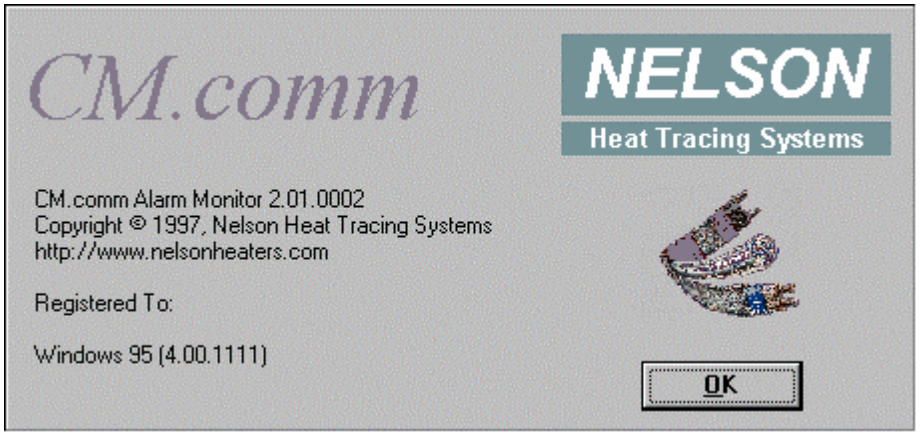
EGS Electrical Group NELSON HEAT TRACE

Installation & Maintenance



CM.comm

Host Communications Software

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CM.comm

Host Communications - Software for Heat Tracing Control

System Overview

The CM.comm Host Communications software package runs on Microsoft Windows 95/98/NT platforms. This application allows the user to monitor and update multiple CM family monitors and controllers. The system communicates via an RS-485 network from a central PC.

CM.comm allows the user to easily manage your entire heat tracing system from a central location.

With CM.comm you can:

- Monitor alarm status from a single location for all panels
- Acknowledge alarms centrally
- Modify setpoints for all controllers in the system within minutes
- Add informational notes about the status of various heat trace circuits
- Maintain a database of Alarm conditions
- Store CM unit configuration data base for future programming
- View Electrical and Mechanical circuit drawings during alarm conditions

System requirements

For Nelson CM.comm to function, the minimum system requirements are:

- PC compatible computer
- Windows 95/98 or NT
- 8 MB of RAM
- 10 MB of free hard disk space
- From 1 to 4 serial ports configured as RS-485.

The RS-485 adapter must be properly installed and functioning before Software Installation can proceed.

Communications Features

- True RS-485 communications interface
- Modbus protocol
- Asynchronous, half duplex communications
- Scan rate of 20 Channels/minute
- Up to 98 CM family units on a single communications Loop
- Communication Loop of up to 5,000 feet

CM.comm Quick Start

- Set the device number on the CM-1, CM-2, etc. Monitoring unit using the pair of rotary switches on the back side of the unit. The top switch controls the tens, the bottom switch controls the ones.

- Install the CM.comm Controller Monitoring Software on your PC using install program defaults.

- Verify that you have installed and properly configured an RS-485 adapter card or an RS-232 to RS-485 converter and that Windows recognizes it. It is essential that the RS-485 interface device provide automatic control of the Send/receive State. For more information on communication settings, refer to Summary.

- Verify that you have a shielded pair communications cable connected between the host PC RS-485 interface and the remote CM device(s).

- Use CM.comm's *Database Explorer* application to configure any UNCONFIGURED Control Monitoring units.

- Start the *Alarm Monitor* application.

- From the File Menu, select "Auto Configure".

- From the Auto Configure dialog box, make the following selections:

    - ✓ Control Loop: Select "Heat Trace Loop #1"
    - ✓ Serial Port: Select the serial port that corresponds to your RS-485 adapter.
    - ✓ Baud Rate: Select "4800" (only choice at this time)
    - ✓ Data Bits: Select "8" (only choice at this time)
    - ✓ Stop Bits: Select "1" (only choice at this time)
    - ✓ Parity: Select "None" (only choice at this time)
    - ✓ Beginning Address: Enter the lowest numbered address that CM.comm should search for.
    - ✓ Ending Address: Enter the highest numbered address CM.comm should search for.

- Click on the "Start" button and CM.comm will attempt to communicate with devices within the specified address range. If any devices are found, CM.comm will query them for all of their current settings and store the information in the CM.comm database. The results of the search for each address will be displayed in the "Search Results" window.

- If the search was successful, you may repeat the process for another Control Loop (Note: this only applies if your system has multiple RS-485 adapters). Otherwise, refer to

- If CM devices were found, it is a good idea to run the Data Explorer application and review all of the settings that were reported to CM.comm. You may make any necessary changes at this time and they will be downloaded to the remote devices during subsequent scanning by Alarm Monitor. For more information, refer to File Menu.

End of Quick Start

Hardware Setup

Identifying your RS-232 ports for use with RS485 converters

Note: Above you will see that COM1: is a 9-pin D-shell Connector and that COM2: is a 25-Pin D-shell. Both are acceptable configurations, and you may use an RS-232 9-pin to 25-pin converter if necessary.

You should also notice that the RS-232 connectors are Male, you can see the pins. The Printer port, LPT1:, is also a 25-Pin D-shell connector, but it is Female.

Insure that you have at least one available RS-232 serial port on your PC.

>>>If you are having trouble with the RS-232/RS 485 installation, please see Trouble Shooting Serial Communications *in the Trouble Shooting section of this guide.*

RS-232 to RS-485 Conversion (25 Pin Version)

If the power supply leads are not attached to the converter, attach them to terminals 1 and 2 (Ground and +V) of the converter.

Currently, Nelson Heat Tracing Systems uses an RS-485 converter with an active dual-colored LED. That alternates between green and yellow to indicate good transmission between the HOST PC and the CM unit.

Use only shielded 18 gauge twisted pair cable for the communication cable between the RS-485 Converter and the CM unit. Overall cable length should be less than 5000 feet per data loop. Connect one wire to "A" and one wire to "B" on the screw down terminals of the RS-485 port. (terminals may be labeled transmit/receive or +/-)

Note that you do not connect the signal ground on the PC Converter.

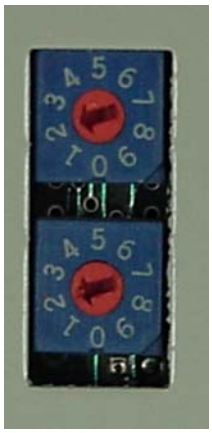
Communication cables should be routed as far as possible from power cables, florescent ballasts, large motors, transformers, etc. to avoid interference with the communication signal.

Plug the RS-485 Port Converter into the available RS-232 Connector on the back of your PC. You may use a 9-to-25 pin or 25-to-9 pin adapter if necessary.

CM-2

The communications terminal block should be mounted in the CM unit's cabinet. Connect the twisted pair communication cable from the Host PC to pins 7 and 8 on the terminal block. Connect the shield ground from the communications cable to screw post 1 on the terminal block. AGAIN -- DO NOT CONNECT THE SHEILD GROUND AT THE CONVERTER.

CM-2 Terminal Block



Setting the device number on the CM Family of Controllers and Monitors

The rotary switches on the back of the unit set the address. The top switch is tens, the bottom is ones.

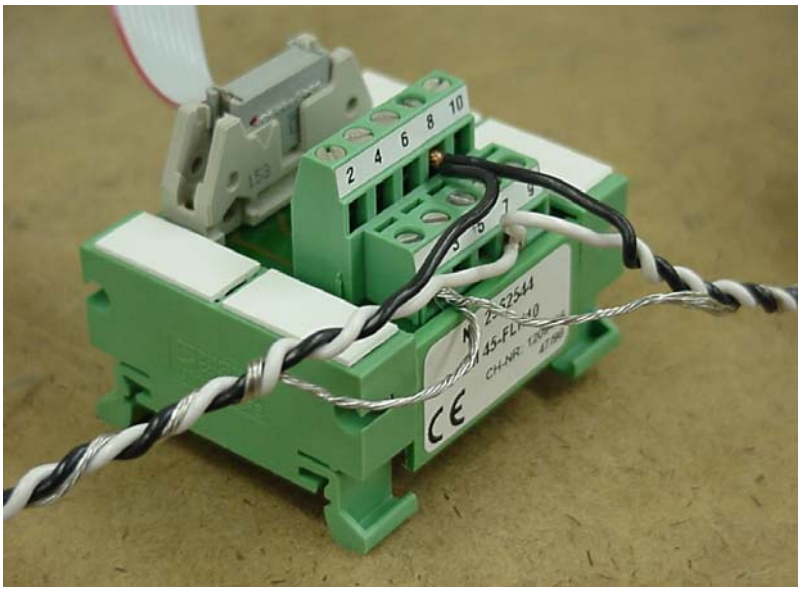
Serial Port on CM-2 with Twisted Pair ribbon cable in place.

Connect the communications terminal block to the CM-2 serial port on the back of the display unit. Use the twisted pair ribbon cable included in the installation kit.

No internal changes or modifications are required to the CM Controller, nor are any changes needed in the CM front panel setup. (Firmware Version 3.x or higher)

Daisy Chaining and Termination

The RS-485 Communication devices allows "Daisy Chaining" of multiple CM units. In other words, you connect your RS-485 Master device (in our case, the PC) to the first CM unit you wish to monitor using the above connection instructions in the Hardware Setup section of this manual. You then connect CM unit #1 directly to CM unit #2, **NOT DIRECTLY TO THE MASTER PC!**



Properly Daisy Chained CM-2 Terminal Block

You have connected the transmit, receive, and signal ground wires from your Master PC RS-485 communications adapter to the terminal block on CM unit #1. Attach the wires for the next CM unit under the same screw terminal as the wires from the Master PC. Connect both wires under each of the three screw posts respectively; post # 7, post # 8, and post # 1. Now connect the communications cable to the second CM unit's terminal block. Be certain to keep track of which wires go to which posts.

Repeat this "Daisy Chain" process until all of your CM units are linked together through the chain to the Master PC. You may mix CM-1, CM-2, CM 2001, etc. controllers and monitors on the chain.

Termination

On the final CM unit in you chain, you must terminate the loop with a resistor. This "termination resistor" prevents signal ringing in your cable and is an essential part of you installation.

The **termination resistor** is placed between screw posts 8 & 7 on the terminal block of the last CM controller or monitor in the "daisy chain."

The value of the termination resistor appropriate for your installation depends on many factors. The resistor shown here is only an example. DO NOT SELECT THE VALUE OF THE RESISTOR YOURSELF. Please contact the factory for proper sizing of the termination resistor in your application.

Although the CM family of monitors and controllers can be set with unit numbers from 0 to 98, in practice, the RS-485 communication standard generally allows for only 31 slaves plus a controller on a communications loop with no repeaters. The limitation is imposed by the signal strength of the RS-485 standard.

Nelson CM Family controllers and monitors act as RS-485 repeaters, consequently, the 31 unit limit is not valid in CM family Control Loops. CM.comm will support up to 98 CM units in a control loop.

Software installation

The current version of the CM.Comm Communications software may be downloaded from the Nelson Heat Tracing web site at www.nelsonheaters.com. Please be certain you are using the most current version of the CM.Comm software.

To minimize conflicts and to insure proper operation, it is recommended that CM.Comm be installed on a "fresh" load of Windows 95/98/NT. At the very least, insure that all previous versions of CM.Comm be uninstalled and that all directories and files created by the previous installation of CM.Comm are deleted.

