# CAT-700B
# Repeater Controller

*Computer Automation Technology, Inc*

# Table of Contents

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# Foreword

For your convenience, this manual is divided into seventeen chapters. A brief description of each chapter and its contents are listed below. Control and programming of the CAT-700B has been carefully structured. Once you become familiar with the procedures described in this manual, you will find it easy to program and control the CAT-700B to suit your particular requirements.

**Chapter 1** - This chapter describes some of the CAT-700B features. Also included are the technical specifications.

**Chapter 2** - This chapter describes the various configurations for the CAT-700B, dipswitch settings and modes of operation.

**Chapter 3** - This chapter describes how to control the CAT-700B. The control operator prefix code [100] must precede each control command. **Do not unlock the CAT-700B when changing control channels.**

**Chapter 4** - This chapter describes how to use the features of the CAT-700B. These are considered repeater user commands.

**Chapter 5** - This chapter describes how to program the CAT-700B with DTMF tones. **During programming the CAT-700B must be un-locked.** Key-up and enter [1234567].

**Chapter 6** - This chapter describes how to program the CAT-700B through the RS-232 computer port using the Windows editor and Communications program.

**Chapter 7** - This chapter describes how to interface the CAT-700B to a RF package. It defines the input - output connections and how to adjust the audio levels.

**Chapter 8** - This chapter describes how to connect the MF-1000 to the CAT-700B to obtain 24 additional user function output switches.

**Chapter 9** - This chapter describes how to connect and set-up the DL-1000C Audio Delay to the CAT-700B.

**Chapter 10** - This chapter describes how to connect and set-up the DR-1000 Digital Voice Recorder to the CAT-700B.

**Chapter 11** - This chapter contains a list of the vocabulary words used to program the voice synthesizer.

**Chapter 12** - This chapter contains PC board layouts for part location for the CAT-700B, MF-1000, DL-1000C, DR-1000 and RLS-1000B.

**Chapter 13** - This chapter contains the schematics diagrams (3) sheets for the CAT-700B, (1) sheet for the MF-1000, DL-1000C, DR-1000 and (2) sheets for the RLS-1000B.

**Chapter 14** - This chapter contains part lists for the CAT-700B, MF-1000, DL-1000C and DR-1000 boards.

**Chapter 15** - This chapter describes how to connect the CAT-700B through the Doug Hall RBI-1 Interface unit to a Kenwood transceiver.

**Chapter 16** - This chapter describes how to connect the CAT-700B to the ICOM IC-706 HF/UHF Transceiver.

**Chapter 17** - This chapter describes how to connect three transceivers to the remote base input of the CAT-700B using the optional RLS-1000B Remote Link Switch.

# I Don't Have Time To Read This Manual

If you are anxious to get the CAT-700B in operating and don't have time to read this manual, the following short version will appeal to you. This is a list of the minimum steps required to install the CAT-700B and verify its operation. Now fire-up your soldering iron and lets get started.

1.  Open the connector kit, remove the 2.5mm power plug and the 25 pin "D" <u>male</u> connector. Solder a +12 volt wire to the center connector and a ground wire to the outer connector of the plug. Connect the wires to a +12VDC power supply.

2.  Solder five wires to the 25 pin "D" male connector. Connect wires to pins 6, 10, 11, 13 and 24.

3.  Connect the pin 10 wire to the transmitter's PTT, the pin 11 wire to the transmitter's modulation input and pin 24 to receiver/transmitter chassis ground.

4.  Turn the +12VDC power supply ON, the repeater should transmit and you should hear the voice synthesizer say: "CAT700 VERSION 2.00" Refer to Figure 7-1 and adjust TX1 control for proper transmitter deviation.

5.  Turn the +12VDC power supply OFF. Connect pin 6 wire to the receiver's COR or COS output. Connect pin 13 wire to the receiver's RECEIVE audio output.

6.  Turn the +12VDC power supply ON. Monitor TP3 with a DC voltmeter. Open and close the repeater's squelch control while observing the voltage on TP3. If TP3 goes from LOW to HIGH dipswitch #1 should be left in the OFF position. If TP3 goes from HIGH to LOW set dipswitch #1 to ON. If TP3 stays LOW, turn the power supply OFF and add a 2200 ohm pull-up resistor on the CAT-700B at the R1 pull-up resistor position. Note: LOW is any voltage less than 0.8VDC. HIGH is any voltage between 3VDC and 15VDC.

7.  Turn the +12VDC power supply ON. Connect an AC voltmeter to TP5. Using a typical transceiver, key-up and send a DTMF tone. Adjust RX1 control for 200mV as indicated on the AC voltmeter. If this causes the repeater to over deviate, readjust TX1. Make sure that RF from the transceiver does not give a false voltmeter indication.

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

9.  Compare the receive and courtesy tone audio and adjust the DTMF TX1 control for the desired courtesy tone level. For best results the courtesy tone should not exceed 1.5KHz deviation. This control also sets the CW ID and will insure that repeater users will always be able to talk over the CW ID when it comes on during a QSO in progress.

10. Key-up and enter the seven digit unlock number [1234567]. The voice will say: "CAT-700 CONTROL."

11. Key-up and send [*3101], followed by the three digit numbers that represents your call letters for voice ID #1. Refer to Chapter 14, Voice Vocabulary Word List. Example: Load Repeater ID #1 with "W4XYZ Repeater"

    ```
    Message Number            W   4   X   Y   Z      Repeater
    Programming                                     
       Command    *31 01 890 004 920 930 950 746
    ```
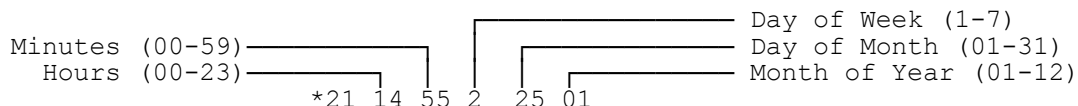
12. Key-up and send [*3102], followed by the three digit numbers that represents your call letters for voice ID #2.

13. Key-up and send [*34], followed by the two digit numbers that represents your call letters for the CW ID. Refer to the CW ID programming table. Example: Load the CW ID memory buffer with W4XYZ/R.

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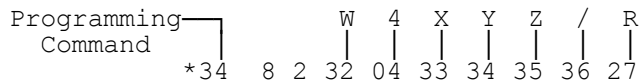
| CW ID PROGRAMMING TABLE | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 00=0 | 03=3 | 06=6 | 09=9 | 12=C | 15=F | 18=I | 21=L | 24=O | 27=R | 30=U | 33=X | 36=/ |
| 01=1 | 04=4 | 07=7 | 10=A | 13=D | 16=G | 19=J | 22=M | 25=P | 28=S | 31=V | 34=Y | |
| 02=2 | 05=5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

14. To read the time, key-up and send [*20]. Un-key, the voice will read the time, day of week, month, day of month and year.

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

```
                                        ┌─────────── Day of Week (1-7)
   Minutes (00-59)───────────┐      ┌───────── Day of Month (01-31)
     Hours (00-23)───────────┤      │  ┌────── Month of Year (01-12)
                   *21 14 55  2   25 01
```

16. Key-up and send [*0]. Un-key, the controller will lock-up and the voice will say: "MANUAL EXIT." The CAT-700B will lock-up automatically when the programming timer expires. The voice will say: "TIMER EXIT."

17. Program a new seven digit UNLOCK code. Set dip-switch #8 to ON and 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: "DATA INPUTS OK." If rejected, the voice will say: "ENTER CONTROL." Key-up and enter the seven digit number again. Set dip-switch #8 to the OFF position.

18. DTMF muting is a feature that prevents your DTMF tones from being transmitted. To enable this feature, key-up and enter [100171]. The voice will say: "ONE SEVEN ON."

19. To test your DTMF key-pad, key-up and enter [3751234567890*#ABC]. The voice will read back all the numbers that were decoded.

20. To check the time, key-up and enter [400].

# Chapter 1 - Introduction and Specifications

Congratulations on your purchase of the CAT-700B Repeater Controller.  The CAT-700B is packed with features normally reserved for controllers costing thousands of dollars more.

Programming the CAT-700B is a snap, with its carefully structured uniform programming commands.  The manual is easy to follow with numerous examples.  The voice synthesizer interacts with you during control and programming operation.

## Scheduler
An advanced [40] 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-700B will do the rest.

## Voice Synthesizer
A vocabulary base of 330 words carefully selected for amateur repeater operation are available to ID your repeater, announce the time and interact with you during control and programming operations.  Additional message buffers can be activated on demand, through hardware inputs or by the scheduler.

## CW ID
The controller will switch to CW when a repeater user talks over the voice ID. When both voice IDs are disabled, the controller will ID in CW only.  You program the speed and tone frequency.

## Digital Voice Clock
The digital voice clock will announce the time upon request, at the completion of an autopatch, during repeater IDs, or on the hour through the grandfather clock feature.

## Courtesy Tone
Memory space is provided for the storage of [8] custom courtesy tones.  Each tone can consist of up to three different tone frequencies of various lengths and separations. Separate courtesy tones denote repeater and link receiver activity.

## Link Control
The CAT-700B will support a link transceiver.  You can enable the transceiver or just the receiver to monitor activity on the transceiver frequency while you use the repeater.  After a pre-selected period of inactivity the transceiver will automatically disconnect.  The CAT-700B will suppress your repeater identification from being transmitted on the transceiver frequency.

## Remote Base Transceiver With RBI-1 Interface
The CAT-700B supports the Doug Hall RBI-1 Interface.  The RBI-1 receives serial data and clock information from the CAT-700B and converts it to the format required to control Kenwood transceivers.  All connections to the transceivers are made through the microphone jack.  In addition to band, frequency, offset and transmitter power, CTCSS tones can be selected remotely.

## ICOM IC-706 HF Frequency Control
The CAT-700B offers a bi-directional serial port to control the IC-706 transceiver. Upon receipt of a DTMF command the CAT-700B will generate the required ASCII commands to control the transceiver.  Since this serial port is bi-directional it is possible to interrogate the transceiver and receive information concerning the frequency and status.

## Digital Voice Recorder

An optional DVR, controlled by the CAT-700B can be added to your repeater. Control of the DVR is fully integrated into the CAT-700B control and command structure. The CAT-700B will permit you to substitute any of the [16] DVR tracks in place of the messages normally generated by the voice synthesizer. In fact: you can even intermix DVR tracks with voice synthesizer messages. A signal report test is also included. Enter a DTMF command to record a seven second test message. Un-key and the test message will playback. You instantly know how your signal sounds through the repeater.

## User Function Output Switches

Four open collector user function output switches control equipment at your repeater site. These switches can be controlled manually by DTMF commands, or by the scheduler during automatic operation. They can be made to turn OFF, ON or Momentarily change state, any time you choose.

## DTMF Regenerator

The CAT-700B will mimic your DTMF input. In sophisticated repeater systems it is often necessary to pass DTMF commands to distant repeaters within the linking system. The CAT-700B will swallow your DTMF tones and regenerate the tones distortion and noise free as they were received. This will insure reliable control of your linking network.

## DTMF Command Generator

Forty DTMF commands can be stored in the CAT-700B memory. These commands can be sent manually by entering a prefix code or automatically by the scheduler.

## User Function Inputs

Four inputs activated by a voltage change from other equipment at the repeater site, causes the CAT-700B to execute any repeater command. External control, or information about the repeater site will be instantly available.

## Repeater Control Prefix

A total of [13] prefix numbers control repeater operation. Each prefix is programmable from one to seven digits depending on the security you require.

## Repeater Timers

A total of [16] timers control repeater operation. Each timer is user programmable to afford maximum flexibility to suite your special requirements.

## DTMF Keypad Test

A DTMF keypad test will read back the numbers decoded in a synthesized voice.

## Macro

By entering a macro control number, the CAT-700B will execute up to ten commands in a string. Memory space is provided for the storage of [40] macro strings. This feature permits the repeater owner to customize the control functions.

## Active Memory Save

Configure the CAT-700B to suite your special requirements. Active Memory Save permits you to store the current settings of the control channels, timers, codes and the first [10] voice messages. Memory space is provided for [6] memory saves. These memory saves can be later recalled with a simple DTMF command.

## DTMF Access
This feature requires the user to enter a DTMF code, to activate the repeater. The voice will say: "OK UP" and the controller will respond to a carrier input. After a short period of inactivity, the DTMF code will again be required.

## Repeater CTCSS Override
When CTCSS is enabled, a user without a CTCSS encoder can activate the repeater by entering the DTMF Access code. The voice will say: "OK UP" and the controller will respond to a carrier input. After a short period of inactivity, the DTMF code will again be required.

## Specifications

| | |
|---|---|
| Microprocessor | 80C251SB |
| Memory | EPROM 512K X 8  -  RAM 8K X 8 (non volatile) |
| Clock Accuracy | $\pm$1 minute per month  at +25 degrees C. |
| | In the absence of power, data and time |
| | will be maintained for ten years. |
| Voice Synthesizer | Texas Instruments TSP53C30 Linear Predictive Coded |
| Voice Vocabulary | 330 Words |
| DTMF Receiver | MT8888 (2) |
| Operating Temperature | -15 to +55 degrees C |
| Call Letter ID | Buffer size  VOICE (23) - CW (28) |
| Control Codes | (13) Buffer size (7) |
| Timers | (16) Short (0.1 to 9.9) - Long (1.0 to 1799) seconds |
| Scheduler | (40) Commands (one minute resolution) |
| Macro | (40) Five Function |
| Memory Saves | (6) Zone Control Channels, Timers, Codes, |
| | First (10) Voice Messages |
| Voice Synthesizer | (20) Messages, Maximum Word Length (23) |
| Digital Voice Recorder | (16) Tracks, Maximum Record Time (2 minutes) |
| User Function Outputs | (4) Switch 40VDC @ 150mA. |
| Hardware Inputs | (4) 10K ohm input impedance |
| Audio Input | Receiver 0.2 - 2VAC adjustable 10K ohms |
| Audio Output | Transmitter 2VAC adjustable 600 ohms |
| Logic Inputs | Low (0 to 0.8VDC)   High (2.4 to 15VDC) |
| Logic Outputs | Open Collector Relay Driver (28VDC at 150mA) |
| Power | +9 to +15VDC at 80mA |
| Size | 6.5" X 8.5" |
| Warranty | Limited one year, parts and labor. |

## FCC Part 15 RF Interference
When installed in the RME-1000 rack mount enclosure, the CAT-700B 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 With Fixed Frequency Transceiver

In this configuration the CAT-700B supports a repeater with a CTCSS decoder and a transceiver on a fixed frequency.

**CAT-700B**

J4

| | | | REPEATER |
|---|---|---|---|
| RX AUDIO #1 | 13 | | |
| COR #1 | 6 | | |
| CTCSS #1 | 4 | | |
| PTT #1 | 10 | | |
| TX AUDIO #1 | 11 | | |
| GROUND | 24 | | |

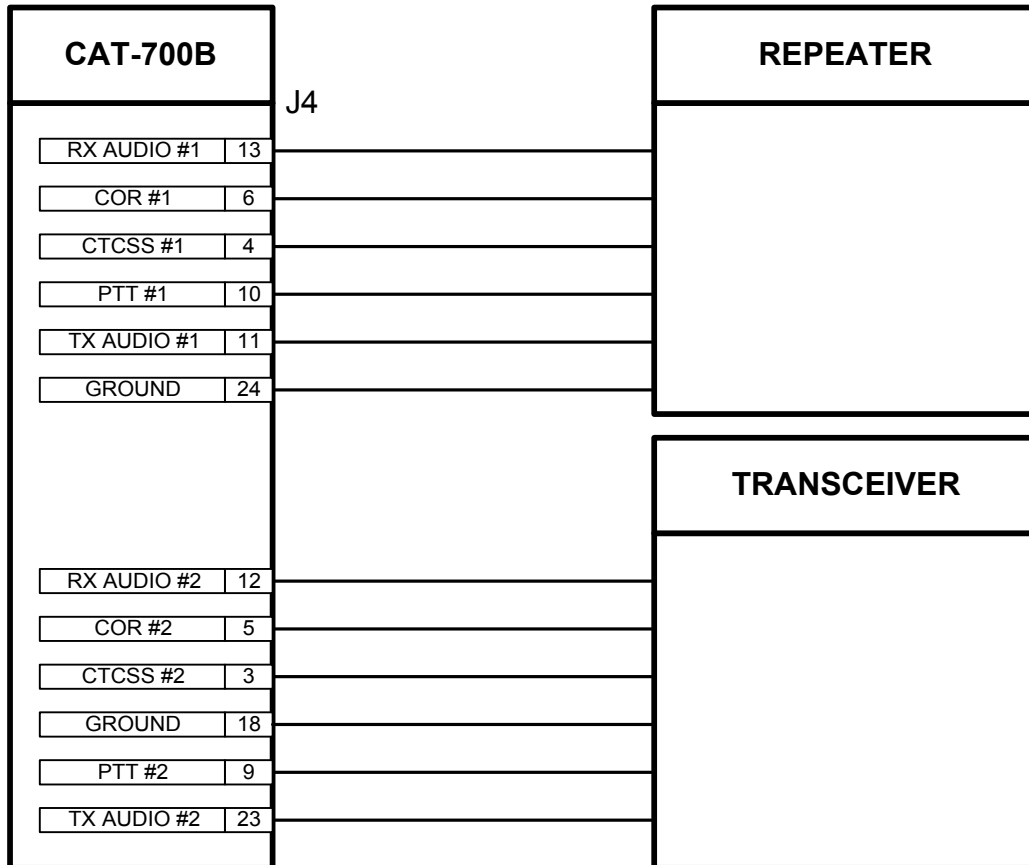| | | | TRANSCEIVER |
|---|---|---|---|
| RX AUDIO #2 | 12 | | |
| COR #2 | 5 | | |
| CTCSS #2 | 3 | | |
| GROUND | 18 | | |
| PTT #2 | 9 | | |
| TX AUDIO #2 | 23 | | |

Figure 2-1

# Repeater And Transceiver Without COR Output

The CAT-700B will support a repeater and a transceiver that does not supply a COR
output signal.  If the transceiver outputs discriminator audio the CAT-700B's on board
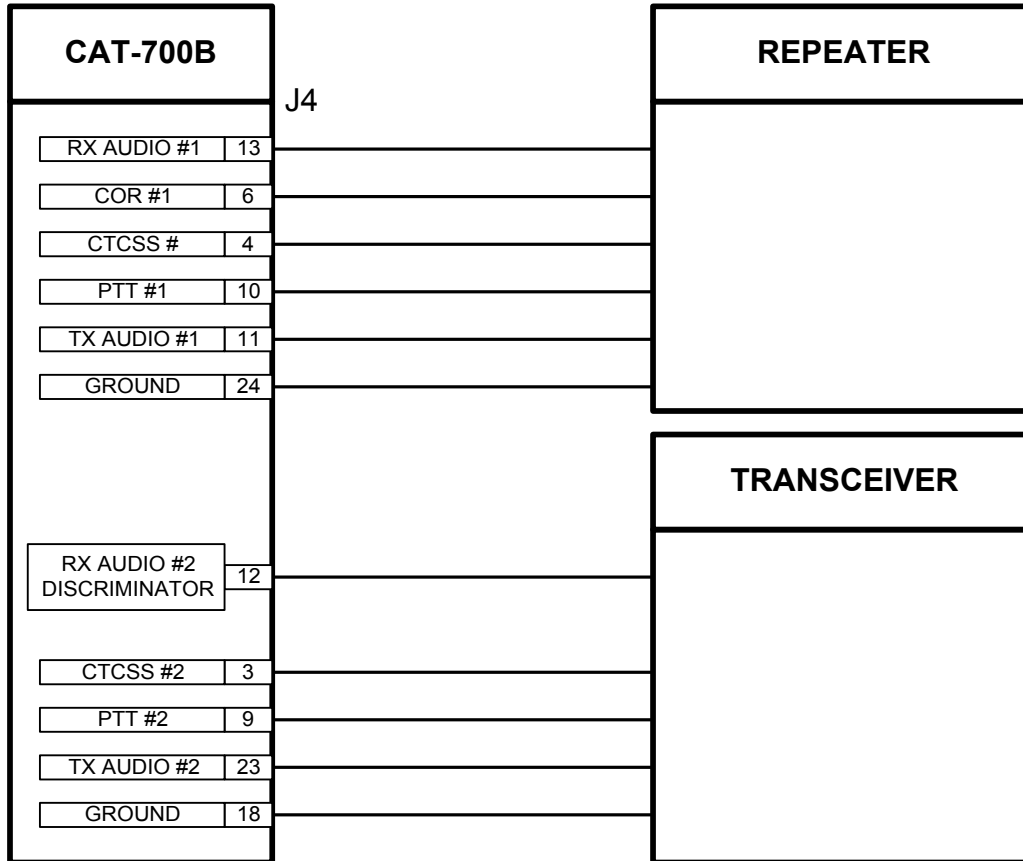COR generator will produce the necessary COR logic.  Set jumper J3 between pins 1 and
2.



Figure 2-2

# Repeater With Serial Tuned Transceiver

In this configuration the CAT-700B supports a repeater and the Doug Hall RBI-1 Interface to control the Kenwood mobile transceivers.  The RBI-1 converts the serial data from the CAT-700B to the format require to control the Kenwood transceivers. All connections to the Kenwood transceivers are made through the microphone jack.  In addition to frequency, offset, and CTCSS tone selection, transmitter power can be remotely controlled through the repeater input.

```
┌─────────────────────┐          ┌─────────────────────┐
│      CAT-700B       │          │      REPEATER       │
│                     │          │                     │
│              J4     │          │                     │
│ ┌─────────────┬───┐ │          │                     │
│ │ RX AUDIO #1 │13 │─┼──────────┼─                    │
│ ├─────────────┼───┤ │          │                     │
│ │   COR #1    │ 6 │─┼──────────┼─                    │
│ ├─────────────┼───┤ │          │                     │
│ │  CTCSS #    │ 4 │─┼──────────┼─                    │
│ ├─────────────┼───┤ │          │                     │
│ │   PTT #1    │10 │─┼──────────┼─                    │
│ ├─────────────┼───┤ │          │                     │
│ │ TX AUDIO #1 │11 │─┼──────────┼─                    │
│ ├─────────────┼───┤ │          │                     │
│ │   GROUND    │24 │─┼──────────┼─                    │
│ └─────────────┴───┘ │          └─────────────────────┘
│                     │          ┌─────────────────────┐
│                     │          │   DOUG HALL RBI-1   │
│                     │          │                     │
│              J2     │          │                     │
│ ┌─────────────┬───┐ │          │  ┌───┐              │
│ │ RX AUDIO #2 │12 │─┼──────────┼──│ 6 │              │
│ ├─────────────┼───┤ │          │  ├───┤              │
│ │   COR #2    │ 5 │─┼──────────┼──│ 7 │              │
│ ├─────────────┼───┤ │          │  ├───┤              │
│ │   GROUND    │18 │─┼──────────┼──│ 9 │              │
│ ├─────────────┼───┤ │          │  ├───┤              │
│ │   PTT #2    │ 9 │─┼──────────┼──│ 8 │              │
│ ├─────────────┼───┤ │          │  ├───┤              │
│ │ TX AUDIO #2 │23 │─┼──────────┼──│ 5 │              │
│ ├─────────────┼───┤ │          │  ├───┤              │
│ │ SERIAL DATA │ 7 │─┼──────────┼──│ 3 │              │
│ ├─────────────┼───┤ │          │  ├───┤              │
│ │SERIAL CLOCK │ 8 │─┼──────────┼──│ 4 │              │
│ ├─────────────┼───┤ │          │  ├───┤              │
│ │   RESET     │25 │─┼──────────┼──│ 1 │              │
│ └─────────────┴───┘ │          │  └───┘              │
│ ┌─────────────┬───┐ │          │                     │
│ │   +12VDC    │16 │─┼──────────┼─ +12VDC             │
│ ├─────────────┼───┤ │    J1    │                     │
│ │   GROUND    │17 │─┼──────────┼─ GROUND             │
│ └─────────────┴───┘ │          │ DUAL/   220  440 1200│
│                     │          │  140                 │
└─────────────────────┘          └──┬─────┬────┬────┬──┘
   ┌────────────────────────────┐   │     │    │    │
   │  KENWOOD TRANSCEIVER #1    │───┘     │    │    │
   └────────────────────────────┘         │    │    │
     ┌────────────────────────────┐       │    │    │
     │  KENWOOD TRANSCEIVER #2    │───────┘    │    │
     └────────────────────────────┘            │    │
       ┌────────────────────────────┐          │    │
       │  KENWOOD TRANSCEIVER #3    │──────────┘    │
       └────────────────────────────┘               │
         ┌────────────────────────────┐             │
         │  KENWOOD TRANSCEIVER #4    │─────────────┘
         └────────────────────────────┘
```
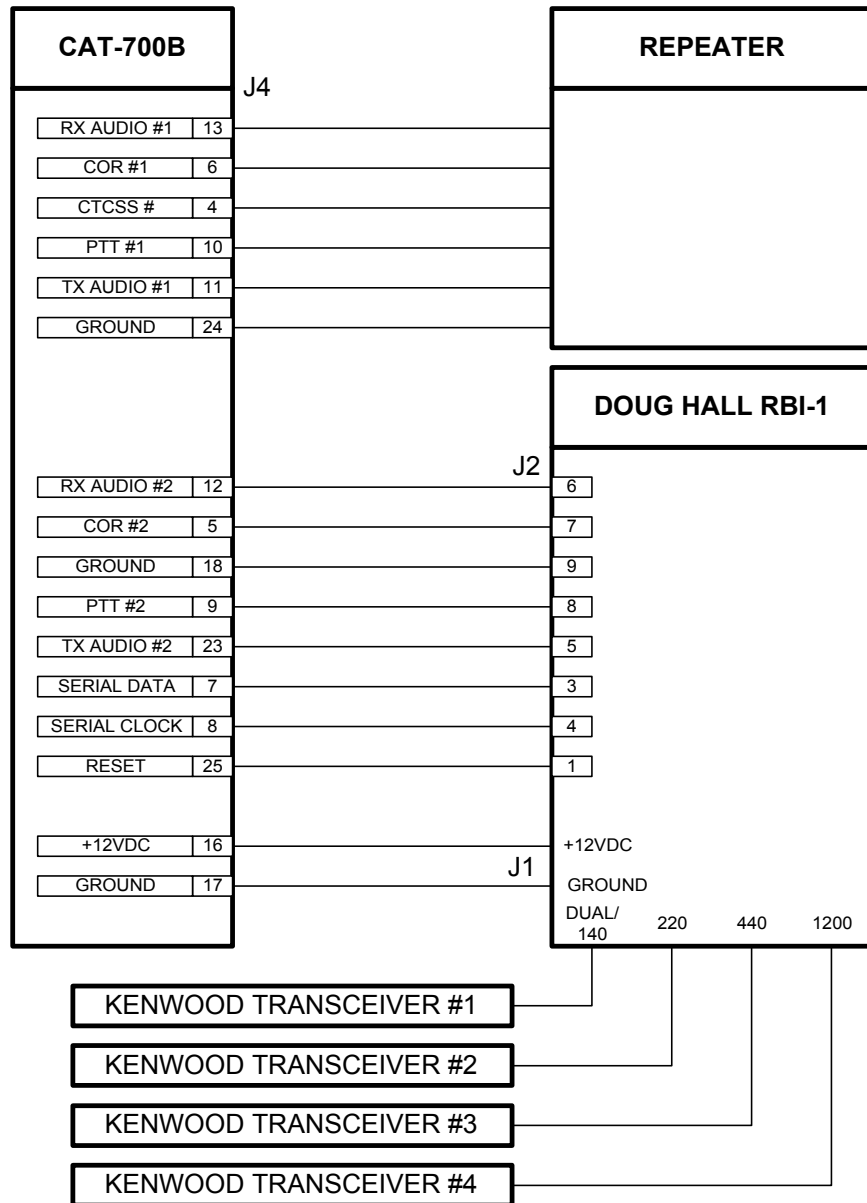
Figure 2-3

