CAT-800
Repeater Controller

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Table of Contents

I Don't Have Time To Read This Manual

If you are anxious to get the CAT-800 in operating and don't have time to read this manual, the following short version will appeal to you. This is a list of the minimum steps required to install the CAT-800 and verify its operation. Now fire-up your soldering iron and let's get started.

Connecting the CAT-800 to the Repeater's Transmitter

Open the connector kit and remove the 2.5mm power plug and the 25 pin "D" connector. Solder a +12 volt wire to the center connector and a ground wire to the outer connector of the power plug. Connect the wires to a +12VDC power supply. Solder five wires to the 25 pin "D" male connector. Connect wires to pins 6, 10, 11, 13 and 17. Connect the pin 10 wire to the transmitter's PTT, the pin 11 wire to the transmitter's modulation input and pin 17 to the repeater's chassis ground.

Transmitter Test

Turn on the +12VDC power supply. The repeater should transmit and you should hear the CAT-800's "power up" message. The voice synthesizer will say: "CAT800 VERSION 1.04." Adjust the TX1 control for proper transmitter deviation. Turn the +12VDC power supply OFF.

Connecting CAT-800 to the Repeater's Receiver

Connect the pin 6 wire to the receiver's COR or COS output. Connect the pin 13 wire to the receiver's receive audio output.

Receiver Test COR1

Monitor the COR#1 test point with a DC voltmeter. Open and close the repeater's squelch control while observing the voltage on the test point. If the voltage goes from low to high COR#1 input is considered active high dipswitch #1 should be off. If the voltage goes from high to low COR#1 input is considered active low dipswitch #1 should be on. If the COR#1 test point remains low with the squelch control opened and closed the receiver's COR output may be an open collector circuit and require a pull-up resistor. The CAT-800 has onboard pull-up resistors on each of the COR input lines. To the left of the cluster of test points are three jumper plugs. Verify a jumper plug is installed on the COR-1 position. This adds a pull-up resistor to the COR#1 input. Turn the +12VDC power supply on. Check for a voltage at the COR #1 test point that is greater than 3VDC. Open the receiver's squelch and verify the voltage drops to 0VDC. Make sure dipswitch #1 is in the on position and the green front panel PORT-1 led turns on when the squelch is opened or when a signal is being received.

Receiver Test RX1

Connect an AC voltmeter to the RX1 test point. Using a typical transceiver, key-up and send a DTMF tone. Adjust RX1 control for 200mV as indicated on the AC voltmeter. If this causes the repeater's transmitter to over deviate, readjust TX1 as required.

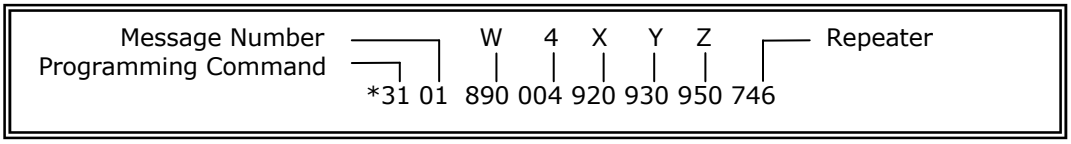
NOTE: Make sure that RF from the transceiver does not get into the voltmeter leads causing a false indication.

Voice Synthesizer Test

Compare receive and synthesized voice audios and adjust the VOICE Level as desired. For best quality speech, the synthesized voice should not exceed 3KHz deviation. The synthesize voice should be lower than the receive audio.

Program Voice Identification

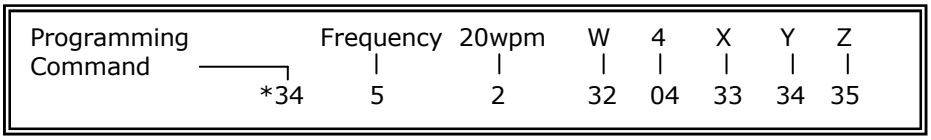
Key-up and enter the seven digit unlock number [1234567]. The voice will say: "CAT-800 CONTROL." Key-up and send [*3101], followed by the three digit numbers that represents your call letters form the Voice Message Vocabulary Word List table. Example: Load Repeater voice ID with "W4XYZ Repeater." To hear the repeater's voice ID, key-up and send [*3001].



VOICE MESSAGE VOCABULARY WORD LIST							
0=000	5=005	A=210	F=370	K=530	P=680	U=870	Z=950
1=001	6=006	B=250	G=410	L=550	Q=720	V=880	REPEATER=746
2=002	7=007	C=270	H=440	M=580	R=730	W=890	
3=003	8=008	D=310	I=470	N=620	S=770	X=920	
4=004	9=009	E=340	J=500	O=650	T=820	Y=930	

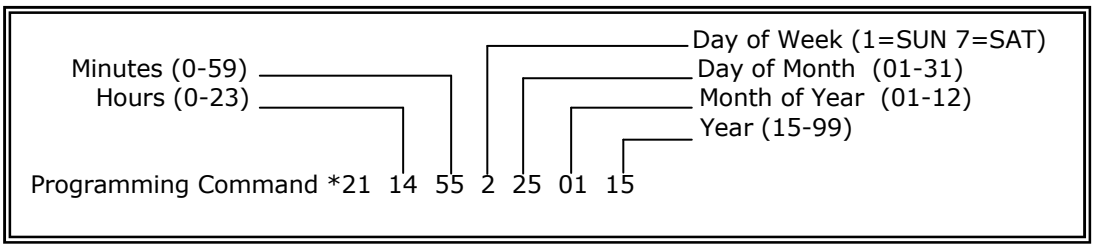
Program CW Identification

Key-up and send [*34], followed by the two digit numbers that represents your call letters. Refer to the CW ID Programming Table. Example: Load the CW ID buffer with W4XYZ/R. To hear the repeater's CW ID, key-up and send [*33].



CW ID PROGRAMMING TABLE									
00=0	04=4	08=8	12=C	16=G	20=K	24=O	28=S	32=W	36=/
01=1	05=5	09=9	13=D	17=H	21=L	25-P	29=T	33=X	
02=2	06=6	10=A	14=E	18=I	22=M	26=Q	30=U	34=Y	
03=3	07=7	11=B	15=F	19=J	23=N	27=R	31=V	35=Z	

Setting the Clock
To read the time, key-up and send [*20]. Un-key, the voice will read the time, day of week, month, day of month and year. To set the clock, key-up and send [*21] followed by the hours, minutes, day of week, day of month, month and year. Un-key and the voice will say "CONTROL OK." Example: 2:55 PM Monday January 25th 2015. All entries must be double digit, except the day of week.



Exit Programming Mode
Key-up and send [*0]. Un-key, the controller will lock-up and the voice will say: "MANUAL EXIT." The CAT-800 will lock-up automatically when the programming timer expires. The voice will say: "TIMER EXIT."

Program Unique Unlock Number
Program a new seven digit UNLOCK number. Set dipswitch #8 to ON and the voice will say: "ENTER CONTROL." Key-up and enter a new seven-digit number. Un-key, if the number is accepted, the voice will say: "CONTROL OK." If rejected, the voice will say: "ENTER CONTROL." Key-up and enter the seven-digit number again. After the new unlock number is accepted set dipswitch #8 to the OFF position.

Enable DTMF Muting
DTMF muting is a feature that prevents your DTMF tones from being transmitted. To enable this feature, key-up and enter [100171]. The voice will say: "ONE SEVEN ON" and your DTMF tones will be muted on the repeater's transmitter output.

Test DTMF Tone Decoding
To verify that all of the DTMF tones are being decoded, key-up and enter [4751234567890*#ABC]. Check that the voice synthesizer reads back [1234567890*#ABC].

Test Time of Day
To verify the correct time, key-up and enter [400]. Check that the voice synthesizer announces the time.

Test Voice Identification
To verify the voice identification, key-up and enter [70001]. Check that the voice synthesizer announces the repeater's identification.

Chapter 1 - Introduction and Specifications

Congratulations on your purchase of the CAT-800 Repeater Controller. The CAT-800 is a three-port controller and will support a repeater on Port #1 and transceivers on Port #2 and #3. The CAT-800 is designed to be a drop-in for the very popular CAT-250 controller adding a third port and Internet conductivity.

Programming the CAT-800 is a snap, with its carefully structured uniform programming commands. The manual is easy to follow and the voice synthesizer interacts with you during control and programming operation. An optional Windows® editor is available to program the CAT-800 controller through its USB port.

Voice Synthesizer
A vocabulary base of 470 words with twenty voice messages is available to ID your repeater system and make voice announcements. Each voice message will accept up to fifteen numbers, letters or words from the vocabulary list in Chapter 10. In addition to the repeater port, voice messages can be directed to Port #2 and Port #3.

DTMF Control
Three DTMF decoders one dedicated to each port afford complete control over the CAT-800 controller.

CW ID
The CW buffer is user programmable in both tone frequency and speed. If both the voice and CW IDs are enabled, the controller will ID in voice. If a repeater user transmits during the voice ID the controller will switch to the CW ID and allow the user's audio to pass.

Courtesy Tone
Create up to eight custom courtesy tones. Each tone can consist of up to three different tone frequencies of various lengths and separations. Courtesy tones can be changed on the fly loading a different courtesy tone number in event macros 20. Courtesy tone event macros 21 and 22 are assigned to the Port #2 and Port #3 receivers.

Port Configuration
The CAT-800 is a three-port controller. Port #1 is configured as a repeater port while Port #2 and Port #3 are transceiver ports. They can be set-up as a half-duplex or full-duplex port by setting dipswitches #4 and #5.

User Function Output Switches
Five open drain switches are available to control equipment at your repeater site. These switches are located on the J1 connector and are controlled manually by DTMF commands from within a user or event macro. They can be made to turn OFF, ON or momentarily change state for a period of 250 or 500mS. Switches #1 and #2 are also available on the Port #2 connector J2 while Switches #3 and #4 are available on Port #3 connector J3. At default the switches are assigned as standard user function switches. These switches can be redefined to control a fan or CTCSS encoder. When Fan Control is selected the switch will follow PTT #1 and remain on for 60 seconds after PTT #1 turns off. When CTCSS Encoder (PTT) is selected the switch will follow PTT #1 but turn off 250mSEC before PTT #1 turns off. When CTCSS Encoder (COR) is selected the switch will follow COR #1.

User Function Logic Inputs
Five logic inputs activated by a voltage change from other equipment at the repeater site, causes the CAT-800 to execute event macros 07 through 16. Two event macros are assigned to each logic input. Different macros are called when the input goes high and then low. To facilitate initial testing, at default the five logic inputs are assigned to turn on and off the five user output switches.

DTMF Keypad Test
A DTMF keypad test will read back the numbers decoded in a synthesized voice. This feature is available on all three ports.

User Macros
The CAT-800 supports forty User Macros each containing sixteen internal commands. A user macro is a series of internal commands, defined by the repeater owner. These macros permit the owner to customize certain aspects of repeater operation. Once the CAT-800 decodes the macro number, the internal commands will execute in the order they were stored within the macro string.

Event Macros
An event macro is a series of internal commands, defined by the repeater owner. Event Macros are positioned throughout the program to execute during certain prescribed operations. The CAT-800 supports sixty event macros with each containing sixteen internal commands.

Specifications

Microprocessor	ARM Cortex M4F processor core, 150 DMIPS performance
Memory	1024KB Flash, 256K SRAM
Voice Synthesizer	Texas Instruments MSP53C391NI2D
Voice Vocabulary	470 Words
Digital Audio WAV Player (Optional)	30 Tracks
DTMF Receivers	(3) MT88L70AS Decoders
Operating Temperature	15 to +55 degrees C
Call Letter ID	(3) Buffer Size VOICE (15) - CW (16)
User Macros	(40) Buffer Size (16)
Event Macros	(60) Buffer Size (16)
Logic Inputs	(5) 10K ohm input impedance
	Low (0 to 0.7VDC) High (3 to 15VDC)
User Function Outputs	(5) Open Drain Relay Driver (28VDC at 100mA)
Audio Input	Receiver 0.2 - 2VAC adjustable 10K ohms
Audio Output	Transmitter 2VAC adjustable 600 ohms
Power	+9 to +15VDC at 80mA
Size	5" X 7"
Warranty	Limited one-year, parts and labor.

FCC Part 15 RF Interference
When installed in the RME-200L rack mount enclosure, the CAT-800 has been tested and found to meet the standards for a Class A digital device, as specified in Part 15 of the FCC Rules. These specifications are designed to provide reasonable protection against such interference in a commercial installation. However, there is no guarantee that interference will not occur in a particular installation.

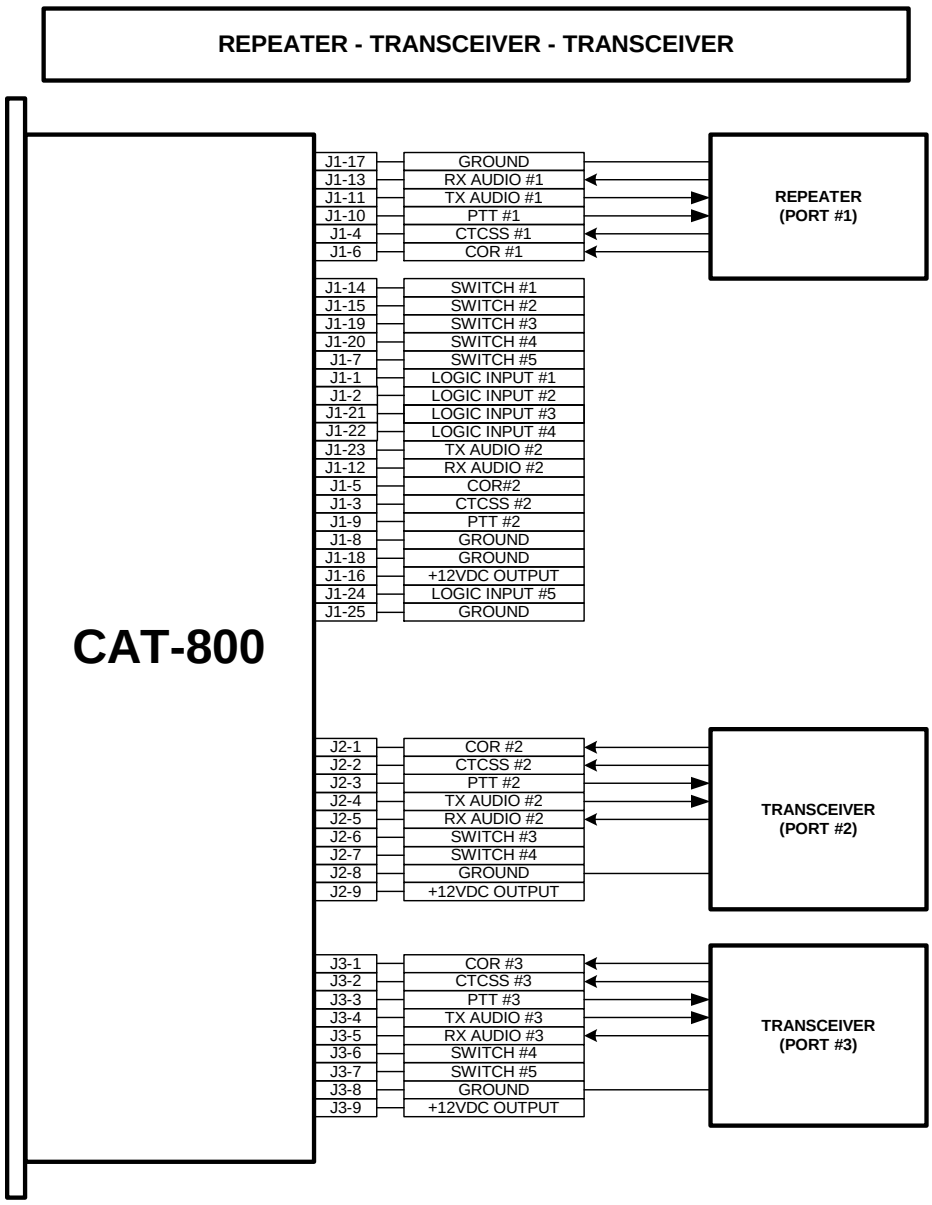


Figure 2-1

In this configuration the CAT-800 supports a repeater on Port #1 and a transceiver on Port #2 and Port #3.

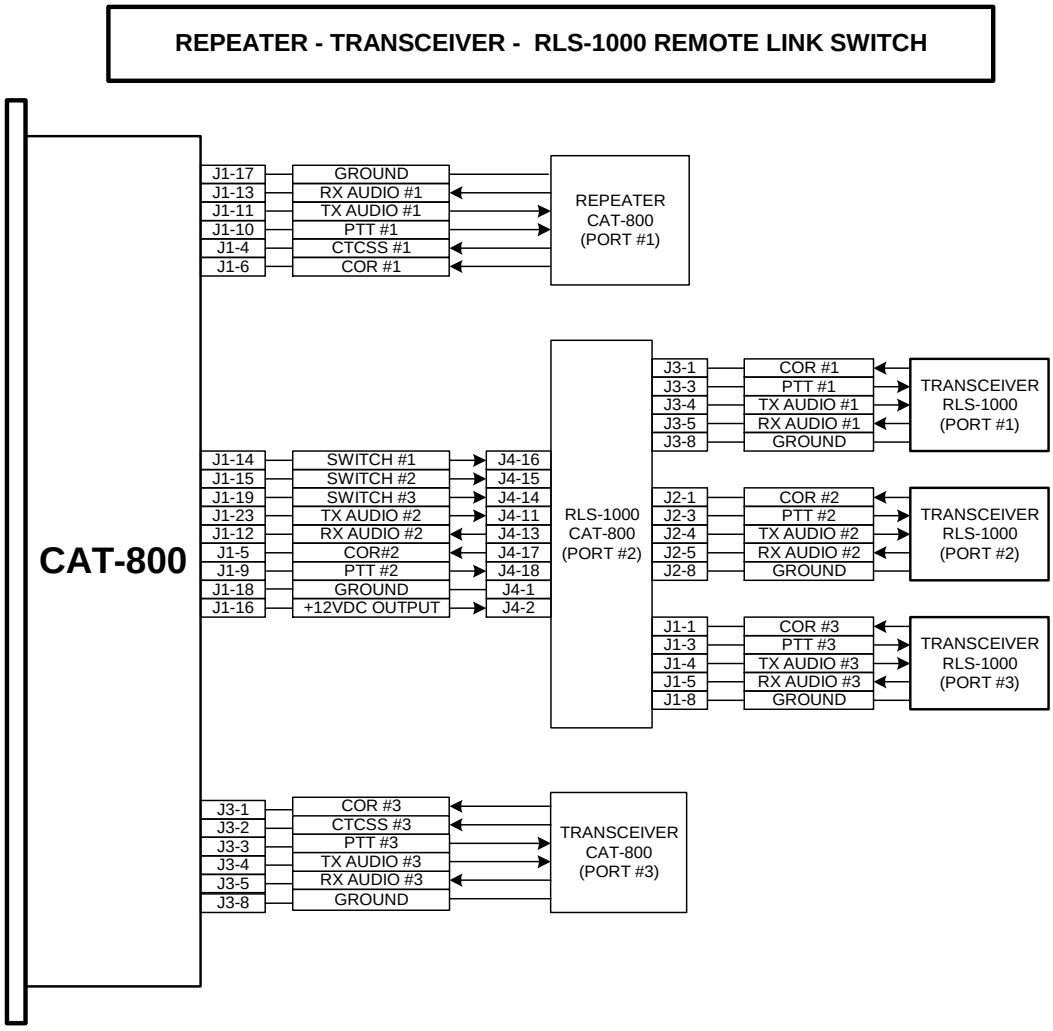


Figure 2-2

In this configuration the CAT-800 supports a repeater on Port #1, an RLS-1000 Remote Link switch on Port #2 and a transceiver on Port #3. The RLS-1000B provides a method to connect three transceivers to Port #2 of the CAT-800 repeater controller. The COR output of the RLS-1000 is active high so dipswitch #2 should be off. Since the receiver audio and COR inputs are mixed, all three transceivers can be selected at the same time. Transceiver selection is accomplished by grounding three of the RLS-1000 control lines. To select transceiver #1 turn on switch #1 [Zone 6-1]. To select transceiver #2 turn on switch #2 [Zone 6-2]. To select transceiver #3 turn on switch #3 [Zone 6-3].

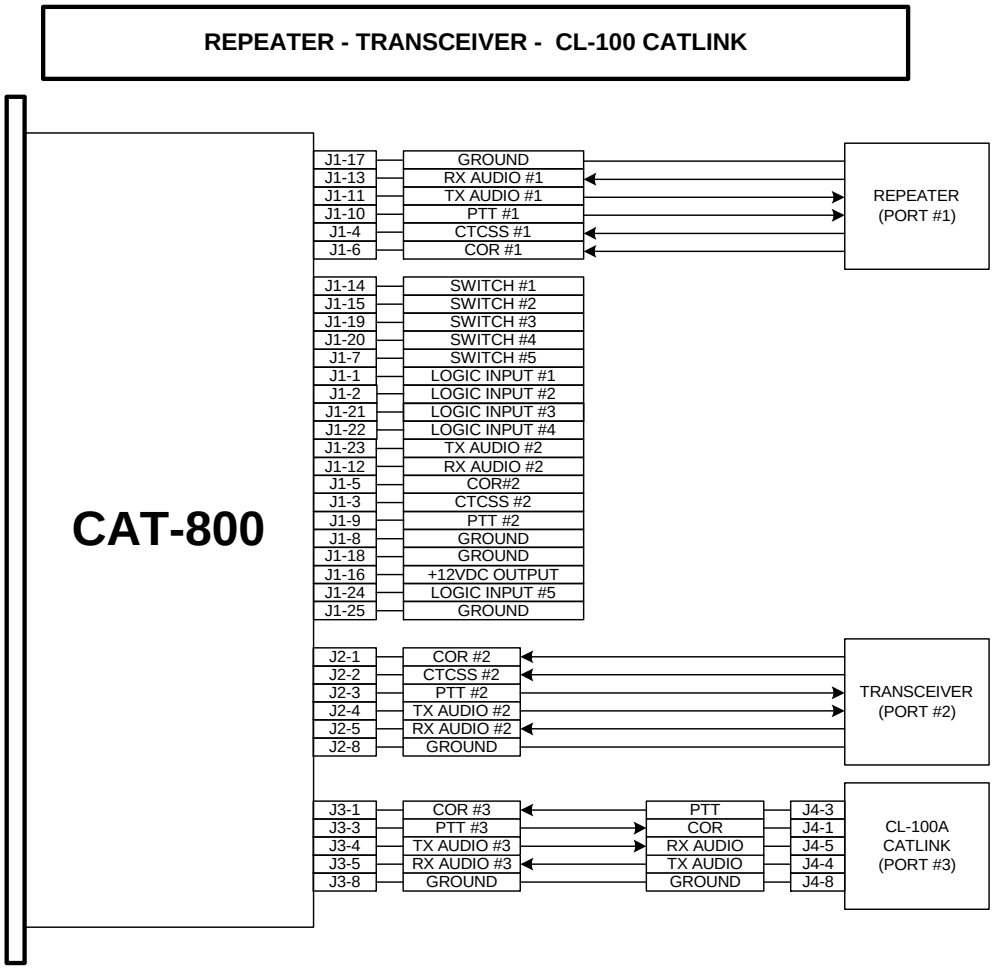


Figure 2-3

In this configuration the CAT-800 supports a repeater on Port #1, a transceiver on Port #2 and a CL-100A on Port #3. The CL-100 is a complete standalone RF interface to the Internet. A pair of Cat-Links will provide a VOIP link to another repeater or remote transceiver. The CL-100 will convert the CAT-800's TX audio and PTT outputs into digital packets and send them through the Internet to another CL-100 or CH-100 Cathub. The CL-100's PTT output provides an active low to the CAT-800's Port #3 COR. This COR input need to be pulled up. Turn on dipswitch #3. The CAT800's PTT provides an active low COR to the Catlink. Set the CL-100's dipswitch #1 to on. The RX and TX audios must be cross-connect.

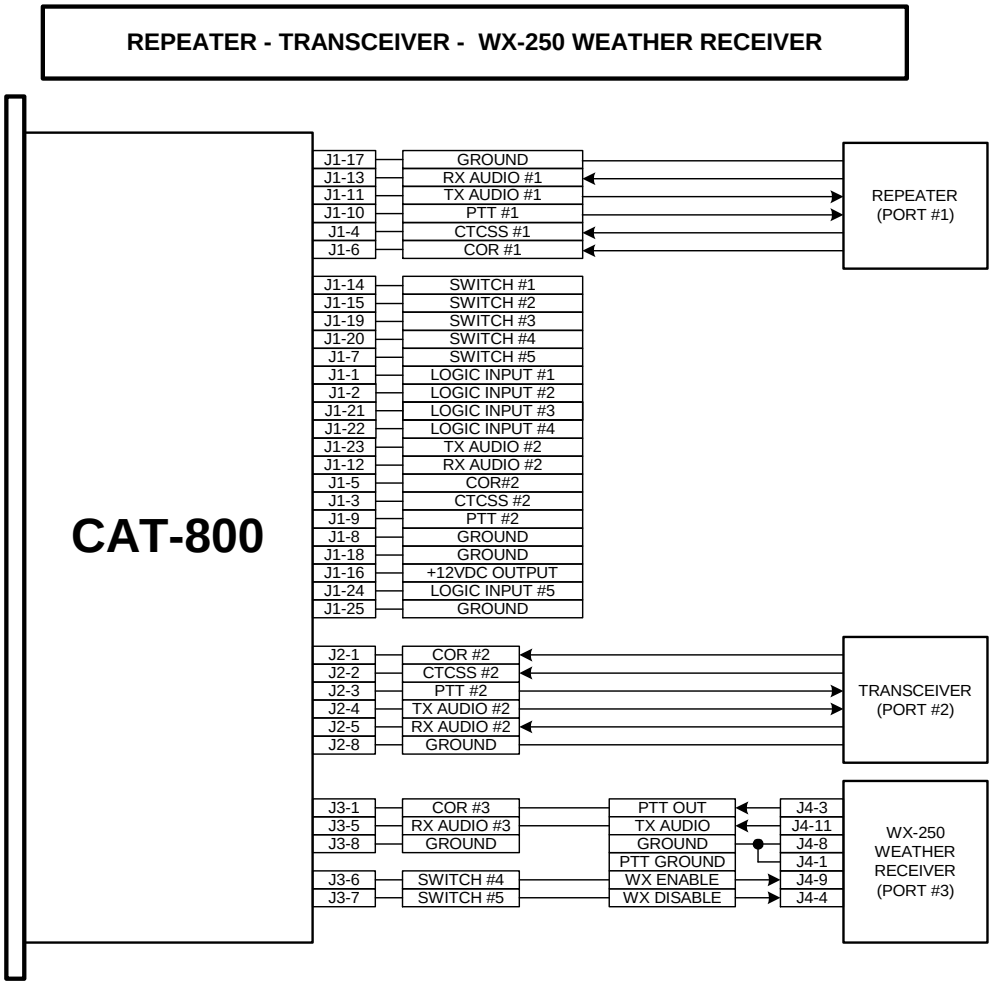


Figure 2-4

In this configuration the CAT-800 supports a repeater on Port #1, a transceiver on Port #2 and a WX-250 Weather receiver on Port #3. The WX-250 is a highly sensitive receiver with a digital decoder that responds to Specific Area Message Encoded (SAME) alerts transmitted by the NOAA weather station located in your geographic area. Select your county code and the type of alerts. Select warnings and or watches. During a weather alert, a relay activates providing COR and RX audio to the CAT-800. When an alert is received [PTT OUT] J4-3 will generate an active low COR #3 to the CAT-800. The [TX AUDIO] J4-11 will provide weather audio containing the weather announcement. On the CAT-250 set dipswitch #3 on to provide the necessary pull-up voltage and set the pull-up jumper to on because the COR input is active low. To monitor the weather receiver on demand, turn on the CAT-800's switch #4 [Zone 6-4] [100641]. This will ground the [WX ENABLE] input J4-9. To disable alerts, turn on switch #5, [Zone 6-5] [100651]. To reset the alert, turn switch #5 on and than back off.

Dipswitch Settings

An eight-position dipswitch configures various functions of the CAT-800.

Switch 1 This switch determines Port #1 COR input logic. Switch #1 should be ON if the Port #1 receiver's COR is an active low and OFF if COR is active high.

Switch 2 This switch determines Port #2 COR input logic. Switch #2 should be ON if the Port #2 receiver's COR is an active low and OFF if COR is active high.

Switch 3 This switch determines Port #3 COR input logic. Switch #3 should be ON if the Port #3 receiver's COR is an active low and OFF if COR is active high.

Switch 4 This switch determines the operation of Port #2. Switch #4 should be ON for full-duplex transceiver operation and OFF for half-duplex transceiver operation.

Switch 5 This switch determines the operation of Port #3. Switch #5 should be ON for full-duplex transceiver operation and OFF for half-duplex transceiver operation.

Switch 6 This switch places the CAT-800 in the cross band repeat mode. With transceivers on both Port #1 and Port #2, enabled the link with the [A2] command. A signal received by the Port #1 receiver will only key the Port #2 transmitter and a signal received by the Port #2 receiver will only key the Port #1 transmitter. With transceivers on both Port #1 and Port #3, enabled the link with the [A3] command. A signal received by the Port #1 receiver will only key the Port #3 transmitter and a signal received by the Port #3 receiver will only key the Port #1 transmitter. With transceivers on Port #1, Port #2 and Port #3, enabled the link with the [A23] command. A signal received by the Port #1 receiver will key the Port #2 and Port #3 transmitter and a signal received by the Port #2 or Port #3 receivers will key the other transmitters.

Switch 7 This switch is used to initialize the CAT-800. Set this switch to ON. Cycle the power OFF and back ON. During power-up, the memory will be flushed and reloaded with default values. The voice will say: "RESET SYSTEM OK." Set dipswitch #7 to the OFF position and recycle power.

Switch 8 This switch is used to program a new MASTER un-lock number. Set switch #8 to ON. The voice will say: "ENTER CONTROL." After the seven-digit master unlock number is entered, set switch #8 to OFF.

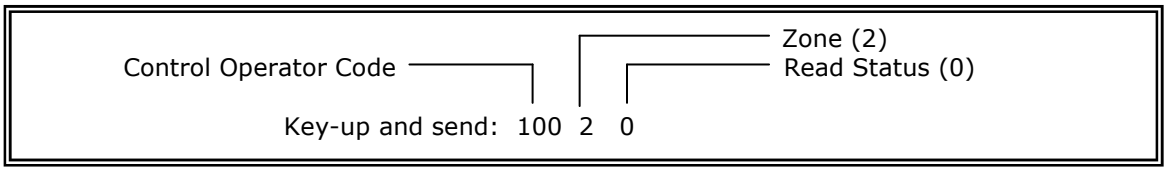
Controller Security

Before placing the CAT-800 into operation five numbers should be changed. They are: the MASTER Unlock number, the Secondary Unlock number and the Control Operator numbers for Port #1, Port #2 and Port #3. See page 5-1 to change the unlock numbers and page 5-15 to change the Control Operator numbers.

Chapter 3 - Repeater Control

The CAT-800 has nine control zones with eight control channels each. These zones can be manually controlled by DTMF commands; user and event macros and logic input action. The first three zones are assigned to control the three ports. Zones 4 and Zone 8 are global control zones common to all three ports. Zone 5 controls the five user logic inputs while Zone 6 controls the five user output switches. Zone 9 is reserved for control of the various Internet functions. NOTE: The procedures described in this chapter are control functions not programming functions. DO NOT UNLOCK the controller with the seven-digit number before trying to control these nine zone channels.

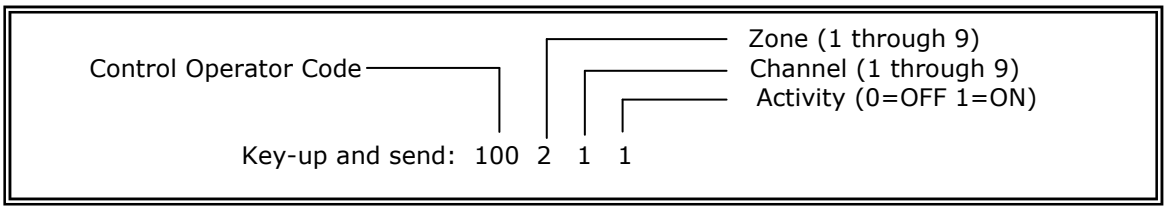
Interrogation of Repeater Control Status
Key-up and send the Port #1 control operator code [100] followed by the zone number and a zero. Un-key and the voice will read back the channels that are turned on in that zone. Example: Read Zone 2 control status. If all the channels are turned off, the voice will say: "CLEAR."



Un-key and the voice will say: "ONE- FIVE- EIGHT"

Changing Repeater Control Status
To change the status of a control function, key-up and send the Port #1 control operator code followed by the zone number, channel number in that zone and a [1] to turn the control channel ON or a [0] to turn the control channel OFF. Un-key and the voice will read back the zone, channel number and control activity.

Example: Turn Zone 2 Channel 1 ON through the Port #1 receiver.



Un-key and the voice will say: "TWO ONE ON."

Control of the CAT-800 is also available through the Port #2 and Port #3 receivers. The procedure is the same as above however the default control operator code for Port #2 is [200] and Port #3 is [300].

CAT-800 Repeater Control Channels

Zone 1

1	PORT #1 TRANSMIT	ENABLE*
2	PORT #1 CTCSS	ENABLE
3	PORT #1 RECEIVER	ENABLE*
4	PORT #1 TURN ON DELAY	ENABLE
5	PORT #1 TRANSMITTER HANG TIME	ENABLE*
6	PORT #1 COURTESY TONE	ENABLE*
7	PORT #1 DTMF MUTING	ENABLE
8	PORT #1 TIMEOUT	ENABLE*

Zone 2

1	PORT #2 TRANSMIT	ENABLE*
2	PORT #2 CTCSS	ENABLE
3	PORT #2 RECEIVER	ENABLE*
4	PORT #2 TURN ON DELAY	ENABLE
5	PORT #2 ECHOLINK® CONTROL	ENABLE
6	PORT #2 AUTO-DISCONNECT	ENABLE
7	PORT #2 DTMF MUTING	ENABLE
8	PORT #2 TIMEOUT	ENABLE*

Zone 3

1	PORT #3 TRANSMIT	ENABLE*
2	PORT #3 CTCSS	ENABLE
3	PORT #3 RECEIVER	ENABLE*
4	PORT #3 TURN ON DELAY	ENABLE
5	PORT #3 ECHOLINK® CONTROL	ENABLE
6	PORT #3 AUTO-DISCONNECT	ENABLE
7	PORT #3 DTMF MUTING	ENABLE
8	PORT #3 TIMEOUT	ENABLE*

Zone 4

1	PORT #2 CONTROL OPERATOR	ENABLE*
2	PORT #2 MACRO CONTROL	ENABLE*
3	PORT #3 CONTROL OPERATOR	ENABLE*
4	PORT #3 MACRO CONTROL	ENABLE*
5	SCHEDULER	ENABLE*
6	RESERVED	ENABLE
7	GRANDFATHER CLOCK	ENABLE*
8	GRANDFATHER CLOCK SLEEP MODE	ENABLE*

NOTE: (*) Indicates the channel's default setting.

