Part Number 128158-01
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3500 Monitoring System Computer Hardware and Software Manual

Bently Nevada Corportion
1617 Water Street
Minden, Nevada 89423

Preface

This manual is divided into two parts. If this is your first installation of the 3500 Monitoring System hardware and software, you should read the first part carefully to obtain an understanding of the components of the system and how to use them to customize your installation.

Part I - Overview, Description, Installation

Part I shows how to install and operate the 3500 Data Acquisition/DDE Server and Operator Display Software, verify the operation of the software, and create custom displays. The following sections are included:

- Product Overview
- System Description
- Software Installation
- 3500 Monitor Rack Communications
- Data Acquisition/DDE Server Software
- Operator Display Software
- 3500 Software Utilities

Part II - Communications Information

Part II shows how to interface 3500 Monitoring System hardware and software to currently existing systems, and how to set up new communications to other vendor products. The following sections are included:

- Remote Communications
- Networks
- X Windows Connectivity
- DDE Communications

Note: Within this manual, references are made to specific vendor hardware and software products. Because of the many products available in the market today, it is impossible to test them all. If a product is mentioned by vendor name and/or vendor part number, it has been tested and will be supported by Bently Nevada Corporation for use with the 3500 Monitoring System hardware and software.

If a product is not specified, Bently Nevada Corporation cannot guarantee it will operate correctly with the 3500 Monitoring System. Additionally, Bently Nevada Corporation may not be able to support the product.

Note: Windows NT 3.5+

The current release of the 3500 Software is designed to operate with the Windows 3.1, Windows for WorkGroups 3.11 and Windows 95 Operating Systems. Many references are made in this manual to Windows NT 3.5+ as a valid operating system. This feature will be available in the spring of 1996.

Your own needs, as network and remote capabilities will determine which operating systems can meet your requirements. Please read the Part II of this manual to determine which systems will best fit your operation.

Additional References

Videos

Rack Installation and Operation - 30 minutes

VHS-NTSC format	P/N 130330-01
PAL format	P/N 130330-02

- Rack components, specifications, installation.
- Module functions, wiring, switch settings.
- Power requirements, daisy-chaining.
- Internal and External terminations.

Software Installation and Operation - 30 minutes

VHS-NTSC format	P/N 130331-01
PAL format	P/N 130331-02

- Host to 3500 Monitor Rack interfacing.
- Rack Configuration, Data Acquisition/DDE Server, Operator Display Software installation and operation.
- Computer Requirements.

Manuals

3500 Monitoring System
Rack Configuration and Test Utilities Guide P/N 129777-01

- Installing the Rack Configuration Software.
- Running the Rack Configuration Software.
- Using Triple Modular Redundant (TMR).
- Using Configuration Software Utilities.

3500 Monitoring System
Rack Installation and Maintenance Manual P/N 129766-01

- Installation and Service Manual for 3500 Monitor Rack.

3500 Field Wiring Diagram Package P/N 130432-01

- Transducer installation.
- Recommended wiring procedures and descriptions

Individual Operation and Maintenance manuals are available for each component of the 3500 Monitor Rack. Contact your local Bently Nevada Corporation Sales and Service Office for more information.

Seminars

3500 Monitoring System
Installation and Maintenance Seminar

- One, two, three, or four day seminars conducted on-site or off-site by Bently Nevada Corporation.
- Courses may be customized to fit your needs.

Contact your local Bently Nevada Corporation Sales and Service Office for more information.

Contents

Data Acquisition / DDE Server Software

Operator Display Software

3500 Software Utilities

Remote Communications

Networks

X Windows Connectivity

DDE Communications

Appendix

Index

Product Overview

To use the 3500 Monitoring System most effectively, you should know the functions and features of the system. This section describes the 3500 Monitoring System and lists additional sources of information. These topics are included:

- 3500 Monitoring System Explanation
- System Benefits
- System Features
- System Information

3500 Monitoring System

The 3500 is a state of the art machinery monitoring system that can collect machinery data from a variety of transducers. It is a dedicated hardware platform designed and built to help manage your critical machinery. The 3500 Monitoring System can provide machinery information to a variety of plant personnel.

As a system, the 3500 Monitoring System consists of:

- transducers
- 3500 Monitor Racks
- software
- a host computer

You can combine one or more of each of these system components to make a customized monitoring system for your operation.

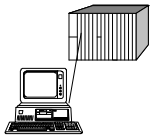
Transducer input from plant machinery is provided to monitor and Keyphasor channels within the 3500 Monitor Rack. This machinery data is collected, compared to alarm setpoints and sent from the monitor rack to one or more of the following locations for processing:

- A Rack Interface Module connected to a host computer operating the 3500 Data Acquisition Software
- A Communications Gateway Module within the 3500 Monitor Rack
- 4 Channel Relay Modules within the 3500 Monitor Rack
- TDIX and DDIX communication processors for machinery diagnostic data access

Machinery data is used at any of these locations to display data, compare data, or format data for other control systems within the plant.

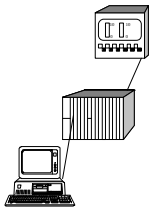
System Benefits

The 3500 Monitoring System enables operators, vibration specialists, maintenance personnel, and others to acquire and display Machine Train vibration data at several different locations simultaneously. This same data is also available to other data presentation systems in industry standard formats.



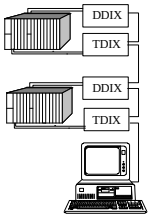
As a single computer system, a host computer connects to 3500 Monitor Racks and collects machinery vibration data for one or more user defined Machine Trains. Data is displayed in several formats including:

- Machine Train Diagrams
- Bargraphs
- Current Values
- Real-time and Historical Trends
- Alarm, System, Computer Lists

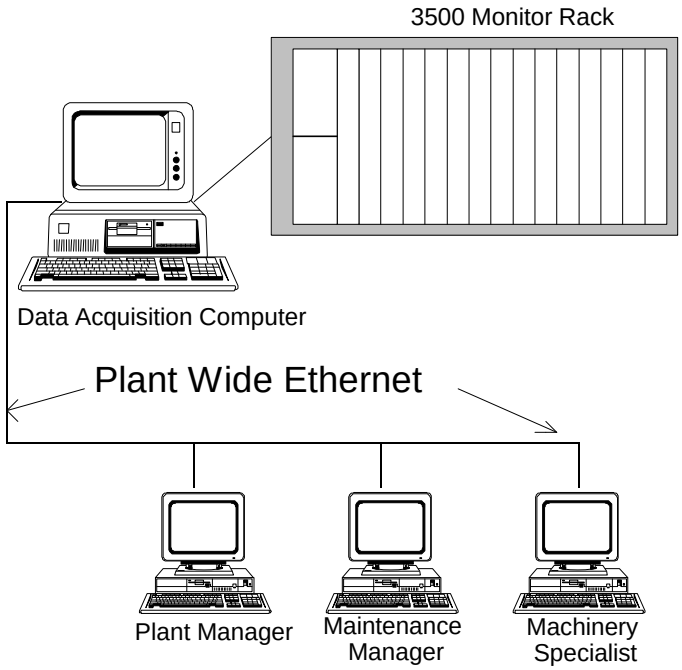


A Communication Gateway added to the 3500 Monitor Rack provides formatted data to other control systems. It also enables the rack to accept monitoring instructions from other products. These instructions include:

- Request/or set date and time
- Request for monitor values and status
- Adjust monitor setpoints, bypass, and other rack functions



A Data Manager Input/Output (I/O) module in the 3500 Monitor Rack provides a dynamic data interface to an existing Bently Nevada Dynamic Data Manager 2/Transient Data Manager 2 (DDM2/TDM2) installation. A single 3500 Monitor Rack can supply static and dynamic data values to two communication processors.

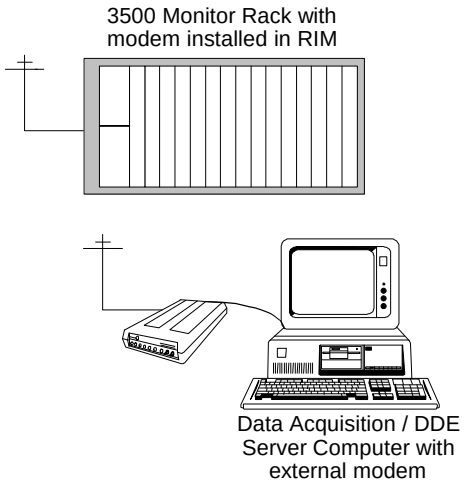


Machinery data from 3500 Monitor Racks can be accessed at several locations within a plant over a network. An Ethernet node running the appropriate network software may access machinery values from 3500 Monitor Racks.

Two types of remote communications provide access to 3500 monitor data from an unlimited number of locations:

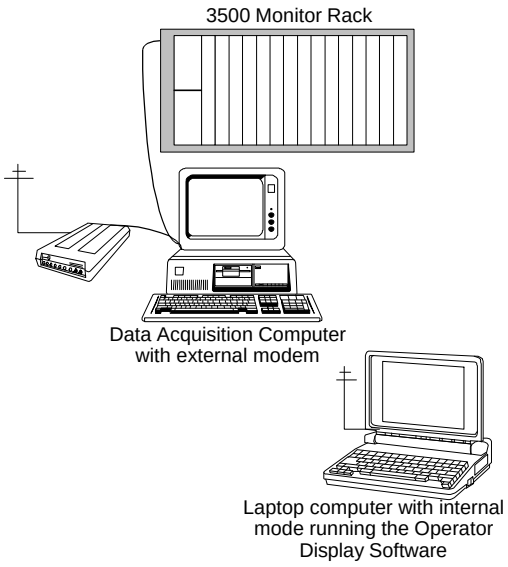
- Remote to 3500 Monitor Rack
- Remote to Computer

3500 Monitor Racks ordered with an optional modem can communicate with host computers at a variety of locations.



Remote to 3500 Monitor Rack

Many combinations of remote communications are available to fit your specific needs.



Remote to Computer

System Features

The following features make the 3500 Monitoring System flexible and easy to use:

- Control panel (panel), Bulkhead, or cabinet (rack) mounting options for the 3500 Monitor Rack.
- Maximum channel density of 56 channels per monitor rack.
- Rack design to meet European EMC requirements.
- Internal or external terminations between transducers and monitor and Keyphasor channels.
- Triple Modular Redundant (TMR) rack option allows a rack to tolerate a single point failure with no interruption of machinery protection.
- Interfacing to UNIX based work stations, Modbus compatible control systems, or over remote communications links.
- Full networking capabilities on Ethernet compatible systems.
- Interfacing to Bently Nevada Corporation DDM2/TDM2 installations.

- Rack architecture designed to meet SP84, IEC65A, and 29CFR 1910.119 safety standards.
- Microsoft Windows compatible software.

System Information

Manuals
Several manuals are available for the 3500 Monitoring System. They are listed by part number, name, and description under "Additional References", page ? and ?.

The *Rack Configuration and Test Utilities Guide* is shipped with the 3500 Rack Configuration Software. This manual provides complete instruction for setting up your rack, installing the Rack Configuration Software, and configuring the 3500 Monitor Rack.

Note: 3500 Monitor Racks must be configured from a host computer using the Rack Configuration Software. Utility software products are provided to verify connections to the rack and test the operation of modules within the rack.

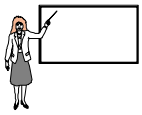
Individual operations and maintenance manuals are available for each module of the 3500 Monitor Rack. They include installation and service instructions, specifications, operating conditions, and spare parts recommendations. A separate *3500 Field Wiring Diagrams* Manual is also available. These manuals ship with each 3500 Monitor Rack.

The *Computer Hardware and Software Manual* provides information specific to the 3500 Data Acquisition / DDE Server and the Operator Display Software. Refer to the Preface of this manual for additional information.

Videos
Two videos are available with the 3500 Monitoring System. Both may be ordered in PAL or VHS format.

The first video, Rack Installation and Operation , takes you step-by-step through each of the modules of the 3500 Monitor Rack. Modules and I/O modules are described in detail, and placed in the 3500 Monitor Rack. Internal and External terminations, rack daisy chaining, and Standard vs TMR rack types are described.

The second video, Software Installation and Operation , shows you how to connect a computer to your 3500 Monitor Rack and how to install and operate each of the 3500 Monitoring System software products. Sample machine train diagrams are drawn, labeled, and displayed. Communications verification between a rack and host are shown, and the operation of each software product is demonstrated.



Seminar

A 3500 Installation and Maintenance Seminar is also available. This seminar can be customized to fit your particular needs. On-site and off-site seminars can be selected, as well as one, two, three, or four day offerings. By working with your local Bently Nevada Corporation Sales and Service office, you can select the best seminar for your personnel.

Each software product available with the 3500 Monitoring System includes an online HELP System that describes and explains details of the software operation.

Tutorials

Software tutorials are available within the Rack Configuration and Operator Assist Display Software. The *Rack Configuration Tutorial* steps you through the use of the software to build your 3500 Monitor rack. The *Data Acquisition / Display Tutorial* shows you how to build machine trains, edit custom train components, and use the display features of the software.

If you are unable to locate the information you need in any of these sources, contact you local Bently Nevada Sales and Service office for additional support.

System Description

The 3500 Monitoring System uses a modular design allowing you to integrate the 3500 Monitor Rack into your existing computer system in a variety of ways. This section describes the different 3500 Monitoring System designs to help you plan your installation. Each component of the system is described briefly to give you an overview of all of the components and how they work together. This section includes the following topics:

- 3500 System Components
  - 3500 Monitor Rack
  - Computer
  - 3500 Software Products
- Basic 3500 Installations
  - Stand-alone
  - Remote to Rack
  - Remote to Onsite Computer
  - Network
- System Setup Guidelines
- Sample 3500 Systems
  - Single Operator Display Computer
  - Operator Display and Data Acquisition Computers on Network
  - Interfacing to Bently Nevada DDM2/TDM2 System
  - Multiple Use System with other vendor Hardware and Software

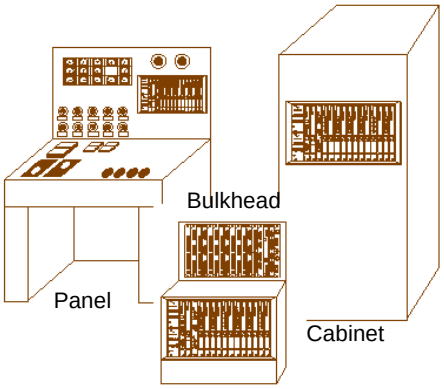
3500 System Components

Components for the 3500 Monitoring System will vary depending on the type of installation you need and the interfacing of this installation to other systems within your plant. Every system will include at least one 3500 Monitor Rack, a computer, and software.

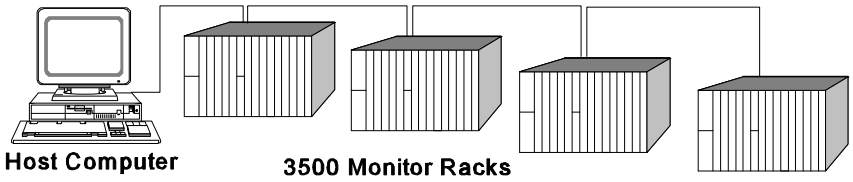
3500 Monitor Rack

3500 Monitor Racks are available in three mounting styles:

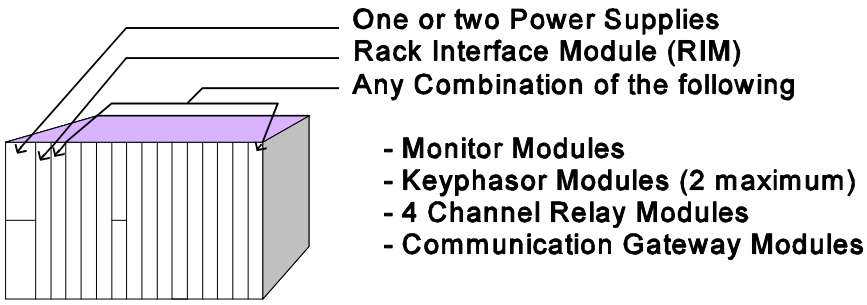
- < 19 inch standard EAI Cabinet mount (400 mm European)
- < Panel mount
- < Bulkhead mount



A 3500 Monitoring System can have one to twelve 3500 Monitor Racks daisy-chained together.



Each 3500 Monitor Rack has 16 slots that may be filled with front panel modules as shown:



There are six types of modules which may be inserted into the front of a 3500 Monitor Rack:

Power Supplies occupy the left-most slot (slot 0) of a 3500 Monitor Rack. One or two supplies (both AC and DC) may be installed in each rack. With two supplies connected to separate power sources, one will act as a backup, guaranteeing uninterrupted machinery monitoring in the event of a power loss.

Rack Interface Module (RIM) occupies the slot (slot 1) next to the power supplies and acts as the communications link between the rack and a host computer. Additional functions include directing communications between other modules within the rack, providing diagnostics information to Bently Nevada communication processors, and maintaining the System and Alarm Event Lists.

Monitor Modules accept one or more channel inputs from various transducers. Depending on the monitor module, the channels may be configured as one of many traditional monitor types, such as Radial Vibration, Thrust, Eccentricity, and Aeroderivative.

Keyphasor Modules are half-size, and each contains inputs for two Keyphasor transducers. Two of these modules may be inserted into a single 3500 Monitor Rack.

4 Channel Relay Modules accept alarm data from one or more monitor modules and evaluates Alert and Danger monitor outputs using And-Or logic to produce relay outputs.

Communication Gateway Modules act as the interface between the 3500 Monitor Rack and other vendor hardware and software systems. These modules accept data from monitors, Keyphasors and relays and output it in industry standard formats. They also accept certain module and rack parameters in the same standard format for controlling the operation of the 3500 Monitor Rack.

Each module type has corresponding Input/Output (I/O) modules connected to the back of the 3500 Monitor Rack. I/O modules are unique to each front panel module type and perform the following functions:

- Contacts for field wiring (both internal and external terminations).
- Ports for connecting direct cable or modem to the rack from a host computer.
- Energized/De-energized relay contacts (for Standard Racks only)

- C 2 oo 3 (2 out of 3) voting on TMR relay contacts.
- < Ports for interfacing to other control systems and Bently Nevada DDM2/TDM2 Systems.
- < Jumpers for identifying transducer types.
- C 4 to 20 mA recorder outputs.

Computer

Computers in the 3500 Monitoring System perform the following functions:

- < Configure a 3500 Monitor Rack
- < Collect data
- < Display data

Configuration computers connect directly to the front or back of the 3500 Monitor Rack. Configuration includes transferring the following parameters from the computer to the rack:

- < alarm setpoints
- < monitor type
- < transducer type
- < scale factor
- < units
- < relay logic
- < etc.

These parameters define the operation of the rack and prepare it for monitoring.

Data Acquisition computers connect directly to the rack(s) to continuously retrieve and trend machinery data.

Operator Display computers present machinery data on the computer screen or printer device. Data displays include trend plotting, bargraphs, current values, and machine train diagrams.

All of these functions may be performed by a single computer or by several computers communicating with each other.

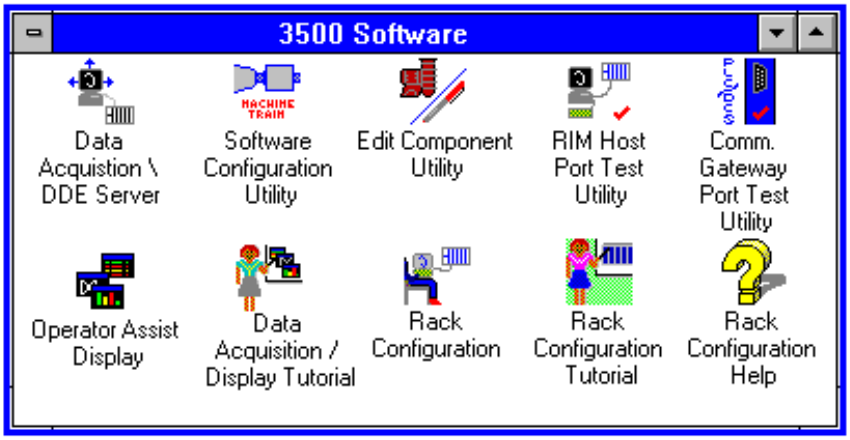
3500 Software Packages
There are three software packages available with the 3500 Monitoring System:

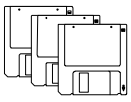
< Rack Configuration
< Data Acquisition/DDE Server
< Operator Display

Each is packaged and shipped separately and includes one or more utility functions to verify and test your installation.

All software is shipped on 3.5 inch high density diskettes. The number of diskettes varies with each package. Upon installation, all software packages build a Windows style group display within your Program Manager.

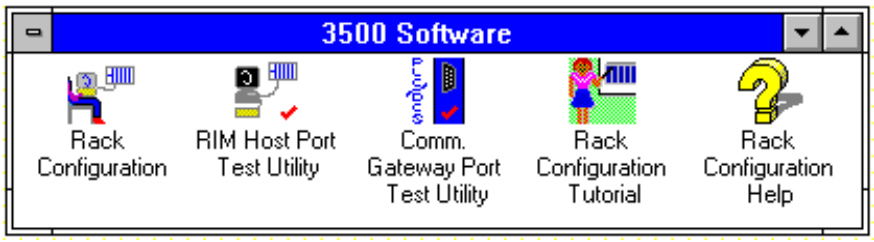
Depending on the software package, the group will contain some or all of the following icons:



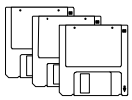


Rack Configuration Software specifies the operating parameters of the 3500 Monitor Racks. Rack Configuration Software can operate on any approved computer whether or not it is connected to a rack. You could configure and store the configurations for several racks in a computer and download this information to the racks at a later time.

After installation of the Rack Configuration Software, the following application icons are available in the 3500 program group:



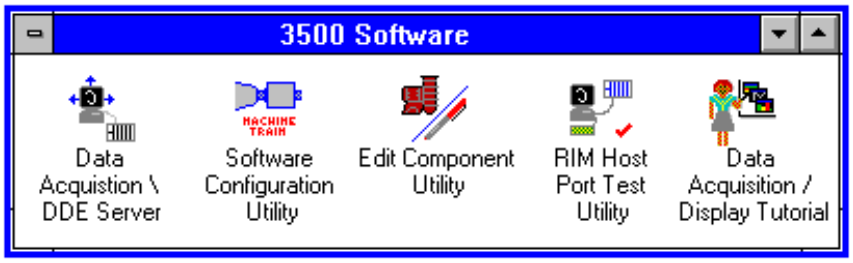
- Rack Configuration
- RIM Host Port Test Utility
- Communication Gateway Port Test Utility
- Rack Configuration Tutorial
- Rack Configuration Help



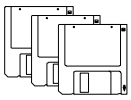
Data Acquisition/DDE Server Software collects machinery data from 3500 Monitor Racks. Once installed, this software operates continuously, accessing 3500 Monitor Racks, retrieving data and making this data available for display and other applications.

Data Acquisition/DDE Server Software has no data displays, nor will it allow you to configure a 3500 Monitor Rack. After starting the software and verifying it is operational, you can shrink the software to an icon and use the computer for other functions. The Data Acquisition/DDE Server Software operates in the background.

After installation of the Data Acquisition/DDE Server Software, the following application icons are available within the 3500 program group:



- Data Acquisition/DDE Server

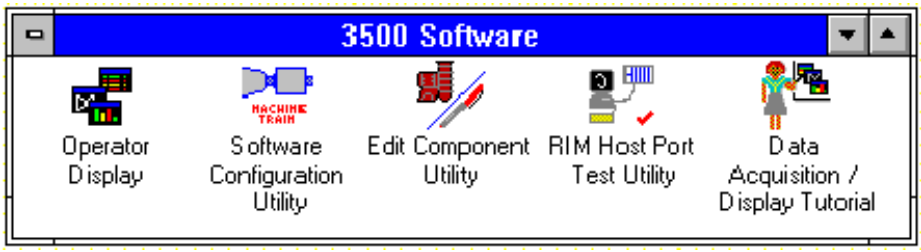


- Software Configuration Utility
- Edit Component Utility
- RIM Host Port Test Utility
- Data Acquisition/Display Tutorial

Operator Display Software lets an operator view the machinery data collected from the 3500 Monitor Racks in the following formats:

- Bargraph displays of monitor channel values (amplitude, gap, phase, etc.)
- Machine Train Diagrams with corresponding data values
- Trend plots (historical and realtime)
- System Event List
- Active Alarm List
- Alarm Event List

After installation of the Operator Display Software, the following application icons are available in the 3500 program group:



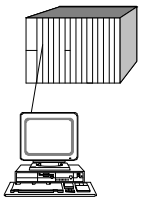
- Operator Display
- Edit Component Utility
- Software Configuration Utility
- RIM Host Port Test Utility
- Data Acquisition / Display Tutorial

Basic 3500 Installations

The four basic 3500 Monitoring System installations are:

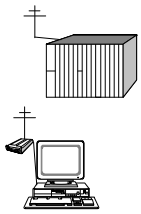
- Stand-alone
- Remote to Rack
- Remote to Computer
- Network

You may combine these systems in a variety of ways to provide a 3500 Monitoring System unique to your needs. Each system is described and samples are included at the end of this manual section. As the flexibility of the 3500 Monitoring System allows many different installations, these are not the only arrangements for the 3500 components.



Stand-alone

A stand-alone system uses a single computer connected to one or more 3500 Monitor Racks daisy-chained together. The computer has Data Acquisition/DDE Server and Operator Display Software installed and operating. The stand-alone computer connects by cable to the 3500 Monitor Rack using either RS232 or RS422 communications. RS232 and RS422 communications require a separate card installed in the computer.

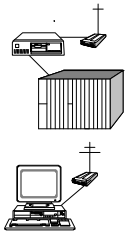


Remote to Rack

A remote to rack system has the same components as a stand-alone system, except that the Remote to Rack uses modems to connect a computer at one location and 3500 Monitor Racks at another. A 3500 Monitor Rack may be ordered with an internal modem (replacing the RS232/RS422 port). The first rack in a daisy-chain of 3500 racks contains an internal modem or external modem cabled to the RS232 port. The rest of the racks have standard RS232/RS422 ports.

At the computer location, an internal (inside the computer) or external modem is used. Because the modem at the 3500 Monitor Rack is initialized when the rack is configured, an initial setup of the modem independent of the Rack Configuration Software is not necessary.

Dedicated phone lines at both modem locations provide the remote link for this system. Data acquisition communications require a highly reliable, permanent phone link.



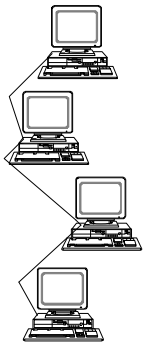
Remote to Onsite Computer

The Remote to Onsite computer system is a second way to access data from a remote location. This system uses two computers. The first computer is connected directly to the rack and collects data continuously using the Data Acquisition/DDE Server Software.

The second computer is at another location and uses modem communications to collect and display data from the first computer. Since the first computer

continuously collects and stores data from the rack, modem communication is only established when you need to access and display machinery data.

Note: The Remote Access Server (RAS) software provided with Windows NT is required to use Remote to Onsite Computer communications. See Part II of this manual for more information.



Network

Network systems involve two or more computers that are linked together and use Ethernet compatible network components. One or more network computers (nodes) can collect data from 3500 Monitor Racks by using the Data Acquisition/DDE Server Software. Additionally, nodes on the network can view data collected at any of the data acquisition nodes by using the Operator Display Software. A maximum of 10 operator display nodes may connect to a Data Acquisition /DDE Server at one time.

Not all nodes of a network must use the same operating system software. Nodes must have either Windows for WorkGroups, Window NT, or Windows 95 software installed to manage the network software. The types of network software you use depend on the Windows product installed. Refer to Part II of this manual for more information about networks.

Individual computers on a network can have the following 3500 software installed at any node:

- Data Acquisition/DDE Server
- Operator Display
- Data Acquisition/DDE Server and Operator Display

3500 Rack Configuration Software may be installed on any node regardless of other 3500 Software installed.

System Setup Guidelines

3500 Monitoring Systems are designed for flexibility. The following guidelines are provided to help you design the right system for your operations.

1. A single computer operating Data Acquisition/DDE Server Software can collect data from one to twelve 3500 Monitor Racks.

2. Stand-alone 3500 Systems will operate with Windows 3.1, Windows for WorkGroups 3.11, Windows NT 3.5, or Windows 95. Systems requiring networking or remote communications must use Windows for WorkGroups 3.11, Windows NT 3.5, or Windows 95.

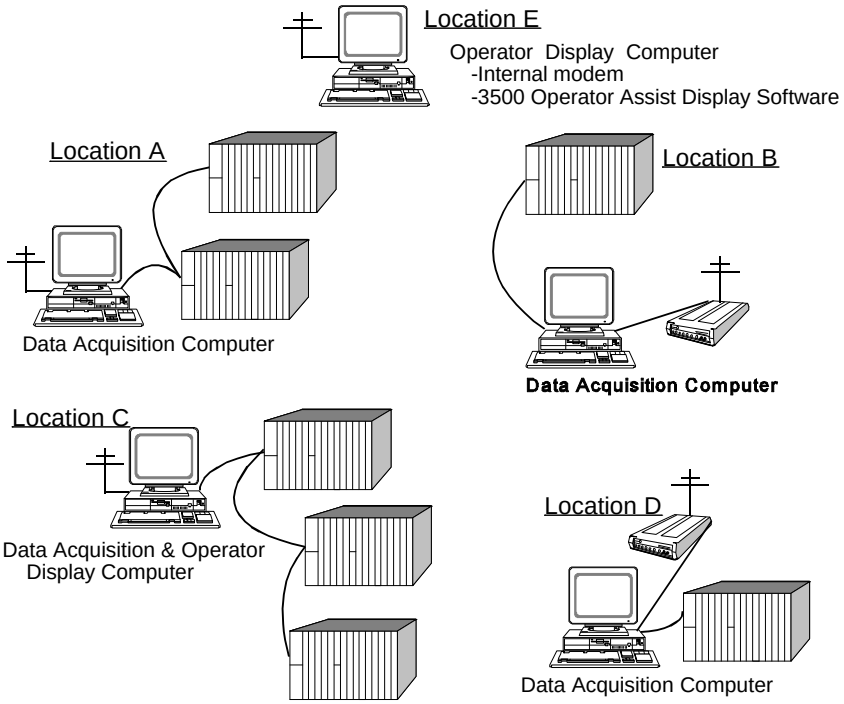
3. If you use remote communications into a network, connect the modem on the network directly to a Windows NT computer.

Sample 3500 Systems

The following examples show some possible 3500 Monitoring System installations:

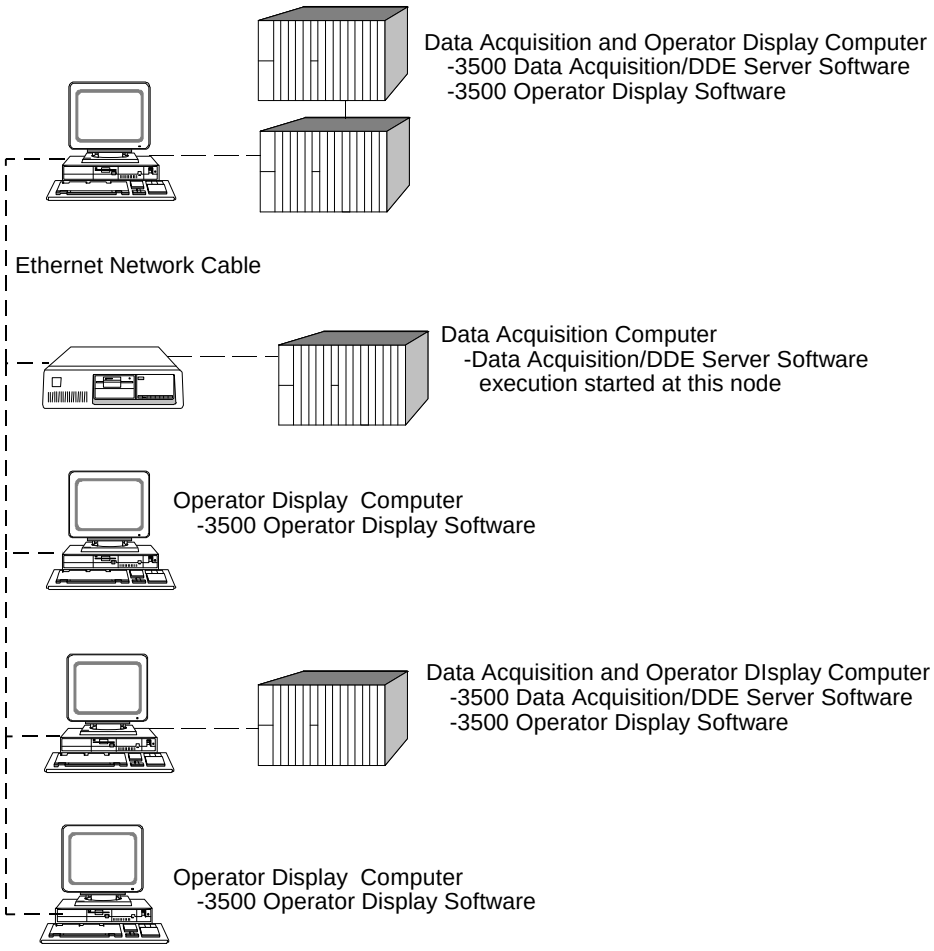
- **Sample 1**: Single Operator Display computer accessing several onsite Data Acquisition computers via modem.
- **Sample 2**: Combination of Data Acquisition and Operator Display computers on single network installation.
- **Sample 3**: Stand-alone 3500 Monitoring System providing machinery data to a DDM2/TDM2 computer system.
- **Sample 4**: Plantwide Ethernet with different stations accessing the Data Acquisition/ DDE Software and Operator Display Software showing X Windows and spreadsheet connectivity.

Sample 1: Single Operator Display Computer accessing several onsite Data Acquisition/DDE Server computers:



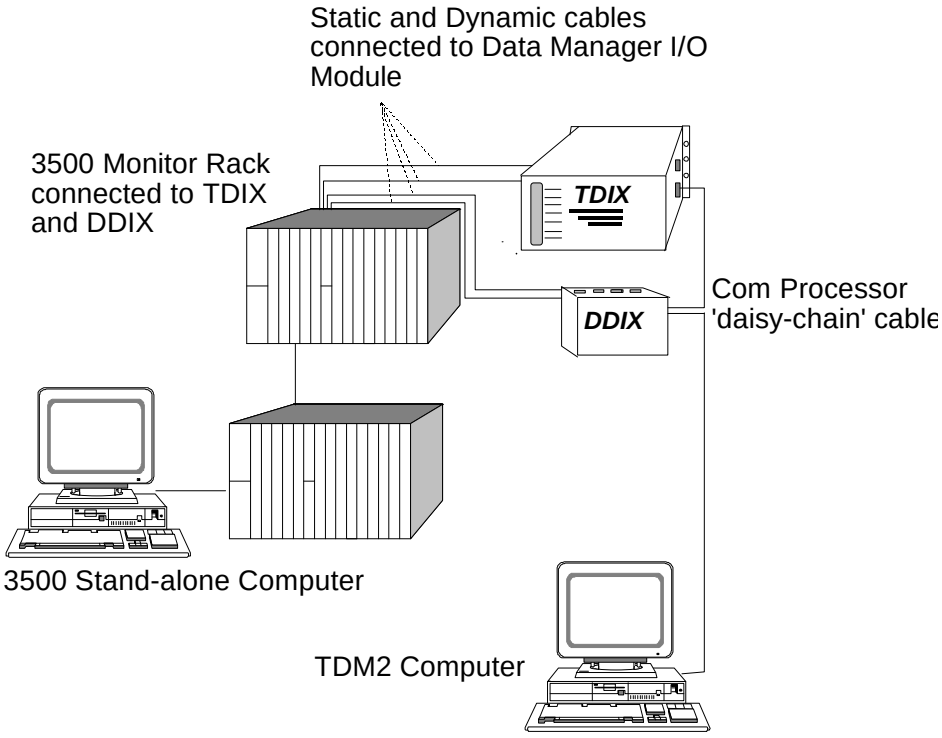
- Operator Display computer (Location E) may call any Data Acquisition computer (Locations A-D).
- The Operator Display Software may be installed with the Data Acquisition/DDE Server Software (Location C) to access machinery data on other Data Acquisition/DDE Server computers (Locations A, B, and D).
- Operator Display computer (Location E) may be a laptop with an internal modem.
- A dedicated phone line should be used at each location.
- All Data Acquisition computers must have Remote Access Server (RAS) software available with Windows NT.
- The Operator Display computer (Location E) must have Remote Access Client software (available with Windows NT, Windows for WorkGroups 3.11, or Windows 95).
- Modems may be internal or external.

Sample 2: Combination of Data Acquisition and Operator Display computers on a network installation:



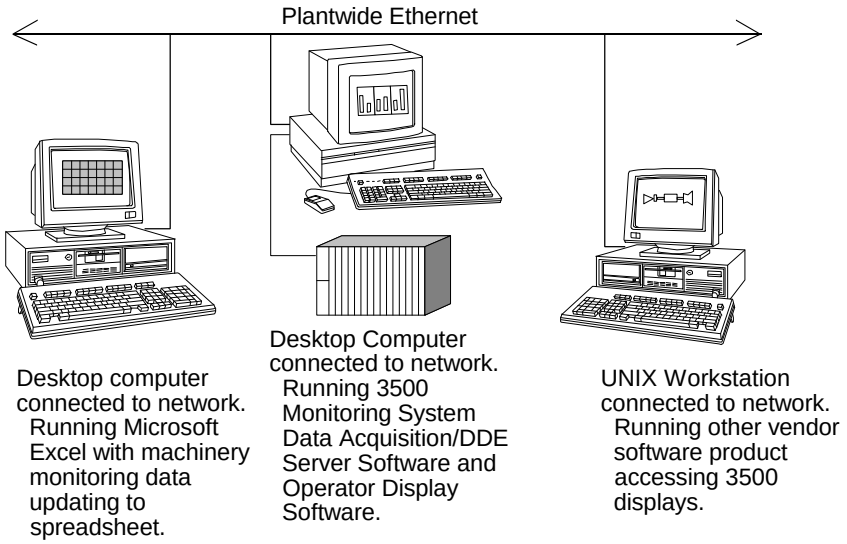
- Any node of the network may install Operator Display, Data Acquisition/DDE Server Software or both.
- Nodes with Data Acquisition/DDE Server Software must connect to 3500 Monitor Racks.
- All nodes must have Microsoft Windows for WorkGroups 3.11, Windows NT 3.5, or Windows 95 and a network card installed.
- Ethernet cabling must be terminated with 50 Ohm terminators at cable ends (except for Fiber Optic cabling).

Sample 3: Stand-alone 3500 Monitoring System providing machinery data to TDM2 (or DDM2) system:



- Two communication processors accept data from a single 3500 Monitor Rack (TDIX and DDIX only).
- Each Communications Processor connected to the 3500 Monitor Rack counts as one rack in the DDM2/TDM2 installation. One DDM2/TDM2 can have a maximum of 12 communication processors connected.
- This system requires two configurations: one for the 3500 Monitor Racks using the 3500 Rack Configuration Software, and the other for the TDM2 installation using the DDM2/TDM2 Software. Both are independent systems.
- All communication processors must be daisy-chained together, even if two of them connect to same 3500 Monitor Rack. See page ? for more information.

Sample 4: Plantwide Ethernet with different stations accessing the Data Acquisition/DDE Software and Operator Display Software to show X Windows and spreadsheet connectivity.



- The computer running the Data Acquisition/DDE Server and Operator Display software is using WinDD by Tektronix.
- The UNIX workstation is acting as an X server which allows the Operator Display Software screens to be displayed.
- The computer running Excel uses NetDDE to access data collected by the Data Acquisition/DDE Server Software to maintain current values in the displayed spreadsheet.

Software Installation

This section lists the minimum requirements for each of the 3500 software packages and shows how to install each one. The section includes the following topics:

- 3500 Software Description
- Rack Configuration Software
  - Computer Requirements
  - Installation Procedures
- Data Acquisition/DDE Server Software
  - Computer Requirements
  - Installation Procedures
- Operator Display Software
  - Computer Requirements
  - Installation Procedures

3500 Software Description

There are three Bently Nevada Corporation software products available for the 3500 Monitoring System:

- Rack Configuration
- Data Acquisition/DDE Server Software
- Operator Display Software

Each software package is available on 3.5" high-density diskettes and includes one or more utility programs to verify and test the operation of the 3500 Monitoring System. All software is designed to install and operate in a Microsoft Windows 3.1, Windows for WorkGroups 3.11, Windows NT 3.5, or Windows 95 operating environment.

Upon installation, a 3500 Software Group will be created in the Program Manager screen of the Windows operating system. Double-clicking the mouse pointer on any icon will start the selected software.

If you install more than one software package on a single computer, icons from all packages will be placed in the 3500 Software Group; a new group will not be created. You may separate these icons into other groups as desired using standard Windows procedures. Refer to your Windows Reference Manual for more information.

If you reinstall software that already exists on your hard disk, existing software will be overwritten if it has an earlier version number. This guarantees the newest software will not be overwritten on your hard disk.

All 3500 Monitoring System software uses standard Windows operating techniques to size and position displays; change to other applications (multi-tasking); open, close and restore windows; and maximize and minimize screens.

Rack Configuration Software

Installation and operation of the Rack Configuration Software is explained completely in the *Rack Configuration and Test Utilities Guide*.

Data Acquisition/DDE Server Software

The Data Acquisition/DDE Server software must be installed on a computer with a permanent connection to 3500 Monitor Racks. This connection may be direct RS232 or RS422 cable, or remote modem.

Computer Requirements

Data Acquisition/DDE Server Software requires a computer with the following:

- 386/33 or greater processor with compatible math coprocessor
- VGA monitor
- 3.5 inch high-density floppy diskette drive
- MSDOS 6.1 or greater
- 8 Megabytes of RAM
- Microsoft Windows 3.1, Windows for WorkGroups 3.11, Windows NT 3.5, or Windows 95
- Minimum of 35 Megabytes of available hard disk (significantly more if historical trends are required)
- DigiBoard RS232 Asynchronous communications card with or without an

RS232/RS422 converter or external modem

Data Acquisition/DDE Server software uses RAM for real-time trends. You may wish to increase the amount of RAM to accommodate longer real-time trend periods.

Hard Disk requirements for the Data Acquisition/DDE Server Software are 35 Megabytes. This space is divided as follows:

- 25 Megabytes for the Data Acquisition/Display Tutorial
- 5 Megabytes for the Data Acquisition/DDE Server Software
- 5 Megabytes for the Product Service Utilities

If either the Rack Configuration Software or the Operator Display Software (or both) are installed on the same computer, one or more of these applications may already be installed and the disk space allocated to them will not be necessary.

Hard disk space is used to store historical trend data. Determine the approximate amount of hard disk space you will need for trend data using the following formula:

Required Hard Disk Space = total points **x** # of trend records **x** 120 bytes

total points:	The total number of points the Data Acquisition computer will gather data for. These points are identified in the Software Configuration Utility.
# of trend records:	The number of records needed to store trend information. One record will be used for each trend value stored. To maintain historical trend values for a period of two weeks using 10 minute trend intervals, you will need 2,016 trend records per point.
120 bytes	Each trend record requires 120 bytes of storage space.

Add 35 Megabytes for the Data Acquisition/DDE Server Software, Product Service Utilities, and Data Acquisition/Display Tutorial and you have the amount of hard disk space needed. Example:

A system has three 3500 Monitor Racks. Each rack has 32 points. You want 5,000 historical trend values stored for each point.

(3 x 32) **x** 5000 **x** 120 = 57,600,000 Megabytes

58 +35 = 93 Megabytes total hard disk space required for Data Acquisition/DDE Server Software and historical trend files.

For this example, 5000 trend records for 96 points would represent a period of about 4 weeks and two hours using a 10 minute historical trend interval.

Installation Procedures

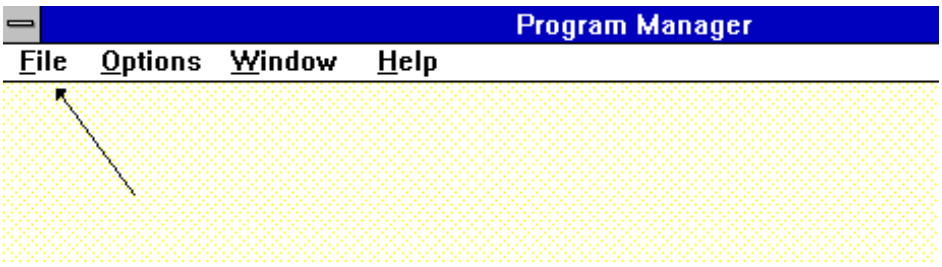
Data Acquisition/DDE Server Software installs on any computer with a direct or modem connection to a 3500 Monitor Rack.

To install the Data Acquisition/DDE Server Software:

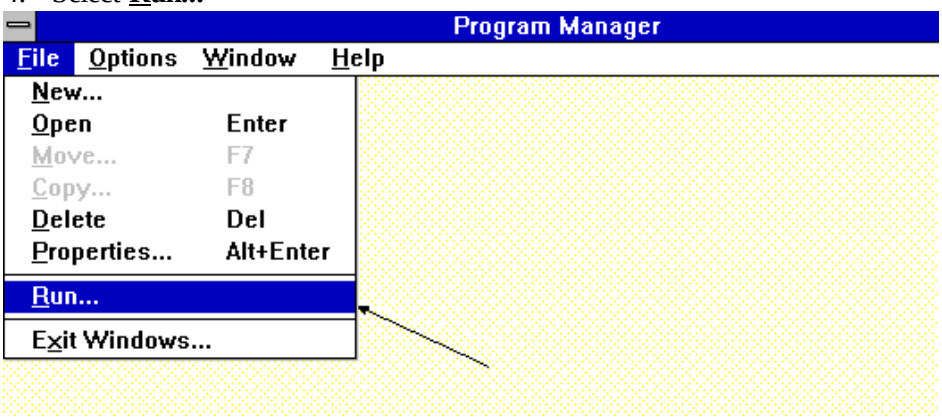
1. Eliminate possible conflicts with other Windows applications by closing all currently running Windows applications.