To install the software, place floppy number one in your floppy drive and click on the a: drive icon under "My Computer"-(My Computer is located in the upper left hand corner of your Windows '95 desktop). You may alternately select run from the "Start" button in the lower left hand corner of your Windows desktop and type in "a:setup".

If you are installing from a CD, open the appropriate drive letter under "My Computer" and click on setup.

During the installation process, the CM.comm installation software will offer the user the option of installing CM.comm in default folders, or alternate folder locations. At this time, please use the default settings given by the CM.Comm installation software. Do not alternate directories for your destination.

Note: During Internal testing, testers noted inconsistent program behavior when using alternate directories. Specifically Data Manager did not seem to be able to locate all required database files.

CM.comm installs all required directories and software. During installation, CM.Comm adds several components to the Windows system. As such, it may ask you to reboot your machine. If this is required, you must run "setup" again. Please repeat the above instructions if this is necessary. CM.Comm will prompt you with this information during the installation, if these steps are required.

Using the CM.Comm Software

CM.comm consists of two primary application programs*: Alarm Monitor* and *Database Explorer*.
CM.comm allows a host PC to communicate with any of Nelson's CM™ line of temperature control and heater monitoring equipment.

DO NOT ENTER THE *ALARM MONITOR* APPLICATION UNLESS YOUR CM MONITORING UNIT IS ALREADY CONFIGURED FOR OPERATION!!!

When "Auto Configure" is selected in the *Alarm Monitor* module, CM.comm downloads the information from the CM controller to the CM.comm database. This process will overwrite any data in the CM.comm main database called Cmcomm.mdb.

If you have a pre-configured CM Monitoring unit, you may proceed to the *Alarm Monitor* application. If you need to configure your CM unit using CM.Comm, you must construct a database using the Database Explorer before you can proceed.

Database Explorer Overview

The *Database Explorer* function of CM.Comm allows you to:

- Compile the information needed to program your CM Monitoring Hardware.
- Add descriptive information to the database.
- Link illustrations with each controller and with each channel within a controller.
- Display alarm conditions and operating parameters obtained during the last scanning session.

(Note: The *Data Explorer* program does not download changes made to the CM.comm database. The *Alarm Monitor* module downloads database changes to controller during its normal polling cycle.)

In order to configure your CM Monitoring Unit, you will need the operating parameters for the specific controller you wish to program. This includes all circuit illustrations, circuit set points for all system circuits, and any additional descriptive information you wish to include in the CM.comm database.

Modifying the Database inside the *Database Explorer*

The *Database Explorer* application allows you to modify the contents of the database containing the set points and operating parameters for a specific controller.

Each channel of the CM Monitoring device may be programmed in the Data Explorer. The user may edit:

Channel, Name
Location
Drawing Number
Comments
Illustrations

Scanning for entire control loops, controllers, or individual channels my be enabled or disabled in the Data Explorer.

The CM.comm *Database Explorer* allows the user to move or copy settings from one control loop to another by using the "drag and drop" Windows function.

Changes made to the Database <u>are not</u> automatically downloaded to the controller. Each data point changed is flagged for download when it is added to the database or when existing data is changed.
Only data that is new OR that has been changed is flagged by the *Database Explorer* to be downloaded. The data is actually downloaded to the specific CM Controller the next time the *Alarm Monitor* program is run.

Modifying the Database outside of CM.Comm

The CM.Comm Database is stored in Microsoft Access format. It is possible to create or modify a CM.Comm database with third party database software. IT IS NOT RECOMMENDED THAT THIS BE ATTEMPTED BY NON-NELSON HEATER PERSONNEL.

CM.comm's database is a flat database with four tables. The only table that requires modification is cmcomm.mdb. A blank copy of this database is stored on the web site, or may be e-mailed to you from Nelson. ONLY USE A BLANK MASTER COPY OF THE CMCOMM.MDB FROM NELSON. DO NOT ATTEMPT TO CREATE YOUR OWN!!! Open and modify the database with your desired information.

All of the data points are described in the header of the database. When modifying the database externally, YOU MUST SET THE DOWNLOAD FLAG TO TRUE (CHECKED) BEFORE YOUR DATA WILL BE DOWNLOADED TO THE CM MONITOR. The download flag appears as the field "Download" in the CM.comm database. Setting the flag to "true" controls the process of transmitting the data set to the CM unit. The data will be downloaded to the CM Monitoring unit the next time the Alarm Monitor program is run.

Illustrations in the database

Illustrations may be added to the CM.comm database and linked to specific circuits in the database. This not only provides clarity in reviewing system design and insuring proper programming of the CM-2, but can also be an invaluable aid in diagnosing and servicing alarms.

Illustrations are created outside of CM.comm in Drafting or CAD programs. AutoCad is an example of a typical application used to generate system design drawings. In order to be accessed by the CM.comm communications program, drawings must be saved in the DWF file format. Generally speaking, you may choose the "save as" option from the File menu of your CAD or Drafting package and save the drawing in the DWF format. Nelson can provide any drawings done by Nelson in the DWF format for your database.

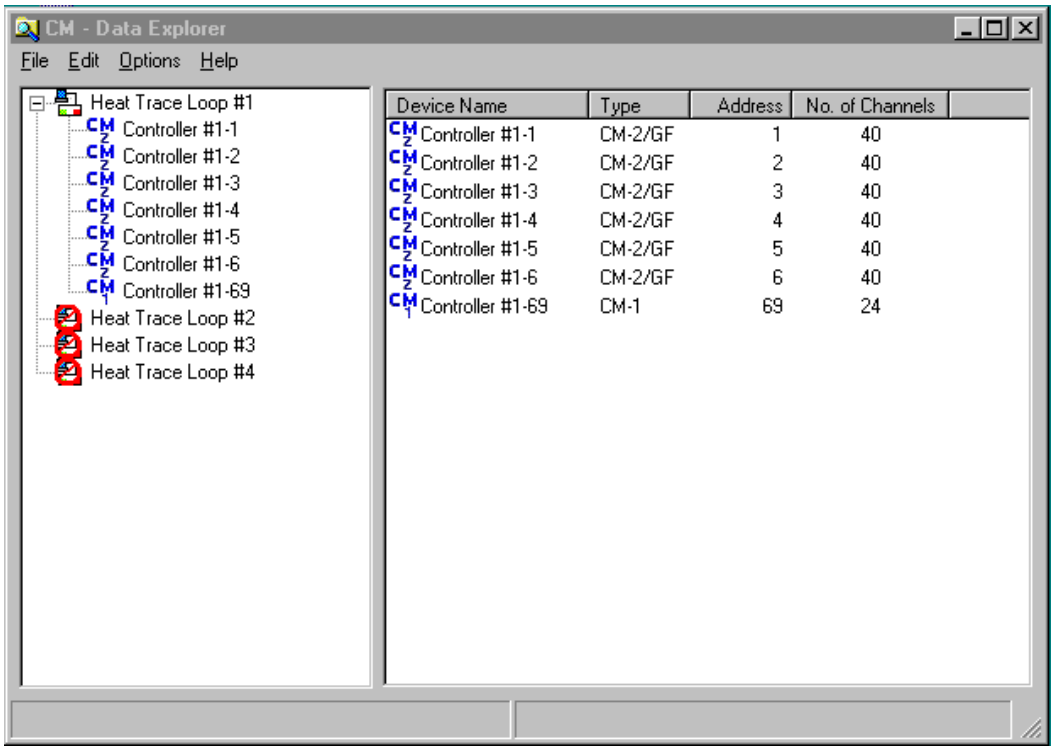
Internally, Nelson uses the program "Whip-n-Post" to convert large numbers of drawings to DWF format with one conversion step.

Note: it is known at this time that Whip-n-Post has a bug. Whip-n-post requires that all drawings to be converted be copied into one directory (folder) on the hard drive. When the program is run, the user-selected directory has all files converted to DWF format. Whip-n-Post DOES NOT convert all drawing files! Several files in the directory will not have an associated DWF file created. There seems to be no rhyme or reason to the bug. At this time, Whip-n-Post does not have a fix for this problem.

Before a drawing may be linked to a circuit in the CM.comm database, it must be placed in the DWF sub-folder in the CM.comm folder. After drawings have been copied the DWF directory, they may be linked in the CM.comm Database Explorer application to specific circuits.

When the *Alarm Monitor* module senses an alarm it displays the alarm condition. From the alarm display screen, you may display the drawings associated with the specific circuit in alarm to aid in troubleshooting.

Using the *Database Explorer*



Database Explorer - Main Screen

From the CM.comm Data Explorer Main screen you may select from these Menu bar selections:

File – Sub menus are:

>**Reports** – Setpoint Detail-Prints the setpoints for the item currently highlighted in the control window.

>**Exit** – Leaves the program

Edit – Sub menus are:

>**Enable/Disable Scanning** – Clicking this option toggles the software to the opposite condition. Enable is checked when selected.

>**Delete** – This deletes either the selected controller (CM Unit) or Loop. *Whichever item is highlighted in the left hand column is the item that will be deleted!!!!*

>**Properties** – Displays the properties of the Controller (CM Unit) or Loop that is currently selected.

Options – Sub menus are:

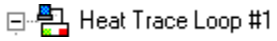
>**Temperature Display Units**

Allows you to select either °F or °C as the units used for temperature displays in CM.comm. Please note that this will not affect the temperature units used for display by the remote CM devices.

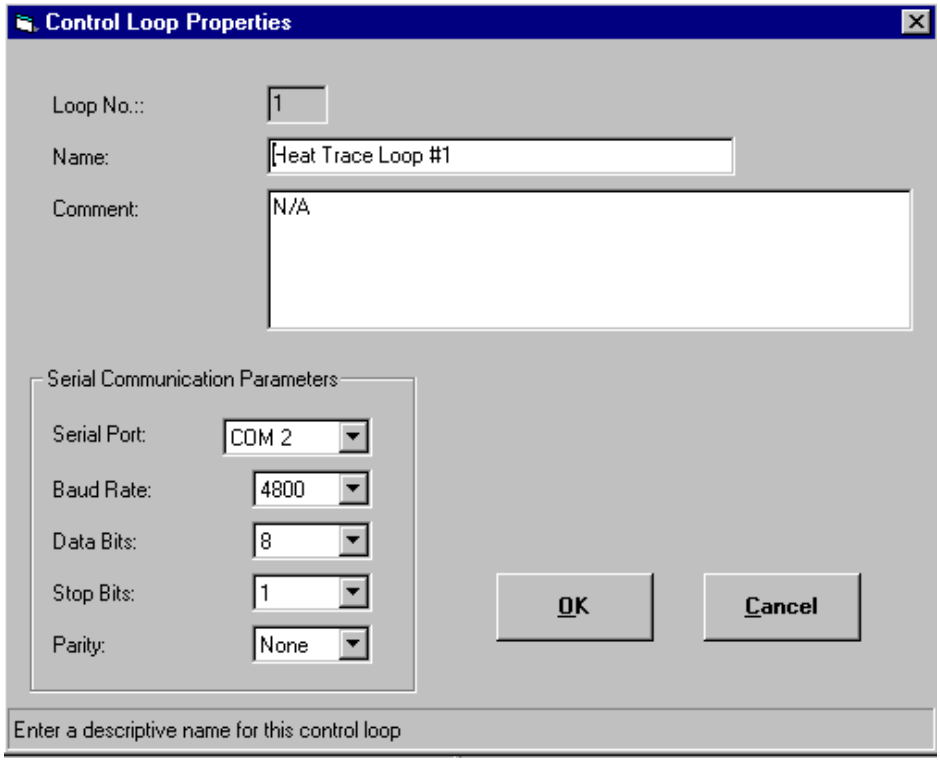
From the *Database Explorer* you may edit data relating to the **Control Loops**, **Controllers,** and individual **Channels.**

Control Loop Properties

From the **Database Explorer -Main Screen** you may update the CM.comm database Control Loop information specifically for a single loop by double clicking on the Heat Trace Loop you wish to edit.



