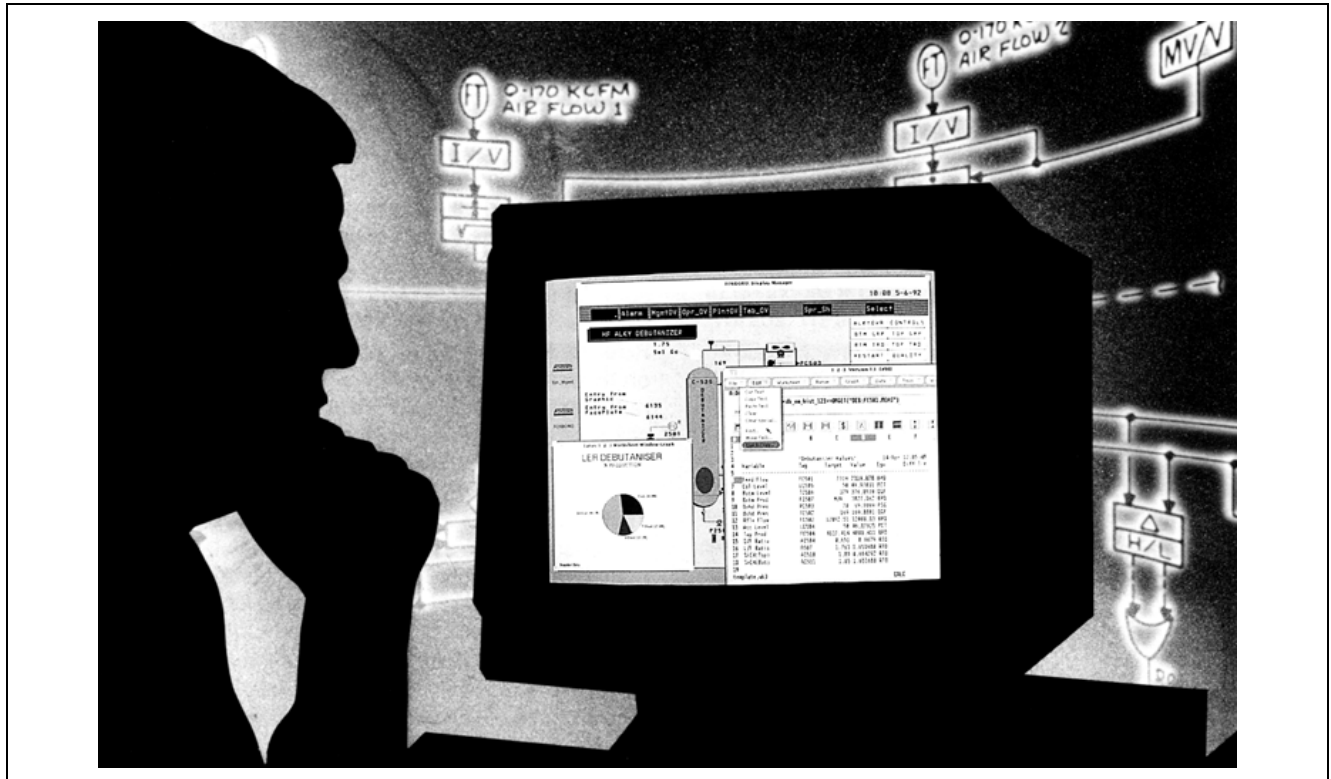


I/A Series[®] Software Human Interface Software



Human Interface Software provides consistent and secure access to, and graphical interactions with all I/A Series Software functions thus enabling optimum process management and control.

I/A Series human interface software has been developed to both meet the day-to-day needs and anticipate the long range demands of the process control industry. As part of the world's first truly Open Industrial System, already field-proven in thousands of plants around the world, this software is characterized by many exclusive capabilities. Its features include the following:

- Total plant operation achievable via fully interactive graphic displays that expertly guide operators and are easy to use.
- Predictable, speedy and consistent real-time response to process events under all conditions.
- OPEN LOOK windows providing an intuitive windows environment that takes advantage of the multi-tasking operating system capability.
- Multiple I/A Series display windows running on both local (single or dual-headed) workstations and remote terminals – providing a more comprehensive view of the process for operator control as well as a cost effective view of I/A Series information for plant and management personnel.
- Graphics files and templates that eliminate re-drawing and re-entering of data and allow speedy customization of displays.
- Simple procedures for operator manipulation of graphics that meet your precise needs.
- Intuitive picking of display objects and menus with a common menu bar structure.

- User-definable display hierarchy via menu building software.
- On-line workstation configuration capability with password protection down to the display level.
- Ability to connect to an INTERSPEC bus and act as a host for INTERSPEC devices.
- Software that interfaces with and assists in implementing an open application platform capable of addressing your total measurement, control and real-time information requirements.
- Object-oriented display software enabling all displays created on one workstation to be transported to other workstations having different levels of performance and resolution. This allows seamless interoperability with other plant information systems and networks.
- On-line configurators that enable you to implement a more robust automation system whose capabilities can expand and evolve along with your operations.
- Reliable, secure operation in rugged plant environments.
- Software that is easy and cost effective to install, configure, operate and maintain.

Human interface software comprises a common real-time display manager and associated subsystems and tools that support all activities related to graphical display and configuration activities. The human interface software manages the differences among all workstations (personal workstations, I/A Series workstations, and I/A Series application workstations) so that display applications are directly transportable from one workstation to another.

All 50 Series workstations support X Window interactions using the OPEN LOOK window manager and this same human interface software to provide access to I/A Series information and applications as well as access to other programming and third party options.

In addition, the human interface software supports multiple I/A Series real time display manager windows on the 50 Series workstations (WP51, AW51) for both the local workstation screens and remote terminals running X Window Systems⁽¹⁾. With this feature, multiple process displays and applications are available to the operator in the central control room as well as accessible to an engineer or technician in the plant and/or plant management personnel in an office area.

The software also supports a terminal emulation mode (VT100) that enables a workstation to serve as a programmer's terminal, or as an interface to some of the available plant/process management tools as required for each unique installation. Refer to detailed PSSs for additional information on these packages and personal workstation requirements. All I/A Series human interface software runs on I/A Series hardware or a personal workstation.

Information in this PSS is divided into two major sections: run-time software for process management and control, and configuration software. Run-time software consists of:

- Real-Time Display Software which includes multiple instances of display manager software
- 50 Series Workstation Windows Software
- Plant Operation Oriented Displays
- Trend Subsystem
- Alarm Subsystem
- Operator Message and Report Software
 - Operator Action Journal
 - Operator Message Interface
 - Process Summary Reporter
- System Management Software

Configuration software consists of:

- Display Building and Configuring Tools
 - Display Builder
 - Display Configurator
 - 50 Series Display Builder
 - Display Conventions Configurator
 - Graphics Status Attributes Configurator
 - Graphics Utilities
 - Group Display Configurator
- Multiple Display Manager Configuration
- Display Utilities
 - Display Reporter and Connection Editor
 - Grouped Object Editor
 - File and Database Conversion
- System Configurator
- Workstation/Environment Configuration
- Process Alarm Configuration

Depending on the function, software may work as virtually independent units or in concert with other software (e.g., Trend Subsystem and Historian). Human interface software will support operations such as:

- Configuring system equipment and software
- Setting up system security
- Accessing specially tailored environments from local workstation screens and remote terminal screens
- Manipulating control displays

(1) X Window System is a network-based standard windowing system.

- Acknowledging alarms and taking corrective action
- Editing standard displays and building new displays
- Connecting dynamic objects within a display related to programs and process control blocks
- Setting up and tracking process control trends
- Checking system health and updating EEPROMs

RUN-TIME SOFTWARE

The following software components are process operator oriented and interact to provide you with a sophisticated yet easy-to-use interface to the total process. They allow you to perform a wide range of operations from viewing and manipulating the process and monitoring system health to taking stations off-line and printing reports.

REAL-TIME DISPLAY SOFTWARE

This real-time display software enables an I/A Series workstation to interact with any and all of the real-time plant, field, and process data that is available in the system. Areas of operational access or “environments” for the workstation are changeable on-line and are preconfigured by using the Password Environment Configurator described later.

All screen selections are based on intuitive “picking” of display objects and menus on the screen. A common menu bar structure with pull-down menus is presented at the top of all displays to enable fast access to available workstation functions. You can specify the content of menus to form a user-defined display hierarchy.

Real-Time Display Software also supports either single-screen or multiple-screen operation. Single-screen operation allows workstations to operate independently of one another; e.g., duplicate workstations can have duplicate or independent responsibilities. Multi-screen operation allows you to configure a group of Workstation Processors (WP20s, WP30s, and 50 Series workstations) having the same host Application Processor (AP) to form a multi-screen cluster. The WPs/AWs can then be operated as a single multi-screen workstation.

Multiple workstation displays can operate in a user-specified coordinated arrangement to support single or multiple operators. Multi-screen real-time software provides the following:

- Ability to direct input devices such as a mouse, trackball, or keyboard, to multiple screens (WP20s, Wp30s).
- Ability to enable/disable input devices on-line.

- Ability to redirect displays from one screen in the cluster to another and toggle any screen between multi-station and single station mode.
- Ability to call up multiple displays simultaneously with a single request.
- Ability to determine on-line those screens that are to be allocated to multiscreen use.

MULTIPLE INSTANCES OF REAL TIME DISPLAY SOFTWARE

Multiple windows for I/A Series real time display software (display manager) are available on the following 50 Series stations: the WP51 and the AW51. These multiple display manager windows can be opened on the screen providing access to multiple process displays and applications on both the local screen and a remote terminal running X Window System. Dual-headed workstations provide an additional local screen for a single workstation with a common keyboard, a common pointing device that moves seamlessly between the two screens, a common bus for touchscreen, and up to four annunciator keyboards.

Windows for multiple display managers can be assigned to one, both, either, or any screen (local or remote) as well as have access limited to specific environments, applications, and actions. In addition, the initial size and screen location, the resizing capability, and the startup option associated with the display manager windows are configurable. Each display manager window has its own unique name and functions independently. This name appears in the window frame preceded by the hosting workstation letterbug.

Multiple display manager windows provide the process operator, engineering personnel, and plant management personnel with the convenience of viewing/working with information specific to their needs from multiple locations – e.g., from the central control room, from a terminal running X Window System in the plant area, or from a terminal located on another network logged into the I/A Series system.

In terms of multi-screen operation and coordinated display sets, the WP51 and AW51 workstation screens in the multi-screen cluster have the advantage of supporting additional displays per screen (e.g., four independent quarter screen displays). Thus, a larger number of process displays are available in the cluster and/or coordinated display set for monitoring and controlling the process.

OPEN LOOK X WINDOW FOR 50 SERIES WORKSTATIONS

The OPEN LOOK Graphical User Interface on 50 Series workstations uses windows and menus to provide an intuitive windows environment. Windowing takes advantage of the multi-tasking operating system capability. It allows you to begin a task in one window while continuing work in another. It also allows a CRT interface within the I/A Series system using X Window System for optionally connected information networks.

In the 50 Series Workstations, applications that can concurrently appear each in its own window are:

- Display Manager(s) (Live process)
- System Manager
- Historian Configurator, Operation, Manual Data Entry
- Integrated Control Configurator
- Process Summary Reporter
- Operator Message Interface
- Spreadsheet
- VT 100 Mode
- Help Functions
- Optional X Window from Connected Plant Information Systems.

The display manager window, a default window that presents the initial Foxboro I/A Series display, is always present on the screen (as a window or icon) and is used to view process displays. This window also provides consistent access to other Foxboro applications via the top menu bar and pull-down menus. With the introduction of multiple display managers on the WP51/AW51, the operator can access I/A Series display information in the number of display manager windows available (via configuration) per screen.

Using multiple windows allows higher productivity in engineering and information management tasks related to plant operations. Figure 1 and Figure 2 show typical multiple-window displays on 50 Series workstations. Workstations can be directly connected to applications running on other platforms (Figure 3) thus allowing single operator interface to multiple systems and multi-media capability.

Alternately, the multiple windowing capability on a 50 Series workstation can be turned off allowing emulation of single window operation where a single display manager provides displays and access to other applications in the same manner as on the WP30.

The contents of a selected application are displayed in a base window on the background screen area known as the workspace. Control of the workspace is handled by using the mouse/ trackball buttons, touchscreen (to emulate left button), and function keys to perform actions such as the following:

- Access function menus, windows, and icons – stack a window in front or back of another window
- Make selections from menus
- Manipulate the size and location of windows – toggle between two window sizes, and change window dimensions
- Scroll the contents of a VT 100-like window
- Iconify a window – change the window to an icon representing it in compressed form or open an icon to its full size window

