CAT-260
Repeater Controller

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Chapter 1 - Introduction and Specifications

Congratulations on your purchase of the CAT-260 Repeater Controller. Programming the CAT-260 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 WINDOW EDITOR is available to program the CAT-260 controller.

Voice Synthesizer
A vocabulary base of 470 words is available to ID your repeater and make voice announcements.

CW ID
The controller will switch to CW when a repeater user talks over the voice ID or ID in CW only depending on how the CAT-260 is configured.

Digital Voice Clock
The digital voice clock will announce the time upon request, during repeater IDs, or on the hour through the grandfather clock feature. A coin cell battery supplies back-up power for the clock.

Scheduler
An advanced [20] position scheduler fully automates repeater operation. Any command that can be manually executed can also be scheduled to one-minute accuracy. Program the hours, minutes, day of week, or day of month and month of year. The CAT-260 will do the rest.

Courtesy Tone
Separate courtesy tones denote repeater and link activity. Create up to eight custom courtesy tones and assign their use by executing event macro 13 Port #1 and event macro 14 for Port #2.

Port Configuration
The CAT-260 is a dual port controller. Port #1 is a repeater port. Port #2 is a transceiver port. The setting of dipswitch #5 determines if port #2 is configured as a simplex transceiver or duplex transceiver port. Dipswitch #6 places the CAT-260 in transceiver/transceiver mode. An input on port #1 will produce an output on port #2 and an input on port #2 will produce an output on port #1.

User Function Output Switches
Six open DRAIN user function output switches control equipment at your repeater site. These switches are controlled manually by DTMF commands or from within a user or event macro. They can be made to turn OFF, ON or momentarily change state.

User Function Inputs
Four inputs activated by a voltage change from other equipment at the repeater site, causes the CAT-260 to activate an event macro. Two macros are assigned to each logic input. Different macros are called when the input goes high and low.

DTMF Keypad Test
A DTMF keypad test will read back the numbers decoded in a synthesized voice. This feature is available on both ports one and two.

User Macros
The CAT-260 supports forty User Macros each containing sixteen commands. A user macro is a series of commands, defined by the repeater owner. Macros permit the owner to customize certain aspects of repeater operation. Once the CAT-260 decodes the macro number, the commands will execute in the order they were stored within the macro.

Event Triggered Macros
An event macro is a series of commands, defined by the repeater owner. Event Macros are positioned throughout the program to execute during certain prescribed operations. The CAT-260 supports fifty event macros each containing twelve commands.

Specifications

Microprocessor	ATxmega256A3BU
Memory	256KB ISP flash, 16KB SRAM
Voice Synthesizer	Texas Instruments MSP53C391NI2D
Voice Vocabulary	470 Words
DTMF Receivers	(2) MT88L70AE
Operating Temperature	-15 to +55 degrees C
Call Letter ID	(4) Buffer size VOICE (15) - CW (16)
User Function Outputs	(6) Switch 33VDC @ 100mA.
Logic Inputs	(4) 10K ohm input impedance
	Low (0 to 0.5VDC) High (3 to 15VDC)
Logic Outputs	Open Collector Relay Driver (28VDC at 50mA)
Audio Input	Receiver 0.2 - 2VAC adjustable 10K ohms
Audio Output	Transmitter 2VAC adjustable 600 ohms
Power	+9 to +15VDC at 80mA
Size	4.5" X 7.0"
Warranty	Limited one-year parts and labor.

FCC Part 15 RF Interference
When installed in the RME-200 rack mount enclosure, the CAT-260 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.

Chapter 2 - System Configuration

Repeater and Transceiver

In this configuration the CAT-260 supports a repeater on port #1 and a transceiver on port #2. Figure 2-1 shows the repeater connected to J2 the "25 Pin D" connector while the transceiver is connected to J1 the "9 Pin D" connector. The transceiver port is also available on the "25 Pin D" connector to be compatible with other CAT controllers.

CAT-260 REPEATER AND TRANSCEIVER CONFIGURATION		

CAT-260

J2-25	GROUND	
J2-13	RX AUDIO #1	
J2-11	TX AUDIO #1	**REPEATER**
J2-10	PTT #1	
J2-4	CTCSS #1	
J2-6	COR #1	

J2-1	USER INPUT #1
J2-2	USER INPUT #2
J2-21	USER INPUT #3
J2-22	USER INPUT #4

J2-14	USER OUTPUT #1
J2-15	USER OUTPUT #2
J2-19	USER OUTPUT #3
J2-20	USER OUTPUT #4
J2-7	USER OUTPUT #5
J2-8	USER OUTPUT #6

J1-1	COR #2	
J1-2	CTCSS #2	
J1-3	PTT #2	**TRANSCEIVER**
J1-5	RX AUDIO #2	
J1-4	TX AUDIO #2	
J1-8	GROUND	

J2-16	+12VDC OUTPUT
J2-17	GROUND

Figure 2-1

Repeater and Three Transceivers with RLS1000B

In this configuration the CAT-260 supports a repeater and three transceivers. With an RLS-1000B Remote Link Switch board connected to port #2 three transceiver can be added to the repeater system. Three of the CAT-260's user function switches are assigned to control the RLS-1000B's transceiver inputs.
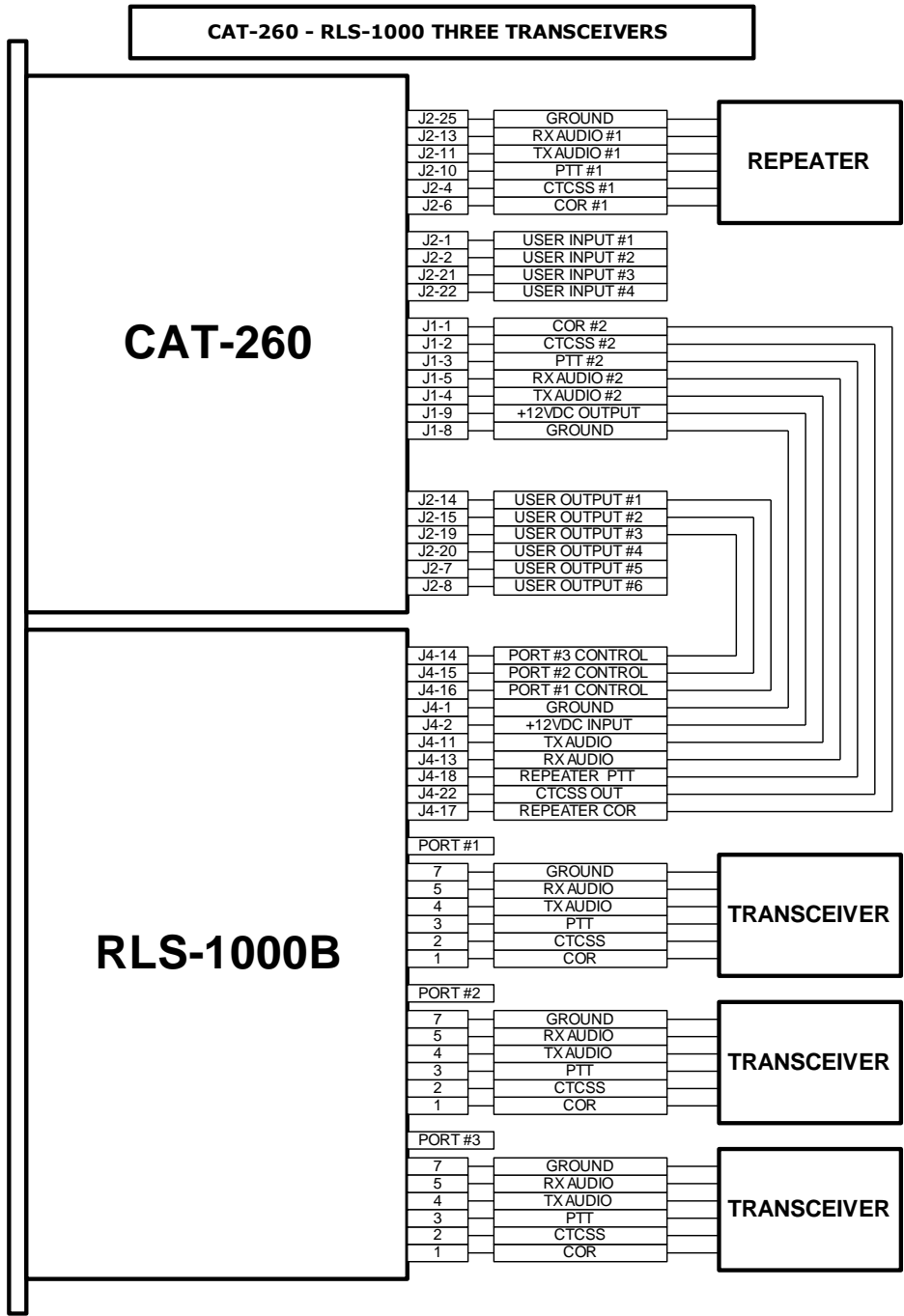
Figure 2-2

Repeater With One Transceiver And WX-250 Weather Receiver

In this configuration the CAT-260 supports a repeater, transceiver and weather receiver. The WX-250 weather receiver mounts on the same 19-inch rack panel as the CAT-260. PTT and transmit audio from the CAT-260 are connected to the repeater's transmitter through the normally closed contacts of the double pole double throw relay located inside the WX-250. When a weather alert is received, the relay will switch the weather alert audio to the TX audio input and provide a PTT signal to key the transmitter.

CAT-260 - WX-250 WITH REMOTE BASE CONFIGURATION

CAT-260

J2-25	GROUND
J2-13	RX AUDIO #1
J2-11	TX AUDIO #1
J2-10	PTT #1
J2-4	CTCSS #1
J2-6	COR #1

TX AUDIO
PTT
GROUND

REPEATER

J1-1	COR #2
J1-2	CTCSS #2
J1-3	PTT #2
J1-5	RX AUDIO #2
J1-4	TX AUDIO #2
J1-8	GROUND

TRANSCEIVER

J2-1	USER INPUT #1
J2-2	USER INPUT #2
J2-21	USER INPUT #3
J2-22	USER INPUT #4

J2-14	USER OUTPUT #1
J2-15	USER OUTPUT #2
J2-19	USER OUTPUT #3
J2-20	USER OUTPUT #4
J2-7	USER OUTPUT #5
J2-8	USER OUTPUT #6

J2-16	+12VDC OUTPUT
J2-17	GROUND

WX-250

J4-8	GROUND
J4-2	PTT INPUT
J4-3	PTT OUTPUT
J4-1	PTT GROUND

J4-10	TX AUDIO INPUT
J4-11	TX AUDIO OUTPUT

J4-4	WX ALERT DISABLE
J4-9	WX ALERT ENABLE

J4-7	WX ALERT START
J4-6	WX ALERT STOP

Figure 2-3

Repeater And Weather Receiver

In this configuration the CAT-260 supports a repeater and weather receiver. The WX-250 is connected to the transceiver port of the CAT-260. When a weather alert is received, a relay inside the WX-250 will switch the weather alert audio to the RX2 audio input of the CAT-260 and provide a COR input signal to activate the repeater's transmitter.

CAT-260 - WX-250 AUXILIARY RECEIVER CONFIGURATION

CAT-260

J2-25	GROUND	
J2-13	RX AUDIO #1	
J2-11	TX AUDIO #1	
J2-10	PTT #1	REPEATER
J2-4	CTCSS #1	
J2-6	COR #1	

J1-1	COR #2
J1-2	CTCSS #2
J1-3	PTT #2
J1-5	RX AUDIO #2
J1-4	TX AUDIO #2
J1-9	+12VDC OUTPUT

J2-1	USER INPUT #1
J2-2	USER INPUT #2
J2-21	USER INPUT #3
J2-22	USER INPUT #4

J2-14	USER OUTPUT #1
J2-15	USER OUTPUT #2
J2-19	USER OUTPUT #3
J2-20	USER OUTPUT #4
J2-7	USER OUTPUT #5
J2-8	USER OUTPUT #6

J2-16	+12VDC OUTPUT
J2-17	GROUND

WX-250

J4-8	GROUND
J4-2	PTT INPUT
J4-1	PTT GROUND
J4-3	PTT OUTPUT

J4-10	TX AUDIO INPUT
J4-11	TX AUDIO OUTPUT

J4-4	WX ALERT DISABLE
J4-9	WX ALERT ENABLE

J4-7	WX ALERT START
J4-6	WX ALERT STOP

Figure 2-4

Dual Repeater

In this configuration two CAT-260 controllers have their link ports cross-coupled. By connecting PTT #2 of one CAT-260 to the COR #2 of the other CAT-260 and TX2 audio of one controller connected to the RX2 audio of the other controller the two repeaters can be linked together. When port #2 is turned off each repeater will stand-alone.

Figure 2-5

Dip Switch
An eight-position dipswitch configures various functions of the CAT-260.
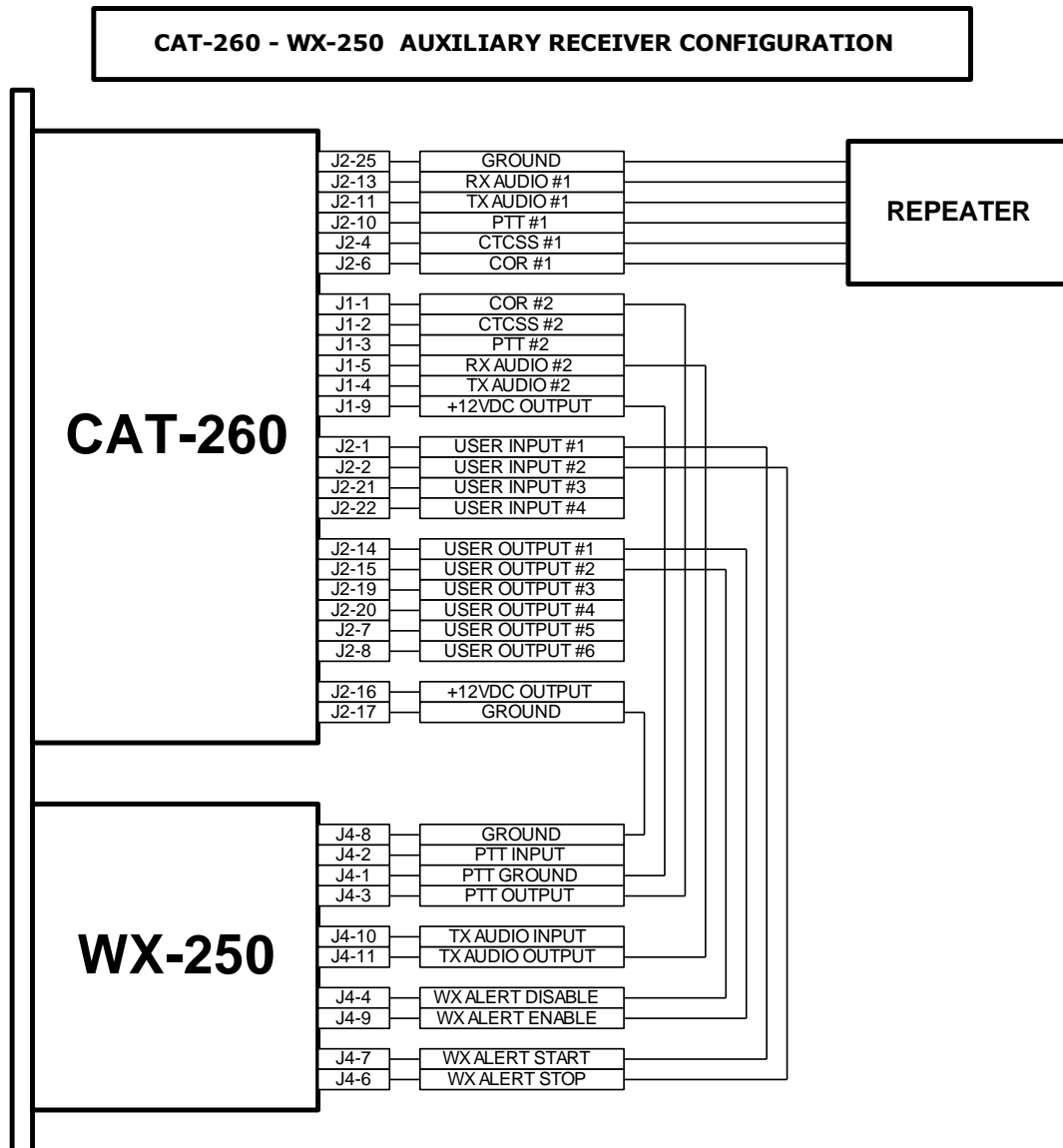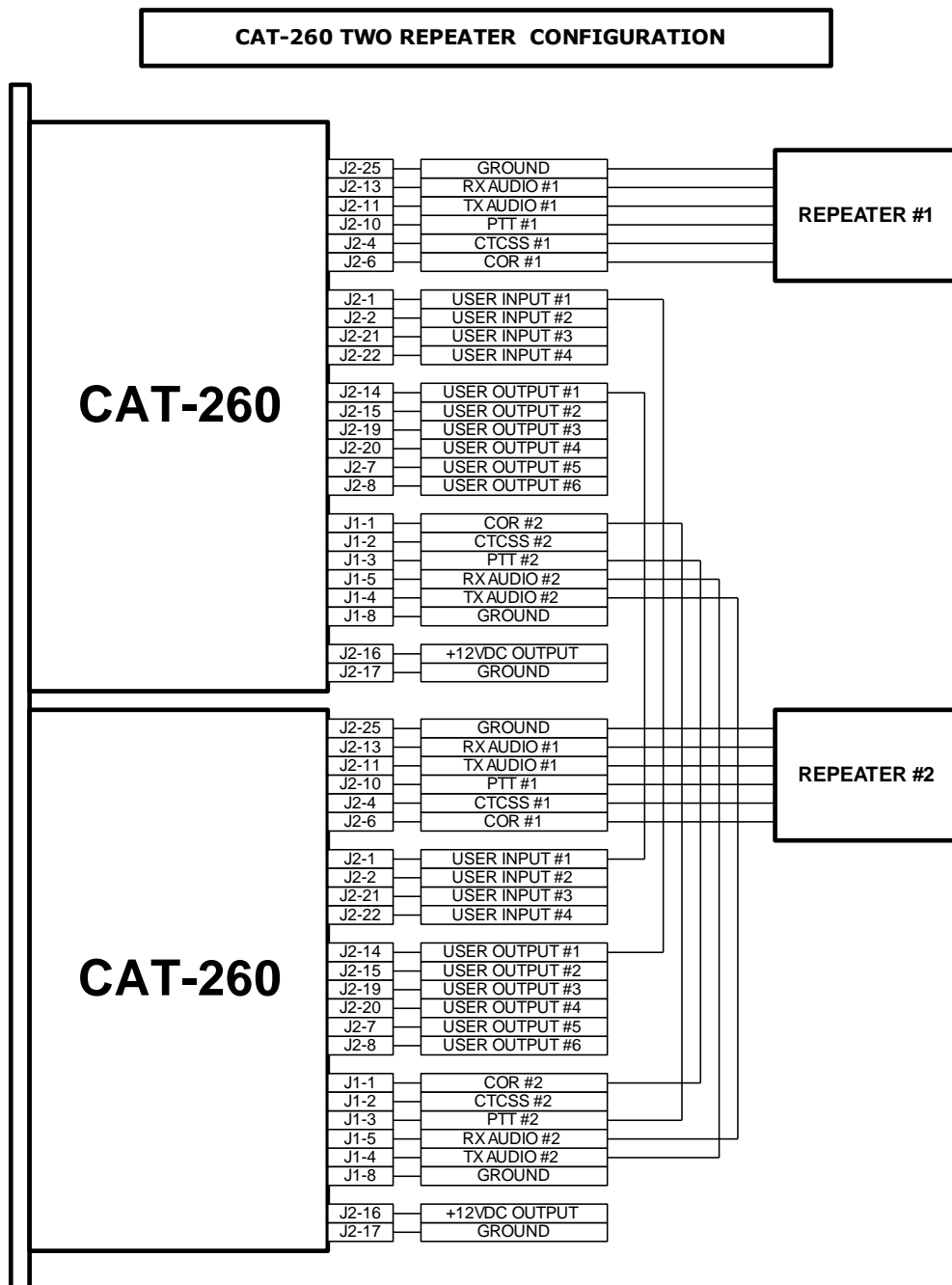
Switch 1 This switch determines Repeater COR input logic. Switch #1 should be ON if the repeater receiver's COR is an active low and OFF if COR is active high.

