

Freelance 800F distributed control system

System description



Glossary

Process station:

This term is used when statements are valid for both, AC 800F controller (FieldController) and rack controller. A process station can be designed redundantly or non-redundantly.

AC 800F:

This is used when a statement only applies to this type of process station. A redundant process station of the FieldController type consists of two AC 800F controllers.

Rack station:

This is used when a statement only applies to this type of process station. A redundant rack station contains 2 rack CPUs.

Controller:

This is used to address an individual, non-redundant process station.

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Freelance 800F: The compact control system

As hardware constitutes less of the price of an automation system, the costs for creating user software become more important, accounting for an average of more than 50% of the total cost of an automation project. This makes it clear that the mechanism, by which cost structures can be changed to the user's advantage, must begin with engineering.

That's essentially why we've developed Freelance 800F: to enhance cost efficiency by reducing engineering costs, while keeping hardware prices consistent with those of programmable logic controllers.

How can engineering costs be reduced?

- Use of only one engineering tool (Control Builder F) to configure the entire system, consisting of automation functions and the operator interface- with displays and logs, as well as to configure fieldbus lines (PROFIBUS, FOUNDATION Fieldbus, HART, etc.) and to parameterize field devices
- Automatic generation of the entire communication between controllers and operator stations
- Lower cost and time investment for data input due to a system-wide uniform database for field devices, process stations and operator stations, leading to data consistency within the entire system
- Uniform, system-wide plausibility check of user programs via all process and operator stations up to intelligent field devices, including formal check for completeness and consistency of the user programs
- Graphical configuration with high-performance editors in programming languages according to IEC 61131-3
 - Function block diagram (FBD)
 - Ladder diagram (LD)
 - Instruction list (IL)
 - Sequential function chart (SFC)
 - Structured text (ST)
- Extensive function block library, to which user-defined function blocks can be added; macro library and graphics symbols to create graphics and faceplates for user-defined function blocks
- Integration of any PROFIBUS-DP or PA slave using the concept of the generic slave (using a GSD-file) with the possibility of configuring these components in user-defined dialogs
- Integration of PROFIBUS devices using FDT/DTM



The same user-friendly configuration and support features also apply to operation and observation. The operator is supported by a mechanism providing not only information from the plant but also operating hints. For this purpose, for example, an intuitive operator interface, logs, and sophisticated alarm and message management function is available.

The quality of Freelance 800F is also reflected in the robust hardware, which is immune to electromagnetic interference and bears the CE Mark as a quality symbol for all its components.

In cases where demands on availability are particularly high, it is possible to configure the process station including the modules redundantly. Fieldbus lines, the system bus, and the operator stations can also be configured redundantly.

The Freelance 800F control system provides powerful automation that is cost-effective and easy to use. Freelance 800F is ideally suited to applications requiring simple handling and attractively-priced hardware and software in power, process or environmental industry.

It is a sound investment in the future, with a simple and clearly designed system based on the motto:

Minimum engineering – maximum automation

System architecture

Freelance 800F is divided into an operator level and a process level. The operator level contains the functions for operation and observation, archives and logs, trends and alarms. Open-loop and closed-loop control functions are processed in the controllers.

The Freelance 800F DigiVis operator level

The DigiVis operator stations use PC hardware, either standard or industrialized in line with the application, running under the Microsoft Windows operating system. DigiVis supports dual-monitor operation, meaning that two monitors can be used on a single PC, operated using one mouse and one keyboard.

One engineering station and several operator stations can be installed at the operator level. The Control Builder F engineering station is used to configure and commission the system. Usually, portable equipment such as laptops, which allow configuration both in the office and on site, is used. The operator level PCs can also be used as engineering station. A permanent connection to the engineering system is not necessary.

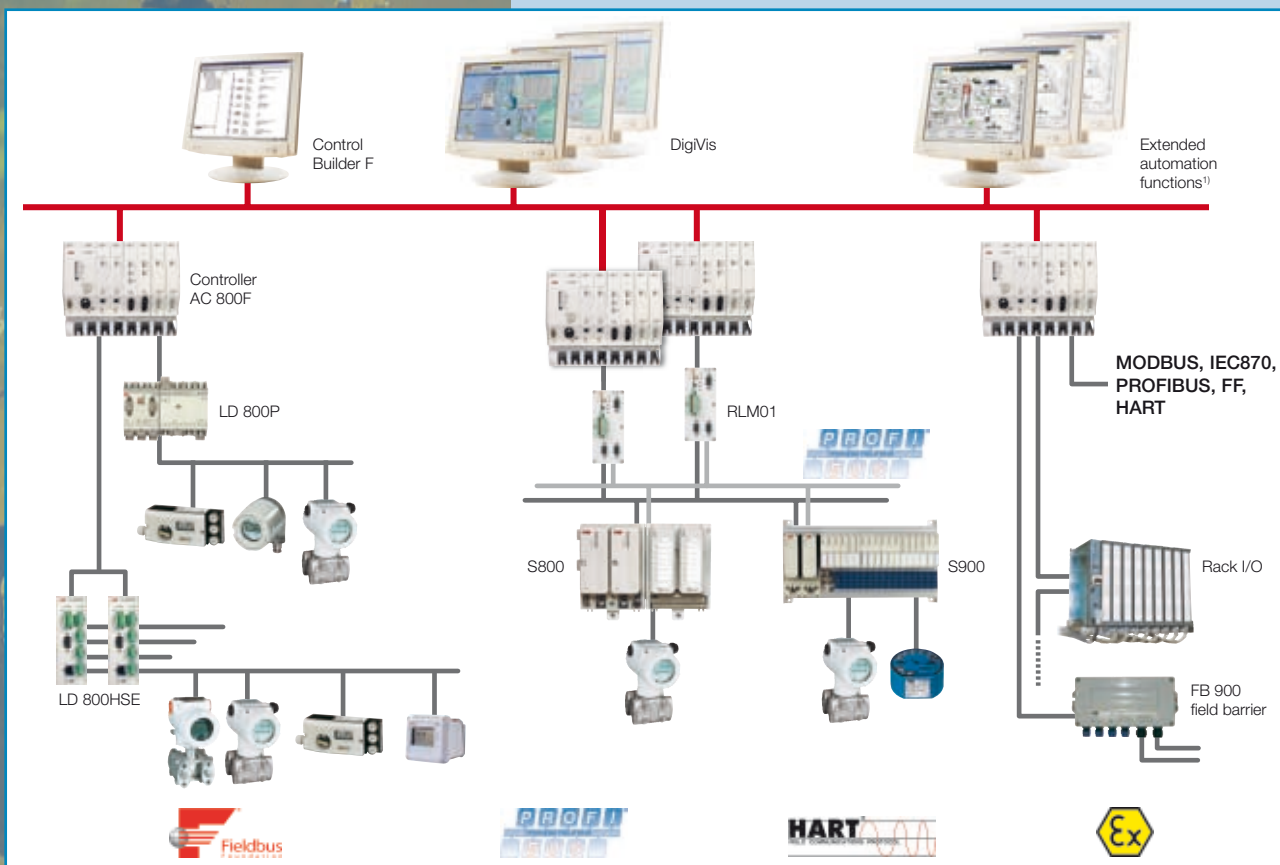


The Freelance 800F process level

At the process level, a Freelance 800F system can consist of several process stations that are connected with I/O units. You have the option of running these process stations either redundantly (CPU redundancy, fieldbus module redundancy) or without redundancy. Modular plug-in input/output modules are used in accordance with the type and quantity of process signals. With AC 800F, fieldbus-compliant components such as remote I/O or field devices can be connected.

System communication

The operator and process levels communicate with each other via the system bus (based on Ethernet) with TCP/IP, where you can choose between various transmission media such as AUI, twisted pair, fiber optic or coaxial cable. A Freelance OPC server is available for connecting to higher-level operator stations (800xA) or other OPC clients. The real-time process values and alarms from the Freelance system can be accessed via OPC. A „C“ programming interface for Windows programs can be used for external applications that do not use the standard OPC interface. The DMS-API is used for this.



¹⁾ E.g. 800xA Operations, 800xA Batch Management and 800xA Information Management



Process-level automation: The controller

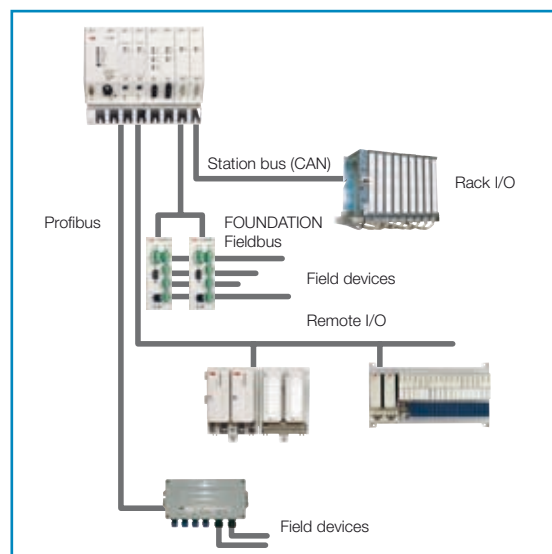
The AC 800F hardware

The AC 800F has a modular structure. The CPU is designed as a backplane to which various modules – power supply units, Ethernet or fieldbus modules – can be attached in line with the application. On the fieldbus side, modules for PROFIBUS-DPV¹, FOUNDATION Fieldbus HSE, MODBUS (master/slave, RTU or ASCII), IEC 60870-5-101 and CAN for Freelance Rack I/O are available. The fieldbus line and the connected PROFIBUS slaves are entirely configured and parameterized using the Control Builder F engineering tool. No further external tools are needed for configuration.

PROFIBUS slaves can be integrated into the system using a GSD¹⁾ file or FDT/DTM²⁾.

In the case of FOUNDATION Fieldbus, configuration takes place using CFF³⁾ or DD⁴⁾ files. This allows fieldbus parameterization even without connected field devices.

Also Freelance Rack I/O can be connected to the AC 800F, in which case a CAN module is used. This allows you to operate five I/O racks, with a total of around 1000 I/Os, for each AC 800F. The I/O racks are equipped with a link module and up to nine I/O modules and can be mounted separately at a distance of up to 400 m from the AC 800F.



¹⁾ GSD = GSD = Device Master Data, abbreviation for the german term Gerätestammdaten. A GSD is the device database file (also called 'device datasheet')
²⁾ FDT/DTM = Field Device Tool / Device Type Manager
³⁾ CFF= Capabilities File
⁴⁾ DD = Device Description

CPU	32-bit super scalar RISC processor with rapid bit processing
RAM	4 MB S-RAM or 16 MB (SD-RAM) for application with battery backup
Task execution	Cyclic (configurable cycle times from 5 ms) Event-driven (predefined events) As fast as possible (PLC mode)
Interfaces	Ethernet PROFIBUS FOUNDATION Fieldbus Station bus (CAN bus) Serial: RS485/422/232 Modbus protocol (master or slave, RTU or ASCII) Telecontrol protocol in accordance with IEC 60870-5-101
Ambient temperature	0...60°C (32...140°F), no forced cooling required

The basic unit with CPU

The core element of the AC 800F is a high-performance processor with rapid bit processing properties making it ideal for use in automation technology.

Mechanical design of AC 800F

The AC 800F process station has a mechanical design similar to that used in programmable logic controls. Its front panel connection technique makes it exceptionally easy to assemble and to service, also allowing it to be mounted on the wall without difficulty.

All AC 800F modules are inserted into racks from the front and secured in position with screws. The modules are activated using a lock switch, which conceals the upper screw opening. The lock switch must be opened to reach the upper screw opening.

