

I/A Series[®] Hardware 50 Series Application Workstation Model AW51



As a multipurpose workstation and file server, the Application Workstation 51 (AW51) performs the following functions:

- Operator interface for display of graphic and textual information via FoxView Display Manager
- Boot services to Control Processors, Gateways/Integrators, Micro-I/A stations, and other I/A Series stations
- File serving tasks
- Platform support for a broad range of applications, both Foxboro, third-party, and userdeveloped

 Interfacing with corporate communication networks and networks at a local or worldwide level.

With optional value point control software, the AW51 supports real-time data acquisition from I/O devices as well as simple to complex process control involving sequence and batch processes.

The Application Workstation 51 Processor is available in several styles to support varying performance requirements. Refer to the appropriate Product Specification Sheet (PSS) for information on a particular style of Application Workstation 51 processor.



OVERVIEW

Key features of the AW51 include:

- A 64-bit RISC processor for maximum display performance and applications expandability for Application Workstation 51, Style D and E processors
- Scalability that ranges from a stand-alone, entrylevel control and I/O station to full network capability on Ethernet or I/A Series Nodebus
- Advanced bulk storage device handling capabilities, providing support for CD-ROM drives, high-capacity hard disk drives, and highcapacity tape drives; additionally, the hard disk drives may be configured mirrored (redundant) for maximum system security and data availability (Style E Only)
- Optional Ethernet, fast Ethernet, IBM Token Ring, and Asynchronous Transfer Mode (ATM) interfaces for connecting to information networks such as DECnet or TCP/IP, thus providing communication with other host computers and networks⁽¹⁾
- Graphical windows interface via the FoxView display manager
- Availability of a standard, proven application programming interface (API) for integration with numerous synergistic third-party control and information applications
- Capability of performing control and I/O data acquisition functions in conjunction with value point control software and communication drivers/interfaces to I/O devices and subsystems.
- Capability for hosting Supervisory Control and Data Acquisition (SCADA) systems
- Capability for hosting Control Processors, Integrators, Micro-I/A stations, and other I/A Series stations⁽²⁾.

In addition to performing functions directly related to information processing and management and optional data acquisition/control, the AW51 performs operations such as on-line configuration.

The user is afforded a broad range of configuration capabilities including database, display, system definition, and control strategy configuration, and system monitoring. Additionally, an environment is available for writing, compiling, and debugging C language and FORTRAN 77 application programs.

AW51 STATION ARCHITECTURE

Networking

The flexibility of I/A Series hardware and software allows the Application Workstation 51 to be used as a stand-alone configuration station or a scalable station for data acquisition and control. In addition to standalone usage, the AW51 can be used on either an I/A Series Nodebus or an Ethernet network.

Nodebus

As a workstation/file server on an I/A Series node, the Application Workstation 51 is compatible with other I/A Series stations on the Nodebus and can provide host services⁽³⁾ for any combination of devices such as:

- Control Processors
- Micro-I/A Stations
- Information Network Interfaces
- SPECTRUM Master and Slave Gateways
- Gateways/Integrators for Allen-Bradley PLCs
- Gateways/Integrators for Modicon Modbus Devices and for interfacing to Foxboro C50 Remote Terminal Units in SCADA systems
- Integrators for Modbus Plus Devices
- Instrument and Device Gateways/Integrators
- Communication Processors
- LAN Interfaces.

In addition, the AW51 can be the display server for Intel WPs (WP20, WP30). Other Application Workstation 51s, Application Processors, and Workstation Processors may exist on the same I/A Series Nodebus. See Figure 1 for an example of AW51⁽²⁾ configurations on an I/A Series Nodebus.

⁽¹⁾ A separate security router may be required in conjunction with these optional information network connections to isolate I/A Series from other unrelated network traffic. Foxboro Information Technology and Application Consulting can provide information on network planning and recommendations.

⁽²⁾ When performing process control and data acquisition, the AW51s hosting capabilities may be limited depending on the complexity of the process control being performed in the AW51.



Figure 1. AW51 Stations on an I/A Series Nodebus

Ethernet

The Application Workstation 51 as a workstation on an Ethernet network is compatible with and provides host services for the following I/A Series stations: Micro-I/A stations, Workstation Processors 70, Workstation Processors 51, and other Application Processors 51. The hosting capability of the AW51 is scalable allowing you to increase the number of stations on the Ethernet as needed. See Figure 2 for an example of AW51 stations on an Ethernet network.

