



Base Station Software

Management of Smart and Conventional Process Instruments

Configuration, Calibration, Status and Diagnostics

Direct Connection to Smart Instruments Via HART® Modem or HART Multiplexers

Access to all Smart Features

Calibration and Maintenance Histories

User Defined Test and Calibration Practices

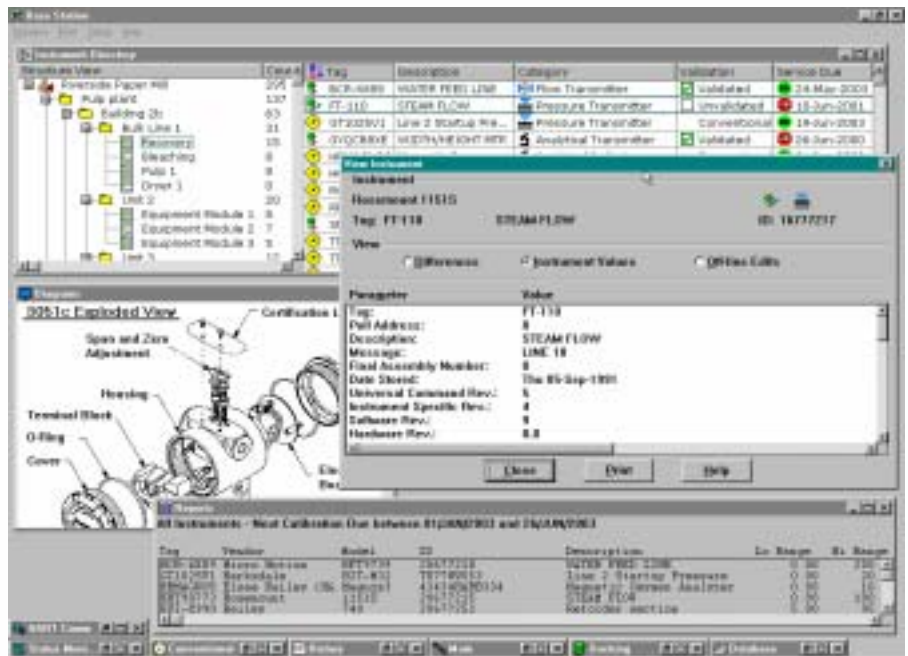
Calibration Schedules

Instrument Database and Reports

Optional Interfaces to Smart Calibrators

Supports ISO 9000 and OSHA 1910 Standards

Microsoft® Windows™ Compatible



Conduct all instrument maintenance and record keeping on one software program

Overview

The Cornerstone family of products establishes the **Open Platform** for the commissioning, calibration and maintenance management of industrial instruments, in the lab and in the field. Cornerstone products provide multivendor support for both conventional and smart instrumentation. Cornerstone creates and maintains a comprehensive instrument Database and individual histories of the configuration, test, calibration and maintenance activities performed on each instrument. Users benefit from labor savings in the collection and

management of maintenance information, increased accuracy, standardization of operator test and calibration practices, easy access to all the features of smart instruments, itemized record keeping to support compliance with quality standards, such as ISO 9000, and the user friendliness of a graphical interface in Microsoft Windows. Support for smart instruments includes all devices that communicate via Revision Levels 4 and 5 of the HART protocol, a de facto standard for the interoperability of smart field instrumentation.

CornerstoneTM
The Open Platform for Instrument Management

Cornerstone Function Windows

The Cornerstone user interface is organized into separate windows corresponding to major application functions. You enter the Main window through the password protected sign-on dialog box. The Main window provides menu access to setup functions and contains the Cornerstone Event Log in

its display area. Located in the lower portion of the Main window are the icons of the other Cornerstone windows:

- Database
- HART Comm
- Conventional

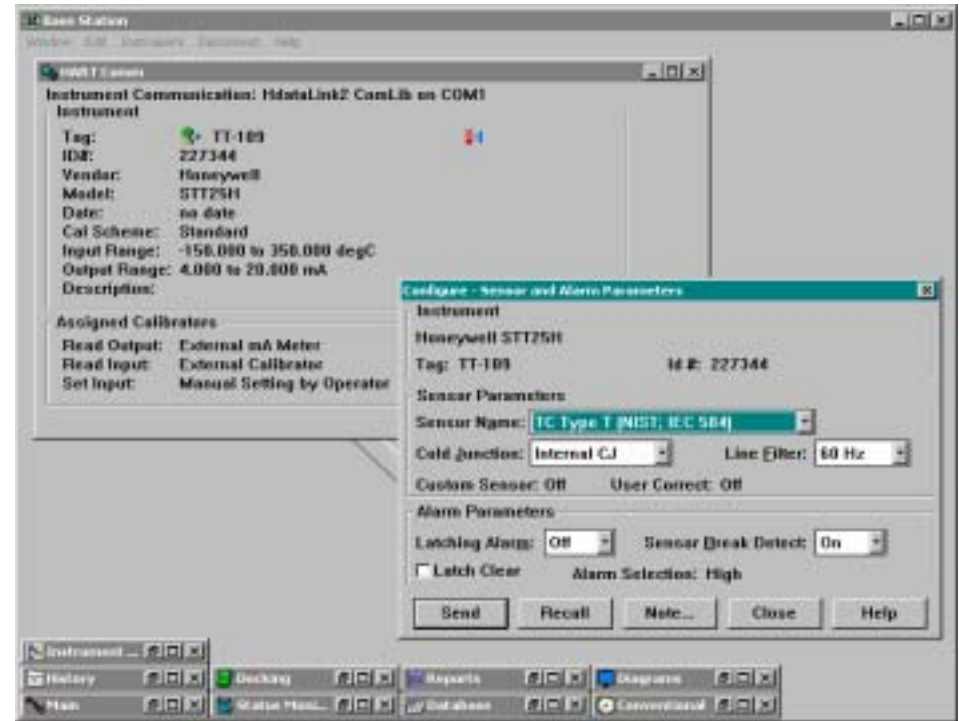
- Instrument Directory
- History
- Reports
- Docking
- Comm Manager
- Diagrams

Instrument Configuration and the Cornerstone Data Base

Instrument configuration management is done through a combination of functions in the Cornerstone Database, HART Comm, and Conventional windows. Configuration records for conventional instruments are manually added to the database through a dialog box in the Conventional window. Cornerstone automates the creation of records for smart instruments by entering the device into the database upon its first connection to the Cornerstone system through the HART Comm window. This saves considerable labor and avoids the inaccuracies inherent in the manual entry of instrument records. It solves the problem of how to construct a database for currently installed smart instruments, while insuring that the information gathered really reflects the configuration of the unit in the field. On multidropped loops, Cornerstone can be used to poll all possible addresses to locate the installed devices on that loop.

The Data Base window provides for the display and off-line editing of individual HART, conventional, and switch instrument configuration records. Off-line editing allows the preparation of numerous record modifications, such as range changes, for an entire set of smart devices before actually connecting to them in the field. Upon each connection to an instrument, the current memory contents of the instrument are compared to the existing record in the database. You are alerted if differences are found, and you have the opportunity to choose which configuration to use.

A set of dates is kept in each instrument database record that tracks major actions or events in the life of the device. These include, among others, date first entered into the database, date of last configuration change, date of last multi-point test, date of last calibration, and



Access device configuration and test functions via the HART Comm window

date on which next calibration is due. Default generic record templates are present for instruments by device type, such as pressure, temperature or flow. In addition, for selected instruments, Cornerstone uses Model Specific Libraries (ModLibs) that define itemized records containing the definition of, and in the case of smart instruments, access to, all of the instrument specifications, device specific parameters and internal functions. For HART instruments, this is accomplished through the integration of the device specific portion of the command set. ModLibs enhance device specific support in the HART Comm and History windows.