The Doug Hall RBI-1 Remote Base Interface supports the Kenwood transceivers listed in Figure 2-4.  Not all transceivers are capable of remote control of CTCSS encoder frequency and transmitter power settings.  Consult the Kenwood manual.

| 140 MHz | 220 MHz | 440 MHz | 1200 MHz | DUAL BAND |
|---------|---------|---------|----------|-----------|
| TM-221  | TM-321  | TM-421  | TM-521   | TM-621   TM-731 |
| TM-231  | TM-331  | TM-431  | TM-531   | TM-631   TM-701 |
| TM-241  |         | TM-441  | TM-541   | TM-721    |

Figure 2-4

## Repeater With IC-706 Serial Tuned Transceiver

In this configuration the CAT-700B supports a repeater and the ICOM transceiver. All connections to the ICOM transceiver are made through the din connector jack.
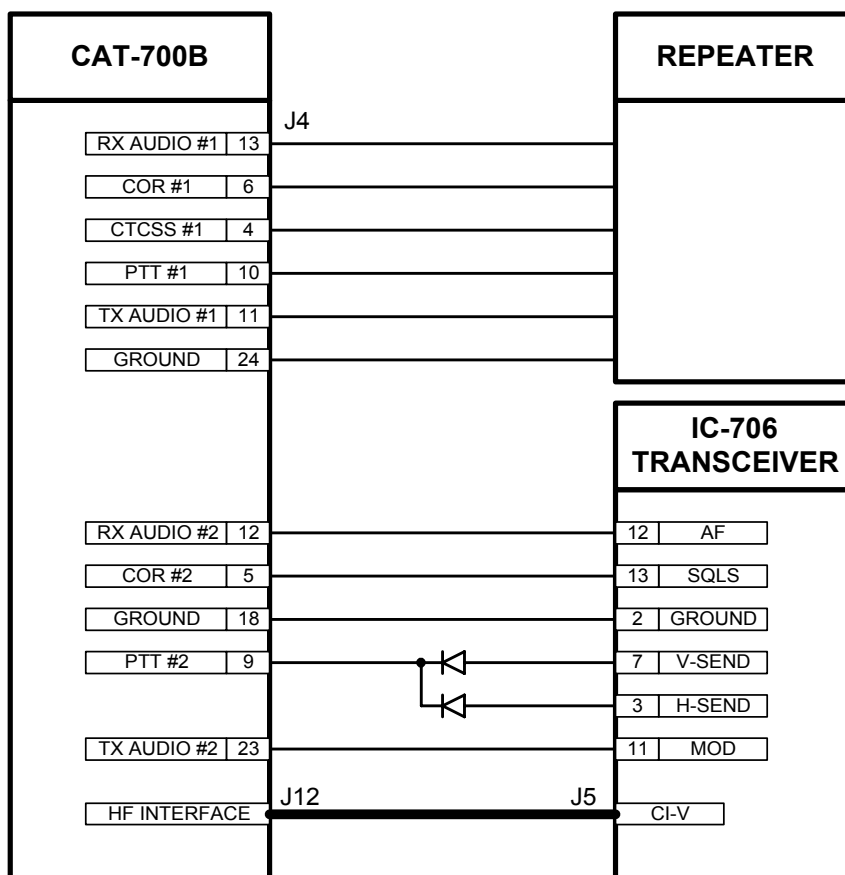


Figure 2-5

# Dip Switch

A eight position dip-switch configures various functions of the CAT-700B.

## 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 COR 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 COR is active high.

## Switch 5

This switch is used to set the CAT-700B for dual transceiver mode.  In this mode when a signal is received by the port #1 receiver, the CAT-700B will only activate the Port #2 transmitter. When a signal is received by the port #2 receiver, the CAT-700B will only activate the Port #1 transmitter.  In this mode the Grandfather clock, Scheduler, User Inputs and Timed Messages are not operational.  The CAT-700B will accept the following DTMF commands:  Unlock Code, Control Operator Codes, Linking Control and all forty Macros.

## Switch 6

This switch is used to define the expanded output switch interface.  Set the switch OFF for the DR-1000 Digital Voice Recorder and ON for the MF-1000 Interface Card.

## Switch 7

This switch is used to initialize the CAT-700B.  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 DATA LOAD COMPLETED."  Set dipswitch #7 to the OFF position.

## Switch 8

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

NOTE: When the dipswitch is changed, DC power must be cycled for the microprocessor to read the new setting.

# Chapter 3 - Repeater Control

The CAT-700B has 8 Zones for a total of 64 remote control channels.  In addition to being controlled by the scheduler, macros or memory saves, these channels can be manually controlled by DTMF commands on the repeater input.

## Interrogation of Repeater Control Status by Radio

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: "ONE TWO FIVE ON."  If all the channels are turned off, the voice will say: "ALL CLEAR."

## Changing Repeater Control Status by Radio

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 3 Channel 5 ON.

```
                                                ┌───────── Zone (1 through 8)
         Control Operator Code ┐    ┌─────────── Channel (1 through 8)
                               │    │   ┌─────── Activity (0=OFF 1=ON)
           Key-up and send: 100   3   5   1
```

Un-key and the voice will say: "THREE FIVE ON."

## Repeater Control Channels

### Zone 1
1. Repeater Transmit          Enable*
2. Repeater CTCSS             Enable
3. DTMF Access                Enable
4. CTCSS Override             Enable
5. Turn on Delay              Enable
6. CTCSS or COR Logic         Enable
7. DTMF Muting                Enable
8. Control Operator CTCSS     Enable

### Zone 2
1. Repeater Time-out Timer    Enable*
2. Transmitter Hang Time      Enable*
3. DTMF Regenerator Link      Enable
4. DTMF Pad Test              Enable*
5. Scheduler                  Enable*
6. Courtesy Tone              Enable*
7. DTMF Generator             Enable*
8. DTMF Regenerator           Enable

### Zone 3
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. Time of Day Request        Enable*
8. Grandfather Clock          Enable*

### Zone 4
1. Link Receive               Enable*
2. Link Transmit              Enable*
3. Link Auto Disconnect       Enable
4. Link CTCSS                 Enable
5. Link Control               Enable*
6. Link Activity Check        Enable
7. Link Macro                 Enable
8. Link Control Operator      Enable*

### Zone 5
1. User Function Input #1     Enable*
2. User Function Input #2     Enable*
3. User Function Input #3     Enable*
4. User Function Input #4     Enable*
5. User Function Output #1    Enable
6. User Function Output #2    Enable
7. User Function Output #3    Enable
8. User Function Output #4    Enable

### Zone 6
1. Expanded Output #1         Enable
2. Expanded Output #2         Enable
3. Expanded Output #3         Enable
4. Expanded Output #4         Enable
5. Expanded Output #5         Enable
6. Expanded Output #6         Enable
7. Expanded Output #7         Enable
8. Expanded Output #8         Enable

## Zone 7

1. Expanded Output #9      Enable
2. Expanded Output #10     Enable
3. Expanded Output #11     Enable
4. Expanded Output #12     Enable
5. Expanded Output #13     Enable
6. Expanded Output #14     Enable
7. Expanded Output #15     Enable
8. Expanded Output #16     Enable

## Zone 8

1. Expanded Output #17     Enable
2. Expanded Output #18     Enable
3. Expanded Output #19     Enable
4. Expanded Output #20     Enable
5. Expanded Output #21     Enable
6. Expanded Output #22     Enable
7. Expanded Output #23     Enable
8. Expanded Output #24     Enable

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

## Zone 1 Repeater Control

### 1. Repeater Transmitter Enable

This is the master repeater switch.  This channel must be enabled for normal repeater operation.  The CAT-700B will continue to respond to control operator commands even when the repeater's transmitter is disabled.  This channel will automatically be enabled after a dipswitch #7 initialization reset.

### 2. Repeater CTCSS Enable

When this channel is enabled, in addition to a COR input, a input from a CTCSS decoder at J3-4 must also be present before the repeater 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 J4-4.

### 3. DTMF Access Enable

When this channel is enabled, a DTMF Access number selected by programming command [*505*] must be entered to activate the repeater.  Once this number is entered and the user un-keys, the voice synthesizer will say: "OK".  A COR input will activate the repeater until it returns to rest.  A rest period of up to 29 minutes can be selected with the [*602*] programming command.  When the CAT-700B is initialized, this timer defaults to 60 seconds.  To return to DTMF Access mode key-up and enter the same DTMF Access number.

### 4. Repeater CTCSS Override

When this channel is enabled, and CTCSS is also enabled, a repeater user without a CTCSS encoder can activate the repeater by entering the DTMF Access number.  Once this number is entered and the user un-keys, the voice will say: "OK".  A COR input will activate the repeater until it returns to rest.

### 5. Turn on Delay Enable

When this channel is enabled, a deliberate and sustained input must be present before the controller will activate the repeater.  Once active, input less than one second will not produce a courtesy tone or a squelch tail.  A time delay of 0.1 to 9.9 seconds can be selected with the [*603*] programming commands.  When the CAT-700B is initialized, this timer defaults to 1.0 second. Use this channel during periods when noise is present on the repeater input.

### 6. Repeater CTCSS OR Logic 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.  This is a layered command. Therefore, Repeater CTCSS Enable, Zone 1 Channel 2 must be ON or this control function will have no effect.

## 7. DTMF Muting Enable

When this channel is enabled, anytime a DTMF tone is received, the audio will be turned off to the repeater's transmitter. The transmit audio will remain muted until a pre-determined time after the last DTMF tone is received. This time is set by the [*606*] programming command. During the mute period, cover beeps are transmitted each second to indicate repeater activity. This feature prevents control commands from being repeated. It provides a 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 pound (#). Refer to Zone 2 Channel 8 for additional information.

## 8. Control Operator CTCSS Enable

When this channel is enabled, a CTCSS input is required for the CAT-700B to accept control or program commands from the control operator.

# Zone 2 Repeater Control

## 1. Repeater Timer Enable

Repeater time-out is user programmable with the [*601*] timer programming commands. When the CAT-700B is initialized, this timer defaults to 3 minutes. When this channel is turned off, the repeater will not time-out.

## 2. Transmitter Hang Time Enable

When this channel is enabled, the repeater's transmitter will remain on for a period of time determined by the COR to Beep and Beep to transmitter drop timers. Turn this channel to make the transmitter turn off the instant COR is lost. This feature is useful when linking to other repeaters or during band openings.

## 3. DTMF Regenerator Link Only Enable

When DTMF muting Zone 1 Channel 7 and DTMF Regenerator Zone 2 Channel 8 are enabled, the controller will mute the original tones while storing the entry in memory. When the user un-keys, the controller will regenerating the same DTMF command on the repeater's transmitter. If this channel is enabled, the controller will regenerate the DTMF command on the Link transmitter only.

## 4. DTMF Pad Test Enable

When this channel is enabled, a repeater user can test their radio's keypad. As the numbers decode, they are stored in memory. When the repeater user stops transmitting the controller will read back all the numbers that were decoded.

## 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. 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. DTMF Generator Enable

This channel enables the DTMF Generator.  DTMF commands stored in memory can be accessed by a prefix code followed by the memory table position.  The CAT-700B will key-up the transmitter and sent the DTMF command.  This feature is similar to the regeneration of DTMF tones during an autopatch.  It provides noise and distortion free commands for other repeaters or equipment in a linking system.

# 8. DTMF Regenerator Enable

When DTMF muting is enabled and a user wants to pass a DTMF command through the repeater, the entry must be preceded by a [#].  If the DTMF regenerator is enabled, the controller will mute the original tones while storing the entry in memory.  When the user un-keys, the controller will regenerating the same DTMF command.  Like the DTMF generator, this feature is intended to provide noise and distortion free tones at the repeater's output.

## Zone 3 Voice Message Control

# 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 23 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 23 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 [*608*] squelch tail message timer.  This message will consist of up to 23 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 [*609*] drop out message timer.  This message will consist of up to 23 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 23 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 23 words selected from the voice vocabulary table and is programmed with the [*3106*] command.

## 7. 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 23 words selected from the voice vocabulary table and is programmed with the [*3107*] command.  When the CAT-700B is initialized, this message defaults to: "THE TIME IS 7:15 PM."

## 8. Grandfather Clock Enable

When this channel is enabled, the CAT-700B will announce the time of day every hour on the hour.  This message will consist of up to 23 words selected from the voice synthesizer vocabulary table and programmed with the [*3108*] command.  When the CAT-700B is initialized, this message defaults to: "CAT-700B REPEATER THE TIME IS 7:15 PM."

## Zone 4 Transceiver Control

## 1. Link Receive Enable

When this channel is enabled, the CAT-700B will accept the [5002] link receive command.  This feature permits monitoring of the Link receiver without transmitting on the Link transmitter.

## 2. Link Transmit Enable

When this channel is enabled, the CAT-700B will accept the [5001] link transmit command.  This feature permits monitoring of the Link receiver and activation of the Link transmitter.

## 3. Link Auto Disconnect Enable

When this channel is enabled, the link will disconnect automatically after a period of repeater inactivity.  Voice message #15 will announce the link has disconnected.  This message will consist of up to 23 words selected from the vocabulary table and programmed with the [*3115*] command.  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 [*616*] programming command.  When the CAT-700B is initialized, this timer defaults to 10 minutes.

## 4. Link CTCSS Enable

When this channel is enabled, in addition to a Link COR input at J3-5, a input from a CTCSS decoder at J3-3 must also be present before the controller will activate the repeater.  A COR input by itself will have no affect.  DO NOT ENABLE THIS CHANNEL unless a CTCSS decoder is connected to J4-3.

## 5. Link Control Enable

The CAT-700B will only respond to the Link control commands [5000] and [5001] through the Repeater input.  This greatly reduces the possibility of the CAT-700B responding to a command meant for another repeater in the linking system. When this channel is enabled, Link control commands will be accepted through the Link receiver input.

## 6. Link Activity Check Enable

When this channel is enabled, the CAT-700B will check for link activity before transmitting on the link frequency.  This will reduce interference on the link system.

## 7. Link Macro Enable

When this channel is enabled, the CAT-700B will accept macro commands from the link side.

## 8. Link Control Operator Enable

When this channel is enabled, the CAT-700B 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 [*513*] programming command.

## Zone 5 User Function Inputs

## 1. User Function Input #1 Enable

When this channel is enabled, a logic input on connector J3-1 by executing the command stored in the Input #1 memory buffer.

## 2. User Function Input #2 Enable

When this channel is enabled, a logic input on connector J3-2 will execute the command stored at the Input #2 memory buffer.

## 3. User Function Input #3 Enable

When this channel is enabled, a logic input on connector J3-21 will execute the command stored at the Input #3 memory buffer.

## 4. User Function Input #4 Enable

When this channel is enabled, a logic input on connector J3-22 will execute the command stored at the Input #4 memory buffer.

## 5. User Function Output #1 Enable

When this channel is enabled, user function switch #1 is turned on.  Connector J3 pin 14 will sink 150 MA.

## 6. User Function Output #2 Enable

When this channel is enabled, user function switch #2 is turned on.  Connector J3 pin 15 will sink 150 MA.

## 7. User Function Output #3 Enable

When this channel is enabled, user function switch #3 is turned on.  Connector J3 pin 19 will sink 150 MA.

## 8. User Function Output #4 Enable

When this channel is enabled, user function switch #4 is turned on.  Connector J3 pin 20 will sink 150 MA.

## Zone 6 Expanded Outputs 1 Thru 8

## 1. Expanded Output #1 Enable

When this channel is enabled, expanded output switch #1 is turned on.  Connector J3 pin 1 on the DVR-1000 or J1 pin 1 on the MF-1000 will sink 150 MA.

## 2. Expanded Output #2 Enable
When this channel is enabled, expanded output switch #2 is turned on.  Connector J3 pin 3 on the DVR-1000 or J1 pin 2 on the MF-1000 will sink 150 MA.

## 3. Expanded Output #3 Enable
When this channel is enabled, expanded output switch #3 is turned on.  Connector J3 pin 5 on the DVR-1000 or J1 pin 3 on the MF-1000 will sink 150 MA.

## 4. Expanded Output #4 Enable
When this channel is enabled, expanded output switch #4 is turned on.  Connector J3 pin 7 on the DVR-1000 or J1 pin 4 on the MF-1000 will sink 150 MA.

## 5. Expanded Output #5 Enable
When this channel is enabled, expanded output switch #5 is turned on.  Connector J3 pin 8 on the DVR-1000 or J1 pin 5 on the MF-1000 will sink 150 MA.

## 6. Expanded Output #6 Enable
When this channel is enabled, expanded output switch #6 is turned on.  Connector J3 pin 6 on the DVR-1000 or J1 pin 6 on the MF-1000 will sink 150 MA.

## 7. Expanded Output #7 Enable
When this channel is enabled, expanded output switch #7 is turned on.  Connector J3 pin 4 on the DVR-1000 or J1 pin 7 on the MF-1000 will sink 150 MA.

## 8. Expanded Output #8 Enable
When this channel is enabled, expanded output switch #8 is turned on.  Connector J3 pin 2 on the DVR-1000 or J1 pin 8 on the MF-1000 will sink 150 MA.

# Zone 7 Expanded Outputs 9 Thru 16

## 1. Expanded Output #9 Enable
When this channel is enabled, expanded user function switch #9 is turned on. Connector J1 pin 9 on the MF-1000 will sink 150 MA.

## 2. Expanded Output #10 Enable
When this channel is enabled, expanded user function switch #10 is turned on. Connector J1 pin 10 on the MF-1000 will sink 150 MA.

## 3. Expanded Output #11 Enable
When this channel is enabled, expanded user function switch #11 is turned on. Connector J1 pin 11 on the MF-1000 will sink 150 MA.

## 4. Expanded Output #12 Enable
When this channel is enabled, expanded user function switch #12 is turned on. Connector J1 pin 12 on the MF-1000 will sink 150 MA.

## 5. Expanded Output #13 Enable
When this channel is enabled, expanded user function switch #13 is turned on. Connector J1 pin 13 on the MF-1000 will sink 150 MA.

## 6. Expanded Output #14 Enable
When this channel is enabled, expanded user function switch #14 is turned on. Connector J1 pin 14 on the MF-1000 will sink 150 MA.

## 7. Expanded Output #15 Enable
When this channel is enabled, expanded user function switch #15 is turned on. Connector J1 pin 15 on the MF-1000 will sink 150 MA.
## 8. Expanded Output #16 Enable
When this channel is enabled, expanded user function switch #16 is turned on. Connector J1 pin 16 on the MF-1000 will sink 150 MA.

# Zone 8 Expanded Outputs 17 Thru 24

## 1. Expanded Output #17 Enable
When this channel is enabled, expanded user function switch #17 is turned on. Connector J1 pin 17 on the MF-1000 will sink 150 MA.

## 2. Expanded Output #18 Enable
When this channel is enabled, expanded user function switch #18 is turned on. Connector J1 pin 18 on the MF-1000 will sink 150 MA.

## 3. Expanded Output #19 Enable
When this channel is enabled, expanded user function switch #19 is turned on. Connector J1 pin 19 on the MF-1000 will sink 150 MA.

## 4. Expanded Output #20 Enable
When this channel is enabled, expanded user function switch #20 is turned on. Connector J1 pin 20 on the MF-1000 will sink 150 MA.

## 5. Expanded Output #21 Enable
When this channel is enabled, expanded user function switch #21 is turned on. Connector J1 pin 21 on the MF-1000 will sink 150 MA.

## 6. Expanded Output #22 Enable
When this channel is enabled, expanded user function switch #22 is turned on. Connector J1 pin 22 on the MF-1000 will sink 150 MA.

## 7. Expanded Output #23 Enable
When this channel is enabled, expanded user function switch #23 is turned on. Connector J1 pin 23 on the MF-1000 will sink 150 MA.

## 8. Expanded Output #24 Enable
When this channel is enabled, expanded user function switch #24 is turned on. Connector J1 pin 24 on the MF-1000 will sink 150 MA.

# Chapter 4 - Repeater Operation

## Time of Day Request

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 7 and can be changed with the [*3107] programming command.

## DTMF Keypad Test

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". Note: The "D" key cannot be tested. See Forced DTMF Command Entry.

## Forced DTMF Command Entry

During normal operation a DTMF command is entered at the drop of receiver COR. It is possible to force a DTMF command entry even while COR is present. The CAT-700B will accept the [D] key as an entry command.

## DTMF Access

When the repeater 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 carrier 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".
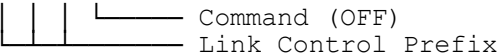
## Repeater CTCSS Override

When repeater CTCSS is enabled, a repeater user without a CTCSS encoder can activate the repeater by entering [325], the DTMF Access number. The voice will say: "OK UP" and the repeater will respond to a carrier input. After a rest period, the DTMF Access code must be re-entered to override the CTCSS requirement. You can bypass the rest period and return the repeater to DTMF access mode by re-entering the DTMF access code. The voice will say: "OK DOWN".

## Link Control By Repeater Input

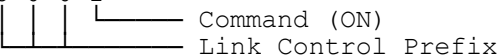This feature permits a connection between the Repeater and Link.

## Link Disconnect

Key-up on the repeater's input and enter the link control prefix [500], followed by a [0]. The CAT-700B will disconnect the link and the voice will announce the link disconnect message 13. This message can be changed with the [*3113] programming command. Example: With a link control prefix of [500], turn off the link.

```
    Key-up and enter: 5 0 0 0
                      │ │ │ └────── Command (OFF)
                      │ │ └──────── Link Control Prefix
```

## Link Connect

Key-up on the repeater's input and enter the link control prefix [500], followed by a [1]. The CAT-700B will connect the repeater and link and the voice will announce the link connect message 14. This message can be changed with the [*3114] programming command. Example: With a link control prefix of [500], turn on the link.

```
    Key-up and enter: 5 0 0 1
                      │ │ │ └────── Command (ON)
                      │ │ └──────── Link Control Prefix
```

## Link Receive Only

Key-up on the repeater's input and enter the link control prefix [500], followed by a [2].  The CAT-700B will connect the repeater and link receiver and the voice will say: "RECEIVER CONNECT."  This mode is identical to link connect, except the link transmitter is disabled.  Example:  With a link control number of [500], turn on the link receiver.

```
Key-up and enter: 5 0 0 2
                  │ │ │ └────── Command (Receive Only)
                  │ │ └──────── Link Control Prefix
```

## RBI-1 Reset

This command will reset the RBI-1 interface.

```
Key-up and enter: 5 2 5 #
                  │ │ │ └────── Command (Entry Clear)
                  │ │ └──────── Transceiver Control Prefix Number
```

## Read Remote Base Frequency

Key-up and enter the remote base frequency prefix number followed by a 0.  Un-key and the voice will read back the current frequency including the offset and the setting of transmitter power.  Example: With a prefix number of 525, read the remote base frequency.

```
Key-up and enter:  5 2 5 0
                   │ │ │ └────── Request Remote Base Frequency Read Back
                   │ │ └──────── Frequency load command prefix.
```

## Load RBI-1 Remote Base Frequency

Key-up and enter the remote base frequency prefix, followed by the band, frequency, offset and CTCSS encoder frequency if desired.  Example:  With a prefix of 525, load 146.820 MHz, minus offset, and CTCSS tone 151.4 Hz.  To suppress the voice read back add a [#] at the end of the entry.

```
Key-up and enter:    5 2 5 2 6 8 2 0 1
                                     └────── 1=Minus, 2=Simplex, 3=Plus
     Load Prefix ──────┘ │ │         └────── Kilohertz 1's (0 or 5)
     Frequency Band ─────┘ │       └──────── Kilohertz 10's
     Megahertz 1 ──────────┘     └────────── Kilohertz 100's
```

```
Key-up and enter:  5 2 5 5 24
                   │ │ │   └────── CTCSS tone 151.4 Hz (See Figure 17-3)
     Load Prefix ──┘ │ │   └────── CTCSS Tone Load Command
```

## Select Transceiver Memory

To select a transceiver memory, key-up and enter the Remote Base Frequency Load prefix, followed by a [*] and the memory number.  Example: With a prefix of 525, select memory 5.  The voice will say: "M5"

```
Key-up and enter:  5 2 5 * 0 5
   Load Prefix ────┘ │ │   └─── Memory location
```

## Load Remote Base Frequency From CAT-700B Memory

Key-up and enter the remote base frequency prefix, followed by the memory table position.  Example: With a prefix of 525, load contents of memory 22.  The voice will say: "FREQUENCY LOAD 22."

```
           Key-up and enter:  5 2 5 22
   Frequency Load Prefix ─────┘ │ │ └─── Memory location
```

## Voice Message Demo

Key-up and enter the voice prefix followed by a message number.  The CAT-700B will key the transmitter and say the message stored at that location.  Example:  With a voice prefix number of 700, play message 7.

```
Key-up and enter: 7 0 0 07
                  │ │ │ └─────── Voice Message
                  └─┴─┴───────── Voice Prefix
```

## DR Track Selection

Key-up and enter the DVR prefix followed by a DVR track number.  The CAT-700B will key the transmitter and play the digital voice recorder track.  Example: With a DVR prefix number of 725 play track 14.

```
Key-up and enter: 7 2 5 14
                  │ │ │ └─────── DR Track
                  └─┴─┴───────── DR Prefix
```

## DVR Signal Report

Key-up and enter the DVR prefix [725] followed by a [*].  Un-key, the voice will say: "START TEST NOW".  Key-up and record a seven second message.  Un-key and the message will play back.  You instantly know how your signal sounds.