Zone 5

1	USER LOGIC INPUT #1	ENABLE*
2	USER LOGIC INPUT #2	ENABLE*
3	USER LOGIC INPUT #3	ENABLE*
4	USER LOGIC INPUT #4	ENABLE*
5	USER LOGIC INPUT #5	ENABLE*
6	RESERVED	ENABLE
7	RESERVED	ENABLE
8	RESERVED	ENABLE

Zone 6

1	USER OUTPUT SWITCH #1	ENABLE*
2	USER OUTPUT SWITCH #2	ENABLE*
3	USER OUTPUT SWITCH #3	ENABLE*
4	USER OUTPUT SWITCH #4	ENABLE*
5	USER OUTPUT SWITCH #5	ENABLE*
6	RESERVED	ENABLE
7	RESERVED	ENABLE
8	RESERVED	ENABLE

Zone 7

1	REPEATER VOICE ID	ENABLE*
2	REPEATER CW ID	ENABLE*
3	TRANSMITTER TURN OFF MESSAGE #1	ENABLE
4	TRANSMITTER TURN OFF MESSAGE #2	ENABLE
5	TIMED MESSAGE #1	ENABLE
6	TIMED MESSAGE #2	ENABLE
7	TIMED MESSAGE #3	ENABLE
8	TIMED MESSAGE #4	ENABLE

Zone 8

1	FORCED DTMF ENTRY (ALL PORTS)	ENABLE*
2	DTMF ACCESS (ALL PORTS)	ENABLE
3	TIME-OF-DAY REQUEST (ALL PORTS)	ENABLE*
4	DTMF KEYPAD TEST (ALL PORTS)	ENABLE*
5	VOICE MESSAGE DEMO REQUEST (ALL PORTS)	ENABLE*
6	TWO-TONE PAGING REQUEST (ALL PORTS)	ENABLE*
7	DIGITAL AUDIO WAV PLAYER (ALL PORTS)	ENABLE*
8	RESERVED	ENABLE

Zone 9

1	INTERNET	ENABLE*
2	ICMP	ENABLE
3	RESERVED	ENABLE
4	RESERVED	ENABLE
5	RESERVED	ENABLE
6	RESERVED	ENABLE
7	RESERVED	ENABLE
8	RESERVED	ENABLE

Read Firmware Version
To read the current firmware version of the CAT-800, key-up and enter the control operator prefix code followed by [*8]. Un-key and the CAT-800's voice will say: "VERSION ONE POINT ONE FIVE". The default control operator code for Port #1 is [100]. EXAMPLE: Key-up and enter [100*8]. Use the default control operator code [200] for Port #2 and [300] for Port #3.

Perform Remote Control Reset
To perform a remote control reset of the CAT-800, key-up and enter the control operator prefix code followed by [*9]. Un-key and the CAT-800's voice will say: "EXPECT MICRO RESET CAT EIGHT HUNDRED REPEATER VERSION ONE POINT ONE FIVE". The default control operator code for Port #1 is [100]. EXAMPLE: Key-up and enter [100*9]. Use the default control operator code [200] for Port #2 and [300] for Port #3. This procedure is identical to cycling the DC power to the CAT-800 and will not effect it's programming.

NOTE: Since the microprocessor is running in several different loops it may be possible to reset the controller remotely. However for the reset to work the microprocessor must be able to recognize the [100*9] command.

Zone 1 Control Channels

1. Port #1 Transmitter Enable (*)
When this channel is enabled the Port #1 PTT will be active. This channel must be enabled for normal repeater operation. The CAT-800 will continue to respond to control operator commands even when this channel is disabled. This channel will automatically be enabled after a dipswitch #7 initialization reset.

2. Port #1 CTCSS Enable
When this channel is enabled, in addition to a COR input, an input from a CTCSS decoder at J1-4 must also be present before Port #1 will activate. At default this input is set for "COR and CTCSS active high logic". Use programming command (*3612) to change the CTCSS logic input to active low. Use programming command (*3613) to change the logic to "COR or CTCSS active high logic". NOTE: To prevent loss of control, DO NOT ENABLE THIS CHANNEL unless a working CTCSS decoder is connected to J1-4.

3. Port #1 Receiver Enable (*)
When this channel is enabled the CAT-800 will respond to a RF input from the Port #1 receiver. When this channel is disabled the Port #1 transmitter will continue to operate by responding to RF inputs from the Port #2 and Port #3 receivers.

4. Port #1 Turn on Delay Enable
When this channel is enabled, a deliberate and sustained input on Port #1 must be present before the controller will respond. A time delay of 0.1 to 9.9 seconds can be selected with the [*623*] programming command. When the CAT-800 is initialized, this timer defaults to 1.0 seconds. This channel is useful during periods when noise bursts are present on the repeater input.

5. Port #1 Transmitter Hang Time Enable (*)
When this channel is enabled, the Port #1 transmitter will have a hang-time subject to the settings of the COR Drop to Courtesy Beep Timer [*620*] and the Courtesy Beep to PTT Drop Timer [*621*]. At default these timers are set for one second and four seconds.

6. Port #1 Courtesy Tone Enable (*) (Event Macro 20)
When this channel is enabled, a courtesy tone will occur when the COR signal is lost. To eliminate the courtesy tone, turn this channel OFF. The timeout timer will continue to be reset.

7. Port #1 DTMF Muting Enable
When this channel is enabled, anytime a DTMF tone is received, the receive audio will be turned off to the Port #1 transmitter. The transmit audio will remain muted until a pre-determined time after the last DTMF tone is received. During the mute period, cover beeps are transmitted each second to indicate repeater activity. This feature prevents control commands from being repeated. It provides an extra measure of security. There may be times when it is desirable to temporarily pass DTMF tones through the repeater. Precede the DTMF string with a (#). This key can be changed with the [*28X] programming command.

8. Port #1 Timeout Enable (*)
When this channel is enabled, a continuous signal on the Port #1 input will cause the Port to turn off. The time-out period is user programmable with the [*601*] timer command. When the CAT-800 is initialized, this timer defaults to 3 minutes. When this channel is turned off, Port #1 will-not timeout.

Zone 2 Control Channels

1. Port #2 Transmitter Enable (*)
When this channel is enabled the Port #2 PTT will be active. This channel must be enabled for normal operation. The CAT-800 will continue to respond to control operator commands even when this channel is disabled. This channel will automatically be enabled after a dipswitch #7 initialization reset.

2. Port #2 CTCSS Enable
When this channel is enabled, in addition to a COR input, an input from a CTCSS decoder at J1-3 or J2-2 must also be present before Port #2 will activate. At default this input is set for "COR and CTCSS active high logic". Use programming command (*3622) to change the CTCSS logic input to active low. Use programming command (*3623) to change the logic to "COR or CTCSS active high logic". NOTE: To prevent loss of control, DO NOT ENABLE THIS CHANNEL unless a working CTCSS decoder is connected to J1-3 or J2-2.

3. Port #2 Receiver Enable (*)
When this channel is enabled the CAT-800 will respond to a RF input from the Port #2 receiver. When this channel is disabled the Port #2 transmitter will continue to operate by responding to RF inputs from the Port #1 and Port #3 receivers.

4. Port #2 Turn on Delay Enable
When this channel is enabled, a deliberate and sustained input on Port #2 must be present before the controller will respond. A time delay of 0.1 to 9.9 seconds can be selected with the [*623*] programming command. When the CAT-800 is initialized, this timer defaults to 1.0 seconds. This channel is useful during periods when noise bursts are present on the repeater input.

5. Echolink® Control Enable
When Port #2 is connected to Port #1 and DTMF Muting (Zone 1 Channel 7) is enabled, a DTMF command entered through Port #1 will be muted on both the Port #1 and Port #2 transmit audios. When this channel is enabled, Port #2 transmit audio will be the actual DTMF command. The DTMF command will continue to be muted on the Port #1 transmit audio.

6. Port #2 Auto-Disconnect Enable (Event Macro #34)
When this channel is enabled, after a period of Port #2 inactivity determined by the setting of the [*605*] timer, the CAT-800 will execute event macro [34]. The default setting of event macro #34 will disconnect Port #2 from Port #1.

7. Port #2 DTMF Muting Enable
When this channel is enabled, anytime a DTMF tone is received, by the Port #2 receiver, the audio will be turned off to the Port #1 transmitter. The transmit audio will remain muted until a pre-determined time after the last DTMF tone is received. During the mute period, cover beeps are transmitted each second to indicate repeater activity. This feature prevents control commands from being repeated. It provides an extra measure of security. There may be times when it is desirable to temporarily pass DTMF tones to the Port #1 transmitter. Precede the DTMF string with a (#). This key can be changed with the [*29X] programming command.

8. Port #2 Timeout Enable (*)
When this channel is enabled, a continuous signal on the Port #2 input will cause the Port to turn off. The time-out period is user programmable with the [*602*] timer command. When the CAT-800 is initialized, this timer defaults to 3 minutes. When this channel is turned off, Port #2 will not timeout.

Zone 3 Control Channels

1. Port #3 Transmitter Enable (*)
When this channel is enabled the Port #3 PTT will be active. This channel must be enabled for normal operation. The CAT-800 will continue to respond to control operator commands even when this channel is disabled. This channel will automatically be enabled after a dipswitch #7 initialization reset.

2. Port #3 CTCSS Enable
When this channel is enabled, in addition to a COR input, an input from a CTCSS decoder at J3-2 must also be present before Port #3 will activate. At default this input is set for "COR and CTCSS active high logic". Use programming command (*3632) to change the CTCSS logic input to active low. Use programming command (*3633) to change the logic to "COR or CTCSS active high logic". NOTE: To prevent loss of control, DO NOT ENABLE THIS CHANNEL unless a working CTCSS decoder is connected to J3-2.

3. Port #3 Receiver Enable (*)
When this channel is enabled the CAT-800 will respond to a RF input from the Port #3 receiver. When this channel is disabled the Port #3 transmitter will continue to operate by responding to RF inputs from the Port #1 and Port #2 receivers.

4. Port #3 Turn on Delay Enable
When this channel is enabled, a deliberate and sustained input on Port #3 must be present before the controller will respond. A time delay of 0.1 to 9.9 seconds can be selected with the [*623*] programming command. When the CAT-800 is initialized, this timer defaults to 1.0 seconds. This channel is useful during periods when noise bursts are present on the repeater input.

5. Echolink® Control Enable
When Port #3 is connected to Port #1 and DTMF Muting (Zone 1 Channel 7) is enabled, a DTMF command entered through Port #1 will be muted on both the Port #1 and Port #3 transmit audios. When this channel is enabled, Port #3 transmit audio will be the actual DTMF command. The DTMF command will continue to be muted on the Port #1 transmit audio.

6. Port #3 Auto-Disconnect Enable (Event Macro 35)
When this channel is enabled, after a period of Port #3 inactivity determined by the setting of the [*606*] timer, the CAT-800 will execute event macro [35]. The default setting of event macro #35 will disconnect Port #3 from Port #1.

7. Port #3 DTMF Muting Enable
When this channel is enabled, anytime a DTMF tone is received by the Port #3 receiver, the audio will be turned off to the repeater's transmitter. The transmit audio will remain muted until a pre-determined time after the last DTMF tone is received. During the mute period, cover beeps are transmitted each second to indicate repeater activity. This feature prevents control commands from being repeated. It provides an extra measure of security. There may be times when it is desirable to temporarily pass DTMF tones through the repeater. Precede the DTMF string with a (#). This key can be changed with the [*29X] programming command.

8. Port #3 Timeout Enable (*)
When this channel is enabled, a continuous signal on the Port #1 input will cause the Port to turn off. The time-out period is user programmable with the [*603*] timer command. When the CAT-800 is initialized, this timer defaults to 3 minutes. When this channel is turned off, Port #3 will-not timeout.

Zone 4 Control Channels

1. Port #2 Control Operator Enable (*)
When this channel is enabled, the CAT-800 will accept control operator commands to change the settings of the zone channels from the Port #2 receiver. The default code is [200]. This code can be changed with the [*502*] programming command.

2. Port #2 Macro Enable (*)
When this channel is enabled, the CAT-800 will accept user macro commands from the Port #2 receiver.

3. Port #3 Control Operator Enable (*)
When this channel is enabled, the CAT-800 will accept control operator commands to change the settings of the zone channels from the Port #3 receiver. The default code is [300]. This code can be changed with the [*503*] programming command.

4. Port #3 Macro Enable (*)
When this channel is enabled, the CAT-800 will accept user macro commands from the Port #3 receiver.

5. Scheduler Enable (*)
When this channel is enabled, all action by the scheduler will be executed per the times programmed in the scheduler table. There may be times, during emergency net operations, when it is not desirable to have channels change automatically. To suspend scheduler operation, turn this channel off.

6. Reserved

7. Grandfather Clock Enable (*) (Event Macro 33)
When this channel is enabled, the CAT-800 will announce the time of day every hour on the hour. This channel enables the Grandfather Clock Event Macro #33, which sends voice message 8 on the repeater's transmitter. When the CAT-800 is initialized, this message defaults to Example: "CAT-800 REPEATER THE TIME IS."

8. Grandfather Clock Sleep Mode Enable (*)
It may be desirable to suspend the grandfather clock operation during the early morning hours. When this channel is enabled, the last announcement will be at 11:00 PM. Time announcements will resume at 7:00 AM the next morning.

Zone 5 Control Channels

1. User Logic Input #1 Enable (*) (Event Macros 07 and 08)
When this channel is enabled, a transition from low to high on connector J1-1 will execute event macro #07 while a transition from high to low will execute event macro #08.

2. User Logic Input #2 Enable (*) (Event Macros 09 and 10)
When this channel is enabled, a transition from low to high on connector J1-2 will execute event macro #09 while a transition from high to low will execute event macro #10.

3. User Logic Input #3 Enable (*) (Event Macros 11 and 12)
When this channel is enabled, a transition from low to high on connector J1-21 will execute event macro #11 while a transition from high to low will execute event macro #12.

4. User Logic Input #4 Enable (*) (Event Macros 13 and 14)
When this channel is enabled, a transition from low to high on connector J1-22 will execute event macro #13 while a transition from high to low will execute event macro #14.

5. User Logic Input #5 Enable (*) (Event Macros 15 and 16)
When this channel is enabled, a transition from low to high on connector J1-24 will execute event macro #15 while a transition from high to low will execute event macro #16.

6. Reserved

7. Reserved

8. Reserved

Zone 6 Control Channels

1. USER Output Switch #1 Enable
When this channel is enabled, switch #1 will perform per its pre-defined function. Connector J1-14 or J2-6 will sink 150 MA to ground. At default this switch is defined as a DTMF remote controlled switch. Use the User Macro #10 command [811] to turn the switch on and User Macro #11 command [810] to turn the switch off. Use the programming command [*391X] to change the operation to a fan control or CTCSS encoder switch.

2. USER Output Switch #2 Enable
When this channel is enabled, switch #2 will perform per its pre-defined function. Connector J1-15 or J2-7 will sink 150 MA to ground. At default this switch is defined as a DTMF remote controlled switch. Use the User Macro #12 command [821] to turn the switch on and User Macro #13 command [820] to turn the switch off. Use the programming command [*392X] to change the operation to a fan control or CTCSS encoder switch.

3. USER Output Switch #3 Enable
When this channel is enabled, switch #3 will perform per its pre-defined function. Connector J1-19 or J3-6 will sink 150 MA to ground. At default this switch is defined as a DTMF remote controlled switch. Use the User Macro #14 command [831] to turn the switch on and User Macro #15 command [830] to turn the switch off. Use the programming command [*393X] to change the operation to a fan control or CTCSS encoder switch.

4. USER Output Switch #4 Enable
When this channel is enabled, switch #4 will perform per its pre-defined function. Connector J1-20 or J3-7 will sink 150 MA to ground. At default this switch is defined as a DTMF remote controlled switch. Use the User Macro #16 command [841] to turn the switch on and User Macro #17 command [840] to turn the switch off. Use the programming command [*394X] to change the operation to a fan control or CTCSS encoder switch.

5. USER Output Switch #5 Enable
When this channel is enabled, switch #5 will perform per its pre-defined function. Connector J1-5 will sink 150 MA to ground. At default this switch is defined as a DTMF remote controlled switch. Use the User Macro #18 command [851] to turn the switch on and User Macro #19 command [850] to turn the switch off. Use the programming command [*395X] to change the operation to a fan control or CTCSS encoder switch.

6. Reserved Enable

7. Reversed Enable

8. Reversed Enable

Zone 7 Control Channels

1. Repeater Voice ID Enable (*) (Event Macro 17)
When this channel is enabled, the CAT-800 will execute Event Macro 17 identifying the repeater's transmitter in voice. Voice message #1 is assigned as the default message.

2. Repeater CW ID Enable (*) (Event Macro 19)
When this channel is enabled, the CAT-800 will execute Event Macro 19 identifying the repeater's transmitter in CW by sending the CW buffer.

3. Transmitter Turn Off Message #1 Enable (Event Macro 27)
When this channel is enabled, the transmitter drop out message #1 will occurs when a repeater user un-keys their transmitter. This message will repeat subject to the setting of the [*611*] turn off message timer. This message will consist of up to 15 words selected from the vocabulary table and programmed with the [*3102*] command.

4. Transmitter Turn Off Message #2 Enable (Event Macro 28)
When this channel is enabled, the transmitter drop out message #2 will occur just before the repeater transmitter turns off. This message will repeat subject to the setting of the [*612*] turn off message timer. This message will consist of up to 15 words selected from the voice vocabulary table and is programmed with the [*3103] command.

5. Timed Message #1 Enabled (Event Macro 29)
When this channel is enabled, timed voice message #1 will occur on a regular schedule subject to the setting of the [*607*] timed message #1 timer and event macro #29. This message will consist of up to 15 words selected from the voice vocabulary table and is programmed with the [*3104*] command.

6. Timed Message #2 Enabled (Event Macro 30)
When this channel is enabled, timed voice message #2 will occur on a regular schedule subject to the setting of the [*608*] timed message #2 timer and event macro #30. This message will consist of up to 15 words selected from the voice vocabulary table and is programmed with the [*3105*] command.

7. Timed Message #3 Enabled (Event Macro 31)
When this channel is enabled, timed voice message #3 will occur on a regular schedule subject to the setting of the [*609*] timed message #3 timer and event macro #31. This message will consist of up to 15 words selected from the voice vocabulary table and is programmed with the [*3106*] command.

8. Timed Message #4 Enabled (Event Macro 32)
When this channel is enabled, timed voice message #4 will occur on a regular schedule subject to the setting of the [*610*] timed message #4 timer and event macro #32. This message will consist of up to 15 words selected from the voice vocabulary table and is programmed with the [*3107*] command.

Zone 8 Control Channels

1. Forced DTMF Entry D Key Enable (*) (All Ports)
When this channel is enabled it is possible to force a DTMF command even while the port is active. To force a DTMF command, end the command with a [D]. This key can be changed with the [*29X] programming command.

2. DTMF Access Enable (ALL PORTS)
When this channel is enabled, the repeater will go to sleep and not respond to normal inputs. If a repeater user enters the DTMF Access number [325] the repeater will wake-up and continue to operate until a period of inactivity occurs determined by the [*614*] sleep timer. Use the [*504*] programming command to change the DTMF Access number.

3. Time of Day Request Enable (*) (All Ports)
When this channel is enabled, repeater users can request the time of day by entering the time of day request number [400]. Example: "THE TIME IS 7:15 PM."

4. DTMF Keypad Test (*) (All Ports)
When this channel is enabled, a repeater user is able to perform a test of their radio's 12 or 16-button keypad. Enter the keypad test number [475] followed by each of the keypad digits. As the numbers are being decoded, they are stored in memory. When the user stops transmitting the controller will read back all the numbers that were decoded. The Forced DTMF Entry key is defaulted to the [D] key. It must be entered last and it will not read back during the pad test.

5. Voice Demo Request Enable (*) (All Ports)
When this channel is enabled, repeater users can play any of the twenty voice synthesizer messages. Enter the voice demo request number [700] followed by the two-digit message number.

6. Two Tone Sequential Paging Enable (*) (All Ports)
When this channel is enabled, a repeater user can transmit a two-tone page. The first tone will be on for one second while the second tone will be on for three seconds. Memory space is provided for twenty paging tones. Enter the paging tone request number [650] followed by the desired two-digit paging tone table position.

7. Digital Audio WAV Player (*) (All Ports) (Optional)
When this channel is enabled, a repeater user can play digital audio tracks. Memory space is provided for thirty tracks. Enter the digital audio WAV player request number [725] followed by the two-digit track number. Digital audio tracks can also be integrated into user and event macros.

8. Reserved Enable

Zone 9 Control Channels

1. Internet Enable
When this channel is enabled, communications is established through the Internet. Use your web browser to control and program the CAT-800 controller.

2. ICMP Enable
Internet Control Message Protocol is used as a network-troubleshooting tool. Network devices use ICMP to send error messages indicating that a request for Internet service is not available. This channel must be enabled for the CAT-800 to respond to a "ping" test.

3. Reserved Enable

4. Reserved Enable

5. Reserved Enable

6. Reserved Enable

7. Reserved Enable

8. Reserved Enable

Chapter 4 - Repeater Operation

Time of Day Message
Key-up, and enter [400], the time of day access code. Un-key, and the voice synthesizer will announce the time. Example: The voice will say: "THE TIME IS 7:30 PM". The time of day announcement is stored in voice message [09] and can be changed with the [*3109] programming command.

DTMF Keypad Test
Key-up, and enter [475], the DTMF keypad access code followed by the keypad numbers and letters to be tested. The entries can be in any order. Un-key, and the voice will read-back all numbers and letters that were decoded including the "STAR" and "POUND". The Forced DTMF Entry key is defaulted to the [D] key. It must be entered last and it will not read back during the pad test.

DTMF Access
When the CAT-800 is in the DTMF Access mode, you must enter the DTMF Access code to activate the repeater. The voice will say: "OK UP" and the repeater will respond to a COR and or CTCSS input. When the repeater returns to rest, for a time determined by the sleep timer, the DTMF Access code must be re-entered to activate the repeater. You can bypass the rest period and return the repeater to DTMF access mode by re-entering [325], the DTMF access code. The voice will say: "OK DOWN".

Two-Tone Paging
The CAT-800 will generate two-tone sequential paging tones. Memory space is provided for twenty different tones. The first tone will send for one second followed by the second tone for tone for three seconds. To send a paging tone key-up and send the paging tone prefix number follower by the two-digit tone table position. The default prefix number is [650]. A two-tone page was entered in table position [01]. Key-up and send [65001].

Forced DTMF Entry
During normal operation a DTMF command is entered when the input goes inactive. It is possible to force a DTMF command entry even while the input is active. The CAT-800 will accept the [D] key as an entry command. This key can be changed with the [*29X] programming command. NOTE: Zone 8 Channel 1 must be enabled for the CAT-800 to accept the Forced DTMF command on ports 1, 2 and 3.

DTMF Muting Override
With DTMF muting enabled, there may be times when it is desirable to pass the DTMF tones to the repeater or link transmitters. To temporarily disable DTMF muting, precede the DTMF string with a pound [#]. Use the DTMF muting programming command [*28X] to change [#] to a different number or character.

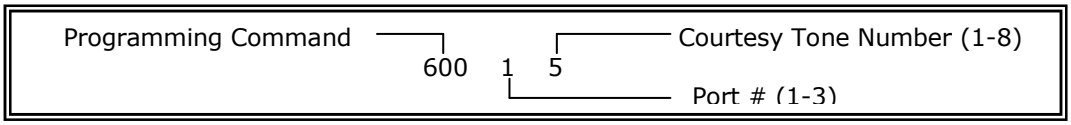
Repeater ID
The CAT-800 will identify in both synthesized voice and CW. If control Zone 7 Channel 1 "Repeater Voice ID" is enabled the CAT-800 will ID in voice only by sending Voice message #1. If Zone 7 Channel 2 "Repeater CW ID" is enabled, the CAT-800 will identify in CW only. If both zone channels are enabled the CAT-800 will identify in voice. However if someone talks over the voice ID the CAT-800 will switch to the CW ID and mix with the receive audio.

User Macro
A user macro is a series of commands, defined by the repeater owner. User macros permit the owner to customize certain aspects of repeater operation. Once the CAT-800 decodes the user macro number, the internal commands will execute in the order they were stored within the macro string. The CAT-800 supports forty user macros

Logic Inputs
The CAT-800 has five logic inputs that are assigned to execute event macros 07 through 16. At default these event macros are programmed to turn on the five output switches. Use the programming commands [*1707] through [*1716] to reconfigure these logic inputs.

User Output Switches
The CAT-800 has five output switches. At default the switches are assigned as DTMF remote control switches. They are controlled by user macros 10 through 19. From the user macro table on page 5-7, key-up and enter [811] to turn switch #1 on or [810] to turn switch #1 off. Use the [*39XX] programming command from the table on page 5-14 to redefine the switches to control a fan relay or CTCSS encoder. The associated Zone 6 control channels must be enabled for the switches to operate.

Load Courtesy Tone
The CAT-800 supports eight unique courtesy tones. To manually load a courtesy tone use the [600] prefix code followed by the port and courtesy tone number. Example: Load courtesy tone #5 into the Port #1 courtesy tone buffer.



Port Linking User Macro Commands
The first seven User Macros have been programmed at default to connect Port #2 and or Port #3 to Port #1. Reprogram the DTMF command, macro action and voice announcement to suite your needs. NOTE: Port #1 has priority over Port #2 and Port #3.

USER MACRO	DTMF COMMAND	PORT #2	PORT #3	MACRO ACTION
01	A0	----	----	Read Port Connection Status
02	A2	ON	OFF	Connect Port #2
03	B2	OFF	OFF	Disconnect Port #2
04	A3	OFF	ON	Connect Port #3
05	B3	OFF	OFF	Disconnect Port #3
06	A23	ON	ON	Connect Port #2 and Port #3
07	B23	OFF	OFF	Disconnect Port #2 and Port #3

Event Macro
An event macro is a series of commands, defined by the repeater owner. Event macros permit the owner to customize certain aspects of repeater operation. Event macros are assigned to various locations through out the CAT-800 program. Examples of event macros are: logic inputs, port activity and timed messages. The commands will execute in the order they were stored within the macro string. The CAT-800 supports sixty event macros.

Voice Message Selection
Key-up and enter the VOICE prefix number [700] followed by the double-digit message number. The CAT-800 will key the transmitter and play the message.

Digital Audio WAV Player Track Selection (Optional)
Key-up and enter the DIGITAL AUDIO WAV PLAYER TRACK prefix number [725] followed by the double-digit track number. The CAT-800 will key the transmitter and play the track.

Chapter 5 - Repeater Programming By DTMF Tone

This section describes how to program the CAT-800 using DTMF commands. The various types of program commands are described in detail and examples are given in the following text. NOTE: DTMF programming is limited to Port #1 only.

Initialization
To initialize the CAT-800, set dipswitch #7 to on and cycle DC power. During power-up, the voice will say: "RESET SYSTEM OK." Set dipswitch #7 to off. Initialization consists of the following operations:

1	All memory locations are cleared.
2	The channels marked with a [*] are enabled.
3	The master unlock number is loaded with the default value [1234567].
4	The secondary unlock number is loaded with the default value [7654321].
5	The Port #1 control operator prefix code is loaded with [100].
6	The Port #2 control operator prefix code is loaded with [200].
7	The Port #3 control operator prefix code is loaded with [300].
8	All codes are loaded with default values.
9	All timers are loaded with default values.
10	The voice ID is loaded with “CAT-800 REPEATER”.
11	All messages are loaded with default messages.
12	Event and User macros are loaded with defaults.

Programming the Master Unlock Number
To program the Master UNLOCK number, set dipswitch #8 to the on position. The Port #1 transmitter will activate and the voice will say: "ENTER CONTROL." Key-up and enter a seven-digit number through the Port #1 receiver input. Un-key, if the number is accepted, the voice will say: "CONTROL OK." If the number is rejected, the voice will say: "ENTER CONTROL." Key-up and re-enter the seven-digit number. When finished set dipswitch #8 to the off position.

Unlocking the Controller [1234567]
To unlock the controller, key-up and enter the master-unlock number. The voice will say: "CAT-800 CONTROL."

Note: The CAT-800 can be unlocked and placed in the programming mode by entering the master-unlock or the secondary unlock number. The master unlock number must be changed by using dipswitch #8. The secondary unlock number can be changed remotely without having to go to the repeater site. For security reasons use the secondary unlock number because it can easily be changed. Use the master-unlock number only when conditions are thought to be secure.

Locking the Controller [*0]
Key-up and send [*0]. Un-key, the controller will lockup and the voice will say: "MANUAL EXIT." The controller will lock automatically when the programming timer expires. The voice will say: "TIMER EXIT." The default time is ten minutes. NOTE: The CAT-800 must be unlocked to perform the following programming functions described in Chapter 5.

CAT-800 Internal Command Assignments

The Internal Command Structure is a series of four digit commands used to program the CAT-800's User and Event Macro strings and the five hardware input switches.

INTERNAL COMMAND TABLE			
	COMMAND	**CHANNEL**	**ACTION**
CONTROL REPEATER ZONE 1	11	1-9	0=OFF 1=ON
CONTROL REPEATER ZONE 2	12	1-9	0=OFF 1=ON
CONTROL REPEATER ZONE 3	13	1-9	0=OFF 1=ON
CONTROL REPEATER ZONE 4	14	1-9	0=OFF 1=ON
CONTROL REPEATER ZONE 5	15	1-9	0=OFF 1=ON
CONTROL REPEATER ZONE 6	16	1-9	0=OFF 1=ON
CONTROL REPEATER ZONE 7	17	1-9	0=OFF 1=ON
CONTROL REPEATER ZONE 8	18	1-9	0=OFF 1=ON
CONTROL REPEATER ZONE 9	19	1-9	0=OFF 1=ON
		COMMAND	**COMMENTS**
PLAY TIME OF DAY		2000	-----
PLAY DAY OF WEEK		2001	-----
PLAY DAY AND MONTH		2002	-----
PLAY SALUTATION		2003	-----
PLAY VOICE MESSAGE		30XX	02-20
PLAY VOICE MESSAGE (Stop Voice Message with Kerchunk)		31XX	02-20
PLAY VOICE ID (Voice Message 01)		3200	-----
PLAY CW ID BUFFER		3400	-----
PLAY CW CHARACTER		35XX	00-46
PLAY DIGITAL AUDIO WAV TRACK		36XX	01-30
PLAY DIGITAL AUDIO WAV TRACK (Stop Track with Kerchunk)		37XX	01-30
PLAY COURTESY TONE		4000	-----
LOAD COURTESY TONE PORT #1 (Receiver Active)		401X	1-8
LOAD COURTESY TONE PORT #2 (Receiver Active)		402X	1-8
LOAD COURTESY TONE PORT #3 (Receiver Active)		403X	1-8
PLAY TWO-TONE PAGING TONE		42XX	01-20
AUDIO SWITCH SW [VOICE TO TX1]		501X	0=OFF 1=ON
AUDIO SWITCH SW [VOICE TO TX2]		502X	0=OFF 1=ON
AUDIO SWITCH SW [VOICE TO TX3]		503X	0=OFF 1=ON
AUDIO SWITCH SW [VOICE TO TX1-TX2]		512X	0=OFF 1=ON

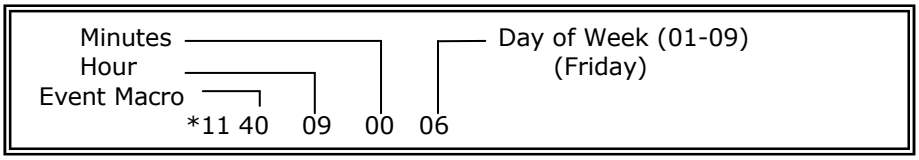
AUDIO SWITCH SW [VOICE TO TX1-TX3]	513X	0=OFF 1=ON
AUDIO SWITCH SW [VOICE TO TX1-TX2-TX3]	514X	0=OFF 1=ON
AUDIO SWITCH CONTROL [WAV PLAYER TO TX1]	521X	0=OFF 1=ON
AUDIO SWITCH CONTROL [WAV PLAYER TO TX2]	522X	0=OFF 1=ON
AUDIO SWITCH CONTROL [WAV PLAYER TO TX3]	523X	0=OFF 1=ON
AUDIO SWITCH CONTROL [WAV PLAYER TO TX1-TX2]	531X	0=OFF 1=ON
AUDIO SWITCH CONTROL [WAV PLAYER TO TX1-TX3]	532X	0=OFF 1=ON
AUDIO SWITCH CONTROL [WAV PLAYER TO TX1-TX2-TX3]	533X	0=OFF 1=ON
LOAD TIME DELAY (SECONDS)	60XX	01-99
PTT#1 CONTROL	611X	0=OFF 1=ON
PTT#2 CONTROL	612X	0=OFF 1=ON
PTT#3 CONTROL	613X	0=OFF 1=ON
PTT#1–PTT#2 CONTROL	621X	0=OFF 1=ON
PTT#1–PTT#3 CONTROL	622X	0=OFF 1=ON
PTT#1–PTT#2–PTT#3 CONTROL	623X	0=OFF 1=ON
PTT#1 AND AUDIO SW [VOICE TO TX1]	631X	0=OFF 1=ON
PTT#2 AND AUDIO SW [VOICE TO TX2]	632X	0=OFF 1=ON
PTT#3 AND AUDIO SW [VOICE TO TX3]	633X	0=OFF 1=ON
PTT#1–PTT#2 AND AUDIO SW [VOICE TO TX1-TX2]	641X	0=OFF 1=ON
PTT#1–PTT#3 AND AUDIO SW [VOICE TO TX1-TX3]	642X	0=OFF 1=ON
PTT#1-PTT#2-PTT#3 AND AUDIO SW [VOICE TO TX1-TX2-TX3]	643X	0=OFF 1=ON
PTT AND VOICE AUDIO SW FROM ACTIVE PORT	651X	0=OFF 1=ON
PTT#1 AND AUDIO SW [WAV PLAYER TO TX1]	661X	0=OFF 1=ON
PTT#2 AND AUDIO SW [WAV PLAYER TO TX2]	662X	0=OFF 1=ON
PTT#3 AND AUDIO SW [WAV PLAYER TO TX3]	663X	0=OFF 1=ON
PTT#1–PTT#2 AND AUDIO SW [WAV PLAYER TO TX1-TX2]	671X	0=OFF 1=ON
PTT#1–PTT#3 AND AUDIO SW [WAV PLAYER TO TX1-TX3]	672X	0=OFF 1=ON
PTT#1-PTT#2-PTT#3 AND AUDIO SW [WAV PLAYER TO TX1-TX2-TX3]	673X	0=OFF 1=ON
PTT AND WAV AUDIO SW FROM ACTIVE PORT	674X	0=OFF 1=ON
USER FUNCTION SWITCH #1	681X	0=OFF 1=ON
USER FUNCTION SWITCH #2	682X	0=OFF 1=ON
USER FUNCTION SWITCH #3	683X	0=OFF 1=ON
USER FUNCTION SWITCH #4	684X	0=OFF 1=ON
USER FUNCTION SWITCH #5	685X	0=OFF 1=ON
USER FUNCTION SWITCH #1 PULSE OUTPUT	691X	(1=500mS - 2=250mS)
USER FUNCTION SWITCH #2 PULSE OUTPUT	692X	(1=500mS - 2=250mS)

USER FUNCTION SWITCH #3 PULSE OUTPUT	693X	(1=500mS - 2=250mS)
USER FUNCTION SWITCH #4 PULSE OUTPUT	694X	(1=500mS - 2=250mS)
USER FUNCTION SWITCH #5 PULSE OUTPUT	695X	(1=500mS - 2=250mS)
READ PORT STATUS	7000	-----
CONNECT PORT #2 TO PORT #1	7121	-----
DISCONNECT PORT #2 FROM PORT #1	7120	-----
CONNECT PORT #3 TO PORT #1	7131	-----
DISCONNECT PORT #3 FROM Port #1	7130	-----
CONNECT PORT #2 AND PORT #3 TO PORT #1	7231	-----
DISCONNECT PORT #2 and PORT #3 FROM PORT #1	7230	-----
EVENT MACRO DISABLE	80XX	01-60
EVENT MACRO ENABLE	81XX	01-60
EVENT MACRO BLOCK IF ANY PORT IS ACTIVE	8300	-----
USER MACRO DISABLE	84XX	01-40
USER MACRO ENABLE	85XX	01-40
VOICE WORDS	9XXX	000-999

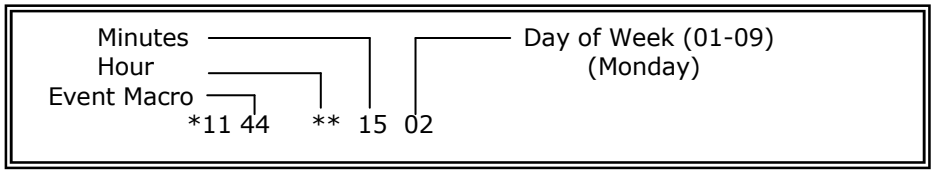
Scheduled Event Macro Time
Event Macros (40-59) are linked to the scheduler. The [*10XX], [*11XX] and [*12XX] programming commands are used to read, program and erase the scheduled time the macros execute. Programming the scheduler is a two-step procedure. Once you have programmed the time with the [*11XX] command you must program the action using the [*17XX] Event Macro programming command.

