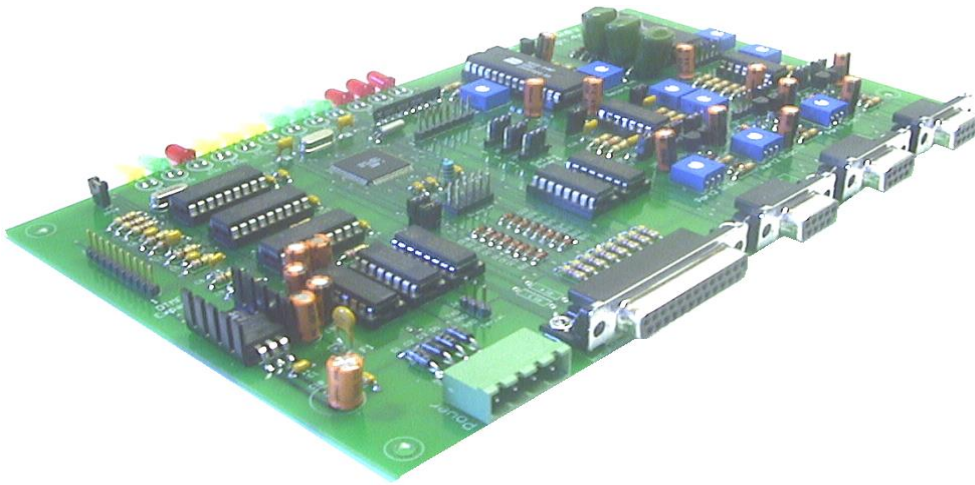




Arcom Communications  
24035 NE Butteville Rd  
Aurora, Oregon 97002  
(503) 678-6182  
arcom@arcomcontrollers.com  
<http://www.arcomcontrollers.com/>



# ***RC210 Repeater Controller***

## ***Operations and Programming Manual***

### ***Firmware version 5.51***

### ***March 6, 2013***

---

Reproduction or translation of any part of this manual beyond that permitted by sections 107 or 108 of the 1976 United States Copyright Act (or its legal successor) without the express written permission of Arcom Communications is unlawful as noted below. Requests for permission to copy or for further information should be addressed to Arcom Communications. Except as noted above, permission is hereby granted for any non-profit group or individual to reproduce any portion of this document provided that: the reproduction is not sold for profit; the intent of reproduction is to further disseminate information on the RC210 Repeater Controller; the reproduction is not used for advertising or otherwise promoting any specific commercial product other than the RC210; and full credit is given to Arcom Communications as the original source of information.

The information contained in the manual has been carefully checked for accuracy and is believed to be entirely reliable. However, no responsibility is assumed for inaccuracies. Arcom Communications reserves the right to make changes in the RC210 Repeater Controller kit to improve reliability, function or design without obligation to purchasers of previous equipment. Arcom Communications does not assume any liability arising out of the application or use of any product or circuit described herein; neither does it convey license under its patent rights or the rights of others.

**(this page intentionally left blank)**

# Contents

|   |    |
|---|----|
| Command Reference.....                                | 6  |
| Command Structure.....                                | 6  |
| Evaluation Of Entered Commands .....                  | 6  |
| Command Accessibility.....                            | 6  |
| Default Commands Accessible When Unlocked.....        | 7  |
| Supervisory Commands .....                            | 7  |
| Supervisory Commands (continued).....                 | 8  |
| Supervisory Commands (continued).....                 | 9  |
| Using A Control Receiver.....                         | 9  |
| Port Linking.....                                     | 10 |
| User DTMF Pad Test.....                               | 10 |
| Auxiliary Audio Inputs.....                           | 11 |
| General Logic Outputs.....                            | 11 |
| Extended Logic Outputs.....                           | 11 |
| Analog Meter Inputs .....                             | 12 |
| Meter Alarms.....                                     | 12 |
| Logic Alarms.....                                     | 12 |
| Remote Base Operation .....                           | 13 |
| Remote Base Operation (continued) .....               | 14 |
| AutoPatch Operation.....                              | 15 |
| Command Macros.....                                   | 15 |
| Message Macros .....                                  | 15 |
| ID Extras.....  | 15 |
| IRLP®/Echolink® DTMF Regeneration.....                | 16 |
| Real Time Clock And Calendar .....                    | 16 |
| Digital Voice Recorder (DVR).....                     | 16 |
| General Timers .....                                  | 16 |
| Programming The RC210.....                            | 17 |
| General Programming Overview .....                    | 17 |
| Unlock Code Programming.....                          | 17 |
| Pre Command Prefix .....                              | 18 |
| Pre Access Code.....                                  | 18 |
| Locking (Leaving Program Mode) .....                  | 18 |
| Programming A Custom Lock Code .....                  | 18 |
| Programming A Custom Terminator Digit.....            | 18 |
| A Word Of Caution Regarding The Terminator Digit..... | 18 |
| Port Unique Versus Global Programming.....            | 19 |
| Port Unique Programming .....                         | 19 |
| Timer Programming.....                                | 19 |
| Timer Programming (continued).....                    | 21 |
| Timer Programming (continued).....                    | 22 |
| CTCSS Encode Control Programming.....                 | 22 |
| CTCSS Encode Control Programming (continued).....     | 22 |
| Real Time Clock And Calendar .....                    | 23 |

|  |    |
|--|----|
| Miscellaneous Programming.....                                       | 24 |
| Remote Base Programming.....   | 25 |
| Selecting The Type Of Remote Base Radio .....                        | 25 |
| Programming Remote Base Memories (non-Doug Hall).....                | 26 |
| Programming Kenwood TM-V7a/TM-G707/TM-271 Memories .....             | 26 |
| Remote Base Prefix .....   | 26 |
| Port Inactivity Macro.....   | 26 |
| Programming The RC210 Command Macros.....                            | 27 |
| Command Macros.....  | 28 |
| Using Command Macros To Remap Controller Functions.....              | 28 |
| Command Macro Priority.....  | 29 |
| Startup Macro .....  | 29 |
| Macro Subset (Guest Macros).....                                     | 29 |
| Some Useful Hints On How To Use The Macro Subset .....               | 30 |
| Determining The Contents Of A Command Macro.....                     | 30 |
| Erasing Command Macros .....   | 30 |
| Using Receiver Macro Functions.....                                  | 30 |
| Controlling Command Macro Access By Port.....                        | 31 |
| Erasing All Command Macros Port Restrictions .....                   | 31 |
| Message Macros.....  | 31 |
| Speech Control Within Command Macros.....                            | 32 |
| List Of Port Direction Commands For Use In Macros.....               | 32 |
| Macro Function Number List .....                                     | 33 |
| Macro Function Number List (continued).....                          | 34 |
| Macro Function Number List (continued).....                          | 35 |
| Macro Function Number List (continued).....                          | 36 |
| Macro Function Number List (continued).....                          | 37 |
| Tail Messages.....   | 38 |
| Some Practical Examples Of Tail Message Programming.....             | 38 |
| Some Practical Examples Of Tail Message Programming (continued)..... | 39 |
| Special Features .....   | 39 |
| Temporarily Disabling ID's And Timeout Timer .....                   | 39 |
| Special Features (continued) .....                                   | 40 |
| DTMF Memories.....   | 40 |
| DTMF Digits Duration and Time Between Digits.....                    | 40 |
| IRLP®/Echolink® DTMF Regeneration.....                               | 40 |
| The Scheduler .....  | 41 |
| Recurring Voice Messages And The Scheduler.....                      | 41 |
| Recurring Voice Messages And The Scheduler (continued).....          | 42 |
| Plan! Plan! Plan!.....   | 42 |
| Erasing Scheduler SetPoints .....                                    | 43 |
| Determining Setpoint Status .....                                    | 43 |
| Voice IDs .....  | 43 |
| ID Extras.....   | 43 |
| Enable/Disable Voice IDs.....  | 43 |
| CW IDs.....  | 44 |
| CW Speed Programming.....  | 44 |

|   |    |
|---|----|
| CW Tone Programming .....   | 44 |
| CW ID Programming .....   | 44 |
| Using The Digital Voice Recorder (DVR) .....  | 45 |
| Recording DVR Tracks .....  | 45 |
| Playing A Recorded DVR Track .....  | 45 |
| Erasing Tracks .....  | 45 |
| Editing Recorded Tracks .....   | 45 |
| Using The Digital Voice Recorder (DVR) (continued) .....  | 46 |
| Finding Out How Much Recording Time You Have Left .....   | 46 |
| User DVR Recording .....  | 46 |
| Auxiliary Audio Inputs .....  | 46 |
| Resetting The RC210 .....   | 46 |
| Courtesy Tone Programming .....   | 47 |
| Using A DVR Track Or Vocabulary As A Courtesy Tone .....  | 48 |
| Courtesy Tone Behavior When Ports Are Linked .....  | 48 |
| Programming Meter Faces - 10-bit A/D Converters .....   | 49 |
| Programming Meter Alarms .....  | 50 |
| A Practical Example .....   | 50 |
| The Differences Between Accuracy And Precision .....  | 51 |
| Programming the Reference Voltage Value for the A/D Converters .....  | 51 |
| Measuring Voltages Higher Than Vref - A Practical Example .....   | 52 |
| Alarm Programming .....   | 52 |
| Programming Which Macro To Use With An Alarm .....  | 52 |
| Updating The Firmware .....   | 53 |
| Downloading And Installing The Required Software On Your Computer .....   | 53 |
| Programming Cable .....   | 53 |
| Downloading Firmware Updates .....  | 53 |
| Running Updater For The First Time .....  | 54 |
| Appendix A .....  | 56 |
| Frequency Agile Radios Supported .....  | 56 |
| Factory Default Programming Values .....  | 56 |
| Appendix B .....  | 57 |
| CTCSS Codes .....   | 57 |
| Appendix C .....  | 58 |
| Default Factory Command Codes .....   | 58 |
| Programming Commands Quick Reference .....  | 59 |
| Programming Commands Quick Reference (continued) .....  | 60 |
| Resetting The Unlock Codes .....  | 60 |
| Vocabulary List .....   | 61 |
| The RC210 Development And Testing Team .....  | 63 |
| ARCOM COMMUNICATIONS NO-NONSENSE LICENSE AGREEMENT FOR THE OPERATING<br>FIRMWARE OF THE RC210 REPEATER CONTROLLER ..... | 64 |

# Command Reference

## Command Structure

The RC210 provides an extremely flexible and powerful command structure. Each port is capable of being controlled independently as well as controlling any other port.

There are 3 types of commands in the RC210:

**Port Specific** - Those commands that are specific to a particular port. For example, if you wanted to select a different courtesy tone on Port 1, you could do so without affecting the courtesy tone on the other ports.

**Global** - Those commands which don't affect a specific port. A good example would be reading a meter face.

**Programming** - Those commands which change the operating parameters of the RC210. Some programming commands affect only a specific port. For example, programming the amount of Hang Time on Port 1. Other programming commands affect things that are not port specific. For example, entering a Remote Base Prefix.

## Evaluation Of Entered Commands

The controller evaluates and acts on entered DTMF digits under two conditions - upon COS (or CTCSS) closure of the receiver receiving the digits or upon receipt of the DTMF Terminator Digit. For example, there is an interfering signal on the receiver you're currently using. Obviously the controller would never detect COS (or CTCSS) closure under this condition. By ending your entered command with a "D", you force the controller to act regardless of the COS (or CTCSS) state. This feature also permits you to string commands together, separated by a "D" and the controller will act on them one-at-a-time. This allows for automated programming, such as is done by our RCP Programming Software. **Note: this terminator digit can be changed to be something other than "D". See the Programming section for details.**

## Command Accessibility

As it arrives from the factory, all commands in the RC210 are protected behind the unlock commands. This means that no commands will be accepted by the RC210 unless one of its 3 ports is first unlocked. Not to worry however, as you can easily assign any function in the RC210 ("re-map") to be accessible without first unlocking the RC210 (this is explained in the Macro section of this manual).

To some, this may seem a strange way to do things but there are distinct advantages to doing so:

- Most repeater system owners don't make the majority of functions available to general users.
- Since every RC210 is shipped with the same default codes, you don't need to spend time reprogramming every, single command in order to prevent malicious users from "playing". Only those functions you specifically make available are accessible.
- You can assign your own custom code to every function as needed.

As you can see, this method gives you complete control over who will have access to which functions in your repeater system without compromising security on your system. And without you having to do a ton of work!

# Default Commands Accessible When Unlocked

This section deals with those commands that allow you to change the operating conditions of the RC210. Except where noted, the settings affected by these commands are stored in non-volatile memory and will survive a power cycle of the controller. For example, if you have CTCSS Access selected on Port 1, that port will require CTCSS until you specifically change the setting, even if the controller loses power.

## Supervisory Commands

These commands are those which typically control the behavior of the RC210, such as enabling and disabling features. They are only accessible while any of the 3 ports is unlocked but may be re-mapped using Command Macros to allow access even though no ports are unlocked. An asterisk next to each description signifies the default power up state of that function (this can be changed by programming).

### **Important**

**Any Port's Supervisory Commands are accessible regardless of which port is currently unlocked and regardless of which Port you're actually connected to. For example, you could unlock Port 3 and change the Carrier/CTCSS setting on Port 1, even though you're actually using a radio connected to Port 2.**

### Receiver Enable/Disable

Each port's receiver may be temporarily disabled individually to prevent a signal from that receiver from being recognized. Note that this setting is not stored in non-volatile memory and upon a controller reset or power up, all receivers will once again be enabled. Also note that for safety reasons, you cannot disable the receiver on the Port to which you're currently connected.

|                                     |                                     |                                     |
|-------------------------------------|-------------------------------------|-------------------------------------|
| <b>1101</b> Port 1 Receiver Enable* | <b>2101</b> Port 2 Receiver Enable* | <b>3101</b> Port 3 Receiver Enable* |
| <b>1100</b> Port 1 Receiver Disable | <b>2100</b> Port 2 Receiver Disable | <b>3100</b> Port 3 Receiver Disable |

### Transmitter Enable/Disable

Each port's transmitter may be disabled individually to prevent keying by itself or other ports. This command completely disables the transmitter on that port, except for ID's

|                            |                            |                            |
|----------------------------|----------------------------|----------------------------|
| <b>1111</b> Port 1 Enable* | <b>2111</b> Port 2 Enable* | <b>3111</b> Port 3 Enable* |
| <b>1110</b> Port 1 Disable | <b>2110</b> Port 2 Disable | <b>3110</b> Port 3 Disable |

### Carrier/CTCSS AND Carrier/CTCSS Only Access

Each port supports an external CTCSS (or digital) decoder, the action of which may be controlled with these commands.

|                                      |                                      |                                      |
|--------------------------------------|--------------------------------------|--------------------------------------|
| <b>1120</b> Port 1 Carrier*          | <b>2120</b> Port 2 Carrier*          | <b>3120</b> Port 3 Carrier*          |
| <b>1121</b> Port 1 CTCSS AND Carrier | <b>2121</b> Port 2 CTCSS AND Carrier | <b>3121</b> Port 3 CTCSS AND Carrier |
| <b>1122</b> Port 1 CTCSS Only        | <b>2122</b> Port 2 CTCSS Only        | <b>3122</b> Port 3 CTCSS Only        |

### TouchTone® Covertone

Whenever a DTMF digit is pressed, the receiver audio from that port is muted. Optionally, a covertone may be selected so users aren't faced with "dead air".

|  |  |  |
|--|--|--|
| <b>1131</b> Port 1 Touchtone®<br>Covertone ON* | <b>2131</b> Port 2 Touchtone®<br>Covertone ON* | <b>3131</b> Port 3 Touchtone®<br>Covertone ON* |
| <b>1130</b> Port 1 Touchtone®<br>Covertone OFF | <b>2130</b> Port 2 Touchtone®<br>Covertone OFF | <b>3130</b> Port 3 Touchtone®<br>Covertone OFF |

## Supervisory Commands (continued)

### Courtesy Tone Selection

Each port has its own, unique 10 programmable courtesy tone sets.

|   |   |   |
|---|---|---|
| <b>1134x</b> Port 1 Courtesy Tone<br>Select x = 1-10 (1*) | <b>2134x</b> Port 2 Courtesy Tone<br>Select x = 1-10 (1*) | <b>3134x</b> Port 3 Courtesy Tone<br>Select x = 1-10 (1*) |
|---|---|---|

**Note: Courtesy Tone selection is not stored in non-volatile memory and will revert to Courtesy Tone #1 upon controller startup. You may define which Courtesy Tone to use upon startup by defining it in the Startup Macro. See the Programming section for details.**

### Kerchunk Filtering

Each port has its own filtering command to prevent users from "kerchunking" that port. When turned on, these filters require that users key up for a period of at least the setting of the Kerchunk Timer before the RC210 will recognize it as a valid signal.

|   |   |   |
|---|---|---|
| <b>1151</b> Port 1 Kerchunk Filter On   | <b>2151</b> Port 2 Kerchunk Filter On   | <b>3151</b> Port 3 Kerchunk Filter On   |
| <b>1150</b> Port 1 Kerchunk Filter Off* | <b>2150</b> Port 2 Kerchunk Filter Off* | <b>3150</b> Port 3 Kerchunk Filter Off* |

### Repeating/Non-Repeating Operation

Each port may be defined as repeating, where a signal on that port's receiver is retransmitted out that port's transmitter. Or it may be defined as non-repeating, where a signal on that port's receiver is NOT retransmitted out that port's transmitter. For example, if you wanted to use Port 2 for a half-duplex/simplex remote base, you would not want its transmitter to be activated by its receiver. You would therefore define that port as being non-repeat. Of course if you want to use a particular port (or all ports) for a repeater, that port needs to be defined as repeating.

|                               |                                 |                                 |
|-------------------------------|---------------------------------|---------------------------------|
| <b>1141</b> Port 1 Repeat*    | <b>2141</b> Port 2 Repeat       | <b>3141</b> Port 3 Repeat       |
| <b>1140</b> Port 1 Non-Repeat | <b>2140</b> Port 2 Non-Repeat * | <b>3140</b> Port 3 Non-Repeat * |

### Mix Monitored Audio with This Port RX Audio

This function selects whether audio from the monitored port(s) is mixed with the audio from the monitoring port or muted when there is activity on the monitoring port.

|                          |                          |                          |
|--------------------------|--------------------------|--------------------------|
| <b>1191</b> Monitor Mix* | <b>2191</b> Monitor Mix* | <b>3191</b> Monitor Mix* |
| <b>1190</b> Monitor Mute | <b>2190</b> Monitor Mute | <b>3190</b> Monitor Mute |

### Mute DTMF ON/OFF

This command selects whether DTMF digits received on the selected port are retransmitted or muted.

|                           |                           |                           |
|---------------------------|---------------------------|---------------------------|
| <b>1211</b> Mute DTMF ON* | <b>2211</b> Mute DTMF ON* | <b>3211</b> Mute DTMF ON* |
| <b>1210</b> Mute DTMF OFF | <b>2210</b> Mute DTMF OFF | <b>3210</b> Mute DTMF OFF |

### Speech Override ON/OFF

Setting the Override to OFF causes user audio to be mixed with non-ID Speech. Setting the Override to ON causes non-ID speech to be stopped if a signal appears on that port's receiver.

|                                  |                                  |                                  |
|----------------------------------|----------------------------------|----------------------------------|
| <b>1201</b> Speech Override ON   | <b>2201</b> Speech Override ON   | <b>3201</b> Speech Override ON   |
| <b>1200</b> Speech Override OFF* | <b>2200</b> Speech Override OFF* | <b>3200</b> Speech Override OFF* |



## Supervisory Commands (continued)

### Speech ID Override ON/OFF

Setting the Override to OFF causes user audio to be mixed with ID Speech. Setting the Override to ON causes ID speech to be stopped if a signal appears on that port's receiver, in which case the voice ID reverts to CW in order to ensure the repeater is properly identified.

|                                    |                                    |                                    |
|------------------------------------|------------------------------------|------------------------------------|
| <b>1181</b> Speech ID Override ON* | <b>2181</b> Speech ID Override ON* | <b>3181</b> Speech ID Override ON* |
| <b>1180</b> Speech ID Override OFF | <b>2180</b> Speech ID Override OFF | <b>3180</b> Speech ID Override OFF |

### Enable/Disable Port DTMF

Each port may have its DTMF decoder disabled. This function is useful under several circumstances, such as when a user is causing problems. As a precaution, it is not possible to disable DTMF on the port to which you're currently connected. For example, you must be using a radio (or repeater) connected to Port 2 or 3 in order to disable DTMF on Port 1.

|                                 |                                 |                                 |
|---------------------------------|---------------------------------|---------------------------------|
| <b>1161</b> Port 1 DTMF Enable* | <b>2161</b> Port 2 DTMF Enable* | <b>3161</b> Port 3 DTMF Enable* |
| <b>1160</b> Port 1 DTMF Disable | <b>2160</b> Port 2 DTMF Disable | <b>3160</b> Port 3 DTMF Disable |

### Require/Not Require CTCSS for DTMF

Each port may be configured to either require a user's signal to contain CTCSS or not require it, in order to enter DTMF commands. This selection controls DTMF access regardless of the state of the access required for repeater access on that port. In other words, it is possible to have a port configured for carrier squelch access, yet require CTCSS for DTMF commands to work.

|                                       |                                       |                                       |
|---------------------------------------|---------------------------------------|---------------------------------------|
| <b>1170</b> Port 1 no CTCSS for DTMF* | <b>2170</b> Port 2 no CTCSS for DTMF* | <b>3170</b> Port 3 no CTCSS for DTMF* |
| <b>1171</b> Port 1 CTCSS for DTMF     | <b>2171</b> Port 2 CTCSS for DTMF     | <b>3171</b> Port 3 CTCSS for DTMF     |

### DTMF Evaluation on COS or CTCSS

You may control how evaluation of entered DTMF commands by either COS closure or CTCSS decoder closure. This can be helpful if your squelch locks open and may be selected on a Port-by-Port basis

|   |
|---|
| <b>1221</b> Port 1 DTMF Command Evaluation on CTCSS Closure |
| <b>2221</b> Port 2 DTMF Command Evaluation on CTCSS Closure |
| <b>3221</b> Port 3 DTMF Command Evaluation on CTCSS Closure |

|   |
|---|
| <b>1220</b> Port 1 DTMF Command Evaluation on COS Closure |
| <b>2220</b> Port 2 DTMF Command Evaluation on COS Closure |
| <b>3220</b> Port 3 DTMF Command Evaluation on COS Closure |

## Using A Control Receiver

Because of the RC210's ability to control any Port from any other Port, there is no need for a special, dedicated control receiver port. By using the right combination of Macro Functions, you can easily and quickly disable or enable any function the RC210 is capable of performing. For example, you have a repeater on Port 1 and a link on Port 2. There is some user randomly entering DTMF, causing disruption to the users of the repeater. You could "come in" through your link and turn off DTMF on Port 1 by unlocking Port 1 and entering the command to turn DTMF off. This could be done without your presence being known to the users on Port 1 if you so chose.

You could even use an existing link or repeater as your control receiver and you will still have positive control of your system at all times. The possibilities are only limited by your imagination and needs of your system.

# Port Linking

## Monitoring A Port from Other Ports

Any port may be selectively monitored by any other port. In the RC210, with multiple monitor commands you can create any combination of monitoring from port to port. This provides considerable flexibility in audio routing. Each of these monitoring commands is a **one-way** connection. In other words, if you select to monitor Port 2 from Port 1, activity on Port 1 will not be retransmitted on Port 2.

To create a two-way path between ports, you have two choices. You can either establish 2, one-way connections between ports or you could use the Linking Commands (this is explained below).

Assume you're on Port 1 and want to monitor activity on Port 2. Enter the command **1301** and a one-way connection is established, allowing the monitoring **of** Port 2 **by** Port 1. Now, activity on Port 2 is retransmitted out Port 1, but Port 1 is not retransmitted out Port 2. It doesn't matter what port is used to issue these commands.

**1301** Monitor Port 2 From Port 1 ON  
**1300** Monitor Port 2 From Port 1 OFF\*

**2301** Monitor Port 1 From Port 2 ON  
**2300** Monitor Port 1 From Port 2 OFF\*

**3301** Monitor Port 1 From Port 3 ON  
**3300** Monitor Port 1 From Port 3 OFF\*

**1311** Monitor Port 3 From Port 1 ON  
**1310** Monitor Port 3 From Port 1 OFF\*

**2311** Monitor Port 3 From Port 2 ON  
**2310** Monitor Port 3 From Port 2 OFF\*

**3311** Monitor Port 2 From Port 3 ON  
**3310** Monitor Port 2 From Port 3 OFF\*

After monitoring for a while, you decide you want to join in the conversation. By issuing the command **2301**, activity on Port 1 is now retransmitted out Port 2. In other words, there is now a two-way connection between Ports 1 & 2.

A two-way connection made in the above manner can be taken down by first turning off monitoring from the port you are on from being monitored by the other port. Then stop monitoring that other port with a second command. For example, if you have a two-way monitor between Ports 1 and 2, and you are actively using Port 1, send the command **2300** first so Port 1 activity does not appear on Port 2, then send **1300** to stop monitoring Port 2. It can be taken down the other way, but if there is an interruption you will be transmitting Port 1 audio on Port 2 and not realize when Port 2 is busy.