## 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-700B decodes the macro number, the commands will execute in the order they were stored within the macro string.

## User Function Control By Repeater Input

This feature permits repeater users to control the four user function switches with a simple DTMF entry.  To control one of the switches, key-up and enter the user function control number followed by the switch number to be controlled and a [0] to turn the switch OFF, a [1] to turn the switch ON or a [2] to momentary change the switch for 0.5 seconds.  Example: With a user function control number of [150], turn on switch three.

```
Key-up and enter: 1 5 0 3 1 ─── Command 0=Off 1=On 2=Change For 0.5 Seconds
   User Function ─┴─┴─┘ └─────── Switch Number
   Control Prefix
```

## DTMF Tone Generator

Key-up and enter the DTMF Generator prefix followed by a table position.  The controller will key the transmitter and send the DTMF tones stored at that location.  Example: With a DTMF tone generator prefix of [300], send the DTMF command stored at table position [3].

```
Key-up and enter: 3 0 0 03
                  │ │ │ └─────── DTMF Generator Table Position
                  └─┴─┴───────── DTMF Generator Prefix
```

## Memory Files

Space is provided for six memory files.  Each memory file includes: control channel settings, codes, timer values, and voice messages 1 through 6.  When the CAT-700B is initialized, all memory files are filled with the default values.  To store active memory as a memory file, you must unlock the CAT-700B and use the [*19X] programming commands.

## Active Memory Identification

Key-up and enter the memory recall prefix [175] followed by [0].  Un-key and the voice will read back the memory file number.  Example:  With a memory recall prefix of [175], and active memory compares to file 3.

```
Key-up and enter:  1 7 5 0
                   │ │ │ └────── Memory File Read Back
                   │ │ └──────── Memory Recall Prefix
```

The voice will say: "FILE ID IS THREE."  If changes were made to active memory and it no longer agrees with the original file in storage, the voice will say: "FILE ID IS THREE MODIFIED."

## Memory Recall

To copy a memory file into active memory, key-up and enter the memory recall prefix [175] followed by the file number [1] through [6].  Example:  With a memory recall prefix of [175], move file [3] to active memory.

```
Key-up and enter: 1 7 5 3
                  │ │ │ └────── Memory File
                  │ │ └──────── Memory Recall Prefix
```

## Expanded Output Switch Control

To control the eight user function switches located on DR-1000, or the twenty-four switches on the MF-1000 Interface Card, key-up and enter the Expanded Output Switch prefix [550] followed by the table position.  The CAT-700B will change the settings of the switches to conform to the pattern stored by the [*44XX] or [*47X] programming commands.  Example:  With a prefix number of [550], set the switches to the conditions previously stored in memory at table position [15].

```
Key-up and enter: 5 5 0 15
                  │ │ │ └────── DR Switch Table Position
                  │ │ └──────── DR Switch Prefix
```

## 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-700B 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-700B 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.

## Unique Courtesy Tones

The CAT-700B determines which courtesy tone to send by reading voice messages 9 and 10.  Since the courtesy tones are assigned a three-digit number and called from a voice message, any word, tone, chime or sound effect listed in Chapter 11 can be used as a courtesy tone.  The choice is yours.

## Read Firmware Version

To check the firmware version, enter the control operator prefix code followed by 98. Example: Key-up and enter [10098].  The voice synthesizer will announce the power-up message that includes the ROM version.

# Chapter 5 - Repeater Programming By DTMF Tone

This chapter describes how to program the CAT-700B controller with a DTMF keypad.  The various types of program commands are described in detail and examples are given in the following text.

## Initialization
To initialize the CAT-700B, set dipswitch #7 to on and cycle DC power.  During power-up, the voice will say: "RESET DATA LOAD COMPLETED."  Set dipswitch #7 to off.  Initialization consists of the following operations:

## Dipswitch #7 Initialization
1.   All memory locations are cleared.
2.   All control channels marked with a [*] are enabled.
3.   The unlock number is loaded with the default value [1234567].
4.   The control operator prefix code is loaded with [100].
5.   The control numbers are set to default values.
6.   The timers are set to default values.
7.   The voice message buffers are loaded with default messages.
8.   All six memory saves are loaded with default values.

## Programming the Unlock Control Number
To program the UNLOCK code, 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: "DATA INPUTS OK."  If the number is rejected, the voice will say: "CONTROL ERROR" followed by "ENTER CONTROL." Key-up and enter the seven-digit number.  Set dipswitch #8 to off.  When the CAT-700B is powered up with dipswitch #7 set to on, the un-lock number defaults to: [1234567].

## Unlocking the Controller By Radio
To unlock the controller, key-up and enter the seven-digit unlock number.  The voice will say: "CAT 700 CONTROL."

## Locking the Controller By Radio
Key-up and send [*0].  Un-key, the controller will lockup and the voice will say: "MANUAL EXIT."  The controller will lock-up automatically when the programming timer expires.  The voice will say: "TIMER EXIT."  The programming time limit can be set with the [*615*] programming command.

NOTE:        The CAT-700B must be unlocked to perform the following programming functions.

## Internal Commands

The Internal Command Structure is a series of commands used to program the scheduler, user function input switches and macros.  Each command is four digits.  The following operations are controlled by the Internal Commands.

| INTERNAL COMMANDS | | | |
|---|---|---|---|
| | POINTER | CHANNEL | ACTION |
| Control Repeater Zone 1 | 11 | 1-8 | 0-1 |
| Control Repeater Zone 2 | 12 | 1-8 | 0-1 |
| Control Repeater Zone 3 | 13 | 1-8 | 0-1 |
| Control Repeater Zone 4 | 14 | 1-8 | 0-1 |
| Control Repeater Zone 5 | 15 | 1-8 | 0-1 |
| Control Repeater Zone 6 | 16 | 1-8 | 0-1 |
| Control Repeater Zone 7 | 17 | 1-8 | 0-1 |
| Control Repeater Zone 8 | 18 | 1-8 | 0-1 |
| | | | Action 0=OFF 1=ON |
| Send Voice Message Repeater | 30 | 01-20 | |
| Send Voice Message Repeater & Link | 31 | 01-20 | |
| Send Time of Day Repeater | 32 | 00 | |
| Send Time of Day Repeater & Link | 33 | 00 | |
| Send Day of Week | 33 | 01 | |
| Send Day and Month | 33 | 02 | |
| Send Salutation | 33 | 03 | |
| Send DTMF Tones Repeater | 34 | 01-20 | |
| Send DTMF Tones Repeater & Link | 35 | 01-20 | |
| Send DTMF Tones Link | 36 | 01-20 | |
| Play DVR Track Repeater | 37 | 01-16 | |
| Play DVR Track Repeater & Link | 38 | 01-16 | |
| Set  DVR Switches | 39 | 01-20 | |
| Load Repeater Courtesy Tone | 50 | 01-08 | |
| Load Link Courtesy Tone | 51 | 01-08 | |
| Set  MF-1000 Switches | 57 | 1-8 | |
| Execute Macro | 58 | 01-40 | |
| Load Memory File | 59 | 01-06 | |
| Time Delay Control (Seconds) | 60 | 01-99 | |
| PTT#1 Control | 61 | 00-01 | |
| PTT#2 Control | 62 | 00-01 | |
| PTT#1-PTT#2 Control | 63 | 00-01 | |
| PTT#1 Control with Voice Delay | 64 | 00-01 | |
| PTT#2 Control with Voice Delay | 65 | 00-01 | |
| PTT#1-PTT#2 Control Voice Delay | 66 | 00-01 | |
| Link Control OFF/ON/RECEIVE/STATUS | 70 | 00-01-02-03 | |
| Kenwood Memory Channel Select | 74 | 01-20 | |

| | | |
|---|---|---|
| Kenwood RF Power Set [LO-MED-HI] | 76 | 01-02-03 |
| Kenwood DC Power [OFF-ON] | 78 | 00-01 |
| Send Voice Word Repeater | 8 | 000-999 |
| Send Voice Word Link | 9 | 000-999 |

Figure 5-1

*   Macro commands 5801-5840 can only be activated by the scheduler or hardware logic input.  One macro cannot call another macro.

## Load Courtesy Tones

Use the internal command to change the Repeater and Link courtesy tones.  Use [50] followed by the courtesy tone number [01-08] for the repeater and [51] followed by the courtesy tone number [01-08] for link input.
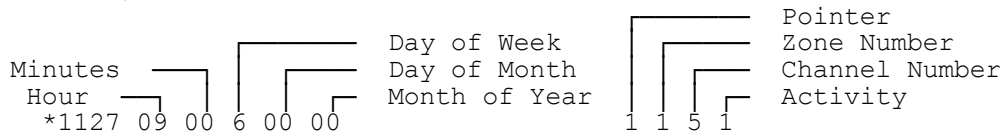
## Scheduler Command Memory

This memory area is reserved for storage of scheduler activity.  This includes the time the command is to be executed, and the action to be taken.

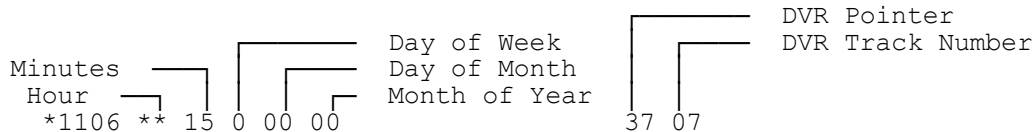## Read Scheduler Locations (01-40)

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, and command stored.

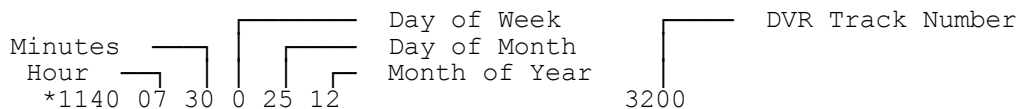## Program Scheduler Locations (01-40)

Key-up and send [*11XX] followed by the hours, minutes, day of week, or day of month and month of year, and the command to be executed.  Un-key and the voice will say: "CONTROL OK."  Example:  Set Zone 1 Channel 5 (ON) -  9:00 AM Every Friday  (Store at Table Location 27)
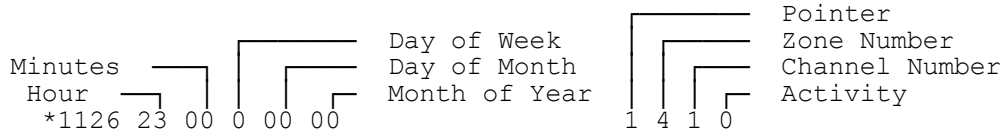
```
                                                    Pointer
                                 Day of Week         Zone Number
         Minutes ─┐    ┌──────── Day of Month        Channel Number
          Hour ─┐ │    │  ┌───── Month of Year       Activity
          *1127 09 00 6 00 00                    1 1 5 1
```

Example:  Play DVR Track 7 on the repeater transmitter, 15 minutes after every hour, (Stored at Table Location 6)

```
                                                    DVR Pointer
                                 Day of Week         DVR Track Number
         Minutes ─┐    ┌──────── Day of Month
          Hour ─┐ │    │  ┌───── Month of Year
          *1106 ** 15 0 00 00                    37 07
```

Example:  Announce Time of Day on the repeater transmitter at 7:30 AM on December 25th
  (Store at Table Location 40)

```
                                 Day of Week         DVR Track Number
         Minutes ─┐    ┌──────── Day of Month
          Hour ─┐ │    │  ┌───── Month of Year
          *1140 07 30 0 25 12                    3200
```

Example: Set Zone 4 Channel 1 (OFF) at 11:00 PM every day (Store at Table Location 26)

```
                                                      ┌──────── Pointer
                          ┌──────── Day of Week       │  ┌───── Zone Number
        Minutes ──┐  ┌──── Day of Month               │  │  ┌── Channel Number
         Hour ──┐ │  │  ┌── Month of Year             │  │  │  ┌ Activity
          *1126 23 00 0 00 00                         1  4  1  0
```

```
┌─────────────────────────────────────────────────────────────────┐
│            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 Scheduler Locations (01-40)
Key-up and send [*12XX].  Un-key, the voice will say: "CONTROL OK."

## Macro Command Memory
Macros are used to store custom commands of up to ten operations that will execute with a single DTMF entry.  Macro [40] is a power-up macro and will execute anytime power is applied to the controller.

## Read Macro Locations (01-40)
Key-up and send [*13XX].  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 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 announce the time and turn on Zone 2, Channel 4.  The Macro Control number [123] is the number entered by a repeater user to execute the macro.

```
  Programming Command ──────┐            ┌──────── Time of Day
                         *14 03 123 * 3200 1241
   Macro Table Position ──────┘   │        └── Control Zone 2 Channel 4 ON
                                   └─────── Macro Control Number (1 to 7 Digits)
```
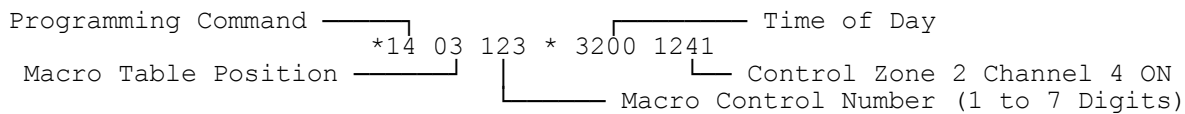
## Erase Macro Locations (01-40)
Key-up and send [*15XX].  Un-key, the voice will say: "CONTROL OK."
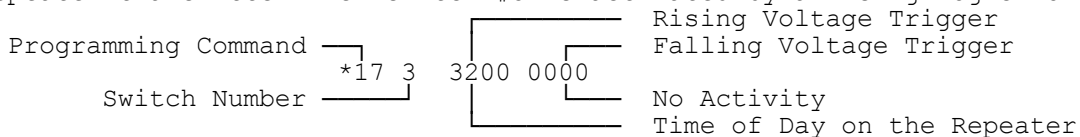
## User Function Inputs
The CAT-700B has 4 logic inputs and 2 memories are provided for each input.  The first location executes on the rising voltage while the second executes on the falling voltage.  If a location is loaded with [0000] no action will take place.
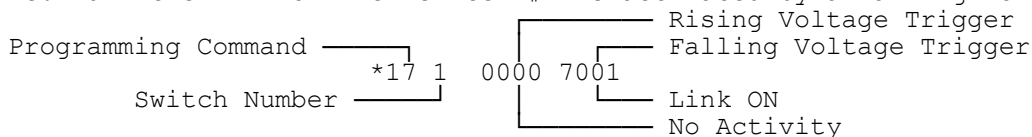
## Read User Function Inputs (1-4)
Key-up and send [*16X].  Un-key and voice will read back the Internal command stored at that switch memory location.  If the location is empty, the voice will say: "ALL CLEAR."

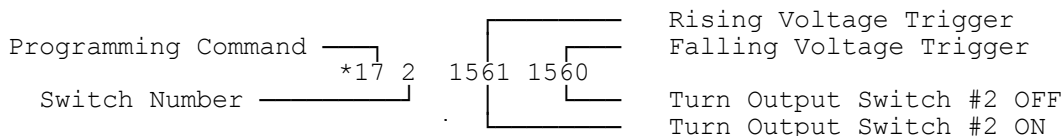## Program User Function Inputs (1-4)

Key-up and send [*17X] followed by the internal command to be stored.  See Figure 5-1.
Un-key and the voice will say: "CONTROL OK."  Example:  Announce the time of day on
the repeater transmitter when switch #3 is activated by a rising logic voltage.

```
                                               ┌──────── Rising Voltage Trigger
         Programming Command ──┐      ┌──────── Falling Voltage Trigger
                            *17 3   3200 0000
         Switch Number ─────────┘      └──────── No Activity
                                      └───────── Time of Day on the Repeater
```

Example: Turn the link on when switch #1 is activated by a falling voltage input.

```
                                           ┌──────── Rising Voltage Trigger
       Programming Command ──────┐    ┌──────── Falling Voltage Trigger
                             *17 1   0000 7001
          Switch Number ──────────┘    └──── Link ON
                                      └────── No Activity
```

Example: Turn user function output switch #2 [Zone 5 Channel 6] on when input switch
#2 is activated by a rising voltage and off with a falling voltage.

```
                                          ┌──────── Rising Voltage Trigger
       Programming Command ──┐    ┌──────── Falling Voltage Trigger
                         *17 2   1561 1560
          Switch Number ──────┘    └──────── Turn Output Switch #2 OFF
                                  └───────── Turn Output Switch #2 ON
```

## Erase User Function Switches (1-4)

Key-up and send [*18X].  Un-key and the voice will say: "CONTROL OK."
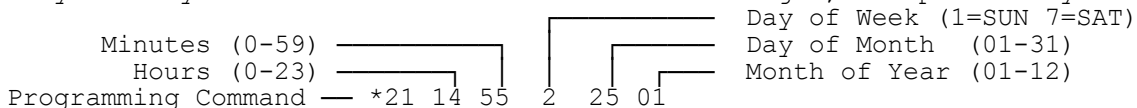
## Save Active Memory File (1-6)

Save the current settings of active memory to be recalled later.  Memory space is
provided for six files.  Configure the active memory to suite your special
requirements.  Use the [*19X] programming command to save the current settings of the
control channels, codes, timers and first ten voice messages.  Example: Save active
memory as File #3.  Key-up and send [*193].  Un-key and the voice will say: "CONTROL
OK."

## Check Time of Day

Key-up and send [*20].  Un-key, the voice will read the time, day of week, day of
month, month and year.  Example: "THE TIME IS TWELVE FIFTEEN PM MONDAY JUNE FIVE."

## Setting the Clock

Key-up and send [*21] followed by the hours, minutes, day of week, day of month, month
of year and year.  Un-key and the voice will say "CLOCK SET OK." Example: 2:55 PM
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
```

## Increase - Decrease Hour

Key-up and send [*22] to advance the clock one hour at the start of daylight savings time.  Key-up and send [*23] to set the clock back one hour at the end of daylight savings time.
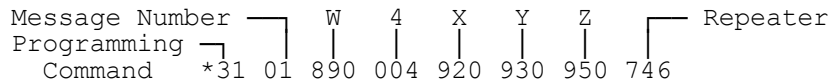
## Voice Synthesizer Memory Storage

Space is provided for twenty programmable messages of up to 23 words each.

## Send Synthesized Voice Message Locations (01-20)

Key-up and send [*30XX].  Un-key and the voice synthesizer will say the message stored at memory location "XX".

## Program Synthesized Voice Message Locations (01-20)

Key-up and send [*31XX], followed by the three digit numbers that represents the words required to construct the message.  Memory space is provided for 23 entries.  Refer to Chapter 13, Voice Vocabulary Word List.  Example:  Load Repeater ID #1 with "W4XYZ Repeater"

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

## VOICE MESSAGE NUMBER TABLE

| | | | |
|---|---|---|---|
| 01 | Repeater ID #1 (AT REST) | 11 | Remote Base Off |
| 02 | Repeater ID #2 (ACTIVE) | 12 | Remote Base On |
| 03 | Squelch Tail Message | 13 | Link Clear |
| 04 | Transmitter Drop Message | 14 | Repeater Time Out Exit |
| 05 | Timed Message #1 | 15 | Repeater Time Out Clear |
| 06 | Timed Message #2 | 16 | Message #16 |
| 07 | Time of Day Message | 17 | Message #17 |
| 08 | Grandfather Clock Message | 18 | Message #18 |
| 09 | Courtesy Tone Repeater | 19 | Message #19 |
| 10 | Courtesy Tone Link | 20 | Message #20 |

## Program Voice Message With Time Variables

To insert the time-of-day into a voice messages load the number [100]. Example: Load the grandfather clock message with "THE TIME IS [ACTUAL TIME] AND THIS IS THE W4XYZ REPEATER."  Other time variables include: [102 - Day of the Week], [103 - Day and Month], [104 - Year] and [105 - Salutation].

```
  Message Number ──┐              ┌── [Actual Time]
        *31 08 830 838 482 100 231 833 482 830 890 004 920 930 950 746
```
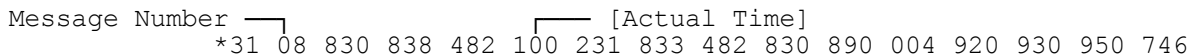
## User Function Switch Control by Voice Message

The voice message buffers can also control the seven user function output switches. If during the execution of a voice message, a user function output switch command (111 through 122) is encountered, the CAT-700B will set the switch and then continue with the remainder of the voice message.

| | | | |
|---|---|---|---|
| 111=UF#1 OFF | 114=UF#2 OFF | 117=UF#3 OFF | 120=UF#4 OFF |
| 112=UF#1 ON | 115=UF#2 ON | 118=UF#3 ON | 121=UF#4 ON |
| 113=UF#1 MOM | 116=UF#2 MON | 119=UF#3 MON | 122=UF#4 MON |

## DVR Track Selection by Voice Message

The voice message buffers can be used to play one of the sixteen DVR tracks. If during the execution of a voice message, a DVR track command (131 through 146) is encountered the CAT-700B will play the recorded message stored at that track.

## Digital Voice Recorder Track Control Commands

| | | | |
|---|---|---|---|
| 131=TRACK #1 | 135=TRACK #5 | 139=TRACK #9 | 143=TRACK #13 |
| 132=TRACK #2 | 136=TRACK #6 | 140=TRACK #10 | 144=TRACK #14 |
| 133=TRACK #3 | 137=TRACK #7 | 141=TRACK #11 | 145=TRACK #15 |
| 134=TRACK #4 | 138=TRACK #8 | 142=TRACK #12 | 146=TRACK #16 |

## Courtesy Tone Selection by Voice Message

The voice message buffers can be used to generate courtesy tones. If during the execution of a voice message, a courtesy tone command (151 through 158) is encountered, the CAT-700B will generate the courtesy tone stored at that memory location.

## Courtesy Tone Control Command

| | | | |
|---|---|---|---|
| 151=TONE #1 | 152=TONE #2 | 153=TONE #3 | 154=TONE #4 |
| 155=TONE #5 | 156=TONE #6 | 157=TONE #7 | 158=TONE #8 |

## Load Courtesy Tone For Repeater Receiver

Key-up and send [*3109], followed by the three-digit number that represents the desired courtesy tone from the courtesy tone command table. Un-key and the voice will say: "CONTROL OK." Example: Select courtesy tone #3.

```
Programming Command ─────┐     ┌──────── Message Number
         Command      *31  09  153 ──── Courtesy Tone #3
```

## Load Courtesy Tone For Link Receiver

Key-up and send [*3110], followed by the three-digit number that represents the desired courtesy tone from the courtesy tone command table. Un-key and the voice will say: "CONTROL OK." Example: Select courtesy tone #5.

```
Programming Command ─────┐     ┌──────── Message Number
         Command      *31  10  155 ──── Courtesy Tone #5
```

## Erase Synthesized Voice Message Locations (01-20)

Key-up and send [*32XX]. Un-key and the voice will say: "CONTROL OK." The voice message will be erased at location [XX].
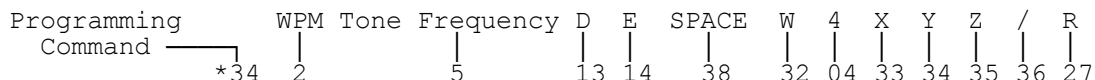
## CW ID Memory Storage

Memory space is provided for a CW identification. The buffer will accept 28 characters. If a repeater user talks over a voice ID, the CAT-700B will switch to the CW ID. If the voice ID messages are disabled, (Zone 3 Channels 1, 2 are off), the controller will ID in CW only. During initialization, the CW buffers are loaded with "CAT700 REPEATER."

## Send Repeater CW ID

Key-up and send [*33]. Un-key and the CAT-700B will send the CW ID at the frequency and speed programmed.

## Program Repeater CW ID

Key-up and send [*34] followed by the frequency, speed and two digit numbers that represent the call letter identification. Memory space is provided for (28) entries. Refer to the CW ID programming table. Example: Load CW ID memory buffer with DE W4XYZ/R at 20 WPM and a tone frequency of 1206Hz.

```
Programming       WPM Tone Frequency D  E  SPACE  W  4  X  Y  Z  /  R
  Command ─────┐    |                |  |    |    |  |  |  |  |  |  |
           *34  2            5        13 14   38   32 04 33 34 35 36 27
```

## CW ID Programming Table

| 00=ZERO  | 10=A | 20=K | 30=U     | 40=;  | 1=24 WPM | 1=697 Hz  |
|----------|------|------|----------|-------|----------|-----------|
| 01=ONE   | 11=B | 21=L | 31=V     | 41=,  | 2=20 WPM | 2=770 Hz  |
| 02=TWO   | 12=C | 22=M | 32=W     | 42=:  | 3=18 WPM | 3=852 Hz  |
| 03=THREE | 13=D | 23=N | 33=X     | 43=?  | 4=15 WPM | 4=941 Hz  |
| 04=FOUR  | 14=E | 24=O | 34=Y     | 44= - | 5=13 WPM | 5=1206 Hz |
| 05=FIVE  | 15=F | 25=P | 35=Z     | 45=(  | 6=10 WPM | 6=1336 Hz |
| 06=SIX   | 16=G | 26=Q | 36=/     | 46=SK |          | 7=1477 Hz |
| 07=SEVEN | 17=H | 27=R | 37=AR    |       |          | 8=1633 Hz |
| 08=EIGHT | 18=I | 28=S | 38=SPACE |       |          |           |
| 09=NINE  | 19=J | 29=T | 39=[.]   |       |          |           |

## Erase Repeater CW ID

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 continue.

