MCN Monitoring and Control Network
Comparator Display System
Remote Comparator Display Software
Installation and Operator Manual
S2-60428-210

CTI Products Inc.

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1. Introduction, and Overview

A basic MCN Remote Comparator Display system is shown in Figure 1. The
MCN Remote Comparator Display system consists of the Host Computer
Interface (HIB) Module and any MCN Comparator I/O Module (such as an AIB or
CIB). The PC runs the MCN Remote Comparator Display software (MCN RCD)
described in this manual. This manual covers the installation and operation of the
software. Details of the HIB (hardware installation and setup) are found in the
HIB reference manual (see reference 2). Also, the MCN system manual
(reference 1) contains more details about the MCN comparator display system.
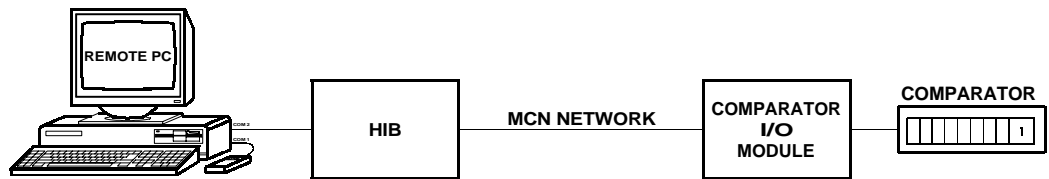
CA-80048-100

Figure 1 - MCN Remote Comparator Display System

Higher Performance System

Some systems may require higher performance for their monitoring and control
system. The HIB module can be replaced by a PC ISA bus card that plugs into the
backplane of the PC. This plug in card is called a PCLTA card and it connects
directly to the MCN network, as shown in Figure 2. Details of the PCLTA
(hardware installation and setup) are found in its technical reference manual (see
reference 4). The PCLTA card can only be used in local monitoring applications.
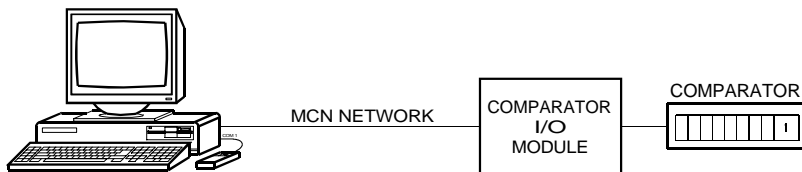
CA-80237-100

Figure 2 - MCN System with PCLTA Card

General Purpose I/O Devices require General Purpose Monitoring and Control Function

The MCNRCD software can also monitor general purpose I/O devices connected to CIB or IOB modules. Typical devices are:

- Door alarm inputs
- Generator run inputs
- Equipment failure inputs
- Relay control outputs
- Transmitter main/standby controls

General Purpose I/O Devices require different status indications than comparators ("On/Off/Fail" versus Vote, Receive, Disable, Fail). Section 9 of this manual describes how to provide custom status indications for general purpose I/O functions using the status text categories and sub-categories.

Software Provided

Two programs make up the MCN RCD software package. They are:

- MCNCFG.EXE - the configuration program
- MCNRCD.EXE - the runtime Remote Comparator Display program

The MCNCFG.EXE program is run by an engineer or technician to build the configuration files when the system is installed or changed. The MCNRCD program is run by a dispatcher or technician to display the status of the voting system.

The MCNRCD.EXE software allows the operator to see which receivers are receiving, voted, disabled, failed or in an error condition on the PC. It also allows the operator to monitor and disable receivers with the Force Vote and Disable functions.

The MCNRCD.CFG file is an ASCII text file that the engineer or technician can edit to change the configuration of several option parameters used by MCNRCD software. This file may be edited by any text based editor program.

1.1 Network Interface Support

The MCN RCD software package can use any version of HIB modules or the PCLTA card for the interface between the PC and the MCN network. The PCLTA card and early versions of the HIB module do not provide modem support. You can determine if you have an early HIB module by looking at the model number found on the rear of the HIB module. All HIB modules have a unit number of S2-60081-xxx. If the 'xxx' number is less than 200 you have an early version HIB module.

Early HIB modules ('xxx' is less than 200):
- Support only local operation with MCNRCD. Skip all modem references in this manual.
- External module that connects to one of the PC's COM ports.
- Requires device driver LDVSLTA.SYS to be loaded by your PC's CONFIG.SYS file (see section 5).

All other HIB modules ('xxx' is 200 or greater):
- Support both local and remote operation with MCNRCD.
- External module that connects to one of the PC's COM ports.
- Requires device driver CTIHIB.SYS to be loaded by your PC's CONFIG.SYS file (see Section 5).

PCLTA Interface:
- Support only local operation with MCNRCD. Skip all modem references in this manual.
- Internal interface card that plugs into an ISA bus slot in the PC.
- Requires device driver LDVPCLTA.SYS to be loaded by your PC's CONFIG.SYS file (see Section 5).

1.2 System Hardware Requirements

Two components are required for the MCN RCD system.
1. Host Computer Interface Module (HIB) or PCLTA interface card
2. A PC to run the MCNRCD software with the following minimum system configuration:
   - 25 MHz 386 DX PC for 1 to 9 Comparator I/O Modules
                          or
     50 MHz 486 DX PC for 10 to 20 Comparator I/O Modules
   - EGA or VGA adapter and monitor
   - 2 MB RAM (if running from DOS)
   - 2 MB free disk space for program and support files
   - 5 to 100 MB additional free disk space if logging Status data
   - 5 to 10 MB addtional free disk space if logging Errors
   - Microsoft or Logitech mouse (optional)
   - One open serial port (for HIB use)
   - One open full-size ISA slot (for PCLTA use)
   - MS-DOS 5.0 or higher

UART Requirements

For applications using the HIB module with a PC serial port, CTI Products recommends that you have a 16550 type UART. This UART has a 16 byte FIFO (First In First Out) buffer for the receiver that is used to prevent UART overrun errors. If your COM port uses a 16450 or 8250 type UART, then you may not be

able to operate the MCNRCD software at the highest baud rate (38400 bps). You may have to run at either 14400 bps or 9600 bps.

If your COM port uses a 16450 or 8250 type UART, and you are running at 38400 bps, and you get the HIB communication error screen (see section 7.2.2.1), try running the MCNRCD software at 1400 bps or 9600 bps (remember to change the HIB's baud rate selection switches to match the new data rate and then reset the HIB module).

Modem Requirements

Modems may be used to create a remote comparator display system. CTI Products, Inc. recommends the following:

- V.34 (28.8 K) modems with V.42bis or MNP 5 data compression for best system performance in systems with 10 or more Comparator I/O Modules.
- V.32bis (14.4 K) modems with V.42bis or MNP 5 data compression for better system response in systems with 1 to 9 Comparator I/O Modules.
- V.32 (9600) modems with data compression for normal system response in systems with 1 to 9 Comparator I/O Modules.

See section 10 for additional modem information, including specific modems that have been tested and verified to operate with MCNRCD.

1.3 Reference Documents

1. Monitoring and Control Network System Manual
   Part Number S2-60425
2. Host Computer Interface Module Hardware Reference Manual (HIB)
   Part Number S2-60427
3. TSAM Interface Module Hardware Reference Manual (TIB)
   Part Number S2-60469
4. PCLTA Interface Card Hardware Reference Manual
   Part Number S2-60648
5. I/O Control Module Hardware Reference Manual (IOB)
   Part Number S2-60630

2. Theory of Operation

This section describes the operation of the MCN Remote Comparator Display software in an MCN comparator display system.

2.1 Comparator Status

The Comparator I/O Module (such as an AIB or CIB) accepts the VOTE, RECEIVE, DISABLE, and FAIL receiver status indicators from the comparator. It sends status messages to the HIB or PCLTA. The HIB or PCLTA passes the messages over the PCs serial port to the MCNRCD software. The MCNRCD software controls the VOTE, RECEIVE, DISABLE, and FAIL status display for each receiver on the screen.

2.2 Controlling the Comparator

The MCNRCD software monitors the mouse and/or keyboard for VOTE and DISABLE commands. When a VOTE or DISABLE command is activated, the MCNRCD software sends a FORCE VOTE or DISABLE command to the Comparator I/O Module. The Comparator I/O Module will then generate the proper FORCE VOTE or DISABLE/ENABLE signal to control the comparator.

2.3 Transmitter Status Monitoring and Control

To provide transmitter status monitoring and control, your MCN system must also include CTI Product's Transmitter Steering Audio Matrix (TSAM) device along with the MCN TIB Module (TSAM Interface Module) (see reference 3).

The MCNRCD software can display transmitter status information along with the corresponding receiver's status information. You can simultaneously view the receiver's current status along with the current state of the corresponding transmitter (whether it is selected or not).

The MCNRCD software can also force a particular transmitter to be the active transmitter by FORCE VOTING the receiver associated with that transmitter. MCNRCD will display a status of *Tx/Vote* for that receiver to indicate that it is currently being FORCE VOTED and that the transmitter is active.

3. Quick Start

We recommend that you first set up the entire system, including PC, modems, HIB or PCLTA, Comparator I/O Device, and any other equipment in the same room to verify system cabling and operation. After the system is up and running, install the individual items at their proper locations.

To install the system, do the following steps in order:

1. Read section 4 of this manual.

2. Install the MCN Remote Comparator Display software on the computer, modify your CONFIG.SYS file to load the proper device driver, and re-boot the computer. See section 5.1 of this manual.

3. Modify your AUTOEXEC.BAT file if required. See section 5 of this manual.

4. Install the HIB or PCLTA. Connect the PC to the HIB. Refer to the hardware reference manuals of the HIB (reference 2) or PCLTA (reference 4) and the MCN system manual (reference 1) for details about module installation.

5. Connect the HIB or PCLTA to the Comparator I/O Module using the MCN network cable.   Refer to the hardware reference manuals of the Comparator I/O Module, as well as the MCN system manual (reference 1) for details about module installation.

6. Run the MCN Remote Comparator Display (RCD) program using the pre-built screen and module set files to verify the proper software and hardware installation. The command line to execute is:

<div align="center">MCNRCD DEFAULT</div>

7. If you have dial-up modems, install them now and test them with your files.

    a) Make sure your modems are configured properly. See section 10 for more details.

    b) Connect the HIB modem to the HIB. See sections 10.2.1 and 10.4 for connection information.

    c) Connect the PC modem to the PC.

    d) Connect the modems to the phone lines. See the Testing Local Back to Back Modems part of section 10 for more details.

8. Run the MCNCFG program to configure the MCN Group Configuration Files and MCN Screen Files for your system and test the system with your custom files.   Refer to section 6.2 for more details.

9. After testing your system locally, finish the permanent installation of your system.

If you move a PC with a dial-up modem to a phone line with a different access code (like Dial 9 for an outside line), you will have to change the dialing string in the MCN Screen File.

4. MCNRCD & MCNCFG Basics

4.1 Using Menu Commands

To access the menu commands, click the menu item with the left mouse button. To use the keyboard to access menu commands, press the A key and the highlighted letter for the menu command.

For example, to access the **File** menu, click the mouse cursor on the File option on the menu bar or press Af key combination on the keyboard.

Some menu commands may not be valid at certain times. When a command is inactive, its text appears as dark gray text on the light gray menu background.

When choosing a file from a file list box, highlight the file and then press E or double-click on the filename with the mouse.

4.2 Configuration Files

A number of configuration files are used by the MCN Remote Comparator Display runtime program (MCNRCD) and configuration program (MCNCFG). Before you begin, read the following sections which describe the purpose of these files.

4.2.1 MCN Group Configuration Files <filename>.GCF

An MCN Group contains up to 16 different MCN modules (Module numbers 0 through F), as defined in the *MCN Comparator Display System Manual*, reference 1. The MCN Group Configuration File (.GCF extension) defines all receivers contained in a single MCN Group.

MCNRCD only supports the first 8 receivers (bank 0) of any Comparator I/O Module, so a single GCF file supports a total of 128 receivers (8 receivers x 16 modules) in a single Group.

When a GCF file is created, a Group number must be assigned to the file (the default is Group 0). The Group number must correspond to the MCN Group number assigned to the Comparator I/O Modules that will be monitored and controlled by MCNRCD.

Each receiver in the GCF file is defined by a receiver name and a channel name. The MCNCFG program allows you to create as many Group Configuration Files as are needed.

4.2.2 MCN Screen Files <filename>.MSF

Each screen that you want to display requires a MCN Screen File (.MSF). The MCN Screen Files include the following:

- Module address of the HIB
- Which MCN Groups to display (up to 4)
- Screen Name
- Channel Title information
- Receiver Placement on the screen

You can make multiple MCN Screen Files that all use the same GCF configuration files if all your receivers won't fit on one screen. You can use multiple screens to break down the receivers into a logical grouping of channels (Police, Fire, Maintenance, etc.).

The program will handle up to 50 MCN Screen Files.

4.2.3 Module Configuration Files <filename>.MCF

Each module in a GCF file has variable information associated with it. This module information is entered using the Module Config command under the **Edit** menu. The Module Configuration File includes the following:

- Module descriptions
- Status text categories assigned to each module

The MCF file is automatically created when a GCF file is saved. The filename used for the MCF file is the same as the GCF filename.

4.2.4 Modem Configuration File (MODEM.INI)

The Modem Configuration File includes commands specific to the particular modem being used. This file and its entries are described in section 10.

4.2.5 Remote Comparator Display Configuration File (MCNRCD.INI)

This file holds the Error Logging settings that are selected in the MCNRCD program. The MCNRCD program reads this file on start-up and uses those error logging options. MCNRCD automatically updates this file whenever you change Logging options (Status/Error).

4.2.6 MCN Error Log File (MCNERR.LOG)

This file holds Error log entries in ASCII text form. Selectable file size range of 1 to 10 MB via the command line option switch: /En (n = 1 to 10). Default size is 1 MB. Each error log entry uses 107 bytes. A warning indication is given on each log when the MCNERR.LOG file reaches 90% full. At 100% capacity, the error log file will automatically be rebuilt down to 50% of the command line option switch (/En) file size The most recent error logs will make up this reduced file. See section 7.6.1 for more details.

4.2.7 MCN Statistics Log File (MCNSTAT.LOG)

This file contains the statistics log entries in an ASCII text form. See section 7.6.2 for more information about statistics logging.

4.2.8 MCN Text Configuration File (MCNRCD.CFG)

This file holds the receiver status text messages that are displayed for the VOTE, RECEIVE, DISABLE and FAIL states. This file can be changed so that you can customize the displayed status messages. See section 9 for more information.

4.2.9 HIB Configuration Program (HIBCNFG.EXE)

This file allows you to program a modem initialization string into the HIB. Whenever the HIB is reset, and configured for remote operation, it sends this string to the modem. See section 10.2.1 for more information.

5. Installation

5.1 Installing the Remote Comparator Display Software

To Install the Remote Comparator Display Software

1. C:> MD CTI ⏎
2. C:> CD CTI ⏎
3. Insert *CTI MCN Remote Comparator Display* disk in A:
4. C:\CTI> COPY A:*.* ⏎
5. Modify your CONFIG.SYS file as shown in section 5.2 of this manual.
6. Modify your AUTOEXEC.BAT file as shown in section 5.4 of this manual.
7. If you are using transmitter steering (your system includes TIB modules), copy the file TXSTEER.CFG to MCNRCD.CFG so that you have the transmitter steering status messages. The standard configuration file, NORMAL.CFG does not include the transmitter steering information.
8. Re-boot to have the changes take effect.

5.2 Loading the Device Driver

A device driver file must be loaded by your CONFIG.SYS file before the runtime comparator display software MCNRCD.EXE can be run. The command line for the device driver should have been edited into your CONFIG.SYS file when the MCN network interface module (either the HIB or the PCLTA card) was installed in the system. If you have not loaded the device driver, modify your CONFIG.SYS file to add the appropriate command line and then re-boot your PC.

Refer to the HIB or PCLTA hardware reference manual of the MCN network interface device you are using for instructions on loading the device driver. Each type of network interface device uses a different device driver file.   You may be able to load the device driver in high memory to conserve conventional memory.

If you attempt to run MCNRCD.EXE without loading this device driver, MCNRCD will show an error when a screen file is loaded and then will exit back to DOS.

5.3 Additional CONFIG.SYS File Changes

In addition to the device driver additions, be sure your C:\CONFIG.SYS file includes the following minimum Files and Buffers:

FILES=20
BUFFERS=20

If you use a MOUSE.SYS mouse driver, make sure its entry is in CONFIG.SYS. If you use a serial mouse, be sure its COM port does not conflict with the serial port for the HIB. Be sure to re-boot the computer after any changes.

5.4 Modifying the AUTOEXEC.BAT File

If you use a MOUSE.COM mouse driver, make sure its entry is in
AUTOEXEC.BAT. If you use a serial mouse, be sure its COM port does not
conflict with the serial port for the HIB. Be sure to re-boot the computer after any
changes.

5.5 Network Interface Installation & Cabling

The physical installation of the HIB module is covered in the HIB's hardware
reference manual, reference 2. If you are using a PCLTA card instead of the HIB
module refer to the PCLTA manual (reference 4) for installation and cabling
instructions.

5.6 Modem Setup

We recommend using a Practical Peripherals PM144MT II modem for dial up
applications or a UDS V.3229 modem for leased line applications. Modem
configuration sheets are provided in section 10 for various modems that have been
tested.

See the modem manual for instructions on how to configure the modem.

See the *Testing Local Back to Back Modems* section of section 10 for a
description of level setting and how to connect the modems in a back to back
configuration for testing.

When connecting the modem to your PC, make sure the modem is connected to
the PC's COM port that is specified on the CTIHIB.SYS driver command line in
CONFIG.SYS.

5.6.1 Internal Modem Support

If you are using an internal modem in the PC, configure the modem so that it uses
the same COM port specified on the CTIHIB.SYS driver command line.

6. Configuring a System -- Using MCNCFG

A basic remote comparator display system consists of a PC connected to a HIB or PCLTA and one or more Comparator I/O Modules (see Figure 1).

An MCN Group Configuration file (.GCF extension) contains all of the receiver information for MCN Comparator I/O Modules addressed into a single MCN Group.

MCN Screen Files (.MSF extension) contain a list of receivers to be displayed on the current CRT screen and where they will appear on the screen. Up to four different MCN Groups can be monitored and controlled from the same MCN screen file.

Up to 88 receivers can appear on the PC display. For many systems this will allow an operator to view all of the receivers in a voting receiver system. On larger systems as many as 50 screens can be created to display a system's receivers.

You will use the MCN Remote Comparator Display Configuration Program (MCNCFG) to create and edit these files when you install or change your system.

6.1 Configuration Steps

To custom configure the MCN Remote Comparator Display software for your radio system do the following:

1. **Build an MCN Group Configuration File (GCF) for your Comparator I/O Module(s):**
   a) Use **Files New Group Configuration** menu command to open a new MCN Group Configuration File.
   b) Enter Receiver Names and Corresponding Channel Name/Notes for each receiver.
   c) Use **Edit Group Number** to assign the two digit number (00-FE) of the MCN Group that these receivers are located in (the default Group number is 00). This number comes from the Group number of the unit address assigned to the Comparator I/O modules. Refer to the MCN system manual (reference 1) for information about module address assignment.
   d) Use **Edit Module Config** to enter the descriptions for each module and change, if needed, the MCNRCD.CFG status text category that will be used by the modules for their status message display.
   e) Use the **Files Save** menu command to save the GCF file.
   f) If you have more than one MCN Group in your system, repeat the above procedure for each MCN Group.

2.   **Build a MCN Screen File (SCF):**

a) Use the **Files New Screen** menu command to open a new MCN Screen File.

b) The **Active Group Files** dialog box will appear. Press E to pop up a list of GCF files. Select the GCF file(s) that you want to display on the screen. Tab to <OK> and press E.

c) The **Select Active Group File** dialog box will be displayed. Select the Group Configuration File you wish to work with first.

d) Enter Channel Titles using the Insert key.

e) Place receivers on the screen using the E key and selecting from the receiver list.

f) If your MCN HIB module has a model number S2-60081-xxx where 'xxx' is the number 200 or greater (this number is found on the rear of the module), set the GROUP and MODULE rotary switches to the unit address you defined for the HIB (these switches are found on the rear of the module. Skip to step h.

g) If your MCN HIB module has a unit number where 'xxx' is less than 200 or if you are using a PCLTA card, you must execute the **Edit HIB Address** command to specify the MCN address of the HIB module or PCLTA card that will be connected to this PC.
Program the Group and Module numbers that you defined for the HIB.

h) Use the **Edit Screen Name** menu command to add a screen name.

i) If you use a dial-up modem, use the **Edit Dialing String** menu command to enter a dialing string (the phone number of the remote HIB).

j) Use the **Files Save** menu command to save the MSF file.

The remainder of this section will walk you through the above steps. There are some additional menu commands that will be covered later.

6.2 Starting the MCNCFG configuration program

1. Exit any application software you are running.
2. Change the current directory to C:\CTI
3. Type: MCNCFG E

This will Start the MCNCFG configuration program and display a screen similar to the one in Figure 3, but with just the menu bar.

6.3 Using the MCNCFG Menu Commands

The MCNCFG program commands are accessed through the programs pull-down menus. These function similarly to the pull-down menus in many popular DOS and Windows™ programs.

The Menu Bar is the top line of the screen. The Menu Bar is always visible. Each item on the bar is the name of a pull-down menu. Press the H key to activate the Menu Bar. The **File** Menu Name is now selected.

To get a complete list of the **File** Menu commands, press the ƒ key. This displays the pull-down File Menu as in Figure 3. Each of the pull-down menus has a short cut activation key. This key is the intensified character in the menu name.
Pressing the H key + the intensified letter of the menu will activate menu.
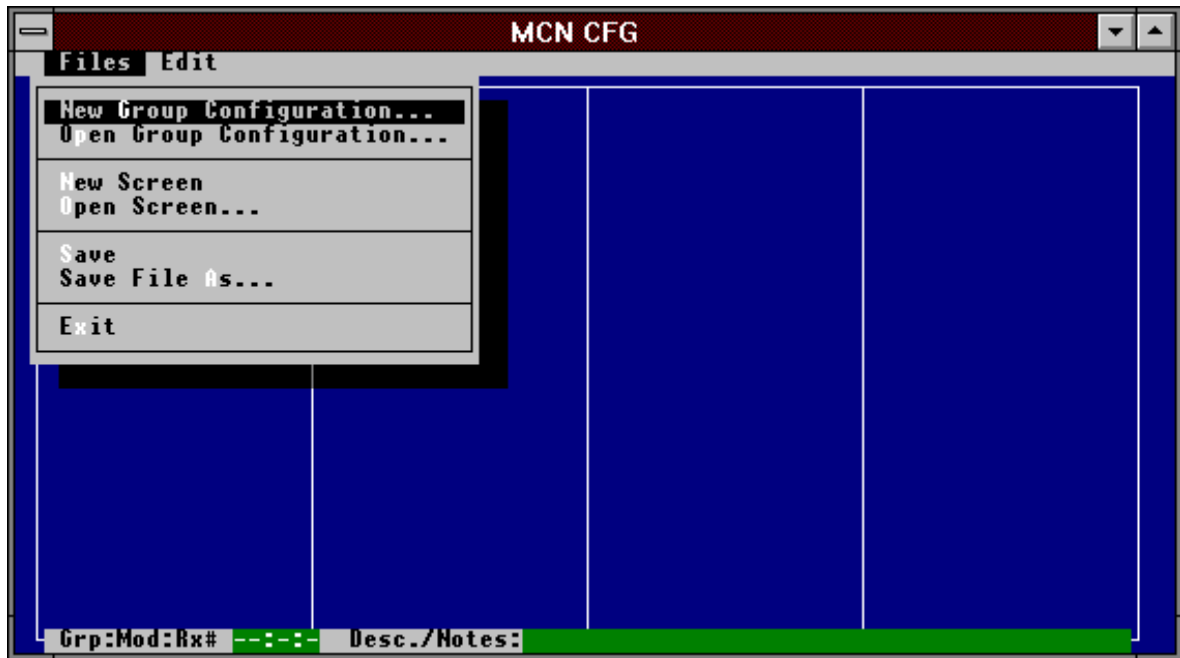
Figure 3 - MCNCFG File Menu

With the mouse, each menu can be activated by clicking on the menu name. Once the menu is activated, individual commands can be activated by clicking on them with the mouse or by pressing the appropriate intensified shortcut key for that command.

When choosing a file from a file list box, highlight the file and then press E or double-click on the filename with the mouse.

6.4 Creating a New MCN Group Configuration File

This is the first step in creating the configuration files for a new system. Select the **Files New Group Configuration** menu command with the keyboard or mouse. The MCNCFG program will bring up a blank module set configuration screen with just the receiver numbers in the left hand column, as shown in Figure 4. A single MCN Group contains 16 unique Module numbers (0 through 9 and A through F). The maximum number of receivers for a given module is 8. Currently MCNRCD can only monitor and control receivers 1 through 8 (bank 0) of any Comparator I/O Module. Section 6.4.2 gives more details about assigning the group number.

If you were working on a module set or screen file and had not yet saved it when you selected the **Files New Group Configuration** menu command, the program will give you a chance to save it.
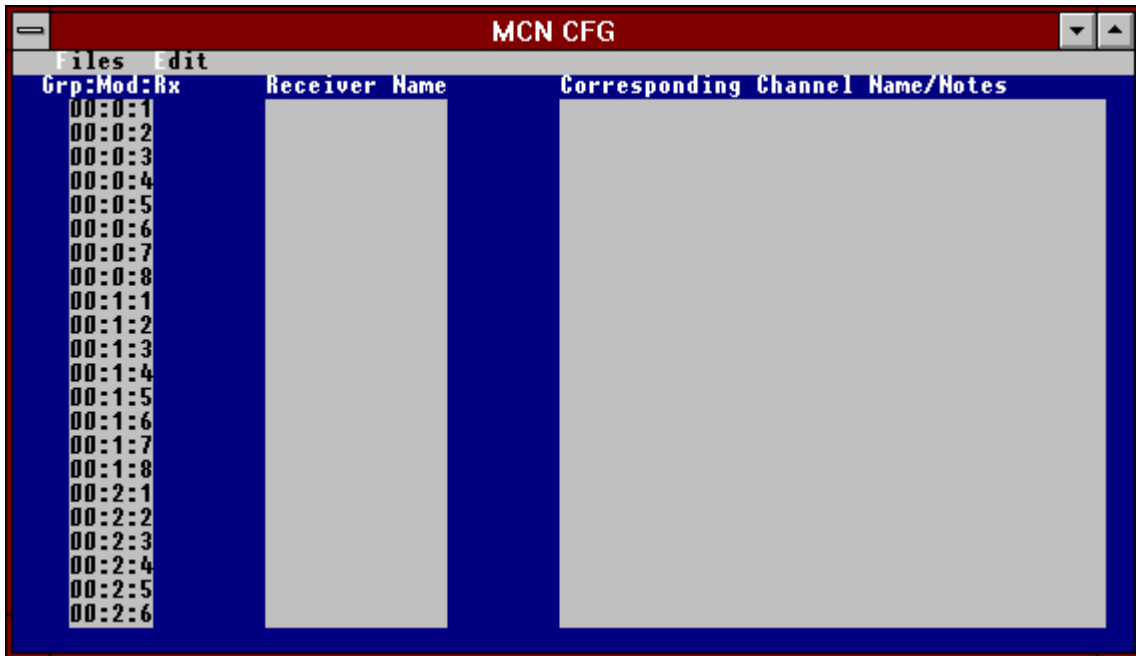
Figure 4 - New Group Configuration Screen

6.4.1 Group Configuration Screen Description

The Group Configuration screen has entries for a total of 128 receiver (8 receivers x 16 different modules). It includes a Receiver Name field and a Channel Name / Note field.

