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RC810 Repeater Controller

Operations and Programming Manual

Radio Card Firmware version 3.868

Motherboard Firmware version 3.868

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Explanation of Terms Used In This Manual

Throughout this Manual, the following terms will be used.

Ports:

Ports may be referred to as *Ports, Radio Cards* or simply *Cards.* These are the daughterboards that actually interface with the radio connected to them. They plug into the Motherboard via a 26 pin connector and receive power and various logic/audio signals from it.

Radio Connector

The female DB9 on the Radio Card to which the radio/repeater connects.

Radio Logic Connector

The male DB9 on the Radio Card which supplies all logic and A/D Inputs for that Port.

Motherboard

The main circuit board to which the Daughterboards connect, which supervises the operation of each of the Radio Cards and provides various voltages and other signals to them.

Serial Port

This refers to the RS232 DB9 on the Motherboard

USB Port

The USB Type 2 connector on the Motherboard.

IO Port

The DB25 connector on the Motherboard.

Introduction

Congratulations on your purchase of one of the most powerful repeater controllers on the market today.

The RC810 represents a breakthrough in repeater controller design and technology through the use of a dedicated speech system, DVR and tone generator on a per port basis. In most other controllers, these sub systems must be shared amongst the various radio ports which means that one Port must wait for another Port to stop doing something before *it* can take that action. If your repeater system consists of more than one repeater, this means periods of dead air and delays while the other repeater speaks or sends a Courtesy Tone or CW ID. In the RC810, since each port has its own speech and tone generation dedicated solely to that Port, there is no need to wait. This means no delays, no dead air and the equivalent of having up to 8 completely independent repeater controllers in 2U rack mount cabinet. Of course, all Ports may be linked and unlinked in any combination as may be needed.

Each Radio Card contains a complete repeater controller unto itself (as explained above).

The RC810 continues the Arcom tradition by making updates to the operating firmware available for free to purchasers of the RC810. As updates become available, they are posted on our website and available free of charge to any RC810 owner. Installing updates requires no more than a computer running Windows 95/98/NT/2000/XP with a serial (or USB) port. You just download the free update and upload it into your RC810 in minutes!

The RC810 comes with 4 Radio Cards (Ports) installed and may be expanded up to a total of 8 Ports. Additionally if you have an Ethernet connection available, an optional LAN Card allows for remote programming of your RC810. This allows for easy configuration of the RC810 using your computer's web browser. Such communications is password protected as well as encrypted for complete security. The optional IDE Card allows for additional memory storage through the use of compact flash memory.

Description of Features Of Ports

Each installed Port in the RC810 may be configured as a standalone repeater, half or full-duplex link or remote base and may be operated independently or in unison with any other. Programming of each of these features and functions is done via DTMF commands or via a computer running Windows® and our MultiLoader© software (available Winter 2008).

Each Port provides the following features:

Programmable MultiLevel Squelch

The on-card squelch may be programmed to control the receiver audio gate close time. This allows for signals of varying strength to control the amount of delay. If the signal is below the programmed threshold level, there is a squelch tail of X milliseconds (X being programmable). If the signal is above this programmed threshold level, the audio gate is closed immediately, resulting in no squelch burst.

Programmable CTCSS/DCS Encoder/Decoder

The on-card Encoder/Decoder allows you program up to 16 CTCSS/DCS decode tones in any combination that may be used to control access. Additionally, up to 16 CTCSS/DCS encode tones in any combination may be generated and sent to the transmitter based on which tone is received (Multi Table)

On-Card Squelch and CTCSS/DCS or External Signals

You have full control of whether to use the on-card resources or if you prefer, you can select to use your external COS and CTCSS/DCS decode signals as well as controlling your external CTCSS/DCS encoder. If you opt to use the on-card resources, all you need to supply from your receiver is unfiltered (non de-emphasized) and ungated discriminator audio.

Filtering of CTCSS and DCS

Audio from the receiver may be programmed to filter CTCSS/DCS signals or allow CTCSS/DCS to pass through the audio chain of the controller.

Speech and DVR

Each Port contains its own 450+ plus “canned vocabulary” non-synthesized speech generator. In addition, 4 minutes of Digital Voice Recorder (DVR) time divided into 40 tracks is available ON EACH RADIO CARD. Playback of DVR Tracks and Vocabulary on a particular Card may be done from any installed Port.

DTMF Decoder

The dedicated DTMF decoder is fully buffered, allowing for “stringing” commands together. This means that each valid command is processed in the order it was received. The on-card DTMF Tone Generator allows DTMF digits to be transmitted with constant level, tone duration and spacing. This eliminates errors caused by noisy signals and inconsistent DTMF tone duration. Muting of audio upon the receipt of DTMF is selectable, as is a cover tone if muting is enabled.

DTMF Encoding

The DTMF encoder ensures constant and reliable DTMF tone generation that may be directed out any Port of your choice.

Description of Features Of Ports (continued)

Pre-Emphasis And De-Emphasis

Standard EIAA de-emphasis may be individually selected for receiver audio, the DTMF decoder, and DVR recordings. Additionally, pre-emphasis may also be individually selected for the tone generator, for Vocabulary and DVR playback. These individual settings allow for complete control of your audio chain as needed, depending on receiver audio source and transmitter modulation method. Selections are made via DIP switch.

The use of low-noise JFET operational amplifiers ensures good gain, high input impedance, and very clean audio. The Driver Amplifiers are capable of sourcing several volts of audio to the transmitter.

Timers

All necessary timers are easily programmable.

Fan Control

Each Port can control its own independent fan based on time or temperature. If programmed for time, the fan will start when that Port's transmitter first goes active and stay on until the programmed timer expires. If programmed for temperature, the fan will start when the programmed temperature is reached and shut off when the sensed temperature falls below the programmed value.

Analog to Digital (A/D) Input

Each Port has its own A/D Input that may be programmed for use as temperature sensor (such as for Fan Control) or for any other purpose (such as transmitter power sensing). A high and low Alarm trip point may be programmed as well.

Note: This A/D Input is independent from those on the Motherboard.

Alarm Inputs

There are 2 Alarm Inputs that may be used to control internal actions of the controller. Each Input recognizes both a logic high-to-low and low-to-high transition. Each type of transition may be programmed to call a unique Command Macro.

Note: These Alarm Inputs are independent from those on the Motherboard.

Logic Outputs

There are 2 Logic Outputs that may be used to control external devices.

Note: These Logic Outputs should not be confused with those on the Motherboard.

Repeating Or Non-Repeating

Any Port may be configured to operate as repeating or non-repeating. If programmed to be repeating, a signal received on that Port's receiver will be retransmitted out that Port's transmitter. In addition, timers normally associated with repeater operation, such as hang time and timeout, are in force as well as identification. If a Port is programmed to be non-repeating, there will be no hang time generated nor will there be Courtesy Tones sent to that Port. ID's may be selected to be sent out a non-repeating Port however.

Whether or not a non-repeating Port may be used for half or full-duplex operation is solely dependent on the radio connected to it. In other words, if you connect a full-duplex radio to a non-repeating Port, the receiver will always be active (and any DTMF command sent to it will be acted upon).

Of course, Ports may be linked or unlinked to and from each other as needed.

Description of Features Of Ports (continued)

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 THAT PORT IS UNLOCKED. In other words, you will need to use any programmed *Pre Access Code* before any Command Macro ON THAT PORT. This is not to be confused with the Pre Command Prefix below.

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.

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 that Port. By defining a Pre Command Prefix (up to 4 digits is permissible), you can access those commands that normally require unlocking with the exception of programming commands that start with a star (*).

Remote Base

Any Port can be used for a remote base - a half-duplex (or simplex) radio connected to the repeater system that allows the repeater users to remotely operate on a different frequency/mode/band than the repeater. Frequency, transmitter offset and CTCSS may all be remotely programmed over the air and the case of multimode radios, mode of operation and frequency entry to 1 Hz is possible. The RC810 also supports control of various FM only mobiles, such as those manufactured by Kenwood, Icom and Yaesu. In addition, several of the new generation of multiband, multimode transceivers such as the Icom 706IIMKG, Yaesu FT-857D and others are supported. Since each Port is completely independent from the others, it is possible to have more than one type of remote base radio connected to the RC810. The complete list of supported remote base radios can be found in Appendix A (with more being added soon!)

Unlock Code

As received from the factory, all functions of each RC810 Radio Card are only accessible by first entering a special code that “unlocks” that Port. Once unlocked, any function or feature is available, including access to other Ports that are installed. This Unlock Code may be reprogrammed up to 8 digits to provide a high degree of security.

Macros

Each Port can store up to 90 Macros that serve a dual purpose. The first purpose is to allow multiple functions to be executed by one DTMF command. The second purpose is to remap that Port’s functions so they are accessible without having to first unlock that Port. Macros that physically reside on another Port or the Motherboard may be programmed to be accessible from any other Port. Each of the 90 Macros may store up to 15 Functions

Message Macros

Each Port can store up to 40 Message Macros, which are used to form sentences and phrases from individual Vocabulary words , DVR Tracks or any combination of the two. Message Macros that physically reside on another Port or the Motherboard may be programmed to be accessible from any other Port

Description of Features Of The Motherboard

In addition to providing needed operating voltages and time bases for the operation of the Radio and Option Cards, the Motherboard also contains many useful devices that are used throughout the entire RC810 system:

Supervision of Radio and Option Cards

The Motherboard is responsible for coordinating linking between Radio Cards by routing and controlling audio paths, PTT and COS signals and so on.

On-Board Battery Backed Up Real Time Clock (RTC) And Calendar

The RTC and Calendar provide a very accurate time and date reference for the Scheduler and other functions in the RC810. The on-board battery backup guarantees the time and date are retained even if the controller is disconnected from power. Under normal conditions, this battery should last 10 years and is readily replaceable.

A/D Inputs

In addition to the inputs on the Port, there are a total of 8 A/D Inputs on the Motherboard. These Inputs are fully scalable and programmable with various "meter faces" that may also be programmed. The inputs are fully protected against overvoltage and RF.

Note: These A/D Inputs are independent of and should not be confused with those on any Radio Card.

Alarm Inputs

There are 8 Alarm Inputs that may be used to control internal actions of the controller. Each Input recognizes both a logic high-to-low and low-to-high transition. Each type of transition may be programmed to call a unique Macro. Each Input is fully protected against overvoltage and RF.

Note: These Alarm Inputs are independent of and should not be confused with those on any Radio Card.

Macros

The Motherboard allows you to program and use an additional 130 Macros to those on the installed Ports. For example, if you have 4 Ports installed, you'd have a total of 490 Macros available for use.

Weather Station Interfacing

You may connect a Peet Brothers or Oregon Scientific weather station to allow readback of such parameters as wind speed, direction, temperature and humidity (this feature will be available 2009).

Coordinating Firmware Updates

As firmware upgrades become available, they only need to be uploaded to the Motherboard, which stores a copy of the firmware in its own non-volatile memory. This is accomplished by using our free Firmware Writer software and any standard Windows® computer. The Motherboard then coordinates the update with the Ports, each one taking its turn updating.

LAN Card

If the optional LAN Card is installed, you can use an Internet connection and a standard web browser to configure and monitor your RC810 remotely. (available 2011)

IDE Card

The optional IDE Card allows the use of additional Memory (available 2008)

Command Reference

Command Structure

The RC810 provides an extremely flexible and powerful command structure. Each Port is capable of being controlled independently as well as controlling or programming any other Port.

There are 3 types of commands in the RC810:

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 which Courtesy Tone is used on other ports.

Global - Those commands which don't affect a specific Port. A good example would be the Scheduler.

Programming - Those commands which change the operating parameters of the RC810. 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 3 conditions - upon COS closure of the receiver receiving the digits, upon the removal of received CTCSS/DCS tone 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 closure under this condition. By ending your entered command with a "D", you force the controller to act regardless of the COS 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 RC810 are protected behind the unlock commands. This means that no commands will be accepted by the RC810 unless one of its Ports is first unlocked. Not to worry however, as you can easily assign any function in the RC810 ("re-map") to be accessible without first unlocking the RC810 (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 RC810 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 RC810. 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 RC810, such as enabling and disabling features. They are only accessible while that Port is unlocked but may be re-mapped using Command Macros to allow access even though that Card is not unlocked. An asterisk next to each description signifies the default power up state of that function (this can be changed by programming).

Any Port's Supervisory Commands are accessible regardless of which Port you're actually connected to. For example, you could unlock Port 8 and change the Carrier/CTCSS setting, even though you're actually using a radio connected to Port 1.

Receiver Enable/Disable

A 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 Receiver Enable*
1100 Receiver Disable

Transmitter Enable/Disable

A Port's transmitter may be disabled individually to prevent keying by itself or other Ports. This command completely disables the transmitter, except for ID's

1111 Transmitter Enable*
1110 Transmitter Disable

Carrier/CTCSS Access

Each Port supports an external or internal CTCSS/DCS decoder, the action of which may be controlled with these commands.

1120 Carrier Access*
1121 Carrier/CTCSS/DCS Access
1122 CTCSS Access Only

Courtesy Tone Selection

Each Port has its own, unique 10 programmable courtesy tone sets. Courtesy Tones only work if that Port is in Repeat Mode.

1134x 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

You may use a special filtering command to prevent users from "kerchunking". When turned on, this filter require that users key up for a period of at least the setting of the Kerchunk Timer before the RC810 will recognize it as a valid signal IF THE TRANSMITTER WASN'T PREVIOUSLY ACTIVE. If the transmitter is already transmitting, Kerchunk filtering is not applied even if turned on.