## Linking Ports Quickly

You may also establish two-way connections (linking) between ports quickly and easily by using only one command. Likewise, you can also disconnect (unlink) ports using these commands. **Note: Even if you established port monitoring using the Monitor Commands above, you may use the Linking Commands to turn them off or modify them. In other words, the Linking Commands take precedence over Monitoring commands.**

**A11** Link Port 1 to Port 2  
**A21** Link Port 1 to Port 3  
**A31** Link Port 2 to Port 3  
**A41** Link all ports to all other ports

**A10** Unlink Port 1 from Port 2\*  
**A20** Unlink Port 1 from Port 3\*  
**A30** Unlink Port 2 from Port 3\*  
**A40** Unlink all ports from all other ports\*

## User DTMF Pad Test

By using this feature, users can test their DTMF pads to make sure their digits are being properly decoded by the RC210. By sending the User DTMF Pad Test Command Prefix, followed by up to 16 digits, the RC210 will read back each digit it correctly decodes.

< User DTMF Pad Test Command Prefix> <up to 16 DTMF digits>

See the Programming Section of this manual for programming the Command Prefix for this feature.

## Auxiliary Audio Inputs

These inputs can be used for connecting external audio devices, such as a weather receiver. When turned on, the selected transmitter is locked on for a period selected by a programmable timer. After this timer times out, the audio is disconnected and the transmitter is unkeyed. Which port a particular input is routed to is determined by programming commands.

|             |                                  |             |                                  |
|-------------|----------------------------------|-------------|----------------------------------|
| <b>1961</b> | Turn Auxiliary Audio Input 1 ON  | <b>3961</b> | Turn Auxiliary Audio Input 3 ON  |
| <b>1960</b> | Turn Auxiliary Audio Input 1 OFF | <b>3960</b> | Turn Auxiliary Audio Input 3 OFF |
| <b>2961</b> | Turn Auxiliary Audio Input 2 ON  |             |                                  |
| <b>2960</b> | Turn Auxiliary Audio Input 2 OFF |             |                                  |

## General Logic Outputs

There are 7 switched outputs that can be commanded on or off. They can also be pulsed ( 0.1 s open, 0.1 s low, 0.1 s open). When an output is high, it is actually an open collector. If you need a logic high present, you can provide a pull up resistor (up to 100 vdc).

|             |   |             |   |
|-------------|---|-------------|---|
| <b>1810</b> | Logic Output 1 Open Collector           | <b>1850</b> | Logic Output 5 Open Collector           |
| <b>1811</b> | Logic Output 1 Low                      | <b>1851</b> | Logic Output 5 Low                      |
| <b>1812</b> | Logic Output 1 Pulsed (open, low, open) | <b>1852</b> | Logic Output 5 Pulsed (open, low, open) |
| <b>1820</b> | Logic Output 2 Open Collector           | <b>1860</b> | Logic Output 6 Open Collector           |
| <b>1821</b> | Logic Output 2 Low                      | <b>1861</b> | Logic Output 6 Low                      |
| <b>1822</b> | Logic Output 2 Pulsed (open, low, open) | <b>1862</b> | Logic Output 6 Pulsed (open, low, open) |
| <b>1830</b> | Logic Output 3 Open Collector           | <b>1870</b> | Logic Output 7 Open Collector           |
| <b>1831</b> | Logic Output 3 Low                      | <b>1871</b> | Logic Output 7 Low                      |
| <b>1832</b> | Logic Output 3 Pulsed (open, low, open) | <b>1872</b> | Logic Output 7 Pulsed (open, low, open) |
| <b>1840</b> | Logic Output 4 Open Collector           |             |   |
| <b>1841</b> | Logic Output 4 Low                      |             |   |
| <b>1842</b> | Logic Output 4 Pulsed (open, low, open) |             |   |

**Note: These outputs are independent of the "Output Sinker" functions provided by the Doug Hall RBI-1 Remote Base Interface. See the Remote Base section of this manual for details.**

## Extended Logic Outputs

If you have connected external shift registers as described in the RC210 Hardware Reference Manual, you have a total of 32 Extended Logic Outputs available. These are available in addition to the 7 on-board Logic Outputs

|               |                                   |
|---------------|-----------------------------------|
| <b>180xxy</b> | Logic Output xx (1-32) to state y |
| y = 0         | Logic low                         |
| y = 1         | Logic High                        |
| y =2          | Pulsed output (low, open, low)    |

## Analog Meter Inputs

Analog measurement capability consists of an 8 channel 10 bit analog to digital converter. Each channel is capable of measuring voltages between 0 and approximately 5 volts DC and may be programmed to reflect actual values. With the proper sensor hardware (see the RC210 Hardware Manual for details), the range of measurement can be anything you need it to be and not only those limited to this range.

Signals may be provided from the receiver's meter and deviation metering circuits, from wattmeters, temperature sensors and other transducers. There are a number of meter face names you can use, including Volts, Amps, Watts, Degrees, Miles per Hour, and Percent. Scaling of these meter faces is completely programmable by the owner.

The voltage from an external sensor is applied to one of the Analog to Digital (A/D) inputs and measured. Then based on how that meter channel is programmed, the RC210 speaks the measured value. For example, if you have Meter 1 programmed to read temperature, the controller will speak the value in "Degrees".

When a meter readback command is entered, the controller reads back a value that represents the average of several measurements taken over the past few seconds. As the A/D measurements are taken every second and smoothed in the controller firmware, this provides for a very stable reading. For maximum accuracy, the reference voltage used by the A/D converter is programmable.

High and low values for each Meter are stored and can be read back by the user on command. This allows for tracking of trends and each high and low value can be cleared using a command for each meter, or by a global command to clear all the stored high and low values with one command.

How to setup Meters and how to calibrate them is explained later in the Programming section of this manual

|                               |                            |
|-------------------------------|----------------------------|
| <b>1400 (channel 1 - 8)</b>   | Readback current value     |
| <b>1400 (channel 1 - 8) 1</b> | Readback stored LOW value  |
| <b>1400 (channel 1 - 8) 2</b> | Readback stored HIGH value |

To reset a meter's High/Low Stored value:

**1500x** where "x" is the Meter 1 - 8 channel you wish to clear. Entering a 0 will clear all channels.

## Meter Alarms

Each of the Meter Inputs has programmable high and low alarms which when tripped will run a Command Macro. See the Programming section of this manual for details.

Each of the 8 Meter Alarms may be enabled and disabled. To enable or disable a meter alarm:

**1600xy** where x = 1 to 8 for the meter channel and y = 1 for ON and 0 for OFF

Disabling a Meter Alarm retains that alarm's programming but causes it to be ignored even if "tripped".

## Logic Alarms

Each Alarm may be individually turned ON, OFF or interrogated. While enabled, an alarm is triggered by 2 different event – its input line transitioning from a logic high to a logic low and from a logic low to a logic high. Each state may be programmed to call its own Command Macro. See the Programming Reference section for details about programming the Alarms. You may also interrogate the logic state of each Alarm, which is handy for troubleshooting and setup.

|             |                  |             |                     |             |                     |
|-------------|------------------|-------------|---------------------|-------------|---------------------|
| <b>1911</b> | Alarm 1 Enabled  | <b>4911</b> | Alarm 4 Enabled     | <b>2913</b> | Alarm 2 Interrogate |
| <b>1910</b> | Alarm 1 Disabled | <b>4910</b> | Alarm 4 Disabled    | <b>3913</b> | Alarm 3 Interrogate |
| <b>2911</b> | Alarm 2 Enabled  | <b>5911</b> | Alarm 5 Enabled     | <b>4913</b> | Alarm 4 Interrogate |
| <b>2910</b> | Alarm 2 Disabled | <b>5910</b> | Alarm 5 Disabled    | <b>5913</b> | Alarm 5 Interrogate |
| <b>3911</b> | Alarm 3 Enabled  |             |                     |             |                     |
| <b>3910</b> | Alarm 3 Disabled | <b>1913</b> | Alarm 1 Interrogate |             |                     |

# Remote Base Operation

Any of the 3 ports may be used to connect a remote base radio. See Appendix A for a list of supported radios.

The type radio you plan to use with the RC210 is selected by programming commands. In addition, because of the different formats used with radios within the Yaesu line, you must also select which model you wish to use if you program to use a Yaesu radio. See the Programming Reference section of this manual for details. Remote Base Commands are available without unlocking the controller.

**The default Remote Prefix is "A7", so you must preface each of the Remote Base codes below with it. You can change the Remote Base Prefix as desired. See page 26 for details.**

The commands to control the radio are:

## Frequency and Transmitter Offset Entry

**A71xxx.xxx y** Enter Frequency with transmit offset\*.  
Frequency entered must be padded with zeros to make it 6 digits long.

Examples:

A 7 1 1 4 6 6 4 0 3 = 146.640 plus offset  
A 7 1 4 4 8 3 2 5 1 = 448.325 minus offset  
A 7 1 0 1 4 1 9 5 2 = 14.195 no offset  
A 7 1 0 0 7 1 5 0 2 = 7.150 no offset

*Note: the offset must always be entered, even if  
if you are not in FM mode.*

\*The last digit represents the repeater offset .  
y equals:  
1 - minus  
2 - simplex  
3 - plus

## CTCSS Entry

**A72xy** Enter CTCSS code and select encode and/or decode. The 2 digit code xx used for a particular frequency is shown in Appendix B.

y equals:  
0 = No Tone  
1 = Encode only  
2 = Encode/Decode

## Mode Entry

**A73x** Mode select. x equals: *Note: This command only has relevance if you're using a remote base radio capable of multimode use.*  
1 = LSB  
2 = USB  
3 = CW  
4 = FM  
5 = AM  
**Note: Any port used for a remote base should be defined as non-repeating.**

## Readback

**A7** Readback current frequency, offset and mode that is currently loaded into radio

## Memory Selection (Internal RC210 Memories)

The RC210 allows you to recall up to 10 previously stored Remote Base Memories (there are a total of 40 memories if the optional RTC is installed. See the RTC Manual for details). Each of these memories stores operating frequency, transmit offset, CTCSS tone and encode/decode selection and operating Mode. When recalled, these parameters will be spoken by the controller. ). (see the Programming section of this manual for details on storing Remote Base Memories)

**A75xx** Recall Remote Base Memories 01-10 (or 01-40 if optional RTC is installed).

## Remote Base Operation (continued)

### Memory Recall When Using the Kenwood TM-V7a/TM-G707/TM-271A/TM-281A/TS-2000

When any of these radios are selected as the remote base radio, up to 255 of their memories may be recalled (180 total for the V7a).

**A77 x y** where x selects which band's memory to recall and "y" is Memory 1 to 255.

The Band Select digit is necessary because the Kenwood mobiles have no idea which memory we're going to recall. This digit is therefore used to tell the radio which band's memory to use. 1 = VHF, 2 = UHF.

However, in the case of the TS-2000, you directly recall the desired memory using all 3 digits as the Memory Channel selection.

Examples:

**A77012** Recall Memory 12

**A77121** Recall Memory 121

**A77299** Recall Memory 299

### Remote Base Power Select When Using the Kenwood TM-V7a/TM-G707/TM-271A/TM-471A or Doug Hall RBI-1

**A79 x** Select Transmitter power of the connect remote base radio, where x

| <u>Kenwood</u> | <u>Doug Hall</u>                                       |
|----------------|--|
| 0 High Power   | 0 Low Power  |
| 1 Medium Power | 1 High Power   |
| 2 Low Power    | 2 Medium Power (only if radio supports this selection) |

Note: Also see *Programming Kenwood TM-V7a/TM-G707/TM-271A/TM-471A Memories* in the Programming section of this manual.

### Using the Doug Hall RBI-1 Remote Base Interface

There are extra remote base commands available for use if you have selected the Doug Hall RBI-1 for use as your remote base. **Note: these only work if "5" is selected as your remote base radio type**

### User Function Outputs

The RBI-1 provides 7 *User Function* outputs that can be used (in addition to Logic Outputs of the RC210) to control hardware at the repeater site. Refer to the Doug Hall manual for details on making connections.

**A74 x y** User Outputs 1 through 7, where "x" is the output and "y" = 1 ON, 2 OFF

### Memory Select

The Doug Hall RBI-1 provides for memory recall of up to 20 memories within the controlled radio

**A76x** Select Memory 1 – 20

### Power Select

**A79x**

- x = 1 Low Power
- x = 2 Mid Power
- x = 3 High Power
- x = 5 Radio Power OFF

# AutoPatch Operation

The optional AP1 Autopatch board provides for full autopatch operations, including reverse patch that allows for programming of the controller from the phone line. Please refer to the AP1 Autopatch Manual for programming and operating instructions

## Command Macros

Command Macros serve several purposes:

- To execute many different functions with one single command. This allows the owner to program multiple controller functions to take place by the entering of only one command.
- To generate and direct speech messages. These are generally used for such things as Good Morning/Afternoon/Evening messages that the scheduler uses.
- To generate DTMF digits and direct them to a Port. This is very useful for sending commands to a remote site linked by radio or for use with an EchoLink or IRLP node.
- To remap controller functions so they'll be available without having to first unlock the controller. By default, the RC210 will not accept commands unless one of the 3 ports is first unlocked. By remapping controller functions in a macro, these functions are made available without having to first unlock a port. This is how you provide commands for your general users.

There are 2 types of Command Macros - "Long" and "Short":

- Command Macros 1 to 40 can store up to 15 functions each
- Command Macros 41 to 90 can store up to 4 functions each

Typically, Command Macros 41 to 90 are used to remap functions and you can include up to 4 functions in a single one of these macros. Remember however that there is nothing preventing you from using ANY Command Macro you like to accomplish this, but most RC210 owners will probably want to reserve the Long Macros for those things where many functions are to be done with a single command. This is however, totally up to you.

**Some important things you need to remember when programming Command Macros:**

- **Any Macro Command Function that is numbered higher than 255 requires two Function positions.**
- **Any Macro Command Function that is numbered higher than 509 requires three Function positions**
- **Any Macro Command Function that is numbered higher than 764 requires four Function positions**

Each macro may be assigned its own unique command code, so you can define one of your own choosing. See the Programming Reference section of the manual on how to program both the macro codes, as well as the macros themselves.

Macros may also be called from the Scheduler and the Alarms to automate commands. See the Scheduler and Alarm sections in the Programming section of this manual for details. Finally, you may manually recall the contents of any Command Macro and the controller will read back those contents.

## Macro Subset

It is possible to program a smaller contiguous range of Command Macros, known as a Macro Subset. This Subset can be defined as any contiguous number of Command Macros. For example, you could define this Subset to be Macros 1 through 15. Or perhaps Macros 40 through 80. It is totally up to you how large or small this Subset should be. Once programmed, you can selectively enable and disable them as needed. For example, let's say you have Macros 10 through 15 defined as your Subset and they contain only the most basic of functions; the intent being to limit your users to only these functions overnight. During the day, they can have access to all your Macros. You enable Subsets with a Macro Function and disable them the same way.

You could also do some trickery with a tone decoder and an Alarm input to restrict users without tone to only the Subset of Macros. But if they have the proper tone, they'd have access to all. It's totally up to you how you want to use this feature!

## Message Macros

There are 40 Message Macros (or 70 if the optional RTC is installed. See the RTC Manual for details), each of which is capable of storing up to 9 words (or DVR tracks) of speech and can be used in conjunction with any Command Macro. These are typically used to provide a message that reflects the action taken by a Command Macro.

For example, you might have a 2 meter remote base connected to Port 2 and you've defined a Command Macro to link Port 2 and Port 1. You could include a message such as "2 Meter Remote Base Link On" by using a Message Macro. Or perhaps you want a scheduled message to be sent at the top of each hour..

## ID Extras

ID Extras allow you to add various "phrases" to the Voice ID Messages. These ID Extras allow you to include such messages as "Good Morning/Afternoon/Evening (automatically selected by the controller for the appropriate time of day), the time of day or date before OR after the actual ID. See the Programming section of this manual for details.

## IRLP®/Echolink® DTMF Regeneration

When you need to send DTMF to an external device, such as an IRLP® / Echolink® node, whether directly connected to the RC210 or via a radio link, it is desirable to ensure that DTMF is clean and unprocessed for maximum reliability.

To use this feature, all a user needs do is enter the Regenerate Prefix, followed by the DTMF digits to be sent to the node/link. The DTMF sequence after the Prefix will then be sent. Optionally, you may include a voice message that will be spoken before the DTMF sequence is sent. **Note: this feature is available while the controller is locked.** By default, the Command Prefix is # .

# <digits to send>

See the Programming section of this manual for details on how to program the Command Prefix and DTMF Regeneration parameters.

## Real Time Clock And Calendar

If the Real Time Clock has been set since the last power outage, this command will announce the current time.

**1700** Announce current time

**Note: If the Real Time Clock has not been set since the past power outage and you don't have the RTC installed, the controller will say "Clock Not Set".**

If the calendar has been set since the last power outage, this command will announce the current date

**1701** Announce current date

**Note: If the Calendar has not been set since the past power outage and you don't have the RTC installed, the controller will say "Date Not Set"**

.

## Digital Voice Recorder (DVR)

The RC210 includes an on-board DVR that allows for recording of custom messages that can be used in any programmable message (ID's and Message Macros). It also allows your users to record their own transmission, for checking the quality of their signal.

The DVR has a total recording time of 63 seconds and divided into 20 "tracks". There is no time limit per track, other than the total recording time available. In other words, you may use the total time available anyway you wish, be it one track that is 63 seconds long or 20 tracks that are 3.14 seconds long. It is totally up to you. See the Programming section of this manual for details on recording DVR tracks for use in messages.

DVR Track 19 is a special case, as that can be used to allow your users to check the quality of their signal into the repeater. This function is available as a Macro Function, so you must specifically define it in order for it to be available to your users.

To use the feature, users enter the Command Code you've programmed, then unkey. The controller responds with "Ready", at which point the user has 4 seconds to key again and speak their message. When they're done, they unkey and the controller will play what was recorded. If after the controller speaks "Ready" and the user does nothing, the controller will timeout the recording and announce such.

Obviously, there needs to be "free" minutes available in the DVR in order for this feature to be useable. If there are no free minutes available and this feature is used, the controller will respond with "Error" instead of the Ready message and the function will be terminated.

## General Timers

There are 3 General Timers that may be used for any purpose you may have. Each timer is independent of the others and may run simultaneously with them as well. Each of these timers is programmable in seconds and when it times out, it will run a Command Macro of your choice. These timers may be used for everything from beacon IDs to automatically turning a feature on or off after functioning it. The use of these timers is only limited by your imagination. See the Programming section of this manual for details.



# Programming The RC210

## General Programming Overview

Each port on the RC210 is programmed individually and the programming for one does not affect the others. The programming commands for each port are identical - the only difference being the port you've "unlocked" to program. This makes it easier to remember the code for programming a particular command and/or function.

For example, the code to program the Initial ID Timer is \*1002, regardless which port you wish to program. What differentiates which port is being programmed is determined by which port you unlocked through the use of its unlock code.

While you are in programming mode you can re-enter an Unlock Code at any time to unlock a different port without having to lock the controller first. For example, if the controller's Port 1 is already unlocked, you can simply enter Port 2's unlock code and change over to programming Port 2. Furthermore, **any Port may be unlocked and programmed, regardless of which Port you're actually connected to. For example, you may program Port 1 while actually using a radio or repeater connected to Port 2 or 3.**

While unlocked, you may also play back your ID messages, based on which port you're currently "connected to". This allows for easy verification of your ID messages as you program them.

|            |  |
|------------|--|
| <b>AA1</b> | The currently unlocked port CWID # 1     |
| <b>AA2</b> | The currently unlocked port CWID # 2     |
| <b>AA3</b> | The currently unlocked port Voice ID # 1 |
| <b>AA4</b> | The currently unlocked port Voice ID # 2 |
| <b>AA5</b> | The currently unlocked port Voice ID # 3 |

As mentioned in the Command Reference section of this manual while any port is unlocked, you can use any of the default command codes.

In addition, by prefacing any Macro Command with "\* \*", you can recall any previously programmed Macro without having to first "lock" the controller.

## Unlock Code Programming

The RC210 comes programmed with a default unlock codes for each port. To unlock any port for the first time, enter the default code.

|              |                             |
|--------------|-----------------------------|
| <b>15281</b> | Port 1 default unlock code  |
| <b>25281</b> | Port 2 default unlock code  |
| <b>35281</b> | Port 3 default unlock code. |

For example, to unlock Port 1 for the first time, enter 1 5 2 8 1 and unkey. The controller will respond with "ULP1", indicating that Port 1 is now unlocked and ready to accept programming. The code to reprogram the unlock code is \* 9 0 0 0 followed by up to 8 digits - those digits will become your new unlock code for that port.

**Note: For security reasons, you should try and use all 8 digits for the unlock codes.**

For example, you want to program the unlock code for Port 1 to "22334455". Key your radio and enter \* 9 0 0 0 2 2 3 3 4 4 5 5 and unkey. The controller should respond with "CODE". Your new code is now set and will stay set until you explicitly change it, even through power off cycles. It is suggested the first thing you do is reprogram the unlock code for each port.

Some owners prefer to use a prefix, followed by a command unlock code. This makes it even easier to remember the codes. For example, you could program Port 1 unlock code as **12463683**, Port 2 as **22463683** and Port 3 as **32463683**. Of course this is strictly up to you, but the flexibility of the RC210 allows you this sort of freedom.

**Important: Write your unlock codes down and keep them in a safe place. Should you lose them, it is possible to reset them back to factory defaults but this cannot be done without physical access to the RC210.. See "Resetting your unlock codes" on Page 45 for details on how to do this.**

**See Programming Commands Quick Reference at the end of this manual for how to reset the Unlock Codes should you forget them.**

## Pre Command Prefix

Sometimes it may be desirable to be able to access commands that haven't been remapped using a Command Macro without having to first unlock a Port. By defining a Pre Command Prefix (up to 4 digits is permissible), you can access those commands that normally require unlocking a Port with the exception of programming commands that start with a star (\*). Any command shown in Appendix C is accessible in this manner. You may also disable this feature if it's not needed by programming a zero:

**\*2109x** where x is from 1 to 4 digits for use as. If programmed to 0, no Prefix is used and this feature is disabled.

If disabled you must first unlock a Port in order to access commands.

## Pre Access Code

You may program a *Pre Access Code* which will then be required to be prepended to all commands EXCEPT UNLOCK CODES AND COMMANDS ENTERED WHILE THE RC210 IS LOCKED. In other words, you will need to use any programmed *Pre Access Code* before any Command Macro. This is not to be confused with the Pre Command Prefix above.

Probably the most common use of a *Pre Access Code* is as a *Site Prefix* in a multi-controller, linked system. By using such a prefix, all controllers in the system can use identical codes with *the Pre Access Code* serving as a site address. For example, let's say we have a linked system consisting of 3 repeaters, all linked together full-time. At each site, we use the command of "ABC" to read backup battery voltage. So we assign site #1 a Pre Access Code of "1", site #2 to "2" and site #3 to "3". Now we access site #3 from site #1 and send DTMF digits **3 A B C**. Site #3 will now read back its backup battery voltage down the link back to site #1. Similarly, we can use addresses in this manner for and from anywhere within our system.

**\*2108x** where x is 1 to 3 digits. If programmed to 0, no Pre Access Code is used.

## Locking (Leaving Program Mode)

To lock the controller when you're done programming, you use a (by default) single "#". The controller will respond with "LOCK", confirming you are no longer in program mode. Also, when any port is unlocked, a timer is started. Should no valid DTMF digit be received at least every 2 minutes, the controller will automatically lock itself and announce that fact.

## Programming A Custom Lock Code

Perhaps # conflicts with your intended code scheme, so the RC210 allows you to reprogram the Lock Code to be up to 4 digits long. **This code is not unique to any port and will be used to lock the controller regardless of which port is unlocked at the time.**

**\*9010xxxx** where "xxxx" is your new Lock Code of any length from 1 to 4 digits.

## Programming A Custom Terminator Digit

By default, the RC210 recognizes a "D" as its terminator digit, forcing any DTMF digits beforehand to be evaluated by the command decoder. Under some circumstances, "D" may conflict with a code used for some other function. If necessary, you can reprogram the terminator digit to be any other single DTMF digit.

**\*9020x** where "x" is the single DTMF digit that will cause the RC210 to evaluate DTMF digits preceding it.

## A Word Of Caution Regarding The Terminator Digit

Should you decide to change the Terminator Digit from its default value, remember that you can no longer use that new digit anywhere in any command. For example, it would be a bad idea to use "1" as your Terminator Digit, as you would not be able to use "1" in any other command, as well as losing access to the defaults commands that have a "1" in their code. Nor would "\*" be a good idea, as you'd never again have access to those programming commands that start with an asterisk (which is just about all of them!).

Generally speaking, if you wish to redefine the Terminator Digit, you should strive to use one of the less commonly used DTMF digits, such as A, B, C or D. But you must also make certain that whichever digit you decide to use does not conflict with a default command either. For example, A is used as part of the default Remote Base Prefix Code. If you wish to use A, you should first reprogram the Remote Base Prefix Code so as not to use A.

# Port Unique Versus Global Programming

There are two types of programming commands:

Those that affect only the port you currently have unlocked. These are referred to as *Port Unique Programming Commands*, which may be done from any radio port. In other words, you can program Port 2 while actually using a radio connected to Port 1.