## Read DTMF Generator Locations (01-20)

Key-up and send [*36XX]. Un-key and the voice will read back the DTMF command stored at that memory location. If the location is empty, the voice will say: "ALL CLEAR."

## Program DTMF Generator Locations (01-20)

Key-up and send [*37XX] followed by the DTMF command to be stored. Un-key and the voice will say: "CONTROL OK." Example: Store the DTMF command [523A67] at table position 8.
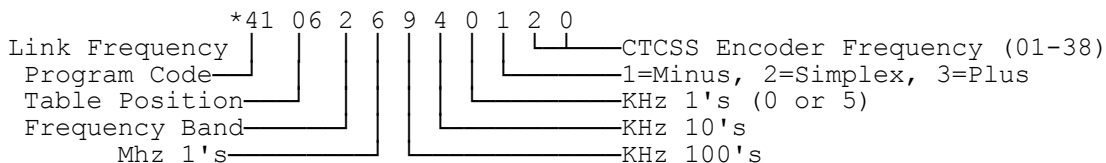
```
       Table Position ──────.─┐       ┌─────────── DTMF Command
                        *37 08     523A67
```

## Erase DTMF Generator Locations (01-20)

Key-up and send [*38XX]. Un-key and the voice will say: "CONTROL OK."

## Read Remote Base Frequency Locations RBI-1 Interface (01-40)

Key-up and send [*40XX]. Un-key and the voice will announce the frequency, offset, and CTCSS encoder setting stored at memory [XX]. Example: The voice will say: "ONE FORTY SIX POINT NINE FOUR MINUS CTCSS 20 ON OFF." or "ONE FORTY SIX POINT NINE FOUR MINUS NO CTCSS." If the memory location is empty, the voice will say: "FREQUENCY POSITION XX IS CLEAR".

## Program Remote Base Frequency Locations RBI-1 Interface (01-40)

Key-up and send [*41XX] followed by the band, frequency (4 digits), offset, and CTCSS encoder frequency. Un-key and the voice will say: "CONTROL OK." Example: At table position 6, load frequency of 146.940 MHz, minus offset, with CTCSS encoder enabled and set to 131.8 Hz. For Band and CTCSS tone selection see Figures 15-2 and 15-3.

```
                    *41 06 2 6 9 4 0 1 2 0
     Link Frequency ─────┘  │ │ │ │ │ │ │ └──CTCSS Encoder Frequency (01-38)
       Program Code─────────┘ │ │ │ │ │ └────1=Minus, 2=Simplex, 3=Plus
     Table Position───────────┘ │ │ │ └──────KHz 1's (0 or 5)
    Frequency Band──────────────┘ │ └────────KHz 10's
           Mhz 1's────────────────┘ └────────KHz 100's
```

## Erase Remote Base Frequency Locations (01-40)

Key-up and send [*42XX]. Un-key and the voice will say: "CONTROL OK."

## DR-1000 Expanded Output Switches

The DR-1000 contains eight switches to control other equipment at the repeater site. A twenty-position table stores the switch settings. These switches can be changed by a DTMF command, scheduler, macro or user function input switch.

## Read DR-1000 Expanded Switch Locations (01-20)

Key-up and send [*43XX]. Un-key and the voice will announce the settings of each switch stored at memory location [XX]. If all switches are off, the voice will say: "ALL CLEAR". If some switches are on, the voice will read back the switches from switch #1 to switch #8.

## Program DR-1000 Expanded Switch Locations (01-20)

Key-up and send [*44XX] followed by the settings of the eight switches. Un-key and the voice synthesizer will say: "CONTROL OK". Example: On DR-1000, at table position 5, set switches 1,3,5 and 6 to on.

```
       Table Location ──────────┐   #1 #2 #3 #4 #5 #6 #7 #8 Switch
Programming Command ────── *44 05    1  0  1  0  1  1  0  0
```

## Erase DR-1000 Expanded Switch Locations (1-20)
Key-up and send [*45XX].  Un-key and the voice will say: "CONTROL OK".

## MF-1000 Expanded Switches
The MF-1000 Interface Card contains twenty-four switches to control other equipment at the repeater site.  An eight-position table stores the switch settings.  These switches can be changed by a DTMF command, scheduler, macro or user function input switch.

## Read MF-1000 Expanded Switch Locations (1-8)
Key-up and send [*46X].  Un-key and the voice will announce the settings of each switch stored at memory location [X].  If all switches are off, the voice will say: "ALL CLEAR".  If some switches are on, the voice will read back the switches from switch #1 to switch #24.

## Program MF-1000 Expanded Switch Locations (1-8)
Key-up and send [*47X] followed by the settings of the twenty-four switches.  Un-key and the voice synthesizer will say: "CONTROL OK".  Example: On MF-1000, at table position 8, set switches 1,3,5,6,12, and 21 to on.

```
Table Location ─┐           Zone 6            Zone 7            Zone 8
                │      1 2 3 4 5 6 7 8  1 2 3 4 5 6 7 8  1 2 3 4 5 6 7 8
Programming ──┐ │      | | | | | | | |  | | | | | | | |  | | | | | | | |
  Command   *47 8      1 0 1 0 1 1 0 0  0 0 0 1 0 0 0 0  0 0 0 0.1.0.0.0
```

## Erase MF-1000 Expanded Switch Locations (1-8)
Key-up and send [*48XX].  Un-key and the voice will say: "CONTROL OK".

## 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-700B is powered up with dip-switch #7 set to the on position.

## Control Operator Port #1 Prefix Number [*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].

## User Output Switch Prefix Number [*502*]
This programming command selects the user function switch prefix number.  This number precedes the switch and activity numbers.  The default number is [150].

## Memory Recall Prefix Number [*503*]
This programming command selects the memory recall prefix number.  This number precedes the memory save number being moved into active memory.  The default number is [175].

## DTMF Generator Prefix Number [*504*]

This programming command selects the DTMF generator prefix number. This number precedes the DTMF generator table position number. The default number is [300].

## DTMF Access Code [*505*]

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 Code [*506*]

This programming command selects the DTMF pad test prefix number. This number must be entered to initiate a DTMF keypad test. The default number is [375].

## Time Of Day Request Code [*507*]

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].

## Link Control Prefix Number [*508*]

This programming command selects the link control prefix number. This number must precede the command used to activate or deactivate the link. The default number is [500].

## Control Operator Port #2 Prefix Number [*509*]

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 the link input. The default number is [200].

## Expanded Output Switch Prefix [*510*]

This programming command selects the expanded user function prefix number. This number must precede the command to change the settings of the expanded user function switches on the DR-1000 or the MF-1000 determined by the setting of dipswitch #6. The default number is [550].

## Voice Demonstration Prefix Number [*511*]

This programming command selects the voice demo prefix number. This number must precede the message number to play a voice message. The default number is [700].

## DVR Track Play Prefix Number [*512*]

This programming command selects the DVR prefix number. This number must precede the DVR track number to play a DVR track. The default number is [725].

## External Modem Connect Code [*513*]

This programming command selects the external modem connect number. When this number is entered, user function switch #4 will turn on. Connect switch #4 to a relay to enable an external modem. Exit the computer communications mode and the switch #4 will turn off. The default number is [825]. Note: This feature must be selected in the windows editor configuration section.

## Remote Base Frequency Load Number [*514*]

This number must precede the command used to change the frequency of the Kenwood transceiver through the RBI-1 interface. Example: To program a remote base Frequency Load Number of 525, key-up and send [*514*525]. Un-key and the voice will say: "CONTROL OK."

## Remote HF Base Control Number [*515*]

This number must precede the command used to enable control of the IC-706 Transceiver. Example: To program a Remote Base Control number of 560, key-up and send [*514*560]. Un-key and the voice will say: "CONTROL OK."

## Read Control And Prefix Numbers [*501 - *515]

Use any of these programming commands to read the assigned prefix number. Example: Read the voice demo prefix number. Key-up and enter [*511], un-key and the voice will say: "PRESET CODE FIVE ELEVEN IS SEVEN ZERO ZERO."

## Timer Memory

This memory area is reserved for storage of [20] timers. These timers are user programmable. If the CAT-700B is initialize by applying power with dip-switch #7 in the on position, the timers will be automatically loaded with default times.

## Repeater Time-out [*601*]

The repeater time-out timer limits the maximum length of a transmission. This timer is programmable between 1.0 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.

## Repeater Sleep Timer [*602*]

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 1.0 and 1799 seconds. The timer default is 60 seconds.

## Repeater Turn on Delay Timer [*603*]

When the repeater is at rest, this timer determines the time COR must be present before the repeater activates. It is programmable between 0.1 and 9.9 seconds. Example: To program this timer to 1.5 seconds, key-up and enter [*603*15]. Un-key and the voice will say: "CONTROL OK." The timer default is 1.0 seconds.

## COR Drop to Courtesy Beep Timer [*604*]

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. The timer default is 1 second.

## Courtesy Beep to PTT Drop Timer [*605*]

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.

## DTMF Mute Delay Timer [*606*]

This timer determines the time the transmit audio will continue to be muted after the entry of the last DTMF tone. This timer is programmable between 0.1 and 9.9 seconds. The timer default is 1 second.

## Repeater ID Timer [*607*]
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 1.0 and 1799 seconds.  The timer default is 480 seconds.

## Squelch Tail Message Timer [*608*]
This timer sets the time between transmissions of the squelch tail message.  The message occurs when a repeater user stops transmitting.  This timer is programmable between 1.0 and 1799 seconds.  The timer default is 1799 seconds.

## Drop Out Message Timer [*609*]
This timer sets the time between transmissions of the drop out message.  The message occurs when a repeater stops transmitting.  This timer is programmable between 1.0 and 1799 seconds.  The timer default is 1799 seconds.

## Voice Delay Timer [*610*]
The CAT-700B generates a PTT output and after a short delay the voice speaks.  This delay is field programmable.  This feature is useful in repeater systems using CTCSS tone squelch or multiple linking where the system is slow to come up.  The voice delay timer can be programmed between 0.1 and 9.9 seconds.  The timer default is 1.0 seconds.

## Program Max Length Timer [*611*]
During the programming mode, this timer determines the maximum time the controller remains unlocked.  This timer is programmable between 1 and 1799 seconds.  The timer default is 300 seconds.

## Test Tone Length Timer [*612*]
The courtesy beep tone generator will produce a continuous tone to adjust audio levels to the transmitter.  This timer is programmable between 1 and 1799 seconds.  The timer default is 30 seconds.

## Timed Message #1 Timer [*613*]
This timer sets the timed message repeat period.  This timer is programmable between 1.0 and 1799 seconds.  The timer default is 1799 seconds.

## Timed Message #2 Timer [*614*]
This timer sets the timed message repeat period.  This timer is programmable between 1.0 and 1799 seconds.  The timer default is 1799 seconds.

## RS-232 Port Connect Timer [*615*]
During programming by computer terminal, this timer determines the maximum time the modem will remain on line.  This timer is programmable between 1 and 1799 seconds.  The timer default is 1200 seconds.

## Link Auto Disconnect Timer [*616*]
During link operation if Zone 6 channel 3 is enabled the link will disconnect automatically after a period inactivity.  Voice message #15 will be called to announce the transceiver has disconnected.  This timer is programmable between 1.0 and 1799 seconds.  The timer default is 600 seconds.

## Read Timer Settings [*601 - *616]

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

The CAT-700B will generate a 941Hz test tone.  This tone is used as a reference when setting audio levels on the CAT-700B.  To activate the tone, key-up and enter [*901] for the repeater tone and [*902] for the link tone.  Timer [*612*] sets the length of the tone.
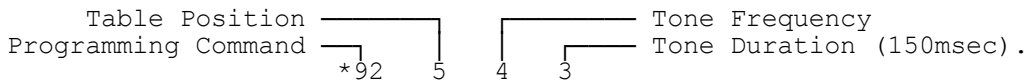
## Courtesy Tone

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-700B 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 941Hz and a duration of 150msec.

```
     Table Position ————————┐      ┌———————— Tone Frequency
Programming Command ——┐     │      │    ┌——— Tone Duration (150msec).
                     *92     5      4    3
```

