

RC-100

Manual of Operations

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RC-100 Repeater Control Manual of Operation Micro Computer Concepts

Table of Contents

- 1.0 Introduction**
 - 1.1 Definitions**
 - 1.2 Controller Details**
- 2.0 Power Up Conditions**
- 3.0 Repeater Operation**
 - 3.1 Controller Connections**
 - 3.2 Access Modes**
 - 3.3 Repeater Time-out**
 - 3.4 Tail Timing**
 - 3.41 Zero Tail**
 - 3.5 DTMF Muting**
 - 3.6 Anti-Kerchunker**
 - 3.7 Sub-audioable Tone Decoding**
 - 3.8 Sub_audioable Tone Encoder Control**
- 4.0 Autopatch**
- 5.0 Control and User Codes**
 - 5.1 Control Operator Codes**
 - 5.2 User Codes**
 - 5.3 Control Action Indicator**
 - 5.4 Master First Digit**
 - 5.5 Fixed Misc Codes**
- 6.0 Tape Function**
 - 6.1 Tape Operation**
- 7.0 Remote Base**
 - 7.1 Remote Base Operation**
 - 7.2 Remote Base On Tail Beep**
 - 7.3 Remote Base Frequency Programming**
 - 7.31 Programming**
 - 7.32 Remote Base Frequency Connections**
 - 7.4 Remote Base DTMF Access**
 - 7.5 Remote Base Key during CW ID**
 - 7.6 Remote Base Automatic Timeout**
- 8.0 DTMF Pad Tester**
- 9.0 Repeater Identification**
 - 9.1 Continuous CW ID**

9.2 External ID

10.0 Tail Beep Control

10.1 Special Tail Beeps

11.0 Crossband Mode

12.0 Controller Installation

12.1 Controller Power

12.2 Programming Codes and CW ID

12.3 Repeater Connections to the Controller

12.31 Repeater Receiver

12.32 Repeater Transmitter

12.4 Audio Adjustments

12.41 CW ID Level Adjustment, LA-1

12.42 Receiver to Transmitter Level, LA-3

12.43 Receiver to DTMF Decoder Level, LA-2

12.44 Remote Base Receiver to transmitter Audio Level, LA-4

13.0 Tone Access Mode

14.0 Aux Output

14.1 AUX Output Control Codes

15.0 RC-100 Programming

15.1 EEPROM Programming

15.2 Enabling Programming

15.3 Control and User Code Programming

15.3.1 Control Code Programming

15.3.2 User Code Programming

15.4 Repeater Parameters Programming

15.4.1 Tail Beep Programming

15.4.2 Tail Beep Time Programming

15.4.3 Repeater Time-out Programming

15.5 CW ID Programming

15.5.1 CW ID Programming Example

15.5.2 CW ID Time Interval

15.5.3 CW ID Tone Programming

15.5.4 CW ID Speed Programming

Table 15.1 Code Select Table

**Assembly Drawing
Schematic**

1.0 Introduction

The RC-100 is a repeater controller for use with a receiver and transmitter operated in a repeater mode. The controller is all that is needed to control the repeater functions including a CW ID and control functions. A remote base feature is also included with 13 TTL frequency control lines. The controller interface requires receiver audio and COS, the transmitter audio and PTT, and the remote base receiver audio, COS, transmitter audio, PTT and if frequency control is desired 13 frequency control lines.

1.1 Definitions

The following is a list of terms used in this manual.

Repeater...a unit which receives a radio transmission on one frequency and retransmits the transmission on another frequency.

Control code...DTMF code for enabling and disabling function within the controller.

User code...DTMF code for accessing various function.

DTMF...registered trade mark of AT&T employing eight audible tones two at a time for remote signaling.

DTMF pad...device for generating DTMFs.

Remote Base...transceiver for linking a repeater to another frequency.

Crossband repeater...repeater operating on two separate bands where an input on one band will transmit on the other band. This mode uses transceivers.

CW...international Morse code employing short and long tones for sending alphanumeric characters.

COS...carrier operated squelch used by the controller for sensing when the repeater receiver has an input.

PTT...push to talk used by the controller to key the transmitter.

EEPROM...Electrically Erasable Programmable Read Only Memory.

1.2 Controller Details

The RC-100's design is state of the art which is why it is small requiring the least number of components. The heart of the controller is an Intel 87C51 microcomputer which contains a microprocessor, uvEPROM containing the controller instructions and operating system, RAM for temporary storage of data and the necessary I/O for monitoring and outputting the controller signals. The DTMF decoder, U3, is a Mitel 8870 containing all the necessary stages for decoding directly from audio to TTL digital DTMF signaling tones. The other various components act as buffers, amplifiers, audio switches and drivers for controlling and interfacing to the repeater.

The RC-100 is DTMF programmable meaning the control and user codes, CW ID and repeater parameters (time-out, etc) are set up using DTMF. This programmed data is stored in an EEPROM (U8) which is a surface mounted device mounted on the solder side of the controller. This memory will retain its data for at least 10 years without the need for a battery.

If a component fails the only part not easily obtainable is the 87C51 due to the program inside the IC was developed by Micro Computer Concepts. Thus to replace the 87C51 one must obtain it preprogrammed from the developer. This can be done for \$35.00 which includes reprogramming with any updates. If the owner wishes to supply his own 87C51 Micro Computer Concepts will program the device for \$20.00 once the IC is received by MCC.

2.0 Power Up Conditions

When power is applied to the controller it initializes itself placing the repeater into a know state. This state is controlled by the controller software and the state stored in the EEPROM memory. The features of the controller can be changed with DTMF codes and when this is done the state is stored in the EEPROM.

As received from MCC the RC-100 is in the repeater enabled mode with remote base enabled, but off, CW ID set to "INIT ID/R", all codes except programming codes erased, time-out set to 3 minutes, tail timer set to 3 seconds and a climbing tail beep.

3.0 Repeater Operation

The RC-100 contains the necessary interface and control for providing repeater operation. The interface includes the audio interface and control between the repeater receiver and transmitter. The audio interface allows for direct connect from unsquelched or squelched audio and the repeater COS receive indicator inputs. The outputs include buffered and amplified transmitter audio and a open collector PTT. All receiver audio is adjustable providing separate level controls for each path to the transmitter and DTMF decoder.

3.1 Controller Connections

To control the interface between the repeater receiver and transmitter the required connections are the receiver audio, receiver COS, transmitter audio and transmitter PTT. These connections permit the controller to sense a receiver input and passing the receiver audio to the repeater transmitter. The transmitter can then be keyed when conditions are right.

The receiver to transmitter audio level is adjustable with LA-3. It is also switched by the audio switch U2b and passed when the proper access is provided by the receiver. Op-amp U1 amplifies and buffers all transmitted audio.

The receiver COS has two inputs, COS HI and COS LO. The controller will see these inputs and take the necessary control actions in keying the transmitter and unmuting the receiver to transmitter audio.

The transmitter PTT is an open collector transistor active low output. It is controlled by the controller and is the only source for keying the transmitter by the controller.

For a detailed description of the controller connections see Section 12 Controller Installation.

3.2 Access Modes

The repeater access mode is carrier, sub-audible (PL) or DTMF access. In the carrier mode any input to the controller COS will cause transmitter keying and receiver audio to pass to the transmitter.

In the sub-audible access mode AUX 11 is converted to an input and the "PL DECODER INPUT" is driven high by an external tone decoder when a repeater user has the proper tone. Both the COS and tone decoder logic input must be active for repeater access.

In the DTMF access mode a three digit *XX DTMF code must be entered

for repeater access. Once this code has been entered the control will function in the carrier mode until at least 20 seconds of no repeater input. Then for repeater access the code must be re-entered.

3.3 Repeater Time-out

The repeater time-out is programmable from 20 seconds to 42 minutes. The time-out timer is reset with the repeater tail beep or DTMF digit one (1). If a user transmits for the time-out period or more the repeater will generate a series of beeps indicating time-out and unkey the transmitter until the user unkeys at which time the repeater transmitter will rekey. If the user timing out the repeater can be overridden by another user that user can reset the time-out timer with a DTMF one (1). This reset digit 1 will reset the time-out timer any time it is entered.

3.4 Tail Timing

The repeater tail timer is programmable from .2 to 25 seconds. The tail timer is provided for keeping the transmitter keyed after the receiver input drops. This prolongs the transmitter's relay life and prevents unwanted transmitter PTT chattering. Within the tail are the various tail tones which are provided for user signaling. See section 10, Tail Beep Control.