You will open the Control Loop Properties Window.



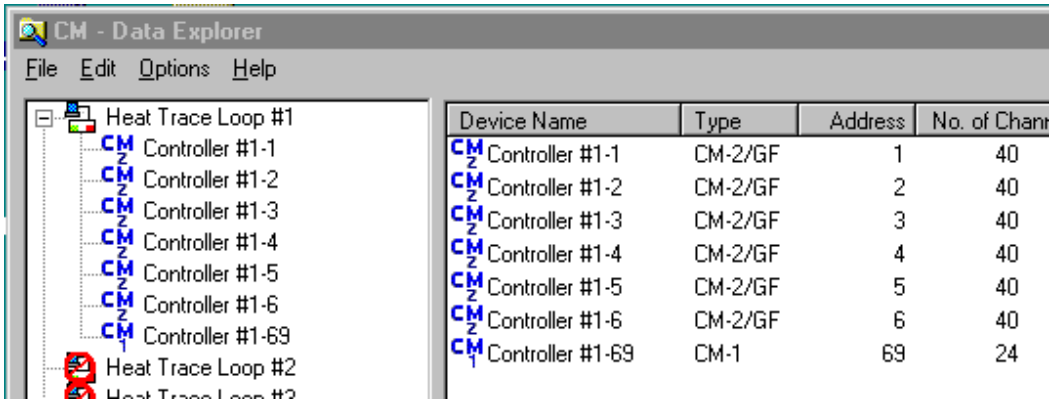
Control Loop Properties Screen

The data fields for the Control Loop Properties screen are:

Loop No.- a display only field. This is the loop you clicked on from the Database Explorer Main Screen
Name – The text string you wish to use to describe the specific loop you are editing. It is a good idea to use numeric information to indicate a sequential group of circuit loops, as well as a text identifier. The name "Heat Trace Loop #1" above is a good example of a text + numeric identifier.
Comment – You may enter any information here you feel needs to be available for future reference

Serial Communications Parameters
Serial Port – The serial port for this control loop. CM.comm will support up to 8 different serial ports. Each port can hold up to 98 different control loops.
Baud Rate – the serial transmission rate this port will use to communicate with outside devices. Only 4800 baud is supported at this time
Data Bits – number of data bits the communications protocol will use to communicate with outside devices. Only 8 data bits are supported at this time
Stop Bits – the number of stop bits in the serial protocol this port will use to communicate with outside devices.
Parity – defines how many parity bits this port will use to communicate with outside devices. None is the only option supported at this time.

Individual Controller settings - General



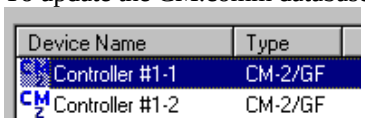
From the CM.comm **Database Explorer – Main Screen**, select the Heat trace loop you wish to edit by clicking the "+" or "-"sign next to the desired Heat Trace Loop.

Only the available loops will show a"+" or "-" sign.

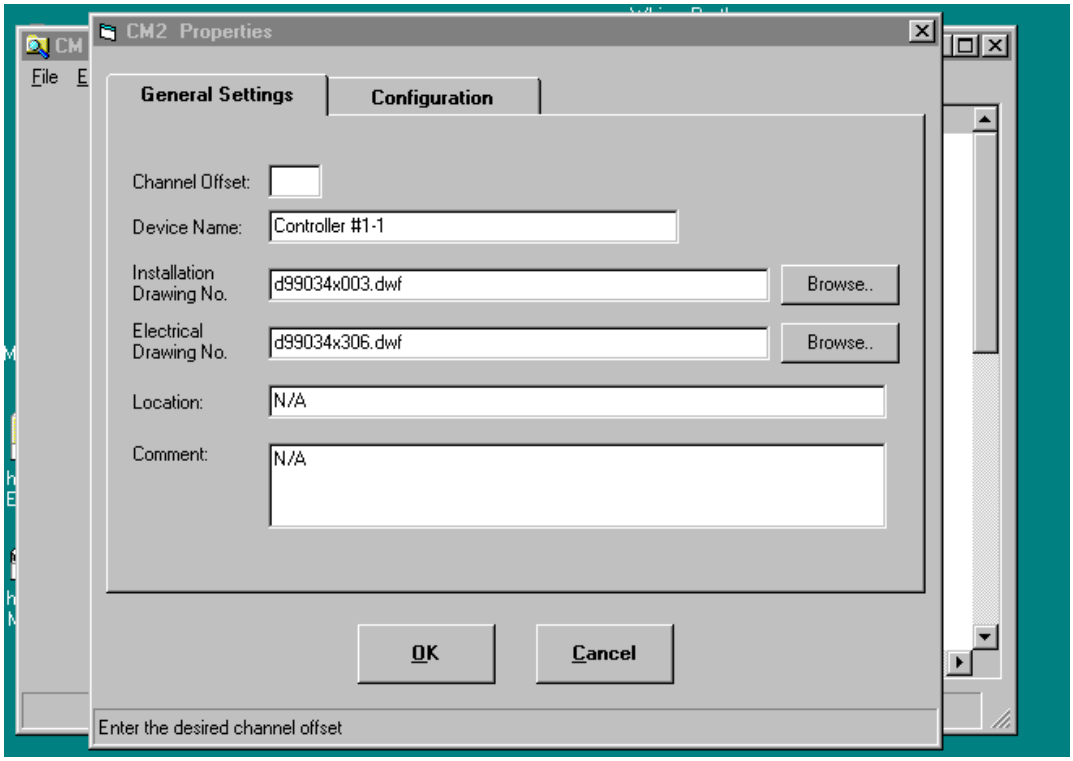
Loops that are inactive or not available will show a red circle with a cross.

You may select the controller from the left hand summary window, or, if you have the Heat Trace Loop selected, you may click on the same controller name in the right hand detail window below the Device Name.

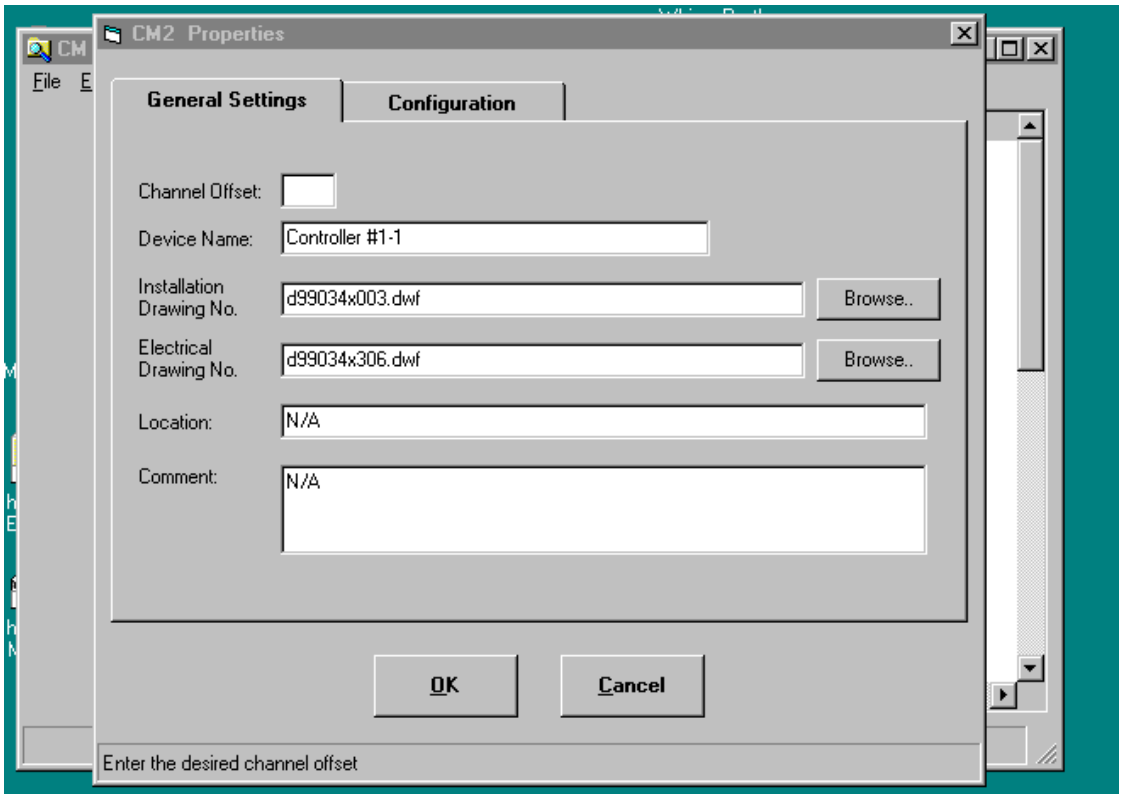
To update the CM.comm database for a selected controller, click on the Device Name you wish to update.



Two tabs will be displayed, the General Settings tab and the Configuration tab.



CM Properties – General Settings Tab



Under the CM Properties Window you have 6 fields you may add to the database record associated with the specific CM Unit you have selected. The fields are:

Channel Offset – this number indicates the number of PREVIOUS Channels on this loop that you wish to use in conjunction with this CM Controller. The offset forces the starting channel on this CM unit to be displayed as OFFSET + 1. The Channel Offset is a display change only and does not affect the operation of the CM units or the CM.comm software.

Device Name - Description used to refer to this circuit.

Installation Drawing No. – the file name of the Mechanical Drawing for this circuit. The "Browse" button may be used to find the specific drawing you wish to use in this location.

Electrical Drawing – the file name of the Electrical Drawing for this circuit. You may use the "Browse" button to find the specific drawing.

>>>>>> Note: *Both of the drawings above must be in the DWF format in the DWF directory*

Location – This is a text description of the physical location of this controller in the plant

Comment – This is a text field. You may put any detailed information in this field.

