



ControlWave Process Automation Controller

ControlWave is a highly adaptable, high performance Distributed Open Controller with exceptional networking capability to provide a complete Process Automation Management Solution. Designed with a great emphasis on scalability and modularity, ControlWave can be configured to maximize the performance of a wide range of control systems, from small or mid-size applications to large ones. Additionally, due to its small form factor and rugged industrial design, ControlWave offers an outstanding ability to match the requirements of the most demanding process plant and remote SCADA system environments. Above all, Bristol Babcock has developed this innovative controller to provide cost-effective solutions by minimizing the time required for installation and configuration.

Through this new open architecture, ControlWave provides an ideal hybrid union of PLC, RTU and DCS without compromising the unique features and capabilities of each product. Consequently, the ControlWave Process Automation Controller not only introduces the great possibilities of an open architecture for emerging communication standards, but it also provides a simple solution for existing networks. From its conception, ControlWave was intended as a very flexible system capable of satisfying the requirements of local, expanded, remote and distributed I/O combinations. It is as widely accepted as a scalable platform because it can be used for small applications using a single rack, but it can also be expanded to large applications spanning an entire plant.

Hardware Features

- 586 based processor provides unparalleled performance
- Up to three 100/10 MB Ethernet ports
- Ethernet remote I/O
- Up to four serial communication ports
- 2, 4, and 8 I/O slot panel mount stainless steel

- chassis, panel or 19" rack mount on 8 slot chassis
- Single and double density I/O modules
- Hot Swap I/O replacement
- Security key-lock to prevent unauthorized access
- Internal loop power for I/O simplifies installation
- AOs maintain last/preset value on CPU Watchdog
- DOs Maintain last or zero value on CPU Watchdog
- Wide temperature range (-40 to +70°C)
- Class I, Div. 2 hazardous location and CE approval



Scalability

ControlWave meets the needs of a wide range of applications, from a RTU to a powerful plant process control system through its modular architecture. For a simple RTU application, ControlWave can be configured with two or four I/O slots in a panel mount package to minimize the physical footprint. The RTUs CPU will support two or four serial communication ports.

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For in-plant control applications **ControlWave** offers either four or eight slot, panel or rack-mount, backplanes. In addition to the serial communication ports, this system supports either one or three 100/10 Base-T Ethernet connections for optimum network segmentation. This unique functionality allows segregation of the field I/O, plant Intranet and external Internet networks.

Specifications

CPU

- AMD Elan 520 processor: 586 CPU-100 Mhz
- Data Memory: 2 MB SRAM battery backed memory
- Historical Archive memory: Stored in either flash or battery backed SRAM
- Code/ Instruction Memory: 4 MB on-board Flash
- Synchronous Dynamic memory: 4 MB (66MHz SDRAM coupled to a 32-bit bus)
- PCI bus for communication expansion module
- 2-digit 'Port 80' display for booting and run-time diagnostics
- Key-lock security switch

Communication

- Two RS-232 serial communication ports with standard PC/AT 9-pin male D-sub connectors on CPU module, both supporting baud rates up to 115.2 KB
- Two expansion RS 232 or RS 485 serial communication ports: up to 115.2 KB
1 standard PC/AT 9-pin D-sub Connector and 1 RJ45 8-pin connector
- Isolation: RS 485 serial communication ports isolated to 500 Vdc
- Up to three independent 100/10 Base-T Ethernet ports with RJ45 connectors
- Isolation: Ethernet ports isolated to 500 Vdc

Power Supply and Chassis

- 12 or 24 Vdc power
- Power-fail detection and recovery sequencer
- System LEDs for: Active , Fail, & Power OK
- Power supply isolation: 500 Vdc
- ISA bus for I/O system (supports Hot Swap I/O) able to drive 8 local chassis I/O modules
- 2 – I/O slot chassis: Panel Mount 7.97"W x 6.97"H x 4.96"D (202.43W x 177.03H x 125.98D)
- 4 – I/O slot chassis: Panel Mount 11.84"W x 6.97"H x 4.96"D (300.73W x 177.03H x 125.98D)
- 8 – I/O slot chassis: Panel Mount or 19" Rack Mount 18.96"W x 6.97"H x 4.96"D (481.58W x 177.03H x 125.98D)

Environmental specifications

- Industrial operational temperature limits (-40 to + 70°C)
- Humidity: 0-95% (non-condensing)
- Vibration limits: 1.0 g acceleration over 10-150 Hz 0.5 g acceleration over 150-2000 Hz
- ESD (Electro Static Discharge) withstand: 15 KV, 8 KV contact

Open standards for programming, network configuration and communication

Only **ControlWave** brings you the perfect combination of industry standards to minimize your learning, engineering and implementation costs. The intelligent tool suites add an extra dimension to the overall umbrella we call OpenBSI.