Those commands which are shared between all ports or don't apply to a specific port. These are referred to as *Global commands*. For example, reading an ADC channel or controlling a remote base radio.

## Port Unique Programming

### Timer Programming

Unless otherwise noted, all of the following commands may be programmed with only those digits necessary. In other words, if the value you wish to enter is "20", you need only enter "20". If you want to enter "1234", you simply enter "1234" for that programming command.

### Hang Time

Each port has its own programmable hang time when that port is configured for full-duplex operation (in half-duplex, there is no hang time). It is programmed in 1/10 second intervals. For example, 1 second would be programmed with a value of "10".

**\*1000x** where "x" is the amount of hang time for that port's transmitter in 1/10 seconds. The range is 0 to 25.5 seconds. The controller responds with "H A N G T I M E R S E T". **Note: setting the timer to 0 gives zero hangtime**

### Time Out Timer

Each port is provided with a time out timer that will drop the transmitter should a signal appear on it's receiver input for longer than the programmed time out period (this only applies if that port is in full-duplex).

**\*1001x** where "x" is the time out period for that port's transmitter in seconds. The range is 1 to 32767. The controller responds with "T I M E O U T S E T". **Note: Setting the timer to zero disables it.**

### Initial ID Timer

This timer sets the amount of time the repeater must be idle before sending the Initial ID. For example, if you set this timer to 10 minutes and that port is in full-duplex and unused for at least 10 minutes, this ID will play upon initial keyup. It won't play again until the repeater sits idle for another 10 minutes.

**\*1002x** where "x" is the amount of time in minutes between ID's. The default time is 10 minutes and there is really no need to change it, but it can be changed from 1 to 255 minutes. The controller responds with "I I D T I M E R S E T".

**NOTE: You may disable ID's completely on any Port by programming a value of 0 for the Initial ID Timer. You will usually want to do this on a Port not set as a repeater Port.**

### Pending ID Timer

After the initial ID is sent, the Pending ID timer is started. While this timer is running, if during this time there is activity on that port, the Pending ID message will be sent. If activity continues, the Pending ID will be sent every period, programmed by its timer. If there is no activity after the initial keyup, no further IDs are sent until the Initial ID period has elapsed. Also see the Pending ID Speech Timer below for more information on how this works.

**\*1003x** where "x" is the amount of time in minutes the Pending ID waits after an Initial ID occurs. The default is 10 minutes and there is really no need to change it, but it can be changed from 1 to 255 minutes. The controller responds with "P I D T I M E R S E T".

## Fan Timer

The RC210 provides a convenient method of controlling a cooling fan, while eliminating unnecessary wear and tear. When any Port is keyed, the fan is started and will remain on for a period determined by the Fan Timer. It will then automatically shut off.

**\*1004x** where "x" is the amount of time you want the fan to remain on after any transmitter unkeys in minutes. The range is 1 to 255 minutes. The controller responds with "FAN TIMER SET".

## Port Inactivity Timer

When ports are connected to other ports, this timer is started. If there is no receiver activity on this port for the period determined by this timer, it will run a macro of your choice (see Programming section of this manual).

**\*1005x** where "x" is the amount of time a connected port should remain connected to **this** port if there no is activity for x minutes. The range is 1 to 255 minutes. The controller responds with "PORT x TIMER SET" (where x is the port number). **Note: Programming the timer to zero disables it.**

## DTMF Mute Timer

If DTMF muting is enabled on a port, audio from its receiver is muted upon receipt of DTMF. Furthermore, if the DTMF Covertone is enabled on this port, it will be used during the mute period as well. When the COS closes, the receiver is again unmuted and (if enabled) the Covertone is stopped. But what happens if a signal remains on the receiver? Obviously, the receiver wouldn't unmute until after that signal went away.

To prevent this from becoming a problem, the DTMF Mute Timer will unmute the receiver and stop the Covertone after a DTMF digit is first received and after certain amount of time. As long as DTMF digits are received, this timer is reset and the muting and Covertone will continue until the user unkeys.

**\*1006x** where "x" is the amount of time in 100 milliseconds steps that the DTMF mute timer should generate DTMF cover tone and the receiver should remain muted between DTMF digits. The range is 0 to 9999 milliseconds (ms). For example, 1 = 100 ms, 7 = 700 ms, 50 = 5 seconds. Regardless of this setting, the receiver will unmute and covertone will be stopped immediately upon COS closure or the receipt of DTMF "#".

## CTCSS Encode Dropout Timer

If you have connected the CTCSS encode control line to an external encoder, you can program this parameter to select how long encoded CTCSS will continue to be transmitted after the receiver COS closure or Courtesy Tone completion.

**\*1007x** where "x" is the amount of time in 1/10 seconds CTCSS should continue to be sent after COS closure or Courtesy Tone completion. The range is 0 to 25.5 seconds.

**Note: programming a 0 disables the timer and the CTCSS encode line will "turn off" immediately upon COS closure. If programmed to 25.4, CTCSS encode will never occur. If programmed to 25.5, CTCSS encode will remain on at all times.**

**Note: See the command \*1021 for selecting the CTCSS Encode polarity**

## Timer Programming (continued)

### Auxiliary Audio Timers

When you turn on one of the Auxiliary inputs, a timer is started. When this timer times out, that input will automatically be turned back off. The default time is 300 seconds (5 minutes) and the range is 1 to 32767 seconds.

- \*1013x Set Auxiliary Input 1 Timeout
- \*1014x Set Auxiliary Input 2 Timeout
- \*1015x Set Auxiliary Input 3 Timeout

### Kerchunk Filter Timer

This timer determines how long a signal must appear on a receiver before it will be recognized as valid, if Kerchunk filtering is enabled. The range is 1 to 6000, with 1000 representing approximately 1 second.

- \*1018x Set Kerchunk Filter Timer

### Pending ID Speech Timer

The RC210 normally uses a spoken ID for its Initial ID (this is selectable with a programming command). The Pending ID may be done in speech or in CW, depending on the setting of this timer. This timer looks for activity on its respective port for the past X seconds. If there has been activity, the Pending ID will be done in CW, otherwise it will be made with the next Voice ID in rotation. Setting this timer to the value of the Pending ID Timer will make it NEVER use a Voice ID for the pending ID. Setting it to zero will make it ALWAYS use a Voice ID for the pending ID. The range is 1 to the value of the Pending ID Timer but is entered in seconds. For example, 10 minutes is 600 seconds.

- \*1019x Set Pending ID Speech Timer

Examples (assuming the Pending ID Timer is set to 10 minutes):

- \*1019 60 Look for activity for the last 60 seconds. If there has been, the next Pending ID will be CW otherwise it will be Voice
- \*1019 600 Pending ID's will always be done in CW
- \*1019 0 Pending ID's will always be done in Voice

### Tail Message Timer

This timer allows you to send programmed Tail Messages based on this timer instead of the number of transmitter "tails". When programmed, this timer starts to run upon COS closure on its Port and is reset if there is COS activity. When used, the Tail Message is **sent only once**.

- \*1020 300 Send currently selected Tail Message 5 minutes after last activity.
- \*1020 0 Disable Tail Message Timer (turn off timed Tail Messages)

See the Tail Messages section of this manual for details on how Tail Messages work and how to program them.

## Timer Programming (continued)

### The General Timers

The 3 General Timers are not related to Ports and any combination may be used on any port. When a General Timer times out, it runs a Command Macro. Each Timer is started and stopped by using a Macro Function (see the Macro Function List, Page 34 for their assignments). It should be noted that once enabled, these Timers will continue to run until it is explicitly disabled. This makes them useful for such things as Beacon ID's but may be used for other purposes as well.

To program the General Timer time period:

**\*1017x y** where **x** is the Timer (1,2 or 3) to program and **y** is number of seconds 1 - 32767 that the timer should run when started.

**Note: Programming the seconds to 0 will disable that Timer**

To Program the Command Macro to run:

**\*2092x y** where **x** is the Timer (1,2 or 3) and **y** is the Command Macro to run 1 - 90

### A Practical Example:

In this example, we want to use a Command Macro 10 to Unlink Ports 1 & 2 and automatically relink them 15 minutes later.

First, we program up Macro 10 to speak Message Macro 1 out Port 1 and link Ports 1 & 2 and start General Timer 1

**\*4002 10 162 187 122 347** Macro 10 speaks Message Macro 1 out Port 1, link Ports 1 & 2 and start General Timer 1

Now we program Macro 11 to relink Ports 1 & 2 and stop Timer 1 (in this example, relinking doesn't cause a message to be spoken. You could of course, include a message as well if you desire):

**\*4002 11 118 391** Link Ports 1 & 2 and stop Timer 1

Now that the required Macros are programmed, we now program the General Timers. First, we program the Timer period:

**\*1017 1 900** Program Timer 1 to 900 seconds (15 minutes)

Next, we program Timer 1 to run Macro 11

**\*2092 2 11** Program Timer 2 to run Command Macro 11

Whenever Macro 10 is run, the ports will be unlinked and 15 minutes later, they will be relinked.

## CTCSS Encode Control Programming

### CTCSS Encode Control Line Polarity

Each Port's CTCSS Encode Control Line may be programmed to be an active low or active open collector. In other words, you can program whether the Control Line should be pulled to ground or allowed to float when you want encoded by an external CTCSS encoder.

**\*1021x** Select Control Line polarity. If **x = 1**, then the output will float when active. If **x = 0** then output will pull to ground when active.

### CTCSS Encode Timer Start After COS or After Courtesy Tone

The CTCSS Encode timer may be selected to start on closure of COS or upon completion of Courtesy Tone. This allows for easy timing to end of hang time. For example, many system owners like to stop the CTCSS tone a few hundred milliseconds before the transmitter drops.

**\*2088x** where **x** selects when to start the encode dropout timer. 1 = After Courtesy Tone, 0 = After COS closure

## CTCSS Encode Control Programming (continued)

### CTCSS Encode During ID's

You may select to have the RC210 send CTCSS during ID's .

**\*2089x** where **x=1** to send CTCSS during IDs and **0** to not send CTCSS during IDs.

## Real Time Clock And Calendar

It is necessary to set the Real Time Clock and Calendar before you'll be able to use the features they provide, such as the time readback and the Scheduler. When programming, it will read back the current time in order to confirm your entry.

### Setting The Real Time Clock

**\*5100 hh mm [ss]** where "hh" is the hours in 24 hour time and "mm" is the minutes. Both must consist of 2 digits. If only hours and minutes are entered, the clock will assume zero seconds when programmed. Alternately you may include seconds when programming for maximum accuracy.

Examples:

|                       |                              |
|-----------------------|------------------------------|
| <b>*5100 01 22</b>    | Set the clock to 1:22 AM     |
| <b>*5100 15 04</b>    | Set the clock to 3:04 PM     |
| <b>*5100 12 12 23</b> | Set the clock to 12:12:23 PM |

### Setting The Calendar

**\*5101 mm dd yy** Set the calendar to MM month, DD day, YY year. When programming, the controller will read back the current day of the week, month, day and year in order to confirm programming.

Examples:

|                       |   |
|-----------------------|---|
| <b>*5101 06 11 03</b> | Set June 11, 2003 as the current date   |
| <b>*5101 10 04 11</b> | Set October 4, 2011 as the current date |

### Enabling/Disabling Year Readback

You may turn ON/OFF the readback of the year when the date is spoken.

|               |                        |
|---------------|------------------------|
| <b>*51020</b> | Turn OFF year readback |
| <b>*51021</b> | Turn ON year readback  |

### Selecting 12 or 24 Hour Readback

You may select 12 or 24 hour readback of the Real Time Clock.

|               |                  |
|---------------|------------------|
| <b>*51030</b> | 12 Hour readback |
| <b>*51031</b> | 24 Hour readback |

### Selecting "Hours" To Be Spoken As Part of 24 Hour Readback

You may select whether to include or not include the use of the word "hours" as part of the 24 Hour Readback mode.

|               |                 |
|---------------|-----------------|
| <b>*51040</b> | Don't say Hours |
| <b>*51041</b> | Say Hours       |

## Adding A Correction Factor To The Real Time Clock

As is the case with any clock that is not referenced to standard such as WWV, the RC210's Real Time Clock may gain (or lose) a few seconds over time. This is unavoidable due to temperature changes, crystal tolerances, etc. Fortunately, the RC210 allows you to "bump" the clock + or - up to 59 seconds in order to obtain the best accuracy possible.

For example, you may notice after your RC210 has been running for a week that its Real Time Clock has lost 2 seconds. With this command, it is a simple matter to add 2 seconds to the clock's time.

**\*5105 2** Add 2 seconds to the Real Time Clock's current time

**\*Note: If you need to subtract seconds from the Real Time Clock, preface the seconds with an "A". For example \*5105 A 3 will subtract 3 seconds from the clock's current time**

In addition to adding 2 seconds to the time, this command also stores this correction factor into non-volatile memory. This allows you to set a scheduler setpoint (in our example above, you'd program a setpoint to run once a week) and automatically apply it to the clock by storing the Macro Function Number into a Command Macro and have the scheduler run that macro at, let's say, Friday night at midnight. See the Command Macro and Scheduler programming sections of this manual for details.

## Reading the RTC Module (if installed)

If the optional RTC module is installed, you can read it and have its setting applied to the RC210 internal Clock/Calendar whenever you need. The RTC module provides higher accuracy than does the on-board clock so regularly doing so will result in a more accurate Clock and Calendar.

This is done by using Command Macro Function 551. See the Command Macro Programming section.

## Miscellaneous Programming

### DTMF Mute On 1st Or 2nd Digit

If DTMF Muting is enabled on a port, this command will select whether muting starts on the 1st or 2nd digit.

**\*2090x** where x=1 to mute on the 1st digit or x=2 to mute on the 2nd digit

### Delay Before Speech/CW Starts

You may program a delay time to allow the transmitter to fully come up to power before speech or CW actually starts.

**\*1022x** Set Delay time, where "x" is the amount of time in milliseconds to delay before speech or CW starts. Range is 0 to 32767.

### User DTMF Pad Test Command Prefix

This programming command is used to set the Prefix for the User DTMF Pad Test

**\*2093x** where x = 1 to 5 digits used for the User DTMF Pad Test

### Which Version Firmware Is Installed?

You can find out which version firmware is currently installed with the following command:

**\*299999** Speak Version Number

### Controlling TimeOut

If programmed to 1, a Port's transmitter will be dropped when a timeout occurs on any other linked Port. If programmed to a 0, a Port's transmitter will be dropped ONLY when a timeout occurs on THAT Port.

**\*2051x** where x = 1 for timeouts affecting linked Ports, 0 for timeouts not affecting linked Ports



## Selecting The Timeout Reset Point

You may select when the Timeout Timer is reset, depending on your needs:

**\*2122x** where x = 0 to 4

- 0 = After COS
- 1 = After CT Segment 1
- 2 = After CT Segment 2
- 3 = After CT Segment 3
- 4 = After CT Segment 4

## Fan Operation

You can select one of 2 modes of fan operation. The first mode will start for any transmitter activity while the second mode will start the fan only when there is a valid signal received on a Port, an Autopatch call is made or an Auxiliary Audio Input is on. This can help to reduce wear and tear on your fan and associated relays.

**\*2119 0** The fan will start for any xmtr activity.

**\*2119 1** The fan will only start when there is receiver, Autopatch or Auxiliary Audio activity.

## Remote Base Programming

The RC210 is capable of controlling several different types of remotely controllable transceivers for use as a remote base.

- Kenwood - all radios that utilize a computer interface that may be directly connected to a an RS-232 compatible serial port, such as the TS-2000 and TS-870
- Kenwood single band and dual band mobiles, TM-V7a, TM-G707, TM-271A
- Elecraft radios
- Icom models IC-706MKIIG, IC-746, IC-756, IC-7000
- Yaesu FT-100D, FT-817, FT-847, FT-857, FT-897

The RC210 also supports the Doug Hall RBI-1 Remote Base Interface, Please refer to its manual when connecting the RC210.

## Selecting The Type Of Remote Base Radio

You select which type of radio you are using by programming:

**\*2083x** where "x" is the radio type

- 1 = Kenwood
- 2 = Icom
- 3 = Yaesu
- 4 = Kenwood V7a
- 5 = Doug Hall RBI-1
- 7 = Kenwood g707
- 8 = Kenwood 271A
- 9 = Kenwood V71a

**\*for Kenwood radios with a computer comport, the RC210 uses a baud rate of 9600**

**\*The RC210 expects to see an Icom radio as the CI-V address of 48H with the baud rate set to "4800". Yaesu radios should be set to a 9600 baud rate.**

**\*this supports the Kenwood TM-V7a mobile dual-band transceiver**

**\*this supports the Kenwood TM-g707 mobile dual-band transceiver**

**\*this supports the Kenwood single band mobile TM-271A**

**\*this supports the Kenwood TM-V71a mobile dual-band transceiver**

If you select Yaesu, there is an additional programming step to take (if not using Yaesu, you may disregard this step):

**\*2084x** where "x" is:

- 1 = FT-100D
- 2 = FT817, FT-857, FT-897
- 3 = FT847

## Programming Remote Base Memories (non-Doug Hall)

The RC210 has 10 internal Remote Base Memories that, once programmed, allow for a single command to recall frequency, transmitter offset, CTCSS tone selection and encode/decode operation. (If the optional RTC Module is installed, there are a total of 40 memories)

To store a memory, first program the remote base with the frequency, Offset, CTCSS and Mode information you wish to store. Then, with the controller unlocked, enter:

**\*2086x** where x is the Memory to store, 1- 10 (1-40 if the optional RTC is installed)

### Programming Kenwood TM-V7a/TM-G707/TM-271 Memories

When using either of these radios as a remote base, it is possible to store and later recall its memories (see the *Memory Recall When Using the Kenwood TM-V7a/TM-G707/TM-271A/TM-471A* section of this manual).

To store a memory, you first need to set up the data that will be stored. This means frequency, transmitter offset, CTCSS tone frequency and CTCSS encode/decode selection. Assuming the default Remote Base Prefix Code of A7:

First, we program the frequency to be stored in a memory, along with its offset

**A71 1470203**

Now we program the CTCSS data. In our example, we will program a CTCSS tone code (from Appendix B) of 11, to encode only.

**A72 11 1**

This is automatically sent to the radio and we can now store it in a memory.

In our example below, we'll store it into Memory 22 of the radio by first unlocking any port (it doesn't matter which) and entering

**\*2087 22**

Notice that unlike the memory recall feature, we don't need to use a band select digit when programming memories. This is because the band selection is automatically determined from the frequency that was previously entered.

## Remote Base Prefix

You can define a prefix that must be prepended to the remote base commands. This allows you to customize the codes required. If changed from the factory default value of "A7", the new Remote Base Command codes must be prepended with the defined prefix code. For example, if you change the Remote Base Prefix Code to "AB", a user would need to enter "A B 3 x " in order to change modes.

**\*2060xxxx** Define Remote Base Prefix Code - maximum 5 digits. If "0" is entered, any existing code is erased, thereby allowing the factory default codes to be used.

Examples:

**\*2060 AB** Define Remote Base Prefix to be "AB"

**\*2060 0** Erase Remote Base Prefix

## Port Inactivity Macro

If any two (or more) ports are linked together, a timer is started. As long as activity occurs on the linked **TO** port, this timer is reset. If no activity occurs during the programmed period, a Command Macro will be run. For example, you could call a Command Macro that disconnects the ports and speak a message to let users know. Of course, you can program the Macro to do whatever you'd like.

When programming this, remember that you're programming only that port that is currently unlocked.

**\*2114 x** where x is the Command Macro 1 to 90 to call

# Programming The RC210 Command Macros

In order for users to be able to control functions in the RC210 without them being required to first unlock the controller, you define a *Command Macro*. The contents of a Command Macro are *Command Macro Functions* which are the actual functions to be performed. In addition, each of the 90 Command Macros may be assigned a unique *Command Code*, which is the code that will be entered by users to run that Command Macro.

You may use any valid DTMF digit in any Command Code except:

- "D" if you're using the default Command Terminator Digit or
- Any DTMF digit you reprogrammed for use as your Command Terminator

Take the time to plan your code strategy prior to actually programming. You can program any of the Command Codes to be from 1 to 8 digits long.

It is strongly suggested that you plan ahead by making a list of command codes you want to program and then double check them for duplicates. If you accidentally program the exact same code into more than one Macro, only the first occurrence will work with subsequent occurrences being ignored by the controller. You will then have to identify with commands aren't working and re-program their code accordingly. Take the time to plan your code structure and you will avoid having to take these steps.

**Remember when programming Macro codes, each one MUST be unique. "12345" is unique from "54321" however.**

Some system owners prefer the concept of having a prefix for a certain group of commands in order to make them easier to remember.

For example, you could program a group Command Macros that all control link functions and then group them together. By assigning them to start with a prefix of "AB", it would be a simple matter to remember that the digit that follows the prefix controls a specific function of port linking.

**AB1** - Link Port 1 to Port 2  
**AB2** - Link Port 1 to Port 3  
**AB3** - Link Port 2 to Port 3  
**AB4** - Link all ports  
**AB5** - Unlink Port 1 from Port 2  
**AB6** - Unlink Link Port 1 from Port 2  
**AB7** - Unlink Port 2 from Port 3  
**AB8** - Unlink all ports

Of course, these are strictly examples and only limited by a maximum of 8 digits for each Macro Command Code and your imagination!

Other system owners prefer a different code strategy and will assign commands based on different groups of users, such as general users and authorized Control Operators. Only some commands will be given to each group, with the Owner reserving programming commands and other deemed critical functions only for themselves.

Again, this is totally up to you and how you wish to organize your system. The RC210 gives you the flexibility to do it any way you want.

Command Macro Functions are run in the order they appear in that Macro.

For example, consider the following Command Macro contents:

**114 121 045 101**

When this Macro is run, it will be done sequentially. That is to say that Function 114 will be run first, followed by 121, 045 and finally 101. Note they are not run in *numerical* order.

The only exception to the above is when a Command Macro calls another Command Macro

For example:

**506 501 544 521**

When this Macro is run, it will be run in numerical order, regardless of the ordering within the Macro. That is to say 501 will be run first followed by 506, 521 and finally 544.

Keep the above in mind when planning your Macro programming

# Command Macros

The RC210 allows for storing up to 90 different *Command Macros* that are stored in non-volatile memory and can be recalled with a single command. Each command in the RC210 is assigned a Function Number (FN) that is then used to store that function in each macro (see the Macro List on Page 33).

Macros are programmed by first entering the macro programming command for the macro you wish to program, followed by a series of 3 digit function numbers to be programmed into that macro. The command syntax is:

**\*4002 mm xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx**

where "mm" are 2 digits representing the macro (01-90) to be programmed, followed by a series of 3 digit numbers where "xxx" represents those commands.

## **IMPORTANT NOTES ABOUT COMMAND MACROS**

**Long Macros (1- 40) will accept up to 15 3 digit function numbers while Short Macros (41- 90) will accept up to 4. Going over these limits will cause the controller to say "ERROR" and that Macro will not be stored.**

**Macro Function Numbers above 255 use 2 slots in a Command Macro. Macro Functions above 510 use 3 slots and Macro Functions and Macro Functions above 764 use 4 slots. Plan accordingly!**

For example, we want to program Macro 2 so it will turn on CTCSS Access on Port 1, connect Port 1 to Port 2 and change Port 2's courtesy tone to #4. By looking up these functions on the Macro Function Number chart, we see the function commands we want are 001, 118 and 062. We enter - all in one transmission:

**\*4002 02 001 118 062**

The controller responds with "M A C R O" and the number of the macro we just programmed.

We can even program macros to include other macros. For example, we want to create a macro that in addition to doing what Macro2 already does, we also want it to change Port 1's courtesy tone to #9. Instead of having to repeat the commands previously stored in Macro 1, we can simply create a new macro containing the additional function and include Macro 2 as well:

**\*4002 03 057 401**

Macros may be embedded into other macros any number of times, up to the limit that macro can hold.

## Using Command Macros To Remap Controller Functions

Another use for Command Macros is to allow user access to controller functions without having to first unlock a port. This gives you complete control over whom should have access to which functions in the RC210.

Let's say you want your users to be able to read the RC210's real time clock easily and you want them to enter "1111" with their radios in order to do so. First, we program a Command Macro for that function. In this example, we'll use one of the Short Macros - Macro 41 - since we only need it perform a single function:

**\*4002 41 116**

We can now assign Macro 41 the code of "1 1 1 1".

**\*2050 41 1111**

Now when someone enters "1 1 1 1", the RC210 will speak the current time (provided you've set the clock that is!). It's that simple.

You can use any of the 90 Command Macros for remapping commands as needed.

## Command Macro Priority

Command Macros have 3 different levels of priorities - low, medium and high.

- High - Once a Command Macro starts, nothing will stop it
- Medium - If a Command Macro contains any speech functions, that speech will be controlled by the Speech Override and Speech ID Override settings. This is the default priority level of all Command Macros.
- Low - Any COS activity on the last active Port will stop that Command Macro and exit.

Priorities are particularly useful for controlling Command Macros that contain speech. For example, you recorded a DVR track with an informational message, such as "This Repeater Requires a Tone Frequency of 100 Hertz", which plays immediately following an ID. Some users might take great delight in kerchunking in the middle of the informational message, stopping it because you have Speech Override turned on. By assigning this Macro a high priority, it will always play uninterrupted.

