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RC210 Repeater Controller

Operations and Programming Manual
Firmware version 4.65

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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.

1101 Port 1 Receiver Enable*	**2101** Port 2 Receiver Enable*	**3101** Port 3 Receiver Enable*
1100 Port 1 Receiver Disable	**2100** Port 2 Receiver Disable	**3100** 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

1111 Port 1 Enable*	**2111** Port 2 Enable*	**3111** Port 3 Enable*
1110 Port 1 Disable	**2110** Port 2 Disable	**3110** Port 3 Disable

Carrier/CTCSS Access

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

1121 Port 1 CTCSS	**2121** Port 2 CTCSS *	**3121** Port 3 CTCSS
1120 Port 1 Carrier*	**2120** Port 2 Carrier*	**3120** Port 3 Carrier*

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".

1131 Port 1 Touchtone© Covertone ON*	**2131** Port 2 Touchtone© Covertone ON*	**3131** Port 3 Touchtone© Covertone ON*
1130 Port 1 Touchtone© Covertone OFF	**2130** Port 2 Touchtone© Covertone OFF	**3130** Port 3 Touchtone© Covertone OFF

Supervisory Commands (continued)

Courtesy Tone Selection

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

1134x Port 1 Courtesy Tone Select x = 1-10 (1*)	**2134x** Port 2 Courtesy Tone Select x = 1-10 (1*)	**3134x** Port 3 Courtesy Tone 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.

1151 Port 1 Kerchunk Filter On	**2151** Port 2 Kerchunk Filter On	**3151** Port 3 Kerchunk Filter On
1150 Port 1 Kerchunk Filter Off*	**2150** Port 2 Kerchunk Filter Off*	**3150** 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.

1141 Port 1 Repeat*	**2141** Port 2 Repeat	**3141** Port 3 Repeat
1140 Port 1 Non-Repeat	**2140** Port 2 Non-Repeat *	**3140** 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.

1191 Monitor Mix*	**2191** Monitor Mix*	**3191** Monitor Mix*
1190 Monitor Mute	**2190** Monitor Mute	**3190** Monitor Mute

Mute DTMF ON/OFF

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

1211 Mute DTMF ON*	**2211** Mute DTMF ON*	**3211** Mute DTMF ON*
1210 Mute DTMF OFF	**2210** Mute DTMF OFF	**3210** 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.

1201 Speech Override ON	**2201** Speech Override ON	**3201** Speech Override ON
1200 Speech Override OFF*	**2200** Speech Override OFF*	**3200** 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.

1181 Speech ID Override ON* **2181** Speech ID Override ON* **3181** Speech ID Override ON*
1180 Speech ID Override OFF **2180** Speech ID Override OFF **3180** 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.

1161 Port 1 DTMF Enable* **2161** Port 2 DTMF Enable* **3161** Port 3 DTMF Enable*
1160 Port 1 DTMF Disable **2160** Port 2 DTMF Disable **3160** 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.

1170 Port 1 no CTCSS for DTMF* **2170** Port 2 no CTCSS for DTMF* **3170** Port 3 no CTCSS for DTMF*
1171 Port 1 CTCSS for DTMF **2171** Port 2 CTCSS for DTMF **3171** 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

1221 Port 1 DTMF Command Evaluation on CTCSS Closure
2221 Port 2 DTMF Command Evaluation on CTCSS Closure
3221 Port 3 DTMF Command Evaluation on CTCSS Closure

1220 Port 1 DTMF Command Evaluation on COS Closure
2220 Port 2 DTMF Command Evaluation on COS Closure
3220 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	**2301** Monitor Port 1 From Port 2 ON	**3301** Monitor Port 1 From Port 3 ON
1300 Monitor Port 2 From Port 1 OFF*	**2300** Monitor Port 1 From Port 2 OFF*	**3300** Monitor Port 1 From Port 3 OFF*
1311 Monitor Port 3 From Port 1 ON	**2311** Monitor Port 3 From Port 2 ON	**3311** Monitor Port 2 From Port 3 ON
1310 Monitor Port 3 From Port 1 OFF*	**2310** Monitor Port 3 From Port 2 OFF*	**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		**A10**	Unlink Port 1 from Port 2*
A21	Link Port 1 to Port 3		**A20**	Unlink Port 1 from Port 3*
A31	Link Port 2 to Port 3		**A30**	Unlink Port 2 from Port 3*
A41	Link all ports to all other ports		**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.

