

# I/A Series<sup>®</sup> Hardware Application Workstation 51 Integrator



I/A Series scalable systems provide entry-level small system solutions incorporating both plant and business automation. With a variety of hardware and software configurations, the high performance Application Workstation 51 Integrator (AW51 Integrator) with the UNIX operating system meets small control system requirements, yet affords full system scalability. Additionally, it supports information network-based operations.

The AW51 Integrator provides full support for the control and monitoring of distributed process applications involving I/A Series Fieldbus devices, Allen-Bradley PLCs, or Modicon Programmable Controllers (PCs). As a stand-alone control workstation it combines the UNIX operating system with full I/A Series functionality to perform data acquisition, regulatory control, and sequential control.

### **Application Workstation 51 Integrator System**

The Application Workstation 51 Integrator provides:

- A 32-bit RISC processor and X-Window graphics technology for maximum display performance and application expandability for Application Workstation 51 Style A, B, and C processors.
- A 64-bit RISC processor for maximum display performance and application expandability for Application Workstation 51 Style D and E processors.
- Control blocks including I/O, control, advanced control, and sequential control functions.



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- The capability to communicate with two of the following:
  - Fieldbus Modules (FBMs) and Fieldbus Cards (FBCs) on a Foxboro Fieldbus (for AW51Bs and AW51Cs only).
  - Allen-Bradley Programmable Logic Controllers (PLCs) on an Ethernet.
  - Modicon Programmable Controllers on a Modbus.
- Advanced bulk storage device handling capabilities to support high-capacity hard disk drives and CD-ROM.
- Full compatibility with existing I/A Series Version 4.2 control, database, display/trending, and configuration software.
- Graphical interface through the I/A Series Display Manager or FoxView.<sup>(1)</sup>

In addition to performing those functions directly related to control of the process, the AW51 Integrator performs operations such as on-line configuration and system management. The user is afforded a broad range of configuration capabilities including database, display, system, and control strategy configuration as well as system monitoring. Also, an environment is provided for writing, compiling, and debugging C language application programs.

# AW51 INTEGRATOR SOFTWARE

# **Control Functions**

Control functions revolve around a configurable process control scheme running in the AW51 Integrator and the device protocol drivers providing communication to the I/O devices.

For cost effectiveness, the AW51 software is packaged to reflect the type and size of control required – small to large I/O for data acquisition, regulatory control, and/or sequential control. For additional information regarding FoxBlocks, see PSS 21S-1B2 B3 Software Overview for AW51 Integrator.

Process displays including block detail displays, trend displays, and user displays provide control information and operator interaction via an optional touchscreen. Alarm displays and optional configured annunciator keyboards provide alarm notification and information for operator response. Process events and process-related operator actions are recordable via the Process Summary Reporter and Operator Action Journal functions.

### **Application Functions**

Applications range from functions such as the storage of memory images, alarm events, and historical data, to larger-scale applications such as advanced control and third-party applications, data base management, and program development. The following paragraphs describe the major application functions performed.

### System Management

The Application Workstation 51 performs system management functions, which include handling all station alarms and messages, providing equipment information for the station and associated peripherals and devices as well as performing equipment change actions and maintaining the time and date in the system station.

### Database Management

Database management involves the storage, manipulation, and retrieval of files containing data received and/or produced by the system. The system includes a run-time license for INFORMIX On-Line Relational Database Management System.

### Historical Data

The system supports the Historian software, which maintains a history of application messages and continuous and discrete values such as measurements, setpoints, outputs, and status switches configured to be sent to the 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 Historian is scalable – 200, 500, or 1,000 points.

The system can be configured to maintain a history of errors, alarm conditions, and selected operator actions (for later review and analysis) by sending a message defining the event to the Historian.

<sup>(1)</sup> Up to four Display Manager Licenses may be used in an I/A Series system.