3.5 DTMF Muting

Whenever the COS input is active the controller normally unmutes the transmitted audio. However, to prevent the passing of DTMF codes over the repeater the controller will mute all DTMF once a valid DTMF is decoded by the DTMF decoder, U3. The muting will continue for one (1) second after the release of the incoming DTMF.

This muting action can be prevented if the first digit entered is a 5 or the muting is disabled with a control code. If the first digit is a 5 the muting will remain off for the duration of the users transmission. Also, the muting control code will toggle the enabling/disabling of muting. When disabled no muting of DTMF will take place. There is only one control code for enabling and disabling the muting with this single code toggling the mute state. See section 15 for programming this code.

3.6 Anti-Kerchunker

To help keep distant stations and noise burst from bringing up the repeater an anti-kerchunker can be turned on. When on a continuous carrier must exist on the repeater input before the repeater is accessed.

This required time can be programmed from .2 to 25 seconds. Once the required input has occurred the repeater will function in normal carrier access until at least 20 seconds of no repeater input occurs.

3.7 Sub-audible Tone Decoding

The RC-100 provides a logic input to be driven by a sub-audible tone decoder. This input is to be driven high for decode. This logic input is via Q8 and is located between the AUX 8 and AUX 9 connections.

The input was designed for the Communications Specialist TS-32 sub-audible tone encoder/decoder. If the TS-32 is used the TS-32s "OUTPUT 2" is to be connected to the "PL DECODER INPUT". The remaining TS-32 connections are power, ground, hang-up (grounded) and decoder audio input.

NOTE: WHEN THE SUB-AUDIBLE MODE IS ENABLED AUX 11 IS NO LONGER ACCESSIBLE WITH DTMF. THIS IS BECAUSE AUX 11 IS FORCED BY THE CPU AS AN INPUT FOR THE SUB-AUDIBLE TONE.

3.8 Sub-audible Tone Encoder Control

AUX 10 can be used to control the ON/OFF of an external sub-audible tone encoder. This feature is useful for opening and closing user receivers employing tone decoders to open their squelch. This feature can also aid linking systems connecting the repeater to other repeater systems.

A programmable timer (.2 to 25 seconds in .1 sec steps) controls the time AUX 10 remains high after the repeater input drops.

When enabled AUX 10 will go high and remain high until the user drops the repeater input plus for the time programmed for the encoder. If the programmed timer is set to say 05 then AUX 10 will remain high for .5 seconds after the user drops the input.

AUX 10 only responds to repeater input, carrier or sub-audible tone mode. The CW ID will not force the AUX high.

When this feature is disabled AUX 10 can be used as a normal AUX output.

If the sub-audible tone encode feature is enabled and then disabled the disabling will turn OFF AUX 10 output turning off the PL encoder. Now the AUX output code can be used to turn on/off the encoder.

4.0 AUTOPATCH

The RC-100 will control an external autopatch. There is no autopatch phone line interface hardware on the RC-100 requiring the user to supply it. The interface is meant to use AUX 14 as the signal to close a phone line interface relay and use AUX 15 to control audio to and from the interface.

There are four DTMF codes which select and control the autopatch. These are "AUTOPATCH SELECT", "AUTOPATCH ENABLE/DISABLE", "AUTOPATCH ON" AND "AUTOPATCH OFF".

As received from MCC the autopatch feature is deselected. In the deselected mode AUXs 14 & 15 are not affected as if no autopatch exist. Using the "AUTOPATCH SELECT" control code the patch software can be turned on and off. When ON AUXs 14 & 15 will be controlled by the autopatch software.

The "AUTOPATCH ENABLE/DISABLE" control code allows for control operator control of the autopatch.

The "AUTOPATCH ON" code is a *XX user code for accessing the patch for giving dial tone. When this code is entered AUX 14 will go high commanding the phone interface to seize the phone line. After the patch is accessed AUX 15 will go low when an input to the repeater COS is active (receiver has input) and go high with no input. AUX 15 controls phone audio between the repeater and phone line.

The "AUTOPATCH OFF" code is the same as the "CLEAR ALL" code. This code will terminate the patch forcing AUXs 14 & 15 low causing the phone relay off and muting the phone audio.

A 3 minute patch time-out timer is provided. This time-out timer will automatically terminate the patch after 3 minutes. The time-out timer can be reset with DTMF 4. Ten seconds prior to time-out a series of beeps will warn of time-out.

WARNING: WHEN USING THE AUTOPATCH AUXS 14 & 15 MUST BE FREE FROM THE AUX MOMENTARY MODE (OFF). MOMENTARY MODES MAY ALSO USE AUXS 14 & 15.

The autopatch code are as follows:

AUTOPATCH SELECT	4136	D _ _	(toggle)
AUTOPATCH ENABLE/DISABLE	4137	D _ _	(toggle)
AUTOPATCH ON	4076	* _ _	
AUTOPATCH OFF	4063	# _ _	(clear all)

5.0 Control and User Codes

The RC-100 contains a DTMF decoder, interface to the repeater receiver and control software for receiving DTMF commands and performing control operator and user functions. The control operator codes are three digit with an A or D as the first digit. Optional use of two digit # codes permits replacement of the A or D enabling control using a 12 digit DTMF pad. The user codes are two digit # and three digit * codes. All DTMF decoding is performed by U3 and interface directly to U4, the microcomputer controller.

The control and user codes are programmable using DTMF. They are stored in the EEPROM (U8). See section 15 for programming these codes.

5.1 Control Operator Codes

The control operator codes are used to enable and disable various repeater functions such as the repeater and remote base. They also allow selection of various operational parameters such as the tail beep.

The A & D control code access can be enabled and disabled with the "CONTROL EN/DIS" code. This is one code with the entry of the code turning ON access to the codes if OFF and OFF if ON (this means toggle).

Below is a list of the control codes and their function:

Master Enable/Disable	Enables/Disables all operation
------------------------------	---------------------------------------

Master Enable/Disable does not enable or disable any function, but rather unkeys transmitter and turns OFF the remote base/tape. When re-enabled the various repeater functions will be in the state when the master was disabled.

NOTE: EN=enable,DIS=Disable

Repeater EN/DIS	Enables/Disables repeat function
Remote Base EN/DIS	Enables/Disables remote base/tape
Freq. Programming EN/DIS	Enables/Disables freq. prog.
Controller Reset	Forces the controller to the power upcondition. CW ID will run on entry.
Control EN/DIS	Enables/Disables A & D codes.
AUX CODE	master code for controlling AUX outputs.
AUX Momentary	controls AUXs12-15 for momentary.
Tape Select	Forces remote base I/O for tape.
Remote Base Select	Forces I/O for remote base.
Remote Base beep	ON/OFF of remote tail beep signal.
RB DTMF access en/dis	enables/disables remote base DTMF decoding scan mode

Crossband Select
Autopatch Select
Autopatch en/dis
External ID en/dis
External ID Record
PL encode en/dis
PL access mode en/dis
normal/CW tailbeep sel

CW tailbeep program
DTMF muting en/dis
DTMF access en/dis

Tone timine en/dis

AUX 1-of-8 output
AUX HEX
Master First Digit en/dis
Master First Digit
Send ID Continous

A equivalent code
D equivalent code

(A/D equivalent or A/D digits may be used in codes)

Forces control to crossband mode.
Selects AUXs 14 & 15 for patch control.
if patch selected enable/disables patch.
enables/disables external ID.
controls recording of external voice ID.
enables control of a PL encoder.
repeater PL/carrier access mode.
toggles between prog CW tail beep and
normal tail beep.
for programming CW tail beep.
enables/disables DTMF muting.
enables/disables requiring entry of DTMF
user code to access repeater.
enables/disables requiring logic from tone
decoder to access repeater.
code for selecting 1 of AUXs 1 thru 8.
output of hex value on AUXs 9-12.
toggles master first digit requirement.
for programming master first digit.
En/Dis IDing every ID interval.

two digit # code replacing A in code
two digit # code replacing D in code

For the following programming codes to function the programming must
first be enabled.