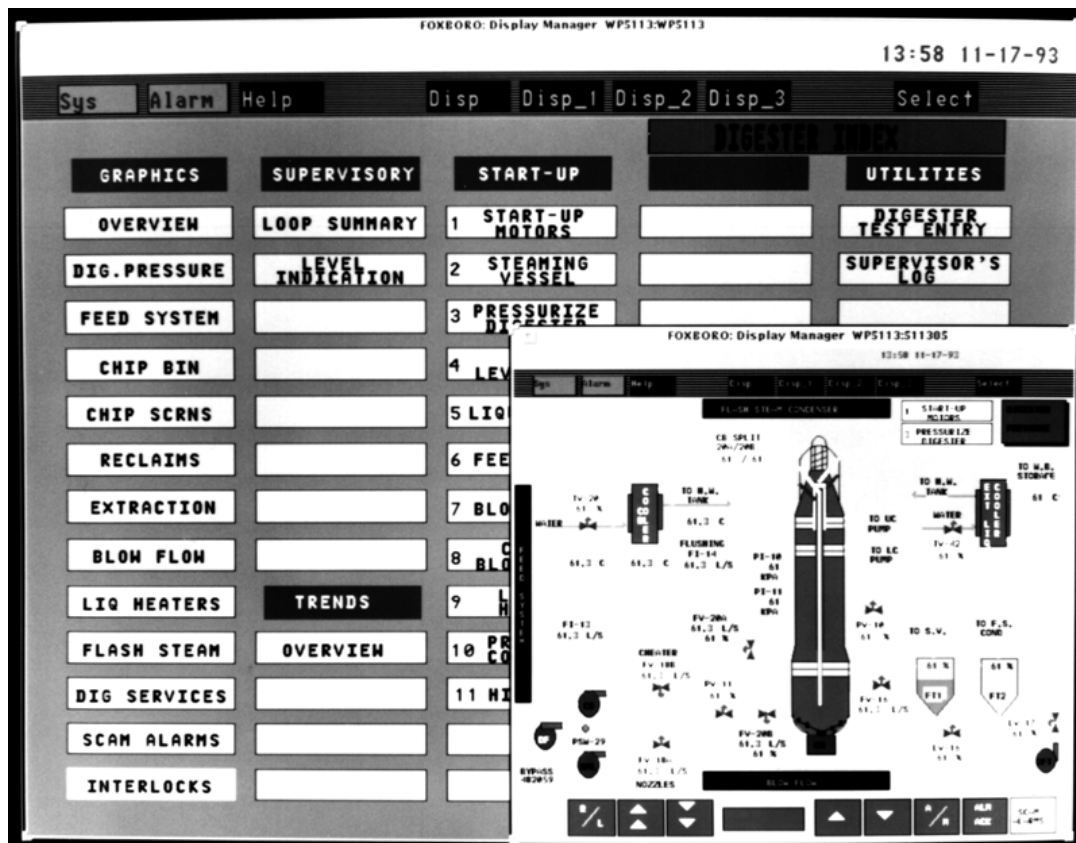


Figure 1. Typical 50 Series Multiple Display Managers

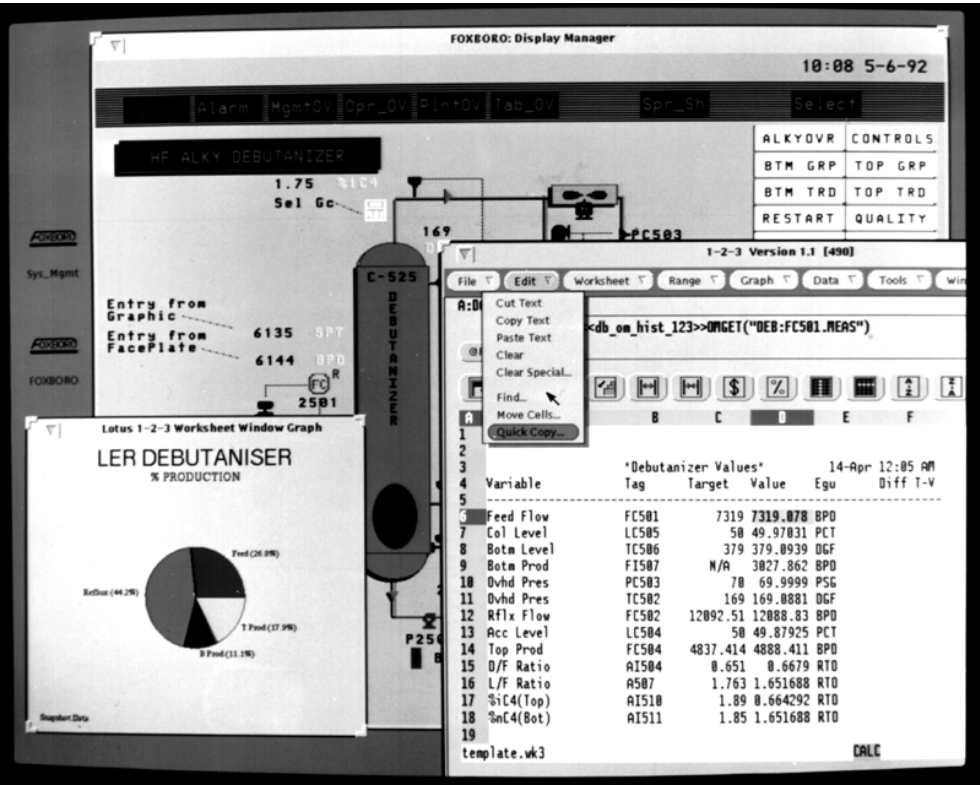


Figure 2. Typical 50 Series Applications Display

Figure 4 shows the basic elements of a window. The types of menus available are:

- A window menu for performing functions related to the window, such as resizing, moving, restacking, opening/closing.
- A workspace menu for accessing a function or submenu of functions, such as, programs, utilities, properties.

- Scroll bar menu, for scrolling specified text in the application pane to new locations within the pane or back to the previous position.
- Pop-up windows for filling in information or making choices.

These menus are available under menu buttons in the control area or as pop-up menus at the pointer location. Menus are accessible on a temporary basis, available until dismissed, or push pinned to the workspace for ready access.

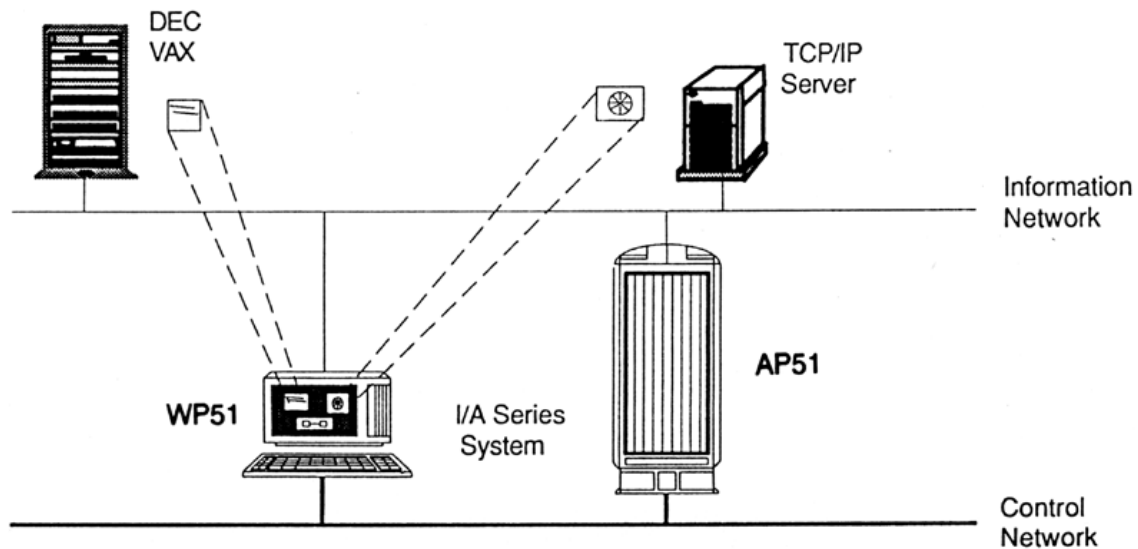


Figure 3. Window to Other Applications Running on Another Platform

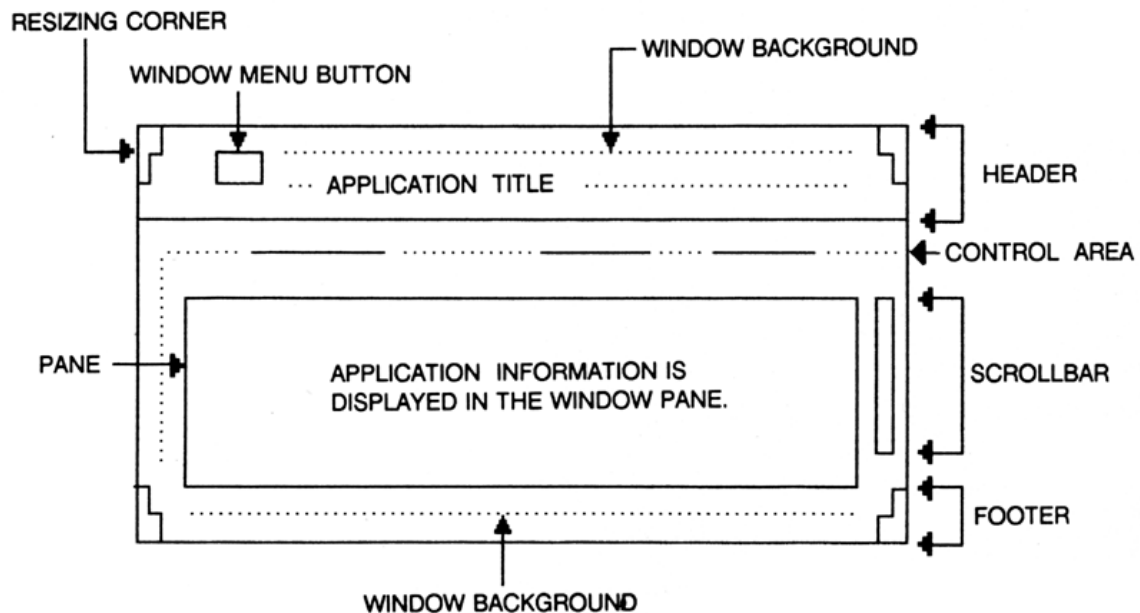


Figure 4. Elements of a Base Window

PLANT OPERATION ORIENTED DISPLAYS

These displays are the major vehicle for operator interaction with the total process. They enable speedy access and the capability to manipulate process control variables and perform standard operator tasks such as ramping values, responding to alarms, and printing reports.

Default Displays

Default displays allow immediate and complete access to an installed process control scheme through a series of automatically generated displays. The Default Display Subsystem, without user configuration, constructs a series of interactive real-time displays that allow access to any control compound, block, or block parameter available to the system. You can call up a full-screen Detail display for any block whether requested directly by name, called via the Current Alarm Display, or selected from any process display.

In addition to automatically generated displays, default displays include preformatted displays that are process operator oriented and are developed through a simple configuration process. All default displays are sized for use with any input device including mouse, trackball, or a touchscreen.

Access to all Default Display Subsystem configurators and subsequent displays is controlled in the same manner as all other I/A Series Systems configurators and displays.

Automatically Generated Displays

Automatically generated displays are fully operational displays, and are presented in three levels of control hierarchy:

- Station display
- Compound and Block Overview display
- Detail display

A Station Block, shown in Figure 5, conveys information about the system capacity parameters for a Control Processor (CP) type station. This block is installed automatically in a CP when the CP database is downloaded, and provides global data storage for CP system functions. Information displayed includes: percent of CPU time used for processing input/output, all blocks and continuous control blocks; free memory available in the CP; Object Manager scanner data; cumulative block processor overruns; total inter-station IPC connections; and peer-to-peer point connection status.

To access a control scheme without configuring displays, the operator can request the Compound and Block Overview display, which is a live display showing all compounds and blocks usually within a workstation's domain. The current level of criticality (the highest priority alarm that exists in any block within the compound) and relevant data is displayed for each compound and block.

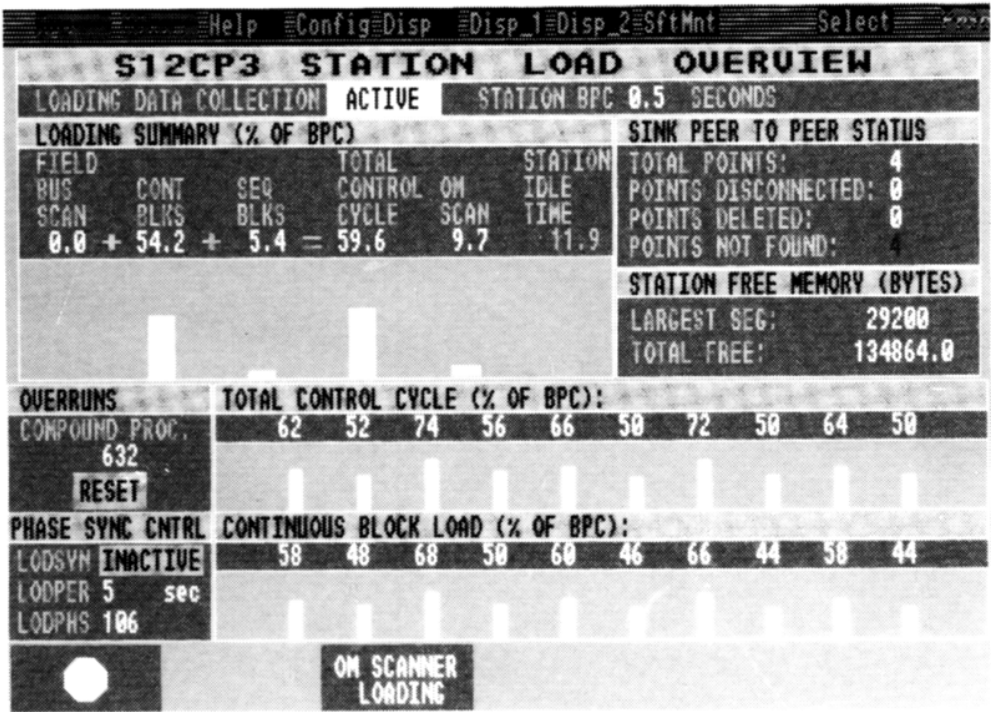


Figure 5. Typical Station Block

All alarm information displayed or set by default displays is received from or sent to Control Processors. This includes the acknowledged/unacknowledged status of the alarms.

Displays for individual compounds are accessed from the Compound and Block Overview display. Compound displays are live displays that allow interaction with all blocks within a single compound. Compounds from several CPs may be grouped and turned on or off as a group.

Detail displays for individual blocks are accessible from the Compound and Block Overview, Alarm History and Current Alarm displays. Detail displays, shown in Figure 6 and Figure 7, are live displays, unique for each block type, that allow operator manipulation of all valid block parameters.

The displays show all connectable block parameters, a faceplate area and a real-time trend area (for continuous control blocks). In graphic format and in a small area, faceplates provide information such as block type and description; measurement, setpoint, output values; block state and status; alarm condition; auto/manual and remote/local designation.

The three categories of block types/domains are:

- Continuous Control
- Sequence Control
- Ladder Logic (Programmable Logic Blocks)

Preformatted Group Displays

To develop more operation-specific displays, preformatted displays can be modified or new ones can be created through a menu-driven configuration and editing process. Optionally, you can link preformatted displays to each other and to user-developed graphics to form a user-defined display hierarchy.

The group display, shown in Figure 8, presents information for up to eight control blocks in a four-over-four screen layout. It shows each block as a faceplate with a unique layout available for each block type. The display can contain faceplates, trends, or X/Y plots or a combination of all three.