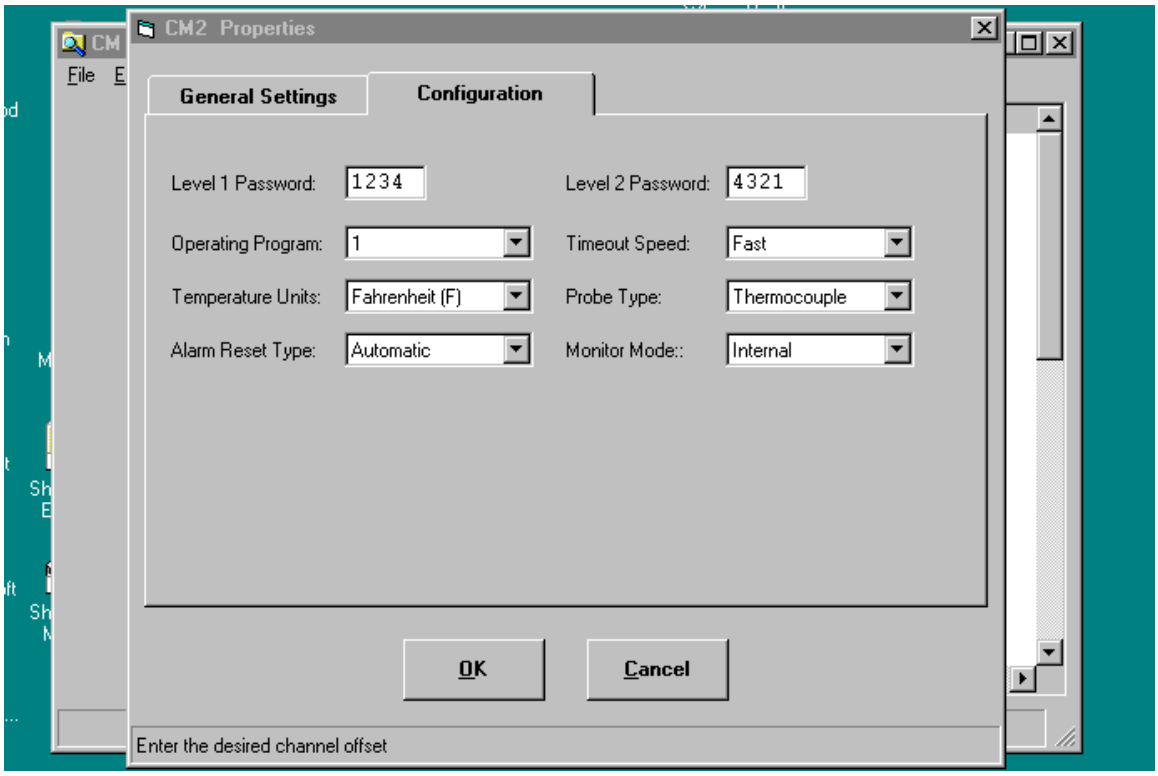
These Fields must be input by the user to correspond to the information that relates to the controller (or circuit) being defined in the record. In addition to the information input and saved in this record, the user may choose to link design drawings to the specific record as a reference to use during an actual alarm condition. Links may be made for both a Mechanical Drawing and an Electrical Drawing for each channel.

CM.comm will only look for the drawings in the DWF directory. All drawing must be in the DWF data format. You may simply type in the name of the file you wish to link to the channel data in the appropriate field, or you may use the "Browse" feature to define that link. One advantage of the "Browse" feature is you will choose the file from a list of drawings in the DWF directory. Since you are choosing from a list, you are certain that the drawing you wish to link is in the proper location, and, since you point and click, there is no danger of misspelling the file name.

>>**Note:** For information on linking drawings to the database with the Browse Button see:

Linking an Illustration to the database using Browse

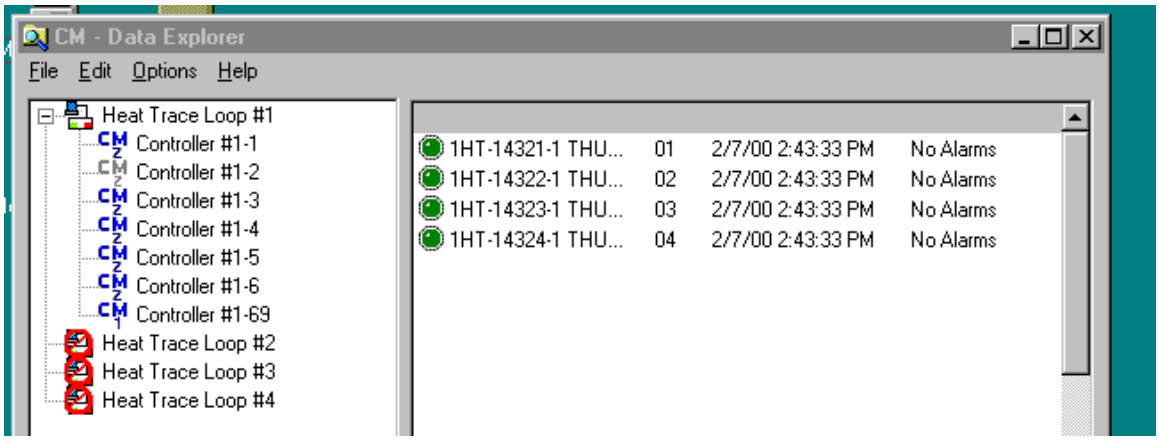
CM Properties – Configuration Tab



Under the CM Properties Configuration tab, you have 8 settings related to the specific CM Unit you have selected. Those 8 fields are:

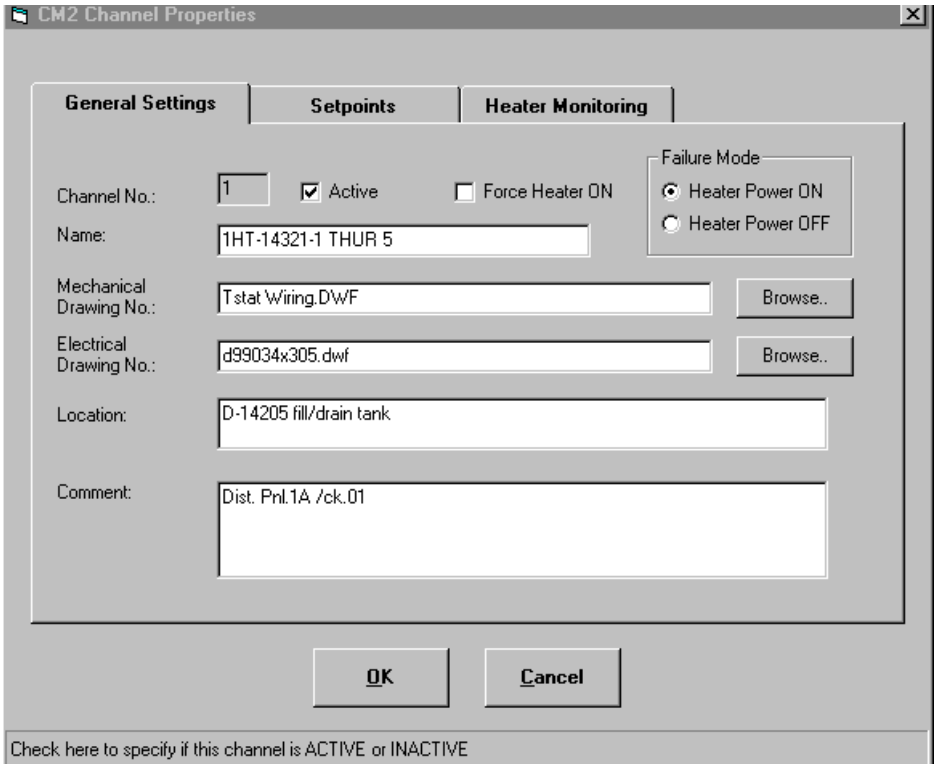
Level 1 Password – Allows access to circuit parameters
Level 2 Password – Allows access to system parameters
Operating Program – There are 5 available Operating programs. Each can be programmed with a unique set of parameters for different processes.
Timeout Speed – Time delay before an alarm is annunciated. Slow=5 minutes, Fast=1 minute
Temperature Units – Degrees Fahrenheit or Degrees Centigrade
Probe Type – RTD or Thermocouple
Alarm Reset Type – Automatic or Manual
Monitor Mode – Internal or External (Will almost always be Internal)

Heat Trace Channel Properties

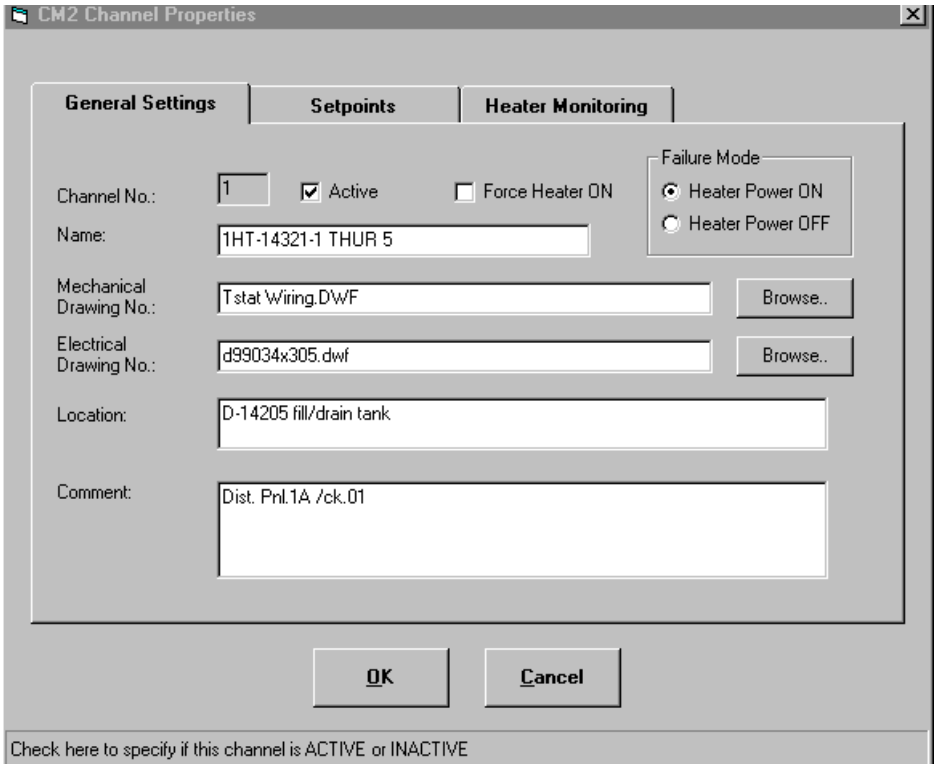


From the CM.comm Database Explorer – Main Screen, select the Channel you wish to edit by clicking the button 1HT-14321-1 THU... or name of the desired Channel in the right hand Channel Detail window.

You will notice three tabs, the General Settings tab, the Set-points tab, and the Heater Monitoring tab.