### Production Control Software

Production control software represents a large range of packages which require varied AW51 Integrator resources. Application packages available from Foxboro include:

- DECnet Connectivity
- System Configurator
- FORTRAN Compiler
- C Compiler
- Data for Windows (DDE Interface)
- INFORMIX On-Line Development Environment
- Report Writer (for 50 Series)
- Spreadsheet (for 50 Series)

Likewise, a broad range of fully certified, non Foxboro third-party applications are available.

### Graphic Display Support

The AW51 Integrator supports graphic displays via a Display Manager by storing and retrieving display formats from the data storage devices, by providing access to stored objects, and by storing tasks which execute in the AW51. Additionally, it executes programs that perform display and trend services.

Also, a display builder and configurator graphic tools are included with this package which allow the user to modify existing displays or create custom-made displays as well as dynamic attributes (e.g., blinking, color change, and ramping) to objects in the displays. As a result, these functions allow the operator to interact with the process via user-generated or usermodified dynamic displays reflecting current control activity.

# Software 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 AW51 Integrator supports configuration functions by providing the human interface and bulk storage for configuration parameters and by executing the configuration processes.

Configuration packages include the Integrated Control Configurator for setting up the control database and the Historian Configurator as well as on-line trending and display building and configuration.

### Application Development Facilities

Application development tools are provided to build programs. This includes tools to document, enter, translate, link, test, and maintain programs written in several programming languages. 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 AW51 Integrator 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 Application Program Interface (API).

### Windows on I/A Series Systems

Application Workstation 51 Styles A, B/B1, and C (with Solaris 2.4 or greater) have the capability of running MS-DOS and Microsoft Windows 3.1 applications in a separate window for local execution. The optional Windows on I/A Series systems package provides the following:

- Advanced multitasking with multiple active windows, such as I/A Series Display Manager, Spreadsheet, and third-party applications.
- Usage of the same touchscreen and modular keyboards as I/A Series applications.
- Access to I/A Series Microsoft-based products such as the optional FoxCAE Engineering Package for Windows.
- Source of I/A Series data for DDE client Microsoft applications running in the Microsoft window via the optional Data for Windows package.
- Network support for Microsoft applications supported by Sun's ODI compliant network driver.

Windows on I/A Series systems provides a separate X Window to run DOS or the Microsoft Windows program. All interaction is handled by and through this single X Window. The X Window is automatically sized based on the Windows display resolution. Within Microsoft Windows, multiple applications can be open and run, as supported by Microsoft Windows.

The Windows on I/A Series systems includes both an accelerator card and SunPC software package.

### Diagnostics

The AW51 Integrator 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 AW51 Integrator. These checks perform sequential tests on the various AW51 Integrator functional elements. Any malfunction detected during the power-up self-checks is reported by means of messages printed on a directly connected printer.

The run-time and watchdog timer checks provide continuous monitoring of AW51 Integrator 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 AW51 Integrator can be isolated and/or confirmed.

### AW51 INTEGRATOR HARDWARE

# AW51 Processor Style B, Style C, Style D, and Style E

The AW51 processor in conjunction with its peripherals performs both application functions and workstation functions. For hardware specifications, refer to PSS 21H-4R4 B4 for the AW51 Style B/B1, PSS 21H-4R5 B4 for the AW51 Style C, PSS 21H-4R2 B4 for the AW51 Style D, and PSS 21H-4R6 B4 for the AW51 Style E. For hardware specifications regarding the alphanumeric keyboard, mouse and trackball specifications, see PSS 21H-4E4 B4; for annunciator keyboard specifications, see PSS 21H-4E1 B4.

# **Standard Communication Interfaces**

Electrical interfacing between the Application Workstation 51 Integrator<sup>(2)</sup> and the various communication networks/buses with controllers and Intelligent devices is accomplished as follows:

- For I/A Series Fieldbus Modules and Fieldbus cards, an I/A Series Fieldbus interface SBus card (for AW51 Style B/B1, and AW51 Style C).
- For Modicon PCs, a Serial interface SBus or PCI card for RS-232-C connectivity to the Programmable Controllers.