2. Insert Disk 1 in the floppy diskette drive (assume A:)

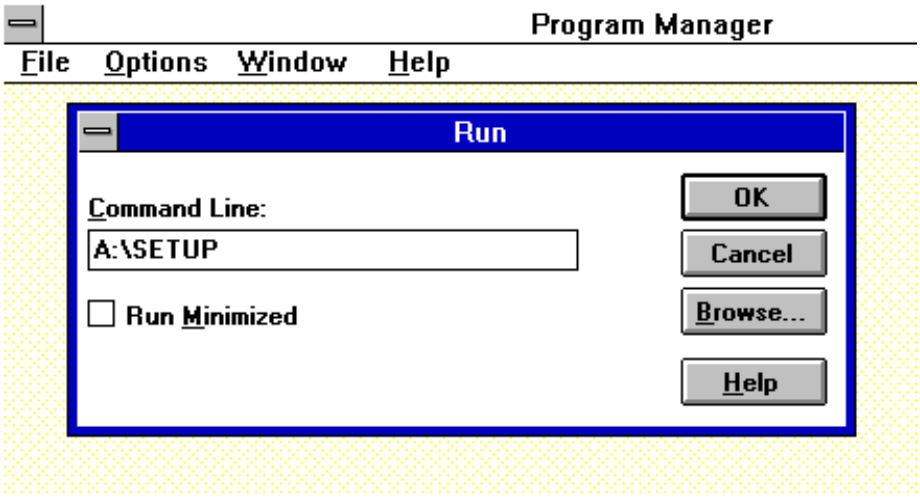
3. From the Program Manager Screen, select **File,**



4. Select **Run...**



5. Type A:\SETUP on the **Command Line**...



6. Select the **OK** button. The installation program will start.

7. Select a hard drive indicating where the software is to be installed.

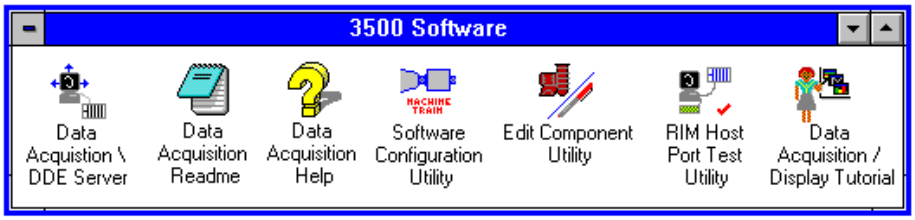
   The default is C:, but any drive may be specified as long as there is enough space available. Data Acquisition/DDE Server Software will automatically install to the \3500 subdirectory. A directory structure of files used by the software will be built on your hard disk. See the Appendix section, page ?, for a description of all installed files for the Data Acquisition/ DDE Server

Software.

8. Choose which applications of the Data Acquisition/DDE Server Software to install.

   The default is to load all applications. If hard disk space is limited or if you have installed the utilities software with other 3500 packages, you may decide not to install some of the applications. However, we recommend that you load all applications.

9. When the installation is complete, a 3500 Software Group will be added to the Windows Program Manager screen that includes the followings icons:



10. Verify the installation of the Data Acquisition/DDE Server Software by double-clicking your mouse pointer on each icon to see that each application executes properly.

Operator Display Software

Operator Display Software must exist on the same computer as the Data Acquisition/DDE Server Software OR be connected by network or modem to an active Data Acquisition/DDE Server Computer. The Data Acquisition/DDE Server Software supplies data to the Operator Display Software.

Computer Requirements

Operator Display Software requires a computer with the following:

< 386/33 or greater processor with compatible math coprocessor
< VGA monitor
< 3.5 inch high-density floppy diskette drive
< MSDOS 6.1 or greater

- 8 Megabytes of RAM
- Microsoft Windows 3.1, Windows for WorkGroups 3.11, Windows NT 3.5, or Windows 95
- Minimum of 35 Megabytes of available hard disk space

Depending on the link to the Data Acquisition hardware and computer, a network card or modem may also be needed along with the appropriate cabling.

Hard Disk requirements for the Data Acquisition/DDE Server Software are 35 Megabytes. This space is divided as follows:

- 25 Megabytes for the Data Acquisition/Display Tutorial
- 5 Megabytes for the Operator Display Software
- 5 Megabytes for the Product Service Utilities

Installation Procedures

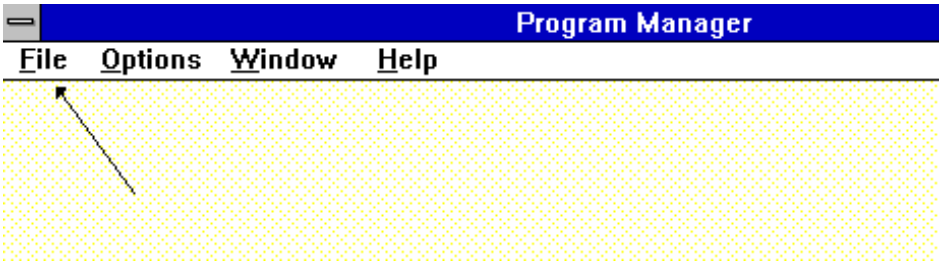
Operator Display Software installs on any computer with the necessary requirements.

To install the Operator Display Software:

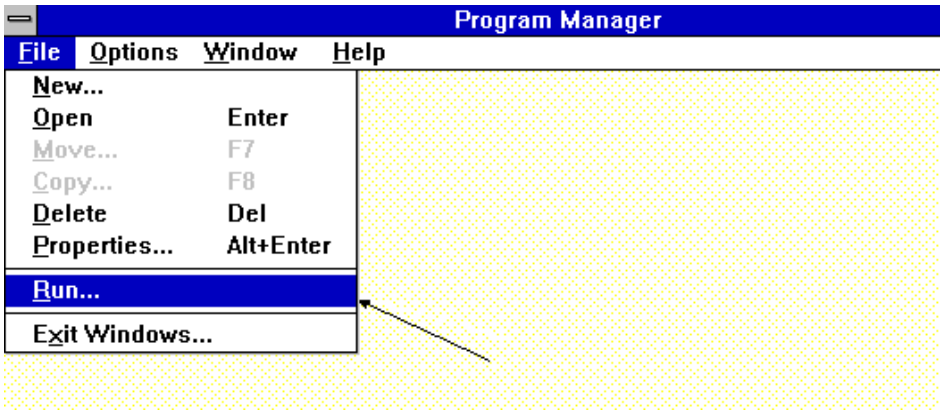
1. Eliminate conflicts with other Windows Applications by closing all currently running Windows applications.

2. Insert Disk 1 in the floppy diskette drive (assume A:)

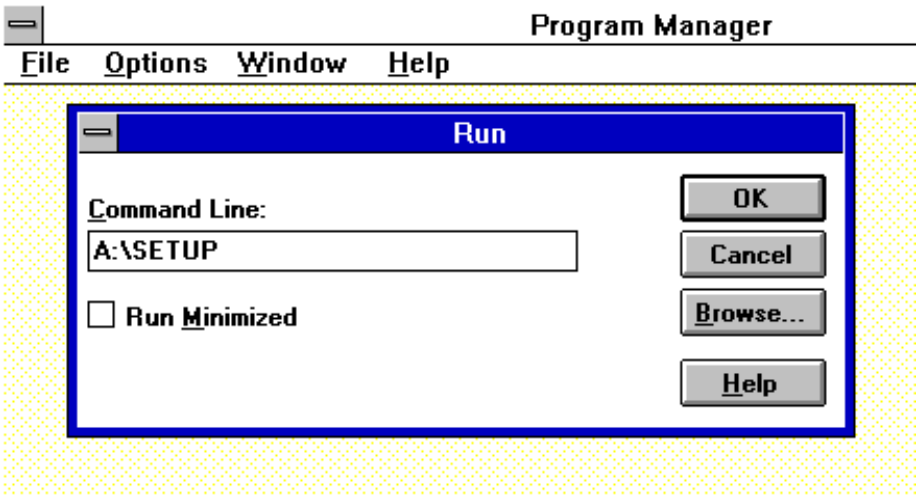
3. From the Program Manager Screen, select **File,**



4. Select **Run...**



5. Type A:\SETUP on the **Command Line**...



6. Select the **OK** button. The installation program will start.

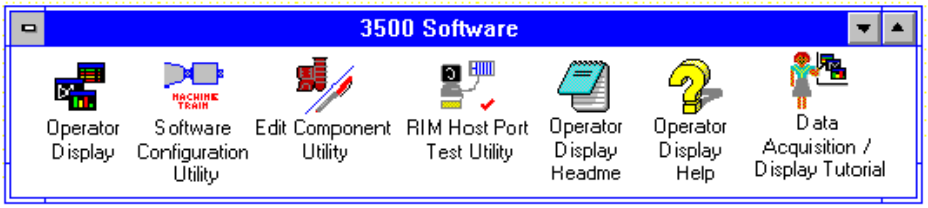
7. Select a hard drive indicating where the software will be installed.

   The default is C:, but any drive may be specified as long as there is enough space available. Operator Display Software will automatically install to the \3500 subdirectory. A directory structure of files used by the software will be built on your hard disk. See Appendix section, page ?, for a description of all installed files for the Operator Display Software.

8. Choose which applications of the Operator Display Software to install.

   The default is to load all applications. If hard disk space is limited or if you have installed the utilities software with other 3500 packages, you may decide not to install some of the applications. However, we recommend that you load all applications.

9. When the installation is complete, a 3500 Software group will be added to the Windows Program Manager screen that includes the following icons:



10. Verify the installation of the Operator Display Software by double-clicking your mouse pointer on each icon to see that each application executes properly.

3500 Monitor Rack Communications

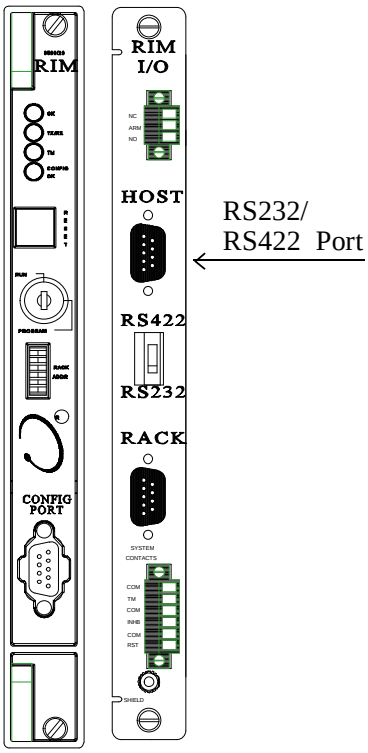
3500 Monitor Racks can communicate in several ways with a variety of hardware. This section describes the available communications links and shows how to connect and verify them. This section includes the following topics:

< Bently Nevada Host to Rack Communications
  - RS232 Communications
  - RS232 Digiboard Installation
  - RS422 Communications
  - Modem Communications
< Rack to Rack Communications
< DDM2/TDM2 Communications

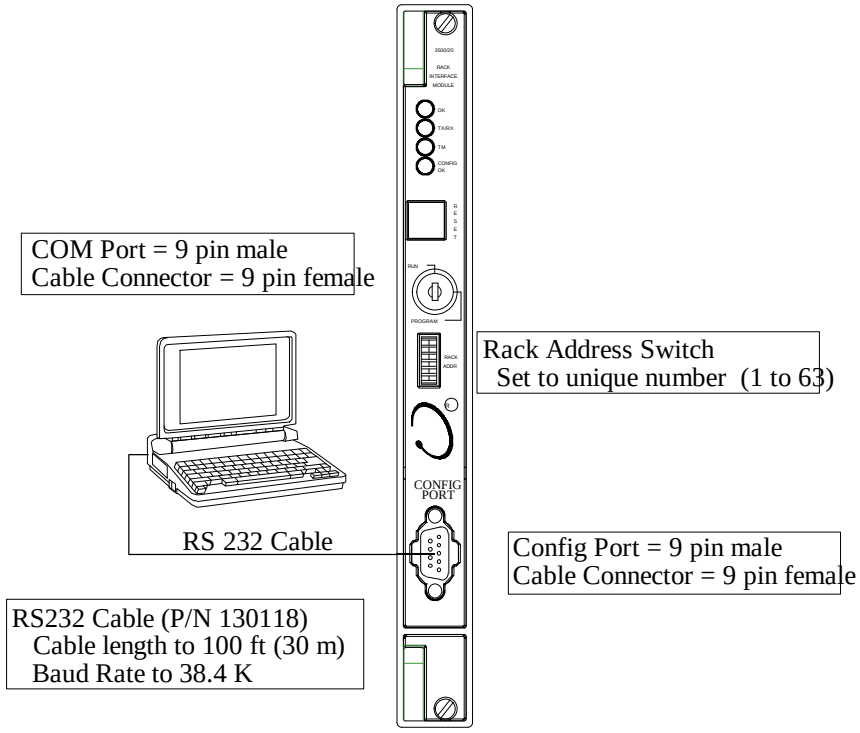
Bently Nevada Host to Rack Communications

Host computers communicate with the 3500 Monitor Rack using the Rack Interface Module (RIM). The RIM always occupies the slot 1 location in the 3500 Monitor Rack (next to the power supplies) and has an RS232 port available on the front of the module.

The RIM I/O module on the back of the rack may be ordered with an RS232/RS422 port OR a modem port. These ports and modem connections on the front and back of the 3500 Monitor Rack are used with a Bently Nevada Host computer to configure and acquire data from the rack.



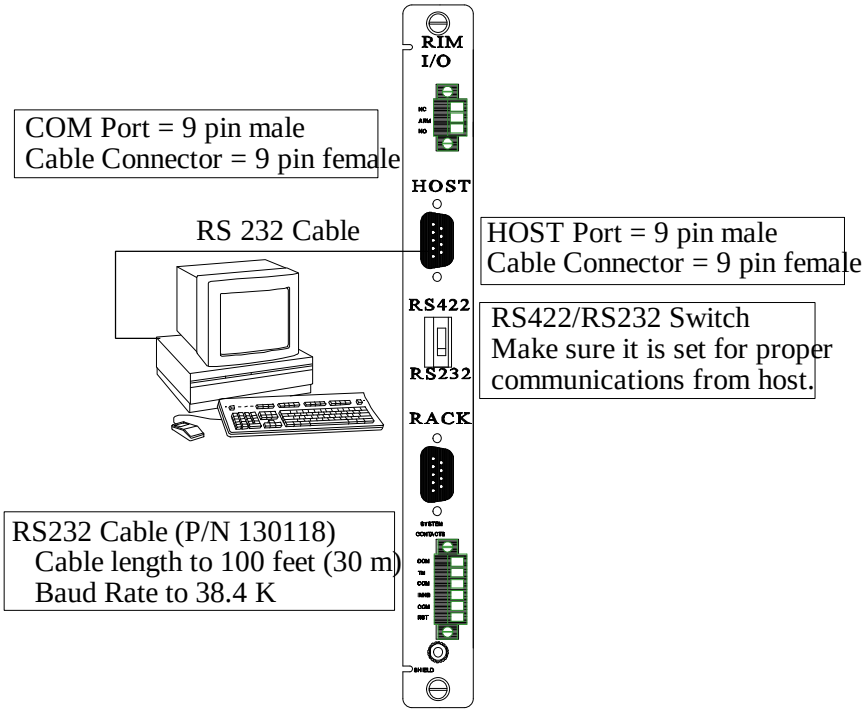
RS232 Communications



Connecting a laptop or desktop host to the RIM using the RS232 Serial COMM port

A laptop or desktop computer with an RS232 serial communication port installed connects by RS232 cable to the Rack Interface Module (RIM) of the 3500 Monitor Rack. Use this connection for the Rack Configuration Software, the Data Acquisition Software*, and the RIM Host Port Test Utility.

*The Data Acquisition/DDE Server Software should connect to the 3500 Monitor Rack using a DigiBoard 232 card. This card provides additional buffering of data retrieved from the 3500 Monitor Rack. High Speed serial communications (19.2 or 38.4 Kbaud) without the Digiboard card is not recommended. The instructions on page 4 show how to install this card.



Connecting a laptop or desktop host to the RIM I/O Module using the RS232 Serial COMM Port

An RS232 cable connects the serial port of a laptop or desktop computer to the RIM I/O Module on the back of the 3500 Monitor Rack (located above the RIM with a Bulkhead mounted 3500 Monitor Rack). When making this connection, make sure the RS232/RS422 switch is set to the RS232 position. Use this connection for the Rack Configuration Software, the Data Acquisition Software*, and the RIM Host Port Test Utility.

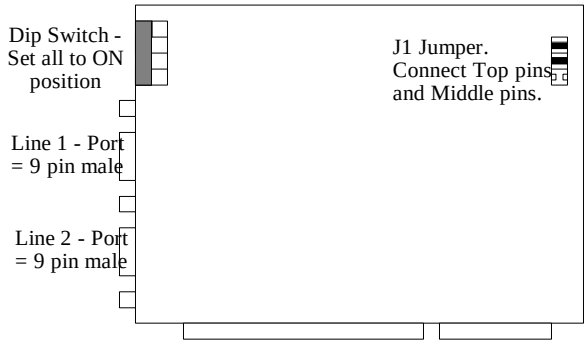
RS232 cable communications can operate to 100 feet (30 m). In general, they can communicate at baud rates to 38.4 Kbaud.

*The Data Acquisition/DDE Server Software should connect to the 3500 Monitor Rack using a DigiBoard 232 card. This card provides additional buffering of data retrieved from the 3500 Monitor Rack. High Speed serial communications (19.2 or 38.4 Kbaud) without the Digiboard card is not recommended. The instructions on page 4 show how to install this card.

RS232 Digiboard Installation

Use the RS232 Digiboard with the Data Acquisition/DDE Server Software. Features of this board guarantee that no data will be lost between the 3500 Monitor Rack and the host computer.

Set the dip switches and the J1 jumper on the DigiBoard as shown. Power down the computer and install the DigiBoard in any empty slot. Close the computer and place the DigiWARE Software diskette in the floppy diskette drive.



Switch and Jumper Settings for DigiBoard Asynchronous Serial Communications Board

If you are unfamiliar with board installation in your computer, we recommend that you make a backup copy of your SYSTEM.INI file before installing this board. This will allow you to start over if problems arise.

These configuration instructions show how to setup your system for the DigiBoard Setup Utility Version 1.40. If you have a newer version of this utility or problems with the setup procedures, refer to the documentation and instructions supplied by the manufacturer.

To Configure the DigiBoard:

1. Start Windows.
2. Select **File...**, **Run..** from the Program Manager screen.
3. Type **A:\WINDOWS\SETUP** (assuming floppy diskette drive is A:)
4. Select the **OK** button.

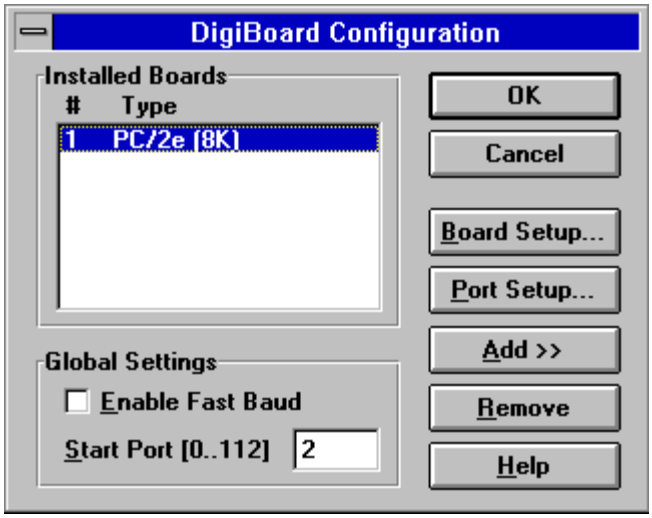
Note: After the first DigiWARE installation, access the DigiWARE configuration from the Windows Control Panel by double-clicking the DigiBoard icon.

5. A series of dialog boxes will follow, containing introductory information. Enter the name of the Windows directory in the appropriate dialog box.

6. Click **Add** when the configuration menu is displayed.

7. Select the start Port of **2** (this will be verified in step 19).

8. Select board **PC/2e (8k)** from the List of Boards.

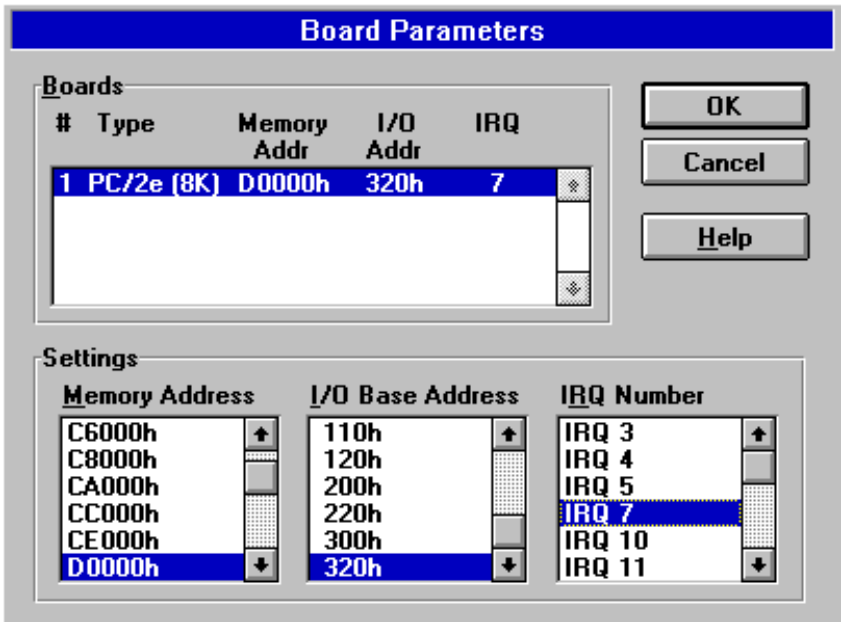


9. Select the **Install** button.

10. Select the **Board Setup** button.

11. The Board Setup Screen will appear. Enter the following settings initially*:

Memory Address	**D0000h**
I/O Base Address	**320h**
IRQ number	IRQ 7

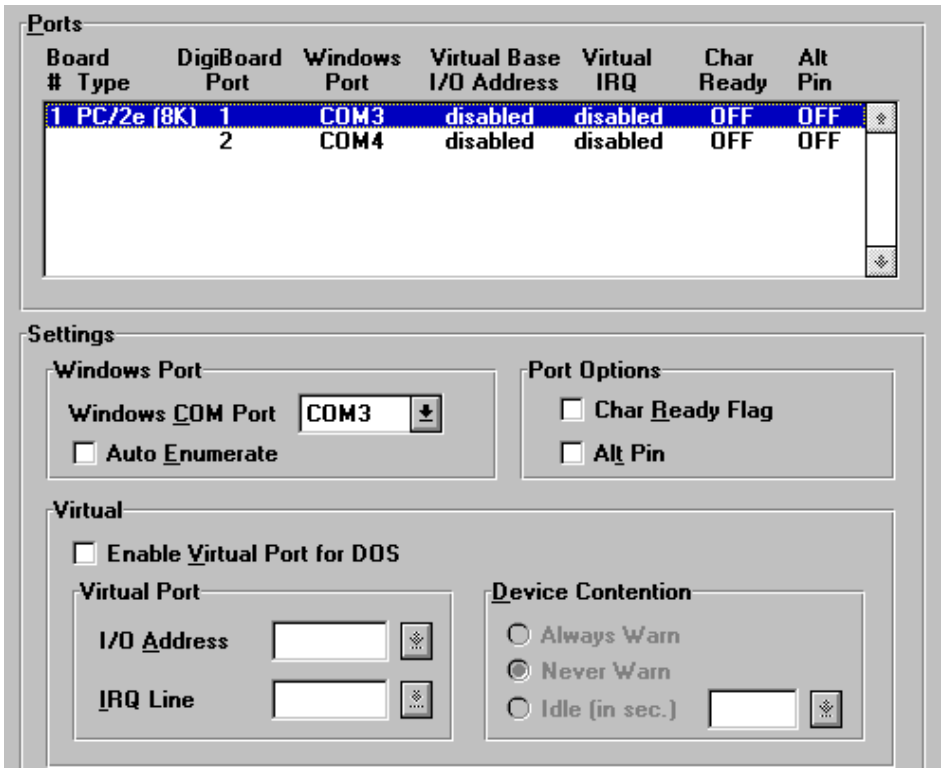


12. Click the **OK** button to return to the DigiBoard Configuration Menu.

13. Select **Port Setup**. The Windows Port parameter identifies the newly created port(s) to the Windows software. In the screens shown in this procedure, the host computer has two serial ports. The ports, added by the DigiBoard card, will be COM3 and COM4. These ports are identified on the following screen as DigiBoard Ports 1 and 2 because they coincide with the first and second ports located on the DigiBoard card.

*Depending on the setup of your computer, some of these locations and addresses may cause conflicts with existing hardware on your computer. Refer to the DigiBoard Software Manual, for more complete instructions.

Note: Most computers have one to four serial ports already installed and named COM1, COM2, etc. If your computer has these ports, you cannot use already existing names. Start naming your ports using the next COM name available (no larger than COM9).



14. Verify the **Char Ready Flag** is not checked.

15. Verify **Alt Pin** is not checked.

16. Verify that no parameters in the **Virtual** box are enabled.

17. Set the Device Contention to **Always Warn**.

18. Select the **OK** button to return to the DigiBoard Configuration Menu.

19. Verify the **Start Port**.
    The host computer used in this procedure has two serial ports installed in the computer. These are identified as port 0 (COM1) and port 1 (COM2). Addition of the DigiBoard card installs two additional ports called port 2 (COM3) and port 3 (COM4).

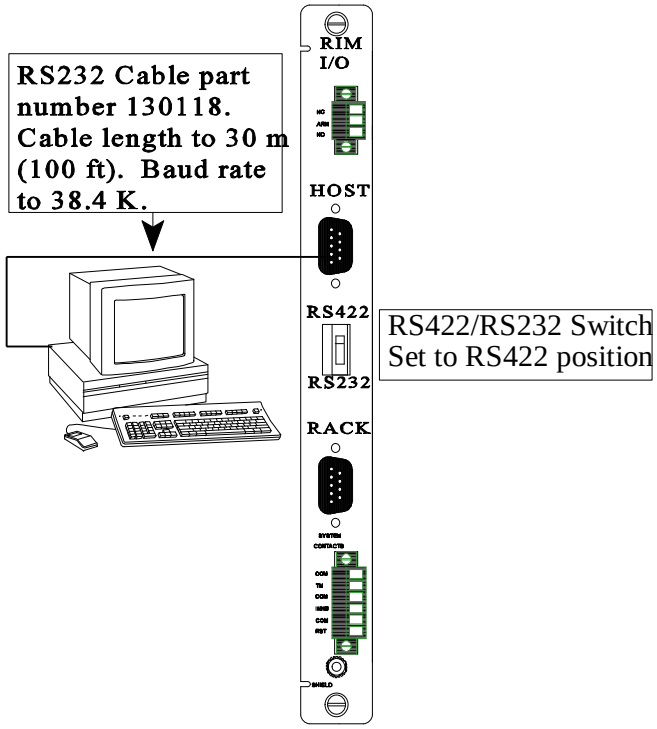
The **Start Port** number is therefore 2 (the first DigiBoard port -COM3). COM4 will automatically have a start port of 3.

20. Select the **OK** button.

21. Answer **YES** to save the DigiBoard Configuration.

22. Answer **Restart Now** when asked if you want to restart Windows.

23. Connect the host computer to the HOST port on the RIM I/O Module as shown.



Desktop Host connected to RIM I/O using an RS232 DigiBoard Card

Note: Host to Rack Interface I/O Cables:

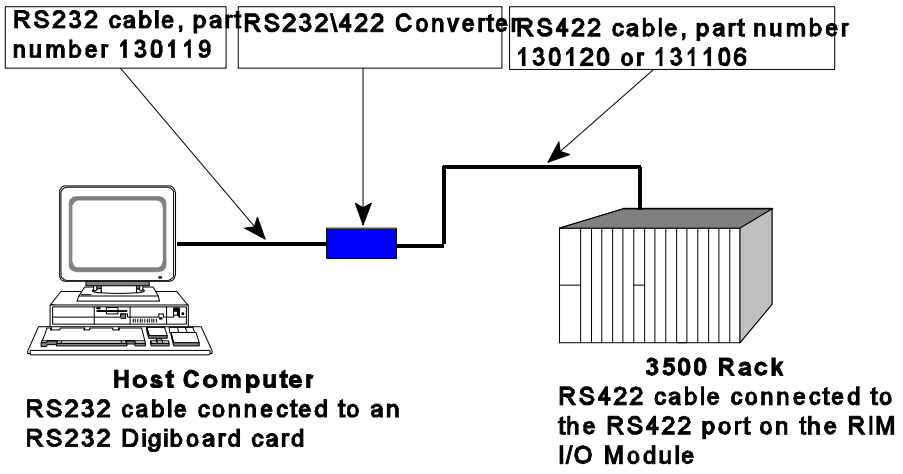
RS232 cable is part number 130118-01 and is shipped in 100 ft (30 m) lengths. This RS232 cable connects the host computer to the RS232/RS422 converter. RS232 Cable connecting the Host computer directly to the 3500 Monitor Rack is part number 130119-01 and comes in the same lengths.

RS422 Cable is part number 130120-01 and can be ordered in lengths of 500 ft (1500 m).

24. Run the RIM Host Port Test Utility to verify the DigiBoard in the host computer is communicating with the 3500 Monitor Rack(s) properly.

RS422 Communications

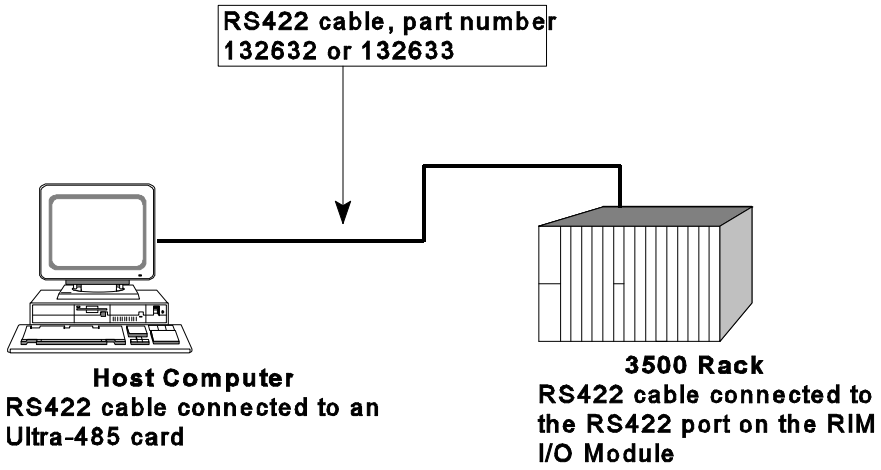
RS422 communications require a separate board installed in an empty slot of the host computer. In general, a laptop computer will not have an empty slot available. You can connect a host computer to the RS422 port on the RIM using an RS232 Digiboard card or an Ultra-485 card.



RS422 Communications Using an RS232 Digiboard Card

The DigiBoard communicates using RS232 communications. The RS232/RS422 converter requires a separate 110 or 220 volt power source. A small light on the converter indicates that power is on and the converter is operational. The instructions on page 4 show how to install an RS232

Digiboard card in the host computer.

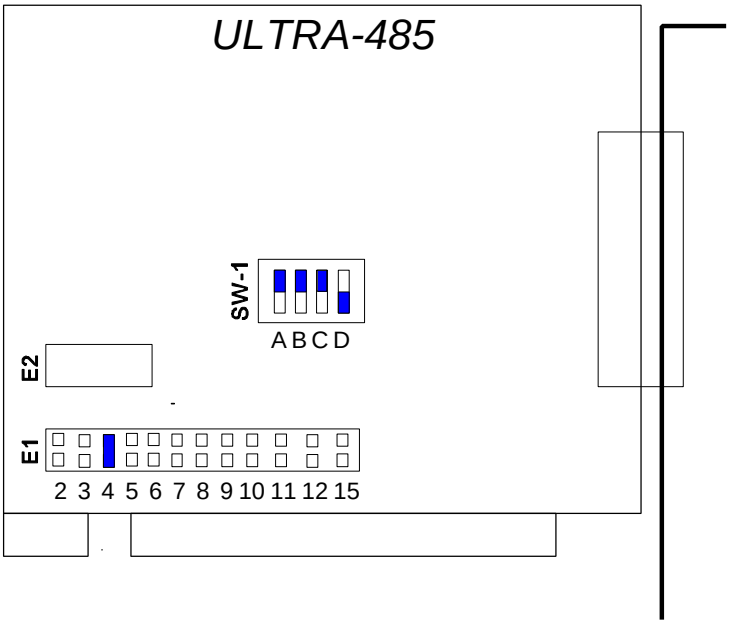


RS422 Communications Using An Ultra-485 Card

The Ultra-485 card uses hardware circuitry to make the RS485 interface appear like an RS232 interface to the computer. Installation consists of choosing an available I/O address and IRQ. A software driver does not need to be installed.

To install the Ultra-485 card:

1. Use the Ports icon in the Windows Control Panel to determine the base I/O port addresses and the IRQs of all the comm ports that are in use on your computer.
2. Choose an address and IRQ for the Ultra-485 card that is different than the addresses and IRQs determined in step 1.
3. Set the base I/O port address for the Ultra-485 card by setting the DIP switches on the card labeled SW-1. The setting shown in the following figure sets the card to be COM3 (the switch labeled "D" is set to off). For address settings for other COM ports, refer to the Model Ultra-485 Product Manual.



Settings for I/0 Address (SW-1) and IRQ (E1)

4. Set the IRQ for the Ultra-485 card by installing a jumper on the jumper bank labeled E1. The setting shown in this figure sets the IRQ for the card to 4. For the jumper position for other IRQ settings, refer to the Model Ultra-485 Product Manual.
5. Install the card in an empty expansion slot.
6. Use the Ports icon in the Windows Control Panel to configure the COM port with the Base I/O Port Address and the Interrupt Request Line (IRQ) that you set in steps 3 and 4.
7. Restart Windows for the settings in step 6 to take effect.

The Appendix, page ?, contains a list of part numbers for the cable, board, and converter needed for RS422 Communications.

Modem Communications

The RIM I/O module can be ordered with an internal modem. This modem is a 14,400 baud modem and replaces the 9 pin RS232/RS422 port.

Additionally, an external modem may be connected to the RS232 port on the RIM module. External modems should be Hayes compatible.

If the standard RIM I/O module is ordered, an external modem may be connected to either the RS232 port on the RIM or the RIM I/O module.

Modem communications used for Data Acquisition/DDE Server Software require a dedicated phone line to guarantee uninterrupted data acquisition.

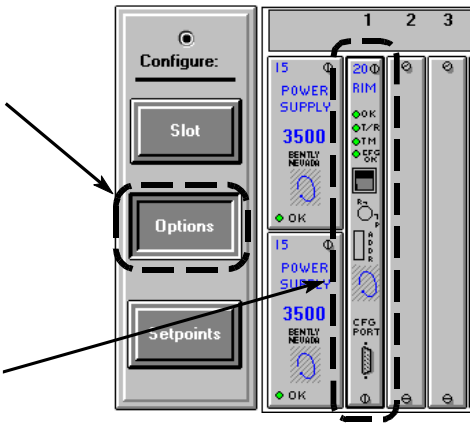
An internal or external modem at the 3500 Monitor Rack can be setup using the Rack Configuration Software. The procedure has been made as automatic as possible.

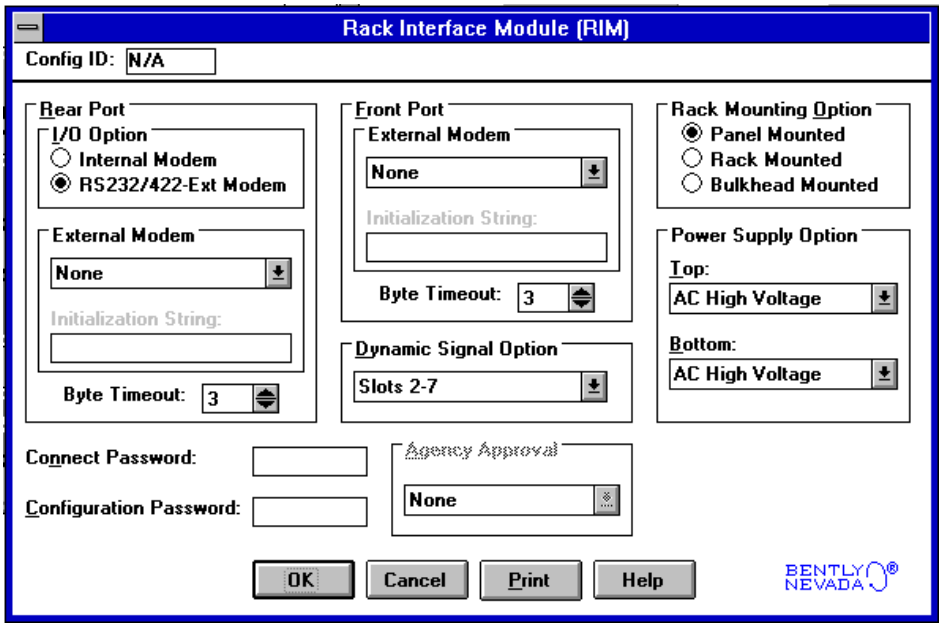
To initialize a RIM modem:

1. Start the Rack Configuration Software by selecting the icon in the 3500 Software Group.

2. Select the **OPTIONS** button and click the mouse once:

3. Select the Rack Interface Module (RIM) and click the mouse once.



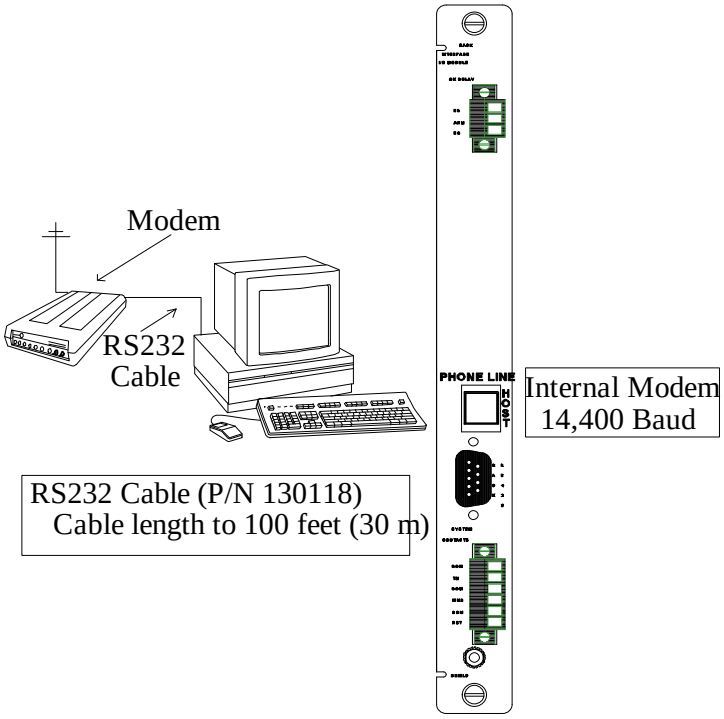


4. Notice the area for the **Rear Port** and **Front Port**. If you have an Internal or external modem connected to the RIM I/O module, select the correct modem type in the **Rear Port** area.

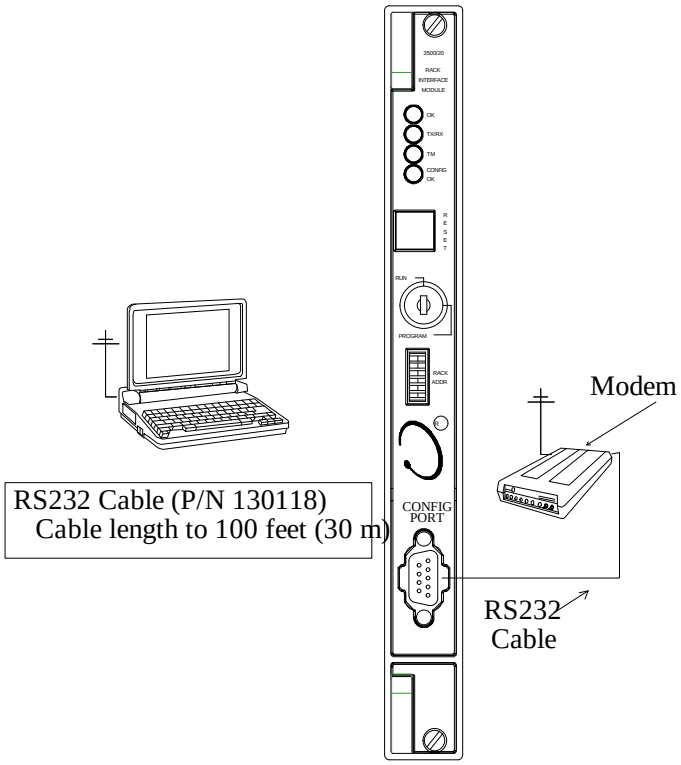
   If you have an external modem connected to the RIM, select the correct modem type in the **Front Port** area.

   If you select one of the available modems, an initialization string is automatically determined and entered for you. The string is stored in the RIM when configuration information is Downloaded.

   The initialization string remains in the RIM of the 3500 Monitor Rack until changed by an operator. In the event of a power failure or loss of communications, the modem will be initialized automatically by the RIM when power or communications have been restored.



Desktop Host with External Modem Communicating with Internal Modem located in RIM I/O Module



Laptop Host with Internal Modem Communicating with External Modem Connected to RIM

Rack to Rack Communications

Communication between 3500 Monitor Racks occurs between the RIM I/O Modules. The Data Acquisition/DDE Server Software requires RIM to RIM rack communications when multiple 3500 Monitor Racks are used.

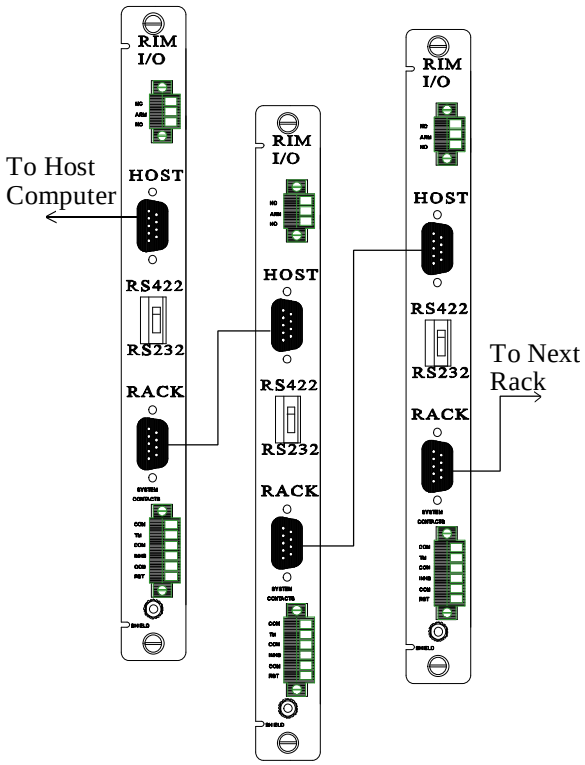
Twelve 3500 Monitor Racks may be daisy-chained together in a single 3500 Monitoring System installation. Communication between racks is RS422 connecting the HOST and RACK ports of the RIM I/O Modules.

The host computer connects to the HOST port of the first 3500 Monitor Rack. The first rack is then connected to the second rack from the RACK port on the first to the HOST port on the second.

If the first rack has an internal modem, the host computer communicates with the modem in this rack. Communication between the racks in the chain uses RS422 communications.

Each 3500 Monitor Rack must have a unique address set on switches on the RIM Module. No two racks in the same daisy-chain may have the same rack address.

Note: Ensure that the byte timeout option in all RIMs in the daisy chain are set sufficiently large to handle all modem delays.



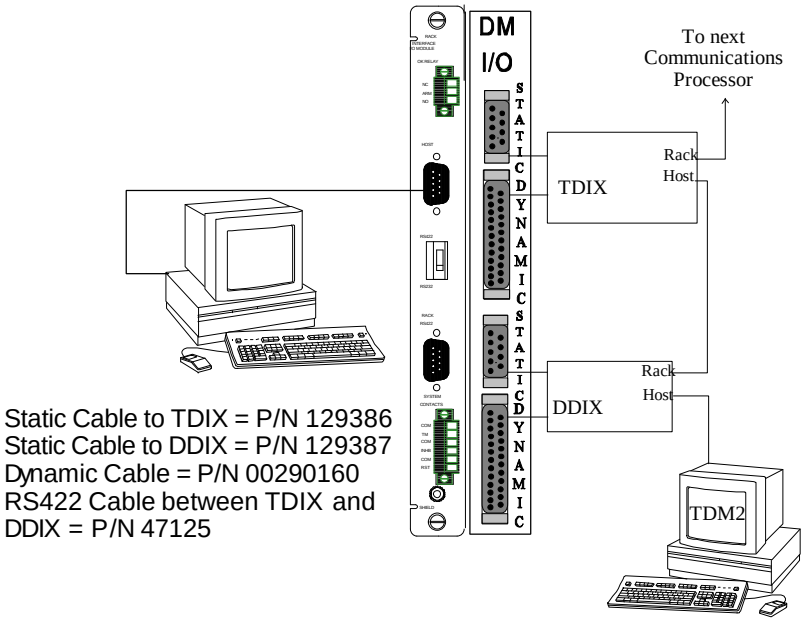
RS422 Cable Connections for Daisy-Chaining 3500 Monitor Racks

DDM2/TDM2 Communications

3500 Monitor Racks can be used in a Dynamic Data Manager 2/Transient Data Manager 2 installation. As with 3300, 7200, or 9000 series Monitor Racks, the 3500 Monitor Racks use communication processors to collect and transmit static and dynamic data values to a DDM2/TDM2 computer.

A single 3500 Monitor Rack may send data to two communication processors. These can be two DDIX, two TDIX, or one of each.