Instrument Database

- Integral instrument database holds records for industrial instruments,

calibrators, and test equipment

- Stores instrument information including identity, usage, operation, key dates, and calibration procedures and parameters
- Instrument capacity is limited only by disk space
- Data fields are tailored to instrument type. Switch instruments have specialized database records.
- Instrument records include your calibration setup & wrapup advisory text blocks
- Define and assign instruments to your own customized "Groups"
- Define new instrument and equipment categories

- A special Tag Note feature lets you attach customized data files to instrument records using the document format and editor program of your choice (e.g. AutoCAD)

Database Management Functions

- Specify instruments by tag or ID, or select from a list based upon your search criteria - Type, Vendor, Model, Group, Description, etc.
- Add, Edit, Delete instruments
- Copy specifications of an existing instrument into a new instrument
- Import instrument configuration data in standard .CSV files
- Export configuration and test/cal history data in standard .CSV files
- Instrument record changes automatically generate history records with as found and as left data values. You specify service reason and service notes for database edits.

Reporting Functions

- Individual or multiple instrument configuration reports
- Tabular Instrument database summary reports

HART Comm Window Functions

Within Base Station, all connections with HART instruments take place through the HART Comm window. You select equipment to use to make the connection. This can be a single loop HART modem on a PC comm port, or you may have an on-line instrument system using HART multiplexers or other plant-wide interface systems.

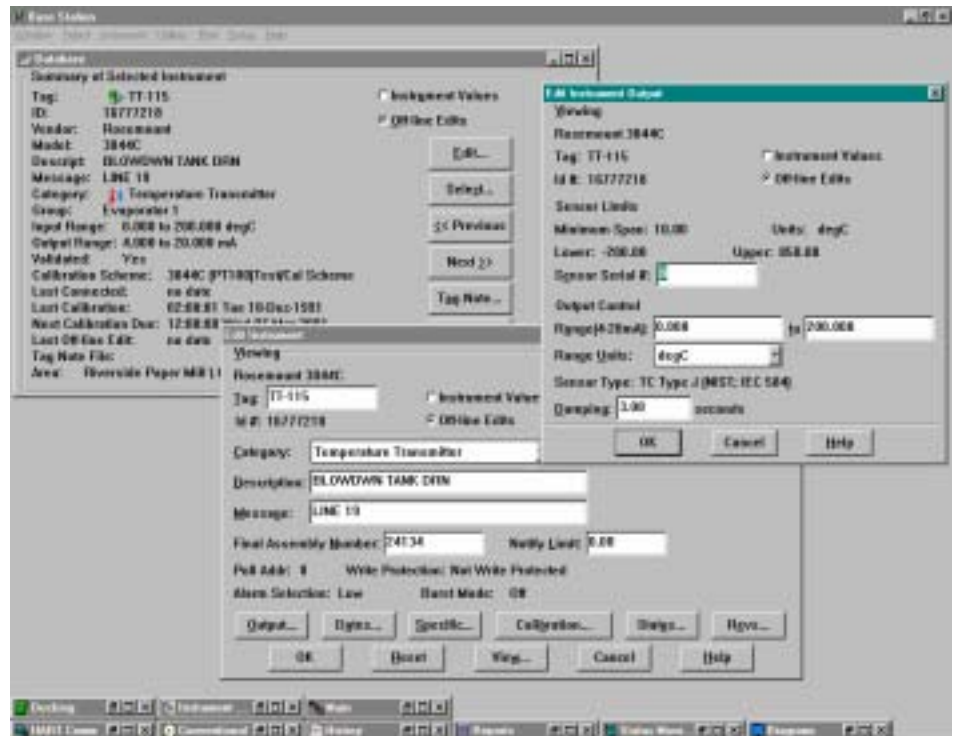
The HART Comm window takes care of the critical “housekeeping” functions associated with communications to HART instruments. Upon connection, the accessed instrument is validated against the established database record. If it is a new instrument, a database record is automatically created for it. For on-line instrument systems, a warning can be posted to remind your technician to make sure the related control loop is set to manual operation. EEPROM control commands are sent to

instruments that require them to store new configuration data. The HART write protection feature is honored by Base Station. The HART Comm window detects the presence of off-line edits to your instrument database record, and offers you the opportunity to send them to the instrument. It also checks for “external” edits to the instrument memory (e.g. from a hand-held communicator) and offers you choices for handling this situation, including restoring the instrument to a previously recorded configuration. These functions operate to meet the Base Station goal of ensuring that the as-left instrument memory at disconnect and the current database record for that instrument match exactly. In the background, Base Station automatically creates the necessary history records to document all instrument modifications and test/calibration activities.

For most HART instruments, the HART Comm window includes the following functions:

- Configure ID information
- Configure output
- Configure burst mode
- Configure HART variables

- Configure specific instrument type parameters
- Configure to look like another instrument
- Configure reset (to factory)
- Instrument test information
- Zero & span test
- Zero & span calibrate
- Input test
- Input zero trim
- Output set to fixed value
- Output test
- Output trim
- Instrument calibration status
- Instrument self test
- Instrument monitor graphical
- Instrument monitor numerical
- Instrument view recall as-found configuration data
- Edit service note
- Edit tag note



Perform off-line edits of transmitter parameters in the Database window

Instrument Directory

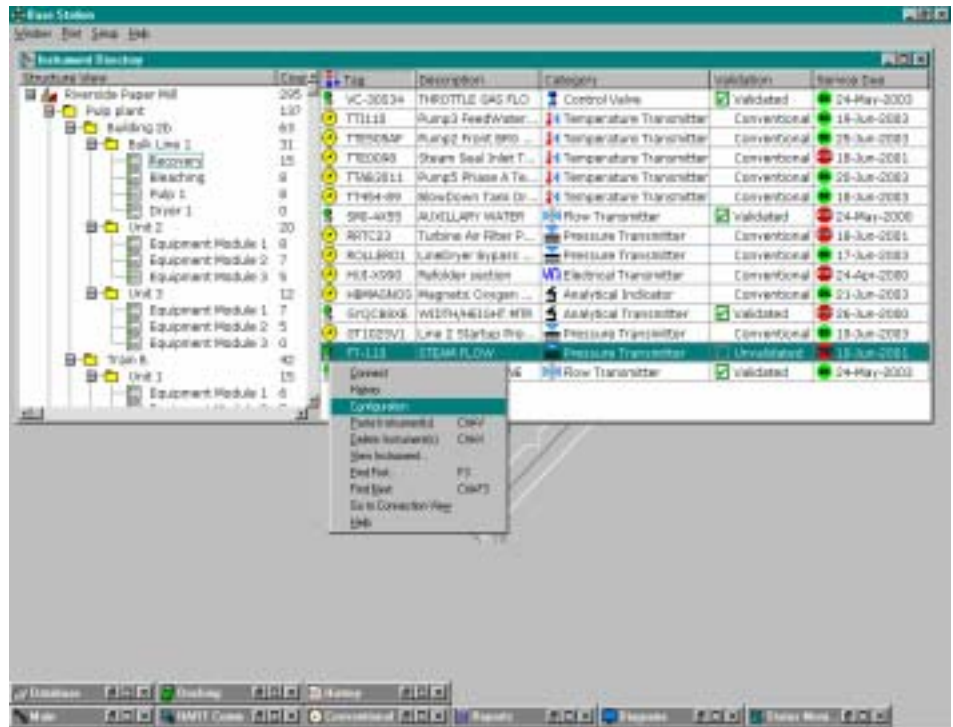
The Instrument Directory window is your primary browser, providing access to all of the instrument records and historical information stored in the Cornerstone database.

Using the features of the Instrument Directory window, you can organize your instrument database into a hierarchical structure that represents a model of the plant where the instruments are deployed. This hierarchy is called the Database Structure View. Since you will be familiar with this organization model for your plant, this display will make it easy for you to browse your instrument database and quickly find any instrument, even if you can't remember its tag.