Program CW ID
Program Disable
Programming Code 1
Programming Code 2

places into CW ID entry mode
Disables programming of control
First code enabling programming
Second code enabling programming

5.2 User Codes

The user codes are as follows:

Tape start
Remote base
Remote base OFF
Remote Base Freq. Prog.
Pad tester ON
Pad tester OFF
Force CW ID
All Clear

Antikerchunker
DTMF access code

Remote Base XMT cntrl

same as remote base OFF code
Turns ON remote base if enabled
Turns OFF remote base
allows entry of frequency
#8 - Turns ON DTMF pad tester
Same as all clear code
Forces CW ID
Turns off DTMF pad tester, patch
cleans up internal functions.
turns ON/OFF antikerchunker
code for accessing repeater when in
DTMF access mode.

#=xmt on/## rcv only mode

5.3 Control Action Indicator

Whenever a control code is entered via the repeater receiver the controller will respond at the end of the control operators transmission with a single short beep followed by a second high or low pitched tone indicating a function was acknowledged. If a function was enabled or turned ON the second beep will be high pitch. If the entered control code disabled or turned OFF a function the second tone will be low pitch. This is meant to signal the control operator of the acceptance of the entered code.

5.4 Master First Digit

In the event the RC-100 is employed on a repeater which is part of a large system where each repeater must have separate control codes, and to insure no conflict in control, a "MASTER FIRST DIGIT" for ALL DTMF codes can be required. As received from MCC this feature is disabled.

When enabled this first digit must proceed any DTMF code. As an example if the first digit is set to a 6 and the force CW id code were #9, the code will be 6#9. All DTMF codes will require this 6 to be entered.

The first digit can be programmed for any of the 16 DTMF digits. This digit is programmed using the "MASTER FIRST DIGIT" programming.

The first digit is enabled/disabled (toggled) with a DXX code. As shipped from MCC the first digit defaults to #. See section 15 for programming the first digit and control code.

5.5 Fixed Misc Codes

The RC-100 has as few fixed, cannot be changed, control codes as follows:

Tail beep enable/disable (toggle)	D04
Timeout timer enable/disable (toggle)	D05
CW tail beep of cw character W	D06
CW tail beep of cw character N	D07
CW tail beep of cw character R	D08
normal tail beep	D09
send CW 73 at end of tail ON	D0*
send CW 73 at end of tail OFF	D0#

6.0 Tape Function

The RC-100 can be used to add a tape player to the repeater for announcing group functions on command by entering the remote base OFF code. The inputs and outputs provided are shared with the remote base I/O. The I/O use will depend on the DTMF codes used to exercise the I/O. For the I/O to function for tape use the tape must be selected with the "Tape Select" control code.

NOTE: If the tape function is used the remote base function cannot be used. This is due to the same inputs and outputs are used for both.

The I/O provided for tape playback is tape run (active low). The tape audio muting is controlled by the CPU and U2b and is the same as the remote base mute. The audio input for the tape is the same as the remote base receiver input.

A tape end signal is provided to signal the controller the tape has ended. This is an active high signal requiring at least 1 volt to indicate tape end. When the tape is running the tape end signal must be low. The tape end signal is the same connection as the remote base COS input.

The tape function is enabled/disabled using the "Remote Base Enable/Disable" codes. When disabled the tape run will remain low (OFF) and muted.

6.1 Tape Operation

When enabled the tape can be accessed and forced to run using DTMF remote base OFF code. When accessed the tape run output will go low turning on the tape and the transmitter will be keyed. This output is an open collector transistor meant to drive the tape player motor. The tape run output will remain low and the repeater transmitter keyed until a high is received on the "tape end" input indicating the tape has ended. If a tape end signal is NOT received within one (1) minute after tape start the tape will automatically time out placing the tape function in the off mode. This will prevent long transmitter key ups in the event the tape player should malfunction.

Tape muting occurs when the tape is off or disabled and whenever a repeater input occurs. This gives priority to the repeater users over the tape message.

7.0 REMOTE BASE

Two outputs and two inputs are provided for controlling a transceiver for linking to another repeater or frequency. The two outputs are remote base PTT (low for key) and remote base transmitter audio. The inputs are remote base receiver COS for sensing the remote base receiver input (high for an active input) and remote base receiver audio. The PTT, COS and receiver audio input lines are shared for use with a tape player (see section 6.0). See assembly drawing for remote base connections.

The on board DTMF decoder can be accessed via the remote base receiver if this feature is enabled. See below for details.

7.1 Remote Base Operation

The operation of the remote base is turned ON using a three digit *XX user code. When turned ON a remote base receiver input will force keying of the repeater transmitter and remote base audio transmitted. When no remote base input is present the remote base receiver audio will be muted.

The remote base transmit is OFF when the remote base is first turned on (receive mode only). This is indicated by the low tone (500 Hz) additional tail beep. To turn on the transmit the DTMF code #* must be entered and the additional tail beep will become a high tone (1 kHz). The receive only mode can be returned to using DTMF code ##.

When the remote base is OFF or disabled the remote base will be unkeyed and the receiver muted.

The remote base will be turned OFF if the repeater is disabled. When the repeater is re-enabled the remote base will be in the state when the repeater was disabled.

7.2 Remote Base ON Tail Beep

When the remote base is ON a special tail beep at the end of a repeater users transmission will be generated. This beep will occur after the normal tail beep. If the remote base transmit is OFF the additional beep will be a low tone (500 Hz) and if ON the tone will be high (1 kHz).

This extra tail beep can be turned ON/OFF with a control code. This might be desirable in the event the remote base is turned on at all times.

The repeater tail beep will not occur at the end of a remote base transmission. This is useful in determining if a repeated signal is from the repeater receiver or remote base receiver.

7.3 Remote Base Frequency Programming

If desired the remote base transceiver's frequency can be DTMF controlled using AUX outputs 1 thru 13 via U4 and U5. If, however, these outputs are not desired for frequency control they may be used as independent AUX outputs (see section 14 for details of the AUX outputs).

Programming of the remote base's frequency can be enabled and disabled with control codes. When enabled the frequency programming can be turned on and the frequency entered. When disabled any attempt to program a frequency will be ignored with the existing frequency in place remaining. Whenever the frequency is programmed it is stored and on power up the last frequency programmed is on AUX 1 thru 13.

The frequency outputs are in four sets with each set controlling a digit of the remote base frequency. Within the four sets there are three sets of 4 and one set of one output. The four sets allow for control of MHz, 100 kHz, 10 kHz and 0/5 kHz. The MHz, 100 kHz and 10 kHz each contain four lines in a binary coded decimal (BCD) format. The 0/5 kHz output is a single line being at a logic 0 state for 0 kHz and logic 1 for 5 kHz.

Along with the frequency the offset, direction of offset can be entered. (offset refers to the difference of the transmit frequency to the receive frequency and offset direction refers to transmit frequency being above, below or the same as the receive frequency).

7.31 Programming

If the frequency programming is enabled the remote base frequency can be changed. To program a remote base frequency first enter the programming DTMF code #0 followed by the MHz value, 100 kHz, 10 kHz, 0 or 5 kHz, offset direction and offset value in MHz and 100 kHz. The offset value is limited to MHz and 100 kHz and will not affect the 10 and 0/5 kHz.

When programming the frequency and offset the only data changed on any programming sequence will be the data entered. Thus, if the frequency only is to be changed enter #0 followed by the frequency and the offset direction and offset value will remain unchanged. Normally the offset value is never changed due to the offset being established by the band of the remote base operation.

To select the offset direction of plus, no offset or minus use DTMF digits 1 for plus, 2 for no offset and 3 for minus. Then when the remote base is in transmit the controller will change the remote base frequency by the offset value. If an offset value of 0.0 MHz is programmed there will be in effect no offset regardless of offset direction selected.

As an example of frequency programming if the desired frequency to be selected is 6.760 MHz with a negative offset of 0.6 MHz the following DTMF sequence is entered.

0 6 7 6 0 3 0 6

The #0 forced frequency programming mode. The 6 7 6 0 set the frequency to 6.760 MHz. The 3 selected a minus offset forcing the remote base frequency to become 6.760 minus 0.6 (6.160) during transmit set up by the last two digits of 0 6. Now the remote base frequency will be 6.760 MHz in receive and 6.160 MHz in transmit. If the frequency is now to be changed to 6.970 MHz with the same offset direction and value use the following code sequence.

0 6 9 7

Since the 0/5 kHz, offset and direction were not changed the last 4 digits of the 8 digit programming sequence need not be entered.

During programming the frequency entry can be terminated by either using DTMF digit * or simply not entering a digit for 2 seconds. When entering the frequency care must be taken to insure a 2 second pause between digits does not occur or programming entry will terminate leaving the remaining data unchanged.