| TONE FREQUENCY | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1=697Hz | 2=770Hz | 3=852Hz | 4=941Hz | 5=1206Hz | 6=1336Hz | 7=1477Hz | 8=1633Hz |
| 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 [770Hz]
     Table Position ———————│┌—— Tone #1 Duration [100msec]
Programming Command ——┐    ││┌— Time #1 Separation [50msec]
                     *92 1  2 2 1  4 3 2  6 4
  Tone #2 Frequency [941Hz] ———————┘   │   └— Tone #3 Duration [200msec]
  Tone #2 Duration [150msec] ————————  │   ——— Tone #3 Frequency [1336Hz]
  Time #2 Separation [100msec] ——————————┘
```
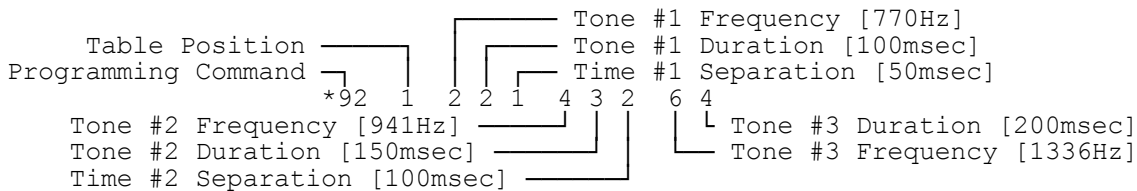
## Erase Courtesy Tone (1-8)

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

## Select Courtesy Tone

To select tone "153" as the Repeater courtesy beep, load Voice Message 9 with "153."
Example: Enter *3109 153.  To select tone "157" as the Link courtesy beep, load Voice
Message 10 with "157".  Enter *3110 157.

## Digital Voice Recorder

The CAT-700B supports the DR-1000 Digital Voice Recorder for true voice message
announcements.  Substitute DVR tracks for voice messages, speed dial IDs and courtesy
tones.  For additional information on how to record tracks over the telephone line,
consult Chapter 10.

## Play Digital Voice Recorder Tracks (01-16)

Key-up and send [*94XX].  Un-key and the CAT-700B will play the prerecorded message
stored at track "XX"

## Record Digital Voice Recorder Tracks (01-16)

Key-up and send [*95XX].  Un-key and the voice will say: "START MESSAGE".  Key-up and
enter the message to be stored at track "XX".

## Erase Digital Voice Recorder Tracks (01-16)

Key-up and send [*96XX].  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: "MANUAL EXIT."  If you fail to exit the
programming mode, when the programming timer [*611*] expires, the CAT-700B will return
to normal repeater operation.  The voice will say: TIMER EXIT."

## DTMF Programming Commands

| COMMAND | DESCRIPTION |
|---------|-------------|
| *10XX | READ SCHEDULER COMMAND |
| *11XX | PROGRAM SCHEDULER COMMAND |
| *12XX | ERASE SCHEDULER COMMAND |
| *13XX | READ MACRO |
| *14XX | PROGRAM MACRO |
| *15XX | ERASE MACRO |
| *16X | READ LOGIC INPUT SWITCH |
| *17X | PROGRAM LOGIC INPUT SWITCH |
| *18X | ERASE LOGIC INPUT SWITCH |
| *19X | SAVE ACTIVE MEMORY |
| *20 | SEND TIME OF DAY |
| *21 | PROGRAM TIME OF DAY |
| *22 | INCREASE CLOCK ONE HOUR |
| *23 | DECREASE CLOCK ONE HOUR |
| *30XX | SEND VOICE SYNTHESIZER |
| *31XX | PROGRAM VOICE SYNTHESIZER |
| *32XX | ERASE VOICE SYNTHESIZER |

| | |
|------|---------------------------|
| *33 | SEND CW ID |
| *34 | PROGRAM CW ID |
| *35 | ERASE CW ID |
| *36XX | READ DTMF GENERATOR |
| *37XX | PROGRAM DTMF GENERATOR |
| *38XX | ERASE DTMF GENERATOR |
| *40XX | READ LINK FREQUENCY |
| *41XX | PROGRAM LINK FREQUENCY |
| *42XX | ERASE LINK FREQUENCY |
| *43XX | READ DVR SWITCHES |
| *44XX | PROGRAM DVR SWITCHES |
| *45XX | ERASE DVR SWITCHES |
| *46XX | READ MF-1000 SWITCHES |
| *47XX | PROGRAM MF-1000 SWITCHES |
| *48XX | ERASE MF-1000 SWITCHES |

| COMMAND | CONTROL NUMBER DESCRIPTION | DEFAULT |
|---------|-----------------------------------|---------|
| *501* | CONTROL OPERATOR CODE (RPT) | 100 |
| *502* | USER OUTPUT SWITCH | 150 |
| *503* | MEMORY RECALL PREFIX | 175 |
| *504* | DTMF GENERATOR PREFIX | 300 |
| *505* | DTMF ACCESS CODE | 325 |
| *506* | DTMF PAD TEST CODE | 375 |
| *507* | TIME OF DAY REQUEST CODE | 400 |
| *508* | LINK CONTROL PREFIX | 500 |
| COMMAND | CONTROL NUMBER DESCRIPTION | DEFAULT |
| *509* | CONTROL OPERATOR CODE(LINK) | 200 |
| *510* | EXPANDED OUTPUT SWITCH | 550 |
| *511* | VOICE DEMO PREFIX | 700 |
| *512* | DVR PREFIX | 725 |
| *513* | RS-232 PORT CONNECT CODE | 825 |
| *514* | REMOTE BASE FREQUENCY LOAD PREFIX | 525 |
| *515* | REMOTE HF BASE CONTROL PREFIX | 560 |

| COMMAND | TIMER DESCRIPTION | RANGE | DEFAULT |
|---------|------------------|-------|---------|
| *601* | REPEATER TIME-OUT | 1-1799 | 180 |
| *602* | REPEATER SLEEP | 1-1799 | 60 |
| *603* | TURN ON DELAY | .1-9.9 | 1.0 |
| *604* | COR DROP TO BEEP | .1-9.9 | 1.0 |
| *605* | BEEP TO PTT DROP | .1-9.9 | 4.0 |
| *606* | DTMF MUTE DELAY | .1-9.9 | 1.0 |
| *607* | REPEATER ID | 1-1799 | 480 |
| *608* | SQUELCH TAIL MESSAGE | 1-1799 | 1799 |
| *609* | DROP OUT MESSAGE | 1-1799 | 1799 |
| *610* | VOICE DELAY | .1-9.9 | 1.0 |
| *611* | PROGRAM MAX LENGTH | 1-1799 | 300 |
| *612* | TEST TONE LENGTH | 1-1799 | 30 |
| *613* | TIMED MESSAGE #1 | 1-1799 | 1799 |
| *614* | TIMED MESSAGE #2 | 1-1799 | 1799 |
| *615* | EXT MODEM CONNECT | 1-1799 | 1200 |
| *616* | LINK AUTO DISCONNECT | 1-1799 | 600 |

| COMMAND | DESCRIPTION |
|---------|-------------|
| *901 | GENERATE 941Hz TONE [REPEATER] |
| *902 | GENERATE 941Hz TONE [LINK] |
| *91X | SEND COURTESY TONE |
| *92X | PROGRAM COURTESY TONE |
| *93X | ERASE COURTESY TONE |
| *94XX | PLAY DIGITAL VOICE RECORDER |
| *95XX | RECORD DIGITAL VOICE RECORDER |
| *96XX | ERASE DIGITAL VOICE RECORDED |
| *0 | MANUAL EXIT |

# Chapter 6 - Repeater Programming By Computer

This chapter describes how to communicate with the CAT-700B through the RS-232 computer interface.  The rate is fixed at [4800] baud with [8] bits, no parity and [1] stop bit.  The default password is [cat700].  The password is case sensitive.  The command prompt is: [**->**].  Entries must be in lower case.  In the examples the carriage return is displayed as (C/R).  The following commands are described in Figure 6-1 below:

| COMMAND | DEFINITION |
|---------|------------|
| U | Xmodem file UPLOAD to send to CAT-700B memory |
| D | Xmoden file DOWNLOAD to save CAT-700B memory to disk |
| q | QUIT the computer terminal mode |

Figure 6-1

Fabricate the cable described in Figure 7-7 of this manual.  Use the cable to connect the computer's serial port to the J10 header on the CAT-700B controller.  Start the [COMM32] communications program.  Click on "Configuration" and "Comm Setup."  Select the Port, 4800 baud, Parity NONE, Data Bits 8 and Stop Bits 1.  Click OK.  Select Program Setup and select CAT-700 communications.  Click OK. **Note: Jumper J11 must be in the CRT position.**

Press **(C/R)** and the CAT-700B will send:  **Enter Password**:  Enter the default password cat700.  The controller will send:  **Data Transfer, D=Download... U=Upload... Q=Quit. Select>**

These commands are used to transfer the contents of the CAT-700B memory between the controller and computer, where it can be stored on disk as a back-up file or used with the editor program.

## Data Transfer Download
To **DOWNLOAD** the memory and save it to disk, Type: **d (C/R)**.  The CAT-700B will send: **Select Xmodem download protocol**.  Place the arrow on the download button and click the left mouse button.  Name the file to be down loaded and click OK.  Once the download sequence starts, monitor the download window display until the download is complete.

## Data Transfer Upload
To **UPLOAD** the memory from disk, Type: **u (C/R)**.  The CAT-700B will send: **Select Xmodem upload protocol**.  Place the arrow on the upload button and click the left mouse button.  Select the file to be uploaded and click OK.  Once the upload sequence starts, monitor the upload window display until the upload is complete.

## Exit Terminal Routine
To quit the terminal mode, Type: **q (C/R)**.  The sign-off message will appear.

## CAT-700 Windows Editor
The CAT Windows Editor offers a monumental break through in repeater controller programming.  No endless string of DTMF tones to enter of confusing script files to write.  Completely mouse driven, just point and click.

## Print Driver

The CAT-700 Windows Editor Program includes a print driver to produce a hard copy of the data in the controller's memory.  Use the printed material to prepare manuals for the system control operators.  From the print driver window select from the following print command boxes:  [Repeater Codes], [Repeater Timers], [Voice Messages], [Control Zones], [Memory Saves 1-6], [Remote Base Frequencies], [Macros], [Scheduler], [Courtesy Tones], [CW Message], [DTMF Tones].

## Voice Messages

From the voice message display window, place the hand on the message cell and double click.  The voice synthesizer editor dialogue box window will appear.  From the voice message display window, place the hand on the message cell and double click.  The voice synthesizer editor dialogue box window will appear.  Double click the letters, words and numbers in the voice word table.
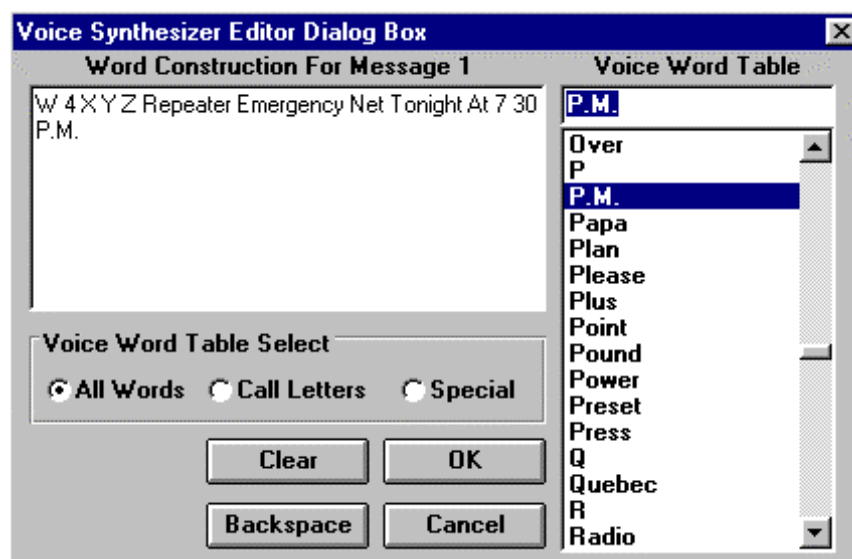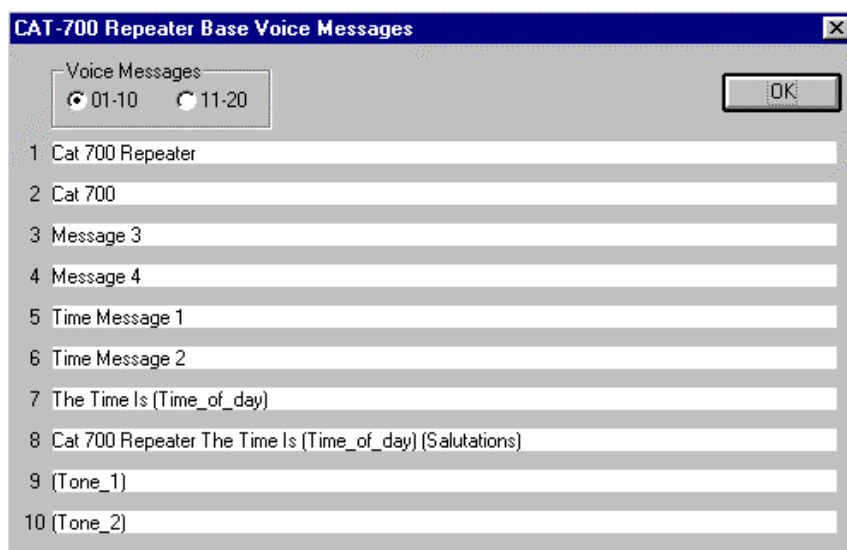
## Scheduler

From the scheduler window, place the hand on the TIME cell and double click. The SCHEDULER POSITION window will appear. Place the hand on the COMMAND cell and double click. The KEYPAD window will appear. Use the keypad to enter the COMMAND and click OK. Place the hand on the SCHEDULED TIME cell and double click. Use the keypad to enter the time and click OK.

**CAT-700 Scheduler**

Scheduler Group: ● 1-10  ○ 11-20  ○ 21-30  ○ 31-40   [OK]

| | Time | Day Of Week | Month/Day Of Year | | Cmd |
|---|---|---|---|---|---|
| 1 | 23:00 | Daily | Skip | | 1121 |
| 2 | ----:15 | Daily | Skip | | 3017 |
| 3 | 19:50 | Thursday | Skip | | 3501 |
| 4 | 15:00 | Daily | Skip | | 5003 |
| 5 | ----:45 | Daily | Skip | | 3200 |
| 6 | 06:30 | Friday | Skip | | 1341 |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |

**Schedular Position 6**

Scheduled Event
- ○ Daily   ○ Weekdays Only   ○ Weekends Only
- ● Select Weekday   [Friday ▼]
- ○ Select Month / Day

Command: 1341   Command Review: TX Drop Msg. ON

☐ Erase(d) Location

Scheduled Time: 0630   ☐ Every Hour   [OK]

## Control Zones

From the zone window, place the arrow on the ZONE TAB of interest and click. The selected zone card will move to the front of the window and the enabled channels in that zone will appear with a check mark in the boxes. To change the status of a control channel in the zone, place the arrow in the desired box and click.

**CAT-700 Base Zones**

Zone 5 | Zone 6 | Zone 7 | Zone 8
**Zone 1** | Zone 2 | Zone 3 | Zone 4

- ☑ 1. Transmitter Enable
- ☑ 2. CTCSS Enable
- ☐ 3. DTMF Access Enable
- ☐ 4. CTCSS Override Enable
- ☑ 5. Turn On Delay Enable
- ☐ 6. CTCSS or COR Logic Enable
- ☑ 7. DTMF Muting Enable
- ☐ 8. Control Operator CTCSS Enable

[OK]

6-3

## Remote Base Frequencies

To program a remote base memory location, from the remote base frequency window, place the hand on the remote base frequency window, place the hand on the frequency cell to be programmed and double click.  The frequency position window will appear.  Place the arrow in the frequency cell and click on the frequency and click on the frequency numbers to advance the frequency to the desired setting.  Place the arrow in the TX OFFSET box and click to select MINUS, PLUS or SIMPLEX offset.  Place the arrow in the POWER box and click on the desired POWER setting.  Place the arrow in the CTCSS box and click to select ON.  Place the arrow in the CTCSS cell and click on the CTCSS tone frequency numbers to advance the CTCSS tone frequency to the desired setting. Click OK to return to the REMOTE BASE FREQUENCY window.

### Remote Base Frequencies

|  | Frequency | Offset | Power | CTCSS | Group Selection |
|---|---|---|---|---|---|
| 1 | 146.610 | Minus | Low | No CTCSS | ⦿ 1-10 |
| 2 | 146.520 | Simplex | High | No CTCSS | ○ 11-20 |
| 3 | 442.200 | Plus | High | 79.7 | ○ 21-30 |
| 4 | 446.100 | Simplex | Medium | No CTCSS | ○ 31-40 |
| 5 | 1250.000 | Minus | Low | 186.2 | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | OK |

### Frequency Position No. 6

**Frequency**

146.940

☐ Erase(d) Position

OK

**TX Offset**
- ⦿ Minus
- ○ Plus
- ○ Simplex
- ○ Minus 20

**Power**
- ○ Low
- ⦿ High
- ○ Med
- ○ Same

**CTCSS**

110.9

**CTCSS**
- ○ Off
- ⦿ On

## Hardware Inputs

From the hardware input window, place the hand on the RISING or FALLING EDGE cell and double click. The KEYPAD window will appear. Use the keypad to enter a new hardware input command and click OK.

**CAT-700 Hardware Inputs**

| Input #1 | Rising Edge | 1551 | User Function Output #1 ON |
| | Falling Edge | 1550 | User Function Output #1 OFF |
| Input #2 | Rising Edge | 1561 | User Function Output #2 ON |
| | Falling Edge | 1560 | User Function Output #2 OFF |
| Input #3 | Rising Edge | 1571 | User Function Output #3 ON |
| | Falling Edge | 1570 | User Function Output #3 OFF |
| Input #4 | Rising Edge | 1581 | User Function Output #4 ON |
| | Falling Edge | 1580 | User Function Output #4 OFF |

OK

## Control Codes

From the repeater code window, place the hand on the CONTROL OPERATOR PREFIX cell and double click. The KEYPAD window will appear. Use the keypad to enter a new control operator prefix code and click OK.

**CAT-700 Repeater Base Codes**

| Control Operator Prefix | 123 | Link Control Prefix | 500 |
| User Output Switch | 150 | Link Frequency Load Prefix | 525 |
| Memory Recall Prefix | 175 | Expanded Output Switch Prefix | 550 |
| DTMF Generator Prefix | 300 | Voice Demo Prefix | 700 |
| DTMF Access Code | 325 | DVR Control Prefix | 725 |
| DTMF Pad Test Code | 375 | RS-232 Port Connect Code | 825 |
| Time Of Day Request Code | 400 | | |

OK

## CAT-700 Repeater

From the Repeater CRT Password cell use the computer keyboard to enter a new password.
From the Repeater 7 Digit Unlock Number cell use the computer keyboard to enter a new
seven digit unlock number.
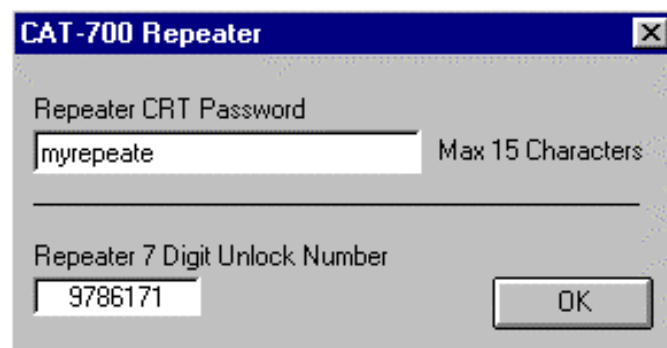
# Chapter 7 - Interfacing to Other Equipment

Interfacing the CAT-700B to your repeater system is a simple matter.  A minimum of two inputs and two outputs are required for the CAT-700B 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.

Additional connections are required to realize all features of the CAT-700B.

## 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 0.8VDC.  A positive voltage is any voltage greater than 3.0VDC.  Set dipswitch #1 on the CAT-700B to ON for (negative logic) and OFF for (positive logic).

## Connection to Receiver

Connect the repeater receiver audio output to J4-13 and the COR to J4-6 of the CAT-700B.  When the repeater's receiver is active, measure the COR level at TP3 Verify this line changes from less than 0.8VDC to greater than 3.0 VDC.  If the COR line will not meet these limits it may be necessary to add a pull-up resistor to the COR #1 line.  This may also be true for the COR #2 input.  Space is provided on the CAT-700B board.

## Connection to Transmitter

Locate your repeater's Push-To-Talk input.  When grounded, this line will make the repeater transmit.  Connect the CAT-700B PTT #1 output (J4-10) 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 (J4-11) to this line.

## Connection to CTCSS Decoder

If your repeater receiver has a CTCSS decoder output, connect it to J4-4.  In addition to COR, the CAT-700B requires a positive logic input to represent a CTCSS input.

## Interface Review

1.     Are dipswitches #1 through #8 in their proper positions?
2.     Is the PTT-1 output at J4-10 connected to the transmitter PTT input?
3.     Is the TX1 Audio at J4-11 connected to the transmitter audio input?
4.     Is the COR-1 at J4-6 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 0.8 VDC to greater than 3.0 VDC?
7.     Is the RX1 AUDIO at J4-13 connected to the receiver audio output?
8.     Is the audio input level sufficient for the DTMF decoder?

## Connector Kit

Included with the controller is a connector kit containing a 25 pin "D" connector to mate with J4, a 2.5mm power plug to mate with J1 (center pin is [+]), connector cable for J10 serial port, two 2200 ohm resistors and two .0047uF capacitors.  If the COR inputs are active low, install the 2200 ohm resistors as pull-ups on the board at the R1 and R2 positions.  If the receiver's COR circuit in not capable of pulling down the 2200 ohm resistor increase the resistor value to 10K ohms.  If the controller is supplied with discriminator audio install the .0047uF capacitors on the bard at the C19 and C21 positions to de-emphasize the audio.

## Audio Level Adjustment

The audio mixing-switching circuits of the CAT-700B are optimized around an input and output of -10dBM (220mV RMS).  For best results the receiver audio input at J4 pin 13 should be 220mV with a test signal of 1000Hz 3Khz deviation.

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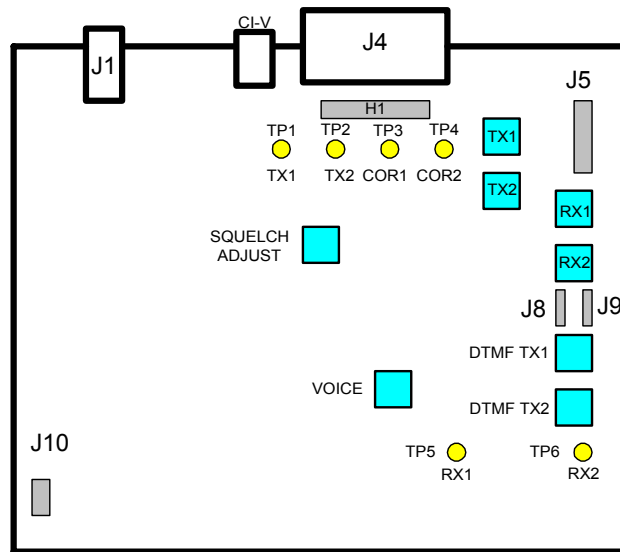


Key-up on the repeater's receiver input and send a DTMF tone.  Adjust the RX1 control R24 for 220mVAC at TP5.  Key-up and send the LINK enable command [5001]. Key-up on the repeater's receiver input and send a DTMF tone.  Adjust the TX1 control R11 for 220mVAC at TP1.  Adjust the TX2 control R12 for 220mVAC at TP2. Key-up on the LINK receiver input and send a DTMF tone.  Adjust RX2 control R37 for 220mVAC at TP6. Verify transmit audio at TP1 is 220mVAC.

Unlock the CAT700 by keying-up on the repeater's receiver input and entering [1234567].  Key-up and enter the [*901] REPEATER test tone programming command. Adjust DTMF TX1 control R55 for 90mVAC at TP1.  Key-up and enter the [*902] LINK test tone programming command.  Adjust DTMF TX2 control R56 for 90mVAC at TP2.

Once the RX1, RX2, DTMF TX1, and DTMF TX2 audios are balanced, key-up on the repeater's receiver input and send a DTMF tone.  Monitor the REPEATER transmitter. Adjust the TX1 Audio level control (R11) as required to set the repeater transmitter deviation to 3KHz or as desired. If the transmitter 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.

Key-up on the repeater's receiver input and send a DTMF tone.  Monitor the LINK transmitter.  Adjust the TX2 Audio level control (R12) as required to set the link transmitter deviation to 3KHz or as desired.  If the link transmitter audio input is very sensitive and you find the TX2 Audio level control is near minimum, set the jumper plug at J7 between pins 1 and 2.

Compare the receive and synthesized voice audio and adjust the voice Level (R48) as desired.  The synthesized voice should be slightly lower than the receive audio.  Adjust R55 for the repeater's desired CW ID and courtesy beep levels.

## Test Point TP1 - Transmitter Audio (TX1)
This test point displays the audio generated by the controller to modulate the REPEATER transmitter.

## Test Point TP2 - Transmitter Audio (TX2)
This test point displays the audio generated by the controller to modulate the LINK transmitter.

## Test Point TP3 - COR #1
This test point displays the COR logic level from the REPEATER receiver.

## Test Point TP4 - COR #2
This test point displays the COR logic level from the LINK receiver.

## Test Point TP5 - Receiver Audio (RX1)
This test point displays the audio received from the REPEATER receiver at the input of the DTMF decoder #1.

## Test Point TP6 - Receiver Audio (RX2)
This test point displays the audio received from the LINK receiver at the input of the DTMF decoder #2.

## Repeater Interface (J4)
Connector J4 provides an interface to the repeater and transceiver.

| REPEATER INTERFACE J4 (DB25-F) | | |
|---|---|---|
| 1. USER INPUT #1 | 10. PTT #1 | 19. USER OUTPUT #3 |
| 2. USER INPUT #2 | 11. TX AUDIO #1 | 20. USER OUTPUT #4 |
| 3. CTCSS #2 | 12. RX AUDIO #2 | 21. USER INPUT #3 |
| 4. CTCSS #1 | 13. RX AUDIO #1 | 22. USER INPUT #4 |
| 5. COR #2 | 14. USER OUTPUT #1 | 23. TX AUDIO #2 |
| 6. COR #1 | 15. USER OUTPUT #2 | 24. GROUND |
| 7. RBI-1 DATA | 16. +12VDC OUTPUT | 25. RBI-1 RESET |
| 8. RBI-1 CLOCK | 17. GROUND | |
| 9. PTT #2 | 18. GROUND | |

Figure 7-2

## Internal Interface Header H1

Header H1 provides an internal interface to all the signals on the J4 connector and the three RBS Control outputs. Extra ground pins are also provided.

| INTERNAL INTERFACE H1 | | |
|---|---|---|
| 1. USER INPUT #1 | 2. USER OUTPUT #1 | 3. USER INPUT #2 |
| 4. USER OUTPUT #2 | 5. CTCSS #2 | 6. +12VDC OUTPUT |
| 7. CTCSS #1 | 8. GROUND | 9. COR #2 |
| 10. GROUND | 11. COR #1 | 12. USER OUTPUT #3 |
| 13. RBI-1 DATA | 14. USER OUTPUT #4 | 15. RBI-1 CLOCK |
| 16. USER INPUT #3 | 17. PTT #2 | 18. USER INPUT #4 |
| 19. PTT #1 | 20. TX AUDIO #2 | 21. TX AUDIO #1 |
| 22. GROUND | 23. RX AUDIO #2 | 24. RBI-1 RESET |
| 25. RX AUDIO #1 | 26. GROUND | |

Figure 7-3

## Accessory Interface (J5)

Connector J5 provides the interface for the DVR-1000 Digital Voice Recorder.

| DVR INTERFACE   (J5) | |
|---|---|
| 1. +12VDC | 7. SERIAL CLOCK |
| 2. GROUND | 12. DVR PLAY AUDIO |
| 5. DVR BUSY | 14. DVR RECORD AUDIO |
| 6. SERIAL DATA | |

Figure 7-4

## Audio Delay Interface (J9) (J8)

This interface is used to connect a audio delay board. The CAT-700B is shipped from the factory with jumpers installed across J9 REPEATER and J8 LINK at pins 1 and 2. This jumper completes the receiver audio path. The audio delay board will eliminate the receiver squelch noise crash and the chirp of the first DTMF tone when muting is enabled.

| AUDIO DELAY INTERFACE (J9) (J8) | | | |
|---|---|---|---|
| 1. AUDIO INPUT | 2. AUDIO OUTPUT | 3. GROUND | 4. +12VDC |

Figure 7-5

## RS-232 Interface (J10)

This interface is used to connect a computer or an external modem to the CAT-700B controller. Programming is accomplished through this serial port. The serial port of the computer or terminal must be configured for 4800 baud, 8 bit, NO parity, 1 stop bit. Fabricate the computer interface cable as shown in Figure 7-7.

| RS-232 INTERFACE   (J10) | | | |
|---|---|---|---|
| 1.  +12VDC | 4.  RS232 OUT | 7.  USER OUT #4 | 10.  N/C |
| 2.  GROUND | 5.  RTS/CTS | 8.  N/C | |
| 3.  N/C | 6.  RS232 IN | 9.  N/C | |

Figure 7-6

## RS-232 Interface Cable

The CAT-700B controller's RS-232 port is available at header J10.  Included in the connector kit is a three-wire cable terminated with a header plug on one end.  Solder a "DB" connector of your choice per Figure 7-7A.
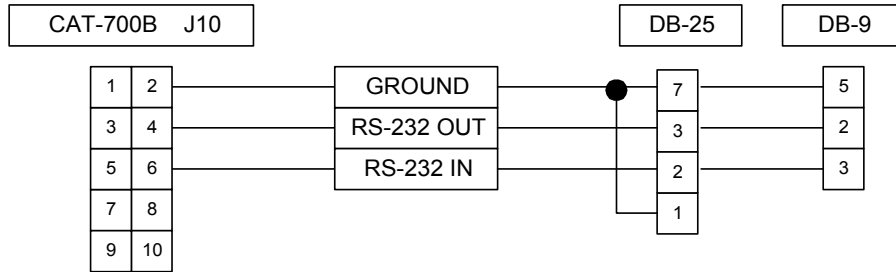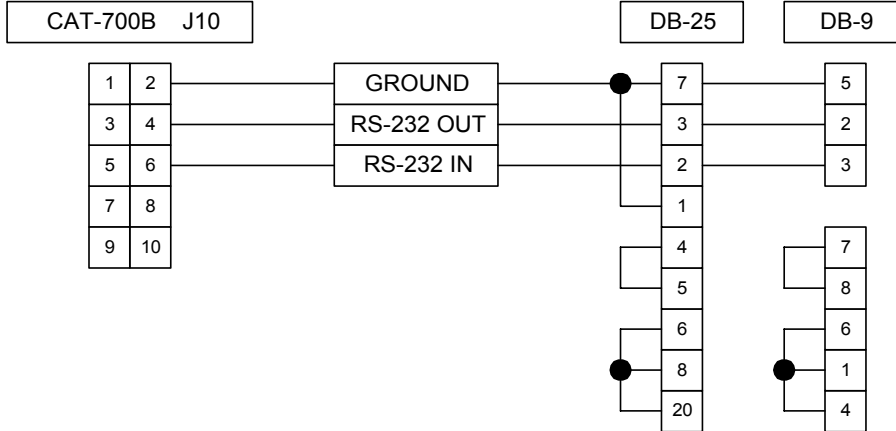


Figure 7-7A

If you intend to operate the CAT-700B with an external modem, some additional connection may be required.  Add the jumpers described in Figure 7-7B.  Some computers may require these jumpers for proper serial port operation.



RS-232 Interface Cable
Figure 7-7B

## IC-706 Transceiver Interface

This interface is used to connect the ICOM IC-706 transceiver to the CAT700B. The jumper at J11 must be set to the [HF] position.
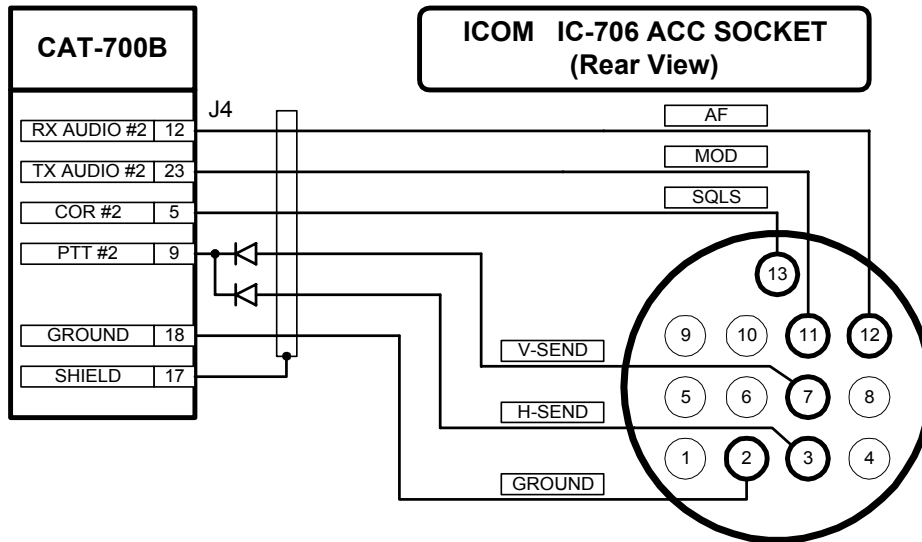


Figure 7-8

## IC-756 Transceiver Interface

This interface is used to connect the ICOM IC-756 transceiver to the CAT700B. The jumper at J11 must be set to the [HF] position.
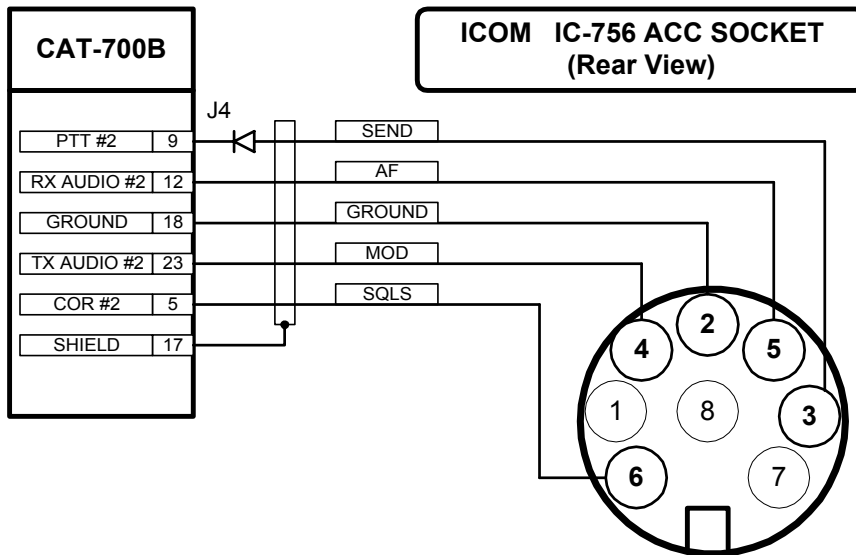


Figure 7-9

## HF Transceiver Installation

The CAT-700B uses a ferrite block filtered 25 pin "D" connector and a low pass filter on the DC power input.  It is important to keep the HF transmitter's RF energy out of the controller's audio circuitry.  Antenna placement, additional shielding, good grounding techniques and additional bypassing and filtering may be required for proper operation.

## CTCSS Decoder

Connect the TS-64 CTCSS Encoder/Decoder assembly to the CAT-700B as described in Figure 7-10.  The decoder must be connected to discriminator audio.  Speaker or volume control audio will have insufficient low frequency CTCSS tone content.

| | TS-64 |
|---|---|
| +12VDC ——— RED | [1]  +12VDC |
| 2200 OHM PULL-UP RESISTOR | |
| CAT-700 ( J4-4) ——— WHITE | [5]  RX AUDIO MUTE |
| TRNSMITTER PTT ——— GRAY | [2]  PTT OUTPUT |
| DISCRIMINATOR ——— GREEN | [4]  DISCRIMINATOR |
| TRANSMITTER EXCITER ——— YELLOW | [6]  CTCSS TONE OUT |
| GROUND ——— BLACK | [3]  GROUND |
| CAT-700 (J4-10) ——— ORANGE | [8]  PTT INPUT |
| GROUND ——— VIOLET | [9] HANG-UP |
| CAT-700 (J4-13) ——— BLUE | [2]  HIGH PASS OUT |
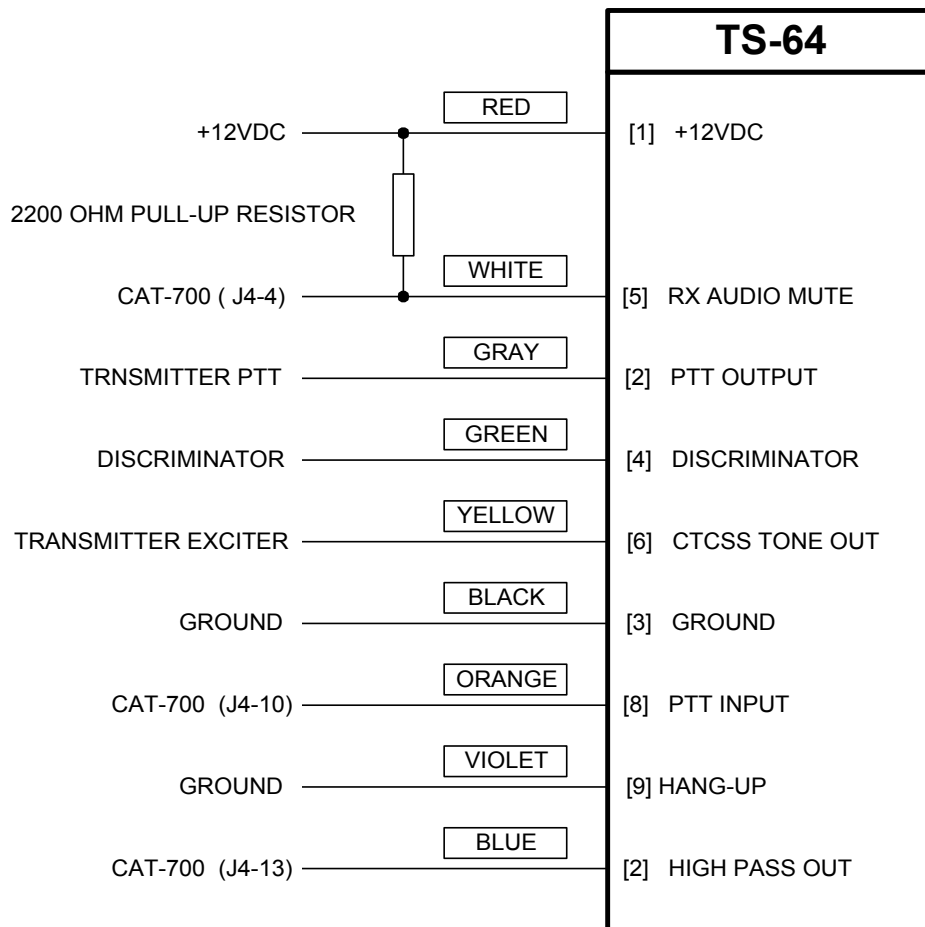
Figure 7-10

## P-700 Connector Kit

The connector kit contains a DB25 male connector with hood, a 2.5 mm DC power plug, two 2200ohm pull-up resistors, a three-wire cable terminated with a header plug for the RS-232 interface and two .0047uF capacitors.  If the CAT-700B is supplied with discriminator audio, install the .0047uF capacitor on the board at positions C19 and C21.

## Positive Current Transmitter PTT

The CAT-700B keys the transmitter by grounding the PTT line.  Some transmitters require a DC current usually from a 12volt DC supply to key.  In these cases a switching device must be installed between the transmitter and the CAT-700B Push-to Talk output at J4-10.  Figure 7-11 describes two possible circuits that will supply the transmitter.  Use caution when connecting this circuit.  Do not apply +12VDC directly to J4-10.  This will result in damage to U3.
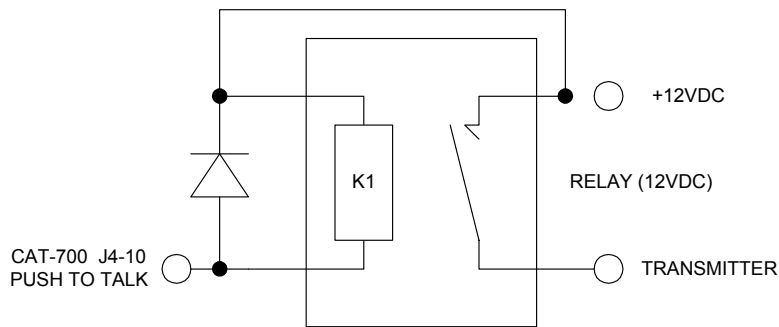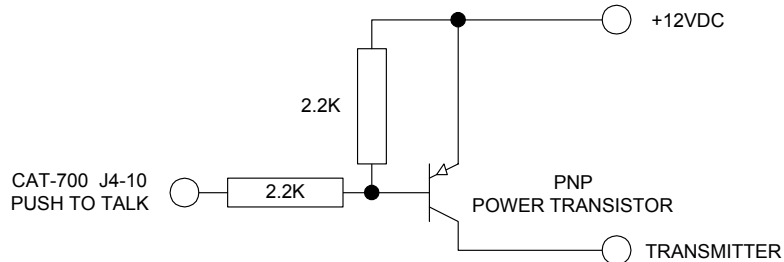
Figure 7-11

## Header Pin Assignments

Header connectors on the CAT-700B, DL-1000C, and DR-1000 use the same numbering system.  Looking at the board's solder side, one of the header pins is connected to a square solder pad.  This is always pin one.  One row of pins are assigned odd numbers while the other row are assigned even numbers.  See Figure 7-12.

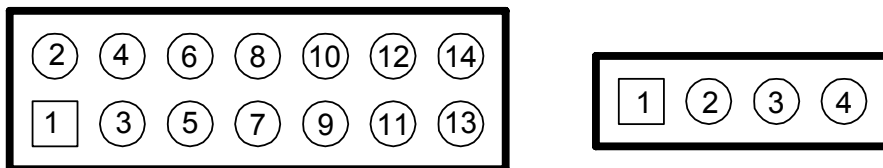# Component Side View Of Headers

Figure 7-12

# Chapter 8 - MF-1000 Serial Interface Card

The CAT-700B supports the MF-1000 Serial Interface Card.  Driven by a 24 bit serial word with supporting clock, data, and strobe signals, the MF-1000 card will convert the serial signal to a series of latched parallel outputs.

| OUTPUT | DESCRIPTION |
|--------|-------------|
| J1 | Expanded User Function Output Zone #8 Channel #8 |
| J2 | Expanded User Function Output Zone #8 Channel #7 |
| J3 | Expanded User Function Output Zone #8 Channel #6 |
| J4 | Expanded User Function Output Zone #8 Channel #5 |
| J5 | Expanded User Function Output Zone #8 Channel #4 |
| J6 | Expanded User Function Output Zone #8 Channel #3 |
| J7 | Expanded User Function Output Zone #8 Channel #2 |
| J8 | Expanded User Function Output Zone #8 Channel #1 |
| J9 | Expanded User Function Output Zone #7 Channel #8 |
| J10 | Expanded User Function Output Zone #7 Channel #7 |
| J11 | Expanded User Function Output Zone #7 Channel #6 |
| J12 | Expanded User Function Output Zone #7 Channel #5 |
| J13 | Expanded User Function Output Zone #7 Channel #4 |
| J14 | Expanded User Function Output Zone #7 Channel #3 |
| J15 | Expanded User Function Output Zone #7 Channel #2 |
| J16 | Expanded User Function Output Zone #7 Channel #1 |
| J17 | Expanded User Function Output Zone #6 Channel #8 |
| J18 | Expanded User Function Output Zone #6 Channel #7 |
| J19 | Expanded User Function Output Zone #6 Channel #6 |
| J20 | Expanded User Function Output Zone #6 Channel #5 |
| J21 | Expanded User Function Output Zone #6 Channel #4 |
| J22 | Expanded User Function Output Zone #6 Channel #3 |
| J23 | Expanded User Function Output Zone #6 Channel #2 |
| J24 | Expanded User Function Output Zone #6 Channel #1 |
| J25 | +5VDC |
| J26 | +12VDC |
| J27 | Ground |
| J28 | Ground |
| J29 | Ground |
| J30 | Ground |
| J31 | Ground |
| J32 | Ground |
| J33 | Ground |
| J34 | Ground |

MF-1000 Output Definitions
Table 8-1

The twenty-four outputs are open collector darlington relay drivers.  Each driver can sink up to 200ma and switch 40 VDC.  Place diodes across the relay coils to protect the driver from negative spikes produced when the relay coil collapses.

## Jumper Selection

Jumper JP1 sets the logic level of the twenty-four outputs.  With the jumper in position "C" all outputs are pulled up to +12VDC through 4700 ohm resistors.  In position "B" the outputs are pulled up to +5VDC.  In position "A" the outputs are pulled down to ground.  JP2 selects the serial strobe input.  This jumper should be between JP2 pins 1 and 2.

# Chapter 9 - DL-1000C Audio Delay Board

When placed in the receive audio path, the DL-1000C will eliminate the first chirp of DTMF tone during DTMF muting, and it will eliminate the squelch crash noise present on many repeater systems. A dipswitch selects delays of 50, 100, 200 or 400 milliseconds. The delayed audio is faithfully reproduced.

Installation is easy. Remove the jumper plug from the CAT-700B at J9. Replace the jumper with the cable from the DL-1000C. The remote base audio can be delayed at J8 with a second DL-1000C. (See figure 9-1).
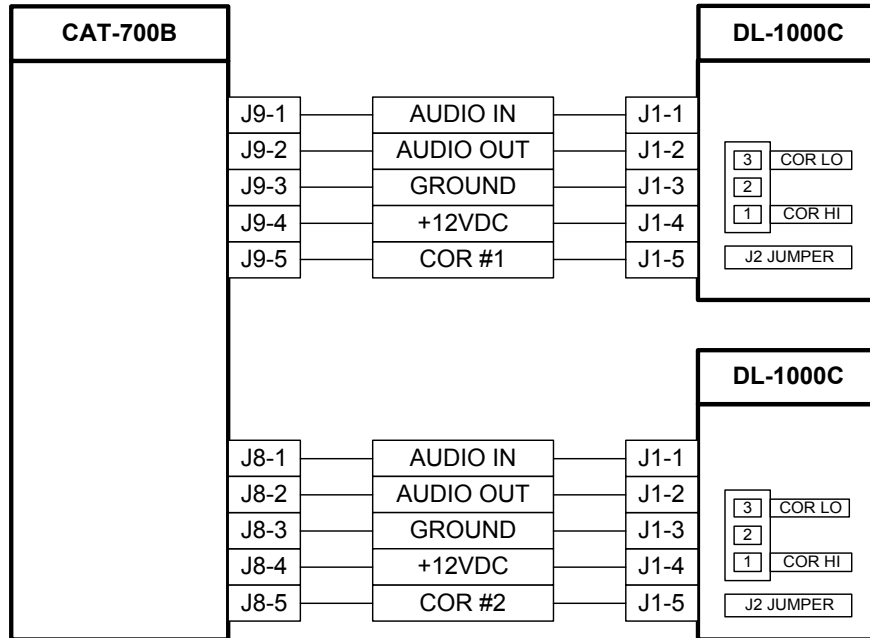
```
┌─────────────┐                                          ┌─────────────┐
│  CAT-700B   │                                          │  DL-1000C   │
├─────────────┤                                          ├─────────────┤
│             │   J9-1 ──┬── AUDIO IN  ──┬── J1-1         │             │
│             │   J9-2 ──┼── AUDIO OUT ──┼── J1-2         │  ┌3┐ COR LO │
│             │   J9-3 ──┼── GROUND    ──┼── J1-3         │  ┌2┐        │
│             │   J9-4 ──┼── +12VDC    ──┼── J1-4         │  ┌1┐ COR HI │
│             │   J9-5 ──┴── COR #1    ──┴── J1-5         │  J2 JUMPER  │
```