You assign a Command Macro a priority level by including one of the following function numbers within that macro, as the first one entered.

228 High Priority  
229 Low Priority

Example: Command Macro 12 will play DVR Track 1 and then play an ID on Port 1, as High Priority:

**\*4002 12 228 162 126 181**

After a Command Macro runs, its priority level is automatically reset to Medium.

## Startup Macro

Macro 1 is a special case in that it is run every time the controller is powered up or otherwise resets. This allows you to define a known startup state of your RC210. You may include any Function within Macro 1, including calling other macros.

## Macro Subset (Guest Macros)

Programming a Macro Subset allows for selectively controlling access to only those Command Macros. This Subset is a range of Command Macros that you define

**\*4009xxyy** where xx is the 2 digit starting Command Macro number and yy is the 2 digit ending Command Macro number.

Examples:

**\*4009 05 10** Define Subset range from Command Macro 5 to 10  
**\*4009 23 52** Define Subset range from Command Macro 23 to 52  
**\*4009 66 68** Define Subset range from Command Macro 66 to 68

Even though you may have a Subset defined, it is not actually in effect until it is specifically enabled. This is done either by unlocking a Port and using the following codes:

**2800** Disable Macro Subset  
**2801** Enable Macro Subset

Or alternately, you may use the appropriate Macro Function to enable and disable as needed (see Macro Function List for the Function Numbers).

## Some Useful Hints On How To Use The Macro Subset

The Macro Subset can be used to allow users to have access to all Command Macros during the day and only a limited number of Command Macros overnight when there may be no control operator available. This may be done either manually or by the Scheduler to automate the process. All you need do is program two Command Macros to enable and disable Macro Subsets. Of course, be sure to use Command Macros that you'll have access to even if Macro Subsets are enabled!

Another useful trick is to use a tone decoder whose tone is not published connected to an Alarm Input and having that Input call a Command Macro which enables the Subset when no tone is being received. When the decoder receives the correct tone, it will change logic states and that same Alarm Input now calls another Command Macro which disables the Subset. This way, users without the proper tone only have access to some Command Macros while users with the proper tone can access them all.

You could even use 2 decoders (one whose tone is published and the other whose tone is kept secret), diode OR the outputs to the appropriate Radio Port connector and also connect the "secret" decoder'

## Determining The Contents Of A Command Macro

This command will cause the RC210 to read back the contents of the selected Command Macro. For example, we think that Command Macro 2 is programmed to speak the current time out Port 1. We can check that by using the following command:

**\*4008x** where x is Macro 1 - 90

So we enter **\*4008 2** and the controller reads back "M A C R O 2 1 6 2 1 1 6". This confirms the contents of Command Macro 2. If we attempt to read back a Command Macro that has no contents, the controller will let you know by speaking "Error".

## Erasing Command Macros

You may erase any Command Macro with the following command:

**\*4003xx** where "xx" is the Macro Number 01-90.

Or you can erase **ALL** Command Macros with:

**\*400499** Clears all Macros

## Using Receiver Macro Functions

Receiver Macro Functions allow the running of Command Macros based on a Port's receiver either becoming active or inactive. This allows for some very creative programming!

For example, maybe you want to switch an external relay whenever someone keys up on Port 1 but want it based on actual receiver activity and not simply the transmitter being active (of course for a non-repeating Port, its transmitter would never go active in the first place!)

First, program that Port's Macro to call (in our example, we are going to use Macros 90 & 91 and unlock Port 1)

**\*2113 1 90** Program Port 1's receiver going active to call Macro 90

**\*2113 0 91** Program Port 1's receiver going Inactive to call Macro 91

Now we also want to program a couple of Macros to allow us to turn this feature ON & OFF as needed (we'll use Macros 92 & 93)

**\*4002 92 358** Enable Port 1 Receiver Active Function

**\*4002 93 361** Disable Port 1 Receiver Active Function

And finally, we program up Macros 90 & 91 to handle turning UF1 on and off in response to receiver activity

**\*4002 90 095** Turn UF1 ON

**\*4002 91 102** Turn UF1 OFF

## Controlling Command Macro Access By Port

By default, any Command Macro will work from any Port. There may be times however, where you want to restrict access to a particular Command Macro to a certain Port or combination of Ports. You can then program which Port(s) to allow:

\*4005 xx yyy where "xx" is the Command Macro number (01 - 90) and "yyy" is the port(s) designation:

|                |                |
|----------------|----------------|
| 1 Port 1       | 13 Ports 1 & 3 |
| 2 Port 2       | 23 Ports 2 & 3 |
| 3 Port 3       | 123 All Ports* |
| 12 Ports 1 & 2 |                |

**Note: If a port is unlocked, that port may run any macro, regardless of its access programming.**

For example, you may only want users on Ports 1 and 2 to be able to link the two ports. In our example above, we programmed Command Macro 42 to link Ports 1 and 2 this. To restrict the use of this Command Macro to only Ports 1 and 2, we program:

\*4005 41 12

**Note: You can change a previously defined port restriction by programming a new one "over the top" of an existing one.**

## Erasing All Command Macros Port Restrictions

If you ever need to clear all the Command Macro port restrictions, you can use the following programming command and all Command Macros will be accessible from any Port:

\*400699

## Message Macros

The RC210 provides 40 *Message Macros* (70 if the optional RTC module is installed. See the RTC Manual for details) that can be used to store custom responses to user entered commands, scheduler events, Alarm events and so on. Each Message Macro can store up to 9 vocabulary words, DVR tracks or any combination of the two.

For example, Command Macro 42 is going to be used to re-map the Port 1 and Port Linking function. When a user uses this macro to link the ports, we want the controller to speak "Link Port One And Two". In our example, we'll use Message Macro #1. With the controller unlocked, we program:

\*2103 01 139 181 001 063 002 programs Message Macro 1 to speak "Link Port One And Two"

**Important: You must always use 3 digits for vocabulary words or DVR tracks, when programming Message Macros. Failure to do so will result in unpredictable results.**

We now program Command Macro 42 to link the ports and also include Message Macro 1:

\*4002 42 187 118

**Hint: notice that we entered the Message Macro function number first, then the function that actually connects the ports. You'll find that when linking ports, it works best if the message is first played then the link established. When unlinking ports, the actual unlinking function should be first, with the Message Macro being last. The reason being that if you have Monitor Mix and/or Speech Override selected for that port, any receiver activity will interfere with the Message Macro being spoken.**

**Note: If you program a Message Macro with a content of 0, it will erase that Message Macro**

# Speech Control Within Command Macros

Normally, speech command acknowledgment is sent out to the port from which the command was entered. For example, if you link Ports 1 & 2, entering the command from Port 1, the command acknowledgment will only be sent to Port 1.

And in the case of Scheduler, Alarm or other instances when a Command Macro is not called by a DTMF command, we need a way to tell the RC210 which port(s) should be used when sending a speech announcement.

Also, under certain circumstances, you may want any such speech sent out to other ports as well. In the above case, it might be useful to have it sent to both ports involved so users on both ports are advised as to the current status of the link. One solution to this would have been for the firmware to automatically send speech to ports that are linked, but this creates a problem - what if one of the ports involved isn't used as a link but rather as a remote base? It's a bad idea to send speech acknowledgments and other "repeater" messages out a remote base since a remote base should emulate the operation of a simplex radio. Simple solution you say - "Why not just program the controller to send speech messages out both ports, unless the linked to port is configured to be half-duplex?"

With so many different system designs out there, many repeater systems use half-duplex links. If the controller did this routing automatically, you'd never be able to direct speech where you want it. So it seems we need more a more flexible solution than simply an automatic one. Also, the controller has no idea which Port(s) speech message should be sent to as part of scheduled speech events.

The solution is to allow you to select, within a Command Macro, which port(s) should receive speech. In our example above, we decide we want speech to be sent out both Ports 1 & 2. We therefore program a macro that will link the two ports and also send speech to Ports 1 & 2:

**\*4002 10 165 118**

By recalling Command Macro 10, Ports 1 & 2 will be linked, with the connect message being sent to both ports.

Now we can program another Command Macro to disconnect the ports and send the speech where we want it:

**\*4002 11 165 122**

By recalling Command Macro 11, Ports 1 & 2 will be unlinked, with the disconnect message being sent to both ports.

**Important: If a macro contains a speech direct command, the speech direct function code MUST be the first one used in that macro. This is important as if it doesn't appear first within the macro, speech may not be properly directed.**

## List Of Port Direction Commands For Use In Macros

|                        |                        |
|------------------------|------------------------|
| <b>162</b> Port 1      | <b>166</b> Ports 1 & 3 |
| <b>163</b> Port 2      | <b>167</b> Ports 2 & 3 |
| <b>164</b> Port 3      | <b>168</b> All Ports   |
| <b>165</b> Ports 1 & 2 |                        |

In addition to the above steering functions, you can also force the speech out the same port as the macro was called from. For example let's say you have macro 10 defined to send speech out Port 1 but there may times you may call that macro from one (or both) of the other ports. By including function 251 in your macro in addition to speech being routed to the ports you specified in that macro, speech would also be routed to the port you recalled that macro from.



## Macro Function Number List

| <b>FN</b> | <b>Description</b>            | <b>FN</b> | <b>Description</b>                                |
|-----------|-------------------------------|-----------|---|
| 001       | Port 1 CTCSS Access           | 061       | Port 2 Courtesy Tone 3                            |
| 002       | Port 2 CTCSS Access           | 062       | Port 2 Courtesy Tone 4                            |
| 003       | Port 3 CTCSS Access           | 063       | Port 2 Courtesy Tone 5                            |
| 004       | Port 1 Carrier Access         | 064       | Port 2 Courtesy Tone 6                            |
| 005       | Port 2 Carrier Access         | 065       | Port 2 Courtesy Tone 7                            |
| 006       | Port 3 Carrier Access         | 066       | Port 2 Courtesy Tone 8                            |
| 007       | Port 1 DTMF Covertone ON      | 067       | Port 2 Courtesy Tone 9                            |
| 008       | Port 2 DTMF Covertone ON      | 068       | Port 2 Courtesy Tone 10                           |
| 009       | Port 3 DTMF Covertone ON      | 069       | Port 3 Courtesy Tone 1                            |
| 010       | Port 1 DTMF Covertone OFF     | 070       | Port 3 Courtesy Tone 2                            |
| 011       | Port 2 DTMF Covertone OFF     | 071       | Port 3 Courtesy Tone 3                            |
| 012       | Port 3 DTMF Covertone OFF     | 072       | Port 3 Courtesy Tone 4                            |
| 013       | Port 1 Enable                 | 073       | Port 3 Courtesy Tone 5                            |
| 014       | Port 2 Enable                 | 074       | Port 3 Courtesy Tone 6                            |
| 015       | Port 3 Enable                 | 075       | Port 3 Courtesy Tone 7                            |
| 016       | Port 1 Disable                | 076       | Port 3 Courtesy Tone 8                            |
| 017       | Port 2 Disable                | 077       | Port 3 Courtesy Tone 9                            |
| 018       | Port 3 Disable                | 078       | Port 3 Courtesy Tone 10                           |
| 019       | Monitor Port 1 from Port 2    | 079       | Port 1 DTMF Muting ON                             |
| 020       | Monitor Port 1 from Port 3    | 080       | Port 2 DTMF Muting ON                             |
| 021       | Disconnect Port 1 from Port 2 | 081       | Port 3 DTMF Muting ON                             |
| 022       | Disconnect Port 1 from Port 3 | 082       | Port 1 DTMF Muting OFF                            |
| 023       | Monitor Port 2 from Port 1    | 083       | Port 2 DTMF Muting OFF                            |
| 024       | Monitor Port 2 from Port 3    | 084       | Port 3 DTMF Muting OFF                            |
| 025       | Disconnect Port 2 from Port 1 | 085       | CTCSS Encode ON (for the duration of this Macro)  |
| 026       | Disconnect Port 2 from Port 3 | 086       | CTCSS Encode OFF (for the duration of this Macro) |
| 027       | Monitor Port 3 from Port 1    | 087       | Read ADC Channel 1                                |
| 028       | Monitor Port 3 from Port 2    | 088       | Read ADC Channel 2                                |
| 029       | Disconnect Port 3 from Port 1 | 089       | Read ADC Channel 3                                |
| 030       | Disconnect Port 3 from Port 2 | 090       | Read ADC Channel 4                                |
| 031       | Port 1 Monitor Mute           | 091       | Read ADC Channel 5                                |
| 032       | Port 2 Monitor Mute           | 092       | Read ADC Channel 6                                |
| 033       | Port 3 Monitor Mute           | 093       | Read ADC Channel 7                                |
| 034       | Port 1 Monitor Mix            | 094       | Read ADC Channel 8                                |
| 035       | Port 2 Monitor Mix            | 095       | UF1 ON  |
| 036       | Port 3 Monitor Mix            | 096       | UF2 ON  |
| 037       | Port 1 Repeat ON              | 097       | UF3 ON  |
| 038       | Port 2 Repeat ON              | 098       | UF4 ON  |
| 039       | Port 3 Repeat ON              | 099       | UF5 ON  |
| 040       | Port 1 Repeat OFF             | 100       | UF6 ON  |
| 041       | Port 2 Repeat OFF             | 101       | UF7 ON  |
| 042       | Port 3 Repeat OFF             | 102       | UF1 OFF   |
| 043       | Port 1 Speech Override ON     | 103       | UF2 OFF   |
| 044       | Port 2 Speech Override ON     | 104       | UF3 OFF   |
| 045       | Port 3 Speech Override ON     | 105       | UF4 OFF   |
| 046       | Port 1 Speech Override OFF    | 106       | UF5 OFF   |
| 047       | Port 2 Speech Override OFF    | 107       | UF6 OFF   |
| 048       | Port 3 Speech Override OFF    | 108       | UF7 OFF   |
| 049       | Port 1 Courtesy Tone 1        | 109       | UF1 Pulse   |
| 050       | Port 1 Courtesy Tone 2        | 110       | UF2 Pulse   |
| 051       | Port 1 Courtesy Tone 3        | 111       | UF3 Pulse   |
| 052       | Port 1 Courtesy Tone 4        | 112       | UF4 Pulse   |
| 053       | Port 1 Courtesy Tone 5        | 113       | UF5 Pulse   |
| 054       | Port 1 Courtesy Tone 6        | 114       | UF6 Pulse   |
| 055       | Port 1 Courtesy Tone 7        | 115       | UF7 Pulse   |
| 056       | Port 1 Courtesy Tone 8        | 116       | Say Time  |
| 057       | Port 1 Courtesy Tone 9        | 117       | Say Date  |
| 058       | Port 1 Courtesy Tone 10       | 118       | Link Port 1 to Port 2                             |
| 059       | Port 2 Courtesy Tone 1        |           |   |
| 060       | Port 2 Courtesy Tone 2        |           |   |

## Macro Function Number List (continued)

| <b><u>FN</u></b> | <b><u>Description</u></b>     | <b><u>FN</u></b> | <b><u>Description</u></b>                       |
|------------------|-------------------------------|------------------|---|
| 119              | Link Port 1 to Port 3         | 181              | Force Next Voice ID In Rotation On Port 1       |
| 120              | Link Port 2 to Port 3         | 182              | Force Next Voice ID In Rotation On Port 2       |
| 121              | Link All Ports                | 183              | Force Next Voice ID In Rotation On Port 3       |
| 122              | Unlink Port 1 from Port 2     | 184              | Force Next CW ID In Rotation On Port 1          |
| 123              | Unlink Port 1 from Port 3     | 185              | Force Next CW ID In Rotation On Port 2          |
| 124              | Unlink Port 2 from Port 3     | 186              | Force Next CW ID In Rotation On Port 3          |
| 125              | UnLink All Ports              | 187              | Play Message Macro 1                            |
| 126              | Play DVR Track 1              | 188              | Play Message Macro 2                            |
| 127              | Play DVR Track 2              | 189              | Play Message Macro 3                            |
| 128              | Play DVR Track 3              | 190              | Play Message Macro 4                            |
| 129              | Play DVR Track 4              | 191              | Play Message Macro 5                            |
| 130              | Play DVR Track 5              | 192              | Play Message Macro 6                            |
| 131              | Play DVR Track 6              | 193              | Play Message Macro 7                            |
| 132              | Play DVR Track 7              | 194              | Play Message Macro 8                            |
| 133              | Play DVR Track 8              | 195              | Play Message Macro 9                            |
| 134              | Play DVR Track 9              | 196              | Play Message Macro 10                           |
| 135              | Play DVR Track 10             | 197              | Play Message Macro 11                           |
| 136              | Play DVR Track 11             | 198              | Play Message Macro 12                           |
| 137              | Play DVR Track 12             | 199              | Play Message Macro 13                           |
| 138              | Play DVR Track 13             | 200              | Play Message Macro 14                           |
| 139              | Play DVR Track 14             | 201              | Play Message Macro 15                           |
| 140              | Play DVR Track 15             | 202              | Play Message Macro 16                           |
| 141              | Play DVR Track 16             | 203              | Play Message Macro 17                           |
| 142              | Play DVR Track 17             | 204              | Play Message Macro 18                           |
| 143              | Play DVR Track 18             | 205              | Play Message Macro 19                           |
| 144              | Play DVR Track 19             | 206              | Play Message Macro 20                           |
| 145              | Play DVR Track 20             | 207              | Play Message Macro 21                           |
| 146              | Auxiliary Audio 1 ON          | 208              | Play Message Macro 22                           |
| 147              | Auxiliary Audio 2 ON          | 209              | Play Message Macro 23                           |
| 148              | Auxiliary Audio 3 ON          | 210              | Play Message Macro 24                           |
| 149              | Auxiliary Audio 1 OFF         | 211              | Play Message Macro 25                           |
| 150              | Auxiliary Audio 2 OFF         | 212              | Play Message Macro 26                           |
| 151              | Auxiliary Audio 3 OFF         | 213              | Play Message Macro 27                           |
| 152              | Alarm 1 ON                    | 214              | Play Message Macro 28                           |
| 153              | Alarm 2 ON                    | 215              | Play Message Macro 29                           |
| 154              | Alarm 3 ON                    | 216              | Play Message Macro 30                           |
| 155              | Alarm 4 ON                    | 217              | Play Message Macro 31                           |
| 156              | Alarm 5 ON                    | 218              | Play Message Macro 32                           |
| 157              | Alarm 1 OFF                   | 219              | Play Message Macro 33                           |
| 158              | Alarm 2 OFF                   | 220              | Play Message Macro 34                           |
| 159              | Alarm 3 OFF                   | 221              | Play Message Macro 35                           |
| 160              | Alarm 4 OFF                   | 222              | Play Message Macro 36                           |
| 161              | Alarm 5 OFF                   | 223              | Play Message Macro 37                           |
| 162              | Speech Out Port 1             | 224              | Play Message Macro 38                           |
| 163              | Speech Out Port 2             | 225              | Play Message Macro 39                           |
| 164              | Speech Out Port 3             | 226              | Play Message Macro 40                           |
| 165              | Speech Out Ports 1 & 2        | 227              | Good Morning/Afternoon/Evening Runtime Variable |
| 166              | Speech Out Ports 1 & 3        | 228              | Macro Priority High                             |
| 167              | Speech Out Ports 2 & 3        | 229              | Macro Priority Low                              |
| 168              | Speech Out All Ports          | 230              | Enable Kerchunk Filter Port 1                   |
| 169              | DTMF Enable Port 1            | 231              | Enable Kerchunk Filter Port 2                   |
| 170              | DTMF Enable Port 2            | 232              | Enable Kerchunk Filter Port 3                   |
| 171              | DTMF Enable Port 3            | 233              | Disable Kerchunk Filter Port 1                  |
| 172              | DTMF Disable Port 1           | 234              | Disable Kerchunk Filter Port 2                  |
| 173              | DTMF Disable Port 2           | 235              | Disable Kerchunk Filter Port 3                  |
| 174              | DTMF Disable Port 3           | 236              | Enable Receiver Port 1                          |
| 175              | DTMF Require CTCSS Port 1     | 237              | Enable Receiver Port 2                          |
| 176              | DTMF Require CTCSS Port 2     | 238              | Enable Receiver Port 3                          |
| 177              | DTMF Require CTCSS Port 3     | 239              | Disable Receiver Port 1                         |
| 178              | DTMF Not Require CTCSS Port 1 | 240              | Disable Receiver Port 2                         |
| 179              | DTMF Not Require CTCSS Port 2 | 241              | Disable Receiver Port 3                         |
| 180              | DTMF Not Require CTCSS Port 3 |                  |   |

## Macro Function Number List (continued)

| <u>FN</u> | <u>Description</u>                    | <u>FN</u> | <u>Description</u>                                    |
|-----------|---------------------------------------|-----------|---|
| 242       | Port 1 Speech ID Override ON          | 298       | Disable Meter 3 Alarm                                 |
| 243       | Port 2 Speech ID Override ON          | 299       | Disable Meter 4 Alarm                                 |
| 244       | Port 3 Speech ID Override ON          | 300       | Disable Meter 5 Alarm                                 |
| 245       | Port 1 Speech ID Override OFF         | 301       | Disable Meter 6 Alarm                                 |
| 246       | Port 2 Speech ID Override OFF         | 302       | Disable Meter 7 Alarm                                 |
| 247       | Port 3 Speech ID Override OFF         | 303       | Disable Meter 8 Alarm                                 |
| 248       | All Courtesy Tones OFF Port 1         | 304       | CTCSS Encode Force OFF                                |
| 249       | All Courtesy Tones OFF Port 2         | 305       | CTCSS Encode to Programmed Value                      |
| 250       | All Courtesy Tones OFF Port 3         | 306       | Bump Clock By Correction Factor                       |
| 251       | Force Audio To Entered Port           | 307       | Say year as part of date                              |
| 252       | Stop ID/Disable Timeout Timer Port 1  | 308       | Don't say year as part of date                        |
| 253       | Stop ID/Disable Timeout Timer Port 2  | 309       | Port 1 Tail Message OFF                               |
| 254       | Stop ID/Disable Timeout Timer Port 3  | 310       | Port 2 Tail Message OFF                               |
| 256       | Resume ID/Enable Timeout Timer Port 1 | 311       | Port 3 Tail Message OFF                               |
| 257       | Resume ID/Enable Timeout Timer Port 2 | 312       | Port 1 Tail Message 1                                 |
| 258       | Resume ID/Enable Timeout Timer Port 3 | 313       | Port 2 Tail Message 1                                 |
| 259       | Send DTMF Memory 1                    | 314       | Port 3 Tail Message 1                                 |
| 260       | Send DTMF Memory 2                    | 315       | Port 1 Tail Message 2                                 |
| 261       | Send DTMF Memory 3                    | 316       | Port 2 Tail Message 2                                 |
| 262       | Send DTMF Memory 4                    | 317       | Port 3 Tail Message 2                                 |
| 263       | Send DTMF Memory 5                    | 318       | Port 1 Tail Message 3                                 |
| 264       | Send DTMF Memory 6                    | 319       | Port 2 Tail Message 3                                 |
| 265       | Send DTMF Memory 7                    | 320       | Port 3 Tail Message 3                                 |
| 266       | Send DTMF Memory 8                    | 321       | Remote Base Memory 1                                  |
| 267       | Send DTMF Memory 9                    | 322       | Remote Base Memory 2                                  |
| 268       | Send DTMF Memory 10                   | 323       | Remote Base Memory 3                                  |
| 269       | Send DTMF Memory 11                   | 324       | Remote Base Memory 4                                  |
| 270       | Send DTMF Memory 12                   | 325       | Remote Base Memory 5                                  |
| 271       | Send DTMF Memory 13                   | 326       | Remote Base Memory 6                                  |
| 272       | Send DTMF Memory 14                   | 327       | Remote Base Memory 7                                  |
| 273       | Send DTMF Memory 15                   | 328       | Remote Base Memory 8                                  |
| 274       | Send DTMF Memory 16                   | 329       | Remote Base Memory 9                                  |
| 275       | Send DTMF Memory 17                   | 330       | Remote Base Memory 10                                 |
| 276       | Send DTMF Memory 18                   | 331       | Port 1 Zero Hang Time Select                          |
| 277       | Send DTMF Memory 19                   | 332       | Port 2 Zero Hang Time Select                          |
| 278       | Send DTMF Memory 20                   | 333       | Port 3 Zero Hang Time Select                          |
| 279       | Clear All Meter Hi/Low Trippoints     | 334       | Port 1 Hang Time Revert to Programmed Value           |
| 280       | Clear Meter 1 Hi/Low Trippoint        | 335       | Port 2 Hang Time Revert to Programmed Value           |
| 281       | Clear Meter 2 Hi/Low Trippoint        | 336       | Port 3 Hang Time Revert to Programmed Value           |
| 282       | Clear Meter 3 Hi/Low Trippoint        | 337       | Allow Autopatch from programmed Ports                 |
| 283       | Clear Meter 4 Hi/Low Trippoint        | 338       | Disable Autopatch                                     |
| 284       | Clear Meter 5 Hi/Low Trippoint        | 339       | Enable Speech ID's Port 1                             |
| 285       | Clear Meter 6 Hi/Low Trippoint        | 340       | Enable Speech ID's Port 2                             |
| 286       | Clear Meter 7 Hi/Low Trippoint        | 341       | Enable Speech ID's Port 3                             |
| 287       | Clear Meter 8 Hi/Low Trippoint        | 342       | Disable Speech ID's Port 1                            |
| 288       | Enable Meter 1 Alarm                  | 343       | Disable Speech ID's Port 2                            |
| 289       | Enable Meter 2 Alarm                  | 344       | Disable Speech ID's Port 3                            |
| 290       | Enable Meter 3 Alarm                  | 345       | User DVR Record test, erase after auto playback       |
| 291       | Enable Meter 4 Alarm                  | 346       | User DVR Record test, don't erase after auto playback |
| 292       | Enable Meter 5 Alarm                  | 347       | Start General Timer 1                                 |
| 293       | Enable Meter 6 Alarm                  | 348       | Start General Timer 2                                 |
| 294       | Enable Meter 7 Alarm                  | 349       | Start General Timer 3                                 |
| 295       | Enable Meter 8 Alarm                  | 350       | Stop General Timer 1                                  |
| 296       | Disable Meter 1 Alarm                 | 351       | Stop General Timer 2                                  |
| 297       | Disable Meter 2 Alarm                 | 352       | Stop General Timer 3                                  |