1961   Turn Auxiliary Audio Input 1 ON   **3961**   Turn Auxiliary Audio Input 3 ON
1960   Turn Auxiliary Audio Input 1 OFF   **3960**   Turn Auxiliary Audio Input 3 OFF
2961   Turn Auxiliary Audio Input 2 ON
2960   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).

1810 Logic Output 1 Open Collector   **1850** Logic Output 5 Open Collector
1811 Logic Output 1 Low   **1851** Logic Output 5 Low
1812 Logic Output 1 Pulsed (open, low, open)   **1852** Logic Output 5 Pulsed (open, low, open)

1820 Logic Output 2 Open Collector   **1860** Logic Output 6 Open Collector
1821 Logic Output 2 Low   **1861** Logic Output 6 Low
1822 Logic Output 2 Pulsed (open, low, open)   **1862** Logic Output 6 Pulsed (open, low, open)

1830 Logic Output 3 Open Collector   **1870** Logic Output 7 Open Collector
1831 Logic Output 3 Low   **1871** Logic Output 7 Low
1832 Logic Output 3 Pulsed (open, low, open)   **1872** Logic Output 7 Pulsed (open, low, open)

1840 Logic Output 4 Open Collector
1841 Logic Output 4 Low
1842 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 explained in the Hardware Reference section of this manual, you have a total of 16 Extended Logic Outputs available.

180xxy   Logic Output xx (1-16) 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

1400 (channel 1 - 8)	Readback current value
1400 (channel 1 - 8) 1	Readback stored LOW value
1400 (channel 1 - 8) 2	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.

1911	Alarm 1 Enabled	**4911**	Alarm 4 Enabled	**2913**	Alarm 2 Interrogate
1910	Alarm 1 Disabled	**4910**	Alarm 4 Disabled	**3913**	Alarm 3 Interrogate
2911	Alarm 2 Enabled	**5911**	Alarm 5 Enabled	**4913**	Alarm 4 Interrogate
2910	Alarm 2 Disabled	**5910**	Alarm 5 Disabled	**5913**	Alarm 5 Interrogate
3911	Alarm 3 Enabled				
3910	Alarm 3 Disabled	**1913**	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._**

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   *Note: the offset must always be entered, even if*
 A 7 1 4 4 8 3 2 5 1 = 448.325 minus offset   *if you are not in FM mode.*
 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

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

CTCSS Entry

A72xxy   Enter CTCSS code and select encode and/or decode. The 2 digit code used for a particular frequency is
     shown in Appendix B. Y =:
0 = No Tone
1 = Encode only
2 = Encode/Decode

Examples:
 A 7 2 1 2 1 = 100.0 Hz encode only   *Note: To turn off CTCSS, enter "01" for the frequency code*
 A 7 2 1 9 2 = 127.3 Hz encode/decode   *and 0*
 A 7 2 0 1 0 = CTCSS off

Mode Entry

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

Memory Selection (Internal RC210 Memories)

The RC210 allows you to recall up to 10 previously stored Remote Base Memories (see the Programming section of this manual for details on storing Remote Base Memories). 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.