Read Scheduled Event Macro Time
Key-up and send [*10XX]. Un-key and the voice will read back the status of the memory location. If there is no command stored at that memory location, the voice will say: "All CLEAR." If a time is stored at that memory location, the voice will read back the time, day and month of year.

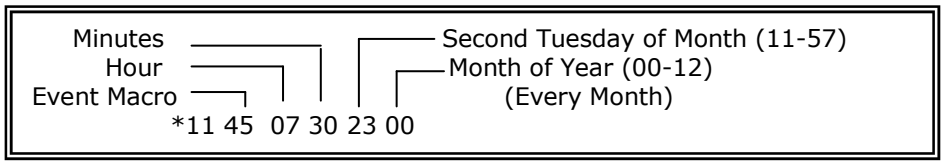
Program Scheduled Event Macro Time
Key-up and send [*11XX] followed by the hours, minutes, day and month of year. Un-key and the voice will say: "CONTROL OK." Example: 9:00 AM Every Friday stored in table position 40.



Program Scheduled Event Macro 15 Minutes After Each Hour
Example: Set Event Macro 44 to execute 15 minutes after every hour on Monday.



Program Scheduled Event Macro Time for Week of Every Month
Example: Set Event Macro 45 for 2nd Tuesday of every month at 7:30 AM.



SCHEDULER PROGRAMMING MINUTES AND HOURS			
00-59	Minutes		
00-23	Hours	(**) = Every Hour	
SCHEDULER PROGRAMMING DAY OF WEEK			
00	Daily	27	Second Saturday of Month
01	Sunday	31	Third Sunday of Month
02	Monday	32	Third Monday of Month
03	Tuesday	33	Third Tuesday of Month
04	Wednesday	34	Third Wednesday of Month
05	Thursday	35	Third Thursday of Month
06	Friday	36	Third Friday of Month
07	Saturday	37	Third Saturday of Month
08	Weekdays	41	Forth Sunday of Month
09	Weekends	42	Forth Monday of Month
11	First Sunday of Month	43	Forth Tuesday of Month
12	First Monday of Month	44	Forth Wednesday of Month
13	First Tuesday of Month	45	Forth Thursday of Month
14	First Wednesday of Month	46	Forth Friday of Month
15	First Thursday of Month	47	Forth Saturday of Month
16	First Friday of Month	51	Fifth Sunday of Month
17	First Saturday of Month	52	Fifth Monday of Month
21	Second Sunday of Month	53	Fifth Tuesday of Month
22	Second Monday of Month	54	Fifth Wednesday of Month
23	Second Tuesday of Month	55	Fifth Thursday of Month
24	Second Wednesday of Month	56	Fifth Friday of Month
25	Second Thursday of Month	57	Fifth Saturday of Month
26	Second Friday of Month		
SCHEDULER PROGRAMMING MONTH AND YEAR			
01-31	Day of Month	(00) = Skip Day of Month	
01-12	Month of Year	(00) = Skip Month of Year	

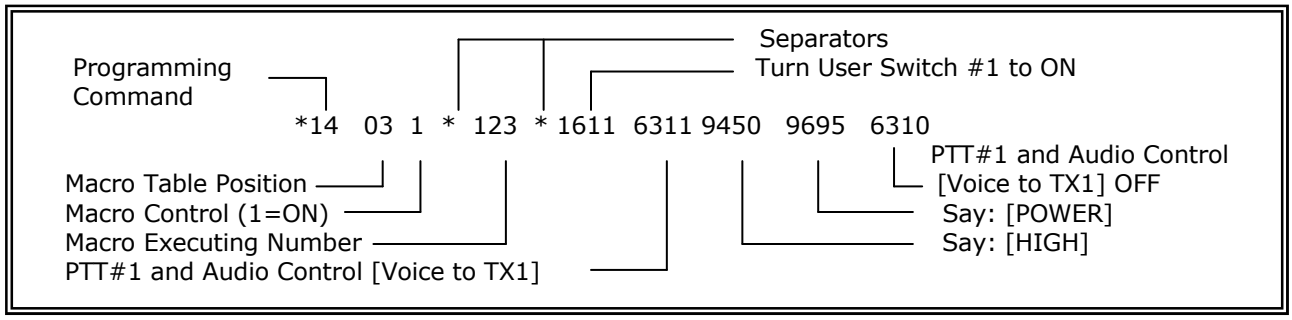
Disable Scheduled Event Macro 40
Key-up and send [*1140 0] to disable scheduler macro 40 or [*1140 1] to enable macro 40.

Erase Scheduled Event Macro Time (40-60)
Key-up and send [*12XX]. Un-key, the voice will say: "CONTROL OK."

User Macro Command Memory
A user macro is a series of commands, defined by the repeater owner. User macros permit the owner to customize certain aspects of repeater operation. Once the CAT-800 decodes the macro number, the commands will execute in the order they were stored within the macro string. The CAT-800 supports forty user macros.

Read User Macro Locations (01-40)
Key-up and send [*13XX]. Un-key and voice will read back the macro control number followed by the enable control byte followed by the macro data commands stored at that memory location. If the location is empty, the voice will say: "MACRO NUMBER XX NO CODE NO DATA."

Program User Macro Locations (01-40)
Key-up and send [*14XX] followed by the macro control number and the string of internal commands to be executed. See Figure 5-1. Un-key and the voice will say: "CONTROL OK." Example: Program macro #3 with a control number of [123] to Turn ON User Function Switch #1 and say: "HI POWER". The Macro Control number [123] is the number entered by a repeater user to execute the macro.



Program User Macro Locations Enable – Disable (01-40)
Key-up and send [*14XX] followed by a [1] to enable the macro or a [0] to disable the macro. This feature permits the macro to be turned off without having to erasing it. Un-key and voice will say: "CONTROL OK."

Erase User Macro Locations (01-40)
Key-up and send [*15XX]. Un-key, the voice will say: "CONTROL OK."

User Macro Default Data
The following table describes a series of default User Macros to connect and disconnect the three ports. These User Macros can be changed with the [*14XX] programming command. The CAT-800 supports a total of forty user macros.

USER MACRO DEFAULT TABLE			
01	A0	READ PORT CONNECTION STATUS	[6511-7000-6510]
02	A2	CONNECT PORT #2 TO PORT #1	[7121-6411-9002-9875-6410]
03	B2	DISCONNECT PORT #2 FROM PORT #1	[7120-6411-9002-9324-6410]
04	A3	CONNECT PORT #3 TO PORT #1	[7131-6421-9003-9875-6420]
05	B3	DISCONNECT PORT #3 FROM PORT #1	[7130-6421-9003-9324-6420]
06	A23	CONNECT PORT #2 AND #3 TO PORT #1	[7231-6431-9002-9003-9875-6430]
07	B23	DISCONNECT PORT #2 AND #3 FROM PORT #1	[7230-6431-9002-9003-9324-6430]
08			
09			
10	811	TURN SWITCH #1 ON	[6811-6511-9800-9001-9656-6510]
11	810	TURN SWITCH #1 OFF	[6810-6511-9800-9001-9654-6510]
12	821	TURN SWITCH #2 ON	[6821-6511-9800-9002-9656-6510]
13	820	TURN SWITCH #2 OFF	[6820-6511-9800-9002-9654-6510]
14	831	TURN SWITCH #3 ON	[6831-6511-9800-9003-9656-6510]
15	830	TURN SWITCH #3 OFF	[6830-6511-9800-9003-9654-6510]
16	841	TURN SWITCH #4 ON	[6841-6511-9800-9004-9656-6510]
17	840	TURN SWITCH #4 OFF	[6840-6511-9800-9004-9654-6510]
18	851	TURN SWITCH #5 ON	[6851-6511-9800-9005-9656-6510]
19	850	TURN SWITCH #5 OFF	[6850-6511-9800-9005-9654-6510]
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
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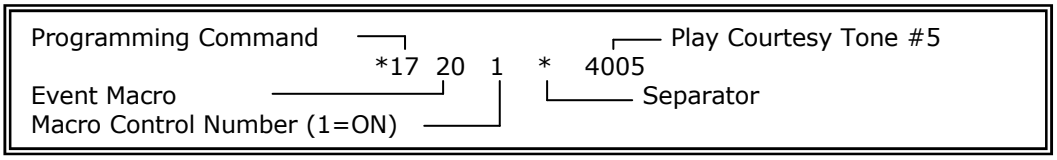
Event Macro Command Memory
Event Macros are used to perform custom operations at pre determined times during repeater operation. There are seven basic types of event macros. They are: Port Activity, Logic Input, Repeater ID, Load and Play Courtesy Tones, Play Voice Messages, Link Auto Disconnect, Scheduled Event.

Read Event Macro Locations (01-60)
Key-up and send [*16XX]. Un-key and voice will read back the macro control number followed by the macro data commands stored at that memory location. If the location is empty, the voice will say: "NO MACRO."

Program Event Macro Locations (01-60)
Key-up and send [*17XX] followed by the macro control number (1 or 0) and the string of internal commands to be executed. Un-key and the voice will say: "CONTROL OK." Example: Program courtesy tone to be tone 5".



Port Activity Event Macros
When a port receives a signal if you have a need to reconfigure the controller's operation, program the port activity event macro associated with that port. When the port becomes inactive use the Port Inactivity event macro to return to the previous settings.

Logic Input Event Macros
The logic inputs are triggered by a voltage change on their inputs. A rising voltage is considered active high and causes the active high event macro to execute. A falling voltage is considered active low and causes active low macro to execute. The voltage must transition through one volt and like the COR and CTCSS inputs a low is any voltage below 0.2VDC and a High is any voltage between 3 and 15VDC.

Repeater ID Event Macros
By FCC regulations an amateur repeater must identify every ten minutes when in use. Three event macros have been assigned to this task. They are: Repeater ID, CW ID and final ID. At default the repeater ID is assigned voice message #1. The final ID and CW ID are assigned to play the CW buffer.

Load and Play Courtesy Tone Event Macros
One second after an input signal terminates on any of the three ports one of the three courtesy tone event macros execute. At default each event macro is programmed with a different tone. This lets the repeater listener know which port received the signal.

Play Voice Message Event Macros
The two transmitter turn off messages and the four timed messages are assigned event macros. If the message is programmed with [30XX] internal command the voice message will block the receive audio. If the message is programmed with [31XX] internal command the voice message will stop if a user kerchunks the repeater.

Link Auto Disconnect Event Macros
If the link auto disconnect feature is enabled after a period on inactivity Port #2 and Port #3 will disconnect from Port #1 and event macro 34 and or 35 will execute. Use these event macros to make changes to the controller's operation.

Scheduled Event Macros
The forty scheduled events are linked to the scheduled times in the scheduler table. Once the time has been entered in the scheduler table use the associated scheduled event macro to tell the controller what you want to happen at that time.

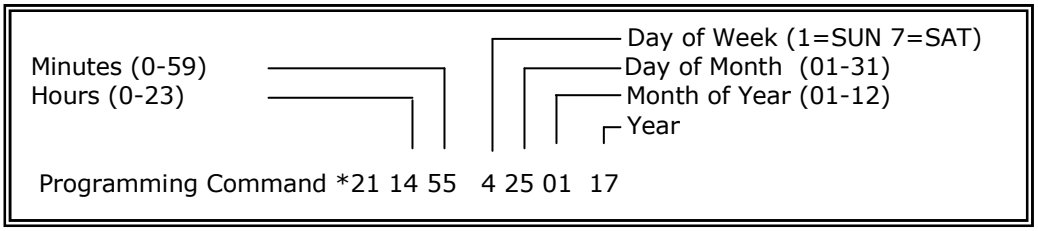
EVENT MACRO DEFAULT TABLE		
01	PORT #1 INPUT ACTIVE	
02	PORT #1 INPUT INACTIVE	
03	PORT #2 INPUT ACTIVE	
04	PORT #2 INPUT INACTIVE	
05	PORT #3 INPUT ACTIVE	
06	PORT #3 INPUT INACTIVE	
07	LOGIC INPUT #1 ACTIVE HIGH	[6811-6311-9800-9001-9656-6310]
08	LOGIC INPUT #1 ACTIVE LOW	[6810-6311-9800-9001-9654-6310]
09	LOGIC INPUT #2 ACTIVE HIGH	[6821-6311-9800-9002-9656-6310]
10	LOGIC INPUT #2 ACTIVE LOW	[6820-6311-9800-9002-9654-6310]
11	LOGIC INPUT #3 ACTIVE HIGH	[6831-6311-9800-9003-9656-6310]
12	LOGIC INPUT #3 ACTIVE LOW	[6830-6311-9800-9003-9654-6310]
13	LOGIC INPUT #4 ACTIVE HIGH	[6841-6311-9800-9004-9656-6310]
14	LOGIC INPUT #4 ACTIVE LOW	[6840-6311-9800-9004-9654-6310]
15	LOGIC INPUT #5 ACTIVE HIGH	[6851-6311-9800-9005-9656-6310]
16	LOGIC INPUT #5 ACTIVE LOW	[6850-6311-9800-9005-9654-6310]
17	REPEATER ID	[5011-3300-5010]
18	REPEATER FINAL ID	[6111-3400-6110]
19	REPEATER CW ID	[3400]
20	PLAY COURTESY TONE PORT #1 ACTIVE	[4000]
21	PLAY COURTESY TONE PORT #2 ACTIVE	[4000]
22	PLAY COURTESY TONE PORT #3 ACTIVE	[4000]
23	REPEATER TIME OUT	[6311-9746-9838-9664-6310]
24	REPEATER TIMEOUT CLEAR	[6311-9746-9838-9664-9283-6310]
25	DTMF ACCESS UP	[6311-9650-9530-9875-6310]
26	DTMF ACCESS DOWN	[6311-9650-9530-9324-6310]
27	TX OFF MESSAGE #1	[6311-3002-6310]
28	TX OFF MESSAGE #2	[6311-3003-6310]
29	TIMED MESSAGE #1	[6311-3004-6310]
30	TIMED MESSAGE #2	[6311-3005-6310]
31	TIMED MESSAGE #3	[6311-3006-6310]
32	TIMED MESSAGE #4	[6311-3007-6310]
33	GRANDFATHER CLOCK MESSAGE	[6311-3008-6310]
34	LINK AUTO DISCONNECT PORT #2	[6311-9561-9002-9838-9664-6310-7120]
35	LINK AUTO DISCONNECT PORT #3	[6311-9561-9003-9838-9664-6310-7130]
36	RESERVED	
37	RESERVED	
38	RESERVED	
39	RESERVED	
40	SCHEDULED EVENT MACRO #40	
41	SCHEDULED EVENT MACRO #41	

42	SCHEDULED EVENT MACRO #42	
43	SCHEDULED EVENT MACRO #43	
44	SCHEDULED EVENT MACRO #44	
45	SCHEDULED EVENT MACRO #45	
46	SCHEDULED EVENT MACRO #46	
47	SCHEDULED EVENT MACRO #47	
48	SCHEDULED EVENT MACRO #48	
49	SCHEDULED EVENT MACRO #49	
50	SCHEDULED EVENT MACRO #50	
51	SCHEDULED EVENT MACRO #51	
52	SCHEDULED EVENT MACRO #52	
53	SCHEDULED EVENT MACRO #53	
54	SCHEDULED EVENT MACRO #54	
55	SCHEDULED EVENT MACRO #55	
56	SCHEDULED EVENT MACRO #56	
57	SCHEDULED EVENT MACRO #57	
58	SCHEDULED EVENT MACRO #58	
59	SCHEDULED EVENT MACRO #59	
60	POWER UP MACRO	[6311-6001-9275-9008-9456-9746-9999-6310]

Erase Event Macro Locations (01-60)
Key-up and send [*18XX]. Un-key, the voice will say: "CONTROL OK."

Check Time of Day
Key-up and send [*20]. Un-key, the voice will read the time, day of week, day of month, month and year. Example: "THE TIME IS TWELVE FIFTEEN PM MONDAY MAY TWENTY THREE TWO THOUSAND FOURTEEN." NOTE: A CR2032 coin battery supplies back-up power for the clock.

Setting the Clock
Key-up and send [*21] followed by the hours, minutes, day of week, day of month, month of year and year. Un-key and the voice will say "CLOCK SET OK." Example: 2:55 PM Wednesday January 25th. 2017. All entries must be double digit, except the day of week.

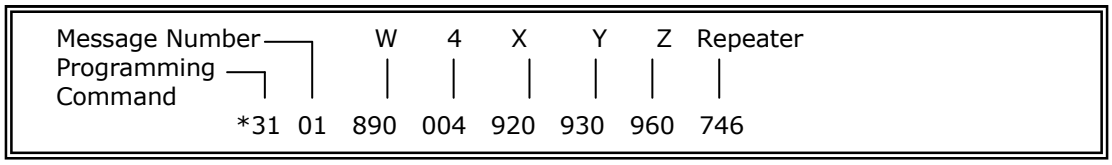


Program DTMF Muting Override Command [*28X]
With DTMF muting enabled, there may be times when it is desirable to pass the DTMF tones to the transmitter. To temporarily disable DTMF muting, precede the DTMF string with a pound [#]. This key can be changed with the [*28X] programming command. To change this key to [A], key-up and send [*28A]. Un-key, the voice will say: "CONTROL OK." Select [*], [#], [A], [B], [C], or [D]. To read the command, key-up and send [*28].

Program Forced Entry Command [*29]
DTMF commands are entered when the port goes inactive. To force a DTMF command when the port is active, end the command with a [D]. This key can be changed with the [*29X] programming command. To change this key to [#], key-up and send [*29#]. Un-key, the voice will say: "CONTROL OK." Select [*], [#], [A], [B], [C], or [D]. To read the command, key-up and send [*29].

Send Voice Message [*3001]-[*3020]
Key-up and send [*3001]. Un-key and the voice synthesizer will say the voice ID message #1.

Program Voice Message [*3101]-[*3120]
Key-up and send [*31XX] followed by the message number and three digit numbers that represent the words required to construct the ID. Memory space is provided for 15 entries. Refer to the Voice Vocabulary Word List. Example: Load Repeater Port #1 ID with "W4XYZ Repeater".



VOICE MESSAGE TABLE		
01	REPEATER VOICE ID	"CAT-800 REPEATER"
02	TRANSMITTER TURN OFF MESSAGE #1	"TRANSMITTER OFF MESSAGE #1"
03	TRANSMITTER TURN OFF MESSAGE #2	"TRANSMITTER OFF MESSAGE #2"
04	TIMED MESSAGE #1	"TIME MESSAGE 1"
05	TIMED MESSAGE #2	"TIME MESSAGE 2"
06	TIMED MESSAGE #3	"TIME MESSAGE 3"
07	TIMED MESSAGE #4	"TIME MESSAGE 4"
08	GRANDFATHER CLOCK MESSAGE	"CAT-800 THE TIME IS"
09	TIME OF DAY REQUEST MESSAGE	"THE TIME IS"
10	MESSAGE 10	"MESSAGE 10"
11	MESSAGE 11	"MESSAGE 11"
12	MESSAGE 12	"MESSAGE 12"
13	MESSAGE 13	"MESSAGE 13"
14	MESSAGE 14	"MESSAGE 14"
15	MESSAGE 15	"MESSAGE 15"
16	MESSAGE 16	"MESSAGE 16"
17	MESSAGE 17	"MESSAGE 17"
18	MESSAGE 18	"MESSAGE 18"
19	MESSAGE 19	"MESSAGE 19"
20	MESSAGE 20	"MESSAGE 20"

Erase Synthesized Voice Message [*3201]-[*3220]
Key-up and send [*32XX]. Un-key and the voice will say: "CONTROL OK." The voice ID will be erased.

CW ID Memory Storage
Memory space is provided for fifteen. During initialization, the CW buffer is loaded with "CAT800/R."

Send CW Identification [*33]
Key-up and send [*33]. Un-key and the CAT-800 will send the CW ID.

Program CW Identification [*34]
To program the CW buffer send [*34] followed by the numbers in the CW ID Programming Table. Memory space is provided for (15) entries. Example: Load CW ID with W4XYZ, Frequency 800Hz and 20 Words per Minute.

Programming Command	Frequency	20wpm	W	4	X	Y	Z
*34	5	2	32	04	33	34	35

CW ID PROGRAMMING TABLE										
00=0	04=4	08=8	12=C	16=G	20=K	24=O	28=S	32=W	36=/	40=;
01=1	05=5	09=9	13=D	17=H	21=L	25=P	29=T	33=X	37=AR	41=,
02=2	06=6	10=A	14=E	18=I	22=M	26=Q	30=U	34=Y	38=SPACE	42=:
03=3	07=7	11=B	15=F	19=J	23=N	27=R	31=V	35=Z	39=.	43=?
Frequency Hz		1=400	2=500	3=600	4=700	5=800	6=900	7=1200		
Speed W.P.M.		1=25	2=20	3=18	4=15	5=5				

Erase CW Identification [*35]
Key-up and send [*35]. Un-key and the voice will say: "CONTROL OK."

Program CTCSS Inputs [*3610 - *3634]
The CAT-800 has three CTCSS logic inputs, one for each of the three ports. At default the three inputs are set for "COR and CTCSS" active high logic. Use the *36XX programming commands to change the CTCSS logic inputs. NOTE: X equals the logic input number 1 through 5.

	CTCSS LOGIC INPUTS	
*3610	READ PORT #1 CTCSS INPUT SETTING	
*3611	SET PORT #1 CTCSS LOGIC (COR AND CTCSS) ACTIVE HI	DEFAULT
*3612	SET PORT #1 CTCSS LOGIC (COR AND CTCSS) ACTIVE LO	
*3613	SET PORT #1 CTCSS LOGIC (COR OR CTCSS) ACTIVE HI	
*3614	SET PORT #1 CTCSS LOGIC (COR OR CTCSS) ACTIVE LO	
*3620	READ PORT #2 CTCSS INPUT SETTING	
*3621	SET PORT #2 CTCSS LOGIC (COR AND CTCSS) ACTIVE HI	DEFAULT
*3622	SET PORT #2 CTCSS LOGIC (COR AND CTCSS) ACTIVE LO	
*3623	SET PORT #2 CTCSS LOGIC (COR OR CTCSS) ACTIVE HI	
*3624	SET PORT #2 CTCSS LOGIC (COR OR CTCSS) ACTIVE LO	
*3630	READ PORT #3 CTCSS INPUT SETTING	
*3631	SET PORT #3 CTCSS LOGIC (COR AND CTCSS) ACTIVE HI	DEFAULT
*3632	SET PORT #3 CTCSS LOGIC (COR AND CTCSS) ACTIVE LO	
*3633	SET PORT #3 CTCSS LOGIC (COR OR CTCSS) ACTIVE HI	
*3634	SET PORT #3 CTCSS LOGIC (COR OR CTCSS) ACTIVE LO	

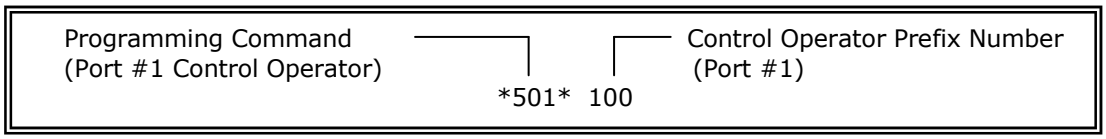
Program USER Function Output Switch Assignments [*39X0 - *39X4]
At default the five switches are set up as DTMF remote control switches. To read a switch setting, enter the [*39X0]. To configure the switch as a user function switch use the [*39X1] programming command. To configure the switch as a fan control relay driver use the [*39X2] programming command. To configure the switch as a CTCSS encoder control switch that follows PTT use the [*39X3] programming command. To configure the switch as a CTCSS encoder that follows COR use the [*39X4] programming command.

When the Fan Control is selected the switch will follow PTT #1 and remain on for an additional 60 seconds after PTT #1 turns off. When CTCSS Encoder Switch (PTT) is selected the switch will follow PTT #1 but turn off 250mSEC before PTT #1 turns off. When CTCSS Encoder Switch (COR) is selected the switch will follow COR #1. NOTE: X equals the switch number 1 through 5.

USER FUNCTION OUTPUT SWITCH ASSIGNMENT TABLE		
*3910	READ USER FUNCTION SWITCH #1 SELECTION	
*3911	PROGRAM AS USER FUNCTION SWITCH	DEFAULT
*3912	PROGRAM AS FAN CONTROL SWITCH	
*3913	PROGRAM AS CTCSS ENCODER SWITCH (PTT)	
*3914	PROGRAM AS CTCSS ENCODER SWITCH (COR)	
*3920	READ USER FUNCTION SWITCH #2 SELECTION	
*3921	PROGRAM AS USER FUNCTION SWITCH	DEFAULT
*3922	PROGRAM AS FAN CONTROL SWITCH	
*3923	PROGRAM AS CTCSS ENCODER SWITCH (PTT)	
*3924	PROGRAM AS CTCSS ENCODER SWITCH (COR)	
*3930	READ USER FUNCTION SWITCH #3 SELECTION	
*3931	PROGRAM AS USER FUNCTION SWITCH	DEFAULT
*3932	PROGRAM AS FAN CONTROL SWITCH	
*3933	PROGRAM AS CTCSS ENCODER SWITCH (PTT)	
*3934	PROGRAM AS CTCSS ENCODER SWITCH (COR)	
*3940	READ USER FUNCTION SWITCH #4 SELECTION	
*3941	PROGRAM AS USER FUNCTION SWITCH	DEFAULT
*3942	PROGRAM AS FAN CONTROL SWITCH	
*3943	PROGRAM AS CTCSS ENCODER SWITCH (PTT)	
*3944	PROGRAM AS CTCSS ENCODER SWITCH (COR)	
*3950	READ USER FUNCTION SWITCH #5 SELECTION	
*3951	PROGRAM AS USER FUNCTION SWITCH	DEFAULT
*3952	PROGRAM AS FAN CONTROL SWITCH	
*3953	PROGRAM AS CTCSS ENCODER SWITCH (PTT)	
*3954	PROGRAM AS CTCSS ENCODER SWITCH (COR)	

Control Code And Prefix Number Memory
This memory area is reserved for storage of control and prefix numbers. These numbers can be from one to seven digits and will change to a default value when the CAT-800 is powered up with dipswitch #7 set to the on position.

Control Operator Prefix Number Port #1 [*501*]
This programming command selects the control operator number for Port #1. This number must precede the command to change the zone control functions. Example: To program a Control Operator Prefix of [100] for Port #1, key-up and send:



Un-key, the voice will say: "CONTROL OK." The default number for Port #1 is [100].

Control Operator Number Port #2 [*502*]
This programming command selects the control operator number for Port #2. The default control operator code for Port #2 is [200].

Control Operator Number Port #3 [*503*]
This programming command selects the control operator number for Port #3. The default control operator code for Port #3 is [300].

DTMF Access Code [*504*]
This programming command selects the DTMF access prefix number. When the repeater is in the DTMF Access Mode it will not respond to a COR input. The repeater user must enter the DTMF access number to activate the repeater. When the repeater returns to rest for a period determined by the sleep timer, this number must be re-entered to activate the repeater. The default number is [325].

Time Of Day Request [*505*]
This number must be entered to request the time of day announcement. Example: To program a Time Request Number of 400, key-up and send [*505*400]. Un-key and the voice will say, "CONTROL OK."

DTMF Pad Test Number [*506*]
This programming command selects the DTMF pad test prefix number. This number must be entered to initiate a DTMF keypad test. Example: To program a DTMF Pad Test Number of 475, key-up and send [*506*475]. Un-key and the voice will say: "CONTROL OK."

Select Courtesy Tone Control Number [*507*]
This programming command selects the Load Courtesy Tone number. The default courtesy tone is number one. Example: To program the load courtesy tone number of 600, key-up and send [*507*600]. Un-key and the voice will say "CONTROL OK."

Paging Tone Control Number [*508*]
This number must be entered to PLAY one of the paging tones. This number must precede the two-digit paging tone table position number. Example: To program a paging tone Control Number of 650, key-up and send [*508*650]. Un-key and the voice will say: "CONTROL OK."

Voice Demonstration Control Number [*509*]
This number must be entered to PLAY one of the voice messages. This number must precede the voice message number. Example: To program a Voice Demonstration Control Number of 700, key-up and send [*509*700]. Un-key and the voice will say: "CONTROL OK."

Play Digital Audio WAV Track Control Number [*510*]
This number must be entered to PLAY one of the digital audio tracks. This number must precede the two-digit track number. Example: To program a Play Audio Track Control Number of 725, key-up and send [*510*725]. Un-key and the voice will say: "CONTROL OK."

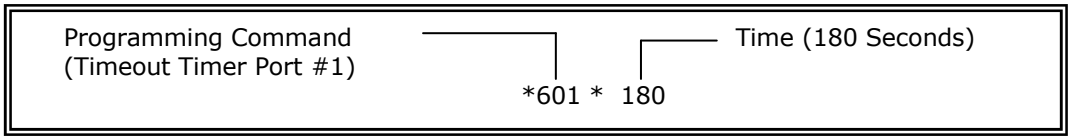
Reserved [*511*]

Secondary Unlock Number [*512*]
This programming command selects the secondary unlock number used to place the CAT-800 in the programming mode. This number is not restricted to a seven-digit number. The default number is [7654321].

Read Control And Prefix Numbers [*501 - *512]
Use this programming command to read the Port #1 control operator code. Example: Key-up and enter [*501], un-key and the voice will say: "CODE FIVE ZERO ONE IS ONE ZERO ZERO."

Timer Memory
This memory area is reserved for storage of [19] timers. These timers are user programmable. When the CAT-800 is initialized, these timers are automatically loaded with default values.

Port #1 Timeout Timer [*601*]
This timer limits the time a signal can appear on the Port #1 receiver input. If this time limit is exceeded the controller will turn off the transmitter. This timer is programmable between 60 and 1799 seconds. Example: To program the Port #1 timer for 3 minutes, key-up and enter [*601*180]. Un-key and the voice will say: "CONTROL OK." When the CAT-800 is initialized this timer defaults to 180 seconds.



Port #2 Timeout Timer [*602*]
This timer limits the time a signal can appear on the Port #2 receiver input. If this time limit is exceeded the controller will turn off the transmitter. When the CAT-800 is initialized this timer defaults to 180 seconds.

Port #3 Timeout Timer [*603*]
This timer limits the time a signal can appear on the Port #3 receiver input. If this time limit is exceeded the controller will turn off the transmitter. When the CAT-800 is initialized this timer defaults to 180 seconds.

System ID Timer [*604*]
This timer sets the time between transmissions of the Port #1 ID. The ID occurs when a repeater user stops transmitting. This timer is programmable between 60 and 1799 seconds. The timer default is 480 seconds.

Port #2 Inactivity Disconnect Timer [*605*]
This timer determines how long Port #2 remains inactive before event macro 38 executes. Control Zone 2 Channel 6 must be enabled. This timer is programmable between 60 and 1799 seconds. The timer default is 600 seconds.

Port #3 Inactivity Disconnect Timer [*606*]
This timer determines how long Port #3 remains inactive before event macro 39 executes. Control Zone 3 Channel 6 must be enabled. This timer is programmable between 60 and 1799 seconds. The timer default is 600 seconds.

Timed Message #1 Timer [*607*]
This timer sets the timed message repeat period. This timer is programmable between 1.0 and 1799 seconds. The timer default is 300 seconds.

Timed Message #2 Timer [*608*]
This timer sets the timed message repeat period. This timer is programmable between 1.0 and 1799 seconds. The timer default is 600 seconds.

Timed Message #3 Timer [*609*]
This timer sets the timed message repeat period. This timer is programmable between 1.0 and 1799 seconds. The timer default is 900 seconds.

Timed Message #4 Timer [*610]*]
This timer sets the timed message repeat period. This timer is programmable between 1.0 and 1799 seconds. The timer default is 1200 seconds.

PTT Off Message #1 Timer [*611*]
This timer sets the time between transmissions of the squelch tail message. The message occurs when a repeater user stops transmitting. This timer is programmable between 1.0 and 1799 seconds. The timer default is 1799 seconds.

PTT Off Message #2 Timer [*612*]
This timer sets the time between transmissions of the drop out message. The message occurs when a repeater stops transmitting. This timer is programmable between 1.0 and 1799 seconds. The timer default is 1799 seconds.

DTMF Programming Length Timer [*613*]
During the programming mode, this timer determines the maximum time the controller remains unlocked. This timer is programmable between 60 and 1799 seconds. When initialize, this timer will default to 600 second.

DTMF Access Sleep Timer [*614*]
This timer determines the time required for the repeater to be at rest before the DTMF access code is required to activate the repeater. This timer is programmable between 60 and 1799 seconds. The timer default is 60 seconds.

COR Drop to Courtesy Beep Timer [*620*]
This timer determines the time between loss of COR and generation of the courtesy beep. This timer is programmable between 0.1 and 9.9 seconds. When initialize, this timer defaults to 1 second. Example: To program the timer for 2.5 seconds, key-up and enter [*620*25].

Courtesy Beep to PTT Drop Timer [*621*]
This timer determines the time between the generation of the courtesy beep and the time the repeater transmitter turns off. This timer is programmable between 0.1 and 9.9 seconds. The timer default is 4 seconds.

Pre-Voice Delay Timer [*622*]
This timer determines the time after PTT goes active and the voice synthesizer begins to speak. This timer is programmable between 0.1 and 9.9 seconds. The timer default is 0.5 seconds.

Turn on Delay Timer [*623*]
When the repeater is at rest, this timer sets the time COR must be present before the repeater will activate. This timer is programmable between 0.1 and 9.9 seconds. Example: To program this timer to 1.5 seconds, key-up and enter [*623*15]. Un-key and the voice will say: "CONTROL OK." When initialize this timer will default to 1.0 seconds. This timer also sets the turn on delay time for the Port #2 input.