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

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

Switch 4 This switch determines Link CTCSS input logic. Switch #4 should be ON if the link receiver's CTCSS is an active low and OFF if CTCSS is active high.

Switch 5 This switch determines the operation of Port #2. Switch #5 should be ON for duplex transceiver operation and OFF for simplex transceiver operation.

Switch 6 This switch places the CAT-260 in the cross band repeat mode. With transceivers on both Port #1 and Port #2, enabled the link with the [5001] 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.

Switch 7 This switch is used to initialize the CAT-260. 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.
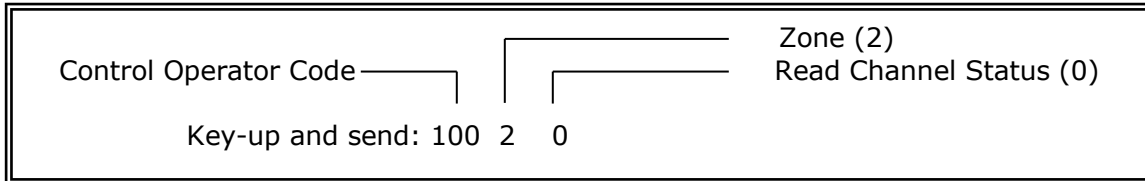
Switch 8 This switch is used to program a new <u>MASTER</u> un-lock number. Set switch #8 to ON. The voice will say: "ENTER CONTROL." After the seven-digit master unlock number is entered, set switch #8 to OFF. This switch is also used to activate the RS-232 port. Turn the power off set dipswitch #8 to on and apply power to the CAT-260.

Chapter 3 - Repeater Control

The CAT-260 has eight control zones. These control zones can be manually controlled by DTMF commands on the repeater input or by user and event macros.

Interrogation of Repeater Control Status
Key-up and send the 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 channel status. If all the channels are turned off, the voice will say: "CLEAR."

```
┌─────────────────────────────────────────────────────────────────┐
│                                    ┌──────────────┐  Zone (2)     │
│   Control Operator Code ───┐       │  ┌────────── Read Channel Status (0) │
│                            │       │  │                           │
│           Key-up and send: 100  2    0                            │
└─────────────────────────────────────────────────────────────────┘
```

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

Changing Repeater Control Status
To change the status of a channel, key-up and send the control operator code [100] followed by the zone number, channel number and a [1] to turn the channel ON or a [0] to turn the channel OFF. Un-key and the voice will read back the zone, channel number and control activity. The voice will say: "ONE ONE ON." or "THREE FIVE OFF."

Example: With a control operator prefix of 100, turn Zone 2 Channel 1 ON.

```
┌─────────────────────────────────────────────────────────────────┐
│                                 ┌──────────────┐  Zone (1 through 4) │
│   Control Operator Code ───┐    │  ┌────────── Channel (1 through 8) │
│                            │    │  │  ┌─────── Activity (0=OFF 1=ON)  │
│           Key-up and send: 100   2  1  1                          │
└─────────────────────────────────────────────────────────────────┘
```
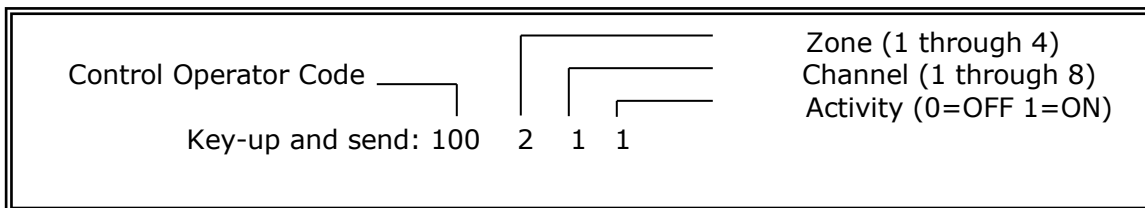
Un-key and the voice will say: "TWO ONE ON."

Control of the CAT-260 is also available through the Port #2 receiver. The procedure is the same as above except the default control operator code for Port #2 is [200].

Repeater Control Channels

Zone 1

1	PORT #1 TRANSMIT	ENABLE*
2	PORT #1 COR AND CTCSS	ENABLE
3	PORT #1 COR OR CTCSS	ENABLE
4	PORT #1 TURN ON DELAY	ENABLE
5	PORT #1 DTMF PAD TEST	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 COR AND CTCSS	ENABLE
3	PORT #2 COR OR CTCSS	ENABLE
4	PORT #2 TURN ON DELAY	ENABLE
5	PORT #2 DTMF PAD TEST	ENABLE*
6	PORT #2 AUTO-DISCONNECT	ENABLE
7	PORT #2 DTMF MUTING	ENABLE
8	PORT #2 TIMEOUT	ENABLE*

Zone 3

1	PORT #2 CONTROL OPERATOR	ENABLE*
2	PORT #2 MACRO CONTROL	ENABLE*
3	RESERVED	ENABLE
4	RESERVED	ENABLE
5	RESERVED	ENABLE
6	RESERVED	ENABLE
7	RESERVED	ENABLE
8	RESERVED	ENABLE

Zone 4

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	SCHEDULER	ENABLE*
6	TIME OF DAY REQUEST	ENABLE*
7	GRANDFATHER CLOCK	ENABLE*
8	GRANDFATHER CLOCK SLEEP	ENABLE

Zone 5

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	USER OUTPUT SWITCH #6	ENABLE
7	DTMF ACCESS	ENABLE
8	FORCED DTMF ENTRY	ENABLE*

Zone 6

1	REPEATER ID #1 (At Rest)	ENABLE*
2	REPEATER ID #2 (Active)	ENABLE*
3	SQUELCH TAIL MESSAGE	ENABLE
4	TRANSMITTER DROP MESSAGE	ENABLE
5	TIMED MESSAGE #1	ENABLE
6	TIMED MESSAGE #2	ENABLE
7	RESERVED	ENABLE
8	RESERVED	ENABLE

Zone 7

1	FAN CONTROL	ENABLE
2	CTCSS ENCODER LOGIC	ENABLE
3	ECHOLINK® CONTROL	ENABLE
4	TRANSMITTER HANG TIME	ENABLE*
5	RESERVED	ENABLE
6	RESERVED	ENABLE
7	RESERVED	ENABLE
8	RESERVED	ENABLE

Zone 8

1	RESERVED	ENABLE
2	RESERVED	ENABLE
3	RESERVED	ENABLE
4	RESERVED	ENABLE
5	RESERVED	ENABLE
6	RESERVED	ENABLE
7	RESERVED	ENABLE
8	RESERVED	ENABLE

* During initialization these control channels are set to the enable position.

Zone 1 - Repeater Control Channels

1. Port #1 Transmitter Enable
This is the master repeater switch. This channel must be enabled for normal repeater operation. The CAT-260 will continue to respond to control operator commands even when the Port #1 transmitter is disabled. This channel will automatically be enabled after a dipswitch #7 initialization reset.

2. Port #1 COR and CTCSS Enable
When this channel is enabled, in addition to a COR input, an input from a CTCSS decoder at J2-4 must also be present before Port #1 will activate. A COR input by itself will have no affect. To prevent loss of control, DO NOT ENABLE THIS CHANNEL unless a CTCSS decoder is connected to J2-4.

3. Port #1 COR or CTCSS Enable
When this channel is enabled, the COR and CTCSS inputs will function as a (OR) logic input. This means activity on either the COR or CTCSS inputs will cause the controller to key the Port #1 transmitter.

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 [*624*] programming command. When the CAT-260 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 DTMF Pad Test Enable
When this channel is enabled, a repeater user is able to perform a test of their radio's 12 or 16-button keypad through the repeater port. As the numbers are being decoded, they are stored in memory. When the repeater 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.

6. Port #1 Courtesy Tone Enable
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 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 pass the DTMF tones through the repeater. To temporarily disable DTMF muting, precede the DTMF string with a (#).

8. Port #1 Timeout Enable
Port #1 time-out is user programmable with the [*601*] timer programming commands. When the CAT-260 is initialized, this timer defaults to 3 minutes. When this channel is turned off, the repeater, port #1 will not timeout.

Zone 2 - Link Control Channels

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1. Port #2 Transmitter Enable
This channel must be enabled for link operation. This channel will automatically be enabled after a dipswitch #7 initialization reset.

2. Port #2 COR and CTCSS Enable
When this channel is enabled, in addition to a COR input at J2-5, an input from a CTCSS decoder at J2-3 must also be present before the repeater will activate. A COR input by itself will have no affect.

3. Port #2 COR or CTCSS Enable

When this channel is enabled, the COR and CTCSS inputs will function as a (OR) logic input. This means activity on either the COR or CTCSS inputs will cause the controller to key the repeater's transmitter.

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 activate the repeater. A time delay of 0.1 to 9.9 seconds can be selected with the [*624*] programming command. When the CAT-260 is initialized, this timer defaults to 1.0 seconds. This channel is useful during periods when noise bursts are present on the transceiver input.

5. Port #2 DTMF Pad Test Enable

When this channel is enabled, a repeater user is able to perform a test of their radio's 12 or 16-button keypad through Port #2. As the numbers are being decoded, they are stored in memory. When the repeater 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.

6. Port #2 Auto Disconnect Enable

When this channel is enabled, the link will disconnect automatically after a period of repeater inactivity. The voice will say: "LINK TIME OUT". A repeater or transceiver COR will keep the link activate until the repeater returns to rest. A rest period of up to 29 minutes can be selected with the [*607*] programming command. When the CAT-260 is initialized, this timer defaults to 10 minutes.

7. Port #2 DTMF Muting Enable

When this channel is enabled, anytime a DTMF tone is received, the audio will be turned off to the Port #2 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 pass the DTMF tones through the repeater. To temporarily disable DTMF muting, precede the DTMF string with a (#).

8. Port #2 Timeout Enable

Link time-out is user programmable with the [*602*] timer programming commands. When the CAT-260 is initialized, this timer defaults to 3 minutes. When this channel is turned off, the repeater link port, will not timeout.

Zone 3 - Link Control Channels

1. Port #2 Control Operator Enable

When this channel is enabled, the CAT-260 will accept control operator commands to change the settings of the zone channels from the link side. 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-260 will accept user macro commands from the link side.

3. Reserved
4. Reserved
5. Reserved
6. Reserved
7. Reserved
8. Reserved

Zone 4 - Miscellaneous Control Channels

1. User Logic Input #1 Enable
When this channel is enabled, an active high logic input on connector J2-1 will execute event macro #5 while an active low logic input will execute event macro #6.

2. User Logic Input #2 Enable
When this channel is enabled, an active high logic input on connector J2-2 will execute event macro #7 while an active low logic input will execute event macro #8.

3. User Logic Input #3 Enable
When this channel is enabled, an active high logic input on connector J2-21 will execute event macro #9 while an active low logic input will execute event macro #10.

4. User Logic Input #4 Enable
When this channel is enabled, an active high logic input on connector J2-22 will execute event macro #11 while an active low logic input will execute event macro #12.

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. Time of Day Request Enable
When this channel is enabled, repeater users can request a time of day announcement by entering the time of day request number. This message will consist of up to 15 words selected from the voice vocabulary table and is programmed with the [*3109*] command. When the CAT-260 is initialized, this message defaults to: "THE TIME IS 7:15 PM."

7. Grandfather Clock Enable
When this channel is enabled, the CAT-260 will announce the time of day every hour on the hour. This message will consist of up to 15 words selected from the voice synthesizer vocabulary table and programmed with the [*3110*] command. When the CAT-260 is initialized, this message defaults to: "CAT-260 REPEATER THE TIME IS 7:15 PM."

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 - Miscellaneous Control Channels

1. USER Output Switch #1 Enable
When this channel is enabled, switch #1 is turned on. Connector J2 pin 14 or J1 pin 6 will sink 100 MA to ground.

2. USER Output Switch #2 Enable
When this channel is enabled, switch #2 is turned on. Connector J2 pin 15 or J1 pin 7 will sink 100 MA to ground.

3. USER Output Switch #3 Enable
When this channel is enabled, switch #3 is turned on. Connector J2 pin 19 will sink 100 MA to ground.

4. USER Output Switch #4 Enable
When this channel is enabled, switch #4 is turned on. Connector J2 pin 20 will sink 100 MA to ground.

5. USER Output Switch #5 Enable
When this channel is enabled, switch #3 is turned on. Connector J2 pin 7 will sink 100 MA to ground.

6. USER Output Switch #6 Enable
When this channel is enabled, switch #4 is turned on. Connector J2 pin 8 will sink 100 MA to ground.

7. DTMF Access Enable
When this channel is enabled, a DTMF Access number selected by programming command [*503*] must be entered to activate Port #1. The repeater will continue to operate until a period of inactivity occurs determined by the [*606*] sleep timer. Once the timer expires the next repeater user must re-enter the DTMF Access number.

8. Forced DTMF Entry D Key
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.

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┌─────────────────────────────────────────────────────┐
│        Zone 6 – Voice Message Control Channels        │
└─────────────────────────────────────────────────────┘
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1. Repeater ID #1 (At Rest) Enable
When this channel is enabled, repeater ID message #1 will repeat subject to the setting of the ID timer. This ID will consist of up to 15 words selected from the voice vocabulary table and is programmed with the [*3101] command.

2. Repeater ID #2 (Active) Enable
When this channel is enabled, the Repeater ID Message #2 will repeat subject to the setting of the ID timer. This ID will consist of up to 15 words selected from the voice vocabulary table and is programmed with the [*3102] command. When Repeater ID #1 and #2 are enabled, ID messages selection will be determined by whether the repeater is at rest or a QSO is in progress.

3. Squelch Tail Message Enable
When this channel is enabled, the squelch tail message occurs when a repeater user un-keys their transmitter. This message will repeat subject to the setting of the [*610*] squelch tail message timer. This message will consist of up to 15 words selected from the vocabulary table and programmed with the [*3103] command.

4. Transmitter Drop Out Message Enable
When this channel is enabled, the voice drop out message will occur just before the repeater transmitter turns off. This message will repeat subject to the setting of the [*611*] drop out message timer. This message will consist of up to 15 words selected from the voice vocabulary table and is programmed with the [*3104] command.

5. Timed Message #1 Enabled
When this channel is enabled, the timed voice message will occur on a regular schedule subject to the setting of the timed message timer. This message will consist of up to 15 words selected from the voice vocabulary table and is programmed with the [*3105] command.

6. Timed Message #2 Enabled
When this channel is enabled, the timed voice message will occur on a regular schedule subject to the setting of the timed message timer. This message will consist of up to 15 words selected from the voice vocabulary table and is programmed with the [*3106] command.

7. Reserved
8. Reserved

Zone 7 - Miscellaneous Control Channels

1. Fan Control Enable
When this channel is enabled, user output switch #6 is converted into a Fan Control output. When PTT #1 turns ON, user output #6 J2 pin 8 will turn ON. After PTT #1 turns OFF this output will remain ON for an additional period of time determined by the [*612*] Fan Control timer. This timer default is 60 seconds. Use this output to control a fan relay to cool the repeater's transmitter. When this channel is enabled, Zone 5 Channel 6 will have no effect.