Channel Properties – General Settings Tab



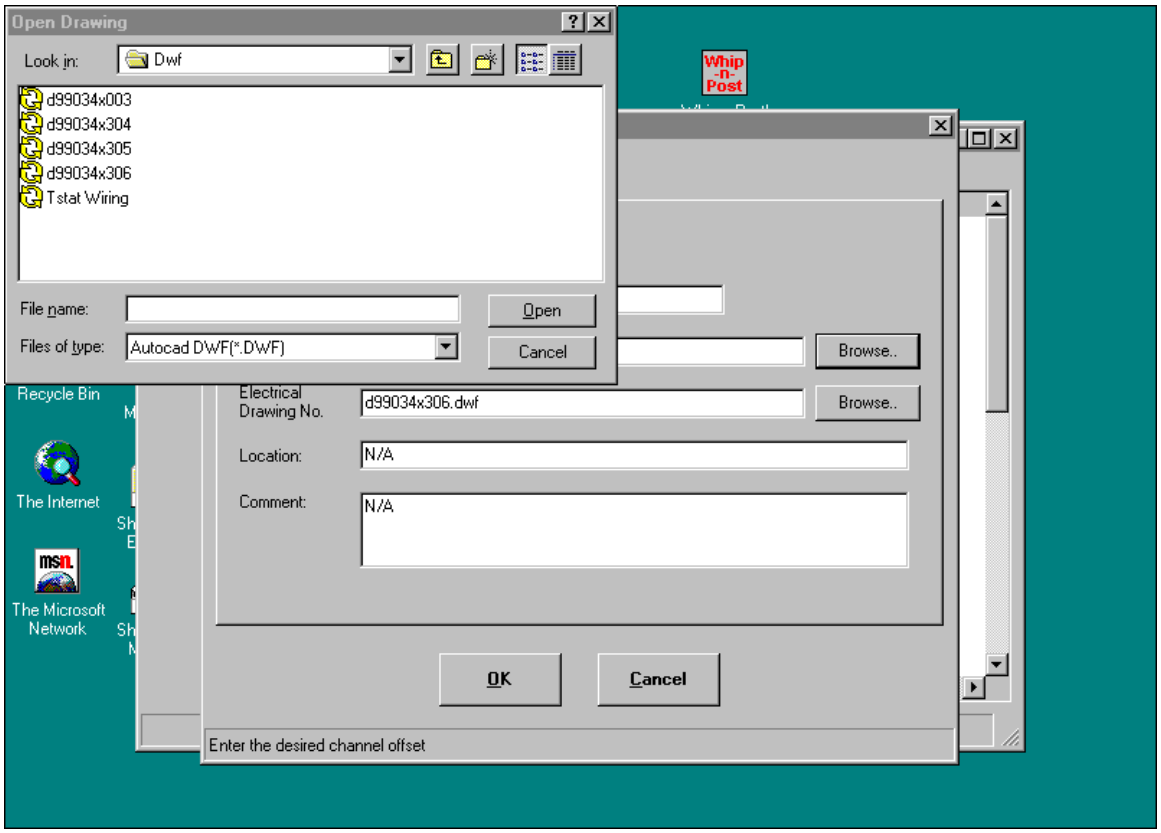
Under the General Settings tab you will find several data fields to input. They are:

Channel Number – this is a display variable only. You selected this by clicking on the channel number.
Active – Check this box to Activate the circuit specified by this channel number
Force Heater on – Check this box to keep heater circuit powered on continuously
Failure mode – When a system failure occurs you may choose one of two circuit states:
Heater Power ON – cable fails on
Heater Power OFF – cable fails off
Name – The description used to refer to this circuit.
Mechanical Drawing – the file name of the Mechanical Drawing for this circuit. The browse button may be used to find the specific drawing you wish to use in this location.
Electrical Drawing – the file name of the Electrical Drawing for this circuit. You may use the "Browse" button to find the specific drawing.
>> Note: Both of the drawings above must be in the DWF format in the DWF directory
Location – This is a text description of the physical location of this circuit in the plant
Comment – This is a text field. You may put any detailed information in this field.

These Fields must be input by the user to correspond to the information that relates to the channel (or circuit) being defined in the record. In addition to the information input and saved in this record, the user may choose to link design drawings to the specific record as a reference to use during an actual alarm condition. Links may be made for both a Mechanical Drawing and an Electrical Drawing for each channel.

CM.comm will only look for the drawings in the DWF directory. All drawings must be in the DWF data format. You may simply type in the name of the file you wish to link to the channel data in the appropriate field, or you may use the "Browse" feature to define that link. One advantage of the "Browse" feature is you will choose the file from a list of drawings in the DWF directory. Since you are choosing from a list, you are certain that the drawing you wish to link is in the proper location, and, since you point and click, there is no danger of misspelling the file name.

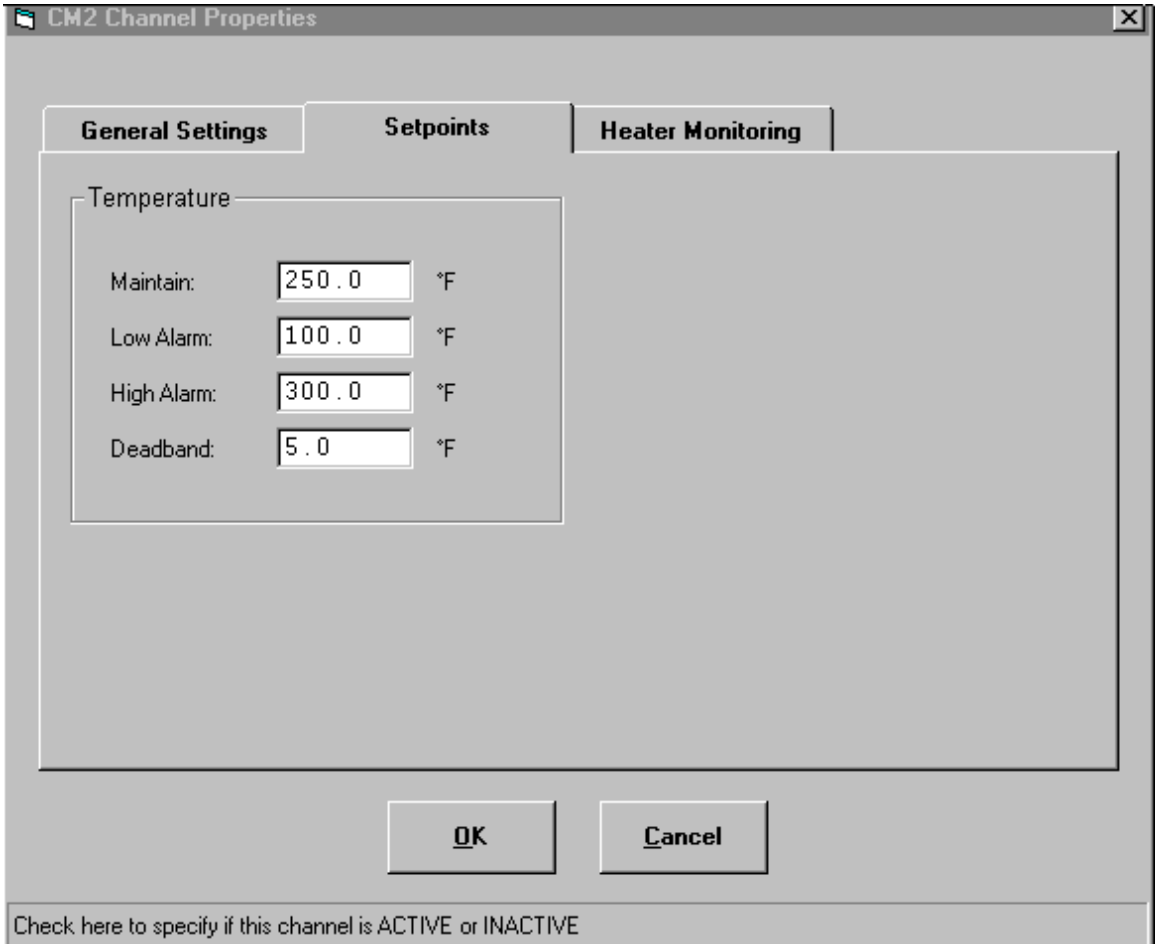
Linking an Illustration to the database using Browse



If you wish to link a drawing to the database record you are editing, select browse for the appropriate drawing (Electrical or Mechanical).

The "Open Drawing" Window, above, will be displayed. You may select any drawing from the DWF subfolder. This subfolder is located in the **C:\Program Files\Nelson Heat Tracing\CMCOMM\DWF** directory. Place your mouse on the desired drawing and double click. The file name you selected will now display in the Mechanical or Electrical drawing window.

Set-points tab

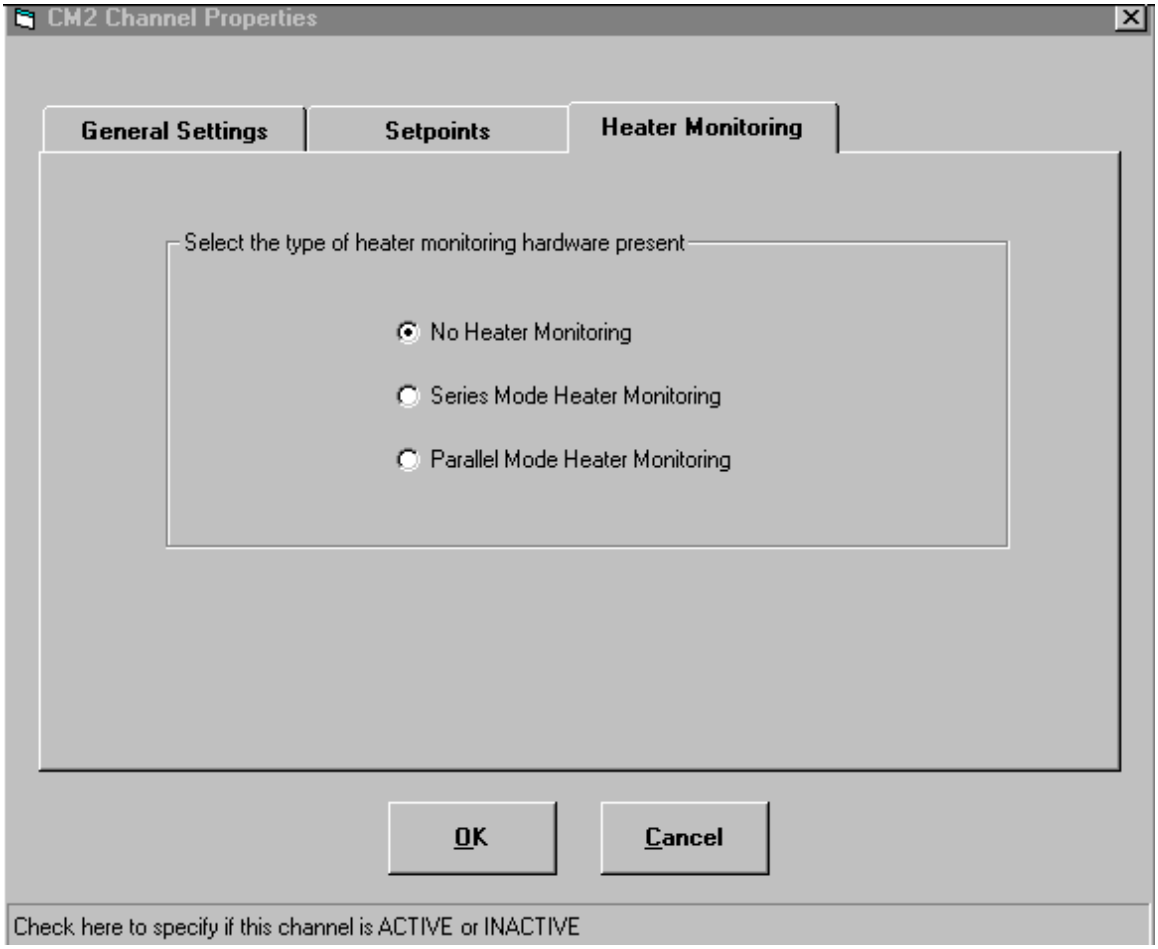


Channel Properties - Setpoints Window

Under this tab, you will input the limits for this specific circuit. The data fields for this tab are:

Maintain – the temperature at which this specific circuit is to operate
Low Alarm – the low temperature at which the CM unit should signal an out of range condition
High Alarm – the high temperature at which the CM unit should signal an out of range condition
Dead Band – the setpoint temperature tolerance in degrees, relative to the " Maintain" temperature.
In this "Dead Band" range, the heater is energized.