1151 Kerchunk Filter On
1150 Kerchunk Filter Off*

Supervisory Commands (continued)

Repeating/Non-Repeating/Remote Base Operation

Each Port may be defined as repeating, where a signal from its receiver is retransmitted out its transmitter. Or it may be defined as non-

repeating, where a signal from its receiver is NOT retransmitted out its transmitter. And finally, it may be programmed for use as a Remote Base, which will enable remote programming (frequency, etc) of the connected radio.

1141 Port Repeat*
1140 Port Non-Repeat
1142 Port is to be used for a Remote Base

Mix Monitored Audio with This Port RX Audio

This function selects whether audio from another linked Port is mixed with the audio from this Port or muted when there is activity on this Port.

1191 Monitor Mix*
1190 Monitor Mute

Mute DTMF ON/OFF

This command selects whether DTMF digits received on this Port are retransmitted or muted.

1211 Mute DTMF ON*
1210 Mute DTMF OFF*

DTMF Covertone

If DTMF Muting is turned on, a covertone may be selected so users aren't faced with "dead air" while DTMF is being entered. (also see the section “Programming The DTMF Covertone” on page 33)

1131 Touchtone© Covertone ON*
1130 Touchtone© Covertone 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 the receiver (or any linked receiver).

1201 Speech Override ON
1200 Speech Override OFF*

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 the receiver (or any linked receiver), in which case the voice ID reverts to CW in order to ensure the repeater is properly identified.

1181 Speech ID Override ON*
1180 Speech ID Override OFF

Supervisory Commands (continued)

Enable/Disable DTMF

You may disable the DTMF decoder on each Port. 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 a different Port.

1161 DTMF Enable*
1160 DTMF Disable

Require/Not Require CTCSS for DTMF

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

1170 Don't require CTCSS/DCS for DTMF*
1171 Require CTCSS/DCS for DTMF

DTMF Evaluation on COS or CTCSS

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

1221 DTMF Command Evaluation on CTCSS Closure
1220 DTMF Command Evaluation on COS Closure*

Using A Control Receiver

Because of the RC810'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 RC810 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 entering the command to turn DTMF off on Port 2. 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 RC810, 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 **2312** 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.

231x Monitor Port x from this Port.
230x Disconnect Port x from this Port.

Note: You cannot monitor a Port from itself. For example, if you're connected to Port 1 and enter 2 3 1 1, you'll receive an error message. Likewise, you connect monitor a Port that is not installed.

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.***

A1x Establish a 2-way Link between Port x and this Port
A0x Disconnect a Link between Port x and this Port

Hint: Even though you may have first established a Monitor connection between Ports, you can use the Unlinking Commands to quickly disconnect Monitored Ports as well.

Note: You cannot link a Port to itself. For example, if you're connected to Port 1 and enter A 1 1, you'll receive an error message. Likewise, you connect link to a Port that is not installed.

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 RC810. By sending the User DTMF Pad Test Command Prefix, followed by up to 16 digits, the RC810 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.

Radio Card General Logic Outputs

Each Radio card has 2 switched buffered outputs and 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
1811 Logic Output 1 Low
1812 Logic Output 1 Pulsed (open, low, open)

1820 Logic Output 2 Open Collector
1821 Logic Output 2 Low
1822 Logic Output 2 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.

Note: These Outputs are separate from those on the Motherboard.

Motherboard General Logic Outputs

The Motherboard provides 8 additional buffered Logic Outputs and up to 32 Extended Logic Outputs (see the RC810 Hardware Manual for detailed information what is needed to recover the Extended Logic Outputs) which may connected to the Motherboard. These Logic Outputs work similarly to those located on the Radio Cards

1910	MB Logic Output 1 OFF	**1950**	MB Logic Output 5 OFF
1911	MB Logic Output 1 ON	**1951**	MB Logic Output 5 ON
1912	MB Logic Output 1 PULSE	**1952**	MB Logic Output 5 PULSE
1920	MB Logic Output 2 OFF	**1960**	MB Logic Output 6 OFF
1921	MB Logic Output 2 ON	**1961**	MB Logic Output 6 ON
1922	MB Logic Output 2 PULSE	**1962**	MB Logic Output 6 PULSE
1930	MB Logic Output 3 OFF	**1970**	MB Logic Output 7 OFF
1931	MB Logic Output 3 ON	**1971**	MB Logic Output 7 ON
1932	MB Logic Output 3 PULSE	**1972**	MB Logic Output 7 PULSE
1940	MB Logic Output 4 OFF	**1980**	MB Logic Output 8 OFF
1941	MB Logic Output 4 ON	**1981**	MB Logic Output 8 ON
1942	MB Logic Output 4 PULSE	**1982**	MB Logic Output 8 PULSE

Extended Logic Outputs may be used:

2000xx y where xx = 00-32 Extended Logic Output # and y:

0 = OFF
1 = ON
2 = PULSE

Analog Meter Inputs

Each Radio Card has its own dedicated Analog Input and the Motherboard contains 8 Analog Inputs called *Channels.* These may be used to measure voltages between 0 and approximately 5 volts DC and may be programmed to reflect actual values. With the proper sensor hardware (see the RC810 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 and Percent. Scaling of these meter faces is completely programmable by the owner.

The voltage from an external sensor is applied to the Analog input and measured. Based on how that “Meter” is programmed, the RC810 speaks the measured value. For example, if you have the Input programmed to read temperature, the controller will speak the value in "Degrees".

When the 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 the Analog Input and how to calibrate it is explained later in the Programming section of this manual

For Radio Card Analog Inputs:		**For MotherBoard Analog Inputs:**	
1400	Readback current value	**1500x**	Readback current value of Channel x (1 - 8)
1400 1	Readback stored LOW value	**1500x 1**	Readback stored LOW value of Channel x (1 - 8)
1400 2	Readback stored HIGH value	**1500x 2**	Readback stored HIGH value of Channel x (1 - 8)

To reset the Analog Input High/Low Stored value:

14100	Reset High/Low Stored Value	**1510x**	Reset High/Low Stored Value of Channel x (1 - 8)

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.

The Meter Alarm may be enabled and disabled. To enable or disable a meter alarm:

Radio Card	**MotherBoard**
1450x x = 1 for ON and 0 for OFF	**1550x y** x = Alarm 01 – 10 y = 1 for ON and 0 for OFF

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

Logic Alarms

There are 2 dedicated Alarm Inputs on each Radio Card that may be individually turned ON or OFF. While enabled, an alarm is triggered by 2 different events – its input line transitioning from a logic high to a logic low and from a logic low to a logic high. Each event may be programmed to call its own Command Macro. See the Programming Reference section for details about programming the Alarms.

9111	Alarm 1 Enabled	**9121**	Alarm 2 Enabled
9110	Alarm 1 Disabled	**9120**	Alarm 2 Disabled

Remote Base Operation

Any Port may be used to connect a remote base radio as long as that Port has been programmed as a Remote Base Port. See Page 14 “Repeating/Non-Repeating/Remote Base Supervisory Command for details. Also see Appendix A for a list of supported radios.

Each Radio Card has its own unique Remote Base Prefix (RB Prefix) that is used to determine which Radio Card is to be used to send the appropriate command to the radio connected to it. This allows for having different remote base radios connected to different Radio Cards as your system may require. See the Remote Base Programming section of this Manual for details.

The type radio you plan to use with the RC810 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 Remote Base Programming section of this manual for details. Remote Base Commands are available without unlocking the Port.

The commands to control the radio are.

Frequency and Transmitter Offset Entry

<RB Prefix> 1xxx.xxx y Enter Frequency with transmit offset*.
Frequency entered must be padded with zeros to make it 6 digits long.

Examples:

<RB Prefix> 1 1 4 6 6 4 0 3 = 146.640 plus offset
<RB Prefix> 1 4 4 8 3 2 5 1 = 448.325 minus offset
<RB Prefix> 1 0 1 4 1 9 5 2 = 14.195 no offset
<RB Prefix> 1 0 0 7 1 5 0 2 = 7.150 no offset

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

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

CTCSS Entry

<RB Prefix> 2xxy 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:
<RB Prefix> 2 1 2 1 = 100.0 Hz encode only
<RB Prefix> 2 1 9 2 = 127.3 Hz encode/decode
<RB Prefix> 2 0 1 0 = CTCSS off

Note: To turn off CTCSS, enter "01" for the frequency code and “0” for Encode/Decode status

Mode Entry

<RB Prefix> 3x Mode select. x equals:
1 = LSB
2 = USB
3 = CW
4 = FM
5 = AM

Note: This command only has relevance if you're using a remote base radio capable of multimode use.

Note: Any Port used for a remote base should be defined as non-repeating

Remote Base Operation (continued)

Memory Selection (Internal RC810 Memories)

The RC810 allows you to recall up to 20 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.

<RB Prefix> 5x Recall Remote Base Memories 1 to 25 (this command only affects NON-DOUG HALL supported radios)

Memory Recall When Using the Kenwood TM-V7a/TM-G707/TM-271A and Icom Radios

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).

<RB Prefix> 7 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. For the TM-271 and Icom Radios, you may use either 1 or 2 for x as the radio doesn't care. But you must use one or the other when entering the command.

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

<RB Prefix> 9 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 RC810) to control hardware at the repeater site. Refer to the Doug Hall manual for details on making connections.

<RB Prefix> 4 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

<RB Prefix> 6x Select Memory 1 - 20

AutoPatch Operation

The optional AP10 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 AP10 Autopatch Manual for programming and operating instructions (available Fall 2008)

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 RC810 will not accept commands unless a Port 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 90 Command Macros for each installed Radio Card.

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

- **A Command Macro may call any other Command Macro, even those on a different Radio Card.**
- **Any Macro Command Function that is numbered higher than 255 requires two slots, while those lower than 254 only require one.**

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.

Message Macros

There are 40 Message Macros, each of which is capable of storing up to 10 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. See the Programming section for details.

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 RC810 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 DTMF Regen 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

This command will announce the current time.

1700 Announce current time

This command will announce the current date

1701 Announce current date

Digital Voice Recorder (DVR)

Each Radio Card in the RC810 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 4 minutes and is divided into 40 "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 4 minutes long, 40 tracks that are 6 seconds long or any combination you can think of. 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 39 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 5 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 from 1 to 32767 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 RC810

General Programming Overview

Each port on the RC810 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

Any Port may be 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 4 or 8.

While the current Port is unlocked, you don't need to unlock the other Port. Simply preface the Programming Command you want to "send" to the other Port with 2 asterisks and the Port number. For example, to program Port 4's DTMF Pad Test Prefix to "85", while actually connected to Port 1, you enter (while Port 1 is unlocked of course):

*** * 4 *2093 85**

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 Play CWID # 1
AA2 Play CWID # 2
AA3 Play CWID # 3
AA4 Play Voice ID # 1
AA5 Play Voice ID # 2
AA6 Play 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.

Unlock Code Programming

The RC810 comes programmed with a default unlock codes for each Radio Card. To unlock any Radio Card for the first time, enter the default code.

5281 Default unlock code

Note: As each Radio Card is unique and independent, you can use the exact same Unlock Code for each one if you desire. And since you can program one Card from another Card without having to first unlock the other card, there is no conflict between codes.

For example, to unlock Radio Card 1 for the first time, enter 5 2 8 1 and unkey. The controller will respond with "ULP1", indicating that it 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 Radio Card.

For example, you want to program the unlock code for Radio Card 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.

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 RC810..

Locking (Leaving Program Mode)

To lock the Port 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 Port will automatically lock itself and announce that fact.

Programming A Custom Lock Code

Perhaps # conflicts with your intended code scheme, so the RC810 allows you to reprogram the Lock Code for each Port to be up to 4 digits long.

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

Programming A Custom Terminator Digit

By default, the RC810 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 for each Port to be any other single DTMF digit.

***9020x** where "x" is the single DTMF digit that will cause the RC810 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.

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 RC810 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.

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 permissible), you can access those commands that normally require unlocking a Port with the exception of programming commands that start with a star (*). Any command shown in Appendix C is accessible in this manner. You may also disable this feature if it's not needed by programming a zero:

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

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

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 3 programmable hang timers that may be selected one at a time. Hang time is applied only when that port is configured for full-duplex operation. Each Timer is programmed in 1/10 second intervals. For example, 1 second would be programmed with a value of "10". By default, HangTimer 1 is used at powerup (you may change this through the use of a Macro)

***1000 x y** where "x" is the Timer # and “y” is the amount of hangtime for that port's transmitter in 1/10 seconds. The range is 0 to 25.5 seconds.

Examples:

***1000 1 20** Program Hang Timer 1 for 2 seconds
***1000 3 15** Program Hang Timer 2 for 1.5 seconds

Note: while setting the timer to 0 will give zero hangtime, since you may select zero hangtime with a Macro, it is unnecessary to program zero hang time this way

Time Out Timer

There are 3 Timeout Timers, one of which may be selected one at a time to 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). By default, Timeout Timer 1 is used at powerup (you may change this through the use of a Macro)

***1001 x y** where "x" is the Timer # and “y” is the time out period for that port's transmitter in seconds. The range is 1 to 32767

Examples:

***1001 1 180** Program Timeout Timer 1 for 3 minutes
***1001 3 60** Program Timeout Timer 3 for 1 minute

Note: while setting the timer to 0 will disable Timeout, since you may disable all Timeout Timers with a Macro, it is unnecessary to program zero this way

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".

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

Timer Programming (continued)

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 RC810 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 seconds. The range is 1 to 32767 seconds. 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

This timer controls 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.

This timer controls both the on-board CTCSS Encoder and an external one properly connected.