 For Allen-Bradley PLCs, a fast SCSI Plus Ethernet SBus or PCI card for connectivity to the Programmable Logic Controllers on the Allen-Bradley Ethernet.

### SCSI Interface

A Small Computer System Interface (SCSI), within the AW51 Integrator, provides an industry standard bus (ANSI standard ANSC X3T9.) to support peripherals that have SCSI compatible controllers. The SCSI interface thus allows flexibility in the utilization of peripheral devices, providing greater system performance and easy system upgrade.

# Bulk Storage Devices

The types of SCSI bulk storage devices serviced by the AW51 Integrator are listed below. The quantities of these devices used by the Application Workstation Styles D and E differ from those used by the Application Workstation 51 Styles A, B, and C.

- One internal 4.2 GB<sup>(3)</sup>, or 9.1 GB<sup>(3)</sup> system hard disk drive (AW51D and AW51E can use up to two).
- Additional external hard drives of 4.2 GB<sup>(3)</sup>, or 9.1 GB<sup>(3)</sup> capacity: up to four hard disk drives (total) in a non-mirrored configuration, up to eight in a mirrored configuration for the AW51A/AW51B/AW51C (AW51D and AW51E can use up to two external hard drives and four in a mirrored configuration).
- One external 2.5 GB Quarter Inch Cartridge (QIC) streaming tape drive. (At least one streaming tape drive should be included per I/A Series system to allow disk backup.)
- One 5 GB or 12 GB, 4 mm digital tape drive.
- One 644 MB CD-ROM drive.

The total number of SCSI devices connected to one Application Workstation 51 Styles A, B/B1, and C cannot exceed seven<sup>(4)</sup>. For example, if a CD-ROM, one digital tape drive, one QIC tape drive, and four hard disk drives are selected, no more SCSI devices can be added. Up to two external SCSI devices from the above list can be connected to the Application Workstation Styles D and E.

<sup>(2)</sup> The AW51 Style B supports up to two optional SBus cards.

<sup>(3)</sup> New drives are supported in I/A Series Version 4.2.x only by Model 51 Style D and E processors; in I/A Series Version 6.x, they are supported by all processors.

<sup>(4)</sup> The maximum number of SCSI devices may be limited by the maximum allowable SCSI equivalent cable length, which is 6 meters (20 feet) for SCSI-2 buses (all processors except the Application Workstation Style E, which has a high speed, ultra-wide SCSI-3 bus with a maximum allowable SCSI equivalent cable length of 3 meters [10 feet]).

In the optional mirrored hard disk drive configuration, a second SCSI port is added. Each SCSI port can connect up to four hard disk drives for the Application Workstation 51 Styles A, B/B1, and C, for a total of eight (four mirrored pairs), or up to two mirrored hard drives for the Application Workstation Styles D and E for a total of four (two mirrored pairs). The tape drives and CD-ROM are not mirrored devices.

### **Workstation Components**

The workstation provides user interface to all system workstation display functions. They allow command and data entry, and display pointer manipulation and control. Workstation components used in conjunction with the AW51 Integrator include:

- Alphanumeric Keyboard
- Annunciator Keyboard and Annunciator/Numeric Keyboard
- 20-inch Workstation Display with/without Touchscreen
- Mouse
- Trackball
- Industrial Pointing Device

Selection of either touchscreen, mouse, trackball, or industrial pointing device is required for picking display objects on the 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 selections necessary for engineer-related functions (e.g., building graphic displays).

The touchscreen (associated with the 50 Series 20-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 AW51 Integrator. (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 trackball or mouse, connect together in a functional pair or independently via a dedicated serial communications link to the AW51 Integrator.

# Alphanumeric Keyboard

The alphanumeric keyboard is used any time new 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 1.



Figure 1. Alphanumeric Keyboard

### Annunciator and Annunciator/Numeric Keyboards

These keyboards provide output information through the use of annunciator lights and audible alarms, plus input information through key switches. An audio alarms feature provides multiple pitches which can indicate audible differentiation of system alarms and process alarm priorities. An external audio output jack is available for an attachable, 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 (Figure 2) provides an array of 48 LED switch pairs/keys displayed in either red or amber. It also contains 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 pre-configured displays or operator responses. The keyboard allows for the insertion of 12 user-defined polyester labels.