- **ControlWave Designer** - Programming Software, I/O Configuration Wizard, and I/O Simulator
- **TechTools** – Diagnostics, Application Downloader, Real-Time ActiveX controls and Setup web pages

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- **OperatorTools** – NetView/LocalView, DataView, HMI Database Builder and Real Time Active X controls
- **RemoteTools** – Provides Operator Tools functionality on a remote PC
- **HistTools** – Historical Data Collector, Scheduler and File Converter

By adhering to such industry standards as Ethernet, TCP/IP, Microsoft Windows[®], COM/DCOM, OLE and Active X, **ControlWave** is able to achieve the highest degree of openness in control system architecture and bring you the optimal process efficiency and productivity you need to ensure a successful system implementation. To minimize your engineering and development time, we have adopted the best programming standard available in IEC 61131-3. IEC 61131-3 compliant programming is supported by the **ControlWave Designer** configuration generation tools, offering all five IEC 61131-3 process languages for batch or continuous control, and ladder logic and sequential languages for discrete control, as well as high level languages for maximum flexibility. Additionally, **ControlWave** is loaded with customized function blocks to simplify the configuration of complicated industrial, water & wastewater, and oil & gas control system applications.

ControlWave Local I/O

ControlWave 'Process Friendly' local I/O modules are designed to maximize usability while minimizing installation, maintenance, and system downtime costs. All of the rugged industrial I/O modules are pre-configured at the factory so there are no switches or jumpers to set. A pull-down door provides front panel wiring terminal access for technicians. The bezel and even the terminations can be easily removed from the I/O card to make wiring even easier. In addition, the availability of both local direct and remote DIN rail terminations conveniently accommodates a wide range of applications.

To minimize field wiring and eliminate the need for marshalling strips, the analog input and digital input

modules are capable of supplying loop power to two wire transmitters and dry contacts. For maximum channel-to-channel isolation, externally powered analog and digital input modules are available.

Status-at-a-glance indicators offer instant visual notification of I/O system problems. Each I/O module has a bi-color Pass/Fail LED to display the on-line diagnostic status. Digital I/O status



LED's are provided for each point. Analog Input modules have a unique feature. Each input point has two LEDs to indicate input under/over range conditions due to open and shorted field devices. The green LED, when lit, indicates the input is in a normal range. The Red LED, when lit, indicates the input is under or over range, typically meaning it is open or shorted.

Features

- Convenient 'Process Friendly' pluggable local and remote wiring terminations simplify installation
- Status-at-a-glance LED indicators
- Single and Double density I/O count available for all modules provide application flexibility
- Loop powered inputs minimize wiring costs
- Easy access pull-down door with terminal wiring labels
- Hot Swap I/O replacement even in Class I, Div. 2 locations

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- All I/O modules are enclosed in a rugged aluminum shell
- Analog outputs configurable for 'Hold last value, Fail-Safe state or preset value'
- Discrete outputs configurable 'Hold last value or fail to zero'

Specifications

All I/O

- Surge protection meets C37.90-1978 and IEC 801-5
- Terminations are pluggable and accept a maximum wire size of 14 gauge
- 'HOT SWAP' module replacement is supported. All I/O is frozen for 300 ms when any module is replaced
- Environmental Specifications
 - Operating Temperature range: -40 to 70°C (-40 to 158°F), storage up to 85°C
 - Relative Humidity: 15-95% non-condensing
 - Vibration: 1.0g for 10-150 Hz
0.5g for 150Hz to 2000Hz
 - RFI Susceptibility: 3V/m – 80 MHz to 1000Mhz (EN50082-2)
 - ESD withstand: 15 KV (air discharge); 8 KV (contact) per IEC 1000-4-2

ControlWave Digital Input Module

- Number of points: 16 or 32 – non-interrupting inputs
- 16-bit wide bus access
- Input Voltage Range: 24 Vdc nominal
- Input current : 5 mA nominal
- Optical isolation: 1500 V field input to logic
- Surge suppression: 500Vdc MOV to chassis 31 Vdc transorb between signal and isolated ground
- Input filtering: 30 ms time constant (contact bounce)
- Dry contact inputs – 21 Vdc on-board isolated

loop power supply for contacts or externally powered voltage inputs

- Power Consumption: 100 mA max @5V (all LED's on)
- Status indication: LED per point status and module OK/FAIL LED