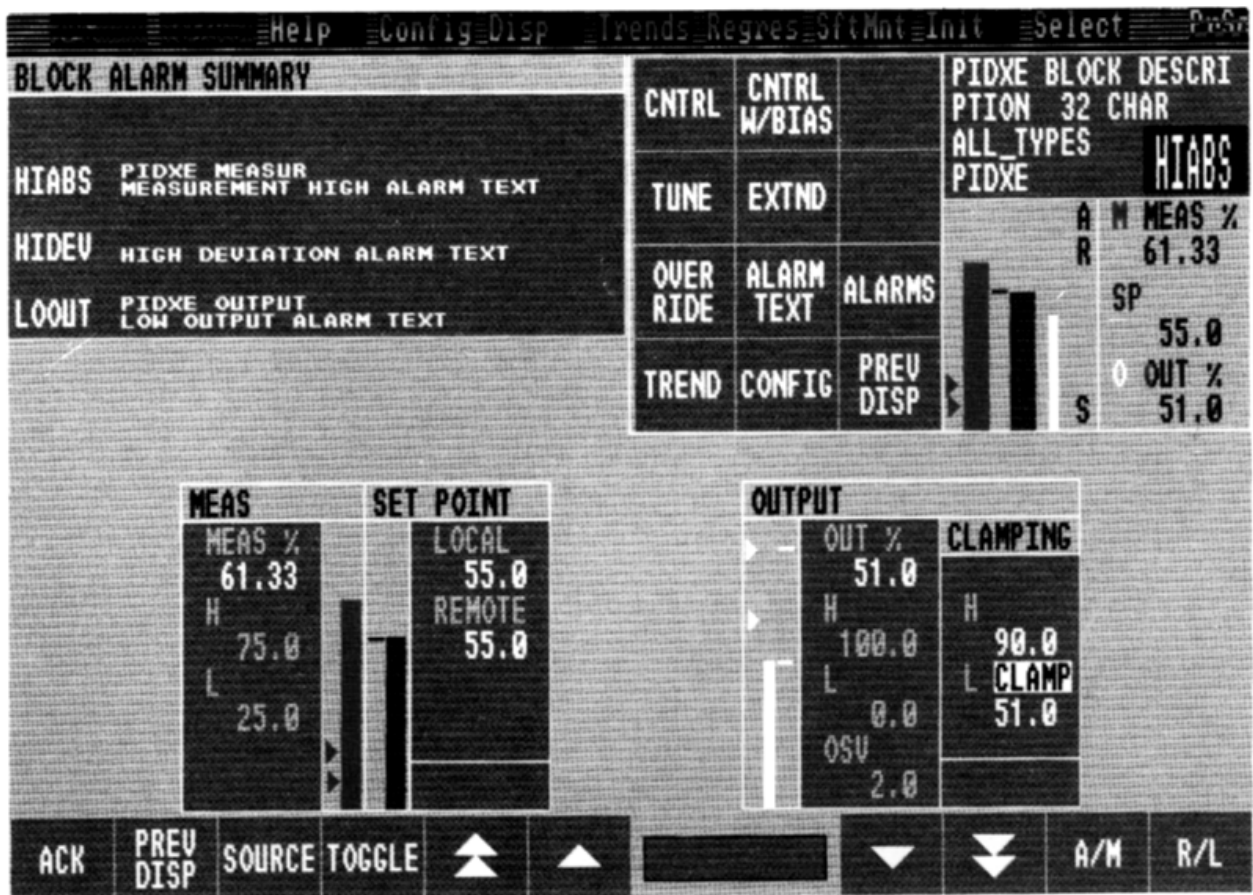


Figure 6. Typical Detail Display With Block Alarm Summary

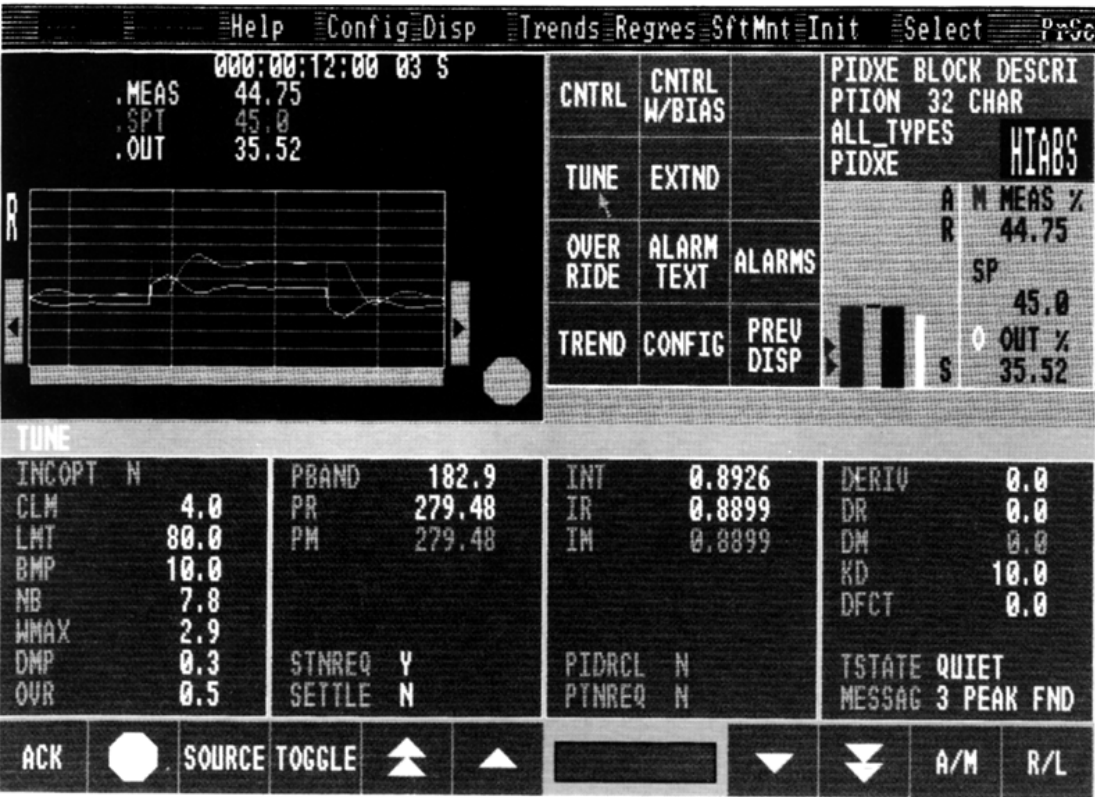


Figure 7. Typical Detail Display With Trend Overlay

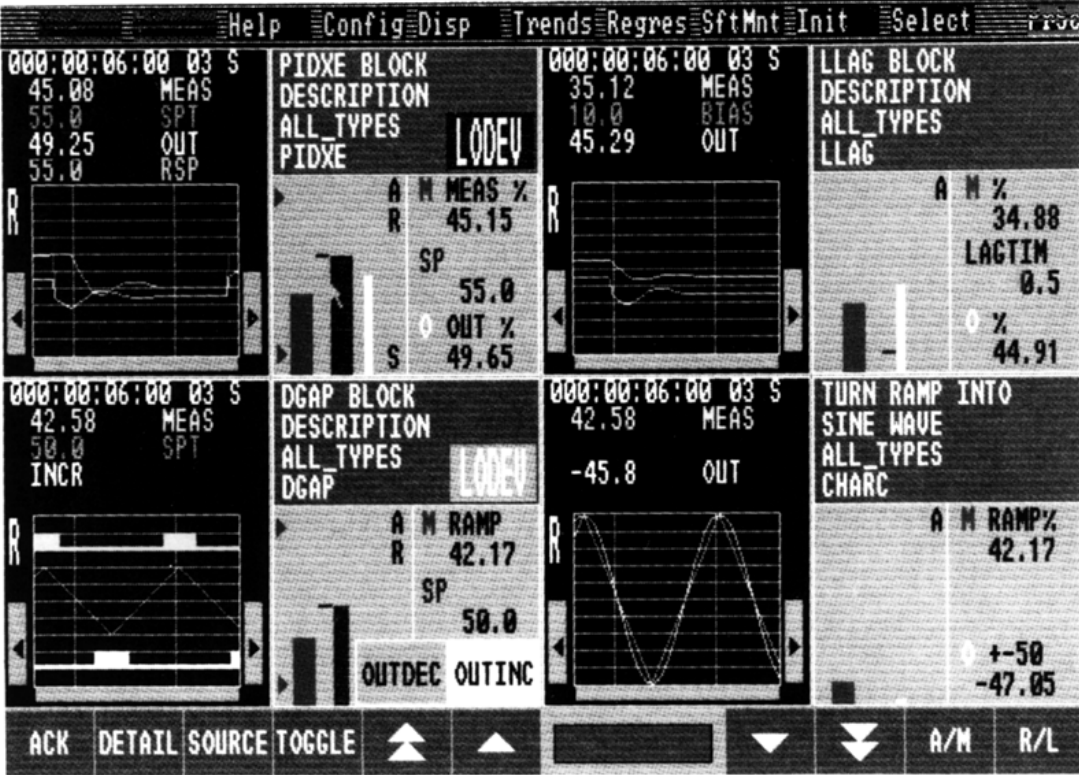


Figure 8. Group Display Example

Once you have generated the group display, you can use the Display Builder and Display Configurator to edit it. For example, as size of individual faceplates or trends can vary from one-eighth screen to full screen, you can edit the original display to change display object size.

Sequence blocks can be intermingled with Continuous blocks and PLB blocks in the group display. All control block types/domains are supported.

Group display interactions are performed with screen function keys. Interactions include:

- Control and alarm monitoring of blocks
- Ramping or numeric entry of set points, ratios, targets, outputs, etc.
- Toggling discrete values and controller states
- Requesting the Detail display for a selected block
- Direct access to the previous display

Invoking Default Displays

Default displays, preformatted displays, and user-defined displays can all be invoked in an identical manner. A specific predefined display can be assigned to and called from any menu, attached to a hard annunciator key or soft (screen) key, called via an application program, or attached to an active display object with a display.

TREND SUBSYSTEM

Trend areas are a collection of pre-built display fields that show lines (trends) representing changing data values from the real-time database, and from the historical database. Trends can be accessed from Display Builder and configured using the Display Configurator or can be imported and configured using the Display Builder on 50 Series workstations.

Trend areas are a collection of pre-built display fields that show lines (trends) representing changing data values from the real-time database, and from the historical database. The on-line trend configurator, selectable from a Detail display, allows you to change trend area attributes and trend line attributes without disrupting the process.

As an addition to preformatted real-time trend displays, Foxboro provides standard templates for trend areas, X/Y plot areas, and profile plot areas that can be copied or imported into any display. The trend areas vary in size (resolution) and are of two types: real-time and historical. The X/Y and profile plot areas also vary in size. The Display Builder and Display Configurator or the Display Builder for 50 Series

Workstations are used to include these areas in user-defined displays and assign the desired configurable options.

You can have up to 4000 points on a 50 Series AP or AW from a given Historian when multiple trends and plots and user-defined connections appear on a screen (base display and overlays). Features of trend areas include:

- Up to four trend lines per trend area representing variable data types (boolean, signed integer, real, and signed long integer)
- Tick marks indicating division of the axis
- Time axis length can be chosen freely
- Y-axis scaling can be specified independently of its length
- Off-normal limits can be specified in a different color
- Background color of a trend area can be specified
- Trend line color can be specified per trend line
- Solid trend can be drawn instead of a line trend
- X-Y trend objects (one variable versus another)

Text fields can be defined and configured to show:

- Scroll frequency for an entire trend area (limited to real-time trend objects)
- Per trend variable:
 - High range value
 - Low range value
 - Value at ruler (for direct readout)
 - Off-normal limits

Real-Time Trending

Real-time trend areas are dynamic, updating trend graphs, displaying the most recent variable data. These trends may show short-term history from a Historian as well as directly accessed data for any accessible control block parameters or system variables. The scan rate at which real-time data is collected is configurable down to one second, although the screen may update less frequently, drawing multiple scans at one time i.e., a two second trend may update every four seconds with the two most recent data values. Scrolling and updating of real-time trends start immediately after calling up the display.

Historical Trending

Historical trend areas provide purely historized data from the historical database files, which include sample data and reduction group data; archived sample group data and archive reduction group data; restored archive sample group and archive reduction group data from floppy disk or streaming tape. When historical trending is performed, it is assumed that the specified variable is assigned to a Historian. Historical trend variables can incorporate any data reduction and archiving functions thereof.

On-line Historical Trend Area interactions include:

- Selection of parameters to be viewed from the Historian data base.
- Specification of the high and low scale of the Y-axis for each variable for more or less detail.
- User definition of the time window (Base time and/or time span) specified by the time axis in order to view another portion of the history or to view a portion in more or less detail.
- Use of a moveable ruler to position and numerically read out historical variables within a displayed time window.
- Specification of off-normal limits.
- Zero axis readings.

X/Y Plots and Profile Plots

The X/Y plots contain two variables which are plotted against each other rather than against time. These variables may be real-time data taken from object manager-connectable variables within the system or a file of X/Y pairs.

The data points are collected at a configured scan rate and displayed as a series of points or markers that can optionally be connected.

Color is used to designate the latest X/Y pair and previously plotted points. Via the use of colors, file data can be visually compared to recent real-time data.

Features of X/Y area include:

- Specification of background color of X/Y plot
- Addition of objects to the background area
- Style selection of real-time and file plot data
- Standard grid
- Colors for representing the most recent data point, real data, and file data

The X/Y plot line attributes for each variable include: high scale value, low scale value, and delta change value (for real-time data). Default values for these attributes may be accessed directly from the Control Processor.

Figure 9 shows an example of a typical trend, faceplate, and X/Y plot. Figure 10 shows an example of a typical process display with a trend area.

The profile plot area displays data accessed from a data array of the following type of data: float, long, integer, or byte. The plot displays each data point along the X-axis with the value of each point associated with the Y-axis. The profile style is either line profile or bar profile and updates occur simultaneously or by exception (only if bar profile).

Features of the Profile Plot area include:

- Up to four lines or bar lines per plot area
- A reference line representing the median value for each line
- Line color specified per plot line under normal conditions
- Off-normal limits specified in a different color
- Reference line color
- Lines or bar lines can also be mirrored along the Y-axis

The profile line options include: high and low scale values, high and low alarm values, the start and end offset for the data array, and the location to which a selected point value is to be sent. Figure 11 shows an example of a Profile Plot.

The Trend Subsystem in conjunction with the optional Trend Pen Configurator, allows Analog Output variables to be assigned to Analog Strip Chart/Pen recorders for hard copy of real-time trend data. Control Processor I/O connections are the hardware interface to analog recorders.

