Features and Benefits

- **High-performance processor:**

  Based on SGI 64-bit RISC™ R10000 CPU server.

  Up to 30 client connections.

  Redundant Ethernet™ (10 Mbps).

  Single autosense/select 10/100 Mbps Ethernet.

- **Full function human system interface:**

  Process monitoring and supervision.

  Alarm reporting and management.

  Trending and tuning.

  Data historian and archiving.

  Logging and report generation.

  System diagnostics.

  Open data export, import.

  ChemFlex™ batch automation.

  Flexible nine level system security.

- **Optional Advanced security:**

  Support of 21 CFR Part 11 requirements.

- **Industry standards:**

  X-Windows™ and OSF™/Motif™ display technologies.

  Unix™ operating system.

  DDE access to industry standard API (@aGlance/IT™).

  IEEE 802.3 Ethernet, TCP/IP protocols.

  ISA S88 batch control standard.

- **High performance dynamic color graphics:**

  User-friendly, intuitive editor.

  Standard dynamic symbol libraries.

  Animation with embedded display logic.

- **Ease of use:**

  Point-and-click navigation.

  Object-oriented configuration.

  Context-sensitive help and online documentation.

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Conductor UX is a Unix-based full-featured human system interface (HSI) platform designed for interfacing with Symphony products which are DCI System Six® compatible. Conductor UX supports data access with area controllers that execute Controlware control strategies. It complements the inherent functionality of the Symphony system with the basic suite of operator directed features and functions that are ergonomically designed to facilitate process monitoring, control, fault mitigation, and optimization. Conductor UX provides Symphony system users with dynamic access to plant-wide or enterprise-wide information. It offers more than just a way for operators to interact with machines. This powerful HSI provides an interface to all enterprise data through open system connectivity.

Custom tailored process displays, alarm summaries, and historical and real-time trend displays provide users immediate access to process status and operations information. Multiple priority alarms allow efficient response to abnormal transient conditions. Operator configurable displays enable situation dependent groupings of critical data elements. Specially designed Conductor UX displays provide online status and troubleshooting for Symphony systems.

Conductor UX is an open platform which combines ABB's expertise of process control with X-Window technology, producing a new era of transparent seamless integration between the worlds of information and process control systems.

ABB

Introduction

Conductor UX represents a major advancement in the domain of integrated process control and management information systems. Based on a foundation of nonproprietary hardware, operating system software, and industry standard open-data-exchange technologies, it expands the capability to meet and exceed the demanding needs of the process operator while seamlessly exchanging real-time process information and operations directives with other key members of the operating enterprise. There has been no compromise on Conductor UX performance as an operator-process interface. All of the customary functions such as alarming, logging, trending, reporting, and controls interface have been designed with special emphasis on efficiency, ergonomics, and process security. The capability for server redundancy with full automatic switchover further enhances the online availability of Conductor UX.

Conductor UX embraces a client/server architecture and object-oriented design principles in its basic design. The resulting configuration versatility and scalability enables solutions ranging from a single server supporting multiple clients to a single processor client/server unit for small or high reliability applications. The full functionality and design attributes of Conductor UX result in a human system interface that is easy to learn, easy to use, easy to configure, and low in cost of ownership.

Client/Server Architecture

Conductor UX is a scalable hardware platform designed to run Conductor UX software applications in addition to third-party packages and custom-developed software. The Conductor UX platform co-exists on the same Cnet with other DCI System Six compatible Symphony nodes including the Conductor NT, Composer CTK, Harmony DCU, and DCU2000G. The scalable features of the Conductor UX platform allow it to be used in support of a basic single CRT local operator station or in support of multiple CRT stations running high-level process or plant management applications interfacing to other plant-wide networks.

The Conductor UX platform consists of four basic components:

- CPU enclosure.
- X-Logic module.
- Monitor.
- Keyboard.

CPU Enclosure

The Conductor UX platform (Fig. 1) is available with a R10000 CPU employing 64-bit RISC processor technology from Silicon Graphics®, Inc. (SGI).