A75x   Recall Remote Base Memories 1 to 10 (this command only affects NON-DOUG HALL supported radios)

Memory Recall When Using the Kenwood TM-V7a/TM-G707/TM-271A/TM-471A

When either 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 radio has 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

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

Kenwood	Doug Hall
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

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. This 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:

- **A Command Macro may call any other Command Macro, regardless of whether it's a Long or Short Macro**

- **Any Macro Command Function that is numbered higher than 255 requires two slots, while those lower than 254 only require one. That is to say that you can only fit two functions with a number higher than 254 into a Short Macro.**

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, 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, 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, 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.

AA1	The currently unlocked port CWID # 1
AA2	The currently unlocked port CWID # 2
AA3	The currently unlocked port Voice ID # 1
AA4	The currently unlocked port Voice ID # 2
AA5	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.

15281	Port 1 default unlock code
25281	Port 2 default unlock code
35281	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 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 permissable), 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 UNLOCKED. 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 TIMER SET". **Note: setting the timer to 0 give 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 "TIMEOUT SET". **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 "IID TIMER SET".

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 "PID TIMER SET".

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 seconds. 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 254, CTCSS encode will never occur. If programmed to 255, 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 is 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 of 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 minutes 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 10 162 187 122 391 411   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 11 118 394   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 15   Program Timer 1 to 15 minutes

Next, we program Timer 1 to run Macro 11

*2092 1 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 Control Programming (continued)

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. This helps to eliminate sometimes annoying crashes as the user radio's squelch closes by allowing them to turn on their CTCSS decode function.

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

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 where "hh" is the hours in 24 hour time and "mm" is the minutes. Both must consist of 2 digits

Examples:

*5100 01 22	Set the clock to 1:22 AM
*5100 15 04	Set the clock to 3:04 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:

*5101 06 11 03	Set June 11, 2003 as the current date
*5101 10 04 11	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.

*51020	Turn OFF year readback
*51021	Turn ON year readback

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 60 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.

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.

ID On A Non-Repeating Port

By default, IDs are not normally sent out a port not programmed to repeat. Under some circumstances (such as a link radio), you may want to properly ID a non-repeater Port. All the normal rules regarding ID's apply under this circumstance.

*2113x where X = 1 for half-duplex IDs or 0 for no half-duplex IDs

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

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

Which Version Firmware Is Installed?

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

*299999   Speak Version Number

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	***for Kenwood radios with a computer comport, the RC210 uses a baud rate of 9600**
2 = Icom	***The RC210 expects to see an Icom radio as the CI-V address of 48H with the baud**
3 = Yaesu	**rate set to "Auto". Yaesu radios should be set to a 4800 baud rate.**
4 = Kenwood V7a	***this supports the Kenwood TM-V7a mobile dual-band transceiver**
5 = Doug Hall RBI-1	
7 = Kenwood g707	***this supports the Kenwood TM-g707 mobile dual-band transceiver**
8 = Kenwood 271A	***this supports the Kenwood single band mobile TM-271A**

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-847, FT-857, FT-897

Selecting RS232 or I/O Control Connector

When controlling a Kenwood mobile radio for use as a remote base (TM-V7a/TM-g707/TM-271/TM-471), you may select which connector to use for communications with the radio. Some owners prefer using the RC210's built-in RS232 serial port while others prefer the I/O connector, because it allows the serial port to be used full-time for other things, such as an RCP connection. (see the Hardware Manual for details).

You may select which connector to use with the following command:

*2082x where x = 0, means to use RS232 and x = 1 to use I/O

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.

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

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 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 22).

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 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.

Note: Long Macros will accept up to 15 3 digit function numbers while Short Macros will accept up to 4. Going over these limits will cause the controller to say "ERROR" and that Macro will not be stored.

Note: Macro Function Numbers above 255 use 2 slots in a Command Macro.

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 002, 019 and 059. We enter - all in one transmission:

*4002 02 002 019 061

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

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 is 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

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* 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.

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 called Command Macros, we need a way to tell the RC210 which port(s) should be used when sending a speech announcement, otherwise it will not know which one!