A Data Manager I/O Module, located behind the Power Supply and RIM, provides two static and dynamic ports. These ports connect by cable to DDIX or TDIX communication processors as shown in the following figure.



Data Manager I/O Module connected to two Data Manager Communication Processors

With two communication processors (CPs) connected to the 3500 Monitor Rack, a total of 48 monitor channels provide machinery data to a DDM2/TDM2 installation. The following rules apply to Data Manager communications:

Two Data Manager communication processors connected to a 3500 Monitor Rack will collect data from the rack using both sets of static and dynamic ports on the Data Manager I/O module according to the following conditions:

- the monitor modules located in rack slots 2 to7 supply data to the first communication processor through the top static and dynamic ports of the Data Manager I/O Module.
- the monitor modules located in rack slots 8 to 13 supply data to the second communication processor through the bottom static and dynamic ports of the Data Manager I/O Module.
- Rack slots 14 and 15 will not supply data to a communication processor.
- The Rack Interface Module (RIM) configuration must be setup to provide data to two communication processors.

A single Data Manager communication processor connected to a 3500 Monitor Rack will collect data using the top static and dynamic ports of the Data Manager I/O Module according to one of the following conditions:

- monitor modules located in slots 2, 4, 6, 8, 10, and 12
  OR
- monitor modules located in slots 2, 5, 8, and 11 (used in TMR applications)
  OR
- monitor modules located in slots 2, 6, and 10 (used in TMR applications)

A DDM2/TDM2 installation accepts data from a maximum of twelve communication processors. Additionally, the 3500 Monitor Rack modules are configured for the DDM2/TDM2 installation using the configuration portion of the DDM2/TDM2 software. Configuration of the 3500 Monitor Racks using the 3500 Rack Configuration Software does NOT automatically configure communication processors and racks for use with the DDM2/TDM2 System. Both configurations are separate and independent.

Data Acquisition/DDE Server Software

This section describes the 3500 Monitoring System Data Acquisition / DDE Server Software package. It includes the following information:

- Requirements
- Modes of Operation
  - Providing data to Operator Display Software
  - Providing data to Third Party Software
- Software Operation
  - Setup
  - Data Acquisition Parameters
  - Real-time Trend Data Requirements
  - Connection Parameters
  - Saving and Retrieving Setup Files
  - Passwords
  - Initiating and Terminating Data Acquisition
  - Data Acquisition Server Password
  - Computer Log
  - Historical Trend
  - Troubleshooting
- Third Party Connectivity via DDE

The Data Acquisition / DDE Server Software has several functions:

- Collect Machinery Monitoring, Alarm, and Events data from 3500 Monitor rack,
- Store historical and real-time trend data for machinery monitoring channels
- Act as a Dynamic Data Exchange (DDE) Server for current machinery monitoring values.

Data Acquisition Software collects and makes machinery monitoring data available to the 3500 Operator Display Software, other vendor software, and Third Party software packages. It does not display machinery monitoring data.

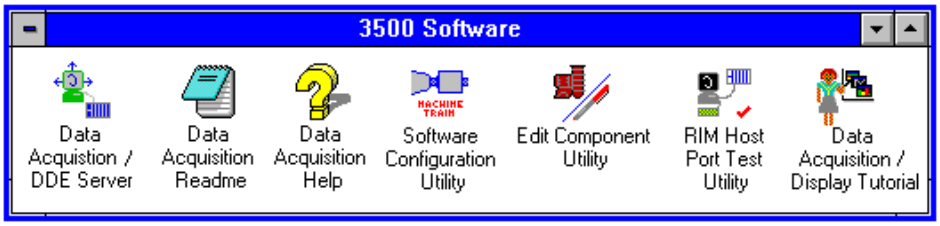
Requirements

The following conditions must exist before using the Data Acquisition Software:

- You must have a valid link to one or more **Configured** 3500 Monitor Racks. This link can be by direct cable (either RS232 or RS422) or by remote modem.
- The Data Acquisition host computer must be able to collect machinery monitoring data 24 hours per day, seven days per week.
- The Data Acquisition / DDE Software must be installed and the Data Acquisition icon present in the 3500 Software Group. Refer to the Software Installation Section of this Manual for installation procedures.
- The host computer must have sufficient memory and hard disk space available for storing the trend information you require.

Note: Trains do not have to be defined to operate the Data Acquisition Software. If no trains exist, each 3500 rack will default to a single train and information will be collected by rack using the rack address as an identifier.

After a successful Data Acquisition/DDE Server Software installation, the following icons will be placed in the 3500 Software Group:



Data Acquisition/DDE Server: Use this software to continuously monitor machinery data from the 3500 Monitor Racks and provide the data to display clients.

Data Acquisition Readme: Contains information about the software products including version number, date, and notes about software revisions and changes.

Data Acquisition Help: Direct access to the Data Acquisition/DDE

 Data Acquisition Help		Server HELP screens. These explain all aspects of the software operation. Help screens are also available within the software by selecting **Help.**
 Software Configuration Utility	Software Configuration Utility:	Used to specify historical trend parameters, build Machine Train Diagrams, and MAP configured points to Machine Trains. This utility software is included with both the Data Acquisition/DDE Server and Operator Display Software packages. Refer to page ? for additional information.
 Edit Component Utility	Edit Component Utility	Used to build custom machine elements for Machine Train Diagrams. This utility software is included with both the Data Acquisition/DDE Server and Operator Display Software packages. Refer to page ? for additional information.
 RIM Host Port Test Utility	Rim Host Port Test Utility:	Use this utility to verify that the host to rack communication link is operating correctly.
 Data Acquisition / Display Tutorial	Data Acquisition/ Display Tutorial:	Explains and shows how to use procedures for Operator Display, Data Acquisition, Software Configuration, and Edit Component Software.

Modes of Operation

The Data Acquisition/DDE Server Software can be used with or without the 3500 Operator Display Software. It will act as a DDE Server to any Third Party software application that recognizes and uses standard Windows DDE access methods. It also supports Windows NetDDE access.

The computer running the Data Acquisition/DDE Server Software maintains all of the data files relating to the 3500 Monitor Racks connected to it. Because the Operator Display Software does not maintain any data files, the software must have a connection to the Data Acquisition computer in order to access these files and the data they contain.

When used as a DDE server for Third Party software applications, the Data Acquisition computer maintains current machinery data in memory in standard formats that can be easily accessed.

Providing Data to 3500 Operator Display Software
When used with the 3500 Operator Display Software, the Data Acquisition/DDE Server Software provides data collected by Machine Train (train based displays) or by 3500 Monitor Rack (rack based displays). Whichever method is used, the 3500 Monitor Racks must first be configured using the Rack Configuration Software.

Rack based displays do not require the setup of machine trains. It is a method of receiving machinery information quickly to verify the operation of your system and to perform checks on transducers, monitors, and rack configurations.

To use the Data Acquisition/DDE Server Software with Rack based displays:

1. Configure all 3500 Monitor Racks using the Rack Configuration Software.

2. Install and configure the Data Acquisition/DDE Server Software according to instructions presented on page ? of this section. This is a very short process and includes the Data Acquisition Parameters, Connection Parameters, and Passwords.

3. Connect the Data Acquisition/DDE Server computer to the 3500 Monitor Racks.

4. Run the Host Port Test Utility to verify communications between the Data Acquisition/DDE Server computer and the 3500 Monitor Racks.

5. Initiate data acquisition.

Once this process is completed, connection to the Data Acquisition/DDE Server computer by the Operator Display software will produce current value, trend, and bargraph displays for each rack (not train) connected to the Data Acquisition/DDE Server computer. Racks will be identified by their rack address.

Train based displays result from assigning your configured 3500 monitor channels, or points to specific Machine Trains. The points are then displayed as a train unit and not by rack. This means that a single Machine Train can contain points from several different racks. This provides a more logical view of machinery data.

Two utility programs have been provided to group your points:

< Software Configuration Utility
< Train Component Utility.

These utility programs have individual icons within the 3500 Software Group and are explained in detail on page ?.

To use the Data Acquisition/DDE Server Software with Train based displays:

1. Configure all 3500 Monitor Racks using the Rack Configuration Software.

2. Run the Software Configuration Utility to define Machine Trains and assign monitor channels, Keyphasors, and relays to each Machine Train (mapping).

   This software allows you to draw your Machine Train Diagrams and place your most important monitor channels, Keyphasors and relays on the

diagram.

3. If necessary, run the Train Component Utility to build custom machinery train components for your Machine Train Diagrams. (Many machine components have already been provided for you)

4. Install and configure the Data Acquisition/DDE Server Software according to instructions presented on page ? of this section. This is a very short process and includes the Data Acquisition Parameters, Connection Parameters, and Passwords.

5. Connect the Data Acquisition/DDE Server computer to the 3500 Monitor Racks.

6. Run the Host Port Test Utility to verify communications between the Data Acquisition/DDE Server computer and the 3500 Monitor Racks.

7. Initiate data acquisition.

Once this process is completed, connection to the Data Acquisition/DDE Server computer by the Operator Display Software will produce Machine Train Diagrams, current value, trend, and bargraph displays for each Machine Train defined in the Data Acquisition/DDE Server computer. Machine Trains will be identified by name.

Providing Data to Third Party Software

When the Data Acquisition/DDE Server Software is used to provided data to Third Party Software, no Machine Train definitions are necessary. Any Third Party Software application that can act as a DDE client can access the machinery data collected by the Data Acquisition computer.

If you are using Windows for WorkGroups 3.11, Windows NT 3.5, or Windows 95, machinery information is also available over a network using NetDDE.

To use the Data Acquisition/DDE Server Software as a server to Third Party applications:

1. Configure all 3500 Monitor Racks using the Rack Configuration Software.

2. Install and configure the Data Acquisition/DDE Server Software according to instructions presented on page ? of this section. This is a very short process and includes the Data Acquisition Parameters, Connection Parameters, and Passwords.

3. Connect the Data Acquisition/DDE Server computer to the 3500 Monitor Racks.

4. Run the Host Port Test Utility to verify communications between the Data Acquisition/DDE Server computer and the 3500 Monitor Racks.

5. Initiate data acquisition.

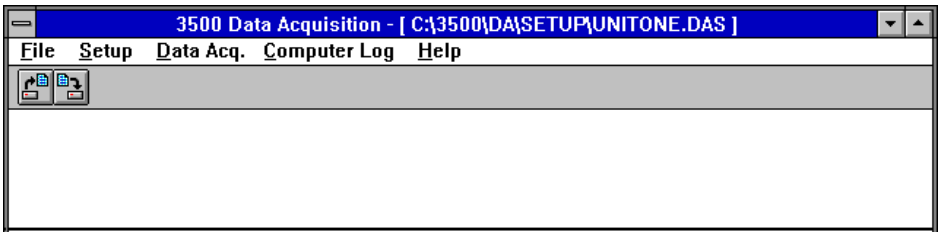
6. Install and configure Third Party software according to manufacturer's instructions.

7. Refer to the DDE Communication Section, page ?, for topic and item information for 3500 Monitor Rack values.

Data Acquisition Software Operation

Data Acquisition / DDE Server Software is sold separately and shipped on 3.5 inch high-density floppy diskettes. See page ? for installation instructions.

Start the Data Acquisition /DDE Server Software by double-clicking your mouse on the Data Acquisition/DDE Server icon. The following display will appear :



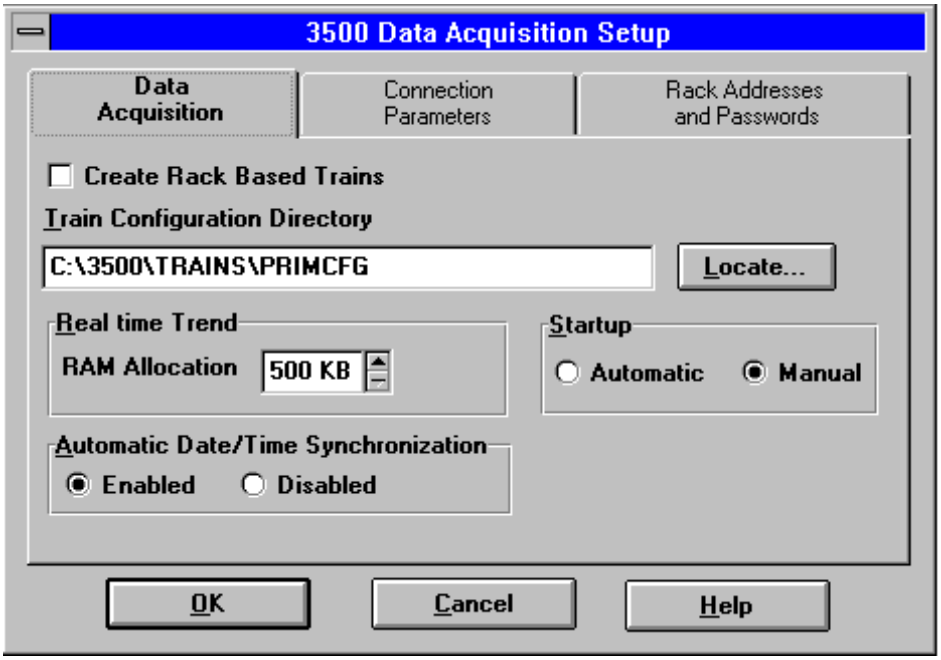
Setup

The Data Acquisition/DDE Server Software must be setup to operate properly. Setup consists of specifying how the computer will communicate with the 3500 Monitor Racks, identifying which racks will communicate with the computer, and selecting which hard disk files contain the rack configuration information.

After the Data Acquisition/DDE Server Software has been set up to communicate with one or more 3500 Monitor Racks, these parameters may be saved to the hard disk for permanent storage. Data Acquisition setup files have a file extension of .DAS.

If you will be using the Data Acquisition Software to call into multiple installations, setup (.DAS) files may be saved for each installation. A Data Acquisition computer communicating remotely with 3500 Monitor Racks may have more than one .DAS file.

Select **Setup** to display the following screen:



Data Acquisition	Select **Data Acquisition** to define parameters controlling how the computer will collect data.

Setup Option	Use this option to...
Train Configuration Directory	Identify the disk and subdirectory where the train files for the connected racks are stored (MCTRAINS.LGL, COMP.DEF, *.RAK). Typically, C:\3500\TRAINS\PRIMCFG.
Locate	Locate other subdirectories.

Setup Option	Use this option to...
Create Rack Based Trains	If the Data Acquisition software will NOT be using Machine Train Diagrams, check this box to report machinery monitoring data values grouped according to 3500 Monitor Racks. Each Monitor Rack will be considered a single Machine Train.
Startup	Identify whether or not your Data Acquisition Software will automatically initiate communications with the 3500 Monitor Racks once the Data Acquisition Software has been started.
Automatic	Initiates rack communications without operator intervention.
Manual	Initiate rack communications by operator request.
Automatic Date/Time Synchronization	Cause the date and time in the Rack Interface Modules of the 3500 Monitor Racks to be set to the date and time of the Data Acquisition Computer.
Enable	Synchronize data and time when the Data Acquisition Software initiates communications with the 3500 Monitor Racks.
Disable	No date and time synchronization is done.
Real-time Trend	Set the amount of RAM used to store real-time trend values. The range of values is 500 Kbytes to 10 Megabytes. See calculation instructions below.

Real-time Trend Requirements

Real-time trend data is collected continuously for all configured points connected to the Data Acquisition computer. Machinery data values are collected as fast as the Data Acquisition computer can request and process the data.

The items which affect the rate of real-time data collection are:

1. The type and speed of the processor in the Data Acquisition computer.
2. The number of other applications currently running on the Data Acquisition Computer.
3. The baud rate between the host computer and 3500 Monitor Racks.
4. The byte time out set in the RIM of the 3500 Monitor Rack. This value is set during Rack Configuration.
5. The number of 3500 Monitor Racks and the number of monitors in each rack being polled by the Data Acquisition software.

Real-time trend values are accessed using the 3500 Operator Display software.

The speed at which machinery data can be gathered from a 3500 Monitor Rack depends upon the number of racks connected to the Data Acquisition/DDE Server computer. If only one rack is connected (at 38.4 Kbaud) to the Data Acquisition computer, real-time trend data will be collected approximately every 0.5 seconds. If eight racks are connected to the Data Acquisition computer, real-time trend data will be collected approximately every four seconds.

Use the following formula to calculate the amount of RAM needed, and the real-time trend time span:

Required RAM = Number points **x** 50 bytes **x** Number samples desired

Total Real-time Trend Time Span = Time to poll rack **x** Number racks **x** Number samples

Where:

Number points = Number of configured points (monitors, relays, Keyphasor transducers) on all 3500 Monitor Racks. The maximum number of points for a single rack is 672.

Number samples desired = Total number of real-time trend samples you wish to have available for each point. Maximum number is 700 per point.

Time to poll rack =

Baud Rate	Time to Poll rack (seconds)	
	Average	Maximum
2400	3.7	10.8
4800	2.0	5.9
9600	1.2	3.2
19,200	0.77	1.8
38,400	0.55	0.55

Example:
A Data Acquisition computer* is connected to four racks daisy-chained together. Each of the four racks has six four-channel monitors and a single 4 Channel Relay module. The computer communicates at 19,200 baud with the RIM of the 3500 Monitor Rack. How much RAM is required to store 700 real-time trend samples for each point?

* Assume the computer has a 486 processor with a 50 MHz clock and is executing Data Acquisition and Operator Display software.

* Typical time to poll a rack assumes that the rack contains 7 Prox/Seis monitors with all channels configured as Radial Vibration channel type.

Number points = 4 racks x
[(4 channels x 6 monitors) + (4 channels x 1 relay)]
= 112 points

Required RAM = 112 x 50 x 700
= 3,920,000 bytes

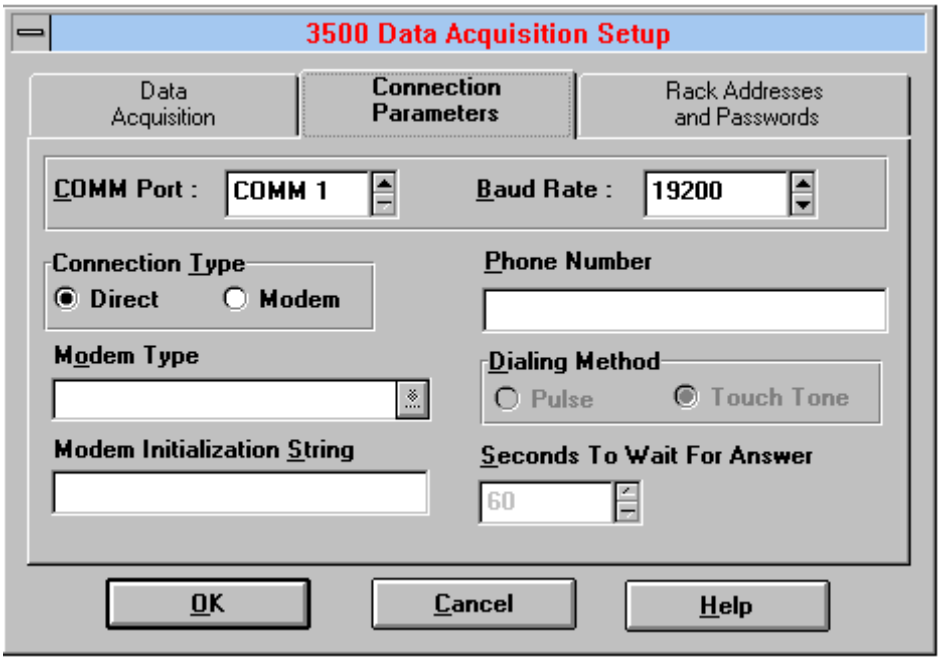
Total Real-time Trend Time Span = .77 second x 4 racks x 700 samples
= 2156 seconds
= 36 minutes

You will need 4 Megabytes of RAM storage to hold 36 minutes of real-time trend data for your 112 points. After 36 minutes, the first (oldest) trend values will be overwritten with the newer trend values.

Note: The amount of RAM used for Real-time trends can affect the performance of your Data Acquisition Computer. The more memory used for trends, the less memory available for other operations. Remember also, that historical (disk based) trends are also available. See page ?.

Connection Parameters

Connection Parameters identify how the Data Acquisition computer will communicate with the 3500 Monitor Rack.



Setup Option	Use this option to...
COMM port	Identify the number of the RS232 port you used for the modem or direct connection to the first 3500 Monitor Rack.
Baud Rate	Identify the data transfer rate between the COMM port and the 3500 Monitor Rack.
(Direct)	The transfer rate between the COM port and the 3500 Monitor Rack. Direct connections can generally handle baud rates to 38.4 Kbaud.
(Modem)	The transfer rate between the COM port and the modem. A modem connection can generally be set to 19.2 Kbaud.
Connection Type	Define the type of connection between the Data Acquisition computer and the 3500 Monitor Racks.

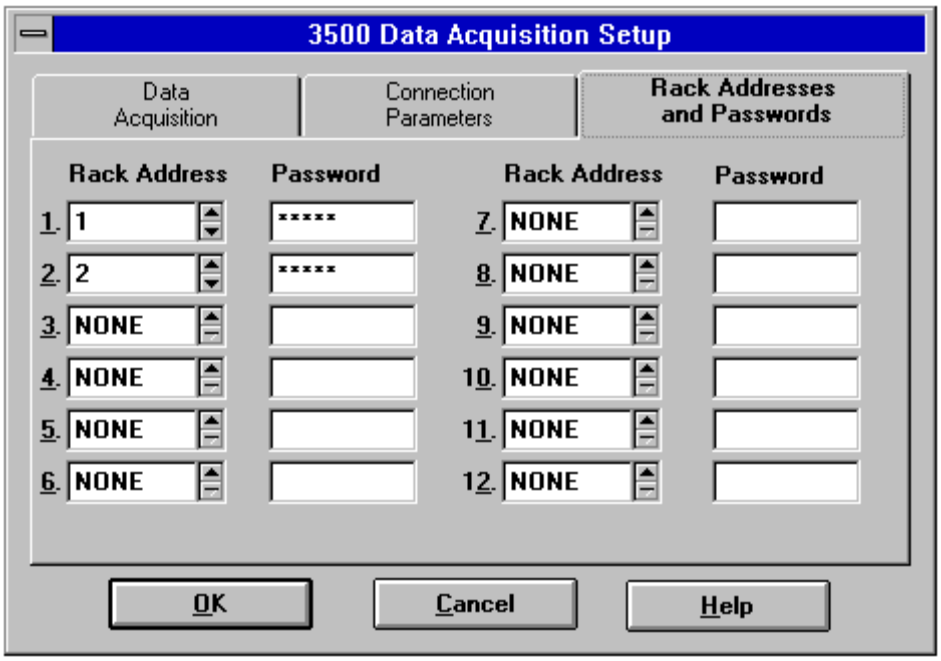
Setup Option	Use this option to...
Modem	A link that uses an internal or external modem at the Data Acquisition computer and at the first 3500 Monitor Rack. Rack Modems are initialized using the Rack Configuration Software.
Direct	A link that uses an RS232 or RS422 direct cable link from the computer to the RIM or RIM I/O Module.
Modem Type	Describe the brand of modem you are using. The Hayes Ultra 9600, Optima 9600, or Motorola Fastalk II 19200 are recommended for use with the 3500 Monitoring System. Other modems, particularly Hayes compatible, may be used.
Modem Initialization String	If your modem is not one of the Bently Nevada approved and tested modems, you may need to insert an initialization string in this field to configure the modem connected to the Data Acquisition computer. Refer to the specific Modem Users Guide or Operation Manual for information concerning this string.
Phone Number	The phone number at the first 3500 Monitor Rack. Enter the number exactly as you would dial it from the phone where the Data Acquisition computer is located. Use commas (,,,) to insert pauses in the dialing sequence. If you dial a special number (such as 7 or 9) to get an outside line, include this in the phone number. Credit card numbers may also be inserted in this field. This parameter is used only for modem connections.

Setup Option	Use this option to...
Dialing Method	Select the type of signal used by the telephone. Available options are **pulse** (often called rotary) or **touch tone**.
Seconds to wait for Answer	Specify the number of seconds to wait for a valid connection between the host computer and the 3500 rack modem.

Rack Addresses and Passwords

Rack Addresses and Passwords

Rack Address parameters define the 3500 Monitor Racks that communicate with the Data Acquisition Computer.



Use this screen to define the 3500 Monitor Racks connected to this Data Acquisition computer. In the example shown, two racks are connected. The racks have addresses of 1 and 2 and both require a password.

This password is necessary to allow the Data Acquisition computer to collect

machinery monitoring data from the rack. 3500 Monitor Rack passwords are specified as the Connect Password in the Rack Configuration Software.

After you enter all of the Setup parameters, select the **OK** button to return to the main screen.

Saving and Retrieving Setup Files

You may save your Setup to be recalled at another time. Select the Save Setup icon or Select **File** and **Save** or **Save As** to make a permanent copy of your Setup parameters on the hard disk.

Setup files have a .DAS extension and are stored by default in the X:\3500\DA_DISP\SETUP subdirectory.

To recall a previously stored Setup file, select the Open Setup File icon, or select **File**, and **Open**.

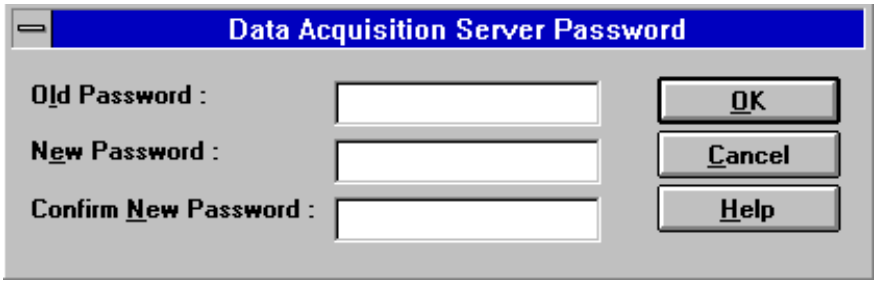
It is important to **Open** the correct .DAS file before attempting to communicate with the 3500 Monitor Rack(s).

Data Acquisition Server Password

You may assign a password to the Data Acquisition/DDE Server Software to secure access to the Data Acquisition computer and the 3500 Monitor Rack(s).

This password must be entered by any Operator Display computer connecting to the Data Acquisition Software from another node on a network or from a remote location.

Select **File**, and **Password...** to display the password dialog box:

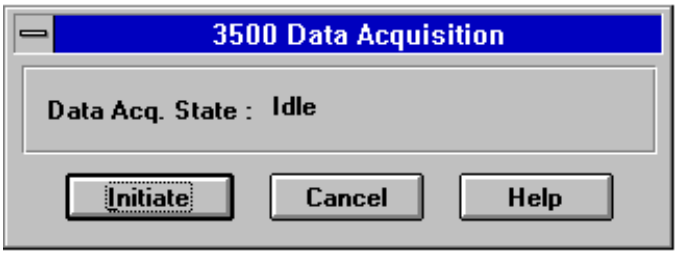


To enter a new password, type it into the **New Password** field. To change an existing password, type the old password into the **Old Password** field and enter a new one in the **New Password** field.

You must **Confirm New Password** by typing it a second time EXACTLY the same way it was entered in the **New Password** field.

Initiating and Terminating Data Acquisition
Before you begin collecting data, verify the connection with the rack by running the RIM Host Port Test Utility.

To begin collecting machinery monitoring data, select **Data Acq.** with your mouse pointer and click once to reveal the 3500 Data Acquisition dialog box.



Idle means the computer is NOT actively collecting machinery data from 3500 Monitor Rack(s). To begin data acquisition, place the mouse pointer on **Initiate** and click once.

After initiating data acquisition with the 3500 Monitor Rack(s), the Data Acquisition state will be **Acquiring Data**. This state indicates that the Data Acquisition Software is currently gathering machinery data from the 3500 Monitor Rack(s).

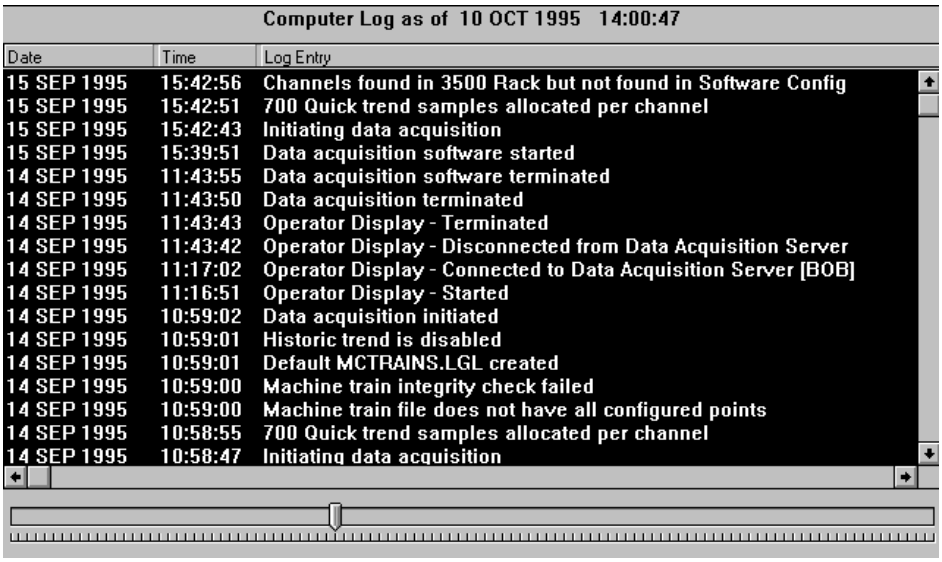
Data acquisition may also be initiated from the Operator Display Software. See page ? for further information.

Computer Log
A Computer Log is a chronological list of occurrences affecting the operation of the Data Acquisition computer. This log will record events that pertain ONLY to the computer being accessed.

The contents of the computer log depend on how the computer displaying the log is connected. When viewing the computer log, you will view the log of the computer you are operating or the Data Acquisition/DDE Server computer you are connected to.

Computer System	**The Computer Log will Contain....**
Computer running Operator Display and Data Acquisition	Events from both the Operator Display and the Data Acquisition Software.
Computer running Operator Display Software on a network but not connected to a Data Acquisition Computer	Events from the Operator Display Software.
Computer running Data Acquisition Software only	Events from the Data Acquisition Software.
Computer running Operator Display Software and connected to a Data Acquisition Computer (via remote or network)	Events from the Data Acquisition Software.

To access the Computer Log, click the mouse pointer **Computer Log** and then **Show**.



This sample shows the latest 2000 events. The most recent event appears at the top of the list. Use the arrows to scroll the list up and down to view the events on the current page. Each page contains 20 entries. To view additional pages, use the horizontal slide bar located at the bottom of the screen.

Computer Log events will show when Data Acquisition was initiated and terminated, when connections were made from other computers, when trend parameters were set and changed, and other events affecting the operation of the Data Acquisition / DDE Server Software.

To remove the Computer Log from your display screen, select **Computer Log** and **Hide**.

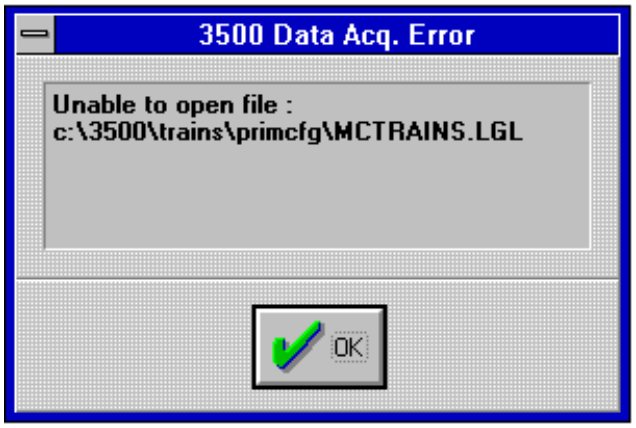
Historical Trend

One of the primary functions of the Data Acquisition Software is to store long term trend information. All historical trend information is stored in point based files on the Data Acquisition computer hard disk. The Data Acquisition Software will continuously fill trend files for each Monitor and Keyphasor channel in the 3500 Monitor Racks.

Each trend file is built by the Software Configuration Utility and contains a user specified number of samples. The samples are filled in a round-robin fashion such that when the file becomes totally filled, the oldest trend sample will be

overwritten with the newest trend sample. Refer to page ? for more information.

Troubleshooting
If the Data Acquisition/DDE Server Software is unable to collect data from the 3500 Monitor Racks, a dialog box describing the problem will be displayed, and/or an entry will be made in the Computer Log. Dialog boxes look like this:



By reading the message, you should be able to correct the problem and continue.

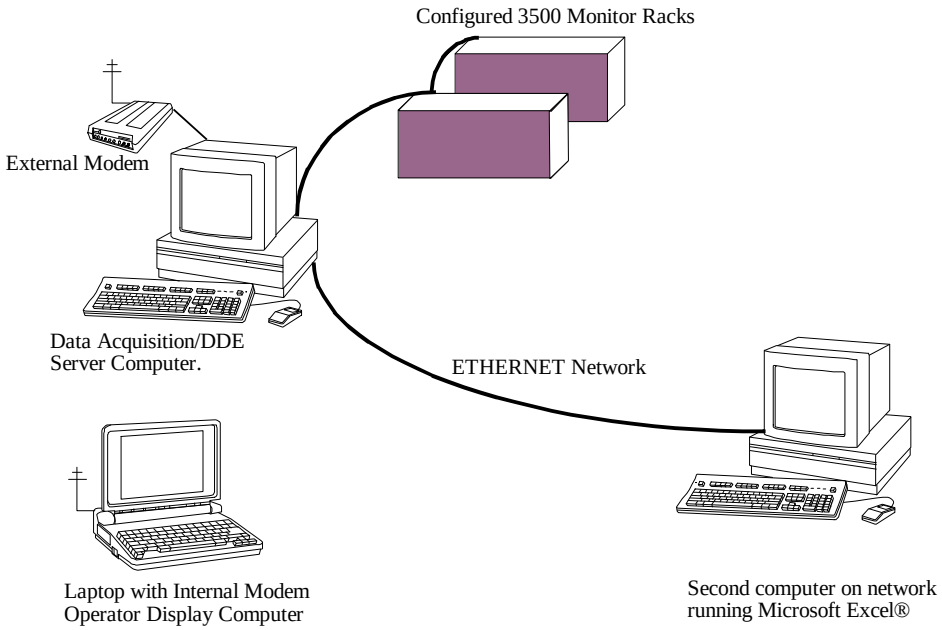
Third Party Server Connectivity via DDE

Dynamic **D**ata **E**xchange (DDE) allows different software applications to access collected machinery data. This means the Data Acquisition Software collects machinery data from 3500 Monitor Racks and stores the data under specific 'topics' and 'items'. Other software products can use these topics and items to retrieve machinery information.

Because machinery data is 'shared' through the computer's memory, applications do not have to talk directly to the 3500 Monitor Racks to collect data. A 'map' of DDE topics and items is included on page ?.

The following figure shows how three computers can use DDE and elements of the 3500 Monitoring System to access data from the same 3500 Monitor Racks:

- A Bently Nevada Data Acquisition computer connected to two 3500 Monitor Rack containing channels from two machine trains.
- A second computer connected to the Data Acquisition computer using an ETHERNET network. The second computer is running Microsoft Excel software to build a spreadsheet that includes machinery monitoring values from the two trains.
- A third computer is remotely connected to the Data Acquisition computer and is displaying data using the Operator Display Software.



Using the DDE Server, the computer on the second node of this network is accessing machinery monitoring values to produce spreadsheet data. The Laptop computer is running the 3500 Monitoring System Operator Display Software using the same information to produce current machinery value displays and graphics.

Both the laptop and the computer on the second network node have established a 'connection' to the Data Acquisition computer using NetDDE communications.

Because of the multiple methods available for using the DDE Server properties of the Data Acquisition / DDE Server Software package, they can not all be

explained here. However, the following information is necessary if you are planning to set up a DDE Server installation.

- The node on a network being accessed for machinery values MUST be the node running the Data Acquisition/DDE Server Software.

- Use Microsoft Windows for WorkGroups, Windows 95, or Windows NT for networking functions. This is the only networking interface tested and recommended by Bently Nevada Corporation.

- Remote computer to network computer connections are made via **Remote Access Service** (RAS) supplied with Windows or Windows NT software. RAS allows a remote computer to look like another 'node' on a network. Currently Windows NT and Windows 95 are the only operating systems which provide the RAS Server capabilities. If this type of functionality is required, Windows NT or Windows 95 should be run on the Data Acquisition node.

- Any software application that supports Net DDE will be able to access and use machinery monitoring data supplied by the Data Acquisition/DDE Server Software.

For more information concerning 3500 installations with other hardware and software products, see Part 2 of this manual.

Operator Display Software

This section describes the 3500 Monitoring System Operator Display Software. It includes the following information:

- Requirements
- Operator Display Software Operation
  - Connection to Data Acquisition/DDE Server Software
  - Train Displays
  - Bargraph Displays
  - Current Value Displays
  - Trend Displays
  - Alarm Events and Active Alarms
  - System Events
  - Computer Logs
  - Initiating Data Acquisition
  - Setting Channel Switches
  - Adjusting Setpoints
  - Other Features

The Operator Display Software allows you to view machinery data collected by the Data Acquisition/DDE Server Software from the 3500 Monitor Racks. To display machinery data, the Operator Display Software must 'Connect' to the Data Acquisition/DDE Server. This connection can be:

- Data Acquisition/DDE Server Software and Operator Display Software operating on the same computer (a stand-alone system).
- Operator Display Software operating on a remote computer with a modem link to a computer running the Data Acquisition/DDE Server Software.
- Operator Display Software operating on a computer that is part of a network. Other network nodes are using the Data Acquisition/DDE Server Software.

Requirements

The following conditions must be met before using the Operator Display Software:

- You must be operating this software on a computer with an **Active**

connection to a Data Acquisition/DDE Server.

C The Operator Display Software must be installed and the following icons present in the 3500 Software Group. Refer to page ? for instructions.

After a successful Operator Display Software installation, the following icons will be placed in the 3500 Software Group:

Operator Display Software: Used to display current values, bargraphs, trends, Machine Train Diagrams, System Event List, Computer Log, and Alarm Event lists.

Software Configuration Utility: Used to specify historical trend parameters, build Machine Train Diagrams, and MAP configured points to Machine Trains. This utility software is included with both the Data Acquisition/DDE Server and Operator Display Software packages. Refer to page ? for additional information.

Edit Component Utility: Used to build custom machine elements for Machine Train Diagrams. This utility software is included with both the Data Acquisition/DDE Server and Operator Display Software packages. Refer to page ? for additional information.

Data Acquisition / Display Tutorial:

Explains and shows how to use procedures for Operator Display, Data Acquisition, Software Configuration, and Edit Component Software.

Operator Display Readme:

Provides additional information concerning the Operator Display Software installation and information not included in this manual or in the Help system.

Operator Display Help:

Allows the Operator Display Help system to be started outside the Operator Display Software.

Operator Display Software Operation

Operator Display Software can display machinery monitoring data in several forms:

- Machine Train Diagrams
- Bargraphs
- Current Values
- Trend displays for selected time periods
- Alarm Event Lists
- System Event Lists
- Computer Logs

Note: Connection: Data Acquisition/DDE Server to Operator Display

Operator Display software must be connected to an active Data Acquisition/DDE Server computer. All data displayed will be from the Data Acquisition computer.

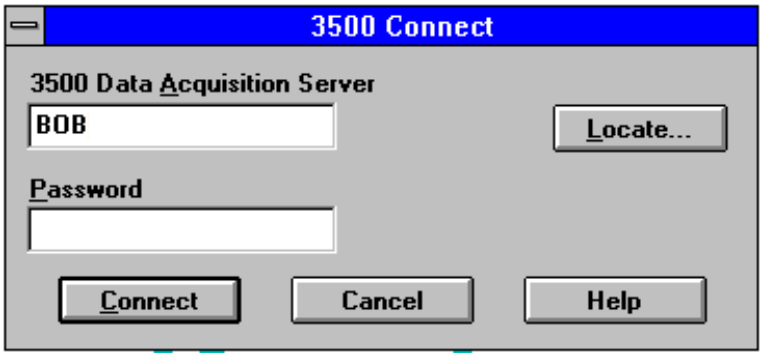
To start the Operator Display Software:

1. Select the Operator Display icon from the 3500 Software Group on your Program Manager screen by placing your mouse pointer on the icon and double clicking.

Connect to Data Acquisition/DDE Server Software
To begin viewing machinery data, you must first connect to a Data Acquisition/DDE Server.

To connect to Data Acquisition/DDE Server Software:

1. Select **File**



2. Select **Connect**

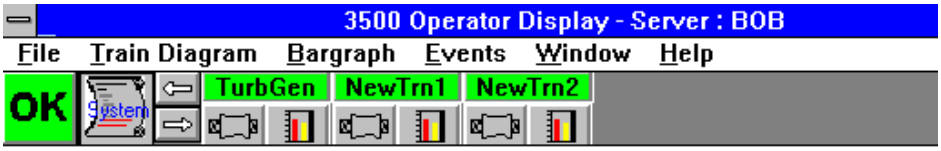
3. Enter the complete name of the Data Acquisition/DDE Server to be connected to. Use the **Locate...** button if necessary.

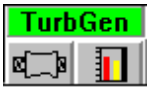
4. Enter a Data Acquisition password if one has been specified in the Data Acquisition Software.

Once a valid connection has been established, all configured machine trains (or

connected 3500 Monitor Racks) associated with the Data Acquisition/DDE Server computer will be available for display.

Train Displays





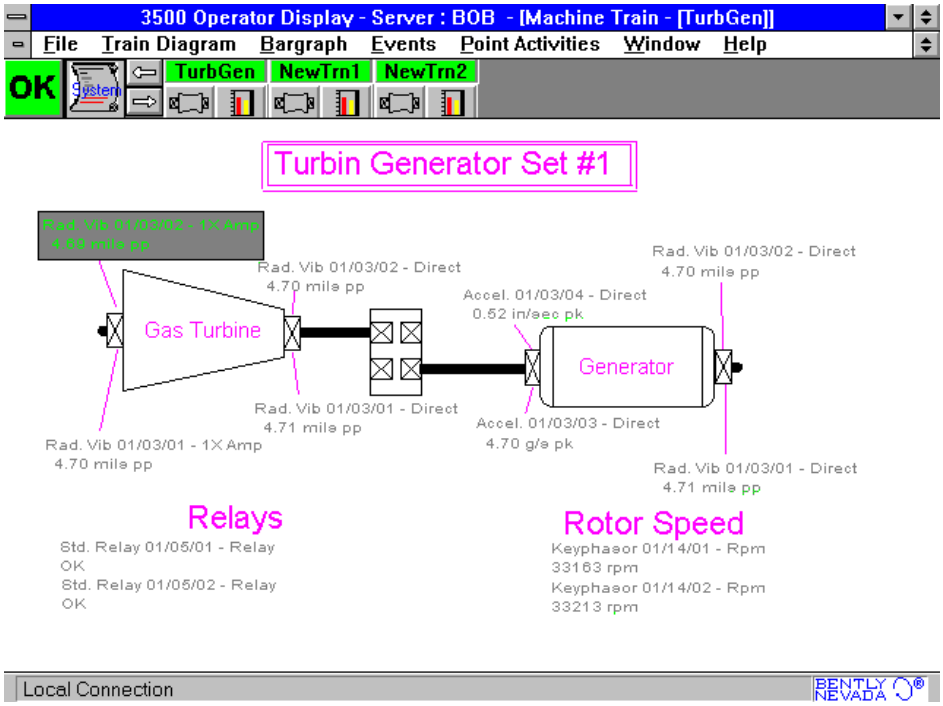
Each defined Machine Train has an icon group with the train name (in this sample - TurbGen, Newtrn1 and Newtrn2) above two icons. This Train Menu Bar contains all currently active trains.

If you selected Rack Based Trains, the Rack Address numbers will be displayed in the Machine Train Name area.

Use these arrow keys to display any trains which may not be displayed on the Train Menu Bar. Place the mouse pointer on the right or left pointing arrow and click as many times as necessary. These train arrows are used only when all currently active train names do not fit on the Train Menu Bar.

Click the mouse pointer on the Machine Train icon for the desired train to display the Machine Train Diagram.

If Machine Trains have not been defined and configured using the Software Configuration Utility, Machine Train Diagrams will not be available.

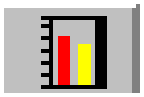


Values on the Machine Train Diagram are updated continuously. Displayed values show configured channels from the 3500 Monitor Racks. These include monitor points, relay points, and Keyphasor points. Values are displayed in different colors depending on their current values according to the following conditions:

< Values printed in green are in the OK range
< Values print in yellow have exceeded their Alert or Alarm1 setpoints
< Values printed in red have exceeded their Danger or Alarm2 setpoints for monitor points or have energized relays for relay points.

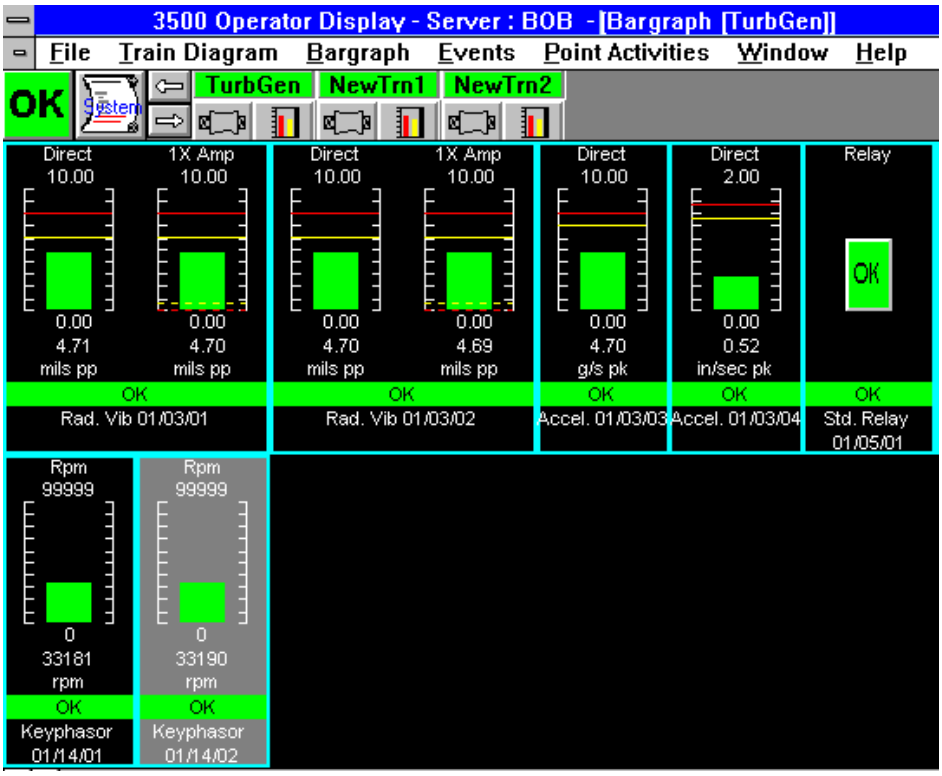
Use standard Windows commands to maximize, minimize, change the size of the display, or move the display. Refer to the Windows manual for more details.