## Macro Function Number List (continued)

| <b><u>FN</u></b> | <b><u>Description</u></b>      | <b><u>FN</u></b> | <b><u>Description</u></b>      |
|------------------|--------------------------------|------------------|--------------------------------|
| 353              | Remote Base Power Select 1     | 407              | Extended Logic Output 12 PULSE |
| 354              | Remote Base Power Select 2     | 408              | Extended Logic Output 13 PULSE |
| 355              | Remote Base Power Select 3     | 409              | Extended Logic Output 14 PULSE |
| 356              | Guest Macros ON                | 410              | Extended Logic Output 15 PULSE |
| 357              | Guest Macros OFF               | 411              | Extended Logic Output 16 PULSE |
| 358              | Receiver 1 Macros ON           | 412              | Extended Logic Output 17 PULSE |
| 359              | Receiver 2 Macros ON           | 413              | Extended Logic Output 18 PULSE |
| 360              | Receiver 2 Macros ON           | 414              | Extended Logic Output 19 PULSE |
| 361              | Receiver 1 Macros OFF          | 415              | Extended Logic Output 20 PULSE |
| 362              | Receiver 2 Macros OFF          | 416              | Extended Logic Output 21 PULSE |
| 363              | Receiver 3 Macros OFF          | 417              | Extended Logic Output 22 PULSE |
| 364              | Extended Logic Output 1 ON     | 418              | Extended Logic Output 23 PULSE |
| 365              | Extended Logic Output 2 ON     | 419              | Extended Logic Output 24 PULSE |
| 366              | Extended Logic Output 3 ON     | 420              | Extended Logic Output 25 PULSE |
| 367              | Extended Logic Output 4 ON     | 421              | Extended Logic Output 26 PULSE |
| 368              | Extended Logic Output 5 ON     | 422              | Extended Logic Output 27 PULSE |
| 369              | Extended Logic Output 6 ON     | 423              | Extended Logic Output 28 PULSE |
| 370              | Extended Logic Output 7 ON     | 424              | Extended Logic Output 29 PULSE |
| 371              | Extended Logic Output 8 ON     | 425              | Extended Logic Output 30 PULSE |
| 372              | Extended Logic Output 9 ON     | 426              | Extended Logic Output 31 PULSE |
| 373              | Extended Logic Output 10 ON    | 427              | Extended Logic Output 32 PULSE |
| 374              | Extended Logic Output 11 ON    | 428              | Extended Logic Output 1 OFF    |
| 375              | Extended Logic Output 12 ON    | 429              | Extended Logic Output 2 OFF    |
| 376              | Extended Logic Output 13 ON    | 430              | Extended Logic Output 3 OFF    |
| 377              | Extended Logic Output 14 ON    | 431              | Extended Logic Output 4 OFF    |
| 378              | Extended Logic Output 15 ON    | 432              | Extended Logic Output 5 OFF    |
| 379              | Extended Logic Output 16 ON    | 433              | Extended Logic Output 6 OFF    |
| 380              | Extended Logic Output 17 ON    | 434              | Extended Logic Output 7 OFF    |
| 381              | Extended Logic Output 18 ON    | 435              | Extended Logic Output 8 OFF    |
| 382              | Extended Logic Output 19 ON    | 436              | Extended Logic Output 9 OFF    |
| 383              | Extended Logic Output 20 ON    | 437              | Extended Logic Output 10 OFF   |
| 384              | Extended Logic Output 21 ON    | 438              | Extended Logic Output 11 OFF   |
| 385              | Extended Logic Output 22 ON    | 439              | Extended Logic Output 12 OFF   |
| 386              | Extended Logic Output 23 ON    | 440              | Extended Logic Output 13 OFF   |
| 387              | Extended Logic Output 24 ON    | 441              | Extended Logic Output 14 OFF   |
| 388              | Extended Logic Output 25 ON    | 442              | Extended Logic Output 15 OFF   |
| 389              | Extended Logic Output 26 ON    | 443              | Extended Logic Output 16 OFF   |
| 390              | Extended Logic Output 27 ON    | 444              | Extended Logic Output 17 OFF   |
| 391              | Extended Logic Output 28 ON    | 445              | Extended Logic Output 18 OFF   |
| 392              | Extended Logic Output 29 ON    | 446              | Extended Logic Output 19 OFF   |
| 393              | Extended Logic Output 30 ON    | 447              | Extended Logic Output 20 OFF   |
| 394              | Extended Logic Output 31 ON    | 448              | Extended Logic Output 21 OFF   |
| 395              | Extended Logic Output 32 ON    | 449              | Extended Logic Output 22 OFF   |
| 396              | Extended Logic Output 1 PULSE  | 450              | Extended Logic Output 23 OFF   |
| 397              | Extended Logic Output 2 PULSE  | 451              | Extended Logic Output 24 OFF   |
| 398              | Extended Logic Output 3 PULSE  | 452              | Extended Logic Output 25 OFF   |
| 399              | Extended Logic Output 4 PULSE  | 453              | Extended Logic Output 26 OFF   |
| 400              | Extended Logic Output 5 PULSE  | 454              | Extended Logic Output 27 OFF   |
| 401              | Extended Logic Output 6 PULSE  | 455              | Extended Logic Output 28 OFF   |
| 402              | Extended Logic Output 7 PULSE  | 456              | Extended Logic Output 29 OFF   |
| 403              | Extended Logic Output 8 PULSE  | 457              | Extended Logic Output 30 OFF   |
| 404              | Extended Logic Output 9 PULSE  | 458              | Extended Logic Output 31 OFF   |
| 405              | Extended Logic Output 10 PULSE | 459              | Extended Logic Output 32 OFF   |
| 406              | Extended Logic Output 11 PULSE |                  |                                |

## Macro Function Number List *(continued)*

The following Macro Functions (with the exceptions of Functions 560 and above) only apply if you have the optional RTC installed

| <u>FN</u> | <u>Description</u>    | <u>FN</u> | <u>Description</u>                                     |
|-----------|-----------------------|-----------|--|
| 460       | Play Message Macro 41 | 515       | Remote Base Memory 35                                  |
| 461       | Play Message Macro 42 | 516       | Remote Base Memory 36                                  |
| 462       | Play Message Macro 43 | 517       | Remote Base Memory 37                                  |
| 463       | Play Message Macro 44 | 518       | Remote Base Memory 38                                  |
| 464       | Play Message Macro 45 | 519       | Remote Base Memory 39                                  |
| 465       | Play Message Macro 46 | 520       | Remote Base Memory 40                                  |
| 466       | Play Message Macro 47 | 521       | Send DTMF Memory 21                                    |
| 467       | Play Message Macro 48 | 522       | Send DTMF Memory 22                                    |
| 468       | Play Message Macro 49 | 523       | Send DTMF Memory 23                                    |
| 469       | Play Message Macro 50 | 524       | Send DTMF Memory 24                                    |
| 470       | Play Message Macro 51 | 525       | Send DTMF Memory 25                                    |
| 471       | Play Message Macro 52 | 526       | Send DTMF Memory 26                                    |
| 472       | Play Message Macro 53 | 527       | Send DTMF Memory 27                                    |
| 473       | Play Message Macro 54 | 528       | Send DTMF Memory 28                                    |
| 474       | Play Message Macro 55 | 529       | Send DTMF Memory 29                                    |
| 475       | Play Message Macro 56 | 530       | Send DTMF Memory 30                                    |
| 476       | Play Message Macro 57 | 531       | Send DTMF Memory 31                                    |
| 477       | Play Message Macro 58 | 532       | Send DTMF Memory 32                                    |
| 478       | Play Message Macro 59 | 533       | Send DTMF Memory 33                                    |
| 479       | Play Message Macro 60 | 534       | Send DTMF Memory 34                                    |
| 480       | Play Message Macro 61 | 535       | Send DTMF Memory 35                                    |
| 481       | Play Message Macro 62 | 536       | Send DTMF Memory 36                                    |
| 482       | Play Message Macro 63 | 537       | Send DTMF Memory 37                                    |
| 483       | Play Message Macro 64 | 538       | Send DTMF Memory 38                                    |
| 484       | Play Message Macro 65 | 539       | Send DTMF Memory 39                                    |
| 485       | Play Message Macro 66 | 540       | Send DTMF Memory 40                                    |
| 486       | Play Message Macro 67 | 541       | Send DTMF Memory 41                                    |
| 487       | Play Message Macro 68 | 542       | Send DTMF Memory 42                                    |
| 488       | Play Message Macro 69 | 543       | Send DTMF Memory 43                                    |
| 489       | Play Message Macro 70 | 544       | Send DTMF Memory 44                                    |
| 490       | Remote Base Memory 11 | 545       | Send DTMF Memory 45                                    |
| 491       | Remote Base Memory 12 | 546       | Send DTMF Memory 46                                    |
| 492       | Remote Base Memory 13 | 547       | Send DTMF Memory 47                                    |
| 493       | Remote Base Memory 14 | 548       | Send DTMF Memory 48                                    |
| 494       | Remote Base Memory 15 | 549       | Send DTMF Memory 49                                    |
| 495       | Remote Base Memory 16 | 550       | Send DTMF Memory 50                                    |
| 496       | Remote Base Memory 17 | 551       | Load RTC Date & Time into RC210 Onboard Clock/Calendar |
| 498       | Remote Base Memory 19 | 552       | CTCSS During ID ON                                     |
| 499       | Remote Base Memory 20 | 553       | CTCSS During ID OFF                                    |
| 500       | Remote Base Memory 21 | 561       | Restart controller (same as cycling power)             |
| 501       | Remote Base Memory 22 |           |  |
| 502       | Remote Base Memory 23 | 570 - 577 | Readback A/D Channel 1 - 8 Stored Low                  |
| 503       | Remote Base Memory 24 | 578 - 585 | Readback A/D Channel 1 - 8 Stored High                 |
| 504       | Remote Base Memory 25 |           |  |
| 505       | Remote Base Memory 26 |           |  |
| 506       | Remote Base Memory 27 |           |  |
| 507       | Remote Base Memory 28 |           |  |
| 508       | Remote Base Memory 29 |           |  |
| 509       | Remote Base Memory 30 |           |  |
| 510       | <b>NOT USED</b>       |           |  |
| 511       | Remote Base Memory 31 | 660 – 679 | Suspend Setpoint 1 - 20                                |
| 512       | Remote Base Memory 32 | 680 – 699 | Resume Setpoint 1-20                                   |
| 513       | Remote Base Memory 33 | 701 – 791 | Call Macro 1 – 90 <b>(there is no Function 765)</b>    |
| 514       | Remote Base Memory 34 |           |  |

# Tail Messages

There are 3 Tail Messages per port, which can be "played" based on either the number of repeater "tails" (hang time) or based on the Periodic Message Timer. Each Tail Message may be programmed to use one of the 90 Command Macros (which are generally used to play a spoken message).

**\*2110 x y** where x is the Tail Message number (1 - 3) and y is the Command Macro to use (1 - 90).

To select which Tail Message is to be used:

**\*2111 x** where x is the Tail Message Number to use 1, 2 or 3.

**Note: Setting the Tail Message Number to 0 turns off all Tail Messages on that Port**

To play a Tail Message based on the number of tails:

**\*2112 x** where x is the number of repeater tails from 1 to 254

To play a Tail Message based on the Periodic Message Timer:

**\*1020 x** Set the Period Message Timer to play the selected Tail Message x seconds after the last COS activity.

Note that it is possible to play a Tail Message based on both the Tail Counter AND the Period Message Timer. If you only want to use Tail Messages based on the Tail Counter, program the Period Message Timer to 0, which will disable it. Conversely, if you only want to use Tail Messages based on the Periodic Message Timer, program the Tail Counter to 0, which will disable it.

Tail Messages may be turned ON and OFF "on the fly" by using their appropriate Macro Function. See the Macro Function List for their Function Number.

## Some Practical Examples Of Tail Message Programming

In this example, we will program Tail Message 1 to play Message Macro 1 every 10 tails:

We've recorded DVR Track 1 which says "The ARC will hold its meeting tonight at 7 PM" which will be called by Command Macro 10:

First, we program Command Macro 10 to play DVR Track 1

**\*4002 10 126**

**Note that we do not need to use a Port Steering Function in this Macro as the RC210 knows to send Tail Message speech out the proper Port. You can however, include a Port Steering Function if you desire.**

Now we program Tail Message 1 to use Command Macro 10

**\*2110 1 10**

Next, we program this port to use Tail Message 1

**\*2111 1**

Next, we program the Tail Counter to count 10 repeater tails:

**\*2112 10**

Finally, we disable the Periodic Message Timer

**\*1020 0**

Now DVR Track 1 will be sent every 10 repeater tails.

## Some Practical Examples Of Tail Message Programming (continued)

In this next example, we want to send this same DVR track to users 5 minutes after repeater activity ends. First, we disable the Tail Counter:

**\*2112 0**

Now we set the Periodic Message Timer to 300 seconds (5 minutes)

**\*1020 300**

Now DVR Track 1 will be sent 5 minutes after the last repeater activity.

And finally, we want to send DVR Track 1 every 5 tails AND 15 minutes after repeater activity ends.

First, we program the Tail Counter:

**\*2112 5**

Lastly, we program the Periodic Message Timer to 900 seconds:

**\*1020 900**

As you can see, there is a lot of flexibility in the use of Tail Messages.

## Special Features

### Temporarily Disabling ID's And Timeout Timer

The RC210 allows for easy use when "broadcasting" special events, such as a WestLink bulletin or Shuttle Audio event. By programming a Command Macro with the appropriate function(s), you can disable IDs on a Port and suspend its Timeout timer for 60 minutes. When the special event is over, you use another Command Macro to re-enable the IDs and timer. And if you combine these powerful features with the scheduler, you can set up the RC210 to completely handle most of the tasks associated with this usually cumbersome chore.

Macro Functions

|            |  |
|------------|--|
| <b>252</b> | Stop ID And Disable Timeout Timer Port 1     |
| <b>253</b> | Stop ID And Disable Timeout Timer Port 2     |
| <b>254</b> | Stop ID And Disable Timeout Timer Port 3     |
| <b>256</b> | Resume ID And Re-Enable Timeout Timer Port 1 |
| <b>257</b> | Resume ID And Re-Enable Timeout Timer Port 2 |
| <b>258</b> | Resume ID And Re-Enable Timeout Timer Port 3 |

Example: Program Command Macro 11 to suspend ID and Timeout Timer on Port 1, link Port 1 to Port 2 to allow a WestLink broadcast that is transmitted via a link on Port 2.

**\*4002 11 252 118**

If the event lasts longer than 60 minutes, you can simply run Command Macro 11 again to restart the 60 minute suspend period.

At the end of the event, Command Macro 12 to resume IDs and re-enable the Timeout Timer on Port 1, unlink Ports 1 & 2:

**\*4002 12 256 122**

# Special Features (continued)

## DTMF Memories

There are 20 DTMF memories (or a total of 50 if the optional RTC is installed. See the RTC Manual for details), which can store up to 10 DTMF digits each. This is useful for sending preformatted DTMF digits to one (or any combination) of the radio ports. Maybe you'll use them in conjunction with a Command Macro to control a remote link or an IRLP or EchoLink node.

Once programmed, the memories can then be recalled in any Command Macro.

**\*2105xx** y y y y y y y y where "xx" is the number of the memory 01-20 (or 01-50 if the optional RTC is installed) and y up to 10 DTMF digits.

**Note: You select which port to send DTMF to by the same method as speech. See Pages 31)**

## DTMF Digits Duration and Time Between Digits

To accommodate different radio link paths, you can program both the duration and time between DTMF Memory digits:

**\*2106x** where "x" is the duration of each DTMF digit transmitted. The range is 1 to 255 milliseconds.

**\*2107x** where "x" is the time between DTMF digits. The range is 1 to 255 milliseconds.

## IRLP®/Echolink® DTMF Regeneration

In order for users to have access to this feature, several parameters need be programmed first.

The Regenerate Prefix is the sequence of DTMF characters that users preface to the DTMF digits they want sent to a connected IRLP®/Echolink® or link radio. It can be from 1 to 6 digits and, by default, it is programmed to #.

**\*2104x** Program Regenerate Prefix, up to 6 digits.

The RC210 needs to know which Port you want the user-entered DTMF sequence to be sent.

**\*2117x** Set Port(s) to send, where x

- |       |                                 |
|-------|---------------------------------|
| 1 -   | Port 1                          |
| 2 -   | Port 2                          |
| 3 -   | Port 3                          |
| 12 -  | Ports 1 & 2                     |
| 13 -  | Ports 1 & 3                     |
| 23 -  | Ports 2 & 3                     |
| 123 - | All Ports                       |
| 99 -  | Turn off (not sent to any Port) |

Finally, you may prepend a Macro action stored in a Command Macro, to be run before the DTMF is sent.

**\*2118x** Run Macro 1 - 90 before sending DTMF. Programming to a 0 results in no Macro being used.



# The Scheduler

The Scheduler lets you automate many routine tasks by defining a specific day of the week, the hour of that day and the number of minutes past the hour you wish that task to run. Such a definition is called a *setpoint*, which is programmed to run a specific macro at a specific time of day. Only macros may be run by the scheduler, however that macro may contain any command(s), including speech commands such as Time of Day.

**Note: setpoints are one-shot events that occur only once at the scheduled time**

One example of a setpoint would be if you wanted to link Port 1 to Port 2 for a net that lasts for an hour every Tuesday at 7 PM. You'd define a macro to link Port 1 to Port 2, then define a setpoint to call that macro at 7 PM. After the net is over, another setpoint could be defined to call a different macro that disconnects the ports.

## How Do We Define Setpoints?

A programming commands allows us to program each setpoint by defining the time and day of week that setpoint should run and the macro to be executed. The format is:

### **\*4001 SS DOW Hours Minutes Macro**

SS is the setpoint number 01-20 and must always be 2 digits

DOW refers to the Day Of Week and is 1 digit:

|               |              |
|---------------|--------------|
| 1 = Monday    | 6 = Saturday |
| 2 = Tuesday   | 7 = Sunday   |
| 3 = Wednesday | 8 = weekdays |
| 4 = Thursday  | 9 = weekends |
| 5 = Friday    | 0 = everyday |

However, you may alternately use 2 digits for DOW entry and it now becomes DOM (Day Of Month) and consists of 2 digits. The first digit signifies which week within a month to use and the second digit signifies the day of that week to use. For example, if an event is wanted for the 2<sup>nd</sup> Thursday of every month, you'd enter 24 for the DOW entry.

Hours and Minutes are the time in 24 hour format. For example, 10 24 = 10:24 am or 22 10 = 10:10 pm

**Hint: The hours digits may be set to a wildcard value with a DTMF "0A". Setting the hours to "0A" causes a match every hour at "minutes" after.**

Macro is the macro to be executed at the appointed time and may be any macro you have defined 01-90. You must use 2 digits.

More than one setpoint can be run at a particular time. For example, if more than one setpoint qualifies at a particular time, the lowest numbered one will be run first, then the next and so on. You can cancel any previously defined setpoint by setting it to a time that will never occur, i.e 25 00 hours.

## Recurring Voice Messages And The Scheduler

You may want to define a setpoint that announces the time every hour (using the hourly wildcard) during morning commute time on weekdays. Easy enough, we'll just program a setpoint to recall a macro that calls function 116 (Say Time), speak on Port 1 and call that macro with a scheduler setpoint to run every hour, starting at 6 AM. The RC210 will now speak the time every hour, on the hour. But we have a problem now - there is no way to stop the hourly announcements without actually reprogramming that setpoint so that it doesn't announce the time any more. Since the controller will now announce the time every hour, 24 hours a day, this obviously doesn't work out the way we want!

So how can we stop that setpoint from continuing to run until we reprogram it? Without something to tell the scheduler to stop running that setpoint, in fact we can't. So once started, the controller is going to announce the time every hour until we do something about it.

In order to get around this problem, the RC210 incorporates another set of commands that allow you to suspend a currently occurring setpoint without having to actually erase that setpoint. These commands are known as the Suspend and Resume commands. What the Suspend command does is to prevent a setpoint from occurring by setting a flag. The RC210's program then knows that since the Suspend flag is set, it shouldn't continue to execute that setpoint. To start it running again, we simply use another setpoint to run another macro that calls the Resume command. The setpoint to announce the time is now free to run once more.

## Recurring Voice Messages And The Scheduler (continued)

First, we program up the needed macros:

\*4002 02 162 116 ←Macro 2 calls Say Time on Port 1  
\*4002 03 680 ←Macro 3 sets the Resume flag On SetPoint 1  
\*4002 04 660 ←Macro 4 sets the Suspend flag On SetPoint 1

**Note: Since Macro 1 is called at controller startup, it should never be used to announce the time, since the clock will never be set at startup.**

Now we program our setpoints:

\*4001 01 8 0A 00 02 ←Call Macro 2 every hour on weekdays  
\*4001 02 8 06 00 03 ←Resume Macro 3 at 6 AM on weekdays (we don't need to use the Port setting here)  
\*4001 03 8 09 00 04 ←Suspend Macro 4 at 9 AM weekdays (again, we don't need to use the Port setting)

Now the controller will announce the time every hour on Port 1, starting at 6 AM on weekdays and stop announcing at 9 AM

## Plan! Plan! Plan!

The most important step you can do is PLAN. You need to figure out exactly what you want the repeater to do, then how the scheduler should be programmed in order to accomplish that. The scheduler is pretty smart, but it can't read your mind!

First of all, let's decide on what we want the scheduler to do. Maybe you'd like to turn off certain features at night, leaving them on until later on the weekends for the night owls. Maybe you have a swap net on Mondays that you would like to monitor. You want to automatically link Port 1 to Port 2 5 minutes before the start time of the net and turn it back off when the net is over. During the weekday morning commute, you'd like to change to a different courtesy tone on Port 2 and announce the time every 15 minutes for the commuters. You also want to put all ports into CTCSS access mode between midnight and 7 am on weekends. Remember that the scheduler can only call macros, so we need to define some macros to do our bidding

From the above, we first define our setpoints and the macro we'll store the function in:

| <u>Setpoint</u> | <u>Time</u> | <u>Day</u> | <u>Macro</u> | <u>Description</u>  |
|-----------------|-------------|------------|--------------|---|
| 1               | 6:00 am     | weekdays   | 2            | Weekday mornings - change to courtesy tone #2 on Port 2, announce the time  |
| 2               | 9:00 am     | weekdays   | 3            | Weekday mornings - back to courtesy tone #1 on Port 2, stop announcing time |
| 3               | 7:00 pm     | Monday     | 5            | Turn link on for net  |
| 4               | 8:00 pm     | Monday     | 6            | Turn link off after net ends  |
| 5               | 12:00 am    | weekdays   | 7            | Change all ports to CTCSS access on weekends at midnight                    |
| 6               | 6:00 am     | weekdays   | 8            | Change all ports to carrier access on weekend mornings at 7 am              |

We first need to program the appropriate macros to function those things we want changed:

\*4002 02 163 061 116 Program Macro 2 to change to courtesy tone #2 on Port 2 and announce the time.  
\*4002 03 060 351 Program Macro 3 to change to courtesy tone back to #1 on Port 2 and suspend announcing the time.  
\*4002 04 371 Program Macro 4 to resume running Macro 1  
\*4002 05 118 Program Macro 5 to link Ports 2 & 3  
\*4002 06 122 Program Macro 6 to unlink Ports 2 & 3  
\*4002 07 002 004 006 Program Macro 7 to change all ports to CTCSS access  
\*4002 08 001 003 005 Program Macro 8 to change all ports to carrier access

We can now program the scheduler setpoints:

\*4001 01 8 06 00 02 Call Macro 2 at 6 AM on weekdays  
\*4001 02 8 09 00 03 Call Macro 3 at 9 AM on weekdays  
\*4001 03 8 06 00 04 Call Macro 4 at 6 AM to restart Macro 1  
\*4001 04 8 18 55 05 Call Macro 5 at 6:55 PM to link Ports 1 & 2  
\*4001 05 8 20 00 06 Call Macro 6 at 8 PM to unlink Ports 1 & 2  
\*4001 06 9 00 00 07 Call Macro 7 at midnight on weekends  
\*4001 07 9 07 00 08 Call Macro 8 at 7 AM on weekends.