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)

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 RC810 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

Periodic 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 Periodic Messages

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

The General Timers

The 5 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 42 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, 3, 4 or 5) to program and **y** is number of seconds 1 to 32767 seconds 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, 3, 4 or 5) and y is the Command Macro to run 1 - 90

Timer Programming (continued)

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

Next, we program Timer 1 to run Macro 11

***2092 1 11** Program Timer 1 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.

Note: If using the internal CTCSS Encoder, this command has no effect

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 RC810 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

The battery backed-up Real Time Clock and Calendar are programmed with the following commands. When programming the Clock, it must be done in 24 hour time (although you can program whether the readback is done in 12 hour or 24 hour format)

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

Selecting 12 or 24 Hour Readback

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

***51030** 12 Hour readback
***51031** 24 Hour readback

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

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

***51040** Don't say Hours
***51041** Say Hours

Adding A Correction Factor To The Real Time Clock

As is the case with any clock that is not referenced to standard such as WWV, the RC810'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 RC810 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 RC810 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.

On-Board CTCSS/DCS Encoder/Decoder Programming

Each Radio Card provides an on-board programmable CTCSS/DCS Encoder and Decoder. You may opt to use these instead of external encoders or decoders. But this is only possible if you supply unfiltered discriminator audio to the Radio Card and use direct FM modulation of the associated transmitter. Of course you may only use either the on-board Encode or Decode if you so choose. You are not required to use both.

You may select the mode of operation:

***2000 x** where x:

0 Disabled
1 CTCSS Mode
2 DCS Mode

The following modes will be implemented in the near future:

3 SelCall EEA
4 SelCall CCIR
5 SelCall ZVEI
6 SelCall DZVEI

Programming CTCSS Tones

When in CTCSS Mode, each Radio Card allows for programming of up to 15 different receive CTCSS frequencies into one half of a *MultiTone Table*. In the other half of this Table, up to 15 different tones may be programmed that are used for encode.

If a signal is received that contains one of the programmed tones, it is considered valid and its location in the Table is noted. The same numbered encode tone is then used. For example, let's say that 107.2 Hz is programmed into the MultiTone Table in position 4. When a signal is received that is transmitting the sub-audible tone of 107.2 Hz, the RC810 will encode whatever tone is programmed into the MultiTone Table's #4 encode position. While most RC810 owners will probably want the same tone encoded as is currently being received, by programming you can nevertheless select which tone is encoded whenever a particular tone is received.

To program a receive tone:

***2001xx yyy** where xx = Table Index 01-15, yyy = tone frequency)

Examples:

***2001 01 1273** Store MultiTone Table Position 1 as 127.3 Hz DECODE
***2001 03 885** Store MultiTone Table Position 3 as 88.5 Hz DECODE

To program an encoded tone:

***2002 01 1273** Store MultiTone Table Position 1 as 127.3 Hz ENCODE
***2002 03 885** Store MultiTone Table Position 3 as 88.5 Hz ENCODE

As mentioned above, when a received tone matches one that is stored in the MultiTone Table, its index is noted. In our examples above, if 107.2 Hz is received, the Radio Card knows this is Index #1. We can program this Index to call a Command Macro with the following:

2003xx yy** where xx = Table Index 01-15, yy = Macro 1 – 90. ***Note: if no Macro is to be called, enter 0 to disable.

On-Board CTCSS/DCS Encoder/Decoder Programming (continued)

Programming DCS Tones

Programming of DCS Tones is pretty much the same as CTCSS except there is no MultiTone Table for DCS use. In other words, you can only program one set (decode and encode) DCS codes at a time. First you must select DCS as the mode. Once this is done, you program the DCS receive code similarly to programming a CTCSS tone, except the Index Number will always be 1. For example:

***2001 01 yyy** where **yyy** = DCS code

Examples:

***2001 01 023** Store DCS code as 023 DECODE

Transmit code programming is similar

***2002 01 023** Store DCS code as 023 ENCODE

Routing On-Board Encoded Tone

You can select where the audio from the on-board CTCSS.DCS encoder is routed. You may program the Radio Card to send tone to an external source (via pin 6 of the Radio Connector) or to the internal Transmit Amplifier that is part of the audio circuitry. However bear in mind that regardless of which method you select, you must be modulating your transmitter via direct FM method with no pre-emphasis whatsoever. If you do not ensure this is the case, encode will not work properly and you will distort your transmitted audio.

***2010 1** Route encoded tone to internal amplifier
***2010 0** Route encoded tone to Radio Connector

Filtering of Tone(s) From Receiver Audio

Without filtering, any CTCSS/DCS tone appearing on the received signal will be passed through the audio chain of the Radio Card with little or no attenuation. Depending on your needs, it may desirable to filter these tones from the received audio before it is passed on to later stages. This command allows you to select whether or not to filter CTCSS/DCS tones from the received signal.

***2015 1** Filter tones from received audio
***2015 0** Do not filter tones from received audio

On-Board MultiLevel Squelch

In addition to providing on-board CTCSS/DCS operations, each Radio Card also contains on-board circuitry that provides noise operated squelch operation.

The squelch operates by sampling the amount of noise generated by receiver and switches the audio passed through the Radio Card on and off. This is known as “audio gating”. When there is no signal, there is a lot of noise and the squelch circuit closes the gate, thereby preventing audio from appearing in later circuitry of the Radio Card. As a signal appears, the amount of noise is reduced and the audio gate is opened. When the signal disappears the noise level obviously increases again and the audio gate is closed again. Except to prevent chopping (fast on and off cycling of the audio gate) of weaker signals, there is usually a certain amount of delay provided so the audio gate closing is slowed down. This prevents the chopping but also introduces the familiar squelch crash so common to FM receivers as the squelch “closes”.

The RC810 allows you to program how quickly the audio gate will close based on how strong a signal is received. This allows for almost silent squelch closure when a strong signal is received yet prevents chopping of weaker signals.

There are 3 programmable Squelch Setpoints that control how quickly the audio gate closed based on signal strength. *By default, the Setpoints are programmed at the Factory to provide satisfactory performance, h*owever you may wish to adjust them to suit your own particular needs. The amount of noise measured by the squelch will vary from a value 1024 at maximum noise to 0 with a full quieting signal. The value is an internal number used by the microprocessor

It should be noted that the Setpoints defining noise level are compared to in sequence and in an ascending order. That is to say that as the signal level decreasing, the amount of noise increases. The default values for signal level are:

Setpoint 1 100
Setpoint 2 300
Setpoint 3 600

The Setpoints for delay are also processed in ascending order and are programmed in milliseconds.

Setpoint 1 0 ms
Setpoint 2 100 ms
Setpoint 3 150 ms

What this all means is that as the amount of noise increases (as the signal gets weaker), the amount of delay before the audio gate is closed increases as well.

First, we program the noise level:

***2021 x yyy** where x is 1,2 or 3 for which Setpoint, yyy = Value of noise level from 0 to 1024.

Then we program the Delay times in milliseconds

***2022 x yyy** where x is 1,2 or 3 for which Setpoint, yyy = Value of delay time in milliseconds, from 0 to 1000

Feel free to experiment but you’ll find the default values are close to optimum. If all else fails you can always reprogram the default settings back in.

Note: Values should not need to be changed very much. In fact if they are moved too far from their default values, the squelch may stop operating altogether. When experimenting, it is best to make small changes, one at a time.

Miscellaneous Programming

DTMF Mute On 1st Or 2nd Digit

If DTMF Muting is enabled, 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

DTMF CoverTone Tone Programming

If DTMF Muting is enabled, DTMF Covertone will be generated while muting is in effect. The Covertone consists of 2 different tones,

repeated at one second intervals. You can program the frequency of each of the 2 tones (you can have only one tone by setting one of them to zero) and the duration of them with the following commands (their default values are shown in parenthesis)

***2025 x y** where x is Covertone 1 or 2 and y is the frequency from 0 to 3500 in Hz. (Tone 1 = 620 Hz, Tone 2 = 440 Hz)
***2026 x** where x is the Covertone duration from 0 to 1000 milliseconds

Delay Before Speech/CW Starts

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

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

User DTMF Pad Test Command Prefix

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

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

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.

***2115 0** The fan will start for any xmtr activity.

***2115 1** The fan will only start when there is receiver, Autopatch or Auxiliary Audio activity.

Remote Base Programming

The RC810 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
- Yaesu FT-100D, FT-877, FT-847, FT-857, FT-897

The RC810 also supports the Doug Hall RBI-1 Remote Base Interface, Please refer to its manual when connecting the RC810.

*Support for new radios is constantly being added

Remote Base Prefix

Since any Port may be used for connecting a remote base radio, it stands to reason that we need a way to direct the appropriate command used to control that radio to the appropriate Radio Card. We do this by defining a unique Remote Base Prefix for each Radio Card. ***Note: By default, Radio Cards 1 through 4 are predefined with the Remote Base Prefix of B1 through B4 respectively.***

IMPORTANT: Each Radio Card MUST have a unique Remote Base Prefix. Failure to observe this rule will result in unpredictable operation.

***2070xxxx** Define Remote Base Prefix Code - maximum 5 digits.

Examples:

2070 AB** Define Remote Base Prefix ***ON THIS CARD to be "AB"

Hint: Don't forget that you can program other Radio Cards from any other Radio Card by using the " * * " command. For example, if you have Port 1 unlocked and wish to program the Remote Base Prefix on Port 4 to be "B4", you can enter * * 4 * 2 0 7 0 B 4

Selecting The Type Of Remote Base Radio

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

***2071x** where "x" is the radio type

1 = Kenwood	***for Kenwood radios with a computer comport, the RC810 uses a baud rate of 9600**
2 = Icom	***The RC810 expects to see an Icom radio as the CI-V address of 48H with the baud rate set to "Auto". Yaesu radios should be set to a 4800 baud rate.**
3 = Yaesu	
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):

***2072x** where "x" is:

1 = FT100D
2 = FT817, FT-857, FT-897
3 = FT847
4 = FT857

Remote Base Programming (continued)

Programming Remote Base Memories (non-Doug Hall)

The RC810 has 20 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:

***2073x** where x is the Memory to store, 1 - 20

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

***2074 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.

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 (Only Command Macros located on this Radio Card may be used. More on this later). 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

Tail Messages

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

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

To select which Tail Message is to be used:

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

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

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

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

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

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

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

Tail Messages are directed out the Port they were programmed from. In other words if you program Tail Messages for Port 1, then that Tail Message will only be sent out Port 1.

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 01 601**

Now we program Tail Message 1 to use Command Macro 10

***2110 1 10**

Next, we program this port to use Tail Message 1

***2111 1**

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

***2112 10**

Finally, we disable the Periodic Message Timer

***1020 0**

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

Some Practical Examples Of Tail Message Programming (continued)

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

***2112 0**

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

***1020 300**

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

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

First, we program the Tail Timer:

***2112 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.

USER NOTES:

Programming The RC810 Command Macros

Introduction To Command Macros

In order for users to be able to control functions in the RC810 without them being required to first unlock the controller, you define a *Command Macro* or simply *Macro.* The contents of a Macro are M*acro Functions* which are the actual functions to be performed. In addition, each Macro may be assigned a unique *Command Code*, which is the code that will be entered by users to run that Macro.

You may use any valid DTMF digit in any Command Code except any DTMF digit you reprogrammed for use as your Command Terminator (by default, this is a “D”).

Radio Card And Motherboard Macros

Each Radio Card contains its own 90 Macros, which may be accessed by any other Radio Card. The Motherboard contains an additional 130 Macros that are also accessible by any Radio Card. The main differences between the two types of Macros are where they are physically stored and how they’re programmed. Once programmed, their use is completely transparent. That is to say that when actually “running” a Macro, all users need to know is the DTMF code used to access it.

When programming Macros, you should keep in mind that the Motherboard Macros aren’t particular to any Radio Card and you probably want to reserve them for “shared use”. For example, a Motherboard Macro might be used for something that isn’t specific to any Radio Card. One such use might be when an Alarm Input on the Motherboard is triggered. But it is totally up to you – Macros on the Motherboard or on a Radio Card are identical in their use.

Planning

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. For example "12345" is unique from "54321" .

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 to Port 2
AB2 - Link to Port 3
AB3 - Link to Port 4
AB4 - Link to Port 5

Of course, these are only 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 RC810 gives you the flexibility to do it any way you want.

Radio Card Macros

The 90 Radio Card Macros may contain up to 15 Function Numbers (FN) that reference the actual functions to be performed by that Macro (see the Macro List on Page 33). It is important to remember that most Radio Card Macros only affect operations on THAT Radio Card. If you want to use a Radio Card Macro to change something on another Card, you must actually call the appropriate Macro on the other Card. More on this later.

Macros are programmed by first entering the macro programming command for the macro you wish to program, followed by a series of 4 digit function numbers to be programmed into that macro. The command syntax for programming a Macro on the currently used Radio Card is:

***4002 mm** xxxx xxxx xxxx xxxx xxxx xxxx xxxx xxxx xxxx xxxx xxxx xxxx xxxx xxxx xxxx

where "mm" are 2 digits representing the macro (01-90) to be programmed, followed by a series of 4 digit numbers where "xxx" represents those commands.