Machine Train Diagram displays are also available by clicking the mouse pointer on the **Train Diagram** selection on the Menu Bar.



Bargraph Displays

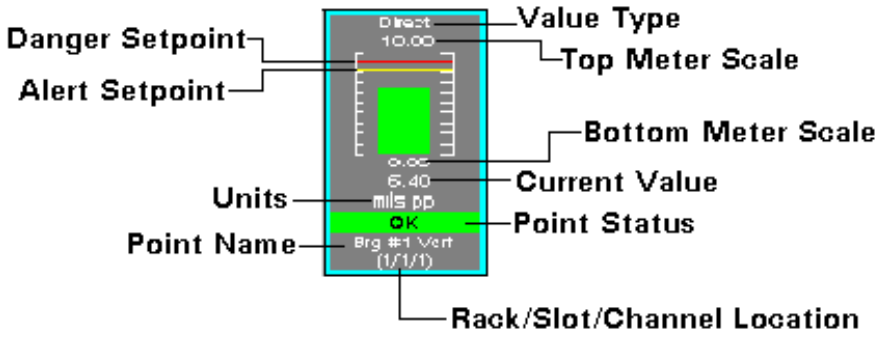
Place the mouse pointer on the Bargraph icon to display current values for ALL of the points assigned to a Machine Train. This includes all points, **even the ones that have not been placed on the Machine Train Diagram.**



Use standard Windows commands to maximize, minimize, change the size of the display, or move the display. Refer to the Windows manual for more details.

Bargraph displays are also available by clicking the mouse pointer on the **Bargraph** selection on the Menu Bar.

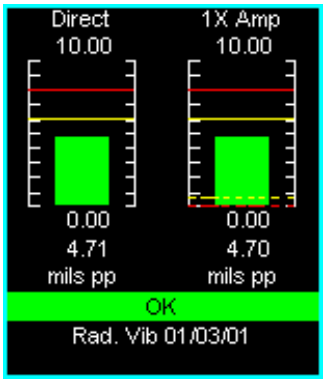
Use the 'scroll bars' located at the bottom and right of the display to move through all of the points on the train.



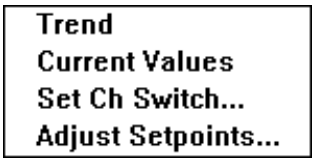
Each bargraph display contains 'cells' for each point and parameter. If a cell is selected, the background will be gray. If it is not selected, the background will be black. The current value is shown both as a decimal number and graphically.

You may request an additional cell of another value for the same point. This will allow you to make comparisons.

For example, you may want to view the direct and 1X amplitude values for the same point.

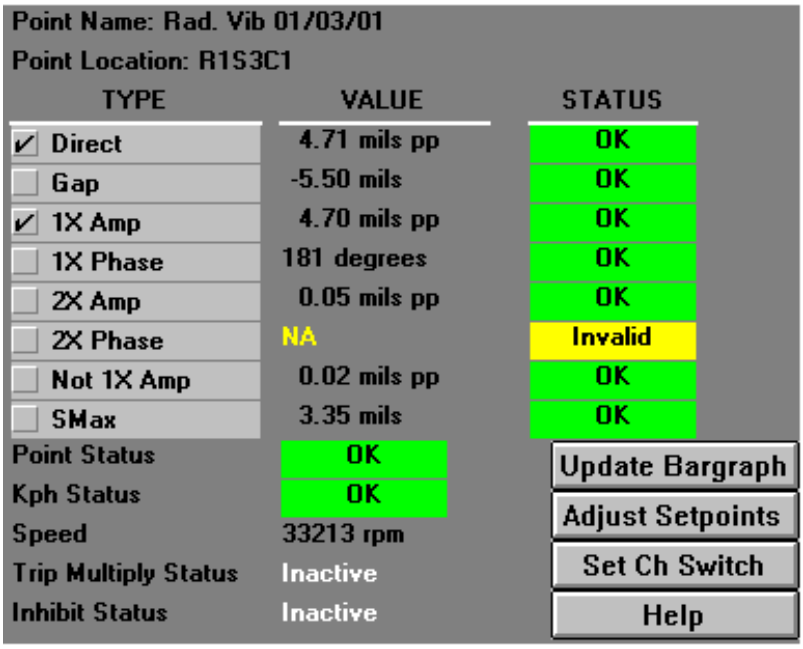


1. Place the mouse pointer on the cell and click the right mouse button one time to display this drop-down menu:

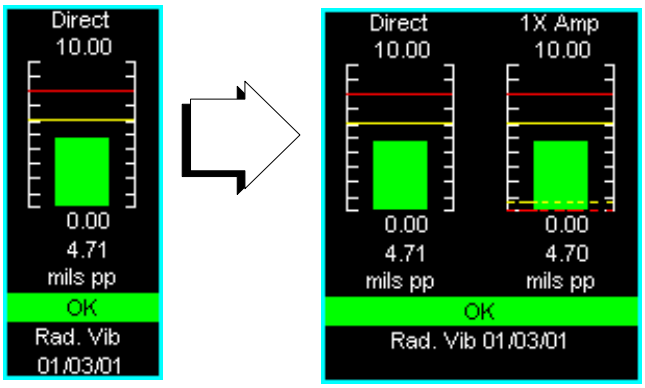


2. Select **Current Values**.

3. On the Current Value screen, select any additional parameters you want to display (for this example - 1X Amplitude).



4. Select **Update Bargraph** to return to the bargraph display.



Before **After**

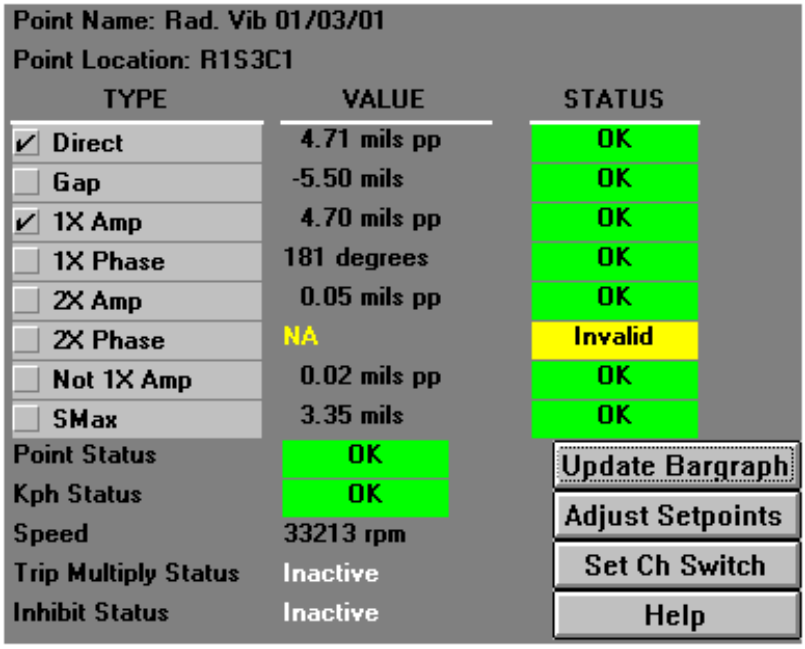
Use this method to display two or more values for the same point. If desired, all parameters for a point may be placed on the bargraph display.

Current Value Displays

The Current Value display shows a complete list of the most recent values of all the **enabled** parameters for a point. You may select the current value display from the bargraph screen or from the **Point Activities...** selection on the Menu Bar.

From the bargraph display, select the point, and click the right mouse button to display the menu below. Select **Current Values**.

The Current Value display updates continuously.



The current value display shows:

- Point Name
- Point Location as R1S3C1 locating Rack 1, Slot 3, and Channel 1
- Enabled proportional values for the point are listed in the TYPE column. A check to the left of the value shows the value is enabled. Values for Direct and 1X Amplitude are enabled in this example.
- Current machinery monitoring values for the points are listed in the VALUE column with the corresponding status in the STATUS column.

- Current Point Status. Valid status indicators include OK, NOT OK, BYPASS, ALERT, DANGER, and INVALID.
- The Keyphasor status and corresponding speed
- Trip Multiply Status and Inhibit Status will show active or inactive depending on the current settings.

The following selections are available from the current values screen:

Display Option	Use this option to...
Update Bargraph	Allow multiple values for a single point to be placed on the bargraph display.
Adjust Setpoints	Change the Alert (Alarm1) and Danger (Alarm2) setpoints for monitors.
Set Ch Switch	Allow channels to be bypassed and alarms to be inhibited.
Help	Access the on-line help screen for more information concerning this display or any of the parameters shown.

Note: Adjusting Setpoints / Setting Channel Switches

Changes made to Setpoints and Channel Switches are sent directly to the 3500 Monitor Racks. These changes become permanent and all computers accessing the same racks will see these changes made.

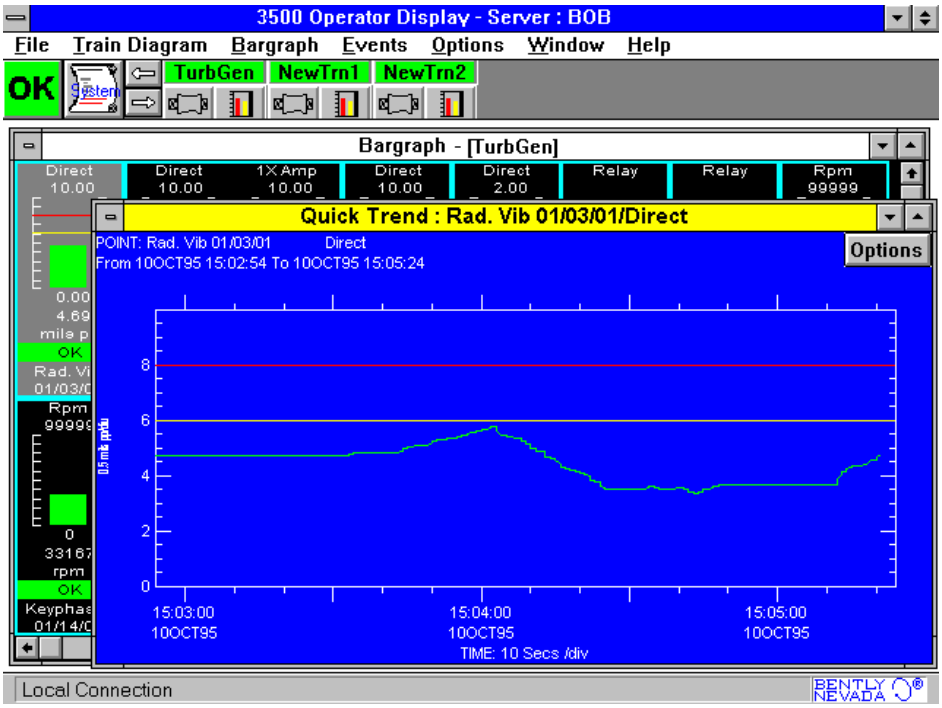
If two users are using the Operator Display Software on different computers, the second computer will be 'locked out' until the first computer has completed changes to Setpoints or Channel Switches. Complete access will resume to both computers once the changes have been sent to the 3500 Monitor Rack(s).

Trend Displays
Both real-time and historical trends are shown using the trend display.

There are four ways to display trends:

- Select **Options...** from the Operator Display Menu Bar.
- Select a Bargraph cell and double-click the right mouse button.
- Select a point on the Machine Train Diagram and double click the left mouse button.
- Select **File Name** from the Menu Bar and **Historical Trend** from the drop-down menu.

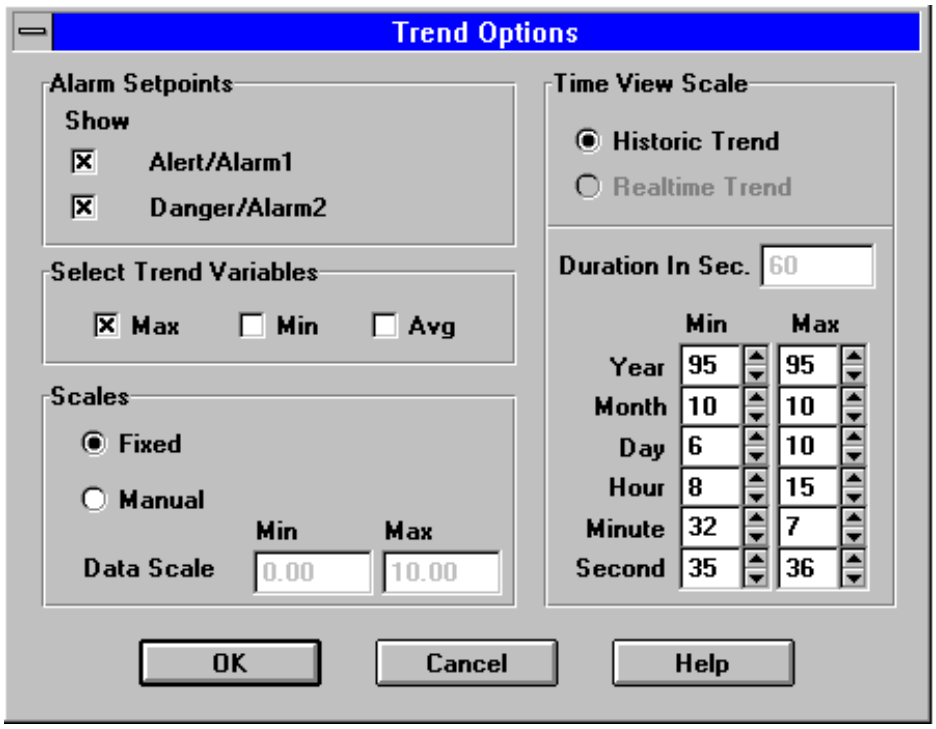
In the following example, the second method is used. Place the mouse pointer on the desired bargraph cell and click the right mouse button. Select **Trend** from the drop-down menu. The current real-time trend display is shown:



The horizontal scale represents increasing time from left to right. The vertical scale shows increasing amplitude from bottom to top.

Both real-time and historical trends may be displayed. Click the **Options** button on the trend display to select a time span for displayed data.

Place the mouse pointer on the **Options** button and click once. The Trend Options display is shown.



Display Option	Use this option to...
Alarm Setpoints	Add or remove the Alert/Alarm1 and-or the Danger/Alarm2 setpoints from the trend display. An 'x' in the **show** box will place these values on the trend display.
Select Trend Variables	Add or remove the maximum, minimum, and-or average trend values from the historical trend display. An 'x' in any or all of these boxes will place the selected value on the historical trend display.

Display Option	Use this option to...
Scales	
Fixed	Set the trend display vertical scale (amplitude axis) to the minimum and maximum scale values configured for the displayed point.
Manual	Set the trend display vertical scale (amplitude axis) to the new values specified in the **Min** and **Max** boxes shown beside **Data Scales**.
Time View Scale	Select **Historical** or **Real-time** trend depending on which type of plot you want to display. Historical trend displays will select stored data from the hard disk. Real-time trend data will select the most current data available and will update continuously.
Duration in Sec.	If real-time trend is selected, this will be the length of time, in seconds, to display trend data. This value is used to set the starting and ending points on the time scale (horizontal axis) of the trend display. Actual data displayed will be a portion of the current trend allowing newer trend values to be displayed as they are collected.
Min, Max	If historical trend is selected, these values determine the starting and ending date and time to be displayed on the time scale (horizontal axis) of the trend display. All historical trend values collected during the specified time period will be displayed. Notice the year is represented by the last two digits of the year and the hour is specified from 0 to 24.
Help	Access the on-line help screen for more information concerning this display or any of the parameters shown.

Alarms
This icon indicates the condition of the highest Alarm status for all points for all trains. There are two types of Alarm lists available:

< Alarm Event Lists
  - List of the last 1000 Alarm events for the 3500 Monitor Rack. This list includes all alarms whether they are currently active or not.
< Active Alarm List
  - All currently **active** alarms listed by rack or by train. This list includes only those points whose state remains in an Alarm condition.

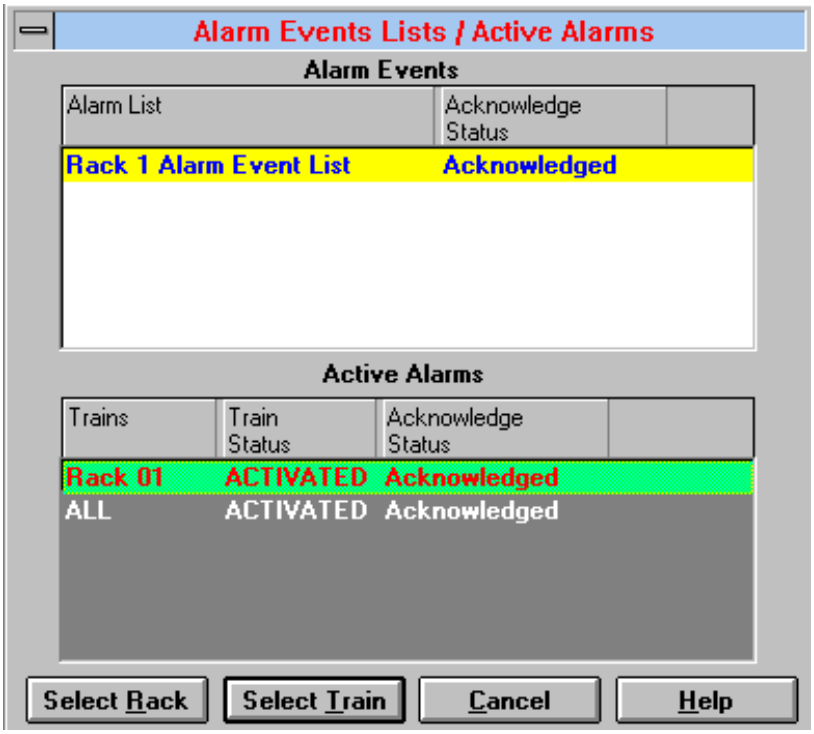
Alarm events are stored in the RIM of each 3500 Monitor Rack and they include:

< Entered of left Alert or Alarm1
< Entered or left Danger or Alarm2
< Entered or left OK or NOT OK
< Entered or left Relay Activated

Colors are used to note the type of alarm event:

< A green background indicates there are no currently active alarms.
< An active Alert/ Alarm1 is displayed with a yellow background.
< An active Danger/Alarm2 is displayed with a red background.

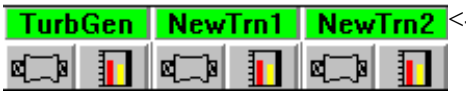
View Alarm events by placing your mouse pointer on the alarm icon and clicking one time.



Use the top half of the display to select an Alarm Event List. These lists are rack-based, showing all of the Alarm conditions occurring for modules in a single rack. Select the rack to view by placing the mouse pointer on the rack number and clicking once. Then click the mouse pointer on **Select Rack**.

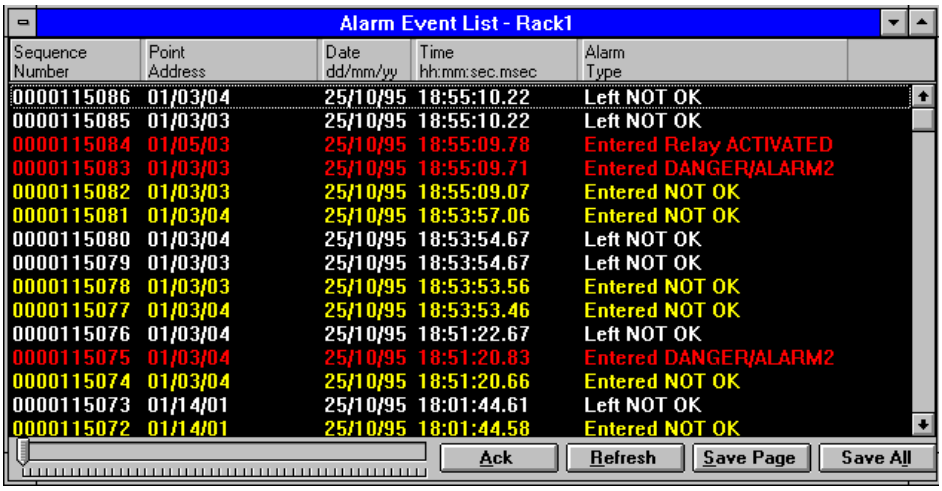
Use the bottom half of the display to select a train based Active Alarm List. Select the train list to view by placing the mouse pointer on the train name and clicking once. Then click the mouse pointer on **Select Train**.

The active alarms for a train may also be viewed by clicking the mouse pointer on the train name above the train/bargraph icons on the main display.



<----- Train Names

The Alarm Event List is shown here:



This chronological list shows the newest alarm events at the top of the list and the oldest alarm events at the bottom of the list.

Use the slider to move through the list by placing the mouse pointer on the slider and dragging it to the left or right to display newer or older events.

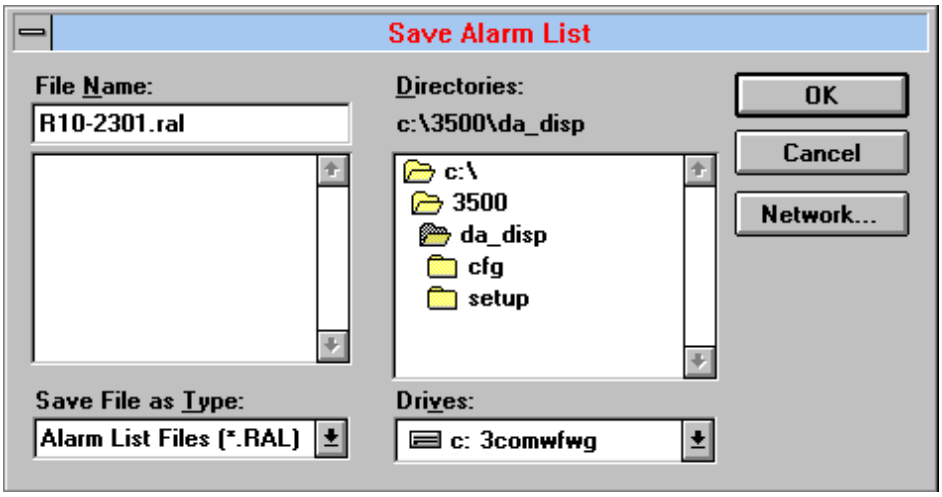
Use the vertical scroll bar to move up and down on this page.

Place your mouse pointer on the **Ack** to acknowledge the alarm events for the rack. By acknowledging these events, you stop the System Alarm indicator icon from flashing.

An Alarm Event List will contain a maximum of 1000 alarm events. These events will be overwritten as new events are added to the list. If you want to keep a permanent copy of events, use the **Save Page**, or **Save All** buttons.

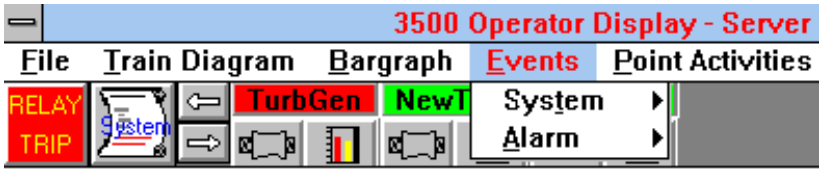
Selecting **Save All**, requests a file name to save the information to. Use a file naming standard easily recognizable to you or other operators in your plant.

Example: R10-2301.ral would mean Rack 10, recorder date ending the 23rd day of January. The file extension (characters following the period - ral) are added to the file name for you to show that this is an alarm event list file.



You may store this file on any available drive in your system, including floppy diskettes.

Alarm Event Lists may also be accessed from the main menu by clicking the mouse pointer on **Events** on the Menu Bar.



To view stored System Events data at a later time, place the mouse pointer on the **Events** selection and click once. Select **Alarm** and use the mouse pointer to select the .RAL file you want to view. Remember that you must have previously stored the file to be able to view it.

Use the **Refresh** button to view the most current information on the screen. Use this button if other alarm events have occurred since the display was requested.

Remove the Alarm Event List from the screen by placing the mouse pointer on the '-' in the upper left corner of the screen and clicking twice.

Acknowledge Status shows whether an alarm has been viewed by an operator. If an alarm occurs, the system alarm indicator will flash.

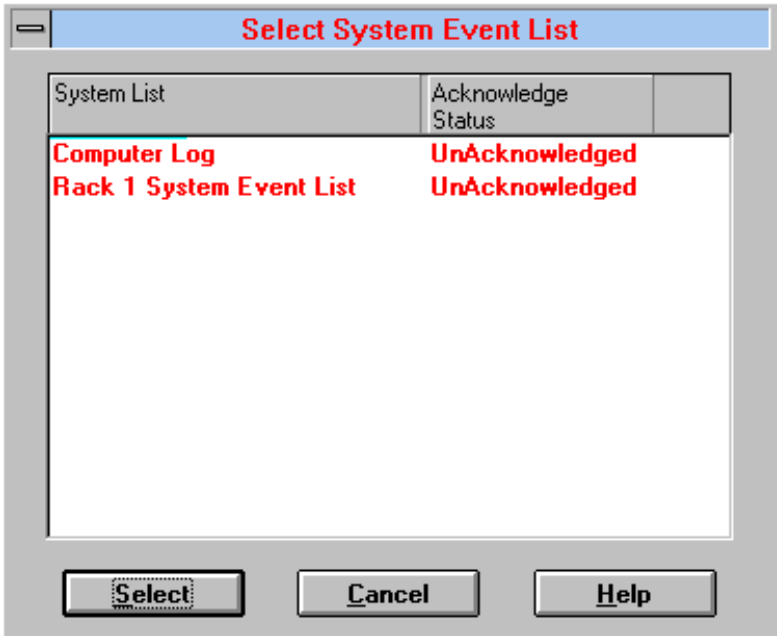
Flashing will continue until an operator acknowledges the alarm by locating it in the active or alarm event list, selecting it, and placing the mouse pointer on the acknowledge button and clicking once. If the alarm is still active, it will no longer cause the system alarm indicator to flash.

Note: Acknowledging Alarms

Do not acknowledge alarms without determining the cause for the alarm. It is important to maintain a clean installation where setpoints are accurate and alarms occur only when something is out of the ordinary.

System Event List
The system list describes events occurring in the 3500 Monitor Rack that are NOT alarms. Each 3500 Monitor Rack contains a System Event List located in the Rack Interface Module (RIM). Each list can store the last 500 rack events. The System Event List records all accesses, self-tests, configuration changes, and other operator initiated actions within the rack.

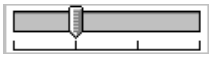
When the System List icon is flashing, a new event has been added to the list. Place the mouse pointer on the icon and click once. The resulting display shows the acknowledge status of the System Event List for each 3500 Monitor Rack.



This list shows the current status (Acknowledged or Unacknowledged) of the System Event List in each 3500 Monitor Rack. Place the mouse pointer on one of the selections in the list and click once. A complete listing for that rack will be displayed.

This chronological list of rack events shows the newest event at the top of the list, and the oldest at the bottom.

Use the slider to move through the list by placing the mouse pointer on the slider and dragging it to the left or right to display newer or older events.



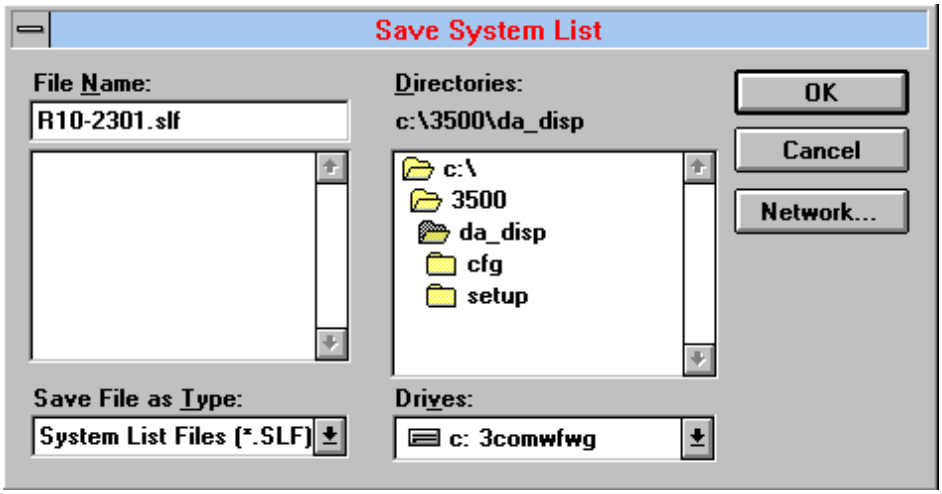
Use the vertical scroll bar to move up and down on this page.

Place your mouse pointer on **Ack** to acknowledge the events for the rack. By acknowledging these events, you stop the System List icon from flashing.

A RIM System Event List will contain a maximum of 500 events. These events will be overwritten as new events are added to the list. If you want to keep a permanent copy of system events, use the **Save Page**, or **Save All** buttons.

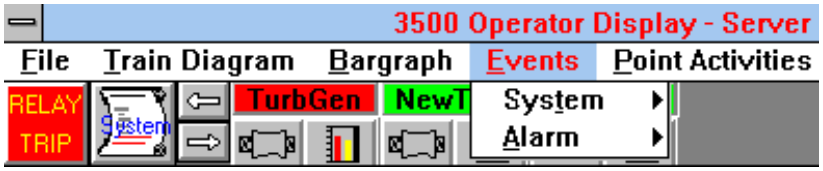
Selecting **Save All**, requests a file name to save the information to. Use a file naming standard easily recognizable to you or other operators in your plant.

Example:
R10-2301.slf would mean Rack 10, recorder date ending the 23rd day of January. The file extension (characters following the decimal point - slf) are added to the file name for you to show that this is a system list file.



You may store this file on any available drive in your system, including floppy diskettes.

System Event List may also be accessed from the main menu by clicking the mouse pointer on **Events** on the Menu Bar.



To view stored System Events data at a later time, place the mouse pointer on the System selection and click once. Select **System**, and use the mouse pointer to select the .SLF file you want to view. Remember that you must have stored the file previously to view it.

Use the **Refresh** button to view the most current information on the screen. Use this button if other system events have occurred since the display was requested.

Remove the System Event List from the screen by placing the mouse pointer on the '-' in the upper left corner of the screen and clicking twice.

Note: Always check the System Event List for EACH rack when you start the Operator Display Software, or if you suspect you are having problems. It describes whether or not you are connected to and communicating with all of your 3500 Monitor Racks.

Computer Logs

Each computer has a Computer Log. This list contains information concerning events affecting the computer including:

- Connections to the computer by remote or network
- Connections to Data Acquisition/DDE Servers
- Initiation and termination of Data Acquisition
- Changes to passwords
- Any errors detected by the system

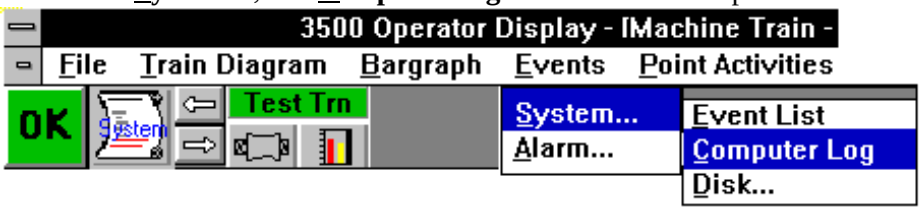
Each computer log will contain the last 2000 entries before it starts to overwrite the earliest entries. When viewing the computer log, you will view the log of the computer you are operating from OR the Data Acquisition/DDE Server

computer you are CONNECTED to.

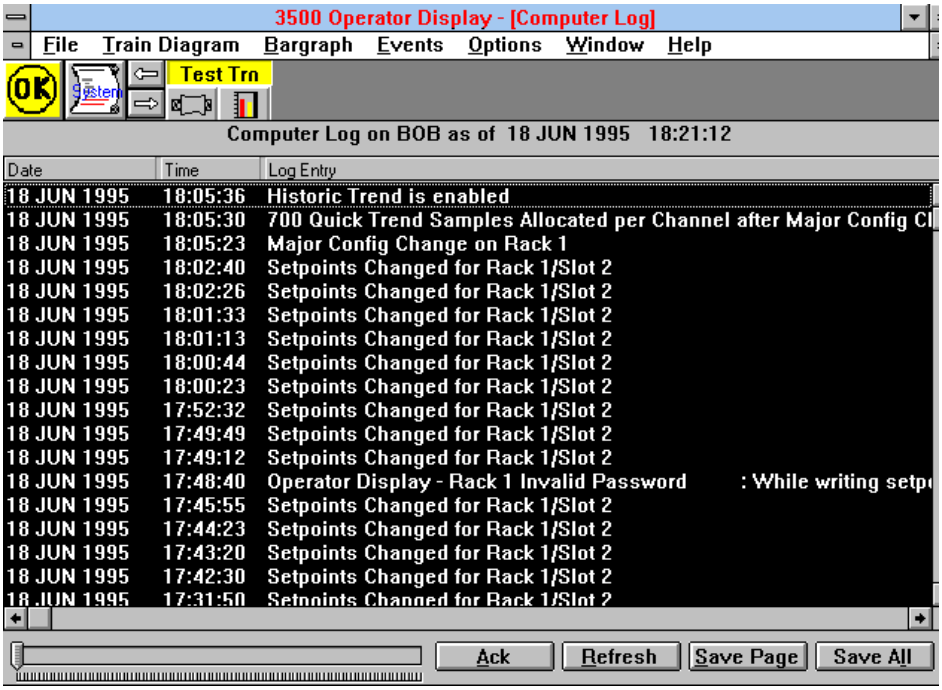
To access the Computer Log:

1. Select **Events** from the Menu Bar.

2. Select **System...** , and **Computer Log** from the second drop down menu.



A sample computer log will look like the display below:



Each entry in the log has a date and time stamp. The title of the list identifies the Data Acquisition computer that contains the list (in this case BOB). Notice some of the entries in the log to get an idea of the types of messages.

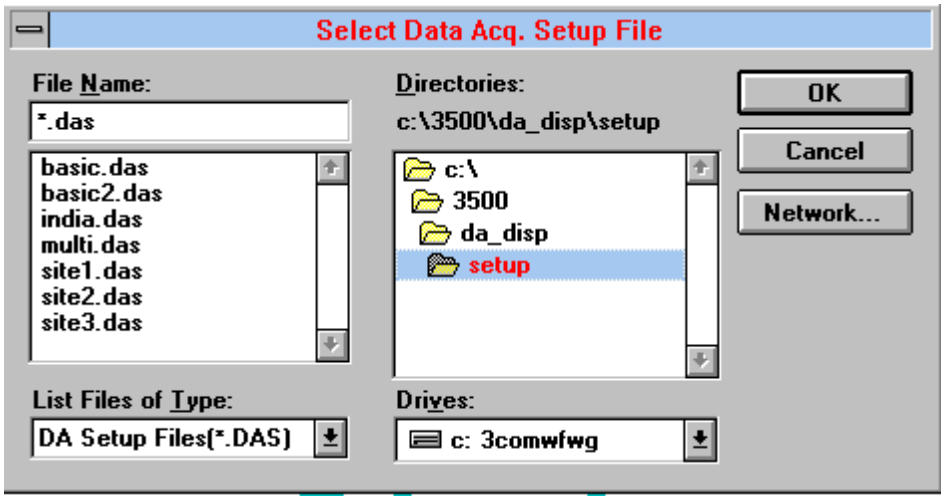
Initiating and Terminating Data Acquisition

The Operator Display Software allows you to start and stop data collection at the Data Acquisition Computer. This process is called initiating (start) and terminating (stop). It is important to note that we are not closing or starting the Data Acquisition Software, only the data collection process it performs. The Data Acquisition Software continues as an active application on the Data Acquisition Computer.

Initiating requests the Data Acquisition Software to begin collecting data from the 3500 Monitor Racks.

To initiate data collection from the Operator Display Software:

1. Select **File...**, and **Initiate Data Acq...** The following screen is displayed:



2. Select the **setup** subdirectory and the .DAS file that represents the connection parameters for the 3500 Monitor Racks connected to the Data Acquisition Computer. See page ? for instructions on creating .das files.

Note: You must be 'connected' to the Data Acquisition Computer before initiating or terminating data acquisition.

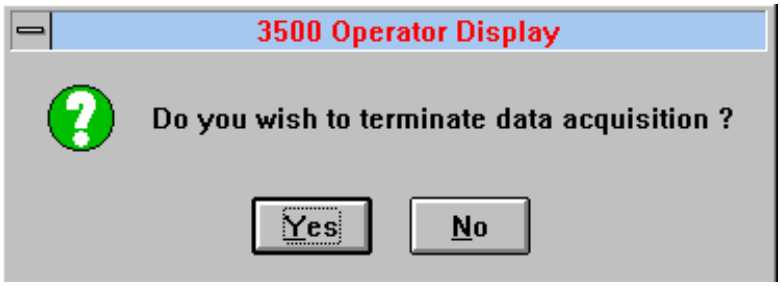
3. Observe the status messages as the connection is made. If the connection is

successful, the appropriate trains for the connected racks should be displayed on the main Operator Display screen.

Terminating causes the Data Acquisition Software to stop collecting data from the 3500 Monitor Racks.

To terminate data collection from the Operator Display Software:

1. Select **File...**, and **Terminate Data Acq...**. The following screen is displayed:



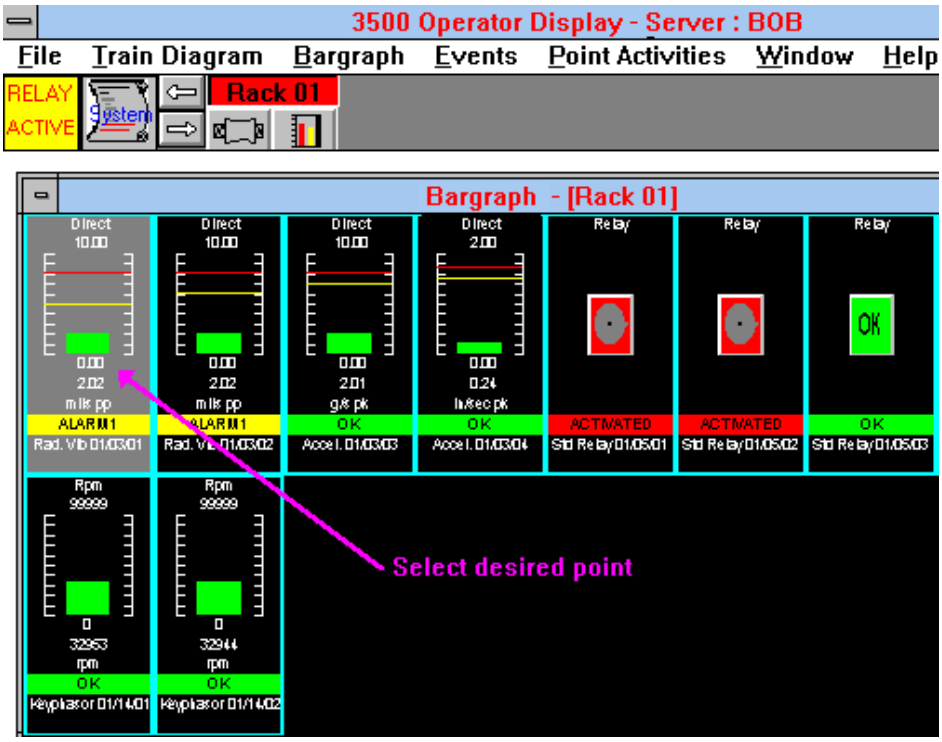
2. If you have entered a password, you will be asked to input it to terminate data acquisition. Observe the status messages as the data collection process is terminated.

Setting Channel Switches

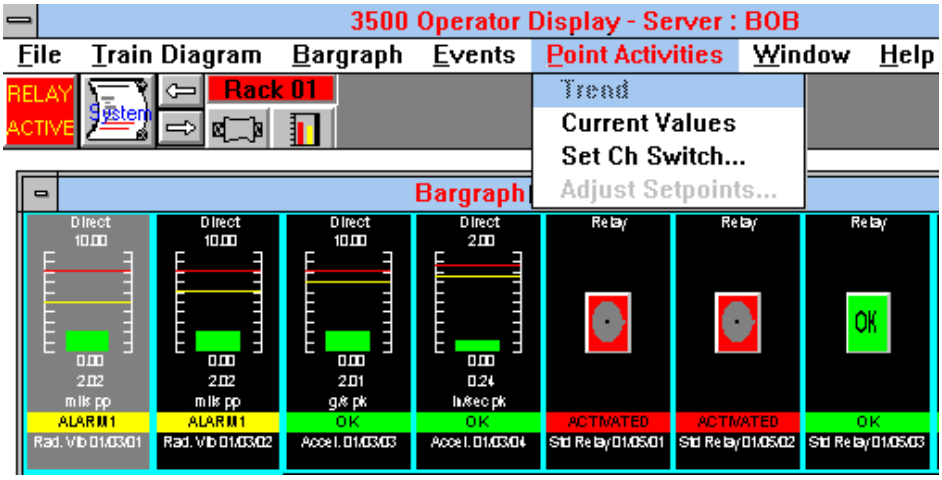
Each 3500 Monitor Channel has software switches which lets you bypass Alert and Danger alarms, the entire channel, or specific alarms. The function of all software switches is described in detail in the component and maintenance manuals included with your 3500 Monitor Rack.

To set or reset a software switch:

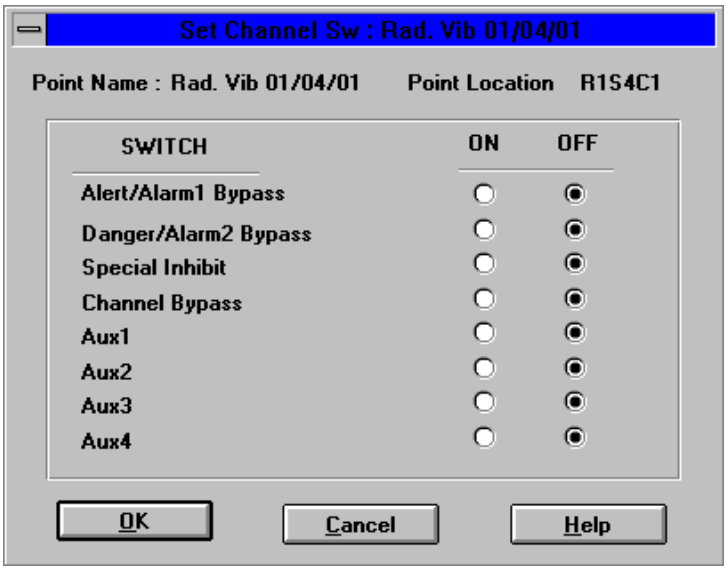
1. Select the point (channel) which contains the switch to be set by displaying the bargraph for the train containing the desired point. Click the mouse pointer on the desired bargraph cell.



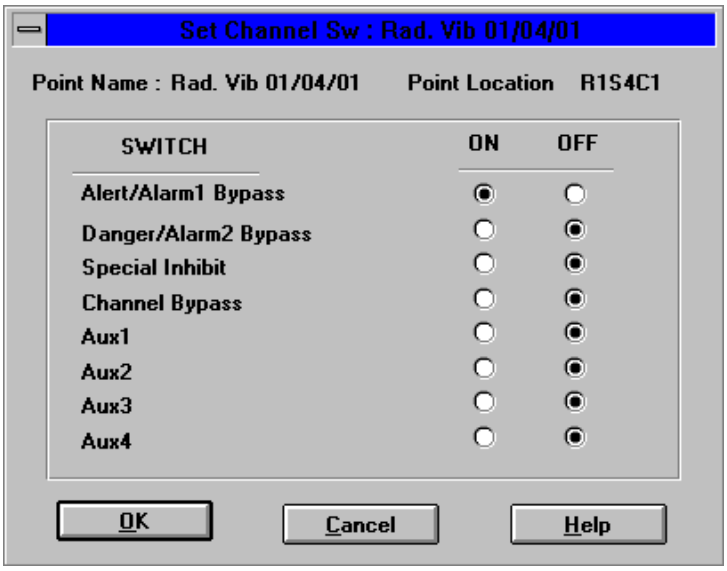
2. Select **Point Activities**, and **Set Ch Switch**.



