many factors that determine the best level, so experiment with the Audio Check Command and adjust the record level until it sounds the best. Looking at the audio with a scope as it is played back will help identify if the record level is set too loud, as the top and bottom of the waves will be flattened (a little bit of clipping on the louder parts is normal and expected). If you have a computer or serial terminal hooked up, you can also record a message with 163 and look at it with the software oscilloscope function to see how much of the available range you are using.

The record and playback levels can be returned to the factory settings as follows: Set up a service monitor to generate a 1KHz tone with 3KHz deviation. Adjust the controller to get one volt peak to peak at the audio test point on the controller (the way the controller receive level is normally set up). Turn the generate function off. To make sure that the DVR is set up and working, use an HT to enter 163, unkey, key and say something, then unkey and listen. The DVR should play back whatever you said. If it does not, review the interfacing and testing sections above. Now key and enter Command 155 000, unkey, then turn the service monitor's generate function on. This will cause the DVR to record the 1KHz tone into track 0. Adjust the voltage at pin 1 of the DVR's audio test bus for one volt peak to peak. When you get it adjusted or after 30 seconds (when the DVR will automatically quit recording), turn the generate function off and enter Command 156 000 to erase DVR track 0. Repeat entering Command 154 000, recording the tone and erasing it with Command 156 000 until you are satisfied that the record level is set, then record the 1KHz tone into DVR track 0 once more and don't erase it. Play it

back by entering Command 154 000. While it is playing, adjust the voltage at pin 3 of the DVR's audio test bus for one volt peak to peak. Command 154 000 may be entered as many times as needed to get the level set. This sets the DVR to play back tracks at the exact same level they were recorded at. If the transmit level is set correctly on the controller, playing this track should cause about 3KHz of deviation. Finally, erase track 0 by entering Command 156 000.

The Audio Check Command:

Before executing any DVR commands on the RLC-2 you should enter Command 153 1 to tell the RLC-2 that the large DVR is installed. The controller will respond by saying "DVR Select one". If you do not do this, some of the commands will work, but others will not.

The easiest way to test the DVR is to execute the "Audio Check" command. To use it, simply key your radio and enter "163", and say something. When you unkey or enter a 'D', the DVR will play whatever you said back to you, then erase it. If this command works, you have the DVR connected and working. You can execute this command as many times as you want to without harm and without wearing anything out. It can also be used to help you know if your signal is noisy into the repeater; just use this command to record a test message and you can listen to your own audio. Yet another use for this command is to find out how much record time (memory) is still available. To do this, start recording and count off the minutes and seconds you have been recording. When the DVR's memory is full, it will stop recording. When you unkey and the message is played back, you will hear yourself count as long as the DVR was able to record before it ran out of memory (this could take a long time if the memory is not almost full - if it takes too long, the max record length timer could stop it before the memory is full).

Recording DVR Tracks:

Before recording a track, you should make sure it is empty. If a track has already been recorded, you will not be able to record it again until you erase it. All tracks are empty when the DVR is powered up.

To record a track using the COR to start and stop the recording, you should enter the record command followed by the track number, "155 TTT" (where TTT is the track number), then unkey (to tell the controller to execute that command and get ready to record). Then key up and start speaking your message. When you are finished, simply unkey. The DVR will automatically delete a fraction of a second of the beginning and end of your message to get rid of any noise caused by keying or unkeying.

If you wish to record a track without using COR, such as from the reverse autopatch in programming mode, you can use a DTMF digit to start and stop the recording. For example, to record track 0, you could enter "155 000 D". As soon as you release the 'D', the DVR will begin recording. When you are finished speaking your message, press any DTMF digit to stop the recording. The DVR will automatically delete a fraction of a second at the end of your message to make sure that the sound of the DTMF digit is completely erased. Note that some phones (especially ones that can be used as speakerphones) mute about the first 1/2 second of each phrase you say; this makes recording nice DVR messages with them very difficult.

After you have recorded the prompting tracks (described later), the recording is more friendly by playing a DVR track that says something like "Please record you message now" after you enter the command and unkey (or press 'D').

When recording you must start recording within 10 seconds of entering the record command and unkeying or you will have to enter the command again. This is so a record command can't be entered and end up recording someone that keys up an hour later not knowing that the record command was the last thing entered.