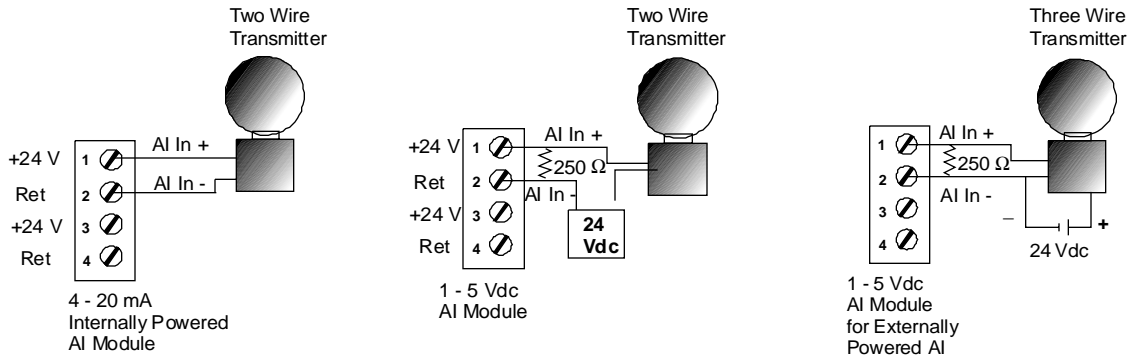
ControlWave Digital Output Module

- Number of points: 16 or 32
- 16-bit wide bus access
- Output type: solid state open source MOSFET
- Operating voltage range: 10 - 31Vdc
- Maximum operating frequency: 20 Hz
- Current sink load capability: 500 mA at 31V
- Electrical isolation: 1500 Vdc
- Surge suppression: 500 MOV to chassis 31 Vdc transorb between signal and isolated ground
- Status indicator: LED per point status and module OK/FAIL LED
- Configurable Fail State 'OFF', or 'Hold Last Value'
- Power consumption: 143 mA max @ 5 Vdc (all LEDs ON)

ControlWave Analog Input Module

- Number of Channels: 8 or 16
- A/D Resolution: 14 bit
- Input Configuration: Isolated voltage input: 500 V per card to chassis 31 V per channel when externally sourced
 - Internally sourced current Input: Single-ended inputs 4-20 mA
 - Voltage Input: Isolated Differential inputs 1-5 V dc
 - Externally sourced current loop with 1-5 V input module and 250 ohm resistor across the input terminals
- Input Impedance: > 100 KW
- Input Filtering : 300 ms to 99.9% of input signal
- Channel Settling Time: 680 microseconds

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- Conversion Time: 25 microseconds
- Accuracy:
 - 0.1% of span 25°C
 - 0.2% of span -20 °C to 70 °C
 - 0.3% of span -40 °C to 70 °C
- Isolated Voltage Common Mode Range: 31 Vdc to isolated common
- LED Indicators : Normal, Over-range/Under-range, module FAIL/OK
- On board References: 1V, 5V
- On-board isolated loop supply for internally powered AI
- Surge Supression: 31 Vdc transorb across in put signals and (-) input to chassis
- 500Vdc MOV isolated common to chassis

ControlWave Analog Output Module

- Number of Channels: 4 or 8
- Output configurations: 4-20 mA (650 max. drive) and 1-5 Vdc @ 5mA max.
- D/A resolution: 12 bit
- Accuracy:
 - 0.1% of span @ 25°C for current output;
 - $0.1\% + (5 W \times I_{load})/4.4$ @ 25°C for voltage
 - 0.2% of span @ -20 to 70 °C for current output;
 - $0.1\% + (5 W \times I_{load})/4.4$ @ 25°C for voltage
 - 0.3% of span @ -40 to 70 °C for current output;
 - $0.1\% + (5 W \times I_{load})/4.4$ @ 25°C for voltage

- Electrical Isolation from the power system by an opto-coupler and a dc/dc converter.
- Settling time: 1 ms
- FAIL and OK module status LED
- Surge Supression: 31 Vdc transorb across output signals and (-) output to common
- 500Vdc MOV isolated common to chassis
- Configurable Output Fail State (hold last value, zero (-5%), to specified value)

ControlWave Universal Digital Input Module and Counter (UDI)

- Number of points: 6 or 12
- Polled DI and High Speed Counter or Low Speed Counter
- Bus Access: 16-bits wide
- Frequency Range: 0-10 KHz
- Input Voltage Range: 12V, 24V
- Debounce circuitry factory set Enabled or Disabled
- Input Current: 5mA +/- 10%
- Each counter input can be configured as a polled input, Low Speed Counter, or High Speed Counter – (Roll-over on 65536, not software resettable)
- Input Filtering, Software configurable for: 20 micro seconds for high speed counter 1 millisecond for low speed counter 30 ms milliseconds for contact closure interruptible DI
- Loop power for dry contact inputs