3. Select the desired software switch by clicking on the circular button next to the switch.



4. Transfer the new switch setting to the 3500 Monitor Rack by selecting the **Send** button.

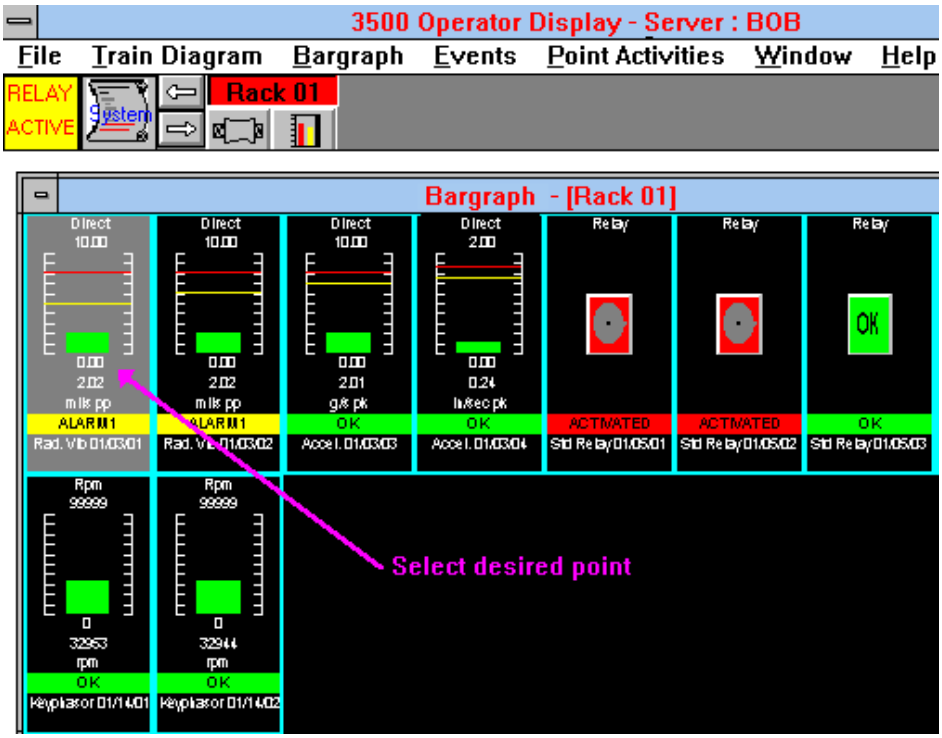


Adjusting Setpoints

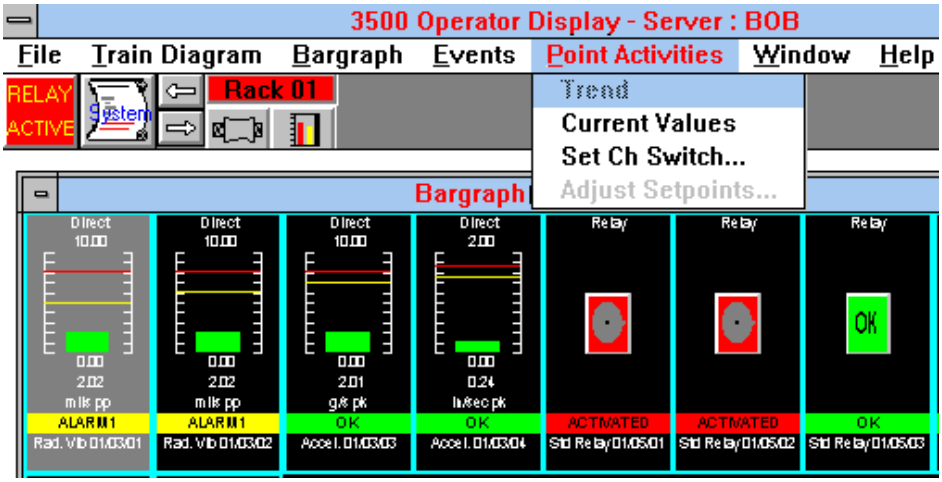
All Alert and Danger setpoints for a monitor channel may be adjusted from the Operator Display Software. For a description of these alarm setpoints, refer to the maintenance manual for the appropriate monitor.

To adjust monitor setpoints:

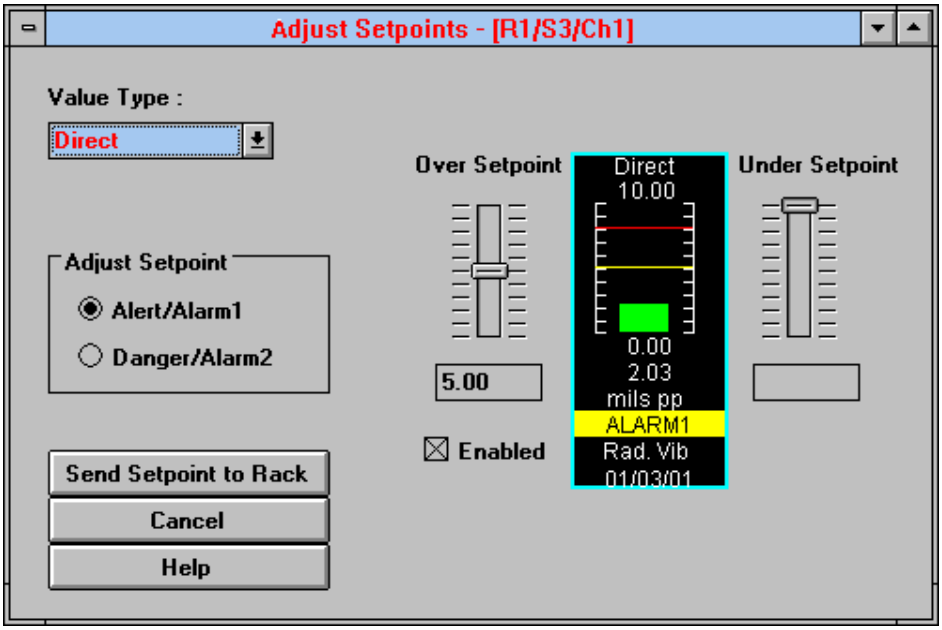
1. Select the point containing the setpoint to be adjusted by displaying the bargraph for the train containing the desired point and clicking the mouse pointer on the bargraph cell.



2. Select **Point Activities**, and **Adjust Setpoints**.



3. Select the desired value type and alarm type (Alert or Danger).



4. Enter the new setpoint value by typing the setpoint level or by moving the setpoint slide, holding the mouse button down as you drag the slider.

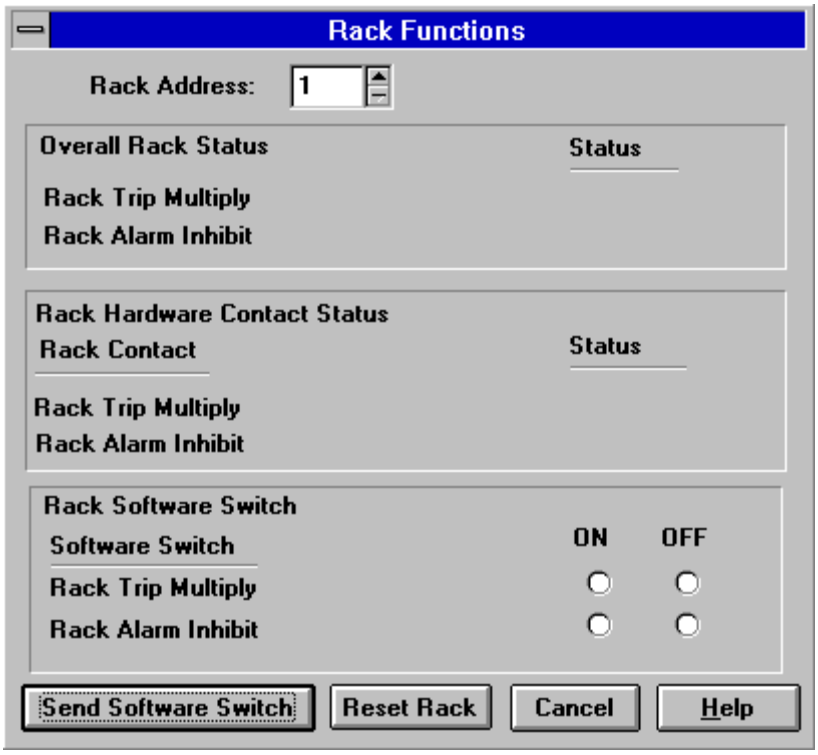
5. Send the changed setpoints to the 3500 Monitor Rack by selecting the **Send Setpoint to Rack** button.

Other Features - Rack Functions

Use the Rack Functions display to view or change the software switch settings of a 3500 Monitor Rack. These settings are different from the monitor switch settings.

To view or change 3500 Monitor Rack Switch Settings:

1. Select **File**, and **Rack Functions...**



You will be asked to enter the connect password to change software switch settings.

Software Switch settings for the 3500 Monitor Rack may be viewed or changed from this display. These switch settings apply to the entire 3500 Monitor Rack.

Rack Trip Multiply allows the input of an integer number that will be used to increase the setpoint values for all channels on the rack. A multiplier of two for the Alert setpoints causes all alert setpoints to be doubled while the trip multiply switch is enabled . This feature is useful when you have a startup or overspeed so that all of your monitor points don't continuously alarm.

Rack Inhibit allows you to override all alarms on the rack. With this feature enabled, all alarm conditions are ignored for all channels on the rack.

After changes have been made, transfer the new settings to the 3500 Monitor Rack by selecting the **Send Software Switch** button**.**

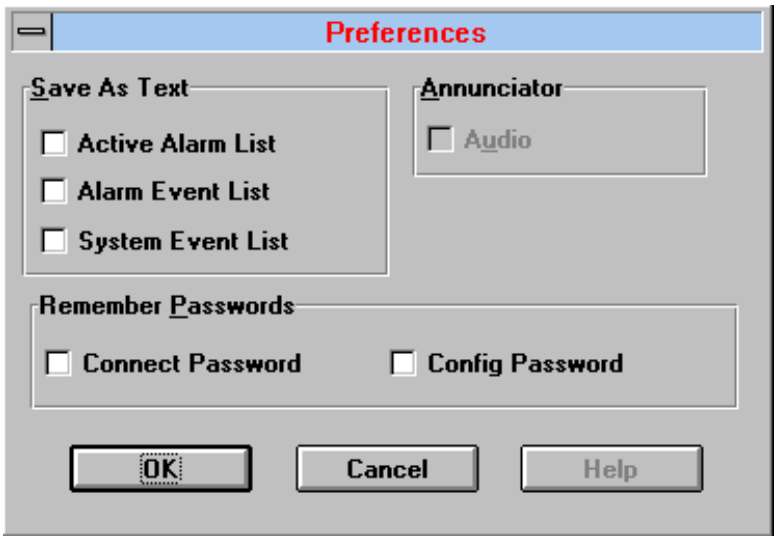
Selecting the **Rack Reset** button will clear all latched alarms and timed OK channel defeats.

Make sure to set the correct **Rack Address** when viewing or changing rack functions.

Other Features - Preferences

To set Preferences for the Operator Display Software:

1. Select **File**, and **Preferences...**



Display Option	Use this option to...
Annunciator	Select audible alarms. Place a check in the **Audio** box to hear a "BEEP" each time a new alarm or system event is detected. This beep is in addition to the flashing icons located at the top of the Operator Display screen.
Save as Text	Select an alternative file format for the **Active Alarm List, Alarm Event List, and System Event List**. This option is valuable if you want to import event lists into other applications.
Remember Passwords	Instruct the Operator Display Software to automatically store and recall the 3500 Rack **Connect** and Rack **Configuration passwords**.

Other Features - Windows Operation

Features available within the Windows software environment are accessible within the Operator Display Software. These include:

< Maximizing and minimizing screen displays (windows)

< Multiple window displays on the same screen using 'tile' or 'cascade' presentations.

- Use of horizontal and vertical scroll bars to move through screen displays.
- Use of 'drop down' menu selections or icons to operate the software.
- Multi-tasking.

Refer to the Windows Manual for information about these and other Windows features.

3500 Software Utilities

3500 Software Utilities let you customize the 3500 Operator Display Software for your particular installation. This section explains how to use the utilities and includes the following:

< Description of the Utilities
< File Types
< 3500 Software Configuration Utility
  - Rack Configurations (.RAK)
  - Creating Machine Trains
  - Grouping Channels in Machine Trains (Mapping)
  - Building Machine Train Diagrams
  - Setting up Historical Trends
< 3500 Edit Component Utility
  - Creating Custom Train Components

Description of the Utilities

Two utilities are provided with the Operator Display and the Data Acquisition/DDE Server Software packages:

Icon	Use this utility to...
	Define Machine Trains and group (MAP) configured points to Machine Trains. This utility is also used to build Machine Train Diagrams and define historical trend parameters.
	Create or edit Machine Train components.

If you run Operator Display and Data Acquisition/DDE Server Software without using these utilities, all configured points will be accessed by rack address number, with each rack considered to be a single Machine Train (rack

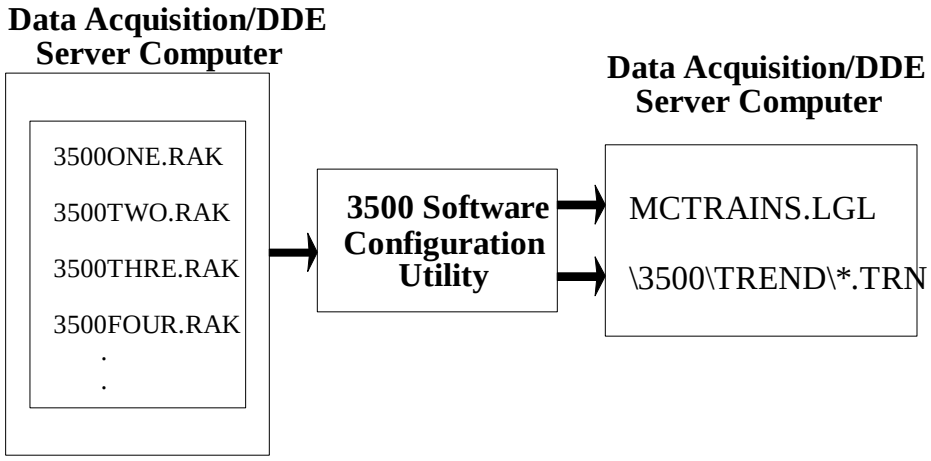
based trains). You can display current values, trends and bargraphs, but you will not be able to view Machine Train Diagrams or collect historical trend information.

It is recommended you use these two utility programs to group your machinery monitoring points and build Machine Trains and Machine Train Diagrams that represent your installation and operations.

3500 Software Configuration Utility

The Software Configuration Utility uses information about the channels in 3500 Monitor Racks that is contained in rack configuration files. These files have the file extension .RAK and are created when you use the 3500 Rack Configuration Software. These files must exist in a directory (typically \3500\TRAINS\PRIMCFG) on the hard drive of the Data Acquisition/DDE Server computer before you can run the Software Configuration Utility.

When you use the utility to group (map) points to Machine Trains or to define historical trends, the utility uses information from the rack configuration files to create new files that contain information about trains and historical trends. The following graphic shows how this process works.



The *.LGL files contain information about Machine Trains and the *.TRN files contain information and data values for creating historical trends. The *.TRN

files are always stored in the \3500\TREND directory. Since the Data Acquisition/DDE Server uses these files to communicate with the 3500 Monitor Racks, all of the *.RAK, *.LGL, and *.TRN files are stored on the Data Acquisition computer and not on the Operator Display computer.

Creating Machine Trains

After the 3500 Monitor Racks have been configured and these configurations downloaded to the racks, it is time to define the Machine Trains for the 3500 Monitoring System. By defining Machine Trains, you will be combining your machinery monitoring points into specific groups that represent complete or partial machinery units within your plant.

Each configured monitor, Keyphasor, and relay point in the 3500 Monitor Racks may be assigned to a single Machine Train. "Mapping" is the term used to assign configured channels to Machine Trains, and the Software Configuration Utility is where the mapping is done.

To create a Machine Train:

1. Establish a connection with a Data Acquisition/DDE Server computer that has valid rack configuration files (.RAK).

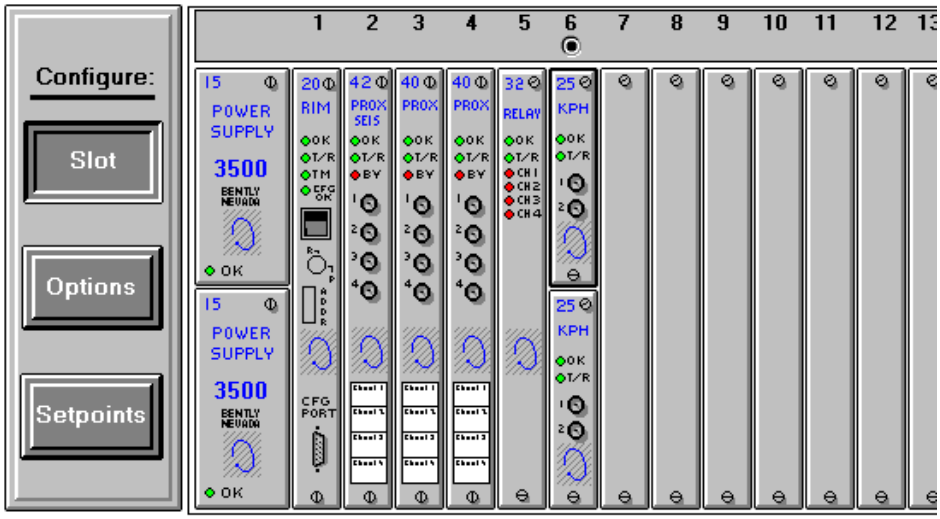
2. Use the Software Configuration Utility to define a Machine Train Name and description.

3. Use the Software Configuration Utility to assign selected configured points to a Machine Train (mapping).

Note: The Data Acquisition/DDE Server computer is the location for all files describing a 3500 installation. This is the computer that will be communicating directly with the 3500 Monitor Racks so it must contain the information pertaining to those racks. The Operator Display computer accesses the information which is collected and stored on the Data Acquisition/DDE Server computer. Data files are not stored on Operator Display computer or by the Operator Display Software.

Rack Configurations (.RAK)

A rack configuration file is created when you build and **Save** or **Save As...**, a file using the Rack Configuration Software. You assign a name to a rack configuration and the extension .RAK is added when you save it. This file (called NEWRACK.RAK in this example) contains information on all of the configured monitor, relay, and Keyphasor channels in a single 3500 Monitor Rack.



This sample rack - NEWRACK.RAK - has monitor modules in slots 2,3, and 4, a 4 channel relay in slot 5, and two Keyphasor modules in slot 6. Our sample Machine Train (NEWTRAIN) will be built containing configured points from this rack.

Machine Trains may contain points from more than one 3500 Monitor Rack. A single Machine Train may have a maximum of one hundred (100) points.

Grouping Channels in Machine Trains - Mapping

Note: Machine Trains and Machine Train Diagrams

A Machine Train Diagram is a graphical representation of a Machinery Train. Points are MAPPED to Machine Trains. Some or all of these points may then be selected to be displayed on the Machine Train Diagrams.

All points selected for a Machine Train may be viewed on a bargraph, trend, or current value display. Only the points placed on a Machine Train Diagram may be viewed on the diagram.

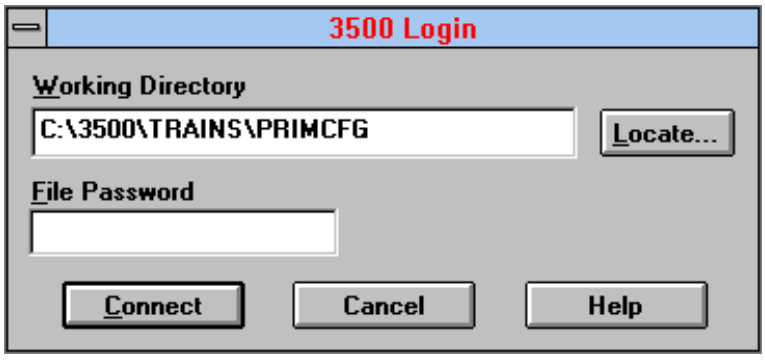
To map points to machine trains:

1. Select the Software Configuration icon from the 3500 Software Group on the Program Manager screen. Double-click on the icon.

2. Connect to a Data Acquisition/DDE Server computer by selecting **File**, **Connect**,

   OR

   by placing the mouse pointer on the connect icon and clicking once.



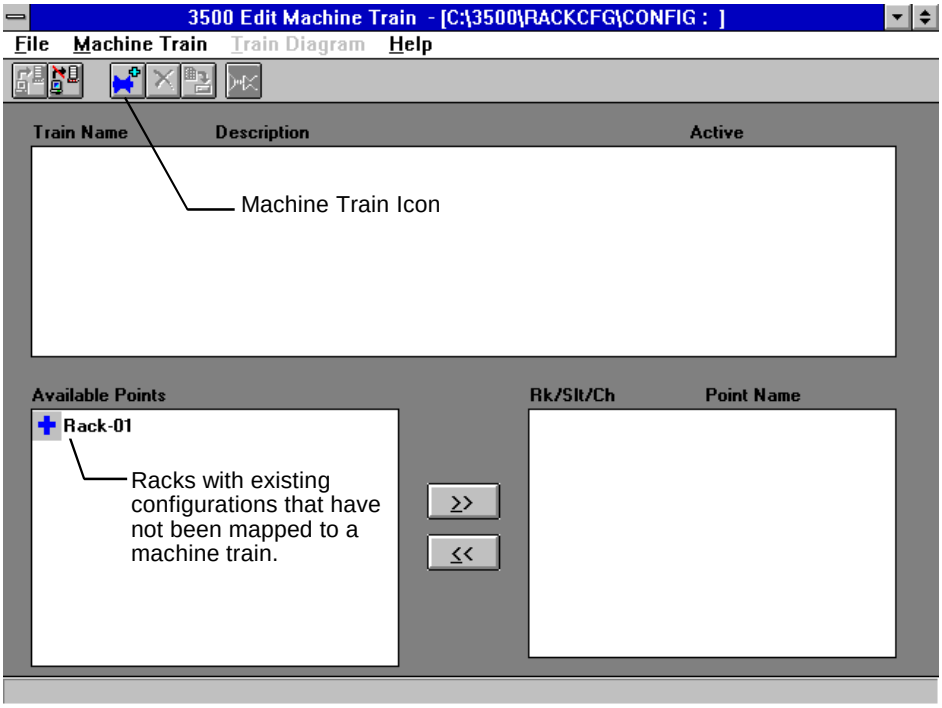
3. Select the **Working Directory** on the Data Acquisition/DDE Server computer. Use the **Locate** button to list available directories.

4. Enter the password (connect password) for the working directory on the

Data Acquisition/DDE Server computer. This is the directory where the NEWRACK.RAK file is stored.

5. Complete the connection by selecting the **Connect** button and clicking once. If a Machine Train file does not exist, the following message will appear:

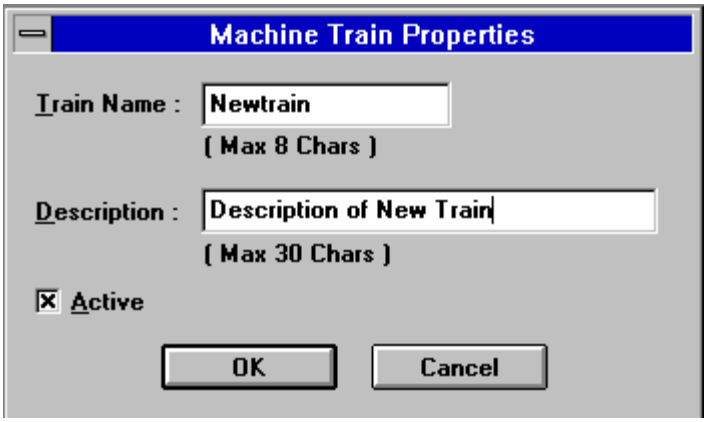
6. Create a new Machine Train file by selecting **Yes.** The following screen will appear:



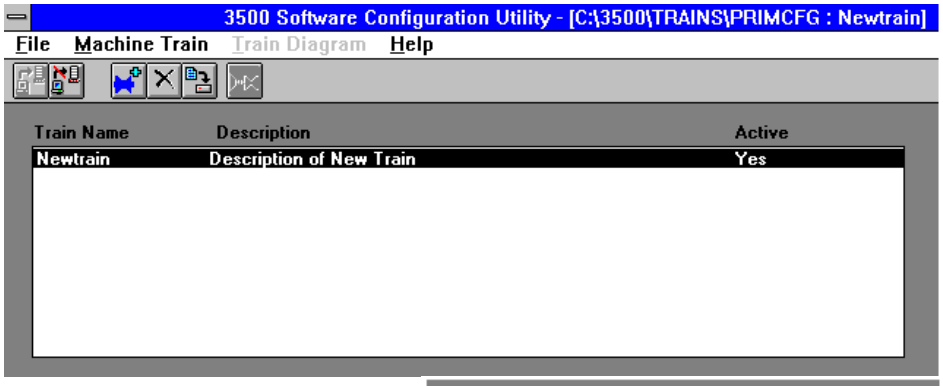
7. To add a new Machine Train, select **Machine Train, Add..,** OR place the mouse pointer on the Machine Train icon and click once.

8. Type in a name and a description for the train you want to add. This example uses the name NEWTRAIN.

   Use the **Active** check box to make the train operational.

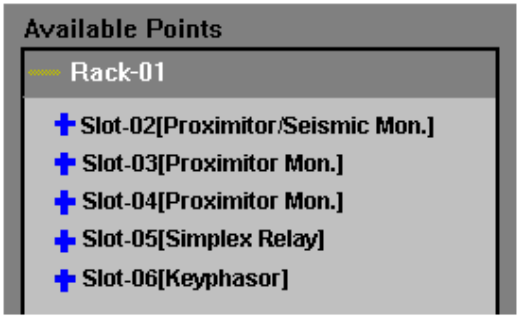


9. Select **OK.** The new train name and description will be added to the 3500 Machine Train Screen.



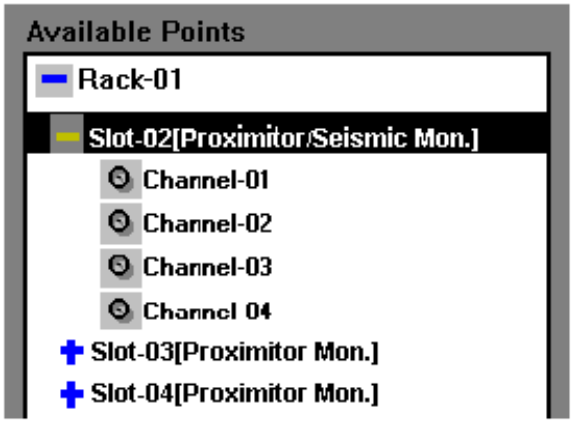
10. Notice all available racks with 'unmapped' points are displayed in the lower right of the same display:

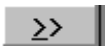
    Display the available channels for a slot by double clicking on the '+' to the left of the slot name.



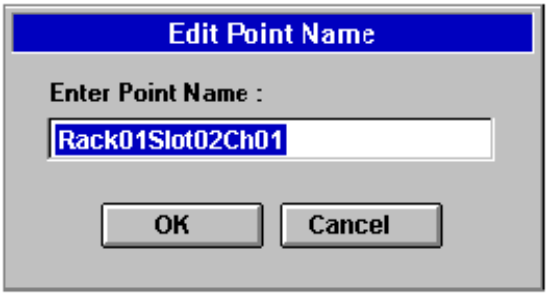
11. Available channels for the slot are displayed by double clicking on the '+' to the left of the Slot name.

    To remove the channel identifications, double click on the '-'.

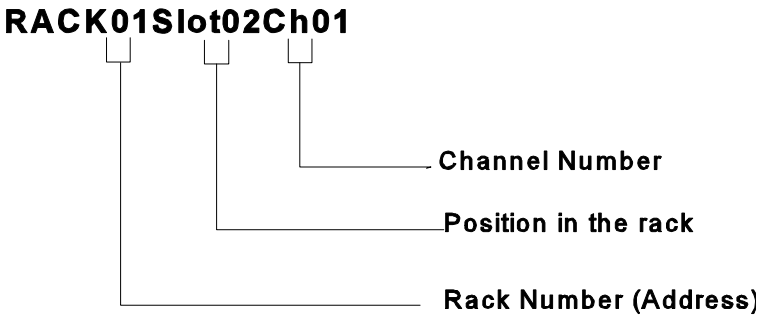




12. Add a channel to the selected train by highlighting the channel number and then clicking the '>>' button. The following dialog will appear:



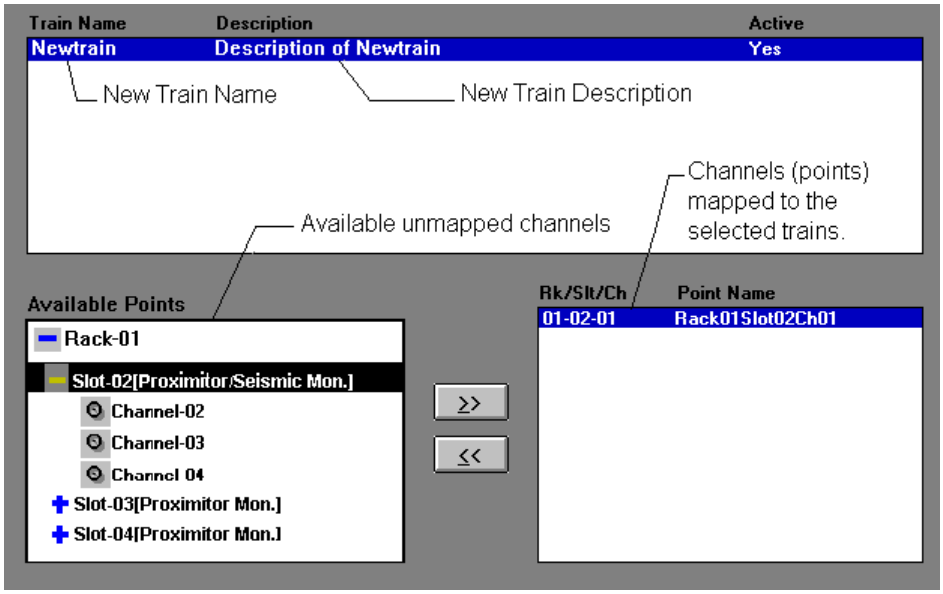
The point name is displayed in the Edit Point Name dialog using the following code:



Add the channel to the train by doing one of the following:

- Click **OK**.
- Type a new point name into the **Enter Point Name** field and click **OK**.

The point name will be added to the Point Name box and the channel identification will be removed from the Available Points box.



13. Repeat steps 11 and 12 until all channels for the train have been selected and placed in the Point Name box.

    Each point (channel) is now 'mapped' to the Machine Train called NEWTRAIN. They become a permanent part of NEWTRAIN until they are removed, assigned to another train, or reconfigured.

14. Save the newly created train by selecting **File**, **Save**. This train information is saved in the MCTRAINS.LGL file in the selected working directory on the Data Acquisition/DDE Server computer.

Building Machine Train Diagrams

A Machine Train Diagram is a graphical representation of your machinery. It may represent a full train or a portion of a train.

All points mapped to a Machine Train are displayed when a Bargraph is requested using the Operator Display Software. Of these points, only those placed on the Machine Train Diagram are shown when the diagram is selected.

Note: Selecting Points to Display on Machine Trains

It is recommended that you select only the most important channels to be displayed on your Machine Train Diagram. If a Machine Train Diagram contains all of the points selected for the train, the display becomes cluttered and difficult to read.

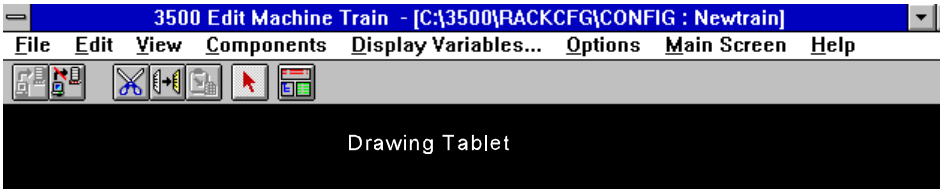
Build a Machine Train Diagram by selecting graphical components and mapped points and placing them on your diagram to create a representation of your machine.

To build a Machine Train Diagram:

1. Select **Train Diagram**,

   OR

   place the mouse pointer on the Train Diagram icon and click once. Your display will resemble the following.

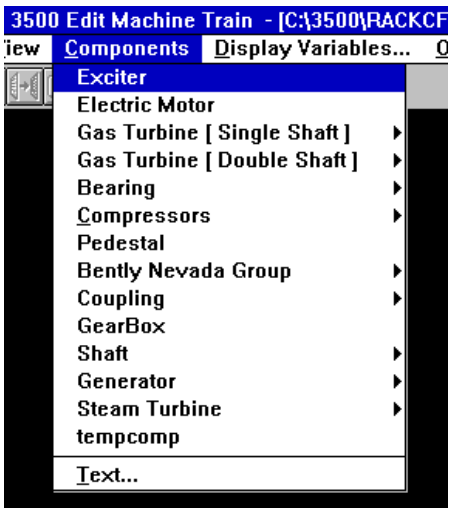


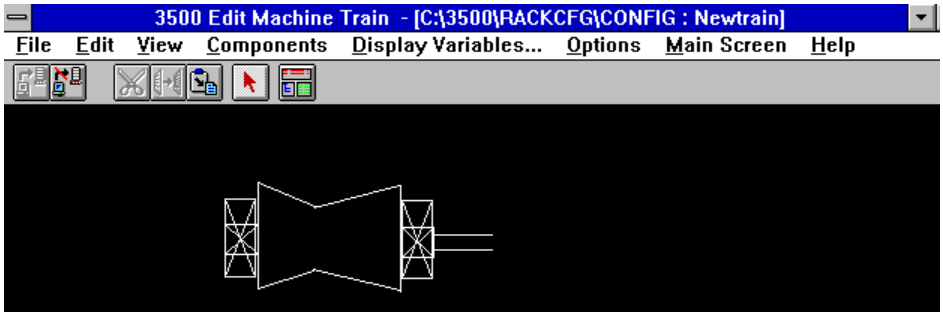
2. Build the graphical portion of the Machine Train Diagram by selecting **Components** and clicking the mouse button once.

A component list is displayed. (See page ? for a complete list of available components.)

Select each component of the train and position it by 'dragging' it with the left mouse button depressed.

Continue to select components and place them on your Machine Train Diagram until you have a representative drawing of your actual train.





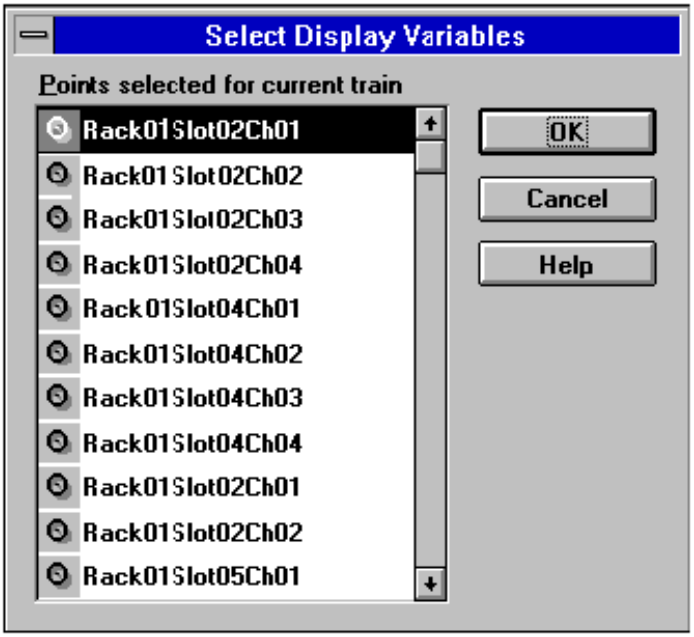
Machine Train Diagram Icons

Icon	Use this icon to...
	'Highlight' a component. Once selected, a component may be moved, deleted, duplicated, etc. Place the mouse pointer on this icon, and then on the component to be highlighted.
	'Cut' or remove one or more items from the drawing tablet. Select and highlight the item to remove. Then, select this icon to 'cut' it from the drawing tablet. To cut more than one item, hold down the CTRL key while you highlight each item to be cut. Then select this icon to cut all items.

Icon	Use this icon to...
	'Copy' or duplicate a highlighted component. Highlight the component to be copied, then place the mouse pointer on the 'copy' icon and click once. Return the mouse pointer to the drawing tablet - the cursor will now be a '+'.
	'Paste' a 'cut' component in a new location.
	Return to your train mapping screen and add or delete points from the Machine Train.

3. Add points to be displayed on your completed Machine Train Diagram by selecting **Display Variables...** .

   Double click the desired point to display all types of data for the point (for example, direct, 1X amplitude, Not 1X, ...)

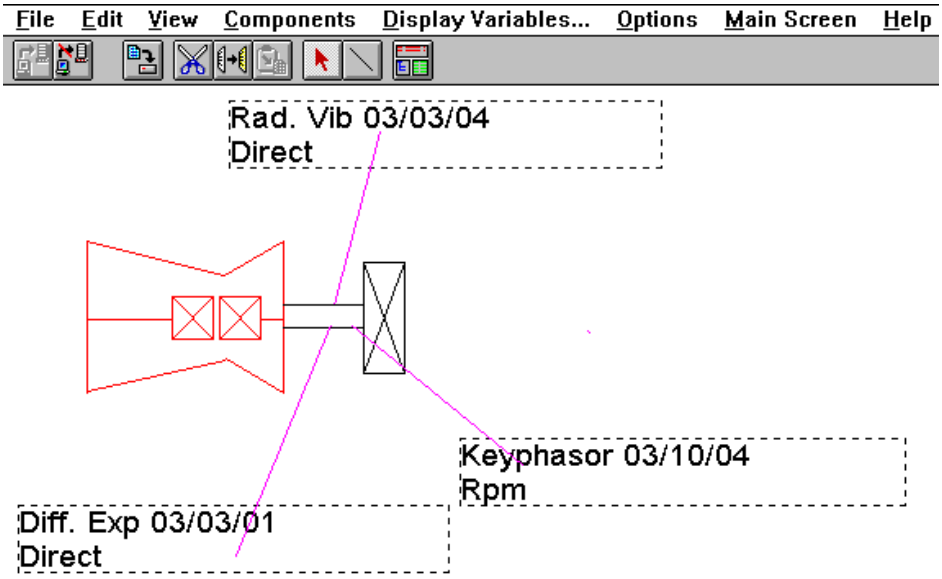


4. Select one point at a time.

5. Select **OK.**

6. Place the mouse pointer on the point and keep the mouse button depressed to drag the point to its correct position on the Machine Train Diagram.

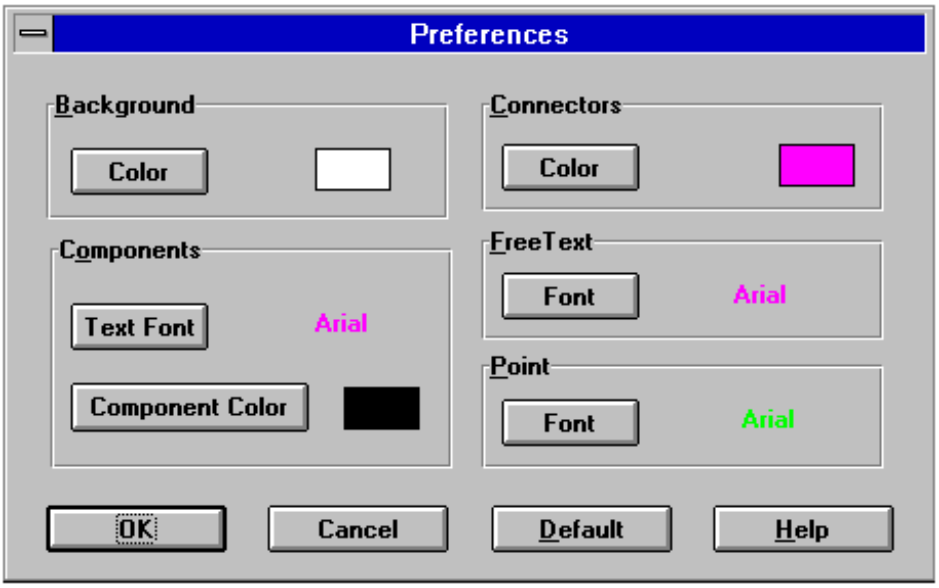
   Continue to add points to the Machine Train using the same procedure.



7. Add lines to your diagram by selecting the line drawing icon. Once selected, your screen cursor will change to a pencil. Keep the mouse button depressed while you 'draw' the line from the point name to its location on the Machine Train Diagram.

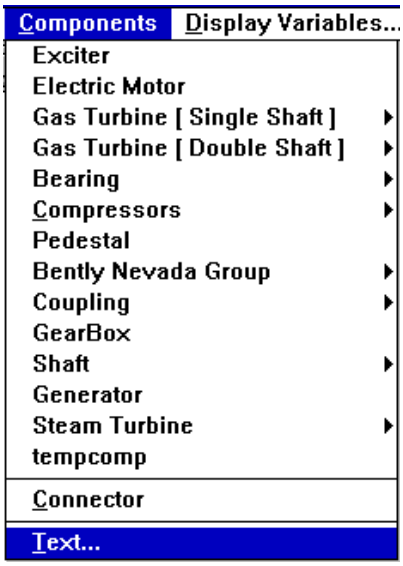
   Use this same tool to underline titles or text on your diagram, or draw a separate area to write other point values to.

8. To change colors or fonts used on your drawing tablet, select **Options, Preferences...**. The following screen will appear:



9. Add text and titles to your diagram by selecting **Components**, **Text...**, and typing the information you want to add. Depress the mouse button to 'drag' the text to the desired location.

Use the text feature to place titles on components of your diagram, add notes and other information, or add point names to your Machine Train Diagram.



When you have completed your Machine Train Diagram, select **File, Save**, to update the MCTRAINS.LGL file in the Working Directory.

Setting Up Historical Trends

Historical trend parameters are specified in the Software Configuration Utility. Once enabled, historical trend information is captured for each configured monitor and Keyphasor point. Historical trend data is collected at specified intervals and stored onto the hard disk of the Data Acquisition/DDE Server computer.

The following trend intervals are available for storing trend data:

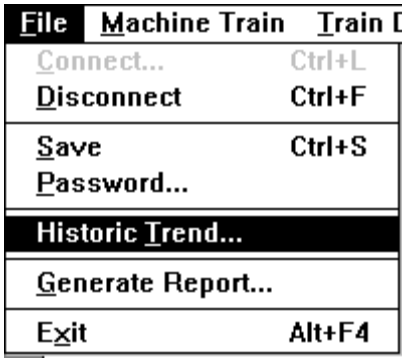
< 10 minutes
< 20 minutes
< 1 hour
< 2 hours
< 3 hours
< 4 hours

Hard disk storage requirements for historical trend data depends on the time interval selected, the number of points configured, and the total number of samples you wish to store. By specifying these parameters when you enable the historical trend, the software will calculate the hard disk requirements for you.

To set up historical trending:

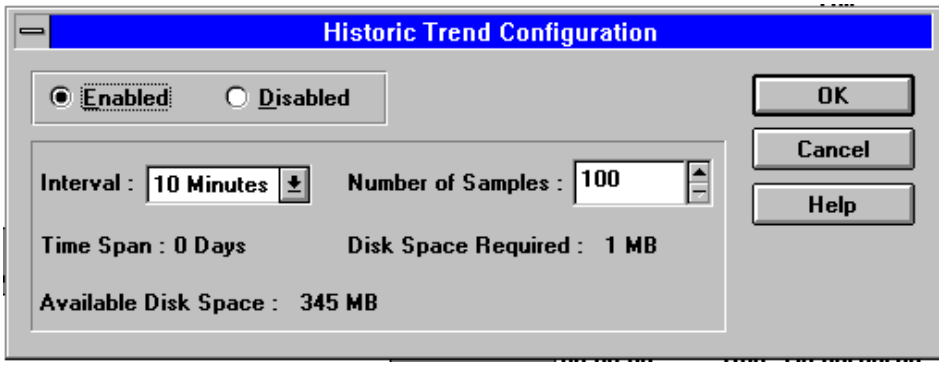
1. Start the Software Configuration Utility by selecting the icon from the 3500 Group.

2. **Connect** to a Data Acquisition computer by selecting the icon or **File...**, and **Connect.**



3. Select **File...**, to display the drop-down menu.

4. Select **Historic Trend...** to display the Historic Trend Configuration screen.



5. Enter the parameters as explained in the following table:

Historical Trend Parameters

Parameter	Use
Enabled	Instruct the Data Acquisition/DDE Server computer to collect and store historical trend samples for Machine Train points.
Disabled	Select this to NOT collect historical trend data.
Interval	The length of time between consecutive values stored in the historic trend file. A 10 minute interval means trend samples will be stored every ten minutes. Three values will be stored; a maximum, a minimum and an average. These values represent the average, maximum, and minimum of all data collected from the 3500 Monitor Rack during the trend interval.
Number of Samples	Select the total number of trend samples to store for each point.
Time Span	This number is computed for you based on the trend interval you select and the number of samples you want to store. If you select an interval of 20 minutes and a number of samples equal to 100, your time span will be equal to 2 days (time span is rounded to the closest integer value in days). This means you will have approximately two days worth of trend data available in the historical trend file.

Parameter	Use
Disk Space Required	This number is computed for you and tells the total amount of disk space that will be needed to store the historical trend data. This number is computed from the number of points on your Machine Trains, and the number of samples you want to store.
Available Disk Space	The amount of hard disk space available on the current drive. Make sure this number exceeds* the Disk Space Required, or you will not be able to store the historical trend information you have selected.

* This is your total hard disk space available. Make sure you leave enough hard disk space for other applications you will be operating and for a working area for the operating system you are using.

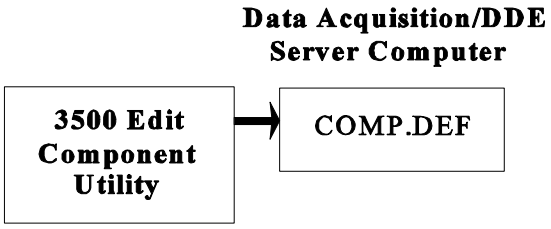
7. Select **OK**.

3500 Edit Component Utility

This utility allows you to change, delete, or add new components to be used in Machine Train Diagrams. You can customize existing components or build new ones by using basic drawing tools provided.