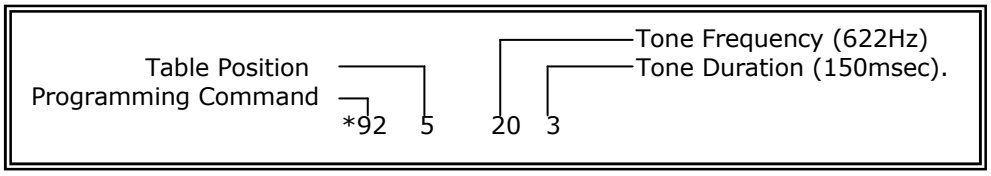
DTMF Muting Timer [*624*]
This timer determines the time the transmit audio will continue to be muted after the entry of the last DTMF tone. When initialize, this timer defaults to 1 second.

Read Timer Settings [*601-*624]
Key-up and send [*601]. Un-key and the voice synthesizer will read back the setting of the Port #1 time-out timer. The voice will say: "TIMER 601 IS THREE MINUTES.

Courtesy Tone
Memory space is provided for [8] custom courtesy tones. Each tone can consist of up to three different tone frequencies of various lengths and separations.

Send Courtesy Tone (1-8)
Key-up and send [*91X]. Un-key and the CAT-800 will transmit the courtesy tone. "X" represents the courtesy tone table location.

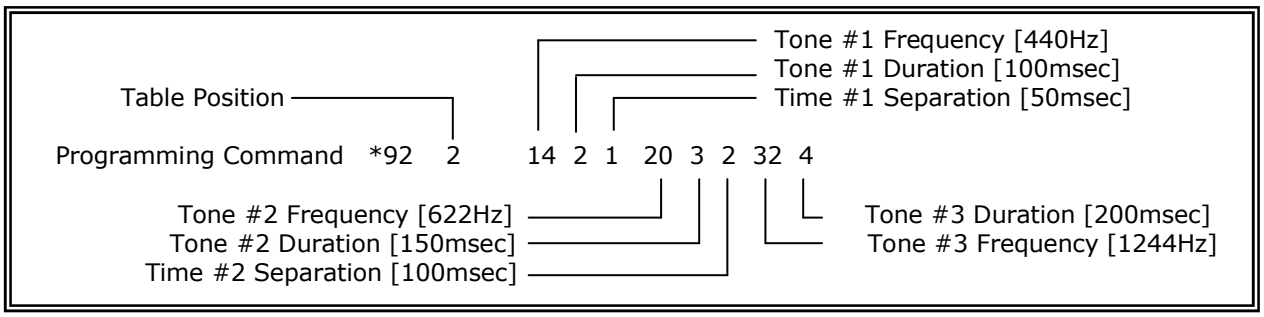
Program Courtesy Tone (1-8)
Key-up and send [*92X] followed by the table position, frequency, duration and separation numbers from the courtesy tone-programming table. Example: Program courtesy tone table location 5 with a tone of 622Hz and duration of 150msec.



COURTESY TONE DEFAULT TABLE								
Tone	Freq	Time	Space	Freq	Time	Space	Freq	Time
1	330 Hz	150mSEC	50mSEC	493 Hz	150mSEC	50mSEC	660 Hz	150mSEC
2	660 Hz	150mSEC	50mSEC	493 Hz	150mSEC	50mSEC	330 Hz	150mSEC
3	880 Hz	150mSEC	50mSEC	1046 Hz	150mSEC			
4	880 Hz	150mSEC						
5	660 Hz	150mSEC						
6	440 Hz	150mSEC						
7	440 Hz	150mSEC	0mSEC	660 Hz	150mSEC			
8	660 Hz	150mSEC	0mSEC	440 Hz	150mSEC			

COURTESY TONE PROGRAMMING TABLE						
TONE FREQUENCY (Hz)						
01=207	06=277	11=370	16=493	21=660	26=880	31=1174
02=220	07=293	12=392	17=523	22=698	27=932	32=1244
03=233	08=311	13=415	18=554	23=740	28=987	
04=246	09=330	14=440	19=587	24=784	29=1046	
05=261	10=349	15=466	20=622	25=830	30=1108	
Tone Duration (Milliseconds)						
0=0	1=50	2=100	3=150	4=200		
5=250	6=300	7=350	8=400	9=450		

To program a multiple courtesy tone, key-up and send [*92X], followed by the desired tone frequency, duration and separation numbers. Example: Program courtesy tone table location 2 with a three-frequency courtesy tone.



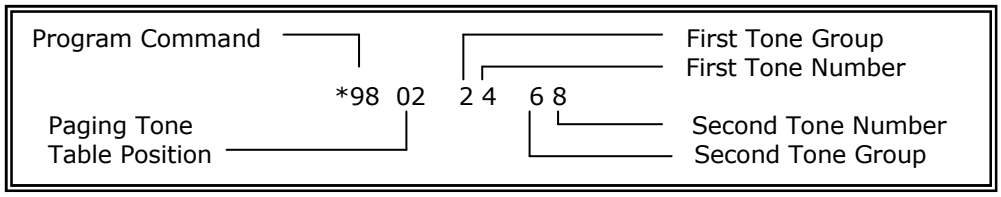
Erase Courtesy Tone (1-8)
Key-up and send [*93X]. Un-key and the voice will say: "CONTROL OK."

Paging Tone Memory

The CAT-800 will generate two-tone sequential paging tones. The first tone will be on for one second while the second tone will be on for three seconds. Memory space is provided for twenty paging tones. See the Two-Tone Sequential Paging Frequency Table.

Send Paging Tone Locations (01-20)
Key-up and send [*97XX]. Un-key and the CAT-800 will send the paging tones stored at that memory location. If the location is empty, the voice will say: "POSITION XX IS CLEAR." During this send command, the length of each tone is increased to four seconds to provide time to measure the frequency on a counter.

Program Paging Tone Locations (01-20)
Key-up and send [*98XX] followed by the paging tone group and tone number. Un-key and the voice will say: "CONTROL OK." Example: Program [707 - 1395Hz] tones at table position 2.



TWO-TONE SEQUENTIAL PAGING FREQUENCIES (Hz)						
Tone	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
1	349.0	600.9	288.5	339.6	584.8	1153.4
2	368.5	634.5	296.5	358.6	617.4	1185.2
3	389.0	669.9	304.7	378.6	651.9	1217.8
4	410.8	707.3	313.0	399.8	688.3	1251.4
5	433.7	746.8	953.7	422.1	726.8	1285.8
6	457.9	788.5	979.9	445.7	767.4	1321.2
7	483.5	832.5	1006.9	470.5	810.2	1357.6
8	510.5	879.0	1034.7	496.8	855.5	1395.0
9	539.0	928.1	1063.2	524.6	903.2	1433.4
0	330.5	569.1	1092.4	321.7	553.9	1122.5

Erase Paging Tone Locations (01-20)
Key-up and send [*99XX]. Un-key and the voice will say: "POSITION XX IS CLEAR."

Audio Test Tone [*901 *902 *903]
The CAT-800 will generate a 1000Hz test tone. Use this tone as a reference when setting the transmit audio levels. To activate the tone, as TX1 audio, key-up and enter [*901]. To activate the tone, as TX2 audio, key-up and enter [*902]. To activate the tone, as TX3 audio, key-up and enter [*903].

Exit Programming Mode [*0]
To exit the programming mode and return to normal repeater operation, key-up and send [*0]. Un-key and the voice will say: "CONTROL EXIT." If you fail to exit the programming mode, the CAT-800 will exit the programming mode when the [*613*] timer expires. The CAT-800 will return to normal operation. The voice will say: TIMER EXIT."

CAT-800 DTMF Programming Commands

ENTRY	DTMF PROGRAMMING COMMAND TABLE	DEFAULT
*10XX	READ SCHEDULED EVENT TIME (40-59)	
*11XX	PROGRAM SCHEDULED EVENT TIME (40-59)	
*12XX	ERASE SCHEDULED EVENT TIME (40-59)	
*13XX	READ USER MACRO (01-40)	
*14XX	PROGRAM USER MACRO (01-40)	
*15XX	ERASE USER MACRO (01-40)	
*16XX	READ EVENT MACRO (01-50)	
*17XX	PROGRAM EVENT COMMAND (01-50)	
*18XX	ERASE EVENT COMMAND (01-50)	
*20	SEND TIME OF DAY	
*21	PROGRAM TIME OF DAY	
*28	READ DTMF MUTING OVERIDE ENTRY KEY	
*28X	PROGRAM DTMF MUTING OVERIDE ENTRY KEY	#
*29	READ FORCED ENTRY KEY	
*29X	PROGRAM FORCED ENTRY KEY	D
*30XX	SEND VOICE MESSAGE (01-20)	
*31XX	PROGRAM VOICE MESSAGE (01-20)	
*32XX	ERASE VOICE MESSAGE (01-20)	
*33	SEND CW IDENTIFICATION	
*34	PROGRAM CW IDENTIFICATION	
*35	ERASE CW IDENTIFICATION	
*3610	READ PORT #1 CTCSS INPUT SETTING	
*3611	SET PORT #1 CTCSS LOGIC (COR and CTCSS) ACTIVE HI	DEFAULT
*3612	SET PORT #1 CTCSS LOGIC (COR and CTCSS) ACTIVE LO	
*3613	SET PORT #1 CTCSS LOGIC (COR or CTCSS) ACTIVE HI	
*3614	SET PORT #1 CTCSS LOGIC (COR or CTCSS) ACTIVE LO	
*3620	SET PORT #2 CTCSS INPUT SETTING	
*3621	SET PORT #2 CTCSS LOGIC (COR and CTCSS) ACTIVE HI	DEFAULT
*3622	SET PORT #2 CTCSS LOGIC (COR and CTCSS) Active LO	
*3623	SET PORT #2 CTCSS LOGIC (COR or CTCSS) ACTIVE HI	
*3624	SET PORT #2 CTCSS LOGIC (COR or CTCSS) ACTIVE LO	
*3630	SET PORT #3 CTCSS INPUT SETTING	
*3631	SET PORT #3 CTCSS LOGIC (COR and CTCSS) ACTIVE HI	DEFAULT
*3632	SET PORT #3 CTCSS LOGIC (COR and CTCSS) ACTIVE LO	
*3633	SET PORT #3 CTCSS LOGIC (COR or CTCSS) ACTIVE HI	
*3634	SET PORT #3 CTCSS LOGIC (COR or CTCSS) ACTIVE LO	
*39X0	READ USER FUNCTION SWITCH SELECTION (X=SWITCH NUMBER)	
*39X1	PROGRAM AS USER FUNCTION SWITCH	DEFAULT
*39X2	PROGRAM AS FAN CONTROL SWITCH	
*39X3	PROGRAM AS CTCSS ENCODER SWITCH (PTT)	
*39X4	PROGRAM AS CTCSS ENCODER SWITCH (COR)	

501	PROGRAM CONTROL OPERATOR NUMBER PORT #1	100
502	PROGRAM CONTROL OPERATOR NUMBER PORT #2	200
503	PROGRAM CONTROL OPERATOR NUMBER PORT #3	300
504	PROGRAM DTMF ACCESS CODE	325
505	PROGRAM TIME OF DAY REQUEST NUMBER	400
506	PROGRAM DTMF PAD TEST NUMBER	475
507	PROGRAM LOAD COURTESY TONE NUMBER	600
508	PROGRAM PAGING TONE DEMO NUMBER (01 – 20)	650
509	PROGRAM VOICE MESSAGE DEMO NUMBER	700
510	PROGRAM DIGITAL VOICE WAV PLAYER DEMO NUMBER	725
511	RESERVED	
512	UNLOCK NUMBER #2 (NOT RESTRICTED TO A 7 DIGIT CODE LENGTH)	7654321
601	PORT #1 TIME-OUT TIMER (60 - 1799 SECONDS)	180
602	PORT #2 TIME-OUT TIMER (60 - 1799 SECONDS)	180
603	PORT #3 TIME-OUT TIMER (60 - 1799 SECONDS)	180
604	SYSTEM ID TIMER (60 - 1799 SECONDS)	480
605	PORT #2 INACTIVITY DISCONNECT TIMER (60 – 1799 SECONDS)	600
606	PORT #3 INACTIVITY DISCONNECT TIMER (60 – 1799 SECONDS)	600
607	TIMED MESSAGE #1 TIMER (60 - 1799 SECONDS)	300
608	TIMED MESSAGE #2 TIMER (60 - 1799 SECONDS)	600
609	TIMED MESSAGE #3 TIMER (60 - 1799 SECONDS)	900
610	TIMED MESSAGE #4 TIMER (60 - 1799 SECONDS)	1200
611	PTT OFF MESSAGE #1 TIMER (60 - 1799 SECONDS)	1799
612	PTT OFF MESSAGE #2 TIMER (60 - 1799 SECONDS)	1799
613	DTMF PROGRAMMING LENGTH TIMER (60 – 1799 SECONDS)	600
614	PROGRAM DTMF ACCESS SLEEP TIMER (60 – 1799 SECONDS)	60
620	PROGRAM COR DROP TO COURTESY BEEP TIMER (0.1 – 9.9 SECONDS)	1.0
621	PROGRAM COURTESY BEEP TO PTT DROP TIMER (0.1 – 9.9 SECONDS)	4.0
622	PRE-VOICE DELAY TIMER (0.1 – 9.9 SECONDS)	0.5
623	TURN-ON DELAY TIMER (0.1 – 9.9 SECONDS)	1.0
624	DTMF MUTING TIMER (0.1 – 9.9 SECONDS)	1.0
*901	TRANSMIT AUDIO TEST TONE PORT #1 (1000Hz for 30 SECONDS)	
*902	TRANSMIT AUDIO TEST TONE PORT #2 (1000Hz for 30 SECONDS)	
*903	TRANSMIT AUDIO TEST TONE PORT #3 (1000Hz for 30 SECONDS)	
*91X	PLAY COURTESY TONE (1–8)	
*92X	PROGRAM COURTESY TONE (1–8)	
*93X	ERASE COURTESY TONE (1–8)	
*97XX	TRANSMIT PAGING TONE (01 – 20)	
*98XX	PROGRAM PAGING TONE (01 – 20)	
*99XX	ERASE PAGING TONE (01 – 20)	
*0	MANUAL EXIT OF PROGRAMMING MODE	

Chapter 6 – Interfacing to Other Equipment

Interfacing the CAT-800 to your repeater system is a simple matter. A minimum of two inputs, two outputs and a ground are required for the CAT-800 to control a repeater. They are:

1. A COR signal from the repeater's receiver to indicate that a signal is being received.
2. A receive audio signal containing DTMF tones to be processed for control of the CAT-800.
3. A Push-To-Talk signal from the CAT-800 to tell the repeater's transmitter to turn ON.
4. A transmit audio signal containing a combination of receive audio, synthesized voice, and courtesy tones to modulate the transmitter.
5. A ground wire to connect the chassis of the repeater to ground on the CAT-800.

NOTE: Additional connections may be required to realize all the features of the CAT-800.

Connection to Repeater Transmitter
Locate the repeater Push-To-Talk input. When grounded, this line will make the repeater transmit. Connect the PTT #1 output (J1-10) to this line. Locate the TX audio input. This is the line were the audio signal used to modulate the transmitter is applied. Connect the TX1 audio (J1-11) to this input.

Connection to Repeater Receiver
Locate the repeater receiver audio output and connect it to J1-13. Locate the repeater COR and connect it to J1-6. Verify the COR line changes from less than 0.2VDC to greater than 3.0 VDC "active high logic" or from greater than 3.0VDC too less than 0.2VDC "active low logic". If there is no voltage present this could be an indication the receiver COR circuit is an open collector switch and requires a pull-up resistor. The CAT-800 has a built in pull-up resistor for Port #1 COR. Set dipswitch #1 to on because COR #1 is considered active low. If the repeater's COR output is 0 VDC and goes above 3VDC when a signal is being received this is considered an active high COR. Dipswitch should be in the off position and you should remove the COR #1 jumper plug located behind the 25 pin "D" connector. For proper operation the Port #1 green COR LED will indicate the CAT-800 is receiving a proper COR signal. When the repeater is receiving a signal the green COR led should be on and when no signal is being received the led should be off. Do no continue until this condition is met.

Connection to CTCSS Decoder
If your repeater has a CTCSS decoder output or you are using an external CTCSS decoder like the TS-64 connect the CTCSS logic output to J1-4. The default setting for this input is "active high logic". If the decoder logic output is active low use the [*3612] programming command to change the controller to accept an "active low logic" input. You can also change from (COR and CTCSS) to (COR or CTCSS) mode with the [*3613], [*3614] programming commands.

Check PTT and COR Activity
When power is applied the CAT-800 will key-up the transmitter, the voice will say CAT-800 and announce the firmware version and turn the transmitter off. If this occurs PTT and TX AUDIO are connected correctly. If this does not occur do not continue until this problem is resolve. If you hear the message but the transmitter remains on, the COR polarity dipswitch #1 is most likely in the wrong position. Change the setting of the dipswitch. You should hear the courtesy tone followed by a four second hang time and the transmitter should turn off.

Check DTMF Decode Activity
Once the COR is resolved the next step is to check DTMF tone decoding. Key-up and enter a DTMF tone. Adjust RX1 control (R21) for 220mVAC at RX1 test point. Check each tone and verify the amber led lights. If there is a distortion problem the first tones to not decode are the [3] and [A]. Verify the repeater receiver and radio used to send the tones are on frequency. If the frequency is off by just a few KHz, inter-mod distortion may cause a DTMF decode problem. If the DTMF tone is not distorted the decoder should function with a level as low as 70mVAC. However adjust the level to 220mVAC to insure user radios with various levels of deviation will decode. If you experience a DTMF decode problem do not continue until the problem is resolved.

Receive Audio De-Emphasis
If the controller is supplied with discriminator audio it may be necessary to de-emphasize the audio. With Jumper P2 installed a 0.0047uF capacitor is placed across the feed back resistor on the audio amplifier. This capacitor causes the high frequency response of the receiver's input amplifier to roll off producing de-emphasis. If the controller is supplied with processed audio, remove the jumper.

Transmit Audio
Once the receive audio is adjusted, key-up and send a DTMF tone. Monitor the transmitter output. Adjust the TX1 Audio control (R22) as required to set the transmitter deviation to 3 KHz or as desired. If the transmit audio adjustment is very sensitive and you find the control near minimum, it is strongly recommended that an external resistor voltage divider be installed at the audio input of the transmitter. Terminate the TX1 audio level by placing a 100 ohm resistor from the transmitter audio input to ground. Install this resistor at transmitter's modulation input not at the CAT-800's TX1 audio output .

Voice Synthesizer Audio
Compare the received and synthesized voice audio and adjust the VOC Level control (R51) as desired. The synthesized voice should be lower than the receiver's audio level and never exceed 3KHz deviation. Over driving the Voice synthesizer audio will cause some letters to sound more alike. Repeat the above procedures for Port #2 and Port #3 using the RX2, TX2, RX3 and TX3 level controls.

Interface Review
Verify the following eight conditions have been met.

INTERFACE REVIEW	
1	Is J1-17 connected to the repeater chassis?
2	Is J1-10 connected to the repeater transmitter's PTT input?
3	Is J1-11 connected to the repeater transmitter's modulation input?
4	Is J1-6 connected to the repeater COR output?
5	Is the COR level changing from less than 0.2 VDC to greater than 3.0 VDC?
6	Is dipswitch #1 on for active low COR voltage change or off for active high COR?
7	Is J1-13 connected to the repeater receiver's audio output?
8	Is the receive audio input level adjusted for 220mVAC at the RX1 test point?

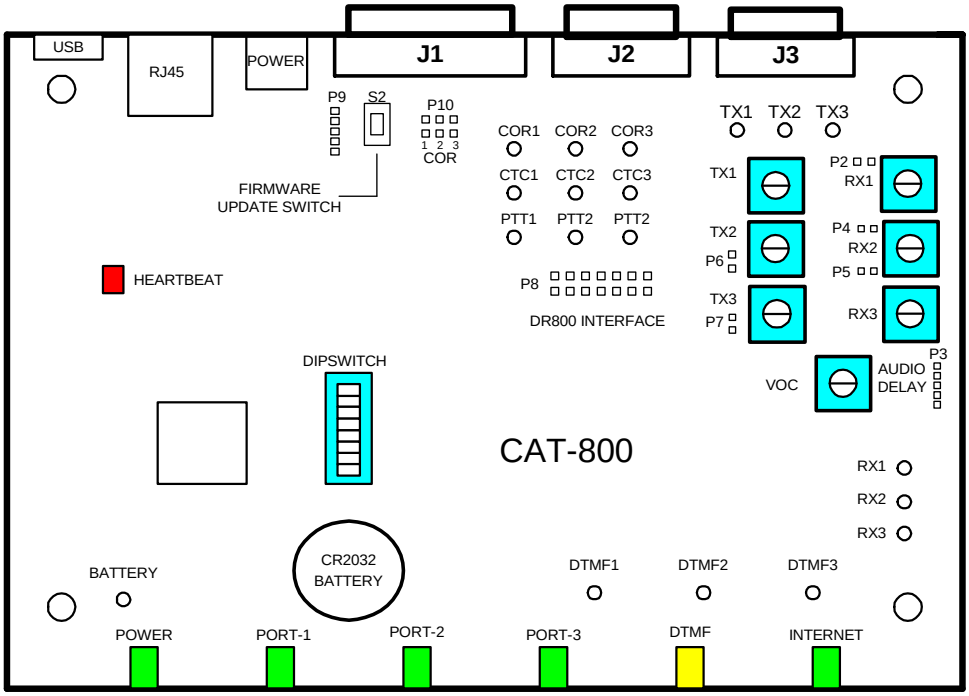
LED Display Indicator
The CAT-800 has six led indicators to display operational status. The green POWER led indicates power is applied and that the five and three volt regulators are operational. Three green leds indicate the input status of the three ports. An active COR input on J1-6 will light the Port-1 led. However if Zone 1 Channel 2 is enabled an active logic input on J-4 from a CTCSS decoder must also be present before the Port-1 led will light. This is also true for the Port-2 and Port-3 leds. The amber led indicates a DTMF tone is being decoded. A green led indicates INTERNET activity. Steady green indicates the CAT-800 is connected to the Internet. A flashing green indicates data is being transferred.

Power Supply
The CAT-800 is powered by an external 12VDC power supply. Connect the positive lead of the supply to the center pin of the coaxial power connector and the negative lead to the outer conductor. The power connector is a 2.5/5.5mm plug.

NOTE: Do not back-feed 12VDC power through J1-16. This is an output not an input and is not protected by the fuse and transorb. A short on the board could result in burned tracks. If necessary, only replace the fuse with a 0.5A fast blow.

Connector Kit
Included with the controller is a connector kit containing a 25 pin "D" connector to mate with J1 and a 2.5mm power plug (center pin is [+]).

CAT-800 Board Drawing



Test Points

The CAT-800 provides twenty-one test points to facilitate adjustments and troubleshooting.

TEST POINT	DESCRIPTION	LOCATION
PTT-1	Port #1 Push-To-Talk Output	J1-10
PTT-2	Port #2 Push-To-Talk Output	J1-9 and J2-4
PTT-3	Port #3 Push-To-Talk Output	J3-4
COR-1	Port #1 Carrier Operated Relay Input	U14-13
COR-2	Port #2 Carrier Operated Relay Input	U14-14
COR-3	Port #3 Carrier Operated Relay Input	U14-12
CTCSS-1	Port #1 CTCSS Input	J1-4
CTCSS-2	Port #2 CTCSS Input	J1-3 and J2-2
CTCSS-3	Port #3 CTCSS Input	J3-2
RX1	Port #1 DTMF Decoder Input	U9-14
RX2	Port #2 DTMF Decoder Input	U9-8
RX3	Port #3 DTMF Decoder Input	U11-14
TX1	Port #1 Transmit Audio Output	J1-11
TX2	Port #2 Transmit Audio Output	J1-23 and J2-4
TX3	Port #3 Transmit Audio Output	J3-4
DTMF1	Port #1 DTMF Strobe	U4-15
DTMF2	Port #2 DTMF Strobe	U5-15
DTMF3	Port #3 DTMF Strobe	U6-15
BATT	Clock Battery Voltage	Plus Lead of Clock Battery
TP-20	3.3 Volt Regulator	
TP-21	5.0 Volt Regulator	

Heartbeat LED

The red LED located on the board will flash once a second to indicate the CAT-800 is executing its program.

Header (P1)
This connector is used to format the microprocessor during manufacturing.
NOTE: Do no connect to this header.

Header (P2)
If Port #1 is supplied with discriminator audio it may be necessary to de-emphasize the audio. With the jumper installed a capacitor will be connected across the feedback resistors of the RX1 audio amplifier. This will lower the gain at the higher frequencies and produce the necessary de-emphasis. If processed audio is supplied to the controller this jumper is not required.

Header (P3)
This connector is used to attach an AD-1000 audio delay or AP-100 audio processor board.

Header (P4)
If Port #2 is supplied with discriminator audio it may be necessary to de-emphasize the audio. With the jumper installed a capacitor will be connected across the feedback resistors of the RX2 audio amplifier. This will lower the gain at the higher frequencies and produce the necessary de-emphasis. If processed audio is supplied to the controller this jumper is not required.

Header (P5)
If Port #3 is supplied with discriminator audio it may be necessary to de-emphasize the audio. With the jumper installed a capacitor will be connected across the feedback resistors of the RX3 audio amplifier. This will lower the gain at the higher frequencies and produce the necessary de-emphasis. If processed audio is supplied to the controller this jumper is not required.

Header (P6)
If the link transmitter's input is very sensitive and you find the TX2 audio level control is near its minimum setting, install the jumper plug on P6 and readjust theTX2 control.

Header (P7)
If the link transmitter's input is very sensitive and you find the TX3 audio level control is near its minimum setting, install the jumper plug on P7 and readjust theTX2 control.

Header (P8)
This connector is used to interface the Digital Voice WAV Player to the CAT-800 Controller. It provides power and the data and clock signals used to control the DR-800 while receiving a busy signal and play back audio from the DR-800.

Header (P9)
This is a serial port used during manufacturing. NOTE: Do not connect to this header.

Header (P10)
If the COR #1 jumper is installed a pull-up resistor will be added to the COR #1 input. This may be required if the receiver's COR circuit is specified as an open collector output. The COR will be considered active LOW. Dipswitch #1 should be on.

If the COR #2 jumper is installed a pull-up resistor will be added to the COR #2 input. Dipswitch #2 should be on.

If the COR #3 jumper is installed a pull-up resistor will be added to the COR #3 input. Dipswitch #3 should be on.

Switch (S2)
This switch is used to up load new firmware using the Texas Instruments program. See Chapter 14 for details.

Connector Assignment Table

J1 the 25 pin "D" connector contains the Port #1 and Port #2 connections and the five Logic inputs and the five output switches. J2 the 9 pin "D" connector contains the Port #2 connections and Output switches #1 and #2. J3 the second 9pin "D" connector contains the Port #3 connections and Output switches #3 and #4.

PORT #1 PIN ASSIGNMENTS J1			
1	LOGIC INPUT #1	14	SWITCH #1
2	LOGIC INPUT #2	15	SWITCH #2
3	CTCSS #2	16	+12VDC OUTPUT
4	CTCSS #1	17	GROUND
5	COR #2	18	GROUND
6	COR #1	19	SWITCH #3
7	SWITCH #5	20	SWITCH #4
8	GROUND	21	LOGIC INPUT #3
9	PTT #2	22	LOGIC INPUT #4
10	PTT #1	23	TX AUDIO #2
11	TX AUDIO #1	24	LOGIC INPUT #5
12	RX AUDIO #2	25	GROUND
13	RX AUDIO #1		

PORT #2 PIN ASSIGNMENTS J2			
1	COR #2	6	SWITCH #1
2	CTCSS #2	7	SWITCH #2
3	PTT #2	8	GROUND
4	TX AUDIO #2	9	+12VDC OUTPUT
5	RX AUDIO #2		

PORT #3 PIN ASSIGNMENTS J3			
1	COR #3	6	SWITCH #3
2	CTCSS #3	7	SWITCH #4
3	PTT #3	8	GROUND
4	TX AUDIO #3	9	+12VDC OUTPUT
5	RX AUDIO #3		

Port Linking

To connect Port #2 to Port #1 the default User Macro command is [A2]. To disconnect Port #2 from Port #1 the default User Macro command is [B2].

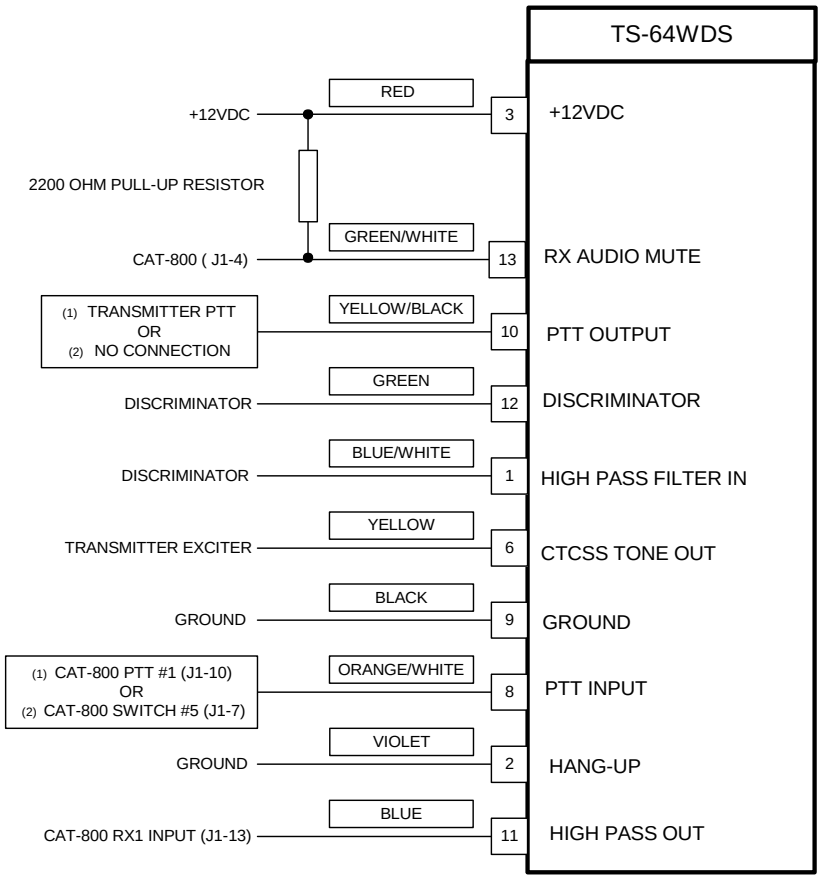
To connect Port #3 to Port #1 the default User Macro command is [A3]. To disconnect Port #3 from Port #1 the default User Macro command is [B3].

To connect Port #2 and Port #3 to Port #1 the default User Macro command is [A23]. To disconnect Port #2 and Port #3 from Port #1 the default User Macro command is [B23].

To change these commands reprogram User Macro 01 through 07. See the table on page 5-7

CTCSS Decoder Diagram

Connect the TS-64WDS CTCSS Encoder/Decoder assembly to the CAT-800 as described in Figure 6-5. The decoder must be connected to discriminator audio. Speaker or volume control audio will have insufficient low frequency CTCSS tone content.



If you only want to send a CTCSS tone on the transmitter's output when a signal is present on the repeater's input connect the CAT-800 PTT #1 directly to the repeater's PTT input. Connect the CAT-800's switch #5 (J1-7) to the TS64WDS's pin #8 ORANGE/WHITE wire. Program switch #5 to follow the COR input with the (*3954) command. Make sure Zone 6 Channel 5 is enabled.

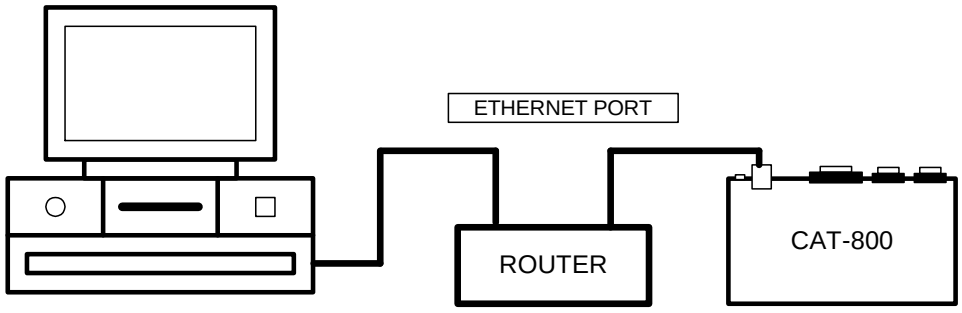
If you only want to send a CTCSS tone on the transmitter's output whenever PTT #1 is active connect the CAT-800 PTT #1 directly to the repeater's PTT input. Connect the CAT-800's switch #5 (J1-7) to the TS64WDS's pin #8 ORANGE/WHITE wire. Program switch #5 to follow the PTT output with the (*3953) command. Make sure Zone 6 Channel 5 is enabled.

If you want to continuously transmit a CTCSS tone without the ability to remote control it, connect the CAT-800 PTT #1 (J1-10) to pin #8 of the TS64WDS's ORANGE/WHITE wire. Connect the TS64's pin #10 YELLOW/BLACK wire to the transmitter's PTT input.

Chapter 7 – Internet Setup

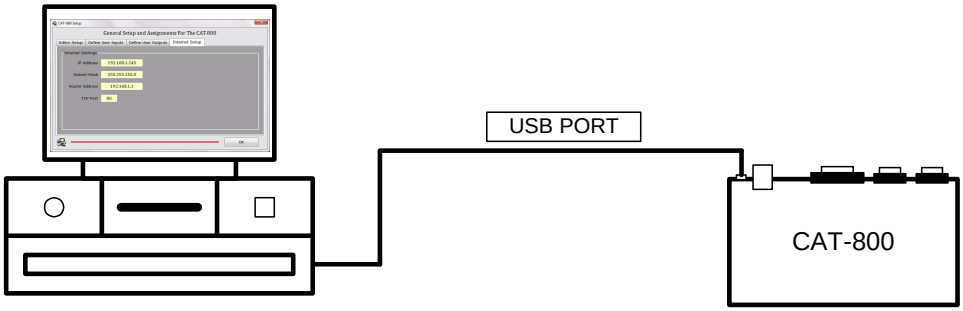
If you plan to connect the CAT-800 to your router it will not be necessary to make any changes to its IP or GATEWAY addresses. If you intend to connect the CAT-800 to a different Internet source you can use the Ethernet port or the USB port with the CAT-800 Editor program.

Internet Setup using Ethernet Port
With the computer set for DCHP addressing put the CAT-800's default address 192.168.1.245 in your browser's address line. Refer to page 8-3 of this manual for the procedure to change the IP, ROUTER and PORT settings as required.



NOTE: You can use a cross over cable or Internet switch in place of the router however you will need to change the address of your computer from DHCP to a static address of 192.168.1.XXX.