2. CTCSS Encoder Switch Enable
When this channel is enabled, user output switch #5 is converted into a CTCSS Encoder Switch output. When Port #1 goes active, user output #5 J2 pin 7 will turn ON. After Port #1 goes inactive, this output will remain ON for an additional period of time determined by the [*626*] CTCSS Encoder timer. This timer default is 4.0 seconds. Use this output to control an external CTCSS encoder. When this channel is enabled, Zone 5 Channel 5 will have no effect.

3. Echolink® Control Enable
When the Link is enabled 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.

4. Transmitter Hang Time Enable
When this channel is enabled, the transmitter will have a hang-time subject to the settings of the COR Drop to Courtesy Beep Timer [*621*] and the Courtesy Beep to PTT Drop Timer [*622*]. At default these timers are set for one second and four seconds.

5. Reserved
6. Reserved
7. Reserved
8. Reserved

Zone 8 - Miscellaneous Control Channels

1. Reserved
2. Reserved
3. Reserved
4. Reserved
5. Reserved
6. Reserved
7. Reserved
8. Reserved

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 [9] and can be changed with the [*3109] programming command.

DTMF Keypad Test Port #1 and Port #2
Key-up, and enter [375], 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 Port #1 and Port #2
When the CAT-260 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".

Forced DTMF Command Entry Port #1 and Port #2
During normal operation a DTMF command is entered when the port goes inactive. It is possible to force a DTMF command entry even while the port is active. The CAT-260 will accept the [D] key as an entry command. This key can be changed with the [*29X] programming command.

DTMF Muting Override Port #1 and Port #2
With DTMF muting enabled, there may be times when it is desirable to pass the DTMF tones to the repeater or link transmitter. To temporarily disable DTMF muting, precede the DTMF string with a pound [#].

Repeater ID #1 (At Rest)
If the repeater has been at rest for a period in excess of the ID timer setting, when the repeater is keyed, the CAT-260 will send ID #1. This ID should be longer than ID #2 and include additional information about the repeater or sponsoring organization. Example: "WITH ONE HUNDRED WATTS OF RF POWER AT YOUR SERVICE THIS IS THE W4XYZ REPEATER SYSTEM -- GOOD AFTERNOON".

Repeater ID #2 (Active)
If a QSO is in progress and it's time to identify the repeater, the CAT-260 will wait until COR drops to send ID #2. This ID should be short so as not to interfere with the QSO in progress. Example: "W4XYZ REPEATER." This ID is also called as the final ID of the ten-minute period.

Macro Execute
A macro is a series of commands, defined by the repeater owner. Macros permit the owner to customize certain aspects of repeater operation. Once the CAT-260 decodes the macro number, the commands will execute in the order they were stored within the macro string.

Link Disconnect
Key-up on the repeater or link input and enter the link disconnect control Macro #28 number [5000]. The CAT-260 will disconnect the link port from the repeater port, and the voice will say: "LINK OFF." See the Event Macro Data table in Chapter 5.

Link Connect
Key-up on the repeater or link input and enter the link connect control Macro #27 number [5001]. The CAT-260 will connect the link port to the repeater port, and the voice will say: "LINK ON." See the Event Macro Data table in Chapter 5.

Link Receive Only
Key-up on the repeater's input and enter the link receive only control Macro #26 number [5002]. The CAT-260 will connect the link port to the repeater port and the voice will say: "LINK RECEIVER ON." The link transmitter will be disabled. See the Event Macro Data table in Chapter 5.

Voice Message Selection
Key-up and enter the VOICE prefix followed by the message number. The CAT-260 will key the transmitter and play the message stored at that location. Example: With a VOICE prefix number of 700, play message stored at table position seven.

Key-up and enter: 7 0 0   0 7

Voice Message Number
Voice Prefix Number
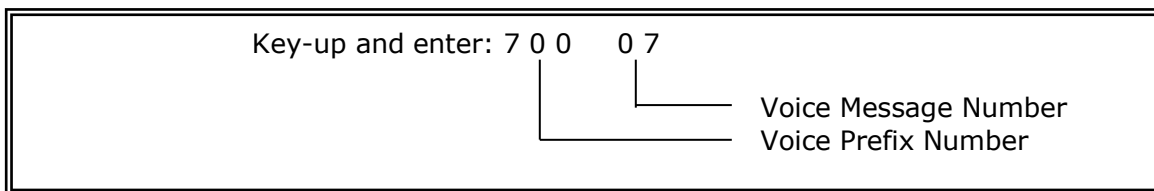
Chapter 5 - Repeater Programming By DTMF Tone

This section describes how the repeater owner using a DTMF keypad programs the CAT-260 controller. The various types of program commands are described in detail and examples are given in the following text.

Initialization
To initialize the CAT-260, 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:

Dipswitch #7 Initialization
1.   All memory locations are cleared.
2.   The control channels marked with a [*] are enabled.
3.   The master unlock number is loaded with the default value [1234567].
4.   The 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.   All codes are loaded with default values.
8.   All timers are loaded with default values.
9.   The two voice Ids are loaded with "CAT-260 REPEATER".
10.   All messages are loaded with default messages.
11.   Event macros are loaded with defaults.

Programming the Master Unlock Number
To program the Master UNLOCK number, set dipswitch #8 to the on position. The voice will say: "ENTER CONTROL." Key-up and enter a seven-digit number. 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 enter the seven-digit number. Set dipswitch #8 to the off position.

Unlocking the Controller By Radio From Port #1 and Port #2 [7654321]
To unlock the controller, key-up and enter the unlock number. The voice will say: "CAT 260 CONTROL."

Note: The CAT-260 can be unlocked and placed in the programming mode with either the unlock or the master unlock number. The master unlock number must be changed by using dipswitch #8. The unlock number can be changed remotely without having to go to the site. For security reasons use the unlock number because it can easily be changed. Use the master unlock number when the conditions are thought to be secure.

Locking the Controller By Radio [*0]
Key-up and send [*0]. Un-key, the controller will lockup and the voice will say: "CONTROL EXIT." The controller will lock automatically when the programming timer expires. The voice will say: "TIMER EXIT." The programming time limit is set by the programming timer [*605*]. The default time is ten minutes.

NOTE: The CAT-260 must be <u>unlocked</u> to perform the following programming functions.

CAT-260 Internal Command Pointer Assignments

	COMMAND	CHANNEL	ACTION
CONTROL REPEATER ZONE 1	11	1-8	0=OFF 1=ON
CONTROL REPEATER ZONE 2	12	1-8	0=OFF 1=ON
CONTROL REPEATER ZONE 3	13	1-8	0=OFF 1=ON
CONTROL REPEATER ZONE 4	14	1-8	0=OFF 1=ON
CONTROL REPEATER ZONE 5	15	1-8	0=OFF 1=ON
CONTROL REPEATER ZONE 6	16	1-8	0=OFF 1=ON
CONTROL REPEATER ZONE 7	17	1-8	0=OFF 1=ON
CONTROL REPEATER ZONE 8	18	1-8	0=OFF 1=ON
		COMMAND	COMMENTS
PLAY TIME OF DAY		2000	
PLAY DAY OF WEEK		2001	
PLAY VOICE MESSAGE (No Interruption with COR)		30XX	01-20
PLAY VOICE MESSAGE (Interruption with COR)		31XX	01-20
PLAY VOICE MESSAGE (Interruption with COR, Switch to CW)		32XX	01-20
PLAY CW BUFFER		3300	
PLAY CW CHARACTER		34XX	01-46
LOAD COURTESY TONE PORT #1		36XX	01-08
LOAD COURTESY TONE PORT #2		37XX	01-08
PLAY COURTESY TONE PORT #1		3800	
PLAY COURTESY TONE PORT #2		3900	
PULSE USER OUTPUT SWITCH #1 (PULSE RATE 100mSEC)		41XX	01-99
PULSE USER OUTPUT SWITCH #2 (PULSE RATE 100mSEC)		42XX	01-99
PULSE USER OUTPUT SWITCH #3 (PULSE RATE 100mSEC)		43XX	01-99
PULSE USER OUTPUT SWITCH #4 (PULSE RATE 100mSEC)		44XX	01-99
PULSE USER OUTPUT SWITCH #5 (PULSE RATE 100mSEC)		45XX	01-99
PULSE USER OUTPUT SWITCH #6 (PULSE RATE 100mSEC)		46XX	01-99
AUDIO SWITCH CONTROL [RX1 TO TX1]		500X	0=OFF 1=ON
AUDIO SWITCH CONTROL [RX1 TO TX2]		501X	0=OFF 1=ON
AUDIO SWITCH CONTROL [RX1 TO TX1 AND TX2]		502X	0=OFF 1=ON
AUDIO SWITCH CONTROL [RX2 TO TX1]		510X	0=OFF 1=ON
AUDIO SWITCH CONTROL [RX2 TO TX2]		511X	0=OFF 1=ON
AUDIO SWITCH CONTROL [RX2 TO TX1 AND TX2]		512X	0=OFF 1=ON
AUDIO SWITCH CONTROL [VOICE TO TX1]		520X	0=OFF 1=ON
AUDIO SWITCH CONTROL [VOICE TO TX2]		521X	0=OFF 1=ON
AUDIO SWITCH CONTROL [VOICE TO TX1 AND TX2]		522X	0=OFF 1=ON
AUDIO SWITCH CONTROL [BEEP OR CW TO TX1]		530X	0=OFF 1=ON

AUDIO SWITCH CONTROL [BEEP OR CW TO TX2]	531X	0=OFF 1=ON
AUDIO SWITCH CONTROL [BEEP OR CW TO TX1 AND TX2]	532X	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 #1 AND PTT #2 CONTROL	613X	0=OFF 1=ON
PTT #1 WITH DELAY AND AUDIO SWITCH [VOICE TO TX1]	614X	0=OFF 1=ON
PTT #2 WITH DELAY AND AUDIO SWITCH [VOICE TO TX2]	615X	0=OFF 1=ON
PTT #1 WITH DELAY AND AUDIO SWITCH [VOICE TO TX1-TX2]	616X	0=OFF 1=ON
USER FUNCTION SWITCH #1 OUTPUT (PULSE 500mSEC)	621X	0=OFF 1=ON 2=PULSE
USER FUNCTION SWITCH #2 OUTPUT (PULSE 500mSEC)	622X	0=OFF 1=ON 2=PULSE
USER FUNCTION SWITCH #3 OUTPUT (PULSE 500mSEC)	623X	0=OFF 1=ON 2=PULSE
USER FUNCTION SWITCH #4 OUTPUT (PULSE 500mSEC)	624X	0=OFF 1=ON 2=PULSE
USER FUNCTION SWITCH #5 OUTPUT (PULSE 500mSEC)	625X	0=OFF 1=ON 2=PULSE
USER FUNCTION SWITCH #6 OUTPUT (PULSE 500mSEC)	626X	0=OFF 1=ON 2=PULSE
DISCONNECT PORT #2 FROM PORT #1	7000	
CONNECT PORT #2 TO PORT #1	7001	
CONNECT PORT #2 RECEIVER TO PORT #1	7002	
DTMF ACCESS REPEATER	710X	0=OFF 1=ON
DISABLE EVENT MACRO	80XX	01-50
ENABLE EVENT MACRO	81XX	01-50
DISABLE USER MACRO	82XX	01-40
ENABLE USER MACRO	83XX	01-40
SEND VOICE WORD	9XXX	001-998

Figure 5-1

Scheduled Event Macro Time (30-49) Command Memory
Event Macros (30-49) 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.

Read Scheduled Event Macro Time (30-49)
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 command is stored at that memory location, the voice will read back the time, day, day of month and month of year.

Program Scheduled Event Macro Time (30-49)
Key-up and send [*1130] followed by the hours, minutes, day of week, or day of month and month of year. Un-key and the voice will say: "CONTROL OK." Example: 9:00 AM Every Friday.

```
┌─────────────────────────────────────────────────────────┐
│  Minutes ──────┐   ┌──────────── Day of Week            │
│  Hour ──────┐  │   │  ┌───────── Day of Month           │
│             │  │   │  │  ┌────── Month of Year           │
│        *1130 09 00 6 00 00                               │
└─────────────────────────────────────────────────────────┘
```
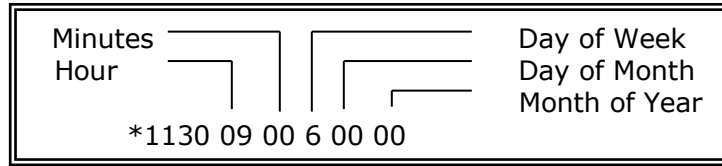
Enable – Disable Scheduled Event Macro (30-49)
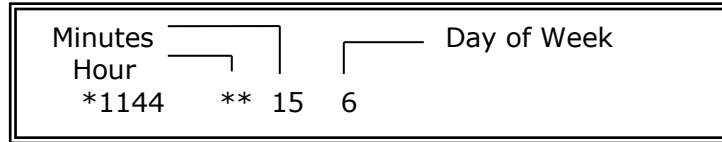Key-up and send [*1130 1] to enable scheduler macro 30 or [*1130 0] to disable macro 30.
Example: Set Event Macro 44 for 15 minutes after every hour on Friday.

```
┌─────────────────────────────────────────────────────────┐
│  Minutes ──────┐       ┌────── Day of Week              │
│   Hour ─────┐  │       │                                 │
│       *1144    **  15  6                                 │
└─────────────────────────────────────────────────────────┘
```

DAY OF WEEK SCHEDULER PROGRAMMING TABLE
0=Daily   2=Monday   4=Wednesday 6=Friday   8=Weekdays
1=Sunday 3=Tuesday 5=Thursday   7=Saturday 9=Weekends

Erase Scheduled Event Macro Time (30-49)
Key-up and send [*12XX]. Un-key, the voice will say: "CONTROL OK."
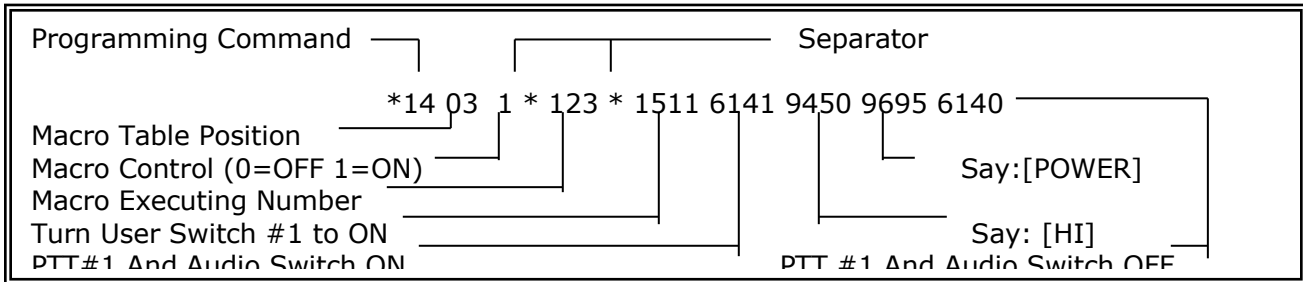
User Macro Command Memory
Macros are used to store custom commands of up to sixteen operations that will execute with a single DTMF entry.

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.

```
┌───────────────────────────────────────────────────────────────────────┐
│  Programming Command ──────┐      ┌───┐──────── Separator              │
│                                                                         │
│          *14 03  1 * 123 * 1511 6141 9450 9695 6140 ──────┐            │
│  Macro Table Position ───────┘  │                          │           │
│  Macro Control (0=OFF 1=ON) ────┘              Say:[POWER] │           │
│  Macro Executing Number                                     │           │
│  Turn User Switch #1 to ON ────────────────┘    Say: [HI]  │           │
│  PTT#1 And Audio Switch ON          PTT #1 And Audio Switch OFF        │
└───────────────────────────────────────────────────────────────────────┘
```

Program User Macro Locations (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."

Event Macro Command Memory
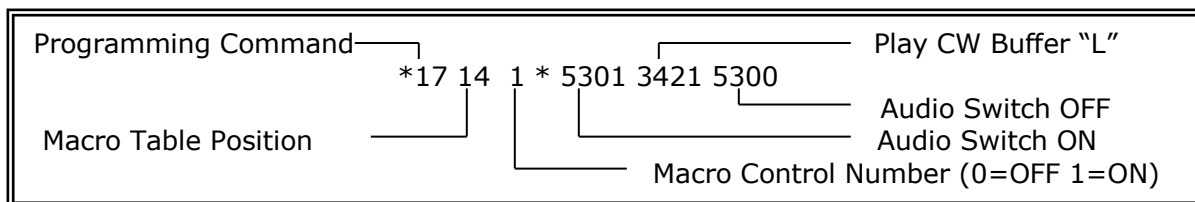Event Macros are used to perform custom operations at pre determined times during repeater operation.