As you can see, if you take the time to plan your setpoints, the RC210 will handle many tedious chores for you, automatically.

## Erasing Scheduler SetPoints

You can erase any setpoint by simply programming a time that will never occur, i.e 2500 hours. However there may be times when you want to clear all setpoints and start "fresh". This command allows you to do so

**\*400799** Clear all setpoints

## Determining Setpoint Status

This command allows you to interrogate the status of any Setpoint. This may aid in troubleshooting why a Scheduler Setpoint isn't working as expected.

**4010xx** Interrogate Scheduler Setpoint where xx = Setpoint 01 – 20.

## Voice IDs

| <u>Command</u> | <u>Description</u> | <u>Maximum Number Of Words</u> |
|----------------|--------------------|--------------------------------|
| <b>*8004</b>   | Voice ID #1        | 22                             |
| <b>*8005</b>   | Voice ID #2        | 22                             |
| <b>*8006</b>   | Voice ID #3        | 22                             |

You may use any combination of vocabulary words and DVR tracks in all ID Voice Messages.

**Important: You must always use 3 digits for vocabulary words or DVR tracks when programming ID Messages. Failure to do so will result in unpredictable results.**

**Hint: You may use AA1, AA2, AA3, AA4 and AA5 to review your stored ID's while that port is unlocked**

## ID Extras

ID Extras allow you to include special messages as part of your Voice ID's:

**\*8007x yy** where "x" is the ID # of the currently unlocked port and "yy" is the extra message to use in that ID:

- 0 Cancel ID Extras
- 1 Say Good M/A/E BEFORE the ID
- 2 Say Good M/A/E AFTER the ID
- 3 Say the time BEFORE the ID
- 4 Say the time AFTER the ID
- 5 Say Good M/A/E and the time BEFORE the ID
- 6 Say Good M/A/E and the time AFTER the ID
- 7 Say Good M/A/E BEFORE the ID and say the time AFTER the ID
- 8 Say the time BEFORE the ID and Good M/A/E AFTER the ID
- 9 Say the time and Good M/A/E BEFORE the ID
- 10 Say the time and Good M/A/E AFTER the ID
- 11 Random rotation of 1 through 10.

## Enable/Disable Voice IDs

You may disable all Voice ID's and force all ID's to be made in CW. By default, Voice ID's are enabled

**\*8008x** Enable Voice IDs  
x = 1 Enabled\* \*Factory default  
x = 0 Disabled

# CW IDs

## CW Speed Programming

\*8000x where "x" is the speed of up to 2 digits. The allowable range is 5 - 50 wpm.

Examples:

- \*8000 5 Program CW speed to 5 wpm
- \*8000 22 Program CW speed to 22 wpm

## CW Tone Programming

Each Port's CW tone may be programmed to be a single or dual tone. If you use only 4 digits to program the tone frequency, the RC210 will generate single tone CW. If you enter more than 4 digits, dual-tones will be generated:

\*8001xxxx (xxxx) where "x" is the tone frequency in Hz of up to 4 (or 8) digits . The allowable range is 0 - 3500 Hz for each.

Examples:

- \*8001 800 Program cw tone of 800 Hz.
- \*80011000 Program cw tone of 1000 Hz.
- \*8001 0660 0440 Program dual tone of 660 and 440 Hz.

## CW ID Programming

There are 2 CW ID messages, each of which may be programmed with up to 15 characters each (See Morse Code Character Table). They normally rotate as the Pending IDs. However if you have Speech Override ON and a signal appears on that port's receiver during a Voice ID, it will revert to CW and play CW message 2. To minimize disruption, it is recommended that you keep CW ID #2 as short as possible.

- \*8002xx-xx Program CWID #1
- \*8003xx-xx Program CWID #2

Examples

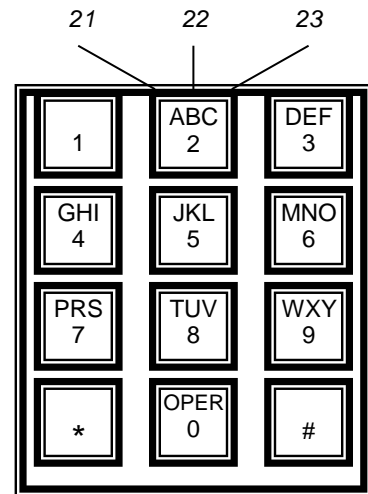
- \*8002 21 42 06 53 32 12 21 82 92 Program "AH6LE/AUX" into ID #1
- \*8003 21 42 06 53 32 12 72 Program " AH6LE/R" into ID #2

**Note: If you exceed 15 characters, all characters that follow will be ignored.**

Figure 6 below shows the relationships between the codes and the layout of a standard Touchtone® pad. As you can see, it makes it easier to remember the code for a particular character without having to look up codes (Q and Z are treated as special cases).

Fig 6 Morse Code Character Table

|   |    |   |    |       |    |
|---|----|---|----|-------|----|
| A | 21 | U | 82 | Word  |    |
| B | 22 | V | 83 | Space | 11 |
| C | 23 | W | 91 | -     | 10 |
| D | 31 | X | 92 | /     | 12 |
| E | 32 | Y | 93 | AR    | 13 |
| F | 33 | Z | 90 | ,     | 14 |
| G | 41 |   |    | ?     | 20 |
| H | 42 | 0 | 00 | SK    | 60 |
| I | 43 | 1 | 01 |       |    |
| J | 51 | 2 | 02 |       |    |
| K | 52 | 3 | 03 |       |    |
| L | 53 | 4 | 04 |       |    |
| M | 61 | 5 | 05 |       |    |
| N | 62 | 6 | 06 |       |    |
| O | 63 | 7 | 07 |       |    |
| P | 70 | 8 | 08 |       |    |
| Q | 71 | 9 | 09 |       |    |
| R | 72 |   |    |       |    |
| S | 73 |   |    |       |    |
| T | 81 |   |    |       |    |



# Using The Digital Voice Recorder (DVR)

The RC210 includes an on-board DVR, which allows you to record up to 20 different "tracks" (messages) of audio. There is a total of 63 seconds recording time available, which can be divided up any way you like. You can have any combination of recorded tracks as long as the total time doesn't exceed the maximum recording time available. DVR tracks may be used in Voice ID's or Message Macros.

## Recording DVR Tracks

To record a track, the controller must have one of its ports first unlocked. The syntax is:

**\*7001x** where "x" is the track number you wish to record 1 - 20

The controller responds with the number of seconds of recording time you have available and then says "Ready". At this point it is waiting for you to key before actually starting to record. You must start recording within 5 seconds after the controller speaks "Ready" or the command will be canceled. Once started, simply unkey to stop recording and your message is will be stored in memory. Don't worry if it's not perfect, as you have some editing commands available with which to "clean it up".

## Playing A Recorded DVR Track

**While in programming mode**, you can use the following command to play back any recorded DVR Track. This is very useful to check the quality of your recording, both before and during editing.

**123x** where "x" is the DVR track to play 1- 20

## Erasing Tracks

Once a track is recorded, it cannot be recorded again without first erasing it (this safeguard prevents you from accidentally recording over a previously recorded track). You can erase a particular track or, should you want to completely "wipe the slate clean", you may erase ALL tracks. When you erase tracks, the controller will let you know how many seconds recording time you have available after the track(s) is cleared.

**\*7002x** where "x" is the track number you want to erase 1 - 20

**\*700399** Erase all DVR tracks

## Editing Recorded Tracks

Rarely will a recorded track be perfect, especially at the end of that recording. The DVR will faithfully record (and playback) whatever it is asked to - squelch bursts and other noise may appear at the end of your recording. The RC210 gives you 2 commands with which to remove (or add) the last 200 milliseconds of a recording, which is very effective at editing those noises from the end of your recordings.

Let's say you've recorded an ID in Track 10 but at the end of it, there is a squelch burst. You can remove the last part of this track in 200 milliseconds increments by using the following command

**\*7004x** where "x" is the Track number to remove the ending 200 millisecond segment.

You can then use the **123 x** command to play back that Track to see how it sounds.

It may be that you will need to remove more than one 200 millisecond segment - perhaps you stopped speaking and didn't unkey for longer time than you should have. You may remove as many segments as you need.

It is possible to remove too many segments, which results in chopping off too much from the end! Fortunately, the RC210 lets you easily add back a previously removed segment with the following command

**\*7005x** where "x" is the Track number to add back the last removed 200 milliseconds segment.

You can add back as many segments as you need.

# Using The Digital Voice Recorder (DVR) (continued)

## Finding Out How Much Recording Time You Have Left

The DVR will keep track of the total amount of recording time you have used. It will also let you know how many seconds of recording time you have left every time you record or erase a track (or erase all tracks). In addition, you can also use the following command at any time you're in programming mode to find out how many seconds of total recording time remain.

**\*70061** Read back the amount of available recording time, in seconds.

Notes:

*When editing tracks, you must do so before you record any new ones or the results may be unpredictable.*

*Be ready to start speaking immediately when you start transmitting to minimize the amount of recording space used. You can not edit the beginning of a track.*

## User DVR Recording

You can program a Command Macro to allow users to record themselves in order to check how well they're "getting into the repeater". This Macro Function will record, playback and then erase the DVR Track (this function uses DVR Track 19). Simply include Macro Function **345** in your Macro.

Alternately, there may be times you want to allow someone to record a DVR Track without giving them access to your Unlock Code(s). By using Macro Function **346**, they can record and playback their message. But DVR Track 19 will not be erased afterwards. And example of its use would be to allow a user to record a SkyWarn© warning for inclusion in a Scheduled message.

## Auxiliary Audio Inputs

Each of the 3 Auxiliary Inputs may be routed to any port's transmitter, or any combination of Ports by the use of Port Steering Macro Functions to control where Auxiliary Audio is routed. You must also use the Port Steering Function to turn that Auxiliary off when you're done with it.

## Resetting The RC210

At times it may be advantageous to reset the controller. Doing this does two things. Firstly, it verifies the operation of the hardware watchdog timer. If you enter the Reset command and for some reason the watchdog timer fails, you'll receive a message saying "Timer Not Set". As it is a fail-safe message, you should never hear it. Upon a successful reset, you'll hear the power up message with the version number.

In addition to testing the watchdog timer, the reset command also forces the controller to start the controller from a known condition And finally, if you have Macro 1 stored, the controller will run it upon reset.

**\*21999** Reset the controller

**Note: Resetting the controller does not overwrite any custom programming you have made. In other words, a reset does not restore factory defaults**

# Courtesy Tone Programming

There are 10 sets of courtesy tones for each port that you can custom program. Each Courtesy Tone can be defined with up to 4 tone segments, duration of those segments and delays between segments. Courtesy tones consist of:

Delay time from the end of a user transmission (when the squelch on a port closes)

The 1<sup>st</sup> tone segment

Delay time from the end of the first tone segment.

A 2<sup>nd</sup> tone segment

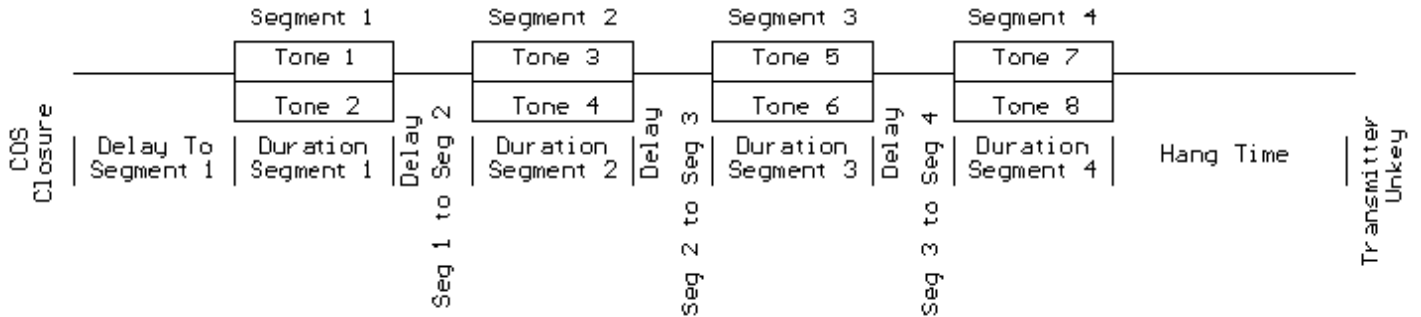
Delay time from the end of the 2<sup>nd</sup> tone segment

A 3<sup>rd</sup> tone segment

Delay time from the end of the 3<sup>rd</sup> segment

A 4<sup>th</sup> tone segment

To program the courtesy tones, the following command is used. Each of the 4 segments have their own programming code.



**\*31CT** Delay to segment 1 \* duration of segment 1 \* Tone 1 \* Tone 2 \*

**\*32CT** Delay to segment 2 \* duration of segment 2 \* Tone 1 \* Tone 2 \*

**\*33CT** Delay to segment 3 \* duration of segment 3 \* Tone 1 \* Tone 2 \*

**\*34CT** Delay to segment 4 \* duration of segment 4 \* Tone 1 \* Tone 2 \*

CT refers to the courtesy tone set you wish to program and is entered as 01, 02, 03 and so on, up to 10. The delay and duration parameters are in milliseconds (ms) and the tone parameters are in hertz (hz). The \* separators must be used.

While each segment allows two tones to be programmed, you can zero out either one for single tones.

Examples:

Program Courtesy Tone 1 to a single 1000 hz tone, 75 ms long, that starts 100 ms after COS closure:

**\*3101 100 \* 75 \* 1000 \* 0 \***

or

**\*3101 100 \* 75 \* 0 \* 1000 \***

Both of the above are identical in function.

Program Courtesy Tone 2 for multiple segments.

Segment 1 - dual tones, 880 and 660 hz, 75 ms long, that start 100 ms after COS closure

Segment 2 - dual tones, 1000 and 880 hz, 50 ms long, that start 75 ms after segment one finishes

**\*3102 100 \* 75 \* 880 \* 660 \***

**\*3202 75 \* 50 \* 1000 \* 880 \***

You can erase any segment by entering null information for it. For example, to completely erase Courtesy Tone 3, segment 3, you can enter

**\*3303 \***

## Using A DVR Track Or Vocabulary As A Courtesy Tone

You may program a Courtesy Tone to use a Message Macro instead of tones. By simply programming Segment 1 Tone 1 to a value of 1 – 40 (representing Message Macro 1 – 40), you will cause that Courtesy Tone to use that Message Macro. Note that when you program a Courtesy Tone in this manner, only Tone 1's value must contain data. The rest may be left blank:

Examples:

Courtesy Tone 1 to use Message Macro 1:

**\*3101 \* 1 \* \* \***

Courtesy Tone 4 to use Message Macro 10:

**\*3104 \* 10 \* \***

Courtesy Tone 9 to use Message Macro 32:

**\*3109 \* 32 \* \* \***

## Courtesy Tone Behavior When Ports Are Linked

When one or more ports are linked together, additional courtesy tones are sent to allow easy identification of the signal heard. For example, if you have Ports 1 and 2 linked and you're currently talking on Port 1, you'll hear an additional courtesy tone whenever someone unkeys on Port 2.

Courtesy Tone #10 is played if the signal comes from the "previous" port and Courtesy Tone #9 is played if the signal comes from the "next" port. The relationship between ports is described below:

### **Previous Port**

If your currently used Port is 1, the Previous Port is 3  
If your currently used Port is 2, the Previous Port is 1  
If your currently used Port is 3, the Previous Port is 2

### **Next Port**

If your currently used Port is 1, the Next Port is 2  
If your currently used Port is 2, the Next Port is 3  
If your currently used Port is 3, the Next Port is 1

For example, Port 1 is linked to Port 2 and a signal arrives on Port 2's receiver. From our list above, we see that Port 2 is Port 1's "next" Port, so Port 1's Courtesy Tone #9 will be sent whenever the signal on Port 2's receive disappears.

Accordingly, we can program Port 1's Courtesy Tone #9 the way we want it to sound.



# Programming Meter Faces - 10-bit A/D Converters

The command syntax is:

**\*2064 C \* M\* X1\* Y1\* X2\* Y2\*** C= Channel 1 to 8 M=Meter Type 0 to 6 X1, Y1, X2, Y2 represent two calibration points. There must be 6 parameters entered to define a meter face, each value ending with \*.

There are 8 meter faces corresponding to the 8 Analog inputs, with each meter face programmed with 1 of 6 values. The programming command consists the **input port**, **meter face type (name)**, and **4 values** representing:

- The low sensed voltage appearing on an input (X1)
- The low meter face reading (Y1)
- The high sensed voltage appearing on an input (X2)
- The high meter face reading (Y2)

Each meter face is calibrated with two *points* to define the sensor you wish to use on that channel. To clear a meter face, simply enter the input port number, then 0 for the meter face name and 4 more 0s, separated by a # sign, to complete the 6 values needed to define a meter face.

A "Meter Face" is an imaginary software meter that is defined by selecting which of the 8 analog inputs you will use, what kind of measurement is being made (volts, amps, etc.) and two data points on the meter. While this may seem confusing at first, the advantage of this method is that it allows you complete flexibility in scaling a particular meter face to the voltage actually being measured. The definable meter faces are:

- 0 Meter OFF
- 1 Volts
- 2 Amps
- 3 Watts
- 4 Degrees
- 5 MPH
- 6 Percent

Note: The calibration data (X1, Y1, X2, Y2) is the actual data that you have measured multiplied 100 and rounded off to the nearest whole number. The controller divides your input values by 100 to reestablish the decimal point.

**Wattmeter example:** If the output of your wattmeter produces 0.25 volts for 10 watts and 2.1 volts for 40 watts you would multiply each of the calibration values by 100 before you enter them:

|                 |  |
|-----------------|--|
| .25 x 100 = 25  | ←Low voltage actually appearing on the ADC pin (X1)  |
| 10 X 100 = 1000 | ←Low meter face reading (Y1)                         |
| 2.1 x 100 = 210 | ←High voltage actually appearing on the ADC pin (X2) |
| 40 x 100 = 4000 | ←High meter face reading (Y2)                        |

We wish to use ADC channel 6 for the Watt meter sensor (meter face 3) using the above calibration data, so we would program:

**\*2064 6\* 3\* 25\* 1000\* 210\* 4000\***

**Voltmeter example:** You want to use ADC channel 4 for a Voltmeter (Meter face 1) and you have a sensor that produces 0 volts when the voltage is 0, and it produces 2.5 vdc when the actual dc voltage is 20 volts. Multiplying the sensor and actual data by 100 and rounding produces X1=0 Y1=0 X2=250 Y2=2000. To define this meter, you would enter the following program codes:

**\*2064 4\* 1\* 0\* 0\* 250\* 2000\***

Notice that the same programming code (\*2064) is used to setup each of the 8 ADC inputs.

**Percent (Quieting) Meter Example:** You want to assign ADC port 2 to Percent Quieting. You have a sensor that measures FM discriminator "noise" by rectifying it (similar to the way an S-meter works on FM). More noise means less quieting. You notice full quieting (100 percent) produces about 0.2 volts on the sensor, and no signal on the input (Zero percent) produces about 1.84 volts on the sensor. X1=0 Y1=100% X2=1.84 Y2=0%. To define this "Percent quieting" meter on ADC port 2 with these values you enter:

**\*2064 2\* 6\* 20\* 10000\* 184\* 0\***

If someone with a full quieting signal accesses this meter, it might say "95 percent" or some reasonable indication of high quieting. **Data Entry Limits:** Physical values must be between -327 and +327 AND the difference between High and Low cannot exceed 327. A range of 0 to 327 is okay, or -150 to +150. Also, calibration points should be in the range of actual expected meter readings.

## Programming Meter Alarms

Each of the Meters has a high and low alarm *trippoint*. Once programmed, when a meter reading reaches either of these points, a Command Macro will be run. For example, a meterface can be defined to read temperature from an external sensor. If the measured temperature exceeds the programmed high level, a Macro will be run. If the temperature drops below the programmed low limit, a Macro will be run. Of course the same Macro can be programmed for both the high and low points but different macros will generally be used for each trippoint. The format for programming a meter alarm is:

**\*2066 alarm number \* meter number \* alarmtype \* trippoint \* macro to run \***

There are 8 meter alarms, 1 through 8

Meter Number is 1 through 8 (for the ADC channels)

AlarmType determines the action taken by that alarm:

1 - Low Alarm

2 - High Alarm

Trippoint is the value to use for the high or low setting, multiplied by 100 and rounded to the nearest whole value. In our example above, we defined the meterface to measure temperatures from -35 to +150 degrees. We want our high trippoint to be set to +100 degrees, so we take "100" and multiply by 100 which gives us "10000". This is the number we enter for the trippoint value. If we want to enter a negative value for the trippoint (for example, -10 degrees), we simply preface the calculated value with a DTMF "A". For example, we want to set the low trippoint to -10 degrees.  $-10 \times 100 = -1000$ , so we would enter "A1000" for the trippoint value.

Macro to run is the Command Macro we want to be executed when our alarm trips.

### A Practical Example

Let's say that we have a temperature sensor connected to Meter Input 1. We also have the PA power control line connected to Logic Output 5. Once our meterface is programmed (as shown in the Programming Meter Faces section above), we want to program a Meter Alarm to put the PA into its low power mode when the sensed temperature rises above 135 degrees. Since our PA control line requires that it be pulled to ground in order to enter low power mode, we need to turn ON the appropriate logic output and we'll use Command Macro 22 for this. And since this is our first Meter Alarm definition, we'll use Meter Alarm 1.

First, we program Macro 22 to turn on Logic Output 1

**\*4002 22 095**

Now we program the Meter Alarm itself

**\*2066 1 \* 1 \* 2 \* 13500 \* 22 \***

Now, if the sensed temperature rises above 135 degrees, the PA control line will be pulled low. Of course, we'd like a way to put the PA back into high power mode once the temperature drops back down to a safe temperature. We decide that once the PA temperature falls back down to 80 degrees, it is safe to put it back into high power mode. We'll use Meter Alarm 2 and use Macro 23 to turn Logic Output 1 back off.

**\*2066 2 \* 1 \* 1 \* 8000 \* 23 \***

When the sensed temperature falls below 80 degrees, the PA will be put back into high power mode.

## The Differences Between Accuracy And Precision

It is easy to become confused when the issues of precision and accuracy are raised. Let's take a few minutes to understand what these terms mean in relation to the RC210. The RC210 can provide accurate measurements good to 3 decimal places of precision, if you take the time to setup the inputs correctly. It might help to explain accuracy and precision to understand how to improve both:

**Accuracy** - The ability of a measurement to match the actual value of that which is being measured. For example, if you measure 3.32 volts, knowing the voltage you're measuring is actually 3.32 volts. The RC210 has a built-in reference voltage of 2.56 volts that is supposed to be accurate. You can also provide an external reference voltage. The accuracy of the reference voltage,  $V_{ref}$ , is the major factor in determining the overall accuracy of the A/D conversion process.

**Precision** - The number of significant digits to which a value has been reliably measured. The precision of the RC210 is dependent on the 10-bit A/D converter. With 10-bits, the A/D device can distinguish among 1024 separate values in the input, from 0 volts to  $V_{ref}$ , which is roughly about 5 volts). If your sensor puts out 0 volts at the lowest expected level of the quantity it is measuring, and  $V_{ref}$  (5.00 volts for example) at the highest expected level of the quantity you are measuring, you will have all 10 bits of precision available to measure the physical quantity.

The next major issue in getting precise measurements is the characteristics of the sensor you use (design, buy, etc.) and how well it matches the A/D converter measurement range (0 to  $V_{ref}$ ) when measuring physical quantities.

Suppose you want to measure 0 to 100 watts with a sensor and feed the sensor voltage to the controller to read back watts. You have a sensor to monitor the power of your repeater transmitter. You have measured the output of your sensor while measuring the power output on a calibrated watt meter and record the following values

At 0 watts the sensor produces 0.1 volts  
At 100 watts the sensor produces 0.6 volts

As you can see, this is a small range of sensor voltage output -- only 0.5 volts. If  $V_{ref}$  is 5 vdc, this is using only 10.0% of the full range of the A/D input. Therefore, only 10.0% of the possible 1024 distinct measurement values is being used, or about 102 distinct measurement points. The range of Watts being measured is 100 watts. Dividing this 100 watts by the 102 points of resolution means the meter will be able to resolve about 1 watt per "division" which is not bad! However if you wanted more precise readings, find a sensor that produces a wider output voltage. For example, a sensor that produces 0.2 volts at 0 watts, and 4.2 volts at 100 watts. Now the sensor voltage range is 4 volts of the 5.0 vdc  $V_{ref}$  maximum. This is 80 percent of the 1024 points of resolution, or about 800 distinct measurement values. Now, for the same 100 watt range being measured, your improved sensor would now have a resolution of  $(100 \text{ watts}) / (800 \text{ divisions}) = 0.125 \text{ watts per "division"}$ . As you can see, a sensor that uses more of the  $V_{ref}$  voltage range increases the precision of your measurement.