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

162	Port 1	**166**	Ports 1 & 3
163	Port 2	**167**	Ports 2 & 3
164	Port 3	**168**	All Ports
165	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

FN	Description	FN	Description
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		

FN	Description	FN	Description
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	Require CTCSS Port 1	237	Enable Receiver Port 2
176	Require CTCSS Port 2	238	Enable Receiver Port 3
177	Require CTCSS Port 3	239	Disable Receiver Port 1
178	Do not require CTCSS Port 1	240	Disable Receiver Port 2
179	Do not require CTCSS Port 2	241	Disable Receiver Port 3
180	Do not require CTCSS Port 3		

FN	Description	FN	Description
242	Port 1Speech 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	391	Stop General Timer 1
296	Disable Meter 1 Alarm	392	Stop General Timer 2
297	Disable Meter 2 Alarm	393	Stop General Timer 3

351 - 370 Suspend Scheduler Setpoint 1 - 20
371 - 390 Resume Scheduler Setpoint 1- 20

401 - 490   Macro 1 - 90 (these codes can only be used inside another macro. It is not possible to recall them directly)

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 is programmed to use one of the 40 Message Macros.

*2110 x y where x is the Tail Message number (1 - 3) and y is the Message Macro to use (1 - 40).

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 Timer 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" and store this into Message Macro 1:

*2103 01 236

Now we program Tail Message 1 to use Message Macro 1

*2110 1 1

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:

*2111 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 Timer:

*2111 5

Lastly, we program the Periodic Message Timer to 300 seconds:

*1020 300

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 30 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

252	Stop ID And Disable Timeout Timer Port 1
253	Stop ID And Disable Timeout Timer Port 2
254	Stop ID And Disable Timeout Timer Port 3
256	Resume ID And Re-Enable Timeout Timer Port 1
257	Resume ID And Re-Enable Timeout Timer Port 2
258	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 30 minutes, you can simply run Command Macro 11 again to restart the 30 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, 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 y y where "xx " is the number of the memory (01-20) 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 miliseconds.

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 message stored in a Message Macro, to be played before the DTMF is sent.

*2118x   Play Message Macro 1 - 40 before sending DTMF. Programming to a 0 results in no message.

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 is the day of week:

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

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.

First, we program up the needed macros:

*4002 02 162 116   ←Macro 2 calls Say Time on Port 1
*4002 03 371   ←Macro 3 sets the Resume flag
*4002 04 351   ←Macro 4 sets the Suspend flag

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:

Setpoint	Time	Day	Macro	Description
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

Voice IDs

Command	Description	Maximum Number Of Words
*8004	Voice ID #1	22
*8005	Voice ID #2	22
*8006	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

Enable/Disable Non-Repeat IDs

Normally, the RC210 will only send IDs to those ports which are programmed to operate as a repeater. However there are times that it is desirable to have a non-repeating port ID, such as when used for point-to-point links. By using the programming command, you can select to have a non-repeating port have IDs.

*2113x where x = 1 to ID a non-repeating port and 0 = to not ID

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				
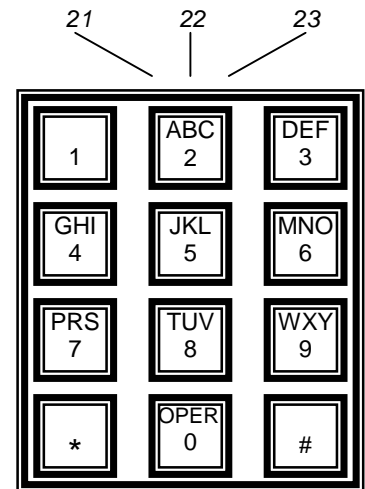
Using The Digital Voice Recorder (DVR)

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 all of them.