I/O Interfaces

With value point control software, the AW51 can be a primary system component providing data acquisition, regulatory control, and sequential control via software drivers and communication interfaces to a variety of I/O devices. These devices may include: Modbus PCs, Allen-Bradley PLCs, SCADA systems, and so forth.



Figure 2. AW51 Stations on an Ethernet Network

AW51 SOFTWARE

Application Functions

Applications performed by the Application Workstation 51 range from functions such as the storage of control databases, alarm events, and historical data, to large-scale applications such as advanced control and third-party applications program capabilities and database management and program development. The following sections describe the major application functions performed.

FoxView

The system's FoxView display manager presents the I/A Series operating environment representing a collection of programs, utilities, and process graphics. Subsets of the operating environment can be configured according to the specific user's tasks. Thus, process operators, process engineers, and software engineers have access via passwords to environments that define their tasks and the functions accessible to them.

FoxView presents dynamic process operator graphics as well as embedded real-time and historical trending. Additionally, it provides access to both FoxAlert (alarm manager) for viewing a comprehensive set of process alarm displays and FoxSelect for an overview of the compounds and blocks in the control database as well as access to block detail displays. Block detail displays provide a dynamic and interactive visual summary of block operation. See PSS 21S-2B8 B4 FoxView for additional information.

Historical Data

The Application Workstation 51 can be configured to contain the historian function, which maintains a history of application messages and continuous and discrete values. These values may represent any parameters such as measurements, setpoints, outputs, and status switches from stations which have been configured to collect data and send it to a historian. In addition, the historian computes and stores a history of averages, maximums, minimums, and other derived values. This information is maintained for display, reporting, and access by application programs. An archiving facility saves the data on removable media, where applicable.

The Application Workstation 51 can be configured to maintain a history of errors, alarm conditions, and selected operator actions. The occurrence of errors, alarms, and other events in other stations may be stored (for later review and analysis) by sending a message defining the event to the historian in the Application Workstation 51. See PSS 21S-4E1 B3 Historian.

System and Network Management Functions

The Application Workstation 51 performs system management functions, which include collecting system performance statistics, performing station reloads, providing message broadcasting, handling all station alarms and messages, and maintaining consistent time and date in all system stations. The Application Workstation 51 also performs network management functions, which comprise that portion of system management functions which deal with the network.

Database Management

Database management involves the storage, manipulation, and retrieval of files containing data received and/or produced by the system. The Application Workstation 51 includes a bundled license for a run-time version of INFORMIX On-Line Relational Database Management System. The FoxHistory package presents its information repository as a set of relational tables via the ODBC retrieval interface. This facilitates integration of FoxHistory with any database application. See PSS 21S-4E2 B3 FoxHistory for specific information.

File Requests

The Application Workstation 51 operating system manages all file requests associated with attached bulk storage devices. Also supported is a remote file system which allows tasks in one station to share files with another station. NFS file sharing is available to other 50 Series stations in the I/A Series network, or to other TCP/IP or NFS capable devices on an optional, directly connected, Ethernet information network.⁽³⁾

Production Control and Plant Information Software

Production control and plant information software represents a broad range of packages which require varied Application Workstation 51 resources. Standard application packages available from Foxboro include:

- Compound Summary Access
- Device Monitor
- FoxDraw
- Historian (ranging in size from: 200 to 8000⁽⁴⁾ points)
- FoxHistory
- Integrated Control Configurator
- INFORMIX On-Line Development Environment
- Mathematics Library
- Operator Message Interface
- Report Writer (50 Series)
- System Management Display Handler
- System Monitor
- Spreadsheet (50 Series)

A wide range of additional application packages are available, such as FoxAMI (Alarm Message Interface), FoxSPC.com (Statistical Process Control), FoxDPM.com (Dynamic Performance Monitor.com), FoxCTS (Change Tracking Software), FoxBatch, FoxEDM (Electronic Document Management).

Likewise, a broad range of fully certified non-Foxboro third-party applications is available. These include packages for various controllers and devices, reporting and production control software, and mathematics applications.

The operation and performance of the production control software is determined by the particular Application Workstation 51 system configuration.