In conclusion, the RC210 can resolve a sensor voltage change of as small as  $V_{ref} / 1024$ . However, as you can see from the above example, the resolution of the physical "thing" being measured is directly affected by the behavior of the sensor. For best results, try to find sensors that produce sensor output voltages between 0 and  $V_{ref}$  over the range of desired physical measurements. This isn't an absolute requirement to get useful and accurate readings, but it will help increase the precision of the measurements.

## Programming the Reference Voltage Value for the A/D Converters

As it comes from the factory, the RC210 comes with the reference voltage value programmed to 5.00 volts. Since component tolerances obviously vary, you will want to measure the actual reference voltage of your RC210 and then program that value into the controller. **Note: This one reference voltage is used by all the A/D inputs. Setting it accurately will improve the measurement accuracy.**

**How to measure the  $V_{ref}$ :** Using a high impedance, precision voltmeter (a digital, not an analog one is recommended) and with power applied to the RC210, carefully measure the voltage at pin 21 of the I/O connector, J1. Write this voltage down - it is only necessary to include two decimal places). For example, if your meter displays "4.962", simply round it off to "4.96". Multiply this value by 100 as our value to enter as  $V_{ref}$ . The example below shows how to enter this measured  $V_{ref}$ .

\*2065 4 9 6

**Note: NEVER apply voltages higher than 5.2 volts to any A/D channel input. It is best to keep any input voltages at or below  $V_{ref}$ .**

## Measuring Voltages Higher Than Vref - A Practical Example

The first step is to decide what the range of actual voltages will be measured:

Suppose the Low end of expected actual voltage 10 volts, and the High end of the expected actual voltage is 18 volts

Since we realize that applying a voltage to the RC210 higher than the programmed reference voltage will "pin" the meter face, we need to "scale" the actual voltage. This can be accomplished using either a pair of resistors as a voltage divider, or a variable resistor to get just a portion of the 18 volts as the maximum value to connect to the ADC input. Using a 5-K pot would be a good choice.

What you want is to have the High end of voltage range (18 volts) to be less than Vref. If Vref is 5.00 volts, you might choose to set the resistor divider (or variable resistor) to produce 4.5 volts as the "sensor" voltage when the actual voltage is 18 volts.

If we look at the math, we see that 4.5 volts is 18 volts divided by 4 so the "sensor" needs to provide  $\frac{1}{4}$  of the actual voltage. If the power supply is currently providing 13.8 volts, divide this by 4 to get 3.45 volts. If you are using a variable resistor (as shown in the Hardware Reference Manual), hookup your "sensor" to the battery, and adjust the pot to produce 3.45 volts on the wiper. This "sensor" will work fine with the ADC input. If the battery voltage ever gets to 18 volts, the wiper of the pot will see 4.5 volts, below the Vref of 5.0 volts, which is what is desired.

We then need to program the meter face used. For this example, we will use Meter 1 and assume the Voltage Reference Value has been left at the factory default of 5.00 volts:

**2064 1\* 1\* 250\* 1000\* 450\* 1800\***

This programs Meter 1 to use the voltmeter meter face and tells the controller that when the sensor is 2.5 volts, this means the actual voltage is 10 volts, and when the sensor (ADC input) is 4.5 volts, the actual voltage is 18 volts. Note that each of the calibration points is the actual measured value multiplied by 100 then rounded to the nearest whole value. This is done because there is no "decimal" point on the DTMF pad, so the controller assumes that the "real" values are whatever you put in, divided by 100.

Using the above example, you should be able to accommodate just about any external sensor.

## Alarm Programming

The RC210 incorporates 5 alarm inputs that can be used to remotely monitor such things as a door open, high temperature of the repeater PA, etc. Each Input responds to a logic level change, such as going from high-to-low and low-to high (this is known as rising and falling edge triggering). When enabled (and triggered), each transition will call its own macro to execute.

For example, you could connect Alarm 1 to an over-temperature switch on the repeater's PA heatsink that closes to ground. You could then program a Macro that turns one of the Logic Outputs on (or off as needed) to select high/low power on the transmitter and speak a message to let you know. Once the PA cools down to the point that the over-temperature switch opens again, the Alarm would run a different Macro, place the repeater back into high power and speak another message to let you know.

Or perhaps you want to connect a weather receiver with S.A.M.E. alerts at the repeater. You simply connect the receiver's S.A.M.E. decoder output to an Alarm Input and program a Macro to play a short message (perhaps "Weather Alert") and also turn on the Aux Audio Input to which you have the weather receiver's audio connected. When NOAA sends a S.A.M.E. Alert, you'll be automatically notified and hear their broadcast.

## Programming Which Macro To Use With An Alarm

As explained earlier, each Alarm Input responds to a change of voltage on its input. For example, if the voltage goes from +5 volts to ground (this is called "*falling*"), that will trigger the Alarm and call a Macro. If the voltage goes from ground to +5 volts (this is called "*rising*"), that will call a different Macro. As you can see, this allows for great flexibility

To program which Macro should be called for a *falling* transition:

**\*2101 <Alarm #> <Macro #>**

To program which Macro should be called for a *rising* transition:

**\*2102 <Alarm #> <Macro #>**

Examples:

**\*2101 1 10** Falling Alarm 1 calls Macro 10

**\*2102 5 2** Rising Alarm 5 calls Macro 2

# Updating The Firmware

The RC210 was designed with ease of firmware upgrades in mind. This allows it to be easily upgraded in the field as new firmware versions are released.

All that is needed to upload updates to the RC210 is a computer running Windows© Win98/NT/XP/2000 and a serial cable (and adapter).

## Downloading And Installing The Required Software On Your Computer

The programming software may be downloaded at our web site:

<http://www.arcomcontrollers.com/ftp/pub/updater.zip>

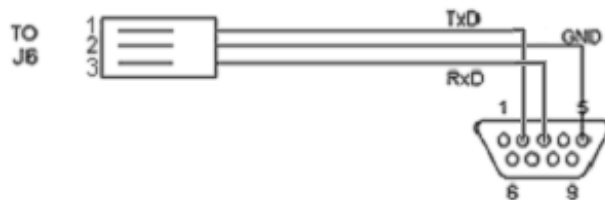
Once downloaded, simply run the setup program to install the Arcom Updater program on your computer.

## Programming Cable

In addition to the software and a standard serial cable, you will also need an adapter that allows connection to the RC210 (note that these connections are not "standard", in that Rxd and Txd are reversed. This is by design and allows you to use a straight through serial cable between your computer and the RC210 without the need for a null modem adapter)

### DB9 Pin    3 Pin Header Pin J6

|   |         |
|---|---------|
| 2 | 1 (Txd) |
| 3 | 3 (Rxd) |
| 5 | 2 Gnd   |



**Note: If you purchased the RC210R Rack Mount Enclosure, you already have a DB25 Programming Connector installed and you may disregard the above**

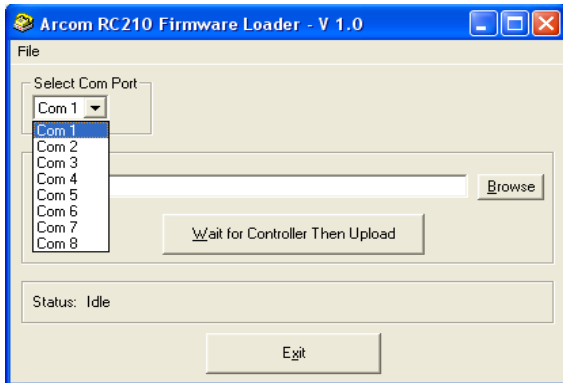
## Downloading Firmware Updates

Once you've installed the program on your computer and have the programming cable, you'll need to download the firmware update from our website:

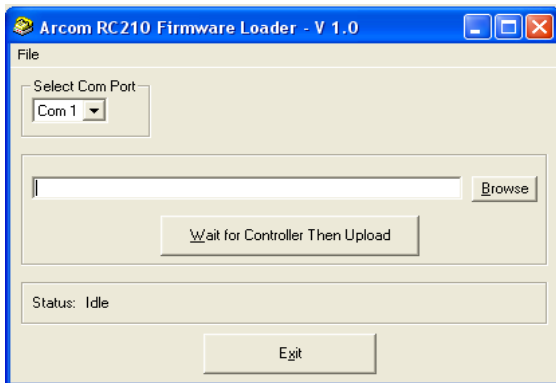
<http://www.arcomcontrollers.com/rc210/updates.html>

We recommend that you create a directory dedicated to firmware updates. As an example, you could name it "updates", but you may call it anything you like. Once downloaded, unzip the update into this directory. Remember the location of this directory as you'll need it later. All updates contain 2 files – a readme.txt and one with a .hex extension. The only one you need be concerned with is the one with the .hex extension.

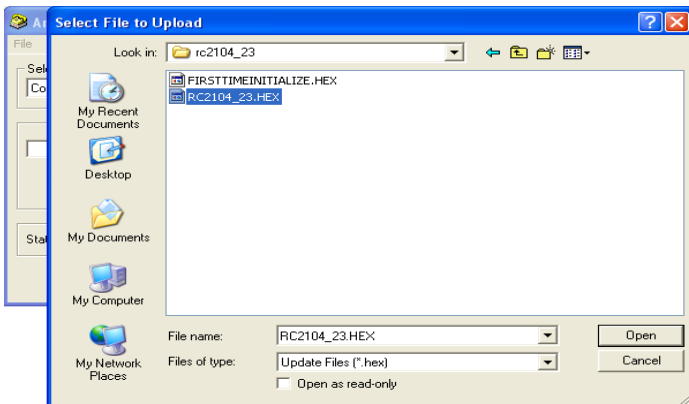
# Running Updater For The First Time



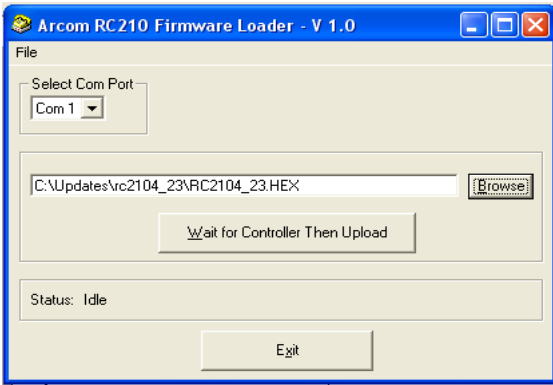
The first time you run Updater, you need to select which comport on your computer you wish to use. Simply make your selection from the drop down menu. After you select this, Updater will remember which port you selected.



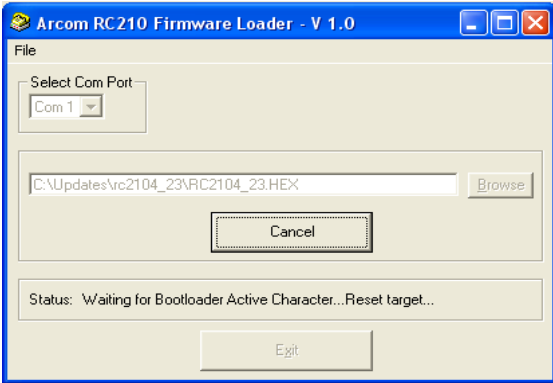
You now need to tell Updater where the update file you want to load is located. Click the Browse button and the usual Windows file window will appear.



Chose the path and filename where you unzipped the update file and click Open

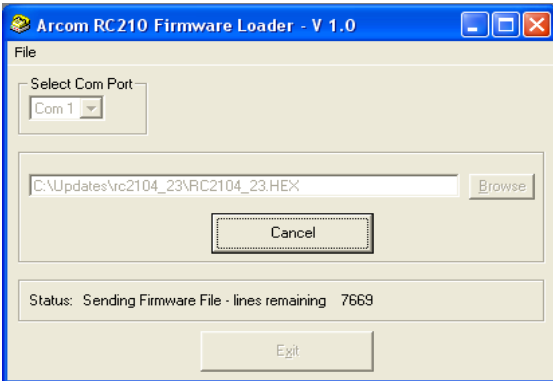


You are now ready to actually upload the update into your RC210. Make sure one end of your serial cable is plugged into the correct com port on your computer and the other end is plugged into the RC210's serial connect (via the adapter cable). Click the Wait for Controller Then Upload button

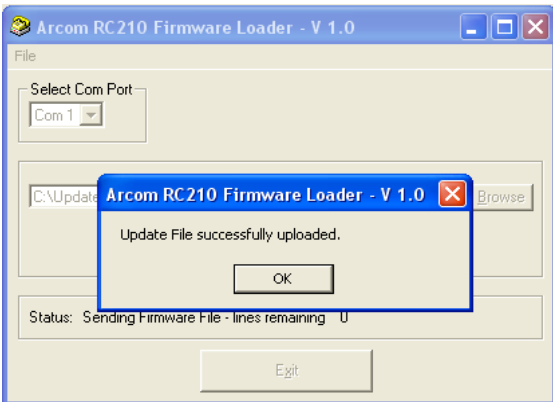


You'll notice the Status Line will inform you of the current status. You should now remove power from your RC210 and reapply it to start the upload.

**NOTE: It is very important that you reapply power "cleanly". This is to say that simply unplugging the power connector and reconnecting it will probably not work properly and you'll receive an error. If at all possible, turn off the power supply, wait a second or two, and turn it back on instead**



Updater will now automatically start the upload. You can watch the progress of the upload in the Status Line



When the upload is complete, Updater will notify you and the RC210 should start on its own. Click OK the Exit to close Updater. You are all done!

# Appendix A

## Frequency Agile Radios Supported

Kenwood - All model radios with a computer port to allow control of radio, such as TS-2000

Kenwood - mobiles TM-V7A, TM-G707, TM-271A, TM-471A

Elecraft - All models with a computer port

Yaesu - FT-817, FT-847, FT-857, FT-897, FT100D

Icom - IC706MKIlg, IC-746, IC-756

Doug Hall RBI-1 Remote Base Radio Interface

## Factory Default Programming Values

When you first receive your RC210, the following values are programmed as default:

### Port Specific

|                         |   |
|-------------------------|---|
| Carrier/PL Access       | Carrier squelch All Ports                   |
| Hang time               | Port 1 - 5 seconds. Ports 2 & 3 - 3 seconds |
| Timeout                 | 180 seconds All Ports                       |
| Cw Tone                 | Port 1 - 600 hz. Ports 2 & 3 - 800 hz       |
| CW Speed                | 20 wpm All Ports                            |
| Monitor Mix             | Yes All Ports                               |
| Port Enabled            | Yes All Ports                               |
| Intertie to other ports | OFF All Ports                               |
| Repeat Mode             | Port 1 - Repeat, Ports 2 & 3 - Non-repeat   |
| Port Enabled            | Yes All Ports                               |
| Receiver Enabled        | Yes All Ports                               |
| DTMF Covertone          | ON All Ports                                |
| Courtesy Tone           | # 1 All Ports                               |
| DTMF Mute               | ON All Ports                                |
| Speech Override         | ON All Ports                                |
| Speech ID Override      | ON All Ports                                |

### Global

|                        |                     |
|------------------------|---------------------|
| Logic Output 1 - 7     | Open                |
| Alarm 1 - 5            | Disabled            |
| Auxiliary Audio Inputs | OFF                 |
| Analog Meter Inputs    | None defined        |
| Command Macros         | None programmed     |
| Macro Recall Codes     | 10901 - 109090      |
| Remote Base Type       | Kenwood Serial Type |
| Fan Turn Off Time      | 5 minutes           |
| Remote Base Prefix     | A7                  |
| Lock Code              | #                   |
| DTMF Terminator        | D                   |
| Say Year               | ON                  |
| RTC Correction Factor  | None                |
| Autopatch Prefix       | C1                  |



# Appendix B

## CTCSS Codes

**Kenwood** (not a typo. There is no "02" Code)

**Yaesu** (note: for FT-847, see manual for correct CTCSS codes)

| #  | Freq | #  | Freq  | #  | Freq  | #  | Freq  | #  | Freq | #  | Freq  | #  | Freq  | #  | Freq  |
|----|------|----|-------|----|-------|----|-------|----|------|----|-------|----|-------|----|-------|
| 01 | 67.0 | 12 | 97.4  | 22 | 136.5 | 32 | 192.8 | 01 | 67.0 | 11 | 94.8  | 21 | 131.8 | 31 | 186.2 |
| 03 | 71.9 | 13 | 100.0 | 23 | 141.3 | 33 | 203.5 | 02 | 69.3 | 12 | 97.4  | 22 | 136.5 | 32 | 192.8 |
| 04 | 74.4 | 14 | 103.5 | 24 | 146.2 | 34 | 210.7 | 03 | 71.9 | 13 | 100.0 | 23 | 141.3 | 33 | 203.5 |
| 05 | 77.0 | 15 | 107.2 | 25 | 151.4 | 35 | 218.1 | 04 | 74.4 | 14 | 103.5 | 24 | 146.2 | 34 | 210.7 |
| 06 | 79.7 | 16 | 110.9 | 26 | 156.7 | 36 | 225.7 | 05 | 77.0 | 15 | 107.2 | 25 | 151.4 | 35 | 218.1 |
| 07 | 82.5 | 17 | 114.8 | 27 | 162.2 | 37 | 233.6 | 06 | 79.7 | 16 | 110.9 | 26 | 156.7 | 36 | 225.7 |
| 08 | 85.4 | 18 | 118.8 | 28 | 167.9 | 38 | 241.8 | 07 | 82.5 | 17 | 114.8 | 27 | 162.2 | 37 | 233.6 |
| 09 | 88.5 | 19 | 123.0 | 29 | 173.8 | 39 | 250.3 | 08 | 85.4 | 18 | 118.8 | 28 | 167.9 | 38 | 241.8 |
| 10 | 91.5 | 20 | 127.3 | 30 | 179.9 |    |       | 09 | 88.5 | 19 | 123.0 | 29 | 173.8 | 39 | 250.3 |
| 11 | 94.8 | 21 | 131.8 | 31 | 186.2 |    |       | 10 | 91.5 | 20 | 127.3 | 30 | 179.9 |    |       |

**Icom** (note: not all Icom radios support remote CTCSS selection or they require direct frequency access of CTCSS tones instead of codes. Check your operating manual)

|    |       |    |       |    |       |    |       |
|----|-------|----|-------|----|-------|----|-------|
| 00 | 67.0  | 13 | 103.5 | 26 | 159.8 | 39 | 199.5 |
| 01 | 69.3  | 14 | 107.2 | 27 | 162.2 | 40 | 203.5 |
| 02 | 71.9  | 15 | 110.9 | 28 | 165.5 | 41 | 206.5 |
| 03 | 74.4  | 16 | 114.8 | 29 | 167.9 | 42 | 210.7 |
| 04 | 77.0  | 17 | 118.8 | 30 | 171.3 | 43 | 218.1 |
| 05 | 79.7  | 18 | 123.0 | 31 | 173.8 | 44 | 225.7 |
| 06 | 82.5  | 19 | 127.3 | 32 | 177.3 | 45 | 229.1 |
| 07 | 85.4  | 20 | 131.8 | 33 | 179.9 | 46 | 233.6 |
| 08 | 88.5  | 21 | 136.5 | 34 | 183.5 | 47 | 241.8 |
| 09 | 91.5  | 22 | 141.3 | 35 | 186.2 | 48 | 250.3 |
| 10 | 94.8  | 23 | 146.2 | 36 | 189.9 | 49 | 254.1 |
| 11 | 97.4  | 24 | 151.5 | 37 | 192.8 |    |       |
| 12 | 100.0 | 25 | 156.7 | 38 | 196.6 |    |       |

# Appendix C

## Default Factory Command Codes

These are the "Factory default" codes when the RC210 is unlocked:

|              |                             |              |                                |                        |                           |
|--------------|-----------------------------|--------------|--------------------------------|------------------------|---------------------------|
| <b>15281</b> | Port 1 Unlock               | <b>1171</b>  | Port 1 PL for DTMF             | <b>1700</b>            | Say Time                  |
| <b>25281</b> | Port 2 Unlock               | <b>2171</b>  | Port 2 PL for DTMF             | <b>1701</b>            | Say Date                  |
| <b>35281</b> | Port 3 Unlock               | <b>3171</b>  | Port 3 PL for DTMF             | <b>18yx</b>            | UF1(y) to UF7(y) x=ON/OFF |
| <b>1100</b>  | Port 1 Receiver Disable     | <b>1180</b>  | Port 1 Speech ID Over Off      | <b>180</b>             | UF Extended               |
| <b>2100</b>  | Port 2 Receiver Disable     | <b>2180</b>  | Port 2 Speech ID Over Off      | <b>A71</b>             | Remote Base Frequency     |
| <b>3100</b>  | Port 3 Receiver Disable     | <b>3180</b>  | Port 3 Speech ID Over Off      | <b>A72</b>             | Remote Base CTCSS         |
| <b>1101</b>  | Port 1 Receiver Enable      | <b>1181</b>  | Port 1 Speech ID Over On       | <b>A73</b>             | Remote Base Mode          |
| <b>2101</b>  | Port 2 Receiver Enable      | <b>2181</b>  | Port 2 Speech ID Over On       | <b>A74</b>             | Doug Hall User Function   |
| <b>3101</b>  | Port 3 Receiver Enable      | <b>3181</b>  | Port 3 Speech ID Over On       | <b>A75x</b>            | Memory Select             |
| <b>1110</b>  | Port 1 Transmitter Disable  | <b>1190</b>  | Port 1 Monitor Mute            | <b>A76x</b>            | Doug Hall Memory Select   |
| <b>2110</b>  | Port 2 Transmitter Disable  | <b>2190</b>  | Port 2 Monitor Mute            | <b>A77xy</b>           | V7a/G707 Memory Recall    |
| <b>3110</b>  | Port 3 Transmitter Disable  | <b>3190</b>  | Port 3 Monitor Mute            | <b>A79x</b>            | RB Power Select           |
| <b>1111</b>  | Port 1 Transmitter Enable   | <b>1191</b>  | Port 1 Monitor Mix             | <b>1910</b>            | Alarm 1 Off               |
| <b>2111</b>  | Port 2 Transmitter Enable   | <b>2191</b>  | Port 2 Monitor Mix             | <b>1911</b>            | Alarm 1 On                |
| <b>3111</b>  | Port 3 Transmitter Enable   | <b>3191</b>  | Port 3 Monitor Mix             | <b>2910</b>            | Alarm 2 Off               |
| <b>1120</b>  | Port 1 Carrier Only Access  | <b>1200</b>  | Port 1 Speech Over Off         | <b>2911</b>            | Alarm 2 On                |
| <b>2120</b>  | Port 2 Carrier Only Access  | <b>2200</b>  | Port 2 Speech Over Off         | <b>3910</b>            | Alarm 3 Off               |
| <b>3120</b>  | Port 3 Carrier Only Access  | <b>3200</b>  | Port 3 Speech Over Off         | <b>3911</b>            | Alarm 3 On                |
| <b>1121</b>  | Port 1 CTCSS/Carrier Access | <b>1201</b>  | Port 1 Speech Over On          | <b>4910</b>            | Alarm 4 Off               |
| <b>2121</b>  | Port 2 CTCSS/Carrier Access | <b>2201</b>  | Port 2 Speech Over On          | <b>4911</b>            | Alarm 4 On                |
| <b>3121</b>  | Port 3 CTCSS/Carrier Access | <b>2201</b>  | Port 3 Speech Over On          | <b>5910</b>            | Alarm 5 Off               |
| <b>1122</b>  | Port 1 CTCSS Only Access    | <b>1210</b>  | Port 1 DTMF Mute Off           | <b>5911</b>            | Alarm 5 On                |
| <b>2122</b>  | Port 2 CTCSS Only Access    | <b>2210</b>  | Port 2 DTMF Mute Off           | <b>1913</b>            | Alarm 1 Interrogate       |
| <b>3122</b>  | Port 3 CTCSS Only Access    | <b>3210</b>  | Port 3 DTMF Mute Off           | <b>2913</b>            | Alarm 2 Interrogate       |
| <b>1130</b>  | Port 1 Covertone Off        | <b>1211</b>  | Port 1 DTMF Mute On            | <b>3913</b>            | Alarm 3 Interrogate       |
| <b>2130</b>  | Port 2 Covertone Off        | <b>2211</b>  | Port 2 DTMF Mute On            | <b>4913</b>            | Alarm 4 Interrogate       |
| <b>3130</b>  | Port 3 Covertone Off        | <b>3211</b>  | Port 3 DTMF Mute On            | <b>5913</b>            | Alarm 5 Interrogate       |
| <b>1131</b>  | Port 1 Covertone On         | <b>1220</b>  | Port 1 DTMF on COS             | <b>A11</b>             | Link Port 1 & Port 2      |
| <b>2131</b>  | Port 2 Covertone On         | <b>2220</b>  | Port 2 DTMF on COS             | <b>A21</b>             | Link Port 1 & Port 3      |
| <b>3131</b>  | Port 3 Covertone On         | <b>3220</b>  | Port 3 DTMF on COS             | <b>A31</b>             | Link Port 2 & Port 3      |
| <b>1134x</b> | Port 1 CT Select            | <b>1221</b>  | Port 1 DTMF on CTCSS           | <b>A41</b>             | Link All Ports            |
| <b>2134x</b> | Port 2 CT Select            | <b>2221</b>  | Port 2 DTMF on CTCSS           | <b>A10</b>             | UnLink Port 1 & Port 2    |
| <b>3134x</b> | Port 3 CT Select            | <b>3221</b>  | Port 3 DTMF on CTCSS           | <b>A20</b>             | UnLink Port 1 & Port 3    |
| <b>1140</b>  | Port 1 Repeat OFF           | <b>1300</b>  | Monitor Port 2 From Port 1 Off | <b>A30</b>             | UnLink Port 2 & Port 3    |
| <b>2140</b>  | Port 2 Repeat OFF           | <b>1301</b>  | Monitor Port 2 From Port 1 On  | <b>A40</b>             | Unlink All Ports          |
| <b>3140</b>  | Port 3 Repeat OFF           | <b>1310</b>  | Monitor Port 3 From Port 1 Off | <b>1960</b>            | Aux Audio 1 Off           |
| <b>1141</b>  | Port 1 Repeat ON            | <b>1311</b>  | Monitor Port 3 From Port 1 On  | <b>1961</b>            | Aux Audio 1 On            |
| <b>2141</b>  | Port 2 Repeat ON            | <b>2300</b>  | Monitor Port 1 From Port 2 Off | <b>2960</b>            | Aux Audio 2 Off           |
| <b>3141</b>  | Port 3 Repeat ON            | <b>2301</b>  | Monitor Port 1 From Port 2 On  | <b>2961</b>            | Aux Audio 2 On            |
| <b>1150</b>  | Port 1 Kerchunk Off         | <b>2310</b>  | Monitor Port 3 From Port 2 Off | <b>3960</b>            | Aux Audio 3 Off           |
| <b>2150</b>  | Port 2 Kerchunk Off         | <b>2311</b>  | Monitor Port 3 From Port 2 On  | <b>3961</b>            | Aux Audio 3 On            |
| <b>3150</b>  | Port 3 Kerchunk Off         | <b>3300</b>  | Monitor Port 1 From Port 3 Off | <b>AA1</b>             | Play CW ID 1              |
| <b>1151</b>  | Port 1 Kerchunk On          | <b>3301</b>  | Monitor Port 1 From Port 3 On  | <b>AA2</b>             | Play CWID 2               |
| <b>2151</b>  | Port 2 Kerchunk On          | <b>3310</b>  | Monitor Port 2 From Port 3 Off | <b>AA3</b>             | Play Voice ID 1           |
| <b>3151</b>  | Port 3 Kerchunk On          | <b>3311</b>  | Monitor Port 2 From Port 3 On  | <b>AA4</b>             | Play Voice ID 2           |
| <b>1160</b>  | Port 1 DTMF Disable         | <b>1400x</b> | Read Meter                     | <b>AA5</b>             | Play Voice ID 3           |
| <b>2160</b>  | Port 2 DTMF Disable         | <b>1500x</b> | Reset Meter hi/low value       | <b>10901 to 109090</b> | Recall Macro 1 to 90      |
| <b>3160</b>  | Port 3 DTMF Disable         | <b>1600x</b> | Meter Alarm ON/OFF             |                        |                           |
| <b>1161</b>  | Port 1 DTMF Enable          | <b>2700</b>  | Allow DTMF into Phone Line     |                        |                           |
| <b>2161</b>  | Port 2 DTMF Enable          | <b>2701</b>  | Mute DTMF into Phone Line      |                        |                           |
| <b>3161</b>  | Port 3 DTMF Enable          | <b>2800</b>  | Macro Subset OFF               |                        |                           |
| <b>1170</b>  | Port 1 no PL for DTMF       | <b>2801</b>  | Macro Subset ON                |                        |                           |
| <b>2170</b>  | Port 2 no PL for DTMF       |              |                                |                        |                           |
| <b>3170</b>  | Port 3 no PL for DTMF       |              |                                |                        |                           |