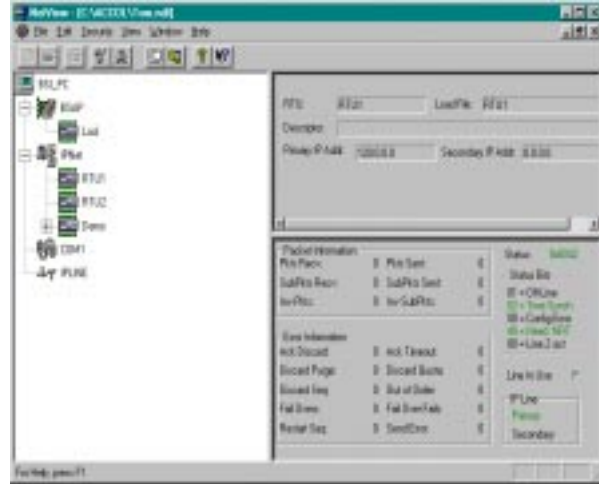
- Electrical Isolation: 1500 Vdc to system logic and 500Vdc to chassis
- Surge Suppression: 31 Vdc transorb across input and to field common
- Terminations: Pluggable, max wire size is 14 gauge. Set, reset, common and Shield terminals per input
- Status Indication: Status LED per input, module PASS/FAIL LED
- Power Consumption: 91 mA max. @5 V (all LEDs ON)

OpenBSI Simply Creative

OpenBSI (Open Bristol System Interface) is a set of network setup, communication diagnostic, and data viewing utilities that provide access to both **ControlWave** and Network 3000 controllers and RTUs. OpenBSI is the only product available in the industry to bring such unique functionality and ease of use to the network level. At the core is the communication interface, written as a Windows 98/NT & 2000 communication server API through which other client applications communicate with the Bristol networks. OpenBSI supports both serial BSAP protocol and Ethernet Internet Protocol communication to **ControlWave** and Network 3000 RTUs and controllers. Above this communication layer are a group of applications known as OpenBSI Utilities. These client utilities communicate through the server to collect and manage data gathered from the network, generate files based on collected historical data, collect alarms, and monitor and control OpenBSI communications.

OpenBSI Utilities

- Communication engine for PC applications
- Supports **ControlWave** and Network 3000 serial and IP protocols
- RS 232, Dial-line, cellular, radio, CDPD, satellite, and Ethernet connections
- Provides on-line download & signal variable



NetView – Network configuration and application LaunchPad

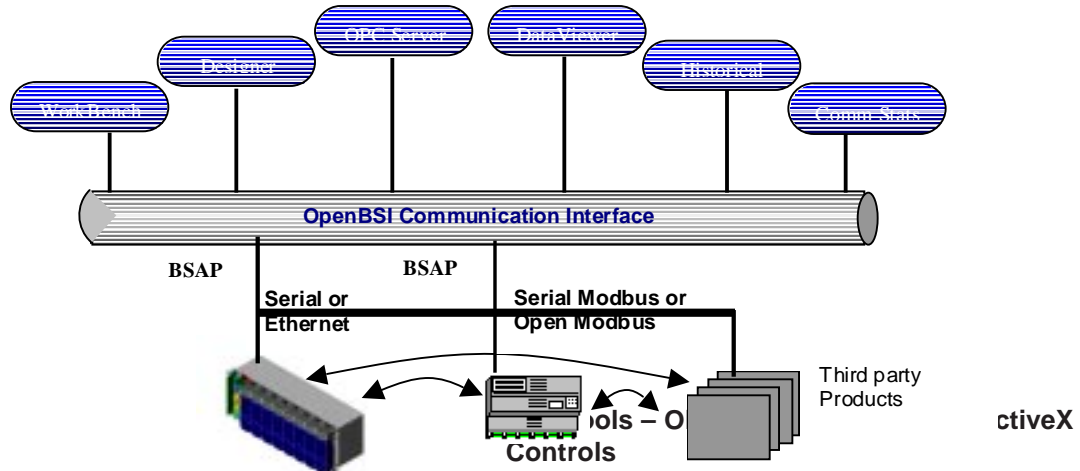
changes

- Allows signal searches based on selective criteria
- Allows network configuration through NetView
- PC and Network communication diagnostics
- OPC Server for interfacing to most HMI software
- Data Collector and Scheduler Utilities Collects historical data on request or scheduled basis

NetView is the basic configuration and application interface for all network operations. NetView uses a tree structure for network graphical display in the Windows Explorer style. Network nodes can be added on-line by simply dragging the node Icon into the tree. This invokes a configuration Wizard simplifying network setup. Through the NetView Wizard, the necessary network parameters are entered for node and IP address, alarm and message routing, and network communication media. Once configured, selecting any node allows direct access to the common OpenBSI utilities to reprogram, download a new application to the node, review communication statistics, view real-time data through DataViewer, and edit controller/RTU properties.

Local Configuration Wizard allows local communication with any attached **ControlWave** controller or RTU to download system flashware upgrades,

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configure cold download parameters, and configure IP and soft-switch parameters.

DataView is an on-line utility for **ControlWave** and Network 3000 nodes used to collect and display several types of process data, including signal values, data array values, signal lists, and audit trail information. Operators have the ability to alter signal values. Multiple DataView windows may be open simultaneously.

The Technicians Toolkits consist of a set of configuration wizards and standard web pages which are used to configure a newly installed **ControlWave** or modify those parameters on an existing controller.