Heater Monitoring Tab



Channel Properties – Heater Monitoring Window

The Heater Monitoring Window allows you to specify the type of heaters on this circuit.
There are three choices for this option screen:

No Heater Monitoring----------Use with CM2, CM2-GF, & CM2001 units
*Series Mode Heater Monitoring-------MI type heaters
+*Parallel Mode Heater Monitoring-----Self Regulating and Constant Wattage type heaters

You may select only one type of monitoring per channel (circuit).
>>Note: If you select “No Heater Monitoring”. In this case, all monitoring for this circuit is disabled.

CM-2-GF and CM-2001 Units will, however, continue to monitor current and ground faults.

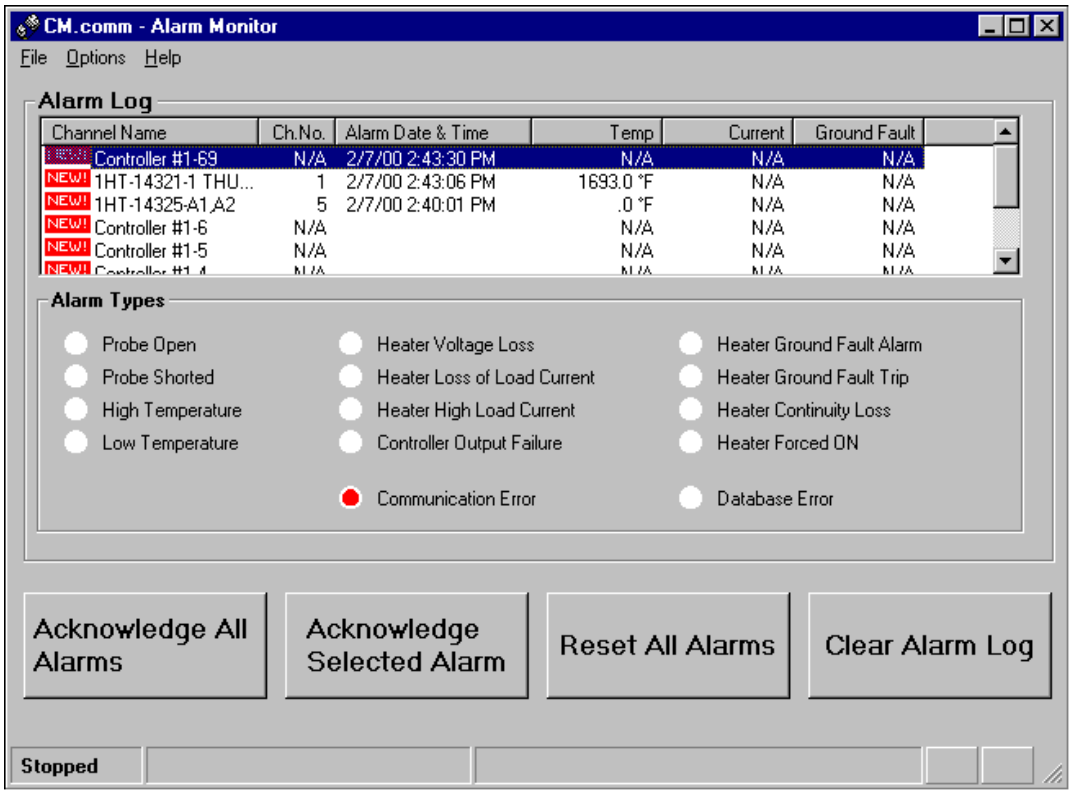
*** Use with CM-2/1 and CM-1 Units**

+ With Parallel Mode Heater Monitoring, a CMD device must be installed at the end of the circuit. Without this device, false continuity alarms will occur.

Alarm Monitor Module

The Alarm Monitor application performs the actual communication by continuously polling all CM devices connected to the network. The information returned by the controller (such as alarm conditions and current operating parameters) is then stored in the PC based database and displayed in an easy to read format. This application also allows the operator to easily acknowledge and reset alarm conditions.

CM.comm Alarm Monitor Main Screen



From the CM.comm Alarm Monitor Main Menu you may select from three Menu bar selections:

File – Sub menus are:

>**Start Scanning** – Remains on Alarm Monitor main screen and begins scanning all configured devices
(Note: To modify or add channel setpoint data, scanning must be disabled. After changes are made, enable scanning.)

>**Auto configure** – Downloads the configuration data from the CM devices to the CM.comm database

Options – Sub menus are:

>**Program Settings**

Alarm Monitor program control options are set here

>**Temperature Display Units**

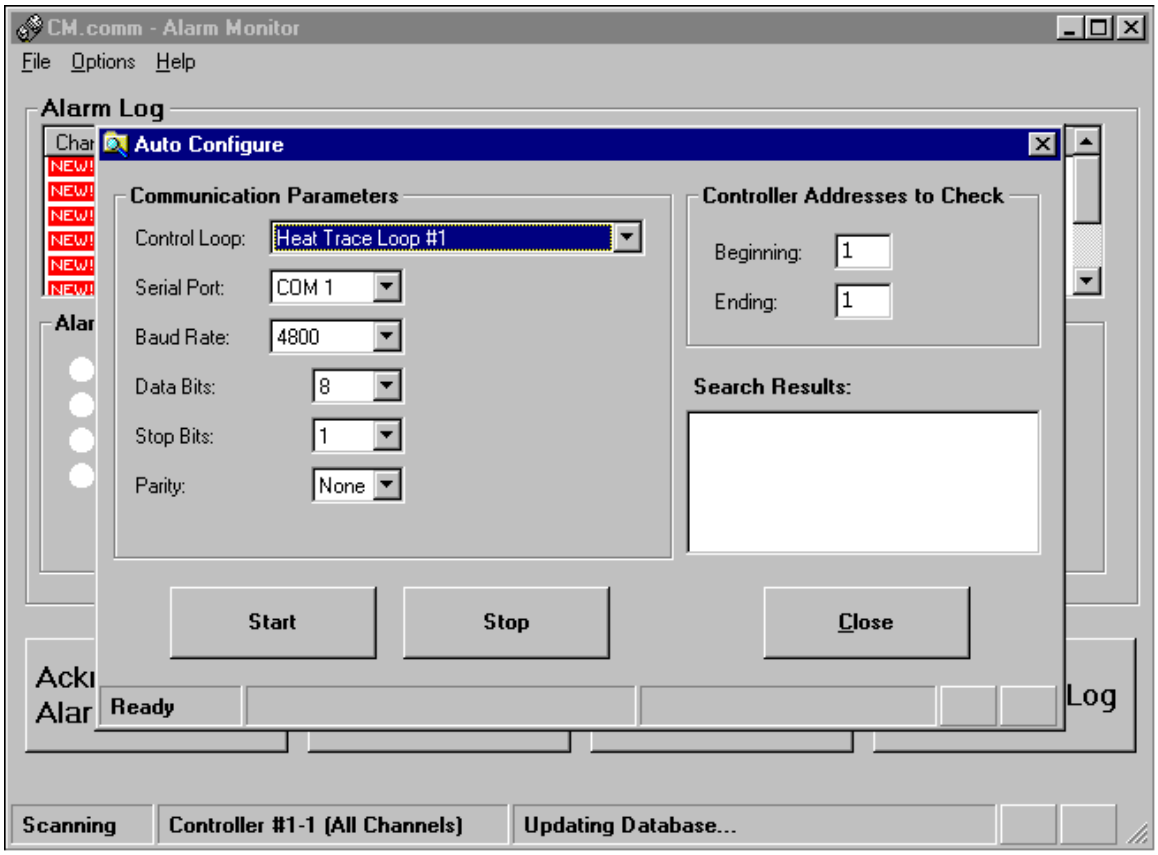
Allows you to select either °F or °C as the units used for temperature displays in CM.comm. Please note that this will not affect the temperature units used for display by the remote CM devices.

The Alarm Monitor Main menu also gives you access to the four Alarm Control Buttons at the bottom.

Acknowledge All Alarms
Acknowledge Selected Alarm
Reset All Alarms
Clear Alarm Log

Auto Configure

From the File sub menu, you may select the Auto Configure option.



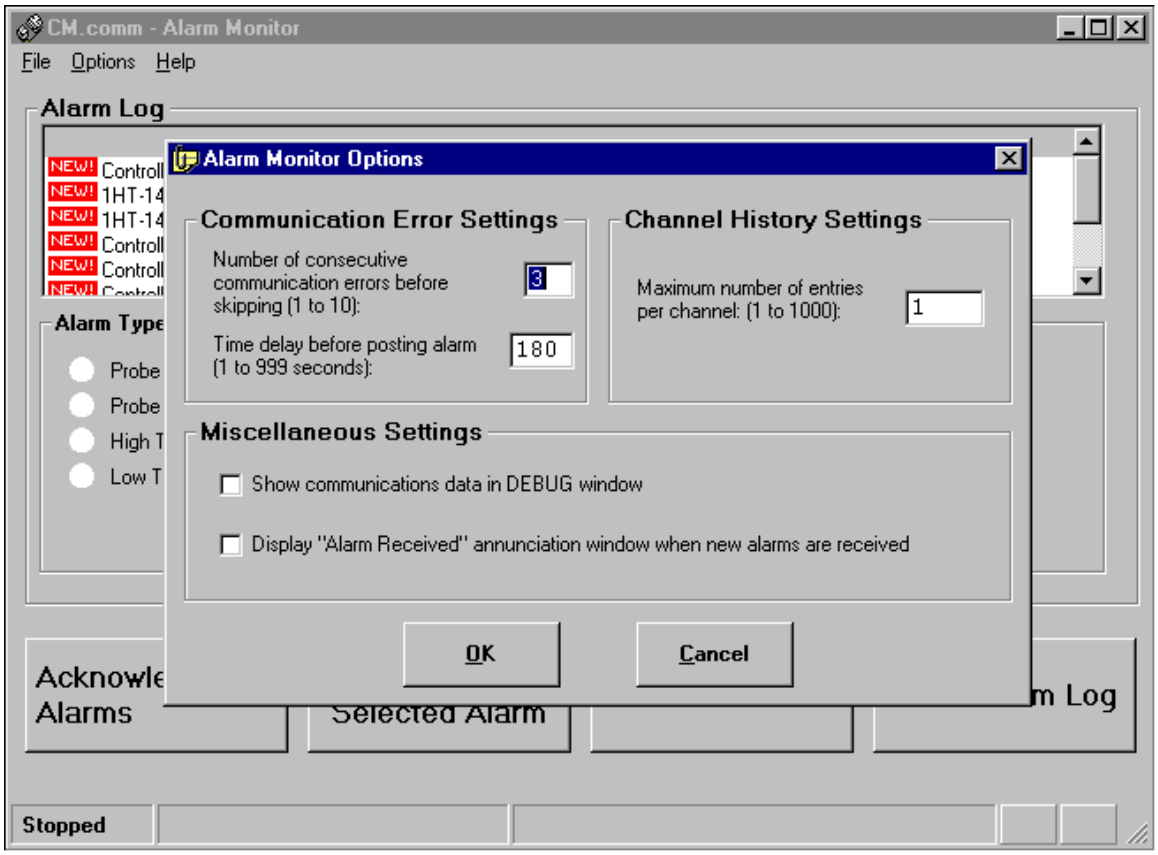
The user must set the auto configure variables for the appropriate Loop to configure. These variables should automatically match those from the Database Explorer for the specific Control Loop selected.