Because of the extremely efficient manner in which memory is utilized in the RC810, Macro Function Numbers use anywhere from one to 6 positions within a Macro, according to the following list:

Function # Range	**Number of positions used**
0001 - 0254	1
0255 - 0510	2
0511 - 0765	3
0766 - 1020	4
1021 - 1275	5
1276 - 1350	6

As an example, we want to program Macro 2 so it will turn on CTCSS & Carrier Access , link Port 1 to Port 4 and change Port 1'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, 228 and 016. We enter - all in one transmission:

***4002 02 0002 0228 0016**

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, in addition to doing what Macro 2 already does, we also want it to call Macro 6, which does additional things. Instead of having to repeat the commands previously stored in Macro 6, we can simply add to Macro 2 to call Macro 6:

***4002 02 0002 0228 0016 0406**

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

Now that the contents of Macro 2 are programmed, the actual DTMF code used to "run" that Macro needs to be programmed:

***2050 02 x** where x is up to 4 digits representing the DTMF digits used to run this Macro

Example:

***2050 02 1234** Program DTMF digits 1 2 3 4 to call Macro 41

Using 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 RC810.

Let's say you want your users to be able to read the RC810'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 Macro 41:

***4002 41 0036**

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 RC810 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.

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.

0126 High Priority
0127 Low Priority

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

***4002 12 0126 0038 0083**

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 each of the Radio Cards. You may include any command within Macro 1, including calling other macros.

Determining The Contents Of A Macro

This command will cause the RC810 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.

Erasing Macros

You may erase any Command Macro with the following command:

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

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

***400499** Clears all Macros

Using Macros On Other Radio Cards

Radio Card Macros control the operations of the particular Radio Card on which they reside. That is to say that Macros that physically reside on Port 1 can normally only control the operations of Port 1. Obviously there needs to be a way to control the operations of one Radio Card from a different Radio Card. This is accomplished by using the correct Macro Function on the Radio Card you're programming to "call" the appropriate Macro on the other Radio Card.

For example, we are programming Macro 5 on Port 1 that will link Port 1 to Port 4. As part of this operation, we also want to change the Courtesy Tone on Port 4 to #3.

Referring to the Radio Card Macro Function List, we first program up the Macro on Radio Card 1 that will call the Macro on Radio Card 4 (in this example, Radio Card 4's Macro will be #10 and will change the Courtesy Tone to #10):

***4002 05 0228 0710** ←Macro 5 Link Port 1 to Port 4 and run Macro 10 on Port 4

While we're programming (and assuming it is not already programmed), we can go ahead and program Macro #10 on Port 4 now:

*** * 4 *4002 10 0022**

User Notes:

Radio Card Macro Function Number List

FN	Description
0001	Carrier Only Access
0002	CTCSS & Carrier Only Access
0003	CTCSS Only Access
0004	Transmitter Enable
0005	Transmitter Disable
0006	Monitor Mix
0007	Monitor Mute
0008	Repeat ON
0009	Repeat OFF
0010	Speech Override ON
0011	Speech Override OFF
0012	Courtesy Tone OFF
0013	Courtesy Tone 1
0014	Courtesy Tone 2
0015	Courtesy Tone 3
0016	Courtesy Tone 4
0017	Courtesy Tone 5
0018	Courtesy Tone 6
0019	Courtesy Tone 7
0020	Courtesy Tone 8
0021	Courtesy Tone 9
0022	Courtesy Tone 10
0023	DTMF Mute ON
0024	DTMF Mute OFF
0025	DTMF Covertone ON
0026	DTMF Covertone OFF
0027	Tone Encode FORCE
0028	Tone Encode OFF
0029	Read ADC
0030	Logic Output 1 OFF
0031	Logic Output 2 OFF
0032	Logic Output 1 ON
0033	Logic Output 2 ON
0034	Toggle Logic Output 1
0035	Toggle Logic Output 2
0036	Say Time
0037	Say Date
0038	Play DVR Track 1
0039	Play DVR Track 2
0040	Play DVR Track 3
0041	Play DVR Track 4
0042	Play DVR Track 5
0043	Play DVR Track 6
0044	Play DVR Track 7
0045	Play DVR Track 8
0046	Play DVR Track 9
0047	Play DVR Track 10
0048	Play DVR Track 11
0049	Play DVR Track 12
0050	Play DVR Track 13
0051	Play DVR Track 14
0052	Play DVR Track 15
0053	Play DVR Track 16
0054	Play DVR Track 17
0055	Play DVR Track 18
0056	Play DVR Track 19
0057	Play DVR Track 20
0058	Play DVR Track 21
0059	Play DVR Track 22
0060	Play DVR Track 23
0061	Play DVR Track 24
0062	Play DVR Track 25
0063	Play DVR Track 26
0064	Play DVR Track 27
0065	Play DVR Track 28
0066	Play DVR Track 29
0067	Play DVR Track 30
0068	Play DVR Track 31
0069	Play DVR Track 32
0070	Play DVR Track 33
0071	Play DVR Track 34
0072	Play DVR Track 35
0073	Play DVR Track 36
0074	Play DVR Track 37
0075	Play DVR Track 38
0076	Play DVR Track 39
0077	Play DVR Track 40
0078	FORCE Tone Encode During Macro Speech
0079	DTMF Decoder Enabled
0080	DTMF Decoder Disabled
0081	Require CTCSS/DCS For DTMF
0082	Not Require CTCSS/DCS For DTMF
0083	Play Next Voice ID In Rotation
0084	Play Next CW ID In Rotation
0085	Play Message Macro 1
0086	Play Message Macro 2
0087	Play Message Macro 3
0088	Play Message Macro 4
0089	Play Message Macro 5
0090	Play Message Macro 6
0091	Play Message Macro 7
0092	Play Message Macro 8
0093	Play Message Macro 9
0094	Play Message Macro 10
0095	Play Message Macro 11
0096	Play Message Macro 12
0097	Play Message Macro 13
0098	Play Message Macro 14
0099	Play Message Macro 15
0100	Play Message Macro 16
0101	Play Message Macro 17
0102	Play Message Macro 18
0103	Play Message Macro 19
0104	Play Message Macro 20
0105	Play Message Macro 21
0106	Play Message Macro 22
0107	Play Message Macro 23
0108	Play Message Macro 24
0109	Play Message Macro 25
0110	Play Message Macro 26
0111	Play Message Macro 27
0112	Play Message Macro 28
0113	Play Message Macro 29
0114	Play Message Macro 30
0115	Play Message Macro 31
0116	Play Message Macro 32
0117	Play Message Macro 33
0118	Play Message Macro 34

Radio Card Macro Function Number List (continued)

FN	Description
0119	Play Message Macro 35
0120	Play Message Macro 36
0121	Play Message Macro 37
0122	Play Message Macro 38
0123	Play Message Macro 39
0124	Play Message Macro 40
0125	Say Good Morning/ Afternoon/Evening
0126	Macro Priority High
0127	Macro Priority Low
0128	Kerchunk Filter ON
0129	Kerchunk Filter OFF
0130	Receiver Enable
0131	Receiver Disable
0132	Speech ID Override ON
0133	Speech ID Override OFF
0134	ID Hold/Timeout Disable for 30 minutes
0135	Remove ID Hold/Timeout
0136	Send DTMF Memory 1
0137	Send DTMF Memory 2
0138	Send DTMF Memory 3
0139	Send DTMF Memory 4
0140	Send DTMF Memory 5
0141	Send DTMF Memory 6
0142	Send DTMF Memory 7
0143	Send DTMF Memory 8
0144	Send DTMF Memory 9
0145	Send DTMF Memory 10
0146	Send DTMF Memory 11
0147	Send DTMF Memory 12
0148	Send DTMF Memory 13
0149	Send DTMF Memory 14
0150	Send DTMF Memory 15
0151	Send DTMF Memory 16
0152	Send DTMF Memory 17
0153	Send DTMF Memory 18
0154	Send DTMF Memory 19
0155	Send DTMF Memory 20
0156	Meter Alarm ON
0157	Meter Alarm OFF
0158	Reset Hi/Low Stored Value
0159	Tail Message OFF
0160	Use Tail Message 1
0161	Use Tail Message 2
0162	Use Tail Message 3
0163	Remote Base Memory 1 Select
0164	Remote Base Memory 2 Select
0165	Remote Base Memory 3 Select
0166	Remote Base Memory 4 Select
0167	Remote Base Memory 5 Select
0168	Remote Base Memory 6 Select
0169	Remote Base Memory 7 Select
0170	Remote Base Memory 8 Select
0171	Remote Base Memory 9 Select
0172	Remote Base Memory 10 Select
0173	Remote Base Memory 11 Select
0174	Remote Base Memory 12Select
0175	Remote Base Memory 13 Select
0176	Remote Base Memory 14 Select
0177	Remote Base Memory 15 Select
0178	Remote Base Memory 16 Select
0179	Remote Base Memory 17 Select
0180	Remote Base Memory 18 Select
0181	Remote Base Memory 19 Select
0182	Remote Base Memory 20 Select
0183	Zero Hang Time
0184	Select Hang Timer 1
0185	Select Hang Timer 2
0186	Select Hang Timer 3
0187	Disable Timeout Timer
0188	Select Timeout Timer 1
0189	Select Timeout Timer 2
0190	Select Timeout Timer 3
0191	Speech ID's Enabled
0192	Speech ID's Disabled
0193	User DVR Record test, erase after auto playback
0194	User DVR Record test, don't erase after auto playback
0195	Alarm 1 ON
0196	Alarm 2 ON
0197	Alarm 1 OFF
0198	Alarm 2 OFF
0199	Start General Timer 1
0200	Start General Timer 2
0201	Start General Timer 3
0202	Start General Timer 4
0203	Start General Timer 5
0204	Stop General Timer 1
0205	Stop General Timer 2
0206	Stop General Timer 3
0207	Stop General Timer 4
0208	Stop General Timer 5
0209	Monitor Port 1 From This Port ON
0210	Monitor Port 2 From This Port ON
0211	Monitor Port 3 From This Port ON
0212	Monitor Port 4 From This Port ON
0213	Monitor Port 5 From This Port ON
0214	Monitor Port 6 From This Port ON
0215	Monitor Port 7 From This Port ON
0216	Monitor Port 8 From This Port ON
0217	Monitor Port 1 From This Port OFF
0218	Monitor Port 2 From This Port OFF
0219	Monitor Port 3 From This Port OFF
0220	Monitor Port 4 From This Port OFF
0221	Monitor Port 5 From This Port OFF
0222	Monitor Port 6 From This Port OFF
0223	Monitor Port 7 From This Port OFF
0224	Monitor Port 8 From This Port OFF
0225	Link This Port to Port 1
0226	Link This Port to Port 2
0227	Link This Port to Port 3
0228	Link This Port to Port 4
0229	Link This Port to Port 5
0230	Link This Port to Port 6
0231	Link This Port to Port 7
0232	Link This Port to Port 8
0233	Unlink This Port From Port 1
0234	Unlink This Port From Port 2
0235	Unlink This Port From Port 3
0236	Unlink This Port From Port 4
0237	Unlink This Port From Port 5
0238	Unlink This Port From Port 6
0239	Unlink This Port From Port 7
0240	Unlink This Port From Port 8

Radio Card Macro Function Number List (continued)

0501 - 0590	Port 1 Macro 1 – 90	**1001 - 1090**	Port 6 Macro 1 - 90
0601 - 0690	Port 2 Macro 1 – 90	**1101 – 1190**	Port 7 Macro 1 - 90
0701 - 0790	Port 3 Macro 1 – 90	**1201 - 1290**	Port 8 Macro 1 – 90
0801 - 0890	Port 4 Macro 1 – 90	**301 - 430**	Motherboard Macro 1 - 130
0901 - 0990	Port 5 Macro 1 -- 90		

Motherboard Macros

As previously discussed, Motherboard Macros are essentially the same as those located on the Radio Cards with 4 differences:

- Motherboard Macros are programmed using different commands
- Motherboard Macros contain additional Macro Functions
- Motherboard Macros may not call other Motherboard or Radio Card Macros
- Motherboard Macros use 3 digit Function Numbers

It is important to note that the same rule governing number of "slots" used by Function Numbers applies to MotherBoard Macros as it does to Radio Card Macros:

Function # Range	**Number of positions used**
0001 - 0254	1
0256 - 0511	2
0512 - 0766	3
0767 – 830	4

Note: Just like on the Radio Cards, Motherboard Macro 1 is run every time the controller starts up.