The CPU enclosure also houses from one to six nine-gigabyte, fast, ultra-wide SCSI hard disk drives supporting a maximum of 54 gigabytes. Each Conductor UX platform can also accommodate one or two fast SCSI II media devices. One of these devices is a 600-megabyte CD-ROM that serves as a read only device used for loading ABB application software. The other remaining position is available for either a two-gigabyte QIC tape or a four-gigabyte DAT tape that functions as read/write devices for the purpose of restoring configuration data or archiving of historical data.

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Figure 1. Conductor UX Platform UNIX Server

Memory

Each Conductor UX platform makes use of error correcting (ECC) synchronous dynamic RAM memory. Each CPU processor is provided with a base of 256 megabytes of memory that can be expanded with DIMM memory by an additional one gigabyte depending on the number of display center terminals (DCTs) being driven by the platform and the specific applications running in the machine. The memory is expandable to a total of 1,256 megabytes of memory. Refer to the Conductor UX data sheet for general minimum memory guidelines based on the quantity of DCTs being driven by the platform.

Process Data Highway Communications

For systems where the integrity of data communications between the Conductor UX platform and the area controllers is critical, a redundant process network option is available. This approach uses an ABB Ethernet Communications Controller (ECCP) for interfacing with the PCI bus backplane in the Conductor UX platform. The ECCP resides within the CPU enclosure and provides redundant IEEE 802.3 Ethernet communications using TCP/IP protocol over the Control Network (Cnet) used to interface with Harmony DCUs, DCU2000Gs, other Conductor UX and NT servers, and Conductor NT clients. The Operations Network (Onet) between the Conductor UX platform and each display center terminal (DCT) or Conductor NT clients uses a separate existing autosense/select 10/100 Mbps Base-T Ethernet port resident within the CPU enclosure. The Onet also uses IEEE 802.3 Ethernet communications with TCP/IP protocol allowing connection to external computer systems. For small systems, the user has the option of using this single network to interface the Conductor UX platform with the area controllers on a single non-redundant highway. In this shared network configuration, the DCTs, Conductor UX platform, and area controllers reside on a common Cnet. This provides a cost effective solution for network communications.

Optional Console Device

Each Conductor UX platform includes a serial cable for connection between the CPU enclosure serial port and a DCT. In addition to its normal use as a process operations monitoring console, a DCT can also be used as a console device for system loading and maintenance. If a DCT is not located within eight feet of the CPU enclosure, then an optional VT-200 style console device is available for system loading and maintenance.

Display Center Terminal (DCT)

The DCT includes a high-resolution, flicker-free color monitor, an X-logic module, operator's keyboard, a cursor positioning device and interconnecting cables to the Conductor UX platform. The DCT communicates with the Conductor UX platform via an Ethernet TCP/IP network. This network can be thinwire, thickwire coax, or fiber optic cable. DCTs may be located remotely from the server.

DCT X-Logic Module

The Conductor UX platform is available with X-Window display electronics (X-logic unit). The X-logic units provide display resolutions greater than one million pixels. The NC900 X-logic unit in conjunction with a 21-inch monitor supports up to 1,600 x 1,200 pixel format at a 4 to 3 aspect ratio. The X-logic module controls the operation of the display center terminal. The most important function of the unit is the graphics processing and window management that permits multiple applications such as trending, alarm review, graphics, point displays, etc. to appear on the display center terminal in different windows simultaneously.

DCT Monitor

A single monitor size selection is available with the Conductor UX platform: 21 inches supporting 256 colors. The 21-inch monitor provides 1,600 x 1,200 pixel resolution. The monitor is provided with a built-in tilt/swivel base (Fig. 2).

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Figure 2. Display Center Terminal

DCT Keyboards

Keyboard options are available with the Conductor UX platform to support a variety of operating environments including installation within a hardened CRT console. Options include the standard full travel "Qwerty" keyboard with 24 dedicated function keys for initiation of specific operator/engineer actions. The standard keyboard includes a three-button mouse. Cursor positioning options include a three-button track ball.