See PSS 21A-1C1 C2 Software Overview for a complete listing of additional software offerings.

(4) AW51 Ethernet station license.

⁽³⁾ A separate security router may be required in conjunction with these optional information network connections to isolate I/A Series from other unrelated network traffic. Foxboro Information Technology and Application Consulting can provide information on network planning and recommendations.

Configuration

Configuration, as used here, refers to the process of entering or selecting parameters to define what a software package does, or to define the environment for a software package. The Application Workstation 51 supports configuration functions by providing bulk storage access for configuration parameters and by executing some of the configuration processes.

The Application Workstation 51 also allows the user to add, expand, and modify operating system parameters according to the specific application requirements, taking into account such factors as system loading and system throughput.

FoxDraw, a process graphic builder and configurator, allows the user to modify existing displays or create new displays using state-of-the-art graphical building tools and palettes of Foxboro or user-created control objects. A library of control objects provides a starting point for quickly building new displays. FoxDraw allows the association of process variables to objects in the displays, such as fill levels, color, visibility, size, and location, to provide visual indication of the current control activity. Operator-controlled elements, such as, push-buttons, ramp keys, and sliders, are easily incorporated in displays to provide operator interaction with the process. See PSS 21S-2B3 B4 FoxDraw.

Control scheme configuration packages include the Integrated Control Configurator and the Intelligent Field Device Configurator for configuring the control database. The annunciator configurator or the optional FoxPanels configurator is available for configuring annunciator alarm notification at the workstation. The Alarm Manager Configurator allows customization of the format and content of process alarm displays.

The Historian configurator allows you to define and configure data collection types such as point sample, reduction groups, message groups, archive groups, manual data entry groups.

Value Point Control Data Acquisition and Control Suite

Scalable value point control software allows the Application Workstation 51 also to perform control and I/O functions ranging from relatively simple inputoutput or data acquisition to more complicated sequential and batch control. Value point control software is scalable, dependent on the number of points controlled and the complexity of the control scheme. Refer to PSS 21S-1B2 B3 AW51 Software Overview for additional information. Software I/O drivers provide the capability to communicate with:

- Other I/O controllers such as Allen-Bradley PLCs, Modbus and Modbus-compatible devices
- Foreign devices such as gas analyzers, turbines, sequence-of-events monitors, paper machine gauges
- I/O data acquisition systems, such as Foxboro SCADA.

There are up to three slots on an AW51D and AW51E.

Application Development Facilities

Application development tools are provided to build programs for all system stations. This includes tools to document, enter, translate, link, test, and maintain programs written in several programming languages. The Application Workstation 51 supports program development for all I/A Series stations (control processors, communications processors, and so forth).

Assembly language, FORTRAN, and C (optional) programs can be written using standard operating system tools. Included are text editors, debuggers, linkers and compilers, plus execution statistics functions.

User Application Program Execution

The Application Workstation 51 also executes user application programs. These may be application packages such as special optimizations, test data collections, special data reductions, or other packages that users may have already developed consistent with the I/A Series API. FoxAPI allows you to build programs on an application platform that interfaces with an I/A Series system. FoxAPI consists of routine libraries, interface drivers and several utility programs. FoxAPI supports the application, presentation, and session layers of the Open Systems Interconnection (OSI) model defined by the International Organization for Standardization (ISO).

The I/A Series and SCADA (Supervisory Control and Data Acquisition) systems are connected via a TCP/IP network. The networked FoxAPI Client/ Server software provides the data exchanges between I/A Series and the SCADA system.

Diagnostics

The Application Workstation 51 utilizes three types of diagnostic tests to detect and/or isolate faults:

- Power-up self-checks
- Run-time and watchdog timer checks
- Off-line diagnostics

Power-up self-checks are self-initiated when power is applied to the Application Workstation 51. These checks perform sequential tests on the various Application Workstation 51 functional elements. Any malfunction detected during the power-up self-checks is reported by messages printed on a directly connected printer.

The run-time and watchdog timer checks provide continuous monitoring of Application Workstation 51 functions during normal system operations. The operator is informed of a malfunction by means of printed or displayed system messages.

Off-line diagnostics are temporarily loaded for the purpose of performing comprehensive tests and checks on various system stations and devices. Using the off-line diagnostics, a suspected fault in the Application Workstation 51 can be isolated and/or confirmed.