```
                                                          ┌─────────────┐
                                                          │  DL-1000C   │
                                                          ├─────────────┤
│             │   J8-1 ──┬── AUDIO IN  ──┬── J1-1         │             │
│             │   J8-2 ──┼── AUDIO OUT ──┼── J1-2         │  ┌3┐ COR LO │
│             │   J8-3 ──┼── GROUND    ──┼── J1-3         │  ┌2┐        │
│             │   J8-4 ──┼── +12VDC    ──┼── J1-4         │  ┌1┐ COR HI │
│             │   J8-5 ──┴── COR #2    ──┴── J1-5         │  J2 JUMPER  │
└─────────────┘                                          └─────────────┘
```

Figure 9-1

## Select Delay

The amount of audio delay is determined by the setting of dipswitch SW1. The typical repeater receiver has a squelch crash noise of Approximately 40 milliseconds. The 100 millisecond setting should be sufficient to eliminate the noise in most cases. If not, increase the delay to the next setting.

| MILLISECONDS | SW1 | SW2 | SW3 | SW4 |
|:---:|:---:|:---:|:---:|:---:|
| 0.0 | OFF | OFF | OFF | OFF |
| 50 | ON | OFF | OFF | OFF |
| 100 | ON | ON | OFF | OFF |
| 200 | ON | ON | ON | OFF |
| 400 | ON | ON | ON | ON |

Figure 9-2

The DL-1000C is inserted in the receive audio path before the controller's audio switch.  This audio switch is controlled by the COR logic signal.  Loss of COR will cause the audio switch to open, preventing the receive audio from reaching the transmitter.  The DL-1000C provides time for the switch to open before the squelch crash noise reaches the switch's input.

During DTMF muting, 40 milliseconds of the first tone will sneak through before the DTMF decoder can tell the microprocessor to open the audio switch. The DL-1000C provides the necessary delay to overcome this problem.

## Discriminator Switch

The DL-1000C can be used with discriminator audio.  A FET switch Q1 is included on the board.  If the repeater's COR logic is connected to the J1 header, the white noise hiss will be eliminated during key-up.  If the COR logic is active high set the J2 jumper between pins 1 and 2.  If the COR is active low set the J2 jumper between pins 2 and 3.

# Chapter 10 - Digital Voice Recorder

The DR-1000 provides true voice message announcements on your repeater system. Substitute DVR tracks for voice messages and courtesy tones. With four minutes of total record time, sixteen audio tracks provide sufficient message capacity. Eight expanded user function switches are also included.

Connect the cable to the CAT-700B at J5. See Figure 10-1 below. Apply power to the controller.

```
        CAT-700B                              DR-1000
                                                                        J3
                       J5              J1                          1  —UF SW1
              1   ──── +12 VDC ────  1                            3  —UF SW2
              2   ──── GROUND   ────  2                            5  —UF SW3
              6   ──── DATA     ────  6                            7  —UF SW4
              7   ──── CLOCK    ────  7                            8  —UF SW5
              5   ──── DVR BUSY ────  5                            6  —UF SW6
      (OUT)  14   ──── RECORD AUDIO ──  14  (IN)                   4  —UF SW7
      (IN)   12   ──── PLAY AUDIO ────  12  (OUT)                  2  —UF SW8
```
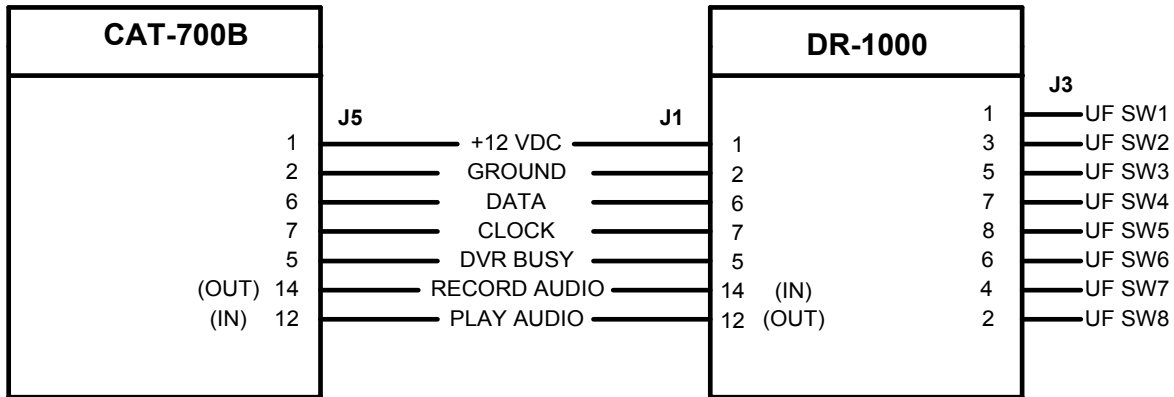
DR-1000 Interface
Figure 10-1

## Format Digital Voice Recorder Memory
When power is first applied, format the DR-1000 memory. Memory is protected during power failures. To format the DR-1000, press the Format switch SW1 located on the board.

## Signal Report Test
Key-up and send the DVR prefix code [725] followed by a [*]. Un-key and the voice will say: "START TEST NOW." Key-up and record a seven second message. Un-key and the test message will play back. You instantly know how your signal sounds through the repeater.

## Track length
The DR-1000 consists of sixteen tracks of fixed lengths. They are:

| Track #1 | 30 seconds | Track #9 | 10 Seconds |
|---|---|---|---|
| Track #2 | 30 seconds | Track #10 | 10 Seconds |
| Track #3 | 30 seconds | Track #11 | 6 Seconds |
| Track #4 | 30 seconds | Track #12 | 6 Seconds |
| Track #5 | 15 seconds | Track #13 | 6 Seconds |
| Track #6 | 15 seconds | Track #14 | 6 Seconds |
| Track #7 | 10 seconds | Track #15 | 6 Seconds |
| Track #8 | 10 seconds | Track #16 | 6 Seconds |

## Record DVR Tracks (01-16)

The CAT-700B must be in the programming mode to record DVR tracks.  Key-up and enter the seven digit unlock code.  Once unlocked, key-up and send [*95XX].  Un-key and the voice will say: "START MESSAGE".  Key-up and enter the message to be stored at track "XX".  Un-key and the voice will say: "CONTROL OK".  To review the message, key-up and send [*94XX].  Un-key and the CAT-700B will play the message stored at track "XX".  To erase a message, key-up and send [*96XX].  Un-key and the voice will say: "CONTROL OK".  Tracks can be recorded, played or erased in any order.  Total record time is four minutes.  Maximum track length is thirty seconds.  The DR-1000 cannot be used in a mailbox type application.  It can only be used for announcement type messages.

## Audio Level Adjustment

Set the RECORD level control R2 and the PLAYBACK level control R3 to mid-range.  This sets the audio path through the DVR at approximately unity gain. Use R2 and R3 to adjust the audio levels as desired.  Measure the TX1 audio level at TP1. Adjust R3 so the playback audio at TP1 is the same level as the audio of the original signal.

## Expanded User Function Switches

The eight expanded user function switches are open collector relay drivers.  Each driver can sink up to 100ma and switch 40 VDC.  Use Zone 6 Channels 1 through 8 to control the user function switches on the DR-1000 or the [550] default prefix code.  Place diodes across the relay coils to protect the driver from negative spikes produced when the relay coil collapses.

# Chapter 11 - Voice Vocabulary

## *CAT-700 Word Listing*

Zero............. 000
One.............. 001
Two.............. 002
Three............ 003
Four............. 004
Five............. 005
Six.............. 006
Seven............ 007
Eight............ 008
Nine............. 009
Ten.............. 010
Eleven........... 011
Twelve........... 012
Thirteen......... 013
Fourteen......... 014
Fifteen.......... 015
Sixteen.......... 016
Seventeen........ 017
Eighteen......... 018
Nineteen......... 019
Twenty........... 020
Thirty........... 030
Forty............ 040
Fifty............ 050
Sixty............ 060
Seventy.......... 070
Eighty........... 080
Ninety........... 090

### *A*
A................ 210
A.M.............. 211
Above............ 214
Adjust........... 217
Advise........... 218
Again............ 221
Alert............ 223
All.............. 224
Alpha............ 225
Amateur.......... 228
An............... 230
And.............. 231
April............ 233
Area............. 235
As............... 236
Assistance....... 237
At............... 239
Attempt.......... 240
Attention........ 241
August........... 242

### *B*
B................ 250
Back............. 251
Band............. 252

Base............. 253
Below............ 255
Bravo............ 257
By............... 260

### *C*
C................ 270
Call............. 272
Calling.......... 273
Cancel........... 274
Cat.............. 275
Caution.......... 276
Change........... 279
Charlie.......... 280
Check............ 281
Clear............ 283
Clock............ 284
Closed........... 285
Club............. 286
Code............. 287
Come............. 288
Complete......... 289
Completed........ 290
Condition........ 292
Connect.......... 294
Contact.......... 295
Control.......... 296

### *D*
D................ 310
Danger........... 311
Data............. 312
Date............. 313
Day.............. 314
Days............. 315
December......... 316
Decrease......... 317
Degree........... 318
Delay............ 319
Delta............ 320
Direction........ 322
Do............... 323
Down............. 324

### *E*
E................ 340
East............. 341
Echo............. 342
Ed (suffix)...... 343
Emergency........ 344
End.............. 345
Enter............ 346
Error............ 348
Exit............. 350

### *F*
F................ 370
Failure.......... 372
Fast............. 374
February......... 375
Feet............. 376
File............. 378
For.............. 004
Foxtrot.......... 386
Freezing......... 387
Frequency........ 388
Friday........... 389
From............. 390
Full............. 392

### *G*
G................ 410
Get.............. 412
Go............... 413
Golf............. 414
Good............. 415
Green............ 416

### *H*
H................ 440
Ham.............. 443
Hamfest.......... 444
Have............. 445
Hazardous........ 446
Hertz............ 449
High............. 450
Hotel............ 453
Hour............. 454
Hours............ 455
Hundred.......... 456

### *I*
I................ 470
Ice.............. 471
Icing............ 472
Identify......... 473
In............... 475
Increase......... 476
India............ 477
Information...... 478
Ing(suffix)...... 479
Inputs........... 480
Intruder......... 481
Is............... 482
It............... 483

### *J*
J................ 500
January.......... 501
Juliet........... 502
July............. 503

# Chapter 12 - Drawings

MF-1000 Serial Interface Board
Figure 12-2
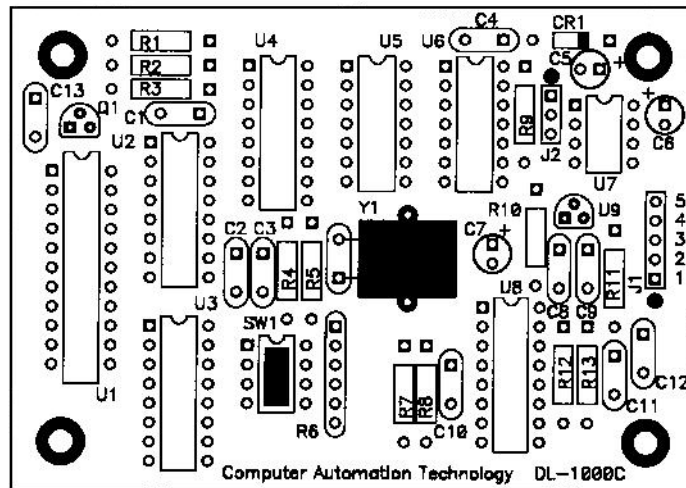
DL-1000C Audio Delay Board
Figure 12-3
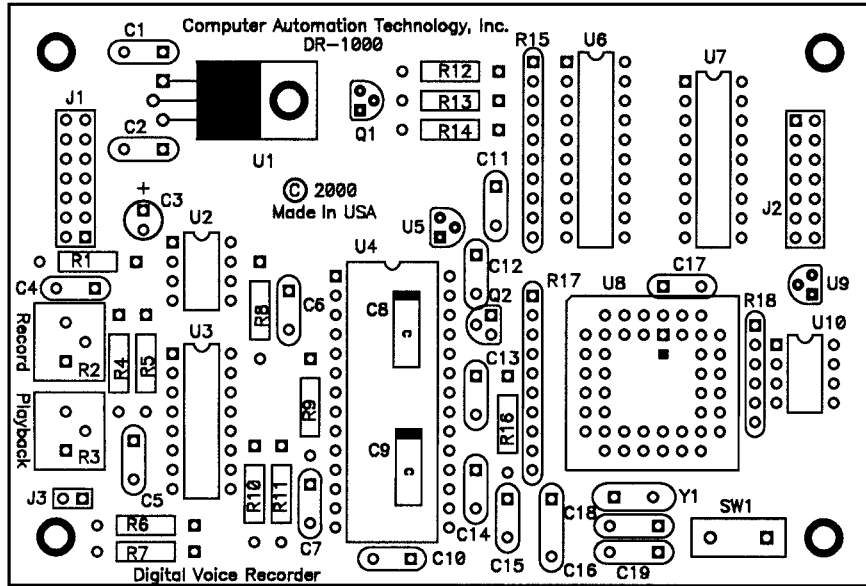
DR-1000 Digital Voice Recorder Board
Figure 12-4
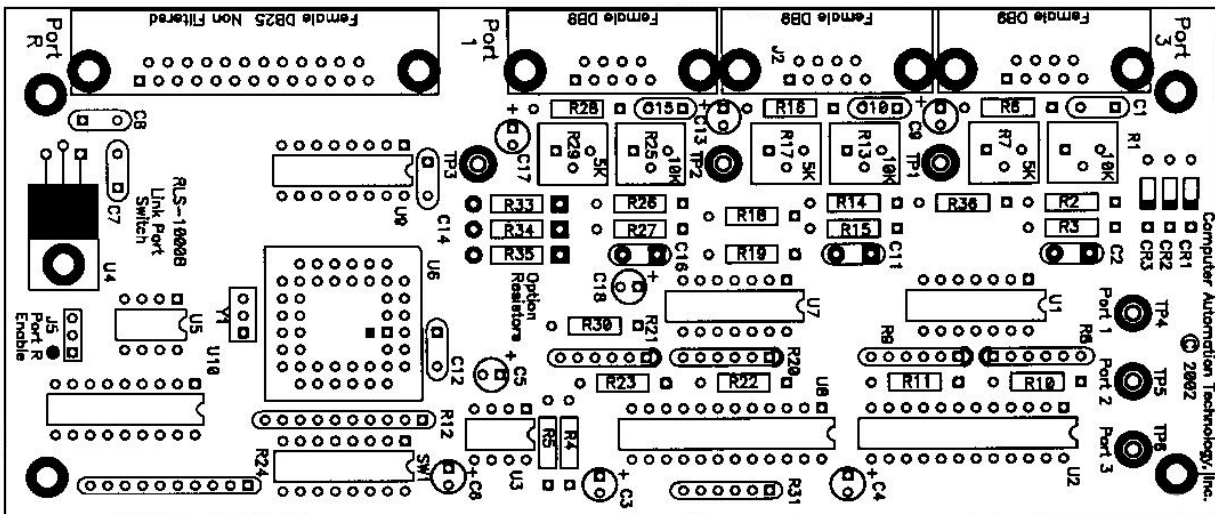


RLS-1000B Remote Link Switch
Figure 12-5

# Chapter 13 - Schematic

CAT-700B Repeater Controller

Size B

DocumentNumber 9000-012 Rev C

Date: Friday, April 19, 2002 Sheet 1 of 3

CAT-700B Repeater Controller

Size B  DocumentNumber 9000-012  Rev B

Date: Saturday, August 03, 2002  Sheet 2 of 3

CAT-700B Repeater Controller

DocumentNumber
9000-012

Size B

Date: Friday, April 19, 2002    Sheet    3    of    3

Rev C

J1

Zone 8 - Channel #8
Zone 8 - Channel #7
Zone 8 - Channel #6
Zone 8 - Channel #5
Zone 8 - Channel #4
Zone 8 - Channel #3
Zone 8 - Channel #2
Zone 8 - Channel #1
Zone 7 - Channel #8
Zone 7 - Channel #7
Zone 7 - Channel #6
Zone 7 - Channel #5
Zone 7 - Channel #4
Zone 7 - Channel #3
Zone 7 - Channel #2
Zone 7 - Channel #1
Zone 6 - Channel #8
Zone 6 - Channel #7
Zone 6 - Channel #6
Zone 6 - Channel #5
Zone 6 - Channel #4
Zone 6 - Channel #3
Zone 6 - Channel #2
Zone 6 - Channel #1
Ground

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.
15.
16.
17.
18.
19.
20.
21.
22.
23.
24.
27/34

R3 - 10K
R4 - 10K
R5 - 10K

Pull Up Resistor
Voltage
Selection

A
B
C
JP1

+5V
+12V

U2   O1 O2 O3 O4 O5 O6 O7 O8 Gnd   ULN2803
U4   O1 O2 O3 O4 O5 O6 O7 O8 Gnd   ULN2803
U6   O1 O2 O3 O4 O5 O6 O7 O8 Gnd   ULN2803

U1   SER QA QB QC QD QE QF QG QH QH'   SRCLK SRCLR RCLK G   74HC595
U3   SER QA QB QC QD QE QF QG QH QH'   SRCLK SRCLR RCLK G   74HC595
U5   SER QA QB QC QD QE QF QG QH QH'   SRCLK SRCLR RCLK G   74HC595

U2, U4, U6 Are Open Collector Output
30 Volt Maximum Voltage

+5V
R6  33K
C4  0.1uf

+12V
JP2
Strobe Select
1   2   3

C2  10uf

U7
LM340
V In  1
V Out  2
Gnd  3

+5V
C1  10uf

Note: CAT-700 requires
Strobe #1 selection
(JP2 1-2)

+5V
R7  330
R2  100
R1  100

Serial Data      6
Serial Clock     7
Latch #1        10
Latch #2         4
Ground           2
+12 Volts        1

DL-1000C Audio Delay Module

Title: DL-1000C Audio Delay Module
Document Number: 9000-023
Size B  Rev A
Date: Tuesday, December 17, 2002
Sheet 1 of 1

J1
Audio Input — 1
Audio Output — 2
Ground — 3
+12V In — 4
Audio Gate — 5

J2
1 - 2 Gate Voltage High
2 - 3 Gate Voltage Low

| Milliseconds Delay | A11 | A12 | A13 | A14 |
| --- | --- | --- | --- | --- |
| 50 ms Delay | ON | OFF | OFF | OFF |
| 100 ms Delay | ON | ON | OFF | OFF |
| 200 ms Delay | ON | ON | ON | OFF |
| 400 ms Delay | ON | ON | ON | ON |

Components:

R1 10K, R2 47K, C13 .001, R3 10K, Q1 VN10KM, CR1 1N4148, +5V

U6A 74HC02, U6B 74HC02, U6C 74HC02, U6D 74HC02

U1 CYC187 — WR, D, Q, CE, A0–A15

R6 10K, SW1 SW DIP-4

U2A 74HCT4020, U2B 74HCT4020, U3A 74HCT4020, U3B 74HCT4020 — CLK, EN, RST, Q0, Q1, Q2, Q3

U8 TP3054 — Vdd, TxOut, TX(-), RXO, TX(+), GND, Vbb, TDATA, RDATA, TSX, FSR, FST, BCLKT, MCLKT, MCLKR, BCLKR

U7 ICL7660CPA — LV, OSC, V+, GND, CAP+, CAP-, VOUT

U9 MC78L05ACTO — VIN, GND, VOUT

U5A 74HC73, U5B 74HC73 — J, CLK, K, Q

U4 74HC4060 — PO, PI, Q8, Q4, RST

Y1 2.0MHz, C2 18pf, C3 18pf, R5 10M, R4 330

C5 10uf, C6 10uf, C7 10uf, R10 100, R9 4.7K, R8 330, R7 330
R12 47K, R13 22K, C12 .1uf, C11 .1uf, R11 10K, C8 .1uf, C9 .1uf

DR-1000  Digital Voice Recorder

Computer Automation Technology, Inc.
Ft Lauderdale, Florida

DocumentNumber
9000-021

Size B    Rev B
Date: Monday, December 08,2003    Sheet 1 of 1

Port 3

J1
1: COR Input
2: CTCSS In
3: PTT Output
6: Output #3
7: Ground
8: Ground
9: +12 Volts

Port 2

J2
1: COR Input
2: CTCSS In
3: PTT Output
6: Output #2
7: Ground
8: Ground
9: +12 Volts

Port 1

J3
1: COR Input
2: CTCSS In
3: PTT Output
6: Output #1
7: Ground
8: Ground
9: +12 Volts

CTCSS Out

CR1 1N4148
CR2 1N4148
CR3 1N4148
R36 10K

U2 MAX335 Audio Switch
Octal Audio Switch
-5V  +5V

U8 MAX335 Audio Switch
Octal Audio Switch
-5V  +5V

Data In
Clock
Enable
-Reset

Y1 12 MHz Resonator
+5 Volt
R12 4.7K

U6 AT89C51/LCC
P1.0 P1.1 P1.2 P1.3 P1.4 P1.5 P1.6 P1.7
P3.0 P3.1 P3.2 P3.3 P3.4 P3.5 P3.6 P3.7
XTAL1 XTAL2
P0.0 P0.1 P0.2 P0.3 P0.4 P0.5 P0.6 P0.7
P2.0 P2.1 P2.2 P2.3 P2.4 P2.5 P2.6 P2.7
ALE
RST
EA
+5V

SW1 SW DIP-8
R12

U10 ULN2804

U5 DS1232
RST RST
TD PBL
ST
+5 Volt

U9 TPIC6C595
S In
SRCK
RCK
CLR
S Out
D0 D1 D2 D3 D4 D5 D6 D7
G
100-mA Current Limit Capability for each output.

Port 1 COR Polarity
Port 2 COR Polarity
Port 3 COR Polarity
Port 1 - Xcvr / Rpt
Port 2 - Xcvr / Rpt
Port 3 - Xcvr / Rpt
Port 3 Priority Enable
CAT-300 Mode Enable

Option Pull Up Resistors
+12 Volt
R33 R34 R35

Port 1 COR
Port 2 COR
Port 3 COR

Port R Force On
J5

Port 1 PTT
Port 2 PTT
Port 3 PTT

U3 ICL7660CPA
LV OSC CAP+ CAP- V+ GND VOUT
C5 10uf
C6 10uf
-5V

+5V
C8 .1uf

U4 LM340T-5.0
IN  OUT  GND
+5V

C7 .1uf
+12 Volt

J4
22 CTCSS Out
18 Repeater PTT
Control Lines
16 Port 1
15 Port 2
14 Port 3
12 Port R
17 Repeater COR
R24 4.7K
+12 Volt
21 Output #1
20 Output #2
19 Output #3
2 +12 Volts In
1, 10, 23, 24, 25 Ground

Port R

Computer Automation Technology, Inc.
Fort Lauderdale, Florida
Title RLS-1000 Port Switch
Size B
Document Number 9000-013
Rev A
Date:
Sheet 1 of 2

Computer Automation Technology, Inc.

Fort Lauderdale, Florida

Title: RLS-1000 Port Switch

Document Number 9000-013

Size B

Rev A

Sheet 2 of 2

Audio Switches U2,U8 MAX335

Port 3

J1
TX Audio
RX Audio
TP1
R6 620
C9 10uf
C1 .1uf
R1 10K
R2 10K
R7 5K
C2
R3 33K
U1A 1 2 3
R10 10K
U1D 14 13 12
R8 10K
TP6
U2H H 19 20 Out In
U2A A 5 6 Out In
R8 10K
R8 10K R8 10K R8 10K
U2G G 17 18 In Out
U2F F 15 16 In Out
U2E E 13 14 In Out

Port 2

J2
TX Audio
RX Audio
TP2
R16 620
C13 10uf
C10 .1uf
R13 10K
R14 10K
R17 5K
C11
R15 33K
U1B 7 6 5
R11 10K
U1C 8 9 10
R9 10K
TP5
U8H P 19 20 Out In
U8A I 5 6 Out In
R9 10K
R9 10K R9 10K R9 10K
U2D D 11 12 In Out
U2C C 9 10 In Out
U2B B 7 8 In Out

Port 1

J3
TX Audio
RX Audio
TP3
R28 620
C17 10uf
C15 .1uf
R25 10K
R26 10K
R29 5K
C16
R27 33K
U7B 7 6 5
R22 10K
U7D 14 13 12
R20 10K
TP4
U8G O 17 18 Out In
U8F N 15 16 Out In
R20 10K
R20 10K R20 10K R20 10K
U8D L 11 12 In Out
U8C K 9 10 In Out
U8B J 7 8 In Out

Internal Audio Mix Bus
R 3 2 1

R19 33K
U7A 1 2 3
R18 10K
R31 680

R21 10K R21 10K R21 10K
R21 10K
LM348 U7C 9 10 8
R23 33K
U8E M 13 14 Out In
R31 680

R31 680
R31 680
R31 680

Port R

J4
11 TX Audio
13 RX Audio
R30 620
C18 10uf

Filtered +5V
C3 10uf
Filtered -5V
C4 10uf

+5V
R4 100
-5V
R5 100

# Chapter 14 - Part List

## CAT-700B Controller Board

| | | | |
|---|---|---|---|
| 1 | Capacitor | .001uF 50V | C24 |
| 4 | Capacitor | .0015uF 50V | C12,C13,C18,C20 |
| 3 | Capacitor | .015uF 50V | C25,C48,C49 |
| 21 | Capacitor | 0.1uF 50V | C1,C6,C7,C8,C9,C16,C17, C30,C31,C34,C35,C36,C37,C38 C41,C42,C43,C44,C45,C46,C47 |
| 2 | Capacitor | (Not Used) | C19,C21 |
| 1 | Capacitor | 470pF 50V | C11 |
| 12 | Capacitor | 10uF 16V | C3,C4,C5,C10,C14,C15 C22,C23,C26,C27,C28,C29 |
| 1 | Capacitor | 470uF 25V | C2 |
| 4 | Capacitor | 33pF 50V | C32,C33,C39,C40 |
| 1 | Connector | 25D (F) | J4 |
| 1 | Connector | 3.5mm Phone Jack | J12 |
| 1 | Connector | (DC Power) | J1 |
| 1 | Connector | Header 1X2 | J2 |
| 2 | Connector | Header 1X3 | J3,J7,J11 |
| 2 | Connector | Header 1x5 | J8,J9 |
| 1 | Connector | Header 2X5 | J10 |
| 1 | Connector | Header 2x7 | J5 |
| 1 | Connector | Header 2X13 | H1 |
| 1 | Crystal | 12.0 MHz | Y1 |
| 1 | Crystal | 3.27 MHz | Y2 |
| 1 | Crystal | 3.58 MHz | Y3 |
| 1 | Diode | Transorb | CR1 |
| 4 | Diode | 1N4148 | CR2,CR3,CR4,CR6 |
| 1 | Fuse | 0.5AMP | F1 |
| 1 | Filter RF | | FL1 |
| 1 | I.C. | N80C251SB16 | U16 |
| 1 | I.C. | 27C512 | U19 |
| 1 | I.C. | 74HCT573 | U18 |
| 2 | I.C. | 74HCT540 | U6,U7 |
| 1 | I.C. | ATF750CL | U9 |
| 1 | I.C. | DS1643Y | U20 |
| 1 | I.C. | DS1232 | U17 |
| 1 | I.C. | TC232CPE | U15 |
| 1 | I.C. | TPIC6259 | U3 |
| 1 | I.C. | ICL7660 | U2 |
| 1 | I.C. | LM348 | U5 |