"Controller Addresses to Check" must include the unit number range for all CM controllers to be configured. See "User set up information".

The Results of the scan are displayed in the **Search Results** window. If the system is properly configured, all CM units within the selected ranges should show up here.

>>**Important Note:** When CM.comm begins scanning in this mode, or any other scan mode, the data downloaded from the CM controller will be placed in the CM.comm database. Unless changes have been made manually in the CM.comm Database Explorer (or modified and flagged outside of CM.comm), the data from the CM Unit will overwrite any data in the CM.comm database.

Alarm Monitor Options



Program Settings

The following options are available from this dialog box:

Communication Error Settings

Number of consecutive communication errors before skipping - If CM.comm encounters a communication error with a remote device, it will immediately retry the communication. You may use this field to specify how many retries CM.comm will attempt before considering this an actual communication failure and move on to the next device.

Time delay before posting alarm - You may use this field to specify how long CM.comm will wait before actually annunciating a communication error as described above. This delay setting applies primarily to the CM2 controller which is unresponsive to communications during its periodic temperature sensor re-calibration mode. When using CM.comm with CM2 controllers, it is recommended that you do not set this value lower than the default value of 180 seconds in order to avoid recurring communication alarms.

Channel History Settings

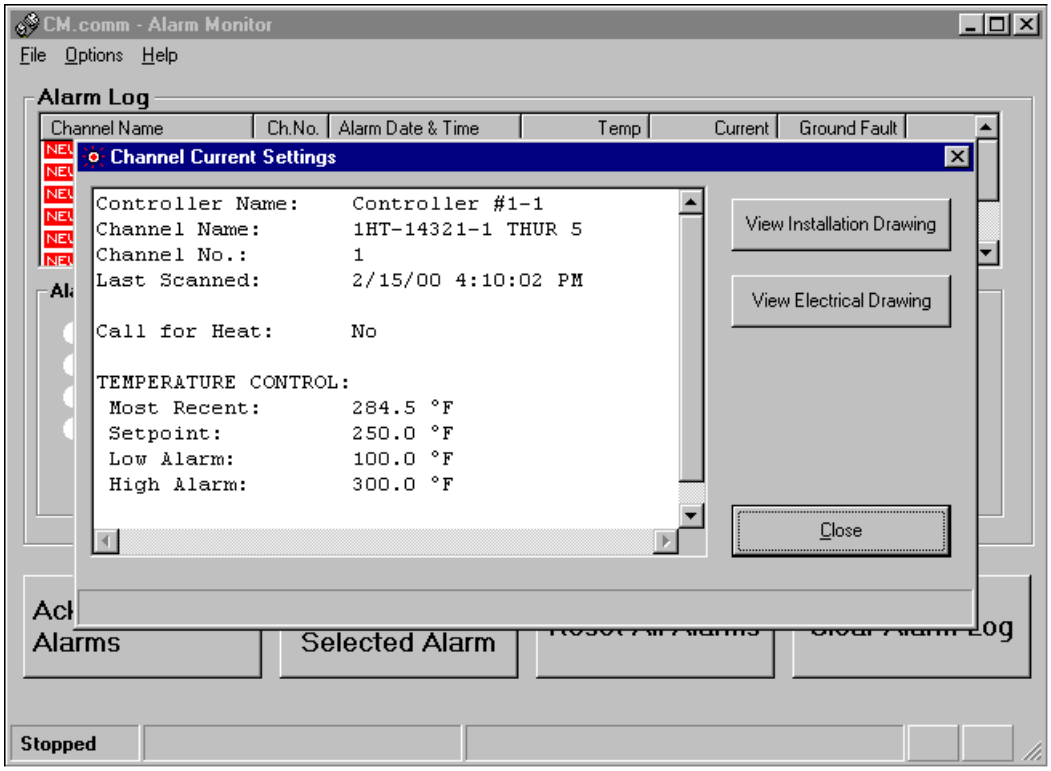
Maximum number of entries per channel – User defined. Sets number of stored alarm records.

Miscellaneous Settings

Show communication data in DEBUG windows – Activates displays of data stream on screen.

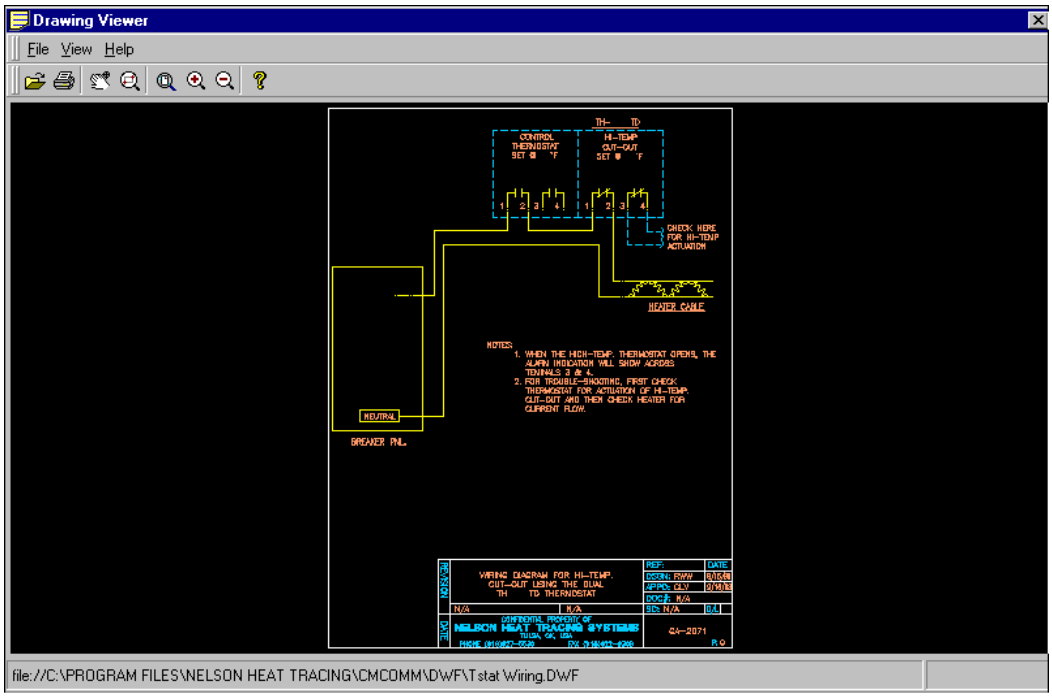
Display "Alarm Received" annunciation window when new alarms are received.

Displaying Circuit Detail under Alarm condition



When an alarm condition exists, it will display in the **Alarm Log window**. By clicking on the Channel in alarm, you will access the **Channel Current Settings** window. This will display database information relating to the circuit in alarm. If additional information is needed, you may select either "View Installation Drawing" or "View Electrical Drawing". These command buttons will allow display of the drawings linked to this circuit in the CM.comm database. The display will appear in the Drawing Viewer window.

Drawing Viewer Window



Drawing is available for viewing only and may not be modified on this screen.

RS-485 - Details

CM.comm communicates with CM devices via a multi-drop, half-duplex (two-wire) RS-485 communication link.

The cable used should be shielded, twisted pair with a minimum size of 18 gauge.

Up to 98 CM devices can be connected to a single communications loop, with the total length of communications cable not to exceed 5,000 feet.

At this time, the only supported baud rate is 4800 and the data frame used is 8 data bits, 1 stop bit and no parity.

CM.comm and all CM devices use the Modbus RTU (binary) communications protocol.
The Modbus protocol provides the internal standard that the CM controllers use for parsing messages. During communications on a Modbus network, the protocol determines how each controller will know its device address, recognize a message addressed to it, determine the kind of action to be taken, and extract any data or other information contained in the message.
If a reply is required, the controller will construct the reply message and send it using Modbus protocol.

A CM.comm network communicates using a master-slave technique, in which only the host PC running CM.comm (the master) can initiate transactions (queries). The other CM devices (the slaves) respond by supplying the requested data to the master, or by taking the action requested in the query.

Supported Controllers

The CM-1 is a multi-channel microprocessor based monitoring system that has been specifically designed to monitor the status of both parallel and series type heating cables.

The CM-2 is a multi-channel microprocessor based control and monitor system that has been specially designed for use with electric heat tracing systems. Its features are designed to optimize performance while minimizing interface complexities for operations personnel.

The system is available in up to 40 circuit configurations that are environmentally hardened so they can be sited at various locations in your plant. The units can be installed in Division 2 hazardous locations with the use of purged enclosures.

Non-volatile memory allows the unit to retain all set-points during a power outage. This feature also allows the unit to be programmed at the factory with circuit control and alarm set points. This eliminates the need for initializing of the system when it is received in the field yet allows responsible field adjustment and alteration. Each circuit can be programmed for the following features:

- Temperature Control Set Point
- High Temperature Alarm Set Point
- Low Temperature Alarm Set Point
- Controller Dead Band

The CM-2001 is a single-point, microprocessor based control and monitor system that has been specially designed for use with electric heat tracing systems.

Alarm Types

Probe Open - Applies to: CM-2, CM-2/GF, CM-2/1
This alarm indicates that CM controller has detected an open circuit for the RTD or thermocouple temperature sensor. This condition will also result in a High Temperature Alarm for the CM-2.

Probe Shorted - Applies to: CM-2, CM-2/GF, CM-2/1, CM-2001
This alarm indicates that CM controller has detected a short circuit for the RTD or thermocouple temperature sensor. This condition will also result in a Low Temperature Alarm for the CM-2.

Probe Failure - Applies to: CM-2, CM-2/GF, CM-2/1, CM-2001

High Temperature - Applies to: CM-2, CM-2/GF, CM-2/1, CM-2001
This alarm indicates that a temperature above the **High Limit Setpoint** has been detected at the probe.

Low Temperature - Applies to: CM-2, CM-2/GF, CM-2/1, CM-2001
This alarm indicates that a temperature below the **Low Limit Setpoint** has been detected at the probe.

Controller Output Failure

Heater Voltage Loss - Applies to: CM-2/1, CM-1, CM-2001
This alarm detects a loss of voltage from the breaker

Heater Loss of Load Current - Applies to: CM-2/GF, CM-2/1, CM-2001
This alarm detects a loss of current draw from the heater cable. This is a programmable setting.

Heater High Load Current - Applies to: CM-2/GF, CM-2/1, CM-2001
This alarm detects a current which has exceeded the high amp setting.

Controller Output Failure - Applies to:

Heater Ground Fault Alarm - Applies to: CM-2/GF, CM-2001
This alarm indicates that the controller has detected a ground fault which exceeds the programmed parameter.

Heater Ground Fault Trip - Applies to: CM-2/GF, CM-2001
This Alarm indicates that a ground fault has occurred which exceeds the programmed parameters and has de-energized the circuit.

Heater Continuity Loss - Applies to: CM-2/1, CM-1, Parallel type heater only.
This alarm indicates that the controller/Monitor has detected a loss of continuity.

Heater forced on - Applies to:

Communication Error - Applies to: CM-2, CM-2/GF, CM-1, CM-2001
This alarm indicates a disturbance in the communications between the CM.comm software and the Control/Monitor unit.

Database Error - Applies to: All units
This alarm indicates that the principle CM.comm database is corrupted and must be replaced by a backup, or re-initialized by running Auto-Config.