On-Line Documentation Facilities

Support facilities include user help and electronic documentation. User help provides on-line information about the Foxboro equipment and software packages. FOXDOC electronic documentation is provided on the FOXDOC CD-ROM.

AW51 HARDWARE

AW51 Processor Style D and Style E

The AW51 processor in conjunction with its peripherals performs both application functions and workstation functions. Additional communication interfaces provide access to I/O devices related to data acquisition and control functions.

For hardware specifications regarding the AW51 Style D and the AW51 Style E, refer to PSS 21H-4R2 B4 and PSS 21H-4R6 B4, respectively. For hardware specifications regarding the alphanumeric keyboard, mouse and trackball specifications, see PSS 21H-4D1 B3; for annunciator keyboard specifications, see PSS 21H-4E1 B4.

SCSI Interface

A Small Computer System Interface (SCSI), designed into the Application Workstation 51E provides an industry-standard bus (ANSI standard ANSC X3T9.2) to support internal and external peripherals that have SCSI-compatible controllers. The Application Workstation 51D supports external SCSI-based devices with an optional SCSI-3 PCI card. The SCSI interface thus allows flexibility in the utilization of peripheral devices, providing greater system performance and easy system upgrade. An optional second SCSI interface on the AW51E processors allows for a redundant hard disk drive configuration for mirroring disk images.

Bulk Storage Devices

The types of SCSI bulk storage devices serviced by the Application Workstation 51 are listed below:

- Internal 9.1 GB⁽⁵⁾ or 18 GB⁽⁵⁾ system hard disk drive (one for AW51D, two AW51E)
- Additional external hard drives of 4.2 GB⁽⁵⁾ or 9.1 GB⁽⁵⁾ capacity: for the AW51E, up to two external nonmirrored hard drives, or up to four in a mirrored configuration; for the AW51D, up to two external nonmirrored hard drives (total) when used with an optional SCS-3 PCI card
- One external 2.5 GB Quarter-Inch Cartridge (QIC) streaming tape drive
- One external 5 GB or 12 GB, 4 mm digital tape drive⁽⁶⁾
- One external 9 GB or 18 GB RAID drive
- One internal 644 MB CD-ROM drive
- One external 72 GB or 90 GB RAID drive

The Application Workstation Style D or E can support up to two⁽⁷⁾ external SCSI devices from the above list (tape drive only). The AW51D requires an optional SCSI-3 PCI card to support these external SCSI devices.

The AW51E can support an optional mirrored hard disk drive configuration when a second SCSI port is installed. Each SCSI port can connect up to two mirrored hard drives for the AW51E for a total of four (two mirrored pairs). The tape drives are not mirrored devices.

^{(5) 4.2} GB drives are supported in I/A Series 4.2.x only by Model 51 Style D and E processors; in I/A Series 6.x, they are supported by all processors.

⁽⁶⁾ At least one tape drive should be included per I/A Series system to allow disk backup.

⁽⁷⁾ The Application Workstation Style D and E has a high speed, ultra-wide SCSI-3 bus with a maximum allowable SCSI equivalent cable length of 3 meters (10 feet).

Network Communication Interfaces

I/A Series Nodebus

Electrical interfacing between the Application Workstation 51 and the I/A Series Nodebus (redundant) requires a Dual Nodebus 10Base-T Interface, or Dual Nodebus Interface Extender Module, depending on your type of processor and distance between the processor and the Nodebus (refer to PSS 21H-7B2 B4).

Ethernet Network

Electrical interfacing between the AW51 and a process control Ethernet network (nonredundant) requires a DNBT or DNBX Ethernet interface card.