If you are using your Base Station for an on-line instrument management system with HART multiplexers connected to your field instruments, the Instrument Directory also displays a Connection View. That view depicts the communications equipment and the connected field instruments and provides for "browsing" the instruments themselves. The Connection View graphically illustrates the physical connection hierarchy of key communications equipment used to interface Base Station to your instruments. It also provides direct access to functions related to the setup of that communications equipment, right from this view.

This window is a split display with the graphical structure maps (Structure View and Connection View) on the left side, and a columnar list of instruments on the right side. The contents of the instrument list on the right side reflect the "contents" of the selected level in the structure displayed on the left side.

Context menus (raised with a right button click) are used throughout the Instrument Directory display to provide access to key functions that relate to each area of the directory. This includes connecting, history data, configuration data, etc. These functions raise the appropriate window, with this instrument already selected for action.



Use the Instrument Directory Window to browse your instrument population according to the organizational structure of your plant.

Plant Structure Levels

- Plant
- Area
- Unit
- Equipment Module
- Control Module
- Instruments
- All level descriptions (above) can be renamed to suit your enterprise
- Each individual structure item within the hierarchy can be named to suit your plant organization

Structure View Instrument List

Displays the following instrument data for the selected plant structure item:

- Instrument icon
- Tag
- Description
- ID
- Category with icon
- Vendor
- Model
- Group
- Validation with icon
- Service Due with icon

You can select column width, order, hiding, and sorting to suit your situation.

Structure Management Functions

These functions allow you to set up and maintain the Instrument Directory exactly as required by your application.

- Add new (level - your name)
- Show instruments
- Find first / Find next
- Print
- Export
- Rename (level)
- Delete (level)
- Assign instrument
- Assign multiple instruments
- Paste instruments

Structure Instrument List Functions

These functions pop up with a right button click on a device in the Instrument List portion of the Directory. They provide direct access to the most important instrument functions provided by the Base Station software.

- Connect - to instrument in HART Comm or Conventional window
- History - display instrument history records in History window
- Configuration - display instrument

configuration data in Database window

- Delete instrument (return to inventory)
- View instrument
- Find first / Find next
- Go to Level 5 (e.g. equipment module) containing selected instrument
- Go to connection view for selected instrument

Connection View Instrument List

Displays the following instrument data for instruments connected through the selected HART communications equipment:

- Instrument icon
- Tag
- Description
- ID
- Category with icon
- Vendor
- Model
- Group
- Node loop
- Poll address
- Scan status with icon

You can select column width, order, hiding, and sorting to suit your situation.

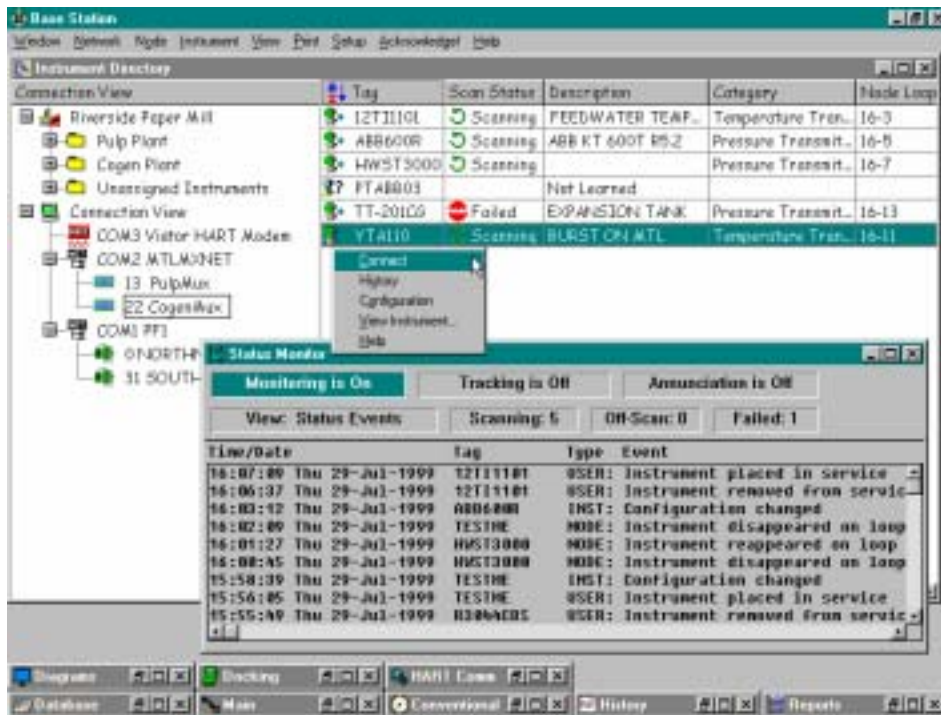
Connection Management Functions

These functions allow you to set up and maintain the HART communications equipment used to interface your HART instruments:

- Print connections

Test and Calibration

You can choose the Test and Calibration method or methods that work best for your process and quality requirements. Regardless of the method used, Base Station conducts standardized practices by following user configured calibration schemes assigned to each instrument in the database. These schemes outline the steps to be taken by a technician, or the calibrator, in the performance of multi-point test and calibration activities in accordance with ISA suggested procedure. Using any of the available calibration methods, the end result is a complete historical record of your calibration activity. From this database you can display, graph, and print calibration records and reports.



Use the Connection View to see instruments connected to a specific HART multiplexer network or node. Right click the mouse to connect to the instrument, view its current configuration in the database, or view its history records.

- Refresh Connection View
- Connect (via HART Modem)
- Setup Communications

Connection View Instrument List Functions

These functions pop up with a right button click on an instrument in the list. They provide direct access to the most important instrument functions provided by the Base Station software:

- Connect - to instrument in HART Comm or Conventional window
- History - display instrument history records in History window
- Configuration - display instrument configuration data in Database window
- View instrument

Docking Calibration

The Docking window provides the software tools needed to manage an instrument calibration program based on docking calibrators. A docking calibrator is a piece of calibration equipment that is typically used in the field to test and adjust instruments. It is characterized by the ability to communicate with a host computer, typically via a serial data link, to acquire its calibration procedures and to return completed calibration data to the computer. Some docking calibrator models have been especially designed to facilitate calibration of HART instruments.

In the Docking window, you assemble instrument calibration “routes” that are collections of instruments you wish to be calibrated by a single calibrator. You build the Route according to your selection criteria. Route definitions remain in the database for as long as you wish. With a click of your mouse, routes are directly downloaded to an intelligent calibrator via a serial cable. The download calibration procedures include instrument ID’s, test points, accuracies, and setup and wrapup advisory prompts.

Bring the calibrator back to the Base Station as often as you like, to upload the test results collected to date. Route

status displays in the Docking window show you the status of all instruments downloaded to the calibrator so that you can track the progress of the route. Docking requires optional Docking CalLib software tailored for the types of docking calibrators that you choose.

Manual Docking

This method allows you to employ all of the calibration management features of the Docking window with any process calibrator. Rather than directly connecting to a calibrator, a route is “downloaded” to a printed report. For each instrument, the report includes key instrument parameters, calibration set-up and wrap-up advisory text, and test point values for the pre-assigned cal scheme. You record field test results in the fill-in-the-blanks spaces provided in the test point table. A manual upload function steps you through the entry of the recorded data into Base Station. Route status displays help you track progress of the route.