# Programming Commands Quick Reference

| <u>Code</u> | <u>What It Programs</u>                  | <u>What It Means</u>   |
|-------------|--|--|
| *1000       | Program Transmitter Hang Timer           | Programs the xmtr Hang Timer for the currently unlocked Port                             |
| *1001       | Program Time Out Time                    | Programs the Timeout Timer for the currently unlocked Port                               |
| *1002       | Program Initial ID Period                | Programs the Initial ID Timer for the currently unlocked Port                            |
| *1003       | Program Pending ID Period                | Programs the Pending ID Timer for the currently unlocked Port                            |
| *1004       | Program Fan Time                         | Programs the length of time the Fan will remain on after xmtr drop                       |
| *1005       | Program Port Activity Timer              | Programs the Link Inactivity Timer for the currently unlocked Port                       |
| *1006       | Program DTMF Mute Timer                  | Programs the DTMF Mute Timer for the currently unlocked Port                             |
| *1007       | Program CTCSS Encode Timer               | Programs the CTCSS Encode Timer for the currently unlocked Port                          |
| *1013       | Program Aux Audio 1 Time Out Timer       | Programs how long Aux Audio 1 remains ON   |
| *1014       | Program Aux Audio 2 Time Out Timer       | Programs how long Aux Audio 2 remains ON   |
| *1015       | Program Aux Audio 3 Time Out Timer       | Programs how long Aux Audio 3 remains ON   |
| *1017xy     | Program General Timer Period             | Programs the General Timers timeout period   |
| *1018       | Program the Kerchunk Filter Delay Period | Programs the Kerchunk filtering time on the currently unlocked Port                      |
| *1019       | Set Pending ID Speak Timer               | Controls how Pending ID Voice/CW IDs are processed                                       |
| *1020       | Set Announce Timer                       | Sets how long Tail Message will play after repeater activity stops                       |
| *1021       | Set CTCSS Encode Control Polarity        | Sets whether the Encode Control Line is active high or active low                        |
| *1022       | Set Speech/CW Delay                      | Sets wait time before speech or CW if xmtr not currently active                          |
| *1024       | Set AutoPatch Timeout                    | Sets the autopatch timeout period.   |
| *1025x      | Set Autopatch Number of Rings            | Sets how many rings before the Autopatch answers   |
| *2050xx     | Program Command Macro Recall Code        | Programs the code used to recall remapped Command Macros                                 |
| *2051x      | Program Linked Ports Timeout             | Programs whether a linked Port will timeout from another Port                            |
| *2060       | Program Remote Base Prefix               | Programs the Prefix prepended to default Remote Base commands                            |
| *2061       | Program Autopatch Prefix Code            | Programs the Prefix prepended to Autopatch commands                                      |
| *2062       | Program Autopatch Blacklist              | Programs numbers to disallow from manually dialing                                       |
| *2063       | Program Autopatch Security Code          | Programs the code that must be entered when Autopatch answers                            |
| *2064       | Program A/D Channel                      | Programs the channel and meter face  |
| *2065       | Program Vref                             | Programs the voltage reference used for A/D measurements                                 |
| *2066       | Program Meter Alarm                      | Programs the high and low trippoints for the Meter Alarms                                |
| *2083       | Set Radio Type                           | Select which type of radio is used as a Remote Base                                      |
| *2084       | Set Yaesu Type                           | If Yaesu is selected, select which type format to use                                    |
| *2086       | Store Remote Base Memory                 | Store Remote Base frequency, CTCSS and offset in <i>controller's</i> non-volatile memory |
| *2087       | Store Kenwood V7/G707 Memory             | Store memory in radio itself   |
| *2088x      | Select CTCSS -COS or Courtesy Tone       | Select CTCSS encode timer after COS or after Courtesy Tone                               |
| *2089x      | CTCSS During ID                          | 1 = CTCSS During ID. 0 = no CTCSS During ID  |
| *2090x      | TT Mute on 1st or 2nd Digit              | 1 = 1st Digit, 2 = 2nd Digit   |
| *2091x      | Allow/Don't allow Terminator Speech      | Select if speech is generated even with Terminator. 1 = yes, 0 = no                      |
| *2092xy     | General Timer Macro Select               | Select which Command Macro a General Timer uses  |
| *2093x      | User DTMF Pad Test Prefix                | Program the prefix used for the DTMF Pad Test (1 - 5 digits)                             |
| *2101       | Program Falling Alarm Macro              | Selects which Macro to run on a High-to-low transition                                   |
| *2102       | Program Rising Alarm Macro               | Selects which Macro to run on a Low-to-high transition                                   |
| *2103       | Program Message Macros                   | Program the messages using in Message Macros   |
| *2104       | DTMF Regen Prefix                        | Programs the prefix to use to send regenerated DTMF to a Port                            |
| *2105       | Program DTMF Memory                      | Programs the DTMF sequence to be sent  |
| *2106       | Program Send DTMF Duration               | Programs the duration of transmitted DTMF digits   |
| *2107       | Program DTMF Pause Time                  | Programs the period between transmitted DTMF digits                                      |
| *2108x      | Program Pre Access Code                  | Programs whether all codes while unlocked use a prefix                                   |
| *2109x      | Program Pre Command Code                 | Programs whether there is access to default command when locked                          |
| *2110x      | Program Tail Message                     | Programs a Tail Message for the currently unlocked Port                                  |
| *2111x      | Select Tail Message                      | Selects Tail Message 1, 2 or 3 for the currently unlocked Port                           |
| *2112x      | Select Tail Counter                      | Sets the Tail Message Counter (0 to 254) 0 turns the counter OFF                         |
| *2113yxx    | Program Receiver Macro Function          | Program Receiver Active/Inactive Macro Function  |
| *2114x      | Port Inactivity Timeout Macro Select     | Select which Macro to run when a linked Port Timeout occurs                              |
| *2115x      | Autopatch Autodial Number Store          | Stores Autopatch Autodial numbers for automatic dialing                                  |
| *2116x      | Autopatch Port Restrictions              | Programs which port(s) the Autopatch may be used from                                    |
| *2117x      | User DTMF Out Port                       | Programs which port(s) User DTMF should be sent to.                                      |
| *2118x      | User DTMF Message Program                | Programs which Message Macro is spoken before DTMF sent                                  |
| *2119x      | Controls why fan starts                  | 0= start for all xmtr activity 1=start only for valid signal/AP/Aux Aud                  |
| *29999      | Say Version                              | Speak the Firmware version currently loaded  |

# Programming Commands Quick Reference (continued)

| <u>Code</u> | <u>What It Programs</u>                   | <u>What It Means</u>   |
|-------------|---|--|
| *2121x      | ID Timers start on COS or PTT             |  |
| *2122x      | Timeout Timer Reset Select                | Selects the point where the Timeout Timer is reset                   |
| *21999      | Reset Controller                          | Reset the controller   |
| *31CTx      | Program Courtesy Tone Segment 1           | Program Courtesy Tone x Segment 1                                    |
| *32CTx      | Program Courtesy Tone Segment 2           | Program Courtesy Tone x Segment 2                                    |
| *33CTx      | Program Courtesy Tone Segment 3           | Program Courtesy Tone x Segment 3                                    |
| *34CTx      | Program Courtesy Tone Segment 4           | Program Courtesy Tone x Segment 4                                    |
| *4001       | Program Scheduler                         | Program the Scheduler to run automated events                        |
| *4002       | Program A Macro                           | Program a series of functions into one macro command or remap        |
| *4003x      | Erase A Specific Command Macro            | Erase a previously stored Command Macro by Macro Number              |
| *400499     | Erase All Command Macros                  | Erase ALL Command Macros   |
| *4005       | Program Command Macro Port Restrictions   | Select which Ports a Command Macro can be called from                |
| *400699     | Erase All Command Macro Port Restrictions | Allows all Command Macros to be called from all Ports                |
| *400799     | Clear All Setpoints                       | Erases all programmed Scheduler Setpoints                            |
| *4008 x     | Readback Macro Contents                   | Reads back the contents of Macro x                                   |
| *4009x      | Program Macro Subset                      | Programs the range of Macros to use in Macro Subset                  |
| *4010xx     | Interrogate Scheduler Setpoint            | Determine if a Setpoint is set to RESUME or SUSPEND                  |
| *5100       | Set Time                                  | Sets the Real Time Clock   |
| *5101       | Set Date                                  | Sets the Calendar  |
| *5102x      | Say/Don't say year as part of date        | Enables/disables readback of the year when the date is spoken        |
| *5103x      | Select RTC 12/24 hour Readback            | Select Real Time Clock 12/24 hour Readback                           |
| *5104x      | Say Hours On/Off                          | Say "Hours" as part of 24 hour Readback. 1= ON, 0=OFF                |
| *5105x      | Bump Clock Seconds                        | Adds or subtracts x seconds from clock time (to allow "fine tuning") |
| *7001x      | Record DVR Message                        | Record a DVR Track x = Track 1 to 20                                 |
| *7002x      | Erase DVR Message                         | Erase a DVR Track x = Track 1 to 20                                  |
| *700399     | Erase ALL DVR Messages                    | Erases all DVR Tracks 1 to 20  |
| *7004x      | Remove last segment of DVR Message        | Remove the last 200 ms. of Track 1 to 20                             |
| *7005x      | Replace last segment of DVR Message       | Replace the last 200 ms. of Track 1 to 20                            |
| *70060      | Recall Seconds Left                       | Tells you the remaining recording time available                     |
| *8000       | Program CW Speed                          | Programs CW Speed of the currently unlocked Port                     |
| *8001       | Program CW Tone                           | Programs the CW Tone(s) frequency of the currently unlocked Port     |
| *8002       | Program CW ID 1                           | Programs the CW Message used for CW ID 1                             |
| *8003       | Program CW ID 2                           | Programs the CW Message used for CW ID 2                             |
| *8004       | Program Voice ID 1                        | Programs the message used for Voice ID 1                             |
| *8005       | Program Voice ID 2                        | Programs the message used for Voice ID 2                             |
| *8006       | Program Voice ID 3                        | Programs the message used for Voice ID 3                             |
| *8007       | Program ID Extras                         | Programs the Extra message for Voice IDs                             |
| *8008x      | Enable Voice IDs                          | Enables/Disables Voice IDs: 1 = Enabled, 0 = Disabled                |
| *9000       | Program Unlock Code                       | Programs the Unlock Code for the currently unlocked Port             |
| *9010x      | Program Lock Code                         | Programs the code to lock ALL ports                                  |
| *9020x      | Program DTMF Terminator                   | Programs the DTMF digit used to force command evaluation             |

## Resetting The Unlock Codes

Should you ever need to reset your unlock codes back to the factory defaults, you may do so without erasing your custom programming. You accomplish this by powering down the controller and temporarily removing the push-on jumper from Port 3's CTCSS polarity selection header (JP5 on version 2.8 pc board, JP8 on version 3.0, JP5 on 3.0a) and grounding Pin 2 (the center pin). Leaving the temporary jumper in place, power up the controller. After the controller speaks its version number and says "READY", all 3 Unlock codes will be set back to their default values. You may then remove the temporary ground connection and reinstall the push-on jumper.

# Vocabulary List

|     |           |     |              |     |                |
|-----|-----------|-----|--------------|-----|----------------|
| 000 | ZERO      | 057 | ACTIVE       | 114 | FEBRUARY       |
| 001 | ONE       | 058 | AFTERNOON    | 115 | FEET           |
| 002 | TWO       | 059 | ALERT        | 116 | FREQUENCY      |
| 003 | THREE     | 060 | ALL          | 117 | FRIDAY         |
| 004 | FOUR      | 061 | AMATEUR      | 118 | FROM           |
| 005 | FIVE      | 062 | AMPS         | 119 | FULL           |
| 006 | SIX       | 063 | AND          | 120 | GET            |
| 007 | SEVEN     | 064 | ANSWER       | 121 | GO             |
| 008 | EIGHT     | 065 | APRIL        | 122 | GOOD           |
| 009 | NINE      | 066 | ASSOCIATION  | 123 | HAM            |
| 010 | TEN       | 067 | AT           | 124 | HELLO          |
| 011 | ELEVEN    | 068 | AUGUST       | 125 | HELP           |
| 012 | TWELVE    | 069 | AUTO         | 126 | HERTZ          |
| 013 | THIRTEEN  | 070 | AUTOMATIC    | 127 | HIGH           |
| 014 | FOURTEEN  | 071 | AUXILARY     | 128 | HOLD           |
| 015 | FIFTEEN   | 072 | AVERAGE      | 129 | HOUR           |
| 016 | SIXTEEN   | 073 | A.M.         | 130 | INTERNET       |
| 017 | SEVENTEEN | 074 | BAND         | 131 | INTRUDER       |
| 018 | EIGHTEEN  | 075 | BASE         | 132 | IS             |
| 019 | NINETEEN  | 076 | BATTERY      | 133 | JANUARY        |
| 020 | TWENTY    | 077 | BELOW        | 134 | JULY           |
| 021 | THIRTY    | 078 | BUSY         | 135 | JUNE           |
| 022 | FOURTY    | 079 | BY           | 136 | LEFT           |
| 023 | FIFTY     | 080 | CALIBRATE    | 137 | LIGHT          |
| 024 | SIXTY     | 081 | CALL         | 138 | LINE           |
| 025 | SEVENTY   | 082 | CANCEL       | 139 | LINK           |
| 026 | EIGHTY    | 083 | CARRIER      | 140 | LOCK           |
| 027 | NINETY    | 084 | CAUTION      | 141 | LOW            |
| 028 | HUNDRED   | 085 | CHANGE       | 142 | MANUAL         |
| 029 | THOUSAND  | 086 | CHECK        | 143 | MARCH          |
| 030 | A         | 087 | CLEAR        | 144 | MAXIMUM        |
| 031 | B         | 088 | CLOCK        | 145 | MAY            |
| 032 | C         | 089 | CODE         | 146 | MEETING        |
| 033 | D         | 090 | COMPLETE     | 147 | MEGA           |
| 034 | E         | 091 | COMPUTER     | 148 | MESSAGES       |
| 035 | F         | 092 | CONNECT      | 149 | METER          |
| 036 | G         | 093 | CONNECTED    | 150 | MILES PER HOUR |
| 037 | H         | 094 | CONTROL      | 151 | MINIMUM        |
| 038 | I         | 095 | CONTROLLER   | 152 | MINUS          |
| 039 | J         | 096 | CURRENT      | 153 | MINUTES        |
| 040 | K         | 097 | DANGER       | 154 | MIX            |
| 041 | L         | 098 | DATE         | 155 | MONDAY         |
| 042 | M         | 099 | DAY          | 156 | MONITOR        |
| 043 | N         | 100 | DECEMBER     | 157 | MORNING        |
| 044 | O         | 101 | DEGREES      | 158 | MUTE           |
| 045 | P         | 102 | DEVIATION    | 159 | NEGATIVE       |
| 046 | Q         | 103 | DIRECTION    | 160 | NET            |
| 047 | R         | 104 | DISCONNECTED | 161 | NIGHT          |
| 048 | S         | 105 | DOWN         | 162 | NO             |
| 049 | T         | 106 | EAST         | 163 | NORTH          |
| 050 | U         | 107 | ECHO         | 164 | NOT            |
| 051 | V         | 108 | EMERGENCY    | 165 | NOVEMBER       |
| 052 | W         | 109 | ENTER        | 166 | NUMBER         |
| 053 | X         | 110 | EQUAL        | 167 | OCLOCK         |
| 054 | Y         | 111 | ERROR        | 168 | OCTOBER        |
| 055 | Z         | 112 | EVENING      | 169 | OF             |
| 056 | ABOVE     | 113 | FAILURE      | 170 | OFF            |

|     |             |     |                  |
|-----|-------------|-----|------------------|
| 171 | ON          | 231 | WEST             |
| 172 | OPERATOR    | 232 | YESTERDAY        |
| 173 | OUT         | 233 | ZULU             |
| 174 | OVER        | 234 | S (makes plural) |
| 175 | PATCH       | 235 | SILENCE (pause)  |
| 176 | PERCENT     |     |                  |
| 177 | PHONE       | 236 | DVR TRACK 1      |
| 178 | PLEASE      | 237 | DVR TRACK 2      |
| 179 | PLUS        | 238 | DVR TRACK 3      |
| 180 | POINT       | 239 | DVR TRACK 4      |
| 181 | PORT        | 240 | DVR TRACK 5      |
| 182 | POWER       | 241 | DVR TRACK 6      |
| 183 | PROGRAM     | 242 | DVR TRACK 7      |
| 184 | P.M.        | 243 | DVR TRACK 8      |
| 185 | RADIO       | 244 | DVR TRACK 9      |
| 186 | READY       | 245 | DVR TRACK 10     |
| 187 | RECEIVE     | 246 | DVR TRACK 11     |
| 188 | REMOTE      | 247 | DVR TRACK 12     |
| 189 | REPEAT      | 248 | DVR TRACK 13     |
| 190 | REPEATER    | 249 | DVR TRACK 14     |
| 191 | SATURDAY    | 250 | DVR TRACK 15     |
| 192 | SECONDS     | 251 | DVR TRACK 16     |
| 193 | SELECT      | 252 | DVR TRACK 17     |
| 194 | SEPTEMBER   | 253 | DVR TRACK 18     |
| 195 | SET         | 254 | DVR TRACK 19     |
| 196 | SKYWARN     | 255 | DVR TRACK 20     |
| 197 | SOUTH       |     |                  |
| 198 | SQUELCH     |     |                  |
| 199 | START       |     |                  |
| 200 | STOP        |     |                  |
| 201 | SUNDAY      |     |                  |
| 202 | SYSTEM      |     |                  |
| 203 | TEMPERATURE |     |                  |
| 204 | THANK YOU   |     |                  |
| 205 | THE (long)  |     |                  |
| 206 | THE (short) |     |                  |
| 207 | THE TIME IS |     |                  |
| 208 | THIS        |     |                  |
| 209 | THURSDAY    |     |                  |
| 210 | TIME        |     |                  |
| 211 | TIMEOUT     |     |                  |
| 212 | TIMER       |     |                  |
| 213 | TODAY       |     |                  |
| 214 | TOMORROW    |     |                  |
| 215 | TONE        |     |                  |
| 216 | TONIGHT     |     |                  |
| 217 | TRANSMIT    |     |                  |
| 218 | TUESDAY     |     |                  |
| 219 | UNDER       |     |                  |
| 220 | UP          |     |                  |
| 221 | USE (noun)  |     |                  |
| 222 | USE (verb)  |     |                  |
| 223 | VOLTAGE     |     |                  |
| 224 | VOLTS       |     |                  |
| 225 | WAIT        |     |                  |
| 226 | WARNING     |     |                  |
| 227 | WATTS       |     |                  |
| 228 | WEATHER     |     |                  |
| 229 | WEDNESDAY   |     |                  |
| 230 | WELCOME     |     |                  |

# The RC210 Development And Testing Team

## Programmers:

Ken Arck, AH6LE (formerly WA6EMV), CTO Arcom Communications  
Jeffrey G. Towle, Ph.D., W6FCC (formerly WA4EGT), InterFlex Systems Design Corp  
Les Fenison, KD7RY  
Terry, NQ4Y

## Testers:

Danny Hampton K4ITL  
Terry Bartholomew NQ4Y  
Dave Hartley K5OZ  
Kris Schatz KR7IS

# **ARCOM COMMUNICATIONS NO-NONSENSE LICENSE AGREEMENT FOR THE OPERATING FIRMWARE OF THE RC210 REPEATER CONTROLLER**

## **IMPORTANT - READ CAREFULLY**

This license statement and limited warranty constitutes a legal agreement ("License Agreement") between you (either as an individual or a single entity) and Arcom Communications for the software product ("Firmware") identified above, including any software, media, and accompanying on-line or printed documentation.

BY DOWNLOADING OR OTHERWISE USING THE FIRMWARE, YOU AGREE TO BE BOUND BY ALL OF THE TERMS AND CONDITIONS OF THIS LICENSE AGREEMENT.

Upon your acceptance of the terms and conditions of the License Agreement, Arcom Communications grants you the right to use the Firmware in the manner provided below.

This Firmware is owned by Arcom Communications and is protected by copyright law and international copyright treaty. Therefore, you must treat this Firmware like any other copyrighted material (e.g., a book), except that you may either make copies of the Firmware solely for backup or archival purposes or transfer the Firmware to a single hard disk provided you keep the original solely for backup or archival purposes.

You may transfer the Firmware and documentation on a permanent basis provided you retain no copies and the recipient agrees to the terms of this License Agreement. Except as provided in this License Agreement, you may not transfer, rent, lease, lend, copy, modify, translate, sublicense, time-share or electronically transmit or receive the Firmware, media or documentation.

TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, ARCOM COMMUNICATIONS DISCLAIMS ALL OTHER WARRANTIES AND CONDITIONS, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE, AND NON-INFRINGEMENT, WITH REGARD TO THE FIRMWARE, AND THE PROVISION OF OR FAILURE TO PROVIDE SUPPORT SERVICES. THIS LIMITED WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS. YOU MAY HAVE OTHERS, WHICH VARY FROM STATE/JURISDICTION TO STATE/JURISDICTION.

LIMITATION OF LIABILITY TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, IN NO EVENT SHALL ARCOM COMMUNICATIONS OR ITS SUPPLIERS BE LIABLE FOR ANY SPECIAL, INCIDENTAL, INDIRECT, OR CONSEQUENTIAL DAMAGES WHATSOEVER (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF BUSINESS INFORMATION, OR ANY OTHER PECUNIARY LOSS) ARISING OUT OF THE USE OF THE FIRMWARE OR INABILITY TO USE THE FIRMWARE PRODUCT OR THE PROVISION OF OR FAILURE TO PROVIDE SUPPORT SERVICES, EVEN IF ARCOM COMMUNICATIONS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.