The remote base frequency will change after 2 seconds of no DTMF. Thus the frequency will not actually change until programming is complete.

7.32 Remote Base Frequency Connection.

Thirteen outputs are provided for controlling the remote base frequency. These consist of 4 for MHz, 4 for 100 kHz, 4 for 10 kHz and one for 0/5 kHz. All of these are TTL lines meaning when each is at a low or zero level it will be 0 to .6 volts and when high or one level it will be 2.4 to 5 volts. If a remote base is used requiring other levels proper buffers must be used between the remote base and RC-100 controller.

The connections are shown on the assembly drawing.

7.4 Remote Base DTMF Access

The on board DTMF decoder, U3, can be accessed from the remote base receiver if this feature is enabled. When enabled the controller scans between the repeater receiver and remote base receiver audio. The DTMF decoder audio is switched between the two receivers. This is done until a valid decode is obtained and the scanning stops locked onto the receiver the DTMF tone was received from. After 2 seconds of no DTMF the scanning resumes.

This feature is provided to permit users on the remote base end to turn on and off the remote base.

To enable this DTMF scanning feature the "RB to DTMF Decoder" must be enabled. This control code is a DXX code and is a toggle enable/disable. When disabled the DTMF decoder remains locked to the repeater receiver. As received this feature is disabled.

When a DTMF tone is detected from the remote base receiver it will NOT cause muting of the repeater to transmitter audio as it will when a DTMF tone is from the repeater receiver. This insures the remote base control will not affect repeater operation.

7.5 Remote Base Key During CW ID

At times it may be desirable for the remote base to send the CW ID when the controller IDs the repeater. The remote base can be forced to key its PTT during the CW ID with the "Remote Base ID" control code. When enabled and if the remote base is ON and if the remote transmit is ON the remote base will key during the CW ID.

By using the Remote Base TX Audio #1, P2-pin 4, the CW ID audio will be coupled to the remote base transmitter. Only the repeater receiver audio is at Audio #2, P2-pin 3, and this audio output does not have the CW ID audio.

7.6 Remote Base Automatic Timeout

The Remote Base or the remote base xmt can be programmed to automatically turn off with no repeater or remote base activity.

The timer is programmed at the "Remote Base Timeout" timer value. The "Remote Base timeout sel" control code will select which is automatically turned off.

When disabled, getting a low tone response, the transmit will turn off leaving the remote base on, but in receive mode. When enabled, getting high tone response, the timeout will turn off the entire remote base.

The timeout timer is programmed in 10 second intervals up to 40 minutes. If the timeout is not desired program the timeout value to be maximum with DTMF ## as the timeout value.

Again this timeout is for NO repeater or remote base activity.

8.0 DTMF Pad Tester

The controller can be forced to read back in CW an entered DTMF digit for testing DTMF pads. The tester is turned ON with the two digit #8 code. When ON the user can enter a single digit and if decoded the controller will send in CW the DTMF digit at the end of the users transmission. The user can enter all of the 16 DTMF digits listening for the CW response after each digit.

The pad tester will automatically turn OFF if no repeater input occurs for 15 seconds. It can also be turned off with the "All Clear" code.

9.0 Repeater Identification

The controller has a CW ID control program for identifying the repeater system. The ID takes place at the time interval programmed by the user (see section 15). For Amateur Radio use this is required by FCC regulation every 10 minutes max and at 20 words per minute (wpm) or less. The CW ID can also be forced with a #X DTMF code.

An external ID can be used using AUX 13 as the strobe for starting this ID. The ID can be another CW ID, a tape, voice IC device, etc. (see section 9.2 below).

When the repeater is in use the ID waits for the end of a users transmission preventing competing with the user. This is known as a smart ID.

Timing of the ID is controlled by the controller through the stored ID table in the EEPROM. The ID tone and speed are programmable and also stored in the EEPROM. The ID level is adjusted with pot LA-1.

9.1 Continuous CW ID

Normally the CW ID is sent only when the repeater is in use and with a final trailing ID. However, the controller can be forced to ID on every ID time interval using the "CONTINUOUS ID" control code. This single control code will toggle the state of the continuous IDing. When enabled the controller IDs at every ID time interval regardless of repeater usage.

9.2 External ID

AUX 13 can be selected to start an external ID. This ID must be supplied by the user and can be any form such as voice IC, tape, etc. To aid in remote recording of the external ID AUX 12 functions as a record/playback control (high for playback).

NOTE: WHEN THE EXTERNAL ID IS ENABLED AUXS 12 & 13 ARE BOTH USED FOR THE EXTERNAL ID FEATURE. ANY OTHER FEATURE WILL NOT CONTROL THESE TWO AUX OUTPUTS.

When both the CW ID AND external ID are enabled and the time to ID occurs the controller examines the control for activity in the previous 10 seconds. If there was activity the internal CW ID is used. If no activity the external ID is strobed. However, if only the CW ID is enabled only the CW ID is used or if only the external ID is enabled only the external ID is used.

When the external ID is strobed AUX 13 goes low for about .5 seconds and then back high. The external ID must respond to this signal by both sending the ID and keying the repeater transmitter. The RC-100 only keeps the ID timing and does not key the transmitter during the external ID.

For remote recording a record control code will control AUXs 12 (record/playback) and AUX 13 (start). To record an external ID the user is to enter the "ID Record" DTMF code and drop the repeater input. On the tail beep rekey and enter the message. This forces the controller to start the record sequence. AUX 12 will go low (record state) and stay low until the user releases the repeater input.

The DTMF codes used to control the external ID is the "EXTERNAL ID ENABLE/DISABLE" control code. The record code is "ID Record" code and functions only if the external ID is enabled.

10.0 Tail Beep Control

The controller provides a tail beep to signal other users of the end of a transmission. The tail beep tones and time it occurs in the repeater tail are programmable and stored in EEPROM.

At the beginning of the beep the repeater time-out timer is reset.

The tail beep consists of four segments each segment programmable to have either a tone of 1000 Hz/n or no tone. For programming the tail beep see section 15.

10.1 Special Tail Beeps

The control has provisions for either a programmable tone tail beep or a CW character tail beep. The tone tail beep is programmed with the "TAIL BEEP PROGRAMMING" select code.

The CW tail beep can be any character and is programmed in the same

manner as the CW ID except only one character is allowed. The CW tail beep and tone tail beep are toggled between each other using the "NORMAL/CW TAIL BEEP" control code.

There are three additional fixed CW tail beeps. The following fixed control codes select these CW character:

character of W	D06
character of N	D07
character of R	D08
tone tail beep	D09
ALL tail beeps OFF	D04

A special sending of 73 in CW just prior to the repeater transmitter unkeying, at the end of the tail, can be forced to be sent using the following codes:

D0* turns 73 ON	D0# turns 73 OFF
-----------------	------------------

11.0 Cross Band Mode

The RC-100 can be used to control a cross band type repeater. This mode uses the repeater side of the control to interface to a transceiver and the remote base side to interface to another transceiver. When an input is detected on either side of the control the other side will be keyed. This operation differs from normal repeater operation in that if an input is detected from either the repeater side or, if on, the remote base side the repeater transmitter is keyed requiring the repeater to be full duplexed (transmit and receive at the same time). In the cross band mode only the transmitter on the other side of the active receiver is keyed.

The cross band mode can be forced with the "CROSS BAND" control code. This control code will toggle the cross band state. When in cross band mode the states of the repeater and remote base are ignored providing cross band operation at all times except if the master control code is used to disable operation. Thus the "MASTER DISABLE" control code is to be used to disable the controller.

As received the RC-100 has a tail beep for both sides of the crossband mode. This tail beep can be turned on or off with the "REMOTE BASE BEEP ON/OFF" control code. If off there is no tail or tail beep on either side of the crossband operation.

If the Remote Base beep is ON a 0.4 second tail exists on both sides of the cross band repeater. When a receiver releases its COS the other side will remain keyed for .4 seconds. During this tail the programmed tail beep is generated indicating the end of the users transmission.

When in cross band mode the CW IDing will be transmitted on both transmitters.

Normally DTMF control must be performed from the repeater side, P1, of the control. However, if the remote base DTMF scan is enabled DTMF control and access can come from the remote base port, P2 and from the repeater port P1. The control will scan between the two ports sampling the two receivers for DTMF audio.