This signals the wish to remove the module to the CPU module, and the fieldbus is automatically shut down. As a result, the remote I/O and field device outputs have the opportunity to assume configured safety values, avoiding undefined states when the module is removed.

All modules are surrounded by metal casing when installed, which gives them optimum mechanical and electrical protection.

All casing materials used are simply screwed together, allowing them to be separated for future recycling. Last but not least, Freelance 800F has taken environmental protection into account by using a minimal amount of paint.

Functions

The scope of functions provided by the Freelance system corresponds to the basic supply defined in IEC 61131-3, in addition to numerous other high-performance, industry-proven functions and function blocks. They are accommodated in a function block library and can be supplemented by user-specific function blocks. While designing the station and during configuration, the processing capacity and speed of the process station can be easily adapted to the demands of the automation task. Program execution in the process station is based on a task-oriented, real-time multitasking operating system, leading to a flexible strategy for processing programs.

Different modes are available for task execution:

- Cyclical processing with cycle times from 5 ms upwards
- Fastest-possible processing (PLC mode)

Along with the user tasks, system tasks – in which functions can also be processed – are automatically made available. These tasks are executed once in case of the following events:

- RUN
- STOP
- COLD START
- WARM START (voltage restored)
- REDUNDANCY TOGGLE
- ERROR

Up to eight cyclic user tasks and one PLC mode task can be configured in a process station.

Fieldbus modules

The AC 800F uses the fieldbus modules to collect and process real-time and diagnostic data. Up to four fieldbus modules can be mounted into one AC 800F.

Functions and function blocks

Analog value processing	<ul style="list-style-type: none"> - Input and output conversion - Linearization - Delay and dead-time filter - Average/extreme value determination in time - Setpoint adjustment - Counter with analog input - Time scheduler 	Monitoring	<ul style="list-style-type: none"> - Analog and binary monitoring - Event monitoring - Audible alarm control - Connection monitoring - Sequence-of-Events (SOE)
Binary value processing	<ul style="list-style-type: none"> - Binary output, monostable - Input and output delay - Pulse/time counter, pushbutton 	Acquisition Arithmetic functions	<ul style="list-style-type: none"> - Disturbance course acquisition, trend acquisition - Basic arithmetic functions, numerical functions - Logarithmic functions - Trigonometric functions - Analog value and time limitation
Closed-loop control	<ul style="list-style-type: none"> - Continuous controllers - Step controllers - On/off controller, three-position controller - Ratio controller - Basic functions - Auto-tuning 	Modbus functions PROFIBUS	<ul style="list-style-type: none"> - Master and slave functions - DPV1 master functions for AC 800F
Open-loop control	<ul style="list-style-type: none"> - Individual drive functions - Sequence control, dosing circuits 	FOUNDATION Fieldbus (FF) Send/Receive	<ul style="list-style-type: none"> - FF High Speed Ethernet (HSE/H1) for AC 800F - Send and receive blocks for inter-system communication
Logic functions	<ul style="list-style-type: none"> - Logic processing - Average/extreme value determination - Comparator, binary switch - Multiplexer - Converter (data type & code) - Flip-flop, edge detection - String blocks - radio controlled adjustment of daylight-saving time 	Phase logic processing	<ul style="list-style-type: none"> - Interface module for batch applications

The fieldbus modules have the following tasks and characteristics:

- Electrical isolation between the process and system
- Status LEDs for the module status
- Independent fault detection and fault signaling
- Connection of the fieldbus lines

Ethernet modules

Process stations and the operator and engineering level in the Freelance 800F system communicate with each other via Ethernet.

Intelligent linking devices

As the AC 800F possesses the high-speed connection of both PROFIBUS (PROFIBUS DP) and FOUNDATION Fieldbus (FF-HSE), the slower buses of the two fieldbus technologies (PROFIBUS PA and FF-H1) can be connected using intelligent linking devices. These devices allow to connect several slow buses to one fast bus, with the advantage that a lot more field devices can be connected to an AC 800F station than when the slow fieldbuses are connected directly.

LD 800P PROFIBUS DP/PA Linking Device

LD 800P is needed to connect PROFIBUS DP to PROFIBUS PA. The LD 800P Linking Device converts the physical bus characteristics of the RS 485 interface for the PROFIBUS DP into PROFIBUS PA physical bus characteristics according to IEC 61158-2,

enables connected PROFIBUS PA devices to be supplied with power via the bus, and additionally allows use in intrinsically safe areas.

For further details, see ABB's Fieldbus Devices brochure (art. no. 3BDD 013172).

FOUNDATION Fieldbus Linking Device LD 800HSE

LD 800HSE serves as a gateway between High Speed Ethernet (HSE Subnet) and the FOUNDATION Fieldbus field devices on H1 links. The provision of data from a H1 link to the HSE Subnet, as well as from one H1 link to another, is guaranteed by the communication – typical of FOUNDATION Fieldbus – between field devices on various H1 links and field devices on the HSE Subnet. In addition, the client/server gateway allows function blocks in H1 devices to be accessed via the HSE interface. LD 800HSE is also designed for redundancy.

For further details, see ABB's Fieldbus Devices brochure (art. no. 3BDD 013172).

Other fieldbus devices

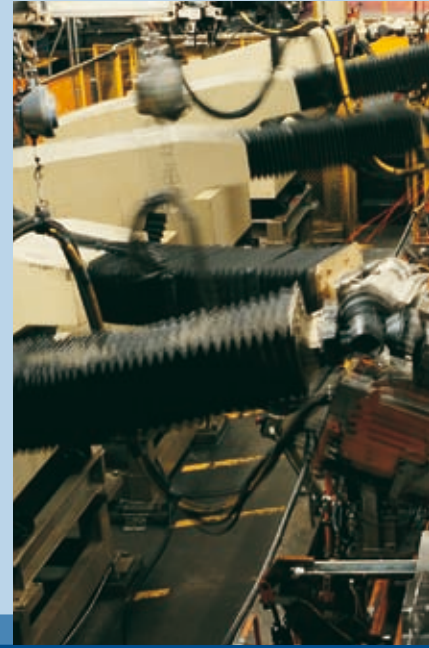
To protect the fieldbus segment and the links, the Fieldbus Barrier FB 900 series can be used. The PC 900 Power Conditioner provides a higher supply current for a H1 link. These devices are described in detail in ABB's Fieldbus Devices brochure (art. no. 3BDD 013172).

Details of the fieldbus modules

Type	Channels	Function
CAN module	1	Connection of up to 5 Freelance I/O racks
Serial module	2	RS232/RS422/RS485 configurable for MODBUS, IEC 60870-5-101 telecontrol protocol
PROFIBUS module	1	Full-value PROFIBUS DPV1 Master
FF-HSE module	1	For the connection of up to 10 LD 800HSE Linking Devices with 10/100 Mbaud autosense twisted pair connection

Ethernet modules for the system bus

Type	Channels	Function
Ethernet module	1	Twisted pair connection 10 base T for connection to hubs or switches
Ethernet module	1	BNC connection 10 base 2 for thin coaxial cable (Cheapernet), 10 MBit/s
Ethernet module	1	AUI connection 10 base 5 and 10 base FL via coupler



Process-level automation: Remote I/O

The fieldbus module for PROFIBUS enables connection of remote I/O units such as the S800 or S900. Whereas the S800 is generally used in process automation, the S900 is preferred, due to its extended channel diagnostics and intrinsic safety, in the chemicals segment and in areas where explosion protection is required.

S800

S800 I/O is a comprehensive, distributed and modular process I/O system that communicates with parent controllers via PROFIBUS. Thanks to its broad connectivity, the system is able to communicate with a wide range of process control systems from both ABB and other suppliers.

By permitting installation in the field, close to sensors and actuators, S800 I/O greatly reduces the installation cost by reducing the cost of cabling. It is possible to exchange modules and reconfigure the system during operation. Redundancy options allow a high degree of availability.

For further details, see S800 Brochure 3BSE009891.

S900

The remote S900 I/O system can be installed directly in zone 1 and zone 2 hazardous areas.

It communicates with the control system level using the Profibus standard, therefore reducing marshalling and wiring costs. The system is sturdy, error-tolerant and easy to service. Moreover, the S900 I/O system is characterized by a compact design, cyclical transmission of secondary HART variables, parameterization and diagnosis of all HART field devices via the fieldbus. Its redundancy ensures maximum availability.

Integrated disconnection mechanisms allow replacement during operation, meaning that there is no need to interrupt the primary voltage in order to exchange the power supply units. Thanks to its sturdy, space-saving design and stable casing that is suitable for any environment, S900 is the best and most cost-effective I/O system for use in zone 1 and 2 hazardous areas.

For further details, see S900 Brochure 3BDD013133.



Process-level automation: Field devices

Freelance 800F enables you to connect and configure PROFIBUS PA devices without directly using a PROFIBUS PA module for the AC 800F. The LD 800P Linking Device allows you to operate PA devices on the PROFIBUS DPV1 module without reducing the DP bus speed to the lower PA baud rate.

Similarly, the LD 800HSE Linking Device allows you to connect and configure FOUNDATION Fieldbus H1 devices without the need for an AC 800F fieldbus module for FOUNDATION Fieldbus H1. The configuration of control in the field with FOUNDATION Fieldbus is supported by Freelance.

HART devices can be connected using HART-compliant modules of the S800/S900.

If the HART devices are connected to the S900, certain S900 modules can be used to transfer additional HART values to the cyclical I/O mapping. This makes it possible to use the second or third measured values of a HART device in the AC 800F as an input for applications.

Process-level automation: Freelance Rack I/O

Rack I/O is installed in conjunction with DCP10 or DCP02 rack CPUs. Rack CPUs do not have access to fieldbus I/O or field devices. In connection with the AC 800F, Rack I/O is used when a rack CPU has been replaced by the AC 800F, or if SOE functionality is needed. In addition, I/O cycles are faster with Rack I/O than with fieldbus. For example, up to 288 binary signals can be updated within 2 ms using just one rack.

Intelligent I/O modules

The I/O modules link the controller and the process, for signal conversion. They receive data from sensors, detectors, transmitters and other field devices and issue positioning commands to the process.

They have the following tasks and characteristics:

- Input and conversion of conventional signals and signal levels
- Galvanic isolation between the process and system
- Status LEDs for inputs/outputs
- Externally-powered outputs
- Automatic fault detection, fault signaling and temperature monitoring
- Sensor and line-break monitoring
- Short-circuit and overload-protected digital outputs
- Digital inputs protected against incorrect polarity
- Potentially isolated analog inputs
- Hot-swap capability
- No switches, jumpers or potentiometers, as all settings are configured using the software
- Front panel connection of process signals via screw terminals with keyed blocks, codeable against incorrect connection

All Freelance Rack I/O modules are intelligent, i.e. they have their own processors. Users can configure the scan times of the I/O modules individually for each module. The fastest scan time is 2 ms for binary modules and 10/500 ms for analog modules. In case of communication errors, the output modules switch the outputs to configurable safety values. Where controller redundancy is configured, the second controller takes over without interruption.

Mechanical design of Rack I/O

The Freelance 800F Rack modules have a mechanical design similar to that used in programmable logic controllers. Its front panel connection method makes it exceptionally easy to assemble and to service, also allowing it to be mounted on the wall.

Freelance 800F Rack modules are inserted into racks from the front and secured in position with screws. Each is contained within a metal enclosure providing exceptional mechanical ruggedness and electromagnetic immunity.