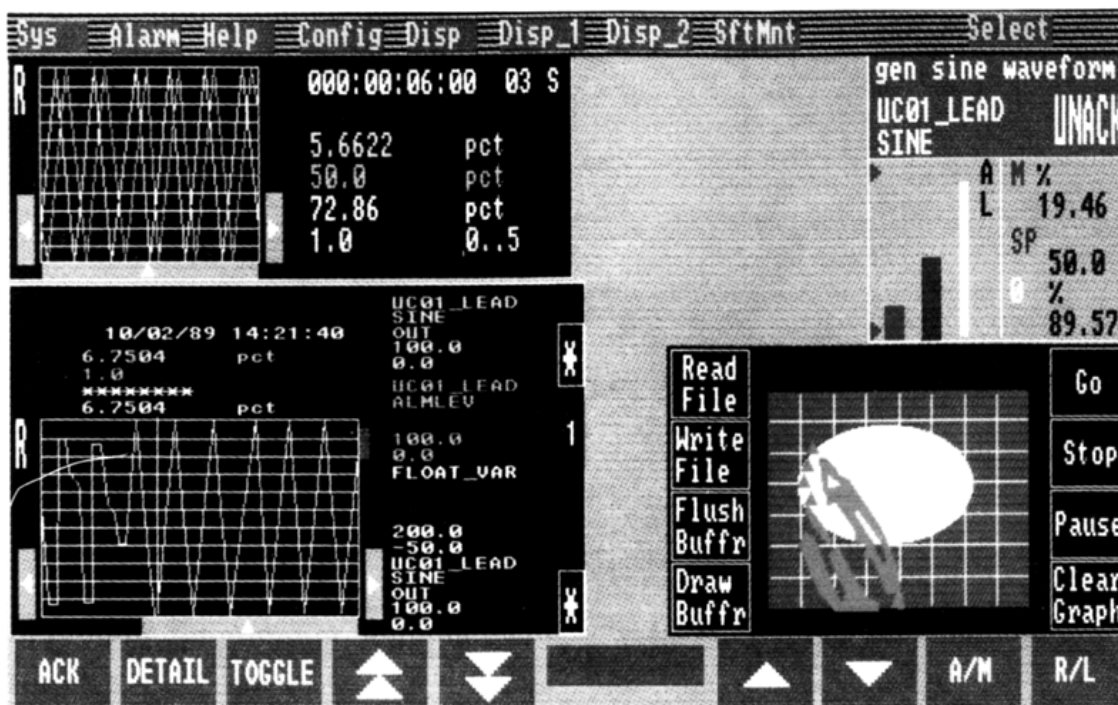


Figure 9. Typical Trend, Faceplate, and X/Y Plot

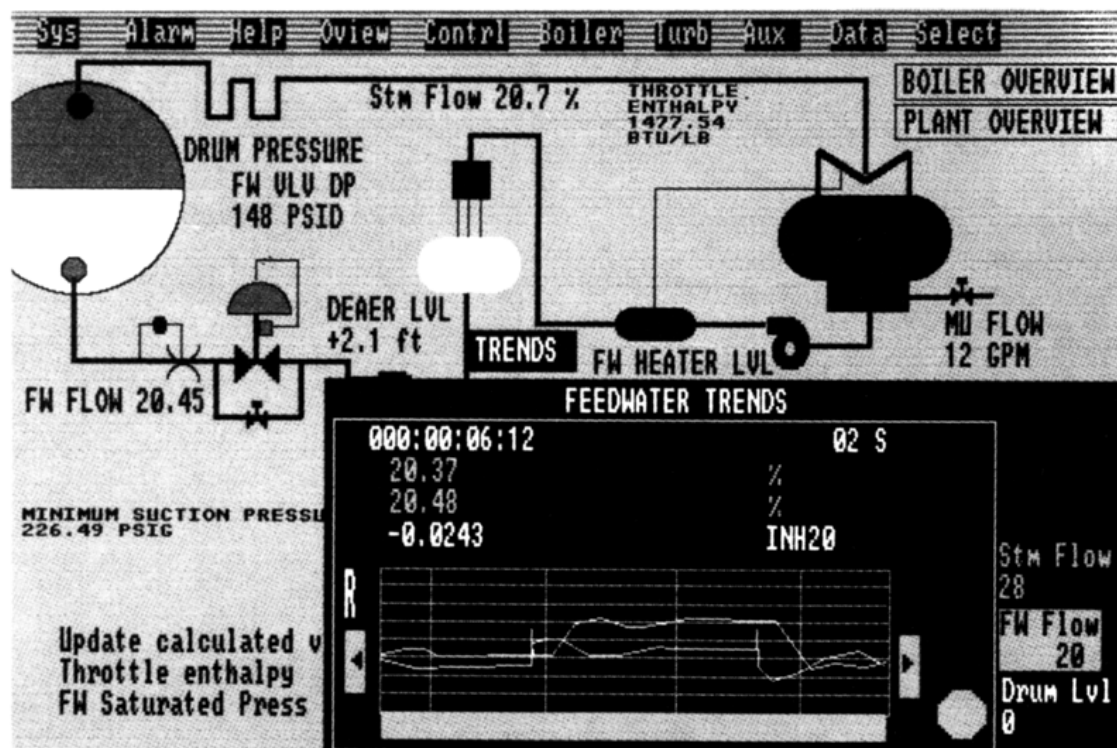


Figure 10. User-Generated Display with Trend

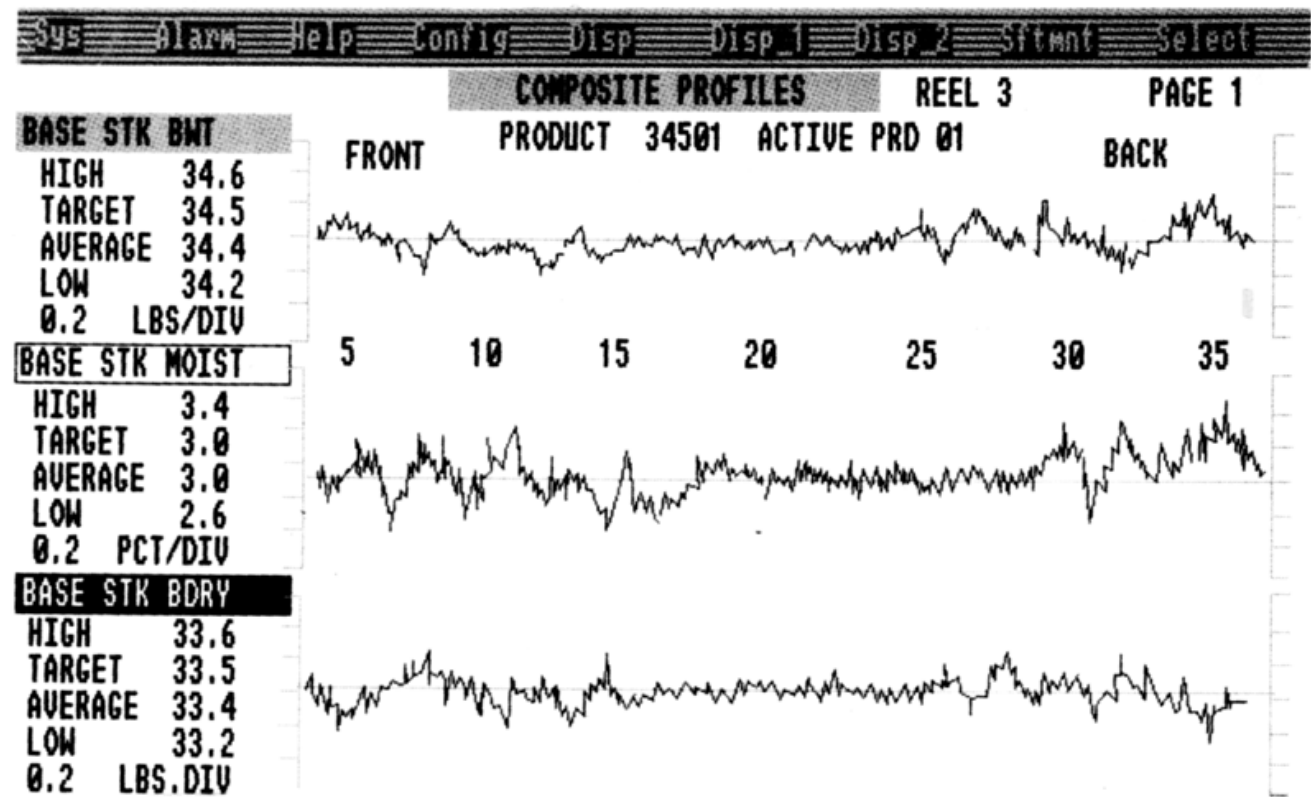


Figure 11. Profile Plot Example

ALARM SUBSYSTEM

The Alarm Subsystem manages the initialization, configuration, display, and actions of alarm messages and alarm associated keys within a workstation. This includes responsibility for the following:

- Blink control of the SYS and ALARM fields on the top menu bar.
- Control of the Current Alarm Display (CAD) and actions associated with process alarm messages.
- Managing the Alarm History Display.
- Configuration and control of the annunciator panels.

Alarms are received by the Alarm Subsystem and queued based on a user-configurable sorting method.

System Alarms—alarms related to the health of the network and of the stations and peripherals on the network cause the SYS box on the top menu bar to blink. Picking this area allows access to System Management related functions. Alarms go to the printer and Historian.

Plant/Process Alarms—alarms related to the process control compounds and blocks cause the ALARM field on the top menu bar to blink. Information available for this type of alarm includes the compound/block/point name, date and time of alarm, value at time of alarm, type of alarm, and value of alarm limit exceeded.

Plant/process alarms, and messages are transmitted to each workstation from their source (control or application processors).

The Alarm subsystem allows each workstation to handle up to two annunciator or annunciator/ numeric keyboards (four on dual-headed workstations) with up to 48 keys or 32 keys and a 16 key numeric keypad each. Through flashing light-emitting diodes (LEDs), the annunciator keyboards provide visual indication of the alarm status of multiple control blocks.

Labels/legends for the keypads are user-definable. You can assign any display or program for direct invocation from any of these dedicated keys.

The notification of alarming at a workstation can be suppressed by assigning an alarm the lowest priority via the Integrated Control Configurator (ICC). The sounding of an audible horn at the workstation can be configured based on a priority of 0 for system alarms and a priority of 1-5 for the incoming process alarms. The alarm priority required to initiate each horn is user-defined. The alarm subsystem supports two annunciator/numeric keyboard horns (four for dual-headed workstations), one console horn (two for dual-headed workstations) and up to six horns external to the I/A Series equipment.

Alarm Panel and Alarm Table configurators and a user changeable file for horn default configuration are used for defining and setting up annunciators and horns. Figure 12 shows an example of a configuration process for an alarm where the user is attaching a display to a key on an annunciator keyboard.

The Alarm Subsystem supports both an Alarm History and a Current Alarm Display. The Alarm History display shows the latest 500 plant/process alarms in chronological order. The configurable CAD displays the plant/process alarms depending on the option chosen for the following:

- the alarm sort which can be chronological sequence, priority, and/or acknowledged status
- the number of alarms per page
- the screen refresh rate
- the alarm tag color

Both the text and the format on CAD are also customizable. Alarm entries clear from the configurable CAD based on the acknowledgment and return to normal states. From this display, graphics associated with the alarms in the CAD can also be redirected to other WPs or with WP51/AW51 to other Display Managers thus allowing continuous viewing of the CAD. A soft key is also available to override this display redirect feature. Figure 13 shows an example of a customized CAD.

The Alarm Subsystem allows you to preselect the display that is preferred for interaction when a plant/process alarm occurs. By configuring one or more control blocks to each LED on the annunciator keyboard as well as configuring a specific display and/or program to each annunciator key, you can easily access the desired display via an annunciator key.

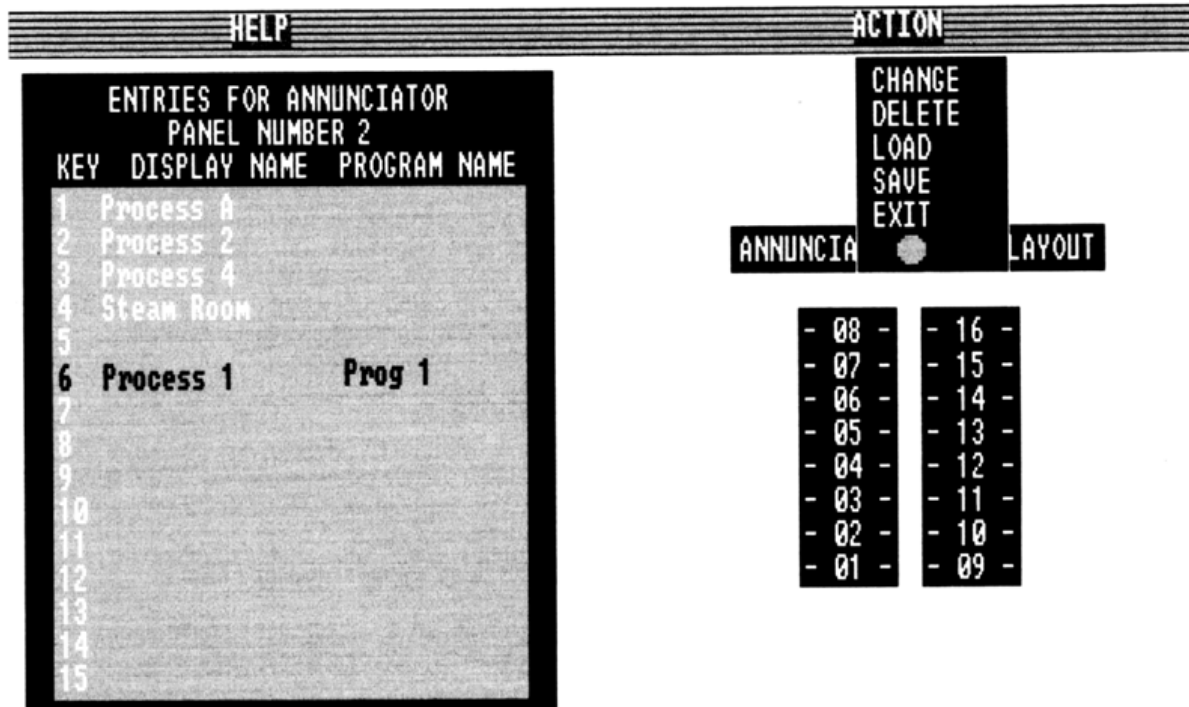


Figure 12. Attaching a Display to an Annunciator Keyboard Key

FOXORO: Display Manager					
13:28 11-17-93					
Sys	Alarm	Help	Config	Disp	Disp_1 Disp_2 SftMnt
Select					
CURRENT ALARMS					
10:02:01	21LIC201HT	#21 BLOWTANK LEVEL	OVERFLOW DANGER!	UNACK	
10:01:56	21LIC201HT	#21 BLOWTANK LEVEL	TEXT	HIDEV	
10:01:47	31FIC110CC	#31 FEED STOCK FLOW	HIGH CROSS CHARGE	UNACK	
10:01:37	21AIC214HT	#21 TOP COMPOSITION	EXCESSIVE #1	HIDEV	
10:01:16	21LIC215HT	#21 REFLUX DRUM LEVEL	LEVEL ABOVE SPT	HIDEV	
09:59:04	21LIC201HT	#21 BLOWTANK LEVEL	VALVE FULL CLOSED	UNACK	
09:58:54	21LIC215HT	#21 REFLUX DRUM LEVEL	OVERFLOW DANGER	HIABS	
09:58:49	21AIC214HT	#21 TOP COMPOSITION	LOW REFLUX DEMAND	LOOUT	
09:58:40	21LIC215HT	#21 REFLUX DRUM LEVEL	LOW INFLOW	LOOUT	
09:58:30	21FIC201HT	#21 DISTILLATE FEED FLOW	DANGEROUS FEED RATE	UNACK	
12:52:52	31FIC110CC	#31 FEED STOCK FLOW	LOW DEMAND	UNACK	
12:52:52	31FIC110CC	#31 FEED STOCK FLOW	ABNORMAL HIGH DEV	UNACK	
12:52:52	31FIC109CC	UNIT CROSSOVER FLOW	VALVE FULL CLOSED	UNACK	
12:52:52	31FIC109CC	UNIT CROSSOVER FLOW	FLOW > 20 GPM HIGH	UNACK	
12:52:52	31FIC109CC	UNIT CROSSOVER FLOW	EXCESSIVE UNIT DEMAND	UNACK	
12:52:52	21FIC213HT	#21 DISTILLATE FLOW	VALVE FULL CLOSED	LOOUT	
12:52:52	21FIC213HT	#21 DISTILLATE FLOW	FLOW > 10 GPM HIGH	HIDEV	
12:52:52	21FIC213HT	#21 DISTILLATE FLOW	TRIM BACK SET POINT	HIABS	
12:52:09	21FIC201HT	#21 DISTILLATE FEED FLOW	FLOW > 10 GPM HIGH	UNACK	
12:44:40	21FIC201HT	#21 DISTILLATE FEED FLOW	VALVE ALMOST CLOSED		
ACK	ACK	BLK	USER	CLR	Page 1
ALN	PAGE	DTL	DISP	ALM	of 1
					TOP
					PRIO
					ALM
					HIST
					PREV
					DISP
					1ST
					PAGE
					PREV
					PAGE
					NEXT
					PAGE

Figure 13. Customized Current Alarms Display Example

These user displays are also invoked via the Top Priority Alarm Display (TOP PRIO) key based on the first entry in the alarm queue. The User Display associated with the top priority alarm is accessible until a new alarm appears as the first entry in the alarm queue. If user displays are not associated with blocks, detail displays are accessed.