12.0 Controller Installation

Installation of the controller requires little effort. Due to the low power required the controller can often be powered by a repeater's 12 volt power supply. Installation of the controller requires the connection of 12 volts DC, receiver COS and audio, transmitter PTT and audio.

12.1 Controller Power

The controller is powered from a 10 to 15 volt input at 100 ma. Two regulator circuits of a 7805 +5 volt regulator (U8) for the logic circuits and an 8 volt zener diode (D1) for regulation of the audio circuit voltage.

12.2 Programming Codes and CW ID

After connecting the controller to the repeater it can be programmed using DTMF. However, prior to programming the controller will have a CW ID of "INIT ID/R", timeout of 3 minutes, have a tail beep and a tail timer of 3 seconds. Once the connections have been made refer to section 15 for programming details.

12.3 Repeater Connections to the Control

A minimum of six connections must be made to the controller. These are the receiver COS and audio, transmitter PTT and audio and 10 to 15 VDC and ground.

12.31 Repeater Receiver

THREE inputs are provided for connection to the repeater receiver; COS HI, COS LO and receiver audio.

The COS is a DC signal going either high or low with a valid repeater receiver input, squelch open. There are two COS inputs, COS HI and COS LO. The COS HI input is for receivers which have a high level (1 volt or more) when the receiver squelch is open. The COS LO is for low level (.5 volts or less) when the squelch is open.

NOTE: IF COS HI IS USED RESISTOR R20 SHOULD BE REMOVED.

The receiver audio input drives the controller DTMF decoder and the repeater transmitter audio buffer. Each of these are adjustable.

NOTE: The repeater receiver audio should pass through the controller and should not go directly to the transmitter. This permits DTMF muting and muting in response to the COS in the event unsquelched audio is

used.

Connection of the COS and receiver audio should be made at the designated points on P1 as shown on the assembly drawing.

12.32 Repeater Transmitter

Two transmitter outputs are provided on the controller; PTT and audio. The PTT is an open collector transistor, Q3. The PTT output goes to ground when the transmitter is to be keyed.

WARNING: If the transmitter employs relays in its keying circuit care must be taken to insure relay turn off spikes do not feed back into the controller when the transmitter unkeys. This can be prevented by placing a diode across the transmitter relay coil with the cathode to the relay supply side and the anode to the PTT side of the relay. If this is not done damage to the control may occur or wierd operation will occur.

The transmitter audio output is an op-amp buffered amplifier capable of driving 1000 ohms. Due to the op-amp gain and if the mike input is used as the audio input a divider circuit may be required. This will be indicated if the CW ID tone level, LA1, is set at about 1/3rd up from fully counter-clock-wise and the ID audio level is much more than desired. If this occurs it is recommended an attenuator be inserted between the control and transmitter audio input. Although the specific values for this attenuator cannot be stated here a good start is to insert a 10k in series with the audio and a 2k to ground at the transmitter input. By increasing the 10k or decreasing the 2k will decrease the audio.

12.4 Audio Adjustments

There are four (4) level adjustments on the controller. Two adjust receiver audio (LA-2 & 3), one adjust remote base/tape receiver audio (LA-4) and one adjust ID and tone levels (LA-1). The following is the procedure for adjusting each.

12.41 CW ID Level Adjustment, LA-1.

The CW ID level is adjusted with LA-1. This adjustment should be adjusted with the CW ID running. The ID is sent whenever the controller is powered up. The recommended level is 2 kHz deviation. If the DTMF level is set so as to allow DTMF decoding entering #9 will force the CW ID.

12.42 Receiver to Transmitter Level, LA-3

The receiver to transmitter audio level is controlled by LA-3 and should

be adjusted for the same level coming into the repeater receiver as going out the repeater. Using an oscilloscope across a monitor receiver speaker terminals is a good indicator. In this setup one should sample a transmission from a users input, then tune the receiver to the repeater output and with the same user transmitting adjust LA-3 for the same repeater output level. In this procedure a single continuous tone should be used. This is often easy to obtain by pressing two side by side DTMF pad digits at the same time forcing the pad to generate a single tone. A complete DTMF may cause muting of the transmitter audio due to the controller muting action. This can be prevented by turning LA-2 CCW preventing DTMF decoding.

12.43 Receiver to DTMF Decoder Level, LA-2.

The receiver DTMF decoder level is adjusted by LA-2. When the decoder detects a DTMF pin 15 of U3 goes high until the tone is removed. Using a voltmeter monitor U3-pin 15 and provide a repeater receiver input with DTMF digit 8. From the fully CCW position slowly adjust LA-2 in the CW direction until pin 15 goes high (3 to 5 volts). Note this setting of LA-2. Continue to adjust LA-2 CW until pin 15 returns low (near 0 volts) and note this setting. If LA-2 is adjusted all the way CW and pin 15 remains high use this fully CW point for the high limit setting. Now adjust LA-2 to the point half way between the two noted setting.

If one has access to an oscilloscope adjusting LA-2 for 1.5 volts peak-to-peak on U3-pin3 using DTMF audio will most often be all the adjustment of LA-3 needed.

Either methods should provide for a wide range of levels for the DTMF decoder to operate. Normally the decoder will accept a 10 db range providing more than typically necessary for accepting many different users.

12.44 Remote Base Receiver to transmitter audio, LA-4.

If the remote base transceiver is in place LA-4 is used to control its receiver to the repeater transmitter level. This level must be made with the remote base on for the remote base is muted when off and when an active input exist at the repeater receiver.

As with the repeater receiver level adjust the remote base receiver level should be adjusted for the same input to output level. See remote base for additional details.

13.0 TONE ACCESS MODE

In some parts of Europe the government requires for a repeater to be accessed by a tone, usually 1750 Hz, transmitted by the user for a given period of time. The Tone Access Mode is provided if this feature is needed. In this mode the controller requires a logic HIGH signal from an external tone decoder driving the "PL DECODER INPUT" for the programmed time interval to access the repeater. After this input has occurred the repeater will operate normally, but after the repeater sets dormant with no input for 20 seconds the PL DECODER INPUT must again be driven high to access the repeater.

The following are the codes and programmable time period settings.

Tone Access Enable/Disable	4112 A	___	___
programmable time	4160	___	___ (0.1 sec steps)

The PL DECODER INPUT is used as the tone decoder logic inputs. This input has a voltage range of 0 to .5 volts for low and 2 to 30 volts for high.

NOTE: the RC-100 does not have a tone decoder, but only a logic input to be driven by the external decoder.

14.0 Aux Outputs

There are 15 AUX outputs for controlling various user defined functions. These outputs are labeled "AUX 1" thru "AUX 15". Each output can be controlled independently with DTMF codes. AUX 12 thru 15 can be placed into momentary mode each going high when a single DTMF digit is active and low otherwise. AUXs 1 thru 8 can be gained to form a 1-of-8 output. Also, AUXs 9 thru 12 can be accessed with a single DTMF code with their outputs forming a four bit hexadecimal output.

On power up all AUX outputs will be forced to the state they were in when power was lost. The controller saves the AUX output states whenever changed.

AUX 1 thru 13 outputs are also used for remote base frequency control. If these outputs are used for controlling the remote base frequency the DTMF codes will not affect outputs 1 thru 13. If the remote base frequency programming is not desired AUX 1 thru 13 outputs can be controlled. To place these AUX outputs under DTMF control use the remote base frequency programming code #0 and set the frequency to 0.000 MHz by entering six zero. Then each AUX output 1 thru 13 can be controlled with DTMF. On power up or control code forced reset the remote base frequency is forced to 0.000 MHz thus allowing control of AUX 1 thru 13. Also on reset AUXs 1 thru 13 are forced low.

AUX outputs 14 and 15 can be controlled regardless of the remote base frequency programming mode. On power up these two outputs are forced low.

The one-of-eight outputs on AUXs 1 thru 8 are accessed by entering the "AUX One-of-Eight" DTMF code followed by a single digit of 0 thru 8. If 0 is entered AUXs 1 thru 8 go low. If the digit entered is 1 thru 8 then the AUX with the same number as the digit entered will be latched high and the remaining 7 outputs will be forced low. This operation will not affect AUXs 9 thru 15. If one of the AUX latched command codes is entered that AUX will be turned on or off overriding the one-of-eight command.

The hexadecimal control of AUXs 9 thru 12 is controlled with the "AUX HEX" DTMF code followed by a fourth digit. This fourth digit will be transferred to AUXs 9 thru 12 with AUX 9 being msb. This operation will only affect AUXs 9 thru 12 and not disturb the remaining AUXs.