All casing materials used are simply screwed together, allowing them to be separated for future recycling. Last but not least, the Freelance hardware components have taken environmental protection into account by using a minimal amount of paint. The modules have no jumpers or switches whatsoever on the printed circuit boards, meaning that the user does not need to open the cartridges. No potentiometers have been used either.

The Freelance Rack I/O is designed to operate in ambient conditions of 0 to 50° C (32 to 122°F) without forced cooling. A temperature sensor within the cartridge monitors the temperature of the module and triggers an alarm when the maximum value permitted is exceeded.

Quality and electromagnetic compatibility

By using a well-shielded metal case for each module and also installing EMC filters in each incoming and outgoing lead, measures have been adopted to comply with EMC standards without the need of installation in cubicles. As a result, the Freelance 800F hardware meets the binding EMC standards and bears the CE Mark. The requirements of IEC 801 and the NAMUR industrial standard have also been fulfilled. A sophisticated test strategy, the installation of optical inspection systems, and integrated self-test functions ensure that the modules are highly reliable.

Type	Channels	Signal range
Digital inputs	32	For active sensors or contacts with external power supply, 24 V DC, Rin 3 kW
	28	2-wire NAMUR initiators or contact inputs (make/break contacts)
	12	3-wire or 4-wire initiators or contact inputs (change-over contacts)
Digital outputs	32	24 V DC, 0.5 A Resistant to short-circuits
	16	Relay output 24V...230VAC/DC, 5 A
Analog inputs	16	0/4...20 mA, Rin 50 W Resolution: 12 bits
	16	0/4...20 mA, Rin 250 W Input for HART-transmitter
	16	0/4...20 mA, Rin 250 W ext. 24 V DC, transmitter supply Resolution: 12 bits
	8	Temperature input Pt100/mV calibrator/thermocouples Resolution: 16 bits
Frequency input	4	For each counter input, 2 enable inputs, 2 outputs, $f \leq 45$ kHz, 24 bit counter, electrically isolated per channel
Analog output	16	0/4...20 mA Resolution: 12 bits

System communication

System bus

The system bus interconnects the process stations, operator stations and engineering station in the Freelance 800F system.

The system bus complies with the Ethernet Standard according to DIN/ISO 8802, Part 3 (IEEE 802.3) and can be used with twisted pair, fiber optic or coaxial cable. It is also possible to use a combination of these standards or to implement 100-MBit/s components within a network as high-speed backbone.

Freelance uses confirmed and unconfirmed services. The unconfirmed UDP service is used for screen updating and lateral communication between controllers. The confirmed TCP/IP service is used for alarming and trend archiving.

The system bus has the following features:

- The ability to cover long distances
- A high data throughput
- Choice of various transmission media (such as twisted pair, coaxial cable or fiber optics)
- A flexible network layout

- Easy connection to a higher plant management level through the OPC standard
- Pre-programmed routines in the event of faults
- Good EMC properties
- Ability to switch bus members on and off during operation
- Highest availability through redundancy

Station bus (CAN bus)

When Freelance I/O racks are used, communication takes place via the station bus. The station bus complies with the CAN (Controller Area Network) industrial standard.

The station bus has the following features:

- The ability to cover short to medium distances
- High data throughput, update times for signals from 2 ms (binary) or 10 ms (analog)
- Exceptional degree of transmission safety and interference immunity (Hamming distance = 6)
- Pre-programmed routines in the event of faults
- Good EMC properties
- Ability to switch bus members on and off during operation
- Automatic initialization of newly mounted modules

OPC

Freelance 800F provides an OPC gateway (server), which allows OPC clients to access data and alarms from the Freelance process stations. From Version 7.1 upwards, the OPC server also allows access to the DPV1 parameters and user parameters of PROFIBUS and HART devices. In the case of HART devices, this is only possible if they are connected to a S900 unit. For V8.2 and higher, the parameters of FOUNDATION Fieldbus devices can also be accessed. It is possible to limit access to this data at the OPC gateway such that an OPC client cannot see certain process points and variables at all, can only read other process points and variables, or has both read and write access to certain process points and variables.

The DigiVis operator station has a built-in OPC client, which permits you to access data from external OPC servers. Using this, for example, data from a SIEMENS control unit can be integrated into a custom graphic in DigiVis.

As several OPC gateways can be used in the Freelance system, server redundancy can be established using OPC clients that support this function. * The Control Builder F engineering software supports this with the redundant OPC gateway configuration.

The trend server option provides a special OPC gateway that is used by the DigiVis operator stations for user-defined trend displays. Access to the trend server is fixed to "read only", and all trend variables are automatically available. There is one trend server per Freelance system.

DMS-API

The DMS Application Programming Interface provides C programmers with a Windows interface through which they can access internal Freelance communications services. This enables them to their own Windows applications that can read online data from the Freelance system and modify values.

Details of process station

Bus type	Fiber optic (FL)	Twisted Pair (TP)	Thin-Ethernet (Cheapernet)	System bus Full-Ethernet (Yellow Cable)	Station bus (CAN-Bus)
Max. length	4500 m	5 x 100 m 5 x 400 m for shielded TP	5 x 185 m	5 x 500 m for Coax, 50 m for AUI	80 m, 400 m
Application	System bus connection of Freelance 800F operator stations (for operation and observation), engineering station and process stations				Station bus and as connection to I/O units
Standard	DIN/ISO 8802 Part 3 (IEEE 802.3) 10BASE-FL	DIN/ISO 8802 Part 3 (IEEE 802.3) 10BASE-T	DIN/ISO 8802 Part 3 (IEEE 802.3) 10BASE2	DIN/ISO 8802 Part 3 (IEEE 802.3) 10BASE5	ISO/DIN 11898
Transmission rate	10 MBit/s	10 MBit/s	10 MBit/s	10 MBit/s	500 KBit/s for 80 m 100 KBit/s for 400 m

*800xA Operations and Process Portal B support server redundancy



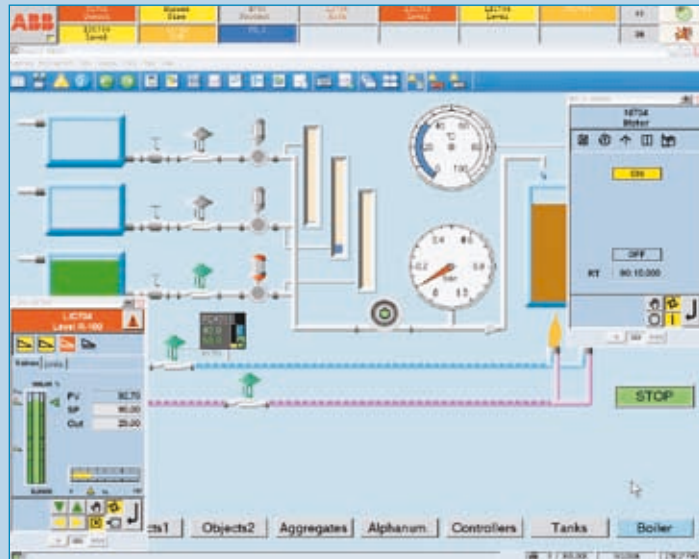
The operator level with DigiVis

The operator stations

The operator stations of the Freelance 800F system run on common personal computers, or, in special cases industrial PCs.

The DigiVis software package, based on Microsoft Windows as a graphical user interface, enhances the ease of use and the performance of process operation. In addition, you can also use any PC peripherals such as monitors, printers, mice and keyboards that are available on the market for Windows-compliant PCs. The operation and observation (DigiVis) and configuration (Control Builder F) functions can also be performed together on one PC. DigiVis operation and observation software has the following features:

- Transparent and rapid operation due to a clearly structured information hierarchy
- User-specific function key assignment for fast display selection
- A large number of pre-engineered display types
- A control aspect, providing access to dynamic interlocking displays for the selected tag (in connection with OPC or trend server)
- An external aspect, providing access to additional information such as PDF documentation, live videos from the plant, standard operational procedures (SOPs), etc.
- Rapid selection of the correct measuring points in case of process alarms
- Uniform message concept and clearly arranged display of messages and operator hints
- Configurable voice output on the PC for messages
- Up to 16 user groups/access profiles, with a maximum of 1000 users, specific password for each user (with optional Security Lock software)
- Trend display with archiving
- Logging of all operator actions, including name and timestamp
- System diagnostics, even down to the field device, allowing full field device error diagnostics
- Various language versions: German, English, Spanish, Swedish, Russian, Polish, French, Chinese and Japanese
- Dual-monitor operation on a single PC, with one mouse and one keyboard



Graphic display with faceplates

Process visualization is supported by:

- Plant-specific custom graphic displays
- Faceplates for process points (tags)
- Up to 15 plant areas with plain text labeling

Plant-specific displays

Plant-specific displays geared to the specific demands of the plant operator can be configured to depict process activities.

Static sections of the graphic displays can be created using the graphics editor. In addition, you also have the option of inserting such static sections in the form of bitmaps. Current process data or process states can be animated dynamically in a suitable

position using features such as bar graphs, dynamic filling and trend windows.

Depending on process states, graphic symbols can be replaced, flash, and change color and position in the graphic display. Process points can be viewed either via faceplates in the graphic displays or via the standard group displays.

Display selector fields or buttons can be used to set up a specific selection hierarchy within custom graphics for operation. The number of custom graphics available in DigiVis is limited only by the hard disk capacity.

Pre-engineered displays

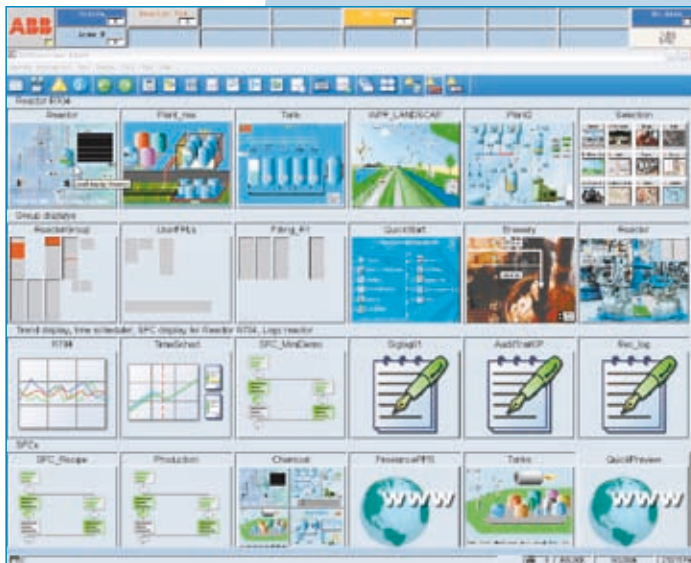
Pre-engineered displays are adapted to the needs of process control engineering with regard to structure and information content. The following displays are available:

- Overview display
- Group display
- Faceplate
- SFC display
- Time scheduler display
- Trend display
- Web display
- Message list and operator hint list
- Logs
- System display

Therefore, most functions already have fully prepared displays for operation and observation, and can be used without any further programming.

Overview display

The process information for the entire plant is presented in a condensed manner in a single overview display. It offers facilities for selecting the group, graphic, SFC, Web, time scheduler and trend displays. Logs can also be called up directly from the overview display. Up to 96 displays (16 lines, each with 6 displays per line) can be shown in the overview display. The group display symbols within the overview display also feature dynamic updating of process points, allowing disturbance states to be detected rapidly through appropriate symbols and colors. If required, you can also set a graphic display of your choice as overview display. It then replaces the standardized overview display.