The configuration screen has entries for the modules within that MCN Group. The receiver number shown in the left column of the Group Configuration Screen is made up of three parts (Grp:Mod:Rx).

1. **Grp** is the MCN Group number (00-FE) assigned to the Comparator I/O Module(s) that you will be monitoring. This number can be changed by using the **Edit Group Number** command.
2. **Mod** is the MCN Module number (0-F) assigned to the Comparator I/O Module(s) that you will be monitoring. All 16 modules of a single MCN Group are supported by a single Group Configuration File.
3. **Rx** is the number of the receiver (1-8) for that Comparator I/O Module. The MCN Remote Comparator Display software supports 8 receivers (bank 0) per MCN Comparator I/O Module.

NOTE: The Group and Module numbers must match the address of the Comparator I/O Module being configured.

6.4.2 Defining a Group Number

Using the **Edit Group Number** menu command, you can define the MCN Group for the Comparator I/O Modules being monitored. Figure 5 shows the pull-down Edit Menu during Group Configuration.
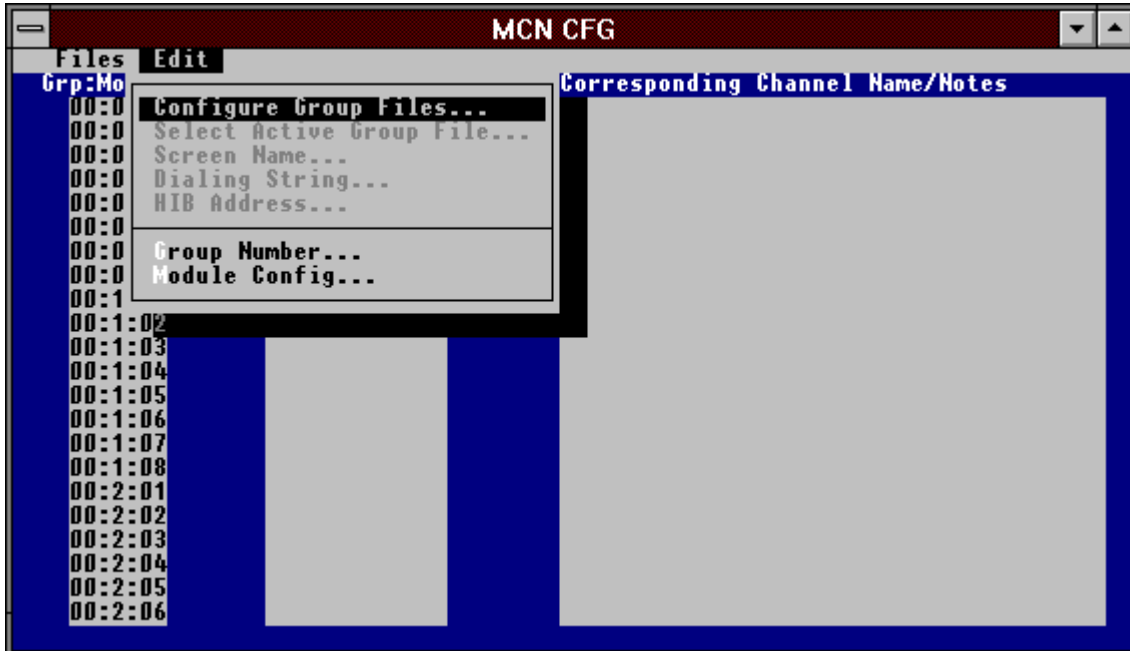
Figure 5 - Group Configuration Edit List

Figure 6 shows the dialog box that appears when the **Group Number** menu command is executed. Enter a new Group number in the range shown on the screen. Again, this Group number is the Group number assigned to the Comparator I/O Modules that will be defined in this Group Configuration File.
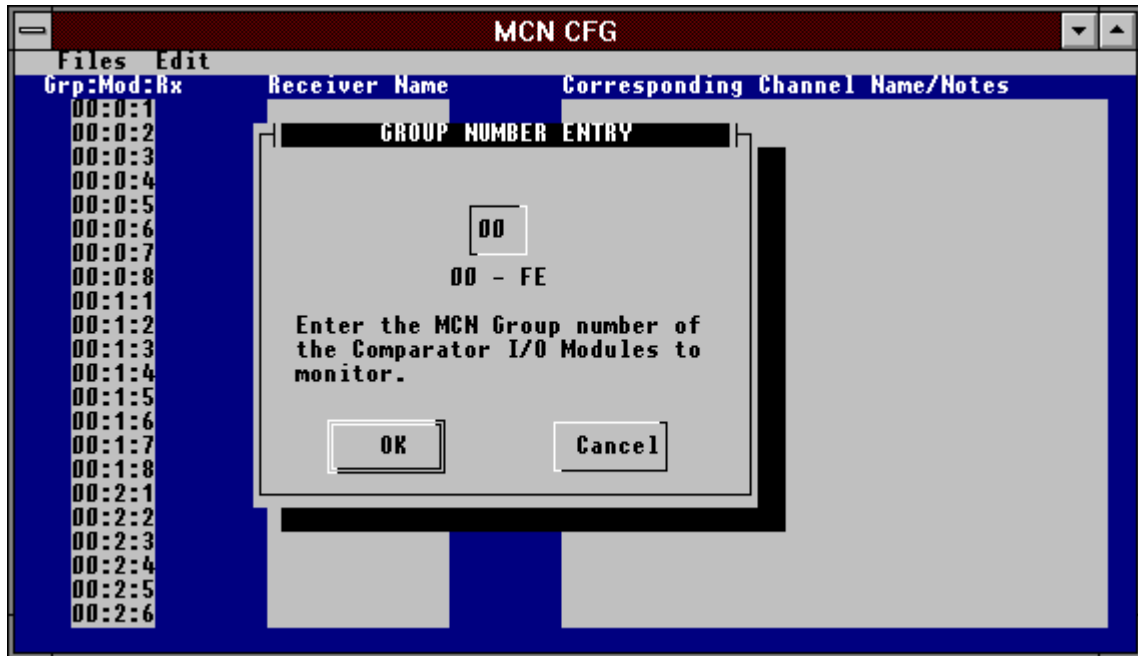
Figure 6 - Group Number Editing

6.4.3 Entering Receiver Names

Enter a descriptive name for each receiver controlled by the Comparator I/O Modules. This will usually be a site name. The receiver name will be displayed on the PC screen to identify the receiver. It is a 13-character alphanumeric field. Typical entries may be "Comm Center", "North Union", "East Bend" and the like.

The Channel Name/Description is used to enter additional information about each receiver. Entering text in this field is optional.

The Receiver Name will be used along with the Channel Name/Note and Comparator I/O Module's unit address in error logging printouts to identify a particular receiver.

Note: When you are finished entering the Receiver Names or the Channel Name/Note fields, be sure to hit E or move your cursor to another field. This will enter the last entry into the database. If you save the file without doing this, you may lose your last entry.

6.4.4 Entering Channel Name/Note Field

The Channel Name/Note field is a 39 character alphanumeric field used to identify the channel for each receiver. When you build your Group Configuration Files, enter a channel name or number for each receiver so you can identify the channel for each receiver at a common site.

The Channel Name/Note field is also used for error logging printouts to identify which channel on a Comparator I/O Module has a disabled or failed receiver. You may find it helpful to include telephone circuit numbers or microwave channel numbers in this field.

A typical radio system may have multiple RF channels that have receivers at common sites, see the system configuration in Figure 12. This system has a *Comm Center* receiver on both the East and West Police channels. This can be confusing if you haven't uniquely identified the receiver with a Channel Description in the Group Configuration File.

NOTE: If transmitter steering information is being monitored, your receiver names could be over written by the status display messages whenever a receiver is not in the idle state. When the receiver returns to the idle state, the entire receiver name will be redisplayed.

6.4.5 Entering Module Configuration Information

The status text category determines how the I/O lines on the I/O modules (CIBs and IOBs) will be displayed on the PC. You will use the DEFAULT category (Vote, Rx, Dis, and Fail) for most comparator applications. Other general purpose I/O applications will need custom status text categories to display status messages such as On/Off, Up/Down, etc.

Each CIB or IOB module can have its own status text category. These categories are assigned to the module using the **Edit Module Config** menu command.

Using the **Edit Module Config** menu command, you can edit the configuration information for each of the I/O Modules being monitored. Figure 5 shows the pull-down **Edit** Menu that gives the **Module Config** menu option. Figure 7 shows the edit screen that appears for the **Module Config** option.
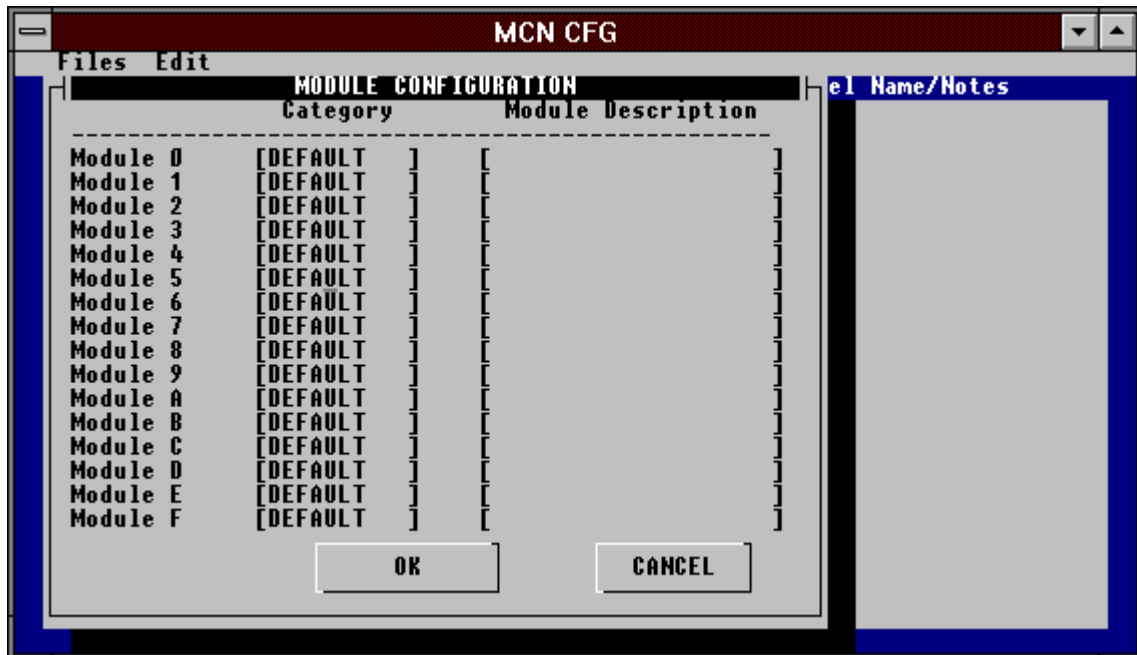
Figure 7 - Module Configuration Editing

When moving around this screen without a mouse, you must use the T key to moved between selections. To exit the screen, press the T key until the cursor is on the OK or CANCEL button and then press E.

6.4.5.1.1   Defining the Module's Status Text Category

From this screen you can program in the status text category that you want used for the Comparator I/O Module. This entry can be up to 10 characters long. The category name entered must be a category name that you created in the MCNRCD.CFG file. Section 9 provides details about the MCNRCD.CFG file and status text categories. The category names entered are stored in the MCF file that is created when you save the Group configuration.

If you are only going to use the default status text category for comparators (you will not be creating any additional categories in the MCNRCD.CFG file), then you will not have to edit this field for any module. When MCNCFG.EXE creates the MCF file, it assigns the category name DEFAULT to all modules.

6.4.5.1.2   Entering a Module Description

From the **Module Config** screen you can also enter a description for each module. This description can be up to 20 characters long. For example, you might enter the building or rack location of each module. This information can then be used as a troubleshooting aid to help locate modules quickly. The descriptions entered are stored in the MCF file that is created when you save the Group configuration.

6.4.6 Group Configuration File Editing Keys

The table below lists the editing key commands available to edit the Group Configuration File.

- **RIGHT ARROW** R

  The **RIGHT ARROW** R key moves the cursor non-destructively one character position to the right in the field.

  When the cursor reaches the end of the field, the **RIGHT ARROW** R key moves the cursor to the beginning of the next field.

- **LEFT ARROW** Q

  The **LEFT ARROW** Q key moves the cursor non-destructively one character position to the left in the field.

  When the cursor reaches the beginning of the field, the **LEFT ARROW** Q key moves the cursor to the beginning of the previous field

- **UP ARROW** Z

  The **UP ARROW** Z key moves the cursor to the same column of the previous line (field).

- **DOWN ARROW** Y

  The **DOWN ARROW** Y key functions identically to **UP ARROW**, except it moves the cursor to the next line.

- **RIGHT TAB** T

  The **RIGHT TAB** (Forward) T key selects the next field. If you are positioned at the bottom of the screen, It will scroll the screen up one line and move to the first column of the next line.

- **LEFT TAB** BT

  The **LEFT TAB** (BT) key functions identically to the Forward Tab, except it selects the previous field.

- **PGUP** O

  PGUP O will display the previous screen of receivers.

- **PGDN** N

  PGDN N will display the next screen of receivers.

- **HOME**

  Pressing the **HOME** Key will move the text cursor to the beginning of the current field.

- **END**

  This Key moves the text cursor to the end of the current field.

- **CTRL+ HOME**
  IF you press **CTRL+HOME** at the same time the cursor is moved to the beginning (receiver #1) of the receiver list.

- **CTRL+END**
  CTRL+END moves the text cursor to the last receiver (receiver #152) of the receiver list.

- **CTRL+D   (DITTO)**
  CTRL+D copies the text (either a receiver name or a channel description) from the line above to the current line. This editing key is useful when your receivers or channel descriptions have common text. Instead of having to re-type the common text for each line, you simply enter it once and the use the **CTRL+D** key to copy the text from the line above to the current line. Then, you simply edit the variable text on the new line. If the cursor is on the top line of the screen, the **CTRL+D** key does nothing.

- **INSERT   Key**
  The **INSERT** key is used to toggle between Insert and Overtype mode. When the **INSERT** key is pressed, the cursor toggles between a blinking underscore (overtype mode) and a blinking block (insert mode).

- **DELETE = Key**
  DELETE erases one character at the current cursor position. This differs from the Backspace key which deletes a character to the left of the current cursor position.

- **SHIFT+INSERT Key**
  This Inserts a blank entry at the current receiver number location and moves all of the following receivers down one row. All receiver numbers following the new entry are incremented by one and pushed down the list.

- **SHIFT+DELETE Key**
  The current receiver entry is deleted and all the receivers numbers following the deleted entry are decremented by one, thereby moving them up the list.

- **ESC X Key**
  The **ESC** X key (Escape) allows the operator to exit out of the current function and return to the preceding command menu.

6.4.7 Inserting and Deleting Receivers

If you make a mistake by skipping or duplicating a receiver when entering your
receivers, you can insert or delete a receiver at the current position of the database.
Use the following editing keys to Insert or Delete receivers:

SHIFT+INS
This inserts a blank entry at the current receiver number location and moves all of
the following receivers down one row.

SHIFT+DEL
The current receiver entry is deleted and all the receivers following the deleted
entry are moved up the list.

6.4.8 Saving the Group Configuration File

When you are finished building your Group Configuration File, use the **File Save**
menu command.

If this is a new Group Configuration File, the **File Save As** dialog box will come
up and you will be prompted for a file name. Enter a standard DOS file name
without the extension. The program will save the file with an .GCF extension.
You will get an error message if you enter the wrong extension.

Figure 8 - Saving a New Group Configuration File

When the GCF file is saved, MCNRCD automatically saves the MCF file to store
your module configuration information.

6.4.9 Example
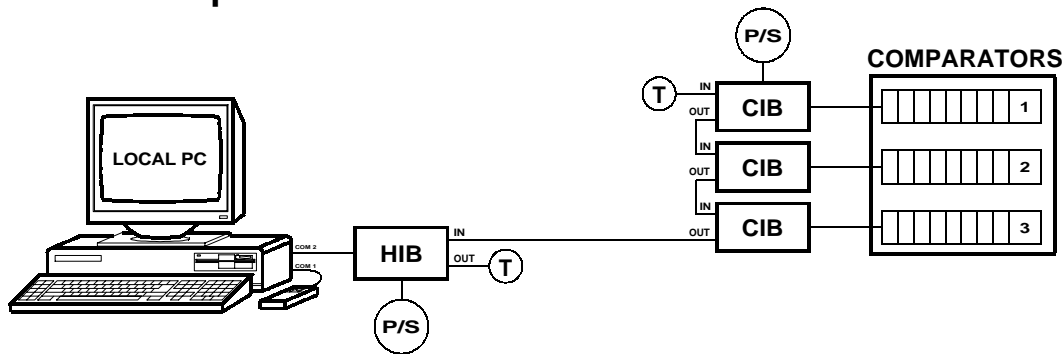
CA-80041-100

Figure 9 - MCN RCD Group Configuration Example

In this system, assume that the four MCN modules have the following unit addresses assigned to them:

- CIB #1 (connected to comparator 1) is Group 00, Module 0
- CIB #2 (connected to comparator 2) is Group 00, Module 1
- CIB #3 (connected to comparator 3) is Group 00, Module 2
- HIB is Group 80, Module 0

These addresses were assigned during system installation so that all of the CIBs of the system were addressed to the same MCN Group. Therefore, only one Group Configuration File needs to be created for the system. If the CIBs were addressed into three different MCN Groups, then three Group Configuration Files would have to be created, one for each CIB.

To create a Group Configuration File for this system, do the following:
1. Execute the **Files New Group Configuration** command
2. Execute the **Edit Group Number** command
3. Enter 00 as the new Group number
4. Select the **OK** box or press E
5. Enter receiver names and channel names/notes for the following receivers (see Figure 10 and Figure 11):
   - 00:0:1 through 00:0:8 (receivers for CIB #1)
   - 00:1:1 through 00:1:8 (receivers for CIB #2)
   - 00:2:1 through 00:2:8 (receivers for CIB #3)
6. Execute the **File Save** command
7. Enter the file name SYSTEM1

Figure 10 - Example Group Configuration

Figure 11 - Example Group Configuration (continued)

Figure 10 and Figure 11 show an example of the receiver names entered for this system. Notice that the **Grp** field, entered in step 3 above, of the receiver names is 00.

Now you have a file named SYSTEM1.GCF that defines all of the receivers for this system. Section 6.5.1 describes how this file will be used to create a MCN Screen File.

6.5 Building a Display Screen for your system

Now that you have your Group Configuration File built, it's time to start building a display screen. A typical screen is shown below. A description of the different fields will follow.
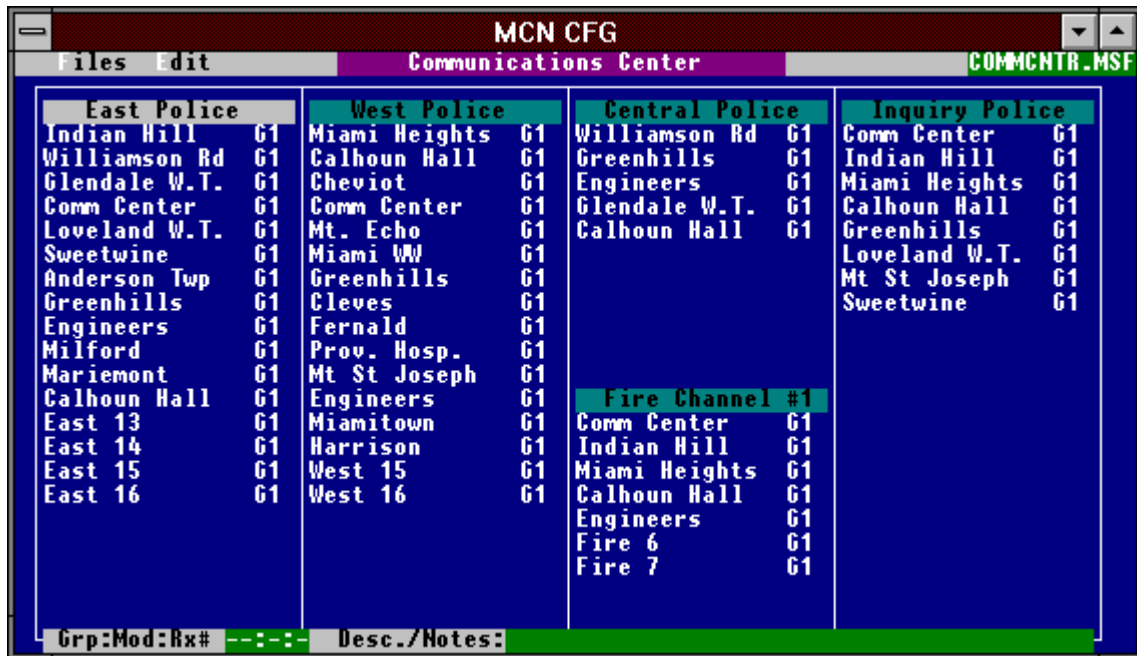
Figure 12 - Typical Fully-Configured Display Screen

File Name Display
MCNCFG displays the name of the currently loaded file on the right of the menu bar. When a new file is being edited, the display remains blank until it is saved with a valid file name.

Receiver Screen Locations
The screen has 88 display positions. Each display position can be used to display a channel title or a receiver name.

Receiver Module Set Numbers
Group configuration file numbers (G1-G4) corresponds to the Group Configuration File the receiver is defined in.

Receiver Status Line
When editing a screen file, MCNCFG displays a receiver status line on the bottom of the screen. Moving the keyboard cursor to a receiver on the display screen shows additional information about that receiver. The status line displays the full

receiver number, including the MCN Group and Module number of the
Comparator I/O Module for the receiver and receiver Desc./Notes.

Tip: It is a good idea to move the cursor over each receiver on the screen and
use the Channel Description field at the bottom of the screen to verify the proper
channel assignments after you are finished building your screen.

6.5.1 Opening a new MCN Screen File

To create a new MCN Screen File, select the **Files New Screen** menu command.
This command will clear the screen and display the **Active Group Files** Dialog
Box as shown in Figure 13.
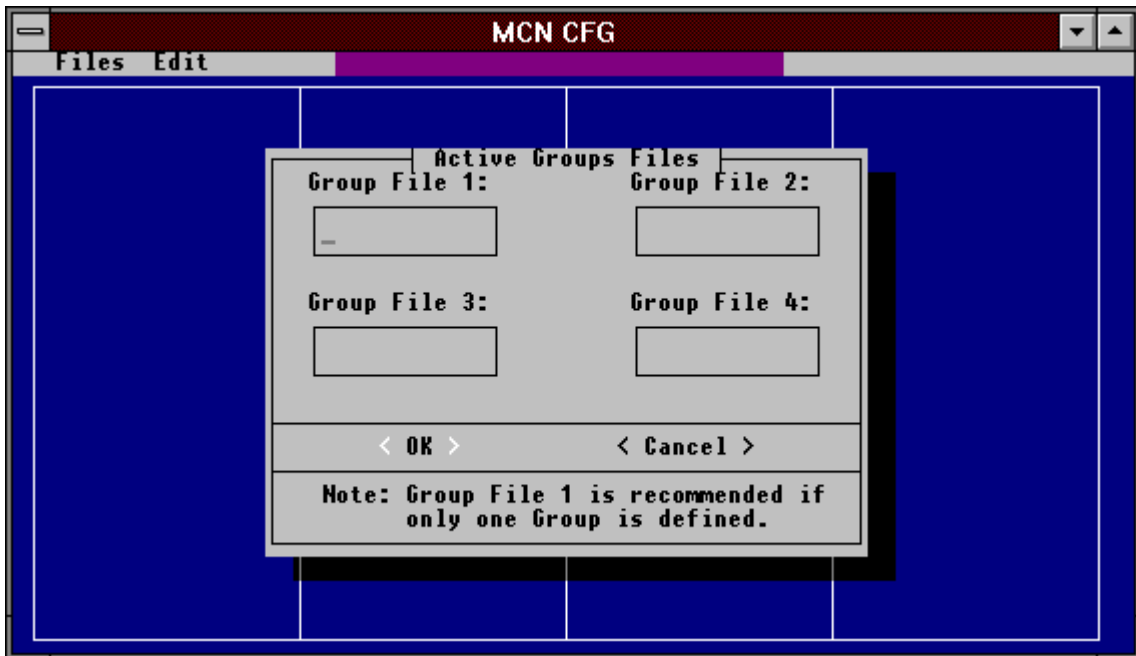
Figure 13- Configure Active Group Files Dialog Box

If you try to open a new screen and have not yet saved your work, a **Save
Changes** warning dialog box will be displayed.

6.5.2 Specify Group Configurations Dialog Box

When you build a screen, you must select the Group Configuration File(s) that contain the receivers you want to monitor and control. Up to four different MCN Groups can be monitored and controlled in a single MCN Screen File.

To Select Group Configuration Files:

1. The cursor will start in Group File 1.
2. Press the E key or left-click the mouse in the Group File 1 box. A list of Group Configuration Files will appear.
3. Select the Group Configuration File for the Group that this screen will monitor. Double click on your choice or press E.

Note: Repeat this procedure if you want to monitor and control receivers from more than one MCN Group.