Interfacing to I/O Devices

Electrical interfacing between the Application Workstation 51 with value point control software and the various I/O devices is accomplished with the following devices:

- A Serial Interface card for RS-232-C connectivity to Modicon Programmable Controllers, Allen-Bradley PLCs, or Foxboro SCADA
- An Ethernet card for connectivity to Allen-Bradley PLCs and Foxboro SCADA

Interfacing to Other Networks

The Application Workstation 51 Style D processor has three PCI slots. The Application Workstation 51 Style E processor has three PCI slots and two UPA video card slots. These processors support the following optional cards:

- IBM Token Ring Interface card for connectivity to IBM Token Ring networks⁽⁸⁾
- MII Connector plus 10/100 Mbps Twisted-Pair Interface Ethernet communications port provides AUI interface for connection to Ethernet when used in conjunction with a MII-to-AUI Adapter
- ATM 155 Mbits/sec network connection via twisted-pair communications port
- ATM 155 Mbits/sec network connection via fiber cable communications port
- Ultra-Wide SCSI plus 10/100 Mbps Twisted-Pair Interface Ethernet for disk mirroring and twistedpair 10/100 Mbits/sec (slow/fast) Ethernet communications port for connectivity to other networks

- 8-Port Serial Controller card
- PGX Video card (for second display in AW51D only)
- UPA Creator Graphics card (for second display in AW51E only).

These selections must be taken into account when ordering an Application Workstation 51.

Workstation Components

The workstation components provide user interface to all system display functions. They allow command and data entry, and display pointer manipulation and control. Workstation components used in conjunction with the Application Workstation 51 include:

- Alphanumeric Keyboard
- Annunciator and Annunciator/Numeric Keyboards and Annunciator Keypanel
- 21-Inch Workstation Display with/without Touchscreen
- 17-Inch Workstation Display without Touchscreen
- Mouse
- Trackball
- Industrial Pointing Device.

As an option, these devices may be mounted in I/A Series Modular Industrial Console bays.

Selection of either touchscreen, mouse, trackball, or industrial pointing device is required for picking display objects on the workstation display.

The touchscreen has sufficient resolution for all functions normally associated with a process operator. The mouse, trackball, or industrial pointing device is required for engineer-related functions (for example, building graphic displays).

The touchscreen (available with the 50 Series 21-Inch Workstation Display) and the annunciator type keyboards connect to a Graphics Controller Input Output (GCIO) interface unit. The GCIO, in turn, connects to one of the two serial ports on the Application Workstation 51. (Alternately, that serial port may be used to connect an optional hard copy device/printer, as discussed later in this Product Specification Sheet.)

The alphanumeric keyboard and the trackball or mouse connect as a functional pair or independently, via a dedicated serial communications link to the Application Workstation 51.

⁽⁸⁾ A separate security router may be required in conjunction with these optional information network connections to isolate I/A Series from other unrelated network traffic. Foxboro Information Technology and Application Consulting can provide information on network planning and recommendations.

Alphanumeric Keyboard

The alphanumeric keyboard is used any time text is entered into the system. It consists of the full set of alphanumeric keys plus punctuation and special symbol keys laid out in the standard QWERTY format, and a numeric data entry pad (with rudimentary cursor control). The alphanumeric keyboard is depicted in Figure 3.





Annunciator and Annunciator/Numeric Keyboards and Annunciator Keypanel

These keyboards and keypanel provide output information through the use of annunciator lights and audible alarms, plus input information through key switches. An audible alarm feature provides multiple pitches which can indicate audible differentiation of system alarms and process alarm priorities. An external audio output jack is available for attaching a customer-supplied audio amplifier with speakers. The external speakers allow the alarm to be heard if the keyboard is located in a high ambient noise environment.

The annunciator keyboard and annunciator keypanel⁽⁹⁾ (Figure 4) each provide an array of 48 LED switch pairs/keys displayable in either red or amber. They also contain a horn silence switch and a lamp test switch. Each LED under control of the software, may be on, off, or flashing as determined by the process conditions. The LEDs, when used in conjunction with the unit's audible annunciator, form an effective means of calling a user's attention to specific areas of the system. The switch associated with each LED may be used to invoke any preconfigured displays or operator responses. The keyboard allows for the insertion of 12 userlegendable polyester labels.



Figure 4. Annunciator Keyboard and Annunciator Keypanel

The annunciator/numeric keyboard (Figure 5) is a combination of 32 LED switch pairs/keys, a 16-section numeric keypad, and one NUM LOCK LED.

The keypad section is suitable for entering numeric data into the system and moving the cursor. The 32 LED switch pairs/keys are arranged in an 8-column by 4-row matrix similar to the annunciator keyboard, and also provide for the insertion of eight user-legendable polyester labels.