14.1 AUX Outputs Control Codes.

AUX outputs 1 thru 15 are controlled by the following DTMF codes. If, however, AUX outputs 1 thru 13 are used for remote base frequency control their associated DTMF codes will not affect the outputs.

The procedure for turning on any AUX output is to first enter the "AUX CODE" followed by the two digits associated with the AUX given in the below table. As an example if the "AUX CODE" were D46 then to turn ON AUX 12 one would enter D46 12. To turn it off enter D46 32.

Function	ON Code	OFF Code
AUX 1	AUX CODE 01	AUX CODE 21
AUX 2	AUX CODE 02	AUX CODE 22
AUX 3	AUX CODE 03	AUX CODE 23
AUX 4	AUX CODE 04	AUX CODE 24
AUX 5	AUX CODE 05	AUX CODE 25
AUX 6	AUX CODE 06	AUX CODE 26
AUX 7	AUX CODE 07	AUX CODE 27
AUX 8	AUX CODE 08	AUX CODE 28
AUX 9	AUX CODE 09	AUX CODE 29
AUX 10	AUX CODE 10	AUX CODE 30
AUX 11	AUX CODE 11	AUX CODE 31
AUX 12	AUX CODE 12	AUX CODE 32
AUX 13	AUX CODE 13	AUX CODE 33
AUX 14	AUX CODE 14	AUX CODE 34
AUX 15	AUX CODE 15	AUX CODE 35

Output ON means output at 2.4 volts or more.
Output OFF means output a .6 volts or less.

The codes for toggling AUX 12 thru 15 to momentary are as follows.

AUX 12	AUX MOMENTARY	1 then AUX 12 high during	a 1
AUX 13	AUX MOMENTARY	2 then AUX 13 high during	a 2
AUX 14	AUX MOMENTARY	3 then AUX 14 high during	a 3
AUX 15	AUX MOMENTARY	4 then AUX 15 high during	a 4

Re-entering the code will toggle the momentary mode off. As a example if the "AUX momentary" code were programmed to be D45 then entering D45 followed by a 3 will force AUX 14 into the momentary mode and each time DTMF digit 3 is entered AUX 14 will go high. If D45 3 is entered again AUX 14 will return to the latched low state.

15.0 RC-100 Programming

The RC-100 contains an EEPROM which stores control codes, user codes, CW ID and operational parameters. This data will be retained for at least 10 years and does not require any battery or power to retain data. The data is programmed into the EEPROM by using DTMF control and software within the 87C51 CPU (U4). The following are the procedures for programming or entering the controller data.

15.1 EEPROM Initialization

If you received the RC-100 from MCC with the EEPROM installed the initialization need not be performed for it was done by MCC and tested. If you are upgrading a REV 1.5 or earlier software revision the initialization must be done as follows.

The initialization clears the EEPROM of all codes and data, forces the CW ID to "INIT ID/R" and forces programming control codes to know values.

The procedure for initialization is as follows.

1. Ground pin 5 of the 87C51 CPU (U4).
2. With pin 5 grounded enter DTMF code "AAA".
If accepted controller will respond with the tone/high tone acceptance signal.

In performing steps 1 and 2 above if the tone/high tone response is not received the initialization was not successful.

The following control codes and parameters are forced when the initialization is complete:

1. All control and user codes are cleared.
2. Programming Enable Code 1 is set to D7B.
3. Programming Enable Code 2 is set to D7C.
4. Programming Disable Code is set to D7A.
5. CW ID is set to "INIT ID/R".
- 6 . Repeater parameters are as follows:
 - a. time-out is 3 minutes
 - b. tail timer is 3 second.
 - c. tail beep set to four tones.
 - d. tail beep sent .7 seconds into tail.
 - e. CW ID speed is 15 wpm and tone 500 Hz.

The programming code is used with a select code selecting the code to be programmed...more about this later.

15.2 Enabling Programming

Whenever power is lost the programming of the EEPROM is disabled by both the EEPROM itself and the 87C51 control software. Thus, any attempt to change the codes or CW ID will require enabling the programming mode.

To enable programming the "Programming Enable Codes 1 and 2" must be entered. As received from MCC these two codes are D7B and D7C. However, these codes can be changed as desired. Due to others having RC-100s it is strongly advised these codes be changed (see section 15.3, Control Code Programming for details).

To enable programming follow this procedure:

1. Enter programming code 1 D7B.
2. Wait at least 3 seconds.
3. Enter Programming code 2 D7C.

Programming codes 1 and 2 are separate codes requiring the 3 second delay between them. Also the two codes must be entered using code 1 first followed by code 2.

If accepted the tone/high tone response will be heard after D7C. If not accepted no response will be sent. If no tone is received the problem may be due to DTMF decoding level or defective EEPROM or installation. It will do no good to continue programming if the tone/high tone is not sent by the RC-100 after the D7C code. In the case of DTMF decoding use the pad tester (#8).

NOTE: THE PROGRAMMING CODES OF ABOVE (D7A, D7B AND D7C) ARE INITIALIZED AT MCC. DUE TO OTHERS OBTAINING THE CONTROL IT IS STRONGLY ADVISED THESE CODES CHANGED SO AS TO PREVENT ANOTHER PARTY FROM ENABLING PROGRAMMING AND ALTERING REPEATER PARAMETERS. THIS IS DONE USING THE SAME PROCEDURE IN SECTION 15.3.

15.3 Control and User Code Programming

The programming of the user codes follows a sequence of entering the four digit select code followed by the code to be programmed. Table 15.1 identifies the select code for each control and user code. Other repeater parameters (repeater time-out) are programmed in this same manner. However, the CW ID follows a different method to be explained in section 15.5.

When programming any code after entering the code and if accepted the controller will send in CW "RR". If not accepted no response will be heard.

When programming any code no more than 1 second can be left between any DTMF digit or programming of the code will be aborted requiring restarting the entry with the programming code. If a mistake is made simply stop entry and start over after about 3 seconds.

15.31 Control Code Programming

The control codes are the A _ _ and D _ _ codes. These are three digit code with the first digit being A or D (the A and D are fixed and cannot be altered).

When programming an A or D code only the second and third digit is to be entered when programming. To program a control code get the select code of the code to be programmed from Table 15.1 and follow the procedure of entering select code followed by the second and third digits to be programmed.

As an example of programming a control code let us take the "REPEATER ENABLE" code to be programmed. Let us say we wish the code to be A12. From Table 15.1 the select code is "4100". To program this code enter:

4100 12 Repeater Enable Code of A12

NOTE: The 4100 is the repeater select code from Table 15.1. and 12 sets the code to A12. The repeater enable code will now be A12 again with the A being fixed part of the code.

All of the A and D control codes are programmed in this same manner. After programming any of the codes the controller will respond with CW "RR" if accepted.

15.32 User Code Programming

The user codes are the * (star) and # (pound) codes. The * codes are three digits with the first digit always being *. The # codes are two digits with first digit #.

When programming a * code only the second and third digit is to be entered since the * is fixed. To program a * code enter the select code followed by the second and third digit to be programmed. The select codes are listed in Table 15.1.

As an example if the "REMOTE BASE ON" code to be programmed is *56. One would enter the following:

4070 56 Remote Base ON Code of *56

If the code was accepted the control will respond with CW "RR".

NOTE: The 4070 select code came from Table 15.1. The 56 is the code to be programmed.

When programming a # code two digits must be entered with first digit always being a zero (0) followed by the desired second digit of the code.

When programming a # code the second digit of the code CANNOT be a 0, 8, 9 * or # for these are used for other controller functions.

As an example let us say we wish to make the "REMOTE BASE OFF" code #7. The remote base off code select code from Table 15.1 is 4060 and for programming we would enter:

4060 07 Remote Base OFF Code of #7

NOTE: The 4060 is the select code for remote base off from Table 15.1. Even though only the 7 is used with the # the two digits of 07 must be entered. If something other than the 0 were to be entered the code would then be inoperative. If desired this allows for the code to be omitted preventing its use.

15.4 Repeater Parameters Programming

The repeater parameters which can be programmed are the tail beep, when tail beep is sent within the tail, tail timer limit, repeater time-out, CW ID time interval, tone and speed. See Section 15.5 for ID parameter details.