The only limit on the length of message that can be recorded is the amount of memory that is still available. To keep people from leaving long mailbox messages, timers:

57 - Public mailbox message length (Default to 10 seconds) Command 160

58 - Public mailbox callsign length (Default to 5 seconds) Command 160

59 - Private mailbox per-message length (Default to 30 seconds) Command 158

60 - General message length (Default to 10 seconds) Command 155, Command 163

You may also need to lengthen your time out timer to record very long messages.

Playing Messages:

There are many things that can cause a DVR message to be played. For example, 163 records a message, then plays it back automatically. Command 155 XXX plays a message to tell you to start recording a new message, then lets you record it. To simply play a message that has already been recorded, you can use Command 154 XXX.

Erasing Tracks:

There are several reasons to erase tracks. Tracks that have been recorded before must be erased before they can be recorded again. Tracks that are no longer being used should be erased to make more storage space available for new messages. Once a track has been erased, there is no way to recover it, so be careful when deleting tracks, especially when deleting a whole range at once from the serial port. Deleting tracks can take several seconds, so don't be surprised if it takes a while before you hear the message erased message. If you are erasing a single message, the controller will continue to run normally while it waits for the DVR to finish deleting the message and send "message erased".

Recording the Prompting Tracks:

There are several special messages that are played automatically at certain times. They should be recorded before attempting to use the prompted record command or the mailboxes. The messages shown below are only suggestions; you can record them to say anything you want them to. To record them, enter the commands and speak the messages shown below. For more information about recording tracks, see the "Recording Tracks" section above.

Command 155 250	"Please record your message now"
Command 155 251	"Your message is stored"
Command 155 252	"Message erased"
Command 155 254	"Who is your message for?"
Command 155 255	"There are no messages."
Command 155 256	"There is mail for..."

If you want to see how your messages sound, you can play most of them by entering Command 154 250<unkey> (for track 250). Message 256 can not be checked this way, so record it and don't worry about checking it until you try out commands 160..162, 068. If you want to erase one of these tracks so you can record it again, enter Command 155 250<unkey> (to erase track 250). After recording these messages, the DVR is ready for use. Flip through the manual and try all of the commands until you are comfortable with them. If you want to erase all of your messages and start over, you can erase them serially or you can unplug the DVR and controller for several seconds, then power them back up (and wait for the DVR to finish its memory test).

The Serial Interface:

The DVR includes a serial port for interfacing to a serial terminal or a computer running terminal software. This connection is not needed for normal operation, but it does provide some capabilities that are not available otherwise. Some of these are:

- The messages in the DVR can be downloaded to a computer with a hard drive for backup, including the public and private mailboxes. In the event that both the main and backup power supplies fail and the DVR's memory is erased or you have to power down to install a software upgrade, you will be able to restore all of your messages. When the messages are downloaded, it is also relatively easy to edit out dead space at the beginning and end of messages. Please note that because the DVR has such a large amount of storage and because serial port transfers are relatively slow, that downloading takes a very very long time, like overnight. It can also take up to twice as much space on the hard drive as the amount of memory you have installed in the DVR.
- A "software oscilloscope" function lets you view a graphical representation of what is stored in any one of the slots. This feature is not real-time and requires that your serial terminal or terminal emulation software supports ANSI cursor control commands (most do). This feature is useful for checking how much of the range of the analog to digital converter is being used.
- A status display lets you check how much storage time is used for each message and mailbox. This can help you know what you should delete when the memory gets full.

If you have connected a terminal or computer to your RLC-2, all you have to do is unplug the cable from the RLC-2 and plug it into the DVR. The default setting is 9600 baud, N81, the same as the default for the RLC-2. If you do not already have a cable and your computer or

serial terminal has a DB-9 connector, you can use a straight through DB-9 cable (not a null modem cable). If you are using a modem or TNC, note that pins 2 and 3 will have to be swapped (a null modem adapter will do this). If you are using a modem or TNC, you will probably have to set them up to make them work transparently - contact Link Communications if you need more information about how to do this.

If everything you type shows up double on your serial screen like this "tteesstt", turn the local echo off on your communications program.

The DVR is unavailable to the controller while it is executing a command entered from the serial port. Because of this, most of the serial commands will time out if you do not respond within about 10 seconds. Pressing the escape key will also get you out of most commands.