The Top Priority Alarm Display is available from both the CAD and Alarm History Display. Acknowledgment of process alarms is from both Detail Displays and the alarm displays; horn silencing is via the annunciator keyboards.

Optionally, workstations can be configured to form a logical Common Alarm Group (CAG). An alarm action, horn silencing or alarm clearing, performed on any workstation in the group affects all the workstations in the group. For WP51s and AW51s, these actions occur for all active display managers configured within the Common Alarm Group.

Display redirection is supported in the Common Alarm Group. Selecting the display key from the CAD or Alarm History Display causes the display to appear on the workstation designated in the CAG configuration file. Alternately, selecting the override redirection key allows the display to remain on the

local screen. For 50 Series workstations requiring display redirection, the display may be directed to a uniquely named display manager associated with a workstation rather than a workstation.

OPERATOR MESSAGE AND REPORT SOFTWARE

Foxboro offers three packages that further enhance human interface tasks and render process operation and interaction more friendly. This software allows operators to obtain printed reports for compound and block status, records of operator actions, and to view a variety of messages.

Operator Action Journal

The Operator Action Journal is a record of specific operator actions taken during process control operations. These actions consist of manipulating certain compound/block parameters in CPs using the Display Manager, for example:

- Ramping or direct data entry of new point values
- Toggling points
- Changing block status
- Acknowledging block alarms

Actions from user built graphics, detail displays, group displays, or external sources (i.e., script files) are logged regardless of the origin of the request. Also logged are environment change actions and entries into configurators.

Information logged for each compound:block parameter change includes:

- Date and time
- Letterbug of WP requesting the change or the name WP51/AW51
- Compound:Block.Parameter for which the change was made
- "Old value" to "new value" text field

The Operator Action Journal configurator allows the engineer to send operator actions to a:

- Logging printer
- Historian for logging and later retrieval
- Report file for later printing at a system printer

The configurator also allows the engineer to specify the time duration for the report and to enter filter patterns to select workstation letterbugs, compound names, and block names to be included in a Journal report.

Operator Message Interface

The Operator Message Interface (OMI) enables process engineers to display messages on workstation screens to instruct, notify, and inform process operators. The Display Builder and Display Configurator allow you to build process displays containing message display objects.

For example, you can build a soft key on the process display and configure the key to blink red when it receives a message. Selecting the key displays a message on the screen.

The Display Builder provides pre-built objects for displaying the following OMI message types:

- Display Message—Provides a message that informs the operator of a process event or reminds the operator to perform an action.
- Confirm Message—Provides a message similar to the Display Message type, but it requires the operator to confirm having read the message.
- Take Action—Displays a message directing the operator to execute an action that, until acknowledged, suspends the process for a specified time period.

- Enter Data—Displays a message directing the operator to enter data for a specified time period. Depending on the data requested, the software then checks that the correct data type was entered.

Because OMI creates an interactive communications network, process operators can acknowledge messages. However, the operator must respond to a message to initiate control actions.

Display objects are linked to message files using the "mfpatch" utility in the VT100 mode. The Message File Configurator is used to configure message files for the following.

- Storage queue size
- Storage host station
- Recording historian
- Reporting printer

To direct operator actions, OMI receives messages from the following I/A Series software:

- Batch Plant Management (BPM)
- Sequence blocks
- C programs

High Level Batch Language (HLBL) is used to write messages for sequence blocks, and Production Management Language (PML) is used to write messages for BPM procedures. You can also write messages using the C programming language in the VENIX or UNIX operating system. Embedding OMI functions in statements using these languages sends the messages to OMI for display on a workstation screen. Depending on the message type, OMI accepts and records an operator's response.

OMI receives messages in the order that they are sent and places multiple messages in a queue. Therefore, before operators view or acknowledge the most recently sent messages, they must first acknowledge any previous messages in the queue.

Using blinking fields in the message display, OMI notifies the operator of the following conditions: new available message, invalid response input, message acknowledgment required.

OMI records and/or prints message file events, e.g., message timeout. You can configure the historians and printers for logging the event messages.

Process Summary Reporter

The Process Summary Reporter (PSR) allows you to generate printed reports listing the status of a set of compounds and blocks that are in an exception condition; e.g., in alarm, in manual, not on control. You can also write the report to a file, which can be copied to diskette for long-term storage of report data.

The reporter runs on an Application Processor, Application Workstation or Personal Workstation, and it can be accessed concurrently by several Workstation Processors. PSR is invoked from the Sys menu and provides an easy-to-use operator interface.

The configurator lets you select configured report files that already exist, or define new report files. Files contain reporting selections including: list of available printers; compound and block names; specifications for the compounds/blocks and their associated exception states and report types; alarm conditions.

Reports are produced in accordance with specifications in the configurator file for those compounds and blocks that are in an exception state. There are three types of reports for compounds:

- Compounds off scan
- Compounds in alarm
- Compounds with alarms inhibited

There are six types of reports for blocks:

- Blocks off scan
- Blocks in alarm
- Blocks with alarms inhibited
- Blocks not on control
- Blocks in manual
- Blocks with bad I/O

Reports can be issued for compounds and/or blocks in a variety of combinations. You can choose: a single type of report, multiple reports, or all types of reports for all entries in a configurator file.

The set of compounds and blocks that are candidates for a report can be defined by means of a name pattern. Selection by pattern can range from all blocks and compounds to a single block or compound.

You can cancel a report after it starts printing, but you cannot cancel output to a file. Figure 14 shows an example of a Process Summary Report.

SYSTEM MANAGEMENT SOFTWARE

The System Management software is a distributed software system that allows you to monitor the health and performance of all components of the configured system and to intervene in both network and system operations. Specifically, it enables such functions as:

- Viewing hierarchal system and network displays indicating the health of system equipment and network communications. You have access to information from the system network down to the sensor level (Intelligent Transmitter).
- Providing network statistics for analyzing network performance.
- Displaying system monitor domain information and complete information about stations and peripherals within the domain.
- Displaying information about Intelligent Transmitters and Hydrostatic Interface Units.
- Allowing a user to perform equipment change actions, such as rebooting a station or putting a peripheral off-line.
- Running on-line and off-Line diagnostics.

Software consists of Station and Software Managers, System Monitors with security and error handling capability, a System Management Display Handler, ROM resident software, and Network Fault Detection software. Information is collected from system files, equipment lists, and system tables. Graphical representations of system equipment guide you to system health displays and diagnostic displays.

BLOCKS WITH ALARMS INHIBITED

Aug 25 09:05 1992

/usr/spool/lp/request/LP02/d5-80

Page 1

Blocks with alarms inhibited

Thur Jul 23 09:05:15 1992

Compound	Block	Description	Prtype	Cr	Bad I/o	Unak	AM*
CP10_HEADR01:CALC01		calc_algorithm	Lo Out	3	-	Y	A
CP10_BOILR02 :AIN003		analog_input	Lo Abs	5	Y	Y	A
CP10_BOILR04 :AIN001		analog_input	Lo Abs	1	-	Y	A
CP10_BOILR04 :AOUT01		analog_output	Lo Abs	5	-	Y	M
CP15_LINE10 :AIN004		analog_input	Hi Abs	5	Y	Y	A

* See Blocks in alarm report

Figure 14. Process Summary Report Example

The System Management Display Handler software runs on any workstation in any environment and the System Management menus and displays can appear on any number of workstations simultaneously. There are multiple copies of this software concurrently resident within the system. Pointing/input devices used for displays are a mouse, trackball, or touchscreen.

System Management Menus and Displays

Operator actions are performed through a number of menus and displays that are initially accessed by selecting SYS_MGMT from the SYS pull-down menu. SYS appears in the main environment menu bar at the workstation. When you select SYS_MGMT, the System Management software determines which of the following conditions exists and puts up the appropriate initial health display:

- When there is only one System Monitor, the System Monitor Domain display appears.
- When information for all System Monitors and their stations fits on one screen, the System Monitor Domains display appears.
- When the information for all System Monitors and their stations does not fit on one screen, the System Monitors display appears.

The System Monitor Domains display shows all stations (and monitors) on the network. The System Monitor display lists the monitors on the network. When you select a specific monitor from this list, a System Monitor Domain display appears that gives the stations and their logical names in the domain of the monitor selected. It also shows the domain and station status. If the station status changes, the menu item is updated; it can indicate failure (acknowledged or unacknowledged), or that it is now usable.

Basic Displays

NETWORK, TIME, PERFORMANCE, CONFIG, and OFFLINE appear as pickable items at the bottom of the initial displays to provide access to more detailed menus and displays. You can move around and among the displays performing such actions as scrolling, exiting, returning to the top menu bar or previous display, paging up or down, and getting Help.

Network Display—When NETWORK is selected from any of the three initial displays a hierarchy of network displays indicating the topology and health of network communications is available.

From these displays you have access to displays providing equipment information and change actions as well as on-line diagnostics.

Time Display—When TIME is selected, the display allows you to set the desired time for the entire system.

Performance Options Display—When you select PERFORMANCE from an initial display, it allows you to:

- View System Management Parameters
- View Peripheral Parameters

System Management counters are made up of the following categories. If you select any of these categories, the counters within that category are displayed for system-wide communications:

- MAC Layer
- Network Layer
- Transport Layer
- Application Layer
- Loading Parameters

Depending on the type of peripheral (printer, FBM, controllers), the types of communication counters will vary.

Configuration Display—When you select CONFIG from an initial display, a Station Display depicting a graphical representation of the selected station and its peripherals appears. It allows you to access:

- Equipment change actions for the station or peripheral (reboot, update the EEPROM, change reporting option).
- Equipment information regarding the current status of the station or its peripherals.
- Configuration information regarding system monitor name and host for station.

Off-Line Diagnostics Display—This display allows you to diagnose station failures by invoking a series of tests to be executed on the selected station. When you select the Off-Line diagnostic tests, the station is taken off-line or, in the case of a Fault Tolerant station, you can choose whether to deactivate the Primary station or the “Shadow” station. After the tests are performed, the results are returned for your evaluation.

On-Line Diagnostics Display—Accessed via the Network Displays, this display allows you to diagnose network failures by running on-line cable tests. These tests check the nodebus or Carrierband LAN/fiber optics cables to diagnose the cause of the communication error depicted on the Network Displays.

Figure 15 and Figure 16 show typical examples of System Manager displays. The user selects a station (UCEE01) from the System Monitor Domain display. The user selects CONFIG and the Station display for UCEE01 appears. From the Station display, the user selects a Fieldbus Module and EQUIP INFO, and has obtained the Equipment Information display for that station.

EMBEDDED HELP

I/A Series Systems provide on-line help that is associated with the software functions themselves and is accessible only when those applications are running. Embedded help provides information and assistance as you use a software program/ function. The information available through help relates to the current display, current program operation or selection. Therefore, it changes as you proceed through the program to provide you with appropriate information.

Help is requested by selecting HELP from the menu bar. A menu of topics relating to the current display or selection appears on the screen. When you select a topic from a menu, the help text is displayed in a partial screen overlay.

Screen control functions are displayed as selectable icons below each help overlay. They are Return, Next Screen, Previous Screen, and Exit Help.

For operator guidance, embedded help can also be user-created to be associated with operational displays.

CONFIGURATION SOFTWARE

The following software components are process engineer oriented and allow you to structure and customize your process operations and information management tasks. You can set up your system to accommodate your current needs with an eye to future change. Later you can modify the structure as you diversify, specialize, or grow and implement more varied or larger applications.

DISPLAY BUILDING, CONFIGURING AND EDITING TOOLS

A wide variety of software tools is available for developing, editing, using and managing displays. With these tools, a sophisticated display structure can be fashioned to satisfy the most stringent user requirements. Prior to building displays, you must develop a display strategy that relates to the operating goals and methods of the plant, and takes into consideration all aspects of the operating environment and operator requirements.

Displays are constructed from a combination of predefined and user-defined graphic objects that can be developed, maintained, and manipulated using Display Builder. These objects are maintained in libraries (on 20/30 Series workstations) and template files (on 50 Series workstations). For font changes and customized markers you can use the Font/Marker Editors.

Configuration of objects provides a means of graphically linking object attributes to the process thus providing you with a view of and interaction with the process via the real-time display. For ease of use the display tools allow easy replication of high level objects connected to a control block.

High level objects are structures of lower level objects having configured connections to incoming data from the process as well as to operator actions. Examples of incoming data connections include filled rectangles showing levels or scaled measurements, updating process values, text changes showing controller mode, status, etc.; operator actions include selecting a variable for interaction, toggling on/off.