Industrial keyboard options include a sealed keyboard with Qwerty and dedicated function keys, integral alarm LEDs and audio annunciation. The industrial keyboard is available in two options: metal case with a built-in track ball for use in a NEMA 4/IP54 dust tight application and an uncased trackball version with a special purge connection for installation within a third party air purged console. The industrial keyboards are based on a polyester film overlay which provides enhanced resistance to solvents and added strength and durability. The industrial keyboards use mechanical key switches beneath the overlay providing superior, tactile feedback.

Process Monitoring and Control

Process monitoring and control is the prime online, high priority, real-time application focus for Conductor UX software. This is achieved by providing process and control status visibility and manipulative access to the process via both custom configured and fixed graphic display representations of the Symphony I/O and control functions. The Cnet, a high speed and secure communication network, links the Conductor UX platform to area controllers providing the operator with a continual real-time link to process information and controller functions.

Windowing System

The windowing system allows one to four process windows (Fig. 3) to be shown on a single display. The user can configure a personalized array of windows to be presented at log-on, with up to 15 additional prearranged arrays using the CRT context feature. Process windows can be sized and arranged to meet user preferences. Pop-up controls may be dragged and dropped to adjacent displays, should the operator desire to keep full view of his current display.

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Figure 3. Four Process Windows

User-Friendly

Conductor UX functionality is designed with the operator in mind. There are several operational features that may be configured by operators according to their personal preferences. For example, the ADP and QuickKey (Fig. 4) features allow the operator to pop up a key pad that can be configured to invoke a specific process graphic or trend display. The software alarm display panel (Soft ADP) provides pop-up displays representing up to four panels, each one with 64 function keys. These keys are backlit with either red or amber indication. By coordinating the key's display destination with the alarms or events that backlit the buttons, the operator can be quickly alerted to take corrective action with one or two keystrokes.

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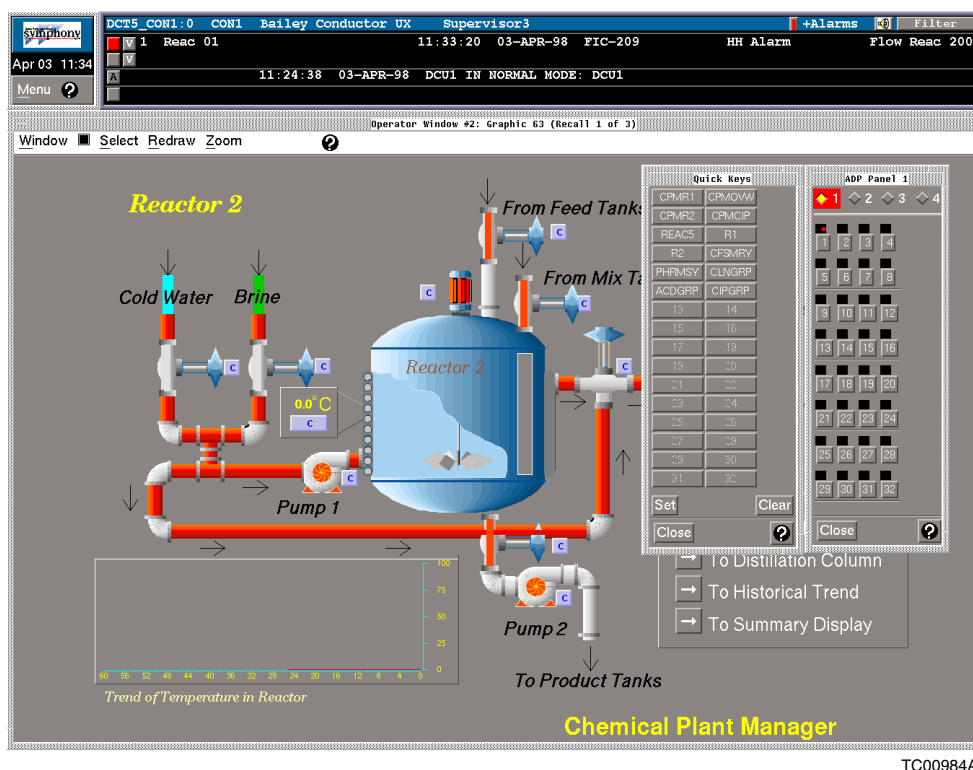
Figure 4. ADP and QuickKey Menus