15.4.1 Tail Beep Programming

The tail beep is formed in four .1 second segments. Each segment can be programmed for no tone or a tone of 1 kHz/N tone. The value of N is programmed with 0 for no tone and 1 and up for the desired tone. To program a tail beep enter the select code 4050 followed by four digits; one digit for each segment.

As an example of programming a tail beep say we wish to program in a single .2 second 500 Hz tone. The entry would be:

4050 2200 tail beep=500, 500, no tone, no tone

The 4050 was the tail beep select code (Table 15.1) with the 22 programming two segments of 500 Hz each and 00 programming two segments of no tone.

As another example say we wish for 75 Hz, 330 Hz, 500 Hz and 1000 Hz tail beep. The entry would be:

4050 4321 tail beep=75, 330, 500, 1000 Hz

If no tail beep is desired entry of 4050 0000 will produce such a tail beep.

15.4.2 Tail Beep Time Programming

The time the tail beep occurs within the tail timer after the user drops the repeater input is programmed with select code 052. The time is in .1 second steps. The tail beep time is programmable from .2 to 25.5 seconds. To program .7 seconds tailbeep time enter:

4052 07 tail beep time of .7 seconds

15.4.3 Repeater Time-out Programming

The repeater time-out is programmable in 10 second intervals from 20 seconds to 2550 seconds (42.5 minutes). To program a time-out the select code is 4054.

15.5 CW ID Programming

The CW ID is programmable with up to 31 characters. However, the programming is different from that of the other codes in that once the CW ID programming has been turned on the CW characters are entered using DTMF 1 for dit, 2 for dah, * for end of character and # for programming complete.

Before programming the CW ID the control code for turning on programming must be performed. This is done in the same manner the other control codes are programmed except using select code 4121 (from Table 15.1). To make the code D49 enter:

4121 49 making CW ID programming code D49

Also, before the CW ID can be changed or programmed the programming must be enabled using the two programming enable codes of D7B and D7C. After this the CW ID programming code must be entered placing the controller in the CW ID entry mode.

15.5.1 CW ID Programming Example

As an example say we wish to program the CW ID to read (space) W8ABC (space) (space). First enter the CW ID programming code using the example above of D49. Follow this with DTMF *, 122* (W), 22211* (8), 12* (A), 2111* (B), 2121* (C), *, *. #.

The first * placed a space as the first character. Any time a space is desired the single entry of * will produce this. The 122 programmed a dit dah dah (W) with the * forcing advancement to the next character. This process continued until the finish of programming at which time the # ended programming.

The CW ID capacity is 31 characters. If it is attempted to exceed this limit the controller will automatically place the end of CW ID character (#) in the ID table and abort programming.

15.5.2 CW ID Time Interval

The time between CW IDs is programmable in 10 second intervals from 20 seconds to 2550 seconds (42.5 minutes). The select code of 4055 is used for programming and using the same procedure as that for programming control codes.

15.5.3 CW ID Tone Programming.

The CW ID tone is programmable using select code 4056. The tone can range from a few Hertz to 1 kHz max. A programming of 01 will produce a tone of 1 kHz, 02 a tone of 500 Hz; the larger the number the lower the tone. To program a tone of 500 Hz enter:

4056 02 CW ID tone of 500 Hz.

15.5.4 CW ID Speed Programming

The CW ID speed is programmable from about 50 wpm to 5 wpm. When programming the speed the larger the number programmed the slower the speed. A programmed value of 07 is about 15 wpm. It is advised a speed parameter of from 5 to 9 be used.

THIS COMPLETES THE DESCRIPTION OF PROGRAMMING. AFTER PROGRAMMING IS COMPLETE ONE SHOULD ALWAYS DISABLE PROGRAMMING WITH THE PROGRAMMING DISABLE PROGRAMMING CONTROL CODE (D7A). THIS WILL PREVENT UNWANTED ALTERING OF THE PROGRAMMED DATA.

Hex to Decimial Conversion table.

time entry	time entry	time entry	time entry	time entry	time entry
00	00	51	33	102	66
01	01	52	34	103	67
02	02	53	35	104	68
03	03	54	36	105	69
04	04	55	37	106	6A
05	05	56	38	107	6B
06	06	57	39	108	6C
07	07	58	3A	109	6D
08	08	59	3B	110	6E
09	09	60	3C	111	6F
10	0A	61	3D	112	70
11	0B	62	3E	113	71
12	0C	63	3F	114	72
13	0D	64	40	115	73
14	0E	65	41	116	74
15	0F	66	42	117	75
16	10	67	43	118	76
17	11	68	44	119	77
18	12	69	45	120	78
19	13	70	46	121	79
20	14	71	47	122	7A
21	15	72	48	123	7B
22	16	73	49	124	7C
23	17	74	4A	125	7D
24	18	75	4B	126	7E
25	19	76	4C	127	7F
26	1A	77	4D	128	80
27	1B	78	4E	129	81
28	1C	79	4F	130	82
29	1D	80	50	131	83
30	1E	81	51	132	84
31	1F	82	52	133	85
32	20	83	53	134	86
33	21	84	54	135	87
34	22	85	55	136	88
35	23	86	56	137	89
36	24	87	57	138	8A
37	25	88	58	139	8B
38	26	89	59	140	8C
39	27	90	5A	141	8D
40	28	91	5B	142	8E
41	29	92	5C	143	8F
42	2A	93	5D	144	90
43	2B	94	5E	145	91
44	2C	95	5F	146	92
45	2D	96	60	147	93
46	2E	97	61	148	94
47	2F	98	62	149	95
48	30	99	63	150	96
49	31	100	64	151	97
50	32	101	65	152	98
51	33	102	66	153	99
				154	9A
				155	9B
				156	9C
				157	9D
				158	9E
				159	9F
				160	A0
				161	A1
				162	A2
				163	A3
				164	A4
				165	A5
				166	A6
				167	A7
				168	A8
				169	A9
				170	AA
				171	AB
				172	AC
				173	AD
				174	AE
				175	AF
				176	B0
				177	B1
				178	B2
				179	B3
				180	B4
				181	B5
				182	B6
				183	B7
				184	B8
				185	B9
				186	BA
				187	BB
				188	BC
				189	BD
				190	BE
				191	BF
				192	C0
				193	C1
				194	C2
				195	C3
				196	C4
				197	C5
				198	C6
				199	C7
				200	C8
				201	C9
				202	CA
				203	CB
				204	CC
				205	CD
				206	CE
				207	CF
				208	D0
				209	D1
				210	D2
				211	D3
				212	D4
				213	D5
				214	D6
				215	D7
				216	D8
				217	D9
				218	DA
				219	DB
				220	DC
				221	DD
				222	DE
				223	DF
				224	E0
				225	E1
				226	E2
				227	E3
				228	E4
				229	E5
				230	E6
				231	E7
				232	E8
				233	E9
				234	EA
				235	EB
				236	EC
				237	ED
				238	EE
				239	EF
				240	FO
				241	F1
				242	F2
				243	F3
				244	F4
				245	F5
				246	F6
				247	F7
				248	F8
				249	F9
				250	FA
				251	FB
				252	FC
				253	FD
				254	FE
				255	FF

Table 15.1 RC-100 Control and User Codes REV 3.57

FUNCTION	SEL	CODE	FUNCTION	SEL	CODE
Repeater Enable	4100	A 0 0	Send ID Continuous	4120	D 2 0
Repeater Disable	4101	A 0 1	CW ID Prog ON	4121	D 2 1 @
Freq prog Enable	4102	A 0 2	Tape Select code	4122	D - - @
Freq prog Disable	4103	A 0 3	Remote Base Select	4123	D 2 3 @
Master Enable	4104	A 0 4	DTMF muting en/dis	4126	D 2 6
Master Disable	4105	A 0 5	Master 1st digit en/dis	4127	D - -
Remote Base En	4106	A 0 6	Master 1st digit prog	4130	D 0 -
Remote Base Dis	4107	A 0 7	Crossband en/dis	4132	D - - @
Controller Reset	4110	A 1 0			
DTMF access en/dis	4111	A 1 1	CW ID enable/disable	4135	D 3 5
Tone Access en/dis	4112	A 1 2	Autopatch select	4136	D - -
AUX 1-of-8 output	4113	A 1 3	Autopatch en/dis	4137	D - -
AUX HEX (aux 9-12)	4114	A 1 4	External ID en/dis	4140	D - -
AUX momentary	4134	D - - x	External ID Record start	4141	D - -
AUX CODE	4146	D - -	PL encode en/dis	4142	D - -
Remote Base beep	4115	A 1 5	PL access mode en	4143	D - -
Remote Base ID TX	4150	D 5 0	PL access mode dis	4144	D - -
Remote Base timeout sel	4151	D 5 1	Zero Tail en/disable	4147	D 4 7
RB DTMF access en/dis	4145	D 4 5	Normal/CW tailbeep sel	4156	D - -
			CW tailbeep program	4155	D - - @
			Control code en/dis	4170	D 7 0