The key components of the Technicians Toolkit are: **Local Connection Wizard** - this program allows a serial point-to-point protocol (PPP) communication link to be established with **ControlWave**.

Configuration Web Pages - A series of configuration web pages, compatible with Microsoft® Internet Explorer, are provided to configure security, historical storage, communication ports, serial and IP address, etc. A set of Active X controls allowing communication access to **ControlWave** are provided for engineers to develop their own custom web pages using any standard package such as Microsoft® FrontPage. Active X controls allow data to be viewed in any compliant container (such as Microsoft Excel and Word or Visual Basic), or any compliant web page Browser such as Microsoft Internet Explorer.



**Configuration Wizard
simplifies Network setup**

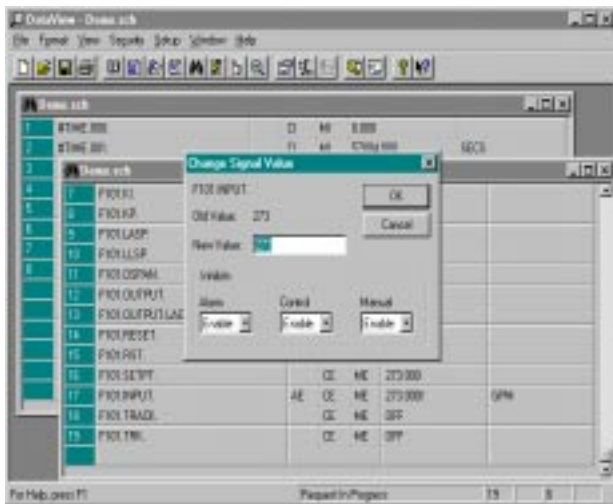
OPC Server

With industry demand for open standards, **ControlWave** answers the call by embracing technologies that open the door for maximizing your efficiency and productivity. The OPC standard was developed by the OPC Foundation comprised of hardware and software suppliers from the process control community. OPC allows the engineer to select best in class hardware and software with confidence



in their interoperability. Our OpenBSI OPC Server was among the first to comply with the OPC Foundation alarm and event server specification.

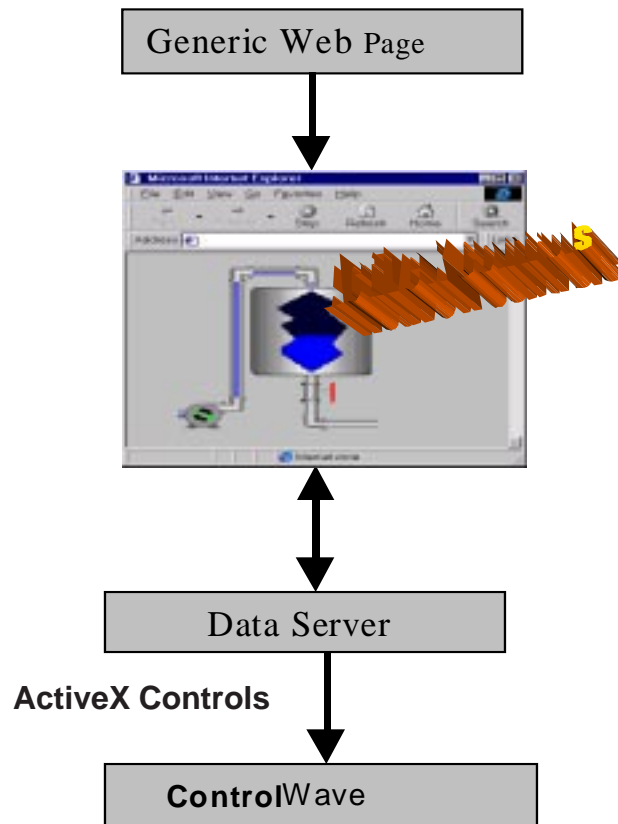
- OPC Data Access 1.0a & 2.0 compatible
- Windows 98/NT & 2000
- Compatible with both **ControlWave** and Network 3000 systems
- 32 bit multi-threading, multi-processor design
- Automatic database builder
- Integrated real-time data monitor
- Supports OPC Browse interface
- Supports both serial comm and IP Ethernet connections
- Supports COM/DCOM & OLE Automation
- Primary and Background polling scheme
- OPC Alarm & Event Server support



DataView for Real-time data display

One of the many benefits **TechTools** brings to you is our use of open standards such as ActiveX Controls. ActiveX is another of the Microsoft standards, which allow plug and play with any ActiveX container, using Microsoft ActiveX container technology such as Visual Basic, HTML web pages, and Microsoft Excel

The set of available ActiveX Controls provides the basic functions necessary to communicate and collect data from **ControlWave**.