The list of programming commands for Motherboard Macros are:

***6002 mmm xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx**

where "mmm" are the 3 digits representing the Macro (001 – 130) to be programmed followed by a series of up to 15 3 digit Macro Functions

***6003 mmm** Erase Motherboard Macro by 3 digit Macro number

Example: ***6003 003** Erase MotherBoard Macro 3

***600499** Erase all Motherboard Macros

***6005 mmm y** Restrict Motherboard Macro mmm to be used only by Port(s) y.

Examples:

***6005 002 4** Allow only Port 4 to run Motherboard Macro 2
***6005 041 134** Allow only Ports 1, 3 and 4 to run Motherboard Macro 41

***600799** Clear all Port Restrictions on Motherboard Macros (allows them to be run from any Radio Card)

Programming MotherBoard Macros to Be Sent To Which Port(s)

A Motherboard Macro may be called by any Radio Card, the Scheduler, Alarms or General Timers. Since a Motherboard Macro's actions may involve any combination of Ports, there needs to be a means by which that Macro knows which Port(s) should receive its actions. This is done with the programming command:

***6006 mmm x** where mmm is the Macro 001 – 130 and x is the Port(s) to which this Macro is sent

Examples:

***6006 001 2** Macro 1 to be sent to Port 2
***6006 010 123** Macro 10 to be sent to Ports 1,2 & 3

MotherBoard Macro Function Number List

FN	Description
001	Carrier Only Access
002	CTCSS & Carrier Only Access
003	CTCSS Only Access
004	Transmitter Enable
005	Transmitter Disable
006	Monitor Mix
007	Monitor Mute
008	Repeat ON
009	Repeat OFF
010	Speech Override ON
011	Speech Override OFF
012	Courtesy Tone OFF
013	Courtesy Tone 1
014	Courtesy Tone 2
015	Courtesy Tone 3
016	Courtesy Tone 4
017	Courtesy Tone 5
018	Courtesy Tone 6
019	Courtesy Tone 7
020	Courtesy Tone 8
021	Courtesy Tone 9
022	Courtesy Tone 10
023	DTMF Mute ON
024	DTMF Mute OFF
025	DTMF Covertone ON
026	DTMF Covertone OFF
027	Tone Encode FORCE
028	Tone Encode OFF
029	Read ADC
030	Logic Output 1 ON
031	Logic Output 2 ON
032	Logic Output 1 OFF
033	Logic Output 2 OFF
034	Toggle Logic Output 1
035	Toggle Logic Output 2
036	Say Time
037	Say Date
038	Play DVR Track 1
039	Play DVR Track 2
040	Play DVR Track 3
041	Play DVR Track 4
042	Play DVR Track 5
043	Play DVR Track 6
044	Play DVR Track 7
045	Play DVR Track 8
046	Play DVR Track 9
047	Play DVR Track 10
048	Play DVR Track 11
049	Play DVR Track 12
050	Play DVR Track 13
051	Play DVR Track 14
052	Play DVR Track 15
053	Play DVR Track 16
054	Play DVR Track 17
055	Play DVR Track 18
056	Play DVR Track 19
057	Play DVR Track 20
058	Play DVR Track 21
059	Play DVR Track 22
060	Play DVR Track 23
061	Play DVR Track 24
062	Play DVR Track 25
063	Play DVR Track 26
064	Play DVR Track 27
065	Play DVR Track 28
066	Play DVR Track 29
067	Play DVR Track 30
068	Play DVR Track 31
069	Play DVR Track 32
070	Play DVR Track 33
071	Play DVR Track 34
072	Play DVR Track 35
073	Play DVR Track 36
074	Play DVR Track 37
075	Play DVR Track 38
076	Play DVR Track 39
077	Play DVR Track 40
078	FORCE Tone Encode During Macro Speech
079	DTMF Decoder Enabled
080	DTMF Decoder Disabled
081	Require CTCSS/DCS For DTMF
082	Not Require CTCSS/DCS For DTMF
083	Play Next Voice ID In Rotation
084	Play Next CW ID In Rotation
085	Play Message Macro 1
086	Play Message Macro 2
087	Play Message Macro 3
088	Play Message Macro 4
089	Play Message Macro 5
090	Play Message Macro 6
091	Play Message Macro 7
092	Play Message Macro 8
093	Play Message Macro 9
094	Play Message Macro 10
095	Play Message Macro 11
096	Play Message Macro 12
097	Play Message Macro 13
098	Play Message Macro 14
099	Play Message Macro 15
100	Play Message Macro 16
101	Play Message Macro 17
102	Play Message Macro 18
103	Play Message Macro 19
104	Play Message Macro 20
105	Play Message Macro 21
106	Play Message Macro 22
107	Play Message Macro 23
108	Play Message Macro 24
109	Play Message Macro 25
110	Play Message Macro 26
111	Play Message Macro 27
112	Play Message Macro 28
113	Play Message Macro 29
114	Play Message Macro 30
115	Play Message Macro 31
116	Play Message Macro 32
117	Play Message Macro 33
118	Play Message Macro 34

Motherboard Macro Function Number List (continued)

FN	Description
119	Play Message Macro 35
120	Play Message Macro 36
121	Play Message Macro 37
122	Play Message Macro 38
123	Play Message Macro 39
124	Play Message Macro 40
125	Say Good Morning/ Afternoon/Evening
126	Macro Priority High
127	Macro Priority Low
128	Kerchunk Filter ON
129	Kerchunk Filter OFF
130	Receiver Enable
131	Receiver Disable
132	Speech ID Override ON
133	Speech ID Override OFF
134	ID Hold/Timeout Disable for 30 minutes
135	Remove ID Hold/Timeout
136	Send DTMF Memory 1
137	Send DTMF Memory 2
138	Send DTMF Memory 3
139	Send DTMF Memory 4
140	Send DTMF Memory 5
141	Send DTMF Memory 6
142	Send DTMF Memory 7
143	Send DTMF Memory 8
144	Send DTMF Memory 9
145	Send DTMF Memory 10
146	Send DTMF Memory 11
147	Send DTMF Memory 12
148	Send DTMF Memory 13
149	Send DTMF Memory 14
150	Send DTMF Memory 15
151	Send DTMF Memory 16
152	Send DTMF Memory 17
153	Send DTMF Memory 18
154	Send DTMF Memory 19
155	Send DTMF Memory 20
156	Meter Alarm ON
157	Meter Alarm OFF
158	Reset Hi/Low Stored Value
159	Tail Message OFF
160	Use Tail Message 1
161	Use Tail Message 2
162	Use Tail Message 3
163	Remote Base Memory 1 Select
164	Remote Base Memory 2 Select
165	Remote Base Memory 3 Select
166	Remote Base Memory 4 Select
167	Remote Base Memory 5 Select
168	Remote Base Memory 6 Select
169	Remote Base Memory 7 Select
170	Remote Base Memory 8 Select
171	Remote Base Memory 9 Select
172	Remote Base Memory 10 Select
173	Remote Base Memory 11 Select
174	Remote Base Memory 12Select
175	Remote Base Memory 13 Select
176	Remote Base Memory 14 Select
177	Remote Base Memory 15 Select
178	Remote Base Memory 16 Select
179	Remote Base Memory 17 Select
180	Remote Base Memory 18 Select
181	Remote Base Memory 19 Select
182	Remote Base Memory 20 Select
183	Zero Hang Time
184	Select Hang Timer 1
185	Select Hang Timer 2
186	Select Hang Timer 3
187	Disable Timeout Timer
188	Select Timeout Timer 1
189	Select Timeout Timer 2
190	Select Timeout Timer 3
191	Speech ID's Enabled
192	Speech ID's Disabled
193	User DVR Record test, erase after auto playback
194	User DVR Record test, don't erase after auto playback
195	Alarm 1 ON
196	Alarm 2 ON
197	Alarm 1 OFF
198	Alarm 2 OFF
199	Start General Timer 1
200	Start General Timer 2
201	Start General Timer 3
202	Start General Timer 4
203	Start General Timer 5
204	Stop General Timer 1
205	Stop General Timer 2
206	Stop General Timer 3
207	Stop General Timer 4
208	Stop General Timer 5
209	Monitor Port 1 From Sent To Port ON
210	Monitor Port 2 From Sent To Port ON
211	Monitor Port 3 From Sent To Port ON
212	Monitor Port 4 From Sent To Port ON
213	Monitor Port 5 From Sent To Port ON
214	Monitor Port 6 From Sent To Port ON
215	Monitor Port 7 From Sent To Port ON
216	Monitor Port 8 From Sent To Port ON
217	Monitor Port 1 From Sent To Port OFF
218	Monitor Port 2 From Sent To Port OFF
219	Monitor Port 3 From Sent To Port OFF
220	Monitor Port 4 From Sent To Port OFF
221	Monitor Port 5 From Sent To Port OFF
222	Monitor Port 6 From Sent To Port OFF
223	Monitor Port 7 From Sent To Port OFF
224	Monitor Port 8 From Sent To Port OFF
225	Link Sent To Port to Port 1
226	Link Sent To Port to Port 2
227	Link Sent To Port to Port 3
228	Link Sent To Port to Port 4
229	Link Sent To Port to Port 5
230	Link Sent To Port to Port 6
231	Link Sent To Port to Port 7
232	Link Sent To Port to Port 8
233	Unlink Sent To Port From Port 1
234	Unlink Sent To Port From Port 2
235	Unlink Sent To Port From Port 3
236	Unlink Sent To Port From Port 4
237	Unlink Sent To Port From Port 5
238	Unlink Sent To Port From Port 6
239	Unlink Sent To Port From Port 7
240	Unlink Sent To Port From Port 8
241	Read MB Analog Channel 1 Current Value
242	Read MB Analog Channel 2 Current Value

Motherboard Macro Function Number List (continued)

FN	Description
243	Read MB Analog Channel 3 Current Value
244	Read MB Analog Channel 4 Current Value
245	Read MB Analog Channel 5 Current Value
246	Read MB Analog Channel 6 Current Value
247	Read MB Analog Channel 7 Current Value
248	Read MB Analog Channel 8 Current Value
249	Read MB Analog Channel 1 Low Value
250	Read MB Analog Channel 2 Low Value
251	Read MB Analog Channel 3 Low Value
252	Read MB Analog Channel 4 Low Value
253	Read MB Analog Channel 5 Low Value
254	Read MB Analog Channel 6 Low Value
255	Read MB Analog Channel 7 Low Value
256	Read MB Analog Channel 8 Low Value
257	Read MB Analog Channel 1 High Value
258	Read MB Analog Channel 2 High Value
259	Read MB Analog Channel 3 High Value
260	Read MB Analog Channel 4 High Value
261	Read MB Analog Channel 5 High Value
262	Read MB Analog Channel 6 High Value
263	Read MB Analog Channel 7 High Value
264	Read MB Analog Channel 8 High Value
265	Clear MB Channel 1 Hi/Low Value
266	Clear MB Channel 2 Hi/Low Value
267	Clear MB Channel 3 Hi/Low Value
268	Clear MB Channel 4 Hi/Low Value
269	Clear MB Channel 5 Hi/Low Value
270	Clear MB Channel 6 Hi/Low Value
271	Clear MB Channel 7 Hi/Low Value
272	Clear MB Channel 8 Hi/Low Value
273	Logic Output 1 ON
274	Logic Output 2 ON
275	Logic Output 3 ON
276	Logic Output 4 ON
277	Logic Output 5 ON
278	Logic Output 6 ON
279	Logic Output 7 ON
280	Logic Output 8 ON
281	Logic Output 1 OFF
282	Logic Output 2 OFF
283	Logic Output 3 OFF
284	Logic Output 4 OFF
285	Logic Output 5 OFF
286	Logic Output 6 OFF
287	Logic Output 7 OFF
288	Logic Output 8 OFF
289	Logic Output 1 TOGGLE
290	Logic Output 2 TOGGLE
291	Logic Output 3 TOGGLE
292	Logic Output 4 TOGGLE
293	Logic Output 5 TOGGLE
294	Logic Output 6 TOGGLE
295	Logic Output 7 TOGGLE
296	Logic Output 8 TOGGLE
297	Extended Logic Output 1 ON
298	Extended Logic Output 2 ON
299	Extended Logic Output 3 ON
300	Extended Logic Output 4 ON
301	Extended Logic Output 5 ON
302	Extended Logic Output 6 ON
303	Extended Logic Output 7 ON
304	Extended Logic Output 8 ON
305	Extended Logic Output 9 ON
306	Extended Logic Output 10 ON
307	Extended Logic Output 11 ON
308	Extended Logic Output 12 ON
309	Extended Logic Output 13 ON
310	Extended Logic Output 14 ON
311	Extended Logic Output 15 ON
312	Extended Logic Output 16 ON
313	Extended Logic Output 17 ON
314	Extended Logic Output 18 ON
315	Extended Logic Output 19 ON
316	Extended Logic Output 20 ON
317	Extended Logic Output 21ON
318	Extended Logic Output 22 ON
319	Extended Logic Output 23 ON
320	Extended Logic Output 24 ON
321	Extended Logic Output 25 ON
322	Extended Logic Output 26 ON
323	Extended Logic Output 27 ON
324	Extended Logic Output 28 ON
325	Extended Logic Output 29 ON
326	Extended Logic Output 30 ON
327	Extended Logic Output 31 ON
328	Extended Logic Output 32 ON
329	Extended Logic Output 1 OFF
330	Extended Logic Output 2 OFF
331	Extended Logic Output 3 OFF
332	Extended Logic Output 4 OFF
333	Extended Logic Output 5 OFF
334	Extended Logic Output 6 OFF
335	Extended Logic Output 7 OFF
336	Extended Logic Output 8 OFF
337	Extended Logic Output 9 OFF
338	Extended Logic Output 10 OFF
339	Extended Logic Output 11 OFF
340	Extended Logic Output 12 OFF
341	Extended Logic Output 13 OFF
342	Extended Logic Output 14 OFF
343	Extended Logic Output 15 OFF
344	Extended Logic Output 16 OFF
345	Extended Logic Output 17 OFF
346	Extended Logic Output 18 OFF
347	Extended Logic Output 19 OFF
348	Extended Logic Output 20 OFF
349	Extended Logic Output 21 OFF
350	Extended Logic Output 22 OFF
351	Extended Logic Output 23 OFF
352	Extended Logic Output 24 OFF
353	Extended Logic Output 25 OFF
354	Extended Logic Output 26 OFF
355	Extended Logic Output 27 OFF
356	Extended Logic Output 28 OFF
357	Extended Logic Output 29 OFF
358	Extended Logic Output 30 OFF
359	Extended Logic Output 31 OFF
360	Extended Logic Output 32 OFF
361	Extended Logic Output 1 TOGGLE
362	Extended Logic Output 2 TOGGLE
363	Extended Logic Output 3 TOGGLE
364	Extended Logic Output 4 TOGGLE
365	Extended Logic Output 5 TOGGLE
366	Extended Logic Output 6 TOGGLE

Motherboard Macro Function Number List (continued)