Creating Custom Train Components

The Software Configuration Utility provides many standard machinery components for drawing Machine Train Diagrams. However, your application may require components not supplied with this software. You can design and build custom machinery components using the Edit Component Utility.
All components are stored in a file called COMP.DEF

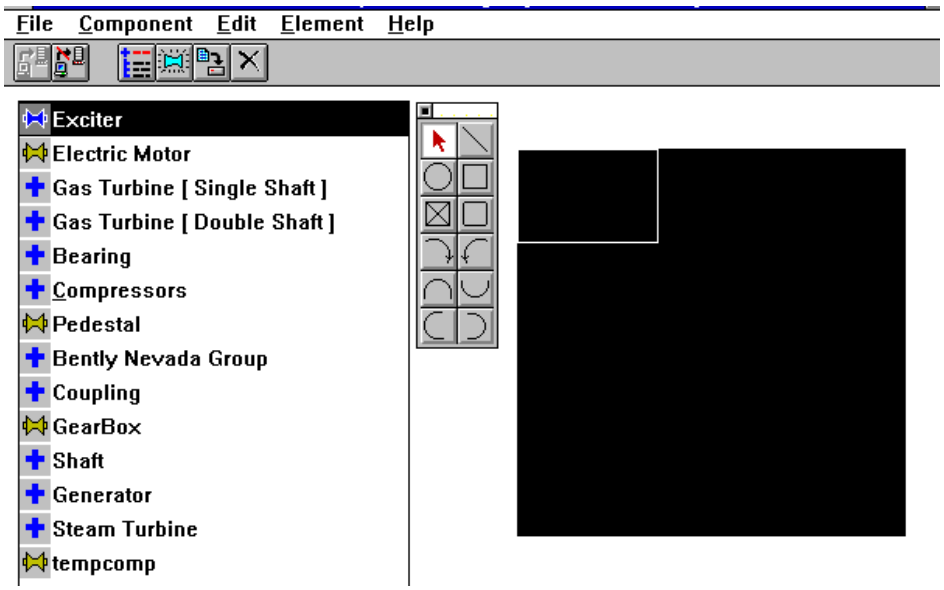


located in the Working Directory of the Data Acquisition/DDE Server computer.

Select the Edit Component Utility icon from the 3500 Software Group on your Program Manager screen. Select **File**, and **Connect** to a Data Acquisition/DDE Server.

A list of train component categories is displayed. Categories preceded by a '+' indicate that a group of components is available within that category. Double-click the mouse pointer on the '+' to view the individual components in the category.

Categories preceded by a machinery icon indicate a single component in the group.



Drawing Table

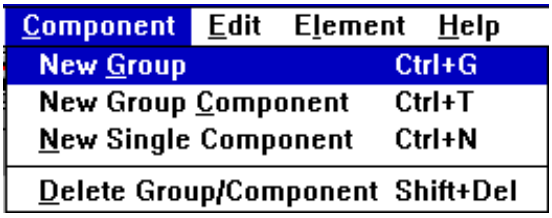
You may:

< create a new component group for your custom components.
< add custom components to an already existing group (category).
< change the design of an existing component.

If you are adding a new component group or adding a new component to an existing group, you MUST name the component (and group) BEFORE you draw the custom component. If this is not done, you may unintentionally overwrite an existing component without meaning to.

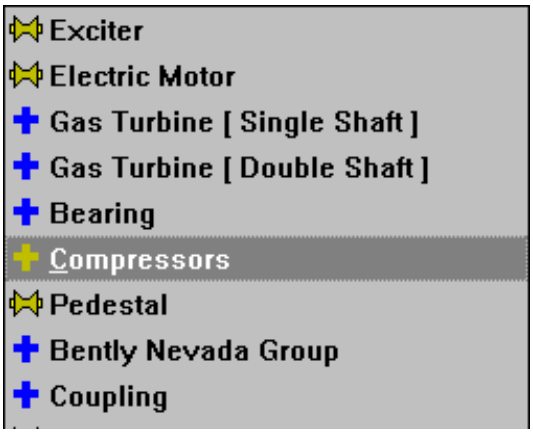
To create a new component group for your custom components:

1. Select **Component**, and **New Group**.



2. Type in the new group name.
3. Select **OK.**
4. Select the new group from the component list and highlight it.
5. Select **Component**, and **New Group Component**.

6. Enter the new component name and select **OK.**
7. Select the new component name from the list and highlight it.
8. Draw your new component.



To add new components to an existing group:

1. Highlight the existing group to add the custom component to. In this example, 'Compressors' is highlighted.

2. Select **Component**, and **New Group Component**.

3. Enter the new component name and select **OK.**

4. Select the new component name from the list and highlight it.

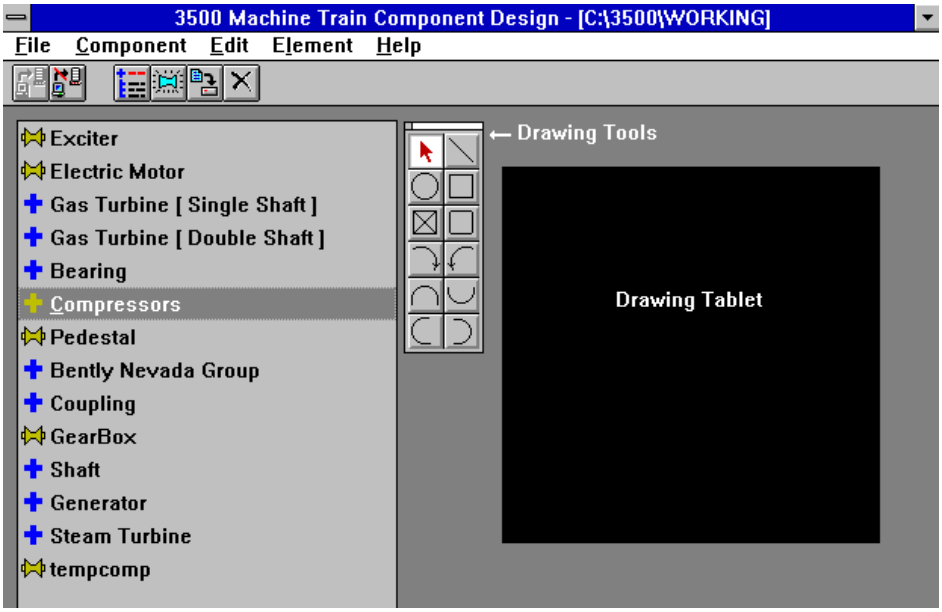
5. Draw your new component.

To change the design of an existing component:

1. Select the component from the existing list. The component will be placed on the drawing tablet.

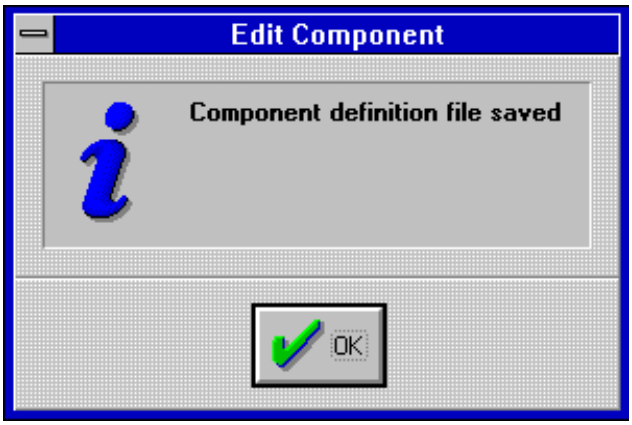
2. Change the component using the drawing tools.

   Use the drawing tablet and drawing tools to build your custom components.



When you have completed your component drawing, select **File**, and **Save.**

The new component can now be used to build your Machine Train Diagrams.



Data Acquisition / Display Tutorial

Note: Only the basics of drawing Machine Train Diagrams and adding new components have been covered in this manual. The best way to learn the software is to use it.

Access the **Data Acquisition/ Display Tutorial** for more information concerning building trains and train components.

Remote Communications

There are several types of remote communications available with the 3500 Monitoring System. This section describes how to establish and maintain remote communications. The following topics are explained:

- Remote Communications Definition
- Equipment Needed
  - Modems
  - Cables
- Host to Rack Communications
  - Requirements
  - Setup
- Host to Host Communications
  - Requirements
  - Setup

Remote Communications Definition

Modem remote communication uses modems to communicate between computers or between a host computer and a 3500 Monitor Rack. Modem communication requires a reliable phone line and compatible modems at both ends of the communications. The 3500 Monitoring System recognizes the following types of remote communications:

- Host Computer to 3500 Monitor Rack
  - An internal or external modem is connected directly to the RIM of the first 3500 Monitor Rack and communicating with another internal or external modem connected to a host computer. The host computer is executing the Data Acquisition/DDE Server Software to collect machinery data values. See page ?.

- Computer to Computer
  - A computer is connected directly to the RIM of the first 3500 Monitor Rack using either RS232 or RS422 cable. This computer is executing the Data Acquisition/DDE Server Software and is collecting machinery data values.

A modem on a second communications port of this computer must also be used to allow one or more Operator Display computers to access this same machinery data.

A second computer with an internal or external modem is communicating with the first over standard telephone lines. The second computer is executing the Operator Display Software to display the machinery monitoring values of the Data Acquisition/DDE Server computer. See page ?.

Equipment Needed

Remote communications requires hardware and software to operate. Hardware includes modems and cables. Software requirements depend on the types of communications you will be using.

Modems

In general, any Hayes compatible modem may be used for remote communications. Bently Nevada Corporation has specified and tested the following modems:

- Hayes OPTIMA 9600
- Hayes Ultra 9600
- Motorola FasTalk II 19200

Setup and initialization strings for each of these modems have been included in the Bently Nevada 3500 Monitoring System Software Products.

If you use a modem that is not listed here, you may have to build an initialization string to enable the modems to talk to each other. Refer to your Modem Reference manual for information on how to build this string.

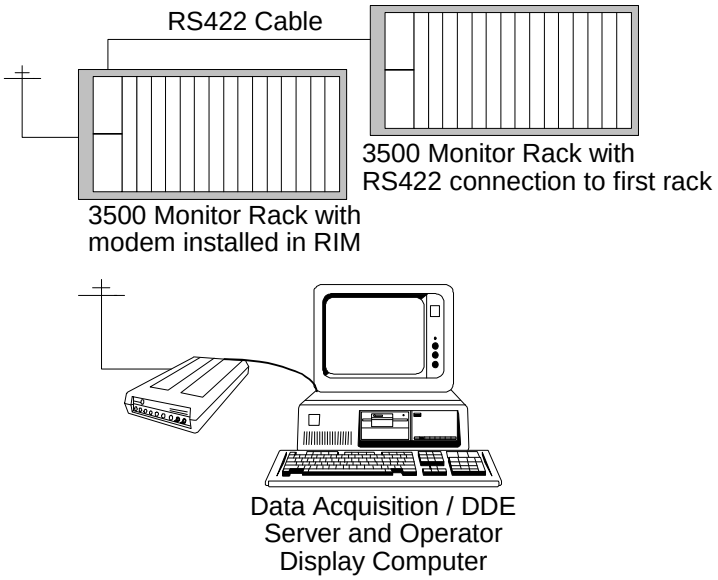
Any modem communications must have dedicated telephone lines, free of noise and other interference.

Cables

RS232 cables are needed if you are using an external modem connected to a computer or 3500 rack. Cable part numbers and descriptions have been included in the Appendix of this manual on pages ? to ?.

Host to Rack Remote Communications

Host to Rack Communications requires a modem at the host computer and at the first 3500 Monitor Rack.



Requirements

The modem at the host computer must be connected to a configured RS232 port on the DigiBoard Asynchronous Communications card. Instructions for setting up this card are on page ? of this manual.

Setup

The modem at the 3500 rack is initialized when the rack is configured. The Rack Configuration Software includes entries for specifying a modem at the front or rear port of the RIM. Once the rack has been configured and the configuration downloaded, the modem initialization is complete.

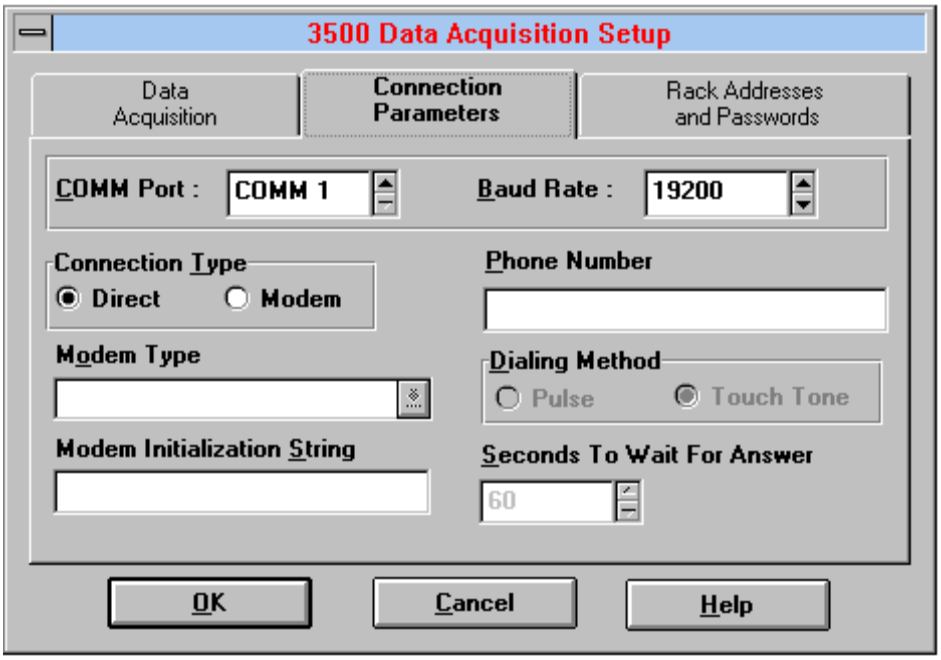
The modem at the host computer is initialized using the Data Acquisition/DDE Server Software.

To initialize the modem:

1. Select the Data Acquisition/DDE Server icon from the 3500 Group on the Program Manager Screen and double-click the mouse button.

2. At the first screen, select **Setup** from the Main Menu Bar.

3. Select **Connection Parameters** to show the following screen:



4. Select the **Comm Port**, **Baud Rate, Connection Type**, the **Modem Type**, for the modem connected to the host computer.

   Baud rate is the data communication rate between the computer and the modem, and not between the two modems. The modems will adjust to a baud rate that is compatible between them.

5. If you intend to use a modem that is not included in the Modem Type list, you may have to input a **Modem Initialization String.** Refer to your Modem Reference Manual and the Appendix of this manual, pages ? to ?, for details concerning this string.

6. Input the **Phone Number** at the rack. Input this number exactly as you would dial it, including area code, credit card numbers, and other codes that may be necessary within your operation. Use commas (,,,) for pauses.

   Input the **Dialing Method** used by the phone at the computer, and the **Seconds to Wait for Answer**. This is the amount of time you want the modem at the host to wait for a response (answer) from the modem at the 3500 rack.

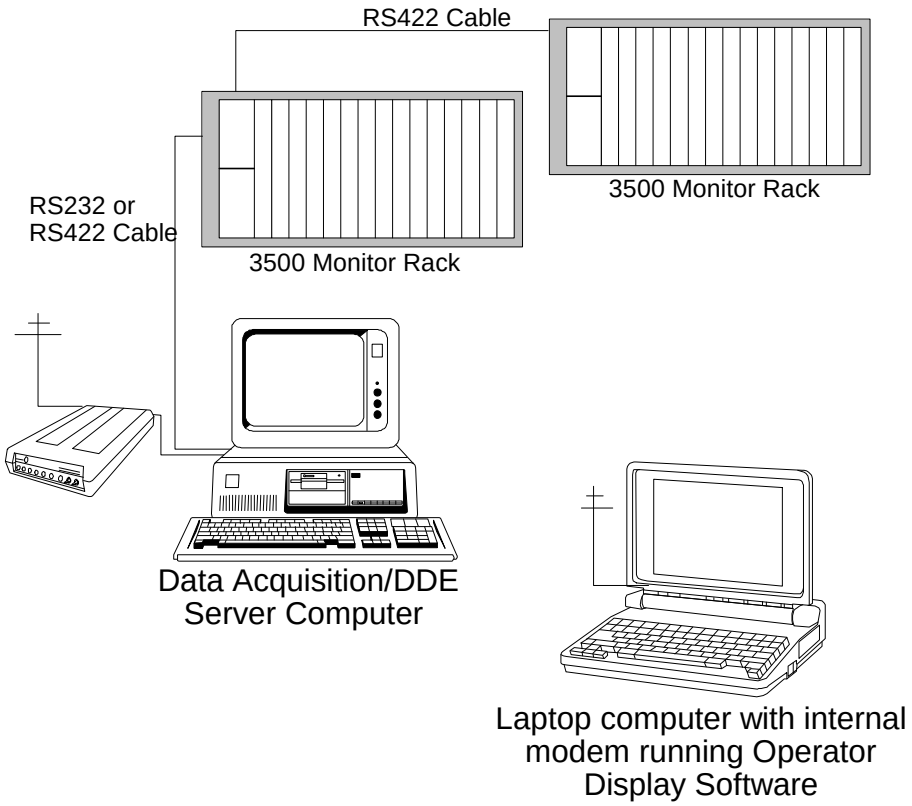
7. Select **OK** after all information has been entered.

8. To save this information, select **File...**, and **Save As**. Enter the name of the Data Acquisition/DDE Setup file (.DAS)* which will be used to store the setup information.

   *More than one setup (.DAS) file may be stored on a Data Acquisition computer. Each file reflects the parameters of the 3500 Monitor Racks connected to the Data Acquisition computer for machinery data collection.

Host to Host Remote Communications

Host to host communications requires a computer and modem at the 3500 Monitor Rack(s) and a second computer with a modem at another location. The computer at the 3500 Monitor Racks is executing the Data Acquisition/DDE Server Software and is connected by direct RS232 or RS422 cable to the first rack.



Requirements

1. Modems at both computers may be internal or external. External modems may be connected to standard RS232 communications ports provided on most computers.

2. The Data Acquisition computer must be using Windows NT 3.5, or Windows 95 operating system and have the Windows Remote Access Software (RAS) server installed and operational.

3. The Data Acquisition computer must continuously collect machinery monitoring data from the 3500 Monitor Racks.

4. The Operator Display computer must be using Windows for WorkGroups 3.11, Windows 95, or Windows NT 3.5 software. The computer acts as a Remote Access Server (RAS) client to the Data Acquisition computer.

5. If the Data Acquisition computer contains Machine Train configurations, Machine Train Diagrams can be displayed at the Operator Display computer.

Setup

This procedure shows how to use Windows Remote Access Service (RAS) to connect an Operator Display Computer to a Data Acquisition computer using modem communication. With this connection, the Operator Display computer has complete access to machinery data as if it were another node on the same network with the Data Acquisition computer.

To set up a Data Acquisition/DDE Server Computer:

1. Verify that Windows NT 3.5 or Windows 95, and the RAS Server software is installed and operational on this computer.

2. Configure the RAS software (refer to page ? for Windows NT and page ? for Windows 95).

3. Initiate data acquisition. For complete instructions on setting up the Data Acquisition Software, refer to page ? in the Data Acquisition/DDE Server section of this manual.

To configure the RAS Server software (Windows 95):

Note: In Windows 95, RAS is referred to as "Dial-up-Networking". Windows NT refers to it as Remote Access Service or RAS.

---

1. Open the Control Panel folder.

2. Double-click on the Add/Remove Programs icon.

3. Select the Windows Setup "folder tab".

4. Select the "Communications" item.
5. Select the "Details" button.
6. Check the "Dial-up-Networking" option.
7. Select OK.
8. Insert the Windows 95 CD ROM (or the requested install diskettes) and select OK.
9. Windows 95 will install "Dial-up-Networking" and you will then be able to run and configure the program using the "Start" button.

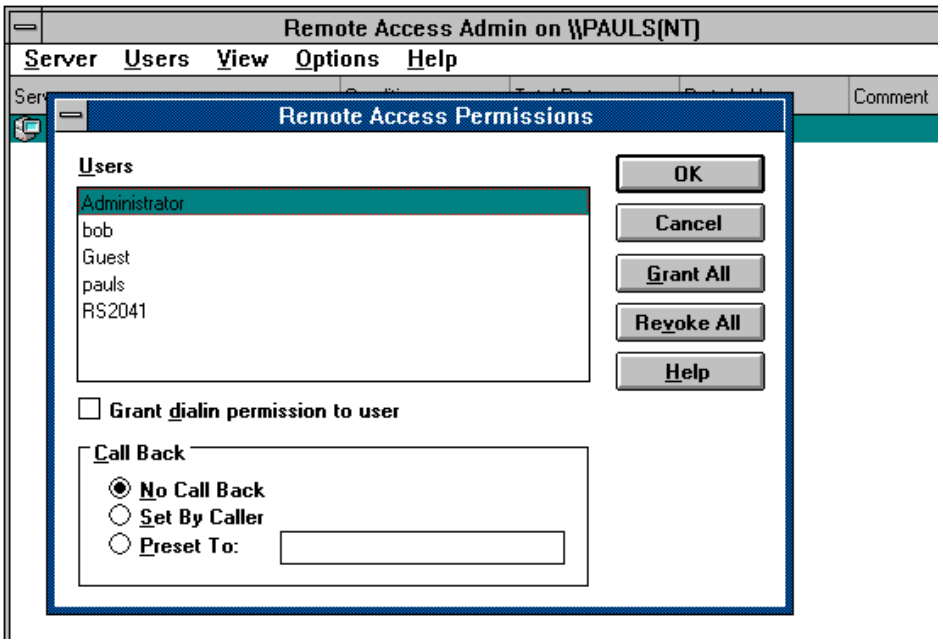
To configure the RAS Server software (Windows NT):

Note: In Windows 95, RAS is referred to as "Dial-up-Networking". Windows NT refers to it as Remote Access Service or RAS.

1. Open the Control Panel Group.
2. Double-click on the Network icon.
3. Select the **Add Software** button.
4. Select the Remote Access Service Software from the resulting list OR insert the CD ROM or diskette with the appropriate software when prompted.
5. Select **Continue**.
6. After the server has been loaded, select **OK** and exit the network setup.
7. You may be required to restart Windows NT to have the new changes incorporated.
8. Once the RAS Server has been loaded, select the Remote Access Admin icon from the Network group.

9. The Remote Access Admin screen will be displayed. Select **Server...**, and **Select Domain or Server** to enter the name of the group (domain) or the name of the computer where the Data Acquisition/DDE Server Software is located. Select **OK**.

10. Select **Users**, and **Permissions** to display the following screen:



11. Add the name of the Operator Display Computer to the **Users** list. Select **OK.**

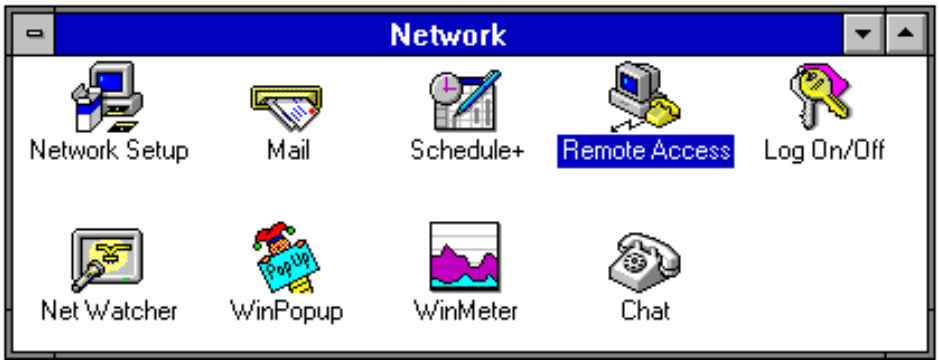
Note: By adding 'Guest' to this list, you can allow anyone to call in using RAS without a password. However, this is not a recommended method to use due to the lack of security precautions taken.

12. Select **Server** and **Start Remote Access Service** to initiate Remote Access Communications to this computer (server). You will now have the capabilities to call into this computer using RAS to access the Data Acquisition/DDE Server software.

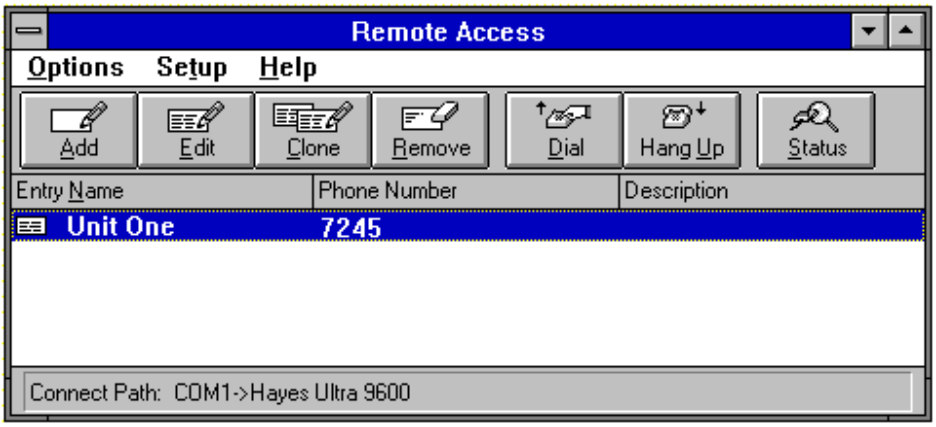
To set up an Operator Display Computer:

1. The Operator Display computer uses the RAS client software to communicate with the Data Acquisition computer. The software is included with Windows for WorkGroups 3.11, Windows 95, and Windows NT 3.5 software.

2. Select the RAS icon from the NETWORK group on the Windows Program Manager screen.



3. Configure the client software by selecting **Setup** and then **Configure** from the Main Menu Bar.



4. Input configuration parameters according to your system setup.

5. Connect to the Data Acquisition computer by selecting the **Dial** icon.

6. After the RAS client software has successfully connected to the RAS server software on the Data Acquisition computer, the Operator Display Software may **Connect** to the Data Acquisition Software. Refer to the Operator Display Software section, page ?, of this manual for connection instructions.

Note: Remember that the RAS software simulates a Microsoft Network. (Select **File**, **Connect**, **Network** from the Operator Display Software.)

Networks

This section includes:

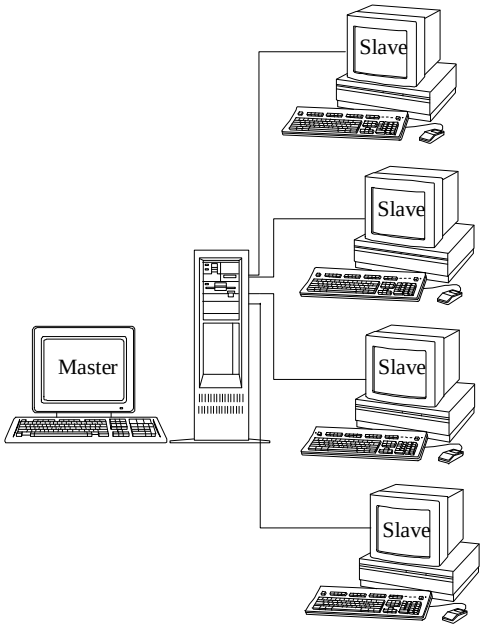
Network Definition

A network allows the connection of one or more computers for the purpose of sharing information. Networks may operate over hardwired cable connections or remotely over modems. Networks operate in one of two forms:

< Master-slave
< Peer-to-Peer

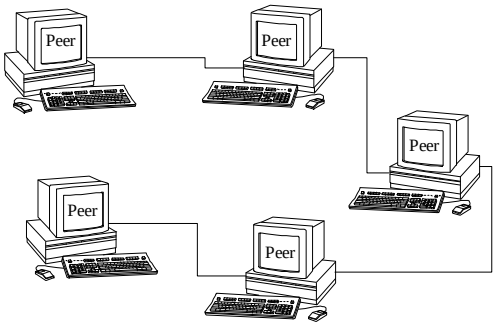
Master-slave

These networks generally have a single computer acting as the controller for several computers linked directly to it. This single computer becomes the 'master' and all communications and transfers of information go through the master. This computer usually has a large storage capacity and separate areas for each computer linked to it. In this type of network, the master must be active for the network to operate.



Peer-to-Peer

A Peer-to-peer network does not have a single controlling computer. Instead, all computers on the network have access to all other computers. Information shared between computers depends on the types of 'access' set up between the computers. If one computer in this type of network fails, others computers on the network are not affected.



The 3500 Monitoring System software uses peer-to-peer networking.

Network Communications

Protocols (both hardware and software) set standards of communication for networks. There are several industry standard protocols available. They allow data from one computer to be transmitted and recognized by another computer on the same network.

Networks require both hardware and software to establish and maintain communications. This section describes the network hardware and software that has been tested with the 3500 Monitoring System.

Software

3500 Monitoring System software can use a variety of protocols, but has been tested and approved with the following protocols:

- TCP/IP
- IPX
- Microsoft Windows for WorkGroups

TCP/IP (Transmission Control Protocol / Internet Protocol) is a common protocol used in many industrial and office environments. It is recognized by many network software products and may be required to allow network packets to pass through routers and bridges.

IPX is a network protocol used by Novelle. It has been in existence for many years and is a common form of network communications. Many existing networks use this protocol.

Windows for WorkGroups has its own network protocol already included with the Windows product. Because network and Windows access has been included in the same package, this is the simplest protocol to use with the 3500 Monitoring System software.

Hardware

Connections between computers on a network must also follow a set of guidelines to ensure proper network operation. The 3500 Monitoring System software has been tested and approved on Ethernet Networks.

Three network cabling structures are supported by the 3500 Monitoring System software:

< ThinNet
< ThickNet
< Fiber Optic

The type of structure used will depend on the number of computers on your network, the distances between computers, and the amount of electrical or mechanical noise present at your installation.

Additionally, each computer on your network will require a network card installed in one of the slots of the computer. Install the network card using the documentation the comes with the card. Install the network using the procedure on page ?. This card will have a BNC, AUI, or twisted pair connector. One of these connectors will connect directly to the cable for your network transmissions.

Many of the newer computers can be ordered with a network capability already installed.

Ethernet

Ethernet refers to a hardware protocol. This is a lower level protocol than that used for the 3500 Monitoring System communications (TCP/IP, IPX, Windows for WorkGroups). Many computers can be connected on an Ethernet protocol network, and can communicate with one another. If only three or four of those computers are using 3500 Monitoring System software, there is no need for the other computers on the network to use or recognize 3500 Monitoring System transmissions. The 3500 Monitoring System software uses Ethernet protocols for all its network transmissions. This means it can be integrated into an already existing Ethernet network without affecting the current operation of the existing network.

3500 Supported Networks

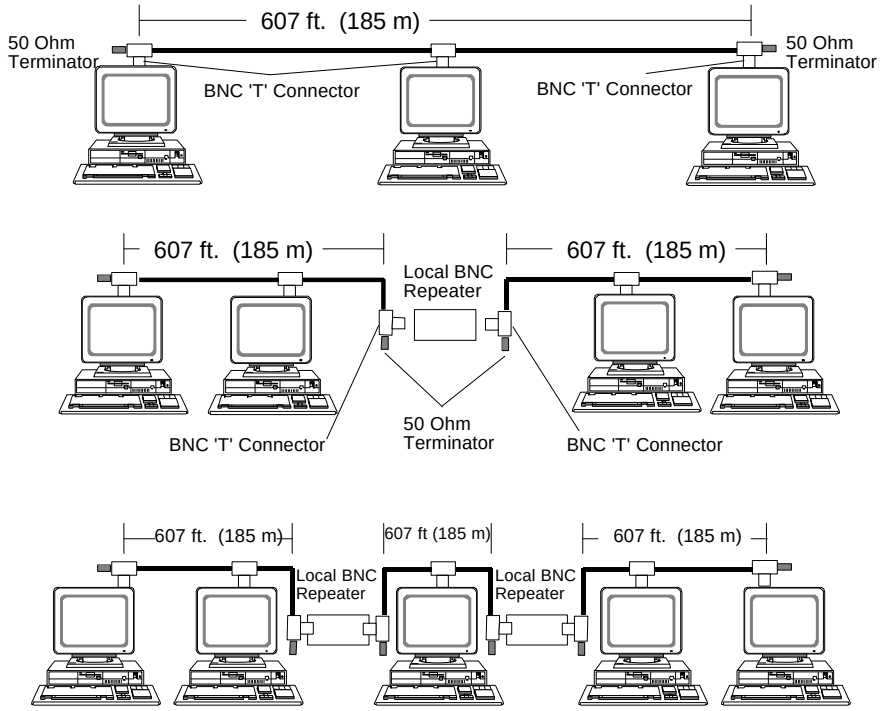
The 3500 Monitoring System supports three network hardware structures. Consider the following factors when you choose which structure to use:

- number of computers on the network
- maximum and minimum distances between computers in the network
- amount of electrical and mechanical noise in the plant
- size and expansion capability of the existing network
- number of remote connections to the network

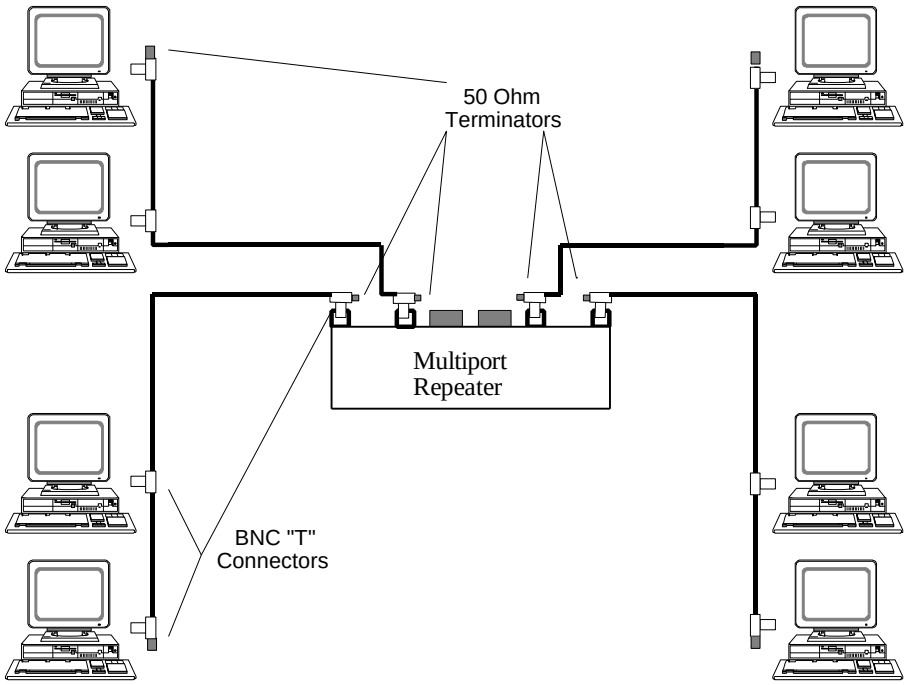
All of these factors will affect the installation of your network hardware. As mentioned earlier, three network hardware structures are supported by the 3500 Monitoring System Software. Select the one that best suits your requirements.

Installing a ThinNet Ethernet Network

A ThinNet network uses BNC connectors and ThinNet RG58 coaxial cable. You may select either a star or a bus structure for a ThinNet network, depending on your needs. A bus structure strings all of the computers along a single Ethernet cable. The following example shows a ThinNet bus structure.



A ThinNet star installation has a central repeater connected to several computers. The following is an example of a ThinNet star structure:



A ThinNet installation must meet the following restrictions:

- Maximum number of computer stations (nodes) on the network is 100. Maximum number of nodes allowed for the 3500 Monitoring System software is 10. [An existing network can add ten 3500 Monitoring System nodes as long as the total number of nodes on the entire system does not exceed 100.]
- Minimum distance between two computer stations (nodes) is 0.5 m (1.6 feet).
- Maximum cable length of the total network is 555 m (1821 feet). [Maximum cable length in bus structure is three 607 foot segments with two BNC repeaters.]

- Maximum single cable length is 185 m (607 feet). [This length is measured from BNC connector to terminator.]
- Each node is connected to network card using BNC 'T' style connector. [No intermediate cabling is allowed.]
- Cable ends must be terminated with 50 O BNC terminator

Refer to the following Bently Nevada Corporation part numbers for ThinNet network installations:

Part Description	Part Number
ThinNet RG58 Coaxial Cable	
20 ft (6 m)	103419-01
60 ft (18.2 m)	103419-02
100 ft (30.4 m)	103419-03
600 ft (182.8 m)	103419-04
Local BNC Repeater	02291087
BNC Transceiver	02291079
Multiport Repeater	02291075
ThinNet Connectors	
50 O ThinNet Terminator	02291081
BNC 'T' Connector	02291082
Barrel Connector	02291083

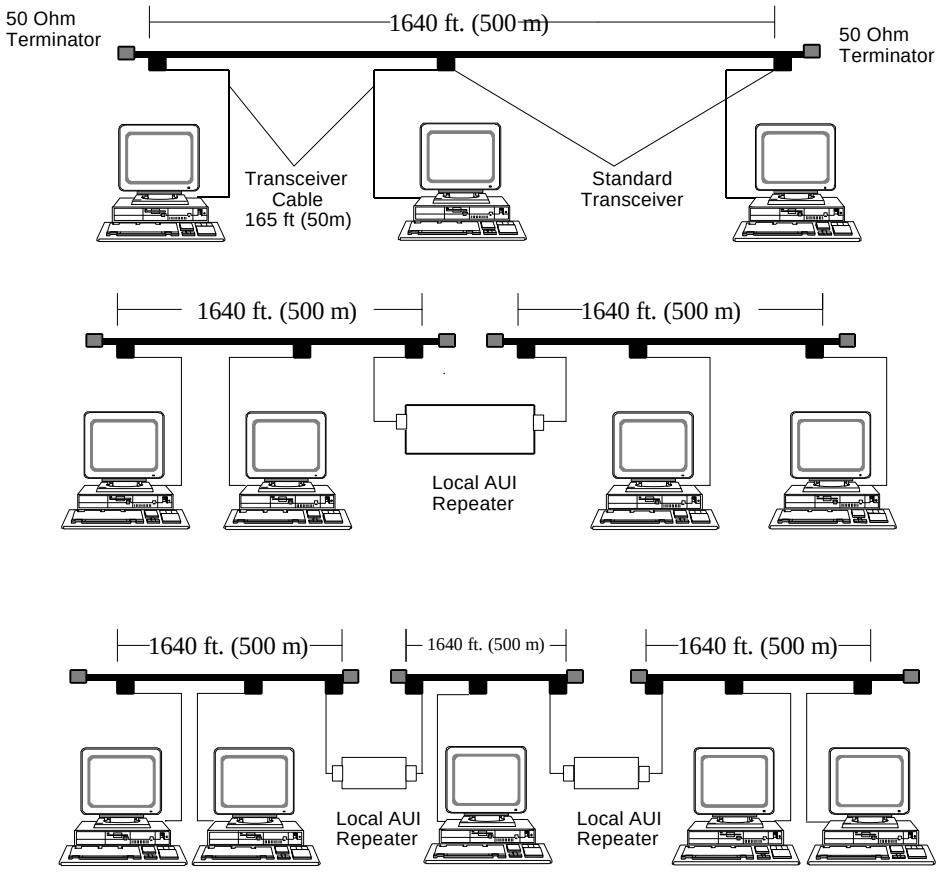
Installing a ThickNet (Standard) Ethernet Network

Use this installation when the maximum distances exceed the 607 feet single cable or 1821 feet total cable length of the ThinNet installation. In some circumstances, a ThickNet installation may be more cost effective than a ThinNet. If you have only two computer stations (nodes) separated by 1500 feet, it would be cost effective to install ThickNet cabling instead of ThinNet with repeaters.

A ThickNet network can be installed as a bus or star just like the ThinNet. The main differences between the two networks is the use of the AUI connectors and a separate transceiver cable.

Computer stations do not connect directly to the main cable as they do with a ThinNet. Instead, short (165 ft (50 m)) transceiver cables connect the main (spine) cable to the computer stations. Transceiver cables connect to the spine cable using a vampire clamp. This clamp has teeth in it that cut into the spine cable to establish a connection. The transceiver cable then connects to the network card in each computer station using AUI connectors.

The following example shows a ThickNet bus structure:



All ThickNet installations must meet the following restrictions:

< Maximum number of computer stations (nodes) on the network is 100. Maximum number of nodes allowed for the 3500 Monitoring System software is 10. [An existing Ethernet network can add ten 3500 Monitoring

System nodes as long as the total number of nodes on the entire system does not exceed 100.].

- < Minimum distance between two computer stations (nodes) in 2.5 m (8.2 feet).
- < Maximum cable length of total network is 1609 m (5250 feet). [Maximum cable length in bus structure is three 5250 foot segments with two local AUI repeaters.]
- < Maximum single cable length is 500 m (1640 feet). [This length is measured from the AUI connector to the terminator.]
- < Each node is connected to the main (spine) cable using transceiver connector and transceiver cable.
- < Maximum transceiver cable length in 50 m (165 feet).
- < Cable ends must be terminated with 50 O terminator.

Refer to the following Bently Nevada Corporation part numbers for ThickNet network installations:

Part Description	Part Number
Standard Ethernet Spine Cable	
100 ft (30.4 m)	103418-01
500 ft (152.4 m)	103418-02
1000 ft (304.8 m)	103418-03
Local ALI Repeater	02291086
Standard Transceiver	02291078
Transceiver Installation Kit (used to connect vampire clamps to spine cable and verify connectivity)	02291088
Spine Cable Connectors	
50 O Spine Cable Terminator	02291084
Barrel Connector	02291085

Note: Most Ethernet Transceivers have an SQE heart beat failure. For proper operation, the SQE must be disabled.

Installing a Fiber Optic Network

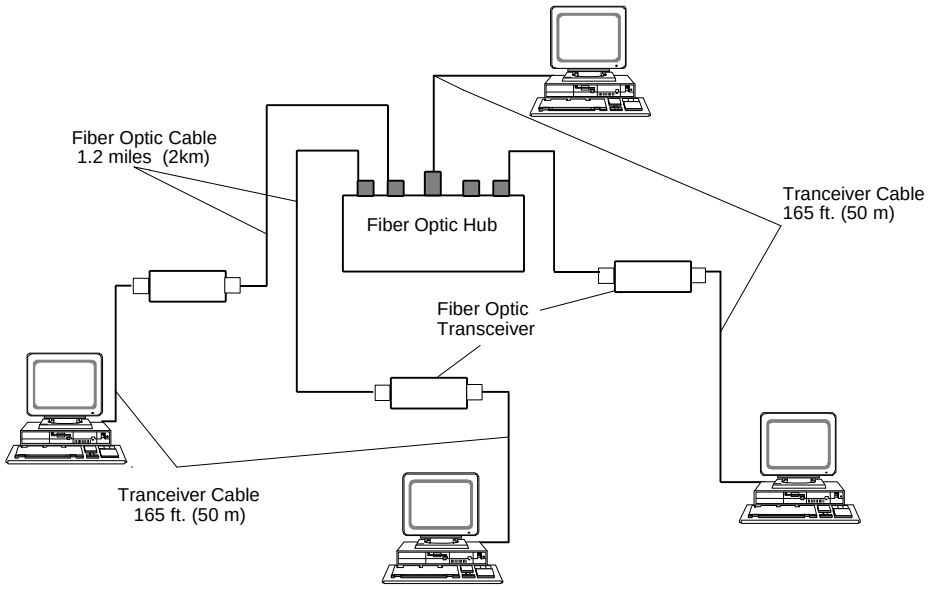
A Fiber Optic network can be installed over the longest distances. It is used when:

< The total cable distance is greater than 1609 m (5250 feet)
< Network cabling is located in areas of high electrical noise

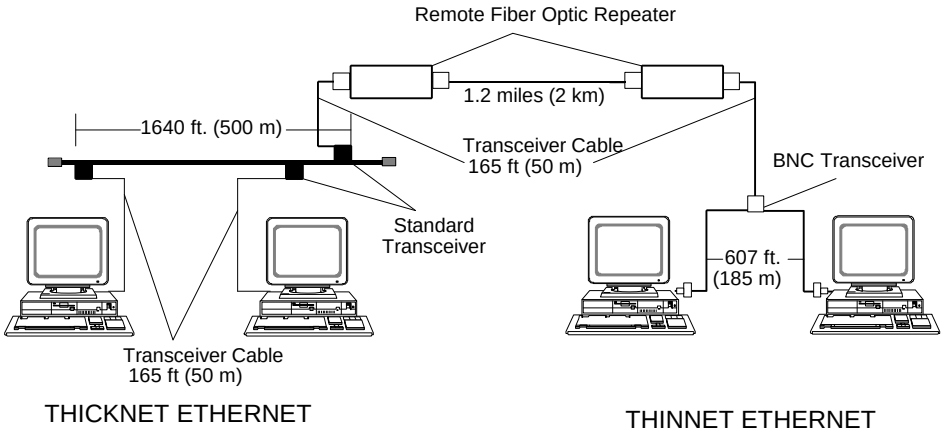
Fiber Optic networks can be used in combination with either or both the ThinNet and ThickNet networks as long as each network's restrictions are not exceeded. Three different Fiber Optic installations are shown in the next few pages. These installations used specific fiber optic cabling and hardware and use the AUI connectors on repeaters and network cards.

Fiber optic network installations require expertise with handling the cables. Cable cuts, splices and attachment of connectors should be done only by those experienced with these components.

The following example shows an all fiber optic network installation:

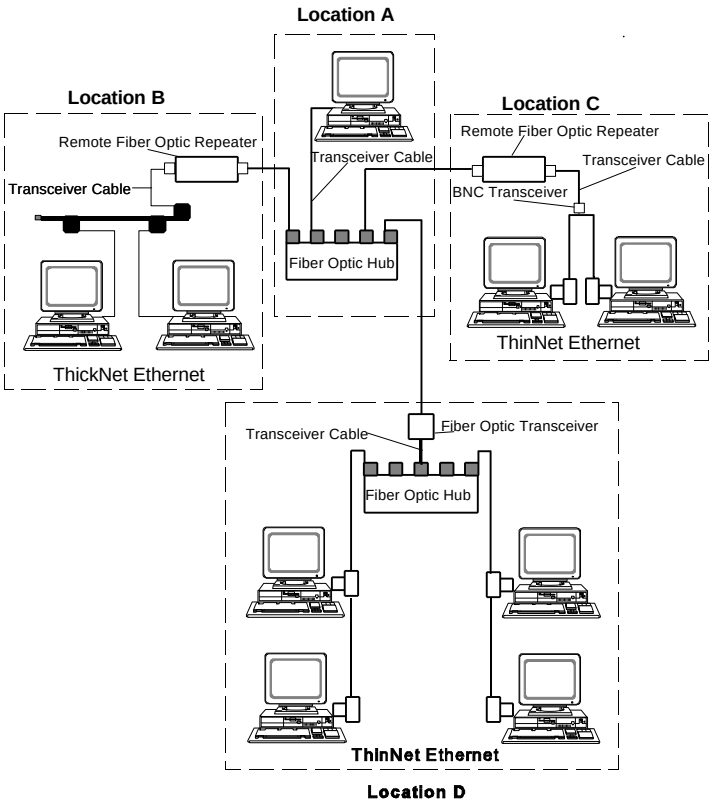


The following fiber optic network joins a ThickNet and a ThinNet network installation:



Different network types may be combined, as long as you do not exceed the individual requirements of each type.