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Control Wave™ AUTOMATION

- **Security** – 56-bit encryption - allows the user to sign on to the RTU.
- **Signal Value** – displays signal values in various formats.
- **Comm Statistics** – works with a standard page that displays the RTU's communication statistics.
- **Configuration Info** – works with a standard page that displays and allows the user to change RTU Configuration information.

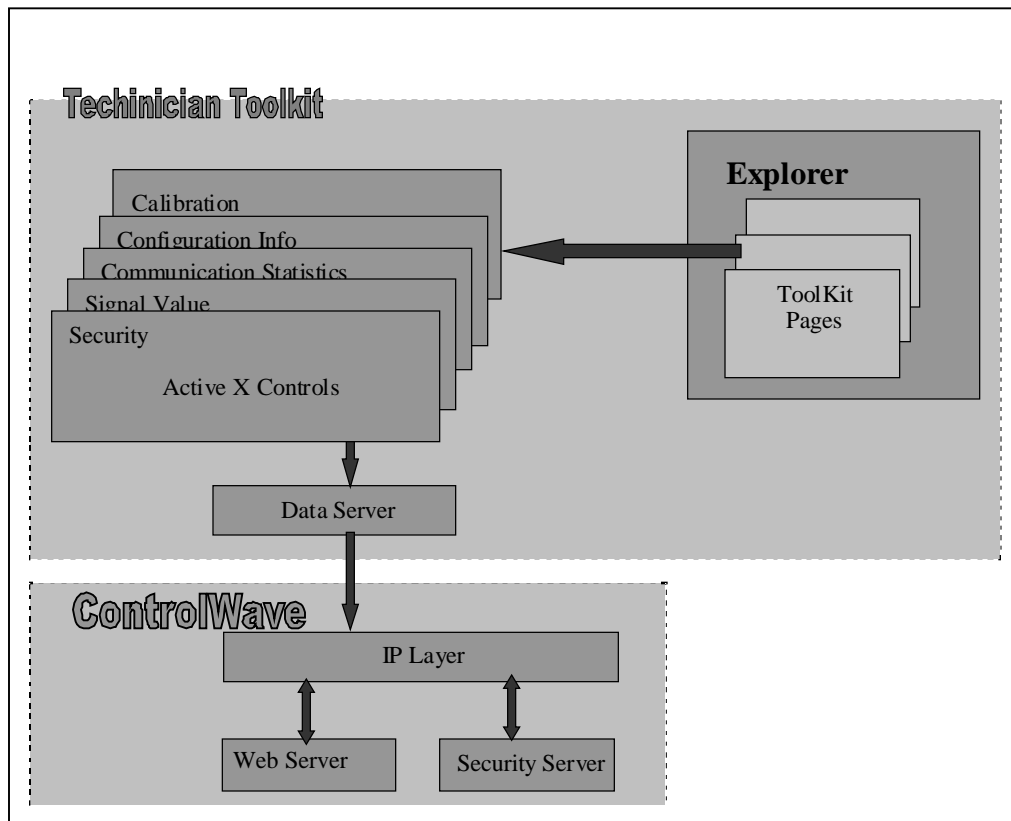
web page builder can be employed to create user defined pages to access **ControlWave**. The web pages are populated with these pre-configured Active X controls.

The Web pages can be stored at the PC or downloaded to **ControlWave**. By storing the Web pages within **ControlWave**, local MMI access can be gained with minimal Bristol software installed on a PC, making this an ideal configuration for technician use.

The IP compliant **ControlWave** opens the door for owner controlled access via Web Pages. Any generic

Software Required:

- Microsoft's Internet Explorer
- Bristol Babcock's Active X Controls
- Bristol Babcock's Data Server



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OpTools & RemoteTools

OpenBSI Utilities provide a full set of communication and data access capabilities for operators directly connected to the **ControlWave** network as well as remote operators connected through one of the main operator PCs. The Operator Tools includes utilities to easily create the OPC server database from the **ControlWave** application configuration files, then provide access to those variables to any OPC compliant HMI product for operator display and interaction with the **ControlWave** network.

ControlWave Open Network Connectivity

HistTools – Historical collection and storage

The **HistTools** include two unique utilities designed to collect historical data files stored in the **ControlWave** database. Both powerful utilities allow historical data to be collected on a scheduled basis. The **Data Collector** is an easy to use utility for small to medium systems allowing each data file to have an independent schedule. The **Scheduler** was designed for larger systems and provides greater flexibility particularly in radio networks.