FN	Description
367	Extended Logic Output 7 TOGGLE
368	Extended Logic Output 8 TOGGLE
369	Extended Logic Output 9 TOGGLE
370	Extended Logic Output 10 TOGGLE
371	Extended Logic Output 11TOGGLE
372	Extended Logic Output 12 TOGGLE
373	Extended Logic Output 13 TOGGLE
374	Extended Logic Output 14 TOGGLE
375	Extended Logic Output 15 TOGGLE
376	Extended Logic Output 16 TOGGLE
377	Extended Logic Output 17 TOGGLE
378	Extended Logic Output 18 TOGGLE
379	Extended Logic Output 19 TOGGLE
380	Extended Logic Output 20 TOGGLE
381	Extended Logic Output 21 TOGGLE
382	Extended Logic Output 22 TOGGLE
383	Extended Logic Output 23 TOGGLE
384	Extended Logic Output 24 TOGGLE
385	Extended Logic Output 25 TOGGLE
386	Extended Logic Output 26 TOGGLE
387	Extended Logic Output 27 TOGGLE
388	Extended Logic Output 28 TOGGLE
389	Extended Logic Output 29 TOGGLE
390	Extended Logic Output 30 TOGGLE
391	Extended Logic Output 31 TOGGLE
392	Extended Logic Output 32 TOGGLE
393	MB Alarm 1 ON
394	MB Alarm 2 ON
395	MB Alarm 3 ON
396	MB Alarm 4 ON
397	MB Alarm 5 ON
398	MB Alarm 6 ON
399	MB Alarm 7 ON
400	MB Alarm 8 ON
401	MB Alarm 1 OFF
402	MB Alarm 2 OFF
403	MB Alarm 3 OFF
404	MB Alarm 4 OFF
405	MB Alarm 5 OFF
406	MB Alarm 6 OFF
407	MB Alarm 7 OFF
408	MB Alarm 8 OFF
409	Bump Clock By Correction Factor
410	Say Year As Part Of Date
411	Don't Say Year As Part Of Date
412	Clock 12 Hour Readback
413	Clock 24 Hour Readback
414	Clock Say Hours
415	Clock Not Say Hours

501 - 631 Suspend Scheduler Setpoint 1 – 130 (there is no 510)
701 - 831 Resume Scheduler Setpoint 1 – 130 (there is no 765)

851 - 980 Call MotherBoard Macro 1 – 130

Message Macros

Each Radio Card 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 10 vocabulary words, DVR tracks or any combination of the two.

For example, Radio Card Macro 42 is going to be used to re-map the Port 1 and Port 2 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 Port 1 unlocked, we program:

***2103 01 249 324 001 075 002** 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.

Also important: Using a Vocabulary word greater than 254 requires 2 slots. Remember if you exceed a total of 10 words total, you'll receive an error and that Message Macro will not be stored.

Since we're using a Radio Card Macro, we now program # 42 to link the ports and also include Message Macro 1:

***4002 42 0085 0226**

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.

Special Features

Temporarily Disabling ID's And Timeout Timer

The RC810 allows for easy use when "broadcasting" special events, such as a NewsLine 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 RC810 to completely handle most of the tasks associated with this usually cumbersome chore.

Macro Functions

0134 Stop ID And Disable Timeout Timer
0135 Resume ID And Re-Enable Timeout Timer

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

***4002 11 0134 0226**

If the event lasts longer than 30 minutes, you can simply run Command Macro 11 again to restart the 30 minute suspend period. OF course you should make sure your audio source properly ID's at least every 10 minutes during this 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 0135 0234**

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 Macro to control a remote link or an IRLP or EchoLink node.

Once programmed, the memories can then be recalled by a 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: DTMF Memories should be programmed on the Radio Card which will actually send the DTMF.

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 Commands

This feature allows the sending of DTMF “on the fly”, without having to use a DTMF Memory. Users enter the *Regen Prefix* followed by a sequence of up to 10 DTMF digits. After they unkey, all digits after the *Prefix* are sent to the pre determined Port(s).

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

The *Regen 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 Command Prefix, up to 6 digits.

The RC810 needs to know which Port(s) you want the user-entered DTMF sequence to be sent.

***2117x** Set Port(s) to send, where x is the Port(s) to send the DTMF

Examples:

***2117 4**	Send DTMF to Port 4
***2117 123**	Send DTMF to Ports 1, 2 & 3

Finally, you may prepend that a Macro be run before the DTMF is sent.

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

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 command 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 SSS DOW Hours Minutes Macro**

SSS is the setpoint number 01-145 and must always be 3 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

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

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

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

Macro is the Macro to be executed at the appointed time and may be any Motherboard or Radio Card Macro (more on this below).

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.

Telling The Scheduler Which Macros To Run

The Scheduler, which resides on the Motherboard, can call either Motherboard or Radio Card Macros. You select which one with the *Scheduler Port* command:

***4000 sss p** where sss is Setpoint 001 – 145 and p is the Port(s) on which to run the Macro.

Note: If p is set to 0 then a Motherboard Macro is used.

Examples:

***4000 002 0** ←Use Motherboard Macro 2
***4000 005 1** ←Use Radio Card Macro 5 on Port 1
***4000 023 134** ←Use Radio Card Macro 23 on Ports 1,3 & 4

Note that when programming Scheduler Port, the Macro is always 3 digits even when programming a Radio Card Macro which normally requires 4 digits.

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 036 (Say Time) on our desired Port(s) and call that Macro with a Scheduler Setpoint to run every hour, starting at 6 AM. The RC810 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 RC810 incorporates another set of commands that allow you to suspend a currently occurring Setpoint without having to actually erase it. 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 RC810'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 our Setpoints:

***4001 001 8 0A 00 002** ←Call Macro 2 every hour on weekdays
***4001 002 8 06 00 003** ←Resume Macro 3 at 6 AM on weekdays
***4001 003 8 09 00 004** ←Suspend Macro 4 at 9 AM weekdays

Now we program the Macros we're going to use (we use MotherBoard Macros since we're using Suspend/Resume Functions which are only available on Motherboard Macros):

***4002 002 036** ←Macro 2 calls Say Time
***4002 003 701** ←Macro 3 sets the Resume flag for Setpoint 1
***4002 004 501** ←Macro 4 sets the Suspend flag for Setpoint 1

We decide we want to send the time announcement to Ports 1 & 4:

***6006 002 14** ←Macro 002 to be sent to Ports 1 & 4

And finally, we tell the Scheduler to use Motherboard Macros for all 3 used Macros:

***4000 001 0** ←Use Motherboard Macro 1
***4000 002 0** ← Use Motherboard Macro 2
***4000 003 0** ← Use Motherboard Macro 3

Now the controller will announce the time ever hour on Ports 1 & 4, starting at 6 AM on weekdays and stop announcing at 9 AM

The Scheduler (continued)

Plan! Plan! Plan!

The most important step you can do is PLAN. You need to figure out exactly what you want your system 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 your repeater on 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. You also want to require CTCSS Access on Port 1 between midnight and 7 am on weekends.

Remember that the Scheduler can only call Macros, so we also need to define some Macros to do our bidding.

In our examples, we're going to use Radio Card Macros and not Motherboard Macros.

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
2	9:00 am	Weekdays	3	Weekday mornings - back to courtesy tone #1 on Port 2
3	7:00 pm	Monday	4	Turn link on for net
4	8:00 pm	Monday	5	Turn link off after net ends
5	12:00 am	Weekdays	6	Change Port 1 to require CTCSS during weekends at midnight
6	6:00 am	Weekdays	7	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 0014** Program Macro 2 to change to Courtesy Tone #2
***4002 03 0013** Program Macro 3 to change to courtesy tone back to #1
***4002 04 0226** Program Macro 4 to link this Port to Port 2
***4002 06 0234** Program Macro 5 to unlink this Port from Port 3
***4002 07 0002** Program Macro 6 to change Port 1 to CTCSS Access
***4002 08 0001** Program Macro 7 to change Port 1 to Carrier Access

We can now program the scheduler setpoints:

***4001 01 8 0A 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 04 8 18 55 04** Call Macro 4 at 6:55 PM to link Ports 1 & 2
***4001 05 8 20 00 05** Call Macro 5 at 8 PM to unlink Ports 1 & 2
***4001 06 9 00 00 06** Call Macro 6 at midnight on weekends
***4001 07 9 07 00 07** Call Macro 7 at 7 AM on weekends.

As you can see, if you take the time to plan your setpoints, the RC810 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
***8005**	Voice ID #1	22
***8006**	Voice ID #2	22
***8007**	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, AA5 and AA6 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:

***8008x 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

***8009x** Enable Voice IDs
x = 1 Enabled* *Factory default
x = 0 Disabled

Enable/Disable Non-Repeat IDs

Normally, the RC810 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 RC810 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.
***8001 1000** Program cw tone of 1000 Hz.
***8001 0660 0440** Program dual tone of 660 and 440 Hz.

CW ID Programming

There are 3 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 ID Override ON and a signal appears on that port's receiver during a Voice ID, it will revert to CW and play the next CW ID in rotation.

***8002xx-xx** Program CWID #1
***8003xx-xx** Program CWID #2
***8004xx-xx** Program CWID #3

Examples

***8002 21 42 06 53 32 12 21 82 92** Program "AH6LE/AUX" into CW ID #1
***8003 21 42 06 53 32 12 72** Program" AH6LE/R" into CW ID #2
***8004 21 42 06 53 32 12 72 70 81** Program" AH6LE/RPT" into CW 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).

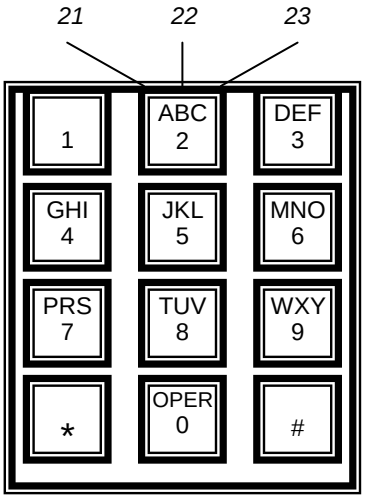


Fig 6 Morse Code Character Table

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)

Each Radio includes an on-board DVR, which allows you to record up to 40 different "tracks" (messages) of audio. There is a total of 4 minutes 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 - 40

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- 40

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 - 40

***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 RC810 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 RC810 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 total 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.

Resetting The RC810

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.

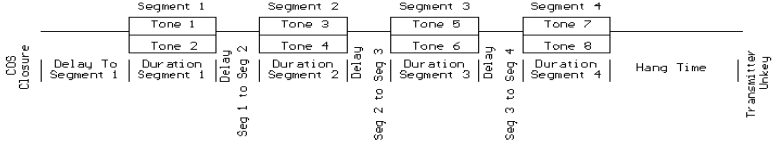
Upon a successful reset, you'll hear the power up message with the version number.

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

Note: Use care when doing a reset as it will cause ALL installed Ports to be reset which might interrupt ongoing communications.



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 #**

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 # #**

Analog Inputs And Meter Faces

In addition to the one Analog Input on each Radio Card, there are 8 additional Analog Inputs located on the Motherboard. They are identical in most ways with the exception of how they're programmed and the command used to do so. As you study the examples below, remember that each Radio Card has only 1 Analog Channel, so you will always use a 1 as the Channel Number when

programming it.

The programming syntax for a Radio Card is:

2060 1* M* X1* Y1* X2* Y2 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 *.

To program an Analog Input on the Motherboard:

2063 1* 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 (only 1 on the Radio Cards), with each meter face programmed with 1 of 6 values. The programming command consists the channel number, 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 the programming of a Meter Face, simply enter the Channel 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 (always 1 with a Radio Card), 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	3 Watts	6 Percent
1 Volts	4 Degrees	
2 Amps	5 Miles Per Hour	

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)

In this example, we'll program the Radio Card Analog Input using the above calibration data, so we would program:

2060 1* 3* 25* 1000* 210* 4000

Voltmeter example: You want to use Motherboard Analog Input 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:

2063 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 Motherboard Analog Input 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.

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 * alarm type * trippoint * macro to run ***

Note: remember that if programming a Radio Card Meter Alarm, the Meter Number is always 1

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 that is mounted on our repeater's transmitter heatsink and is connected to a Radio Card's Analog Input .We also have the PA power control line connected to Logic Output 1 on that Radio Card. 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 and Macro 23 to turn Logic 1 off

***4002 22 030**
***4002 23 034**

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 RC810. The RC810 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 RC810 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 RC810 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 RC810 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 Radio Cards and Motherboard Analog Inputs come 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 RC810 and then program that value into the co ***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 RC810, carefully measure the voltage at pin 1 of J2 (the white connector on the Motherboard which is wired to the TO-3 cased LM323 on the back panel of the RC810’s rack mount). 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 examples below shows how to enter this measured Vref.

***2061 4 9 6** ←Program Vref on Radio Card
***2064 4 9 6** ←Program Vref On Motherboard

Note: While all Analog Inputs are protected against overvoltage, it’s a good idea to avoid applying voltages above 5 volts to any A/D channel input for longer than a few seconds.

Measuring Voltages Higher Than Vref - A Practical Example

The voltage applied to an A/D input cannot exceed Vref, which is 5.00 volts by default.

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 RC810 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 on the Motherboard 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.