Directed Calibration

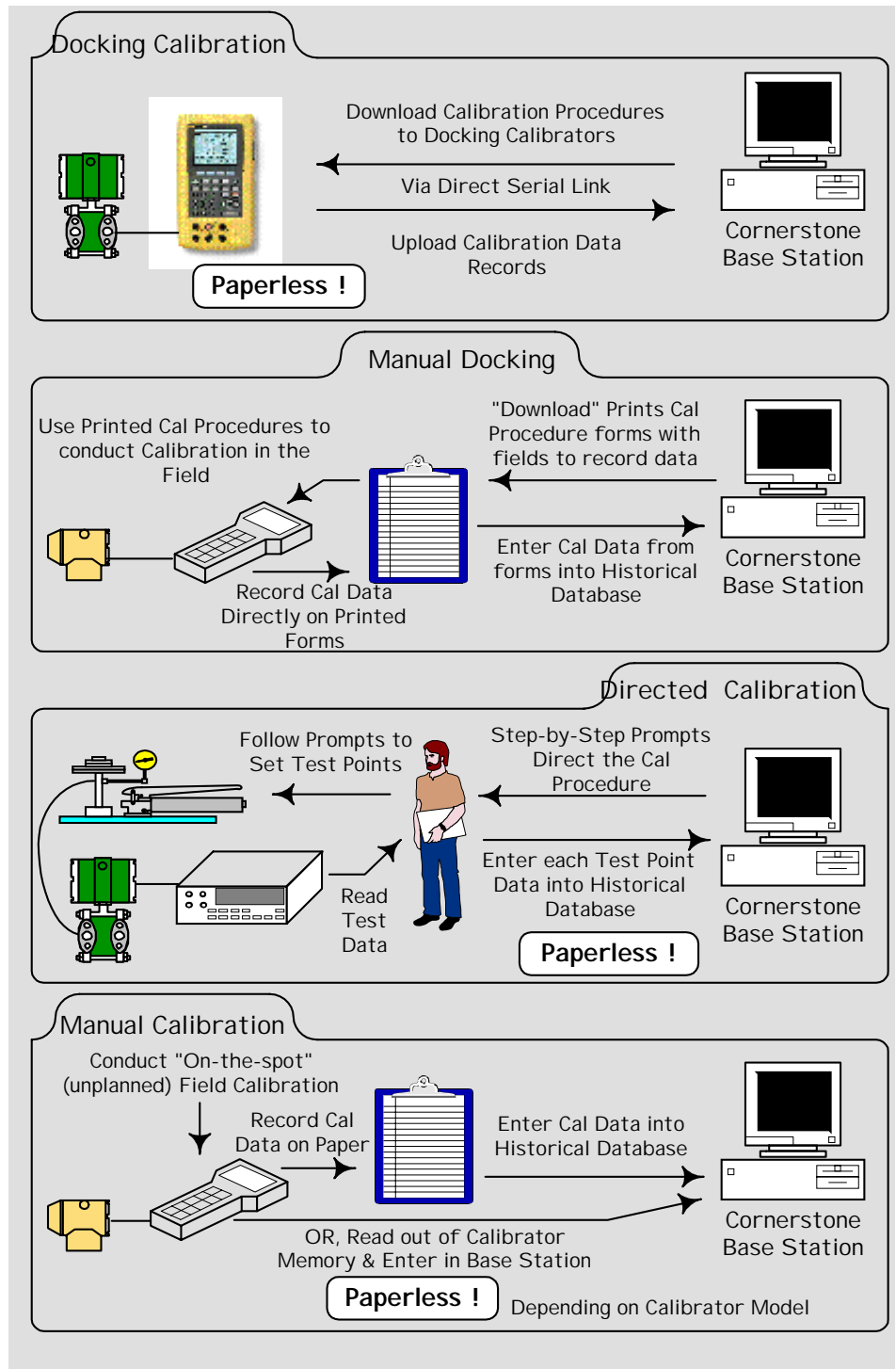
This method can be used when your Base Station computer is in close proximity to your calibration activity. When you select an instrument for Directed Calibration, Base Station steps you through the calibration procedure with instructions displayed on the monitor. You enter test data for each test point, as requested by the computer. Error calculations and test results are displayed immediately.

Manual Calibration

Even if you had not scheduled a calibration using a Route or had not performed a Directed Calibration, Base Station can still record data from any manual calibration you may perform. Depending on the calibration equipment you choose, you may need to record field calibration data on paper for transport to the Base Station. If your calibrator can store test results in memory and display them on demand, then no paper is necessary. Base Station provides a special manual calibration data entry feature that takes you step by step through the entry of your field generated test data.

HART Instrument Calibration

Zero and span is the traditional test performed on conventional and smart instruments alike to gauge the overall



accuracy of the device. Zero and span calibration is analogous to using the zero and span buttons on the instrument to fine tune the operational characteristics. The 4-20ma test and calibration are used to validate and adjust the accuracy of a smart transmitter's digital-to-analog signal conversion circuits. Cornerstone also supports the testing and trimming of the sensor input of a smart transmitter. Comprehensive support for smart instruments also includes the ability to invoke a special zero trim function found in certain gauge pressure and

differential pressure transmitters and some flow meters.

The Cornerstone HART Comm window is the point of access to the instrument self test and to all other device specific tests and diagnostic capabilities. These functions, along with the ability to change range and other configuration parameters, may be very effectively used to complement an existing control system. For many functions, you can digitally interrogate and analyze the instrument, even while it remains in

service in the loop. A monitor window supplements this diagnostic access with the ability to present a graphic or tabular, real-time display of the current output of the instrument. For HART devices, any reportable values may be graphed in any combination you specify. Complete interpretation of instrument specific data and test results is provided if a ModLib for that instrument is installed in the Cornerstone system

Calibration Record Types

For any of the calibration methods available, a history record is generated based on the type of calibration performed:

- Zero & Span Cal
- Instrument Input Cal
- Instrument Output Cal
- Switch Test/Cal
- Configuration Change
- Service Notes (free form text)

Calibration Data

As appropriate for the calibration record type, the following data is stored for each calibration event:

- Date/time
- Service Reason
- Technician
- Review Status & Reviewer
- Equipment Used
- Actions Taken
- Results - Error Calculations
- As Found / As Left Data

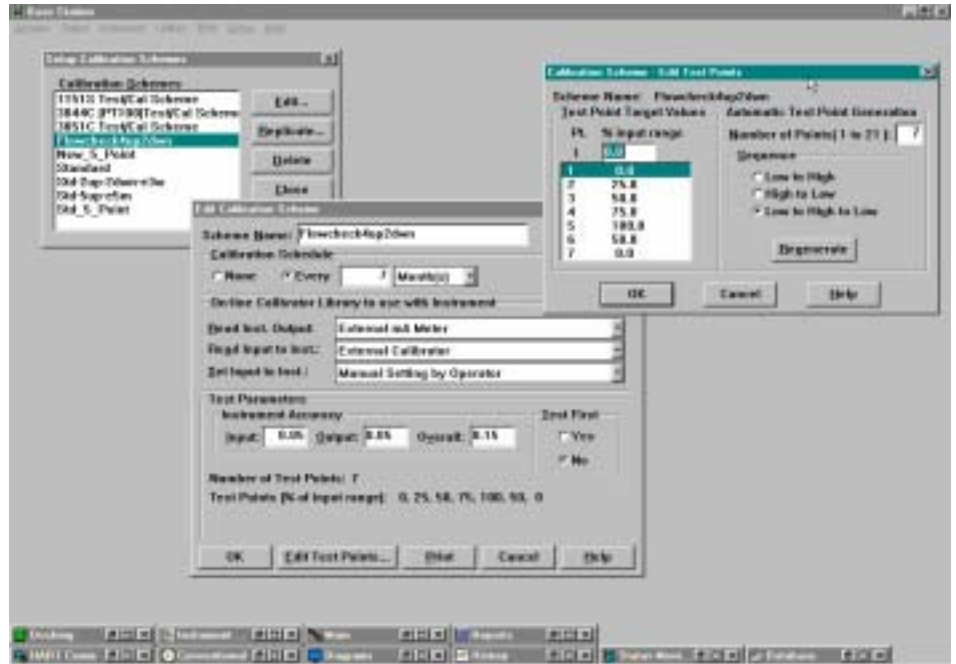
Calibration Schemes

Each instrument in the database is assigned a named Cal Scheme that defines:

- Up to 21 test points
- Input & output error tolerance for HART instruments
- Overall error tolerance
- Calibration interval/schedule
- Test required before calibration

Calibration Methods

- Manual Calibration
- Directed Calibration



Define customized, named calibration schemes to standardize calibration practices