Figure 5. Annunciator/Numeric Keyboard

⁽⁹⁾ The Annunciator KeyPanel is suitable for mounting in the Modular Industrial Workstation or Modular Industrial Console.

21-Inch Workstation Display with/without Touchscreen

The 21-inch workstation display is a color monitor supporting ultra-high resolution applications. See Figure 6. The monitor works in conjunction with a mouse/trackball, an alphanumeric keyboard, and the annunciator keyboards (via the GCIO interface circuit box) and the system software. The GCIO box provides optional touchscreen capability as well as housing the alarm horn.





The optional touchscreen is attached to the front surface of the 21-inch monitor and divides the viewing screen into a matrix of transparent selectable areas. The user selects display objects by touching them on the screen. The touchscreen senses the action and sends a data signal to the Application Workstation 51 software, indicating the position of the selection. The color monitor is suitable for mounting in a workstation bay or on a desktop.

17-Inch Workstation Display without Touchscreen

The 17-inch workstation display is an analog cathode ray tube (CRT) color monitor supporting ultra-high resolution applications supported on the AW51D only. The 17-inch color monitor is suitable for tabletop mounting only.

20-Inch Flat Panel Workstation Display

The 20-Inch Flat Panel Workstation Display is an LCD flat panel display (FPD) color monitor that supports multi-window display applications requiring ultra-high resolution. The monitor has a lighter weight, with lower power levels than traditional CRT monitors of comparable screen size, and is not susceptible to image distortion from ambient magnetic fields. The monitor surface provides a wide viewing angle, and has no curvature to capture reflective highlights. The LCD display consists of a 1280 x 1024 pixel matrix. This monitor can be used with the Model 51, Style D and E workstation processors and application workstations, and newer versions of the 70 Series workstation processors and application workstations. This monitor is suitable for desktop use.



Figure 8. 20-Inch Flat Panel Workstation Display

The monitor utilizes a tilt and swivel stand which can raise or lower the monitor, and swing the monitor horizontally and vertically. The monitor can be removed from this stand for mounting on another surface.

The FPD monitor has a protective shield over the display surface to protect the LCD panel.



Figure 7. 17-Inch Workstation Display

Mouse

The 50 Series mouse is a tabletop-operated cursor control device. Three buttons on the mouse allow the user to make selections on areas of the screen determined by the position of the cursor and enable features associated with the X-Windows feature of the I/A Series software.

The 30 Series and 70 Series mouse are 2-button, tabletop-operated cursor control devices which function the same as the 50 Series type and may be used with or without a mouse pad. Figure 9 depicts the mouse.



Figure 9. Mouse

Trackball

The trackball (Figure 10) is a stationary component that contains a rotatable sphere. The trackball may be located on a tabletop. User rotation of the sphere causes the display pointer to move in a manner equivalent to the action of a mouse. Buttons similar to those on the mouse are also provided for user selections.



Figure 10. Trackball

Industrial Pointing Device

The industrial pointing device (Figure 11) is a completely sealed device specifically designed for harsh environments. A single touch mouse-type button controls both cursor direction and speed. Two click pads provide user selections.



Figure 11. Industrial Pointing Device

Hard Copy Device Connection

The Application Workstation 51 serial port(s) may be used for connection of one of the following optional hard copy devices (printer):

- Dot-Matrix Printer
- Color Dot-Matrix Printer.

In addition, the parallel port may be used for the connection of other hard copy devices: a color PostScript printer and a color InkJet printer.

Some options are mutually exclusive, specifically, either the GCIO interface (used for the touchscreen and the annunciator type keyboards) or one serial printer may be configured. These selections must be taken into account when ordering an Application Workstation 51.

Mounting Options

The Application Workstation 51 Style D is housed in an F-module form factor, and the Application Workstation 51 Style E is housed in an E-module form factor.

These form factors mount in I/A Series enclosures⁽¹⁰⁾, including the Modular Industrial Workstation and the Modular Industrial Console. Alternatively, any form factor can be mounted in a 19-inch rack equipped with the appropriate Foxboro designed modular mounting structure, or in a tabletop configuration.

⁽¹⁰⁾The Application Workstation 51 Style D and E require a Foxboro designed dual height modular mounting structure to fit in certain enclosures. Refer to modular mounting structure specific documentation to determine which enclosures it can be installed inside.

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