USER NOTES:

Alarms/Logic Inputs

Alarm Programming

The RC810 incorporates 2 Alarm Inputs on each Radio Card and 8 on the Motherboard 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 on a Radio Card 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 link that Port as needed to broadcast the Alert. 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:

***2119 <Alarm #> <Macro #>** ←Radio Card Alarm
***2121 <Alarm #> <Macro #>** ←Motherboard Alarm

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

***2120 <Alarm #> <Macro #>** ←Radio Card Alarm
***2122 <Alarm #> <Macro #>** ←Motherboard Alarm

Examples:

***2119 1 10** Falling Alarm 1 calls Radio Card Macro 10
***2120 2 2** Rising Alarm 2 calls Radio Card Macro 2

***2121 4 5** Falling Alarm 4 calls Motherboard Macro 5
***2122 7 20** Rising Alarm 7 calls Motherboard Macro 20

AutoPatch Operation

Please refer to the AP10 Autopatch Manual for information (available Fall, 2010)

Updating The Firmware

Please refer to the RC810 MultiLoader Manual for details on how to update the operating firmware of the RC810.

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, IC-7000

Doug Hall RBI-1 Remote Base Radio Interface

Factory Default Programming Values

When you first receive your RC810, the following values are programmed as default:

Radio Cards

Carrier/PL Access	Carrier Only squelch	Analog Input	Not defined
Hang Time 1	5 seconds	Macros	None defined
Hang Time 2	2 seconds	Macro Recall Codes	10901 - 109090
Hang Time 3	1 second	Remote Base Type	Kenwood Serial Type
Timeout 1	180	Autopatch Prefix	C1
Timeout 2	60	Alarm Input 1 & 2	Disabled
Timeout 3	Disabled	Logic Output 1 & 2	OFF (open collector)
CW Tone	600 Hz	Remote Base Prefix	A7
CW Speed	20 wpm	Lock Code	#
Monitor Mix	Yes	DTMF Terminator	D
Transmitter Enabled	Yes	DTMF Covertone	ON
Receiver Enabled	Yes	DTMF Enable	Enabled
Courtesy Tone	#1	DTMF Mute	ON
Repeat Mode	Enabled	DTMF Require CTCSS	NO
Speech Override	ON	Fan Turn Off Time	5 minutes
Speech ID Override	ON		

Motherboard

Logic Output 1 - 8	OFF (open collector)
Alarm 1 - 8	Disabled
Analog Inputs 1 – 8	Not defined
Say Year	ON
12/24 Hour Readback	12 Hour
Say Hours	OFF
RTC Correction Factor	None
Clock/Calendar	Set to factory time zone
Macros	None defined
Macro Recall Codes	20901 - 2090130

Appendix B

CTCSS Codes

Kenwood

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

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:

5281 Unlock

1100 Receiver Disable
1101 Receiver Enable

1110 Transmitter Disable
1111 Transmitter Enable

1120 Carrier Only Access
1121 CTCSS & Carrier Access
1122 CTCSS Only Access

1130 DTMF Covertone OFF
1131 DTMF Covertone ON

1134x Courtesy Tone Select 1 - 10

1140 Non-Repeat
1141 Repeat
1142 Remote Base

1150 Kerchunk OFF
1151 Kerchunk ON

1160 DTMF Disable
1161 DTMF Enable

1170 DTMF Require Tone
1171 DTMF Not Require Tone

1180 Speech ID Over OFF
1181 Speech ID Over ON

1190 Monitor Mute
1191 Monitor Mix

1200 Speech Override OFF
1201 Speech Override ON

1210 DTMF Mute OFF
1211 DTMF Mute ON

1220 DTMF Evaluate on COS
1221 DTMF Evaluate on Tone

1300 LEDs OFF
1301 LEDs ON

1400 Read Radio Card Meter
1400 1 Read Radio Card Low Value
1400 2 Read Radio Card High Value
1410 Reset Radio Card Meter Hi/LOW Stored Value
1450x Radio Card Meter Alarm ON/OFF
1500x Read Motherboard Analog Input Channel 1 - 8
1500x 1 Read MB Analog Input Channel 1 - 8 Stored Low
1500x 2 Read MB Analog Input Channel 1 - 8 Stored High
1510 Reset MB Meter Hi/LOW Stored Value
1550x y Motherboard Meter Alarm 1 - 10 ON/OFF

1700 Say Time
1701 Say Date

1810 Radio Card Logic Output 1 OFF
1811 Radio Card Logic Output 1 ON
1812 Radio Card Logic Output 1 PULSE
1820 Radio Card Logic Output 2 OFF
1821 Radio Card Logic Output 2 ON
1822 Radio Card Logic Output 2 PULSE

19x0 Motherboard Logic Output x OFF
19x1 Motherboard Logic Output x ON
19x2 Motherboard Logic Output x PULSE
x = 1 to 8

2000xxy Motherboard Extended Logic xx OFF/ON/PULSE

231x Monitor Port x
230x Stop Monitoring Port x

A1x Link To Port x
A0x Unlink From Port x

A71 Remote Base Frequency
A72 Remote Base CTCSS
A73 Remote Base Mode
A74 Doug Hall User Function
A75x Memory Select
A77x V7a/G707 Memory Recall
A79x RB Power Select

9110 Radio Card Alarm 1 OFF
9111 Radio Card Alarm 1 ON
9120 Radio Card Alarm 2 OFF
9121 Radio Card Alarm 2 ON

9210 MotherBoard Alarm 1 OFF
9211 MotherBoard Alarm 1 ON
9220 MotherBoard Alarm 2 OFF
9221 MotherBoard Alarm 2 ON
9230 MotherBoard Alarm 3 OFF
9231 MotherBoard Alarm 3 ON
9240 MotherBoard Alarm 4 OFF
9241 MotherBoard Alarm 4 ON
9250 MotherBoard Alarm 5 OFF
9251 MotherBoard Alarm 5 ON
9260 MotherBoard Alarm 6 OFF
9261 MotherBoard Alarm 6 ON
9270 MotherBoard Alarm 7 OFF
9271 MotherBoard Alarm 7 ON
9280 MotherBoard Alarm 8 OFF
9281 MotherBoard Alarm 8 ON

10901 to 109090
Recall Macro 1 to 90

Programming Commands Quick Reference

Code	What It Programs	What It Means
***1000xy**	Program Transmitter Hang Timer	Programs Hang Timer 1, 2 or 3
***1001xy**	Program Time Out Time	Programs Timeout Timer 1,2 or 3
***1002x**	Program Initial ID Period	Programs the Initial ID Timer
***1003x**	Program Pending ID Period	Programs the Pending ID Timer
***1004x**	Program Fan Time	Programs the length of time the Fan will remain on after xmtr drop
***1005x**	Program Port Activity Timer	Programs the Link Inactivity Timer
***1006x**	Program DTMF Mute Timer	Programs the DTMF Mute Timer
***1007x**	Program CTCSS Encode Timer	Programs the CTCSS Encode Timer
***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
***2000x**	Program Tone Mode	Programs the On-Board Tone Unit Mode of Operation
***2001x**	Program Receive Tone Table	Programs the On-Board Tone Unit Receive frequency/code
***2002x**	Program Transmit Tone Table	Programs the On-Board Tone Unit transmit frequency/code
***2003x**	Program Receive Tone Macro To Use	Programs which Macro to use when a tone is received
***2010x**	Program Encoded Tone/Code Routing	Programs where the On-Board Tone Unit sends encoded tone/code
***2015x**	Filter/Don't Filter CTCSS/DCS	Controls filtering of CTCSS/DCS on received signal
***2021xy**	Program Squelch Level	Programs the On-Board Squelch Level/Delay Level
***2022xy**	Program Squelch Delay	Programs the On-Board Squelch Level/Delay Delay
***2025xy**	Program DTMF Covertone Frequencies	Programs the tones used if DTMF Covertone is enabled
***2026xy**	Program DTMF Covertone Duration	Programs the duration of tones if DTMF Covertone is enabled
***2030**	Program Autopatch Prefix Code	Programs the Prefix prepended to Autopatch commands
***2031**	Program Autopatch Blacklist	Programs numbers to disallow from manually dialing
***2032**	Program Autopatch Security Code	Programs the code that must be entered when Autopatch answers
***2033x**	Autopatch Autodial Number Store	Stores Autopatch Autodial numbers for automatic dialing
***2034x**	Autopatch Port Restrictions	Programs which port(s) the Autopatch may be used from
***2050xx**	Program Radio Card Macro Recall Code	Programs the code used to recall Radio Card Macros
***2055xx**	Program Motherboard Macro Recall Code	Programs the code used to recall Motherboard Macros
***2060xx**	Program Radio Card Meter Face	Programs the Radio Card's Analog Input
***2061x**	Program Radio Card Vref setting	Programs the Radio Card's Analog Input voltage reference
***2062xx**	Program Radio Card Meter Alarm	Programs the Radio Card's Meter Alarm trip points
***2063xx**	Program Motherboard Meter Faces	Programs the Motherboard Analog Inputs
***2064x**	Program Motherboard Vref setting	Programs the Motherboard Analog Input voltage reference
***2065xx**	Program Motherboard Meter Alarms	Programs the Motherboard Meter Alarm trip points
***2070x**	Program Remote Base Prefix	Programs the Prefix prepended to default Remote Base commands
***2071x**	Set Radio Type	Select which type of radio is used as a Remote Base
***2072x**	Set Yaesu Type	If Yaesu is selected, select which type format to use
***2073x**	Store Remote Base Memory	Store Remote Base memory *controller's memories 1 - 20*
***2074x**	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)
***2103x**	Program Message Macros	Program the messages using in Message Macros
***2104x**	USER DTMF Prefix	Programs the prefix to use before any default command
***2105x**	Program DTMF Memory	Programs the DMTF sequence to be sent
***2106x**	Program Send DTMF Duration	Programs the duration of transmitted DTMF digits
***2107x**	Program DTMF Pause Time	Programs the period between transmitted DTMF digits
***2108x**	Program Site Prefix	Programs the Site Prefix digits
***2109x**	Program Programming Prefix	Programs the Programming Prefix

Programming Commands Quick Reference (continued)

Code	What It Programs	What It Means
***2110x**	Program Tail Message	Programs Tail Message 1, 2 or 3
***2111x**	Select Tail Message	Selects Tail Message 1, 2 or 3
***2112x**	Select Tail Counter	Sets the Tail Message Counter
***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**	Set Fan Mode of Operation	Selects on conditions under which Fan is started
***2117x**	User DTMF Out Port	Programs which port(s) User DTMF should be sent to
***2118x**	User DTMF Macro Program	Programs which Macro is run before DTMF sent
***2119x**	Program Falling Alarm Radio Card Macro	Selects which Radio Card Macro to run on a High-to-low transition
***2120x**	Program Rising Alarm Radio Card Macro	Selects which Radio Card Macro to run on a Low-to-high transition
***2121x**	Program Falling Alarm Motherboard Macro	Selects which Motherboard Macro to run on a High-to-low transition
***2122x**	Program Rising Alarm Motherboard Macro	Selects which Motherboard Macro to run on a Low-to-high transition
***21999**	Master Reset	Forces reset of entire controller
***29999**	Say Version	Speak the Firmware version currently loaded
***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
***4000**	Program Scheduler Port To Use	Program which Port(s) a Scheduler event is sent to
***4001**	Program Scheduler	Program the Scheduler to run automated events
***4002**	Program A Radio Card Macro	Program a series of functions into a Radio Card Macro
***4003**	Erase A Specific Radio Card Macro	Erase a previously stored Radio Card Macro by Macro Number
***400499**	Erase All Radio Card Macros	Erase ALL Radio Card Macros
***400599**	Clear All Setpoints	Erases all programmed Scheduler Setpoints
***4008x**	Readback Radio Macro Contents	Reads back the contents of Radio Card Macro
***4009**	Program Radio Card Guest Macro Range	Program the range of Radio Card Guest Macros
***5100**	Set Time	Sets the Real Time Clock
***5101**	Set Date	Sets the Calendar
***5102x**	Say/Don't say year as part of date	Enables/disables readback of the year when the date is spoken
***5103x**	12/24 Hour Select	Selects 12 or 24 hour time announcement
***5104x**	Say/Don't Hours as part of 24 hour	Selects if “hours” is spoken as part of 24 hour time announcements
***5105x**	Bump Clock Seconds	Adds or subtracts x seconds from clock time (to allow "fine tuning")
***6002**	Program A Motherboard Macro	Program a series of functions into a Motherboard Macro
***6003**	Erase A Specific Motherboard Macro	Erase a previously stored Motherboard Macro by Macro Number
***600499**	Erase All Motherboard Macros	Erase ALL Motherboard Macros
***6005**	Restrict Motherboard Macro Ports	Program which Ports are allowed to run Motherboard Macros
***6006**	Motherboard Macro Send to Port	Program which Ports a Motherboard Macro is sent to
***6008**	Readback Motherboard Macro Contents	Reads back the contents of Motherboard Macro
***6009**	Program Radio Card Guest Macro Range	Program the range of Radio Card Guest Macros
***7001x**	Record DVR Message	Record a DVR Track x = Track 1 to 40
***7002x**	Erase DVR Message	Erase a DVR Track x = Track 1 to 40
***700399**	Erase ALL DVR Messages	Erases all DVR Tracks 1 to 40
***7004x**	Remove last segment of DVR Message	Remove the last 200 ms. of Track 1 to 40
***7005x**	Replace last segment of DVR Message	Replace the last 200 ms. of Track 1 to 40
***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 CW ID 3	Programs the CW Message used for CW ID 3
***8005**	Program Voice ID 1	Programs the message used for Voice ID 1
***8006**	Program Voice ID 2	Programs the message used for Voice ID 2
***8007**	Program Voice ID 3	Programs the message used for Voice ID 3
***8008**	Program ID Extras	Programs the Extra message for Voice IDs
***8009x**	Enable Voice IDs	Enables/Disables Voice IDs: 1 = Enabled, 0 = Disabled
***9000**	Program Unlock Code	Programs the Unlock Code
***9010x**	Program Lock Code	Programs the code to lock
***9020x**	Program DTMF Terminator	Programs the DTMF digit used to force command evaluation