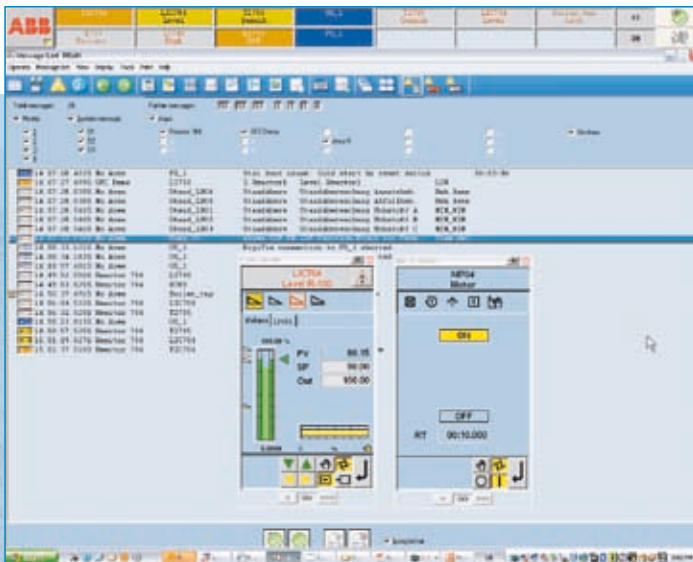


Overview display

Faceplates

Faceplates allow both overview and detailed information to be obtained simultaneously. Since faceplates are predefined, they are available immediately in the system following the definition of a process point, without any additional programming.

This is also the case for user-defined faceplates. Therefore, faceplates can be displayed on a monitor together with standardized and freely constructed displays. A selected process point can always be displayed via its faceplate.



Faceplates

Group display

The group display is a combination of several faceplates and contains detailed information about associated process points. All functions, including controllers, time and monitoring functions as well as open-loop control functions, can be displayed and operated.

To provide a quick source of information, analog values are displayed as colored bars. To allow more precise reading, they are shown as alphanumeric values. Pending disturbance states in the respective variables can be detected immediately through a change in color and flashing, and can be acknowledged directly in the faceplate or message list. Configured limits can be additionally displayed as symbols. You can create your own faceplates for user-defined function blocks.



Group display

SFC display

The sequential function chart (SFC) based on the IEC 61131-3 standard is viewed in a standardized SFC display showing the current program state of the sequential function chart.

In the SFC display, the current steps and program path already processed are displayed in different colors. Disturbance states, such as non-fulfilled process criteria or time outs can be easily detected by a color change within a criteria window for steps and transitions. Furthermore, a display selection can be configured for each step and transition. The variables shown in the criteria window can be operated.

An SFC overview display allows direct access to a step or transition, and the desired information can be selected immediately. This is particularly beneficial in the case of complex open-loop control structures, when rapid intervention by the operator is essential.

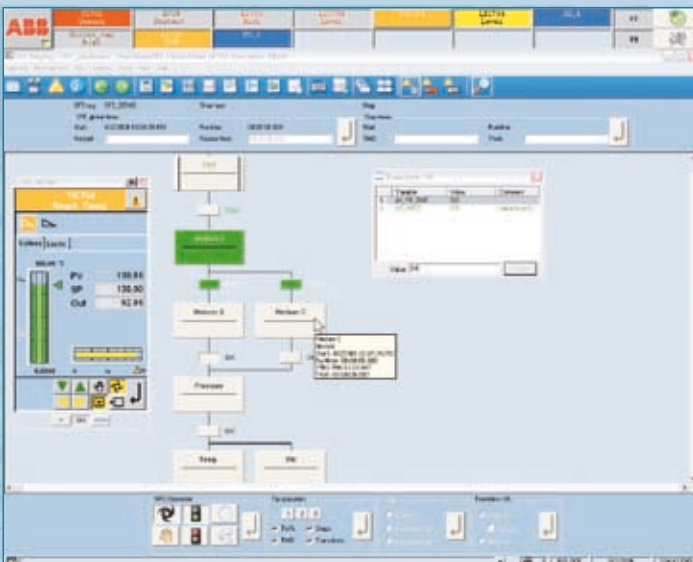
The Control Aspect allows the animated display of the transition program, similar to the commissioning display in Control Builder F.

The display is generated automatically and is an alternative to the transition window, which allows you to configure a standardized, reduced display of a transition program.

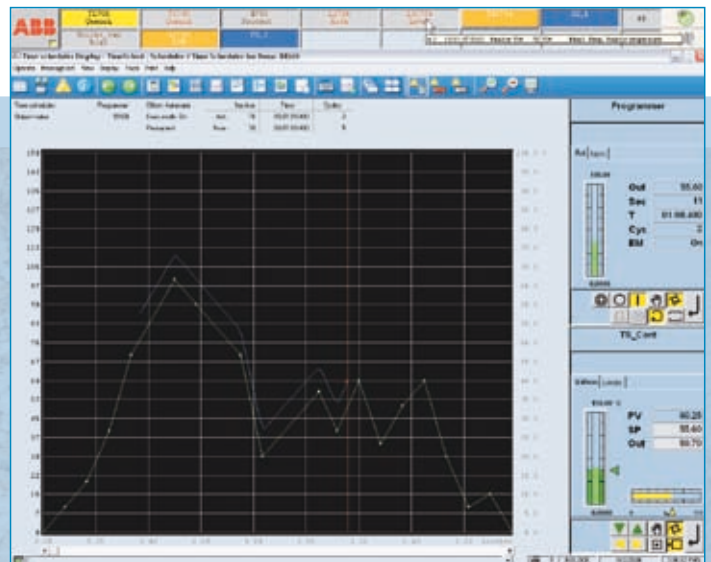
Time scheduler display

The time scheduler module makes it possible to define analog variables during a pre-defined time by default, e.g. as a set point value for a connected controller. The current set point is determined from a series of up to 32 configured values describing a set point curve. The time scheduler display is easy to operate. Apart from enabling the switching of operation modes, it also permits the modification of the current set point. Manual alterations to the set point are displayed in a separate curve.

A manual set point can be defined by offsetting the configured set point. A return (time-delayed) to the original value is possible at any time. A program can be executed cyclically or by stating a certain number of runs.



SFC display



Time scheduler display

Web display

The Web display provides a simple means of displaying Web pages on the operator station, without covering the message line. For example, this allows you to observe the picture of a camera using a built-in Web server, making it easy to monitor flames or observe chimneys. However, in addition to showing Web pages, it is also possible to start programs and display documents using this display.

Trend display and archiving

The chronological sequence of analog and binary process variables can be displayed as a trend display and archived.

The following can be shown in one trend display:

- Up to six signals in different colors
- The associated measuring point name with short text
- The current measured value with scale and unit used

The trend display can be altered by:

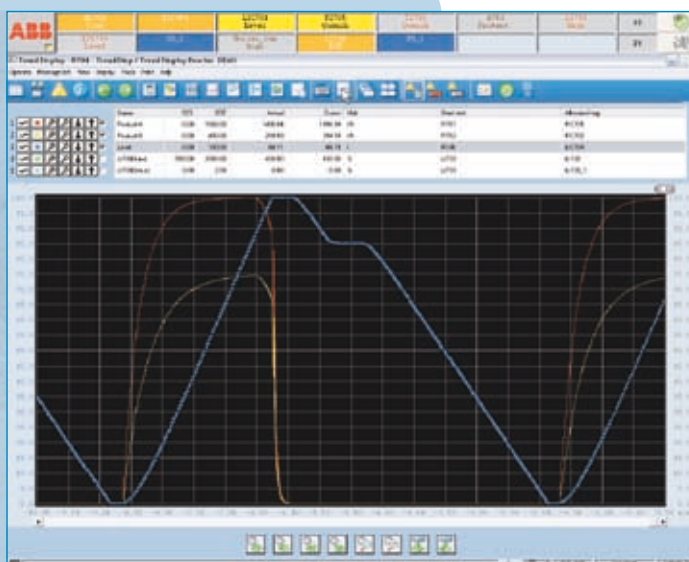
- Moving the time axis to show previous values
- Hiding trends
- Increasing and decreasing the signal range
- Selecting specific settings for each trend progression (e.g. color or interpolation)
- Using a variable time range (seconds through to weeks)

If a trend display is configured with archiving, the measured values are recorded as a cyclical function of the operator station. The archived values can be backed up on any data medium or sent via file transfer protocol (FTP) to any subscriber on the Ethernet. They are then available for further evaluations and can be exported in CSV³ format using the separate DigiBrowse software. The original data is binary-coded and therefore protected against manipulation.

User-defined trend displays

Operators can compile any process values in a trend display themselves by selecting the required process values from a list of all variable names. The task of archiving this trend data on the hard disk of the operator station PC can also be carried out easily in the same way.

A prerequisite for user-defined trends is that the system contains a trend server.



Trend display

³CSV=comma separated value, a format in which data can easily be imported into Excel and evaluated

Messages and operator hints

Process disturbances are detected by the controllers and forwarded to the operator stations with a time-stamp.

The Freelance 800F system allows the following message types: system error (S1-S3), process error (P1-P4) fault message and operator hint message (P5). Process errors are divided into fault messages (P1-P3) and switching messages (P4). When parameterizing the function blocks, it is possible, depending on the type, to assign up to 4 messages to the limit monitoring units integrated into the block. Whereas the internal controller time is generally used for the timestamp for messages, you also have the option of using a special function block to assign external timestamps to alarms. In this way, for example, you can generate an alarm from a device connected to the Modbus in the correct chronological order with the device's timestamp. Different methods of acknowledgement can be selected for each priority level. Incoming messages are displayed in different colors, along with the name and disturbed status of the process point in accordance with their priority.

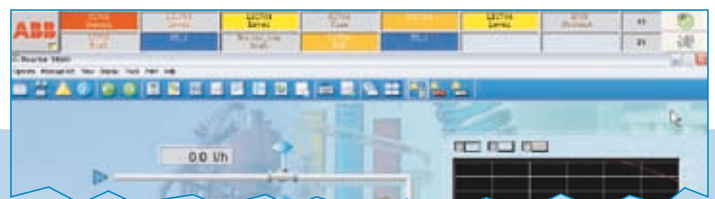
Message line

The upper area of the display is always reserved as a message line for the higher-level display of all message types from the entire process.

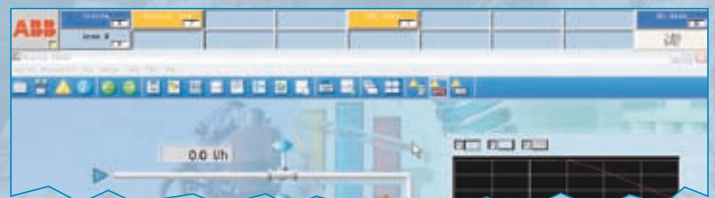
The message line optionally displays either the newest or oldest messages, as well as buttons for acknowledging messages and viewing operator hints. There is also a field for indicating overflow, a field for acknowledging alarms and a field showing the number of unacknowledged messages in the message list. For quick operation, the faceplate of the disturbed process point can be accessed directly from the message line.

Operators can choose between three different message line views:

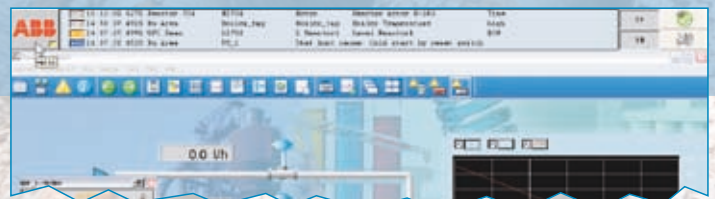
- Standard view
- Area view
- List view



Standard view



Area view



List view

Message list

The message list offers an overview of all pending messages. It features a chronological list of fault, switch and system error messages. The latest message is placed at the beginning or end of the list, as required. This message sequence can be altered by configuration.