*2100 x y where "x" is the audio input and "y" is the port(s) that is sent the audio

x = 1 Aux Input 1	**y** = 1 Port 1
x = 2 Aux Input 2	**y** = 2 Port 2
x = 3 Aux Input 3	**y** = 3 Port 3
	y = 12 Ports 1 & 2
	y = 13 Ports 1 & 3
	y = 123 Ports 1, 2 & 3

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 1st tone segment
Delay time from the end of the first tone segment.
A 2nd tone segment
Delay time from the end of the 2nd tone segment
A 3rd tone segment
Delay time from the end of the 3rd segment
A 4th tone segment
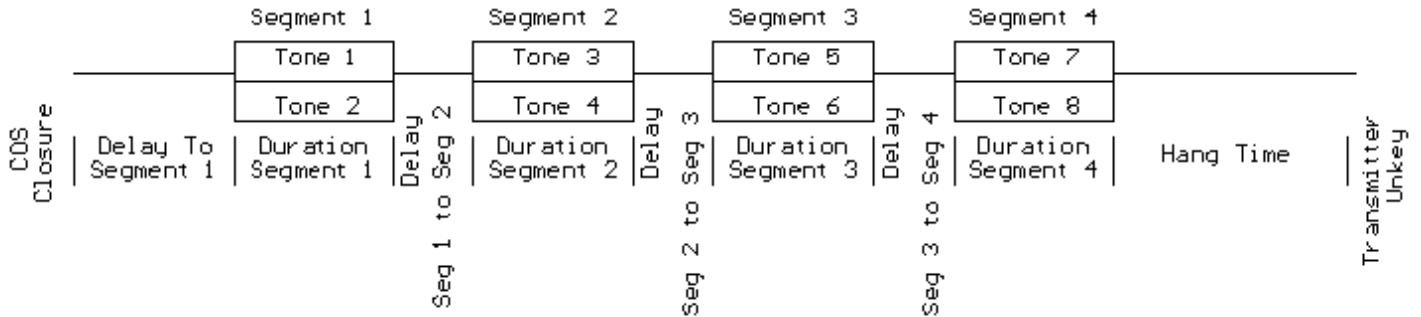
To program the courtesy tones, the following command is used. Each of the 4 segments have their own programming code.

*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 10 meter alarms, 1 through 10
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 x 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, Vref, 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 Vref, 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 Vref (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 Vref) 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 Vref 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 Vref 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 watts) / (800 divisions) = 0.125 watts per "division". As you can see, a sensor that uses more of the Vref voltage range increases the precision of your measurement.

In conclusion, the RC210 can resolve a sensor voltage change of as small as Vref / 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 Vref 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 Vref: 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 Vref. The example below shows how to enter this measured Vref.

*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 Vref.

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 ¼ 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.ah6le.net/arcom/rc210/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
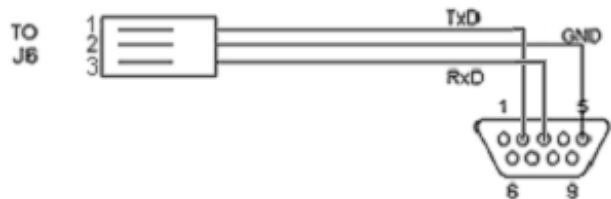
Downloading Firmware Updates

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.ah6le.net/arcom/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
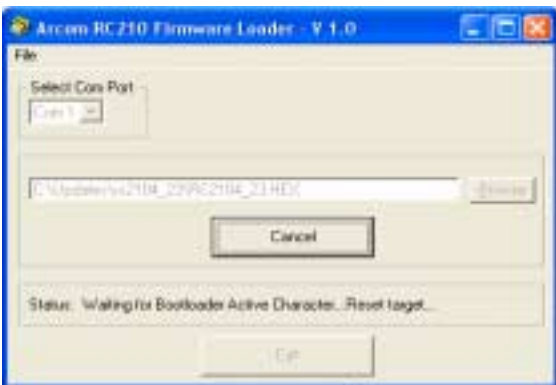
You'll notice the Status Line will inform you of the current status.