Figure 2. Annunciator Keyboard

The annunciator/numeric keyboard (Figure 3) 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. The 32 LED switch pairs/keys are arranged in an eight column by four row matrix similar to the annunciator keyboard, and also provide for the insertion of eight user-defined polyester labels.



Figure 3. Annunciator/Numeric Keyboard

# 20-inch Workstation Display with/without Touchscreen

The 20-inch workstation display is a full color monitor supporting ultra-high resolution applications. See Figure 4. The monitor supports a mouse/trackball, alphanumeric keyboard, and the annunciator type keyboards via the GCIO interface circuit box and the system software. The GCIO box provides optional touchscreen capability as well as housing for the alarm horn.



Figure 4. 20-inch Workstation Display (Tabletop Version)

The optional touchscreen is bonded to the front surface of the 20-inch workstation display 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 AW51 Integrator software, indicating the position of the selection.

The color monitor is suitable for mounting on a desktop or in a Modular Industrial Workstation bay.

# Mouse

Buttons on the mouse allow the user to make selections of areas of the screen determined by the position of the pointer. Figure 5 depicts the mouse.



Figure 5. Mouse

# Trackball

The trackball (Figure 6) 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 similar to the action of a mouse. Similarly, buttons are also provided for user selections



Figure 6. Trackball

### Industrial Pointing Device

The industrial pointing device (Figure 7) is a completely sealed device specifically designed for harsh environments. A single touch "mouse" button controls both cursor direction and speed. Two click pads provide user selections.



Figure 7. Industrial Pointing Device

# Hard Copy Device Connection

The AW51 Integrator serial port may be used for connection of one of the following optional hard-copy devices (printer):

- Dot-Matrix Printer 80
- Color Dot-Matrix Printer 132

In addition, the parallel port may be used for the connection of another hard-copy device: a color PostScript printer.

### **Optional Selections**

The AW51 Integrator (Style A, B/B1, and C) processor has SBus slots that may be used for the following optional cards depending on your current configuration:

- IBM Token Ring Interface Card for connectivity to IBM Token Ring networks
- AUI Ethernet Interface Card for connectivity to Ethernet networks
- TGX Color Frame Buffer Card for dual monitor configurations
- Windows on I/A Series systems package utilizing a SunPC accelerator card and SunPC 4.1 for Solaris software

The Application Workstation 51 Style D and E processors have available three PCI slots. These processors can use the following optional cards:

- IBM Token Ring Interface Card for connectivity to IBM Token Ring networks<sup>(5)</sup>.
- MII Connector plus 10/100 Mbps TP I/F 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 TP I/F Ethernet for disk mirroring and twisted-pair 10/100 Mbits/sec (slow/fast) Ethernet communications port for connectivity to other networks.
- Eight-Port Serial Controller Card

A PGX video PCI card is also available for the Application Workstation 51 Style D to support a second display.

The Application Workstation 51 Style E has two UPA video card slots, for UPA Creator Graphics cards to support a a primary and secondary display.

The above selections must be taken into account when ordering an Application Workstation 51 with AW51 Integrator.

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.

# Mounting Options

The Application Workstation 51 Style B/B1 and C consists of a single module having a C-module form factor; the Application Workstation 51 Style A consists of a single module having an A-module form factor. The Application Workstation 51 Style D consists of an F-module. The Application Workstation 51 Style E consists of an E-module. These form factors mount in I/A Series enclosures<sup>(5)</sup>, including the Modular Industrial Workstation and the Modular Industrial Console. Alternatively, either form factor can be mounted in a 19-inch rack equipped with the appropriate Foxboro designed modular mounting structure, or in a tabletop configuration.

<sup>(5)</sup> The Application Workstation 51 Styles 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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