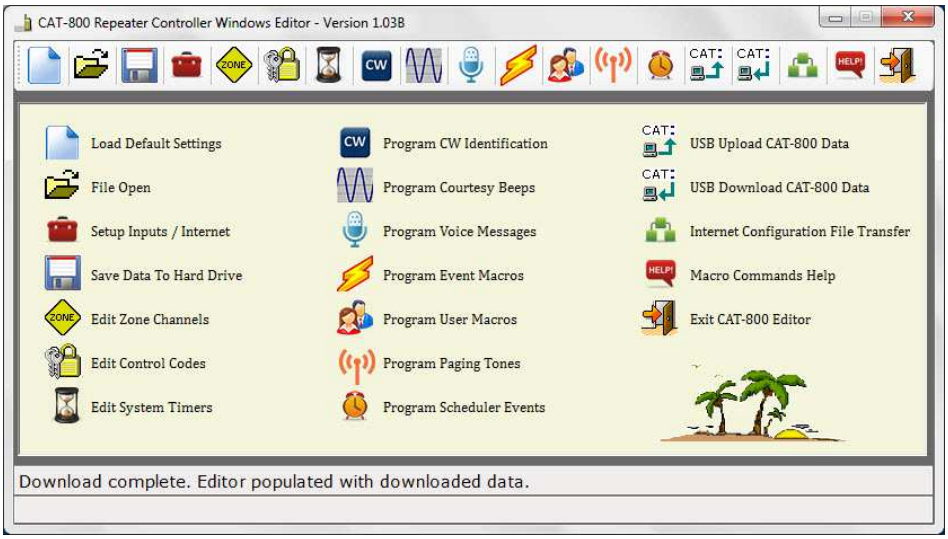
Internet Setup using USB Port
Connect your computer's USB port to the CAT-800 at J6 as described in the figure below. Start the windows editor program to display the **"CAT-800 Repeater Controller Editor"** main window. Along the top of the window click the "Load Default Settings" button. On the main editor window click the "Setup Internet/Input" button. Click on the "Internet Setup" tab. . If you intend to connect the CAT-800 to a different Internet source you can use this window to make changes to the new IP, Router and Port addresses. See page 9-6 for instructions to change the IP, ROUTER and PORT addresses.



Chapter 8 – Windows Editor

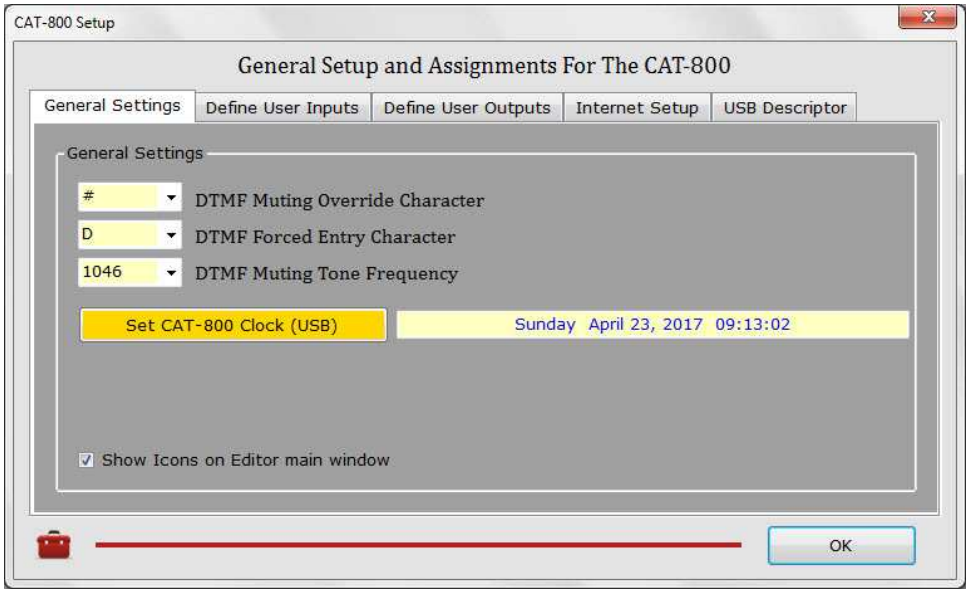
ED-800 Windows Editor

Start the windows editor program to display the **"CAT-800 Repeater Controller Editor"** main window. Along the top of the window click the "Load Default Settings" button. All of the buttons will light up and the editor will display the CAT-800 memory as it is after a reset when power is applied with dipswitch #7 in the on position. The window should resemble the one shown below.



CAT-800 Setup

Along the top of the main editor window click the "Setup Internet/Input" button. You will see a window similar to the one below.



Program DTMF Muting Override Command

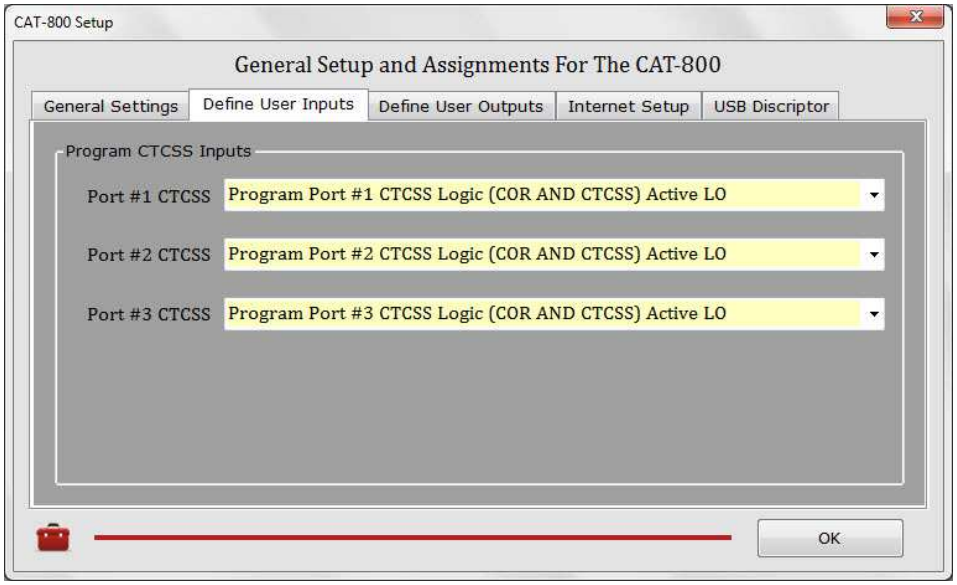
With DTMF muting enabled, there may be times when it is desirable to pass the DTMF tones to the transmitter. To temporarily disable DTMF muting, precede the DTMF string with a pound [#]. This key can be changed to a [*], [A], [B], [C] or [D].

Program Forced Entry Command
DTMF commands are entered when the port goes inactive. To force a DTMF command when the port is active, end the command with a [D]. This key can be changed to a [*], [#], [A], [B] or [C].

DTMF Muting Tone Frequency
When DTMF Muting is enabled and a DTMF command is entered, a series of cover tones will be sent in place of the actual DTMF tones entered. You can change the cover tone frequency.

Set the CAT-800 Clock (USB)
This window displays the time of your computer's clock. If the time is correct click the "Set CAT-800 Clock" button. When the button turns green the CAT-800's clock will be set.

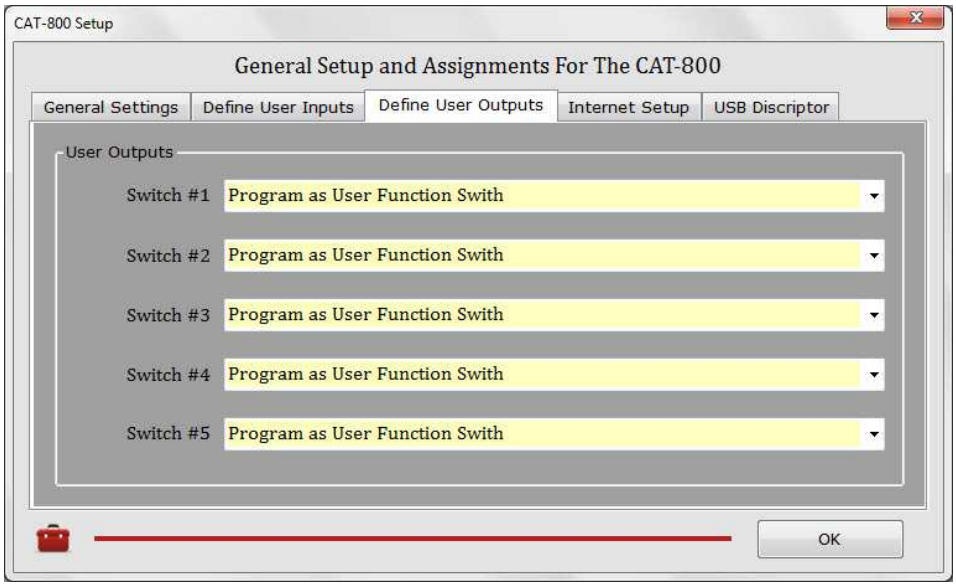
Define Logic Inputs
Click on the "Define CTCSS Input" tab. You will see a window similar to the one below. The CAT-800 has three CTCSS logic inputs, one for each of the three ports. At default the three inputs are set for "COR and CTCSS" active high logic. Click the down arrows to display the drop down menu. Select the desired CTCSS logic for each of the three inputs. You can also change the DTMF muting override and DTMF forced entry characters and the muting tone frequency. When finished click "OK".



CAT-800 Define User Outputs

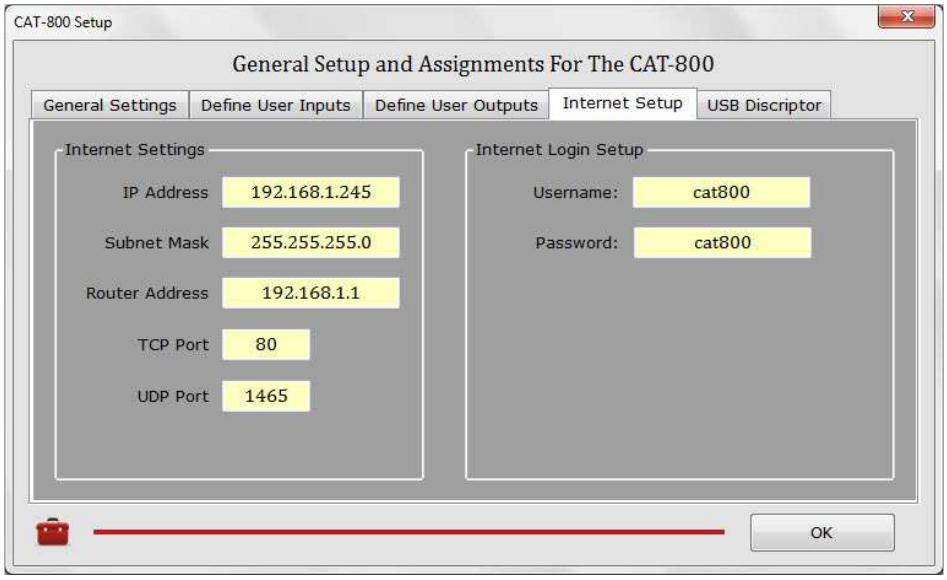
Click on the "Define User Outputs" tab. You will see a window similar to the one below. The CAT-800 has five user defined output switches. At default the five outputs are set up as DTMF remote control switches. Click the down arrows to display the drop down menus. Configure the switch as a fan control relay driver, a CTCSS encoder control switch that follows PTT or a CTCSS encoder that follows COR. When finished click "OK".

NOTE: The Fan Control switch will follow PTT #1 and remain on for 60 seconds after PTT #1 turns off. The CTCSS Encoder Switch (Follows PTT) will follow PTT #1 but turn off 250mSEC before PTT #1 turns off. The CTCSS Encoder Switch (Follows COR) will follow COR #1.



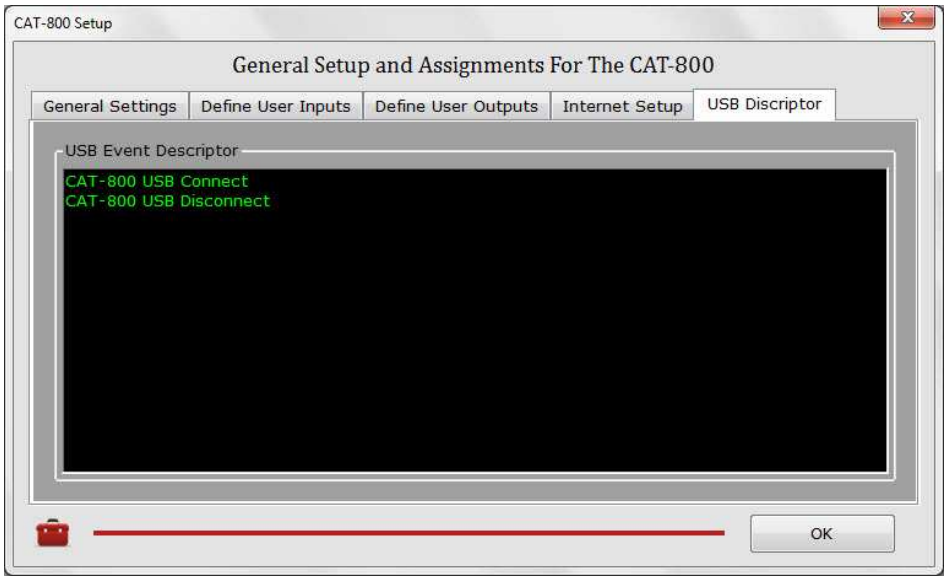
CAT-800 Internet Setup

Click on the "Internet Setup" tab. You will see a window similar to the one below. If you plan to connect the CAT-800 to your router it will not be necessary to make any changes to the addresses in this window. If you intend to connect the CAT-800 to a different Internet source you can use this window to make changes to the new IP, Router and Port addresses. Use this window to change the Username and Password.



USB Discriptor

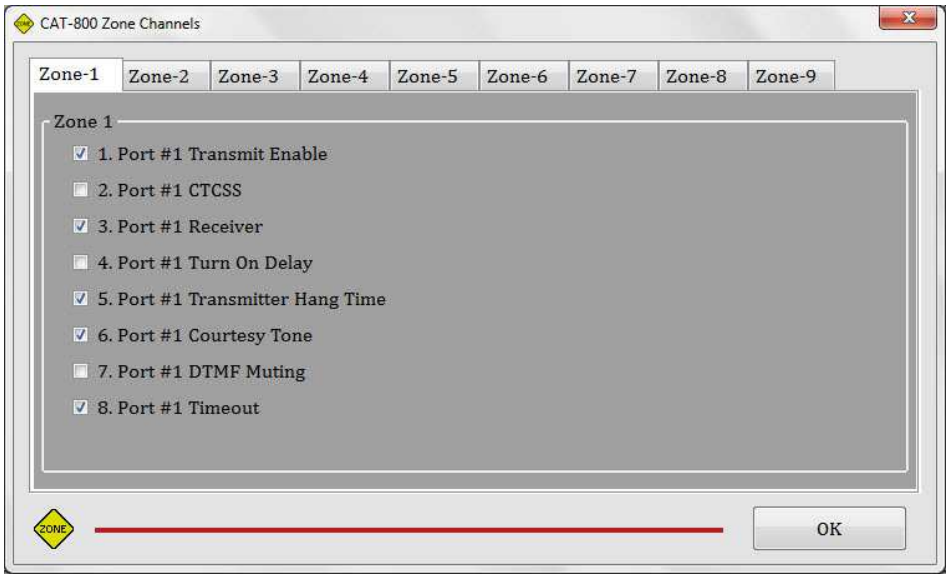
Click on the "USB Discriptor" tab. You will see a window similar to the one below. This is a USB diagnostic tool. When you connect the USB cable, if your computer recognizes the CAT800 as a USB device "CAT-800 USB Connect" will be displayed. When you unplug the cable "CAT-800 USB Disconnect" will be displayed.



CAT-800 Zone Channels

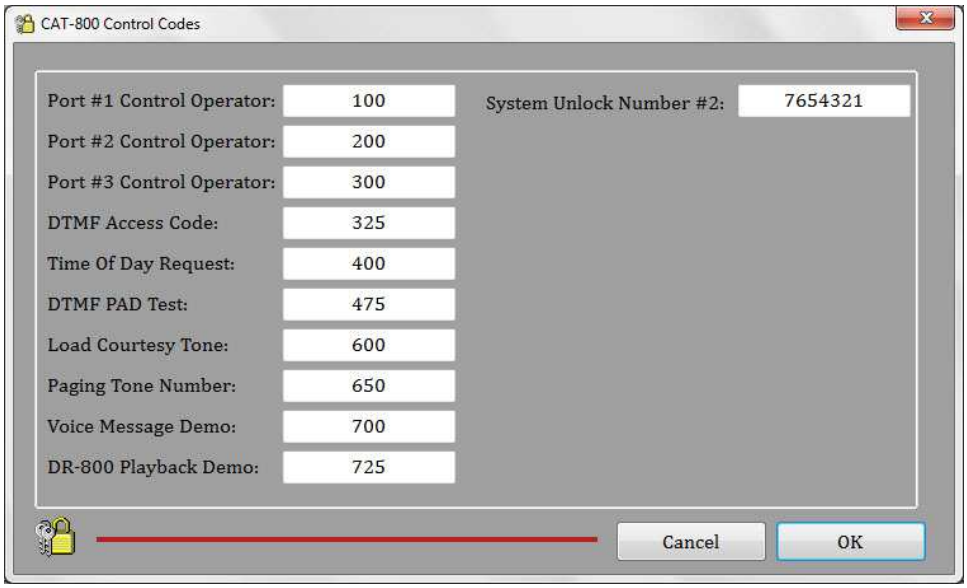
The CAT-800 has nine control zones with eight control channels each. The first three zones are assigned to control the three ports. Zones 4 and Zone 8 are global control zones common to all three ports. Zone 5 controls the five user logic inputs while Zone 6 controls the five user output switches. Zone 9 is reserved for control of the various Internet functions.

If you clicked on the "Edit Zone Channel" button at the top of the main editor window you will see a window similar to the one below. Put a check mark in the boxes of the control function you want to enable and click "OK".



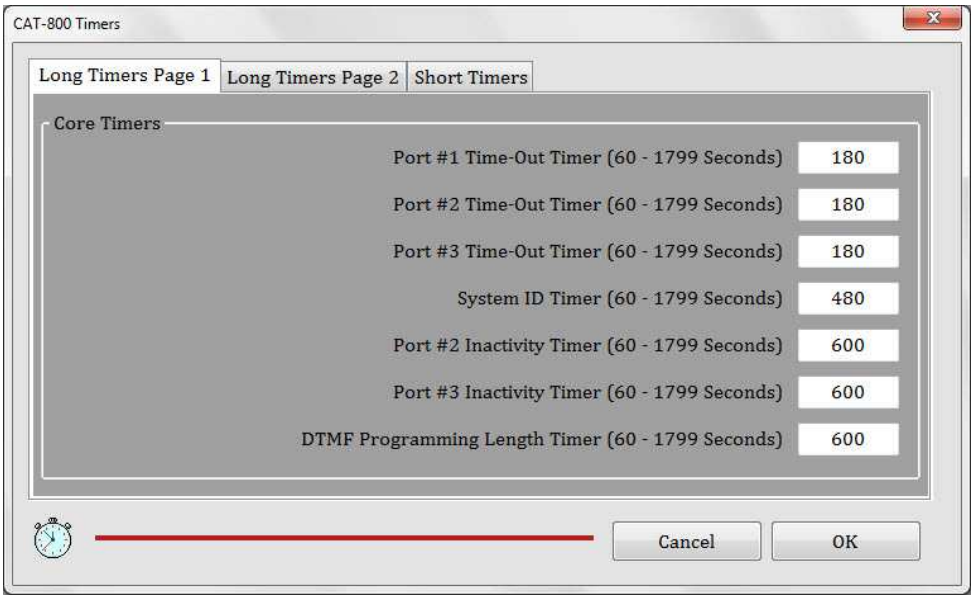
CAT-800 Control Codes

If you clicked on the "Edit Control Codes" button at the top of the main editor window you will see a window similar to the one below. The codes can be between one and seven digits and can contain the letters A, B and C. The D is a forced entry and cannot be used as part of a control code. When finished click "OK".



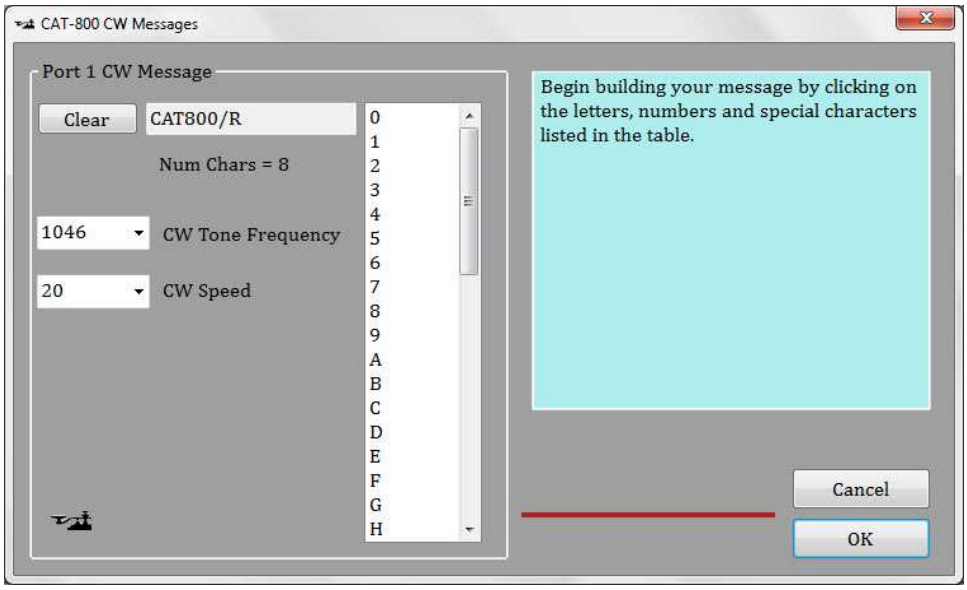
CAT-800 Timers

If you clicked on the "Edit System Timers" button at the top of the main editor window you will see a window similar to the one below. There are two long timer pages and one short timer page. The long timers can be programmed to any time between 60 and 1799 seconds. Example ten minutes would be entered as 600. The short timers can be programmed to any time between 0.1 and 9.9 seconds. Example 2.0 seconds would be entered as 20. When finished click "OK".



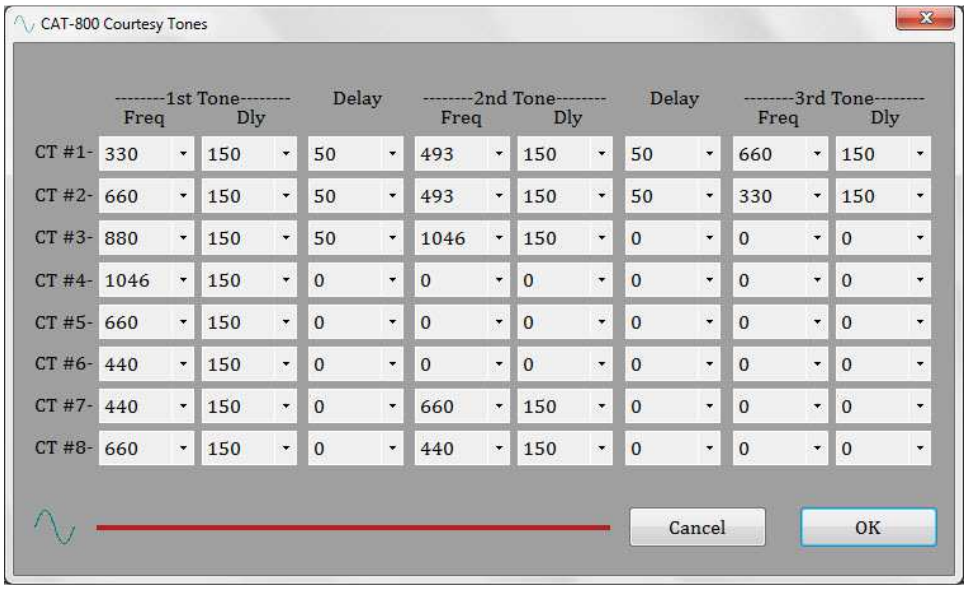
CAT-800 CW Message

If you clicked on the "Program CW Identification" button at the top of the main editor window you will see a window similar to the one below. Click the CLEAR button. Click the numbers and letters in the vertical column to construct the repeaters CW identification. Use the down arrows to select the tone frequency and speed. When finished click "OK".



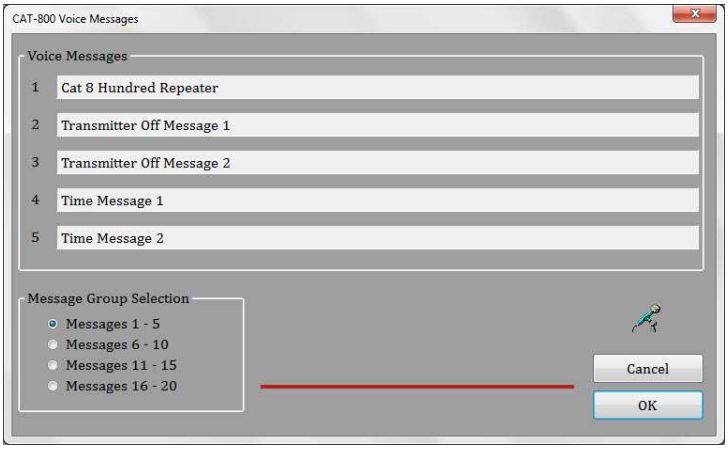
CAT-800 Courtesy Beeps

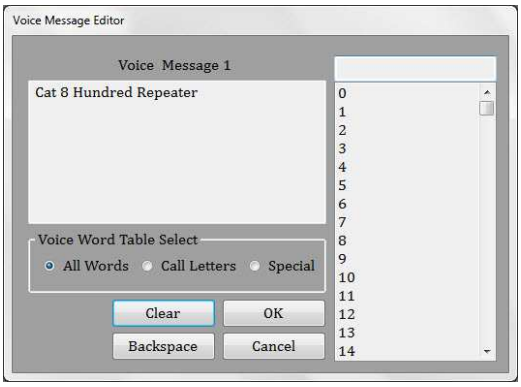
If you clicked on the "Program Courtesy Beep" button at the top of the main editor window you will see a window similar to the one below. The first three courtesy tones are assigned to ports one through three. Use the down arrows to change the tone frequency, duration of the tone in milliseconds and the tone separation if the courtesy tone consists of more than one tone. When finished click "OK".



CAT-800 Voice messages

If you clicked on the "Program Voice Message Identification" button at the top of the main editor window you will see a window similar to the one below. Voice Message #1 is the repeater's identification. Place the hand on the message and click. The voice message editor window will appear. Clear the message by clicking the CLEAR button. Click on the numbers, letters and words in the vertical column to construct a new voice message. When finished click "OK".

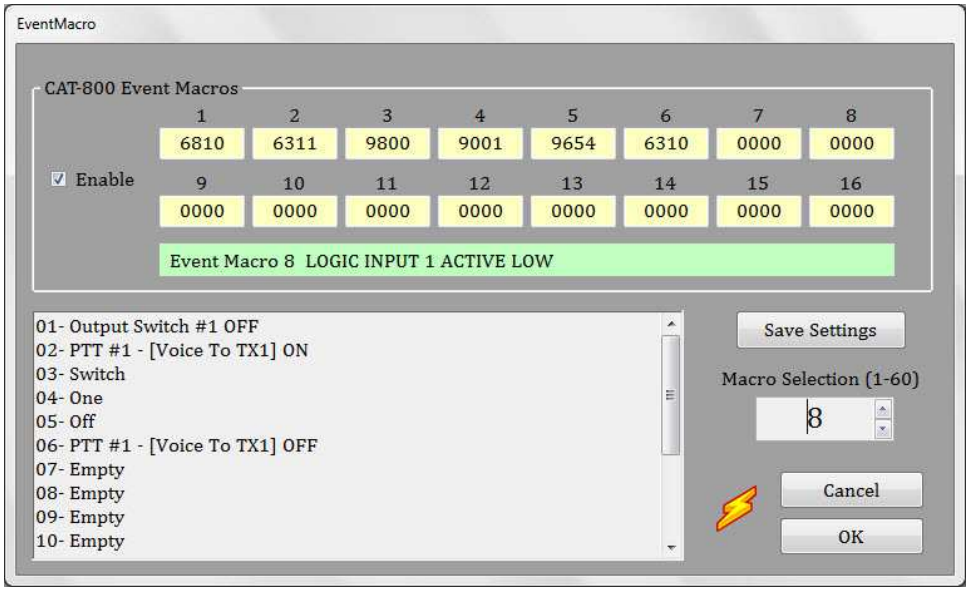




CAT-800 Event Macros

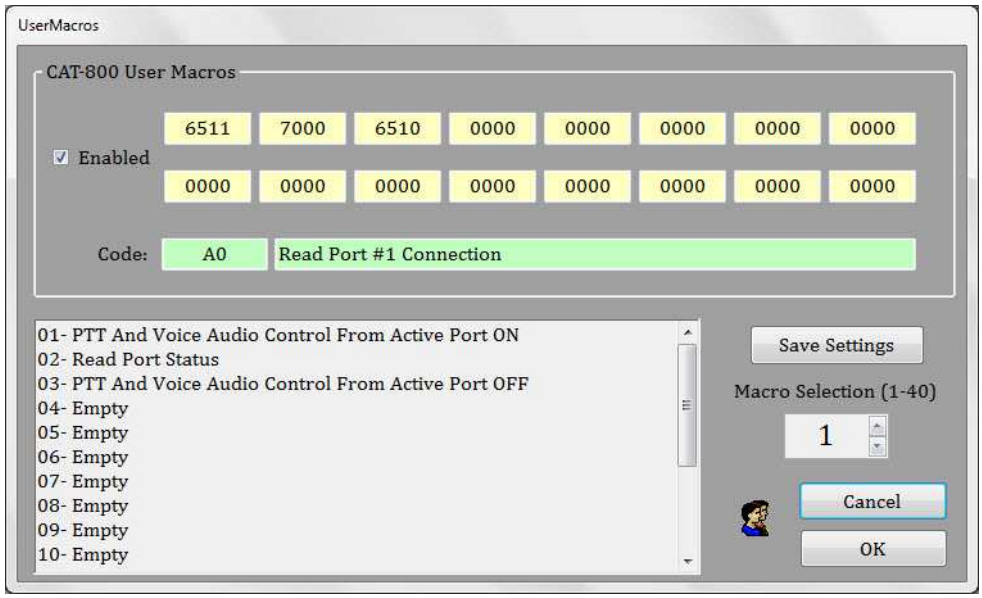
Event Macros are used to perform custom operations at pre determined times during repeater operation. There are seven basic types of event macros. They are: Port Activity, Logic Input, Repeater ID, Load and Play Courtesy Tones, Play Voice Messages, Link Auto Disconnect and Scheduled an Event. An event macro consists of up to sixteen four digit internal commands. If you clicked on the "Program Even Macro" button at the top of the main editor window you will see a window similar to the one below. Enter the four-digit internal commands in the order they are to be executed. Be sure and check mark the enable box. When finished click "Save Settings" and "OK".

NOTE: Click on the "Help" button at the top of the main editor window to display the "Table of Internal Commands". The table is also available in this manual on pages 5-2 and 5-3.



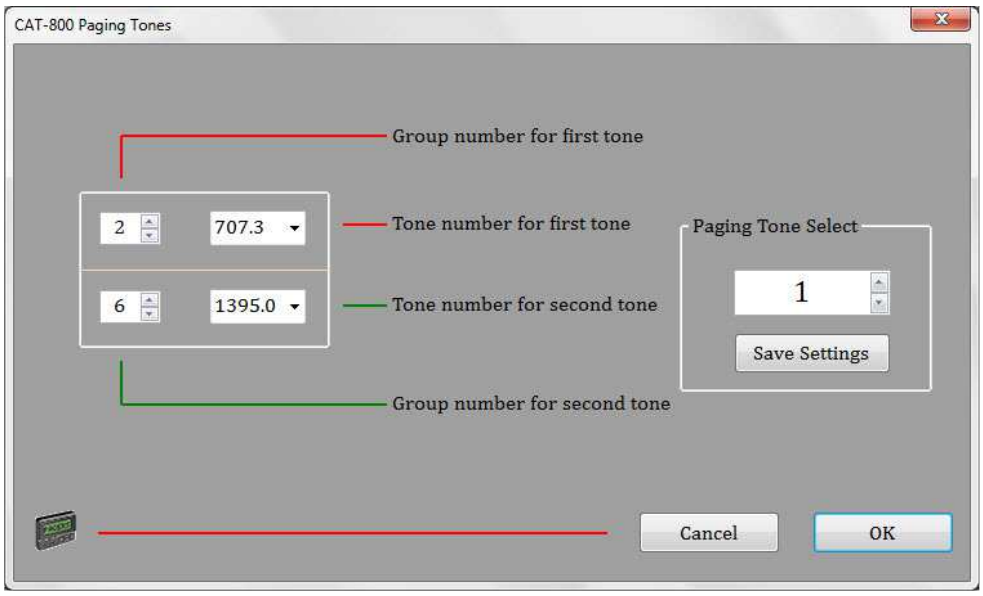
CAT-800 User Macros

User macros are a series of commands, defined by the repeater owner. User macros permit the owner to customize certain aspects of repeater operation. Once the CAT-800 decodes the macro number, the commands will execute in the order they were stored within the macro string. The CAT-800 supports forty user macros. If you clicked on the "Program User Macros" button at the top of the main editor window you will see a window similar to the one below. User macros use the same four digit internal commands as the event macros. The only difference is a DTMF control code is added. This is the code entered by the repeater user to execute the macro. This code can be from one to seven digits. When selecting this code make sure it does not conflict with an existing code in the system. Be sure and check mark the enable box. When finished click "OK".

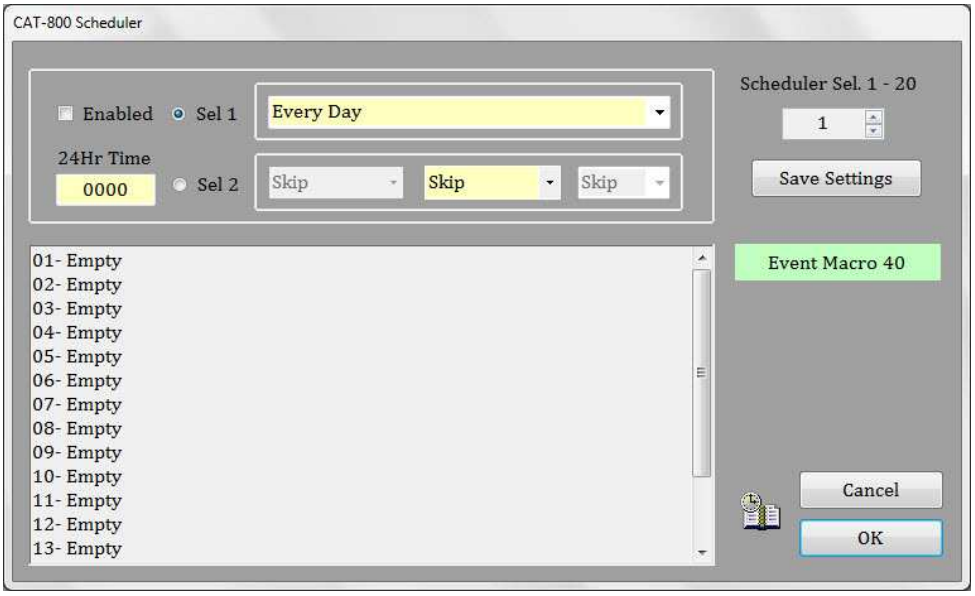


CAT-800 Paging Tones

If you clicked on the "Program Paging Tones" button at the top of the main editor window you will see a window similar to the one below. Use the arrow buttons to select the first and second tones. When finished click "Save Setting" and "OK".