4. Press the **T** key until the <OK> button is highlighted and press E. (You can also use the mouse to click the < OK > button.)
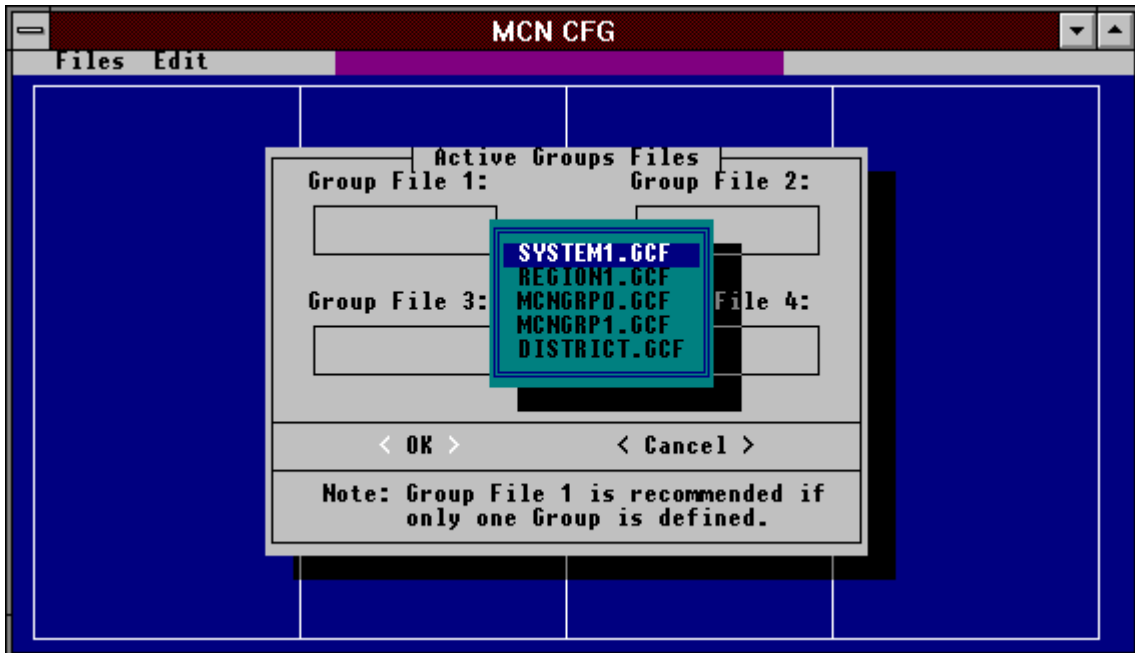
Figure 14 - Selecting a Group Configuration File

Normally the **Active Group Files** dialog box is used only when you start to build a new MCN Screen File. You can also bring up the **Active Group Files** dialog box using the **Edit Group Configurations** menu command to change the GCF files that a screen refers to. If you change a Group File name using the **Edit Group Configurations** menu command, any receivers names from the original Group Configuration File that were placed on the screen will be changed to the receiver names from the new Group Configuration File. When you press the <OK> button, the MCNCFG program will bring up the **Set Active Group File** Dialog box.

6.5.3 Selecting One Group to Work With -- Set Active Group Dialog Box

When you place receivers on a display screen, you can work with receivers from only one Group file at a time.

To select Group file 1, press E to select that .GCF file. Select one of the other Group files to work with by using the Z or Y keys. Press the T key to get to the OK button and then press E. You can also select a Group file with the mouse.

If you need to place receivers from more than one Group on the same screen, place the receivers from one Group first and then use the **Edit Select Active Group File** menu command to select a different Group to work with.
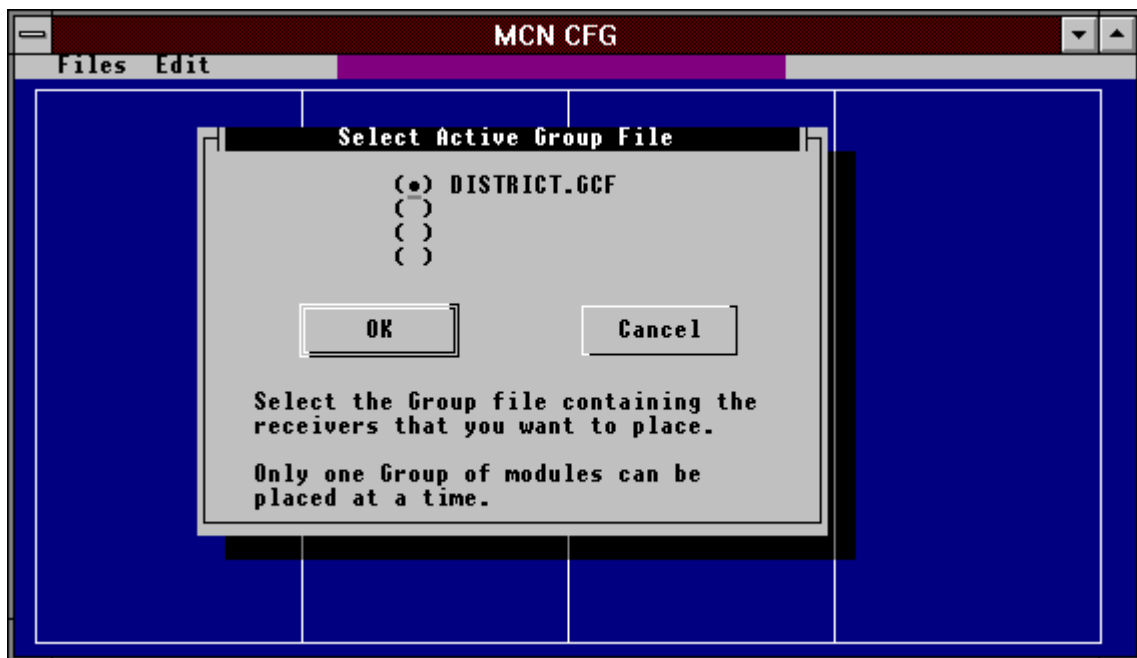
Figure 15 - Set Active Group File Dialog Box

6.5.4 Assigning a Unit Address to the HIB or PCLTA

As stated in the MCN System Manual, reference 1, section *Setting the Unit Address*, all MCN modules must have a unique address assigned to them.

If your HIB module has a model number S2-60081-xxx where 'xxx' is 200 or greater, the HIB's unit address is set by the rotary switches located on the rear of the module. See reference 1 for details about these switches. You can then skip using the **Edit HIB Address** command.

If your HIB's model number has an 'xxx' number less than 200 or if you are using a PCLTA card, then you must use the **Edit HIB Address** command to enter the unit address of the HIB because the HIB module does not have the rotary switches to do this. The unit address of the HIB is programmed into the MCN Screen File

using the **Edit HIB Address** command. Figure 16 shows the dialog box that appears.
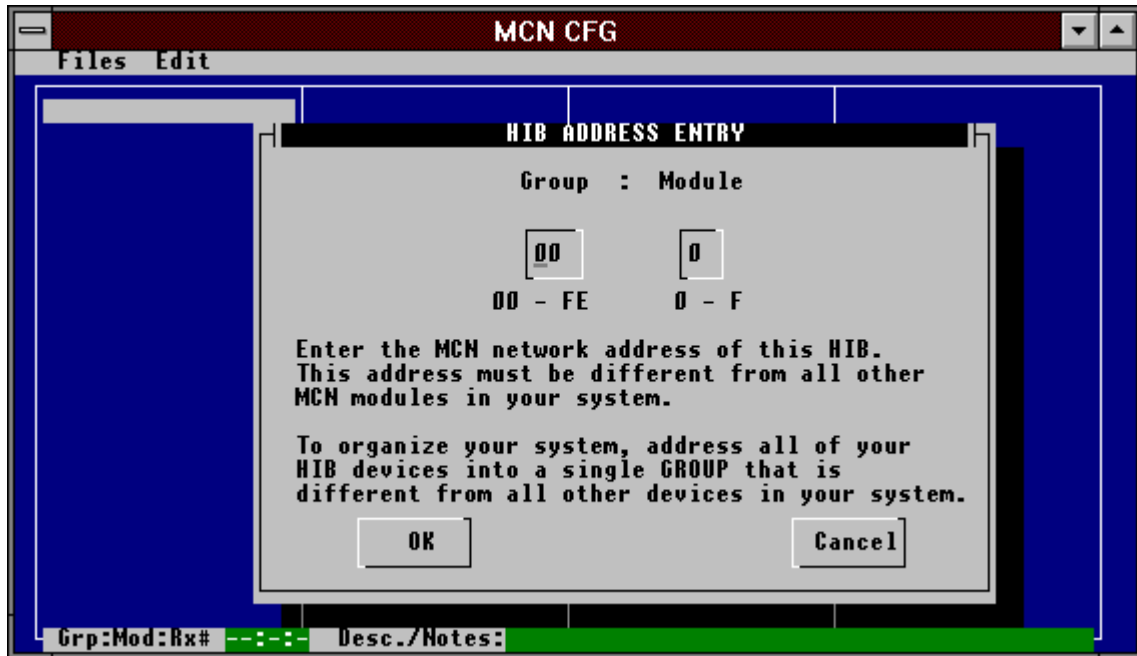
Figure 16 - HIB Address Entry Dialog Box

To enter a new address for the HIB or PCLTA, do the following:
1. For the Group number, enter a number between 00 and FE (hex). The default Group number is 80 (hex).
2. T over to the Module number field and enter a number between 0 and F (hex).
3. T over to the <OK> button and press E to save the new address.

Every screen file must have the correct HIB or PCLTA address programmed.

All MCN modules in a system must have its own unique address. Each MCNRCD screen files on a single PC should have the same unit address assigned to them and all PCs should be assigned to a unique unit address. When assigning addresses to the modules, you may want to reserve a single MCN Group (or cluster of Groups if you have more than 16 HIBs and PCLTAs in the system) for all of the HIBs and PCLTAs. Typically, Group numbers 80 and up are used for HIBs and PCLTAs.

6.5.5 Adding Channel Titles to the Display Screen

If you display multiple channels on a screen, you will probably want to add channel titles to help the user identify the receivers. Channel Titles can be 18-characters long.

Tip: As you build your display, you can add Channel Titles and place Receivers in whatever order you want. (You don't have to add all the Channel Titles first.) It is usually easier to enter a Channel Title and place the receivers for that channel. You can then determine where to place the Channel Title and Receivers for the next channel.

To Add a Channel Title To the Screen

1 Select the position where you wish to place a **Channel Title** by moving the keyboard cursor to that screen location or by clicking on the location with the right mouse button. Press INSERT. The keyboard cursor will change color to the Channel Title color.

2 Type in the Channel Title that you want to appear at that screen position. You can use spaces to center up the title. After typing the title press E. The title then changes color to the keyboard cursor color. Move the keyboard cursor to see how the Channel Title will normally be displayed.

6.5.6 Placing Receivers on the Screen

Once you have either created a new Screen File or opened an existing one, you are ready to determine where the receivers will appear on the screen. The MCNCFG Program is now in the *Place Receivers* mode.
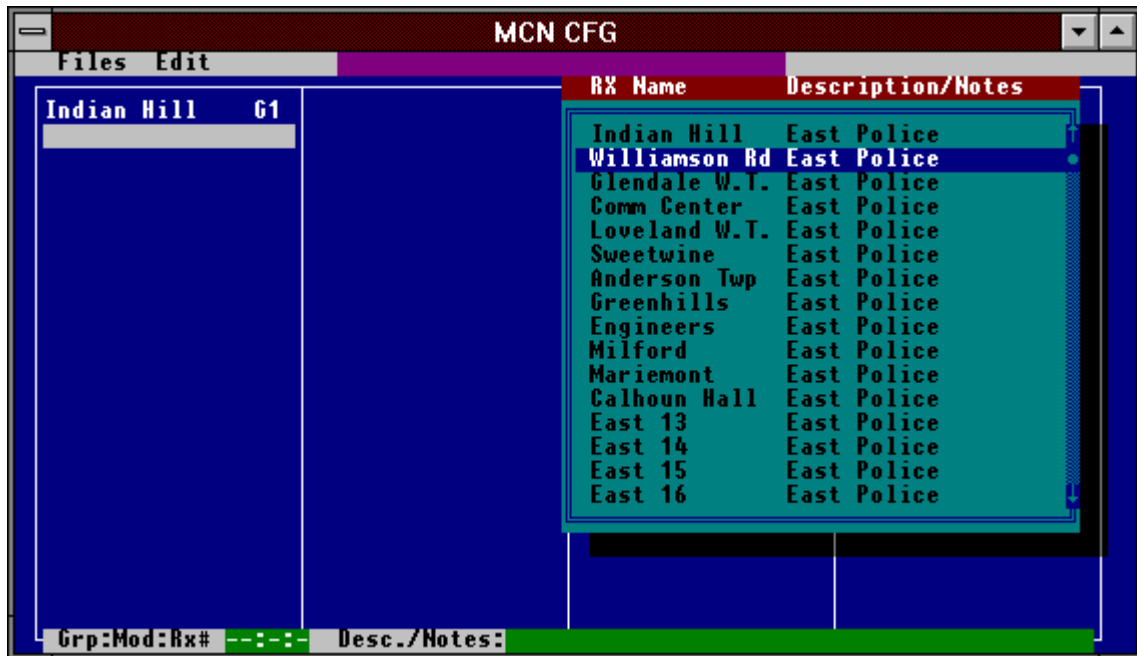
Figure 17 - Placing Receivers on a Display Screen

To Place a Receiver on the Screen
With the Keyboard...
1. Select the position where you wish to place a receiver by moving the keyboard cursor to that screen location.
2. Press E. This brings up the receiver list box as shown in Figure 17.
3. Select a receiver to be displayed in that position. Use the keyboard cursor movement keys to highlight the desired receiver and then press E to select the desired receiver.

TIP: After you place a receiver, the keyboard cursor automatically moves to the next screen position. Pressing E brings up the receiver list box and automatically highlights the next receiver in the list. Pressing E again places the receiver on the screen. By repeatedly pressing E in this way you can quickly place receivers on the screen in the order they appear in the list box.

With the Mouse...
1. Select the position where you wish to place a receiver by clicking the left mouse button on that area of the screen. The Keyboard cursor is moved to the area you selected and the receiver list box appears.
2. Select a receiver to be displayed in that position. To select a receiver use the mouse to double click on the desired receiver name.

TIP: You can use any combination of keyboard and mouse controls to place receivers. As an example you can pick screen positions with the keyboard cursor by pressing E. Then pick the receiver from the list box by using the scroll bars and double clicking with the mouse.

6.5.7 Deleting a Receiver or Channel Title From the Screen
With the Keyboard...
1   Select the receiver name or channel title you wish to delete by moving the keyboard cursor to that screen location. Press the = key.
With the Mouse...
1   Move the mouse cursor to the name or channel title you wish to delete.
2   If you have a two or three button mouse, press the right and left mouse buttons together, and then release them.
    If you have a three button mouse, press the middle button then release.

6.5.8 Edit Screen Name
You can enter a screen name for each screen that you build. The screen name will be displayed on the top line of the screen in the Remote Comparator Display (MCNRCD) program. This command can only be executed when a valid screen file (*.MSF) is loaded.

Note: If you plan to display only one radio channel on a screen, you can enter the channel name in place of the screen name. You can then use all 88 receiver positions for actual receivers.

To enter a screen name:
1. Use the **Edit Screen Name** menu command. The **Screen Name** dialog box will appear.
2. Enter the screen name in the edit box. You can use spaces to center the screen name.
3. Use the T key to highlight the <OK> button and press E to confirm your selection. You can also use the mouse to select <OK>.
4. The new screen name will appear on the menu line of your screen.
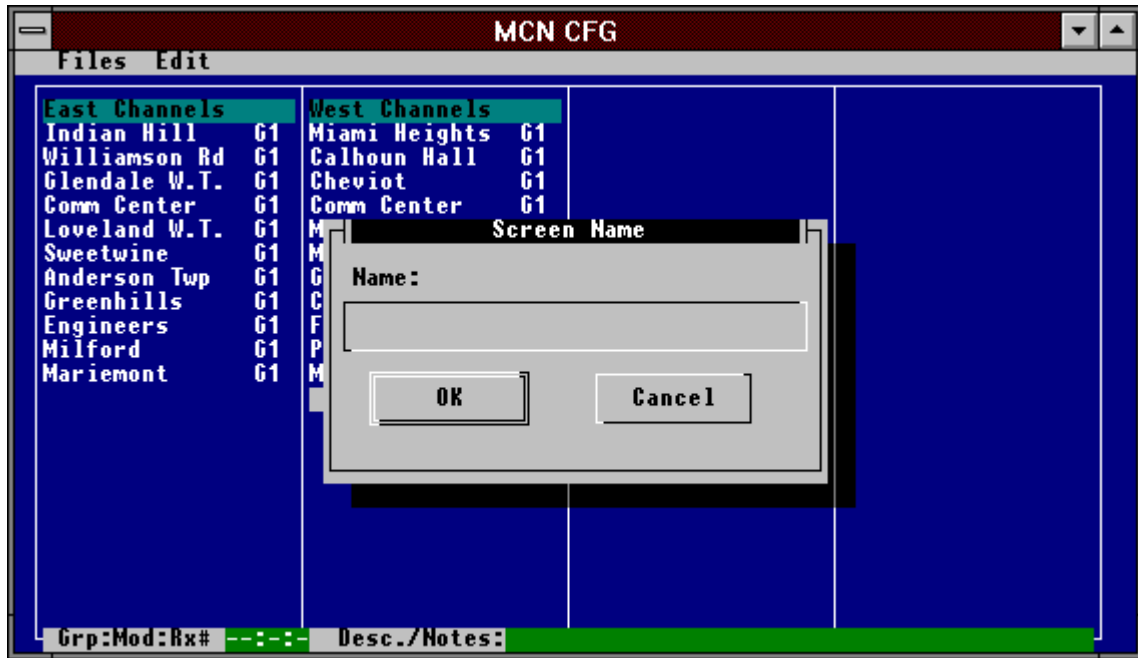
Figure 18 - Entering a Screen Name

6.5.9 Entering the HIB Telephone Number / Modem Dialing String

If you are using the MCNRCD and HIB with dial-up modems, you must enter a modem dialing string (the phone number for the HIB location) into the screen file.

To program the dialing string for this screen:

1   While the screen file is loaded press H, e, d or pick the **Edit Dialing String** menu command with the mouse. If a screen file is not loaded this command is inactive.

2   Type the "AT" dialing command for your modem, including PBX access codes, phone number.

Figure 19 - Entering the HIB Dialing String

The dialing string consists of:

Description	Typical Entry
1. Modem Attention Code	ATDT
2. PBX Access Codes & Wait (if needed)	9W
3. HIB Modem Telephone Number	555-1234

The above example would be entered as: "ATDT9W555-1234" (Don't enter the quotes.)

For more information on your modems dialing commands consult your modems documentation and section 10 for more details.

Tip: An easy way to test your modem dialing commands is to use a terminal program such as Procomm. You can try different dialing strings to make sure they work. Note that if you try calling the HIB with a terminal program such as Procomm, you will see strange control characters coming back to you when the modems connect.

6.5.10 Saving the MCN Screen File

When you are finished building your screen, you must save the MCN Screen File.

Tip: Before you save the file, it is a good idea to move the cursor over each receiver on the screen and use the Channel Description field at the bottom of the screen to verify the proper channel assignments.

Use the **Files Save** menu command to save your MCN Screen File.

If this is a new MCN Screen File, the **File Save As** dialog box will come up and you will be prompted for a file name. Enter a standard DOS file name without the extension. The program will save the file with an .MSF extension. You will get an error message if you enter the wrong extension.

After you save a screen file, the file name will appear on the right side of the menu bar.

6.5.11 Example

Using the system example shown in Figure 9 and the Group Configuration File SYSTEM1.GCF that was created in section 6.4.9, we will now create a screen file that can be used to monitoring and control of the system. To create this file, do the following:

1. Execute the **Files New Screen** command, the cursor will start in Group File 1
2. Press the E key to get the list of Group Configuration Files.
3. Using the arrow keys, position the highlighted bar on the file SYSTEM1.GCF and press the E key to select the file.
4. Press the T key until the <OK> button is highlighted and press E
5. The **Select Active Group File** dialog box will appear with the file name SYSTEM1.GCF in the top position.
6. Press the E key to select this as the active file.
7. Enter any Channel Titles that you want to help describe your system.
8. Place the receivers on the screen.
9. If your MCN HIB module has a model number S2-60081-xxx where 'xxx' is the number 200 or greater (this number is found on the rear of the module), set the GROUP number rotary switches to 80 and the MODULE number rotary switch to 0 (these switches are found on the rear of the module. Skip to step 11.

10. If your MCN HIB module has a unit number where 'xxx' is less than 200 or if you are using a PCLTA card, you must execute the **Edit HIB Address** command to specify the MCN address of the HIB module that will be connected to this PC.

    For the Group number box, enter 80.
    Press the T key to move the cursor to the Module entry box.
    For the Module number box, enter 0.
    Press the T key until the <OK> button is highlighted and press E

11. Execute the **Edit Screen Name** command to specify a name for this screen file.
12. In the edit box, enter the string SYSTEM EXAMPLE.
13. Use the T key to highlight the <OK> button and press E to confirm your selection.
14. Execute the **File Save** command to save the screen file.
15. Enter the file name EXMPLSYS and press E.

Now, the file name EXMPLSYS.MSF is the MCN Screen File for the example system.
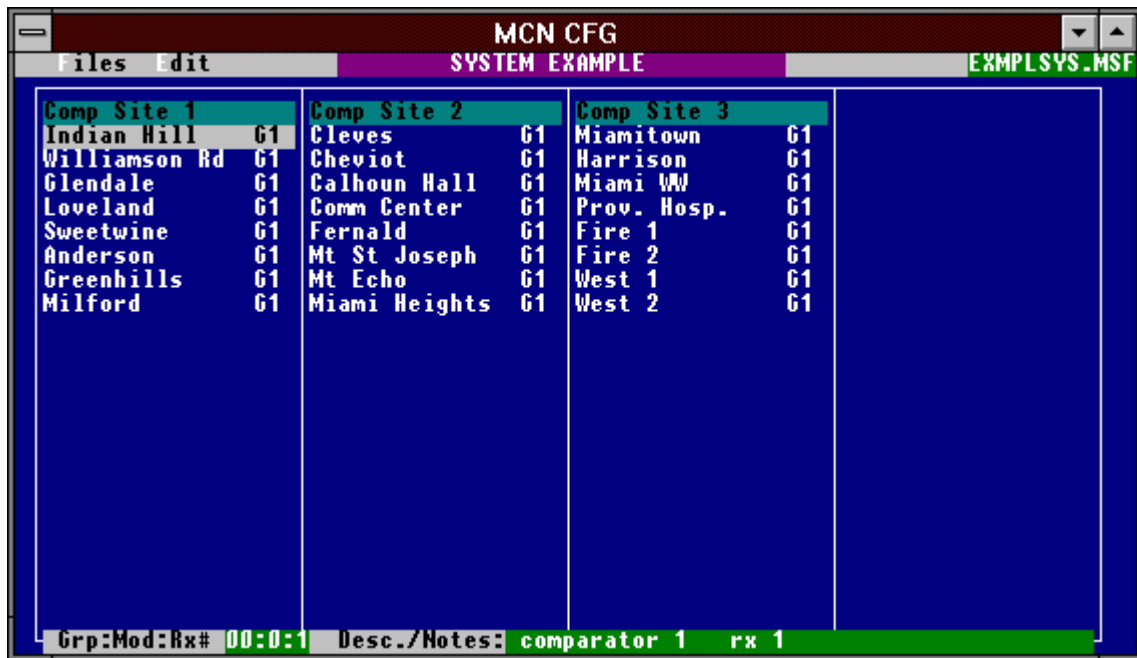
Figure 20 - System Example

6.5.12 Exiting the Configuration Program

When you are finished building the Group and MCN Screen Files, use the **Files Exit** menu command to quit the program.

If you try to exit and have not yet saved your work, a **Save Changes** warning dialog box will be displayed.

6.6 Additional MCNCFG Menu Commands and Dialog Boxes

The above tutorial took you through the creation of new Group and MCN Screen Files. In the process we skipped some menu commands and dialog boxes in the program. These have to deal mostly with working with existing files. This section covers the remaining menu commands and dialog boxes.

6.6.1 Opening an Existing Group File

You can open an existing Group Configuration for further editing by using the **Files Open Group Configuration...** menu command.

This menu or list box contains a list of all Group Configuration Files (*.GCF) stored on the current directory of the display PC's hard drive. Choose the file by double-clicking on it with the mouse or highlighting it and pressing E.

If you try to open a Group Configuration File and have not yet saved your work, a **Save Changes** warning dialog box will be displayed.

6.6.2 Opening an Existing MCN Screen File

You open existing Screen Files by using the **Files Open Screen...** menu command.

When you open an existing screen file, the program will not automatically display the **Active Group Files** dialog box, since the Group(s) have already been configured. If you need to change the Group configuration, or select a different active Group file to work with, these commands are available under the **Edit** Menu.

If you try to open a Screen File and have not yet saved your work, a **Save Changes** warning dialog box will be displayed.

6.6.3 Renaming a File

You can save a Group Configuration File or a MCN Screen File with a different name. To do this, do the following:
1. Select the **Files Save As** menu command. The **File Save As** dialog box will be displayed.
2. Enter a standard DOS file name without the extension. (You will get an error message if you enter the wrong extension.)
3. Press E or select the <OK> button with the mouse.

4. The program will save the file with the proper extension (GCF for Group Configuration Files and MSF for MCN Screen Files).

5.

Note: The original file will not be deleted or modified.

6.6.4 MCNCFG "File Already Exists" Warning

If you do a **File Save As** menu command and you specify a file name that is already used, the MCNCFG program will display a **File Already Exists** warning dialog box. It asks you whether you want to overwrite the old file. Your choices are:

<Yes>   Overwrites old file.

<No>   Does not overwrite the old file. This option lets you enter a new file name.

<Cancel>   Does not overwrite the old file. Cancels the Save As command and returns to the Group or Screen configuration screen.

6.6.5 MCNCFG "Save Changes" Warning

If you make any changes to your currently loaded Group or Screen file, and then try to load another file or exit the program, the MCNCFG configuration program will display a **Save Changes** dialog box. This asks you if you want to save changes. Your choices are:

<Yes>   Saves changes and continues with the Load or Exit operation.

<No>   Discards changes and continues the Load or Exit operation

<Cancel>   Keeps changes in memory (but doesn't save the changes to disk) and cancels the Load or Exit operation.

7. Running the MCN Comparator Display (MCNRCD) Program

This section shows you how to operate the MCN Remote Comparator Display (MCNRCD.exe) program.