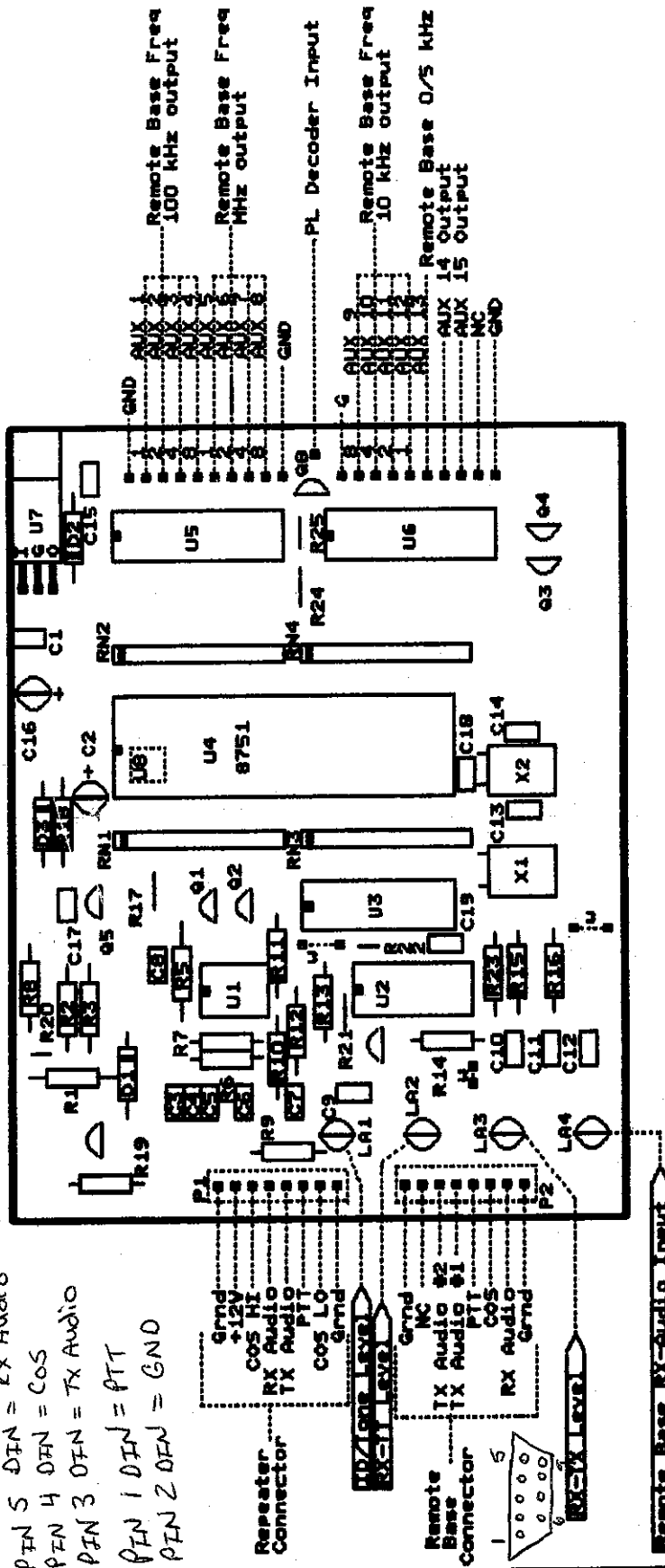
Programming Disable 4172 D 0 0 (default D7A)
 Programming Enable 1 4173 D 0 1 (default D7B)
 Programming Enable 2 4174 D 0 2 (default D7C)

PARAMETERS	SEL	VALUE	Time steps/tone/speeds
Tail beep programming	4050	4 3 2 0 @	4 segments each 1 kHz/n
Tail beep time	4052	0 4 @	.1 sec
Tail Time	4053	1 0 @	.1 sec
Time-out Timer	4054	1 0 4 @	10 sec
CW ID timer	4055	1 0 4 @	10 sec
CW ID tone (01=1 kHz)	4056	- - @	1 kHz/n
CW ID speed (07=15 wpm)	4057	- - @	higher value lower speed
Anti-krchunk access time	4160	- - @	.1 sec
Sub-audible tone on time	4167	- - @	.1 sec
Remote Base Timeout	4161	- - @	10 sec

FUNCTION	SEL	CODE	FUNCTION	SEL	CODE
Remote Base ON	4070	* 0 1	OFF	4060	# 0 0
Patch ON	4076	* - -	OFF/clear all	4063	# - -
A equivalent	4061	# - -	D equivalent	4062	# - -
Anti-kerchunker ON/OFF	4071	* - -			
DTMF Access code	4072	* - -	Force CW ID	4064	# 6 4

NOTE: CODES WITH @ REQUIRE PROGRAMMING ON TO FUNCTION.

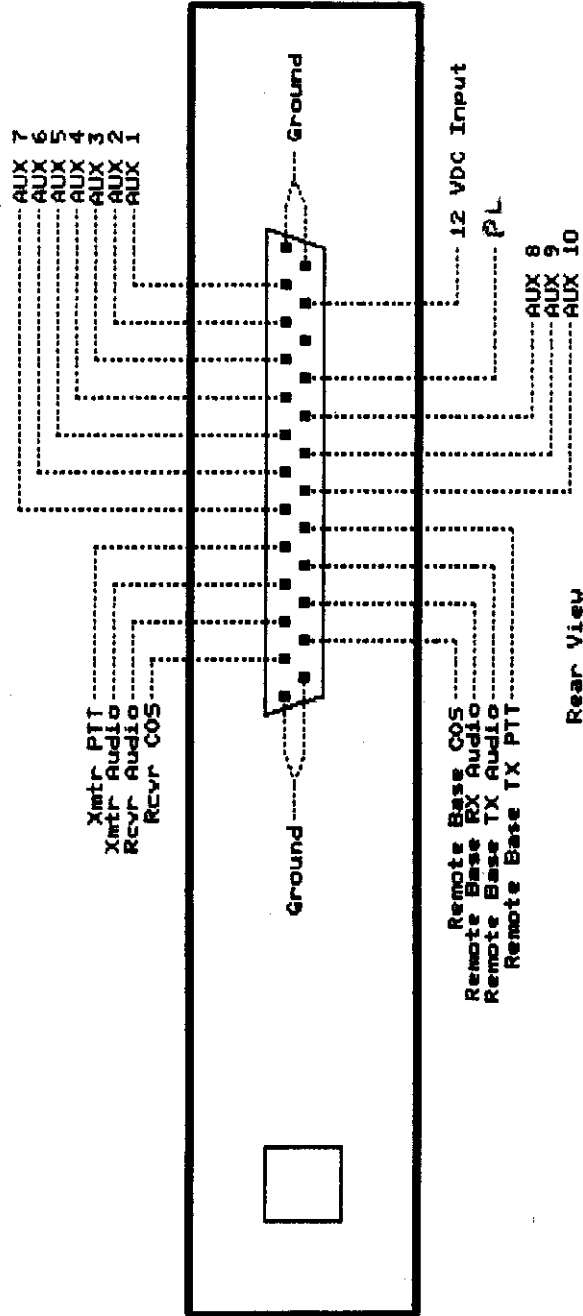
MALE DFN
 PIN 5 DFN = RX Audio
 PIN 4 DFN = COS
 PIN 3 DFN = TX Audio
 PIN 1 DFN = PTT
 PIN 2 DFN = GND



U8 is surface mounted IC on solder side of PCB.
 "u" means jumper

last used: U8, LA4, X2, Q8, C18, R25.

RC-100 Repeater Controller Assembly Drawings		
Size	Document Number	REV
A	RC100.asu	F
Date:	February 22, 1996	Sheet 1 of 1



Rear View

ENC-1 Enclosure for RC-100	
Micro Computer Concepts	
Size	REV
A	A
Document Number	ENC-1B.dwg
Date:	August 10, 1992
Sheet	1 of 1