Just as in the message line, different priorities are color-coded. Messages can be acknowledged both by block and by page. To provide a better overview, the user can hide certain priorities or plant areas on the screen display. The size of the message list can also be configured.

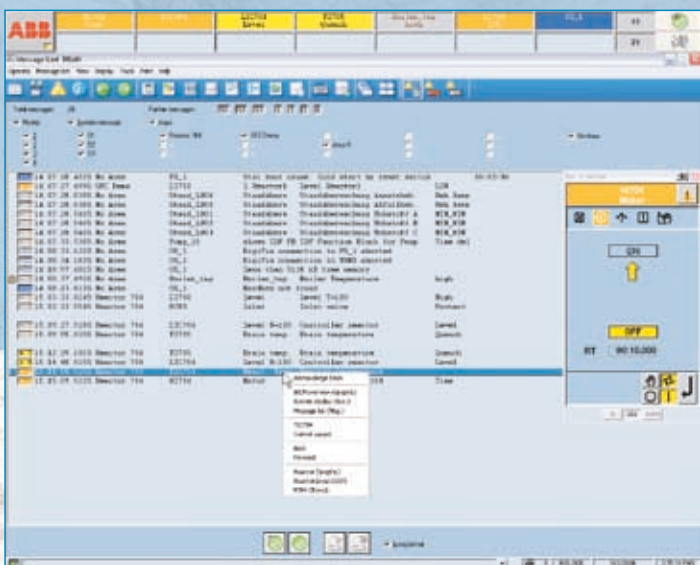
Other displays (e.g. faceplates, graphic or trend displays) featuring the disturbed process point in its process-relevant environment can be selected from the message list. Associated displays and aspects can be accessed directly by right-clicking on a message.

Operator hint list

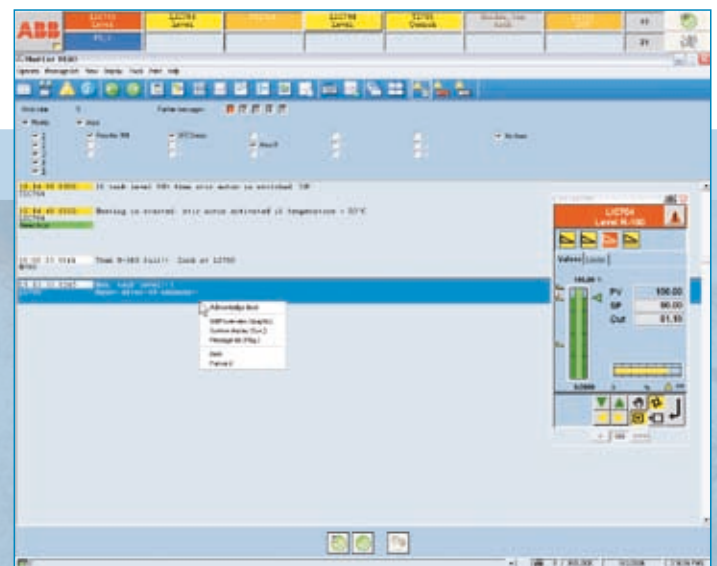
A hint for the operator can be configured for each fault and switching message. Hints are intended as a means of informing the operator about the cause of the message or about the procedure to be adopted for eliminating a process fault. If necessary, hints can also provide further user help.

All configured hints are displayed in the hint list.

Faceplates or other displays can also be called up directly from the hint list to operate a process point or analyze critical process situations.



Message list



Operator hint list

Logging

Logs are used to document events, states and sequences from the process. Log files can be saved on a hard disk, displayed on the monitor and output on the printer or on a data medium such as CD, DVD or memory stick for further evaluation. In addition, the archived files can be automatically sent to any subscriber on the Ethernet via the file transfer protocol. The DigiBrowse software makes it possible to view the data and to convert it into ASCII (CSV file) for further evaluation, for instance using Excel.

The Freelance 800F system features the following log types:

Signal sequence log

The signal sequence log is used for logging events such as process and system messages, switching messages and hints. Even operator intervention can be logged in detail together with the user name and

timestamp. The user can determine which message priorities are to be logged. Binary events can be logged with an accuracy of 2 ms for the whole system (sequence of events). Signal sequence log 1 allows the operation of a line printer in order to immediately print every alarm when it is received.

Plant log

At certain intervals or in certain situations, the plant log records the current values or states of process variables. It can run cyclically, or can be started and stopped manually or by an event. The output format is freely configurable.

Disturbance course log

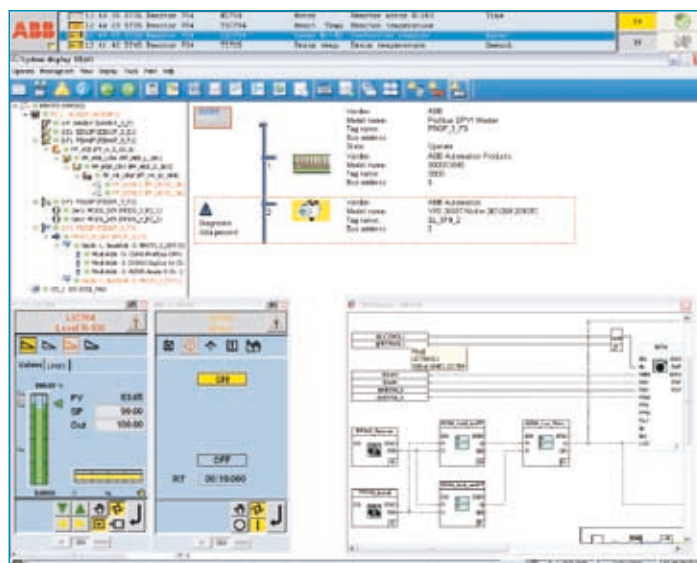
The disturbance course log is used to examine the course of disturbances. To this end, the measured values before and after a disturbance are recorded in the controller with a high time resolution and archived in an operator station. Four logs of each type can be configured in one operator station.



System diagnosis

The current state of the hardware and software of a Freelance 800F system is shown in the standardized system display. Here, information can be obtained in various degrees of detail about the status of anything from the system or an individual controller to a field device.

The simple system display is available to all operators of a DigiVis operator station. From Version 8.2 onwards, the additional information is also available for field devices on the FOUNDATION Fieldbus.



Easy system diagnostics with the system display

Freelance – Your standard automation solution

800xA components can be added to the system to meet additional requirements (extended automation)

800xA Operations (operation and observation)

DigiVis makes it possible to operate and observe all process stations in a Freelance system. In the case of 800xA Operations, in contrast, ABB offers a very convenient means of connecting several Freelance systems to a common operator level in very large plants.

Here, the relevant faceplates are generated automatically for all process points in the lower-level Freelance systems. DigiVis and 800xA Operations are compatible, meaning that both operator levels can be used together, for instance DigiVis in the local control room and 800xA Operations in the head office.

Batch processing in Freelance

Freelance is also ideally suited for batch automation in accordance with ISA S88. In this case, the additional 800xA Batch Management software, which has been optimized for Freelance, is used. Again, the system structure can be designed very flexibly.

Standard operation can either remain on DigiVis, with parallel batch management workstations and appropriate servers, or operation, observation and batch management can be carried out entirely using 800xA.

Configuration and commissioning with Control Builder F

The engineering station

A standard PC may be used as an engineering station for configuration, while a laptop computer is used for on-site commissioning and service.

The Control Builder F software package is not merely an aid for uniform configuration of the automation functions and of the operator interface (DigiVis). It is also a high-performance tool for commissioning the process. Control Builder F performs configuration and program compilation in a very user-friendly way based on the IEC 61131-3 standard, which, among other things, defines graphical programming methods. The entire Freelance system can be configured either online (while Freelance 800F is connected) or offline (without a connection to the target system). For offline configuration, no process station is necessary. The application program created can be transferred to the target system at any time.

In particular, this is also true for FOUNDATION Fieldbus configuration, whereby Control Builder F can be used to generate the distributed device application even without devices being available.

Control Builder F offers the following features for configuration, parameterization and commissioning:

- A single software tool for configuration of the automation functions, the operator interface with displays and logs, and fieldbus parameters
- Graphical configuration with powerful editors according to IEC 61131-3 in any of the following programming languages:
 - Function block diagram (FBD)
 - Instruction List (IL)
 - Ladder diagram (LD)
 - Sequential function chart (SFC)
 - Structured text (ST)
- A function block library with more than 220 tried and tested functions, greatly exceeding the basic ones outlined in IEC 61131-3



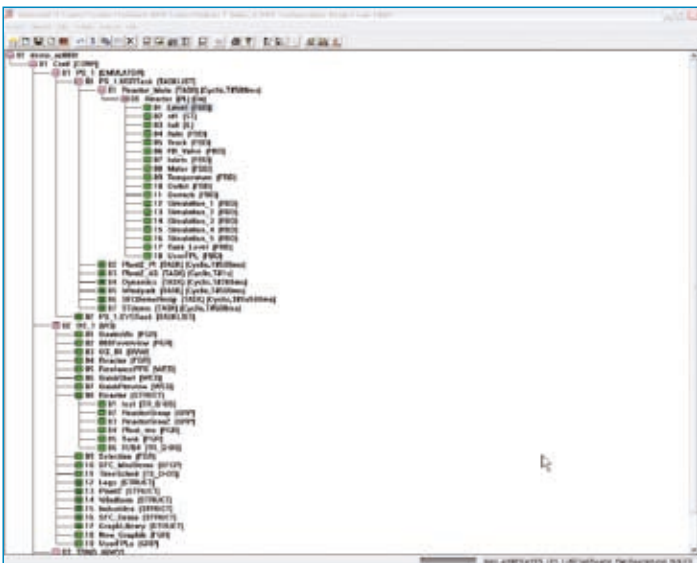
- An extensive macro library containing more than 200 graphic symbols, which can be added to by the user
- A project tree for flexible program generation and transparent program structuring
- Verification of automation functions, with the chance to find and remove errors quickly and easily
- Convenient cross-reference function allowing variables and process points to be found easily in any editor right up to the graphic display
- Importing and exporting of programs, displays, variables, process points and parts of the project tree
- Password protection to prevent unauthorized modification
- Password protection for user-defined function blocks
- Uniform system-wide graphical documentation of the entire user program, system communication and all field device parameters
- Integrated online help
- Project file (application) backup on any data medium (hard disk, CD, memory stick, etc.), or controlled by the system on one of the operator station PCs
- Testing and simulation of user programs (e.g. interlocks) even without connected hardware using the controller emulator



Project tree

The project tree is the central instrument for managing the entire user program and commissioning. All project configuration data is displayed as a tree structure. Within the project tree:

- The configuration data in a project is structured
- Task levels are defined
- Programs are assigned to the task levels
- Programs, displays and logs can be opened for editing, copied and moved
- Programs are checked for plausibility and their processing status displayed
- Project configuration data is exported and imported
- User programs are loaded into the process and operator stations



Project tree

Project data base

All configured signals, variables and process points are managed in the Freelance 800F system as lists in a common project database:

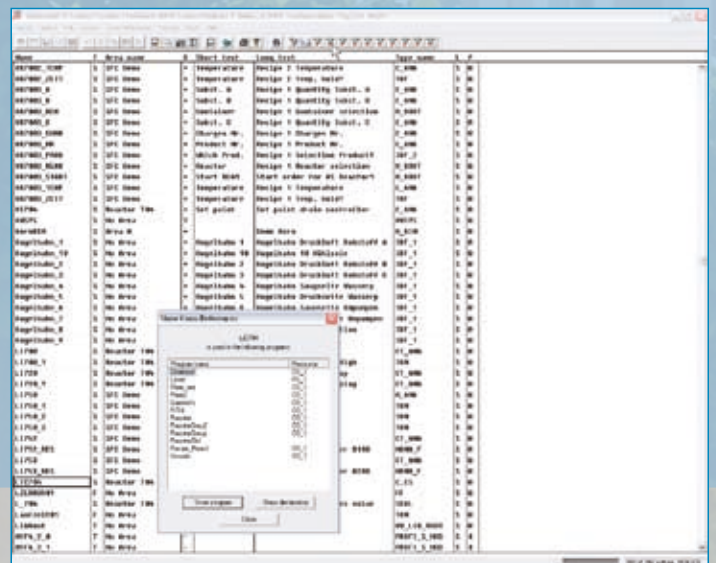
- List of variables (inputs, outputs, internal variables)
- Process point list (function blocks)
- Graphics
- Programs

Because the database is system-wide, data only needs to be entered once, avoiding further potential errors during configuration. The single project database file makes archiving or backup ease of use.