Use the HART Comm window to perform computer guided multi-point tests

- Automated Calibration
- Docking calibration
- Manual Docking calibration
- Advanced Calculations - Zero error, Span error, Max error, Linearity error, and Hysteresis error. With sufficient test data, statistical techniques are used to extrapolate an instrument operational profile over its entire range.
- You set up which of the five error types determine pass/fail for your instrument population

Error Calculations

You can set up Base Station to perform either of two types of error calculations:

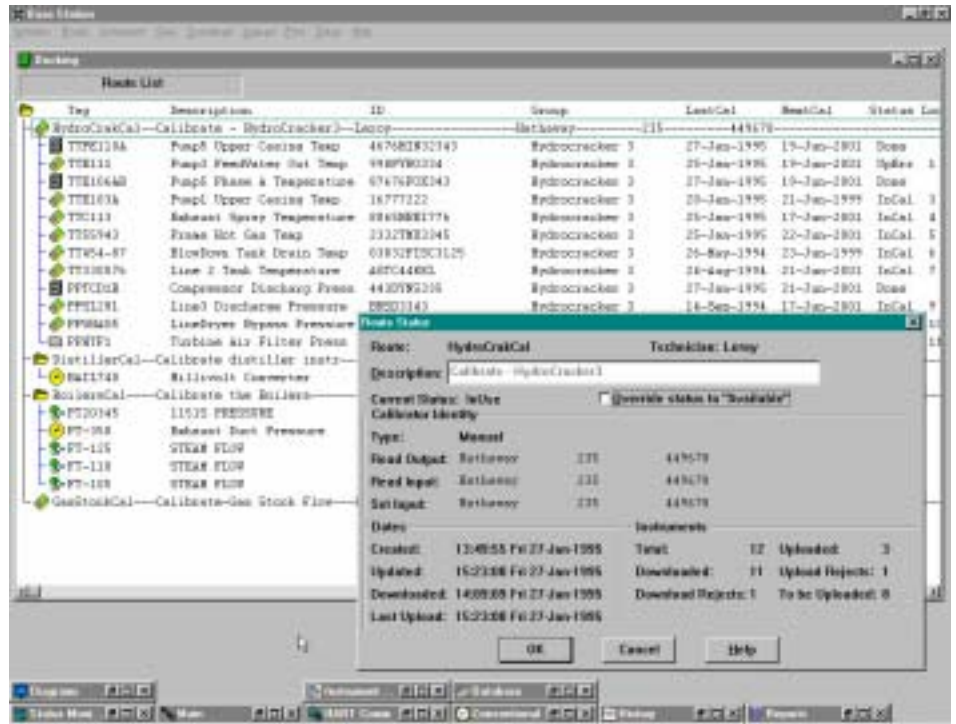
- Basic Calculations - Zero error, Span error, Max error, and Linearity error if sufficient data available

Docking Calibrator Support

Optional docking calibrator interface libraries (CalLibs) may be added to your Base Station to provide a direct serial link between your Base Station computer and specific intelligent Calibrator models. Through these CalLibs, Base Station can directly send your calibration routes and detailed test procedures to the calibrator, and can later upload complete records of your field tests, automatically creating Base Station history records.

The following optional docking CalLibs are available for use with Base Station:

- ◆ Altek 895, 896
- ◆ Druck/Unomat MCX and DPI 605
- ◆ Fluke® Documenting Process Calibrators: 702, 743, 744
- ◆ Beta Calibrators: 135, 235, 922, BetaGauge II, BetaFLEX
- ◆ Rochester Instruments AccuPro Diamond™ Plus: 9002, 9004, 9005
- ◆ Transmation: 160, 180, 195, 196, 1292, 1294

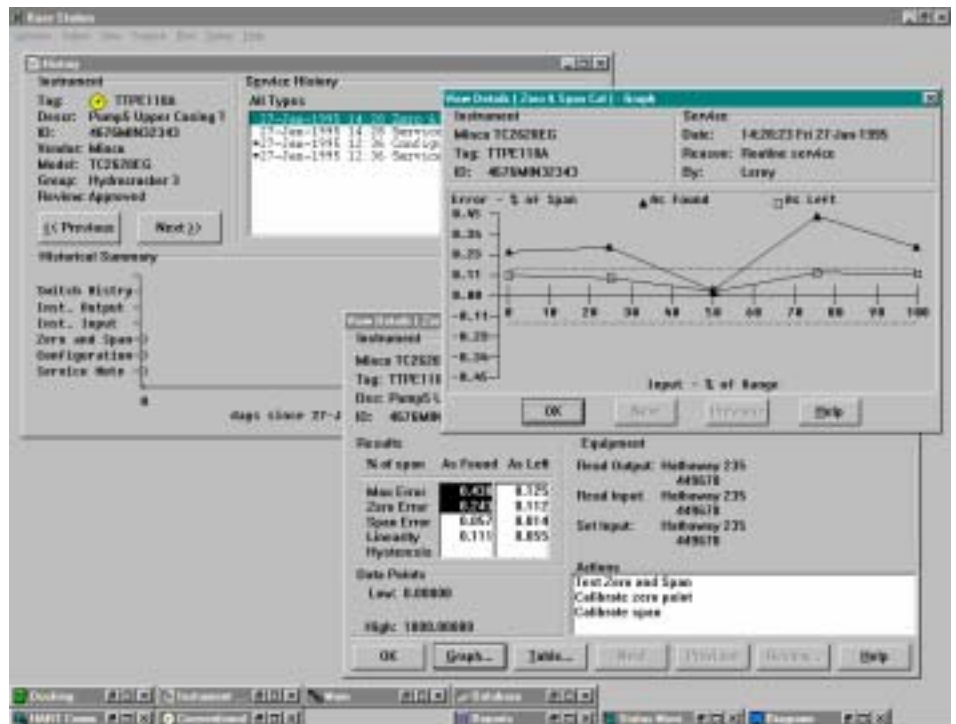


To track work-in-progress, view the Base Station Docking window list of all of your calibration routes and the calibration status of the instruments in each route.

Historical Records

The Cornerstone History files retain the maintenance life story of the instruments in the database. Service History records are created and stored for configuration changes, switch tests, zero and span test and calibration, 4-20ma test and calibration, and optional service notes entered during any maintenance activity. The display contents of the History window can be changed to include all or only a single type of the service histories. Based on that choice, the summary area is filled with additional information to assist you in the selection of the desired individual record. The summary area may also be used to display a graph of the historical trend for maximum error, linearity, hysteresis, zero error or span error.

Once a record is selected, detailed data for that record is displayed. Controls are provided that make it easy for you to move forward or backward through the dated chain of records. The modified parameters in configuration records are highlighted for quick determination of



Review a graph of previous instrument test results in the History window

the changes from one date to the next. Test and calibration records present "as found" and "as left" data in either graphical or tabular display format. Service notes are presented in a text area for editing and review. Once reviewed, the notes may no longer be modified. Supervisory review of history records may only be accomplished through the History window. The History window functions are an integral component in Cornerstone's support for user compliance with ISO 9000 quality guidelines.