The default baud rate of 9600 baud works well for both uploading and downloading. Faster baud rates are supported, but may not work reliably. Downloading may work at a higher baud rate than uploading. When uploading, you may have to set the character pacing time (check the ASCII transfer settings on your communications program) to avoid overruns. The line pacing can be set relatively small, often to 0. When uploading at high baud rates, if the data that appears on your screen has missing or incorrect characters but you are not getting error messages, the data is probably being uploaded correctly and you can ignore the incorrect characters that you see on the screen. Most errors in uploading are caused by trying to upload to a track that is not empty. If the DVR is reset either by powering it down or by the serial reset commands, the baud rate is automatically reset to 9600 baud.

069: Serial LED Status Screen

This command requires separate DOS software available from Link Communications, Inc. World Wide Web site or for purchase from Link. This software emulates the front panel LED display on a serial screen. This is handy for troubleshooting the controllers operation. This command enables or disables the controllers data stream sent out the serial port to an attached computer. It is not advised to use this mode if in HF remote base mode.

```
<069> c
```

Parameters:

- 069 is the default command name
- C is the serial control variable
 - 0 - disables serial status mode
 - 1 - Enables serial status mode

```

                                RLC-2 Status Display V4.17

. Input 1      X Output 1      . PL Main          X PTT Main
. Input 2      . Output 2      X COR Main         . PTT Link 1
. Input 3      X Output 3      . PL Link 1        . PTT Link 2
. Input 4      . Output 4      . COR Link 1       X DTMF Main
. Analog 1     . Output 5      . PL Link 2        . DTMF Link 1
. Analog 2     X Output 6      . COR Link 2       . DTMF Link 2
. Analog 3     X Output 7      . Control RX       . DTMF Patch
. Analog 4     . Output 8      . DTMF Act.        . DTMF Control

                                . Main TOT      . Serial 1        . Phone Ring
                                . Link 1 TOT   . Serial 2        . Phone Off Hook
                                . Link 2 TOT   . Serial 3        X Serial Log-On
                                . Main Hang     . Serial 4        . CW Tone
                                . Link 1 Hang   . Serial 5        X Voice
                                . Link 2 Hang   . Serial 6        X Main Access
                                . 1 Second     X Serial 7        . Link 1 Access
                                . DVR Active    . Serial 8        . Link 2 Access

DTMF TICKER TAPE WILL SHOW UP HERE . . . .
```

The display is updated once a second. When DTMF digits are received they will scroll across the bottom of the screen in the area marked 'DTMF Ticker Tape'.

Software Parameters:

- From the DOS prompt type the following: STATUS2 P
 - Where Status2 is the program name
 - P is the COMM port 1,2,3,4
- Baud rate is set to 9600 baud

241: Serial Upload Data File

This command uploads a serial data file that was generated by the RLC-2 controller. This file will only upload V4.XX software blocks. Do not edit the upload file without using the Link Communications Inc. editor.

```
<241>
```

Execution Source:

This command can only be executed from the RS-232 port

Parameters:

There are no parameters for this command

Notes:

- Once you enter command 241, the controller will prompt you to begin the upload. All functions on the controller will cease to operate except the serial system. Data files have been successfully uploaded at 9600 baud without errors. Once the upload is complete the controller will prompt you with a checksum match message. If the checksums do not match try a slower baud rate, or change your ASCII upload requirements character pacing timing. This may slow the upload but it will guarantee a successful transfer.

Error Codes:

(System wide errors are listed in front of the manual)

Example 1:

I need to re-upload my hex file after I re-initialized the controller

```
241 <Enter>
```

Response:

There is no response for this command

242: Serial Download Data File

This command downloads the controllers memory contents from the controller to your computer. This will only currently download the main RAM block, not the autopatch RAM. Before executing this command set-up your computer for ASCII download. Once the computers file has been opened, execute Command 242. When the download has stopped and given you a file checksum, you can close the file.

```
<242>
```

Parameters:

There are no parameters for this command

Defaults:

There are no defaults for this command

Error Codes:

(System wide errors are listed in front of the manual)

Example 1:

I have completely set-up my controller. Now I need to save the contents on my computer incase of any problems.

```
242 <Enter>
```

Response:

Serial download data on your screen

243: Serial Command Name List

This command lists all the controllers command names including execution sources, DTMF and serial locking.