```
 1  I.C.          LM1458              U13
 1  I.C.          TL084CN             U4
 1  I.C.          ULN2804A            U8
 2  I.C.          MT8888C             U22,U23
 1  I.C.          MAX335              U14
 1  I.C.          TSP53C30AN2L        U21
 1  I.C.          LM340T-5.0          U1
 5  Jumper Plug                       P3,P6,P7,P8,P9
 3  Resistor      100  5% 1/4W        R10,R40,R41
 3  Resistor      620  5% 1/4W        R4,R5,R29
 4  Resistor      1K   5% 1/4W        R17,R25,R26,R27
 1  Resistor      2.2K 5% 1/4W        R30
15  Resistor      10K  5% 1/4W        R6,R7,R8,R23,R33,R36,R44
                                      R45,R46,R47,R53,R54,R57,R60,R64
 2  Resistor      18K  5% 1/4W        R49,R50
 3  Resistor      22K  5% 1/4W        R15,R18,R32
 3  Resistor      22K  5% 1/4W        R15,R18,R32
 2  Resistor      33K  5% 1/4W        R22,R35
 2  Resistor      33K  5% 1/4W        R22,R35
 7  Resistor      47K  5% 1/4W        R13,R14,R16,R21,R34,R42,R43
 5  Resistor      100K 5% 1/4W        R19,R58,R59,R62,R63
 2  Resistor      220K 5% 1/4W        R20,R31
 2  Resistor      560K 5% 1/4W        R61,R65
 2  Resistor      5K    Variable      R11,R12
 6  Resistor      10K   Variable      R24,R28,R37,R48,R55,R56
 4  Resistor      10K   10pin         R38,R39,R51,R52
 2  Resistor      (Not Used)          R1,R2
 1  Switch        Dip-8 Pole          SW1
 6  Test Points                       TP1,TP2,TP3,TP4,TP5,TP6
```

## MF-1000 Multi Function Board

```
 2  Resistor      100 5% 1/4W         R1,R2
 3  Resistor      4.7K 10 pin         R3,R4,R5
 1  Resistor      33K 5% 1/4W         R6
 1  Resistor      330 5% 1/4W         R7
 2  Capacitor     10uF 15V            C1,C2
 1  Capacitor     0.1uF 50V           C4
 3  I.C.          74HC595             U1,U3,U5
 3  I.C.          ULN2803A            U2,U4,U6
 1  I.C.          7805                U7
 1  Header        2X17                J1
```

| 1 | Header | 2x7 | J2 |
| 1 | Header | 2X3 | JP1 |
| 1 | Header | 1X3 | JP2 |
| 2 | Jumper | | |
| 1 | Cable | Ribbon 2X7 | |

## DL-1000C Audio Delay Board

| 7 | Capacitor | 0.1uF 50V | C1,C4,C8,C9,C10,C11,C12 |
| 3 | Capacitor | 10uF 16V | C5,C6,C7 |
| 2 | Capacitor | 18pF 50V | C2,C3 |
| 1 | Capacitor | .001uF 50V | C13 |
| 1 | Crystal | 2.048Mhz | Y1 |
| 1 | Diode | 1N4148 | CR1 |
| 1 | Header | 1X3 | J2 |
| 1 | Header | 1X4 | J1 |
| 1 | I.C. | 74HC73 | U5 |
| 1 | I.C. | 74HC02 | U6 |
| 2 | I.C. | 74HC4520 | U2,U3 |
| 1 | I.C. | CY7C187 | U1 |
| 1 | I.C. | MC7805AC | U9 |
| 1 | I.C. | 74HC4060 | U4 |
| 1 | I.C. | TP3054 | U8 |
| 1 | I.C. | 7660CPA | U7 |
| 3 | Resistor | 10K  5% 1/4W | R1,R3,R11 |
| 1 | Resistor | 4.7K 5% 1/4W | R9 |
| 1 | Resistor | 22K  5% 1/4W | R13 |
| 1 | Resistor | 100  5% 1/4W | R10 |
| 2 | Resistor | 47K  5% 1/4W | R2,R12 |
| 3 | Resistor | 330  5% 1/4W | R4,R7,R8 |
| 1 | Resistor | 10MEG 5% 1/4W | R5 |
| 1 | Resistor | 10K 6pin Network | R6 |
| 1 | Switch | Dip 4 Pole | SW1 |
| 1 | Transistor | VN10KM | Q1 |

## RLS-1000B Remote Link Switch

| | | | |
|---|---|---|---|
| 8 | Capacitor | 10uF 16V | C3,C4,C5,C6,C9,C13,C17,C18 |
| 7 | Capacitor | 0.1uF 50V | C1,C7,C8,C10,C12,C14,C15 |
| 3 | Capacitor | .0047uF 50V | C2,C11,C16 (Select Part) |
| 3 | Connector | DB-9F | J1,J2,J3 |
| 1 | Connector | DB-25F | J4 |
| 1 | Crystal | 12MHz | Y1 |
| 3 | Diode | 1N4148 | CR1,CR2,CR3 |
| 1 | Header | 1X3 | J5 |
| 1 | I.C. | LM340T-5 | U4 |
| 1 | I.C. | ICL7660 | U3 |
| 1 | I.C. | AT89C5124JC | U6 |
| 1 | I.C. | TD62084AP | U10 |
| 1 | I.C. | TPIC6C595 | U9 |
| 1 | I.C. | DS1232 | U5 |
| 2 | I.C. | LM348 | U1,U7 |
| 2 | I.C. | MAX335CNG | U2,U8 |
| 1 | Jumper | | JP1 |
| 3 | Resistor | 10K Variable | R1,R13,R25 |
| 3 | Resistor | 5K Variable | R7,R17,R29 |
| 1 | Resistor | 10K 10Pin SIP | R12 |
| 4 | Resistor | 10K  6Pin SIP | R8,R9,R20,R21 |
| 1 | Resistor | 4.7K 10Pin SIP | R24 |
| 1 | Resistor | 680  6Pin SIP | R31 |
| 2 | Resistor | 100 .25W | R4,R5 |
| 4 | Resistor | 620 .25W | R6,R16,R28,R30 |
| 3 | Resistor | 2200 .25W | R33,R34,R35 (Select Part) |
| 9 | Resistor | 10K .25W | R2,R10,R11,R14,R18,R22,R23,R26,R36 |
| 4 | Resistor | 33K .25W | R3,R15,R19,R27 |
| 1 | Switch | Dip 8 Position | SW1 |
| 6 | Test Point | | TP1,TP2,TP3,TP4,TP5,TP6 |

# Chapter 15 - Remote Base Interface

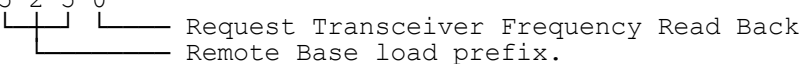## Remote Base Transceiver With RBI-1 Interface

In this mode the CAT-700B supports the Doug Hall RBI-1 Interface. The RBI-1 receives serial data and clock information from the CAT-700B and converts it to the format required to control the Kenwood transceivers. All connections to the transceivers are made through the microphone jack. In addition to band, frequency, offset and transmitter power, CTCSS tones can be selected remotely. By using the RBI-1 "GENERIC FORMAT" future enhancements will include squelch adjustments and audio level control. The RBI-1 supports the following Kenwood Transceivers:

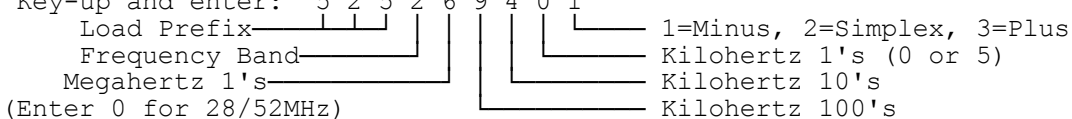| 140 MHz | 220 MHz | 440 MHz | 1200 MHz | DUAL BAND |
|---------|---------|---------|----------|---------------|
| TM-221  | TM-321  | TM-421  | TM-521   | TM-621   TM-731 |
| TM-231  | TM-331  | TM-431  | TM-531   | TM-631   TM-701 |
| TM-241  |         | TM-441  | TM-541   | TM-721          |

Figure 15-1

## Read Remote Base Frequency

To read the transceiver frequency, key-up and enter the Remote Base Frequency Load prefix number followed by a 0. Un-key and the voice will read back the current frequency including the offset. Example: With a prefix number of 525, read the transceiver frequency.

```
Key-up and enter:   5 2 5 0
                    └─┘ └──── Request Transceiver Frequency Read Back
                     └─────── Remote Base load prefix.
```

## Load Remote Base Frequency

To load a transceiver frequency, key-up and enter the Remote Base Frequency Load prefix, followed by the band, frequency, and offset. Example: With a prefix of 525, load 146.940 MHz, minus offset. The voice will say: "FREQUENCY-ONE-FORTY-SIX-POINT-NINE-FOUR-ZERO-MINUS."

```
Key-up and enter:   5 2 5 2 6 9 4 0 1
        Load Prefix─────┘ │ │     │ │ └── 1=Minus, 2=Simplex, 3=Plus
     Frequency Band───────┘ │     │ └──── Kilohertz 1's (0 or 5)
       Megahertz 1's────────┘     └────── Kilohertz 10's
   (Enter 0 for 28/52MHz)───────────────── Kilohertz 100's
```

To suppress the voice read-back add a [#] at the end of the entry.

| Frequency Band Selection Table   (RBI-1 V3.0 Software) | | | | |
|---|---|---|---|---|
| Band 0   430  | Band 3   220  | Band 6   1280 | Band 9   1240 | Band C   52  |
| Band 1   1250 | Band 4   440  | Band 7   1290 | Band A   420  | Band *   28  |
| Band 2   140  | Band 5   1270 | Band 8   1260 | Band B   900  | Band #   130 |

Figure 15-2

During a frequency load, the CAT-700B will automatically send the commands to turn on DC power, set transmitter power to low and disable the CTCSS encoder and decoder. If a frequency load includes a change in band, the CAT-700B will send the DC power off command before loading the frequency and turning on the new band unit.

## Select Transceiver Memory

To select a transceiver memory, key-up and enter the Remote Base Frequency Load prefix, followed by a [*] and the memory number. Example: With a prefix of 525, select memory 5. The voice will say: "M5"

```
    Key-up and enter:  5 2 5 * 0 5
        Load Prefix ————┘ └┘    └─┘— Memory location
```

## Load Transceiver Frequency From CAT-700B Memory

To load a transceiver frequency from one of the CAT-700B forty memory locations, key-up and enter the Remote Base Frequency Load prefix, followed by the memory table position. Example: With a prefix of 525, load contents of memory 22. The voice will say: "FREQUENCY LOAD 22."

```
    Key-up and enter:  5 2 5   2 2
        Load Prefix ————┘ └┘   └─┘— Memory location
```

## Read CTCSS Frequency

To read a CTCSS frequency, key-up and enter the prefix, followed by [5].

## Load CTCSS Frequency

To load a CTCSS frequency, key-up and enter the Remote Base Frequency Load prefix, followed by a [5] and the two digit number that represents the CTCSS tone frequency from the table at Figure 15-3. Example: With a prefix of 525, load 151.4 Hz tone. The voice will say: "CTCSS-TWENTY-FOUR-ON-OFF."

```
    Key-up and enter:  5 2 5 5 2 4
                     ——┘ └┘ │ └─┘——————— CTCSS Tone From Table
        Load Prefix ————————┘ └──————————— CTCSS Tone Load Command
```

| 01 = 67.0 | 08 = 88.5 | 15 = 110.9 | 22 = 141.3 | 29 = 179.9 | 36 = 233.6 |
|-----------|-----------|------------|------------|------------|------------|
| 02 = 71.9 | 09 = 91.5 | 16 = 114.8 | 23 = 146.2 | 30 = 186.2 | 37 = 241.5 |
| 03 = 74.4 | 10 = 94.8 | 17 = 118.8 | 24 = 151.4 | 31 = 192.5 | 38 = 250.3 |
| 04 = 77.0 | 11 = 97.4 | 18 = 123.0 | 25 = 156.7 | 32 = 203.5 |            |
| 05 = 79.7 | 12 = 100.0 | 19 = 127.3 | 26 = 162.2 | 33 = 210.7 |            |
| 06 = 82.5 | 13 = 103.5 | 20 = 131.8 | 27 = 167.9 | 34 = 216.1 |            |
| 07 = 85.4 | 14 = 107.2 | 21 = 136.5 | 28 = 173.8 | 35 = 225.7 |            |

Figure 15-3

During a CTCSS load, the CAT-700B will automatically send the commands to turn on the CTCSS Encoder. If the CTCSS Decoder is desired, it must be manually enabled.

```
    Key-up and enter:  5 2 5 5 3
        Load Prefix ————┘ └┘ └─┘——————— CTCSS Decoder ON
```

## Set CTCSS Encoder - Decoder

To set the CTCSS Encoder to on, key-up and enter the Remote Base Frequency Load prefix, followed by the two-digit number that represents CTCSS Encoder ON from Figure 15-4.  The voice will say: "CTCSS-ON."

```
Key-up and enter:   5 2 5 5 1
      Load Prefix ──┘ └┘ └┴── CTCSS Encoder ON
```

| CTCSS Control | | | |
|---|---|---|---|
| 50   Encoder OFF | 51   Encoder ON | 52   Decoder OFF | 53   Decoder ON |

Figure 15-4

## Read Remote Base RF Power

To check the setting of the Remote Base RF power, key-up and enter the Remote Base Frequency Load prefix, followed by [6].

## Set Remote Base RF Power

To set the RF power, key-up and enter the Remote Base Frequency Load prefix, followed by the two-digit number that represents the desired power setting from Figure 15-5. Example:  With a prefix of 525, set RF power to high.  The voice will say: "RF-POWER-HIGH."

```
Key-up and enter:   5 2 5 6 3
      Load Prefix ──┘ └┘ └┴── RF Power Level 3 (High)
```

| Remote Base RF Power Control | | |
|---|---|---|
| 61   Level 1 (Low) | 62   Level 2 (Medium) | 63   Level 3 (High) |

Figure 15-5

## Read Remote Base DC Power

To check the setting of the Remote Base DC power, key-up and enter the Remote Base Load prefix, followed by [8].

## Set Remote Base DC Power

To set the remote base DC power, key-up and enter the Remote Base Frequency Load prefix, followed by the two-digit number that represents the DC power command. Example:  With a prefix of 525, turn off the DC power.  The voice will say: "DC POWER OFF."
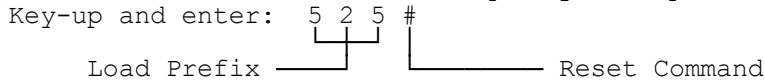
```
Key-up and enter:   5 2 5 8 0
      Load Prefix ──┘ └┘ └┴── DC Power Off
```

| Remote Base DC Power Control | |
|---|---|
| 80   DC Power OFF | 81   DC Power ON |

Figure 15-6

## Reset the RBI-1 Interface

To reset the RBI-1 by remote control, (push the reset switch on the back of the RBI-1), key-up and enter the Remote Base Frequency Load prefix, followed by the [#].