The intuitive, user-friendly, graphic interface provides a consistent, and easy to learn and use navigation system for transitioning among process, controller, trend, alarm, log, and utility displays. All operations are performed using a pointing device (mouse or track ball) allowing the operator to focus on the process interface and not the machine interface. Preassigned function keys allow shortcuts for common operator actions.

Conductor UX software supports fixed and free-format display hierarchies. The fixed hierarchy of summary, group, and point displays allows the operator to easily navigate the process in a simple repeatable pattern. The free format or custom hierarchy allows any interconnection of standard and custom displays. Custom displays can have any combination of dynamic, faceplate, ISA standard or custom symbols along with imbedded real-time process parameter values. Control faceplates may be viewed from any desired location in the control process graphics.

Logging and Report Generation

Conductor UX software has a powerful, intuitive logging and report generation application. There are two logging types: event and spreadsheet. Each type may be stored or printed as it occurs or as scheduled.

Table 1. Logging and Reports

Type	Class	Description
Fixed format spreadsheet	Process alarm System alarm Operator message Operating errors Operator action Priority Area	Reports current and historical events which occurred in a time period. Events include: process alarms, system alarms, operator actions, diagnostics, and operator messages. Events may be filtered by priority, process area, or event type. Event logs can be printed based on a triggering event or scheduled on an hourly, daily, weekly, and/or monthly basis.
Event triggered scheduled		An optional log which combines the mathematical and charting functionality of eXclaim! with data from the Conductor UX historian. This provides the user with a wide range of calculation, format, and reporting options. Custom tailored logs can be easily developed and maintained using a universally understood tool. Spreadsheet logs may be scheduled to execute and print on an event and/or periodic time or event basis.

Data Trending and Archiving

Trending

Trend displays (line charts) are one of the most important tools customarily used in operating and analyzing industrial processes. Conductor UX addresses this need by presenting the operator with an extensive set of trending functions and features. Trends may represent minimum, maximum, average, or instantaneous process values. One to eight trends may be shown in a single display. Segments of a trend may be selected and *zoomed* to give magnified details of an event or process excursion. A time cursor allows the user to move back and forth in time and display the numeric values corresponding to the cursor's location in time.

The *historical database* is the collection point for data supplied for trending displays, logs and special reports. It supports an extensive data archiving facility. Collection and storage rates, retention spans, and collection type (i.e., minimum, maximum, average, and instantaneous) are assignable. Data may be collected and stored at time intervals ranging from one second to several hours. Historical data is retained in circular files.

A powerful feature is the block database which allows a single identifier for a group of tags (up to 500). These grouped tags may have computations applied with the resultant values stored and accessible for trending and other applications.

Archiving

Archiving capability provides for removal and long term storage of historical trend data on a removable DAT or QIC tape.

Alarm Management

The Conductor UX alarm management and presentation package assists operators in understanding the severity of abnormal process and system associated state conditions. Dedicated displays, presentation techniques, and filtering controls reduce the alarm overload burden thus enabling operators to concentrate on the highest priority controlling factors associated with the process or system excursion. Vectoring from an alarm message allows the operator to move to any control display in the system with a single mouse click. Sixteen assigned priority levels allow operators to quickly move to the center of the upset. Configurable tones allow the operator to audibly ascertain the importance of the alarm.

Alarm Filtering

Alarms may be filtered at the mini-alarm window according to classification (i.e., process, system event, priority, and area). Each classification has different filtering options. This easy-to-use classification process greatly reduces operator response times as well as enabling segregation of events on a process unit (area) basis. Operators responsible for multiple units can easily scan and react to alarms exclusively related to the area of interest.