When low level objects are grouped together along with the incoming and outgoing graphical linkages, these Graphically Linked Objects (GLOBS) can easily be repetitively configured into a display. Simply import the GLOBS from a template and configure a single connection to the name of the desired control block.

Display Builder

The Display Builder uses pull-down menus and a high resolution pointing/input device, such as a mouse or trackball, for function selection. It also creates overlays as unique files. You can configure any

number of overlays to exist on the screen at any one time. Overlays may contain any information that must be invoked quickly from a "base" display (typically for gaining more detail).

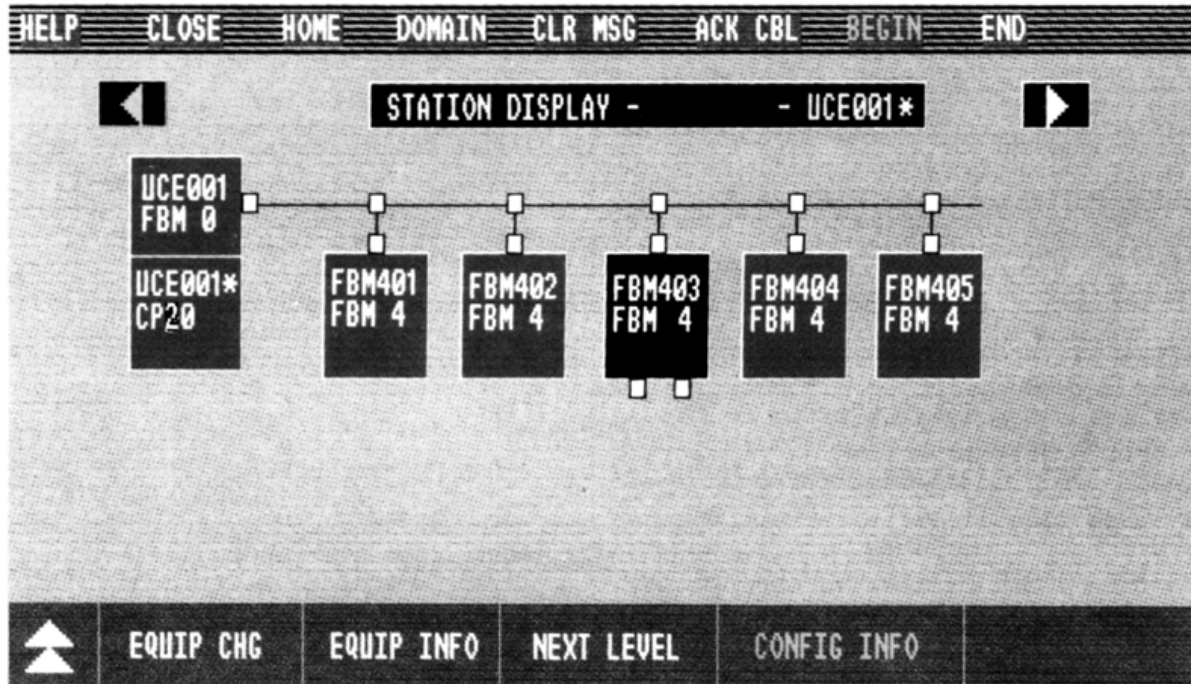


Figure 15. Typical Station Display

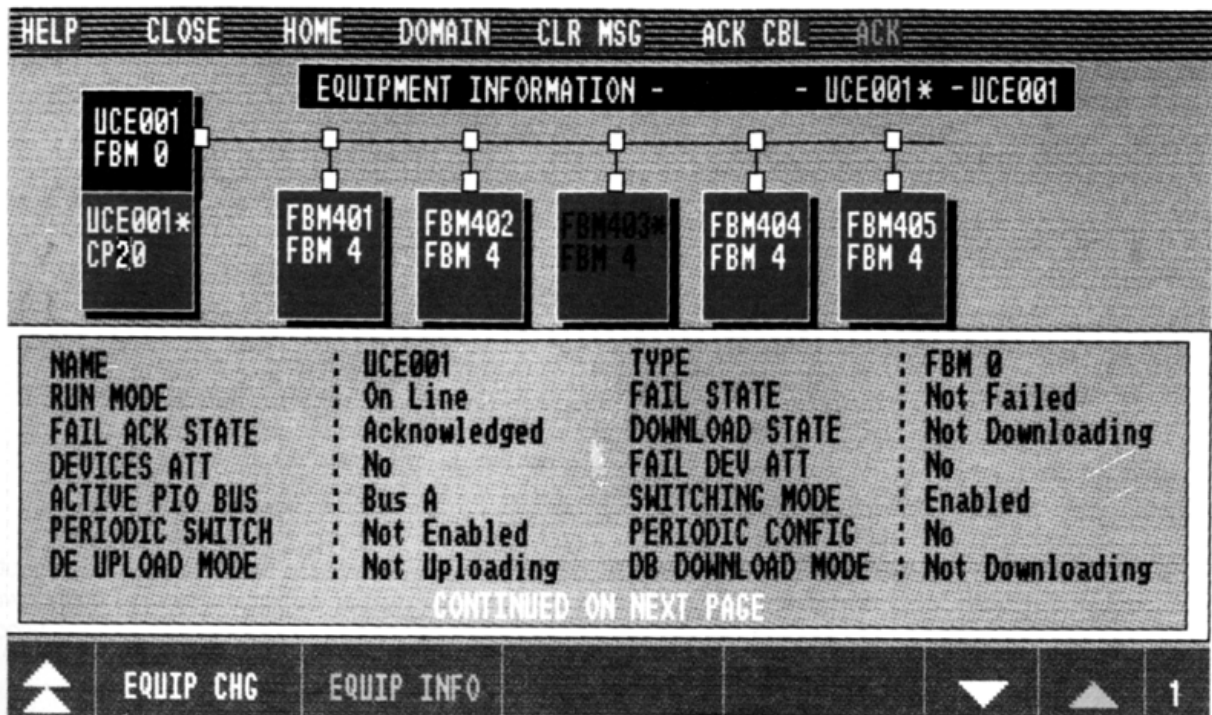


Figure 16. Typical Equipment Information Display for a Station

The builder is a general purpose, object-oriented editor for the construction and editing of detailed, interactive displays. It produces an object-oriented data base that is used during the building process. The flexibility of the software enables you to build displays representing any type of application rather than limiting you to predefined, generic displays.

All parts of the display are called "objects." A "group" is an object made up of several other objects. These objects have attributes that can be linked to the process via the Display Configurator and/or the 50 Series Display Builder. The following types of objects are available for constructing displays:

Geometric Shapes—Lines, rectangles, polygons, arcs, and ellipses.

Text—Alphanumeric characters in a variety of fonts and sizes.

Markers—Small, single-color shapes such as pumps, valves, and icons, that are used repeatedly.

Groups—Object(s) composed of other objects.

Template Files (Library Files on 20/30 workstations)—Standard and user-defined/ configured objects for inclusion in user-built displays.

Display objects can be edited by performing operations such as:

Move—Change the location of an object within a display.

Stretch/Shrink—Alter the dimensions of an object.

Cut/Copy/Paste—Delete, duplicate, and add objects.

An object can be given a unique name and incorporated (by name) into another object. There is no inherent limit on the complexity of objects or the number of objects contained in another object. Attributes assigned to objects can be graphically linked to the process.

As shown by Figure 17, drawing functions are organized as a set of tools and resources, selectable from the menu bar, that are used to construct and edit objects.

Resources are used to aid in the construction. The major functions include:

- Filing
- Drawing
- Library (For 20/30 Series workstations only)
- Editing
- Resources
- Grids

Figure 18 shows a display in the process of being built. The Resource functions are being used so that a fill color can be specified.

Display Configurator

The Display Configurator portion is used to convert static displays into dynamic displays that interact with the process, and provide a logical hierarchy of control capability. It enables the user to connect display objects, trend objects, X/Y plot, or Profile Plot objects to shared system variables to reflect the current value of the variable, or to connect to control variables to allow the operator to view and change the value of the variable. For pre-configured objects that may require connection changes, either the 50 Series Display Builder or the Display Configurator may be used.

It is also used to configure the selectability of a given display object to perform one or more of the following functions when the user picks that display object:

- Run/execute a program
- Call up a display or overlay
- Close the current display or overlay
- Write text to a file
- Set a relative pick
- Ramp
- Momentary contact (Hold-down Pulse or Timed-Pulse)

Trends, X/Y plots, and profile plots are also configurable via the Display Configurator.

User Interface

The association of variables (process or shared) with display objects requires the use of both graphical and hierarchical methods to move about and within the display object data base. Pull-down menus accessible from the DISPLAY field are used to select objects in the display hierarchy and specify connection attributes, as shown in Figure 19.

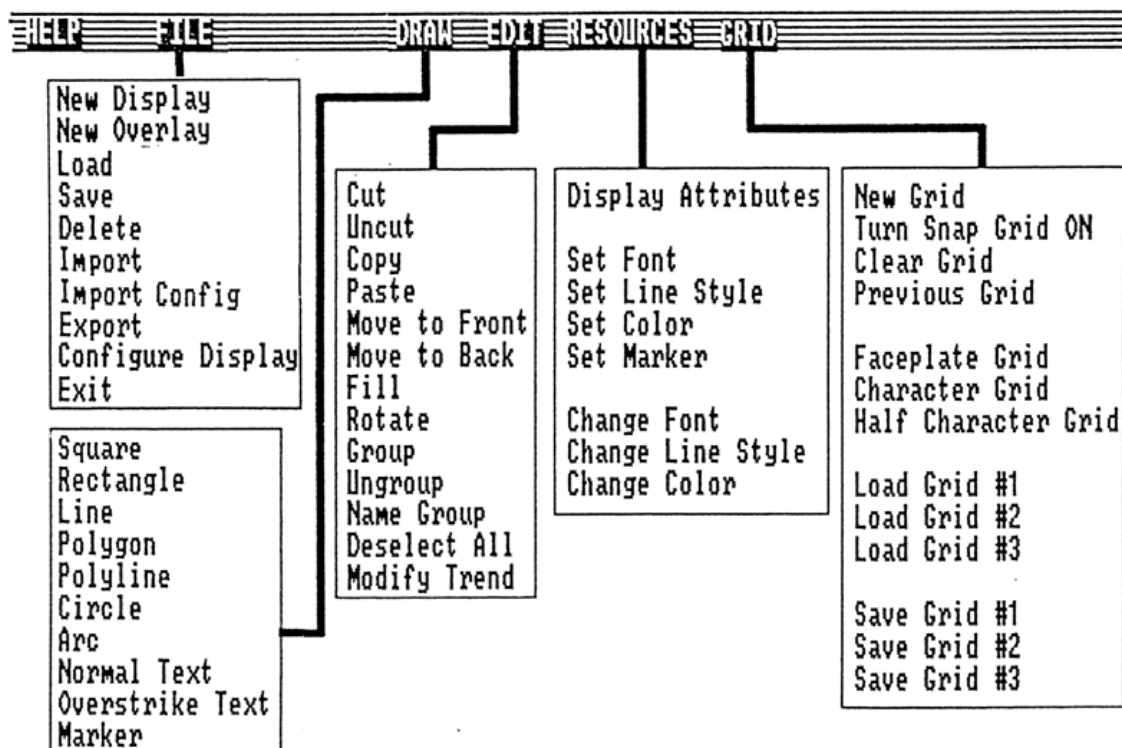


Figure 17. 50 Series Display Builder Menus

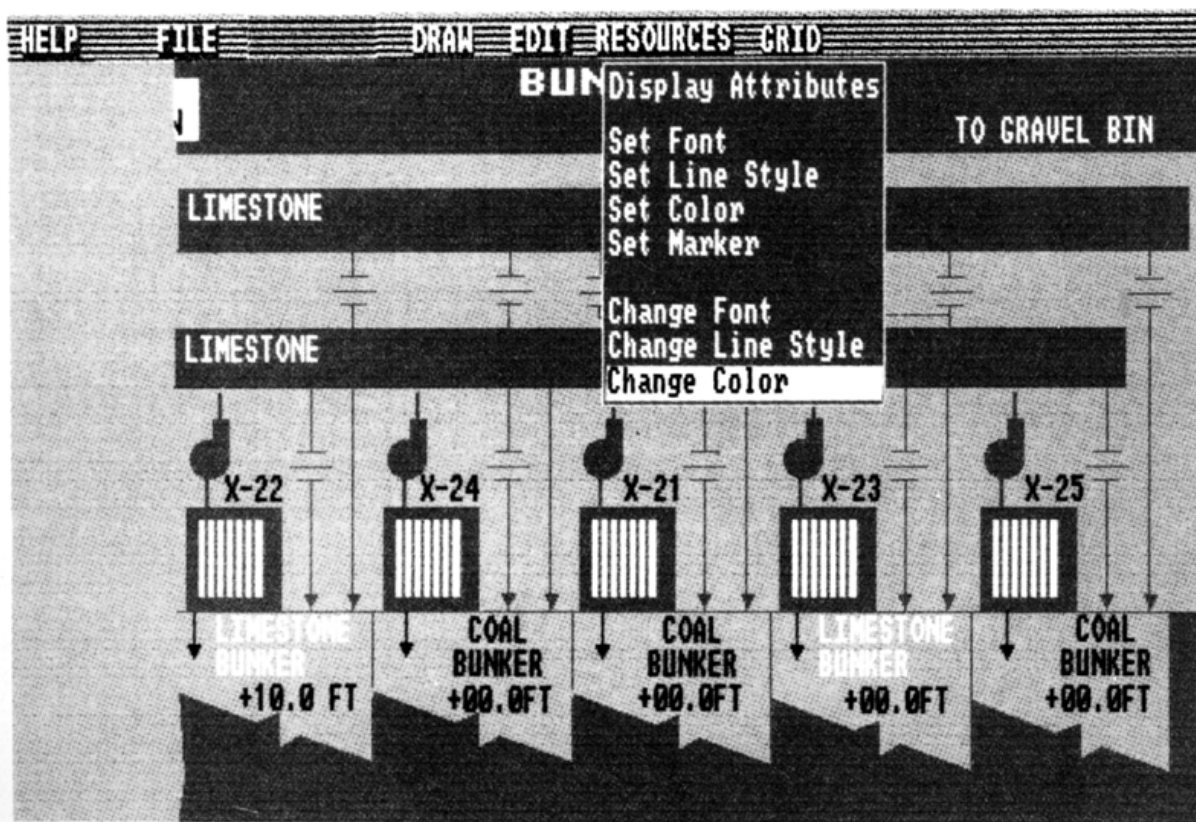


Figure 18. Building a Typical Display

Display Object Data Base—The Display Object data base is composed of all the display objects that are part of the hierarchy of object groups. The root group contains all display object groups. At each level in the hierarchy, the associated display menu indicates the position of the currently selected object in the hierarchy as well as all of the connectable attributes of that object.