The list of variables and tags is created automatically when a user program is generated. However, the variables and process points can also be opened and modified directly in the FBD or IL.

Other list functions include:

- Project-wide modification of name, comments, data or module type
- Search and display based on specified search criteria
- Cross-reference function permitting rapid, system-wide location of all programs and displays in which a selected variable or process point is used



Tag list with cross references

Configuration of automation functions

Configuration of function block diagrams

The function block diagram (FBD) is a graphical programming language for performing open-loop and closed-loop control functions.

An FBD program is an arrangement of elements of the function block diagram, in which functions, function modules, and program inputs and outputs are logically combined via signal flow lines. The signal processing needed for controlling a process is obtained by means of the FBD programs. The CAD functional capabilities permit easy positioning and connection of functions and function modules in the plan.

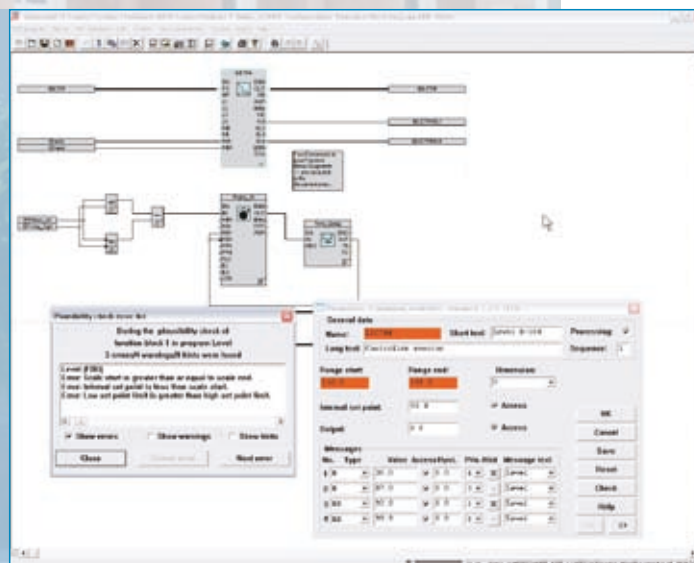
Corresponding to the signal flow, inputs are always displayed on the left and outputs always on the right. Users can have either read or write access to the variables. The layout of the terminals and the color of signal flow lines provide information about the data type.

The parameters of the function blocks are also defined in the FBD program. As a result, parameter dialogs, in which all block-specific entries can be made, are available. Once completed, the FBD program can be verified using a plausibility check for errors or syntactic accuracy. Any errors or warnings are displayed in a list, and it is possible to go directly to the source of the error by simply clicking on the relevant line in that list.

The cross references in a program can also be displayed for the whole system. Here, too, the corresponding displays or programs with plausibility error messages can be called up directly in order to gain easy access to the variables or process points referred to.

An FBD program is configured as follows:

- Define name for FBD program
- Open editor for FBD program
- Select function blocks
 - Position in the graphic area
- Connect functions with the signal flow lines
 - Enter input and output variables
- Define parameters for the functions
- Check FBD program for plausibility
- Correct any syntax errors



Program with parameterization screen and plausibility check error messages

Configuration of sequential function charts

The sequential function chart (SFC) readily allows transparent, graphical creation of sequential control programs. To create an SFC program, steps are configured with assigned actions (commands) and transitions with step-enabling conditions. Programs (function block diagram, ladder diagram, structured text, or instruction list) can be assigned to the steps and transitions. A further feature of the sequential function chart is the facility for creating alternative and parallel branches as well as the synchronization of these sequential structures. At the same time as the sequential function chart is configured, the SFC display for operation and observation on the operator station is generated automatically.

Configuration of structured text

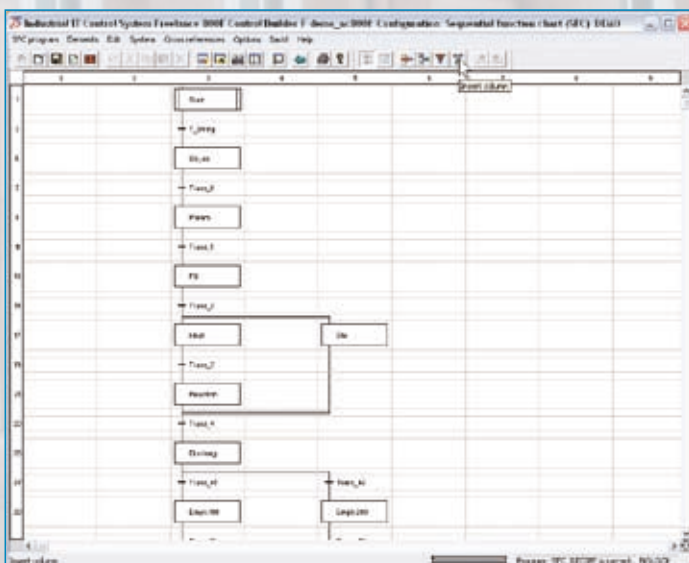
Structured text is one of the text-oriented programming languages of IEC 61131-3, in which program processing is determined by instructions. All functions and function blocks in Control Builder F can also be called in ST programs. The scope of the functions is partly covered by the ST operands. Function blocks can be used in the ST program following declaration.

Parameter definition of the function blocks also takes place in the same way as in the ladder diagram or function block diagram. In contrast to that of the function block diagram (FBD), the scope of functions of the structured text also includes conditional commands and loop commands, which are called using appropriate key words. The processing sequence is determined from the order of the commands in the ST editor. The only way to specifically change the order is to insert loop commands.

Configuration of instruction lists

All Freelance 800F processing functions can be defined by the instruction list (IL). The scope of the instruction list exceeds that of the function block diagram and sequential flow chart, as jump commands and program loops can also be programmed. The operands can be displayed and entered with a selection list according to IEC 61131-3. The functions and function modules in the function block diagram can also be called and integrated into the instruction list.

Parameter definition of the function blocks also uses the same parameter definition screens as those used in the function block diagram.



SFC program

The screenshot shows the IL editor interface with a table of instructions and an 'Operations' dialog box. The table has columns for Line, Label, Op., Operand, and Comment. The 'Operations' dialog box is open, showing a list of operations: LDI, ORI, ANDI, XORI, XORI, AND, OR, XOR, LD, LDN, LDI, LDN, and SET.

Line	Label	Op.	Operand	Comment
0001		LD	Q.0	
0002		ST	Q.0	
0003		LD	M.05	
0004		ST	Q.0	
0005		LD	M.0	
0006		ST	Q.0	
0007		LD	M.0	
0008		ST	Q.0	
0009		LD	M.0	
0010		ST	Q.0	
0011		LD	M.001	
0012		ST	Q.0	
0013		LD	M.05	
0014		ST	Q.0	
0015		LD	M.0	
0016		ST	Q.0	
0017		LD	M.0	
0018		ST	Q.0	
0019		LD	M.0	
0020		ST	Q.0	
0021		LD	M.0	
0022		ST	Q.0	

IL program

Configuration of ladder diagrams

Along with the function block diagram (FBD) and sequential function chart (SFC), the ladder diagram (LD) is also one of the graphical languages of the IEC 61131-3.

The ladder diagram language originates from the area of electromagnetic relay systems and describes the flow of current through individual rungs. The boundaries of a rung are defined on the right and left side by devices known as power rails, which have the logical state 1 (current is flowing). A rung is created with the elements of the ladder diagram (links, contacts and coils).

Functions and function blocks in the ladder diagram can be called up and used in the same way as in the function block diagram. Parameters are also defined for function blocks using the same parameter screens.

Configuration of operation and observation functions

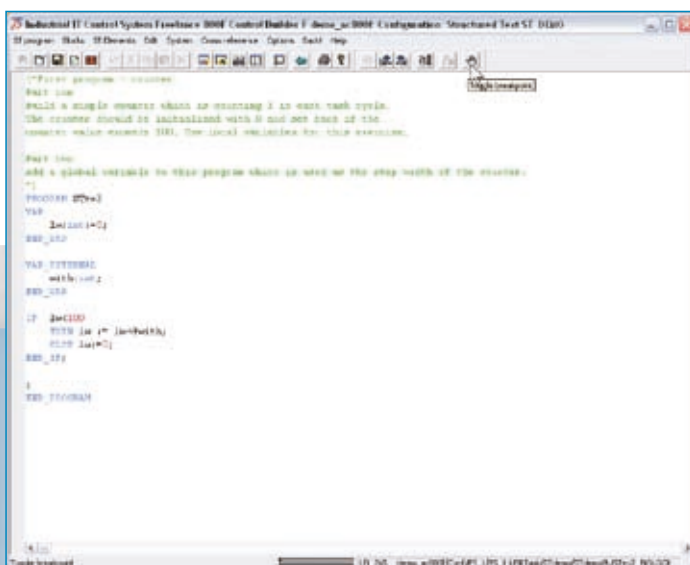
The following functions can be configured for operation and display:

- Custom graphic displays
- Web displays
- Standard display types: overview display, group display, trend display, time schedule display
- SFC display
- Signal sequence, disturbance course and plant log
- Message list and message line
- Operator hint list.

Since the common system database is automatically accessed while configuring these functions, there is no need to re-enter the data.

Standardized displays (pre-engineered)

Standard displays can be configured very easily using Control Builder F. To configure a group display, for example, it is only necessary to select the process points via the selection list. The entry is made automatically. In this manner, up to 10 large analog face-plate process points can be entered per group display. The configuration procedure for the overview display is equally simple, as the displays are entered from a selection list.



Structured text

Freely configurable graphic displays

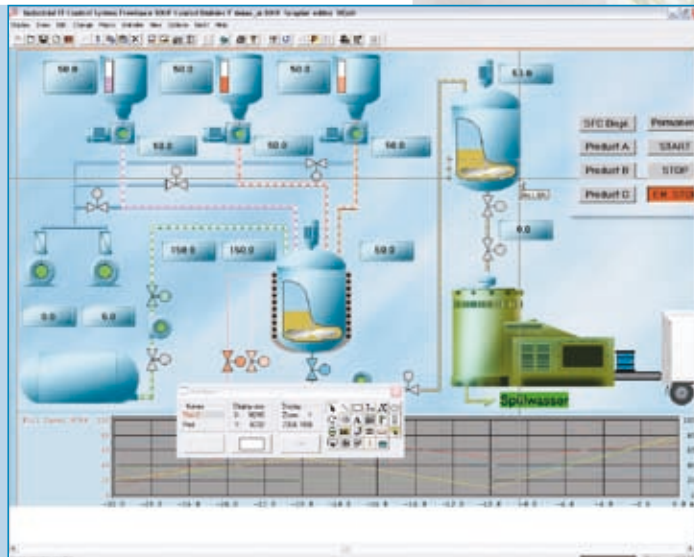
Plant-specific graphic displays can be constructed for displaying the process.