- Starting the MCNRCD Program -- Quick Start
- Loading a Screen File (*.MSF)
- Modem Dialing / System Initialization
- MCNRCD Information Screen
- Comparator Display Screen Layout
- Controlling Receivers with the Mouse and Keyboard
- Logging Options (Status / Error)
- Exiting the MCNRCD Program
- MCNRCD Program Command Line Options
- Running the MCNRCD Program Automatically From Batch Files

7.1 Starting the MCNRCD Program -- Quick Start

To start the MCN Remote Comparator Display program, type the following at the DOS command line:

C:> CD CTI E

C:> MCNRCD E

This assumes you have already installed the correct device driver in your CONFIG.SYS file.

See Section 7.7 for descriptions of the command line options available.

7.2 Loading a Screen (File / Load Command)

The Screen function allows the user to select a screen to be displayed. One screen may be selected from a list of up to 50.

Place the mouse cursor over the **Load Screen....** option in the **Files** menu and click the left mouse button or hit the keyboard **A l** E. This will bring up a vertical menu bar with the screen files as shown in Figure 21.

Use the mouse cursor or the keyboard up and down arrows to highlight a screen file to load. Double click the left mouse button or hit E to load the file.
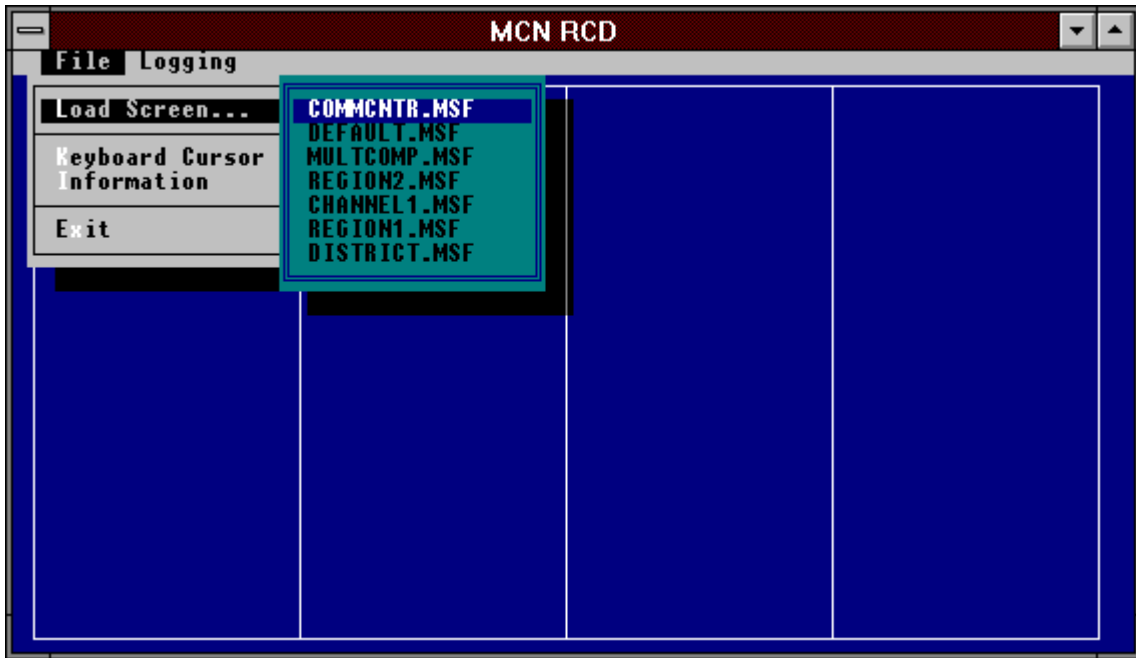
Figure 21 - MCNRCD File Load Screen

Quick Start Hint: To initially test your system, load the DEFAULT.MSF screen file before you build your custom Group Configuration Files and MCN Screen Files. This is a pre-built MCN Screen File that is shipped with the MCNRCD software. It is pre-configured for Comparator I/O Modules addressed to both Group 00 and Group 01.

When a new screen is selected, its MCN Screen File (MSF) and the associated Group Configuration Files (GCF) will be loaded. The screen will be displayed with the appropriate receiver names.

7.2.1 Modem Dialing

If you are using a MCN RCD system with dial-up modems, the MCNRCD program will go through a dialing sequence to connect to the remote HIB. The program reads the dialing string from the MCN Screen File (*.MSF), or the MCNRCD command line, and proceeds to make the connection.

Figure 22 - Call Progress Status

The above example shows the progress of a call before the remote HIB modem answers. The MCN Initialization Box has a Cancel button which allows you to terminate the call before the remote HIB modem answers.

When you are running the MCN Remote Comparator Display program in dial-up mode and you exit, the MCNRCD program will disconnect the current modem connection. It will display a **Modem Disconnect Sequence** dialog box to inform you of the status of the disconnect sequence.

7.2.2　System Initialization

When the screen file is loaded, an MCN Initialization message box will appear on the screen. This message box will show the progress of the HIB initialization, as shown in Figure 23. When this message box appears, MCNRCD attempts to communicate with and initialize the HIB or PCLTA.
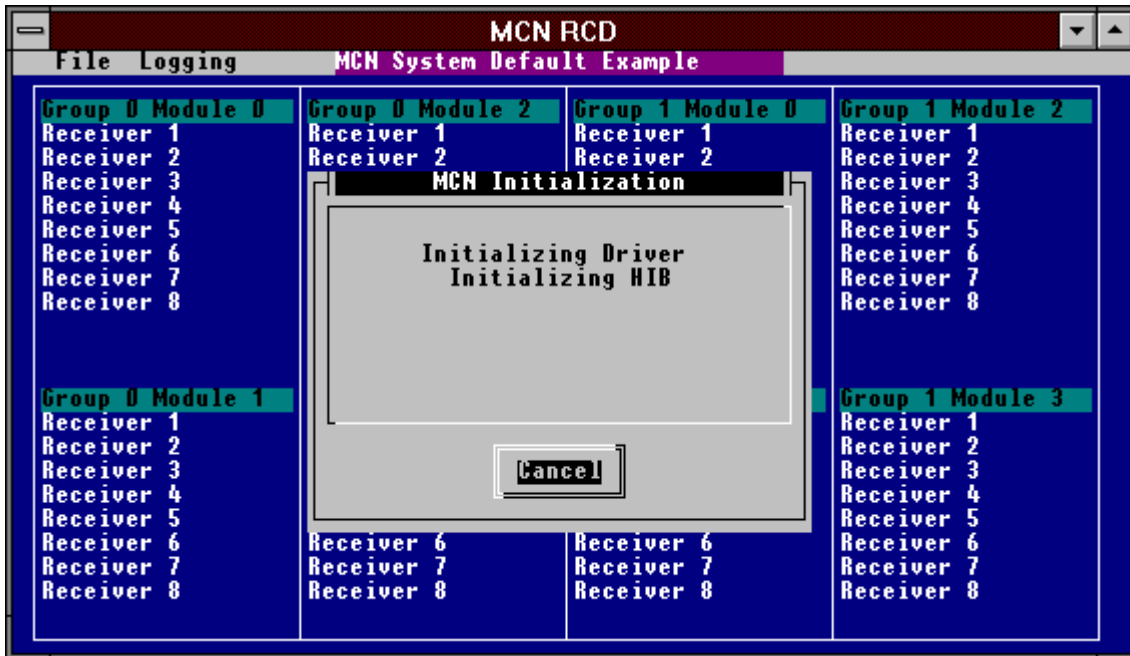
Figure 23 - HIB Initialization Message Box

For the first screen load of your MCNRCD session, the message "Checking for router" will appear. The MCNRCD software is attempting to initialize a router that may be installed in the system (this router is used only in large, custom systems). This router initialization or attempt to find the router takes a few seconds. If your system does not have a router installed, this message will not appear on any other screen loads (unless you exit to DOS and restart the MCNRCD software). If your system does have a router installed, this router initialization will occur on every screen load.

After the HIB or PCLTA is initialized, MCNRCD removes the message box from the screen and logs a status message indicating that the HIB or PCLTA has been successfully initialized.

MCNRCD then begins to communicate with all of the Comparator I/O Modules that are defined in your Group Configuration Files for the loaded screen file. Figure 24 shows the screen display during this part of the system initialization. Notice the message "Initializing Network..." that appears in the upper right corner of the screen. This message indicates that MCNRCD is trying to initialize all of the configured Comparator I/O Modules. MCNRCD will attempt to establish

communications with each module individually to find out which modules are actually connected to the MCN network and operating.

If all of the configured Comparator I/O Modules are connected to the MCN network and are powered, this module configuration will take only a second or two. However, if the screen file has a module configured that is not connected to the MCN network or is not powered, then the module configuration will take longer (MCNRCD will delay approximately two seconds for each module that is configured but not connected to the MCN network or not operating).
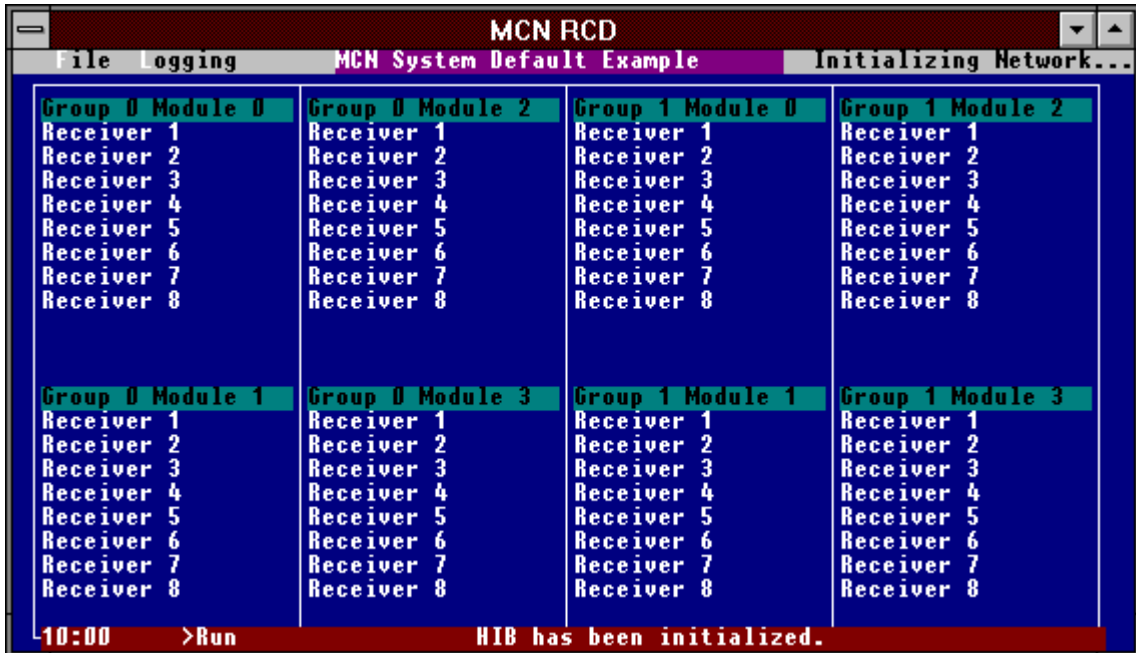
Figure 24 - Initializing the MCN Modules

When MCNRCD is finished initializing the Comparator I/O Modules, the "Initializing Network..." message is removed. MCNRCD is now ready for normal system operation.

7.2.2.1   **HIB Initialization Failures**

During the HIB initialization sequence, see Figure 23, if MCNRCD is not able to establish communications with the HIB, MCNRCD will time out and display the error message shown in Figure 25. This error message will also be displayed if, during system operation, MCNRCD is no longer able to communicate with the HIB. If this error occurs, follow the diagnostic tips displayed to correct the problem, and then press E key or place the mouse cursor on the **Continue** button and click the left mouse button. MCNRCD will then attempt to re-initialize the HIB.

NOTE: If no action is taken to continue, MCNRCD will automatically continue after one minute.
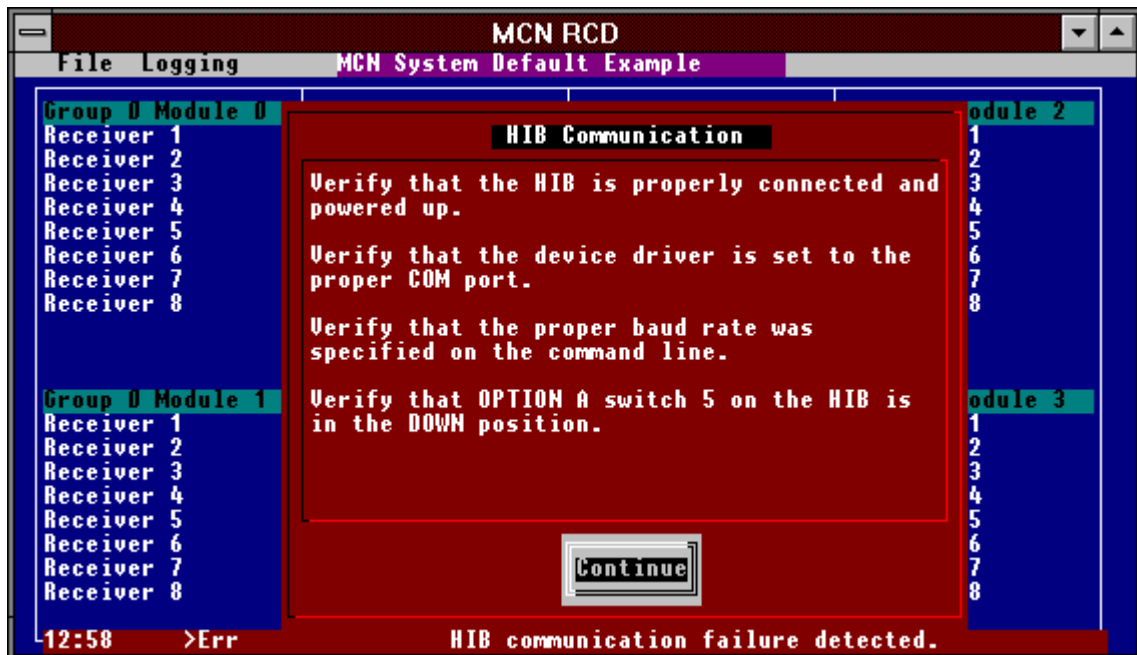
Figure 25 - HIB Initialization Failure

Note: If a HIB initialization error does occur after the system has been running for only a short time, then check the type of UART your COM port uses. If it is a 16450 or 8250 type UART, then try running the MCNRCD software at a slower data rate, either 14400 bps or 9600 bps (remember to change the HIB's baud rate selection switches to match the new data rate and then reset the HIB module).

7.3 MCNRCD Information Screen

An **Information** option is available in the **File** menu that gives various information about the MCNRCD system. Figure 26 shows the information available when a screen file is loaded.
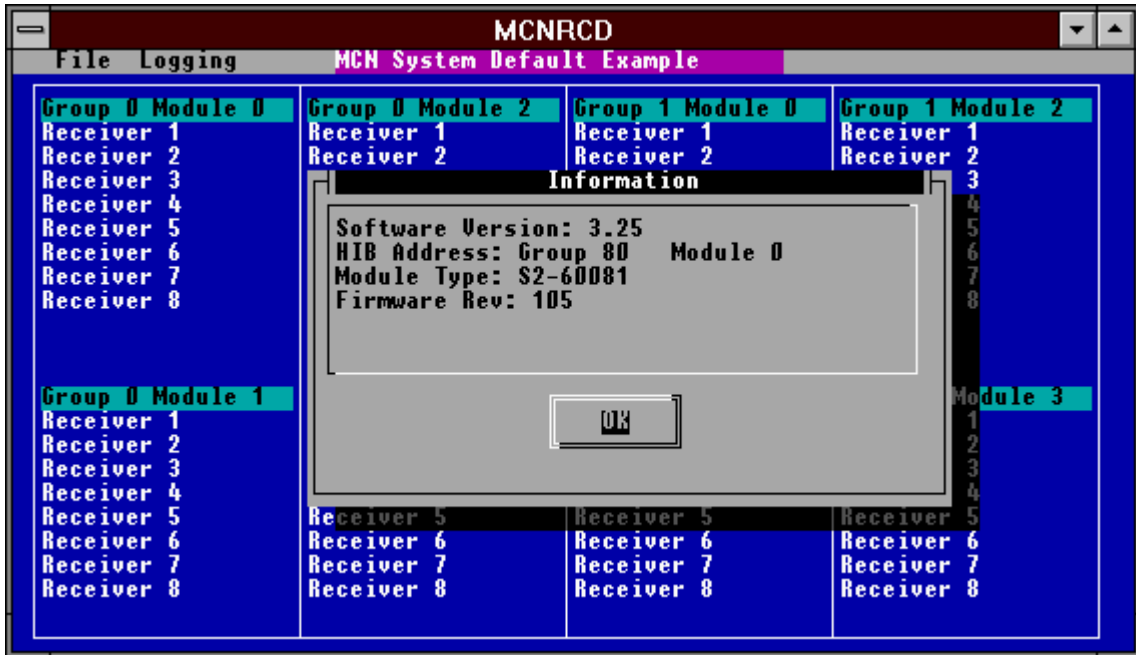
Figure 26 - MCNRCD Information Box

The software version number is the version number for MCNRCD.

The HIB address is the MCN module address for the HIB.

Module type is the HIB's model number. If you are using a PCLTA card instead of the HIB, the module type will be "PCLTA".

Firmware rev is the HIB's firmware revision number. This line is omitted if you are using a PCLTA.

7.4 Comparator Display Screen Layout

A typical receiver screen is shown below:
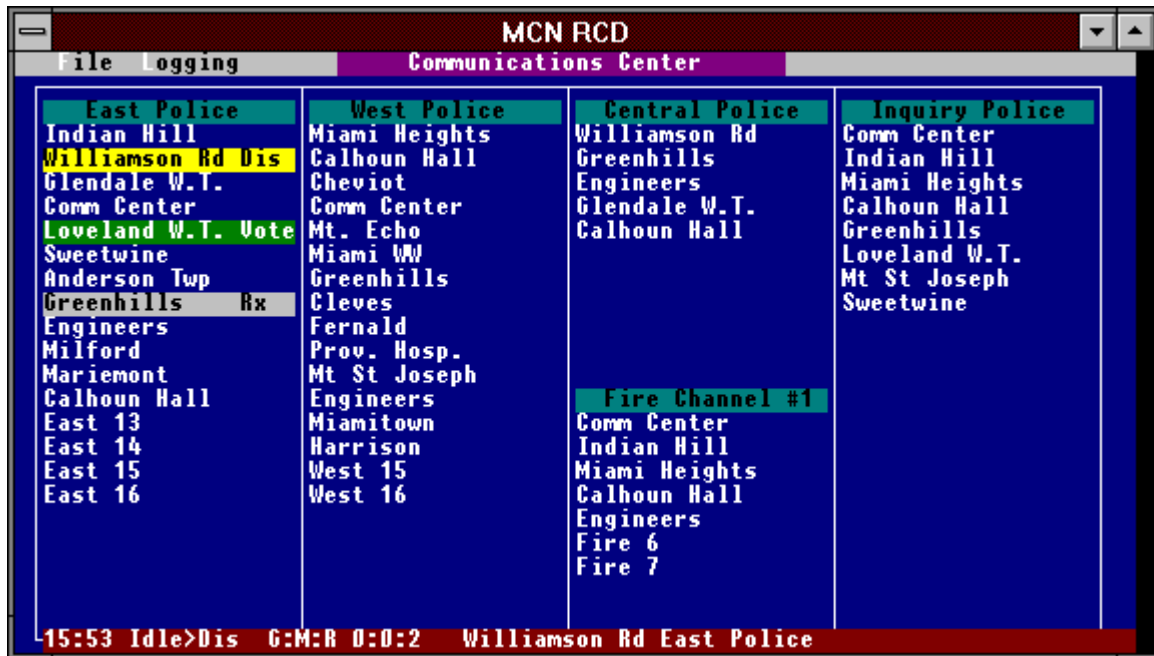
Figure 27 - Receiver Activity on an MCNRCD Screen

The Receiver Display Screen has the following items:

- Menu Bar   Located at the top left of the screen

- Screen Name   Located at the top center of the screen

- Channel Titles   Highlighted areas that extend across the receiver
                    Name column and the Receiver Indicator Column

- Receiver Names   Located on the left side of the four columns in the
                    body of the screen

- Receiver Indicators   Located to the right of the Receiver Names

- Error Status Line Present on the bottom line of the screen when an
                    error has occurred and the "Show Errors On
                    Screen" option is enabled.

The Receiver Indicators display the status of the receivers. The following status indications can be displayed:

Status	Indicator	Background color	Text Color
No Activity		Blue	
Vote	Vote	Green	White
Receiving	Rx	Lt Gray	Dark Gray
Disabled	Dis	Yellow	Black
Failed	Fail	Red	White
Error	Err	Brown	Yellow
Transmitter Selected	Tx	Magenta	White
Vote + Tx Selected	Tx/Vote	Green	White
Receiving + Tx Selected	Tx/Rx	Lt Gray	Dark Gray
Disabled + Tx Selected	Tx/Dis	Yellow	Black
Failed + Tx Selected	Tx/Fail	Red	White

Table 1 - Receiver States

The last 5 items listed in Table 1 are used to show a transmitter's status along with the corresponding receiver's status. This transmitter status will only be displayed if the Comparator I/O Module monitoring the receivers is also operating with a TSAM Interface Module (TIB) to provide monitoring and control of transmitter sites (see section 2.3).

7.5 Controlling Receivers

You can use the MCNRCD program to control the receiver operation at your remote comparator. You can manually FORCE VOTE a receiver from the PC and listen to its audio quality over your system. You can also DISABLE a receiver that is defective or has a bad phone line. When the receiver or phone line is repaired, you can re-enable the receiver from the PC.

7.5.1 Controlling Receivers With The Mouse

The mouse is used to force vote sites and to disable sites from the main receiver screen.

To Force vote (monitor) a receiver:
To force vote a site, place the mouse cursor over a receiver and click the left mouse button. The receiver will remain voted as long as you hold the left mouse button.

To Disable a receiver:
To disable a site, place the mouse cursor over a receiver and click the right mouse button. The receiver will remain disabled.

To Re-Enable a receiver:
To re-enable a site, place the mouse cursor over the previously disabled receiver and click the right mouse button.

Quick Start Tech Note: Test the FORCE VOTE and DISABLE functions for each receiver on the screen and verify the operation at the comparator. Some configurations of Comparator I/O Modules do not have the FORCE VOTE (MON) output and the VOTE input jumpered together on the board. These modules will not give a vote indication back to the PC until the lines are connected together at the comparator. The same holds true for the Disable circuits on some boards.

7.5.2 Controlling Receivers With The Keyboard
MCNRCD lets you execute all program functions from the keyboard as well as from the mouse. To allow keyboard operation, a keyboard cursor is used. Control of the cursor is provided by the cursor arrow keys. Keyboard commands are then used to control the receiver selected by the cursor.

The MCNRCD program checks for the presence of a mouse at startup. If one is detected, the Keyboard Cursor is turned off. If no mouse is detected, the Keyboard Cursor will be turned on. You can also manually turn the keyboard cursor on and off.

To Turn the Keyboard Cursor On or Off:
1   From the **File** menu, choose **Keyboard Cursor On (Off)** A f k E. The keyboard cursor will turn off if it was previously on or turn on if it was previously off.

To Force Vote a receiver:
1   Verify that the Keyboard Cursor is on.
2   Position the Keyboard Cursor over the receiver you wish to control.
3   Momentarily press v. The receiver will be voted while v is pressed.

To Disable a receiver:
1   Verify that the Keyboard Cursor is on.
2   Position the Keyboard Cursor over the receiver you wish to control.
3   Momentarily press d. This disables the receiver, it remains disabled until d is pressed a second time

7.6 Logging Options (Error or Statistics)
MCNRCD supports two types of information logging.

The first is **Error** logging, which is used to log only failure information. This
information can be logged to the screen, the disk or both. The **S**how Errors On
Screen [ ] box enables the program's status line to display the error message
received.

The second type of logging is **Statistics** logging, which is used to log all changes
from all Comparator I/O modules. This information can only be logged to the
disk. When statistics logging is enabled, any modules errors that occur (modules
falling off-line, etc.) are displayed on the screen as well as being logged to the file.

*Only one of the two types of logging (Statistical or Error) may be enabled at a
time*. The type of logging desired is selected from the **Logging Options** menu of
MCNRCD, as shown in Figure 28.

Logging Options selections are saved in the MCNRCD.INI file, so they take
effect each time you restart the MCNRCD program.
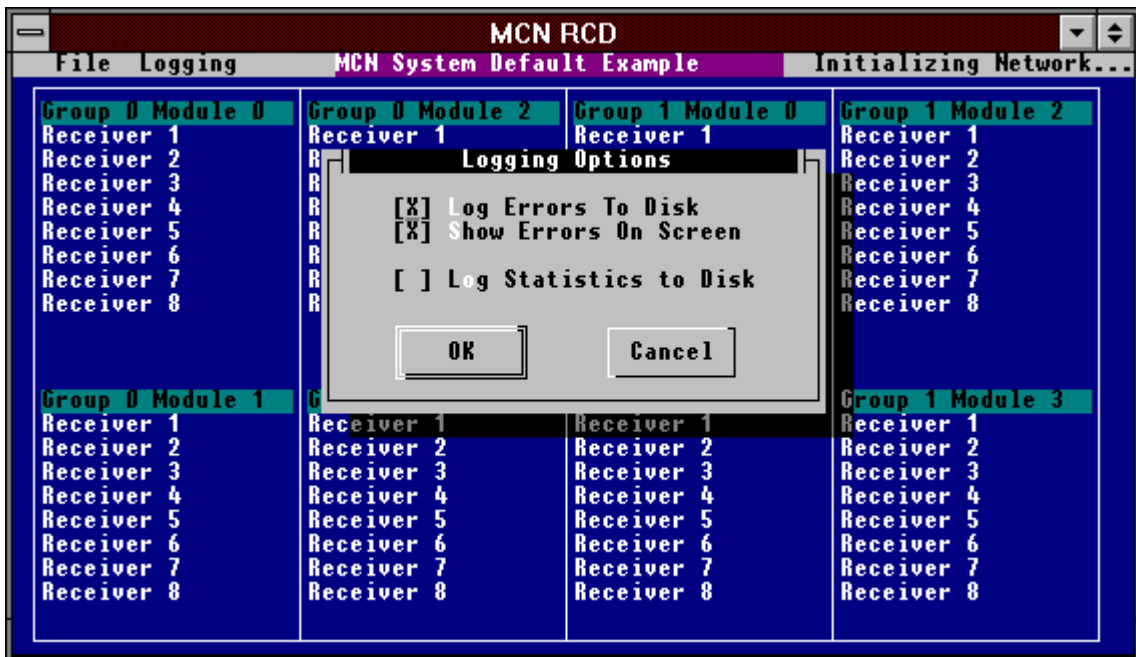
Figure 28 - Logging Options Dialog Box

7.6.1 Error Logging

MCNRCD provides the capability to continuously monitor your comparator/voting receiver system. MCNRCD optionally reports detected errors to the display screen and/or a log file. Maintenance and supervisory personnel use these reports to track down intermittent system problems.