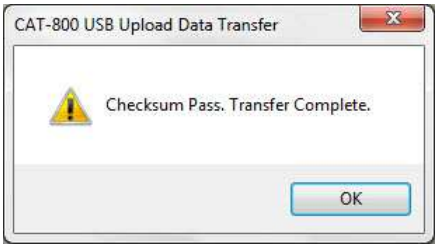


CAT-800 Scheduler clicked on the "Program Scheduler Position" button at the top of the main editor window you will see a window similar to the one below. Programming the scheduler is a two-step procedure. Each of the twenty table positions are directly linked to an event macro. Example scheduler position #1 is linked the event macro #40. In other words event macro 40 will execute and the time, day or date programmed in this window. Enter the time, day of week or day of month and month of year. Put a check mark in the enable box. Click the "Save Settings" button and click "OK".



CAT-800 Save File
Once you have finished preparing the program file click on the "Save Data To Hard Drive" button at the top of the main editor window. The "Save As" window will appear. Name the file and click on the "Save" button. Two files will be generated and saved on your hard drive as: yourname.ini. One file is used during an upload through the USB port while the other file is used during the upload through the Internet.

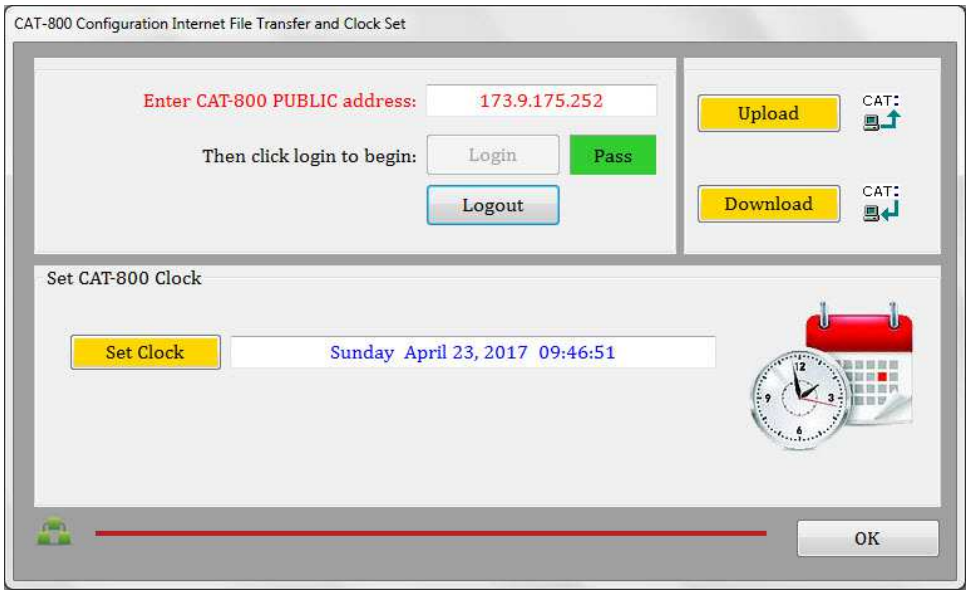
CAT-800 Upload Data USB Transfer
Connect a USB cable between the CAT-800 and your computer. Click the "CAT Up Arrow" button to transfer the configure file you prepared with the editor program into the memory of the CAT-800 controller



CAT-800 Download Data USB Transfer
You can also click the "CAT Down Arrow" button to transfer the configure file from the CAT-800 to the editor.

CAT-800 Configuration File Internet Transfer / Clock Set
If the CAT-800 is at a remote location you can transfer your configuration file through the Internet. Click the configuration file transfer button at the top of the main editor window. Enter the IP address in the window and click the Login button. A green Pass should appear. Click the Upload button to send your configuration data to the CAT-800 or click the Download button to receive the CAT-800's current configuration.

NOTE: To login, the user name and password in your current configuration file must be the same and the user name and password stored in the CAT800 controller.



NOTE: Internet communications between your computer and the CAT-800 uses port 1465 UDP. You will need to open this port on your router and computer's firewall protection program.

Set the CAT-800 Clock (Internet)
This window displays the time of your computer's clock. If the time is correct click the "Set Clock" button. When the button turns green the CAT-800's clock has been set.

CAT-800 Help
Click the HELP icon to display the event macro table, internal command table, voice message table and vocabulary word list. The internal commands are a series of four digit numbered commands used to program the CAT-800's User and Event Macro strings and the five hardware input switches.

Chapter 9 – Internet Control and Programming

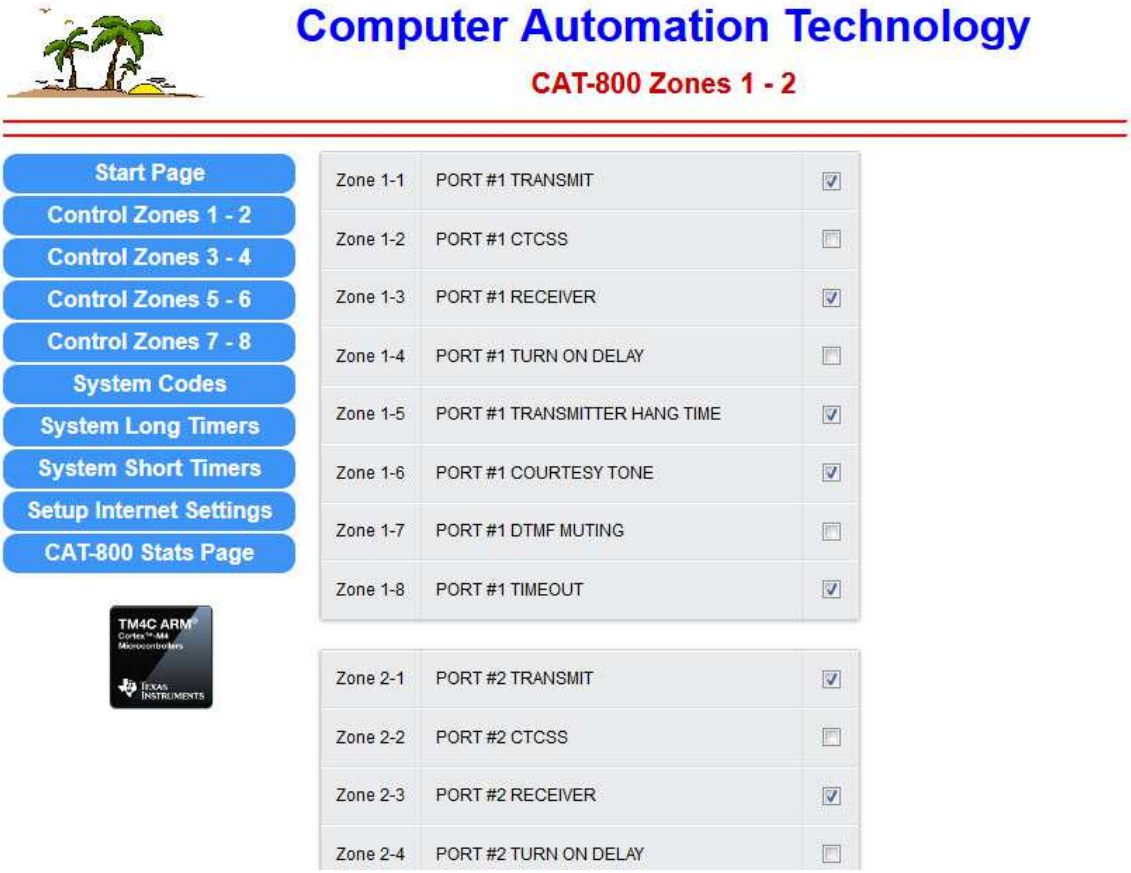
Connect the CAT-800 to a port on your router. Place the CAT-800's default IP address 192.168.1.245 in the address line of your browser. Press enter and the computer will display the CAT-800 Login page. The default Username and Password are case sensitive and are both **cat800.**

NOTE: Zone 9 Channel 1 must be enabled to communicate with the CAT-800 through the Ethernet.

CAT-800 Start Page
If the CAT-800 is connected to the internet, you can use the Internet browser in your computer, I-Phone or I-Pad to control, program and execute user macros, force voice messages and send paging tones. To execute one of the forty user macros enter the number into the cell and click [EXECUTE]. To send one of the twenty voice messages enter the voice message number and click [EXECUTE]. To send one of the twenty paging tones enter the paging tone number and click [EXECUTE]. Click the [EXECUTE] button to send the time of day. The CAT-800 will announce the time on the port #1 transmitter.

The CAT-800 also displays the software version, Internet connect time, microprocessor temperature, and which ports are linked. Buttons are provided to Load Factory defaults, reset the microcontroller and logout.

CAT-800 Zone Control Channels
The CAT-800 has nine zones of eight control channels each. Zones 1 through Zone 8 control various operation of the CAT-800 controller. Check the box to enable the control function or uncheck the box to disable the control function. Then go to the bottom of the page and click [SAVE SETTINGS]. The window below displays the first two of the eight control zones. Zone 9 is reserved for controlling Internet operation and is not displayed. See page 3-13 for more information about Zone 9.



1-1. Port #1 Transmitter Enable
When this box is checked the Port #1 PTT will be active. This channel must be enabled for normal repeater operation. The CAT-800 will continue to respond to control operator commands even when this box is unchecked. This channel will automatically be enabled after a dipswitch #7 initialization reset.

1-2. Port #1 CTCSS Enable
When this box is checked, in addition to a COR input, an input from a CTCSS decoder at J1-4 must also be present before Port #1 will activate. To prevent loss of control, DO NOT CHECK THIS BOX unless a working CTCSS decoder is connected to J1-4.

1-3. Port #1 Receiver Enable
When this box is checked the CAT-800 will respond to a RF input from the Port #1 receiver. When this channel is disabled the Port #1 transmitter will continue to operate by responding to RF inputs from the Port #2 and Port #3 receivers.

1-4. Port #1 Turn on Delay Enable
When this box is checked, a deliberate and sustained input on Port #1 must be present before the controller will respond. When the CAT-800 is initialized, this timer defaults to 1.0 seconds. This channel is useful during periods when noise bursts are present on the repeater input.

1-5. Port #1 Transmitter Hang Time Enable
When this box is checked, the Port #1 transmitter will have a hang-time subject to the settings of the COR Drop to Courtesy Beep Timer and the Courtesy Beep to PTT Drop Timer. At default these timers are set for one second and four seconds.

1-6. Port #1 Courtesy Tone Enable (Event Macro 20)
When this box is checked, a courtesy tone will occur when the COR signal is lost. To eliminate the courtesy tone, uncheck the box and click save. The timeout timer will continue to be reset.

1-7. Port #1 DTMF Muting Enable
When this box is checked, anytime a DTMF tone is received, the receive audio will be turned off to the Port #1 transmitter. The transmit audio will remain muted until a pre-determined time after the last DTMF tone is received. During the mute period, cover beeps are transmitted each second to indicate repeater activity. This feature prevents control commands from being repeated. It provides an extra measure of security. There may be times when it is desirable to temporarily pass DTMF tones through the repeater. Precede the DTMF string with a (#).

1-8. Port #1 Timeout Enable
When this box is checked, a continuous signal on the Port #1 input will cause Port #1 to turn off. The time-out period is user programmable. When the CAT-800 is initialized, this timer defaults to 3 minutes. When this box is unchecked, Port #1 will-not timeout.

2-1. Port #2 Transmitter Enable
When this box is checked the Port #2 transmitter will be active. This channel must be enabled for normal operation. The Port #2 receiver will continue to respond to control operator commands even when the box is unchecked. This channel will automatically be enabled after a dipswitch #7 initialization reset.

2-2. Port #2 CTCSS Enable
When this channel is enabled, in addition to a COR input, an input from a CTCSS decoder at J1-3 or J2-2 must also be present before Port #2 will activate. At default this input is set for "COR and CTCSS active high logic". NOTE: To prevent loss of control, DO NOT CHECK THIS BOX unless a working CTCSS decoder is connected to J1-3 or J2-2.

2-3. Port #2 Receiver Enable
When this channel is enabled the CAT-800 will respond to a RF input from the Port #2 receiver. When this channel is disabled the Port #2 transmitter will continue to operate by responding to RF inputs from the Port #1 and Port #3 receivers.

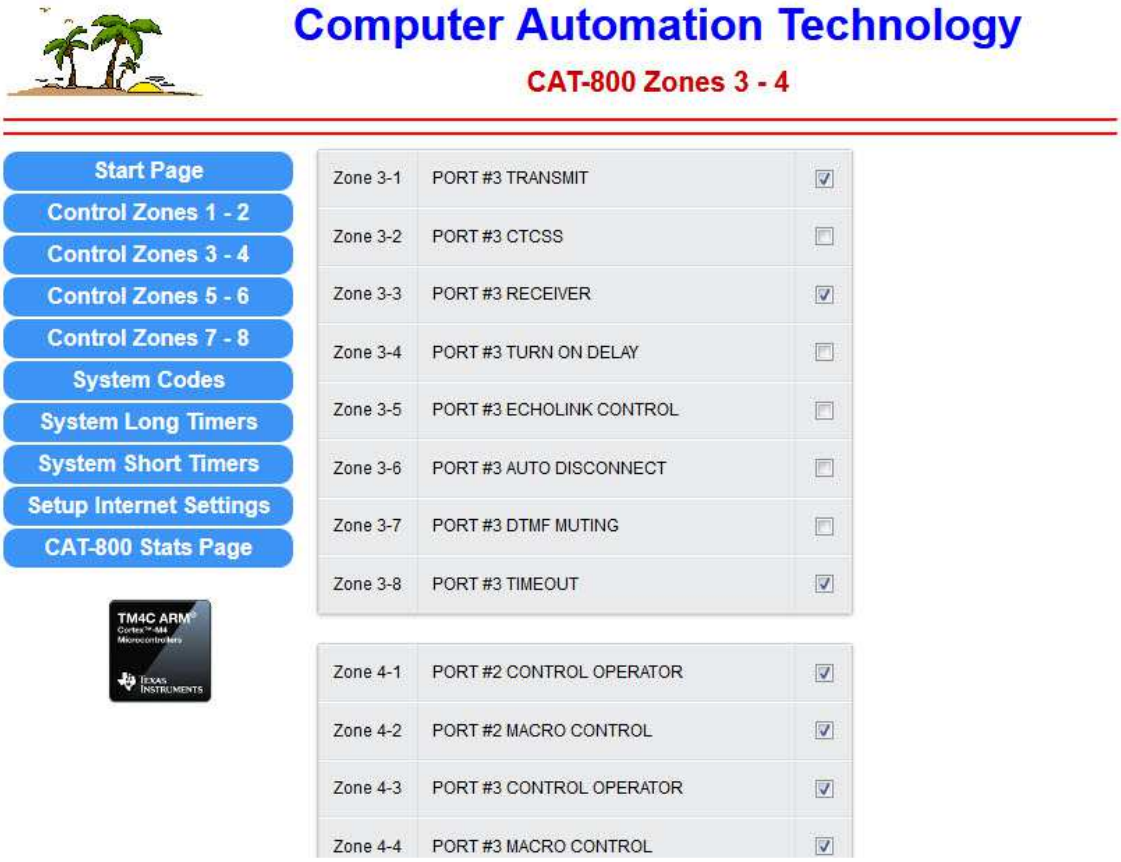
2-4. Port #2 Turn on Delay Enable
When this box is checked, a deliberate and sustained input on Port #2 must be present before the controller will respond. When the CAT-800 is initialized, this timer defaults to 1.0 seconds. This channel is useful during periods when noise bursts are present on the repeater input.

2-5. Echolink® Control Enable
When Port #2 is connected to Port #1 and DTMF Muting is enabled, a DTMF command entered through Port #1 will be muted on both the Port #1 and Port #2 transmit audios. When this box is checked, Port #2 transmit audio will be the actual DTMF command. The DTMF command will continue to be muted on the Port #1 transmit audio.

2-6. Port #2 Auto-Disconnect Enable (Event Macro #34)
When this box is checked, after a period of Port #2 inactivity the CAT-800 will execute event macro [34]. The default setting of event macro #34 will disconnect Port #2 from Port #1 and Port #3.

2-7. Port #2 DTMF Muting Enable
When this box is checked, anytime a DTMF tone is received, by the Port #2 receiver, the audio will be turned off to the Port #1 transmitter. The transmit audio will remain muted until a pre-determined time after the last DTMF tone is received. During the mute period, cover beeps are transmitted each second to indicate repeater activity. This feature prevents control commands from being repeated. It provides an extra measure of security.

2-8. Port #2 Timeout Enable
When the box is checked, a continuous signal on the Port #2 input will cause the repeater to turn off. The time-out period is user programmable. When the CAT-800 is initialized, this timer defaults to three minutes. When the box is not checked the repeater will-not timeout.



3-1. Port #3 Transmitter Enable
When this box is checked the Port #3 transmitter will be active. This channel must be enabled for normal operation. The Port #3 receiver will continue to respond to control operator commands even when the box is unchecked. This channel will automatically be enabled after a dipswitch #7 initialization reset.

3-2. Port #3 CTCSS Enable
When the box is checked, in addition to a COR input, an input from a CTCSS decoder at J3-2 must also be present before Port #3 will activate. At default this input is set for "COR and CTCSS active high logic". NOTE: To prevent loss of control, DO NOT ENABLE THIS CHANNEL unless a working CTCSS decoder is connected to J3-2.

3-3. Port #3 Receiver Enable
When the box is checked the CAT-800 will respond to a RF input from the Port #3 receiver. When the box is unchecked the Port #3 transmitter will continue to operate by responding to RF inputs from the Port #1 and Port #2 receivers.

3-4. Port #3 Turn on Delay Enable
When the box is checked, a deliberate and sustained input on Port #3 must be present before the controller will respond. When the CAT-800 is initialized, this timer defaults to 1.0 seconds. This channel is useful during periods when noise bursts are present on the repeater input.

3-5. Echolink® Control Enable
When Port #3 is connected to Port #1 and DTMF Muting is enabled, a DTMF command entered through Port #1 will be muted on both the Port #1 and Port #3 transmit audios. When the box is checked, Port #3 transmit audio will be the actual DTMF command. The DTMF command will continue to be muted on the Port #1 transmit audio.

3-6. Port #3 Auto-Disconnect Enable (Event Macro 35)
When the box is checked, after a period of Port #3 inactivity determined by the setting of the Auto Disconnect timer, the CAT-800 will execute event macro [35]. The default setting of event macro #35 will disconnect Port #3 from Port #1 and Port #2.

3-7. Port #3 DTMF Muting Enable
When the box is checked, anytime a DTMF tone is received by the Port #3 receiver, the audio will be turned off to the repeater's transmitter. The transmit audio will remain muted until a pre-determined time after the last DTMF tone is received. During the mute period, cover beeps are transmitted each second to indicate repeater activity. This feature prevents control commands from being repeated. It provides an extra measure of security. There may be times when it is desirable to temporarily pass DTMF tones through the repeater. Precede the DTMF string with a (#).

3-8. Port #3 Timeout Enable
When the box is checked, a continuous signal on the Port #3 input will cause the repeater to turn off. The time-out period is user programmable. When the CAT-800 is initialized, this timer defaults to three minutes. When the box is not checked the repeater will-not timeout.

Zone 4 Control Channels

4-1. Port #2 Control Operator Enable
When the box is checked, the CAT-800 will accept control operator commands to change the settings of the zone channels from the Port #2 receiver. The default Port #2 Control Operator code is [200].

4-2. Port #2 Macro Enable
When the box is checked, the CAT-800 will accept user macro commands from the Port #2 receiver.

4-3. Port #3 Control Operator Enable
When the box is checked, the CAT-800 will accept control operator commands to change the settings of the zone channels from the Port #3 receiver. The default Port #3 Control Operator code is [300].

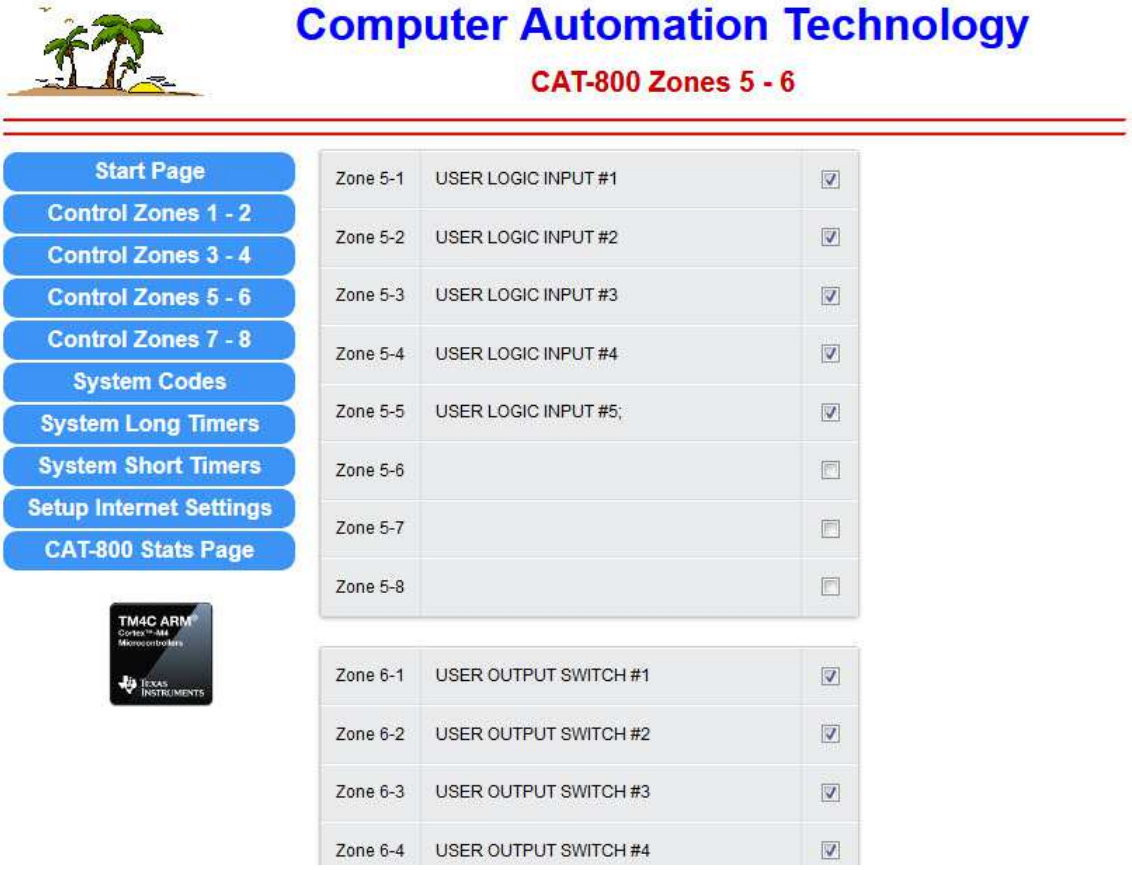
4-4. Port #3 Macro Enable
When the box is checked, the CAT-800 will accept user macro commands from the Port #3 receiver.

4-5. Scheduler Enable
When the box is checked, all action by the scheduler will be executed per the times programmed in the scheduler table. There may be times, during emergency net operations, when it is not desirable to have channels change automatically. To suspend scheduler operation, uncheck the box.

4-6. Reserved

4-7. Grandfather Clock Enable (Event Macro 33)
When the box is checked, the CAT-800 will announce the time of day every hour on the hour. This channel enables the Grandfather Clock Event Macro #33, which sends voice message 8 on the repeater's transmitter.

4-8. Grandfather Clock Sleep Mode Enable
It may be desirable to suspend the grandfather clock operation during the early morning hours. When the box is checked, the last announcement will be at 11:00 PM. Time announcements will resume at 7:00 AM the next morning.



5-1. User Logic Input #1 Enable (Event Macros 07 and 08)
When the box is checked, a transition from low to high on connector J1-1 will execute event macro #07 while a transition from high to low will execute event macro #08.

5-2. User Logic Input #2 Enable (Event Macros 09 and 10)
When the box is checked, a transition from low to high on connector J1-2 will execute event macro #09 while a transition from high to low will execute event macro #10.

5-3. User Logic Input #3 Enable (Event Macros 11 and 12)
When the box is checked, a transition from low to high on connector J1-21 will execute event macro #11 while a transition from high to low will execute event macro #12.

5-4. User Logic Input #4 Enable (Event Macros 13 and 14)
When the box is checked, a transition from low to high on connector J1-22 will execute event macro #13 while a transition from high to low will execute event macro #14.

5-5. User Logic Input #5 Enable (Event Macros 15 and 16)
When the box is checked, a transition from low to high on connector J1-24 will execute event macro #15 while a transition from high to low will execute event macro #16.

6-1. USER Output Switch #1 Enable
When this box is checked, switch #1 will perform per its pre-defined function. Connector J1-14 or J2-6 will sink 150 MA to ground. At default this switch is defined as a remote controlled switch and is controlled by user macros 10 and 11. To turn switch #1 on go to the START PAGE and enter 10 in the Execute User Macro box and click the EXECUTE button. To turn Switch #1 off enter 11 in the box and click EXECUTE.

6-2. USER Output Switch #2 Enable
When this box is checked, switch #2 will perform per its pre-defined function. Connector J1-15 or J2-7 will sink 150 MA to ground. At default this switch is defined as a remote controlled switch and is controlled by user macros 12 and 13. To turn switch #2 on go to the START PAGE and enter 12 in the Execute User Macro box and click the EXECUTE button. To turn Switch #2 off enter 13 in the box and click EXECUTE.

6-3. USER Output Switch #3 Enable
When this box is checked, switch #3 will perform per its pre-defined function. Connector J1-19 or J2-6 will sink 150 MA to ground. At default this switch is defined as a remote controlled switch and is controlled by user macros 14 and 15. To turn switch #3 on go to the START PAGE and enter 14 in the Execute User Macro box and click the EXECUTE button. To turn Switch #3 off enter 15 in the box and click EXECUTE.

6-4. USER Output Switch #4 Enable
When this box is checked, switch #4 will perform per its pre-defined function. Connector J1-20 or J2-7 will sink 150 MA to ground. At default this switch is defined as a remote controlled switch and is controlled by user macros 16 and 17. To turn switch #4 on go to the START PAGE and enter 16 in the Execute User Macro box and click the EXECUTE button. To turn Switch #4 off enter 17 in the box and click EXECUTE.

6-5. USER Output Switch #5 Enable
When this box is checked, switch #5 will perform per its pre-defined function. Connector J1-5 will sink 150 MA to ground. At default this switch is defined as a remote controlled switch and is controlled by user macros 18 and 19. To turn switch #5 on go to the START PAGE and enter 18 in the Execute User Macro box and click the EXECUTE button. To turn Switch #5 off enter 19 in the box and click EXECUTE.

Computer Automation Technology

CAT-800 Zones 7 - 8

Zone 7-1	REPEATER VOICE ID	☑
Zone 7-2	REPEATER CW ID	☑
Zone 7-3	TRANSMITTER TURN OFF MESSAGE #1	☐
Zone 7-4	TRANSMITTER TURN OFF MESSAGE #2	☐
Zone 7-5	TIMED MESSAGE #1	☐
Zone 7-6	TIMED MESSAGE #2	☐
Zone 7-7	TIMED MESSAGE #3	☐
Zone 7-8	TIMED MESSAGE #4	☐

Zone 8-1	FORCED DTMF ENTRY (ALL PORTS)	☑
Zone 8-2	DTMF ACCESS (ALL PORTS)	☐
Zone 8-3	TIME-OF-DAY REQUEST (ALL PORTS)	☑
Zone 8-4	DTMF KEYPAD TEST (ALL PORTS)	☑

7-1. Repeater Voice ID Enable (Event Macro 17)
When the box is checked, the CAT-800 will execute Event Macro 17 identifying the repeater's transmitter in voice. Voice message #1 is assigned as the default message.

7-2. Repeater CW ID Enable (Event Macro 19)
When the box is checked, the CAT-800 will execute Event Macro 19 identifying the repeater's transmitter in CW by sending the CW buffer.

7-3. Transmitter Turn Off Message #1 Enable (Event Macro 27)
When the box is checked, the transmitter drop out message #1 will occurs when a repeater user un-keys their transmitter. This message will repeat subject to the setting of the turn off message timer.

7-4. Transmitter Turn Off Message #2 Enable (Event Macro 28)
When the box is checked, the transmitter drop out message #2 will occur just before the repeater transmitter turns off. This message will repeat subject to the setting of the turn off message timer.

7-5. Timed Message #1 Enabled (Event Macro 29)
When the box is checked, timed voice message #1 will occur on a regular schedule subject to the setting of the timed message #1 timer and event macro #29. This message will consist of up to 15 words selected from the voice vocabulary table.

7-6. Timed Message #2 Enabled (Event Macro 30)
When the box is checked, timed voice message #2 will occur on a regular schedule subject to the setting of the #2 timer and event macro #30. This message will consist of up to 15 words selected from the voice vocabulary table.

7-7. Timed Message #3 Enabled (Event Macro 31)
When the box is checked, timed voice message #3 will occur on a regular schedule subject to the setting of the #3 timer and event macro #31. This message will consist of up to 15 words selected from the voice vocabulary table.

7-8. Timed Message #4 Enabled (Event Macro 32)
When the box is checked, timed voice message #4 will occur on a regular schedule subject to the setting of the timed message #4 timer and event macro #32. This message will consist of up to 15 words selected from the voice vocabulary table.

8-1. Forced DTMF Entry D Key Enable (ALL PORTS)
When the box is checked it is possible to force a DTMF command even while the port is active. To force a DTMF command, end the command with a [D].

8-2. DTMF Access Enable (ALL PORTS)
When the box is checked, the repeater will go to sleep and not respond to normal inputs. If a repeater user enters the default DTMF Access number [325] the repeater will wake-up and continue to operate until a period of inactivity occurs determined by the sleep timer.

8-3. Time of Day Request Enable (ALL PORTS)
When the box is checked, repeater users can request the time of day by entering the default time of day request number [400].

8-4. DTMF Keypad Test (ALL PORTS)
When the box is checked, a repeater user is able to perform a test of their radio's 12 or 16-button keypad. Enter the default keypad test number [475] followed by each of the keypad digits. As the numbers are being decoded, they are stored in memory. When the user stops transmitting the controller will read back all the numbers that were decoded. The Forced DTMF Entry key is defaulted to the [D] key. It must be entered last and it will not read back during the keypad test.

8-5. Voice Demo Request Enable (ALL PORTS)
When the box is checked, repeater users can play any of the twenty voice synthesizer messages. Enter the voice demo request number [700] followed by the two-digit message number.

8-6. Two Tone Sequential Paging Enable (ALL PORTS)
When the box is checked, a repeater user can transmit a two-tone page. The first tone will be on for one second while the second tone will be on for three seconds. Memory space is provided for twenty paging tones. Enter the default paging tone request number [650] followed by the desired two-digit paging tone table position.

8-7. Digital Audio WAV Player (ALL PORTS)
When this channel is enabled, a repeater user can play digital audio tracks. Memory space is provided for thirty tracks. Enter the digital audio WAV player request number [725] followed by the two-digit track number. Digital audio tracks can also be integrated into user and event macros.

8-8. Reserved

CAT-800 System Codes
You can change any of the CAT-800 control or unlock codes by changing the codes in the appropriate boxes and clicking [SAVE SETTINGS] at the bottom of the page. These numbers can be from one to seven digits and will change to a default value when the CAT-800 is powered up with dipswitch #7 set to the on position. NOTE: The primary unlock number must be seven digits.

Computer Automation Technology

CAT-800 System Codes

- Start Page
- Control Zones 1 - 2
- Control Zones 3 - 4
- Control Zones 5 - 6
- Control Zones 7 - 8
- System Codes
- System Long Timers
- System Short Timers
- Setup Internet Settings
- CAT-800 Stats Page

CONTROL OPERATOR NUMBER PORT #1	100
CONTROL OPERATOR NUMBER PORT #2	200
CONTROL OPERATOR NUMBER PORT #3	300
DTMF ACCESS CODE	325
TIME OF DAY REQUEST NUMBER	400
DTMF PAD TEST NUMBER	475
LOAD COURTESY TONE NUMBER	600
PAGING TONE DEMO NUMBER (01 – 20)	650
VOICE MESSAGE DEMO NUMBER (01 - 20)	700
PLAY WAV TRACK DEMO NUMBER (01 - 30)	725
PRIMARY UNLOCK NUMBER	1234567

Control Operator Prefix Number Port #1
This number must precede the command to change the zone control functions through the Port #1 receiver.

Control Operator Number Port #2
This number must precede the command to change the zone control functions through the Port #2 receiver.

Control Operator Number Port #3
This number must precede the command to change the zone control functions through the Port #3 receiver.

DTMF Access Code
This number must be entered to activate the repeater when DTMF access is enabled. When the repeater is in the DTMF Access Mode it will not respond to a COR CTCSS input. The repeater user must enter the DTMF access number to activate the repeater. When the repeater returns to rest for a period determined by the sleep timer, this number must be re-entered to activate the repeater.

Time Of Day Request Code
This number must be entered to request the time of day announcement.

DTMF Pad Test Number
This number must be entered to initiate a DTMF keypad test.

Select Courtesy Tone Control Number
This number must be entered to load a Courtesy Tone.

Paging Tone Control Number
This number must be entered to PLAY one of the paging tones. This number must precede the two-digit paging tone table position number.

Paging Tone Control Number
This number must be entered to PLAY one of the paging tones. This number must precede the two-digit paging tone table position number.

Voice Demonstration Control Number
This number must be entered to PLAY one of the voice messages. This number must precede the two-digit voice message number.

Play Digital Audio WAV Track Control Number
This number must be entered to PLAY one of the digital audio tracks. This number must precede the two-digit track number.

Primary Unlock Number
This number must be entered to unlock the CAT-800 and place it in the programming mode for over the air DTMF programming. The Primary Unlock number must be seven digits.

Secondary Unlock Number
This number must be entered to unlock the CAT-800 and place it in the programming mode for over the air DTMF programming. This number is not restricted to a seven-digit number.

CAT-800 Long Timers
You can change any of the CAT-800 Long Timer settings by changing the time in the appropriate boxes and clicking [SAVE SETTINGS] at the bottom of the page. When the CAT-800 is initialized, these timers are automatically loaded with default values.

Computer Automation Technology

CAT-800 System Long Timers

- Start Page
- Control Zones 1 - 2
- Control Zones 3 - 4
- Control Zones 5 - 6
- Control Zones 7 - 8
- System Codes
- System Long Timers
- System Short Timers
- Setup Internet Settings
- CAT-800 Stats Page

PORT #1 TIME-OUT TIMER (60 - 1799 SECONDS)	180
PORT #2 TIME-OUT TIMER (60 - 1799 SECONDS)	180
PORT #3 TIME-OUT TIMER (60 - 1799 SECONDS)	180
SYSTEM ID TIMER (60 - 1799 SECONDS)	480
PORT #2 INACTIVITY DISCONNECT TIMER (60 – 1799 SECONDS)	600
PORT #3 INACTIVITY DISCONNECT TIMER (60 – 1799 SECONDS)	600
TIMED MESSAGE #1 TIMER (60 - 1799 SECONDS)	300
TIMED MESSAGE #2 TIMER (60 - 1799 SECONDS)	600
TIMED MESSAGE #3 TIMER (60 - 1799 SECONDS)	900
TIMED MESSAGE #4 TIMER (60 - 1799 SECONDS)	1200
PTT OFF MESSAGE #1 TIMER (60 - 1799 SECONDS)	1799

Port #1 Timeout Timer
This timer limits the time a signal can appear on the Port #1 receiver input. If this time limit is exceeded the controller will turn off the transmitter. This timer is programmable between 60 and 1799 seconds. When the CAT-800 is initialized this timer defaults to 180 seconds.