MACRO	DEFINITION	MACRO	DEFINITION
01	PORT #1 COR/CTCSS ACTIVE	26	PORT #2 RECEIVE ONLY
02	PORT #1 COR/CTCSS INACTIVE	27	PORT #2 CONNECT
03	PORT #2 COR/CTCSS ACTIVE	28	PORT #2 DISCONNECT
04	PORT #2 COR/CTCSS INACTIVE	29	PORT #2 AUTO DISCONNECT
05	LOGIC INPUT #1 ACTIVE HIGH	30	SCHEDULED EVENT MACRO #30
06	LOGIC INPUT #1 ACTIVE LOW	31	SCHEDULED EVENT MACRO #31
07	LOGIC INPUT #2 ACTIVE HIGH	32	SCHEDULED EVENT MACRO #32
08	LOGIC INPUT #2 ACTIVE LOW	33	SCHEDULED EVENT MACRO #33
09	LOGIC INPUT #3 ACTIVE HIGH	34	SCHEDULED EVENT MACRO #34
10	LOGIC INPUT #3 ACTIVE LOW	35	SCHEDULED EVENT MACRO #35
11	LOGIC INPUT #4 ACTIVE HIGH	36	SCHEDULED EVENT MACRO #36
12	LOGIC INPUT #4 ACTIVE LOW	37	SCHEDULED EVENT MACRO #37
13	PLAY COURTESY TONE #1	38	SCHEDULED EVENT MACRO #38
14	PLAY COURTESY TONE #2	39	SCHEDULED EVENT MACRO #39
15		40	SCHEDULED EVENT MACRO #40
16	SQUELCH TAIL MESSAGE	41	SCHEDULED EVENT MACRO #41
17	TRANSMITTER DROP MESSAGE	42	SCHEDULED EVENT MACRO #42
18	ID MESSAGE INITIAL	43	SCHEDULED EVENT MACRO #43
19	ID MESSAGE PENDING	44	SCHEDULED EVENT MACRO #44
20	ID MESSAGE FORCED	45	SCHEDULED EVENT MACRO #45
21	ID MESSAGE FINIAL	46	SCHEDULED EVENT MACRO #46
22	TIMED MESSAGE #1	47	SCHEDULED EVENT MACRO #47
23	TIMED MESSAGE #2	48	SCHEDULED EVENT MACRO #48
24	DTMF ACCESS UP	49	SCHEDULED EVENT MACRO #49
25	DTMF ACCESS DOWN	50	POWER UP

Read Event Macro Locations (01-50)

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 (01-50)

Key-up and send [*17XX] followed by the macro control number and the string of internal commands to be executed. Un-key and the voice will say: "CONTROL OK." Example: Program the Port #2 courtesy tone to be the letter "L".

```
                                                                  ┌──────────── Play CW Buffer "L"
  Programming Command ───────┐                    ┌─────
                             *17 14  1 * 5301 3421 5300
                                                       └─────────── Audio Switch OFF
  Macro Table Position ──────────────┘      │                      Audio Switch ON
                                             └──────── Macro Control Number (0=OFF 1=ON)
```

Erase Event Macro Locations (01-50)

Key-up and send [*18XX]. Un-key, the voice will say: "CONTROL OK."

Event Macro Default Data

01	PORT #1 COR/CTCSS ACTIVE									
02	PORT #1 COR/CTCSS INACTIVE									
03	PORT #2 COR/CTCSS ACTIVE									
04	PORT #2 COR/CTCSS INACTIVE									
05	LOGIC INPUT #1 ACTIVE HIGH	1511								
06	LOGIC INPUT #1 ACTIVE LOW	1510								
07	LOGIC INPUT #2 ACTIVE HIGH	1521								
08	LOGIC INPUT #2 ACTIVE LOW	1520								
09	LOGIC INPUT #3 ACTIVE HIGH	1531								
10	LOGIC INPUT #3 ACTIVE LOW	1530								
11	LOGIC INPUT #4 ACTIVE HIGH	1541								
12	LOGIC INPUT #4 ACTIVE LOW	1540								
13	COURTESY TONE PORT #1 INPUT	5301	3800	5300						
14	COURTESY TONE PORT #2 INPUT	5301	3421	5300						
15										
16	SQUELCH TAIL MESSAGE	5201	3003	5200						
17	TRANSMITTER DROP MESSAGE	5201	3004	5200						
18	ID MESSAGE INITIAL	6120	5201	3201	5220					
19	ID MESSAGE PENDING	6120	5201	3202	5220					
20	ID MESSAGE FORCED	5301	3300							
21	ID MESSAGE FINIAL	6141	3001	6140						
22	TIMED MESSAGE #1	6141	3005	6140						
23	TIMED MESSAGE #2	6141	3006	6140						

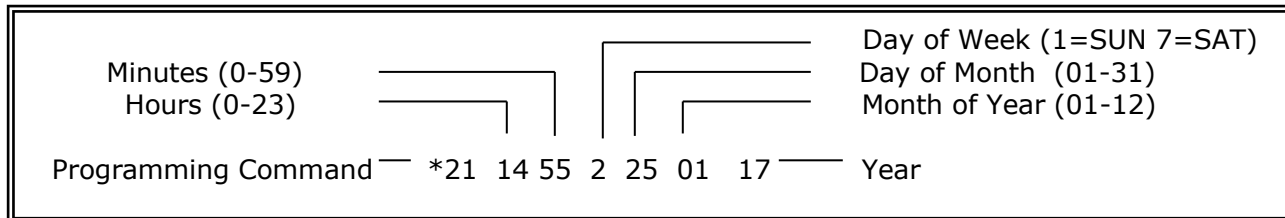|										
24	DTMF ACCESS UP	6141	9650	9530	9875	6140				
25	DTMF ACCESS DOWN	6141	9650	9530	9324	6140				
26	PORT #2 RECEIVE ONLY	6141	3013	6140	7002					
27	PORT #2 CONNECT	6161	3012	7001	6160					
28	PORT #2 DISCONNECT	6161	3011	6160	7000					
29	PORT #2 AUTO DISCONNECT	6161	3014	6160	7000					
30	SCHEDULED MACRO 30									
31	SCHEDULED MACRO 31									
32	SCHEDULED MACRO 32									
33	SCHEDULED MACRO 33									
34	SCHEDULED MACRO 34									
35	SCHEDULED MACRO 35									
36	SCHEDULED MACRO 36									
37	SCHEDULED MACRO 37									
38	SCHEDULED MACRO 38									
39	SCHEDULED MACRO 39									
40	SCHEDULED MACRO 40									
41	SCHEDULED MACRO 41									
42	SCHEDULED MACRO 42									
43	SCHEDULED MACRO 43									
44	SCHEDULED MACRO 44									
45	SCHEDULED MACRO 45									
46	SCHEDULED MACRO 46									
47	SCHEDULED MACRO 47									
48	SCHEDULED MACRO 48									
49	SCHEDULER MACRO 49									
50	POWER UP	6141	9275	9002	9050	9999	6001	9101	9100	6140

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: Back-up power for the clock is supplied by a 3.3-volt coin cell. During a power failure the battery will power the clock. During power up the CAT-260 will announce the time.

Setting the Clock [Long Entry]

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 Monday January 25th. All entries must be double digit, except the day of week.

```
                                                    Day of Week (1=SUN 7=SAT)
    Minutes (0-59) ──────────┐    ┌──────────    Day of Month  (01-31)
    Hours (0-23) ────────────┐│    │┌──────────    Month of Year (01-12)

    Programming Command ── *21  14 55  2  25  01  17 ── Year
```

Setting the Clock [Short Entry]

Key-up and send [*22] followed by the hours, and minutes. Un-key and the voice will say "CLOCK SET OK." Example: 2:55 PM Monday.

```
    Hours (0-23) ──────────┐    ┌── Minutes (0-59)

    Programming Command ── *22 14  55
```
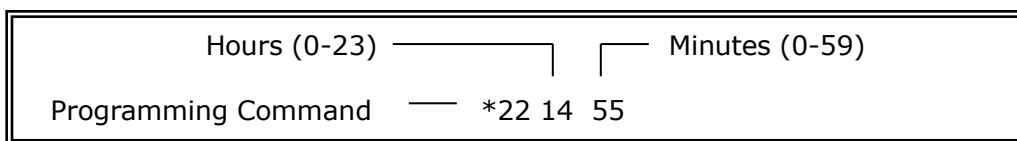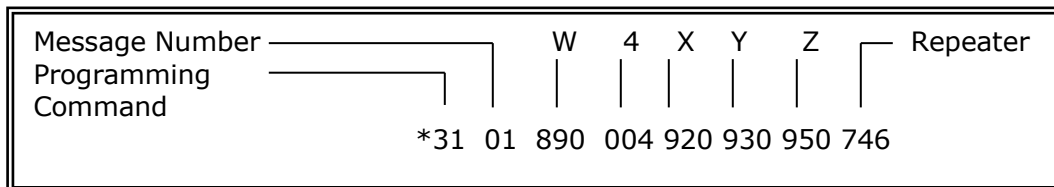
Program Forced Entry Command [*29]

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 ID.

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 ID with "W4XYZ Repeater".

```
    Message Number ──────────    W    4   X   Y    Z  ┌── Repeater
    Programming           ──────┐│    │   │   │    │  │
    Command               ──────┘
                          *31  01  890  004 920 930 950 746
```

VOICE MESSAGE ASSIGNMENT NUMBER TABLE		
01	REPEATER ID #1 (AT REST)	"CAT-260 REPEATER"
02	REPEATER ID #2 (ACTIVE)	"CAT-260"
03	SQUELCH TAIL MESSAGE	"MESSAGE 3"
04	TRANSMITTER DROP MESSAGE	"MESSAGE 4"
05	TIMED MESSAGE #1	"MESSAGE 5"
06	TIMED MESSAGE #2	"MESSAGE 6"
07	REPEATER TIME OUT EXIT	"REPEATER TIME OUT EXIT"
08	REPEATER TIME OUT CLEAR	"REPEATER TIME OUT CLEAR"
09	TIME OF DAY MESSAGE	"THE TIME IS"
10	GRANDFATHER CLOCK MESSAGE	"CAT-260 REPEATER THE TIME IS"
11	REMOTE BASE OFF	"REMOTE BASE OFF"
12	REMOTE BASE ON	"REMOTE BASE ON"
13	REMOTE BASE RECEIVE ONLY	"REMOTE BASE RECEIVE"
14	REMOTE BASE AUTO CLEAR	"REMOTE BASE CLEAR"
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.
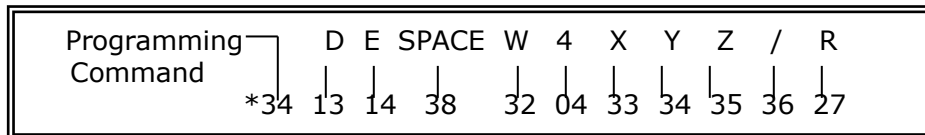
CW ID Memory Storage
Memory space is provided for a CW identification. The buffer will accept 15 characters. During initialization, the CW buffer is loaded with "CAT260/R."

Send CW Identification [*33]
Key-up and send [*33]. Un-key and the CAT-260 will send the CW ID.

Program CW Identification [*34]

Key-up and send [*34], followed by the two digit numbers that represents the call letter identification. Memory space is provided for (15) entries. Refer to the CW ID programming table. Example: Load CW ID memory buffer with DE W4XYZ/R.

```
┌─────────────────────────────────────────────────────────────────┐
│  ┌─────────────────────────────────────────────────────────────┐ │
│  │ Programming ─┐   D  E  SPACE  W   4   X   Y   Z   /   R       │ │
│  │ Command      │   │  │   │     │   │   │   │   │   │   │       │ │
│  │            *34  13 14  38    32  04  33  34  35  36  27       │ │
│  └─────────────────────────────────────────────────────────────┘ │
└─────────────────────────────────────────────────────────────────┘
```

00=0	07=7	14=E	21=L	28=S	35=Z	42=[?]
01=1	08=8	15=F	22=M	29=T	36=/	43=[-]
02=2	09=9	16=G	23=N	30=U	37=AR	44=(
03=3	10=A	17=H	24=O	31=V	38=SPACE	45=SK
04=4	11=B	18=I	25=P	32=W	39=[.]	
05=5	12=C	19=J	26=Q	33=X	40=[;]	
06=6	13=D	20=K	27=R	34=Y	41=[:]	

Erase CW Identification [*35]

Key-up and send [*35]. Un-key and the voice will say: "CONTROL OK." If the CW ID buffer is empty and a repeater user keys-up during a voice ID, the voice ID will stop.

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-260 is powered up with dip-switch #7 set to the on position.

Control Operator Prefix Number Port #1 (Repeater) [*501*]

This programming command selects the control operator prefix number for the repeater port. This number must precede the command to change the zone control channels. Example: To program a Control Operator Prefix of [100], key-up and send:

```
┌─────────────────────────────────────────────────────────────────┐
│  Programming Command ──┐      ┌── Control Operator Prefix Number  │
│                        │      │                                   │
│                      *501*   100                                  │
└─────────────────────────────────────────────────────────────────┘
```
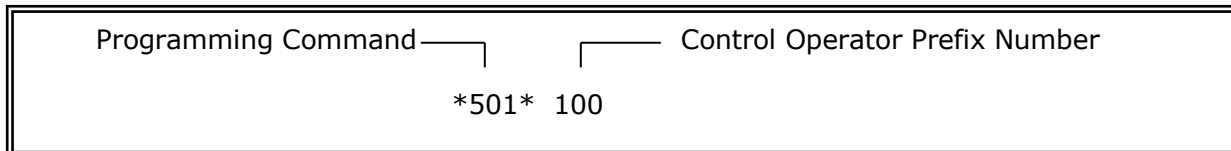
Un-key, the voice will say: "CONTROL OK." The default number is [100].

Control Operator Prefix Number Port #2 (Link) [*502*]

This programming command selects the control operator prefix number for the link port. This number must precede the command to change the zone control channels through port #2 the link input. Example: To program a Control Operator Prefix of [200], key-up and send and send [*502*200].

DTMF Access Code [*503*]

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].

DTMF Pad Test Number [*504*]
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 375, key-up and send [*504*375]. Un-key and the voice will say: "CONTROL OK."

Port #2 Link Disconnect Control Number [*505*]
This number is used to disconnect the link. Example: To program a link disconnect control number of 5000, key-up and send [*505*5000]. Un-key and the voice will say: "CONTROL OK."

Port #2 Link Connect Control Number [*506*]
This number is used to connect the link. Example: To program a link connect control number of 5001, key-up and send [*506*5001]. Un-key and the voice will say: "CONTROL OK."

Port #2 Link Receive Only Control Number [*507*]
This number is used to activate the link receive only mode. Example: To program a link receive only control number of 5002, key-up and send [*507*5002]. Un-key and the voice will say: "CONTROL OK."

Voice Demonstration Control Number [*508*]
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 [*508*700]. Un-key and the voice will say: "CONTROL OK."

Time of Day Number [*509*]
This programming command selects the time request number. This number must be entered to request a time of day announcement. The default number is [400].

Unlock Number [*510*]
This programming command selects the unlock number used to place the CAT-260 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 - *510]**
Use this programming command to read the control operator and prefix numbers. 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 [16] timers. These timers are user programmable. When the CAT-260 is initialized, these timers are automatically loaded with default values.

Port #1 Timeout [*601*]
This timer limits the Port #1 transmission length. This timer is programmable between 60 and 1799 seconds. Example: To program the timer for 3 minutes, key-up and enter [*601*180]. Un-key and the voice will say: "CONTROL OK." When initialize, this timer defaults to 180 seconds.

```
           Programming Command                        Time (180 SECONDS)
                            *601*   180
```
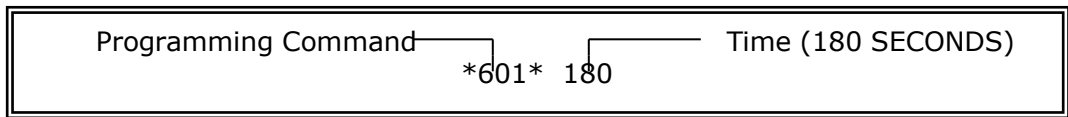
Port #2 Timeout [*602*]
This timer limits the Port #2 transmission length. This timer is programmable between 60 and 1799 seconds. Example: To program the timer for 3 minutes, key-up and enter [*602*180]. Un-key and the voice will say: "CONTROL OK." When initialize, this timer defaults to 180 seconds.

System ID Timer [*603*]
This timer sets the time between transmissions of the repeater 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.

System Pending ID Timer [*604*]
The CAT-260 waits until the input is clear before generating a voice ID. If the System ID Timer expires and the input is still not clear, the CAT-260 will wait an additional period of time before a forced ID is sent. This timer sets the length of this period. This timer is programmable between 60 and 1799 seconds. The timer default is 120 seconds.

CRT and Programming Length Timer [*605*]
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 [*606*]
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.

Link Auto Disconnect Timer [*607*]
During link operation if Zone 2 channel 6 is enabled the link will disconnect automatically after a period inactivity. This timer is programmable between 60 and 1799 seconds. The timer default is 600 seconds.

Timed Message #1 Timer [*608*]
This timer sets the timed message repeat period. This timer is programmable between 60 and 1799 seconds. The timer default is 1799 seconds.

Timed Message #2 Timer [*609*]
This timer sets the timed message repeat period. This timer is programmable between 60 and 1799 seconds. The timer default is 1799 seconds.

Squelch Tail Message Timer [*610*]
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 60 and 1799 seconds. The timer default is 1799 seconds.

Drop Out Message Timer *611*]
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 60 and 1799 seconds. The timer default is 1799 seconds.

Fan Control Timer *612*]
When Zone 7 Channel 1 is enabled, user output switch #6 becomes a Fan Control output. When PTT #1 turns ON, User Output #6 (J2 pin 8) will turn ON. After PTT #1 turns OFF this output will remain ON for an additional period of time determined by the [*612*] Fan Control timer. This timer is programmable between 60 and 1799 seconds. The timer default is 60 seconds.

COR Drop to Courtesy Beep Timer [*621*]
This timer determines the time between loss of COR and the 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 [*621*25].

Courtesy Beep to PTT Drop Timer [*622*]
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 [*623*]
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 [*624*]
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 [*624*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 [*625*]
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.

CTSCC Encoder Timer [*626*]
This timer determines the time the CTCSS Encoder Logic remains on after Port #1 goes inactive. When initialize, this timer defaults to 4 second.

Read Timer Settings [*601-*626]
Key-up and send [*601]. Un-key and the voice synthesizer will read back the setting of the repeater's time-out timer. The voice will say: "TIMER 601 IS THREE MINUTES."

Audio Test Tone [*901-*902-*903]
The CAT-260 will generate a 1000Hz test tone. Use this tone as a reference when setting 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 TX1 and TX2 audio, key-up and enter [*903].
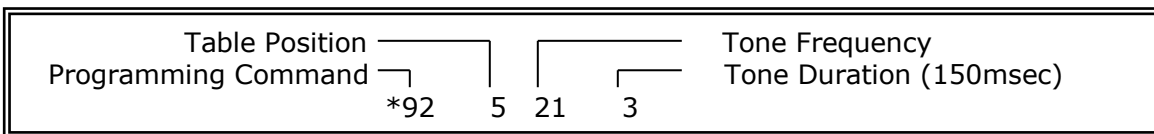
Courtesy Tone
Memory space is provided for [8] custom courtesy tones. Each tone can consist of up to three different tone frequencies of various lengths and separations.