Errors are detected for all of the receivers in each MCN Group being monitored by the loaded screen file, not just the receivers shown on the currently loaded screen. Error conditions detected by MCNRCD include any receiver **Fails, Disables** , or **Errors**. An error indicates some invalid comparator action. An example would be if the comparator control lines showed a receiver as being Voted and Disabled at the same time.

Each Group Configuration File can monitor up to 128 receivers when fully loaded. When an error is detected, MCNRCD takes one of the following user configured actions:

- The receiver information and error condition is shown on the screen.

- The error is written to the log file on disk.

- The error is ignored.

- The error is shown both on screen and logged to disk.

Selecting Error Logging Options

1. From the **Logging** menu select **Options...** to display the **Log Options** Dialog Box.
2. To show errors on the display screen as they occur, select the **Show Errors on Screen** check box with a mouse, or press the H s keys.
3. To log errors to disk select the **Log Errors to Disk** check box with a mouse, or press the H l keys.

Errors are logged to disk and stored in a file named MCNERR.LOG. The file size (in MB) for logging errors is set by the Command Line Option switch '/En', where n = 1 to 10. The default file size is 1 MB if no option is given. See Section 7.8.1 for more details on the Command Line Options. Error log entries are stored as ASCII text consisting of 107 bytes per log. An Error log file size selection of 1 MB (default) can hold 9570 entries.

When the MCNERR.LOG **file is 90% full**, a warning beep and a percent full message is on the top right of the menu bar are given on each subsequent log. Pressing **F1** brings up the **On line help text**, giving you detailed instruction on how to backup the log file. The On line help is available only when the MCNERR.LOG file is over 90% full. If a copy of the MCNERR.LOG error log file is desired, exit MCNRCD, copy the MCNERR.LOG to a new file name, and then delete the MCNERR.LOG file.

Whenever the MCNERR.LOG **file is 100% full**, it will **automatically** be **reduced to 50%** of its selected size to make room available for new error log entries. The oldest Error logs are deleted and the most recent error log entries are saved in the reduced MCNERR.LOG file.

Warning
While the MCNRCD program is deleting the oldest Error log data to make room for additional entries, comparator activity is not being monitored.

Notice:
This deletion process is not reversible and may take between several seconds to a few minutes depending upon the log file size and the computer's speed performance.

When the MCNRCD program is started and Error logging is enabled, the Error Log Full message box will appear if the MCNERR.LOG file is larger than the size selected from the command line (or the default size). The Error Log Full message box gives the option to either continue running MCNRCD with Error logging disabled, or to first have the Error log file reduced down to 50% of its size by deleting the oldest entries and then continue logging. See Figure 29.
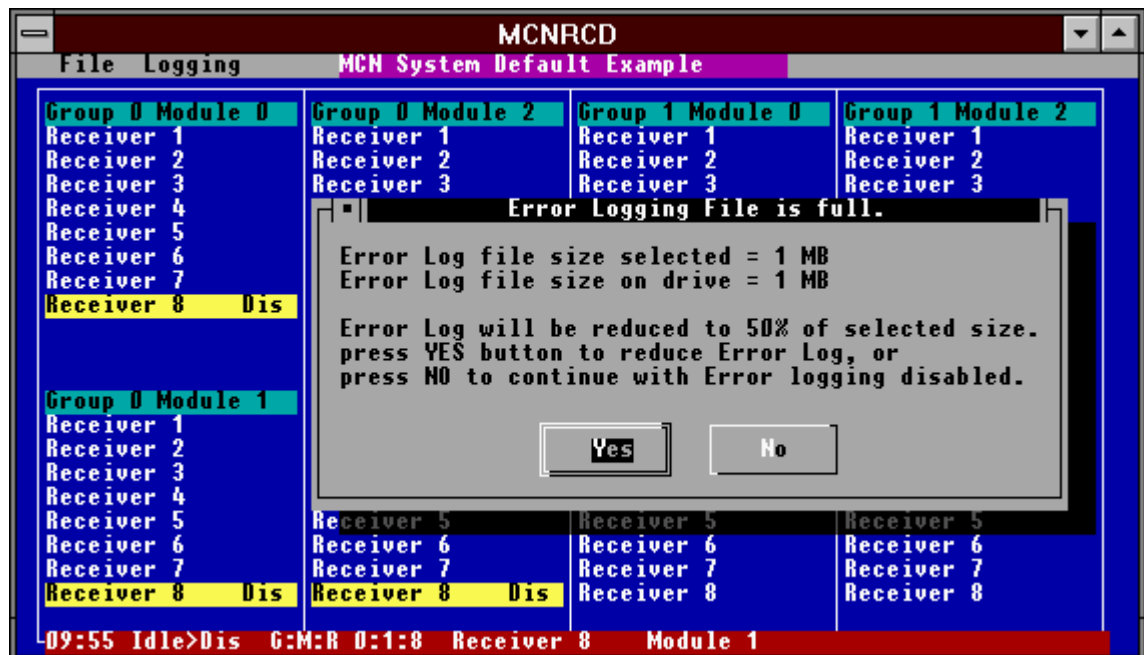
Figure 29- Error Log Full Message Box

The most recent 300 entries in the Error Log file (MCNERR.LOG) may be viewed at any time without exiting the MCNRCD program.

To View The 300 Most Recent Error Log Entries

1. Select **View** from the **Logging** menu or press the following: H l v keys. This opens the viewing window.
2. Use the vertical and horizontal scroll bars or the cursor movement keys to move through the error log listing. The cursor will initially be located on the line below the most recent error entry. You must be on an actual error log entry to scroll left and right across the full window.
3. When you are finished, click on the cancel button to close the window.

Warning
While the View Last Entries window is open, the comparator activity is no longer being monitored. Comparator errors are not logged while this window is open.
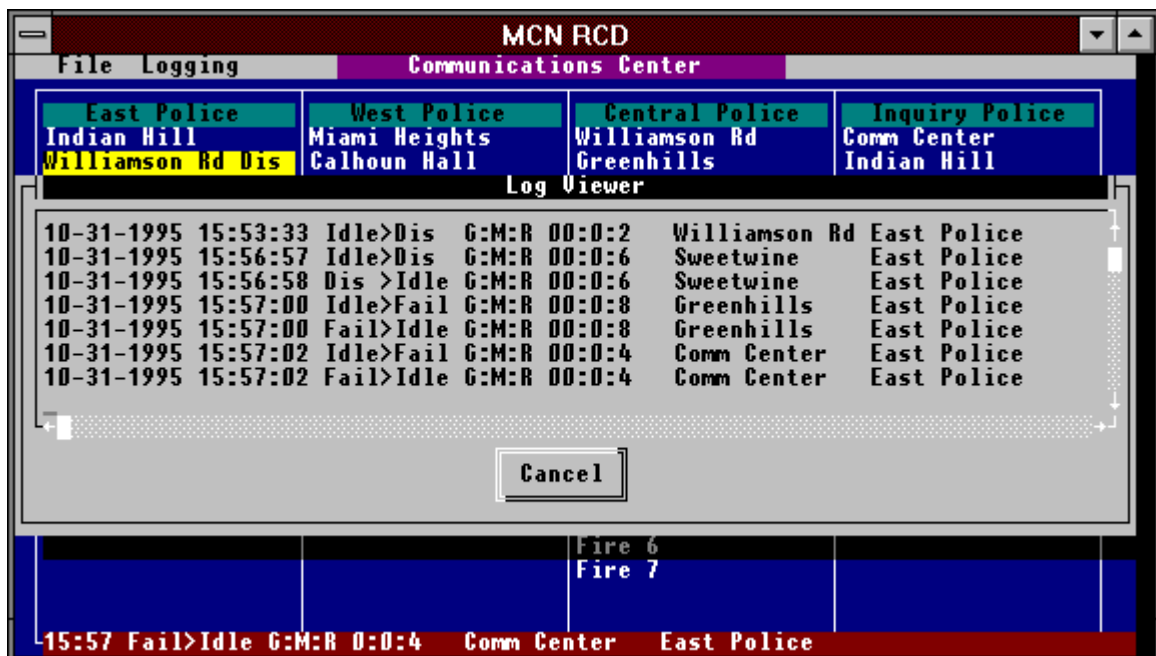
Figure 30 - Viewing Error Log Entries

To Clear the On Screen Error Status Line

1. Select **Clear Status Line** from the **Logging** menu.or press the H l.c keys.

7.6.2 Statistics Logging

In some applications, you may want to check overall system performance or system utilization. With the MCNRCD program you can log system activity to disk by selecting the **Log Statistics To Disk** option in the **Logging Options** menu.

Selecting Statistical Logging

1. From the **Logging** menu select **Options...** to display the **Log Options** Dialog Box or press the H l.o keys.
2. Select the **Log Statistics to Disk** check box with a mouse, or move the cursor with the arrow keys.

The activity statistics are stored in a file called MCNSTAT.LOG. This statistical log is a condensed version of the error log information. In order for a state to be logged, the state's text definition line in the MCNRCD.CFG file must have the "log" field set to 1. Therefore, if you want to log all receiver activity, edit the MCNRCD.CFG file and set the "log" fields for the states you want to gather statistics on to a 1.

TIP: Log filed in MCNRCD.CFG are used for both statatistical and error logging. If error logging is enabled with all "log" fields set to 1, the program will run slow since it must log every state change to disk. You may want to have an MCNRCD.CFG file for Error Logging and also a different configuration file for Statistical logging.

When using statistics logging, make sure you have a disk cache program, such as SMARTDRV.EXE, loaded in your AUTOEXEC.BAT file. This will greatly increase your logging performance since a lot of data will be written to the disk during statistics gathering.

Statistical log entries are stored as numerical data in ASCII text format.
The following data is logged when a receiver changes state (in the order given):

- MCN Group number (2 hex digits)
- Module number (1 hex digit)
- Receiver number (2 hex digits)
- Old state (2 hex digits)
- New state (2 hex digits)
- Time of the state change (Hr:min:sec)
- Date of the state change (month - day)

An example of an Statistical log entry is the following:

"00,2,05,01,04,10:03:09,08-23"

As you can see, all the fields are comma separated. Each line has double quotes as the first and last character. The example has the following format:

> 00 is the Group number of the MCN module
> 2 is the Module number of the MCN module
> 05 is the receiver number
> 01 is the old state of the receiver (Vote)
> 04 is the new state of the receiver (Receive)
> 10:03:09 is the time of the state change
> 08-23 is the day-month of the state change

The 2 digit numbers for the old and new states correspond with the state numbers defined by the text definition line of the status text category assigned to the module. For system errors, the new state number may be F1 hex through F9 hex. Section 7.6.3 shows the MCN system messages that can occur, along with the error code number that will be contained in the MCNSTAT.LOG file. The old state number will always be F2 hex, indicating that the new state number is a system error code.

Statistical log entries are stored on disk in a file named MCNSTAT.LOG. The file size (in MB) for logging errors is set by the Command Line Option switch '/Sn where n = 1 to 100. The default file size is 1 MB if no option is given See Section 7.8.1 for more details on the Command Line Options Statistical log entries are stored as ASCII text consisting of 30 bytes per log. A Statistical log file size selection of 1 MB (default) holds about 34,000 entries.

"Open and Close" markers are written to the MCNSTAT.LOG file depending on the state of the Statistical Log file.

The Open marker consisting of the following:
"X1 , Screen File name , Time, Date"

The Close marker consisting of the following:
"X9 , Screen File name , Time, Date"

These markers are used to separate the log data for different Screen file's Statistical log data. If different Screens are loaded while the program is running, each Screen's Statistical log data will be marked by the X1 (Open) and X9 (Close) stamps so that the data can be grouped according to each Screen loaded.

An example of a Statistical Log file using the default screen is shown here:
"X1,DEFAULT.MSF ,13:19:23,06-05"
"00,1,01,F2,F4,13:19:23,06-05"
"X9,DEFAULT.MSF ,13:19:26,06-05"

Data accumulated in the MCNSTAT.LOG can be used by a custom written
analytical program to see how your system is performing or how it is being
utilized. CTI does not furnish this type of software.

When the Statistical log file **MCNSTAT.LOG is 100% full**, a message box will
appear. The operator can continue to run the MCNRCD program with Statistical
logging disabled or back up the MCNSTAT Log file and rename or delete the
older file. See Figure 31 below.
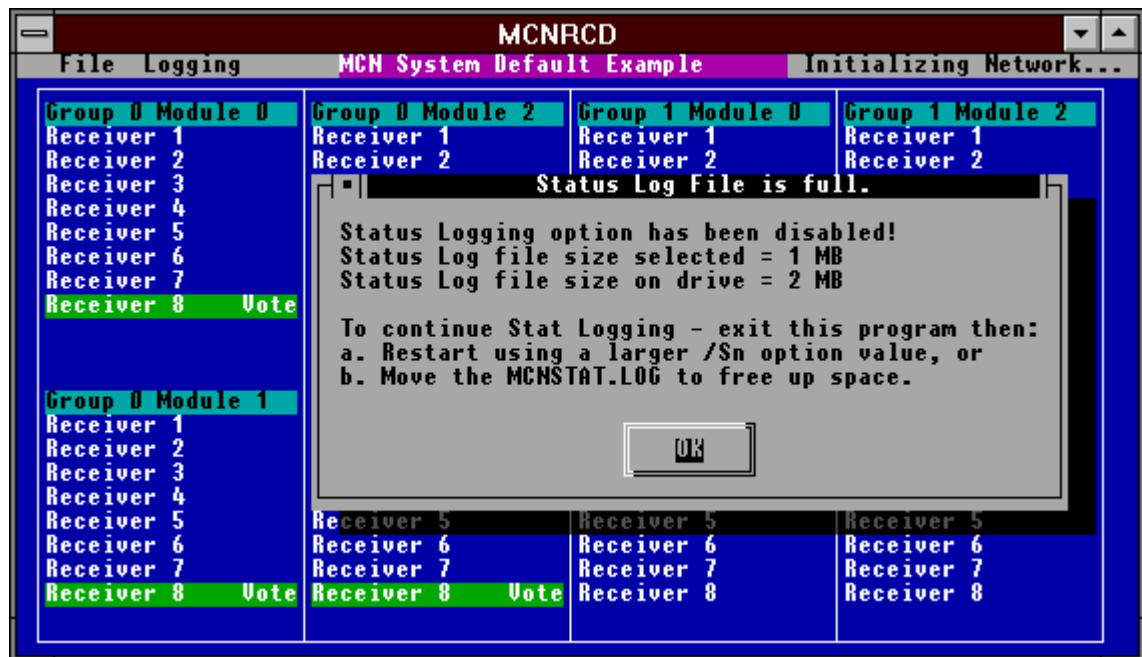
Figure 31 - Statistical Log File Full

7.6.3 MCN System Messages

During system initialization and operation, MCNRCD may detect various system errors. These system errors will always be logged to the screen, regardless of the **Show Errors on Screen** option setting. If the **Log Errors to Disk** option is enabled, then these system errors will also be logged to the MCNERR.LOG file. The following system errors are detected and logged by MCNRCD:

- **Invalid configuration data received.   Error code F0**
  The specified Comparator I/O Module is not compatible with this version of MCNRCD.

- **Comparator communication failure detected.   Error Code F1**
  A communication link failure has occurred between the specified Comparator I/O Module and the comparator it is attached to. Comparator link failures will only be reported if the Comparator I/O Module implements Link Failure Reporting. Refer to the hardware reference manual of the Comparator I/O Module being used to see if it supports this feature (for example, Link Failure Reporting is supported in the AIB module, but not in the CIB module).

- **Module error has been corrected.   Error code F3**
  The previously reported Comparator I/O Module error has been fixed and the module is now ready for normal operation. This will happen, for example, if an AIB module that has reported a comparator communication link failure resume communications with the comparator (i.e. the cable between the AIB and the comparator was disconnected, causing the comparator link failure message, and was then reconnected).

- **No configuration data received from module.   Error code F4**
  MCNRCD could not establish communications with the specified Comparator I/O Module. The module is configured in the Group Configuration File of the loaded screen file, but the module is not connected to the MCN network or is not powered.

  MCNRCD will periodically attempt to initialize previously unrecognized modules so that status monitoring and control can begin with that module. Generally, a module connected to the network or powered up after the screen file has been loaded should be brought on-line within a couple of minutes.

- **Module is back on-line.   Error code F5**
  MCNRCD has resumed communications with a Comparator I/O Module that previously had a network communication link failure. When the module is back on-line, MCNRCD is able to resume normal status monitoring and control of the Comparator I/O Module.

- **Network communication link failure detected.   Error code F6**
  MCNRCD can no longer communicate with the specified Comparator I/O
  Module (the module is off-line). The module may have been disconnected
  from the MCN network or power may be been removed from the module.
  MCNRCD can no longer provide status monitoring and control for this
  module.

  When a module is off-line, MCNRCD will periodically attempt to initialize
  the module so that status monitoring and control can begin with that module.
  Generally, a module connected to the network or powered up after the screen
  file has been loaded should be brought on-line within a couple of minutes.

- **HIB communication failure detected.   Error code F7**
  MCNRCD can no longer communicate with the HIB module. All status
  monitoring and control is halted. This error can occur during both HIB
  initialization (when a screen file is loaded) or during normal system operation.
  See section 7.2.2.1 for more information about HIB communication failures

- **No carrier from modem.   Error code F8**
  This error will only occur when the HIB and the PC are connected through
  modems. This error indicates that the modem carrier has been lost, either by a
  phone line disconnect or by one of the modems being turned off.

  If this error occurs, MCNRCD will automatically restart the HIB initialization
  and modem dialing (if this is a dial-up application) after 1 minute if no action
  is taken to continue.

- **HIB has been initialized.   Error code F9**
  This system message indicates that the HIB module has been successfully
  initialized by MCNRCD.

- **Error Code *xx* reported by this module.**
  The unit referenced by the displayed Group/Module number detected an error.
  The value defined by "*xx*" is an error code specified to that unit. To find the
  meaning of the error code, refer to the unit's hardware reference manual
  Module Error Codes section.

7.7 Exiting the MCNRCD Program

To exit the program, position the mouse cursor over the **Exit** block under the **Files**
menu and double click the left mouse button.

To exit the program using the keyboard, press **Af x** E. This will terminate the
program and return control to DOS.

7.8 MCNRCD Program Command Line Options

When you start the MCNRCD software, you specify various options on the DOS command line. This allows you to tailor the program operation from the command line or from a batch file. This section of the manual describes all the command options available.

The MCNRCD command line and options are entered at the DOS prompt in the following format:

MCNRCD *ScreenName* {options}

The *ScreenName* and {options} entry are optional

Screen Name

This can be any valid screen file name. When specified, this screen is automatically loaded at startup. The default extension *.MSF is assumed. **If specified, the ScreenName must be the first option specified after the MCNRCD command.** Other command line options are order independent.

The MCNRCD program then checks to see if the file exists in the current DOS directory. If the file exists, it is loaded automatically and receiver activity is displayed. If the file does not exist, the program displays "Invalid Screen File Name". Press OK to exit to DOS.

/? or /HELP

Displays a list of all MCNRCD command line options.

/B

Specifies monochrome mode. Use on monochrome monitors and LCD displays with limited gray scale support.
The keyboard cursor is marked with > RX Name < symbols when in the monochrome mode. This allows you to easily locate the cursor when receiver activity is displayed on the screen.

/En (n = 1 to 10)

Specifies the file size limit of MCNERR.LOG for logging Errors to disk.
The value of **n** is from 1 to 10 MB, with a default value of n= 1. Each Error log entry requires 107 bytes. With the default size of 1 MB, the error log file can log up to 9570 entries.

/Sn (n = 1 to 100)

Specifies the file size limit of MCNSTAT.LOG for logging Statistics to disk.
The value of **n** is from 1 to 100 MB (millions of bytes), with a default value of n=1. Each Stat log entry requires 30 bytes. With the default size of 1 MB, the Statistical log file can log up to 34,000 entries.

/D:Dialing_string

(Normally not used) This command line option substitutes the **Dialing_string** on the command line for the dialing string programmed into the MCN Screen File (specified with the **ScreenName** option).

If this option is used, a valid **ScreenName** must also be specified on the command line.

Every time a screen file is loaded, its dialing phone number is compared with the dialing phone number of the **ScreenName** MCN Screen File. If the dialing phone number match, then the **Dialing_string** number is dialed instead. If the number does not match, then the phone number of the new screen file is dialed.

For example, assume there is a screen file called FILE1 which has the following phone number programmed:
         ATDT5551111
If the following command line is executed:

                    MCNRCD file1 /D:ATDT5551234

MCNRCD will dial the number 555-1234 instead of 555-1111. Now, suppose FILE2 is a screen file with the dial string ATDT5551111 programmed into it and FILE3 is a screen file with the dial string ATDT5551212 programmed. If FILE2 is loaded (using the SCREEN LOAD command of MCNRCD), then no new dialing will occur because both screen files call out the same dialing phone number. If FILE3 is loaded, then the number 555-1212 will be dialed. If FILE2 is then loaded again, the number 555-1234 will be dialed because FILE1 and FILE2 contain the same phone number, therefore the /D: override dial string is used instead.

For a detailed explanation of the modem dialing string format, please refer to section 10.

/NODIAL (optional)

For the entire MCNRCD session, whenever a screen is loaded, any programmed dialing string in the MCN Screen File is ignored.
This option allows you to use a MCN Screen File that is configured for a dial up line in a leased line configuration without having to go into MCNCFG and reprogram the MCN Screen File.

/LL

This is the Leased Line option. Only use this option if the HIB and PC are connected through leased line modems. In a leased line configuration, the HIB's OPTION A switch 5 must be in the UP position.

/baudrate

Valid options are /9600, /14400, /19200, /38400. This command sets the baud rate of the PC's COM port. This command is optional, and if not specified, MCNRCD uses a default baud rate of 38400.

If the HIB is connected directly to the PC COM port, the **/baudrate** specified must match the baud rate setting on the HIB's OPTION A switches 1, 2, and 3.

NOTE: When selecting a baud rate, use the highest baud rate supported by the COM port, preferably 38400. However, if your COM port uses a 16450 or 8250 type UART (instead of the 16550), then you may have problems running at 38400. If so, use either 14400 or 9600 for the data rate.

7.8.1 Command Line Examples

To start the MCN Remote Comparator Display software, you must be in the proper directory:

C:> **CD CTI** E

7.8.1.1 Overriding the dialing string
Command line: MCNRCD /NODIAL

All programmed dialing strings are ignored during this MCNRCD session.

7.8.1.2 Specifying a different baud rate
Command line: MCNRCD /19200

MCNRCD will initialize the PC's COM port to 19200 baud instead of the default baud rate of 38400.

7.8.1.3 Setting up for Leased Line operation
Command line: MCNRCD /9600 /LL

The HIB and the PC are connected through leased line modems that are communicating at 9600 baud. The HIB's OPTION A, switch 5 must be in the UP position for leased line operation.

7.8.1.4 Selecting an Error Log file size of 5 MB
Command line:....MCNRCD /E5

MCNRCD will allow up to a 5 MB file size for logging Errors to MCNERR.LOG. The program will also check to see that there is enough free disk space available to hold a file of this size. If there is not enough disk room, a message box will appear giving the status of how MCNRCD will continue.

7.9 Running MCNRCD Program Automatically From Batch Files

Once you have determined the proper command line options to use, you can put them in a batch file to make start-up easier. You may also put them in your AUTOEXEC.BAT file so that the MCN Remote Comparator Display program

automatically start up when your computer re-boots. To do this, make a batch file
with the following lines or add them to your AUTOEXEC.BAT file:

> **C:**
> **CD \CTI**
> **MCNRCD** *command line options*

The *command line options* are the command line options determined above.

8. Troubleshooting

Problem:

The mouse works in the configuration program, but it freezes when I load run the MCNRCD Remote Comparator Display program.

Using the wrong COM port

This problem will happen if you specify a COM port that conflicts with your mouse in your command line switch.

To recover from this, exit from MCNRCD and edit your CONFIG.SYS file. Specify the proper COM port on the device driver command line. Refer to section 5.2 and use the **/Pn** option.

Conflict with the COM port IRQ

This problem will happen if the interrupt request number (IRQ) being used by device driver is also being used by another device in the system.

To recover from this, exit from MCNRCD and edit your CONFIG.SYS file. Specify, on the device driver command line, an IRQ number for the COM port that does not conflict with any other device in your PC. Refer to section 5.2 and use the **/Un** option.

Problem:

The system doesn't respond.

- Check the network and power connections. Also refer to the troubleshooting sections of the MCN System Manual and the Hardware Reference manual for the HIB and the Comparator I/O Modules (CIBs and AIBs).

Problem:

When MCNRCD is initializing the HIB, I get the HIB communications failure error message.

- Verify that the HIB is connected to the proper COM port on the PC.
- Verify that the baud rate specified on the MCNRCD command line matches the settings of the HIB's OPTION A switches 1, 2 and 3. If not, change the command line baud rate setting or change the HIB's baud rate switches and reset the HIB.
- Verify that the HIB's OPTION A switch 5 is in the DOWN position if the HIB is connected directly to the PC or UP is the HIB using modems. If not in the correct position, change the switch and reset the HIB.

- If you are using an HIB as the network interface device, try using the /W option on the device driver command line (refer to the HIB's hardware reference manual for details about the device driver command line). Try using a delay of about twice the character delay, as shown in the table below.

Baud Rate	Delay (in microseconds)
9600	1700
14400	1200
19200	900
38400	300

- Try running the HIB and MCNRCD software at a lower data rate, either 14400 or 9600 bps. Remember to change the HIB's baud rate selection switches for this new data rate and then reset the HIB module.

Problem:
Modem will not dial. I get the "Unable to connect" error when MCNRCD tries to dial.
- Verify that your MODEM.INI file contains a valid initialization string for your modem.
- Verify that the modem's line port is properly connected to the phone jack.
- Verify that the HIB is properly connected to the remote modem.
- Verify that the HIB's OPTION A switch 5 is in the UP position. If not, put the switch in the UP position and reset the HIB.
- Try turning off the modem and HIB and then turning on the modem followed by turning on the HIB.
- Run the HIBCNFG.EXE program to configure the HIB's modem initialization string. See section 10 for details about HIBCNFG.EXE.