History Record Types

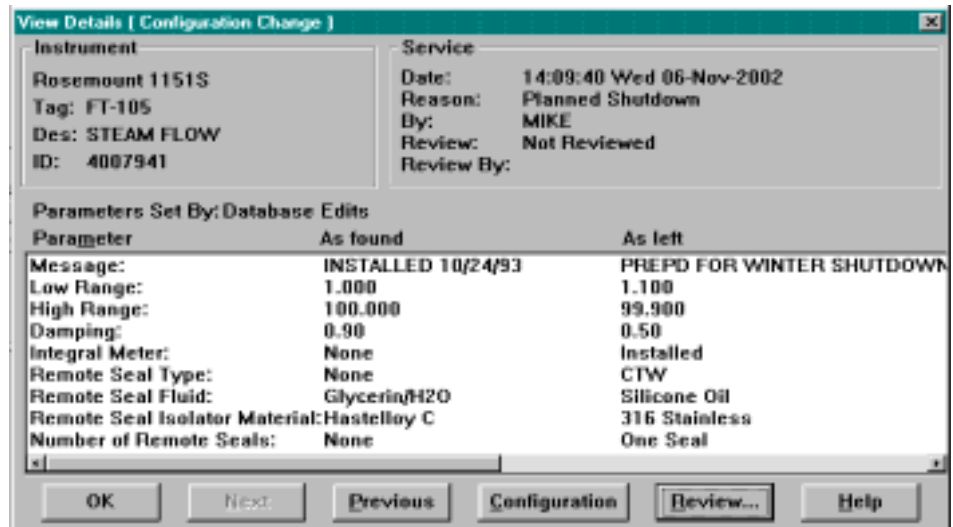
- Zero & Span Cal
- Instrument Input Cal
- Instrument Output Cal
- Switch Test
- Configuration Change
- Service Notes (text)

Historical Calibration Data

- Date/time
- Service Reason
- Technician
- Review Status & Reviewer
- Equipment Used
- Actions Taken
- Results - Error Calculations
- As Found / As Left test point data

Calibration Review

- By Supervisor
- Records Name of Reviewer
- Approve or Disapprove



Review a record of past instrument parameter changes

Historical Summary Data

- View by error type, e.g. history of max. error, linearity error, etc.
- Tabular list of error values & pass/fail on each test date
- Graph of error values over time
- Print summary data in tabular or graphic form

Detail Data Display/Print

- View complete history record for single service event
- As Found & As Left data, error calcs, pass/fail result in tabular form
- View test data in graphic form

- Configuration change history shows as found & as left values
- Next & Previous buttons step through history for a selected instrument

Other History Features

- Service Notes are text notes about a service event
- History records can be deleted with sufficient security level
- Summary lists show all services performed for each instrument. Select individual service records from the list

On-line HART Instrument Connection

Base Station can be used as the cornerstone of a powerful on-line instrument management system for your enterprise. Interface components for such a system include a wide variety of HART multiplexers, PLC's, control system, or intrinsic safety barrier equipment that supports HART communications. In addition, you will need the optional Cornerstone Communication Library (ComLib) that interfaces the make and model of interface hardware you have chosen. You can use one or more types of HART interface hardware in one Cornerstone system.

The standard Base Station includes a Communication Manager window that provides an interface to HART multi-

plexer equipment through corresponding ComLib software modules. This window is used to maintain the configuration and connection to instruments attached to your HART communications hardware. The Communication Manager window fulfills several major functions.

- In conjunction with the appropriate Cornerstone ComLib software, it supports the setup and maintenance of HART compatible multiplexer communications equipment from specific vendors.
- It maintains the On-line Event Log, which records status events for multiple instrument networks of differ-

ent types for a unified presentation. Log entries include Time and Date, network or node name, event type, and event description.

- New event messages are highlighted in the On-line Event log, and may be audibly announced.

The On-line Event Log is a principal feature of the Communication Manager window and the optional Status Monitor window. It presents events related to the operation of an on-line instrument management system. The events inform you of network, node, and instrument status changes sensed by the ComLibs, as well as errors that may be detected in the operation of the ComLibs.

This log operates much like a typical alarm display on a control system, including new message annunciation and operator acknowledge functions. All or portions of the log can be printed according to criteria you specify.

Network Functions

- **Learn** - Automatically locates all instrument networks, multiplexer nodes, and connected instruments. You can choose to do this for the entire system or for selected nodes. Located instruments are added to the Active Instrument List to show all instruments connected to your Base Station system. Learn is used initially to build the software list of instruments connected to a new Base Station on-line instrument system. Subsequently, it is used to detect and add new instruments or entire new instrument nodes when you expand your system.
- **Restart** - Sends reset commands to each multiplexer node and accesses each instrument to verify connectivity. You can choose to do this for the entire network or only for selected nodes.
- **Scanning** - Allows you to enable or disable scanning of all nodes or selected nodes. Scanning is the periodic accessing of connected multiplexer nodes to gather current status of the nodes and connected instruments, as reported by the nodes.

Node Functions

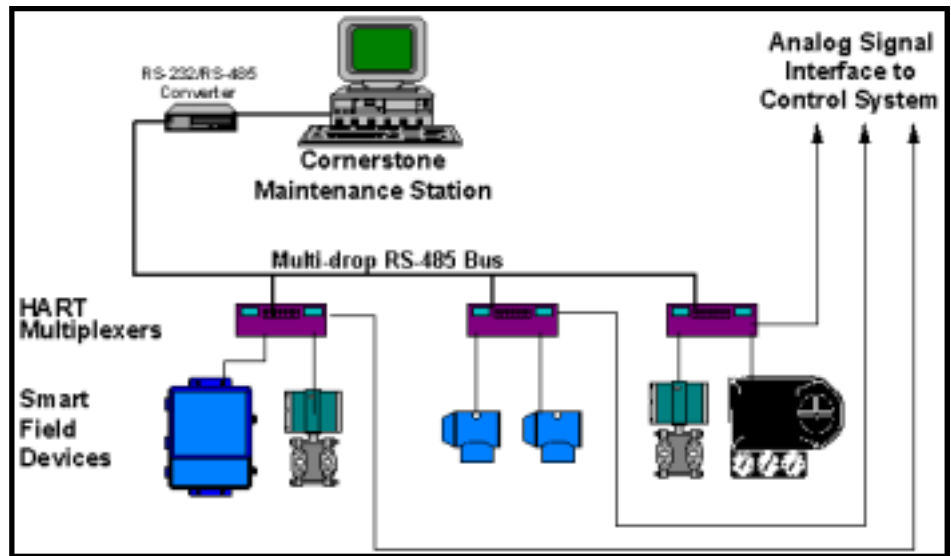
This window provides functions for a selected multiplexer node. The specific features provided here differ depending on which type of multiplexer equipment is employed. These features are provided in this window by the Cornerstone ComLib interface software used to support the multiplexer model you are using.

- **Identification** - Review or change node configuration information.
- **Operation** - View and interact with node operational parameters.
- **Scanning** - Change the scan status of a single node.
- **Self Test** - Conduct a test of the node.

Instrument Functions

Functions are provided to assist you in managing the on-line connection to your instrument population. These include:

- **Active List** - Shows all active in-



A typical configuration for an On-line HART Management System. Details of the network connection to Base Station and the HART interface equipment may differ depending on which type of equipment is employed in your system.

- **Fix Tags** - Some multiplexers can detect non-unique Tags in connected instruments. This function helps you fix these so that all instruments have the required unique Tag.
- **Fix UID's** - Some multiplexers can detect non-unique ID's in connected instruments. This function helps you fix these so that all instruments

have the required unique identifiers.

Other Functions

- **Print** - all or part of the On-line Event Log.
- **Setup Annunciation** - Enable or Disable annunciation of new on-line events and change the reminder interval.