Send Courtesy Tone (1-8)
Key-up and send [*91X]. Un-key and the CAT-260 will transmit the courtesy tone. "X" represents the courtesy tone table location.
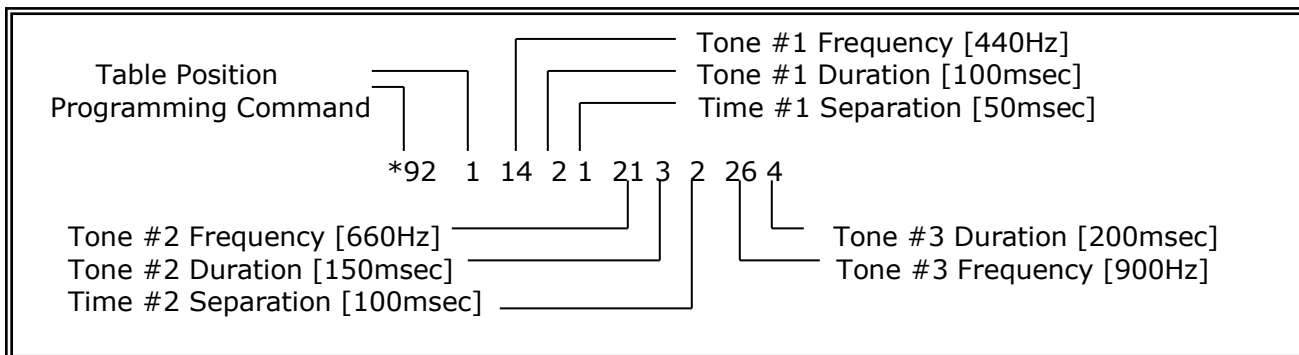
Program Courtesy Tone (1-8)

Key-up and send [*92X], followed by the frequency, duration and separation numbers from the courtesy tone table. This programming command is used to develop eight custom courtesy tones 151 through 158. The tone created with the [*925] programming command is identified as tone "155". Example: Program courtesy tone table location 5 with a tone of 660Hz and duration of 150msec.

```
              Table Position ────────┐     ┌──────── Tone Frequency
       Programming Command ──┐       │     │   ┌──── Tone Duration (150msec)
                            *92      5    21   3
```

TONE FREQUENCY TABLE						
01=207Hz	06=277Hz	11=370Hz	16=493Hz	21=660Hz	26=880Hz	31=1174Hz
02=220Hz	07=293Hz	12=392Hz	17=523Hz	22=698Hz	27=932Hz	32=1244Hz
03=233Hz	08=311Hz	13=415Hz	18=554Hz	23=740Hz	28=987Hz	
04=246Hz	09=330Hz	14=440Hz	19=587Hz	24=784Hz	29=1046Hz	
05=261Hz	10=349Hz	15=466Hz	20=622Hz	25=830Hz	30=1108Hz	

TONE TIMING (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 1 with a three-frequency tone.

```
                                           ┌──────── Tone #1 Frequency [440Hz]
            Table Position ────────┐       │  ┌───── Tone #1 Duration [100msec]
     Programming Command ──┐       │       │  │  ┌── Time #1 Separation [50msec]
                          *92   1  14  2  1  21 3  2  26 4

  Tone #2 Frequency [660Hz] ──────────┘              ┌── Tone #3 Duration [200msec]
  Tone #2 Duration [150msec] ─────────┘              └── Tone #3 Frequency [900Hz]
  Time #2 Separation [100msec] ───────┘
```

Erase Courtesy Tone (1-8)

Key-up and send [*93X]. Un-key and the voice will say: "CONTROL OK."

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-260 will exit the programming mode when the [*605*] timer expires. The CAT-260 will return to normal operation. The voice will say: TIMER EXIT."

DTMF Programming Commands

ENTRY	DESCRIPTION	DEFAULT
*10XX	READ SCHEDULER EVENT TIME (30-49)	
*11XX	PROGRAM SCHEDULER EVENT TIME (30-49)	
*12XX	ERASE SCHEDULER EVENT TIME (30-49)	
*13XX	READ USER MACRO COMMAND (01-40)	
*14XX	PROGRAM USER MACRO COMMAND (01-40)	
*15XX	ERASE USER MACRO COMMAND (01-40)	
*16XX	READ EVENT MACRO COMMAND (01-50)	
*17XX	PROGRAM EVENT MACRO COMMAND (01-50)	
*18XX	ERASE EVENT MACRO COMMAND (01-50)	
*20	SEND TIME OF DAY	
*21	PROGRAM CLOCK LONG TIME OF DAY (All Clock Parameters Including Year)	
*22	PROGRAM CLOCK SHORT TIME OF DAY (Hours and Minutes only)	
*29	READ FORCED ENTRY KEY	
*29X	PROGRAM FORCED ENTRY KEY	D
*30XX	PLAY VOICE MESSAGE (1-20)	
*31XX	PROGRAM VOICE MESSAGE (1-20)	
*32XX	ERASE VOICE MESSAGE (1-20)	
*33	SEND CW IDENTIFICATION	
*34	PROGRAM CW IDENTIFICATION	
*35	ERASE CW IDENTIFICATION	
*36XX	SET CW TONE FREQUENCY (01-32)	25
*37X	SET CW SPEED (1-5) (1=10 2=15 3=20 4=25 5=30WPM)	3
*38XX	SET MUTING TONE FREQUENCY (01 – 32)	20
501	PROGRAM CONTROL OPERATOR NUMBER PORT #1 (REPEATER)	100
502	PROGRAM CONTROL OPERATOR NUMBER PORT #2 (LINK)	200
503	PROGRAM DTMF ACCESS NUMBER	325
504	PROGRAM DTMF PAD TEST NUMBER	375
505	PORT #2 DISCONNECT CODE	5000
506	PORT #2 CONNECT CODE	5001
507	PORT #2 RECEIVE ONLY CODE	5002
508	PLAY VOICE MESSAGE DEMO CODE	700

509	TIME OF DAY MESSAGE CODE	400
510	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	SYSTEM ID TIMER (60 - 1799 SECONDS)	600
604	SYSTEM PENDING ID TIMER (60 – 1799 SECONDS)	120
605	PROGRAMMING LENGTH TIMER & CRT TIMEOUT (60 – 1799 SECONDS)	600
606	PROGRAM DTMF ACCESS SLEEP TIMER (60 – 1799 SECONDS)	60
607	PROGRAM LINK AUTO DISCONNECT TIMER (60 – 1799 SECONDS)	600
608	TIMED MESSAGE #1 TIMER (60 - 1799 SECONDS)	1799
609	TIMED MESSAGE #2 TIMER (60 - 1799 SECONDS)	1799
610	SQUELCH TAIL MESSAGE TIMER (60 - 1799 SECONDS)	1799
611	DROP OUT MESSAGE TIMER (60 - 1799 SECONDS)	1799
612	FAN CONTROL TIMER	60
621	COR DROP TO COURTESY BEEP TIMER (0.1 – 9.9 SECONDS)	1.0
622	COURTESY BEEP TO PTT DROP TIMER (0.1 – 9.9 SECONDS)	4.0
623	PRE-VOICE DELAY TIMER (0.1 – 9.9 SECONDS)	0.5
624	TURN-ON DELAY TIMER (0.1 – 9.9 SECONDS)	1.0
625	DTMF MUTING TIMER (0.1 – 9.9 SECONDS)	1.0
626	CTCSS ENCODER TIMER (0.1 – 9.9 SECONDS)	4.0
*901	TRANSMIT AUDIO TEST TONE PORT #1 (REPEATER)	
*902	TRANSMIT AUDIO TEST TONE PORT #2 (LINK)	
*903	TRANSMIT AUDIO TEST TONE PORT #1 AND PORT #2	
*91X	READ COURTESY TONE (1–8)	
*92X	PROGRAM COURTESY TONE (1–8)	
*93X	ERASE COURTESY TONE (1–8)	
*0	MANUAL EXIT OF PROGRAMMING MODE	

Chapter 6 – Interfacing to Other Equipment

Interfacing the CAT-260 to your repeater system is a simple matter. A minimum of two inputs, two outputs and a ground are required for the CAT-260 to control a repeater. They are:

1.   A COR signal to indicate when a signal is being received.
2.   A receive audio signal containing DTMF tones to be processed for control.
3.   A Push-To-Talk signal to tell the repeater transmitter to turn ON.
4.   A transmit audio signal containing a combination of receive audio, synthesized voice, and courtesy tone.
5.   Connection to the repeater's chassis.

NOTE: Additional connections are required to realize all the features of the CAT-260.

Determining COR Logic
Locate your repeater receiver's COR output. This line has a DC voltage that changes state when a signal is being received.   If the COR line is 0 volts and goes to a positive voltage when a signal is received it is said to be (positive logic) or active HIGH. If the COR line is a positive voltage, and goes to 0 volts when a signal is received it is said to be (negative logic) or active LOW. Note: 0 volts is any voltage less than 0.5VDC. A positive voltage is any voltage greater than 3.0VDC. Set dipswitch #1 on the CAT-260 to ON for (negative logic) and OFF for (positive logic).

Connection to Receiver
Connect the repeater receiver audio output to J2-13 and the COR to J2-6 of the CAT-260. Verify this line changes from less than 0.5VDC to greater than 3.0 VDC. If the COR line will not meet these limits it may be necessary to add the pull-up resistor to the COR #1 line. Install the jumper at the J10 header. This may also be true for the COR #2 input.

Connection to Transmitter
Locate your repeater's Push-To-Talk input. When grounded, this line will make the repeater transmit. Connect the CAT-260 PTT #1 output (J2-10) to this line. Locate your repeater's TX audio input. This is the line were the audio signal used to modulate the transmitter is applied. Connect the TX1 AUDIO (J2-11) to this line.

Connection to CTCSS Decoder
If your repeater receiver has a CTCSS decoder output, connect it to J2-4. If the CTCSS output is active high set dipswitch #2 off. If the CTCSS output is active low set dipswitch #2 on.

Interface Review
1.   Are dipswitches #1 through #8 in their proper positions?
2.   Is the PTT-1 output at J2-10 connected to the transmitter PTT input?
3.   Is the TX1 Audio output at J2-11 connected to the transmitter audio input?
4.   Is the COR-1 input at J2-6 connected to the repeater receiver COR output?
5.   Is dipswitch #1 ON for active low COR or OFF for active high COR?
6.   Is the COR level changing from less than 0.5 VDC to greater than 3.0 VDC?
7.   Is the RX1 AUDIO output at J2-13 connected to the receiver audio output?
8.   Is the RX1 AUDIO level sufficient for DTMF decoding (200mVAC) at the RX1 test point?

Connector Kit
Included with the controller is a connector kit containing a 25 pin "D" connector to mate with J2, and a 2.5/5.5mm power plug to mate with J3 (center pin is [+]).

Power Supply
The CAT-260 is powered by an external 12VDC power supply. Connect the positive lead of the supply to the center pin of the coaxial power connector J3 and the negative lead to the outer conductor.

Audio De-Emphasis Jumpers (J8-J9)
If the controller is supplied with discriminator audio it is necessary to de-emphasize the audio. With the jumpers installed on J8 (Port #1) and J9 (Port #2), .0047uF caps will be connected across the feedback resistors of the receiver audio amplifiers. This will lower the gain at the higher frequencies and produce the necessary de-emphasis. If de-emphasize audio is supplied to the controller these jumpers should be removed.

Audio Level Adjustment
The audio mixing-switching circuits of the CAT-260 are optimized around an input of −10dBM (220mV).

Connect a signal generator to the repeater's receiver input. Adjust the signal generator's output for a standard test signal of 1000 Hz at 3 KHz deviation. If a signal generator is not available, select a radio that you suspect has the DTMF tone pad adjusted for approximately 3 KHz deviation.

Key-up on the repeater input and send a DTMF tone. Adjust the RX1 control for 220mVAC at the RX1 Test Point. If a link transceiver is connected to the CAT-260, key-up and send the LINK enable command [5001]. Key-up on the LINK receiver input and send a DTMF tone. Adjust RX2 control for 220mVAC at the RX2 Test Point.
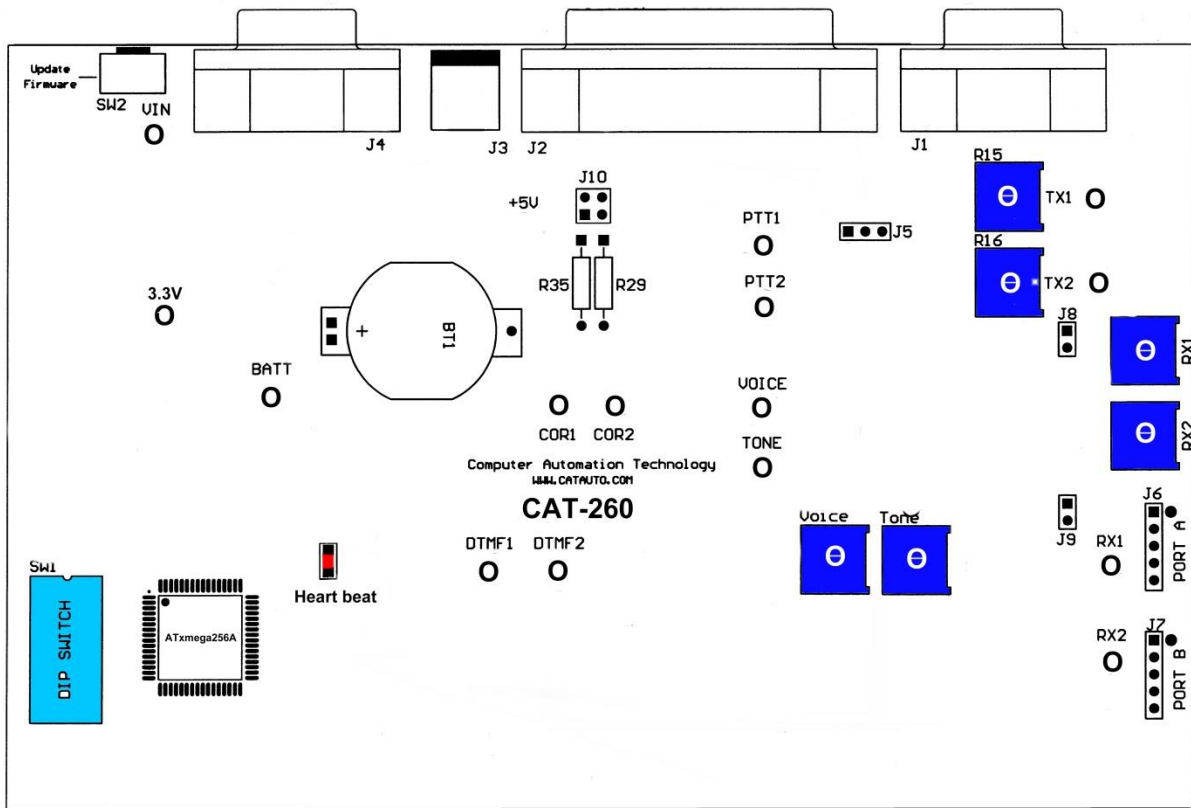

Figure 6-1

Test Points

The CAT-260 provides twenty-one test points to facilitate adjustments and troubleshooting.

TEST POINT		DESCRIPTION	LOCATION
TP8	PTT-1	Port #1 Push-To-Talk Output	J2-10
TP9	PTT-2	Port #2 Push-To-Talk Output	J2-9 and J3-3
TP1	COR-1	Port #1 Carrier Operated Relay Input	J2-6
TP2	COR-2	Port #2 Carrier Operated Relay Input	J2-5 and J3-1
TP5	RX1	Port #1 DTMF Decoder Input	U6-14
TP6	RX2	Port #2 DTMF Decoder Input	U6-8
TP3	TX1	Port #1 Transmit Audio Output	J2-11
TP4	TX2	Port #2 Transmit Audio Output	J2-23 and J3-4
TP14	DTMF1	Port #1 DTMF Strobe	U3-15
TP15	DTMF2	Port #2 DTMF Strobe	U11-15
TP7	BATT	Clock Battery Voltage	Plus Lead of Clock Battery
TP11	V-IN	+12VDC Input	Plus Pin of J3
TP10	5VDC	+5.0 Volt Regulator	U1 Pin 3
TP12	VOICE	Voice Synthesizer	U13 Pin 14
TP13	TONE	Tone Generator	U13 Pin 8

Heartbeat LED

The red LED located on the board will flash once a second to indicate the CAT-260 is executing its program.

Once the RX1, and RX2 audios are adjusted, key-up on the repeater input and send a DTMF tone. Monitor the REPEATER transmitter. Adjust the TX1 Audio level control as required to set the repeater transmitter deviation to 3 KHz or as desired. If the repeaters transmit audio input is very sensitive and you find the TX1 Audio level control near minimum, it is strongly recommended that an external voltage divider be installed at the audio input of the repeater's transmitter.

If a link transceiver is connected, key-up on the repeater input and send a DTMF tone. Monitor the LINK transmitter. Adjust the TX2 Audio level control as required to set the link transmitter deviation to 3 KHz or as desired. If the link-transmit audio input is very sensitive and you find the TX2 Audio level control is near minimum, set the jumper plug at J5 between pins 1 and 2.

Compare the receive and synthesized voice audio and adjust the voice Level as desired. The synthesized voice should be slightly lower than the receive audio level.

Unlock the CAT-260 by keying-up on the repeater input and entering: [1234567]. Key-up and enter the [*901] test tone programming command. Verify that the test tone provides approximately 1.5 KHz transmitter deviation. Adjust the TONE control as required. Key-up and enter [*0] to exit the programming mode. Readjust the TONE control if the courtesy tone or CW id is not to your liking.