Problem:
The remote modem does not answer or answers but hangs up before the connection is established.
- Verify that the HIB is properly connected to the remote modem.
- Verify that the HIB's OPTION A switch 5 is in the UP position. If not, put the switch in the UP position and reset the HIB.
- Try turning off the modem and HIB and then turning on the modem followed by turning on the HIB.
- Run the HIBCNFG.EXE program to configure the HIB's modem initialization string. See section 10 for details about HIBCNFG.EXE.

Problem:
I cannot get the HIB and PC to communicate through my leased line connection.

- Verify that the baud rate specified on the MCNRCD command line matches the settings of the HIB's OPTION A switches 1, 2 and 3. Either change the command line baud rate setting or change the HIB's baud rate switches and reset the HIB.
- Verify that the HIB's OPTION A switch 5 is in the UP position. If not in the UP position, change the switch and reset the HIB.
- Verify that you specified the **/LL** command line option for MCNRCD.

9. Appendix A - Changing Status Message Text

The MCNRCD software as furnished will display standard comparator status messages of Vote, Rx, Dis, and Fail. You can change the text, color, and logging flags for these status indications in the MCNRCD.CFG file. You may want to do this for the following reasons:

- You want to change the standard comparator display text or colors.
- You want to display general purpose Inputs & Outputs.
- You want to define a status condition which should (or should not) be logged to the disk under normal operation.
- You want to control other I/O points, depending on the state of a particular module.
- You want to sound a tone or alarm on the PC's speaker when a particular status condition is detected.

MCNRCD can support both comparator and non-comparator (general purpose) displays at the same time using Status Text Categories. (ex: a Default category for comparators and an Alarm category for alarms). Each I/O module (such as a CIB or IOB) is then assigned a Status Text Category for use to display its inputs.

9.1 Status Text Configuration File

The MCNRCD.CFG file contains the formatting and control information for the status messages displayed by the MCNRCD software. This file is an ASCII file that can be modified with any ASCII text editor, such as the MS-DOS Editor. When modifying and saving this file, make sure the file is saved as a normal ASCII file. Do not allow the editor to embed special control characters into the file or else MCNRCD will not be able to run since it will not be able to interpret the file.

Two configuration files are provided with MCNRCD (NORMAL.CFG and TXSTEER.CFG) for comparator display status messages. The file NORMAL.CFG does not include any transmitter steering information and therefore, the status messages displayed are shorter. The receiver name is not overwritten by the status message when the file NORMAL.CFG is copied to MCNRCD.CFG.

If you need to display transmitter steering information, copy the file TXSTEER.CFG to MCNRCD.CFG. This file, as shown in the example file that follows, includes status messages for transmitter steering. These status messages are longer than those in NORMAL.CFG and therefore, part of the receiver name will be over written when the status messages are displayed for a receiver. The full receiver name is redisplayed when the receiver returns to the idle state.

Below is an example MCNRCD.CFG file for a comparator display system:

```
0102
;   Display text for MCNRCD
;
;  Format:
;      state #,  hex input,  color video,  b/w video,  log,
display position, sound time, sound freq.,
;      audio, output,  "text"
;
[DEFAULT]
VOTE=M
DISABLE=L
00 00 1F 0F 0 04 0000 00000 0 00 " "
01 01 2F 70 0 04 0000 00000 1 00 "Vote"
01 05 2F 70 0 04 0000 00000 0 00 "Vote"
02 04 70 70 0 04 0000 00000 2 00 "Rx"
03 10 E0 70 1 04 0000 00000 3 00 "Dis"
03 14 E0 70 1 04 0000 00000 0 00 "Dis"
03 50 E0 70 1 04 0000 00000 0 00 "Dis"
03 54 E0 70 1 04 0000 00000 0 00 "Dis"
04 40 4F F0 1 04 0000 00000 0 00 "Fail"
04 44 4F F0 1 04 0000 00000 0 00 "Fail"
05 00 6E 70 1 04 0000 00000 0 00 "Err"

<OUTPUT>
378 00 00
378 FE 01
378 FD 02
378 FB 04
378 F7 08
378 EF 10
378 DF 20
378 BF 40
378 7F 80
378 FE 00
378 FD 00
378 FB 00
378 F7 00
378 EF 00
378 DF 00
378 BF 00
378 7F 00

<PORT INIT>

<AUDIO>
N72 P8 N72 P8 N72
N58 P8 N40
N61 P8 N61 P8 N61
```

Figure 32 - Example MCNRCD.CFG File

Any line that begins with a semicolon (;) is a comment line. The first line of the file should not be modified, this is a file version number that is maintained by MCNRCD.

The lines

                    [DEFAULT]
                    VOTE=M
                    DISABLE=L

are special lines that define a status text category. Section 9.12 describes these
category definition lines in detail.

9.2 Text Definition Line Format

There are 11 separate fields contained in a single text definition line of the
MCNRCD.CFG file.

Data for fields 1 through 10 must be located in specific columns. If the data is not
located in the proper columns, MCNRCD will not be able to interpret the
MCNRCD.CFG file and will then display an error message during startup and exit
back to DOS.

Field	Description
state #	2 digit hex number that gives a numeric representation of the defined state. Valid ranges for the state # are 00 through 7F hex. States 80 through FF hex are reserved. The same **state #** should be used for any text definition lines that have the same **text** field. See the state # fields in the example MCNRCD.CFG file (section 9) for the "Dis" text. Even though there are 4 different input values that display "Dis", they all have the same state # (03). This field must begin in column 1.
input value	2 digit hex number that defines the input data value received from the Comparator I/O Module which indicates a receiver's current status. The format of this data is given in section 9.3. This field must begin in column 4.
color video	2 digit hex number that defines the color video attributes for the displayed text. This video attribute is used if the MCNRCD /B command line option is not used. Valid video attributes are given in section 9.5. This field must begin in column 7.
b/w video	2 digit hex number that defines the black & white video attributes for the displayed text. This video attribute is used if the MCNRCD /B command line option is used. Valid video attributes are given in section 9.5. This field must begin in column 10.
log	1 digit number that defines the logging option for the state. Set this field to 0 if no error logging should occur for this state or set this field to 1 if you want error logging to occur for this state (error logging will only occur if it is enabled in the Log Options menu). This field must begin in column 13.
display position	2 digit decimal number that specifies the number of character places, from the right side of the display position, to reserve for displaying the status message text. This field can be in the range of 01 through 18. Additional information about this field is given in section 9.6. This field must begin in column 15.

tone time	4 digit decimal number that specifies the duration of the *tone frequency* (in seconds) tone. The range for this field is 0000 through 0100. Additional information about this field is given in section 9.7. This field must begin in column 18.
tone frequency	5 digit decimal number that specifies the frequency of the tone to sound when the input condition occurs. The range for this field is 00000 or 00037 through 32767. A value of 00000 means that no tone is to be sounded when the input condition occurs. Additional information about this field is given in section 9.7. This field must begin in column 23.
audio string	1 digit decimal number that specifies the audio string to be played when the input condition occurs. The range for this field is 0 through 9. A value of 0 means that the audio string playing is disabled for this input condition. Additional information about this field is given in section 9.8. This field must begin in column 29.
output port control	2 digit decimal number that specifies the output port control sequence to be executed when the input condition occurs. The range for this field is 00 through 99. A value of 00 means that the output port control is disabled for this input condition. Additional information about this field is given in section 9.9. This field must begin in column 31.
text	User configurable text string to define the state. The maximum length of the text string is 18 characters. The text must have a double quote character (") before the first text character and after the last text character. The two double quotes are not displayed and are not counted in the text string length. If any **text** field of the MCNRCD.CFG file is longer than 5 characters, then the receiver names will be partially over written when a status message is displayed. The full receiver name will be redisplayed when the receiver returns to the idle state.

9.3 State Number Field

This field gives a numeric value for the text definition line. The valid range for this field is 00 through 7F hex (states 80 through FF hex are reserved).

Important: When assigning a **state number** to a text definition line, any text definition lines that have the same text (even though the input value field may be different) should have the same state number.

The **state number** field is used in two ways by the MCNRCD software.

Logging

When logging is enabled (either error logging or statistics logging), the MCNRCD software uses the state number to determine if the new log entry needs to be created for the receiver state change. The MCNRCD software keeps track of the current state of each receiver by saving the state number. When a receiver's input value changes, the MCNRCD software compares the current state number for that receiver with the state number assigned to the new input value. If the state numbers match, no log entry is stored. If the state number are different, a new log entry is made showing the transition from the previous state to the new state. If statistics logging is enabled (see section 7.6.2), the state numbers are stored in a new log entry.

Keyboard Cursor Display

When the keyboard cursor is enabled, and the keyboard cursor is moved onto or off of a display location, the MCNRCD software has to redisplay the status text message for that display position so that the background can change colors. During this status message redisplay, the MCNRCD software first gets the state number that it has stored for the current receiver and then finds the first text definition line in MCNRCD.CFG with that same state number to get the status message text to display. If the status text message is different from the currently displayed status text message, then the receiver's status message will change. Therefore, to avoid this problem, never assign the same state number to text definition lines that have different status text messages.

9.4 Input Value Format

The status messages displayed for each display position are represented by four bits in a status byte, with each bit being an input status signal. From these four bits, up to 16 different status messages can be shown for any display position.

Input Status Signal	Status Byte Binary Weight
VOTE	01 hex
RECEIVE	04 hex
DISABLE	10 hex
FAIL	40 hex

Table 2 - Status Byte Binary Weights

Table 2 shows the binary weight of each MCNRCD input line, along with the name of the input status signal. The binary weights of the four input status signals are summed to create the **input value** field of the MCNRCD.CFG text definition line. For your application, all valid combinations of these binary weights must be defined by separate text definition lines. Table 3 shows the possible combinations of the binary weights (in the Input Value Field column) and the status name combination for the value. A column has also been provided for you to enter the text corresponding to the input value.

Input Value Field (hex)	Status Signal Combinations	Custom Text
00	-	
01	VOTE	
04	RECEIVE	
05	RECEIVE + VOTE	
10	DISABLE	
11	DISABLE + VOTE	
14	DISABLE + RECEIVE	
15	DISABLE + RECEIVE + VOTE	
40	FAIL	
41	FAIL + VOTE	
44	FAIL + RECEIVE	
45	FAIL + RECEIVE + VOTE	
50	FAIL + DISABLE	
51	FAIL + DISABLE + VOTE	
54	FAIL + DISABLE + RECEIVE	
55	FAIL + DISABLE + RECEIVE + VOTE	

Table 3 - Input Value Definitions

9.4.1 Input Value For Comparator I/O Systems

Each receiver's status is described by a single byte of status information received from the Comparator I/O Modules. The status information byte format is defined in Table 4. Any value not shown in the table results in an ERROR status display ("Err"). The "x" bits in the table indicate input value bits that can be either a 0 or a 1, therefore both conditions of this bit must be accounted in separate text definition lines of the MCNRCD.CFG file.

Bits 76 54 32 10	State
00 00 00 00	IDLE
00 00 0x 01	VOTE
00 00 01 00	RX
0x 01 0x 00	DISABLE
01 00 0x 00	FAIL
00 00 00 10	TX
00 00 0x 11	TX/VOTE
00 00 01 10	TX/RX
0x 01 0x 10	TX/DISABLE
01 00 0x 10	TX/FAIL

Table 4 - Input Value Format

Note: In Table 4, any bit position shown as a 1 is an active input signal and any bit shown as a 0 is an inactive input signal. For the MCN system, all I/O signals are active low, so any active input signal is low at the CIB or IOB I/O connector and any inactive input signal is high at the CIB or IOB I/O connector.

From Table 4 you can see that one condition defines an IDLE state:
  1. 00 00 00 00 : IDLE

For this IDLE state, the displayed text defined in MCNRCD.CFG must be a single space. The color video attribute for this state must be 1F hex and the black and white video attribute for this state must be 0F hex.

Two conditions define a VOTE state:
  1. 00 00 00 01 : VOTE
  2. 00 00 01 01 : VOTE + RX

Only one condition defines a RX state:
  1. 00 00 01 00 : RX

Four conditions define a DISABLE state:
1. 00 01 00 00 : DISABLE
2. 00 01 01 00 : DISABLE + RX
3. 01 01 00 00 : DISABLE + FAIL
4. 01 01 01 00 : DISABLE + FAIL + RX

Two conditions define a FAIL state:
1. 01 00 00 00 : FAIL
2. 01 00 01 00 : FAIL + RX

The last five states of the table (the TX states) are only displayed when a TSAM Interface Module (TIB) is configured into the system. These states are present in the TXSTEER.CFG file but not in the NORMAL.CFG file. If you need to display the TX states (you are displaying transmitter steering information), then copy the file TXSTEER.CFG to MCNRCD.CFG.

9.5 Status Text Colors

The following defines the color and b/w video attribute bytes (Table 5 shows the layout of the bits for the attribute byte):

bit 7 = 0 for normal background intensity, 1 for high
      background intensity
bits 4 - 6 = background color
bits 0 - 3 = foreground color

7	6 5 4	3 2 1 0
background intensity	background color	foreground color

Table 5 - Video Attribute Byte Definition

Color definitions are:

0 = black	8 = dark gray
1 = blue	9 = lt blue
2 = green	A = lt green
3 = cyan	B = lt cyan
4 = red	C = lt red
5 = magenta	D = lt magenta
6 = brown	E = yellow
7 = lt gray	F = white

Note: Only colors 0 through 7 are available for background colors because the background color is defined by only 3 bits.

For example, for black letters on a red background, use 40.

9.6 Display Position Field

This field allows you to specify the number of character positions to reserve for the status text message. This field is a two digit decimal value in the range 00 through 18.

Below is a diagram for the layout of each receiver display position, showing all 18 character places. The receiver name is displayed beginning at character position 1. The character positions reserved for the status text messages begin at character position 18 and go to the left.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

For example, if we have the following text definition line:

01 01 2F 70 0 05 "Vote"

the display position field is set to 5. Therefore, the last 5 character positions are reserved for this status text message. When this status message is displayed, the status message *Vote* will be displayed beginning at character position 14.

To create an attractive status display, we recommend that you set the display position fields of all text definition lines of a category to the length of the longest status text message in that category. If you happen to be using sub-categories, then you can set the display position fields of all text definitions lines of a sub-category to the length of the longest status text message in that sub-category.

9.7 Audible Tone Output

To alert operators when a particular status message text is displayed, an audible tone can be sounded on the PC's speaker using the **tone time** and **tone frequency** fields of the status message text definition line. The tone time field (having a range of 0000 to 0100) specifies the number of seconds the tone should be sounded and the tone frequency field (having a range of 00000 or 00037 to 32767) specifies the frequency of the tone. The audible tone output of a text definition line is disabled by setting the tone frequency field to a value of 00000.

The tone output can be controlled in one of the following ways:
1. By setting the tone frequency field to a valid number and setting the tone time to 0000, you can create a tone cancel command. This could be used to immediately stop any tone that is playing when the receiver changes to that state.
2. By setting the tone frequency field to 00000, you can have the current tone continue playing for the entire duration specified in the tone time field when the receiver changes to that state.

If the PC is sounding a tone for an input condition, and another input condition occurs that causes a new tone to be output, then the current tone being played is canceled and the new tone is output for its specified duration.

NOTE: If the PC is sounding a tone, pressing the E key will also cancel the tone.

9.8 Audio Output

The **audio output** field allows you to specify an audio sequence to be played when the status message text is displayed. Unlike the tone control mentioned previously, the audio output allows multiple tones to be output. As with the tone output, an audio output that is currently playing on the PC's speaker can be canceled by pressing the E key.

The audio output field is used to specify the number of the audio string to be played. Up to nine audio strings can be defined. The audio strings are found under the **<AUDIO**> header in the MCNRCD.CFG file (see Figure 32). The first line under the <AUDIO> header is audio string number 1. Any blank lines or comment lines are not counted as audio strings. If the audio output field is set to 0, no audio string is played when the status text message is displayed.

If both the audio output field and the tone frequency field are programmed on the same text definition line, the MCNRCD software will perform the tone frequency output and ignore the audio output field.

9.8.1 Audio String Format

The audio strings found under the <AUDIO> header must conform to a specific syntax. If the audio string syntax is invalid, an error message will be displayed when the MCNRCD software attempts to play the audio string.

The audio strings use the following syntax:

Set Octaves and Play Tones
On   Sets current octave (n = 0-6)
< or > Up or down one octave
Nn   Plays note n (n = 0-84, 0 is a rest)
A-G   Plays A, B, ..., G in current octave (# or + = sharp, - = flat)

Set Tone Duration and Tempo
Ln   Sets length of a note (L1 is whole note, L4 is quarter note, etc.)
        n=1-64
MS   Each note plays 3/4 of length
MN   Each note plays 7/8 of length
ML   Each note plays full length
Tn   Sets number of quarter notes per minute (n = 32-255, 120 default.
Pn   Pause for the duration of n quarternotes (n = 1-64)

Table 6 shows the notes that can be played in an audio string, along with the frequency of the notes.

The default MCNRCD.CFG file shown in Figure 32 defines three audio output strings. The strings play the following tones:

Audio String #	Output Tones
1	3 beeps, each at 3951 Hz
2	a 1760 Hz beep followed by a 622 Hz beep
3	3 beeps, each at 2093 Hz

Note # (Nx)	Octave (Ox)	Note	Standard Musical Note	Freq Hz
0		Pn	Rest	0
1	0	C	C 2	65
2	0	C+	C# 2	69
3	0	D	D 2	73
4	0	D+	D# 2	78
5	0	E	E 2	82
6	0	F	F 2	87
7	0	F+	F# 2	93
8	0	G	G 2	98
9	0	G+	G# 2	104
10	0	A	A 2	110
11	0	A+	A# 2	117
12	0	B	B 2	123
13	1	C	C 3	131
14	1	C+	C# 3	139
15	1	D	D 3	147
16	1	D+	D# 3	156
17	1	E	E 3	165
18	1	F	F 3	175
19	1	F+	F# 3	185
20	1	G	G 3	196
21	1	G+	G# 3	208
22	1	A	A 3	220
23	1	A+	A# 3	233
24	1	B	B 3	247
25	2	C	C 4	262
26	2	C+	C# 4	277
27	2	D	D 4	294
28	2	D+	D# 4	311
29	2	E	E 4	330
30	2	F	F 4	349
31	2	F+	F# 4	370
32	2	G	G 4	392
33	2	G+	G# 4	415
34	2	A	A 4	440
35	2	A+	A# 4	466
36	2	B	B 4	494
37	3	C	C 5	523

Note # (Nx)	Octave (Ox)	Note	Standard Musical Note	Freq Hz
38	3	C+	C# 5	554
39	3	D	D 5	587
40	3	D+	D# 5	622
41	3	E	E 5	659
42	3	F	F 5	699
43	3	F+	F# 5	740
44	3	G	G 5	784
45	3	G+	G# 5	831
46	3	A	A 5	880
47	3	A+	A# 5	932
48	3	B	B 5	988
49	4	C	C 6	1047
50	4	C+	C# 6	1109
51	4	D	D 6	1175
52	4	D+	D# 6	1245
53	4	E	E 6	1319
54	4	F	F 6	1397
55	4	F+	F# 6	1480
56	4	G	G 6	1568
57	4	G+	G# 6	1661
58	4	A	A 6	1760
59	4	A+	A# 6	1865
60	4	B	B 6	1976
61	5	C	C 7	2093
62	5	C+	C# 7	2218
63	5	D	D 7	2350
64	5	D+	D# 7	2489
65	5	E	E 7	2637
66	5	F	F 7	2794
67	5	F+	F# 7	2960
68	5	G	G 7	3136
69	5	G+	G# 7	3323
70	5	A	A 7	3520
71	5	A+	A# 7	3730
72	5	B	B 7	3951
73	6	C	C 8	4186
74	6	C+	C# 8	4435
75	6	D	D 8	4699

Note # (Nx)	Octave (Ox)	Note	Standard Musical Note	Freq Hz
76	6	D+	D# 8	4978
77	6	E	E 8	5274
78	6	F	F 8	5588
79	6	F+	F# 8	5920
80	6	G	G 8	6272
81	6	G+	G# 8	6645
82	6	A	A 8	7040
83	6	A+	A# 8	7459
84	6	B	B 8	7902

Table 6 - Audio String Notes

9.9 Output Port Control

The **output port control** field allows you to specify a output port control sequence to execute when the status message text is displayed. The output control sequences are specified under the heading **<OUTPUT>** in the MCNRCD.CFG file. The format of these sequences is the following:

port #   mask   control

NOTE: The MCNRCD software requires that any output port being used with this output port control must be a read/write port. The MCNRCD software reads the current value of the port by doing an input of the port address.

The three fields of each line under this heading are the following:

1. The port # field is a 3 digit HEX value that specifies the address of the output port that will be modified.
2. The mask field is a 2 digit HEX value that clears bits in the current output port value (this value is logically AND'ed with the current output port value).
3. The control field is a 2 digit HEX value that sets bits in the current output port value (this value is logically OR'ed with the current output port value).

The control sequence is
new value = (current value AND mask) OR control

The example MCNRCD.CFG file shown in Figure 32 defines 17 different output control sequences that can be executed. To execute an output control sequence, simply set the output port control field of the status message text definition line to the output port sequence number. The first sequence under the <OUTPUT>

header is sequence line number 1. Any blank lines or comment lines are not counted in the output port sequence number.

For example, using the MCNRCD.CFG file in Figure 32, output port sequence number 08 causes bit 6 (byte value 40 hex) to be set on port 378 (hex.)
All other bits on the port are unaffected.

9.9.1 Output Port Initialization

When the MCNRCD software is first started, you will want to set any output ports that have output port control sequences defined for them to a default condition. The header **<PORT INIT>** in the MCNRCD.CFG file allows you to define these initial conditions. The format of a port initialization line is the following:

port # value

where **port #** is the address of the output port and **value** is the initialization value to write to the port at startup. These initialization sequences must be on the lines just following the <PORT INIT> header. If you do not want any initial value written to the port at startup, do not enter a port initialization line for that port address.

The example MCNRCD.CFG file in Figure 32 does not have any port initialization sequences defined (since there are no sequences under the <PORT INIT> header). Below is an example of what an initialization sequence would look like.

```
<PORT INIT>
378 00
3C0 00
3C8 FF
```

In this example, when the MCNRCD software starts executing, it will write the value 00 to output ports 378 and 3C0 (hex) and will write the hex value FF to output port 3C8 (hex).

Again, this port initialization only occurs when the MCNRCD software is first started, not on each screen load.

9.10 Display Process

When MCNRCD receives an update from a Comparator I/O Module, the following process is used to display the status text:

- MCNRCD compares the input data against the input value fields defined in the MCNRCD.CFG file.

- If a match is found, the text defined for that input value is displayed (the double quotes are not displayed) and the state number is stored internally for MCNRCD use. Depending upon the usage of the /B option, MCNRCD will either use the color video field attributes or the b/w video attributes for the text and receiver name display.

- If no match is found, the text for the **last** state definition in the category's list will be displayed (usually this will be an error condition).

- If the log field for either the previous state or this new state is 1, an error could be logged to the screen and/or the disk (depending upon the logging option settings).

  When an error is logged, up to the first 8 characters of the state text are placed into the old and new state fields of the log message. This log message is displayed at the bottom of the screen or written to the log file MCNERR.LOG.

- When the text string is displayed, it is left justified to the longest defined text string within the MCNRCD.CFG file. If needed, the receiver name will be truncated so that the entire state's text string will fit on the screen. The entire receiver name will be redisplayed when the receiver returns to the IDLE state (which is defined as all spaces).

9.11 Examples

The following examples are based on the example MCNRCD.CFG file described in section 9.

A receiver is in IDLE state and the receiver's new input value is 04 hex (RX)
- MCNRCD displays the *Rx* text for the receiver.
- Because logging fields of both the IDLE state and the RX state are 0, no error logging occurs.
- MCNRCD stores a new state value of 02 hex for the receiver.

A receiver is in RX state and the receiver's new input value is 01 hex (VOTE)
- MCNRCD displays the *Vote* text for the receiver.
- Because logging fields of both the RX state and the VOTE state are 0, no error logging occurs.
- MCNRCD stores a new state value of 01 hex for the receiver.

A receiver is in VOTE state and the receiver's new input value is 11 hex (DISABLE + VOTE)
- MCNRCD displays the *Err* text for the receiver because there is no definition for this input value (no input value match is found). This is an error since a disabled receiver should not vote.
- Because the logging field of the ERROR state is 1, an error will be logged to the screen and/or disk, depending upon the logging option settings.
- MCNRCD stores a new state value of 05 hex for the receiver.

A receiver is in the DISABLE state and the receiver's new input value is 01 hex (VOTE)
- MCNRCD displays the *Vote* text for the receiver.
- Because the logging field of the DISABLE state is 1, an error will be logged to the screen and/or disk, depending upon the logging option settings.
- MCNRCD stores a new state value of 01 hex for the receiver.

9.12 Status Text Categories

There are some comparator display applications that also require monitoring and control of non-comparator functions, such as alarm systems. The status message text that is displayed for the alarm system can be different from the Vote, Rx, Dis, and Fail status messages of the comparator system. MCNRCD can support these non-comparator functions along with comparator display functions on the same screen or on separate screens.

This is done by creating additional status text categories in the MCNRCD.CFG file. Status text categories allow you to display different status message text for different I/O modules. For example, in the example MCNRCD.CFG file shown in Figure 34, an input value of 01 will cause the "Vote" status message to be displayed. If an alarm category were also included in the file, the 01 input could cause a status message of "ACTIVE" to be displayed. Each status text category can have a number of text definition lines that define the status message text displayed for that category, corresponding to the 16 combinations of four input bits.

A new category is created in the MCNRCD.CFG file by entering the following lines:

[*category name*]
VOTE=*x*
DISABLE=*x*

followed by the text definition lines that define the status message text associated with the valid input values.

The *category name* is an ASCII string of up to 10 characters. The left and right brackets must surround the name.

The next two lines (VOTE=*x* and DISABLE=*x*) define how mouse and keyboard buttons will control the MCN module outputs for the category. The *x* character of both lines can be one of the following:

- M if the button should act as a momentary switch
- L if the button should act as a latched switch
- O (the letter 'O') if the button should be disabled (Off)

For momentary switches, the output is active when the mouse button or keyboard key are pressed and inactive when released. For latched switches, the output changes state only when the mouse or keyboard button is pressed. Releasing the mouse or keyboard button has no affect on the module's output. For disabled switches, the mouse and keyboard button have no control over the module's output.