System Data Base—The System data base refers to any I/A Series system variable or value in the system that is accessible through the Object Manager. This includes all shared program variables and all control variables.

The system data base is accessed by typing the qualified path name of the system variable to be read or written in the appropriate connection dialog box.

Display File Manipulation

The Display Configurator accepts Display Builder .dwf files to configure as well as installed files to reconfigure. You have direct access to Display Builder software for necessary object changes. Once a display is configured, it is installed for use by Display Manager in an interactive mode.

Connection Types

A connection between an external variable and a display attribute may be active or passive, and continuous or discrete. Active connections alter process or system variables in response to operator manipulation of the display. Passive connections alter attributes of display objects in response to changes in process or system variables.

Certain attributes can be active and passive and you may configure both an active and a passive connection to them.

The active connection determines the behavior of the object (position, shape, text contents, etc.) as long as the object is selected for user manipulation. The passive connection determines the behavior at all other times.

Continuous connections vary continuously over a given range, such as temperature. These connections can only be made to “real” variables.

Discrete connections exhibit a finite number of states, such as pump status or steps in a sequence.

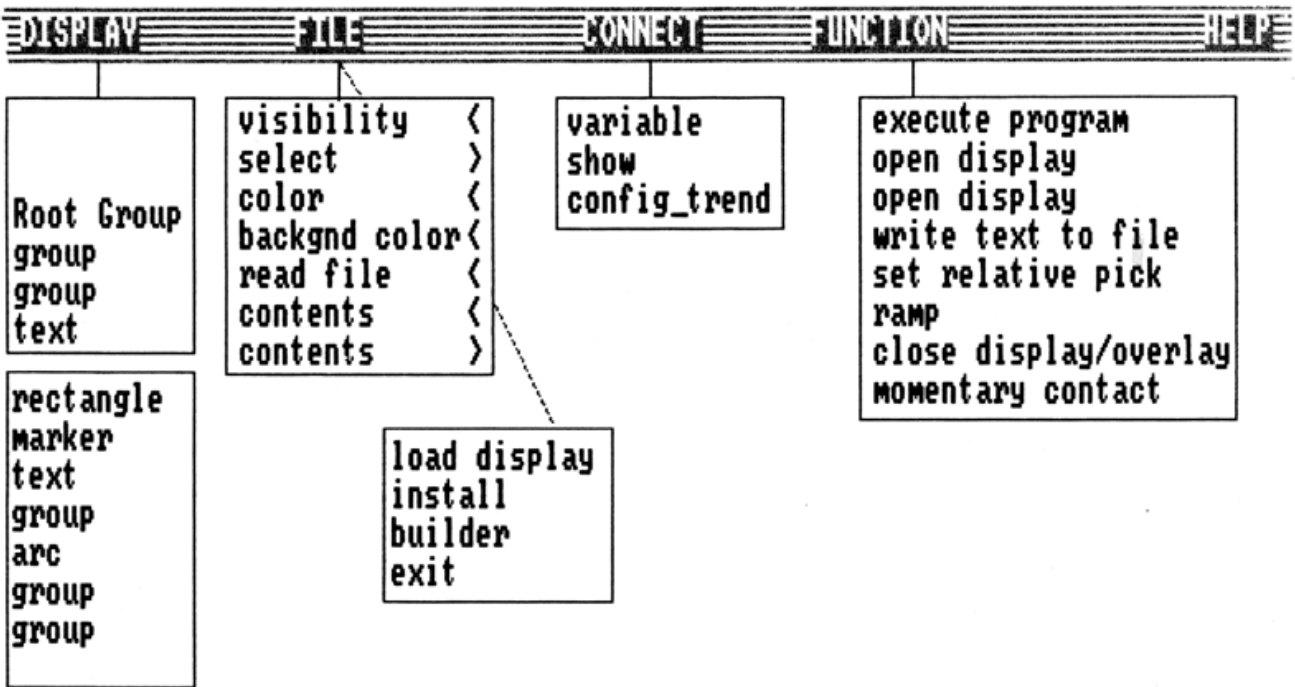


Figure 19. Display Configurator Menus

A list of display attributes with their associated display object types and indicating the type of applicable connection follows.

Selecting an object and the desired object attribute for connection presents an appropriate configuration dialog box. The dialog box allows you to enter a connectable variable and related configuration information (e.g., state table, type of pulse, change delta). If the object selectability attribute is to be configured, the function menu becomes selectable and selecting the desired function accesses the appropriate dialog box for configuration. As with other objects, selecting a trend or plot provides access to configuration dialog boxes specific to trends or plots. Changes to or deletion of configured connections is via the connect menu.

This configurator is a menu driven subsystem that allows you to build and edit named conventions used to connect display object attributes, such as color and text contents, to individual bits in `compound:block.parameters` and global variables.

For example, to show alarm type and criticality level for a particular block parameter on a user-generated display, you would be concerned with configuring text (to indicate alarm type such as HIABS) and color (e.g., red = most critical). By using a match/mask template, you can map out all possible conditions and/or states for the block that would indicate a specific alarm and its level.

Display Builder and Display Configurator are used in conjunction with Display Conventions Configurator. Conventions are stored in a file that is read by the Display Configurator.

Diagram illustrating the mapping of drawing commands to their parameters:

Command	Parameter 1	Parameter 2	Parameter 3	Parameter 4	Parameter 5	Parameter 6	Parameter 7
line (polygon, polyline)	x	x	x	x	x	p	d
rectangle (square)	x	x	x	x	x	a	d
marker	x	x	x	x	x	p	d
text (normal)	x					p	d
arc (circle)	x					p	d
visibility	x	x	x	x	x	p	d
select	x	x	x	x	x	a	d
color	x	x	x	x	x	p	d
fill color	x			x	x	p	d
line style					x	p	d
fill level	x			x	x	p	c
backgrnd color		x				p	d
read file		x				p	d
contents<		x				p	c/d
contents>		x				a	c
start angle	x					p	c
arc length	x					p	c
marker number			x			p	d
row location<			x			p	c
row location>			x			a	c
col location<			x			p	c
col location>			x			a	c

Graphics Status Attributes Configurator

This software allows you to edit a configuration file used by the Display Manager to show out-of-service (OOS) and bad input/output (BADIO) status of control blocks in Detail displays, faceplates, and user displays. When a display object is connected to a point that reports one of these states, the Display Manager changes the graphic attributes of the object as specified by this configuration file. Display actions for BADIO and OOS are separately configurable.

The configuration file is global in that it governs the graphic behavior of all WPs hosted by the AP on which it resides.

This configurator is a prompt driven configurator and is accessible via the Virtual Terminal (VT100) mode. It provides a brief description of the command options, shows you the selected configuration, and prompts you for any changes. A file with default values supplied for the system is available.

Display objects that can be configured to display the connection status are:

Rectangle	Normal Text	Overstrike
Polygon	Circle	Text
Line	Polyline	Arc
		Marker

Their attributes include visibility, color, fill color, line style, marker number, foreground and background color.

Graphics Utilities

The Graphics Utilities are a collection of general purpose graphics editors and utility files for the construction of new fonts and markers, or for editing Foxboro supplied fonts and markers. In addition, a color palette is available with both the Foxboro supplied colors and colors that are customizable.

The editors are used to modify both the standard I/A Series system graphic utility files which store system markers, fonts and colors, and user graphic utility files for user markers. These files are referenced by all displays upon display callup.

The fonts, markers, and colors are accessible in the Display Builder and Display Configurator software for use in building and configuring displays.

Font Editor software allows you to edit a font set or create a variety of fonts for use on displays. When accessed within the Display Builder, the selected character font set is available in one of four sizes: single-width, single-height; single-width, double-height; double-width, single-height; double-width, double-height.

Marker Editor software allows you to create graphics symbols that are used repeatedly. Symbols usually appear as industry-standard shapes, and are included in a marker table. A typical library of markers could include four pages of 8 x 8 pixel markers, eight markers per page, for various process control related graphics symbols. Figure 20 shows an example of a marker after it has been built, and its subsequent use in a marker table.

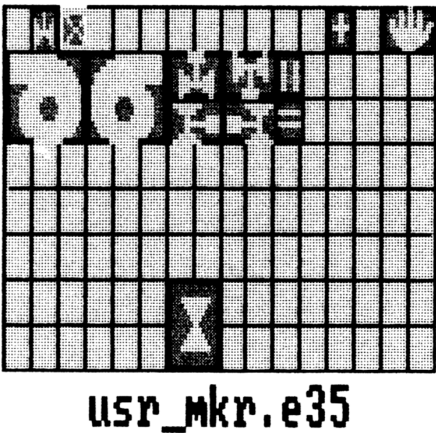


Figure 20. Typical Graphics Marker Table

The Color Palette Editor allows you to edit colors in the system palette file or create palette work files. You can change the eight foreground and 32 background colors available from the color palette to create more than 16 million colors. The first sixteen background colors are standard colors related to Foxboro displays. Blink colors and blink rate can also be set.

Group Display Configurator

You can use this software on 20/30 workstations to easily build, configure or modify a display of faceplates, trend objects, and X/Y plots. These display objects and their soft keys are automatically retrieved from a Foxboro supplied library of objects. Additionally, fields associated with the objects are automatically connected to process variables. As each standard template occupies one-eighth of the screen, a group display supports up to eight templates in a four-by-two layout. The three types of templates are:

- The faceplate object, which is used as an interface for monitoring and controlling the process. Each block type has a common faceplate layout with features unique to the block.

- The trend object, which is used to view the trending of up to four data variables plotted against time. The trend consists of a graph, update fields, and function keys.
- The X/Y plot, which contains a graph with two data variables plotted against each other rather than against time.

You can create group displays either before or after all blocks are configured with the Integrated Control Configurator, and either before or after the trend points are defined with the Historian. However, when the control database exists prior to building the displays, all pertinent data (such as engineering scale and units, delta values) is extracted directly from the block record. (Note that the Display Builder software on the 50 Series workstations is used to perform the configuration tasks related to group displays created on 50 Series workstations.)

Installation of a group display formats it for interactive use in the process control environment.

To access the interactive display, you must:

- Assign it to a menu
- Attach it to a hard or soft annunciator key
- Call it via an application program, or
- Attach it to an active display object within another display.

DISPLAY UTILITIES

The Display Reporter and Connection Editor and Grouped Object Editor are easy to use utilities that are specially designed to save engineering time and work. They allow a number of display changes and provide display maintenance and troubleshooting capabilities.

Display Reporter and Connection Editor

This tool is an optional display maintenance and engineering utility that allows you to edit and verify display connections and document those connections. It provides a means for troubleshooting displays and making minor display changes. It may be used in conjunction with the Grouped Object Editor with which you can update or add grouped objects to displays. Accessible in the Virtual Terminal (VT100) mode, the reporter/editor provides the following functions:

- Locates connection mistakes
- Documents current display connection information, and
- Allows connection changes to one or multiple displays

While developing application displays, you can generate a set of new displays by copying existing templates and then adapting these displays by using this utility. By specifying multiple files you can make changes to a set of displays.

You can correct connection errors by using the connection editing functions or the Display Configurator. This editor can also be used to fine tune display connections, such as change delta values and numeric formatting. Filters and options provide added flexibility and simplify operations. Connections that can be verified are:

- Parameter (Compound:Block.Parameter) and shared variable connections
- Implied connections (e.g.3, :BLOCK.PARAM)
- Open display, open overlay, read file, write file connections.

As verification of variables involves Interprocess Communications broadcast messages, you can further manage connection verification by specifying the time between each connection verification request.

Reports produced may be in abbreviated or detailed format, and can indicate the current status of each connection if you invoke the verification option. When you use the output option, the report is saved to an ASCII report file. Reports are:

- Exception reports
- Connection lists
- Connection reports

Grouped Object Editor

This optional tool is a display engineering and maintenance utility that executes in the VENIX or UNIX environment on an AP or PW through a number of commands. Functions performed are:

- Update faceplate scaling factors, strings, and change delta, as well as trend scaling factors and change delta value on a single display or multiple displays
- Add faceplates, trends, individual or group buttons, and user-defined objects to new or existing displays
- Report to the screen or a designated file on faceplates and trends in group displays and other display types. Information generated includes the complete path name of the display file; faceplate data such as screen location, block type, and compound:block name; and trend data such as compound:block name, screen location, type of trend, name of each parameter connected to a trend line, and color associated with each trend line.

You need only specify the update function in the command line together with the display files to be updated, and you can globally update all displays affected by enhanced Foxboro faceplates or block definition changes associated with new I/A Series software releases. Alternately, you can update display files with customized faceplates, trends, and user-defined objects.

Using the editor reduces the amount of time to engineer displays, particularly for repetitive types of operations in multiple displays.

SYSTEM CONFIGURATOR

The system configuration process allows a person with limited product knowledge to specify the system network, equipment, software and packaging and documents the configuration. As you define hardware and software and the logical and physical connections, the configurator generates a database for the system configuration diskette. In turn, the diskette provides the information for software installation and a list of materials that is the input to the price quotation subsystem. This subsystem is an interface to the order entry and manufacturing processes for direct product shipment from the plant of manufacture.

A Control Processor Sizing Spreadsheet that runs on MS-DOS under Lotus 1-2-3 is available as a separate option. It is used prior to configuration to estimate the loading and throughput requirements for process control schemes and provides a more accurate means of estimating configuration requirements for CPs.

You can use the target system itself to define (or redefine) and document the system configuration, and install the software. Or, you can perform system configuration even before you place your order. In this case, the configurator is used by sales personnel or the customer and runs on a PW. You can define, quote, and enter the order from a remote site directly to the manufacturing plant.

Software Operation

The System Configurator is an interactive, menu-driven package designed for ease of use. A mouse, trackball or touch screen is used to select various action menu entries and data fields. Wherever feasible, all valid actions are displayed so the user knows all possible choices at any point in the configuration process.

Each screen includes a help function that initiates help text or a menu of topics. Selecting a menu item overlays a static screen of information relative to the current display and selected menu item. Paging and

scrolling icons appear at the bottom of each configuration table.

The configurator is based on a hierarchical structure: e.g., in the network you move from LAN to node to station to peripheral device; in the packaging area you move from Area to Enclosure to Cell or Mounting Structure. System configurator applies a set of rules to the definition processes to identify the options desired at any point in the configuration process.

A typical approach is to configure the system at the conceptual level by defining the network hierarchy and the packaging hierarchy, and then to make adjustments by selecting items from the catalog.

Functions

You can select and modify an existing configuration or create a new configuration. The initial display shows a selectable list of any configurations already on the hard disk and provides a New Entry area for naming and describing a new configuration.