This next example shows a fiber optic network connecting several other network types.



All Fiber Optic installations must meet the following restrictions:

- Maximum number of computer stations (nodes) on the network is 100.
- Maximum number of nodes allowed for the 3500 Monitoring System software is 10. [An existing Ethernet network can add ten 3500 Monitoring System nodes as long as the total number of nodes on the entire system does not exceed 100.]
- Maximum cable length of total network is 5.8 km (3.6 miles). [For a single fiber optic hub wit six cable connections, the maximum cable length from hub to transceiver is 2 km (1.2 miles).]
- Each node is connected to the main fiber optic cable using fiber optic transceiver connector and transceiver cable.
- Maximum transceiver cable length is 50 m (165 feet).
- A single station may be connected to a fiber optic hub using transceiver cable.

Refer to the following Bently Nevada Corporation part numbers for Fiber Optic network installations:

Part Description	Part Number
Fiber Optic Duplex Cable XXXX = User specified length in feet	103420 - XXXX
Fiber Optic Hub	02291077
Remote Fiber Optic Repeater	02291076
Fiber Optic Transceiver	02291080

Note: Most Fiber Optic cables are labeled with an A or B on each of the fiber tubes. The A tube (transmit) on one end of the cable is physically connected to the B tube (receive) on the other end.

Network Hardware and Software

Any network card supported by the Windows Operating System and your computer will work with the three network installations described above.

Network Hardware

Hardware used will be determined by your installation. Use cables, cards, and connectors compatible with your existing installation.

Network Software

Bently Nevada Corporation supports three network software products:

- Microsoft Windows for WorkGroups (version 3.11)
- Microsoft Windows NT (version 3.5)
- Microsoft Windows 95

All software packages include network applications and recognize some or all of the protocols (TCP/IP, IPX, Windows for WorkGroups) used by 3500

Monitoring System Software. Regardless of which network package you use, your computer station (node) must meet the following requirements:

< IBM compatible computer with
  - Minimum 386/20 processor and corresponding 80387 coprocessor
  - 3.5 inch high density floppy diskette drive
  - Microsoft DOS 6.0+ installed and operational
  - Minimum 8 MB RAM
  - Hard disk capacity for MS-DOS, Network Software, and any 3500 Monitoring System software products to be used [hard disk should have minimum of 35 MB unused space]
  - VGA compatible monitor
< A network card installed with proper switch and jumper settings

With your computer operational as described, select the network software and protocol you will be using and proceed with your network installation.

Network Installations

The following descriptions describe how to install the three protocols (Windows for WorkGroups, TCP/IP, and IPX) with each of the supported operating systems (Windows for WorkGroups, Windows NT, and Windows 95). These are general instructions to give you an idea of the procedures necessary to build an operational network.

There are many different types of computers and networks. Your installation may not conform to these installations. Consult you network administrator or operating system manuals for more information.

Windows for WorkGroups

Windows for WorkGroups allows you to configure multiple networks. In general, each network card will support up to four adapters (network drivers) allowing four different communications protocols with a single card. Depending on the type of connection you are making on the network, the choice of adapters will be made for you as long as the hardware you are connecting to has the same adapter configured.

Refer to the appropriate section below for instructions concerning network setup procedures for your selected protocol (Windows for WorkGroups, TCP/IP, IPX).

Windows for WorkGroups Protocol

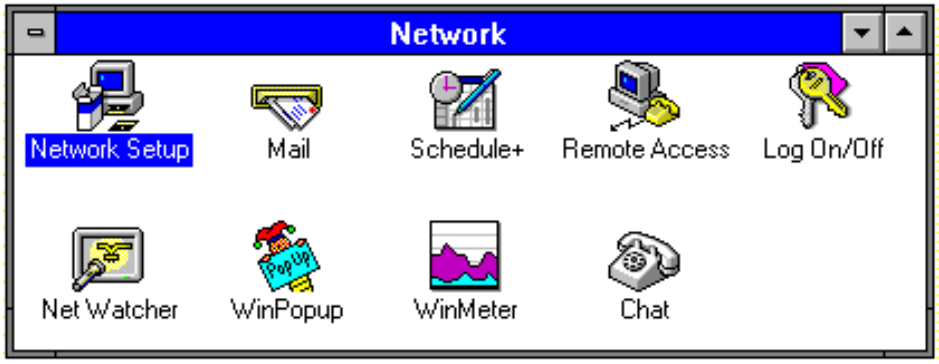
You will need to setup the Windows for WorkGroups Operating Systems to identify your Ethernet card and Windows for WorkGroups protocol.

To use the network features in Windows for WorkGroups, at least one network adapter must be properly installed and set up on your computer.

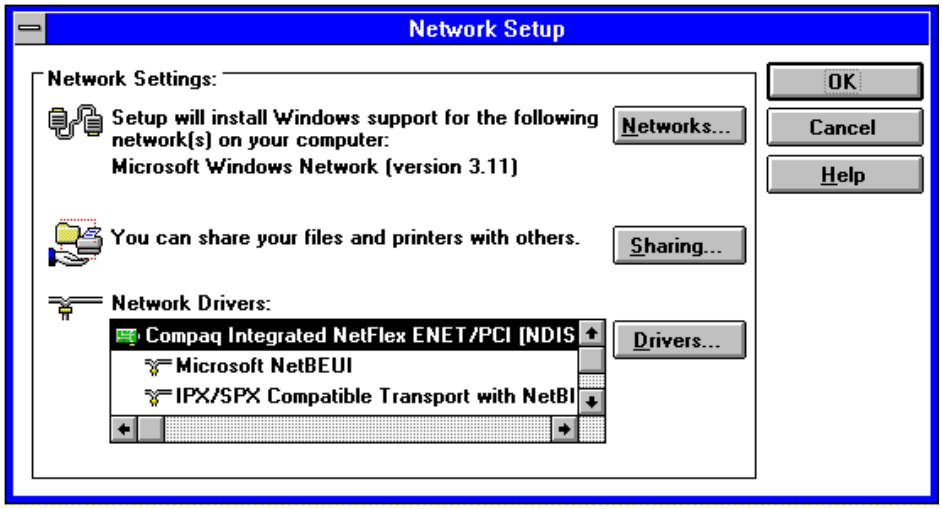
If you are using more than one type of network (for example, if you are using both a Token Ring and an Ethernet network), you need to install one or more network adapters for each network type. Install the network adapter according to the manufacturer's instructions. Add the driver to your operating system according to the following procedure.

To add a network-adapter driver:

1. With Windows for WorkGroups installed, the following **Network** group will be available on the Program Manager screen:

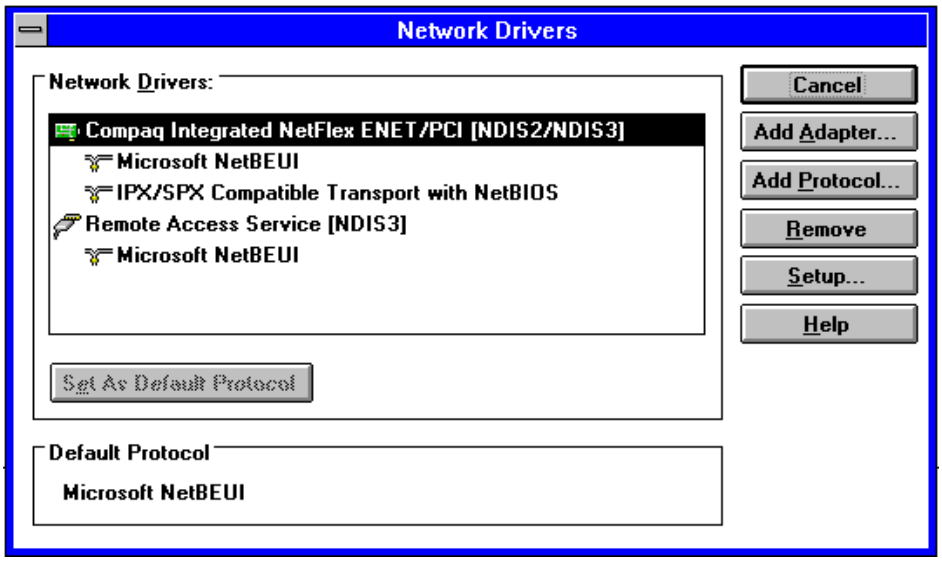


2. Select the Network Setup icon to display the following screen:



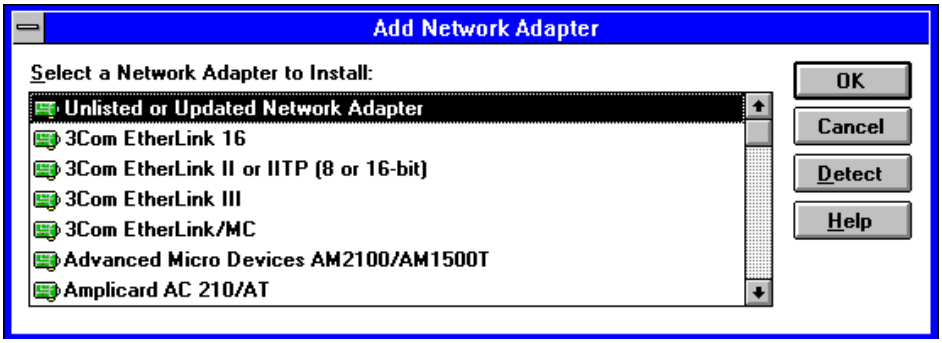
In this example the Network used is the Compaq Integrated NetFlex FNFT/PCI, with two configured adapters; Microsoft NetBEUI and MIPX/SPX Compatible Transport with NetBEUI.

3. Select the **Drivers** button. The Network Drivers dialog box appears:



4. Select the **Add Adapter** button to display the Add Network Adapter screen:

.



5. Select the adapter you have installed from the list.

   If you network adapter is not listed:
   a. Select **Unlisted**, or **Updated Network Adapter**.
   b. Place the requested diskette in the floppy drive, OR type the drive letter and directory requested.
   c. A dialog box will appear listing adapter drivers.
   d. Select the network adapter you are using.
   e. Some network adapters may require additional settings. If this is the case, a dialog box will appear requesting these settings. In most cases, select the **Default** settings. These can be changed later if they do not work properly.

6. Select **OK** on all screens as you return to the Program Manager. Changes will not take effect until you restart Windows.

If you encounter any problems select the **Help** button from any screen for a more detailed explanation.

If you use **Windows for WorkGroups protocol,** you must designate one or more nodes on the network as the 'server'. These nodes will usually be the nodes operating the Operator Display software (see page ? for more information).

TCP/IP Protocol

Microsoft does not officially support using TCP/IP with Windows for WorkGroups.

IPX Protocol

Several IPX drivers are available with the Windows for WorkGroups operating system. Use the procedures described for the Windows for WorkGroups protocol described in the previous section to load the IPX driver you will be using.

Windows NT

Network setup under Windows NT is very easy and almost automatic. When you install Windows NT, the setup program will attempt to detect all available Network adapters. You can then select Network software to install the protocols.

To install additional adapters:

1. Open the control panel appelett.

2. Select the network icon from the control panel

3. To install a new or different adapter, or to select a new one from the list of available adapters, select the **Add Adapter** button.

4. A list of available adapter choices will appear. Choose from the available adapters or insert a disk with new adapters when prompted.

5. Select the **Continue** button.

6. Enter the requested settings (IRQ, IO address, etc.). In most cases, the default settings should work. However, there may be conflict with other devices installed on your host computer (mouse or sound card).

7. Select **OK** on each screen as you exit the network setup.

8. Restart Windows NT to incorporate the changes.

TCP/IP Protocol

TCP/IP protocol software comes with your Windows NT CD. If you choose to install TCP/IP protocol and related software components, they will be selected from the CD ROM. You may choose to use and install TCP/IP software from another vendor.

TCP/IP protocol requires an IP address, a subnet mask, and gateway addresses. Obtain these from your network or system administrator.

To install TCP/IP protocol:

1. Open the control panel.
2. Select the network icon from the control panel.
3. In the Installed Adapter Cards Box, highlight you installed network card adapter.
4. Select the **Add Software** button.
5. A box will appear containing software protocol choices. Select the protocol you wish to add - TCP/IP.
6. Select **Continue**.
7. Follow the instructions on the Protocol Setup Screen or Installation Options if necessary.
8. Select **Continue** or **OK** as requested.
9. After the protocol has been selected and set up, you may be prompted to insert the Windows CD ROM path or installation diskettes.
10. When you have finished configuring the protocol, select **OK**.
11. Restart Windows NT to incorporate the changes.

IPX Protocol

IPX protocol software comes with your Windows NT CD. If you choose to install IPX protocol and related software components, they will be selected from the CD ROM. You may choose to use and install IPX software from another vendor.

IPX protocol requires an IP address, a subnet mask, and gateway addresses. Obtain these from your network or system administrator. The procedure for installing any type of protocol for Windows NT is the same for all types. Use the same steps described for the TCP/IP protocol installation.

Windows 95

Windows 95 supports all three protocols used by the 3500 Monitoring system. Use the following procedures to install TCP/IP or IPX protocols using the Windows 95 Operating System.

To install network protocols for Windows 95:

1. View the Control Panel folder.
2. Double-click the Network icon.
3. Select the Add... button.
4. Select the Protocol item.
5. Select the Add... button
6. Select the appropriate protocol (as TCP/IP, IPX, etc.)
7. Insert the Win95 CD ROM or requested install diskette.
8. Select OK.
9. Following this installation, you will need to configure the selected protocol. This requires an IP address. Get the address from your network administrator or configure your protocol to obtain network addresses dynamically.

10. Select the Network icon from the Control Panel.

11. Select the install protocol.

12. Select the Properties button.

13. Configure the requested properties.

14. Windows 95 will have to be restarted for these changes to be in effect.

Note: The procedures provided here for adding network protocols, network adapters, and other software are to be used as guidelines for your installation.

There are many different types of networks, and frequent changes to existing operating system software. Because of this, it is always best to consult your network and operating system manuals for the latest information.

X Windows Connectivity

X Window is a standard Graphical User Interface (GUI) used on UNIX systems. In general, a GUI is a mouse- and keyboard-controlled interface with pull-down (drop-down) menus, onscreen buttons, scroll bars, and overlapping windows for running separate applications. An X Window environment is a client-server design that operates well over remote links.

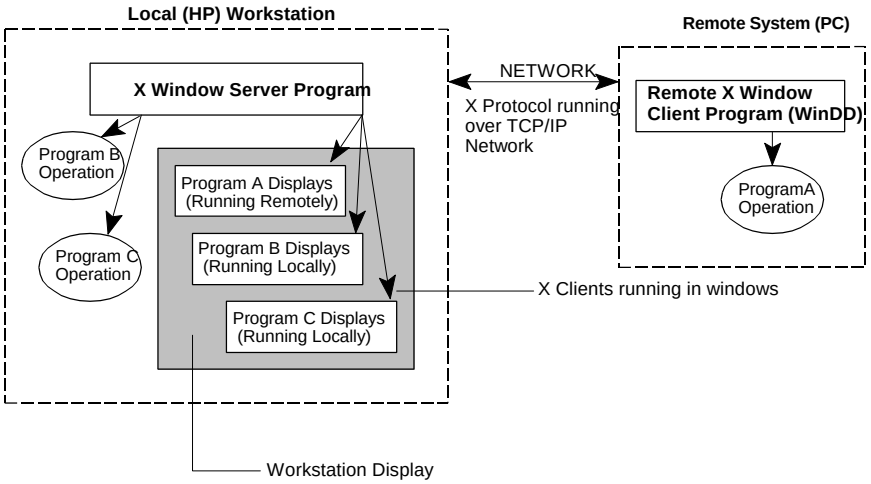
The X Window system runs programs in one or more windows on a bit-mapped screen. Users can run multiple programs at once in each window and switch among windows by clicking them with the mouse.

This section includes

- X Window Environment
- 3500 Operator Display Software in X Windows
- Setting up an X Windows Display for Operator Display Software
  - Installing WinDD on the Operator Display Computer
  - Setting Up Network Communication on the Operator Display Computer
  - Setting Up Network Communications on the Unix Workstation
  - Testing the Communication Between the Operator Display Computer and the Unix Workstation
  - Transferring the Client Program from the Operator Display Computer to theWorkstation
  - Displaying Operator Display Screens on the Unix Workstation

X Window Environment

The following diagram shows the basics of X Window operation:

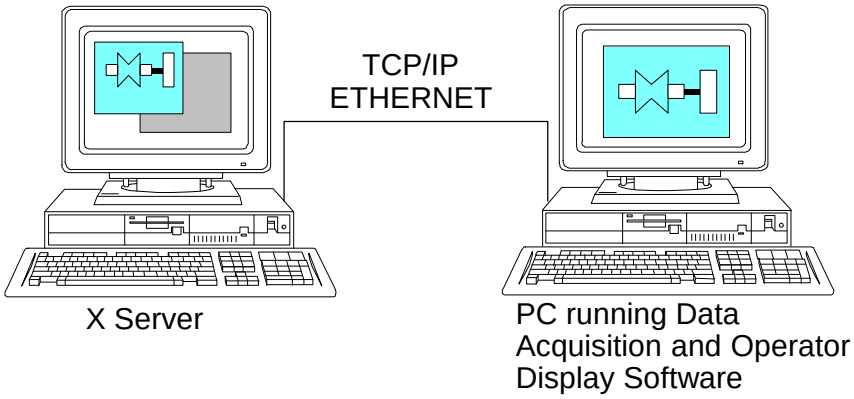


- A program called the X Server runs on the local workstation and manages its own windows and programs.
- Each program window is called an X Client. The window interacts with the X Server program running on the same computer using a client-server relationship.
- The X Server performs all the program operations (processing) for the X Clients, interacting with those clients with a messaging system. X Server controls the entire local workstation environment so that programs cooperate when accessing memory and other system resources.
- The X Server runs the X Windows Manager program that provides GUI interfacing.
- The X Server running on the local workstation can interact with programs running on remote computers and display the output of those programs in a local window. This interaction uses a client-server relationship. The local server has complete control and the remote processes, called clients not servers, are controlled by the local X Server.

3500 Operator Display Software in X Windows

The 3500 Operator Display Software may operate in an X Window environment on a local workstation. The X Window interface between the X Server and client is event-oriented. The system minimizes transmission time by transmitting only the information necessary to update the X Server displays.

Since the 3500 Operator Display and Data Acquisition Software are personal computer (PC) based applications, they do not run directly on an X Windows workstation. However, the displays of these packages may appear on the workstation. The diagram below shows the relationship between the workstation and the PC and shows how the 3500 software uses these platforms.



Setting up an X Windows Display for Operator Display Software

This section shows how to display screens from a single PC running the 3500 Data Acquisition/DDE Server Software and the 3500 Operator Display Software on a workstation computer running a UNIX operating system.

Your own installation may include the single PC operating as a node on a network and running just the Data Acquisition/DDE Server Software with other nodes running the Operator Display Software. There are many possibilities. Each node accessed by the UNIX computer (HP Workstation) must be running

the WinDD Operating System described here.

Bently Nevada Corporation has tested the Tektronix WinDD Operating System for use with X Windows applications. The procedures in this section refer to version 1.01 of this Operating System. If your software has a newer version number, refer to the reference manual delivered with your software for more complete information. Detailed installation steps are also provided with the WinDD CD ROM.

These procedures assume a working knowledge of Windows NT type operating systems, familiarity with client-server relationships, and an understanding of the administration process involved in setting up client-server relationships. Be prepared to spend some time, as much as half a day, with this installation and verify all operations at each step. As with any installation, we recommend that you backup your system before starting this procedure.

To display an Operator Display screen on a Unix workstation:

1. Install WinDD on the Operator Display computer.
2. Set up network communications on the Operator Display Computer.
3. Set up network communications on the Unix workstation.
4. Test the communication between the Operator Display computer and the Unix workstation.
5. Transfer the client program from the Operator Display computer to the workstation.
6. Display Operator Display screens on the Unix workstation.

Installing WinDD on the Operator Display Computer

Install WinDD on the PC you will be using to communicate with the HP Workstation. WinDD replaces the Windows Operating system you are currently using and operates like Windows NT. With WinDD installed, you have all of the Windows capabilities you are familiar with, plus the additional X Windows capabilities.

You may choose to add WinDD as a separate operating system on the PC. You would then select which operating system to use each time you turn the PC on. Your own needs and requirements dictate how you set up the PC.

You will need the following items to install WinDD:

< Setup Boot disks (3).
< WinDD installation CD.
< Base license disk.
< Network card, connectors, and cables for both the PC and the HP worstation.
< IP network address and subnet mask for both machines. Obtain these addresses from your system or network administrator.

To install WinDD on a PC:

1. Power down the PC.
2. Insert the Setup Boot Disk #1 and power up the PC.
3. Respond to the questions as they are asked.
4. Decide whether or not you will load WinDD as a separate operating System or use it to overwrite a currently existing Windows NT operating system. Answer **Update** to overwrite an existing system. Answer **Install** to add a second operating system.
5. Complete the installation by following normal Windows NT setup procedures.

Setting Up Network Communication on the Operator Display Computer

If the PC running Operator Display is part of a network installation, use the procedures for setting up a Windows NT network.

1. Setup your particular network protocols using procedures described in the Network section of this manual. These may include IPX/SPX, TCP/IP, NetBEUI, etc.
2. Setup the TCP/IP protocol to be used with the WinDD connection to the HP Workstation. You will need the IP address and network mask for this step.
3. Set up the FTP Server Service to transfer the necessary files from your WinDD installation disk to the workstation. The FTP is necessary only for this transfer, and you may wish to disable it after the installation process is complete. If it does not interfere with other operations, this service is helpful for file transfers between the PC and HP Workstation.

4. Install the base license disk when requested. Additional licenses can be added anytime after the base license has been installed.
5. Use the User Manager icon and the WinStation Administration icon in the Administration Tools group to setup user accounts for the PC and to configure TCP ports for connections to other WinDD users.

Setting up Network Communications on the Unix Workstation

Skip this section if your workstation already has an IP address and has the TCP/IP protocol setup. In general, UNIX systems will have a networking tool. These instructions use SAM which is available for HP workstations.

1. Setup the IP address and TCP/IP protocol on the Workstation.

Note: The default address for a stand-alone workstation is 127.0.0.1. This address cannot be used with WinDD because of its loop-back features. Another address must be used. Request the IP address from the system or network administrator.

---

2. Log into the HP Workstation as root.
3. Start X Windows if it is not already running.

Note: Be very careful when logged in as root. This log in has unlimited access and you may cause damage to your system.

---

4. Execute SAM by entering

   #sam &

   at the command line. SAM will start in a new window.

5. Select the Networking/Communications-> menu item from the options list.
6. Select Network Interface Cards.
7. Select the network card to configure from the list displayed.
8. Select the Actions menu.
9. Select Configure.
10. Enter the Internet (IP) address and the Subnetwork (subnet) Mask.
11. Select OK and Exit from SAM.

Testing the Communication Between the Operator Display Computer and the Unix Workstation

Test the communication between the PC and the workstation by using the following procedures to ping the network nodes from both stations.

To ping the PC from the Workstation:
From the workstation, type

$ping<address> {address is the IP address of the PC}

If the PC responds to the ping, a display will appear showing the data sent to the PC, the PC address, and the timing information between the two machines.

Note: You can set up an 'alias' for this address so you are not required to remember the IP address. In the /etc/hosts file, add an entry:

	<IP address>	<alias>	#comment
Example:	192.168.101.91	mypc	#my WinDD machine

To ping the Workstation from the PC:
From the PC, open a DOS window. At the C:> prompt, type

ping<address> {address is the IP address of the HP Workstation}

If the ping locates the machine with the address entered, a display will appear showing the data sent to the HP Workstation, the address of the workstation, and information about the timing between the two machines.

Transferring the Client Program from the Operator Display Computer to the Workstation

A client program allows the workstation to access the Operator Display screens running on the PC. This procedure shows how to transfer files using the FTP Server Service that was created in the procedure on page 5.

1. Setup an FTP subdirectory on the PC
2. Copy the file needed from the WinDD CD ROM into this subdirectory. The file name is WINDD.HP and resides in the \eval\<host> directory of the CD ROM. (<host> can be one of several directory names including hp, sgi, sol, or sun.)
3. Execute the transfer from the root of the HP Workstation in order to place the file in the proper location on the HP Workstation.

   #ftp <address of PC>
   login: <name to PC user>
   password:

4. Change to a binary transfer mode:

   #ftp>bin

5. Get the file:

   #ftp>get windd.hp

6. Quit FTP by entering:

   #ftp>bye

7. Place the file in the desired location on the HP Workstation and use the **chmod** command to make it executable:

   #chmod a+x windd.hp

Displaying Operator Display Screens on the Unix Workstations

1. Start WinDD Client by running HP-VUE and double-clicking on the WINDD.HP icon or by typing

   $ windd.hp&

   at the command line.

2. Enter the IP address of the PC you will connect to. You can use the name that you set as an "alias" in the procedure on page 7. The client will now act as a remote terminal to the WinDD PC.
3. From the HP workstation, log on to the client PC by selecting **File** and then **Send CTRL-ALT-DEL** .

Note: HP keyboards do not recognize the CTRL-ALT-DEL keystroke sequence needed to log on to WinDD. Select **File** and send **Send CTRL-ALT-DEL** to send this sequence to the PC.

DDE Communications

This section describes the Dynamic Data Exchange (DDE) feature of the Data Acquisition/DDE Server Software. It includes the following information:

- Data Acquisition/DDE Server Overview
- NetDDE
- Data Acquisition/DDE Server Protocol
  - DDE Requests
  - NetDDE Requests
  - DDE and NetDDE Response
- Sample Systems
  - Quattro Pro DDE Example
  - Quattro Pro NetDDE Example
  - Visual Basic Program Example

Data Acquisition/DDE Server Overview

Dynamic Data Exchange is a method for transferring data between applications. It is used in Windows, Windows for WorkGroups, Windows 95, and Windows NT to provide a dynamic (real-time) exchange of data between two or more applications.

The operation of a library can give you an idea of the server/client relationship used for Dynamic Data Exchange. The library is the server, collecting and managing many types of information (books, magazines, etc.). Everyone has controlled access to this information once they present a library card. They are the clients. By using the resources of the library, each client is able to obtain the particular information they need when they need it.

The Data Acquisition/DDE Server has two functions.

- To continuously gather machinery information from one or more 3500 Monitor Racks and store this information in both internal RAM based repositories and in a more permanent format (Trend) on the Hard Disk.

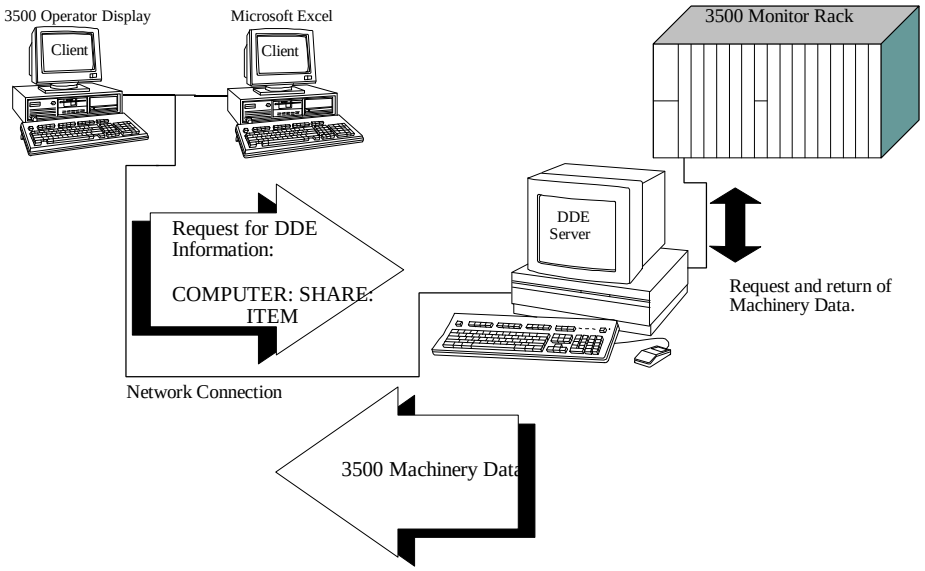
< To service DDE requests from other applications such as 3500 Operator Display Software, 3500 Rack Configuration Software, Microsoft Excel Spreadsheet, and many other DDE aware applications. These type of applications are known as 'clients'.

The connection between the client and server is called a 'link'. Links can be:

< Advise Links (warm links)
  - When a specific data value changes, the client is notified. The client may then request the changed data.
< Hot Links
  - Data is available to the client in real-time. As a data value changes, it is automatically sent to the client.
< Cold Links
  - Data is retrieved by the client only when the client requests it.

When the Data Acquisition/DDE Server software is started, the Windows task list will contain the 3500 Data Acquisition entry.

The Data Acquisition/DDE Server acts as a 'server' of machinery information, making the 3500 machinery monitoring data available to 'clients'. It continuously collects machinery data and provides this data to other applications, such as the Operator Display Software, Microsoft Excel, Quattro Pro, and Visual Basic programs. The figure below shows this client/server architecture.



Clients must request information from the server in a specific form. This form is dependent upon whether the request for information is being made across a network (NetDDE) or on the same computer (DDE).

A network request (NetDDE) from a computer other than the Data Acquisition/DDE Server computer must contain the following information:

< Computer Name
  - Identifies the computer which is running the Data Acquisition/DDE Server application.
< Share Name
  - The name that the 3500 Data Acquisition registered as. This field will always be "CHANNELDATA$".
< Item
  - Identifies the location of the data to be retrieved. Locations are named by rack, slot, and channel; rr/ss/cc.

A request made from an application running on the same computer (DDE) as the Data Acquisition/DDE Server must contain the following information:

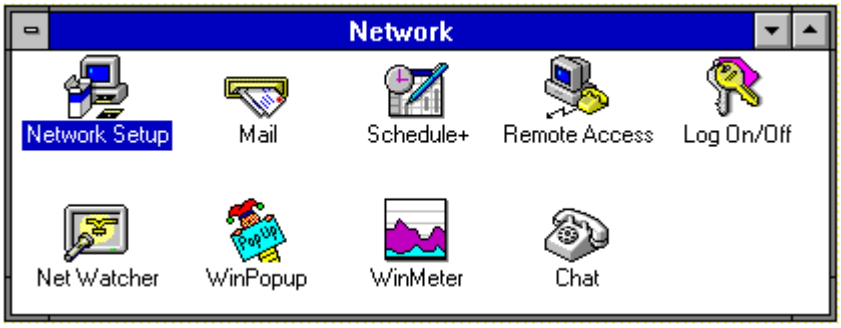
< Service Name
  - Identifies the 3500 Data Acquisition/DDE Server and should always be "SERVER3500".
< Topic
  - Specifies the type of data requested. Currently, static channel data and alarm status may be retrieved from the server. This field should be set to "CHANNELDATA".
< Item
  - Identifies the location of the data to be retrieved. Locations are named by rack, slot, and channel; rr/ss/cc.

The server used in the 3500 Monitoring System is the DDE Server associated with the Data Acquisition Software. This Data Acquisition/DDE Server accesses rack data through a connection to the Rack Interface Modules of the 3500 Monitor racks. The protocol used is one developed by Bently Nevada Corporation.

NetDDE

NetDDE extends DDE capabilities over a network. With NetDDE, applications on two or more workstations (nodes) can share real-time information. To use NetDDE, Windows for WorkGroups, or Windows NT software must be installed and operational on all computers on the network.

Once a Windows application is installed, install and configure the network by selecting the Network Group and the Network Setup icon.



Refer to your Windows Reference Manual for complete network installation instructions.

Date Acquisition/DDE Server Protocol

The Data Acquisition/DDE Server Software is a link to the 3500 Monitor Rack(s) through the RIM. The Operator Display and Rack Configuration Software establish a connection with the NetDDE capabilities when they establish a network connection. Collection of data using these software packages is transparent to the user. No SERVER:TOPIC:ITEM information is required. This is all part of the Operator Display and Rack Configuration Software.

If you want to access the Data Acquisition/DDE Server from other software applications, you will need to know how the server handles machinery data. The following protocol specifies how to retrieve machinery data into Third Party software.

DDE Request:

Service Name: SERVER3500
Topic: CHANNELDATA
Item: Rack Number / Slot Number / Channel Number
Example - [SERVER3500 | CHANNELDATA] "01/02/01"

Net DDE Request:

Computer Name: Name of Computer \ NDDE$
Share Name: CHANNELDATA$
Item: Rack Number / Slot Number / Channel Number
Example - [\\BNCServer \ NDDE$ | CHANNELDATA$] "01/02/01"

DDE and NetDDE Response:
The following fields are contained in every DDE and NetDDE response. The length of the response is dependent upon the number of proportional values (such as direct amplitude, Gap, 1X phase and amplitude, etc.) returned for a specific channel. Refer to the individual Module Operations and Maintenance Manuals for a description of the proportional values returned. Each field is delimited by a user defined character (default is <tab>).

Field1 : Rack# Slot# Ch# NumPPL's
Field2 : Date Time (dd mmm yyy hh:mm:ss)
Field3 : Proportional Value #1 Type
Field4 : Proportional Value #1
Field5 : Units
Field6 : Sub Units
Field7 : Point Status
Field8 - Field12 : Proportional Value #2 / Status
Field13 - Fieldx : Additional Proportional Values / Status...
Last Field : Overall Channel Status

Example: A monitor in Rack number 1, Slot number 2, Channel number 1 is configured as a thrust channel with Direct and Gap proportional values.

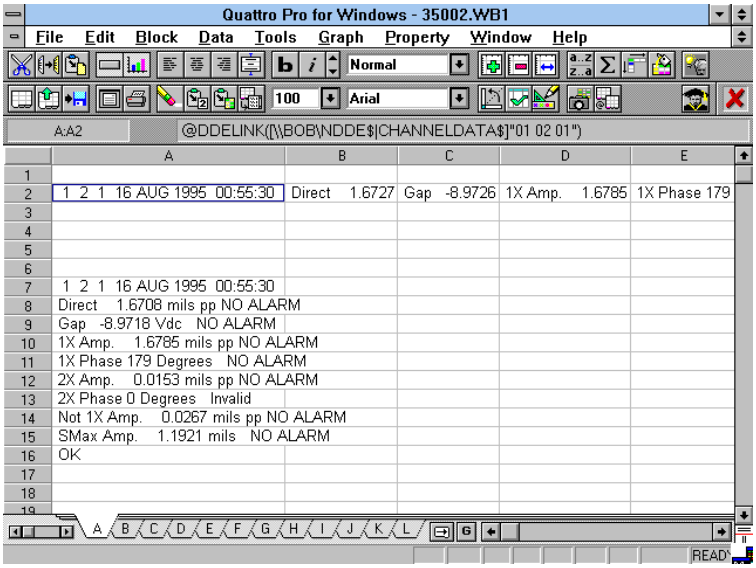
1 2 1 2<tab>23 AUG 1995 14:09:12 <tab>Direct <tab> 1.45<tab> mils<tab>pp<tab>NO ALARM<tab>Gap<tab>-15.8<tab>Volts<tab> <tab>ALERT<tab>ALERT

Note: The delimiter character can be specified in the SRVR3500.ini file. The delimiter character (specified as an ASCII value) is under the heading External DDE Clients :

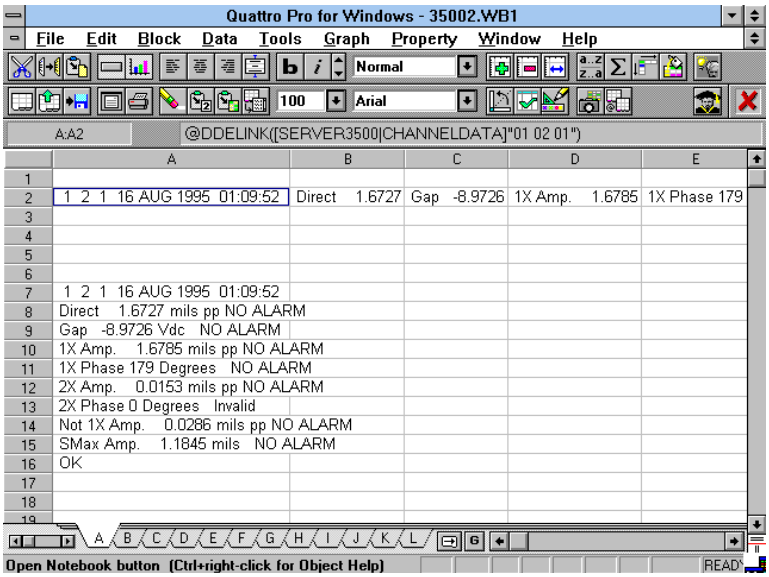
[External DDE Clients]
Delimiter=9

Sample Systems

Quattro Pro DDE Example

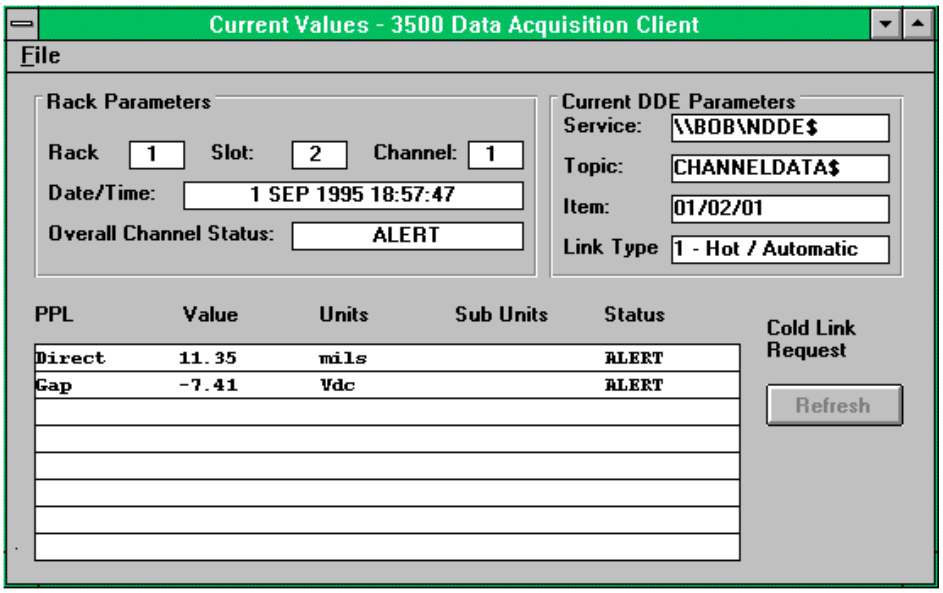


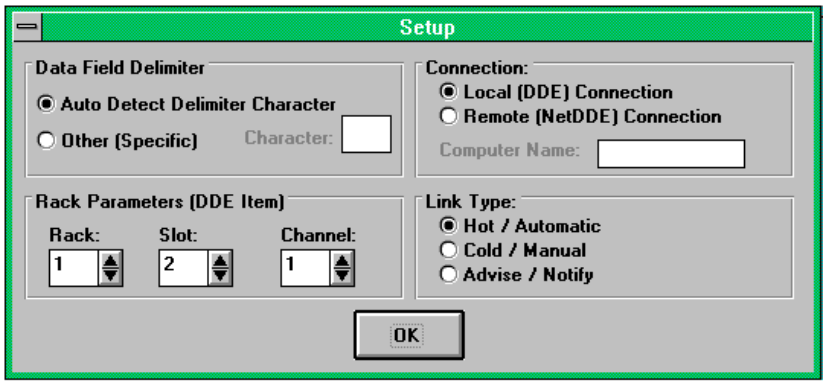
Quattro Pro NetDDE Example



Visual Basic Program Example

The following two diagrams show simple Visual Basic screens which allow the retrieval of machinery data from the 3500 Data Acquisition/ DDE Server and setup of a DDE conversation with this DDE Server. The main Visual Basic subroutines used to provide these displays are also included below the diagrams. The full Source code for these Visual Basic screens is provided with the 3500 Data Acquisition/DDE Server Software in the \3500\DA_DISP\DDE_SMPL directory. These Visual Basic procedures are provided for use only as examples.





```
'*************************************************************
'  Routine: mnuFileInitiate_Click
'
'  Description: This event routine initiates our DDE link.  Upon calling
'       this event routine, the following labels should be defined:
'       lblService - to either SERVER3500 or \\Computer Name\NDDE$
'       lblTopic   - to either CHANNELDATA or CHANNELDATA$
'       lblLink    - contains one of the following lables
'                      "1 - HOT", "2 - WARM",  "3 - COLD"
'
'   Constants:
'      LINK_NONE = 0,  LINK_AUTOMATIC = 1,  LINK_NOTIFY = 2,
'      LINK_MANUAL = 3
'*************************************************************
Sub mnuFileInitiate_Click ()

    ' We may generate a run time error if the server is not running
    On Error GoTo LinkFailed

    lblDDEMsg.LinkMode = LINK_NONE  ' reset our link
    lblDDEMsg.LinkTopic = lblService.Caption & "|" & lblTopic.Caption
    lblDDEMsg.LinkItem = lblItem.Caption
    lblDDEMsg.LinkMode = Left(lblLink, 1)

    'enable Terminate menu Item and disable Initiate menu and Refresh items
    mnuFileTerminate.Enabled = True
    mnuFileInitiate.Enabled = False
    cmdRefresh.Enabled = False

    ' now only allow user to change item
    mnuFileSetup.Caption = "&Change Item..."

    If lblDDEMsg.LinkMode = LINK_MANUAL Then
        ' enable our refresh button
        cmdRefresh.Enabled = True
    End If
    Exit Sub

LinkFailed:
 MsgBox "Link failed, check that the DDE server is running.", MB_OK, "DDE Link"
 Exit Sub

End Sub
```

```
'*************************************************************
' Routine:  lblDDEMsg_Change
'
' Description:  This event routine is called whenever the contents of the
'   label lblDDEMsg changes.  When the label has changed, we've
'   received new data from the 3500 Data Acquisition Server.  We now
'   need to parse this data and display it.
'
'   The idea behind the parse in this routine is to get the field of
'   data, then chop it off from the start of the working string.
'
'PsuedoCode:
' IF valid string
'   Fill Rack label
'   remove Rack number, Slot, Channel and Date/Time
'
'   IF auto detect delimiter character,
'      it follows the number of PPLs
'   END IF
'
'   FOR each PPL
'      init PPL string
'      FOR each PPL data field
'         get data
'         chop off working string
'      NEXT data field
'   NEXT PPL
'   Over all channel status = last field in message
' ELSE
'   invalid string - display it in first PPL label
' END IF
'*************************************************************
Sub lblDDEMsg_Change ()
'   START VARIABLE DECLARATIONS '
Dim i%, j%
Dim numPPLs%
Dim strT$   ' temp working string
Dim strPPL$

'   START CODE SECTION '
    If lblDDEMsg <> "" Then  ' If label is not empty
      If lblDDEMsg Like "#*" Then ' check for valid string (if 1st char is a
      number)
        strT = lblDDEMsg
```

```
        lblRack = Left$(strT, InStr(strT, " "))
        strT = Right$(strT, Len(strT) - InStr(strT, " "))
        lblSlot = Left$(strT, InStr(strT, " "))
        strT = Right$(strT, Len(strT) - InStr(strT, " "))
        lblChan = Left$(strT, InStr(strT, " "))
        strT = Right$(strT, Len(strT) - InStr(strT, " "))

        If bAutoDetectDelimeter Then
           cDelimiter = Mid$(strT, 2, 1) ' assumes 1 digit for Num PPLs
        End If

        numPPLs = Val(Left$(strT, InStr(strT, cDelimiter)))
        strT = Right$(strT, Len(strT) - InStr(strT, cDelimiter))
        lblDate = Left$(strT, InStr(strT, cDelimiter) - 1)
        strT = Right$(strT, Len(strT) - InStr(strT, cDelimiter))

        For i = 0 To numPPLs - 1
           strPPL = ""
           For j = 1 To 5
              strPPL = strPPL & Format$(Left$(strT, InStr(strT,
                       cDelimiter) - 1), "!@@@@@@@@@@@@@")
              strT = Right$(strT, Len(strT) - InStr(strT, cDelimiter))
           Next j
           lblPPL(i) = strPPL
        Next i
        lblChStatus = strT
      Else
        lblPPL(0) = lblDDEMsg
      End If
    End If
End Sub
```

Appendix

The Appendix is included to give you detailed information on topics and 3500 Monitoring System information that are mentioned in this manual. The following are included in this Appendix:

- Glossary
- Modem File Programming Information
- File Structures for 3500 Software
- Machine Train Components
- 3500 Monitoring System Part Numbers
- 3500 System Setup Steps
- Passwords
- 3500 Monitoring System - Problem Report Forms

As with any manual, the information included here is as current as the manual itself. Check the Readme and Help files delivered with your 3500 Monitoring System Software for the most current information available.

Glossary

Acceptance Region

Trend information of the 1X or 2X vibration vectors (amplitude and phase) presented in polar format, or the shaft average centerline position in Cartesian format. The user defines the normal Acceptance Region for each shaft radial vibration or position measurement on the machine, based on historical data for the machine under all normal operating condition. Some systems provide hardware and/or software alarm (Alert and Danger) set point capability. Alarm setpoints are set independently for maximum and minimum values of both amplitude and phase. Acceptance Region information is the most important indicator of a shaft crack.