Port #2 Timeout Timer
This timer limits the time a signal can appear on the Port #2 receiver input. If this time limit is exceeded the controller will turn off the transmitter. When the CAT-800 is initialized this timer defaults to 180 seconds.

Port #3 Timeout Time
This timer limits the time a signal can appear on the Port #3 receiver input. If this time limit is exceeded the controller will turn off the transmitter. When the CAT-800 is initialized this timer defaults to 180 seconds.

System ID Timer
This timer sets the time between ID transmissions. The ID occurs when a repeater user stops transmitting. This timer is programmable between 60 and 1799 seconds. The timer default is 480 seconds.

Port #2 Inactivity Disconnect Timer
This timer determines how long Port #2 remains inactive before event macro 38 executes. Control Zone 2 Channel 6 must be enabled. This timer is programmable between 60 and 1799 seconds. The timer default is 600 seconds.

Port #3 Inactivity Disconnect Timer
This timer determines how long Port #3 remains inactive before event macro 39 executes. Control Zone 3 Channel 6 must be enabled. This timer is programmable between 60 and 1799 seconds. The timer default is 600 seconds.

Timed Message #1 Timer
This timer sets the timed message repeat period. This timer is programmable between 1.0 and 1799 seconds. The timer default is 300 seconds.

Timed Message #2 Timer
This timer sets the timed message repeat period. This timer is programmable between 1.0 and 1799 seconds. The timer default is 600 seconds.

Timed Message #3 Timer
This timer sets the timed message repeat period. This timer is programmable between 1.0 and 1799 seconds. The timer default is 900 seconds.

Timed Message #4 Timer
This timer sets the timed message repeat period. This timer is programmable between 1.0 and 1799 seconds. The timer default is 1200 seconds.

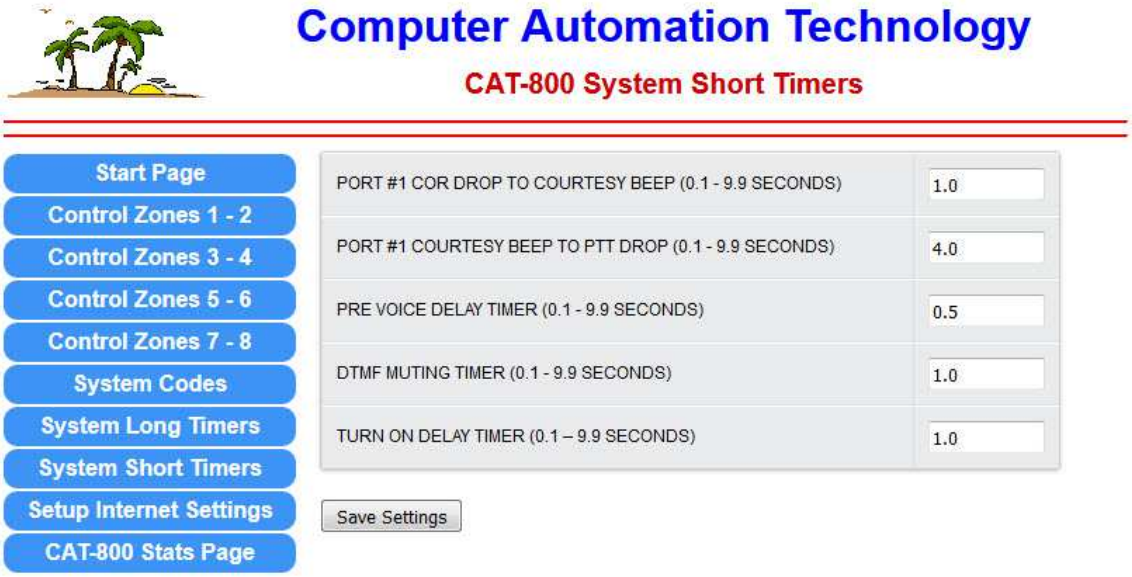
PTT Off Message #1 Timer
This timer sets the time between transmissions of the squelch tail message. The message occurs when a repeater user stops transmitting. This timer is programmable between 1.0 and 1799 seconds. The timer default is 1799 seconds.

PTT Off Message #2 Timer
This timer sets the time between transmissions of the drop out message. The message occurs when a repeater stops transmitting. This timer is programmable between 1.0 and 1799 seconds. The timer default is 1799 seconds.

DTMF Programming Length Timer
During the programming mode, this timer determines the maximum time the controller remains unlocked. This timer is programmable between 60 and 1799 seconds. When initialize, this timer will default to 600 second.

DTMF Access Sleep Timer
This timer determines the time required for the repeater to be at rest before the DTMF access code is required to activate the repeater. This timer is programmable between 60 and 1799 seconds. The timer default is 60 seconds.

CAT-800 Short Timers
You can change any of the CAT-800 Short Timer settings by changing the time in the appropriate boxes and clicking [SAVE SETTINGS] at the bottom of the page. When the CAT-800 is initialized, these timers are automatically loaded with default values.



COR Drop to Courtesy Beep Timer
This timer determines the time between loss of COR and generation of the courtesy beep. This timer is programmable between 0.1 and 9.9 seconds. When initialize, this timer defaults to 1 second.

Courtesy Beep to PTT Drop Timer
This timer determines the time between the generation of the courtesy beep and the time the repeater transmitter turns off. This timer is programmable between 0.1 and 9.9 seconds. The timer default is 4 seconds.

Pre-Voice Delay Timer
This timer determines the time after PTT goes active and the voice synthesizer begins to speak. This timer is programmable between 0.1 and 9.9 seconds. The timer default is 0.5 seconds.

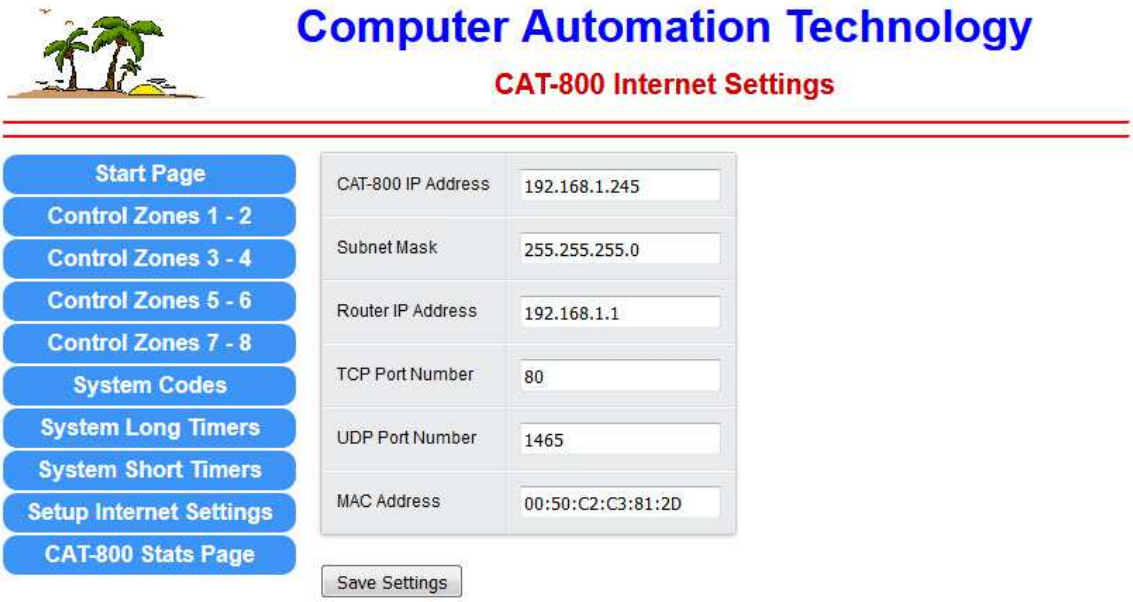
DTMF Muting Timer
This timer determines the time the transmit audio will continue to be muted after the entry of the last DTMF tone. When initialize, this timer defaults to 1 second.

Turn on Delay Timer
When the repeater is at rest, this timer sets the time COR must be present before the repeater will activate. This timer is programmable between 0.1 and 9.9 seconds. When initialize this timer will default to 1.0 seconds. This timer also sets the turn on delay time for the Port #2 and Port #3 inputs.

CAT-800 Internet Settings

This page displays the IP address, Subnet Mask, Router IP Address, UDP and TCP Port numbers. The MAC Address is assigned to every piece of equipment that connects to the Internet. This number cannot be changed and is the electronic serial number for your CAT-800 controller. If necessary, use this web page to change the IP address, Router address or Port numbers.

NOTE: If you change any information on this page when you click "Save Settings" communication with the CAT-800 will be lost.



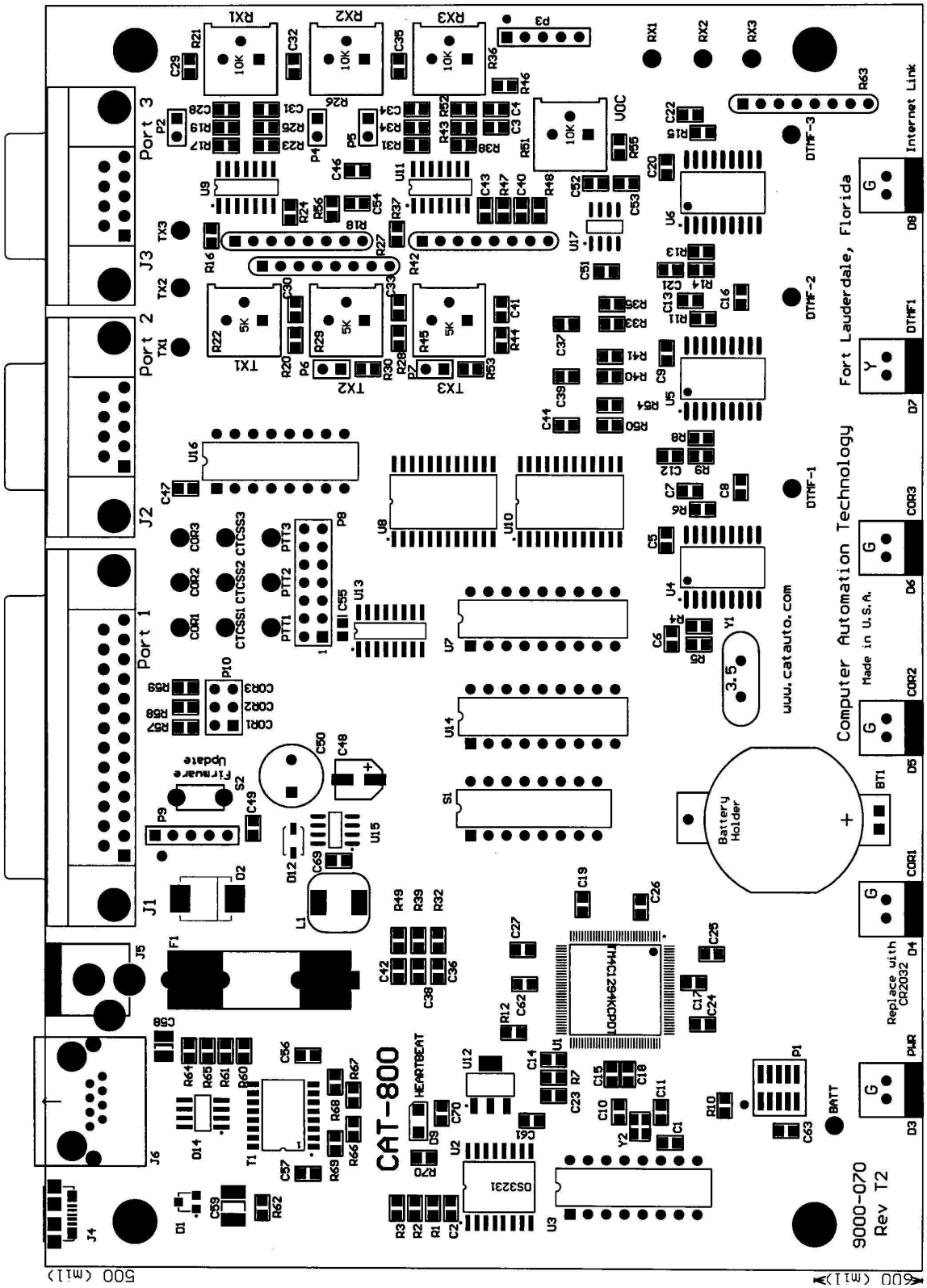
Chapter 10 - Voice Vocabulary

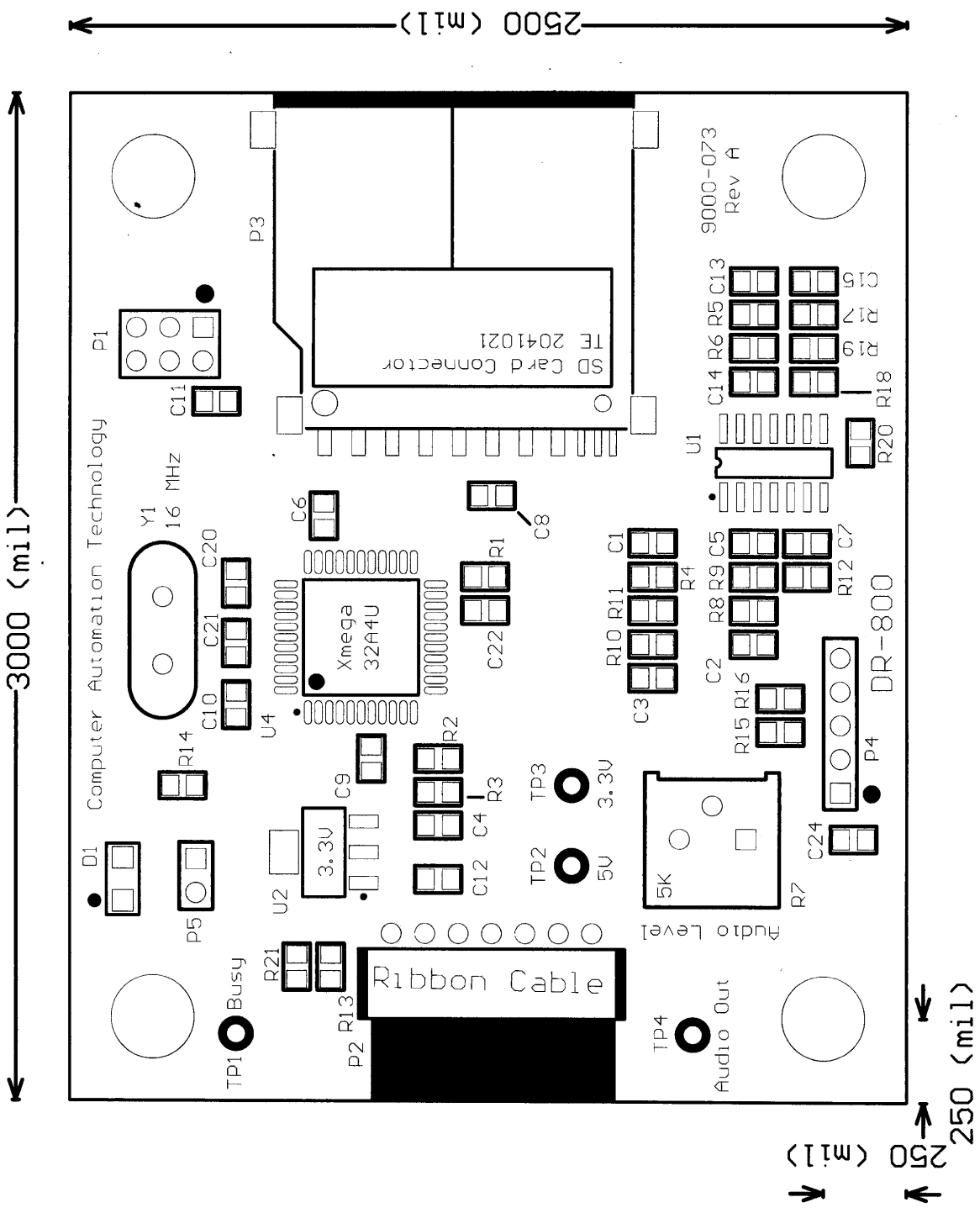
Zero	000	Back	251	Evacuation	349	It	483
One	001	Band	252	Exit	350	Index	486
Two	002	Base	253	Expect	351	**J**	500
Three	003	Battery	254	**F**	370	January	501
Four	004	Below	255	Fail	371	Juliet	502
Five	005	Between	256	Failure	372	July	503
Six	006	Bravo	257	Fahrenheit	373	June	504
Seven	007	Break	258	Fast	374	**K**	530
Eight	008	Button	259	February	375	Key	531
Nine	009	By	260	Feet	376	Keypad	532
Ten	010	**C**	270	File	378	Kilo	533
Eleven	011	Calibrate	271	Filed	379	Knots	534
Twelve	012	Call	272	Final	380	**L**	550
Thirteen	013	Calling	273	Fire	381	Land	551
Fourteen	014	Cancel	274	Flag	382	Last	552
Fifteen	015	Cat	275	Fog	383	Late	553
Sixteen	016	Caution	276	For	384	Left	554
Seventeen	017	Center	277	Foxhunt	385	Less than	555
Eighteen	018	Celsius	278	Foxtrot	386	Let	556
Nineteen	019	Change	279	Freezing	387	Level	557
Twenty	020	Charlie	280	Frequency	388	Light	558
Thirty	030	Check	281	Friday	389	Lima	559
Forty	040	Circuit	282	From	390	Line	560
Fifty	050	Clear	283	Front	391	Link	561
Sixty	060	Clock	284	Full	392	List	562
Seventy	070	Closed	285	Fall	393	Load	563
Eighty	080	Club	286	**G**	410	Lock	564
Ninety	090	Code	287	Gear	411	Lockout	565
A	210	Come	288	Get	412	Long	566
A.M.	211	Complete	289	Go	413	Look	567
Abort	212	Completed	290	Golf	414	Low	568
About	213	Computer	291	Good	415	Lower	569
Above	214	Condition	292	Green	416	**M**	580
Acknowledge	215	Congratulation	293	Ground	417	Machine	581
Action	216	Connect	294	**H**	440	Macro	582
Adjust	217	Contact	295	Hail	441	Make	583
Advise	218	Control	296	Half	442	Malfunction	584
Aerial	219	Current	297	Ham	443	Manual	585
Affirmative	220	Cycle	298	Hamfest	444	Many	586
Again	221	Calm	299	Have	445	March	587
Air	222	**D**	310	Hazardous	446	May	588
Alert	223	Danger	311	Heavy	447	Mayday	589
All	224	Data	312	Henry	448	Me	590
Alpha	225	Date	313	Hertz	449	Measure	591
Alternate	226	Day	314	High	450	Measured	592
Altitude	227	Days	315	Hold	451	Meeting	593
Amateur	228	December	316	Home	452	Mega.	594
Amps	229	Decrease	317	Hotel	453	Message	595
An	230	Degree	318	Hour	454	Meter	596
And	231	Delay	319	Hours	455	Meters	597
Answer	232	Delta	320	Hundred	456	Micro	598
April	233	Department	321	Heat	457	Mike	599
Are	234	Direction	322	**I**	470	Miles	600
Area	235	Do	323	Ice	471	Milli	601
As	236	Down	324	Icing	472	Million	602
Assistance	237	Drizzle	325	Identify	473	Minus	603
Association	238	Due	326	Immediately	474	Minute	604
At	239	Dynamic	327	In	475	Minutes	605
Attempt	240	**E**	340	Inch	484	Mobile	606
Attention	241	East	341	Inches	485	Modified	607
August	242	Echo	342	Increase	476	Monday	608
Automatic	243	Ed (suffix)	343	India	477	Month	609
Autopatch	244	Emergency	344	Information	478	More than	610
Auxiliary	245	End	345	Ing (suffix)	479	Move	611
Avenue	246	Enter	346	Inputs	480	Much	612
Average	247	Equals	347	Intruder	481	**N**	620
B	250	Error	348	Is	482	Near	621

Negative	622	Repair	744	Transmitter	847	Tic	971
Net	623	Repeat	745	Try	848	Laughter	972
New	624	Repeater	746	Tuesday	849		
Next	625	Reset	747	Turn	850	Female	
Night	626	Rig	748	Type	851	Good Morning	980
No	627	Right	749	Today's	852	Good Afternoon	981
Normal	628	Road	750	Tone	854	Good Evening	982
North	629	Roger	751	**U**	870		
Not	630	Romeo	752	Uniform	871	Time Variables	
November	631	Route	753	Unit	872	Time of Day	100
Now	632	**S**	770	Unlimited	873	Day of Week	101
Number	633	Safe	771	Until	874	Day and Month	102
O	650	Saturday	772	Up	875	Salutation	103
O'clock	651	Scattered	773	Use(noun)	876	Year	104
October	652	Seconds	774	Use(verb)	877		
Of	653	Security	775	**V**	880	**Play CW Buffer**	
Off	654	Select	776	Variable	881	CW Buffer	180
Ohms	655	Send	777	Verify	882		
On	656	Sent	778	Version	883	**User Switch Control**	
Open	657	September	779	Victor	884	500mS Delay	150
Operation	658	Sequence	780	Volts	885	UF #1 Off	151
Operator	659	Service	781	**W**	890	UF #1 On	152
Or	660	Set	782	Wait	891	UF #1 (250mS)	153
Organization	661	Severe	783	Warning	892	UF #1 (500mS)	154
Oscar	662	Short	784	Watch	893	UF #2 Off	155
Other	663	Showers	785	Watts	894	UF #2 On	156
Out	664	Shut	786	Way	895	UF #2 (250mS)	157
Over	665	Side	787	Weather	896	UF #2 (500mS)	158
Overcast	666	Sierra	788	Wednesday	897	UF #3 Off	159
P	680	Sleet	789	Week	898	UF #3 On	160
P.M.	681	Slow	790	Weekday	899	UF #3 (250mS)	161
Papa	682	Snow	791	Welcome	900	UF #3 (500mS)	162
Pass	683	South	792	Well Done	901	UF #4 Off	163
Patch	684	Speed	793	West	902	UF #4 On	164
Per	685	Squawk	794	What	903	UF #4 (250mS)	165
Phone	686	Star	795	Whiskey	904	UF #4 (500mS)	166
Pico	687	Start	796	Will	905	UF #5 Off	167
Plan	688	Stop	797	Wind	906	UF #5 On	168
Please	689	Storm	798	Windows	907	UF #5 (250mS)	169
Plus	690	Sunday	799	With	908	UF #5 (500mS)	170
Point	691	Switch	800	Wrong	909		
Police	692	System	801	Wind Chill	910		
Position	693	S (plural)	802	**X**	920		
Pound	694	**T**	820	X-Ray	921		
Power	695	Tango	821	**Y**	930		
Practice	696	Target	822	Yankee	931		
Preset	697	Telephone	823	Year	932		
Press	698	Temperature	824	Yellow	933		
Program	699	Terminal	825	Yes	934		
Pull	700	Test	826	Yesterday	935		
Push.	701	Than	827	You	936		
Put	702	Thank-You	828	Your	937		
Percent	703	That	829	**Z**	950		
Pressure	704	The (short E)	830	Zed	951		
Q	720	The (long E)	831	Zero	952		
Quebec	721	Then	832	Zone	953		
R	730	This	833	Zulu	954		
Radio	731	This-is	834				
Radios.	732	Thousand	835	Pause 1	960		
Rain	733	Thunderstorm	836	Pause 2	961		
Raise	734	Thursday	837	Pause 3	962		
Range	735	Time.	838	Pause 4	963		
Rate	736	Timer	839				
Ready	737	Today	840	Sound Effects			
Receive	738	Tomorrow	841	Chime 1	964		
Receiver	739	Tonight	842	Chime 2	965		
Red	740	Tornado	843	Chime 3	966		
Release	741	Tower	844	Gunshot	967		
Remark	742	Traffic	845	Laser	968		
Remote	743	Transmit	846	Phaser	969		

Chapter 11 Drawings

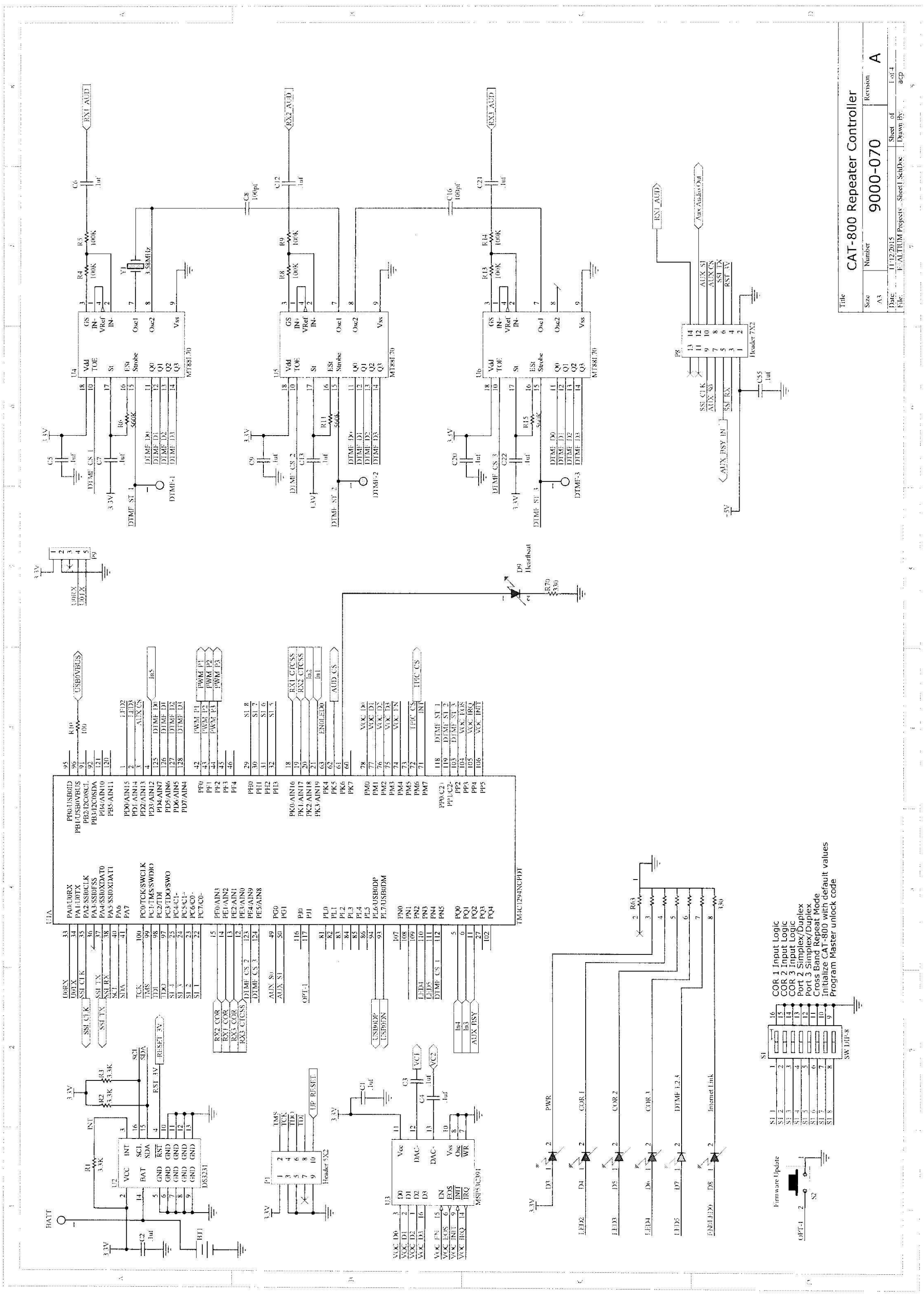
CAT-800 Repeater Controller Board

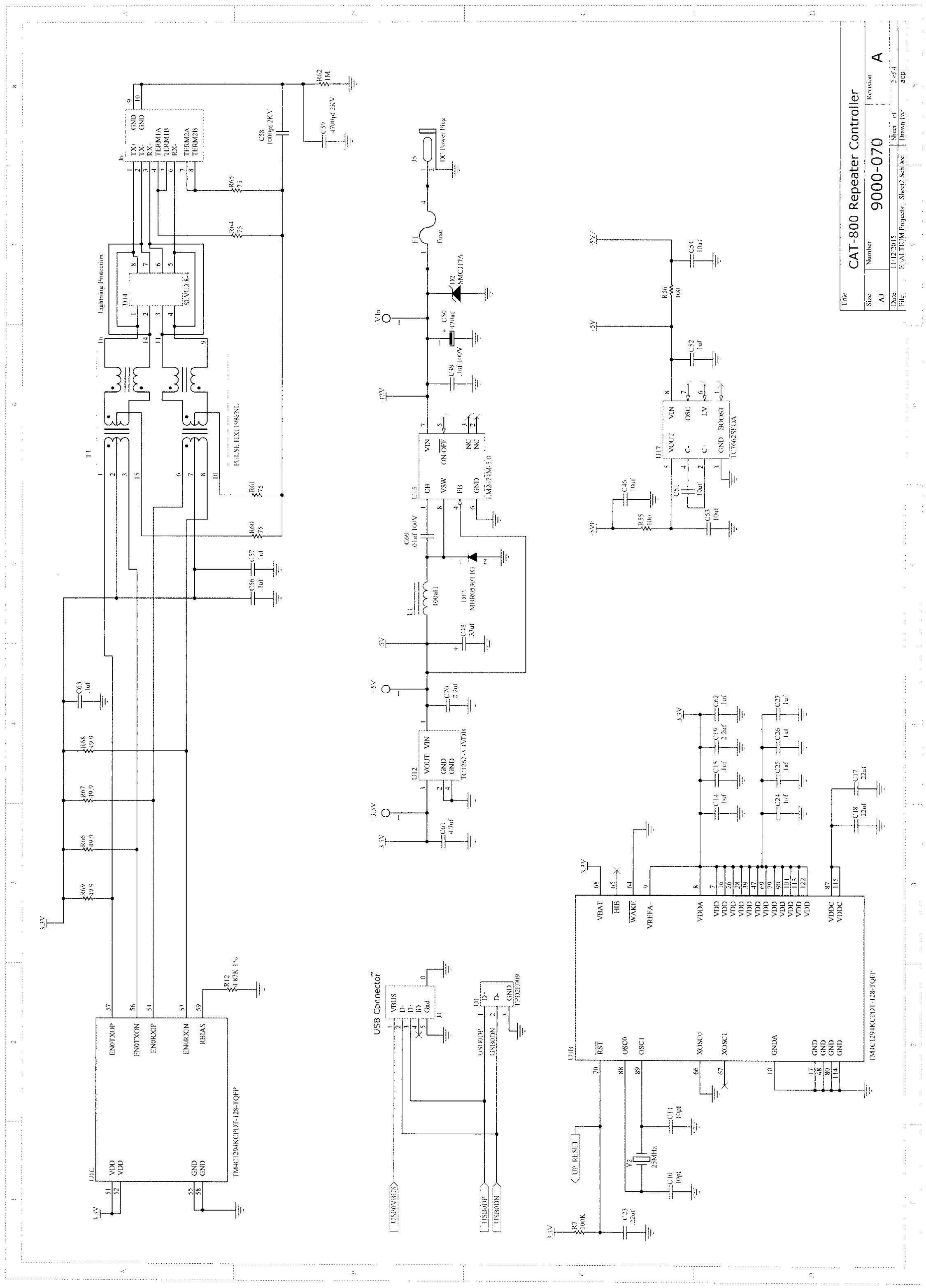


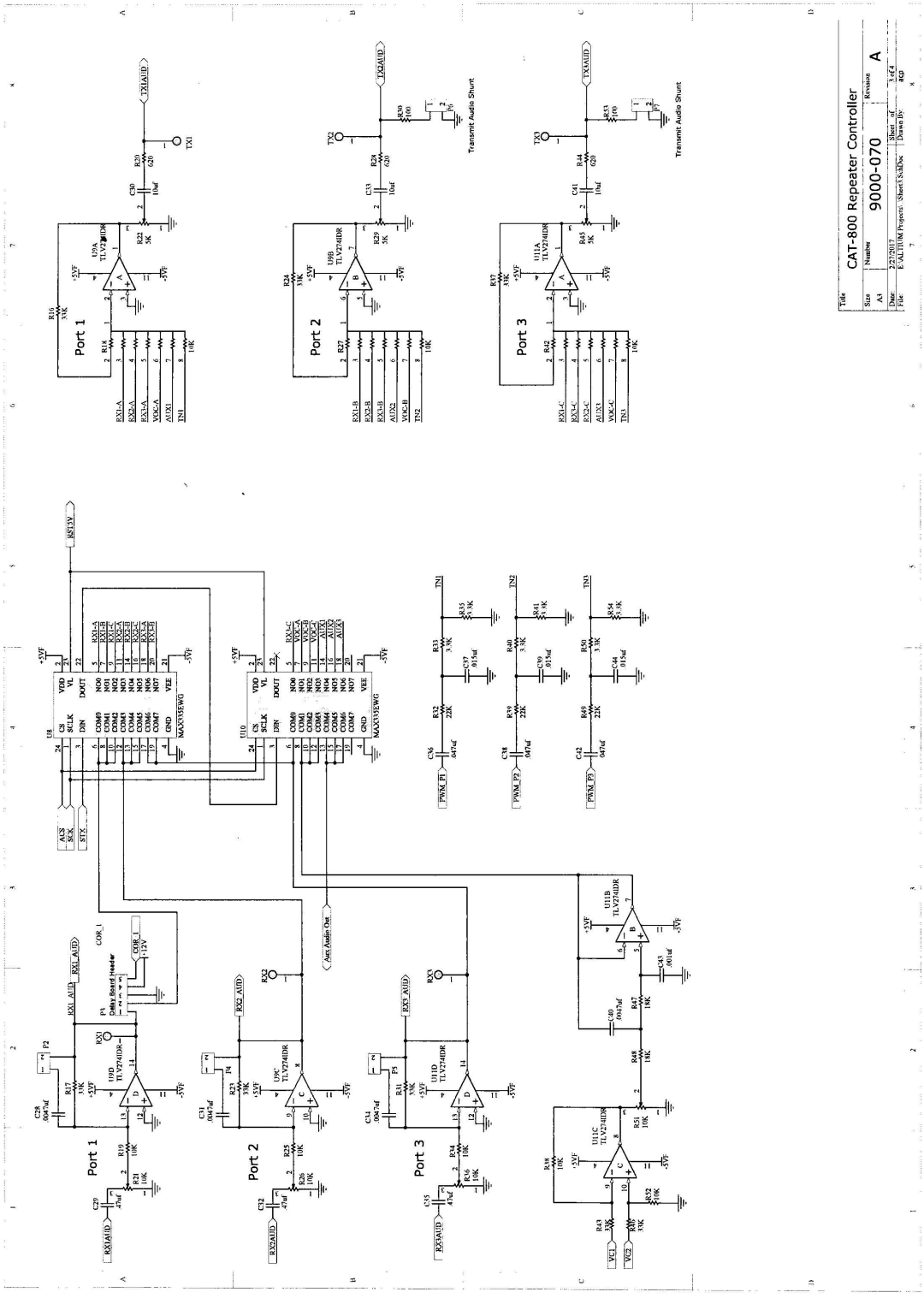

2500 (mil)
3000 (mil)
250 (mil)
250 (mil)
SD Card Connector
TE 2041021
9000-073
Rev A
Computer Automation Technology
Y1
16 MHz
Xmega
32A4U
DR-800
Ribbon Cable
Audio Level
5K
3.3V
5V
Busy
Audio Out
P1
P2
P3
P4
P5
U1
U2
U4
TP1
TP2
TP3
TP4
D1
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C20
C21
C22
C24
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
R20
R21