The main, Select Configurator menu provides access to the following:

- System Information
- Define Network
- Define Packaging
- Select from Catalog
- Edit Software Parameters
- Check Configuration
- Document Configuration
- Quote Configuration

System Information—This function allows entry of general system requirements, such as specifying a printer for priority 2 messages and factory default power voltage for enclosures. This avoids having to re-enter repetitive information at later detailed levels. However, you can still make changes for individual enclosures during Define Packaging operations.

Define Network—Used to specify the logical hierarchy, and types of hardware and software and relationships at each level in the hierarchy, including logical network connections. Selections can be made for Broadband and Carrierband LAN, Node and station. Network hierarchy must be completely defined before the software can be installed.

Define Packaging—The packaging hierarchy defines the physical relationships among the pieces of hardware in a configured system. The hierarchy comprises areas, enclosures, modules and peripherals. To aid in accommodating communications and environmental needs, the configuration definition can be divided into geographical areas. An area is a grouping of enclosures set up in a single physical location. A centralized system has only one area.

Select From Catalog—Primarily used for ordering individual pieces not specified during configuration, for spare parts, or for additions to existing systems. The catalog contains item numbers, quantities, descriptions, and options for every item that can be included in a sales order.

Edit Software Parameters—This function allows access to items that define software packages and associated hardware assignments. You can specify program names, letterbugs, system monitors, common network logical name parameters, library volume names, printer/terminal ports, and logical device backups.

Figure 21 and Figure 22 show two displays that appear when you choose to define the system by its network hierarchy.

Check Configuration—At any time in the configuration process, the user can check the configuration for missing logical connections, unattached network and packaging items, Nodebus and Fieldbus assignments, and software packages without hosts.

Document Configuration—This function provides two types of printed documentation describing a system configuration; predefined and customized reports. Predefined reports are: Item, Network, Packaging, Software, and All Reports.

A general purpose reporting method in which any information can be selected and sorted is available for customized reports.

WORKSTATION/ENVIRONMENT CONFIGURATION

Within the scope of I/A Series systems, an “environment” is a particular user's view of the system and the process to which it is connected. A specific environment may be associated with a user, a group of users, or can be fixed for a given workstation.

This is the first level of security for accessing and manipulating system information. Altering the entries listed in a menu provides a second level of security and restricting the selection of individual fields within displays provides a third level.

Different environments have different groups of selectable fields for the utmost security. Workstation configuration is enabled by the Password Environment Configurator available on the WP20 and WP30. It allows you flexibility to set up security schemes to match your plant operation setup. On the WP51/AW51, the ability to protect individual entries displayed in pull-down menus is provided.

The configurator is a collection of environment editing functions and tools that maintain a set of configuration data files that allow the user to perform the following functions:

- Provide access security for the different operation environments of the system.
- Allow an authorized user to modify environment menus (menu bar entries), and to associate specific displays with the invocation of any given environment.

The configurator can run in any workstation as a transient application task, and it operates primarily with simple menu selections and dialog box prompts.

An alphanumeric keyboard and a high resolution input device, such as a mouse or trackball, are required for configurator operation. Any input device can be used to access menus subsequently built.

As a result of having “environments,” you are presented with a new set of applications and programs when a change is made from one environment to another. The five default environments are:

- Process Operator's Environment
- Process Engineer's Environment
- Plant Management Environment
- Maintenance Environment
- Software Engineer's Environment

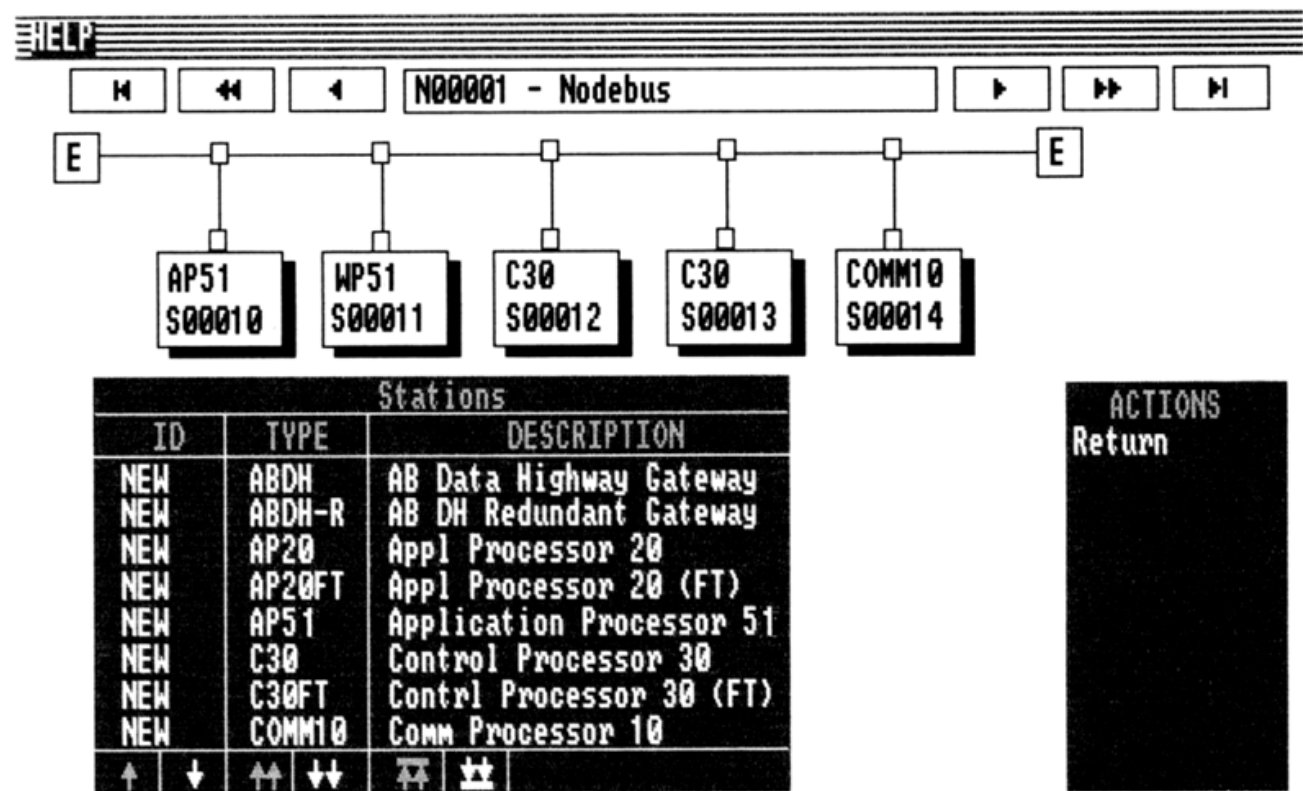


Figure 21. Node Level System Configurator Display Example

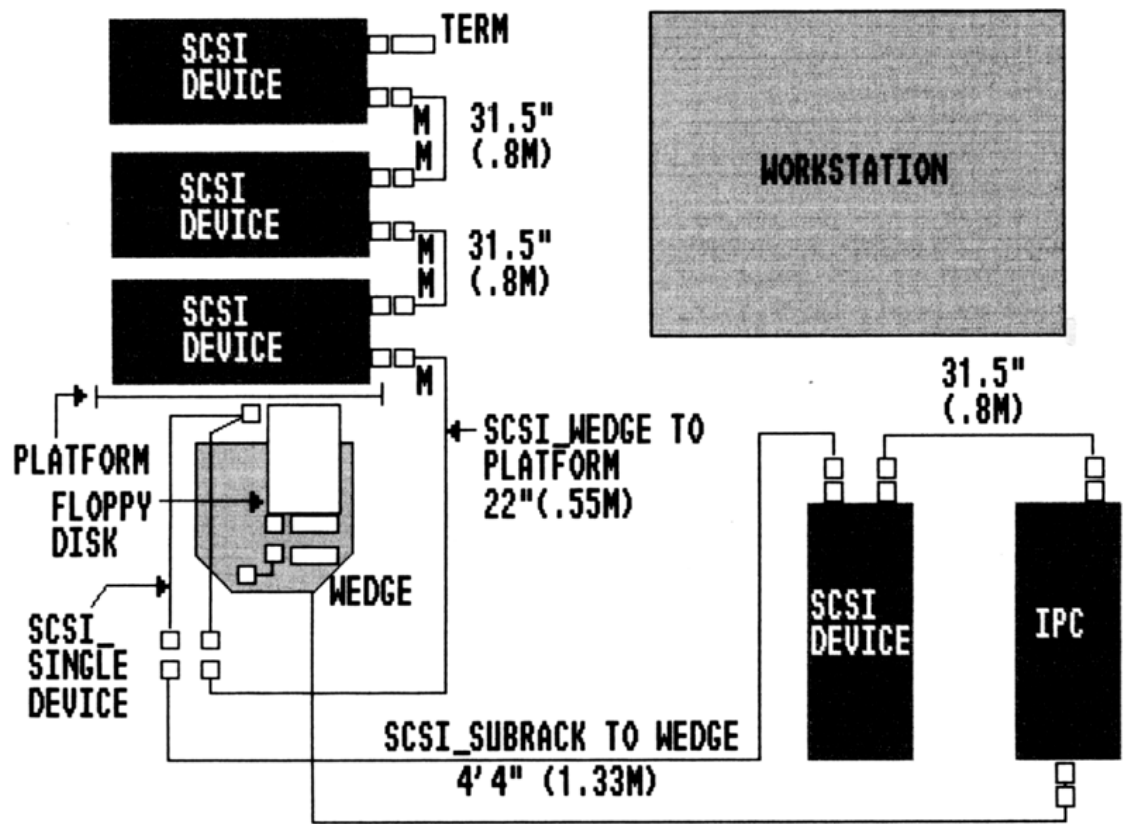


Figure 22. System Configurator Display Example for Equipment Selection

The content of all environments and menu bars can be configured to suit the user. Additional environments can be assigned as required by using the configurator. Figure 23 shows a view of the environments as they typically relate to one another.

Access Security

In the system as shipped, there are no restrictions on changing from one environment to another. However, it is highly recommended that you use the available

password protection restricting access to environments. This is done through the configurator, usually by the person in charge of the overall system. Passwords are kept in an encrypted ASCII file in an Application Processor (file server) on a per file server basis. You must make a separate set of password assignments for each file server associated with a workstation. This is done so that a particular user's view or environment can be accessed from multiple workstations on the I/A Series network.

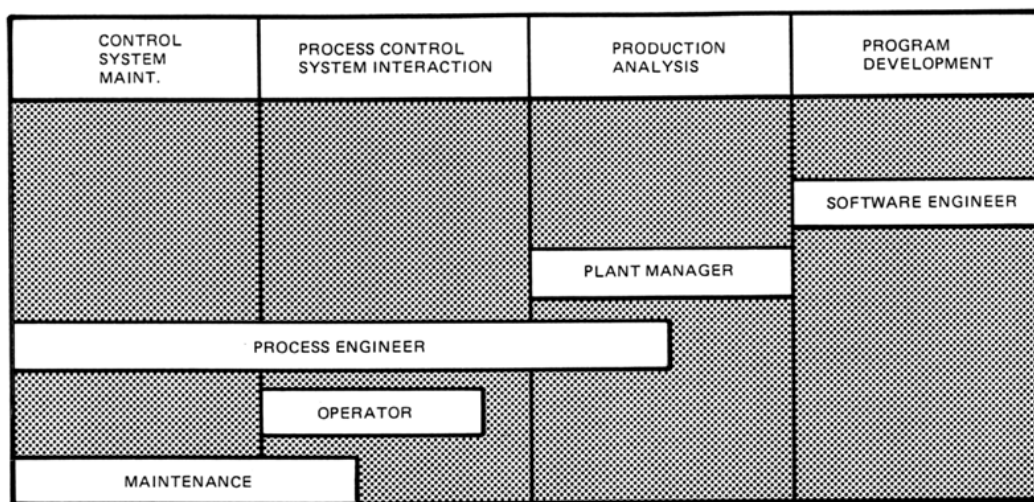


Figure 23. Typical Relationships Among Environments

Default Environment Menus

The software and functions available through each environment are indicated by the top menu bar on the workstation screen. They include programs, displays, and utilities. In the system as shipped, the five default environments are pre-arranged. Three items that always appear in the top menu bar for the default environments are SYS, ALARM, and HELP.

DISPLAYS also appears in most default menu bars.

Typical menu contents are:

Top Menu Bars for Initial Environment

SYS

- Change_Env
- AlarmHistory
- AP_Switch (WP20/WP30)
- Display_Name
- DM_Usage (WP51/AW51)
- Documentation
- Multiscreen
- Prev_Dis
- PrintScreen
- Proc_Summary
- RebootStation
- Sys_Mgmt
- Update_Lights

ALARM

- Current Alarm Display
- Provides access to Top Priority Alarm Display (Detail or User-Specified) and Alarm History Display

DISPLAYS (PULL-DOWN MENUS OF USER-SPECIFIED DISPLAYS)

HELP (ON-LINE HELP)

SELECT (ACCESS TO THE COMPOUND SUMMARY SCREEN)

Additional content of top menu bars and their submenus for other default environments are:

PROCESS OPERATOR'S ENVIRONMENT

- Sys
- Alarm
- Help
- Displays (Dis, Disp_1, Disp_2, Disp_3)
- Select

PROCESS ENGINEER'S ENVIRONMENT:

- Sys
- Alarm
- Help
- Config
- Disp
- Disp_1

Disp_2

SftMnt

Select

CONFIGURATORS:

AlarmPanel_Cfg (WP20/WP30)

AlarmTable_Cfg (WP20/WP30)

Control_Cfg

Coord_Dispatch_Cfg (WP20/WP30)

Display_Build

Display_Cfg

DspConventions

File_Utility (WP20/WP30)

Font_Editor

Grp_Dispatch_Cfg (WP20/WP30)

Historian

Install_SW

Marker_Editor

MsgFile_Cfg

OperActJournal

Palette_Editor

PSR_Config

SSG_Cfg

Select_Printer

PLB_Monitor

REM_Config (WP20/WP30)

PLANT MANAGEMENT ENVIRONMENT:

Sys

Alarm

Help

Tools

Select

MAINTENANCE ENVIRONMENT:

Sys

Help

Disp

Select

SOFTWARE DEVELOPMENT ENVIRONMENT:

Sys

Alarm

Help

Config

Disp

SftMnt

Select

Software Selection

To customize operations environments for your installation, you must make selections from the Password Environment configurator. The software is accessed by selections under the SYS and UtilCfg fields in the top menu bar. A list of current environment assignments appears for additions, deletions, and changes.

Customizing and configuring operations environments for your installation consists of choosing a variety of options and selecting the functions desired from a variety of options and selecting the functions desired from the menus presented. Configuration specifications easily can be changed by repeating the selection process as needed.

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