The VOTE= line defines the operation of the left mouse button and the 'V' keyboard button. The DISABLE= line defines the operation of the right mouse button and the 'D' keyboard button. These lines must not include any spaces before or after the '=' character. If either line is incorrect, MCNRCD will display an error message and stop execution (the error message will tell you which line is incorrect).

In the example MCNRCD.CFG file shown in section 9, only one category is defined. The category name is DEFAULT and any Comparator I/O Module that is assigned to use the DEFAULT category will use the status text messages of the category DEFAULT when receiver changes occur. For this category, the left mouse button and 'V' keyboard key are programmed for momentary operation and the right mouse button and 'D' keyboard key are programmed for latched operation. See section 6.4.5.1.1 for details about assigning the category name with the Comparator I/O Modules.

9.12.1 Status Text Category Example

Suppose we have a MCN system like the one shown in Figure 33. In this system, there are three MCN I/O modules being monitored and controlled by the PC, which is running MCNRCD. Each module is connected to a different type of I/O device. The Comparator I/O Module is connected to a RF receiver comparator system, Input/Output Control Module 1 is connected to an alarm system and Input/Output Control Module 2 is connected to a control system.
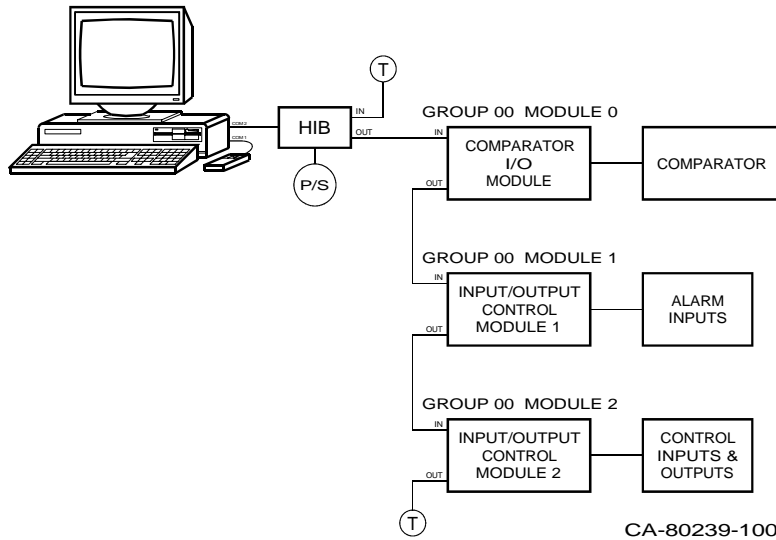
Figure 33 - MCN System With Multiple I/O Types

Because there are three types of I/O devices being monitored and controlled, we need to define three separate categories in the MCNRCD.CFG file so that we can monitor all three MCN I/O modules on a single MCNRCD screen file. These three categories will define the text that is displayed for each MCN I/O module. Figure 34 shows an example MCNRCD.CFG file that contains the three categories.

Notice that each category can have a variable number of text definition lines. Also notice that each category specifies different operation of the keyboard and mouse buttons.

```
0102
;  Display text for MCNRCD
;
; Format:
;    state #,  hex input,  color video,  b/w video,  log, display position, sound time, sound freq.,
;    audio, output,  "text"
;
; Comparator Display Category
[DEFAULT]
VOTE=M
DISABLE=L
00 00 1F 0F 0 04 00 0000 00000 0 00 " "
01 01 2F 70 0 04 00 0000 00000 0 00 "Vote"
01 05 2F 70 0 04 00 0000 00000 0 00 "Vote"
02 04 70 70 0 04 00 0000 00000 0 00 "Dis"
03 14 E0 70 1 04 00 0000 00000 0 00 "Dis"
03 50 E0 70 1 04 00 0000 00000 0 00 "Dis"
03 54 E0 70 1 04 00 0000 00000 0 00 "Dis"
04 40 4F F0 1 04 00 0000 00000 0 00 "Fail"
04 44 4F F0 1 04 00 0000 00000 0 00 "Fail"
05 00 6E 70 1 04 00 0000 00000 0 00 "Err"


;
; Alarm Category
[ALARMS]
VOTE=O
DISABLE=O
00 00 1F 0F 0 06 00 0000 00000 0 00 " "
01 01 2F 70 0 06 00 0000 00000 0 00 "Active"
02 04 70 70 0 06 00 0000 00000 0 00 "Fail"
03 44 4F F0 1 06 00 0000 00000 0 00 "Access"
04 00 6E 70 1 06 00 0000 00000 0 00 "Err"
;
```

```
; Control Category
[CONTROL]
VOTE=L
DISABLE=L
00 00 1F 0F 0 04  00 0000 00000 0 00 "Idle "
01 01 2F 70 0 04  00 0000 00000 0 00 "On"
02 04 70 70 0 04 00 0000 00000 0 00 "Off"
03 10 E0 70 1 04 00 0000 00000 0 00 "Run"
03 50 E0 70 1 04 00 0000 00000 0 00 "Stop"
04 00 6E 70 1 04 00 0000 00000 0 00 "Err"

<OUTPUT>
378 00 00
378 FE 01
378 FD 02
378 FB 04
378 F7 08
378 EF 10
378 DF 20
378 BF 40
378 7F 80
378 FE 00
378 FD 00
378 FB 00
378 F7 00
378 EF 00
378 DF 00
378 BF 00
378 7F 00

<PORT INIT>

<AUDIO>
N72 P8 N72 P8 N72
N58 P8 N40
N61 P8 N61 P8 N61
```

Figure 34 - Multiple Category MCNRCD.CFG File

When we create the Group Configuration File for this system, we must change the category names assigned to the two Input/Output Control Modules. The Comparator I/O Module's assigned category name does not need to be changed since this module will use the category DEFAULT (MCNRCD automatically assigns the category name DEFAULT to each module when the MCF file is created). The category names are changed using the **Edit Module Config** command in MCNCFG.EXE (see section 6.4.5). Figure 35 shows what the MODULE CONFIGURATION screen will look like after you change the category names. A simple module description was also entered for each module. Notice that the category names are assigned to the specific Module number of the MCN I/O modules.

```
 ─                              MCN CFG                              ▼ ▲
Files  Edit
            ┌──────────MODULE CONFIGURATION──────────┐  el Name/Notes
            ╷                Category       Module Description
            ─────────────────────────────────────────────
            Module 0    [DEFAULT    ]   [comparator #1_      ]
            Module 1    [ALARMS     ]   [building 1 alarms   ]
            Module 2    [CONTROL    ]   [control system monit]
            Module 3    [DEFAULT    ]   [                    ]
            Module 4    [DEFAULT    ]   [                    ]
            Module 5    [DEFAULT    ]   [                    ]
            Module 6    [DEFAULT    ]   [                    ]
            Module 7    [DEFAULT    ]   [                    ]
            Module 8    [DEFAULT    ]   [                    ]
            Module 9    [DEFAULT    ]   [                    ]
            Module A    [DEFAULT    ]   [                    ]
            Module B    [DEFAULT    ]   [                    ]
            Module C    [DEFAULT    ]   [                    ]
            Module D    [DEFAULT    ]   [                    ]
            Module E    [DEFAULT    ]   [                    ]
            Module F    [DEFAULT    ]   [                    ]

                    ┌──────────┐       ┌──────────┐
                    │    OK    │       │  CANCEL  │
                    └──────────┘       └──────────┘
```

Figure 35 - Category Name Assignments

After the categories have been assigned to the modules, you will want to enter the Group Configuration information, specifying which MCN Modules will be displayed on the screen. Figure 36 shows a configuration for our example system. Notice that Module 0, Rx 1 through 8 are receivers in a comparator system, Module 1, Rx 1 through 8 are alarm system monitors and Module 2, Rx 1 through 5 are control system monitors.

```
 ─                              MCN CFG                              ▼ ▲
 Files   Edit
 Grp:Mod:Rx       Receiver Name      Corresponding Channel Name/Notes
    00:0:01       Deer Park          receiver 1
    00:0:02       Winton Hills       receiver 2
    00:0:03       Sharonville        receiver 3
    00:0:04       Green Hills        receiver 4
    00:0:05       White Oak          receiver 5
    00:0:06       Glendale           receiver 6
    00:0:07       District 1         receiver 7
    00:0:08       District 2         receiver 8
    00:1:01       Door 1             alarm 1
    00:1:02       Door 2             alarm 2
    00:1:03       Window 1           alarm 3
    00:1:04       Window 2           alarm 4
    00:1:05       Motion 1           alarm 5
    00:1:06       Motion 2           alarm 6
    00:1:07       First Floor        alarm 7
    00:1:08       Second Floor       alarm 8
    00:2:01       Pump 1             control 1
    00:2:02       Pump 2             control 2
    00:2:03       Light 1            control 3
    00:2:04       Motor A            control 4
    00:2:05       Motor B            control 5
    00:2:06
```

Figure 36 - Multiple Category Group Configuration Screen

After the Group Configuration File is created, the Screen Configuration File can be created. Figure 37 shows the MCNRCD display for the screen configuration entered.
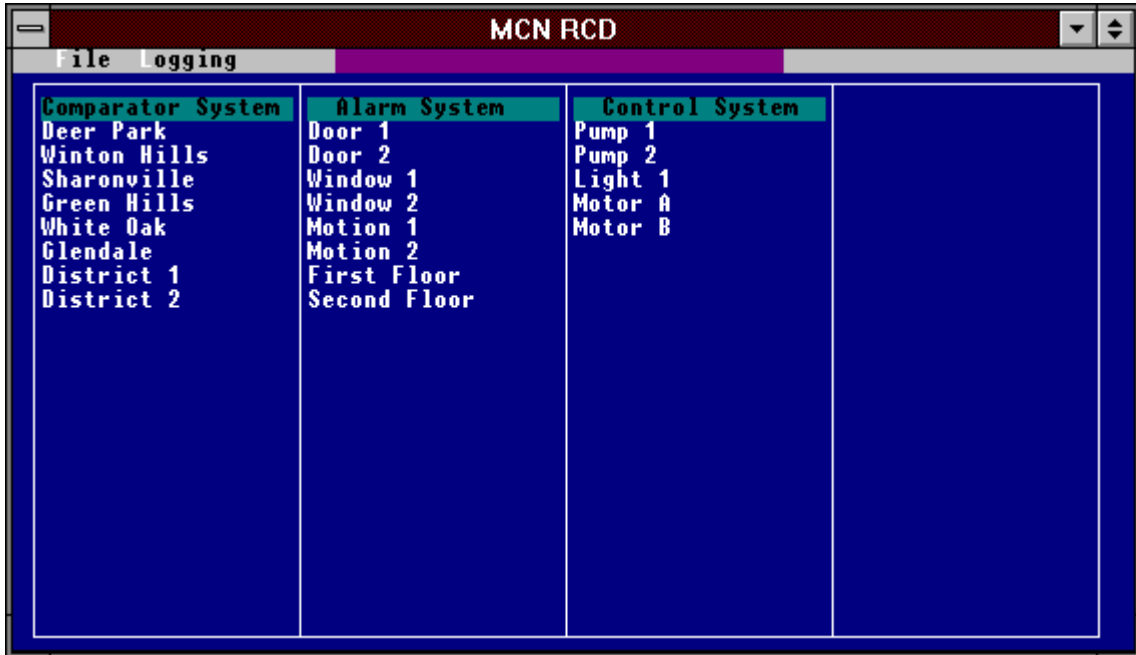
Figure 37 - Multiple Category Screen File

Using this screen configuration, along with the MCNRCD.CFG file given in Figure 34, we can now display status messages customized for each MCN I/O device in our system. Table 7 shows which status text will be displayed by MCNRCD for each MCN I/O module when the specific input values are received.

Input Value	Comparator I/O Module	Input/Output Control Module 1	Input/Output Control Module 2
01	Vote	Active	On
04	Rx	Fail	Off
10	Dis	Err	Run
50	Dis	Err	Stop
44	Fail	Access	Err

Table 7 - Multiple Category Text Display

The output controls for each category in Figure 37 are setup to operate as shown in Table 8.

Category	Left Mouse or V Keyboard Button	Right Mouse or D Keyboard Button
DEFAULT	Momentary	Latched
ALARMS	Off or Disabled	Off or Disabled
CONTROL	Latched	Latched

Table 8 - Category Mouse/Keyboard Controls

Assume in our example system that all outputs on the three MCN I/O modules are inactive. If the left mouse button is pressed when the mouse cursor is on the *Winton Hills* display position, the VOTE output that is connected to the *Winton Hills* receiver will change to active. The MCNRCD screen will display **Vote** for the receiver's state. When the left mouse button is released, the VOTE output will return to inactive. The receiver's status display on the MCNRCD screen will be blank. This is because the left mouse button for the Comparator I/O Module is programmed for momentary operation in the category DEFAULT.

If the right mouse button is pressed when the mouse cursor is on the *Light 1* display position, the Input/Output Control Module DISABLE line that is connected to the *Light 1* output will change to active. The output's status display on the MCNRCD screen will show **Run**. This I/O line is the line that is controlled by the DISABLE input status signal for that display position. When the right mouse button is released, the output remains active. The output will not return inactive until the right mouse button is pressed again. . The output's status display on the MCNRCD screen will then change to blank.

9.12.2 Sub-categories

It is possible to connect different types of I/O devices to a single MCN I/O module (such as a CIB or IOB). This is done by creating sub-categories within a single category in the MCNRCD.CFG file. To create a sub-category you need to reserve one or more of the input status signals that make up the input value for the sub-category selector. The binary combinations of the sub-category selector bits define the sub-category number. If the input status signal is floating, the sub-category selector bit is a logic zero. If the input status signal is tied to ground, the sub-category selector bit is a logic one.

```
0102
;   Display text for MCNRCD
;
; Format:
;     state #,  hex input,  color video,  b/w video,  log, display position, sound time, sound freq.,
;     audio, output,  "text"
;
; Comparator Display Category
[DEFAULT]
VOTE=M
DISABLE=L
00 00 1F 0F 0 04 00 0000 00000 0 00 " "
01 01 2F 70 0 04 00 0000 00000 0 00 "Vote"
01 05 2F 70 0 04 00 0000 00000 0 00 "Vote"
02 04 70 70 0 04 00 0000 00000 0 00 "Dis"
03 14 E0 70 1 04 00 0000 00000 0 00 "Dis"
03 50 E0 70 1 04 00 0000 00000 0 00 "Dis"
03 54 E0 70 1 04 00 0000 00000 0 00 "Dis"
04 40 4F F0 1 04 00 0000 00000 0 00 "Fail"
04 44 4F F0 1 04 00 0000 00000 0 00 "Fail"
05 00 6E 70 1 04 00 0000 00000 0 00 "Err"


;
; Alarm and Control Category
```

```
[ALM-CTRL]
VOTE=L
DISABLE=L
; Sub-Category for alarms
00 00 1F 0F 0 06 00 0000 00000 0 00 " "
01 01 2F 70 0 06 00 0000 00000 0 00 "Active"
02 04 70 70 0 06 00 0000 00000 0 00 "Fail"
03 05 4F F0 1 06 00 0000 00000 0 00 "Access"
; Sub-Category for control
00 40 2F 70 0 04 00 0000 00000 0 00 " "
05 41 70 70 0 04 00 0000 00000 0 00 "On"
06 44 70 70 0 04 00 0000 00000 0 00 "Off"
07 50 E0 70 1 04 00 0000 00000 0 00 "Run"
08 51 E0 70 1 04 00 0000 00000 0 00 "Stop"
09 00 6E 70 1 04 00 0000 00000 0 00 "Err"

<OUTPUT>
378 00 00
378 FE 01
378 FD 02
378 FB 04
378 F7 08
378 EF 10
378 DF 20
378 BF 40
378 7F 80
378 FE 00
378 FD 00
378 FB 00
378 F7 00
378 EF 00
378 DF 00
378 BF 00
378 7F 00

<PORT INIT>

<AUDIO>
N72 P8 N72 P8 N72
N58 P8 N40
N61 P8 N61 P8 N61
```

Figure 38 - Sub-Category MCNRCD.CFG File

Figure 38 shows an example MCNRCD.CFG file that includes two categories, one is DEFAULT and the other is ALM-CTRL.

The ALM-CTRL category contains two sub-categories. One sub-category is made up of alarm status messages and the other is made up of control status messages. Notice in the ALM-CTRL category that bit 6 (I/O bit 3, "DIS") of the input value field (40 hex binary weight) is 0 for the alarm sub-category and 1 for the control sub-category.

Again, the sub-categories are created by using one or more of the input status signals from Table 2 to create a sub-category index. In the example in Figure 38, only one input status signal is used as the sub-category selector, the FAIL status signal, which is the 40 hex binary weight input. For each receiver that is assigned to the alarm sub-category, the FAIL status signal must be left floating, since the sub-category selector is a logic 0. For each receiver that is assigned to the control sub-category, the FAIL status signal must be tied to ground, since the sub-category selector is a logic 1.

The following tables show how many sub-categories can be created in a single category by reserving various input status signals for the selector.

Creating 2 sub-categories

Table 9 shows how two sub-categories can be created by reserving the FAIL input status signal (binary weight 40 hex) for the selector. Up to 8 status messages can be defined for each sub-category, with the VOTE, RECEIVE and DISABLE input status signals selecting between each status message.

Input Value Field	Sub-category #	Sub-Category Selector I/O Bit FAIL	Active Status Signals
00	0	0	-
01	0	0	VOTE
04	0	0	RECEIVE
05	0	0	RECEIVE + VOTE
10	0	0	DISABLE
11	0	0	DISABLE + VOTE
14	0	0	DISABLE + RECEIVE
15	0	0	DISABLE + RECEIVE + VOTE
40	1	1	-
41	1	1	VOTE
44	1	1	RECEIVE
45	1	1	RECEIVE + VOTE
50	1	1	DISABLE
51	1	1	DISABLE + VOTE
54	1	1	DISABLE + RECEIVE
55	1	1	DISABLE + RECEIVE + VOTE

Table 9 - 2 Sub-categories / 8 States Each

Note: In Table 9, any bit or input status signal shown as a 1 is an active input signal and any bit shown as a 0 is an inactive input signal. For the MCN system, all I/O signals are active low, so any active input status signal is low at the CIB or IOB I/O connector and any inactive input status signal is high at the CIB or IOB I/O connector.

Creating 4 sub-categories

Table 10 shows how four sub-categories can be created by reserving the FAIL and the DISABLE input status signals (binary weight 40 hex and 20 hex) for the selector. Up to 4 status messages can be defined for each sub-category, with the VOTE and RECEIVE input status signals selecting between the status messages in each sub-category.

Input Value Field	Sub-category	Sub-Category Selector I/O Bits FAIL	DISABLE	Active Status Signals
00	0	0	0	-
01	0	0	0	VOTE
04	0	0	0	RECEIVE
05	0	0	0	RECEIVE + VOTE
10	1	0	1	-
11	1	0	1	VOTE
14	1	0	1	RECEIVE
15	1	0	1	RECEIVE + VOTE
40	2	1	0	-
41	2	1	0	VOTE
44	2	1	0	RECEIVE
45	2	1	0	RECEIVE + VOTE
50	3	1	1	-
51	3	1	1	VOTE
54	3	1	1	RECEIVE
55	3	1	1	RECEIVE + VOTE

Table 10 - 4 Sub-categories / 4 States Each

Note: In Table 10, any bit or input status signal shown as a 1 is an active input signal and any bit shown as a 0 is an inactive input signal. For the MCN system, all I/O signals are active low, so any active input status signal is low at the CIB or IOB I/O connector and any inactive input status signal is high at the CIB or IOB I/O connector.

Creating 8 sub-categories

Table 11 shows how eight sub-categories can be created by reserving the FAIL, DISABLE and RECEIVE input status signals (binary weight 40 hex, 20 hex and 10 hex) for the selector. Two status messages can be defined for each sub-category, with the VOTE input status signal selecting between the messages.

Input Value Field	Sub-category	Sub-category Selector I/O Bits			Active Status Signals
		FAIL	**DISABLE**	**RECEIVE**	
00	0	0	0	0	-
01	0	0	0	0	VOTE
04	1	0	0	1	-
05	1	0	0	1	VOTE
10	2	0	1	0	-
11	2	0	1	0	VOTE
14	3	0	1	1	-
15	3	0	1	1	VOTE
40	4	1	0	0	-
41	4	1	0	0	VOTE
44	5	1	0	1	-
45	5	1	0	1	VOTE
50	6	1	1	0	-
51	6	1	1	0	VOTE
54	7	1	1	1	-
55	7	1	1	1	VOTE

Table 11 - 8 Sub-categories / 2 States Each

Note: In Table 11, any bit or input status signal shown as a 1 is an active input signal and any bit shown as a 0 is an inactive input signal. For the MCN system, all I/O signals are active low, so any active input status signal is low at the CIB or IOB I/O connector and any inactive input status signal is high at the CIB or IOB I/O connector.

9.12.2.1   Sub-Category Example

Suppose we have a MCN system like the one shown in Figure 39. In this system, there are two MCN I/O modules being monitored and controlled by the PC, which is running the MCNRCD software. Each module is connected to a different type of I/O device. The Comparator I/O Module is connected to a RF receiver comparator system and the Input/Output Control Module is connected to both alarm inputs and control system inputs and outputs.
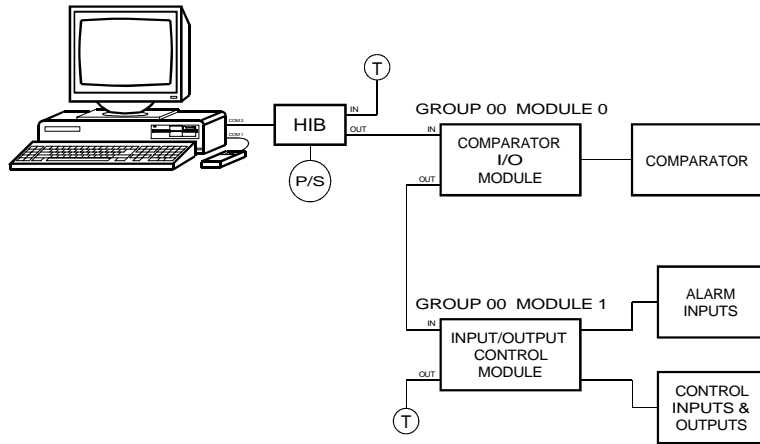
CA-80242-100

Figure 39 - Sub-Category Example System

The MCNRCD.CFG file shown in Figure 38 shows the two categories defined for this system. In this system, the Comparator I/O Module will use the category DEFAULT. The Input/Output Control module will use the ALM-CTRL category. This category includes the sub-categories for alarm input and control inputs. In order for the correct status messages to be displayed for the Input/Output Control module, the sub-category selector input must be properly set for each group of inputs. The sub-category selector input for this example is the input that corresponds with the FAIL status input signal of Table 2. For this system, any alarm inputs must have their sub-category selector input left floating (no connect) so that the selector bit is inactive. Any control inputs must have their sub-category selector input pulled low so that the selector bit is active.

10. Appendix B: Modem Support

Dial-up and leased line modems are supported in the MCN Remote Comparator Display system. A modem cable wiring list is provided in the HIB's hardware reference manual, reference 2.

Note: The PCLTA card cannot be used in dial-up or leased line applications.

The following modems have been **tested and verified** to operate properly with the HIB and with MCNRCD:

- Practical Peripherals PM336MT II 33600 Modem
- Practical Peripherals PM288MT II 28800 Modem
- Practical Peripherals PM144MT II 14400 Modem
- US Robotics Model 336 Sportster 33600 Modem **
- US Robotics Model 278 Sportster Vi 14400 Modem
- Zoom VFP 28.8 28800 Internal Voice/Fax Modem (at the PC end)
- Zoom Model 425 14400 Voice/Fax Modem
- Motorola SURFR 28800 Fax Modem
- Motorola UDS V.3225 9600 Modem
- Motorola UDS V.3229 14400 Modem

The following modem(s) have been tested and are **not recommended**:

- Hayes Accura 144 + Fax 144 Modem

** Note: Our testing has shown that USR Model 336 Sportster modems will not connect to modems running at 14400 baud! Also, see the USRSP336 .INI and USRSP336.HIB files for external switch options if connecting to other modems.

CTI Products Inc. can provide modems for dial-up or leased line applications.

10.1 Modem Initialization

When the MCNRCD program finds a dialing string in the MSF file, it will automatically initialize the modem using the commands specified in the MODEM.INI file and then dial the number in the MSF file.

The dialing string for the number you wish to dial must be programmed into the MCN Screen File or specified at start up with the /D:*DialingString* option. This dialing string contains the phone number of the modem at the HIB location as well as any special dialing codes required by your phone system.

The format of the dialing string is the following: **ATDT***dialstring*

where **ATDT** is the command string header (this tells the modem to dial a phone number) and *dialstring* is the actual phone number to be dialed. If the **ATDT** is omitted from the dialing string, the modem will not successfully dial the number.

To Configure Your System for Automatic Modem Initialization and Dialing:

1. Program the HIB phone number and modem dialing command into the proper MCN Screen File. Refer to section 6.5.9. Or you can specify the HIB's dialing string with the /D:*DialingString* command line option.
2. From DOS, copy the proper initialization file (ex: UDSV3229.INI) to MODEM.INI. If an initialization file for your modem is not included on the disk, copy the closest one to MODEM.INI and use a text editor to enter the proper initialization settings in the MODEM.INI files, as described in the next section.
3. Start the MCNRCD program.
4. Load any screen file that uses the HIB you wish to dial.

10.1.1 Modem Initialization Requirements

When modems are used with the HIB and MCNRCD in a comparator display system, certain modem features must be set. Below is a list of features that you must set in both the remote modem (connected to the HIB module) and the local modem (connected to the PC running MCNRCD).

- Turn off local character echo. Most modems use the 'E0' command.
- Turn on verbose responses. Most modems use the 'V1' command.
- Set the modem to auto answer mode (only required for the remote modem connected to the HIB). Most modems use the 'S0=1' command.
- Set the modem for normal DTR operation. When DTR is toggled, the modem terminates a call and goes into command mode. Most modems use the '&D2' command.
- Set the modem for normal CD operation. The modem activates the CD (carrier detect) signal when connecting with another modem and deactivates CD when disconnecting. Most modems use the '&C1' command.
- Turn on hardware flow control (RTS/CTS). Refer to your modem manual for this command.
- Set the modem for constant speed DTE operation (the modem's DTE speed will remain fixed, no matter what the line connection speed is). This is also referred to as Automatic Speed Buffering (ASB). Refer to your modem manual for this command.
- Turn on data compression.