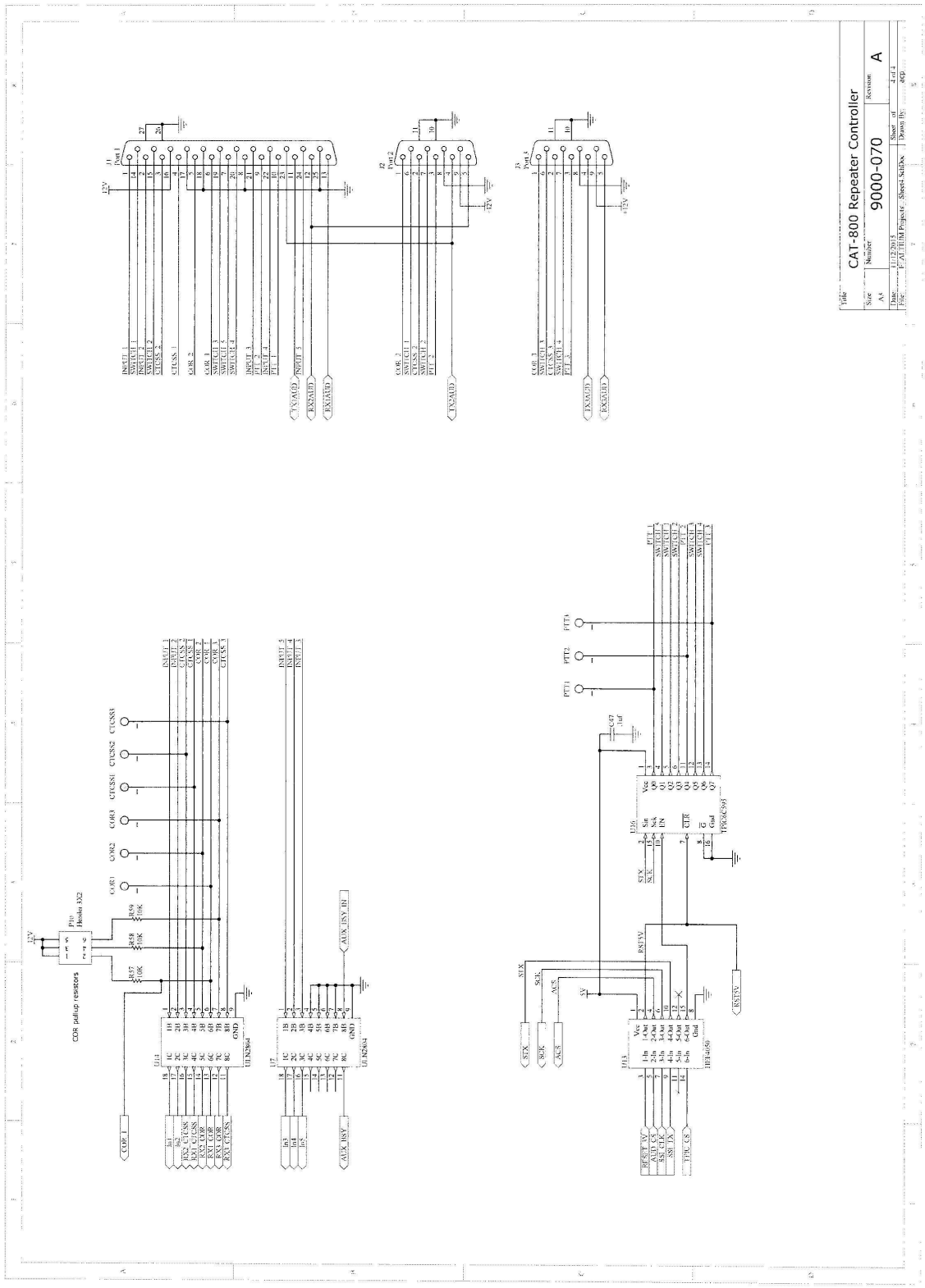
Chapter 12 - Schematic

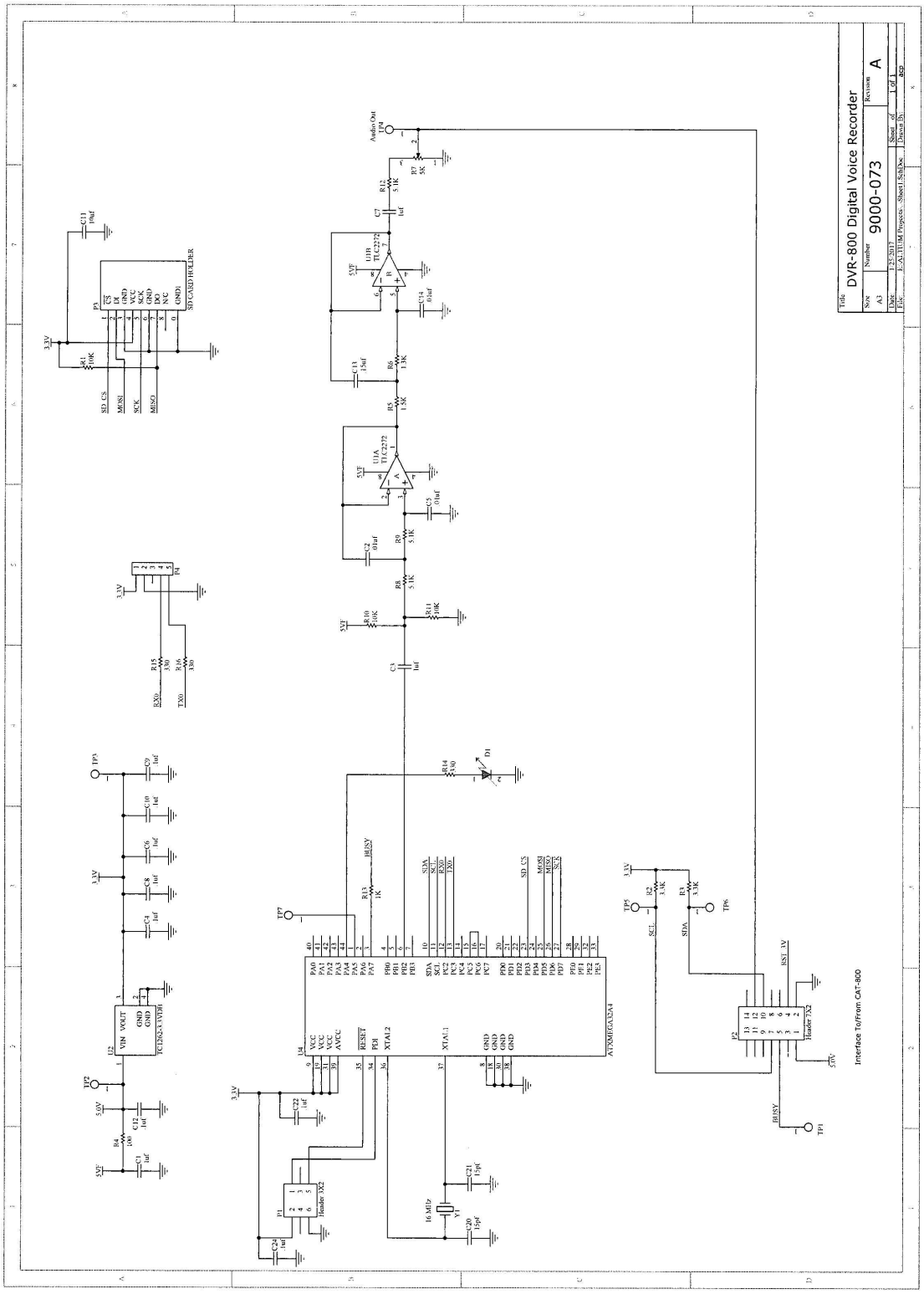
Controller Board (CAT-800)	Sheet 1 of 4
Controller Board (CAT-800)	Sheet 2 of 4
Controller Board (CAT-800)	Sheet 3 of 4
Controller Board (CAT-800)	Sheet 4 of 4
Digital Voice WAV Player Board (DR-800)	Sheet 1 of 1


CAT-800 Repeater Controller
9000-070
A


CAT-800 Repeater Controller
9000-070
A
USB Connector


CAT-800 Repeater Controller
9000-070
A
Port 1
Port 2
Port 3
Transmit Audio Shunt
Transmit Audio Shunt
Transmit Audio Shunt
Auto Audio Disc


CAT-800 Repeater Controller
9000-070
A
4 of 4
COR pullup resistors


DVR-800 Digital Voice Recorder
Number 9000-073
Revision A
Interface To/From CAT-800
ATXMEGA32A4
TCL262-3.3VDBV
TLC2272
Header 7X2
Header 3X2
SD/CARD HOLDER
16 MHz

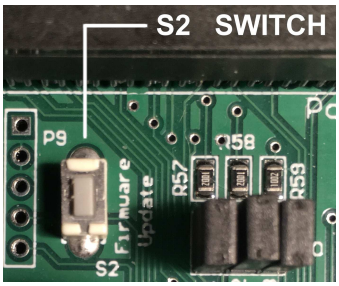
Chapter 13 - Part List

CAT-800 Repeater Controller Parts List

Quantity	Type	Value	Designation
3	Capacitor	33pf 50V	C46,C48,C50
1	Capacitor	.001uf 50V	C26
1	Capacitor	.0047uf 50V	C25
2	Capacitor	.015uf 50V	C34,C36
25	Capacitor	.1uf 50V	C1,C2,C4,C5,C6,C8,C9,C19,C24,C31 C32,C33,C35,C37,C38,C39,C40,C41 C42,C43,C44,C45,C47,C49,C51
3	Capacitor	.47uf 50V	C29,C32,C35
4	Capacitor	User Option Capacitor	C17,C18,C27,C28
10	Capacitor	10uf 16V	C7,C10,C11,C12,C20,C21,C22,C23 C29,C30
1	Capacitor	470uf 25V	C50
1	Connector	DC Power	J5
2	Connector	DB9 Female	J2,J3
1	Connector	DB25 Female	J1
1	Connector	USB	J4
1	Connector	Ethernet	J6
1	Connector	Header 1X5	J3
1	Connector	Header 2X5	P1
1	Connector	Header 2X7	J7
1	Crystal	25 MHz Resonator	Y2
1	Crystal	3.58MHz	Y1
1	Diode	SMCJ17A	D2
1	Fuse	0.5 Amp	F1
1	I.C.	TC1362-3.3VDR	U12
2	I.C.	LM348	U9,U11
2	I.C.	MAX335	U8,U10
1	I.C.	TM4C1294NCPDT-128-TQFP	U1
1	I.C.	ISD4004	U7
1	I.C.	MSP53C391	U3
1	I.C.	TPIC6C595	U16
2	I.C.	ULN2804N	U14
3	I.C.	MT88L70	U4,U5,U6
1	I.C.	DS3231	U2
1	I.C.	HfC4050	U13
1	I.C.	TC7660SEDA	U17
1	I.C.	LM340-5.0	U15
1	I.C.	MCP101	U10
2	Resistor	100 Ohm	R61,R62
3	Resistor	620 Ohm	R20,R28,R44
3	Resistor	5K Variable	R22,R29,R45
7	Resistor	10K	R22,R23,R25,R37,R39,R41,R43
4	Resistor	10K Variable	R21,R26,R36,R51

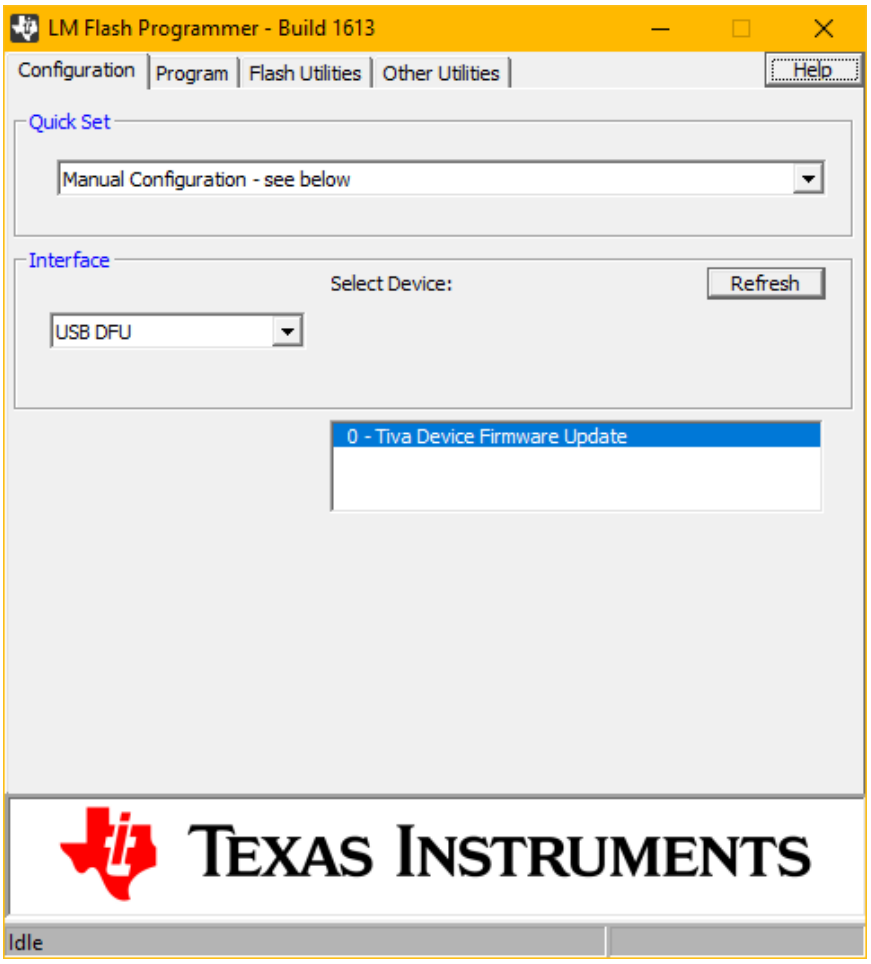
1	Resistor	10K 6 Pin SIP	R6
3	Resistor	10K 8 Pin SIP	R18,R27,R42
3	Resistor	10K 10 Pin SIP	R2,R4,R5
13	Resistor	33K	R7,R18,R19,R26,R28,R29,R30 R31,R36,R38,R40,R42,R48
2	Resistor	82K	R16,R17
8	Resistor	100K	R49,R50,R52,R53,R55,R56,R58,R59
4	Resistor	560K	R51,R54,R57,R60
4	Resistor	User Option	R8,R9,R10,R11
1	Switch	DIP Switch 8 Position	S1

Chapter 14 – USB Firmware Upgrade Procedure



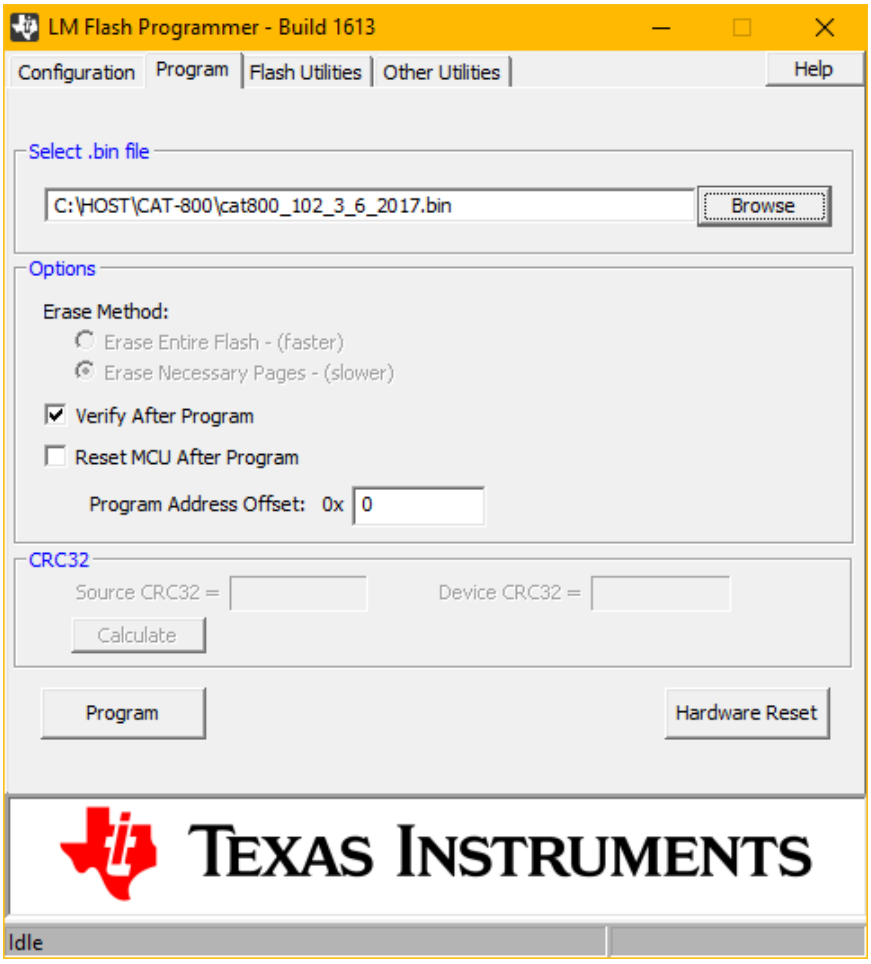
After you perform a firmware update it is necessary to re-initialize the CAT-800 controller using a dipswitch #7 reset. This will erase your configuration data. Make sure you have saved your existing configuration file before continuing with this procedure.

Turn off power to the CAT-800. Push and hold the firmware update button switch S2. Turn on power then after two seconds, release S2 and verify the power light is on. Open the LMI Flash Programmer installed on your computer to display the window below:



Note: You may need to click the "Refresh" button several times before the Tiva Device Firmware Update message appear within the window.

Click the "Program" tab to display the window below:



Click the Browse button and select the new CAT-800 firmware Update File ("bin" file).

NOTE: Set Program Address Offset to 0 and check "Verify After Program".

When ready, click the Program button (located above the red Texas icon). After programming and verification has completed remove power from your CAT-800. After a few seconds, re-apply power and verify the voice synthesizer announces the new firmware version.

Cycle power with dipswitch #7 on to re-initialize the controller. Set dipswitch #7 to off. Using the CAT-800 editor program upload your configuration file.

Chapter - 15 Controller Projects

Project #1 - "Emergency Power Announcement"
This project turns on Timed Message #1 to announce to repeater users that the repeater is operating on emergency power. When line power is restored the message turns off.

1. Unlock the controller to place the controller in programming mode.
   Key-up and enter: [1234567]
2. Program timed message #1 to say: "EMERGENCY POWER"
   Key-up and enter: [*3104 344 695]
3. Program timed message #1 to repeat every ten minutes.
   Key-up and enter: [*607* 600]
4. Program logic input #1 to turn off and on timed message #1.
   Key-up and enter: [*1707 1 * 1750] Key-up and enter: [*1708 1 * 1751]
5. Lockup the controller to return it to normal operation.
   Key-up and enter: [*0]
6. Connect a 5 or 12 VDC wall wart to the controller. Connect the (+) lead to J1-1 and the (-) lead to J1-8.
7. Turn on Zone 5 Channel 1.
   Key-up and enter: [100 511]

Project #2 - "Emergency Net Announcement"
This project turns on Timed Message #2 at 6:00 AM to remind repeater users to check into the emergency net at 7:00PM each Monday night. At 7:15 PM Message #2 will turn off.

1. Unlock the controller to place the controller in programming mode.
   Key-up and enter: [1234567]
2. Program Timed Message #2 to say: "CHECK IN TO THE EMERGENCY NET TONIGHT AT SEVEN P M" every thirty minutes throughout the day.
   Key-up and enter: [*3105 281 475 002 830 623 842 239 007 030 680 580]]
3. Schedule message #2 to turn on at 6:00 AM every Monday morning.
   Key-up and enter: [*1140 06 00 02] Key-up and enter: [*1740 1 1761]
4. Schedule message #2 to turn off at 7:15 PM every Monday night.
   Key-up and enter: [*1141 19 15 02] Key-up and enter: [*1741 1 1760]
5. Lockup the controller to return to normal operation.
   Key-up and enter: [*0]

Project #3 - "Unique Repeater Off/On Command"
This project sets up a unique DTMF command to turn the repeater off and a unique DTMF command to turn the repeater back on with a voice announcement for each.

1. Unlock the controller to place the controller in programming mode.
   Key-up and enter: [1234567]
2. Program User Macro #20 to turn off the repeater with the DTMF command [123] and announce that the repeater is being turned off.
   Key-up and enter: [*1420 1 * 123 * 6511 9746 9654 6510 1110]
3. Program User Macro #21 to turn on the repeater with the DTMF command [321] and announce that the repeater is back on.
   Key-up and enter: [*1421 1 * 321 * 1111 6511 9746 9656 6510]
4. Lockup the controller to return to normal operation.
   Key-up and enter: [*0]

Project #4 – "Change Grandfather Clock Message"
This project removes: "CAT EIGHT HUNDRED REPEATER" from the grandfather clock message and replace it with "W4XYZ REPEATER". Substitute your call letters.

1. Unlock the controller to place the controller in programming mode.
   Key-up and enter: [1234567]
2. Program the voice Message #8 with W4XYZ repeater.
   Key-up and enter: [*3108 890 004 920 930 950 746 830 838 482 100 103]
3. Lockup the controller to return to normal operation.
   Key-up and enter: [*0]

Project #5 – "Change the Port #1 CTCSS Logic active low"
This project changes the Port #1 CTCSS logic input from active high to active low COR and CTCSS logic. At default all three CTCSS inputs are set for active high COR and CTCSS logic.

1. Unlock the controller to place the controller in programming mode.
   Key-up and enter: [1234567]
2. Change the Port #1 CTCSS logic to active low.
   Key-up and enter: [*3612]
3. Lockup the controller to return to normal operation.
   Key-up and enter: [*0]

Project #6 – "Add a Fan to cool the repeater using the controller's switch #1"
The fan will turn on when the transmitter turns on and remain on for an additional minute after the transmitter turns off. Connect a small 12VDC relay to the controller. Connect one coil lead to J1-14 and the other lead to a source of +12VDC. Place a spike suppression diode across the coil with the banded end on the +12V lead.

1. Unlock the controller to place the controller in programming mode.
   Key-up and enter: [1234567]
2. Change Switch #1 to a fan control switch.
   Key-up and enter: [*3912]
3. Lockup the controller to return to normal operation.
   Key-up and enter: [*0]
4. Turn on Zone 6 Channel 5.
   Key-up and enter: [100 6 1 1]
5. Turn off Zone 5 Channel 1.
   Key-up and enter: [100 5 1 1]

Project #7 – "Place the controller in DTMF Access mode from midnight until 6:00 AM"
During the early morning hours a control operator may not be available to monitor the repeater. Some repeater owners may choose to place the repeater into DTMF Access mode. The repeater will appear to be a sleep but if the DTMF Access number is entered the repeater will wake up. The default number is: [325]. After a period of inactivity the repeater will go back to sleep.

1. Unlock the controller to place the controller in programming mode.
   Key-up and enter: [1234567]
2. Schedule DTMF Access to turn on at 11:59 PM every day.
   Key-up and enter: [*1142 23 59 00] Key-up and enter: [*1742 1 * 1821]
3. Schedule DTMF Access to turn off at 06:00 AM every day.
   Key-up and enter: [*1143 06 00 00] Key-up and enter: [*1743 1 * 1820]
4. Lockup the controller to return to normal operation.
   Key-up and enter: [*0]

Project #8 – "Program Scheduler to make club meeting announcement.
This project programs the scheduler to turn on Timed Message #1 at 6:00 AM on the second Tuesday of the month and turn Timed Message #1 off at 8:30 PM.

1. Unlock the controller to place the controller in programming mode.
   Key-up and enter: [1234567]

2. Program Timed Message #1 to say: "CLUB MEETING TONIGHT AT 7:30 PM".
   Key-up and enter: [*3104 286 593 842 239 007 030 680 580]

3. Program Scheduler Event #40 to occur at 6:00 AM on the second Tuesday of the month.
   Key-up and enter: [*1140 06 00 23]

4. Program Scheduler Event #41 to occur at 7:30 PM on the second Tuesday of the month.
   Key-up and enter: [*1141 19 30 23]

5. Program Event #40 to turn on Timed Message #1. "Zone 7 Channel 5"
   Key-up and enter: [*1740 1 *1751]

6. Program Event #41 to turn off Timed Message #1. "Zone 7 Channel 5"
   Key-up and enter: [*1741 1 * 1750]

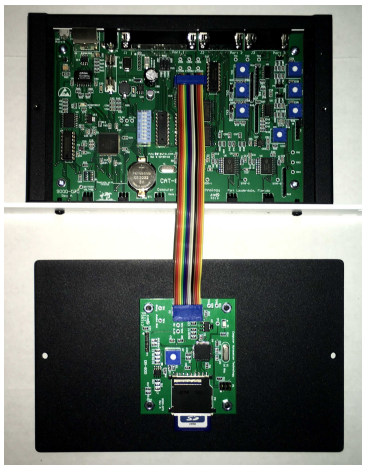
Chapter – 16 DR-800 Digital Voice WAV Player

The DR-800 plays prerecorded WAV files stored on a standard SD memory card. The Digital Voice Player will support thirty WAV files of any length limited only by the size of the SD memory card used.

Digital Voice WAV Player Installation
Mount the DR-800 on the under side of the cover using the supplied drill template and hardware. Connect the ribbon cable to the P8 header on the CAT-800 board. The CAT-800 controller requires firmware Version 1.02 or greater.

Turn on the power and check the red LED on the DR-800 lights indicating the SD card has initialized. The SD memory card supplied with the DR-800 has five prerecorded tracks for test purposes. Track [T01.wav] is a 30 second 1000 Hz test tone. Track [T02.wav] is a 60 second recording of the NOAA weather transmitter located in Miami Florida. Track [T03.wav] is a 12 second sample-meeting announcement. Track [T04.wav] is an aircraft cabin chime suitable to use as a unique courtesy tone. Track [T05.wav] is a Westminster chime suitable for used in the grandfather clock message.

Digital Voice WAV Player Adjustment
If you have access to a deviation meter, key-up and enter [72501] to play track #01. Adjust R7 on the DR-800 board for 3 KHz deviation at the transmitter output. If a deviation meter is not available, key-up and enter [72502] to play track #02. Adjust R7 so the track's audio level is the same as the repeaters receive audio.



Turn the power off and remove the SD memory card. Insert the card in your computer's memory slot. Transfer your recorded WAV files to the card. Reinsert the card into the Digital WAV Player. Turn the power on. Verify the red LED on the DR-800 board is lit. Fold the ribbon cable back on its self and close the cover.

WAV File Preparations
You can use any of the popular WAV file generator programs. The only requirement is that the file must be recorded in monaural with a sampling rate of 8000, 11025 or 16000 and be formatted in WAV (Microsoft) signed 16-bit PCM. There is very little difference in audio quality at the various sampling rates. A WAV file recorded with a 16000-sample rate uses approximately 2,000 KB per minute. This means the 8GB SD card supplied with the DR-800 can hold recordings in excess of sixty minutes.

WAV File Name Requirement
As you record the WAV files their filename must correspond to their track number. For example: The filename for track #1 must be "T01.wav" and the filename for track #30 must be "T30.wav".

NOTE: If you do not use all thirty tracks it is suggested that you save track #1, track #2 and track #3 for future testing and evaluation.

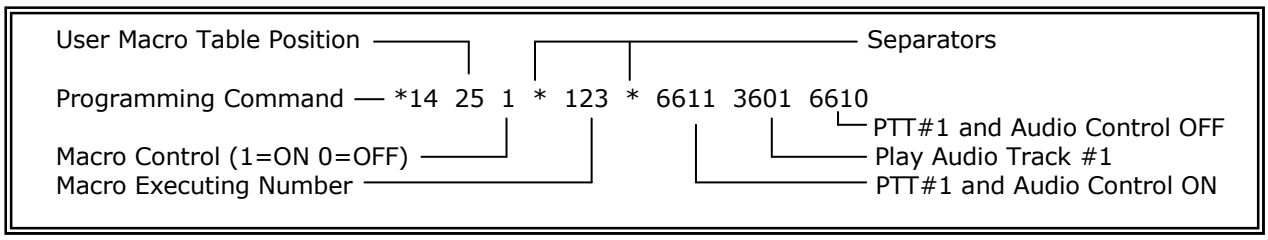
Digital Audio WAV Player Control
A control channel has been assigned to the WAV player. Zone 8 Channel 7 must be enabled for the WAV player to operate. This control channel is enabled at default.

Digital Audio WAV Player Demo
To play a track, key-up and enter the DIDITAL AUDIO WAV player prefix number [725] followed by the two-digit track number. The CAT-800 will key the transmitter and play the track. [725] Is the default prefix number. This number can be changed using the [*510*XXX] programming command.

NOTE: Digital audio tracks can also be integrated into user and event macros.

Program User Macro to Play Digital Voice WAV Track
Program User Macro #25 to play digital voice audio track #1 when a user sends the DTMF command [123]. Unlock the controller with the seven digit unlock number [1234567]. Key-up and send [*1425] followed by a [1] to enable the macro and [123] as the macro DTMF command control number and the string of internal commands to be executed. Un-key and the voice will say: "CONTROL OK." Example: Program Macro #25 with control number [123] to turn on PTT #1, Play track #1 and turn off PTT #1.

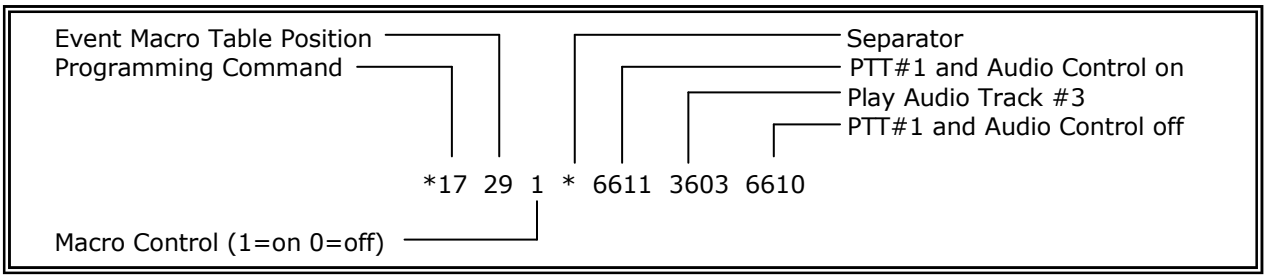
NOTE: Macro Control number [123] is the number entered by a repeater user to play track #01. At default Track #01 is programmed with a 30 second 1000 Hz test tone.



Digital Audio WAV Track Internal Command Table

PLAY DIGITAL AUDIO WAV TRACK	36XX	01-30
PLAY DIGITAL AUDIO WAV TRACK (Stop Track with Kerchunk)	37XX	01-30
PTT#1 AND AUDIO SW [WAV PLAYER TO TX1]	661X	0=OFF 1=ON
PTT#2 AND AUDIO SW [WAV PLAYER TO TX2]	662X	0=OFF 1=ON
PTT#3 AND AUDIO SW [WAV PLAYER TO TX3]	663X	0=OFF 1=ON
PTT#1–PTT#2 AND AUDIO SW [WAV PLAYER TO TX1-TX2]	671X	0=OFF 1=ON
PTT#1–PTT#3 AND AUDIO SW [WAV PLAYER TO TX1-TX3]	672X	0=OFF 1=ON
PTT#1-PTT#2-PTT#3 AND AUDIO SW [WAV PLAYER TO TX1-TX2-TX3]	673X	0=OFF 1=ON
PTT AND WAV AUDIO SW FROM ACTIVE PORT	674X	0=OFF 1=ON
PTT#1 AND AUDIO SW [WAV PLAYER TO TX1]	661X	0=OFF 1=ON
PTT#2 AND AUDIO SW [WAV PLAYER TO TX2]	662X	0=OFF 1=ON
PTT#3 AND AUDIO SW [WAV PLAYER TO TX3]	663X	0=OFF 1=ON
PTT#1–PTT#2 AND AUDIO SW [WAV PLAYER TO TX1-TX2]	671X	0=OFF 1=ON
PTT#1–PTT#3 AND AUDIO SW [WAV PLAYER TO TX1-TX3]	672X	0=OFF 1=ON
PTT#1-PTT#2-PTT#3 AND AUDIO SW [WAV PLAYER TO TX1-TX2-TX3]	673X	0=OFF 1=ON
PTT AND WAV AUDIO SW FROM ACTIVE PORT	674X	0=OFF 1=ON

Program Event Macro #29 Timed Message #1 to Play Track #3
Unlock the controller with the seven digit unlock number [1234567]. Key-up and send [*1729] followed by a [1] to enable the macro followed by the string of internal commands to be executed. Un-key and the voice will say: "CONTROL OK."



Timed Message #1 repeats every five minutes. To change the repeat time to once every twenty minutes unlock the controller with the seven digit unlock number [1234567]. Key-up and send [*607*1200] for 1200 seconds.

NOTE: Control Zone 7 Channel 5 must be enabled for Timed Message #1 to function. This control channel is not defaulted on. Key-up and enter [100751].

Program Event Macro #20 Port #1 Courtesy Tone as an Aircraft Cabin Chime
Unlock the controller with the seven digit unlock number [1234567]. Key-up and send [*1720 1 * 6611 3604 6610]. Un-key and the voice will say: "CONTROL OK."

Program Event Macro #33 Grandfather Clock Message to Play Westminster Chimes
Unlock the controller with the seven digit unlock number [1234567]. Key-up and send [*1733 1 * 6611 3605 6610 6311 3008 6310]. Un-key and the voice will say: "CONTROL OK."

Reprogram Voice Message #8
In voice message #8 remove the words "cat eight-hundred" and replace them with your call letters.
Example: Replace "cat eight-hundred" with "W4XYZ"

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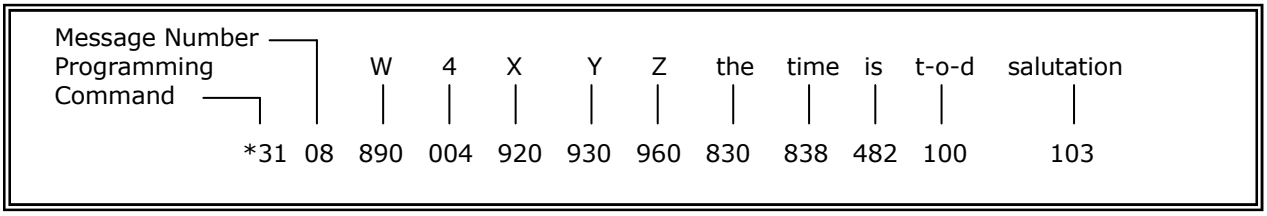

WAV File Generation
If you do not have a program to generate WAV files for the DR-800 may I suggest a program called: Audacity 2.1.2. This program was used to generate the default test WAV files of tracks #1, #2, #3, #4 and #5. This is an open source program available on the Internet for down loading at www.audacityteam.org

Set the recording to MONO and the sample rate to 8000, 11025 or 16000. Adjust the record level to peak around "–12". Press the red circle to start recording and the yellow square to stop the recording. Press the green arrow to play the recording. If you are satisfied with the recording click "File". In the drop down box click "Export Audio". Save the recording to the SD memory card. Remember the filename must be T01.wav to T30.wav depending on your track assignment.

NOTE: Not all SD memory cards will initialize in the WAV player. Before you transfer WAV files to the card plug it in, if the red LED lights your good to go.