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 - IC706MKIIg, 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)

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

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

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

#	Freq	#	Freq	#	Freq	#	Freq
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:

Code	Description	Code	Description	Code	Description
15281	Port 1 Unlock	1170	Port 1 no PL for DTMF	1400x	Read Meter
25281	Port 2 Unlock	2170	Port 2 no PL for DTMF	1500x	Reset Meter hi/low value
35281	Port 3 Unlock	3170	Port 3 no PL for DTMF	1600x	Meter Alarm ON/OFF
1100	Port 1 Receiver Disable	1171	Port 1 PL for DTMF	2700	Allow DTMF into Phone Line
2100	Port 2 Receiver Disable	2171	Port 2 PL for DTMF	2701	Mute DTMF into Phone Line
3100	Port 3 Receiver Disable	3171	Port 3 PL for DTMF		
				2800	Macro Subset OFF
1101	Port 1 Receiver Enable	1180	Port 1 Speech ID Over Off	2801	Macro Subset ON
2101	Port 2 Receiver Enable	2180	Port 2 Speech ID Over Off		
3101	Port 3 Receiver Enable	3180	Port 3 Speech ID Over Off	1700	Say Time
				1701	Say Date
1110	Port 1 Transmitter Disable	1181	Port 1 Speech ID Over On		
2110	Port 2 Transmitter Disable	2181	Port 2 Speech ID Over On	181yx	UF1(y) to UF7(y)
3110	Port 3 Transmitter Disable	3181	Port 3 Speech ID Over On	180	UF Extended
1111	Port 1 Transmitter Enable	1190	Port 1 Monitor Mute	A71	Remote Base Frequency
2111	Port 2 Transmitter Enable	2190	Port 2 Monitor Mute	A72	Remote Base CTCSS
3111	Port 3 Transmitter Enable	3190	Port 3 Monitor Mute	A73	Remote Base Mode
				A74	Doug Hall User Function
1120	Port 1 Carrier Access	1191	Port 1 Monitor Mix	A75x	Memory Select
2120	Port 2 Carrier Access	2191	Port 2 Monitor Mix	A76x	Doug Hall Memory Select
3120	Port 3 Carrier Access	3191	Port 3 Monitor Mix	A77x	V7a/G707 Memory Recall
				A79x	RB Power Select
1121	Port 1 CTCSS Access	1200	Port 1 Speech Over Off		
2121	Port 2 CTCSS Access	2200	Port 2 Speech Over Off	1910	Alarm 1 Off
3121	Port 3 CTCSS Access	3200	Port 3 Speech Over Off	1911	Alarm 1 On
				2910	Alarm 2 Off
1130	Port 1 Covertone Off	1201	Port 1 Speech Over On	2911	Alarm 2 On
2130	Port 2 Covertone Off	2201	Port 2 Speech Over On	3910	Alarm 3 Off
3130	Port 3 Covertone Off	2201	Port 3 Speech Over On	3911	Alarm 3 On
				4910	Alarm 4 Off
1131	Port 1 Covertone On	1210	Port 1 DTMF Mute Off	4911	Alarm 4 On
2131	Port 2 Covertone On	2210	Port 2 DTMF Mute Off	5910	Alarm 5 Off
3131	Port 3 Covertone On	3210	Port 3 DTMF Mute Off	5911	Alarm 5 On
1134x	Port 1 CT Select	1211	Port 1 DTMF Mute On	A11	Link Port 1 & Port 2
2134x	Port 2 CT Select	2211	Port 2 DTMF Mute On	A21	Link Port 1 & Port 3
3134x	Port 3 CT Select	3211	Port 3 DTMF Mute On	A31	Link Port 2 & Port 3
				A41	Link All Ports
1140	Port 1 Half Duplex	1220	Port 1 DTMF on CTCSS		
2140	Port 2 Half Duplex	2220	Port 2 DTMF on CTCSS	A10	UnLink Port 1 & Port 2
3140	Port 3 Half Duplex	3220	Port 3 DTMF on CTCSS	A20	UnLink Port 1 & Port 3
				A30	UnLink Port 2 & Port 3
1141	Port 1 Full Duplex	1221	Port 1 DTMF on COS	A40	Unlink All Ports
2141	Port 2 Full Duplex	2221	Port 2 DTMF on COS		
3141	Port 3 Full Duplex	3221	Port 3 DTMF on COS	1960	Aux Audio 1 Off
				1961	Aux Audio 1 On
1150	Port 1 Kerchunk Off			2960	Aux Audio 2 Off
2150	Port 2 Kerchunk Off	1300	Port 1 To Port 2 Off	2961	Aux Audio 2 On
3150	Port 3 Kerchunk Off	1301	Port 1 To Port 2 On	3960	Aux Audio 3 Off
		1310	Port 3 To Port 1 Off	3961	Aux Audio 3 On
1151	Port 1 Kerchunk On	1311	Port 3 To Port 1 On		
2151	Port 2 Kerchunk On				
3151	Port 3 Kerchunk On	2300	Port 2 To Port 1 Off	**10901 to 109090**	
		2301	Port 2 To Port 1 On	Recall Macro 1 to 90	
		2310	Port 2 To Port 3 Off		
1160	Port 1 DTMF Disable	2311	Port 2 To Port 3 On		
2160	Port 2 DTMF Disable				
3160	Port 3 DTMF Disable	3300	Port 3 To Port 1 Off		
		3301	Port 3 To Port 1 On		
1161	Port 1 DTMF Enable	3310	Port 3 To Port 2 Off		
2161	Port 2 DTMF Enable	3311	Port 3 To Port 2 On		
3161	Port 3 DTMF Enable				