RC810 Vocabulary List

000	ZERO	062	ACTIVE	124	COME
001	ONE	063	ADJUST	125	COMPLETE
002	TWO	064	ADVISE	126	COMPUTER
003	THREE	065	AFFIRMATIVE	127	CONDITION
004	FOUR	066	AFTERNOON	128	CONGRATULATIONS
005	FIVE	067	ALERT	129	CONNECT
006	SIX	068	ALL	130	CONNECTED
007	SEVEN	069	ALOFT	131	CONTACT
008	EIGHT	070	ALPHA	132	CONTROL
009	NINE	071	ALTERNATE	133	CONTROLLER
010	TEN	072	ALTITUDE	134	COUNT
011	ELEVEN	073	AMATEUR	135	CURRENT
012	TWELVE	074	AMPS	136	CYCLE
013	THIRTEEN	075	AND	137	DANGER
014	FOURTEEN	076	ANSWER	138	DATE
015	FIFTEEN	077	ANTENNA	139	DAY
016	SIXTEEN	078	APRIL	140	DAYS
017	SEVENTEEN	079	ARCOM	141	DECEMBER
018	EIGHTEEN	080	AREA	142	DECREASE
019	NINETEEN	081	AS	143	DECREASING
020	TWENTY	082	ASSOCIATION	144	DEGREES
021	THIRTY	083	AT	145	DELTA
022	FOURTY	084	AUGUST	146	DEVIATION
023	FIFTY	085	AUTO	147	DEVICE
024	SIXTY	086	AUTOMATIC	148	DIAL
025	SEVENTY	087	AUXILIARY	149	DINNER
026	EIGHTY	088	AVERAGE	150	DIRECTION
027	NINETY	089	A_M	151	DISABLED
028	HUNDRED	090	BAND	152	DISCONNECTED
029	THOUSAND	091	BANK	153	DISCRIMINATOR
030	MILLION	092	BASE	154	DISPLAY
031	A	093	BATTERY	155	DIVIDED
032	B	094	BELOW	156	DOOR
033	C	095	BETWEEN	157	DOWN
034	D	096	BLOWING	158	EAST
035	E	097	BOARD	159	ECHO
036	F	098	BOOST	160	ELEVATION
037	G	099	BOZO	161	EMERGENCY
038	H	100	BRAVO	162	ENTER
039	I	101	BREAK	163	EQUAL
040	J	102	BROKEN	164	ERROR
041	K	103	BUSY	165	ESTIMATED
042	L	104	BUTTON	166	EVACUATE
043	M	105	BY	167	EVACUATION
044	N	106	CALIBRATE	168	EVENING
045	O	107	CALL	169	EXAM
046	P	108	CALLING	170	EXIT
047	Q	109	CALM	171	EXPECT
048	R	110	CANCEL	172	FAHRENHEIT
049	S	111	CARRIER	173	FAIL
050	T	112	CAUTION	174	FAILURE
051	U	113	CELCIUS	175	FARAD
052	V	114	CENTER	176	FAST
053	W	115	CHANGE	177	FEBRUARY
054	X	116	CHARLIE	178	FEET
055	Y	117	CHECK	179	FILED
056	Z	118	CIRCUIT	180	FINAL
057	ABORT	119	CLEAR	181	FIRE
058	ABOUT	120	CLOCK	182	FIRST
059	ABOVE	121	CLOSED	183	FLOW
060	ACKNOWLEDGE	122	CLUB	184	FOXTROT
061	ACTION	123	CODE	185	FREEDOM

186	FREQUENCY	253	LOOK	320	PLEASE
187	FRIDAY	254	LOW	321	PLUS
188	FROM	255	LOWER	322	POINT
189	FRONT	256	LUNCH	323	POLICE
190	FULL	257	MACHINE	324	PORT
191	GALLONS	258	MANUAL	325	POSITION
192	GATE	259	MARCH	326	POWER
193	GAUGE	260	MAY	327	PRACTICE
194	GET	261	MAYDAY	328	PRESSURE
195	GO	262	MAXIMUM	329	PRIVATE
196	GOLF	263	ME	330	PROBE
197	GOOD	264	MEAN	331	PROGRAM
198	GOODBYE	265	MEASURE	332	PROGRAMMING
199	GREENWICH	266	MEETING	333	PULL
200	GROUND	267	MEGA	334	PUSH
201	GUSTING_TO	268	MESSAGES	335	P_M
202	HAIL	269	METER	336	QUEBEC
203	HALF	270	MICRO	337	RADAR
204	HAM	271	MIKE	338	RADIO
205	HAMFEST	272	MILES	339	RAIN
206	HAMVENTION	273	MILESPERHOURS	340	RANGE
207	HAVE	274	MILLI	341	RATE
208	HAZARDOUS	275	MINIMUM	342	READY
209	HELLO	276	MINUS	343	REAR
210	HELP	277	MINUTES	344	RECEIVE
211	HENRY	278	MIX	345	REMOTE
212	HERTZ	279	MOBILE	346	REPAIR
213	HIGH	280	MONDAY	347	REPEAT
214	HOLD	281	MONITOR	348	REPEATER
215	HOME	282	MONTH	349	RIG
216	HOTEL	283	MORE_THAN	350	RIGHT
217	HOUR	284	MORNING	351	ROAD
218	HOURS	285	MOTOR	352	ROGER
219	IDENTIFY	286	MOVE	353	ROMEO
220	IMMEDIATELY	287	MUCH	354	SAFE
221	IN	288	MUTE	355	SATURDAY
222	INCH	289	NEGATIVE	356	SCATTERED
223	INCREASE2	290	NET	357	SECOND
224	INCREASING	291	NEW	358	SECONDS
225	INDIA	292	NEXT	359	SECURITY
226	INDICATED	293	NIGHT	360	SELECT
227	INFORMATION	294	NO	361	SEPTEMBER
228	INSIDE	295	NORTH	362	SEQUENCE
229	INTERNET	296	NORTHEAST	363	SERVICE
230	INTRUDER	297	NORTHWEST	364	SET
231	IRLP	298	NOT	365	SEVERE
232	IS	299	NOVEMBER	366	SEXY
233	IT	300	NUMBER	367	SHORT
234	JANUARY	301	OCLOCK	368	SHUT
235	JULIET	302	OCTOBER	369	SIDE
236	JULY	303	OF	370	SIERRA
237	JUNE	304	OFF	371	SITE
238	KEY	305	OHMS	372	SKYWARN
239	KILO	306	ON	373	SLOW
240	KNOTS	307	OPEN	374	SMOKE
241	LATE	308	OPERATOR	375	SNOW
242	LAUNCH	309	OSCAR	346	SOUTH
243	LEFT	310	OTHER	377	SOUTHEAST
244	LESS_THAN	311	OUT	378	SOUTHWEST
245	LEVEL	312	OUTSIDE	379	SPEED
246	LIGHT	313	OVER	380	SQUELCH
247	LIMA	314	PAPA	381	START
248	LINE	315	PASSED	382	STOP
249	LINK	316	PATCH	383	STORM
250	LIST	317	PERCENT	384	SUNDAY
251	LOCK	318	PHONE	385	SWITCH
252	LONG	319	PICO	386	SYSTEM

387	TANGO	423	VERIFY	606	DVR TRACK 6
388	TANK	424	VICTOR	607	DVR TRACK 7
389	TARGET	425	VOLTS	608	DVR TRACK 8
390	TEEN	426	WAIT	609	DVR TRACK 9
391	TELEPHONE	427	WAKE	610	DVR TRACK 10
392	TEMPERATURE	428	WAKE_UP	611	DVR TRACK 11
393	TEST	429	WARNING	612	DVR TRACK 12
394	THANKYOU	430	WATCH	613	DVR TRACK 13
395	THAT	431	WATTS	614	DVR TRACK 14
396	THE(LONG)	432	WEATHER	615	DVR TRACK 15
397	THE(SHORT)	433	WEDNESDAY	616	DVR TRACK 16
398	THE TIME IS	434	WELCOME	617	DVR TRACK 17
399	THIS	435	WEST	618	DVR TRACK 18
400	THIS_IS	436	WHISKEY	619	DVR TRACK 19
401	THUNDERSTORMS	437	WILL	620	DVR TRACK 20
402	THURSDAY	438	WIND	621	DVR TRACK 21
403	TIME	439	WITH	622	DVR TRACK 22
404	TIMER	440	WRONG	623	DVR TRACK 23
405	TIMEOUT	441	XRAY	624	DVR TRACK 24
406	TODAY	442	YANKEE	625	DVR TRACK 25
407	TOMORROW	443	YES	626	DVR TRACK 26
408	TONE	444	YESTERDAY	627	DVR TRACK 27
409	TONIGHT	445	YOUR	628	DVR TRACK 28
410	TORNADO	446	ZED	629	DVR TRACK 29
411	TOTAL	447	ZONE	630	DVR TRACK 30
412	TRAFFIC	448	ZULU	631	DVR TRACK 31
413	TRANSMIT	449	-ER	632	DVR TRACK 32
414	TUESDAY	450	-ING	633	DVR TRACK 33
415	UNDER	451	S(MAKES PLURAL)	634	DVR TRACK 34
416	UNIFORM	452	SILENCE(PAUSE)	635	DVR TRACK 35
417	UNTIL			636	DVR TRACK 36
418	UP	601	DVR TRACK 1	637	DVR TRACK 37
419	USE(noun)	602	DVR TRACK 2	638	DVR TRACK 38
420	USE(verb)	603	DVR TRACK 3	639	DVR TRACK 39
421	VALVE	604	DVR TRACK 4	640	DVR TRACK 40
422	VARIABLE	605	DVR TRACK 5		

RC810 Feature And Specifications

Ports (Radio Cards)

- Supplied with 4, expandable to 8 total - each port may be operated as an independent repeater port or as a link or remote base port
- May use external COS and CTCSS logic or on-board generated signals. If using external signals, dip switch selection of active high or low signals
- On-board CTCSS/DCS encoder and decoder, programmable with multi-tables
- On-board multilevel squelch with 3 programmable audio gating delay/RSSI setpoints
- Dip switch selection of receiver de-emphasis and transmitter pre-emphasis for all generated speech and tones
- Software selectable CTCSS/DCS filtering of receiver audio
- SelCall Encoding
- Unique programmable hang, timeout, activity, DTMF mute and kerchunk timers
- Selectable CTCSS/DCS/Carrier squelch modes (true "AND" operation) on each port
- Selectable CTCSS/DCS encode control output with programmable delay dropout for controlling external (or internal) CTCSS encoder on each port
- Dedicated DTMF decoder which may be disabled
- Dedicated fan control output and A/D input for temperature sensing
- May be defined to require CTCSS or not require CTCSS for DTMF operation
- Unique 10 courtesy tones with up to 4 segments each (dual tone per segment)
- May be used as for Control Receiver
- Regenerated DTMF - very handy for IRLP®, Echolink© and radio link use.
- Optional plug-in audio delay board
- Optional Repeater Builder AP-50 Limiter Board simply plugs in.

IDs

- Each Port has 3 unique Voice and 3 unique CW ID's.
- Selectable rotation with Initial and Pending ID algorithm
- Programmable Initial and Pending ID timers
- Voice ID's may be disabled on a per port basis for CW only identification
- CW IDs may be programmed with dual or single tones as well as speed

Linking

- Any Port may be linked to any other Port (or combination of Ports) on command
- Selectable Monitor Mute/Monitor Mix audio when linked
- Inactivity timer automatically calls a Command Macro after a programmable amount of time of inactivity on that Port (may be disabled)

Remote Bases

- Frequency agile HF/VHF/UHF remote base with support for Kenwood, Icom, Yaesu and Doug Hall RBI-1

Speech Messages

- Each Radio Card (Port) has its own on-board speech (no need to share one speech generator among the different Ports)
- 452+ word vocabulary in real human speech. May be used in programmable ID's or other messages
- 100 Message Macros for easy use of custom programmed phrases
- Any combination of Vocabulary or DVR tracks may be used in any message
- Programmable Tail Messages

Digital Voice Recorder

- Each Port has its own DVR for recording your own custom messages (DVR tracks may be used in any programmable message). Total time of 4 minutes PER PORT

Command Macros

- 90 Command Macros PER PORT for easy one command functions. May also call other Command Macros for unlimited functionality. Additional 130 Macros supplied by Motherboard for a total of 850.

Scheduler

- 145 Setpoints for timed events based on time of day, day of week and day of month

General Purpose Timers

- Each Port provided 5 fully independent and programmable Timers that may run any Command Macro

Serial Port

- RS-232 and USB ports for programming and weather station interfacing

Analog Meters

- 1 A/D Channel on each Radio Card. 8 additional channels on Motherboard. Each channel is fully scaleable with 6 different meter faces
- Each channel has programmable high and low alarms
- Inputs protected against over or negative voltages

Optional LAN Card

- SSL Encrypted and password protected access allows configuration and monitoring of controller. Configurable TCP/IP parameters

Logic Outputs and Inputs

- 6 digital Alarm inputs
- 8 digital outputs may be commanded high/low/pulse. May be expanded to 64

Mechanical

- 2U high (3.5 inches) x 19 inches x 8.25 inches D
- Removable cover on front panel for easy access to level adjustments and LED monitors

Optional Accessories

- ADB Audio delay module
- Repeater Builder AP-50 Audio Filter/Limiter
- MultiLoader Windows© programming software
- AP10 Autopatch with reverse