Time-Date	Tag	Type	Event
17 14 57 Tue 14-Mar-1995	VT1000	INST	Non-Primary Variable back within limits
17 14 46 Tue 14-Mar-1995	VT1000	INST	Non-Primary Variable out of limits
17 09 51 Tue 14-Mar-1995	VT1000	INST	Non-Primary Variable back within limits
17 09 40 Tue 14-Mar-1995	VT1000	INST	Non-Primary Variable out of limits
17 08 59 Tue 14-Mar-1995	VT1000	INST	Non-Primary Variable back within limits
17 08 48 Tue 14-Mar-1995	VT1000	INST	Non-Primary Variable out of limits
17 40 44 Tue 14-Mar-1995		USER	Instrument reconciliation completed
17 38 29 Tue 14-Mar-1995		USER	Instrument reconciliation started
17 34 00 Tue 14-Mar-1995		USER	Network restart complete
17 34 00 Tue 14-Mar-1995	HUE01040	USER	Node scanning enabled
17 34 00 Tue 14-Mar-1995	BOILER00	USER	Node scanning enabled
17 32 53 Tue 14-Mar-1995		USER	Network restart initiated
17 15 03 Tue 14-Mar-1995		USER	Network restart initiated
17 11 21 Tue 14-Mar-1995		USER	Instrument reconciliation started
17 10 58 Tue 14-Mar-1995	VT1000	INST	Non-Primary Variable out of limits
17 10 44 Tue 14-Mar-1995		USER	Network restart complete
17 10 44 Tue 14-Mar-1995	HUE01040	USER	Node scanning enabled
17 10 44 Tue 14-Mar-1995	BOILER00	USER	Node scanning enabled
17 09 45 Tue 14-Mar-1995		USER	Network restart initiated
16 45 25 Tue 14-Mar-1995		USER	Instrument reconciliation started
16 28 09 Tue 14-Mar-1995	XTC 340A	INST	Configuration change flag cleared
16 28 09 Tue 14-Mar-1995		USER	Instrument reconciliation completed
16 26 39 Tue 14-Mar-1995		USER	Instrument reconciliation started
16 26 14 Tue 14-Mar-1995	XTC 340A	INST	Configuration changed
16 26 14 Tue 14-Mar-1995	VT1000	INST	Non-Primary Variable out of limits
16 25 58 Tue 14-Mar-1995		USER	Network restart complete
16 25 58 Tue 14-Mar-1995	HUE01040	USER	Node scanning enabled
16 25 58 Tue 14-Mar-1995	BOILER00	USER	Node scanning enabled
16 24 50 Tue 14-Mar-1995		USER	Network restart initiated
15 47 16 Tue 14-Mar-1995		USER	Instrument reconciliation started
15 41 45 Tue 14-Mar-1995	XTC 340A	INST	Configuration changed
15 41 45 Tue 14-Mar-1995	VT1000	INST	Non-Primary Variable out of limits
15 41 45 Tue 14-Mar-1995	L2001-A	INST	Configuration changed
15 41 26 Tue 14-Mar-1995	HUE01040	USER	Node learn complete
15 41 26 Tue 14-Mar-1995	HUE01040	USER	Node scanning enabled

The Communications Manager window displays the On-line Event Log documenting instrument network, multiplexer node, and instrument status changes.

- **Setup Communications Libraries** - Setup ComLib operational parameters.
- **Setup On-line Event Log** - Choose the maximum number of entries.
- **Acknowledge** - new event messages and turn off annunciation

Optional Instrument Status Monitor

You can purchase an optional Instrument Status Monitor (ISM) software module to enhance the functions of an on-line instrument monitoring system using HART Multiplexers. ISM replaces the Communication Manager

window with the Status Monitor window that includes all the Communications Manager functions described here and adds enhanced ISM features to:

- Automatically build your instrument database by connecting to all new instruments
- Automatically reconcile as-found device configurations with current database records
- Scan and acquire process variables and detect status changes in all attached instruments
- Display status change messages in

the On-line Event Log

- Update displays with instrument scan status
- Track field changes in device configuration and automatically create history records to document the changes
- Let you customize the On-line Event Log display with event filters

Additional details about the Instrument Status Monitor option are described in a separate document.

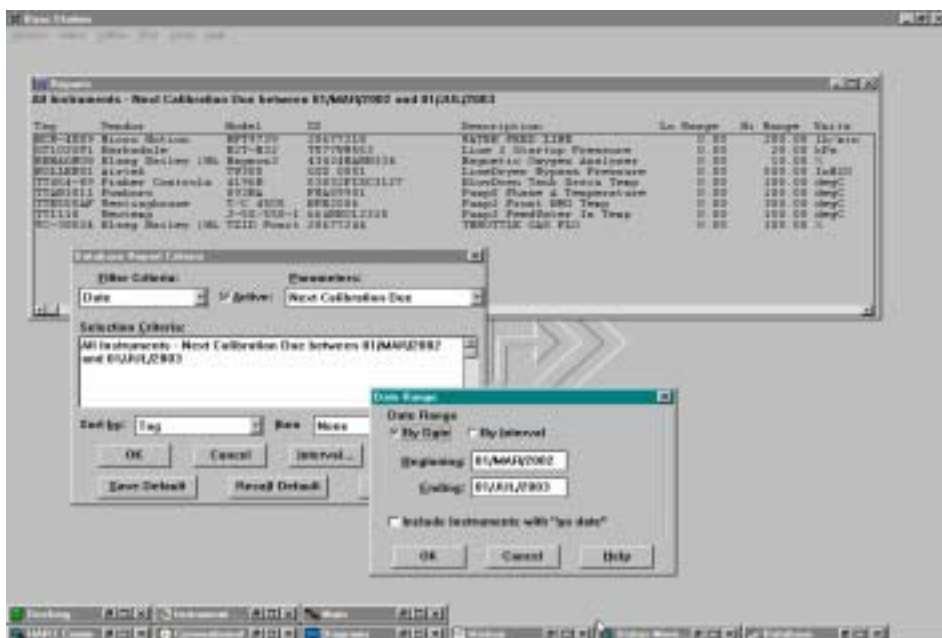
Event Log and Reports

The Cornerstone Event Log in the Main window contains a dynamically updating list of operator events (e.g., sign on), instrument events (e.g., test performed), and workstation events (e.g., change in the size of the configured database). The newest events are posted at the top. This provides technicians, supervisors and managers with easy access and online review of the latest actions. The Event Log may be printed from the Reports window.

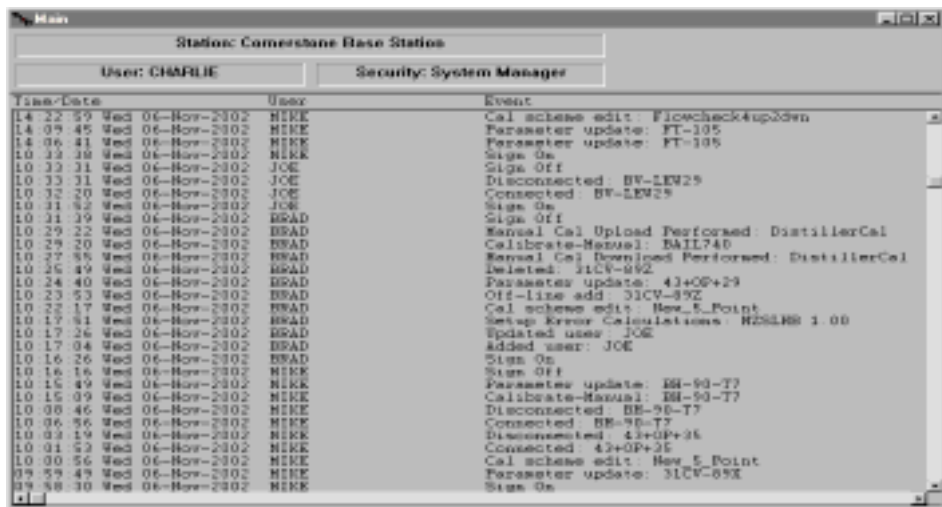
The Cornerstone Reports window utilizes the same instrument selection criteria found in the Database and History windows to present a variety of reports for onscreen display or routing to a printer. The selection criteria makes it possible to tailor report contents by tag, instrument manufacturer, model, user group definitions, history record review status, and date parameters within a given time frame. For each selected instrument, the report lists tag, vendor, model, ID, description, range, units and the date chosen from the list of possible dates. Cornerstone reports give you ready visibility to the instrument population and provide your organization with direct support for calibration and maintenance scheduling.

A special Calibrator Cross Reference report lists all instruments calibrated with a specified calibrator.

Other reporting capabilities are available via print functions in the Instrument Directory, History, Database, Docking, Communications Manager, and Main windows.