Repeater and Link Interface (J2)
Connector J2 provides an interface to the repeater and transceiver.

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	SWITCH #6	21	LOGIC INPUT #3
9	PTT #2	22	LOGIC INPUT #4
10	PTT #1	23	TX AUDIO #2
11	TX AUDIO #1	24	RESERVED
12	RX AUDIO #2	25	GROUND
13	RX AUDIO #1		

Figure 6-2

Link Interface (J1)
Connector J1 provides an alternate interface between Port #2 of the CAT-260 and the Link transceiver. This permits the use of independent cables between the repeater and link transceiver.

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		

Figure 6-3

CTCSS Decoder

Connect the TS-64WDS CTCSS Encoder/Decoder assembly to the CAT-260 as described in Figure 6-4. The decoder must be connected to discriminator audio. Speaker or volume control audio will have insufficient low frequency CTCSS tone content.

				TS-64WDS
+12VDC	RED	3	+12VDC	
2200 OHM PULL-UP RESISTOR				
CAT-260 (J2-4)	GREEN/WHITE	13	RX AUDIO MUTE	
(1) TRANSMITTER PTT OR (2) NO CONNECTION	YELLOW/BLACK	10	PTT OUTPUT	
DISCRIMINATOR	GREEN	12	DISCRIMINATOR	
DISCRIMINATOR	BLUE/WHITE	1	HIGH PASS FILTER IN	
TRANSMITTER EXCITER	YELLOW	6	CTCSS TONE OUT	
GROUND	BLACK	9	GROUND	
(1) CAT-260 PTT #1 (J2-10) OR (2) CAT-260 SWITCH #5 (J2-7)	ORANGE/WHITE	8	PTT INPUT	
GROUND	VIOLET	2	HANG-UP	
CAT-260 RX1 INPUT (J2-13)	BLUE	11	HIGH PASS OUT	

To continuously transmit a CTCSS tone on the transmitter wire pins 8 and 10 per option #1
To transmit a CTCSS tone only when a receive signal is present, wire pins 8 and 10 per option #2.
Program timer (*626*) for 0.1 seconds and turn on Zone 7 channel 2.

Figure 6-4

Chapter 7 – ED-260 Windows Editor

ED-260 Windows Editor
Start the windows editor program to display the **"CAT-260 Repeater Controller Editor"** main window. Along the top of the window click the "Manila Folder" button. Open the "CAT-260 Default.ini" file. All of the buttons will light up and the editor will display the CAT-260 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.
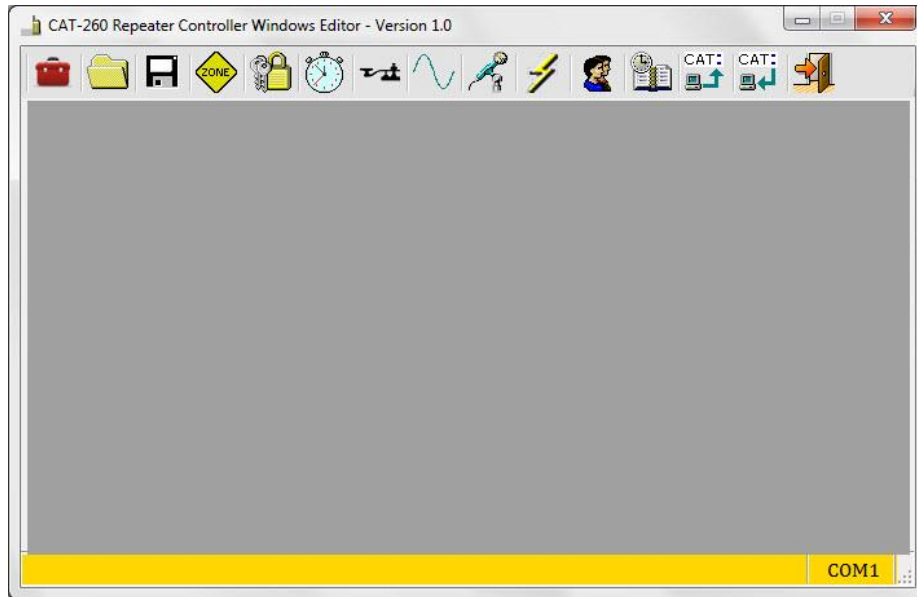
CAT-260 Zone Channels
The CAT-260 has eight control zones with eight control channels each. Zone 1 is assigned to control port #1 with Zone 2 controlling port #2. Zones 3 through Zone 8 are global control zones common to both ports. Clicked the "Zone button" at the top of the main editor window. You 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".

7-1
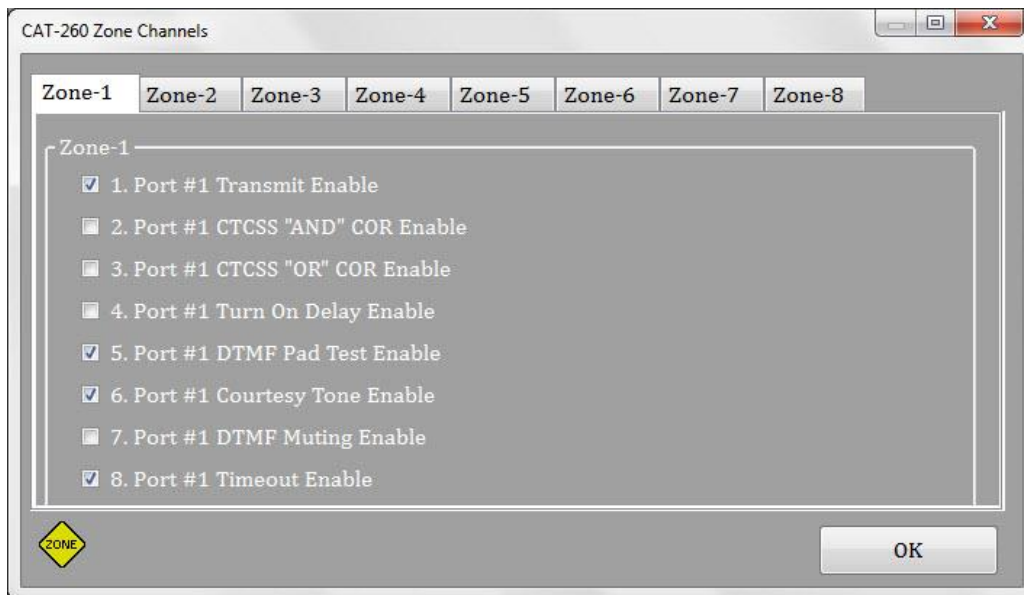
CAT-260 Control Codes

The CAT-260 has twelve control codes. Clicked on the "Lock& Keys" button at the top of the main editor window. You will see a window similar to the one below. A code 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. NOTE: The main unlock code must be seven-digits. For security purposes, change the Control Operator codes for ports one and two as well as the two unlock codes before putting the CAT-260 into service. When finished click "OK".
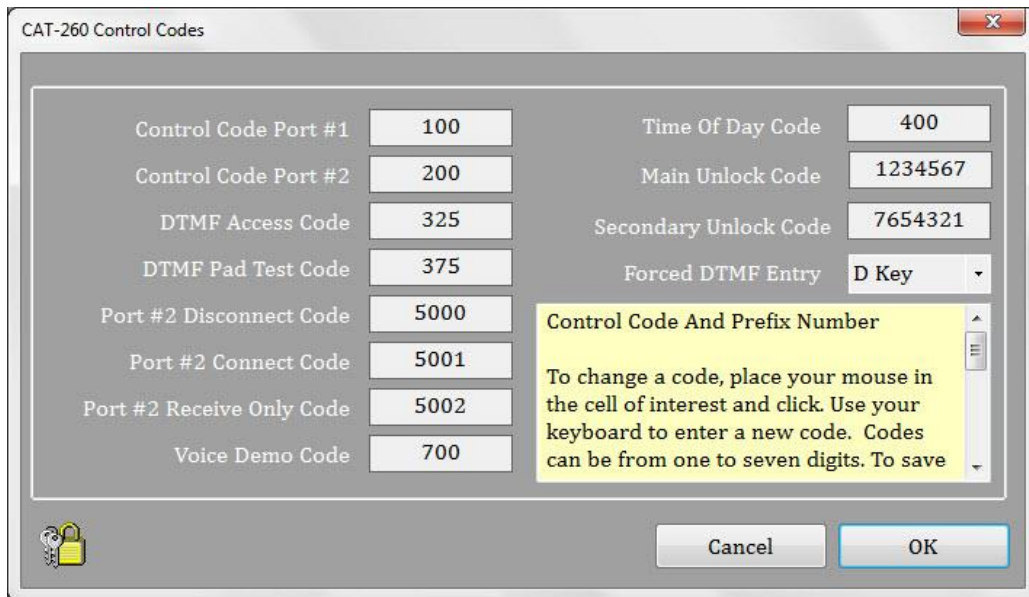
CAT-260 Timers

The CAT260 has six short timers and twelve long timers. Click on the "Stopwatch" button at the top of the main editor window you will see a window similar to the one below. There is one short timer page and one long timer page. The long timers can be programmed to any time between 60 and 1799 seconds. Example ten minutes would be entered as 600 seconds. 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".

7−3
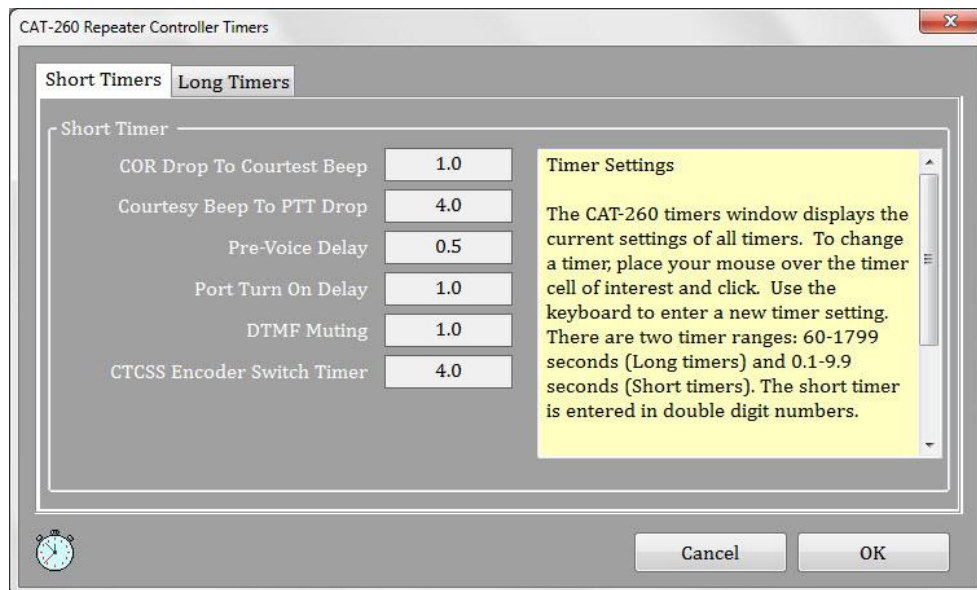
CAT-260 CW Message

If you clicked on the "Telegraph Key" 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".
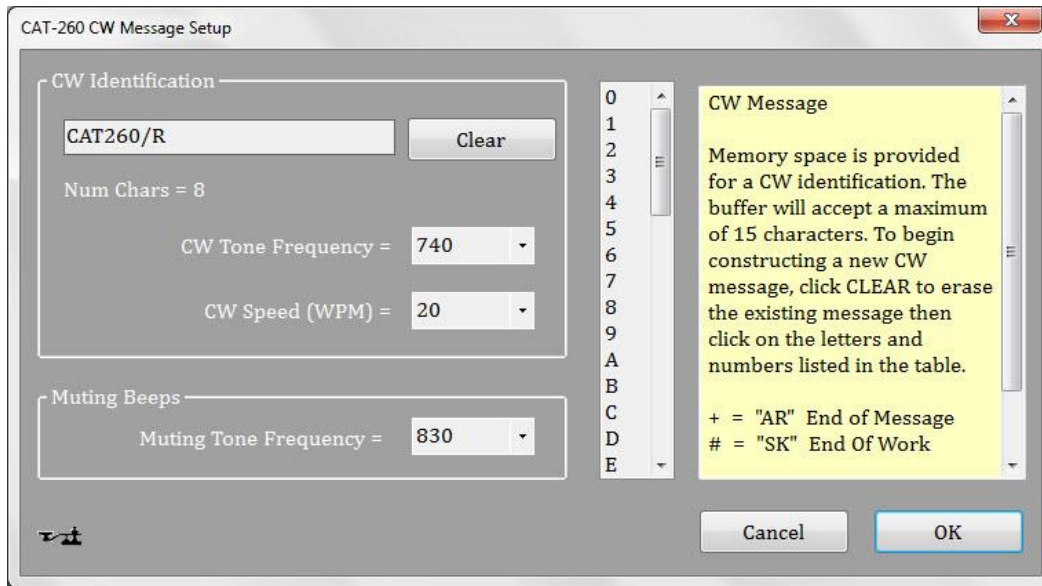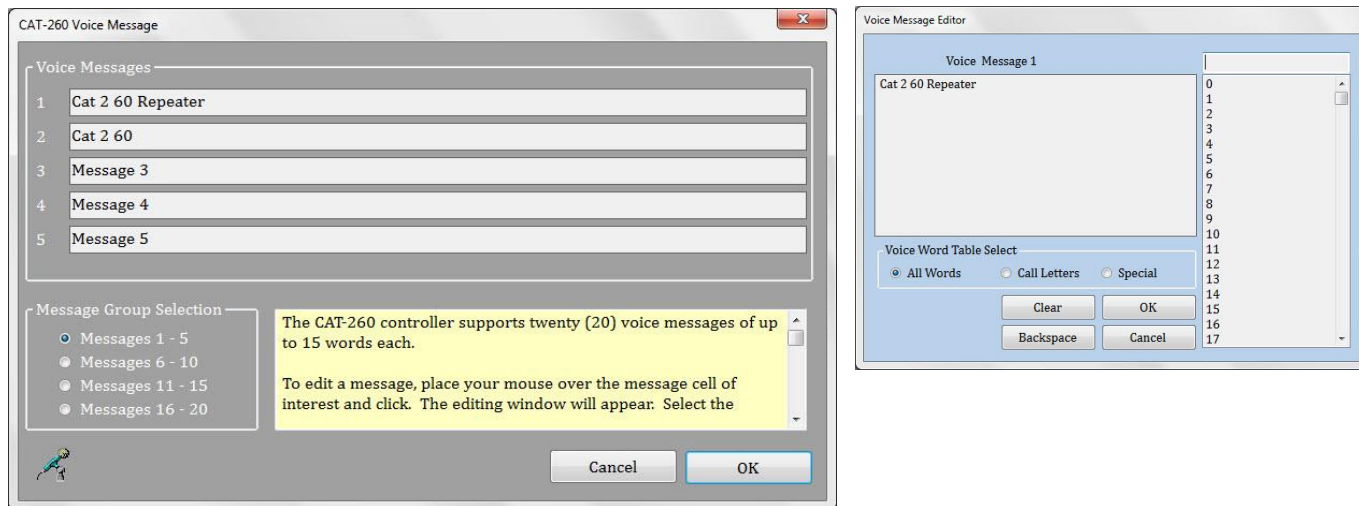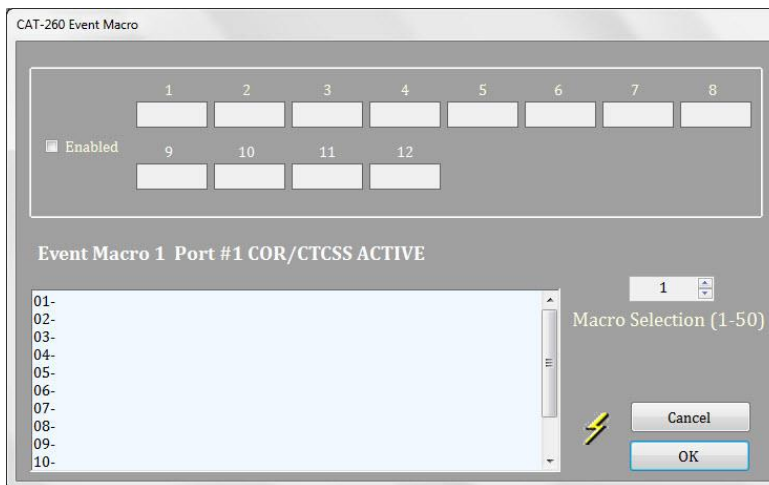

CAT-260 Courtesy Beeps

If you clicked on the "Sine Wave" button at the top of the main editor window you will see a window similar to the one below. The first two courtesy tones are assigned to port one and two. 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".
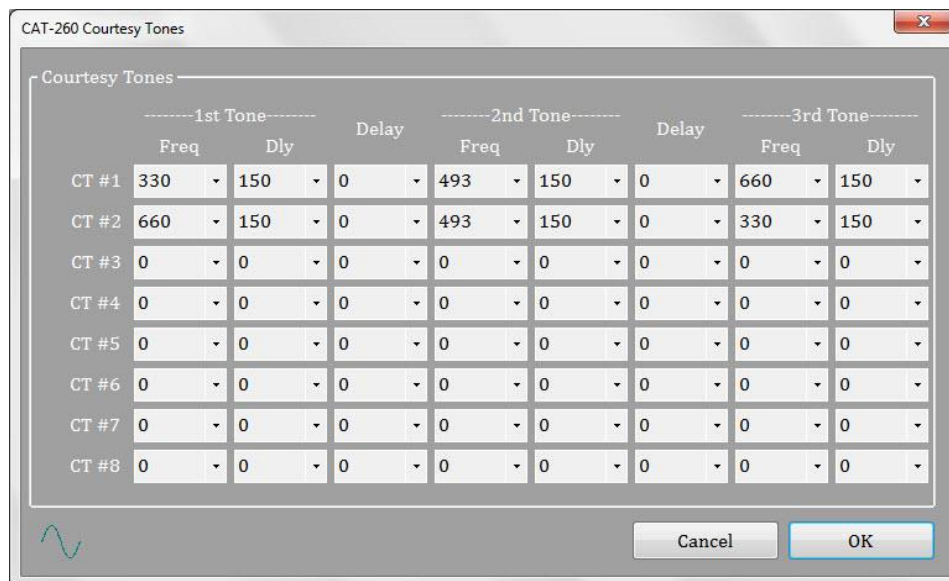
CAT-260 Voice messages

If you clicked on the "Microphone" 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 at rest ID. Voice Message #2 is the repeater's active ID. 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-260 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 twelve four digit internal commands. If you clicked on the "Lightning Bolt" 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. A table of internal commands is located on page 5-2 and 5-3 of this manual.