The graphic displays contain static and dynamic display elements.

The static part of the plant display – the background display – is composed of separate graphic elements which can be modified in color, line type and filling pattern and can, for example, display the schematic plant layout.

The following constructional aids in the system make it easier to create displays:

- Static elements such as lines, polylines, rectangles, polygons, ellipses, arcs and texts are created, for example, by specifying the start and end points.
- Display sections already created can be duplicated, moved, rotated in 90° steps, transposed or superimposed.
- The combination of several graphic elements can be saved as a macro and stored in libraries to be used when desired.
- The zoom function facilitates precise construction of the individual graphic display elements.
- Import of bitmap files facilitates the generation of static background displays.



Graphics editor

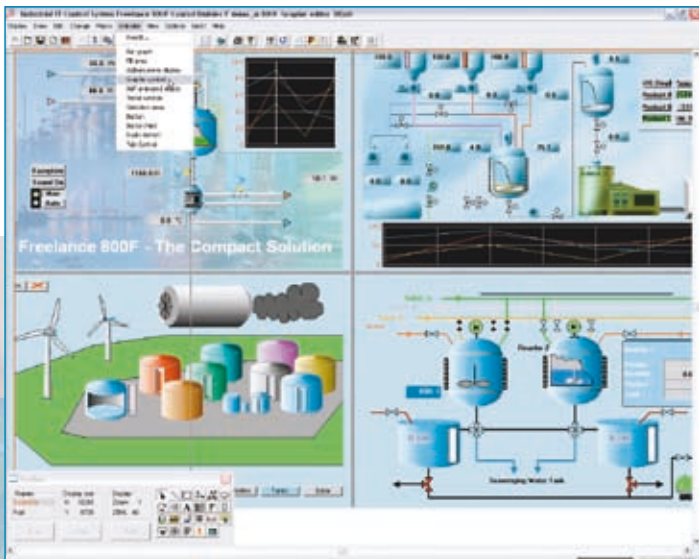
The process variables are displayed in the dynamic section of the display – the foreground display. Specific process variables can be visualized simply by making the display elements dynamic.

The following types of dynamic elements can be used:

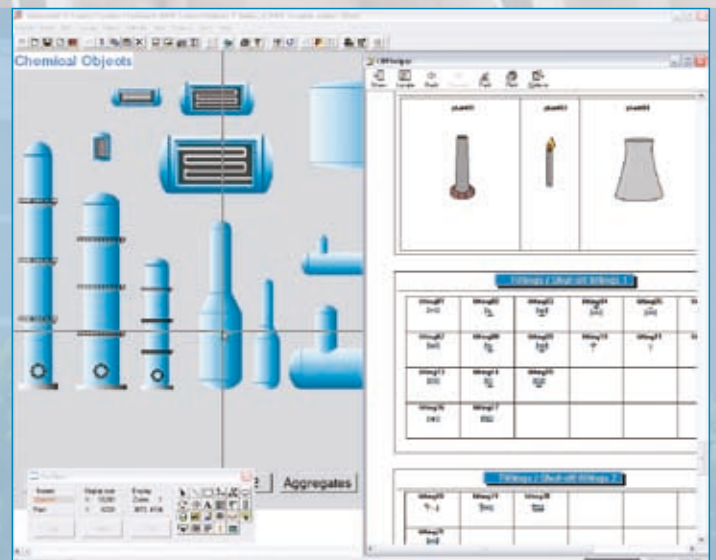
- Bar graphs and dynamic filling set to operate in different directions
- Superimposed numerical values and text variables
- Trend window

- Color change or symbol change to depict states
- Continuous or discrete position modifications of the graphic symbol
- Keys (buttons) for the direct execution of actions (e.g. write value or similar)
- Animated objects, e.g. mixers that turn realistically
- Tool tips

Selection fields can be defined at any position so that the operator can access any other displays using the mouse or keyboard.



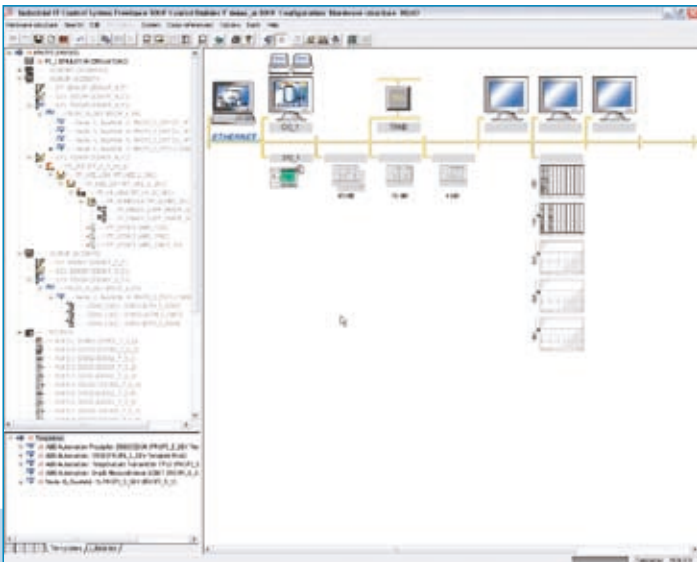
Graphic display for four plant sections



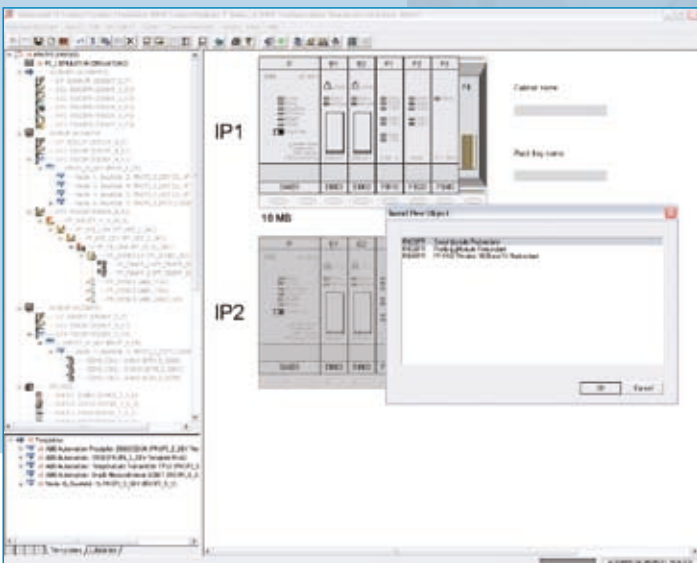
Graphic display with online help for the macro library

Hardware structure

The required hardware structure can be entered in a graphical system overview and the system communication can also be defined there. It is possible to assign particular DigiVis operator stations to specific process stations. Furthermore, detailed information can be obtained on the operator and process stations, together with their modules and the AC 800F controllers with their connected fieldbus lines. In the station overview display, the operator and process stations can be equipped using selection lists. Specifications for processing, display and I/O channel assignment can be made for the individual modules of the process stations.



Definition of the hardware structure



Configuration of AC 800F

Fieldbus and field device configuration

The respective bus parameters, for instance the baud rate, number of subscribers and time constants, can be set for each fieldbus module. Control Builder F also suggests a setting for the bus parameters in line with how the fieldbus is equipped. This makes work easier for those new to the subject.

PROFIBUS

In the configuration view of the fieldbus line, new PROFIBUS slaves can be integrated into the fieldbus line using a GSD-file or FDT/DTM technology.

Using the template concept, it is also possible to integrate completely pre-configurable PROFIBUS slaves by means of drag and drop. The intelligent PA/DP Linking Device LD 800P is transparent with regard to configuration, allowing PA devices to be viewed as if they were connected to the PROFIBUS DP. Parameter definition screens are then available in the device display for defining parameters for both remote I/O and PA field devices.



Configuration of the fieldbus line (PROFIBUS)

HART

HART devices connected to the S900 or S800 can be configured with the aid of either HART templates or HART DTMs. HART templates consist of pre-configured DPV1 services which tunnel a HART command via the PROFIBUS to the HART device on the analog channel of a particular S800 or S900 module. Users can also create HART templates themselves.

FOUNDATION Fieldbus

The devices are configured in the feedforward part by linking the Device Description (DD) files. This makes it possible to configure the FF without the field devices having to be physically connected to the controllers. The devices are configured on the H1 links of the LD 800HSE Linking Devices. As Control Builder F supports control in the field for FF devices, it is possible to configure function charts that interconnect the modules in the individual FF devices to form a control loop, without AC 800F having to be included in the control loop. Control Builder F then automatically generates a process that is passed on to the Link Active Scheduler (LAS). Redundant Link Active Schedulers are also supported. However, it is also possible to use the FF devices "only" as I/O suppliers, closing the control loops via AC 800F and its PID controller module.

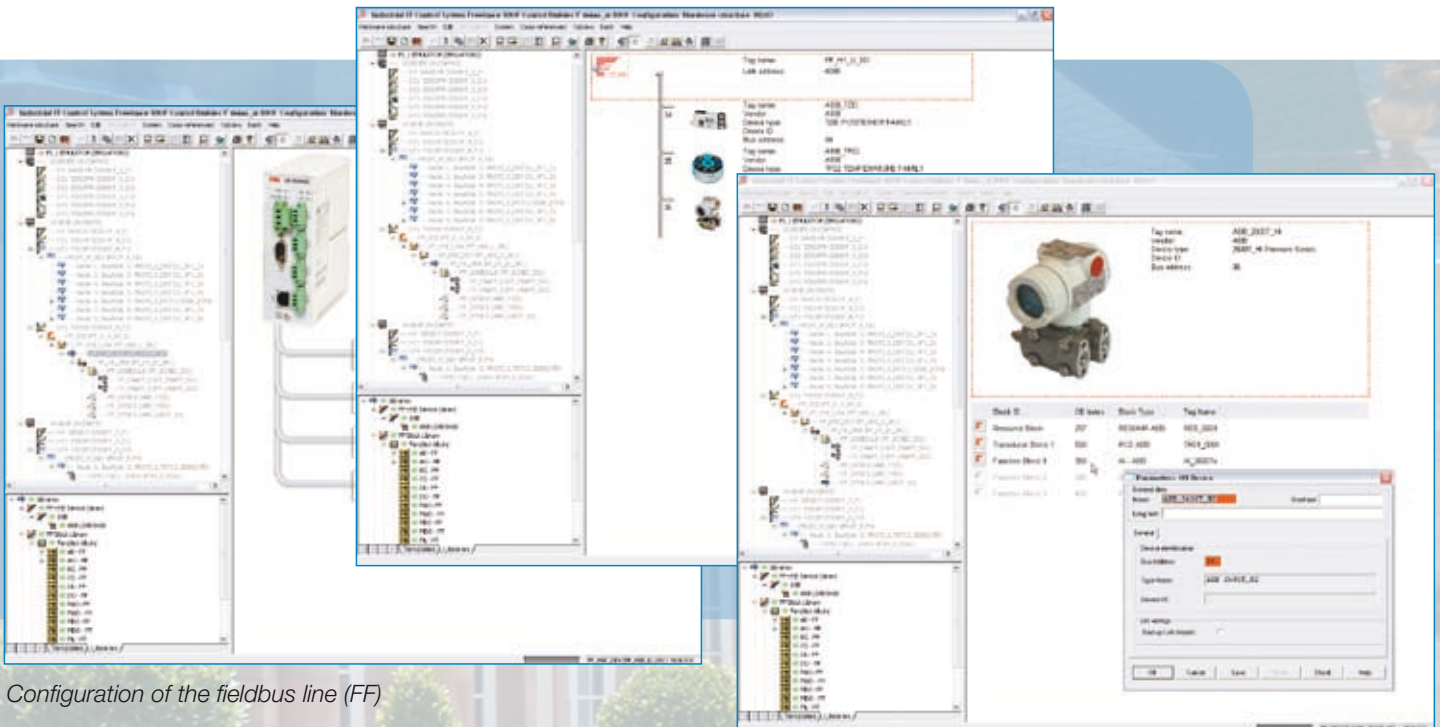
Graphical documentation

The fully graphical forward documentation allows configured programs and displays to be output. The documentation is always up-to-date, as the current configuration data is accessed. Various sorting criteria, such as drawing numbers, assure an orderly and transparent output of the data to be documented.