Alarm Inhibit

In addition to filtering, individual alarms may be inhibited manually, or by other alarms. This feature reduces the impact of alarm showers, and nuisance alarms to relieve the burden on operators during upset conditions.

Mini-Alarm Window

The primary role for Conductor UX is that of a process interface where alarms must always be immediately accessible. The Mini-Alarm Window (Fig. 5) is permanently located at the top of the screen. It allows operators to monitor any process and system alarms regardless of the number and type of windows currently on the display.

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Figure 5. Mini-Alarm Window

Special features include:

- Single click access to any system display.
- Dedicated system alarm acknowledge.
- Operator settable filters to eliminate nuisance alarms.

Alarm Review Display

A complete alarm summary display (Fig. 4) is always available to the operator in any open process window by a single point-and-click operation. This display contains a listing of all active or unacknowledged process related alarms in the system. The alarms can be reviewed, sorted, and acknowledged individually or by window. Each alarm can have an associated display that can be invoked via the specific alarm listing. A freeze feature allows the operator to stop fast moving alarm streams for easy reading. In addition to the alarm review page that is dedicated to process

alarms, an event historian is also available for reviewing the last 10,000 system events. System events include not only process alarm occurrence and acknowledgment, but also system events such as a device failure, and operator actions such as making a set point change.

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Figure 6. Alarm Summary Display

OPEN Standard Data Export

Any data associated with a real-time or historical tag name within Conductor UX can be accessed by a client running @aGlance/IT client software. This access can be via the Ethernet LAN or a WEB browser located remotely from the control room or plant site.

Operation and System Security

Conductor UX has a comprehensive password-based security system. The user password (up to seven characters) is assigned to one of nine levels of operational privilege. Each of the levels can be assigned access to all, or combinations of, 60 access functions, some of which are listed below:

- Password assignment.
- Security system activate/deactivate.
- Operator/engineer/supervisor access to Conductor UX functions.
- Process control functions.
- Area access/alarm assignment.
- Priority access.
- Log-on window array.
- Message class.
- 64 QuickKey/ADP key assignment.
- 16 CRT context key assignments.
- Configure, tune, and view.
- Manual data entry.
- Historical database maintenance access.
- Network device assignment access.

Also supported is an optional advanced Security feature that supports 21 CFR Part 11 requirements. Included with this option are password ageing, password minimum length, no-activity time out, expanded audit trail data capture for alarm acknowledge, batch management, and backup/restore action. It also includes batch area re-assignment on unit operations.

Configuration

Conductor UX utilizes object-oriented software making it easy to configure and use. Configuration is done by filling in the blanks. All global operating functions execute on the basis of tag names. A full-featured graphics editor supports the online development of custom graphic displays using static, dynamic and animated industry standard symbols. Displays may be created or edited and invoked online without impacting console functions. Configurations may be backed up or restored via QIC tape, DAT, or to Ethernet mounted storage devices.

Batch Automation

Conductor UX makes use of ChemFlex, a powerful S88 based batch management software package which provides the tools to configure a batch application; schedule and monitor the execution of batches; and store and document the results of a batch execution. ChemFlex handles the simplest single product, single train processes as well as the complex multi-product, multi-train processes. Batch recipes are developed as graphical representations using an object-oriented approach employing user-definable color-coded recipe procedures that are dynamically updated during batch execution. Automatic recipe version numbering and history removes any doubt as to the origin of a recipe, or whether the latest version of a recipe is being used. Batch events and process data are automatically collected and retrieved on a Batch ID basis.

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ABB

ABB Inc.
29801 Euclid Avenue
Wickliffe, Ohio 44092
Phone: +1 440 585-8500
Fax: +1 440 585 8756
www.abb.com/controlsystems

ABB AB
SE-721 59 Västeras, Sweden
Phone: +46 (0) 21 34 2000
Fax: +46 (0) 21 13 78 45
www.abb.com/controlsystems

ABB GmbH
Dudenstraße 44-46, D-68167
Mannheim, Germany
Phone: +49 (0) 1805 266 776
Fax: +49 (0) 1805 776 329
www.abb.com/controlsystems