CAT-260 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-260 decodes the macro number, the commands will execute in the order they were stored within the macro string. The CAT-260 supports forty user macros. If you clicked on the "People" 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".
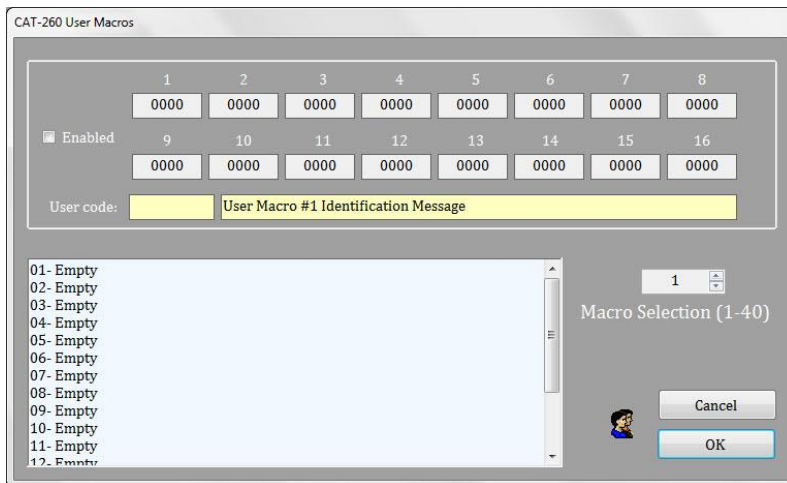
CAT-260 Scheduler

Clicked on the "Clock & Book" 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 #30. In other words event macro 40 will execute at 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.
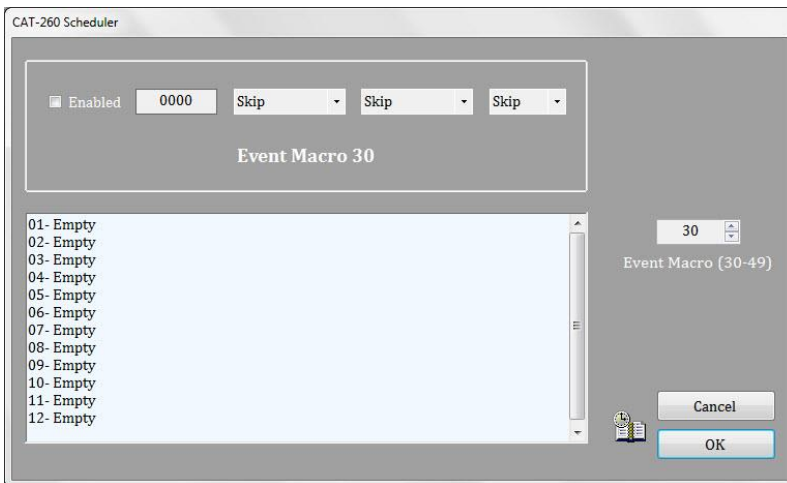
CAT-260 Save File

Once you have finished preparing the program file click the "Floppy Disk" button at the top of the main editor window. The "Save As" window will appear. Name the file and click the "Save" button. A file will be created on your hard drive as: **yourname.ini** and saved to the following location: Documents\CAT Files\CAT-260

RS-232 Computer Interface

Connect your computer's COMM port to the CAT-260 at J4 as described in Figure 7-1. Connect a "DIRECT" RS-232 cable between the CAT-260 and your computer. If your computer does not have a RS-232 port you will need a USB to RS-232 converter cable.
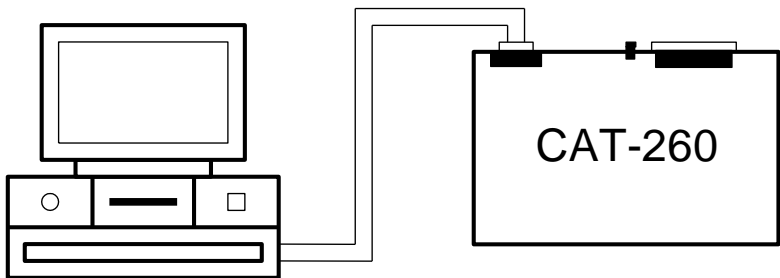

Figure 7-1

**Activation Of The RS-232 Port With Dipswitch #8**

To activate the RS-232 port, set the DC power to OFF. Set dipswitch #8 to ON. Turn the DC power to ON.

Activation Of The RS-232 Port By Radio

If the CAT-260 is connected to the repeater you can activate the RS-232 port by radio. Key-up into Port #1 and enter the control operator prefix code [100] followed by [97]. The voice synthesizer will say: "CONNECT" and the transmitter will drop off.

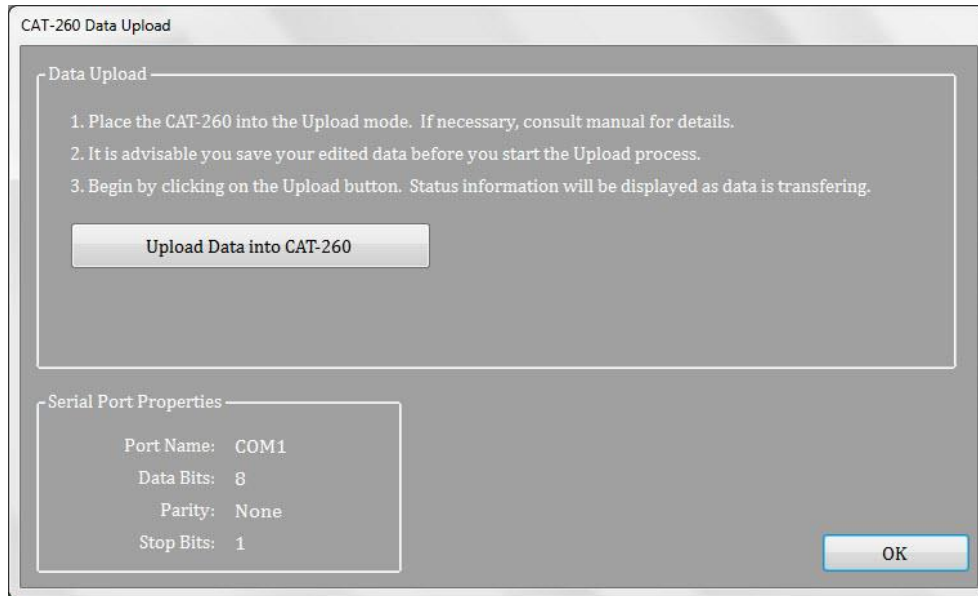**CAT-260 Setup**

Along the top of the main editor window click the "Red Tool Box" button. You will see a window similar to the one below. Click the "Ping" button to verify communications have been establish between your computer and the CAT-260.
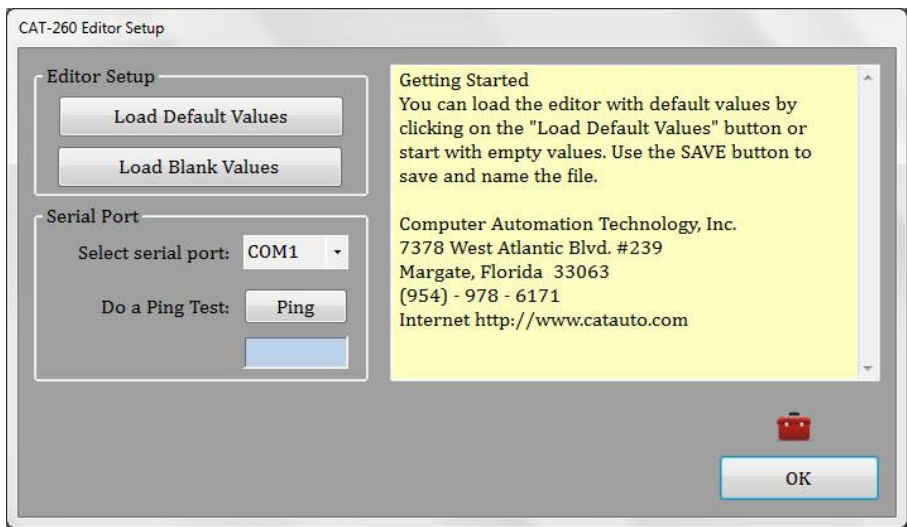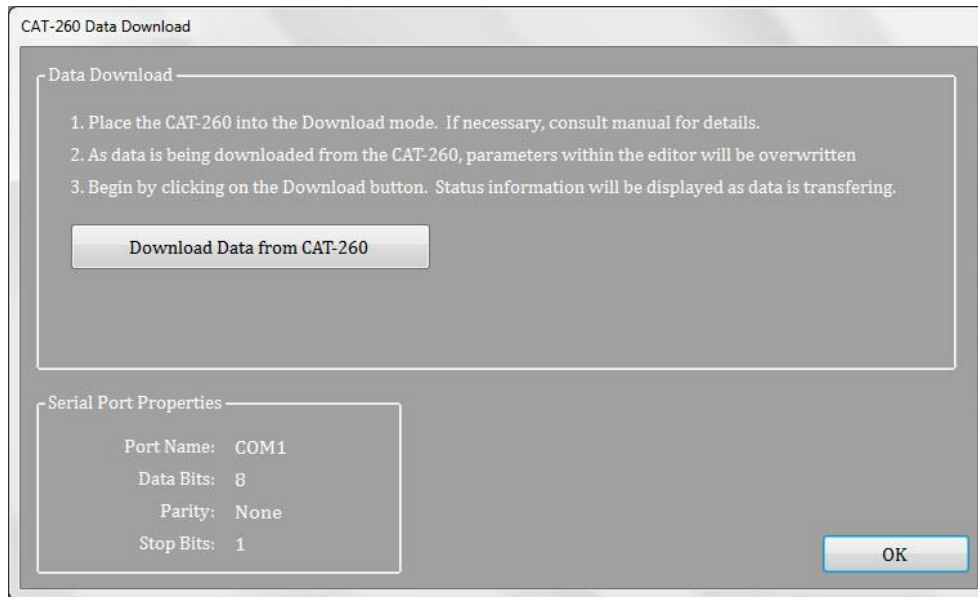
CAT-260 Upload Data Transfer

Click the "CAT Up Arrow" button to transfer the configure file you prepared with the editor program into the memory of the CAT-260 controller

CAT-260 Data Upload

Data Upload

1. Place the CAT-260 into the Upload mode. If necessary, consult manual for details.

2. It is advisable you save your edited data before you start the Upload process.

3. Begin by clicking on the Upload button. Status information will be displayed as data is transfering.

> Upload Data into CAT-260

Serial Port Properties

Port Name: COM1
Data Bits: 8
Parity: None
Stop Bits: 1

> OK

CAT-260 Download Data USB Transfer

You can also click the "CAT Down Arrow" button to transfer a configure file from the CAT-260 to be displayed by the editor program.

CAT-260 Data Download

Data Download

1. Place the CAT-260 into the Download mode. If necessary, consult manual for details.

2. As data is being downloaded from the CAT-260, parameters within the editor will be overwritten

3. Begin by clicking on the Download button. Status information will be displayed as data is transfering.

> Download Data from CAT-260

Serial Port Properties

Port Name: COM1
Data Bits: 8
Parity: None
Stop Bits: 1

> OK

Chapter 8 – CAT-260 Flash Memory (Update Firmware)

Set the power input to the CAT-260 to off. Connect a "Direct" serial cable from your computer to the CAT-260 serial port DB-9 connector (J4). Open the CAT-260 Flasher application Program to display the window below.
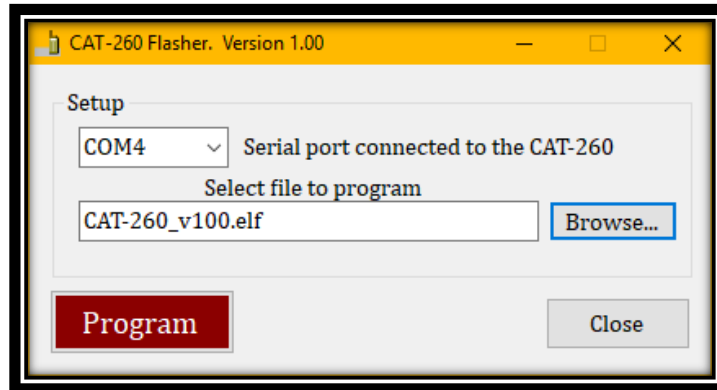
Press and hold the CAT-260's push button (SW2). Apply power and observe the red (heartbeat) LED. After the LED flashes 3 times then stays on release the push-button.

Select the COM port number active to the CAT-260. Click the Browse button and select the new CAT-260 firmware update file (CAT-260_x100.elf). Click the "Program" button. A second window will open running the ATMEL "avrdude" program giving feedback during the update process.

When done, click the Close button to close both open windows.

Chapter 9 - Voice Vocabulary

Zero	000	Area	235	Calm	299
One	001	As	236	**D**	310
Two	002	Assistance	237	Danger	311
Three	003	Association	238	Data	312
Four	004	At	239	Date	313
Five	005	Attempt240		Day	314
Six	006	Attention	241	Days	315
Seven	007	August	242	December	316
Eight	008	Automatic	243	Decrease	317
Nine	009	Autopatch	244	Degree	318
Ten	010	Auxiliary	245	Delay	319
Eleven	011	Avenue	246	Delta	320
Twelve	012	Average	247	Department	321
Thirteen	013	**B**	250	Direction	322
Fourteen	014	Back	251	Do	323
Fifteen	015	Band	252	Down	324
Sixteen	016	Base	253	Drizzle	325
Seventeen	017	Battery	254	Due	326
Eighteen	018	Below	255	Dynamic	327
Nineteen	019	Between	256	**E**	340
Twenty	020	Bravo	257	East	341
Thirty	030	Break	258	Echo	342
Forty	040	Button	259	Ed (suffix)	343
Fifty	050	By	260	Emergency	344
Sixty	060	**C**	270	End	345
Seventy	070	Calibrate	271	Enter	346
Eighty	080	Call	272	Equals	347
Ninety	090	Calling	273	Error	348
A	210	Cancel	274	Evacuation	349
A.M.	211	Cat	275	Exit	350
Abort	212	Caution	276	Expect	351
About	213	Center	277	**F**	370
Above	214	Celsius	278	Fail	371
Acknowledge	215	Change	279	Failure	372
Action	216	Charlie	280	Fahrenheit	373
Adjust	217	Check	281	Fast	374
Advise	218	Circuit	282	February	375
Aerial	219	Clear	283	Feet	376
Affirmative	220	Clock	284	File	378
Again	221	Closed	285	Filed	379
Air	222	Club	286	Final	380
Alert	223	Code	287	Fire	381
All	224	Come	288	Flag	382
Alpha	225	Complete	289	Fog	383
Alternate	226	Completed	290	For	384
Altitude	227	Computer	291	Foxhunt	385
Amateur	228	Condition	292	Foxtrot	386
Amps	229	Congratulation	293	Freezing	387
An	230	Connect	294	Frequency	388
And	231	Contact	295	Friday	389
Answer	232	Control	296	From	390
April	233	Current	297	Front	391
Are	234	Cycle	298	Full	392

Fall	393	Land	551	Net	623
G	410	Last	552	New	624
Gear	411	Late	553	Next	625
Get	412	Left	554	Night	626
Go	413	Less than	555	No	627
Golf	414	Let	556	Normal	628
Good	415	Level	557	North	629
Green	416	Light	558	Not	630
Ground	417	Lima	559	November	631
H	440	Line	560	Now	632
Hail	441	Link	561	Number	633
Half	442	List	562	**O**	650
Ham	443	Load	563	O'clock	651
Hamfest	444	Lock	564	October	652
Have	445	Lockout	565	Of	653
Hazardous	446	Long	566	Off	654
Heavy	447	Look	567	Ohms	655
Henry	448	Low	568	On	656
Hertz	449	Lower	569	Open	657
High	450	**M**	580	Operation	658
Hold	451	Machine	581	Operator	659
Home	452	Macro	582	Or	660
Hotel	453	Make	583	Organization	661
Hour	454	Malfunction	584	Oscar	662
Hours	455	Manual	585	Other	663
Hundred	456	Many	586	Out	664
Heat	457	March	587	Over	665
I	470	May	588	Overcast	666
Ice	471	Mayday	589	**P**	680
Icing	472	Me	590	P.M.	681
Identify	473	Measure	591	Papa	682
Immediately	474	Measured	592	Pass	683
In	475	Meeting	593	Patch	684
Inch	484	Mega.	594	Per	685
Inches	485	Message	595	Phone	686
Increase	476	Meter	596	Pico	687
India	477	Meters	597	Plan	688
Information	478	Micro	598	Please	689
Ing (suffix)	479	Mike	599	Plus	690
Inputs	480	Miles	600	Point	691
Intruder	481	Milli	601	Police	692
Is	482	Million	602	Position	693
It	483	Minus	603	Pound	694
Index	486	Minute	604	Power	695
J	500	Minutes	605	Practice	696
January	501	Mobile	606	Preset	697
Juliet	502	Modified	607	Press	698
July	503	Monday	608	Program	699
June	504	Month	609	Pull	700
K	530	More than	610	Push.	701
Key	531	Move	611	Put	702
Keypad	532	Much	612	Percent	703
Kilo	533	**N**	620	Pressure	704
Knots	534	Near	621	**Q**	720
L	550	Negative	622	Quebec	721