Programming Commands Quick Reference

Code	What It Programs	What It Means
*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
*2082x	Select Remote Base Program Port	Selects to use RS232 or I/O for programming Remote Base
*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 *controller's* 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 DTMD Pad Test (1 - 5 digits)
*2100	Set Aux Audio Port Routing	Set the port(s) to which the Aux audio should be sent
*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	USER DTMF Prefix	Programs the prefix to use before any default command
*2105	Program DTMF Memory	Programs the DMTF 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
*2113x	Non-Repeat IDs ON/OFF	Allows/Disallows IDs to be sent out a non-repeating port
*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)

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

167	OCLOCK		224	VOLTS
168	OCTOBER		225	WAIT
169	OF		226	WARNING
170	OFF		227	WATTS
171	ON		228	WEATHER
172	OPERATOR		229	WEDNESDAY
173	OUT		230	WELCOME
174	OVER		231	WEST
175	PATCH		232	YESTERDAY
176	PERCENT		233	ZULU
177	PHONE		234	S (makes plural)
178	PLEASE		235	SILENCE (pause)
179	PLUS			
180	POINT		236	DVR TRACK 1
181	PORT		237	DVR TRACK 2
182	POWER		238	DVR TRACK 3
183	PROGRAM		239	DVR TRACK 4
184	P.M.		240	DVR TRACK 5
185	RADIO		241	DVR TRACK 6
186	READY		242	DVR TRACK 7
187	RECEIVE		243	DVR TRACK 8
188	REMOTE		244	DVR TRACK 9
189	REPEAT		245	DVR TRACK 10
190	REPEATER		246	DVR TRACK 11
191	SATURDAY		247	DVR TRACK 12
192	SECONDS		248	DVR TRACK 13
193	SELECT		249	DVR TRACK 14
194	SEPTEMBER		250	DVR TRACK 15
195	SET		251	DVR TRACK 16
196	SKYWARN		252	DVR TRACK 17
197	SOUTH		253	DVR TRACK 18
198	SQUELCH		254	DVR TRACK 19
199	START		255	DVR TRACK 20
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			

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