- Archive Collection – collection and storage to disk of the **ControlWave** archive data
- Audit Collection - collection and storage to disk of the **ControlWave** audit data.
- Exports data files to third party, .CSV & ODBC applications
- DDE compliant for use with other popular Windows applications

OpenBSI Packages

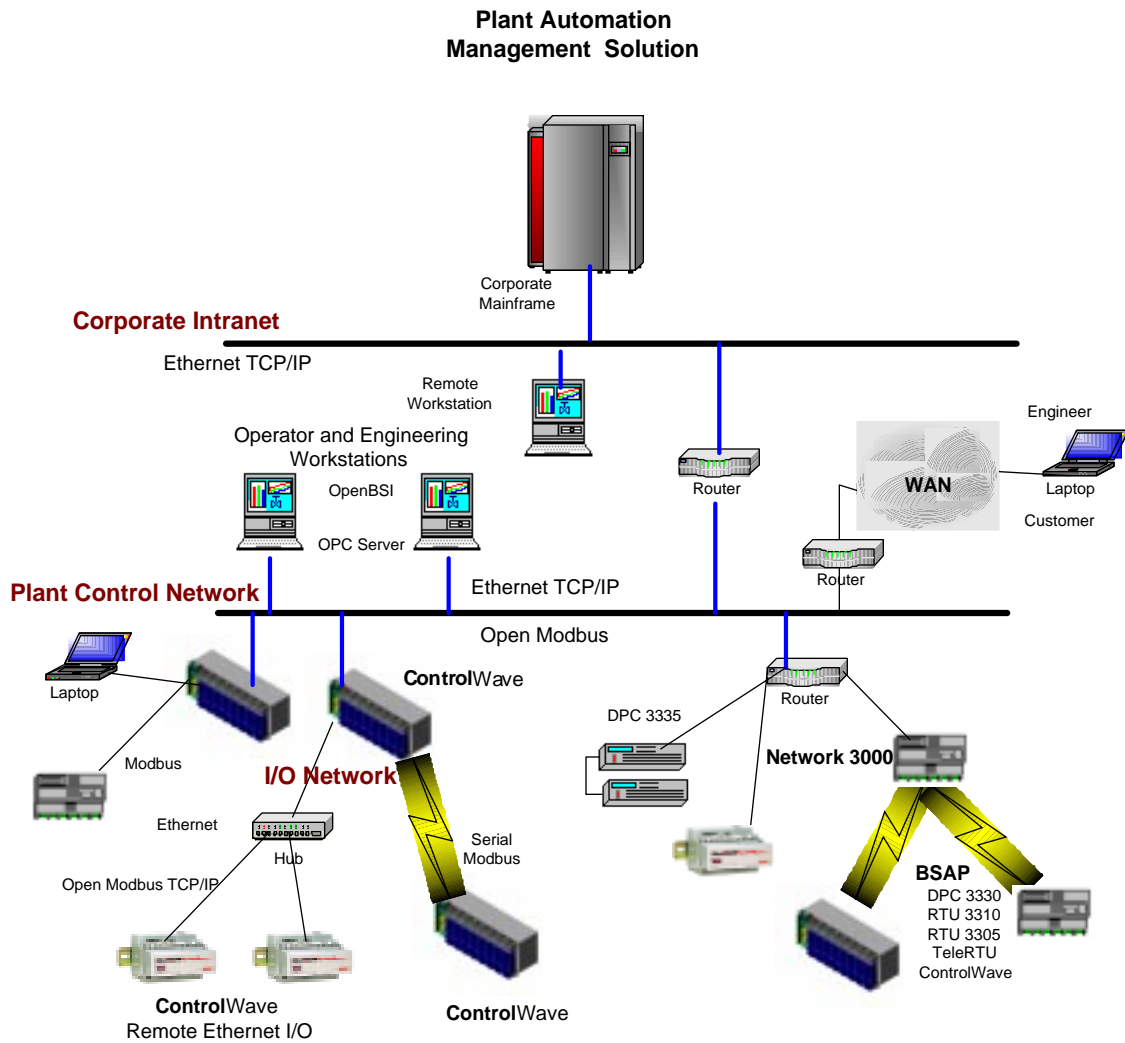
Designer	WorkBench	TechTools	OpTools	RemoteTools	HistTools
NetView	ACCOL		NetView	NetView	
Data Server	WorkBench	Data Server	Data Server	Data Server	
LocalView					
DownLoader			DownLoader		
DataView			DataView	DataView	
Comm Stats			Comm Stats	Comm Stats	
I/O Config Wizard					Collector
I/O Simulator					Scheduler
					DDE Server
		Active X controls	Active X controls	Active X controls	
		Setup Web pages			
			OPC Server (optional)		

Designer and TechTools are for **ControlWave** only.

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By embracing the open system network technologies available through TCP/IP, Ethernet, OPC, and Microsoft™ DNA, as well as pseudo standards such as Modbus and Open Modbus, **ControlWave** can provide a total Process Automation Management Solution for in-plant LAN based networks and Wide Area Network SCADA systems.



With the exceptional connectivity provided by the **ControlWave** network, access to real-time data and operating conditions, historical data, maintenance and performance data are all available to the global network. **ControlWave** provides the needed information to the plant floor technician, operator, engineer, supervisor and corporate management, even external customers.