```
        Key-up and enter:   5 2 5 #
                            └─┴─┘   │
        Load Prefix ─────────┘      └────────── Reset Command
```

## CAT-700B - RBI-1 Interface

Fabricate a cable between J4 on the CAT-700B and J2 on the RBI-1 Remote Base Interface.  Follow the wiring described in Figure 15-7.  Provide +12VDC and GROUND to the PHONO jack on the rear of the RBI-1 interface.  Connect the Kenwood interface cables between the RBI-1 and the various MIC connectors on the Kenwood transceivers. Consult the RBI-1 Manual to determine if all the control features are available on a particular transceiver.
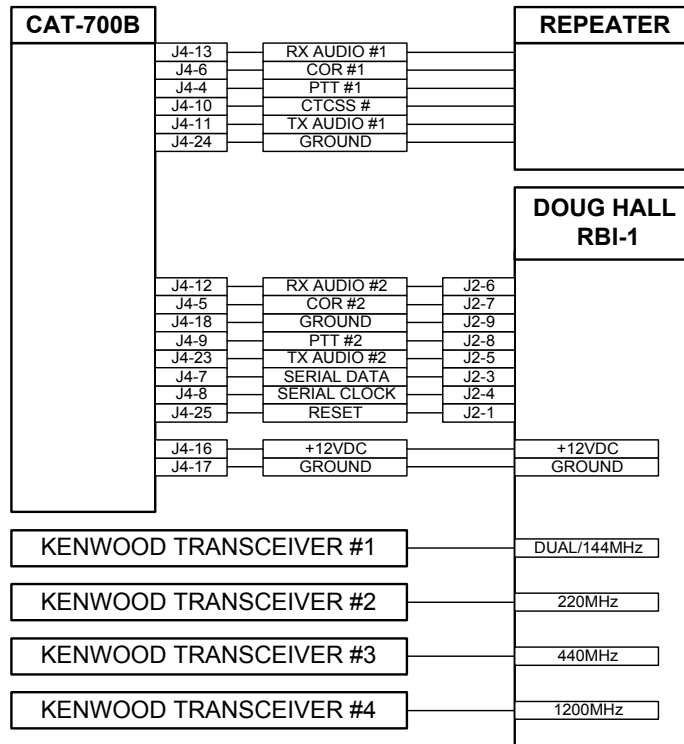
**CAT-700B**

| J4-13 | RX AUDIO #1 |
| J4-6 | COR #1 |
| J4-4 | PTT #1 |
| J4-10 | CTCSS # |
| J4-11 | TX AUDIO #1 |
| J4-24 | GROUND |

**REPEATER**

**DOUG HALL RBI-1**

| J4-12 | RX AUDIO #2 | J2-6 |
| J4-5 | COR #2 | J2-7 |
| J4-18 | GROUND | J2-9 |
| J4-9 | PTT #2 | J2-8 |
| J4-23 | TX AUDIO #2 | J2-5 |
| J4-7 | SERIAL DATA | J2-3 |
| J4-8 | SERIAL CLOCK | J2-4 |
| J4-25 | RESET | J2-1 |

| J4-16 | +12VDC | +12VDC |
| J4-17 | GROUND | GROUND |

| KENWOOD TRANSCEIVER #1 | DUAL/144MHz |
| KENWOOD TRANSCEIVER #2 | 220MHz |
| KENWOOD TRANSCEIVER #3 | 440MHz |
| KENWOOD TRANSCEIVER #4 | 1200MHz |

Figure 15-7

## Link Audio Frequency Response

If the transmit audio out of the Kenwood remote base is muffled or has little or no high frequency response, remove capacitor C17 or both C17 and C16 on the RBI-1 Interface board.

For more information concerning the RBI-1 Interface contact:

Doug Hall Electronics
815 E. Hudson Street
Columbus, Ohio 43211
    (614) 261-8871

# Chapter 16 – ICOM IC-706 Transceiver Interface

The CAT-700B offers a bi-directional serial port to control the IC-706 transceiver. Upon receipt of a DTMF command the CAT-700B will generate the required ASCII commands to control the transceiver. Since this serial port is bi-directional it is possible to interrogate the transceiver and receive information concerning the frequency and status. The CAT-700B acts like a computer providing full control. The CAT-700B will use its voice synthesizer to announce the status of the various transceiver functions.

Connect the CAT-700B, IC-706 transceiver and repeater as shown in Figure 16-1. See Figure 7-8 for the connections to the IC-706 ACC connector. On the CAT-700B set the jumper at (J11) to the "HF" position. Set dipswitch #3 to the ON position because the IC-706 COR output is active low. Enable Zone 9 Channel 1. Key-up and send: [100 9 1 1] Un-key and the voice will say: "NINE ONE ON."

## ICOM IC-706 Set-up

Set the IC-706 to "Initial Set Mode Operation" by applying power while pressing the [LOCK] button. Press the [MENU] button one or more times to select [25 CI-V ADDRESS]. Rotate the Main Dial to select an address of [4EH].
Press [MENU] to select [26 CI-V BAUD]. Set the BAUD to [AUTO] or [4800].
Press [MENU] to select [27 CI-V TRN]. Set the TRN to [OFF].
Press [MENU] to select [28 CI-V 731]. Set the 731 to [OFF].
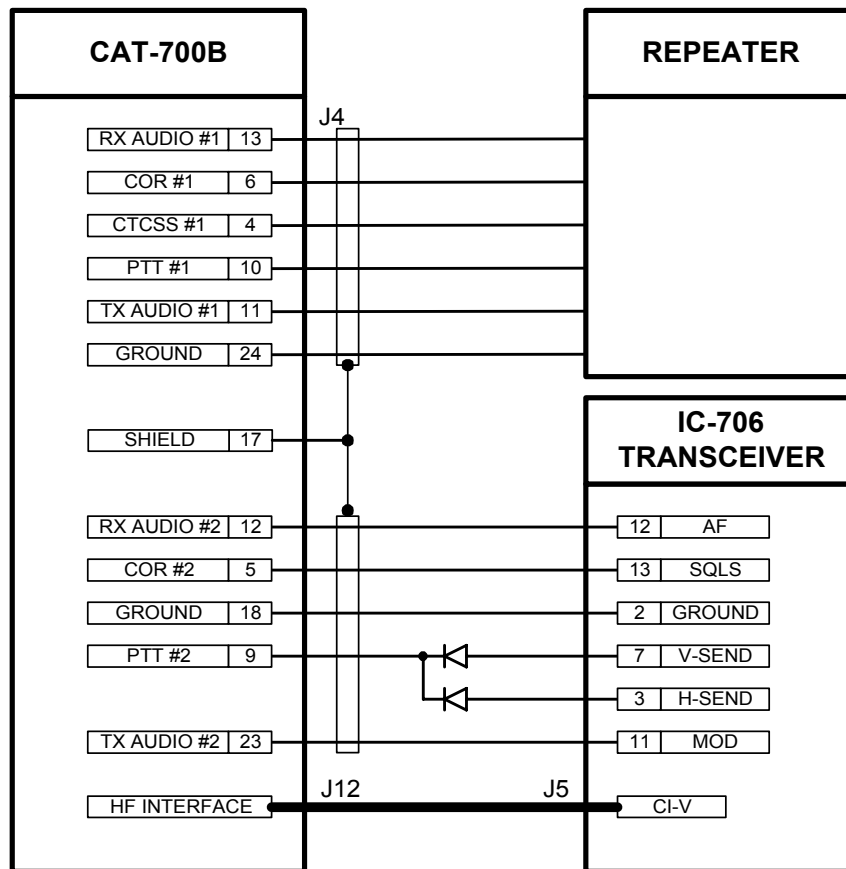Exit "Initial Set Mode Operation" by turning the POWER to [OFF].



Figure 16-1

16-1

## HF Remote Base Control Commands

In response to DTMF inputs from the repeater operator the CAT-700B will issue control and programming commands to the transceiver. The CAT-700B will convert ASCII information received from the transceiver into voice messages describing the frequency and control settings of the transceiver. Use any of the commands described below to control the transceiver through the computer interface. The HF transceiver control prefix number must precede the commands used to activate the HF transceiver. The default number is [560].

| Command | HF Control Mode |
| --- | --- |
| (Prefix)   1 | Remote HF Base Receive Only |
| (Prefix)   2 | Remote HF Base Receive/Transmit |
| (Prefix)   3 | Remote HF Base Receive Only with Squelch |
| (Prefix)   4 | Remote HF Base Receive/Transmit with Squelch |

Figure 16-2

## Remote HF Base Receive Only [560-1]

In this mode the CAT-700B will continuous key the repeater's transmitter and repeat the signals received by the ICOM IC-706. Signals received by the repeater's receiver will have priority over the HF transceiver but not cause the transceiver to transmit.

## Remote HF Base Receive/Transmit [560-2]

In this mode the CAT-700B will continuous key the repeater's transmitter and repeat the signals received by the ICOM IC-706. Signals received by the repeater's receiver will have priority over the HF transceiver and cause the transceiver to transmit.

## Remote HF Base Receive Only with Squelch [560-3]

In this mode the CAT-700B will respond to transceiver COR and only key the repeater's transmitter when a signal is received by the IC-706 transceiver. Signals received by the repeater's receiver will have priority over the HF transceiver but not cause the transceiver to transmit.

## Remote HF Base Receive/Transmit with Squelch [560-4]

In this mode the CAT-700B will respond to transceiver COR and key the repeater's transmitter when a signal is received by the IC-706 transceiver. Signals received by the repeater's receiver will have priority over the HF transceiver and cause the transceiver to transmit.

## Exit Remote HF Base Control Mode [#]

Key-up and press [#] to exit the Remote HF Base Control mode.

---

**HF Transceiver Installation**

The CAT-700B uses a ferrite block filtered 25 pin "D" connector and a low pass filter on the DC power input. It is important to keep the HF transmitter's RF energy out of the controller's audio circuitry. Antenna placement, additional shielding, good grounding techniques and additional bypassing and filtering may be required for proper operation.

---

# Quick Command Keypad Definitions

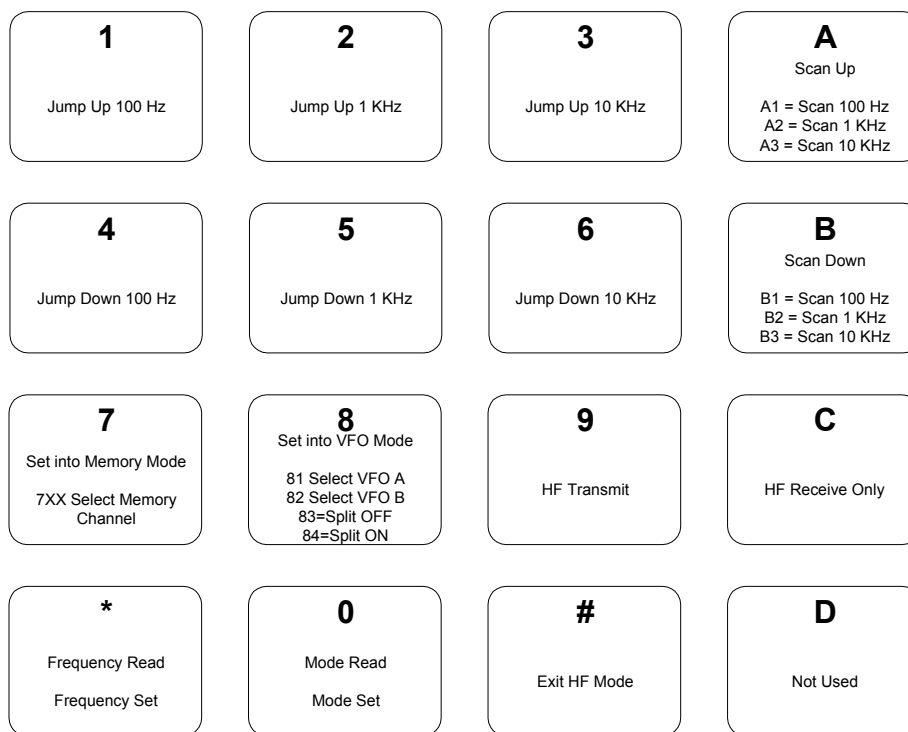| 1<br><br>Jump Up 100 Hz | 2<br><br>Jump Up 1 KHz | 3<br><br>Jump Up 10 KHz | A<br>Scan Up<br><br>A1 = Scan 100 Hz<br>A2 = Scan 1 KHz<br>A3 = Scan 10 KHz |
|---|---|---|---|
| 4<br><br>Jump Down 100 Hz | 5<br><br>Jump Down 1 KHz | 6<br><br>Jump Down 10 KHz | B<br>Scan Down<br><br>B1 = Scan 100 Hz<br>B2 = Scan 1 KHz<br>B3 = Scan 10 KHz |
| 7<br><br>Set into Memory Mode<br><br>7XX Select Memory Channel | 8<br>Set into VFO Mode<br><br>81 Select VFO A<br>82 Select VFO B<br>83=Split OFF<br>84=Split ON | 9<br><br>HF Transmit | C<br><br>HF Receive Only |
| *<br><br>Frequency Read<br><br>Frequency Set | 0<br><br>Mode Read<br><br>Mode Set | #<br><br>Exit HF Mode | D<br><br>Not Used |

Figure 16-3

## Frequency Read-Set [*]
To read the frequency displayed in the IC-706 window, key-up and press the [*].  To load a frequency, key-up and enter [*MHZ*KHZ]. EXAMPLE: To load the frequency 14.125 MHz, key-up and enter [*14*125].

## Mode Read-Set [0]
To read the mode displayed in the IC-706 window, key-up and press the [0].  To change the mode, key-up and enter: [01]=LSB, [02]=USB, [03]=AM, [04]=FM, [05]=CW.

## Memory Mode Set-Select [7]
Key-up and press [7] to set the IC-706 to memory mode.  To select a memory, key-up and enter [7XX]. EXAMPLE: To select memory [25], key-up and enter [725].

## VFO Mode Set-Select Frequency Split [8]
Key-up and press [8] to set the IC-706 to VFO mode.  Press [81] for VFO-A and [82] for VFO-B.  Key-up and press [83] to set the IC-706 frequency split on and [84] to set the frequency split off.

## HF Transmit [9]
Key-up and press [9] to set the IC-706 transmitter to on.  Key-up and press [C] to return to receive only mode.

## HF Receive Only [C]
Key-up and press [C] to set the IC-706 to receive only.  Key-up and press [9] to return to transmit mode.

## Exit Quick Command and Remote HF Base Mode [#]
Key-up and press [#] to exit the HF Transceiver mode.

## Scan Up [A]
Key-up and press [A] to scan up in frequency.  The IC-706 will scan at the last step rate selected. To change the step rate enter [A1]=100Hz steps, [A2]=1KHz steps, [A3]=10KHz steps.

## Scan Down [B]
Key-up and press [B] to scan down in frequency.  The IC-706 will scan at the last step rate selected. To change the step rate enter [B1]=100Hz steps, [B2]=1KHz steps, [B3]=10KHz steps.

## Bump Up [1][2][3]
To bump up in frequency, key-up and enter [1]=100Hz, [2]=1KHz, [3]=10KHz.

## Bump Down [4][5][6]
To bump down in frequency, key-up and enter [4]=100Hz, [5]=1KHz, [6]=10KHz.

# Zone 9 HF Transceiver Control Channels

## 1. HF Transceiver Enable
This is the master HF transceiver switch.  This channel must be enabled for the CAT-700B to accept the [560X] command to activate the HF transceiver interface.

## 2. HF Auto Disconnect Enable
When this channel is enabled, the HF transceiver interface will disconnect automatically after a period of repeater inactivity determined by the [*616*] link auto disconnect timer.  This timer's default setting is ten minutes.

## 3. CW Identification Enable
When this channel is enabled, the CAT-700B will ID in CW when the HF Remote transceiver is activated.

## 4. Repeater Hang Time Enable
When this channel is enabled and the CAT-700B is in the transceiver mode, the repeater's transmitter will remain on for a period of time determined by the [*604*] COR to Beep and [*605*] Beep to transmitter drop timers.

## Programming Command

## Remote HF Base Control Prefix Number [*515*]
This programming command selects the Remote HF Base control prefix number.  This number must precede the commands used to activate the remote HF Base.  The default number is [560].

# Chapter 17 - RLS-1000B Remote Link Switch

The RLS-1000B provides a method to connect up to three transceivers to the remote base port of the CAT-700B repeater controller.   Transceiver selection is accomplished by grounding three control lines.  Since the receiver audio and COR inputs are mixed, all three transceivers can be selected at the same time.  To select a transceiver, connect the CAT-700B user function switch outputs to the control line inputs on the RLS-1000B.
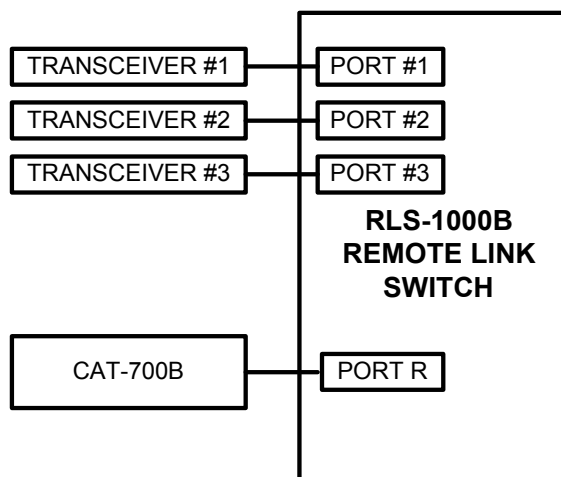


Figure 17-1

## COR Output Polarity
The COR output will always be active HIGH. The COR polarity dipswitch on the CAT-700B must be set to the OFF position.

## Audio Input Output
The audio input and output circuits are identical to the CAT-700B controller. Level adjustments on both the input and output amplifiers, makes it easy to compensate for varying input and output requirements.   The audio input impedance is 10K ohms while the output is 600 ohms.

## Receiver Audio Response
Each receiver input has a buffer amplifier with a gain of three.   The frequency response is flat over a range of 300 to 3000 Hz. If discriminator audio is being used, it may be necessary to add some high frequency roll off. Space has been provided to install a capacitor across the feedback resistor on each receive audio amplifier. These locations are identified on the RLS-1000B board as C2, C11 and C16.   Start with a .0047uF capacitor.   Increase the value to provide more high frequency roll off or decrease the value to provide less high frequency roll off.

## Dip Switch Selection

### Switch #1 - Port #1 COR Polarity
This switch determines COR input logic for the RLS-1000B port #1 input. Switch #1 should be ON if the COR input is active low and OFF if the COR input is active high. For an active low COR input a pull-up resistor may be required. Install a 2200ohm .25W resistor on the RLS-1000B board at the R33 position.

### Switch #2 - Port #2 COR Polarity
This switch determines COR input logic for the RLS-1000B port #2 input. Switch #2 should be ON if the COR input is active low and OFF if the COR input is active high. For an active low COR input a pull-up resistor may be required. Install a 2200ohm .25W resistor on the RLS-1000B board at the R34 position.

### Switch #3 - Port #3 COR Polarity
This switch determines COR input logic for the RLS-1000B port #3 input. Switch #3 should be ON if the COR input is active low and OFF if the COR input is active high. For an active low COR input a pull-up resistor may be required. Install a 2200ohm .25W resistor on the RLS-1000B board at the R35 position.

### Switch #4 - Port #1 Configuration
This switch configures port #1. If a transceiver is connected to the RLS-1000B at port #1, dipswitch #4 should be in the OFF position. If a repeater is connected to port #1, dipswitch #4 should be in the ON position.

### Switch #5 - Port #2 Configuration
This switch configures port #2. If a transceiver is connected to the RLS-1000B at port #2, dipswitch #5 should be in the OFF position. If a repeater is connected to port #2, dipswitch #5 should be in the ON position.

### Switch #6 - Port #3 Configuration
This switch configures port #3. If a transceiver is connected to the RLS-1000B at port #3, dipswitch #6 should be in the OFF position. If a repeater is connected to port #3, dipswitch #6 should be in the ON position.

### Switch #7 - Port #1 Priority Enable
Switch #7 provides a method of assigning port #1 with priority over ports #2 and #3. If switch #7 is OFF the RLS-1000B will be configured for normal operation. Any COR input will enable the corresponding audio switch and pass the receive audio to the mixer. If switch #7 is ON port #1 will have priority. Audio switches for ports #2 and #3 will be disabled when port #1 COR is active.

### Switch #8 - Port #1 CAT-300 Mode Enable
Switch #8 configures the RLS-1000B for operation with the CAT-300 in the one repeater, two-transceiver mode. This mode is not used when the RLS-1000B is connected to the CAT-700B controller.

### Port R - Enable
To activate Port-R, J4 pin 12 must be grounded. With the jumper plug on J5 pins 1 and 2 Port-R is forced on. Use the CAT-700B remote base on and off commands to control the connection between the RLS-1000B and the CAT-700B.

### CAT-700B - RLS-1000B Interconnect
Figure 17-2 describes how to connect three remote base transceivers to the link port of the CAT-700B controller. Control of the remote base is through user function switches one, two and three.
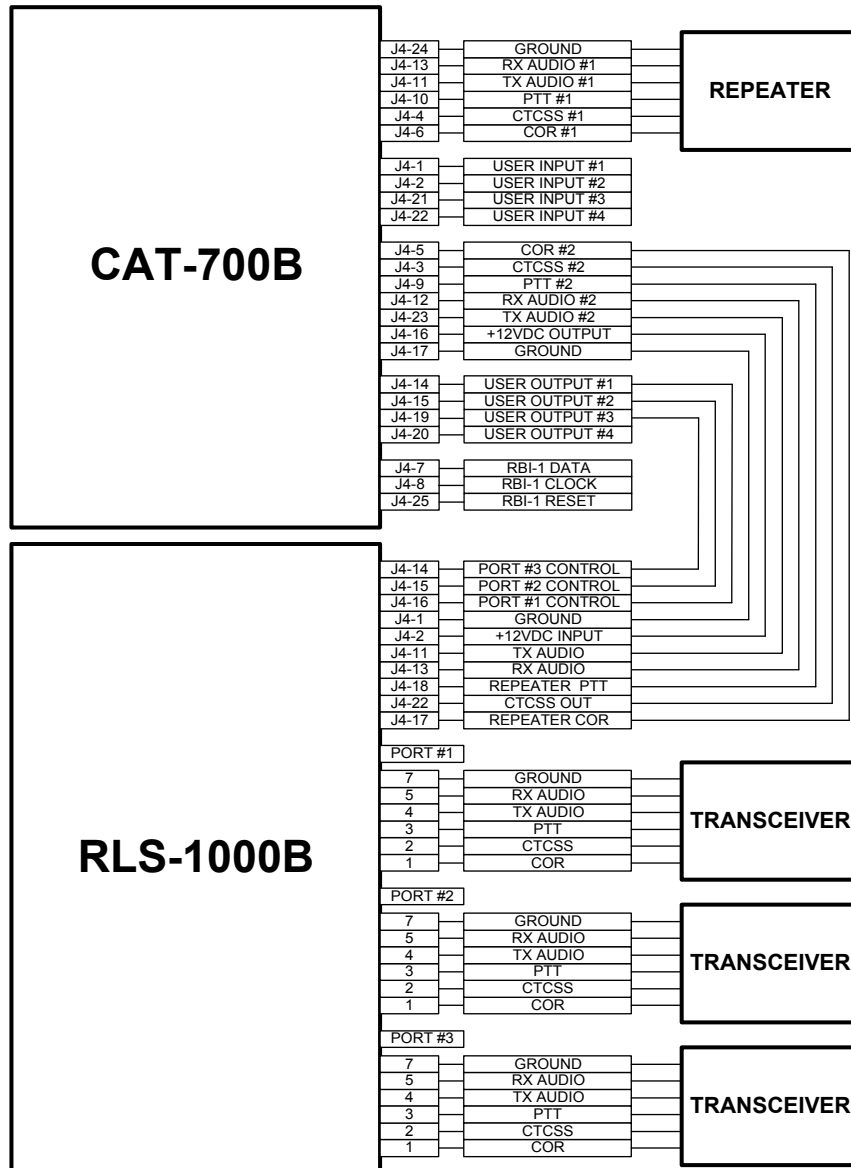
**CAT-700B**

| | |
|---|---|
| J4-24 | GROUND |
| J4-13 | RX AUDIO #1 |
| J4-11 | TX AUDIO #1 |
| J4-10 | PTT #1 |
| J4-4 | CTCSS #1 |
| J4-6 | COR #1 |

**REPEATER**

| | |
|---|---|
| J4-1 | USER INPUT #1 |
| J4-2 | USER INPUT #2 |
| J4-21 | USER INPUT #3 |
| J4-22 | USER INPUT #4 |

| | |
|---|---|
| J4-5 | COR #2 |
| J4-3 | CTCSS #2 |
| J4-9 | PTT #2 |
| J4-12 | RX AUDIO #2 |
| J4-23 | TX AUDIO #2 |
| J4-16 | +12VDC OUTPUT |
| J4-17 | GROUND |

| | |
|---|---|
| J4-14 | USER OUTPUT #1 |
| J4-15 | USER OUTPUT #2 |
| J4-19 | USER OUTPUT #3 |
| J4-20 | USER OUTPUT #4 |

| | |
|---|---|
| J4-7 | RBI-1 DATA |
| J4-8 | RBI-1 CLOCK |
| J4-25 | RBI-1 RESET |

**RLS-1000B**

| | |
|---|---|
| J4-14 | PORT #3 CONTROL |
| J4-15 | PORT #2 CONTROL |
| J4-16 | PORT #1 CONTROL |
| J4-1 | GROUND |
| J4-2 | +12VDC INPUT |
| J4-11 | TX AUDIO |
| J4-13 | RX AUDIO |
| J4-18 | REPEATER PTT |
| J4-22 | CTCSS OUT |
| J4-17 | REPEATER COR |

PORT #1

| | |
|---|---|
| 7 | GROUND |
| 5 | RX AUDIO |
| 4 | TX AUDIO |
| 3 | PTT |
| 2 | CTCSS |
| 1 | COR |

**TRANSCEIVER**

PORT #2

| | |
|---|---|
| 7 | GROUND |
| 5 | RX AUDIO |
| 4 | TX AUDIO |
| 3 | PTT |
| 2 | CTCSS |
| 1 | COR |

**TRANSCEIVER**

PORT #3

| | |
|---|---|
| 7 | GROUND |
| 5 | RX AUDIO |
| 4 | TX AUDIO |
| 3 | PTT |
| 2 | CTCSS |
| 1 | COR |

**TRANSCEIVER**

Figure 17-2