Active

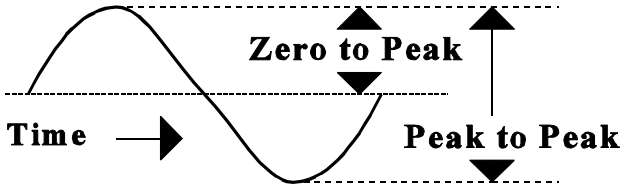
Word describing to the software that a channel, monitor, Keyphasor, rack or train is configured and ready for data collection. Any item declared active has been configured in the Rack Configuration software and the software will expect to collect data from that item. See inactive.

Alarm Event List

Chronological list of alert, danger, NOT OK, and relay tripped events recorded for relay modules in the rack. Each event is tagged with the date and time of the event with the newest events at the top of the list.

Amplitude

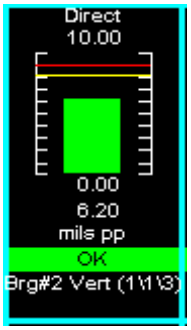
The magnitude of periodic dynamic motion (vibration). Amplitude is typically expressed in terms of signal level, for example, millivolts, or the engineering units of the measured variable, for example, mils, micrometres (for displacement), inches per second (for velocity), etc. The amplitude of a signal can be measured in terms of peak to peak, zero to peak, rms, or average.



Autobaud

The ability of a device to gauge the transmission rate of data being sent from another device. The 3500 Rack Interface modem has this capability.

Bargraph



Presentation of the Operator Display Software showing graphical and numerical current value of machinery channel data, location of setpoints, and meter scales.

Bently Nevada Corporation Supported Modem

Modem specified by Bently Nevada Corporation. 3500 Monitoring System Software is guaranteed to operate correctly when used with Bently Nevada supported modems. If other modems are used, instructions are available for setting the modem to correct parameters for operation, but Bently Nevada cannot support these modems if they do not operate properly. Bently Nevada supported modems for the 3500 monitoring system include Hayes ULTRA 9600, Hayes OPTIMA 9600, and Motorola FasTalk II 19200.

Bulkhead Mount

A 3500 Monitor Rack with I/O modules mounted directly above the front panel modules and facing the same direction. The unit is approximately twice as high as the standard 3500 rack and allows the unit to be mounted flush to a wall or surface.

Bussed I/O

The type of external termination used with Triple Modular Redundant (TMR) 3500 Monitor Racks. A single transducer signal is carried by cable from the external termination block to the I/O Module of a TMR Monitor. This allows a single cable to carry the same transducer signal to three input signals.

Cabinet Mount

A 3500 Monitor Rack with mounting flanges on the front to allow it to be placed and secured in a standard 19" EIA cabinet.

CG
Acronym for Communication Gateway (module).

Channel
A single point on a monitor, Keyphasor, 4 channel relay, or TMR relay module.

Communication Gateway
Hardware module of the 3500 Monitor Rack which collects specified data from monitor, Keyphasor, and 4 channel relay modules and transmits the data to other communication devices using industry standard protocols.

Communication Processor
An interface module used in an on-line monitoring system to communicate data from a monitor rack to the computer. Bently Nevada communication processors used with the 3500 Monitoring System include the DDIX (Dynamic Data Interface External for steady state static and dynamic data), and the TDIX (Transient Data Interface External for steady state and transient static and dynamic data).

Computer Log
A file of system events maintained by the Data Acquisition/DDE Server and Operator Display Software packages. It is a chronological list of computer system events that can be displayed. It includes all events relevant to the specific computer and includes time and date of system initiation, system termination, connection to other computers, loss of communications to one or more racks, and outside access.

Configuration Database
Set of permanently stored parameters describing a specific 3500 Monitoring System. This database contains rack, train, and module parameters used to define the 3500 Monitoring System.

Configuration Parameters
Data values supplied by the user of the 3500 Monitoring System. These values are stored in the configuration database and used by the 3500 software to describe the 3500 system to the hardware and software. Configuration parameters are entered using the 3500 Rack Configuration Software.

Converter
See RS232/RS422 Converter.

CP
Acronym for communication processor.

Data Acquisition / DDE Server Computer
A computer linked directly to one or more 3500 Monitor Racks and actively gathering machinery monitoring data from those racks. A Data Acquisition / DDE Server Computer can be a stand-alone computer, a computer connected to a network, or a remote computer connected via modem.

Data Acquisition Interface Card
An RS232 intelligent asynchronous serial communications board used by the Data Acquisition / DDE Server Software. This card is inserted in the host computer to collect machinery data from the 3500 Monitor Racks. One type of card is supported by Bently Nevada Corporation for these communications - the DigiWare DigiBoard PC/Xe. This card is used for both RS232 and RS422 communications. A separate RS232 to RS422 converter is used for RS422 communications between the interface card in the host computer and the 3500 Monitor Rack.

Data Acquisition / DDE Server Software
One of the three software offerings of the 3500 Monitoring System. This software is necessary for any computer system that will be connected directly to the Rack Interface Module (RIM) of one or more 3500 Monitor Racks to collect machinery monitoring data. This software has the ability to collect machinery data and store trend data. It does not display any of the collected machinery data.

Database Files
See Configuration Database.

Data Points
The term used to describe 3500 monitor, Keyphasor or 4 channel relay channels after they have been assigned to a machine train. Within the 3500 Monitoring System Software, channels are often referred to as points and vice versa.

DDE

Acronym for Dynamic Data Exchange. This is the base protocol supported by the Data Acquisition/DDE Server Software for providing machinery data to other software applications.

DDIX

Acronym for Dynamic Data Interface External.

Direct Connection

Type of communications used between a single computer and the first 3500 Monitor Rack in a series of racks. A direct connection is by RS232 or RS422 cabling from the host computer to the 3500 rack.

Dynamic Data

Data (steady state and-or transient) which contains that part of the transducer signal representing the vibration characteristics of the measured variable. Typical dynamic data presentations include orbit, timebase, frequency spectrum, polar, Bode, cascade, and waterfall. From this data it is possible to derive static data such as amplitude, frequency, filtered amplitude, and phase lag angle from the signal. See Steady State Dynamic Data and Transient Dynamic Data.

Dynamic Data Exchange

See DDE. DDE and NetDDE allow machinery data collected by a 'server' to be made available to 'clients' for use in their software applications.

Dynamic Data Interface

A communication processor that allows a DDM2/TDM2 host computer to obtain static data, monitor status, and steady state dynamic data from the transducer outputs of a 3500 Monitor Rack.

Dynamic Data Interface External

A communication processor that may be connected to a 3500 Monitor Rack to collect steady state static and dynamic data for use in a DDM2/TDM2 system installation.

Ethernet

A protocol standard for a network structure. Using this standard, several computers can be linked by different cable configurations and access each other's information. This is the network protocol used by 3500 Monitoring System Software.

External Termination

A feature of the monitor, and Keyphasor I/O modules that allows them to be cabled directly to an external termination module. Transducer signals are received at the external termination module and transmitted via cable to the monitor and Keyphasor I/O modules. This reduces crowding of signal wiring directly into the back of the I/O modules at the rack.

External Termination Module

The hardware units that receive the transducer signals and allow them to be transmitted by cable to the I/O modules at the 3500 Monitor Rack. External termination modules are available for each monitor and Keyphasor module.

Fiber Optic

A network structure that allows operation over long distances, and in high electrical noise environments. The network uses special fiber optic cable and components, and may be combined with Thicknet or ThinNet cable structures within the same network.

Frequency Component

Each dynamic signal contains amplitude, frequency and phase characteristics. 3500 Data Acquisition software collects 1X and 2X frequency components of dynamic data.

Gap

See Probe Gap.

Host Computer

The personal computer used to configure, collect, access, store and-or display machinery monitoring values of the 3500 Monitoring System.

Hysteresis

The difference in levels (dead band) between the trigger threshold and the reset

designed to reduce false triggering of a Keyphasor. Hysteresis is set in the hardware of all Keyphasor modules by the Rack Configuration Software.

Inactive

The status of a device (as a monitor, channel, rack, or train) to the 3500 Monitoring System Software. An inactive device is one that was configured to not provide data. All spare channels should be configured as inactive.

Internal Termination

A type of I/O module used for Keyphasors, monitors, and 4 channel relays, where the transducer signals are wired directly into the I/O modules.

I/O

Abbreviation for Input/Output.

I/O Module

Hardware components connected to the 3500 Monitor Rack to accept transducer input signals, and to transmit information from the 3500 Monitor Rack. Each front panel module of the rack has a corresponding I/O module attached to the back of the rack. Bulkhead racks have I/O modules mounted directly above the front panel modules.

Keyphasor

Transducer which produces a once-per-shaft-revolution voltage pulse, called the Keyphasor signal. This signal is used primarily to measure shaft rotative speed and as a reference for measuring vibration phase lag angle. It is extremely useful as a quick reference between shaft rotative speed and vibration frequency, and is an essential element in measuring rotor slow roll bow or runout information. The Keyphasor transducer is typically a proximity probe (recommended for permanent installations) in which the probe observes a physical gap change event.

Mapping

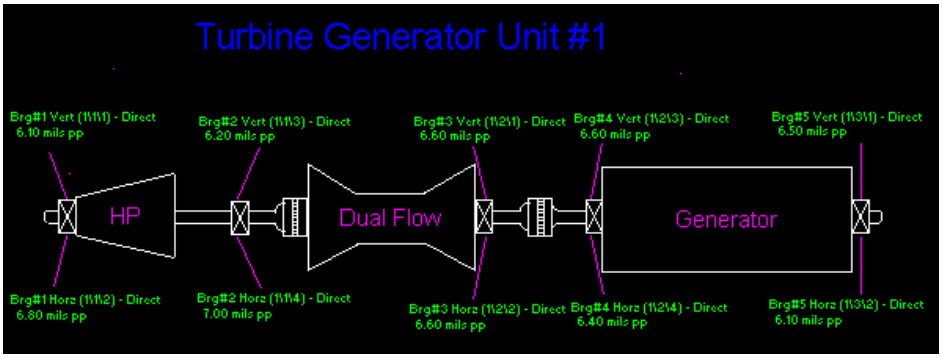
The process of assigning transducer and relay channels to trains within the 3500 Monitoring System Software. Before a Machine Train can be defined, points configured for each rack must be selected and attached (mapped) to the Machine Train they will be monitoring.

Machine Train

A collection of monitor channels, Keyphasor channels, and 4 channel relay channels which define a group of points usually representing a complete or partial machine.

Machine Train Diagram

A graphical representation of complete or partial machine train or machine train unit. Used in the 3500 Monitoring System Operator Display Software to show representation of trains and current values of transducers located on the train.



Micrometre

A unit of length or displacement equal to 10^{-6} metres.

Mil

A unit of length or displacement equal to 0.001 inch or 25.4 micrometres.

Modbus

Industry standard communication protocol. Modbus is a registered trademark of Modicom Corporation.

Modem

A hardware device that allows communications between computers or a computer and 3500 Monitor Rack over standard telephone lines. See Bently Nevada Corporation Supported Modem.

Module
The hardware component inserted into the front of a 3500 Monitor Rack (4 channel relay, monitor, Keyphasor, communication gateway, and rack interface). Also describes the I/O components inserted into the rack (Data Manager I/O, 4 channel relay I/O, communication gateway I/O, etc.).

Monitor
Hardware device used to accept transducer signals. The 3500 Monitoring System uses several types of monitor modules capable of accepting multiple transducer inputs.

Monitor Part Number
An extended number that describes a Bently Nevada Monitor Module by type, termination options, and approval options. Monitor modules are ordered by part numbers as specified in the Bently Nevada Data Sheets and catalogue.

Network
A method of connecting several computers together to share information and resources. 3500 Monitoring System Software will operate over Ethernet type networks.

Node
Any computer on a network.

Not 1X
In a complex vibration signal, notation for unfiltered peak to peak signal components having frequencies equal to overall frequency minus the frequency at shaft rotative speed.

Operator Display Software
Software product of the 3500 Monitoring System that lets you present trends, current values, Machine Train Diagrams and bargraphs of machinery monitoring data on a computer screen. This software is either used on a computer that is actively collecting machinery monitoring data using the Data Acquisition/ DDE Server Software, or is connected by direct cable, modem, or network to a computer using the Data Acquisition / DDE Server Software.

Panel Mount
A 3500 Monitor Rack with 'squeeze' clamps on either side that allow it to be installed in an operator panel.

Passwords
User selected names or character combinations that have to be input to allow access to certain features and functions of the 3500 Monitoring System software.

Peak to Peak (PP), Peak to Peak Value
The difference between positive and negative extreme values of an electronic signal or dynamic motion. See Amplitude.

Phase Angle (Phase Lag Angle)
The timing relationship, in degrees, between two vibration signals, or a Keyphasor pulse and a vibration signal; also, the phase difference between two signals such as the input force signal and output response signal. The 'lag' corresponds to 'minus' in mathematical formulations.

Point
A channel in a 3500 monitor, Keyphasor, or relay module that has been mapped to a Machine Train. See also Data Points.

PP
Units used for peak to peak measurement.

Probe
Specifically, a proximity probe transducer, although sometimes used to describe any transducer.

Probe Gap
The physical distance between the face of a proximity probe tip and the observed surface. The distance can be expressed in terms of displacement (mils, micrometres) or in terms of voltage (millivolts). Standard polarity convention dictates that a decreasing gap results in an increasing (less negative) output signal.

Proportional Values

3500 Monitors (and their associated transducer systems) can read various types of data including; direct vibration amplitude, probe gap, and other vibration amplitude and phase information. Proportional values are the data or signals which represent the original transducer signal. These proportional values are used by computer software programs to relate what is occurring at the monitor with what is shown on a computer screen.

Proximitor

A Bently Nevada signal conditioning device which sends a radio frequency signal to an eddy current proximity probe, demodulates the probe output, and provides output signals proportional to both the average and dynamic probe gap distances. Also called an oscillator-demodulator. Proximitor is a Bently Nevada registered trademark.

Proximity Probe

A noncontacting device which measures the displacement motion and position of an observed surface relative to the probe mounting location. Typically, proximity probes used for rotating machinery measurements operate on the eddy current principle and measure shaft displacement motion and position relative to the machine bearing(s) or housing.

Rack

Hardware enclosure for modules of the 3500 Monitoring System. May take three forms: panel mounting, cabinet mounting, or bulkhead mounting.

Rack Configuration Software

Software product of the 3500 Monitoring System that sets the parameters for the modules in a 3500 Monitor Rack, uploads these parameters to the rack, downloads configuration data from a rack, and allows storing of rack configurations to computer hard disks. This software is the main link for specifying the operating characteristics of any 3500 Monitor Rack.

Rack Interface Module (RIM)

Hardware unit of the 3500 Monitor Rack that controls the major functions of the rack. Each 3500 Monitor Rack must have either a standard RIM or TMR RIM in slot 1 and a corresponding RIM I/O module attached to the back of the rack. The RIM provides the port or modem interface for connection to other

3500 Monitor racks or to a host.

RAS

Acronym for Remote Access Service.

Remote Connection

Type of communications between a host computer and a 3500 Monitor Rack. Remote connections use modems at the host computer and the 3500 rack to transmit and receive information over standard phone lines.

Remote Access Service

Provides a method for a remote workstation or mobile user to dial into a network and access the resources of that network. The link is typically via dialup lines using modems, so transmission speeds do not provide users with the same performance they would get if directly attached to the network. Remote access software treats the remote computer like a dumb terminal and performs all computing tasks at the local area network site. A dedicated computer is needed to service the needs of each dial-in user.

RIM

Acronym for Rack Interface Module.

RS232/RS422 Converter

Hardware device used to change an RS232 signal to an RS422 signal. Used to allow host to 3500 Monitor Rack communications over longer distances and at higher transmission rates. Used in conjunction with DigiBoard Data Interface card.

Scale Factor

The change output per change in input (sensitivity) of a transducer. Also, the factor by which a signal must be increased or decreased to meet the input requirements of an instrument.

Server

A Data Acquisition/DDE Server Computer that supplies data to computers running Operator Display Software, WinDD, or NetDDE.

Simplex Rack

See Standard Rack.

Standard Rack

A 3500 Monitor Rack with single signal paths from the transducer to the monitor I/O modules.

Static Data

Data which describes the quantitative characteristics of the measured parameter. Static data can also include quantitative values describing the conditions under which the parameter was measured. For predictive maintenance purposes, static data is typically presented in various forms of trend graphs and displays or lists of current values. Examples of static data include vibration amplitude, phase lag angle, frequency, average shaft position, shaft rotative speed, time, date, monitor alarm and OK status.

Steady State Data

Data (static or dynamic) acquired from a machine which is on-line, under (relatively) constant operating conditions (shaft rotative speed, load, etc.).

Steady State Dynamic Data

Dynamic data acquired under steady state machine conditions. Typical data presentations include orbit, timebase, and frequency spectrum. Can be instantaneously trended.

Steady State Static Data

Static data acquired under steady state machine conditions. Example: shaft centerline position.

TCP/IP

Transmission Control Protocol/Internet Protocol. A network protocol which allows data to be transmitted between devices.

TMR

Acronym for Triple Modular Redundant.

TMR Rack

A 3500 Monitor Rack with three monitors for each transducer signal, dual power supplies, and three relay paths for monitor signals.

ThickNet (Thicknet)

Cable type for network structure. Refers to a network whose nodes are not directly connected to the main network cable, but are attached using a transceiver and transceiver cable.

ThinNet

Cable type for network structures. Refers to a network whose stations are linked directly in the main network cable using BNC 'T' connectors.

Threshold

The level where a trigger or other function is initiated.

Train

A machine train or portion of a machine train. A group of points or channels describing a monitored unit.

Train Diagram

See Machine Train Diagram.

Transducer

A device for translating the magnitude of one quantity into another quantity. The second quantity often has units of measure different from the first and serves as the source of a useful signal. Vibration transducers convert mechanical motion into a proportional electronic signal (typically a voltage-proportional signal).

Transient Data

Data (static or dynamic) acquired under changing machine conditions (startup and coastdown).

Trend Data

The periodic recording and-or storage of static and-or dynamic data for the purpose of observing changes as a function of time. Trend data is the most fundamental level of information in any predictive maintenance program.

Trend Interval

The time period between consecutive data points on a trend display or plot.

Triple Modular Redundant

Transducer signal paths that are partially or completely triplicated to reduce the possibility of faults. In a Triple Modular Redundant installation, two of the three signals must agree for a condition to occur.

1X

In a complex vibration signal, notation for the signal component that occurs at the rotative speed frequency. Also called synchronous.

2X

In a complex vibration signal, notation for a signal component having a frequency equal to two times shaft rotative speed.

Zero to Peak

One-half of the peak to peak value. See Amplitude.

Modem File Programming Information

The Rack Configuration Software supports a number of popular modems. To customize your configuration software to work with these and other modems, a modem setup file has been provided in the \3500 directory called HOSTMDM.DAT.

The modem setup file contains programming information for all supported modems and allows one additional custom configuration. This file is a simple ASCII text file that can be inspected or modified with any DOS or Windows text editor. The following entries are provided in the modem setup file:

Setup Entry	Use...
Hayes Ultra 9600	For Hayes Ultra 9600 modem using V.32 protocol.
Hayes Optima 9600	For Hayes Optima 9600 using the V.32 protocol.
Motorola FasTalk II 19200	Select the Motorola FasTalk II modem using the V.32 protocol.
Custom	For support of other types of modems. The entry supplied is a copy of the Hayes Ultra 9600 modem setup.

To support other modems, use the Custom modem type. To do this, you should edit the Custom entry as required and select **Custom** for modem type on the Setup screen. Be aware that modems are highly nonstandard; getting a new modem to communicate correctly will require an intimate understanding of how to operate and program the custom modem.

The modem setup file consists of an "entry" name followed by 6 modem command fields. These fields contain modem setup and control information, including modem initialization strings. Use these guidelines when editing the fields.

- The maximum length of a line is 80 ASCII characters. Consult your modem manual to determine the maximum initialization string length.
- The commands must be in the same order as listed in the following table.
- Fields that are not needed should be left blank, but not deleted.
- Lines cannot be added or their position changed.

Custom Modem Line Definitions

Modem File Entry	Line Definition
1	Reset to factory default string.
2	Initialization string 1
3	Initialization string 2*
4	Dial Method (Touch Tone or Pulse). Pulse is also referred to as rotary.
5	Connect string. This is the text returned from the modem when a connection is made.
6	Number of seconds to wait for an answer.*

* Null if not needed.

Some experimenting may be required to obtain the modem settings that give the best results. Since the modem to modem connection baud rate is determined by the modem, it is usually necessary to enable hardware flow control (RTS/CTS).

Many modems will automatically default to data compression. These features can cause large "dead times" in commands and responses from the Personal Computer and the 3500 Monitor Rack. The 3500 rack looks for a specific amount of dead time in a command to signify the end of a message. To ensure that the rack correctly services commands sent from the Personal Computer, you should either set the "Byte Time Out" field in the Rack Interface Module's configuration to a large value OR set up the modem to not utilize these features.

File Structures

3500 Monitoring System Software creates the following directories and files in the hard disk of the computer. Refer to the following information to verify your files and directory structures. You may also use this information to remove software applications. C: is assumed to be the hard disk designation.

Different software can share the same files. Before removing files, check the other software applications to verify they are not used in another software application.

3500 Data Acquisition/DDE Server Software

Directory: \3500\DA_DISP
Files:
SRVR3500.EXE
COMMSRVR.EXE
SRVR3500.INI
COMP.DEF
TRENDINT.DAT

Directory: \3500\DA_DISP\SETUP
Files:
DEFAULT.DAS

Directory: \3500\WORKING\CRGCHNG

Directory: \3500\TRAINS

Directory: \3500\TRAINS\PRIMCFG

Directory: \3500\DLL
Files:
BNCCOMM.DLL
BNCSPLSH.DLL
SHAREWFW.DLL
SHARENT.DLL
SHARE32.DLL

Directory: \WINDOWS\SYSTEM (Windows 3.1 and Windows for WorkGroups only)
Files: CTL3DV2.DLL
THREED.VBX
SPIN.VBX

Directory: 3500\DA_DISP\DDE_SMPL
Files: CHANDDE.EXE
FORMMAIN.FRM
FRMSETUP.FRM
CHANDDE.MAK
README.TXT

Directory: \3500\TREND

Directory: \WINNT\SYSTEM (Windows NT only)
Files: CTL3DV2.DLL

Directory: \3500\LOG
Files: COMPUTER.LOG

Operator Display Software

Directory: \3500\DA_DISP
Files: OPERDISP.EXE
OPERDIS2.EXE
3500HELP.HLP
LAUNCH.EXE
EDITTRN.EXE
EDITCOMP.EXE
COMP.DEF
TRENDINT.DAT
OPERDISP.INI
OPERDIS2.INI
EDITTRN.INI
EDITCOMP.INI

Directory: 3500\DA_DISP\CFG

Directory: 3500\DA_DISP\CFG2

Directory: \3500\DA_DISP\LISTS

Directory: \3500\LOG
Files: COMPUTER.LOG

Directory: \3500\DLL
Files: TREND.DLL
COMMON.DLL
BNCSPLSH.DLL
BIDS45.DLL
OWL250.DLL
BC450RTL.DLL
BWCC.DLL

Directory: \3500\TRAINS

Directory: \3500\TRAINS\PRIMCFG
Files:

Directory: \WINDOWS\SYSTEM (Windows 3.1 and Windows for WorkGroups only)

Directory: \WINNT\SYSTEM (Windows NT only)
Files: CTL3DV2.DLL

Directory: \PRESENT.6
Files: IAUTHOR.INI
IAUTHOR.PTH
PRESENT.EXE
IAPRTSHR.EXE
*.DRV
*.DLL

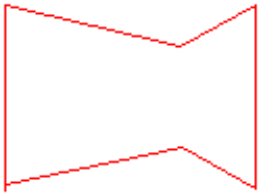
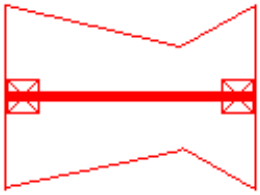
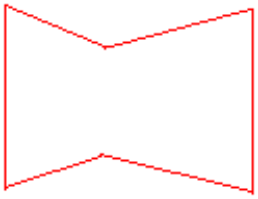
Directory: \PRESENT.6\2500MS
Files 2500MS6.EXE
ODICON.ICO

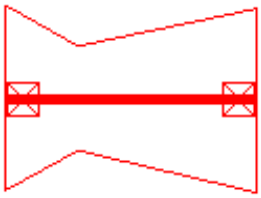
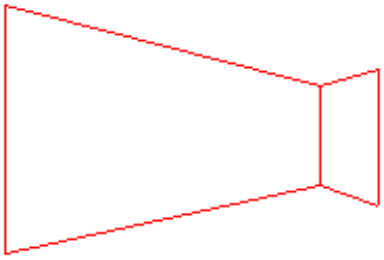
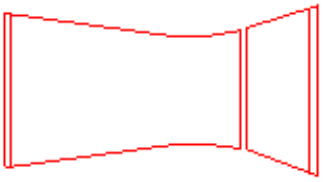
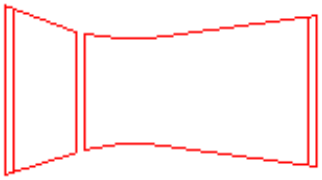
Directory:	\PRESENT.6\\2500MS\ANIMATE
Files:	*.ANI
Directory:	\PRESENT.62500MS\GRAPHICS
Files:	*.BMP
	*.PCX
Directory:	\PRESENT.6\2500MS\ICONWARE
Files:	*.IW
	*.IWM
	*.IAM
Directory:	\PRESENT.6\2500MS\TEXT
Files:	*.SMT

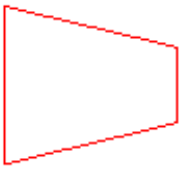
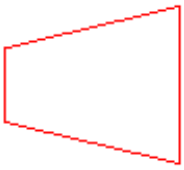
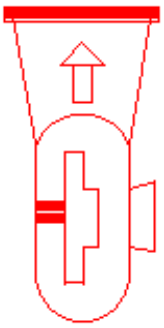
Machine Train Components

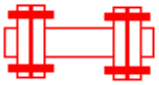
The following Machine Train components have been provided for you. Use the Edit Component Utility to change, add, or delete components. All components are permanently stored in the COMP.DEF file stored on the hard disk of the Data Acquisition/DDE Server computer.

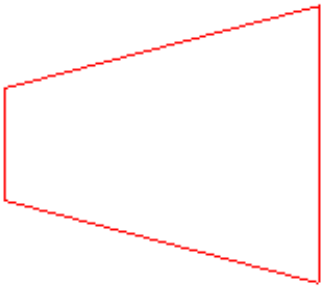
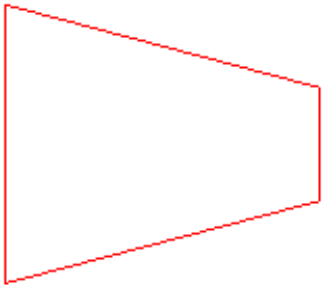
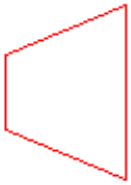
Machine Train Components (file COMP.DEF)

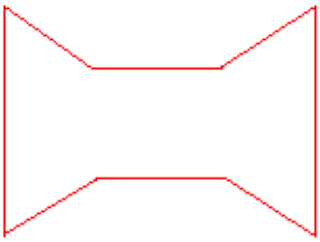
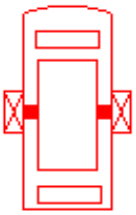
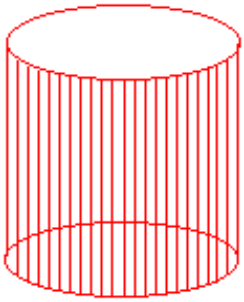
Component	Description
	Exciter
	Electric Motor
	Gas Turbine [Single Shaft] L-R Flow
	Gas Turbine [Single Shaft] Internal Bearing LR
	Gas Turbine [Single Shaft] R-L Flow

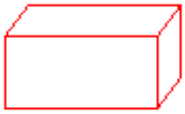
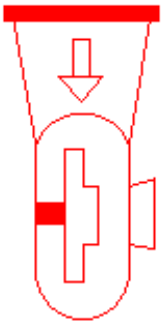
Component	Description
	Gas Turbine [Single Shaft] Internal Bearing RL
	Gas Turbine [Single Shaft] Many Stage Gas Turbine
	Gas Turbine [Double Shaft] L-R Flow
	Gas Turbine [Double Shaft] R-L Flow
	Bearing Thrust
	Bearing Rolling Element

Component	Description
	Bearing Fluid Film
	Bearing Radial
	Compressors Compressor - LR
	Compressors Compressor - RL
	Compressors Single Stage Overhung Compressor
	Pedestal

Component	Description
	Coupling Rigid Coupling
	Coupling Gear Coupling
	Shaft Short Shaft
	Shaft Medium Shaft
	Shaft Long Shaft
	Shaft Extra Long Shaft
	Shaft Left End Shaft
	Shaft Right End Shaft
	Shaft Right Flange
	Shaft Left Flange
	Generator Small Generator

Component	Description
	Generator Large Generator
	Steam Turbine Large Steam Turbine - LR
	Steam Turbine Large Steam Turbine - RL
	Steam Turbine Small Steam Turbine - LR
	Steam Turbine Small Steam Turbine - RL

Component	Description
	Steam Turbine Dual LP Turbine
	Gear Box Standard Gear Box
	Gear Box Plant Air Comp. Gear Box
	Tanks Large Cylindrical Tank
	Tanks Small Cylindrical Tank

Component	Description
	Tanks Large Rectangular Tank
	Tanks Small Rectangular Tank
	Expander

3500 System Setup Steps

The following procedures describe the steps you should take to install your 3500 Monitoring System. It is provided to give you a perspective of the tasks needed to install this system.

1. Unpack and check each item as described in the 3500 Monitoring System Rack Installation and Operation Manual .

2. Set the switches and jumpers on the 3500 Monitor Rack
   .. Set rack address switches on RIM
   .. Set transducer jumpers on monitor I/O modules
   .. Set Normally Energized/Normally De-Energized switches on 4 Channel Relay I/O Modules
   .. Set RS232/RS422 switch on RIM I/O module (depending on the type of communications used between the host and 3500 Monitor Rack)
   .. Set Standard/TMR switch on 3500 rack backplane (behind RIM module)

3. Field Wire Racks (Internal / External terminations).
   .. Monitor signal Inputs
   .. Keyphasor signals
   .. Relay outputs to annunciators and other devices
   .. Power supplies
   .. OK relay RIM I/O Module (Rack OK)
   .. System contacts (Trip Multiply, Inhibit, reset, etc.) on RIM I/O

4. Verify host computer hardware and software.
   .. Minimum
      .. 386\20 processor with 80387 math coprocessor
      .. 8 Megabytes RAM
      .. 3.5 inch high density floppy diskette drive
      .. 35 Megabyte hard disk drive (depends on software you are using)
      .. VGA
      .. MSDOS 6.0+
      .. Windows 3.1+, Windows for WorkGroups or Windows NT
      .. Serial COMM Port, or DigiBoard RS232 or RS422 port

5. Install Rack Configuration Software on host.
   .. RS232 direct connect to RIM
   .. RS232 direct connect to RIM I/O module
   .. RS422 direct connect to RIM I/O module
   .. Internal or external modem connection to RIM or RIM I/O module

6. Run RIM Host Port Test Utility.
   .. **SETUP** connection, baud rate, address
   .. Verify connection between host and 3500 Monitor Rack
      .. Communication with RIM only; rack does not have to be configured

7. Configure 3500 Monitor Rack using Rack Configuration Software.
   .. Optional upload of default configuration from 3500 Monitor Rack
      .. Select **CONNECT** screen
      .. **UPLOAD** default parameters
      .. Make changes
      .. **SAVE** and **DOWNLOAD** to 3500 Monitor Rack

8. Use Rack Configuration Software to adjust 4 channel monitor modules.
   .. Select **OPTIONS** for channel pairs
      .. Adjust zero position
      .. Adjust transducer scale factors
   .. Only necessary for initial installation of 3500 Monitor Rack

9. **DOWNLOAD** configurations to racks.
   .. Only if changes were made during step 8.

10. Backup configurations.
    .. Use **SAVE** or **SAVE AS** to store rack configurations to hard or floppy disk

11. Verify 3500 Monitor Racks using procedures described in the 3500 operating and maintenance manuals.

12. Establish permanent Data Acquisition/DDE Server connection to 3500 Monitor Racks.
    .. Requires host computer with DigiBoard RS232/RS422 card installed

13. Verify Data Acquisition/DDE Server connection using RIM Host Port Test Utility.

14. If using communication gateway modules, verify operation of port using Comm. Gateway Port Test Utility.

15. Field cable racks.
    .. Connect external communication processors to Data Manager I/O module
    .. Connect RS422 cabling between 3500 Monitor Racks
    .. Connect communication gateway cabling between racks

16. Install Data Acquisition/DDE Server on host computer.
    .. At Program Manager Screen
        .. **File**, **Run**, A:\SETUP <enter>

17. Run Software Configuration Utility.
    .. Map configured points to Machine Trains
    .. Build Machine Train Diagrams
    .. Build custom Machine Train components (if necessary) using Edit Component Utility

18. Configure Data Acquisition/DDE Server parameters
    .. **Baud Rate**
    .. **Connection Type**
    .. **COMM** port number
    .. **Trend Interval** and **Number of Samples**
    .. **Password**
    .. **Rack Addresses** and **Passwords**

19. Initiate Data Acquisition/DDE Server Software

20. Verify Data Acquisition/DDE Server software operation
    .. Check System Event list
    .. Check Computer Log

21. Install Operator Display Software
    .. At Program Manager Screen
        .. **File**, **Run**, A:\SETUP <enter>

22. Verify operation of Operator Display Software.
    .. Check group and group icons installed by software
    .. Check computer log

23. Run Operator Display Software and verify data collection and display
    .. Check Machine Train Diagrams
    .. Check current values and bargraphs
    .. Check system and alarm lists

3500 Monitoring System Part Numbers

These part numbers are provided to help you determine your needs for installing, ordering, or upgrading a 3500 System. This is not a complete list. As the system grows, new numbers will be added. Please contact your local Bently Nevada Corporation Sales or Service Representative for additional information.

Cables

Cable part numbers that contain 'XXX' have additional parameters that must be specified when ordering the cable. Cable part numbers without 'XXX' extensions are available in 10 ft (3 m) lengths only.

EXAMPLE: 129665-XXXX-YY-ZZ

XXXX represents the cable length. Valid lengths are: 10 ft (3 m), 25 ft (7.6 m), 50 ft (15.2 m), 100 ft (30.5 m), 250 ft (76 m), 500 ft (152.5 m). Not all lengths are available for all cables.

YY represents assembled (02) or unassembled (01).

ZZ represents the type of insulation used in the cable. (01) is PVC insulation and (02) is Teflon insulation.

130118-XXXX-YY	Host to 3500 Rack RS232 Interface Cable
132632-XXXX-YY	Host Computer to 3500 Rack Cable - RS422-PVC
132633-XXXX-YY	Host Computer to 3500 Rack Cable - RS422-Teflon
02290860	Host to External Modem Cable - RS232
130119-01	Host Computer to RS232/422 Converter Cable
130120-XXXX-XX-XX	RS232/422 Converter to 3500 Rack Cable -

	RS422 with PVC insulation
131106-XXXX-YY	RS232/RS422 Converter to 3500 Rack Cable - RS422 with Teflon insulation
130121-YY-ZZ	RS422 Extension Cable
130122-XXXX-YY	3500 Rack to 3500 Rack Cable - RS422 with PVC insulation
131107-XXXX-YY	3500 Rack to 3500 Rack Cable - RS422 with Teflon insulation
129386-01	Static Data Cable - 3500 Rack to TDIX
129387-01	Static Data Cable - 3500 Rack to DDIX
02290160	Dynamic Data Cable - 3500 Rack to TDIX/DDIX
129525-XXXX-YY	3500 Transducer Signal to External Termination Block Cable
129529-XXXX-YY	3500 Rack Recorder Output to External Termination Block Cable
129530-XXXX-YY	3500 Rack Keyphasor Signal to External Termination Block Cable
129665-XXXX-YY	Communication Gateway (3300/90) to Communication Gateway Cable - RS422 with PVC insulation
131108-XXXX-YY	Communication Gateway (3300/90) to Communication Gateway Cable - RS422 with Teflon insulation
130419-XXXX-YY	Host Computer to Communication Gateway Cable - RS232

130420-XXXX-YY	Honeywell PLCG to Communication Gateway Cable - RS232
130530-XXXX-YY	RS232/RS422 Converter to Communication Gateway Cable - RS422 with PVC insulation
131109-XXXX-YY	RS232/RS422 Converter to Communication Gateway Cable - RS422 with Teflon insulation
130531-YY-ZZ	RS422 Extension Cable for Communication Gateway

Software

Three software packages are available for the 3500 Monitoring System. Each host computer must have its own software.

All software is shipped on 3.5 inch, high density floppy diskettes.

3500/01 - AA	
AA = 01 *	Rack Configuration Software
AA = 02	Rack Configuration Software Update Only
3500/02 - AA	
AA = 01	Data Acquisition / DDE Server Software
AA = 02	Data Acquisition / DDE Server Software Update Only
3500/03 - AA	
AA = 01 **	Operator Display Software
AA = 02	Operator Display Software Update Only

* The 01 option includes the Rack Configuration and Utilities Guide (part number 129777-01).

** The 01 option includes the Computer Hardware and Software Manual (part number 128158-01).

Monitor Modules

Monitor modules have two different options. The first option (AA) selects the type of I/O modules to be used. The second option (BB) selects the type of agency approvals necessary.

AA = 01	Discrete I/O Module with Int. Term.
AA = 02	Discrete I/O Module with Ext. Term.
AA = 03	Bussed I/O Module with Ext. Term.
AA = 04	Internal Barriers
BB = 00	No Approvals Required
BB = 01	CSA/NRTL/C
BB = 02	BASEEFA

3500/40-AA-BB	Proximitor Monitor (No Bussed I/O Module)
3500/42-AA-BB	Proximitor/Seismic Monitor
3500/44-AA-BB	Aeroderivative GT Vibration Monitor

Other Front Panel Modules

3500/15-AA-BB-CC Power Supply

AA = 01	Low Voltage AC Power Supply - Top
AA = 02	High Voltage AC Power Supply - Top
AA = 03	High Voltage DC Power Supply - Top
BB = 00	No Power Supply - Bottom
BB = 01	Low Voltage AC - Bottom
BB = 02	High Voltage AC - Bottom
BB = 03	High Voltage DC - Bottom
CC = 00	No Approvals Required
CC = 01	CSA/NRTL/C
CC = 02	BASEEFA

3500/20-AA-BB-CC	Rack Interface Module (RIM)
AA = 01	Standard RIM
AA = 02	Triple Modular Redundant
BB = 01	I/O Module with internal Modem
BB = 02	I/O Module with RS232/RS422 connector
CC = 00	No approvals required
CC = 01	CSA/NRTL/C
CC =02	BASEEFA
3500/32-AA-BB	Standard 4 Channel Relay Module
AA = 01	Standard Relay Output
BB = 00	No Approvals Required
BB = 01	CSA/NRTL/C
BB = 02	BASEEFA
3500/34	Triple Modular Redundant Relay Module
3500/25-AA-BB-CC	Keyphasor Module
AA = 01	2 Keyphasor Channels
AA = 02	4 Keyphasor Channels
BB = 01	I/O Module with Internal Terminations
BB = 02	I/O Module with External Terminations
CC = 00	No Approvals Required
CC = 01	CSA
CC = 02	BASEEFA

3500/90-AA-BB	Communication Gateway Module
AA = 01	MODBUS I/O Module
BB = 00	No Approvals Required
BB = 01	CSA/NRTL/C
BB = 02	BASEEFA
130768-01	Blank Panel Kit. Includes front and rear panels.

Manuals

129777-01 3500 Monitoring System / Rack Configuration and Utilities Guide

129766-01 3500 Monitoring System Rack Installation and Maintenance Manual

129773-01 3500/42 Proximitor/Seismic Monitor Manual

129768-01 3500/20 Rack Interface Module Operation and Maintenance Manual

129769-01 3500/90 Communication Gateway Module Operation and Maintenance Manual

129767-01 3500/15 and /16 Power Supply Operation and Maintenance Manual

129720-01 3500/25 Keyphasor Module Operation and Maintenance Manual

129772-01 3500/40 Proximitor Monitor Operation and Maintenance Manual

129774-01 3500/45 Aeroderivative GT Vibration Monitor Operation and Maintenance Manual

129771-01 3500/32 and /34 Relay Module Operation and Maintenance Manual

130432-01 Field Wiring Diagram Package

Other Products

02230411	RS232/RS422 Converter 110 VAC (for use with host RS422 communications to 3500 Rack)
02230412	RS232/RS422 Converter 220 VAC
02230413	DigiBoard RS232 Serial Communication Board
	Transducer External Termination Block
125808-01	Prox - Euro.
128015-01	Prox - B. S.
125808-02	Prox/Seis - Euro.
128015-02	Prox/Seis - B. S.
125808-03	Aeroderivative - Euro.
128015-03	Aeroderivative - B. S.
	Keyphasor External Termination Block
128718-01	Euro.
128726-01	B.S.
	Recorder Output External Termination Block
128702-01	Euro.
128710-01	B.S.
	Video - 3500 Monitoring System / Rack Installation and Operation (25 Minutes)
130330-01	NTSC VHS
130330-02	PAL
	Video - 3500 Monitoring System / Software Installation and Operation (30 minutes)
130331-01	NTSC VHS
130331-02	PAL

Passwords

Passwords are used in several areas of the 3500 Monitoring System to accommodate your particular security requirements. Once you have assigned a password, do not forget it.

3500 Monitor Rack Passwords

3500 Monitor Racks have two levels of password security: connect and configuration. The connect password allows you to assign a password for access to each 3500 Monitor Rack. The configuration password allows a user to configure a rack.

Connect Password This is set in the Rack Configuration Software, by selecting the **Options** button for the Rack Interface Module (RIM). Once set, this password is used to allow the Rack Configuration Software to establish a Direct, Remote, or Network connection to the 3500 Monitor Rack.

Once entered, the connect password will be requested at the following times:

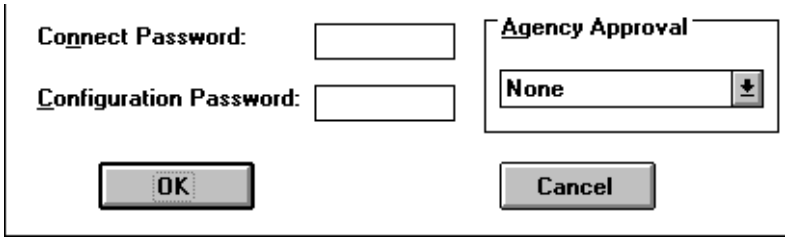
Connect Password location	Password is required to...
Data Acquisition Setup Screen	Connect the Data Acquisition computer to the 3500 Monitor Rack.
Operator Display Rack Functions Screen	Reset the rack clearing latched alarms, not OKs, and timed OK channel defeats.
Operator Display Rack Functions Screen	Enable or disable Trip Multiply or Alarm Inhibit for the rack.
Operator Display Adjust Setpoints Screen	Modify a monitor setpoint. Configuration password is also required.
Operator Display Set Channel Switch Screen	Set or reset any supported software channel switches.
Operator Display Adjust Setpoints Screen	Modify a monitor setpoint. Connect password is also required.

Configuration Password This password is set in the Rack Configuration

Software, by selecting the **Options** button for the Rack Interface Module (RIM). Once set, this password is used to allow changes to be made to the configuration parameters for the rack.

Once entered, the configuration password will be requested at the following times:

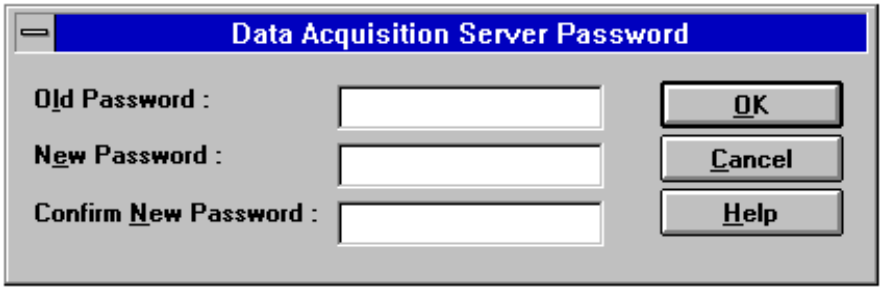
Configuration Password location	Password is required to...
Operator Display Adjust Setpoints Screen	Modify a monitor setpoint. Connect password is also required.



Data Acquisition Password

The Operator Display Software requires a connection to an operating Data Acquisition Computer. To secure this connection, a password can be set within the Data Acquisition software.

Data Acquisition / DDE Server Password This password is set within the Data Acquisition/DDE Server Software by selecting **File**, and **Password**. Once entered, this password must be used by anyone using the Operator Display Software to connect to this Data Acquisition/DDE Server. This password is also required to terminate Data Acquisition from the Operator Display or Data Acquisition Software.



Edit Component Password

The Edit Component Utility allows you to password protect the library of machine components. A set of machine components are saved in the file COMP.DEF. Each COMP.DEF file may have a different password.

Software Configuration Utility Password

The Software Configuration Utility allows you to password protect your Machine Train configuration. When this utility creates the MCTRAINS.LGL file, this password is stored within the file. Each Software Configuration may have a different password.

3500 Monitoring System - Problem Report

Every effort is made to guarantee the quality of all components of the 3500 Monitoring System. If you experience problems with this manual, or any of the products associated with the 3500 Monitoring System, please notify your local Bently Nevada Corporation Sales or Service Representative or complete the following information and mail or FAX it to Bently Nevada Corporation. Please be as specific as possible, and mention part numbers and revisions if available.

Date: _____
Name: _____
Company: _____
Phone: _____
FAX: _____

Problem: _____
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Mail or FAX to: Bently Nevada Corporation
1617 Water Street
Minden, Nevada 89423 U.S. A.
FAX: (702) 782-9253
ATTN: Quality Assurance
OR

To your local Bently Nevada Sales or Service Representative.

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