<243>

Parameters:

There are no parameters for this command

Defaults:

There are no defaults for this command

Error Codes:

(System wide errors are listed in front of the manual)

Example 1:

I need a list of all the controllers command names.

243 D or unkey

Response:

Serial command name lists

244: *Change the Serial Baud Rate or Send Serial Data*

This command changes the serial baud rate for the RS-232 port if only 1 digit is entered. If 3 or more digits are entered the controller will convert those digits into serial data and send them.

`<244> x y or xxx`

Parameters:

X is the serial baud rate

Baud Number	Baud Rate
0	9600
1	4800
2	2400
3	1200
4	600
5	300

Y is the echo control

Where 1 - disables serial output

0 - enables serial output

or...

XXX is a number from 000..255 which is the ASCII data send (See Appendix

Defaults:

Baud rate defaults to 9600

Error Codes:

E1 - Invalid baud rate

E2 - Invalid Serial character. Number must be between 000..255

(System wide errors are listed in front of the manual)

Example 1:

I need to change my baud rate from 9600 to 2400 baud and enable serial output

`244 2 0 D or unkey`

Response:

"Computer Programming Rate Is <X>"

There is no voice response when sending ASCII data

Chapter 17 Examples

Example 17-1: Setting up the Serial Port

I need to set-up the serial port to 2400 baud before I do a serial download.

1) Command 244 is provided to change the serial baud rate. Locate 2400 baud in the below table and enter the reference number into Command 244.

Serial baud rate

Baud Number	Baud Rate
0	9600
1	4800
2	2400
3	1200
4	600
5	300

2) Enter '2' into Command 244

244 2 0<Enter> ; Sets the baud rate to 2400 N-8-1 and enables serial output

Example 17-2: I want to download the RAM into a file

This example will take you through a session of downloading the controllers RAM content into a file on your computer. This file is a backup of your systems settings (except the autopatch). If the controller is ever re-initialized with version 4.XX software the user can then upload the file and maintain the previous settings before the initialization occurred.

1) Once you have set-up the computers baud rate to what the controller defaults to you can execute the download commands. If you have set the controller up correctly you should get the DTMF> prompt when you hit the <ENTER> key. If you do not get this verify your serial ports set-up.

2) Set-up your computers terminal software to ASCII download. Your computer will ask for a file name to save the file once received. Enter a name that is easy to remember.

3) Once you have entered a name and the computer is waiting to receive the file type the digits 242. This will execute Command 242. Once you have entered the command the controller will begin to send 'Garbage' looking data. This will continue for several seconds. At the end of the file download the controller will give prompt you to close your download file. Typical programs use the 'Escape' digit to close the file once the download is complete. The file length is typically 16,072 bytes long. If your file is much bigger or smaller beware of possible download problems.

4) To upload a file from the computers disk you will need to set-up your controller for ASCII file upload using Command 241. Once you execute Command 241 the controller will stop working until either a reset is received or the file upload session is complete. The steps in uploading a file:

- Execute Command 241

The controller will prompt you to begin your upload or hit { } to terminate the upload process.

- Upload the controllers file from your computers disk drive
- Once the upload is complete the controller will state the calculated check-sum and the files expected checksum. If the checksums match the data that you uploaded to the controller matched what the controller downloaded. If the checksums do not match the file you uploaded has problems.
- Failed checksums will leave the controller in an unknown state. Try re-uploading the file at a slower baud rate.

2920	341
2925	340
2930	340
2935	339
2940	339
2945	338
2950	337
2955	337
2960	336
2965	336
2970	335
2975	335
2980	334
2985	334
2990	333
2995	332
3000	332

Appendix C: Voice Word Look-up Table

Custom word requests can be given to Link Communications for \$50.00 per word. The words will be added to the general word directory when purchased. Contact Link Communications Inc. for more information. (-F) Indicates The Female Voice

ZERO	000	L	041	AVON	082
ONE	001	M	042	A_M	083
TWO	002	N	043	BAND	084
THREE	003	O	044	BANK	085
FOUR	004	P	045	BASE	086
FIVE	005	Q	046	BATTERY	087
SIX	006	R	047	BELOW	088
SEVEN	007	S	048	BETWEEN	089
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