R	730	System	801	Watch	893
Radio	731	S (plural)	802	Watts	894
Radios.	732	**T**	820	Way	895
Rain	733	Tango	821	Weather	896
Raise	734	Target	822	Wednesday	897
Range	735			Week	898
Rate	736				
Ready	737	Telephone	823		
Receive	738	Temperature	824	Weekday	899
Receiver	739	Terminal	825	Welcome	900
Red	740	Test	826	Well Done	901
Release	741	Than	827	West	902
Remark	742	Thank-You	828	What	903
Remote	743	That	829	Whiskey	904
Repair	744	The (short E)	830	Will	905
Repeat	745	The (long E)	831	Wind	906
Repeater	746	Then	832	Windows	907
Reset	747	This	833	With	908
Rig	748	This-is	834	Wrong	909
Right	749	Thousand	835	Wind Chill	910
Road	750	Thunderstorm	836	**X**	920
Roger	751	Thursday	837	X-Ray	921
Romeo	752	Time.	838	**Y**	930
Route	753	Timer	839	Yankee	931
S	770	Today	840	Year	932
Safe	771	Tomorrow	841	Yellow	933
Saturday	772	Tonight	842	Yes	934
Scattered	773	Tornado	843	Yesterday	935
Seconds	774	Tower	844	You	936
Security	775	Traffic	845	Your	937
Select	776	Transmit	846	**Z**	950
Send	777	Transmitter	847	Zed	951
Sent	778	Try	848	Zero	952
September	779	Tuesday	849	Zone	953
Sequence	780	Turn	850	Zulu	954
Service	781	Type	851		
Set	782	Today's	852	Pause 1	960
Severe	783	Tone	854	Pause 2	961
Short	784	**U**	870	Pause 3	962
Showers	785	Uniform	871	Pause 4	963
Shut	786	Unit	872		
Side	787	Unlimited	873	Sound Effects	
Sierra	788	Until	874	Chime 1	964
Sleet	789	Up	875	Chime 2	965
Slow	790	Use(noun)	876	Chime 3	966
Snow	791	Use(verb)	877	Gunshot	967
South	792	**V**	880	Laser	968
Speed	793	Variable	881	Phaser	969
Squawk	794	Verify	882	Laughter	972
Star	795	Version	883		
Start	796	Victor	884	Female	
Stop	797	Volts	885	Good Morning	980
Storm	798	**W**	890	Good Afternoon	981
Sunday	799	Wait	891	Good Evening	982
Switch	800	Warning	892		

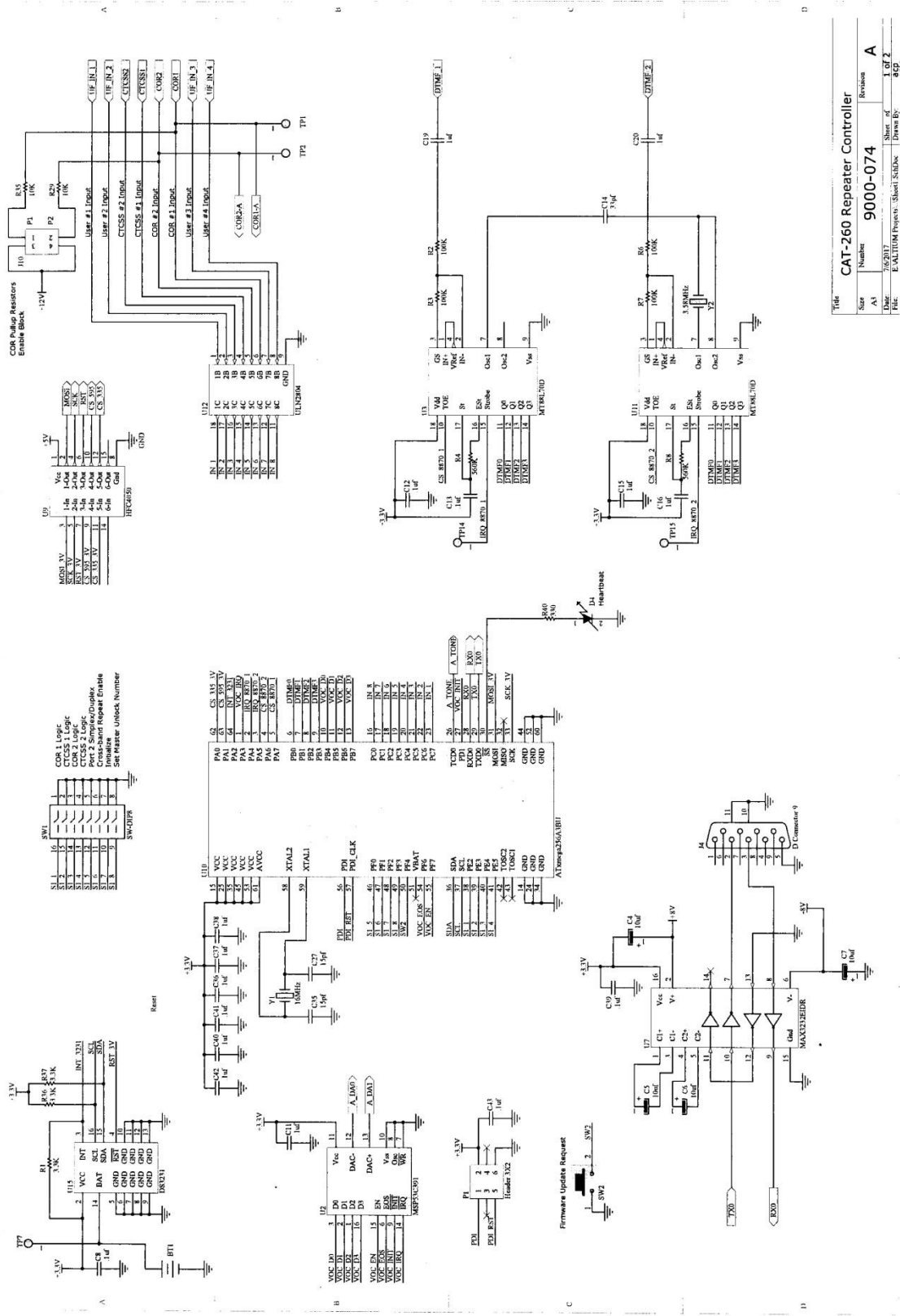| Time Variables		Day and Month	102
Time of Day	100	Salutation	103
Day of Week	101	Year	104

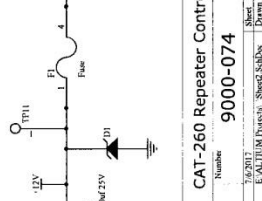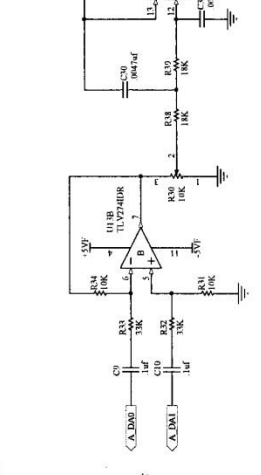# Chapter 10 - Drawings
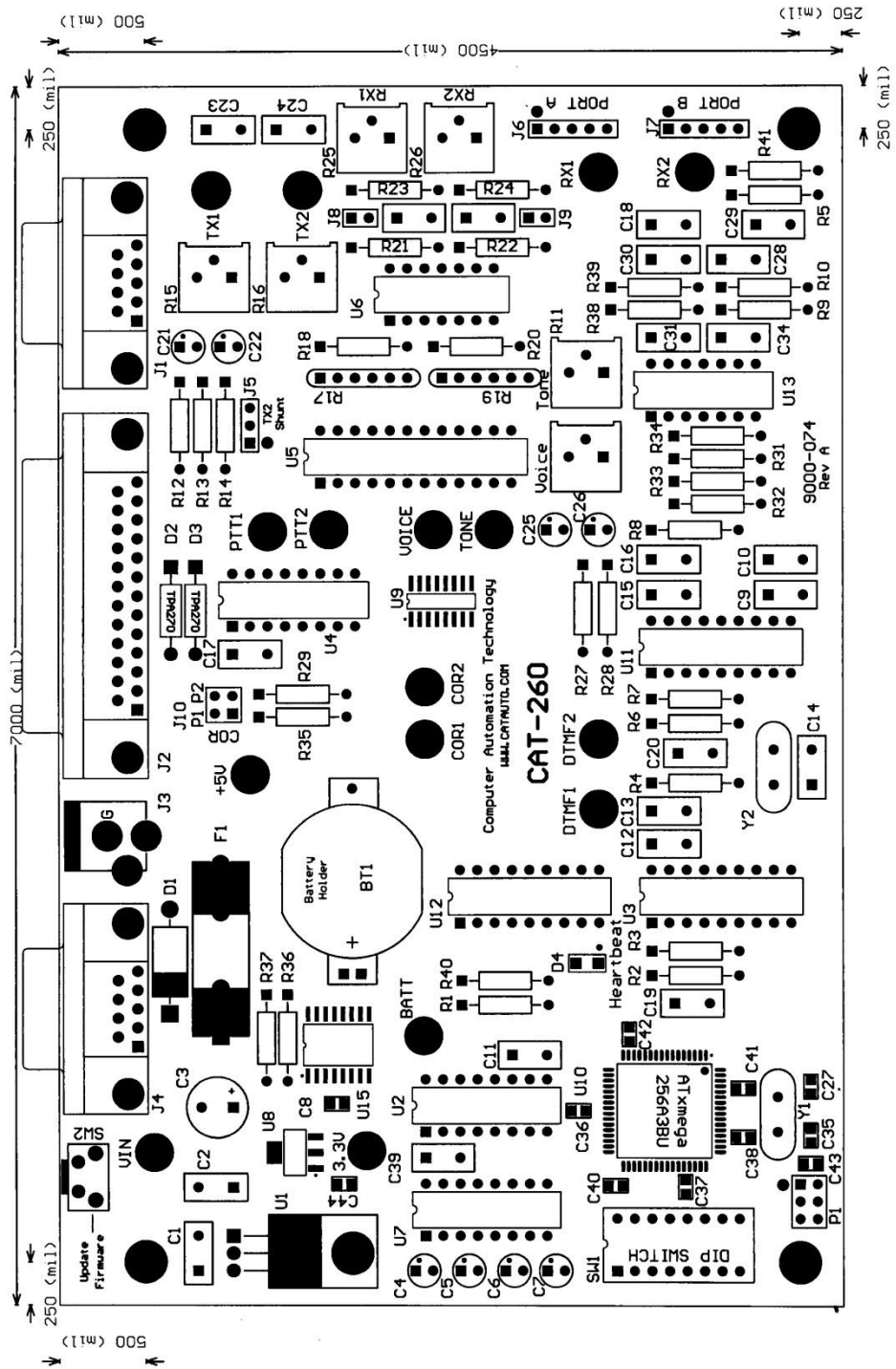
CAT-260 Repeater Controller
Figure 10-1

Chapter 11 - Schematic

CAT-260 Repeater Controller

Size	Number		Revision
A1	9000-074		A

Date: 7/6/2017   Sheet of 1 of 2

File: E:\ALTIUM Projects\..Sheet1.SchDoc   Drawn By: acp

CAT-260 Repeater Controller

Title	CAT-260 Repeater Controller		
	Number	Revision	
	9000-074	A	
Size		Sheet of	
A3		2 of 2	
Date	7/6/2017	Drawn By: Shaun2.SchiDoc	acp
File:	E:\ALTIUM Projects\...		
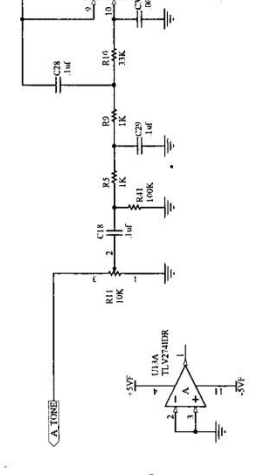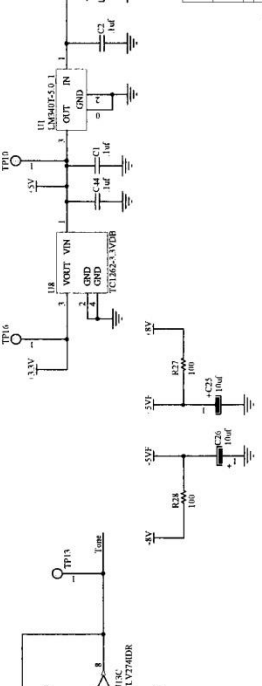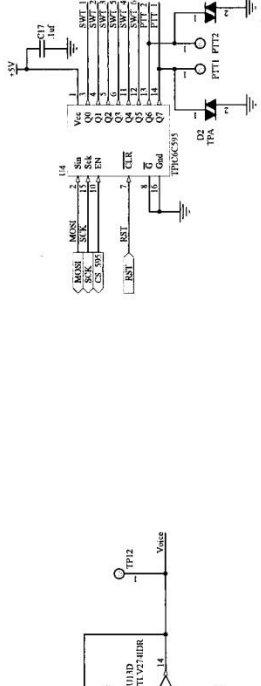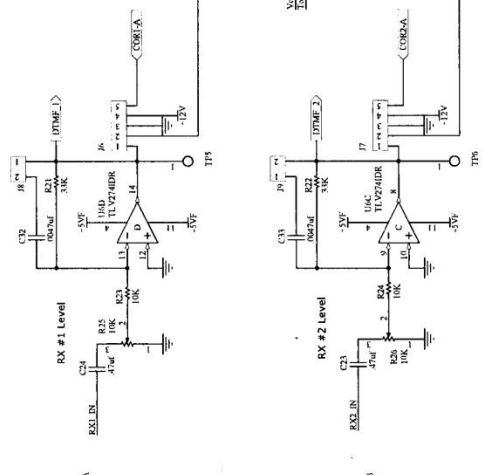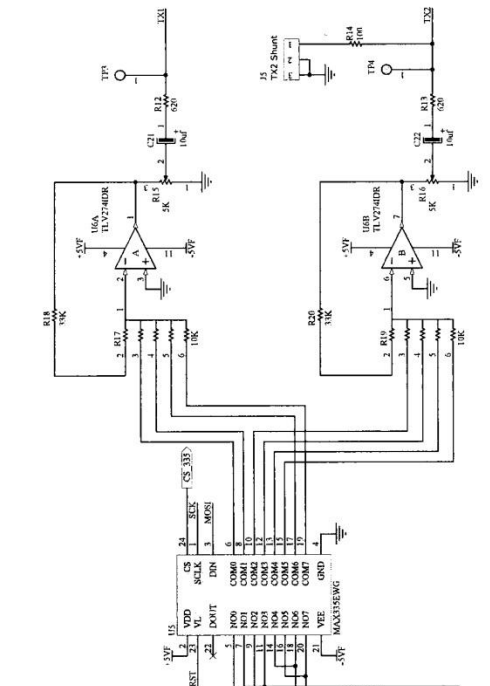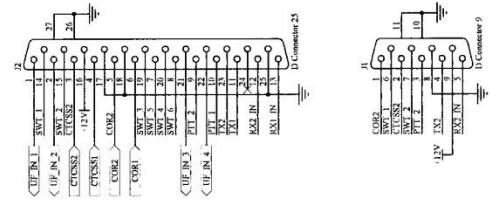
Chapter 12 - Part List

2	Capacitor	22pf	C27,C35
1	Capacitor	33pF	C14
4	Capacitor	.0047uf 50V	C28,C30,C32,C33
1	Capacitor	.001uF 50V	C31
15	Capacitor	.1uf 50V	C1,C2,C8,C11,C12,C13,C15,C16 C17,C19,C20,C36,C37,C38,C39
2	Capacitor	.47uf 50V	C23,C24
8	Capacitor	10uf 16V	C4,C5,C6,C7,C21,C22,C25,C26
1	Capacitor	470uf 50V	C3
1	Battery	Panasonic CR2032	BT1
2	Connector	DB9 Female	J1,J4
1	Connector	DB25 Female	J2
1	Connector	DC Power	J3
2	Connector	Header 1X2	J8,J9
1	Connector	Header 1X3	J5
2	Connector	Header 1X5	J6,J7
1	Diode	LED (RED)	D4
1	Crystal	3.58 MHz	Y2
1	Fuse	0.5 Amp Fast	F1
1	I.C.	ATMega 1281	U10
1	I.C.	LM340T-5.0	U1
2	I.C.	TLV2741DR	U6,U13
1	I.C.	MAX335	U5
1	I.C.	MAX3232EIDR	U7
1	I.C.	DS3231	U15
1	I.C.	MSP53C391	U2
2	I.C.	MT8870D	U3,U11
1	I.C.	TPIC6C595	U4
1	I.C.	ULN2804	U12
3	Resistor	100 Ohm	R14,R27,R28
1	Resistor	330 Ohm	R40
2	Resistor	620 Ohm	R12,R13
3	Resistor	1000 Ohm	R5,R9,R10
2	Resistor	5K Variable	R15,R16
4	Resistor	10K Variable	R11,R25,R26,R30
6	Resistor	10K Ohm	R23,R24,R29,R31,R34,R35
2	Resistor	10K 6 Pin SIP	R17,R19
2	Resistor	18K	R38,R39
6	Resistor	33K	R18,R20,R21,R22,R32,R33

4	Resistor	100K	R2,R3,R6,R7
2	Resistor	560K	R4,R8
3	Resistor	4.7K	R1,R36,R37
1	Resonator	12 MHz	Y1
1	Switch	DIP SW 8	SW1
1	Switch	Push Button	SW2
2	Transorb	TPA	D2,D3
1	Transorb	1N6278A	D1