Section 10.2 describes how the local and remote modems are programmed with initialization strings.

10.1.2 The MODEM.INI file

The MCN Remote Comparator Display (MCNRCD) is designed to be universal so that it can use many types of Hayes compatible modems. Because there are

many different modems with differing features and levels of compatibility, all modems cannot be tested. Even "minor" firmware revisions cause significant changes in modem behavior.

The MODEM.INI file furnished with the system is configured for use with Practical Peripherals PM144MT II modems. You may edit the file settings to match your modem. Edit this file with a text editor or word processor (EDIT in DOS is a good choice). Be sure to save this file as an unformatted (plain ASCII) file. Comments may be added to the file by inserting the ";" character at the beginning of a line.

Several other initialization files are provided on the MCNRCD diskette. The modem types are described in each .INI file. For more information about the modems they support, simply read the *.INI file with a text editor. To use one of the provided initialization files, copy it to MODEM.INI file with the DOS copy command.

If you have problems with configuration, you can try to send the initialization string from a video terminal or a PC with a communications program such as Procomm™ .

A description of each line of the file follows. All the bold items are the lines as they appear in the file. Normal text is the description.

Note: If you are using modems other those listed in this appendix, we ask you to send us the configuration information that works with your modems. We will compile a list of modem parameters for different modems and will send the information out with future software upgrades. Please indicate the manufacturer, model number, firmware or product revision level and the configuration strings for each end. It is also helpful to us if you can send an extra copy of the modem manual or at least the configuration section.

---

init$1=AT&F\^ATQ0V1&C1&D3E0\\N\\Q\^AT&W\^^^

Modem initialization string:

Command	Description
AT	Get modem's attention
&F	Load Factory Default configuration
\	Carriage Return. Terminates the above command. A single backslash is interpreted by the MCNRCD program as a Carriage Return. (If you need to send a backslash, put a double backslash, \\ in the command line and the program will send one backslash.)
^	Wait .5 seconds for defaults to be loaded. The ^ is not sent. The MCNRCD program interprets the ^ as a command to wait for .5 seconds. Different modems may require more or less time.
AT	Get modem's attention
Q0	Response Displays ON
V1	Enable Verbose (word) response messages
	This will give responses such as "Connect 9600" instead of just numeric responses.
&C1	DCD is on when carrier present.
	The MCNRCD program uses the DCD line to see if the carrier has dropped. It also monitors it during the hang-up sequence. The DCD line must follow the received carrier. It must not be forced on all the time.
&D3	Modem hangs up and resets when the DTR goes low.
	The MCNRCD program uses the DTR line to hang up the modem and put it into command mode. The modem must support this mode of operation.
E0	Local character echo OFF
	This turns off the echo of the AT commands and dialing strings sent to the modem.

The above commands are fairly standard for most modems. If the modem does not support these or equivalent commands, it will most probably not work with the MCNRCD program.

The following commands pertain to MNP error correction and compression options. They are not available on all modems and the commands for these options varies widely among modems that support them. Consult your modem manual for the proper commands.

We have found that even though many modems do not support these commands, they do not object to them. Simply delete these commands if your modem objects to them.

%C1	Enables data compression. Turns on speed translation (buffering). This allows for constant speed DTE operation.
\\G	Enable RTS/CTS Flow Control. Note that the MCNRCD program translates the \\G to a \G when sending the string to the modem. see the discussion for the \ Carriage Return.
\	Carriage Return. Terminates the above commands.
^	Wait .5 seconds.

The following commands store the current configuration into the modem's non-volatile memory. They are not strictly required, but they do add a degree of additional reliability.

AT	Get modem's attention
&W	Write current configuration to non-volatile memory.
\	Carriage Return. Terminates the above command.
^^^	Wait 1.5 seconds for the modem to store the parameters. Other modems may require more or less time.

command_mode1=+++

This is the command mode escape switch. This command changes the modem from data mode into command mode. This command requires a guard time afterwards for the modem to go into command mode. The default time is 1 second on most modems.

The escape character can usually be set in the S2 register in the modem. The Guard Time can usually be set in the S12 register. Be sure it is set to between .5 and 1 second.

hangup1=ATH

This is the command that tells the modem to hang up the current connection.

10.1.3 Leased Line Modems

For a leased-line operation, the modems should be configured as follows:

PC Modem	**HIB Modem**
Leased Line	Leased Line
Originate	Forced Answer

The modems may be used in 4-wire or 2-wire configuration. The modems will come on-line faster in the 4-wire mode since training is quicker.

If leased line modems are used, the following system configurations must be set:

- OPTION A switch 5 on the HIB must be in the UP position.
- The /LL command line option must be specified on the MCNRCD command line.
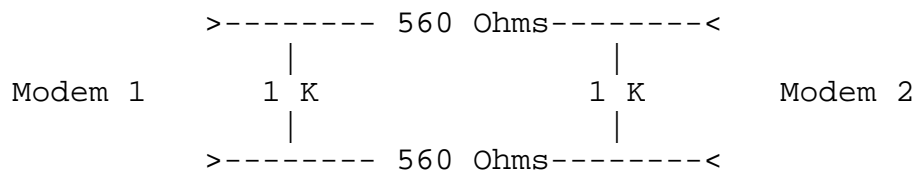
10.1.4 Testing Local Back to Back Modems

It is a good idea to test your system locally before installing the HIB at a remote location. Here are some hints to help you set up your test with the modems. For dial-up modems, connect both modems to dial-up phone lines. In-house analog extension lines on a PBX can be used.

Note: If you use a PBX extension line, be sure to use a standard analog extension line, not a digital extension line.

If you are using dial-up modems, set them up using two telephone lines or extensions. Program the PC modem to call from its phone to the other modem.. Leased line modems may have problems being hooked directly together without a phone line. Without a phone line, the modem will see a very high receive signal level. This can cause some modems to generate garbage data on the receive side. Reducing the receive signal level to about -10 to -16 dBm will usually cure this problem.

One way to reduce this level is by reducing the transmit level to -10 dBm on both modems. You can do this by entering the Modem Configuration menu on the V.3229 modem. If you do this, be sure to reset the levels when you install the system!

Another way to avoid receive garbage due to high levels is to connect the modems via an attenuator. A 12 dB attenuator for a 2-wire circuit can be made with 4 resistors as shown:

```
             >-------- 560 Ohms--------<
                 |                  |
 Modem 1        1 K                1 K        Modem 2
                 |                  |
             >-------- 560 Ohms--------<
```

Use two of these circuits for a 4-wire connection.
This appendix outlines the PC to modem and HIB to modem interfaces for the MCN Remote Comparator Display systems. This information is provided as an additional aid to help set up and maintain your PC comparator display system.

10.2 Modem Programming

The UDS V.3225 and 3229 modems are programmed with the front control panel. See section 12 for details about these front panel controls.

Most other modems can only be programmed from their DTE port. Programming involves disconnecting the modem from the HIB and connecting it to dumb terminal or a PC running communication software such as Procomm™.

The MCNRCD program automatically sets the proper modem parameters for your modem each time you place a Dial-Up call. The settings for the modem are stored in the MODEM.INI file. Several other INI files are available for different modem types. A table of available INI files is shown below.

Initialization File	Use with Modem Types
PM336MT.INI	Practical Peripherals PM336MT II
PM288MT.INI	Practical Peripherals PM288MT II
PM144MT.INI	Practical Peripherals PM144MT II
USRSP336.INI	US Robotics Model 336 Sportster**
USRSPVI.INI	US Robotics Model 278 Sportster Vi
ZOOM144.INI	Zoom Model 425 14400 Voice/Fax Modem
ZOOM288.INI	Zoom VFP 28.8 28800 Voice/Fax Modem
SURFR288.INI	Motorola SURFR 28800 Fax Modem
UDSV3225.INI	Motorola UDS V.32/V3225 Modem
UDSV3229.INI	Motorola UDS V.32/V3229 Modem

Additional modem initialization files may be included on the disk. Check for a README file for new additions.

The US Robotics Modem Model 336 Sportster will not connect to modems at 14400 baud!

The MCNRCD program cannot program modem options when the modem is used in leased line mode. If you are using the modems over leased lines, you must manually program the PC modem to be compatible with the HIB modem.

10.2.1 Programming the HIB's Modem Initialization String Using HIBCNFG.EXE

When the HIB module is configured for remote mode operation (OPTION A switch 5 is in the UP position), a modem initialization string is sent to the modem each time the HIB is reset or power cycled. This initialization string is stored in the HIB's non-volatile memory. Modems that use different command sets, may require you to change the HIB's default initialization string.

You may need to change this default initialization string for your specific modem to add additional commands or modify the delays. To change this initialization string, you only need to connect the HIB to the PC and run the program HIBCNFG.EXE that was provided with your MCNRCD.EXE program.

The command line for HIBCNFG is the following:

HIBCNFG {*/baudrate*} {*/?*} {*filename*}

All of the command line parameters are optional.

/baudrate
Valid options are /9600, /14400, /19200, /38400. This command sets the baud rate of the PC's COM port. This command is optional, and if not specified, MCNRCD uses a default baud rate of 38400.

If the HIB is connected directly to the PC COM port, the **/baudrate** specified must match the baud rate setting on the HIB's OPTION A switches 1, 2, and 3.

If the HIB is connected to a modem (for remote operation), the **/baudrate** specified must match the DTE speed of the modem being used.

/?
Displays help information about HIBCNFG

filename
The file that contains the modem initialization string to be programmed into the HIB. If no filename is specified, HIBCNFG uses the default filename MODMINIT.HIB. If a filename is specified, but no extension is provided, HIBCNFG appends a ".HIB" extension to the specified filename.

The initialization string contained in the file must follow a set format. Special characters can be inserted into the initialization string to provide delays between characters or for sending a carriage return to the modem. These special characters are the following:

- '^' to insert a 500 msec delay into the string
- '\' to insert a <cr> into the string
- '\\' to insert a single '\' into the string

HIBCNFG looks through the file for a special marker that indicates where the modem initialization string is located. This marker is "INIT=" and it must begin in column 1 of the line. Everything that follows "INIT=" is programmed into the HIB. If the "INIT=" marker is not found, HIBCNFG will return an error message. The maximum length of the initialization string is 50 characters. Any text beyond 50 characters is truncated from the initialization string.

The default initialization string (found in the file MODMINIT.HIB) is

INIT=^A^T^Z^\^^ATE0V1&C1&D2&Q5&K3S0=1\^^AT&W0\

Thus, with the default string, the HIB will output the following when it is reset:
- delay 1/2 second before sending any characters (this gives the modem time to power up if both the HIB and modem are powered up simultaneously).
- the ATZ command is sent to the modem followed by a carriage return to reset it. A 500 msec delay is put between each character to give the modem time to perform its automatic baud rate detection and setting.
- a 1 second delay is added (2 '^' characters) to give the modem time to reset itself.
- the initialization string is sent, with no delays, to program the modem for remote, auto answer operation.
- a 1 second delay is added (2 '^' characters) to give the modem time to reset itself.
- the AT&W0 command is sent to the modem so that the modem will store the new configuration in it non-volatile memory. By doing this, the modem will always power up in the correct mode of operation if it is turned on before the HIB is.

The following is a list of steps required to change the initialization string:
1. Connect the HIB to the PC, using the COM port specified in your DEVICE=CTIHIB.SYS command line of CONFIG.SYS. Make sure the HIB's OPTION A switch 5 is DOWN and that the HIB's baud rate switches, OPTION A switches 1, 2 and 3 match the baud rate that will be specified on the HIBCNFG command line.
2. Disconnect all cables from the HIB's NETWORK IN and NETWORK OUT ports.
3. Run the HIBCNFG.EXE program supplied on your *CTI MCN Remote Comparator Display* disk.
4. After executing the command, you will be told if the initialization string was successfully programmed or not. If the command fails, make sure your HIB is connected to the PC properly and that the HIB's option switches are set properly and then try again.

10.3 Multiple Speed Operation

If you would like to be able to dial into the HIB with modems using different baud rates such as 28800 or 14400, you will need a modem that supports *Automatic Speed Buffering* (ASB) or Constant Speed DTE. ASB is required because the HIB communicates at only one baud rate (selectable from the HIB's option switches). If you use remote PCs to call in at different baud rates, the modem must buffer data and convert the data from the variable phone line rate to the HIB's constant rate.

All of the recommended modems support ASB. To use this feature with other modems consult the documentation supplied with your modem.

To Enable ASB on the V.3225 or 3229 modems:
1. Select the change MNP Options menu.
2. Disable the MNP protocol (the ASB option is not available if the MNP protocol is enabled).
3. Enable Constant Speed DTE.

10.4 Modem System Example

Figure 40 shows a remote monitoring system that displays monitoring and control information for 8 receivers.
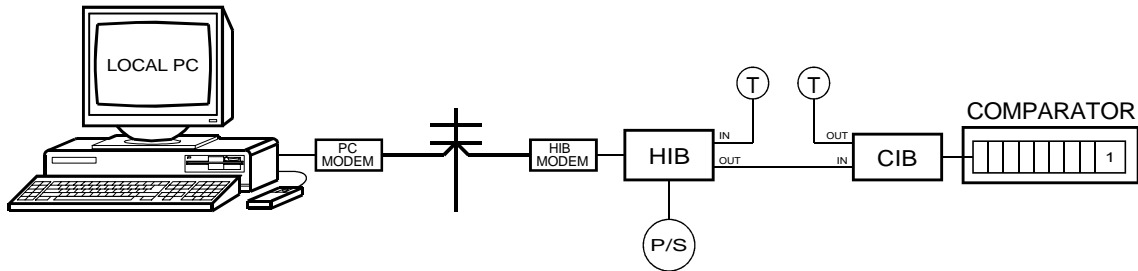
CA-80152-100

Figure 40 - Modem System Example

In this system, the PC Modem is connected to the COM port that is specified in the CTIHIB.SYS command line of CONFIG.SYS. The local PC has a file called MODEM.INI that contains an initialization string for the PC Modem. The screen configuration files used in this system must contain the phone number of the HIB Modem, or, when the MCNRCD command line is entered, the dialing string of the HIB Modem must be provided.

The HIB in this system is configured for remote operation (its OPTION A, switch 5 is in the UP position). When the HIB is reset, it sends its user programmed (using the HIBCNFG.EXE program) modem initialization string to the HIB Modem and waits for the modem's Carrier Detect line to become active, indicating that a call has been established.

11. Appendix C - Modem Configurations

The table below shows the initialization commands used by various modems that have been tested with the HIB and MCNRCD program.

Modem Command	Pratical Peripherals PM144MT II PM288MT II PM366MT II	Motorola SURFR 28800 Fax Modem	Motorola UDS V.3225	Motorola UDS V.3229
Local Echo Off	E0	E	E0	E0
Enable verbose responses	V1	V1	V1	V1
Normal CD operations	&C1	&C1	&C1	&C1
Normal DTR operations	&D2	&D2	&D3	&D3
Enable auto answer	S0=1	S0=1	S0=1	S0=1
Enable flow control	&K3	\Q3	\Q3	\Q3
Enable data compression	&Q5	%C1	%C1	%C1
Enable error correction	&Q5	\N3	\N3	\N7
Enable constant or fixed serial port baud rate (enable ASB)	Set by the &Q5 command	\J	\J	\J

Modem Command	US Robotics Model 278 Sportster Vi	US Robotics Model 366 Sportster Vi	Zoom Model 425 14400 Voice/Fax	Zoom VFP 28.8 Internal 28800 Voice/Fax
Local Echo Off	E0	E0	E0	E0
Enable verbose responses	V1	V1	V1	V1
Normal CD operations	&C1	&C1	&C1	&C1
Normal DTR operations	&D2	&D2	&D2	&D2
Enable auto answer	S0=1	S0=1	S0=1	S0=1
Enable flow control	&H1	&H1	&K3	&K3
Enable data compression	&K1	&K1	%C3	%C3
Enable error correction	&K1	&K1	&Q5	&Q5
Enable constant or fixed serial port baud rate (enable ASB)	&B1	&B1	Set by the &Q5 command	Set by the &Q5 command

12. Appendix D - Modem Configurations

UDS V.3225 MODEM CONFIGURATION SHEET

Configuration Procedure for V.3225 Modems version 2.12.12:

1. Load Factory Option Set #1.
2. Change the required settings for your operating mode except the Options Restored at Disconnect. (See *) All options different than option set #1 are highlighted.
3. Save Settings.
4. If you are using a Dial-up mode Set Options Restored / Retained as needed.
5. If you are using leased line mode, connect both modems together over the   leased line or test line and wait until the modems train and connect. Once the modems are on line set the Options Retained / Restored as required.
6. Save Settings.

Menu Options 1	Leased Line Modem	Dial Up Line Modem
Modem Parameters	**Modem Parameters**	**Modem Parameters**
DCE RATE	9600 TRELLIS	9600 TRELLIS

NORMAL ORIGINATE / FORCED ANSWER
    -HIB MODEM
    -PC MODEM
	FORCED ANSWER
	NORMAL ORIGINATE
		FORCED ANSWER
		NORMAL ORIGINATE

V.32 FAST TRAIN	DISABLED	DISABLED
AUTO RETRAIN	ENABLED	ENABLED
TRANSMIT CLOCK	INTERNAL	INTERNAL
DIAL LINE / LEASE LINE	LEASED LINE	DIAL LINE
-	4-WIRE (RECOMMENDED)	-
-	TX LEVEL IS 0 DBM	-
-	DIAL BACKUP IS	-
-	LOOKBACK TIMER IS 15	-
JACK TYPE	RJ11 (PERMISSIVE)	RJ11 (PERMISSIVE)
LINE CURRENT DISCONNECT	LONG	LONG
LONG SPACE DISCONNECT	DISABLED	DISABLED
V.32 CLEARDOWN	DON'T CARE	DON'T CARE
V.22 GUARD TONE	DISABLED	DISABLED
MNP Options		
MNP PROTOCOL	ENABLED (\N3)	ENABLED (\N3)

DTE SPEED
    -HIB MODEM
    -PC MODEM
	CONSTANT DTE SPEED
	CONSTANT DTE SPEED
		CONSTANT DTE SPEED
		CONSTANT DTE SPEED

AUTO FALL BACK	NORMAL	NORMAL
FLOW CONTROL	RTS/CTS (\Q3)	RTS/CTS (\Q3)
XON/XOFF PASS THROUGH	DON'T CARE	DON'T CARE
DATA COMPRESSION	ENABLED(%C1)	ENABLED(%C1)
INACTIVITY TIMER	OFF	OFF
MNP BREAK CONTROL	5	5
DTE Parameters		
ASYNC / SYNC DATA	ASYNC	ASYNC
DTE RATE	19200 OR 9600	19200
CHAR SIZE	8 BIT	8 BIT
PARITY	NO	NO
DIAL METHOD	ASYNC COMMANDED DIALER	ASYNC COMMANDED DIALER

Factory Options 1	Leased Line Modem	Dial Up Line Modem
Modem Parameters	Modem Parameters	Modem Parameters
DTE Parameters (continued)		
AT COMMAND SET -HIB MODEM - PC MODEM	DISABLED DISABLED	ENABLED ENABLED
DTR RESPONSE	IGNORE (&D)	DTR RESETS (&D3)
DSR STATE	FORCED HIGH	FORCED HIGH
DCD STATE	FORCED HIGH	DCD IS NORMAL (&C1)
CTS STATE	FORCED HIGH	FORCED HIGH
DTE FALLBACK	DISABLED	DISABLED
OPTIONS AT DISCONNECT	OPTIONS RESTORED AT	OPTIONS RESTORED AT
Test Parameters		
BILATERAL ANALOG	DISABLED	DISABLED
BILATERAL DIGITAL	DISABLED	DISABLED
DTE LOCAL TEST	DISABLED	DISABLED
DTE REMOTE TEST	DISABLED	DISABLED
REMOTE COMMANDED	ENABLED	ENABLED
TEST TIME-OUT	OFF	OFF
Dial Line Parameters		
TONE DIAL / PULSE	TONE DIAL	TONE DIAL
AUTO DIAL	# 1	# 1
WAIT FOR DIAL TONE / BLIND	WAIT FOR DIAL TONE	WAIT FOR DIAL TONE
WAIT DELAY	2 SEC	2 SEC
PAUSE DELAY	2 SEC	2 SEC
CALL TIME-OUT	30 SEC	30 SEC
ANSWER ON RING	1	1
801 V.32 TIME-OUT	LONG	LONG
AUTOCALLBACK	DISABLED	DISABLED
Speaker Options		
VOLUME CONTROL	MEDIUM	MEDIUM
ON / OFF CONTROL	UNTIL CARRIER DETECT	UNTIL CARRIER DETECT
Additional AT Options		ADDITIONAL AT OPTIONS
		ECHO OFF (E) **

** Programmable only with a communications program using the modems DCE port

UDS V.3229 MODEM CONFIGURATION SHEET

Configuration Procedure:
1. Load Factory Option Set #1.
2. Change the required settings for your operating mode except the Options Restored at Disconnect. (See *) All option set changes from option set #1 are highlighted.
3. Save Settings.
4. If you are using a Dial-up mode Set Options Restored / Retained as needed.
5. If you are using leased line mode, connect both modems together over the leased line or test line and wait until the modems train and connect. Once the modems are on line set the Options Retained / Restored as required.
6. Save Settings.

Factory Options 1	Leased Line Modem	Dial Up Line Modem
Modem Options	**Modem Options**	**Modem Options**
DCE RATE	14400	14400
NORMAL ORIGINATE 　　-HIB MODEM 　　-PC MODEM	 FORCED ANSWER NORMAL ORIGINATE	 FORCED ANSWER NORMAL ORIGINATE
FAST TRAIN	DISABLED	DISABLED
AUTO RETRAIN	ENABLED	ENABLED
SQ. AUTO RATE	DISABLED	DISABLED
TRANSMIT CLOCK	INTERNAL	INTERNAL
DIAL LINE TX LEVEL	-10 DBM	-10 DBM
DIAL / LEASED LINE	LEASED LINE	DIAL LINE
	4 WIRE OR 2 WIRE	
	LEASED TX LEVEL 0DBM	-
	MANUAL DIAL BACKUP	
	LOOPBACK TIMER 15 MIN.	-
JACK TYPE	RJ-11	RJ-11
LINE CURRENT DISCONNECT	LONG	LONG
LONG SPACE DISCONNECT	DISABLED	DISABLED
V.22 GUARD TONE	DISABLED	DISABLED
Protocol Options		
LAPM PROTOCOL	DISABLED	DISABLED
MNP PROTOCOL	ENABLED (\N7)	ENABLED (\N7)
PROTOCOL FALLBACK	DISABLED	DISABLED
DATA COMPRESSION	NORMAL (%C1)	NORMAL (%C1)
DTE SPEED	CONSTANT DTE SPEED	CONSTANT DTE SPEED
DTE FLOW CONTROL	RTS (\Q3)	RTS (\Q3)
DCE FLOW CONTROL	CTS (\Q3)	CTS (\Q3)
XON/XOFF PASSTHRU	DON'T CARE	DON'T CARE
INACTIVITY TIMER	OFF	OFF
BREAK OPTION	#5	#5
V.42 FAST DETECT	ENABLED	ENABLED

Factory Options 1	Leased Line Modem	Dial Up Line Modem
Modem Options	Modem Options	Modem Options
DTE Parameters		
Async / Sync Data	Async	Async
DTE Rate	38400	38400
Char Size	8 Bit	8 bit
Parity	None	None
Dial Method	Async Commanded Dialer	Async Commanded Dialer
AT Command Set	Enabled	Enabled
DTR Response	Ignore (&D)	DTR Resets (&D3)
DSR State	Forced High	Forced High
DCD State	Forced High (&C)	Normal (&C1)
CTS State	Forced High	Forced High
DTE Fallback	Disabled	Disabled
Options Retained at	Options Restored at	Options Restored at
Test Parameters		
Bilateral Analog Loop	Disabled	Disabled
Bilateral Digital Loop	Disabled	Disabled
DTE Local Test	Disabled	Disabled
DTE Remote Test	Disabled	Disabled
Remote Commanded Test	Enabled	Enabled
Test Time-out	Off	Off
Dial Line Parameters		
Tone Dial / Pulse	Tone Dial	Tone Dial
Auto Dial	#1	#1
Wait For Dial Tone / Blind	Wait For Dial Tone	Wait For Dial Tone
Pause Delay	2 Sec	2 sec
Call Time-out	30 Sec	30 sec
Answer on Ring	1	1
801 V.32 Time-out	Long	Long
Autocallback	Disabled	Disabled
Speaker Options		
Volume	Medium	Medium
On / Off Control	Until Carrier Detect	Until Carrier Detect
Additional AT Options		**Additional AT Options**
		Echo Off (E) **

** Programmable only with a communications program using the modems DCE port.

13. Appendix E - System Performance

The following is a list of steps that you can take to maximize the performance of MCNRCD:

- Make sure that all of the MCN modules that are configured in the GCF files of the loaded screen configuration file are connected to the MCN network (including MCN modules that are not displayed on the current screen but that are configured in the GCF file).

  When a screen file is loaded, MCNRCD establishes communications with each MCN module that is defined in the GCF files that were loaded. If MCNRCD cannot talk with a particular module (it is powered off or is not connected), then MCNRCD will log a 'no configuration data received' error for the module. MCNRCD will then, periodically, attempt to establish communications with that module. This attempt to re-establish communications will slow down MCNRCD operation.

- **Run the HIB and MCNRCD at the highest possible DTE baud rate (preferably 38400 baud).**

- If using modems, make sure the modems are set for Automatic Speed Buffering or Constant Speed DTE so that the HIB and PC can run at the highest possible baud rate, even though the modem line speed may lower.

- If using modems, enable both data compression and error correction.

- If possible, disable logging to the disk. The time the PC takes to write the log information to the hard disk can have an impact on overall system performance, depending upon the speed of your PC's hard disk and the amount of data being logged to disk.

- You will experience slower system performance if your monitoring and control system includes more than 10 Comparator I/O Modules (CIB modules, for example), and you are running the HIB and MCNRCD with DTE rates of 9600 baud. Updates to the screen from the comparator will be fast, but responses from FORCE VOTES and FORCE DISABLES (using either the keyboard or the mouse) will be slower.

  To increase system performance, run the HIB and MCNRCD at higher baud rates (preferably 38400 baud).

14. Appendix F - Customer Support

If you need help in setting up your system, call one of our engineers at:
(513) 595-5900.

Ask to speak to a CTI Products, Inc. engineer. Our hours are from 8:30 to 5:00 Eastern time.