Alarm Management

Acknowledge Selected Alarm - Sets alarm screen status to "Ack" (Acknowledged) for specified alarm
Acknowledge All Alarms - Sets alarm screen status to "Ack" (Acknowledged) for all alarms
Reset All Alarms - Resets the alarm condition at the CM unit
Clear Alarm Log - Eliminates all alarms from the CM.comm Alarm log database

Troubleshooting CM.comm

Opening the CM.comm Debug Window

For communication error information, select the Options >> Program Settings menu command and then place a check mark next to "Show communications data in debug window", then click on "OK". You can then re-run Auto Configure. When the debug window is active and CM.comm encounters a communications error, it will display additional information about the error in the debug window.

If Auto Configure is unable to find some or all of the CM devices that you have connected to your network, here are a few suggestions to help narrow down the possible causes.

- No CM devices found:
  - ✓ Verify that the serial port number specified actually corresponds to the RS-485 adapter or converter.
  - ✓ Verify that the range of addresses specified actually correspond to the addresses which have been physically set on each of the CM devices.
  - ✓ Verify that the host PC RS-485 adapter or converter provides automatic control of its transmit/receive state. CM.comm DOES NOT control the RTS line.
  - ✓ Verify that the communications cable is correctly connected to both the RS-485 adapter and the CM devices. Pay particular attention to the +/- (or A/B) pin outs.
- Some CM devices found:
  - ✓ Verify that the range of addresses specified actually correspond to the addresses which have been physically set on each of the CM devices.
- If you are receiving CRC errors on some addresses:
  - ✓ Check for more than one device set at the same address.
- If the CM devices that are not found are CM-2001 type:
  - ✓ Verify that their baud rate is set to 4800. This is done via the units user interface.

Trouble Shooting Serial Communications

How do I know how many serial ports I have?

There are several easy ways to find out about RS-232 (Serial) Ports on your computer.

- First, you can simply select the “Control Panel” folder from the “My Computer” icon in the top left hand portion of your Windows desktop. Once the Control Panel is open, select the “System” icon. From the tabs at the top of the System window select the “Device Manager” tab. From the Device Manage, open the Ports (com & lpt) device by clicking on the plus sign next to the device. You will be shown how many printer and serial ports your system has available. Note this information.
- Most computers display the peripheral information on the screen before booting Windows. If you press the <Pause> key, located top row of your keyboard on the far right, you can view the peripherals installed in your computer. Note the number of COM ports on your system.
- Many systems allow you to view the system BIOS setup during the power-on-self-test, or POST period. Look at your screen during the initial power up cycle. You should see a message similar to the following:
  - ➢ Press <F1> to enter setup or
  - ➢ Hit <Delete> to enter setup now
  - ➢ Press <esc> for BIOS setup
- By pressing the appropriate key, you will enter the BIOS setup for your PC. DO NOT MAKE ANY CHANGES TO THE BIOS SETTINGS. If you accidentally change a setting, select the “Exit without saving changes” option on you BIOS setting menu. You are only interested in looking at the system peripheral settings. You do not want to alter any system settings.
- Select the “System Peripherals” or similar option from your menu. You should see COM1 or Serial A or something very similar on your screen. Note the number and settings of the COM ports in your system.

♦

What does a Serial Port look like?

PC Serial Ports are visible on the back of your computer. The Serial connector may be either a 9-pin or 25-pin connector.
PC Serial Ports are shaped like the letter "D", either small, in the case of the 9-pin connector, or long, in the case of the 25-pin connector.

Identify the pin configuration of your available RS-232 port.
You should have either a DB-9 or DB-25 pin male connector (D-shell) connector.
You may use a 9-to-25-pin or 25-to-9-pin adapter if required.

How do I know if my Serial Port is available?

Once you have determined the number of Serial (COM) ports in your computer, you must determine how many are in use.

Mice

On many newer Computers, Mice are on the "PS/2" port, and will not be serial devices.
If this is the case, skip to checking on your Modem.
Mice are often found using one of the RS-232 ports on desktop computers.
They can use COM1: or COM2:
Generally mice use COM1:

Modems

Open your Window Control Panel and select the Modem Icon. (It looks like a telephone)
This will display the location of any Modems present in your system. Note the COM ports used by your modem.

Modems May be internal or external and still occupy a COM Port
Modems use COM1: COM2:, COM3: or COM4:
(Certain modem, such as WIN modems may even use higher com port addresses)
Generally, modems use COM2:.
Even if your modem does not appear to occupy a COM port check in your Control Panel – Modems option to be sure.

What do I do after I determine how many devices use your system serial ports?

After identifying and accounting for used ports, you must have at least one unused RS-232 port on your computer. If you do not, you must add an additional RS-232 Serial adapter to your PC before you can proceed.

When you have identified the available port, you may attach your RS-485 Converter to the port.

Insure that the converter is designed for half-duplex operation.
Insure that the converter is for RS-232 to RS-485 conversion.
Insure that the converter is correct for RS-232 to RS-485.

RS-485 card

Install the RS-485 card per the manufacturer's installation instructions. *****Caution*****-interrupt conflicts are the most common problem when setting up serial communications devices. The RS-485 card should be configured for 2 wire (half duplex) operation. Configuration of additional card parameters should be done according to the card manufacturer's instructions.

CM-1 MODBUS COMMANDS

03 read registers |addr|03|# registers(1byte)|data…….. |crcc|
06 write a register |addr|06|register #(2bytes)|data(2bytes) |crcc|

"registers" are 2bytes/16bits

CM-1 "register" addresses/descriptions: (all addresses in hex)

RAM write locations: (Issue remote commands here)

0000 data=1, acknowledges all alarms, data=2, resets board/all alarms,
0001 data=channel# 0000-0017, acknowledge individual channel alarm
0002 data=channel# 0000-0017, reset individual channel

RAM read locations:

0000	Channel flag table*	0000-0017
0100	CM1 board ID ascii string	0100-0108 (ascii)
0200	Option jumpers 1-8	0200
0300	Option jumpers 9-16	0300

* Channel flag bit significance: (hi true)

b15-b10 not used
b9 channel programmed active
b8 lo-series mode/hi-parallel mode
b7 channel ON
b6 channel in alarm
b5 alarm pending
b4 alarm acknowledged
b3 not used
b2 continuity out of tolerance
b1 current out of tolerance
b0 voltage out of tolerance

CM1 Option Jumpers:

opt 1	Reflash time 1 hr	With no reflash plugs installed
opt 2	" 2 hr	default reflash is 24 hours
opt 3	" 4 hr	
opt 4	" 8 hr	
opt 5	" 16 hr	
opt 6	" 32 hr	
opt 7	Display channels 25-48	
opt 8	50 Hz operation	

opt 9	Alarm timeout 30 sec*	With no timeout plugs installed
opt 10	" 1 min	default timeout is 5 minutes
opt 11	" 2 min	
opt 12	" 4 min	
opt 13	" 8 min	
opt 14	Voltage priority operation	
opt 15	Auto alarm reset	
opt 16	Fast/slow display scan	

* 10 sec alarm timeout when opt 9
is only timeout plug installed

CM-2 MODBUS COMMANDS

03 read registers |addr|03|# registers(1byte)|data..... |crcc|
06 write a register |addr|06|register #(2bytes)|data(2bytes) |crcc|

`registers' are 2bytes/16bits

CM-2 `register' addresses/descriptions: (all addresses in hex)

EEPROM locations:

1000 * Setpoint base address	1000-1027 = chan1-chan40
1028 * Low temp limit base	1028-104F
1050 * High temp limit base address	1050-1077
1078 * Deadband base address	1078-109F

* for operating program # 0,
add offset of 00A0 for prog 1
0140 for prog 2
01E0 for prog 3

13C0	Channel params base address	13C0-13E7
1400	Low load current alarm setpt base	1400-1427 = 0-300 = 0-30.0 amps
1428	High load current alarm setpt base	1428-144F "
1450	Ground fault trip setpoint	1450-1477 = 0-255 = 0-255 ma
1478	Ground fault alarm setpoint	1478-141F "

13FF	System e2prom crcc	
13FE	not used	
13FD	not used	
13FC	not used	
13FB	not used	
13FA	not used	
13F9	not used	
13F8	RTD auto lead resistance cal	0/1 = no,use 0 ohms/yes, calibrate
13F7	Groundfault alarm trip response	0/1 = slow/fast
13F6	Autotest duration	minutes
13F5	Autotest interval	hours
13F4	Ground fault adapter used	0/1 = no/yes
13F3	Operating program number	0-3
13F2	Panel setting program number	0-3
13F1	Degrees C/Degrees F	0/1 = F/C
13F0	Auto alarm reset	0/1 = no/yes
13EF	Int/Ext continuity monitoring	0/1 = ext/int
13EE	not used	
13ED	RTD/TC	0/1 = tc/rtds
13EC	Fast/Slow continuity alarm	0/1 = fast/slow
13EB	Level 1 password	0-9999 (decimal)
13EA	Level 2 password	0-9999 (decimal)
13E9	Displayed chan No. offset	0-859 (decimal)

RAM locations:

0000 * Issue remote command here:
1=acknowledge all alarms,
2=reset all alarms,
3=force heater autotest cycle

0100	Actual temperature base address	0100-0127 (Degrees/10)
0200	Channel temp probe lead resistance	0200-0227 (ohms/10)
0300	Channel on/of status	0300-0327 (bit4, 1=on)
0400	Htr load current	0400-0427 0-255 = 0-30.6amps
0500	Ground fault current	0500-0527 0-255 = 0-255 ma
0600 *	Alarm stack ** (double words)	0600-064E
0700 *	Alarm acknowledge flags	0700-0727 1=acknowledged
0800	System ID string	0800-080F 32 bytes max
0900	GFadapter reading pointer	0900 0-39, should be changing
0A00	System Ambient Temp	0A00 degrees/.1
0A01	RTD front end offset	0A01 ohms/.1
0A02	RTD correction factor	0A02 %/.01
0A03	TC front end offset	0A03 uvolts
0A04	TC correction factor	0A04 %/.01
0A05	COMALM flags	0A05
0A06	COMALMX flags	0A06
0A07	CM-2 supply voltage (+24)	0A07 volts/.1
0A08	CM-2 V+ (+15v)	0A08 "
0A09	CM-2 V- (-15v)	0A09 "
0A0A	CM-2 Vcc (+5.0v)	0A0A "
0A0B	CM-2 Vdd (-16v)	0A0B "
0A0C	CM-2 Vgg (-40v)	0A0C "
0B00 *	Heater Force-On registers 0	B00-0B27 1=force heater on 0=normal

* writes only allowed to these ram pages

** alarm stack is 41 double words, upper word not used at this time
topmost word pair, 06A0, are the `common alarms' essentially an OR
of the whole alarm stack

Bit significance of alarm words:

bit 21-31 not used
bit 20 Heater forced on
bit 19 Heater ground fault trip } ground fault adapter and
bit 18 Heater ground fault alarm } CT modules required **
bit 17 Heater hi load current }
bit 16 Heater low load current }

bit 15 Hi temp }
bit 14 Low temp } these bits transfer to
bit 13 Heater } the front panel alarm leds
bit 12 Probe }
bit 11 Com. fail }
bit 10 Memory fault }
bit 9 Heater load current (when hi or low) **
bit 8 Heater ground fault (when in alarm or tripped) **

bit 7 Heater continuity }
bit 6 Heater current } "sense card" configurations only
bit 5 Heater voltage }
bit 4 Output
bit 3 Low temp
bit 2 Hi temp
bit 1 Shorted probe
bit 0 Open probe