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Key-lock Security

The front panel keyswitch on **ControlWave** provides a high level of manual security by allowing three / modes of operation to restrict access to on-line functions.

In *Run Mode*, **ControlWave** will reject any attempt to download or modify the running program, either locally or over the network.

In *Remote Mode*, **ControlWave** will allow downloading and on-line program modification through the network, provided the security access requirements have been met. Local download and on-line modification of the running program is prohibited.

In *Local Mode*, **ControlWave** will allow download and on-line modification through either the network connection or through a local serial communication port provided the security access requirements have been met.

Multi-user Security Access

Security is an essential element of any open system, particularly those with Internet access. **ControlWave** employs a User Name/Password access system protected by a 56-bit encryption technique through the TCP connection. There can be up to thirty-two users, who sign-in using their name and password. Both the name and the password can be up to sixteen characters.

The security system provides for up to sixty-four access rights to read and write data values and files via FTP, access and configure historical and audit data information, edit configuration, run internal

diagnostics, read and reset system status. It further allows the programming software to read, write and download the **ControlWave**.

The Secure Data Advantage

ControlWave sets a new standard for providing intelligent control at the point where control is needed. Whether you need control on the plant floor or at a remote site in the "middle of nowhere" **ControlWave** is the solution for control, communication and secure data to help you make the right operating decisions.

ControlWave was designed to provide the optimum level of data security using a distributed database architecture. All data including time & date stamped alarms, alarm limits, and historical data are stored locally in each industrially rugged **ControlWave**, thereby distributing your data integrity risk. To further ensure that the data is always current and historically accurate, the historical data is stored in non-volatile flash memory within **ControlWave**. Historical data is even maintained during and after program downloading.

When historical data is collected from **ControlWave**, it is converted and appended to .CSV and/or ODBC compliant databases but does not destroy the original historical data stored in **ControlWave**. Thus, a flexible and secure historical data system is clearly recognized as a benefit to virtually every industrial application.

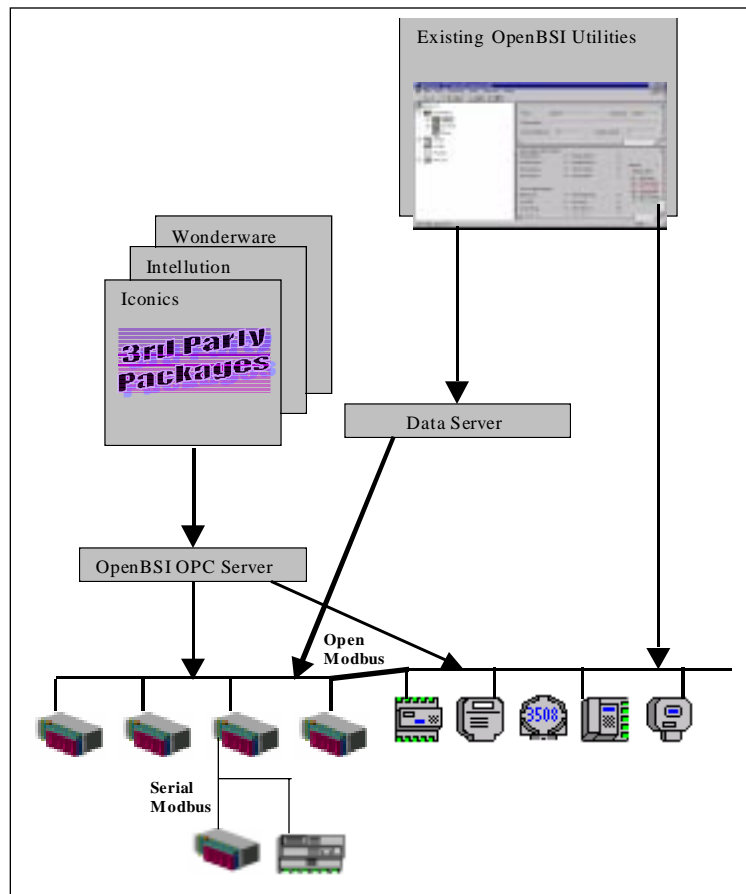
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The Bridge Between Systems

Continuing our tradition of introducing innovative new solutions while maintaining compatibility with existing systems, Bristol Babcock again provides a migration path for existing customers by bridging the new **ControlWave** system with Network 3000 systems already in place. The network bridge is enabled by employing the open architecture technologies afforded by TCP/IP and OPC in both networks. TCP/IP allows seamless Ethernet connectivity to both

networks as well as the corporate Intranet so both **ControlWave** and Network 3000 controllers can reside and communicate on the same LAN. Bristol Babcock's OpenBSI OPC Server facilitates the merging of the two networks for technical, engineering and operator data access. The data source, configuration and path are completely transparent to the OPC client. Real-time data can also be passed between the two communication networks making this a total Plant Automation Management Solution.



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