Display or print data base reports based on your specified selection criteria



Review prior actions in the Cornerstone Event Log displayed in the Main window

Base Station Printed Reports

Base Station's comprehensive set of standardized printed reports help you to thoroughly document your maintenance activities. Reports are accessed in each of the functional Base Station windows and include:

Main Window Reports

- Event log

HART Comm Window Reports

- Service Note
- Instrument input test
- Instrument output test
- Tag note
- View instrument recall
- Zero & span test

Conventional Window Reports

- Service note
- View instrument recall
- Zero & span test

Database Window Reports

- Calibration scheme
- Component list

- Service note
- Group names
- Import report
- Instrument categories table
- Instrument configuration record
- Manual entry of calibration test data
- Tag note
- Upload report
- View instrument

Reports Window Reports

- Instrument database
- Main event log events
- On-line Event log
- Calibration cross reference

History Window Reports

- History configuration change details
- History configuration change differences
- History instrument input cal details
- History instrument input cal summary
- History instrument output cal details
- History instrument output cal summary

- History service note details
- History switch test details
- History switch test summary
- History zero & span cal summary
- Service history

Docking Window Reports

- Instrument setup advisory
- Instrument wrapup advisory
- Route plan summary
- Route plan details
- Route status report
- Upload/download report
- Work list summary
- Work list details

Comm Manager Window Reports

- Active instrument list
- On-line event log

Instrument Directory Window Reports

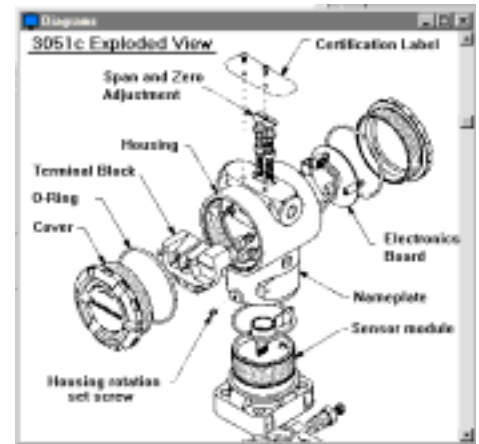
- Connection view instrument list
- Connection view structure
- Instrument directory details
- Instrument directory tag list

Diagrams

The Diagrams window is an added feature that extends the information capability of Cornerstone beyond the limitations of typical database applications. The Diagrams window is the location within Base Station in which Cornerstone, vendor or user supplied graphical albums may be recalled for online presentation. Cornerstone supports the installation and display of graphic images created external to Cornerstone in selected industry standard graphical file formats. Through these albums, instrument and plant diagrams, schematics and text can

become a source of online documentation for the technician. Example uses would be the inclusion of plant location maps and excerpts from instrument user manuals, such as connection drawings, part schematics, and operational instructions. The Diagrams window is a part of the Cornerstone online documentation support that includes extensive use of the Windows HELP facility.

Access user installable graphical documentation files via the Diagrams window



HART Protocol Support

Cornerstone provides a robust implementation of the HART protocol that incorporates direct connection to a single device or several instruments via multi-drop connection, multi-master support, and operation as either primary or secondary master. Cornerstone implements generic support for any fully compliant HART instrument through the universal and common practice portions of the HART command set. Generic support includes access to tag, ID,

description, range, units, transfer function assignment, the instrument self test function and other data.

Instrument specific support is accomplished through the integration of the transmitter specific command set, as realized in Cornerstone ModLibs. This level of support provides full, customized, formatted access to instrument specific data and functions not addressable through the universal

and common practice commands. This is particularly important for the more complex instruments like the various flow meters and valve positioners but is just as relevant for simpler devices that may contain special characterization functions. Only through instrument specific ModLibs can all the features of the HART devices really become active parts of your management of the instrument population.

ISO 9000 Support

The ISO 9000 guidelines for quality stress the importance of conducting calibration and maintenance activities according to documented, trackable procedures. Cornerstone focuses on providing support for users in achieving compliance with ISO 9000. Technician practice is standardized through the use of user configured Cornerstone calibration schemes. All steps in the scheme must be completed in the order specified for a history record of the activity to be created. Each scheme is identified by its own user supplied name and may be individually printed for

permanent documentation. The test and calibration activities with their associated service notes are recorded and retained in the History database, and may also be printed. The Cornerstone database provides an additional level of tracking through the incorporation into the history records of supervisor approval/disapproval for each test and calibration. The history records provide a comprehensive trace of the maintenance performed on each device. The Reports window functions further document the instrument population as part of a continuing chronological

record, most particularly in respect to the important date parameters kept for each device. The Cornerstone reports also complement the individual instrument histories by making the Event Log a documented record that provides a cross reference to actions performed within the reported time frame. Finally, you may take advantage of the Diagrams window to place site and organizational guidelines and procedural information at the fingertips of the user.

User Defined Setup Parameters

The Cornerstone user has control over many aspects of the configuration of the Base Station software and its operation. The system administrator can define valid user names, and assign any of four authorization levels that govern access to Cornerstone functions. Each instrument may be assigned to a user defined Group designation, which may then be employed in the selection and reporting of instruments. You can define multiple calibration schemes to most accurately reflect the practice to be followed in the calibration of different devices. You specify the calibration scheme parameters including frequency of calibration, number of test points, desired accuracy, and test equipment. You manage the list of maintenance reasons from which a technician can select the activity to be stored in a history record. You can also create and install albums for subsequent access

through the Diagrams window.

All of the following software setup functions are at your disposal to make the software operate in accordance with your application requirements.

- Users
- Own password
- Workstation
- Event log
- Communication libraries
- Week
- Error Calculations
- Service due
- Site contact
- Group names
- Calibration schemes
- Service reasons
- Vendors

- Models
- Categories
- Tag note template
- Tag note file type
- Communication with instrument
- Instrument date use
- Monitor options
- Calibration certificate
- Upload to Base Station
- Docking calibrator
- Annunciation
- (On-line) Log entries
- Area terminology
- Area auto-expand
- Refresh rate
- Font
- Gridlines
- View size

Other Features

- Protects your data with user password sign-on and 4 security levels
- Prints calibration documents with your own customized "Calibration Certificate" signature/note block
- Traces back to instruments calibrated with particular calibrator
- Documents the NIST traceable certification of your calibrators
- Validates (on download) proper match of instruments to calibrator
- Alerts you to any test that measures an error exceeding the instrument's "Notify Limit"
- Documents significant Base Station and user activity in the event log
- Attaches custom text and graphic data files to each instrument record using Tag Notes feature
- Provides extensive on-line Help including complete User's Manual

Computer Platform Requirements

PC compatible computer with:

- Microsoft Windows XP, Windows 2000, Windows NT, or Windows 98
- Processor - as required for good Windows performance
- RAM memory - as required for good Windows performance
- CD-ROM drive
- 60 MB hard disk space. User database sizing affects the total hard disk space required
- SVGA or better graphics system and display
- Optional: Serial ports may be required for calibrator interfaces, a HART modem, or HART multiplexer equipment
- Optional: Windows compatible pointing device and interface port, Windows compatible printer, and suitable printer port
- Optional Multi-user Kits support networked operation using a single shared instrument database.

- HART Modem - To connect to HART instruments, you need an optional HART compatible modem. Several such modems have been certified for operation with Cornerstone software. One of these, the Viator from MACTek, may be purchased from your Cornerstone supplier. Viator is available with a serial interface or on a PCMCIA card.

Snapshots...

The screenshots illustrate the software's capabilities in managing instrument data, scheduling services, and monitoring performance. Key windows include:

- Setup Group Names:** A dialog for defining instrument categories and their associated icons.
- View Historical Summary:** A window showing a table of instrument performance data, including Date, As Found, and As Left values.
- Service Review:** A window for reviewing service status, with options for Approved or Disapproved.
- Event Log Report Criteria:** A window for configuring event log reports, including user and date ranges.
- View Details:** A window showing detailed service information for a specific instrument, including date, reason, and technician.
- Setup Categories:** A window for defining instrument categories, types, and their associated I/O settings.
- Trend:** A window showing a graph of instrument performance over time.

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