The scope of documentation can be specified as desired by the user, such as:

- Program and display contents, cross references, parameter definition data and comments
- System overview and hardware configuration

The documentation specification can be stored for future use. The FBD, IL, LD, SFC and ST programs, displays, etc. are documented in the form in which they appear on the screen. Using Freelance 800F documentation management, complete or selected partial project documentation can be produced within a short space of time. It is also possible to include bitmaps (such as customer logos) in the drawing footer.



Configuration of the fieldbus line (FF)

Commissioning

During commissioning, all or some of the user program is loaded into the operator and process stations.

It is also possible to:

- Load modifications
- Start and stop process stations
- Start, stop or reset tasks
- Define and activate parameters for function blocks
- Define and activate parameters for field devices
- Display, set and track process values
- Combine any process values at any time in a trend window
- Perform version and status checks
- Perform system diagnoses right up to the field device

Displaying process states

The editors for displaying the configured programs can also be accessed during commissioning. As opposed to during configuration, the process states of the I/O variables are also displayed in the program. The status of the binary process signals is displayed, for instance, in the FBD display by a change in the graphical representation of the signal flow lines.

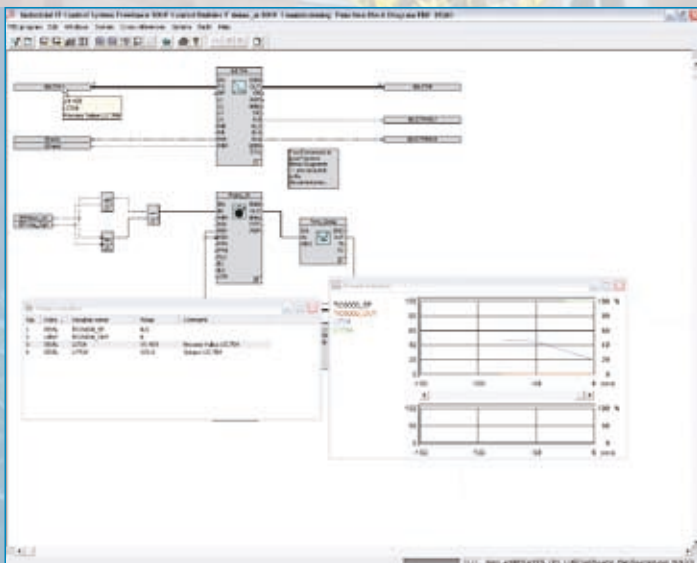
Value and trend windows are available for displaying process values. They offer an optimal overview of the current process values for commissioning and test purposes.

Here, the user is not restricted to the display of I/O variables for the program currently shown on the screen. Variables from other programs and/or process stations can also be displayed, as well as values from connections between various function blocks of the current program.

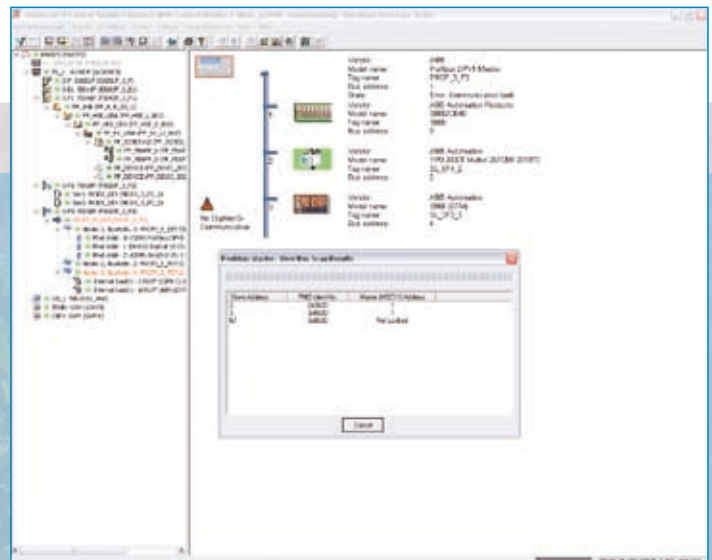
Modifying parameters

Parameters can also be modified during the commissioning phase, allowing optimal program settings for the process. These parameters can be altered from either the engineering station or the operator station. Whether the changes made are retained permanently or only temporarily is decided by the commissioner.

Through a parameter upload, it is possible to view all parameter modifications made in a particular period of time and to select those which are to be saved in order to be used at the next cold start.



Trend and value window during commissioning



Fieldbus line during commissioning

Other features allow you to force inputs and outputs and to specify new values for simulation purposes.

Commissioning the fieldbus lines

PROFIBUS

The fieldbus line overview shows whether the configured PROFIBUS I/O and PA devices are available. In addition, the bus can be scanned using Control Builder F in order to detect new or incorrectly configured devices. Such devices can then be given the correct address from Control Builder F via the PROFIBUS.

During commissioning, Freelance allows you to compare configured parameters with the parameters that exist in the device. This makes it possible to detect device parameters that have been changed locally and transfer them to the configuration by means of uploading. When the PROFIBUS device transmits diagnoses, they can be displayed by Control Builder F. When FDT/DTM technology is used, specific diagnostic options can be used, provided that the device manufacturer has incorporated such options in the DTM.

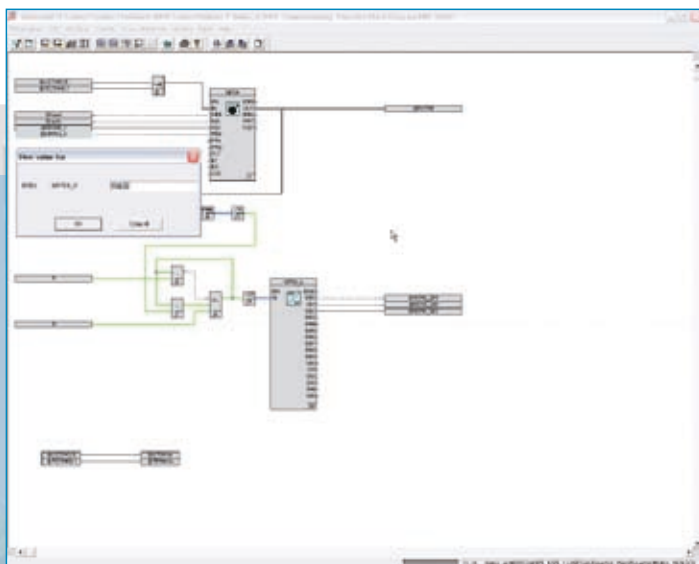
Individual PROFIBUS devices can be removed from cyclical data traffic in order to perform maintenance without it being necessary to stop the fieldbus.

FOUNDATION Fieldbus

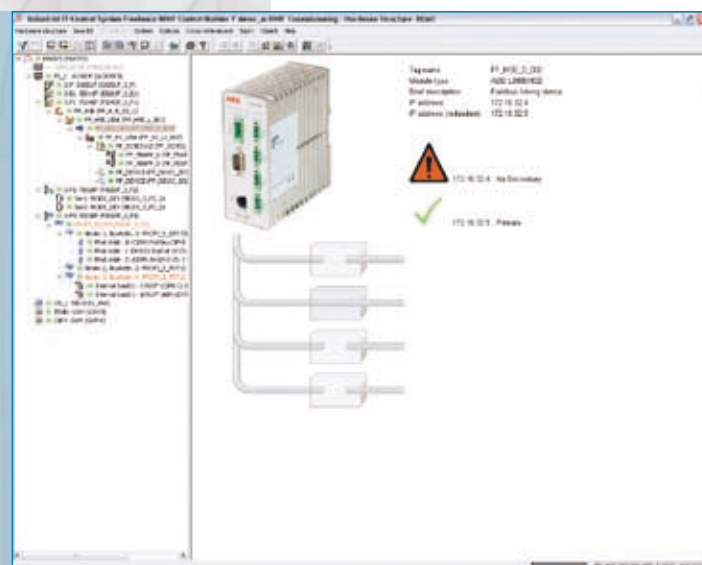
Live lists displaying which devices exist are available for HSE and H1. The process point (tag) and device ID are written to the field device by assigning existing values to configured values. The states of the modules in the devices are displayed.

During commissioning, Freelance allows you to compare configured parameters for the device modules with the parameters that exist in the device. This makes it possible to detect device parameters that have been changed locally and transfer them to the configuration by means of uploading.

The Link Active Scheduler (LAS) can be stopped in order to interrupt processing of the control loops in a H1 link.



“New value” window: defining field device parameters during commissioning



Online diagnosis of fieldbus components



Engineering and services

ABB Automation is one of the world's largest suppliers of equipment, systems and services for measurement and process automation.

A crucial factor in maintaining this market position is the quality of our products, from manufacture right through to services. The DQS Certificate based on DIN ISO 9001 awarded to ABB Automation as far back as 1990 bears testimony to this fact. The same applies for the EQNet Certificate based on ISO 9000/EN 29000.

However, Freelance 800F includes more than just outstanding technical features. We have also paid a great deal of attention to rational planning, installation and modification processes, allowing you to perform engineering and maintenance activities quickly and cost-effectively.

Or, if you prefer, our highly-qualified specialists can perform these activities for you, including:

- Planning and engineering
- Installation planning and execution
- Plant documentation
- Commissioning
- Technical training
- After-sales service

Our instrumentation and control specialists, or our certified partners in system integration, will be happy to assist you in planning and implementing your automation project. ABB Automation's staff can also work with you to plan and implement the installation of a Freelance system in your plant.

Under this arrangement, the ABB Automation Engineering Department will compile the specific project documentation for you. This can include functional diagrams, circuit diagrams, configuration documentation, and operating documentation including system descriptions and instructions for operation, modes of operation and plant maintenance.



At many sites, ABB Automation has its own commissioning engineers who work together with planning engineers, process instructors and operators to commission your plant, optimize it, perform a test run and hand over the system to the operator.

To make sure your operators are fully knowledgeable in the operation of the Freelance 800F compact control system, we offer a range of technical training courses.

In addition, we offer a computer-based training program for Freelance 800F on a multimedia DVD. This will provide you with the basic knowledge you need for configuration, therefore allowing you to start using the system very quickly and efficiently.

Finally, the ABB Automation Service Department provides maintenance services for all Freelance 800F systems and peripheral modules. When it comes to rectifying a fault, we provide you quickly with the necessary specialists and spare parts.

Freelance 800F system data

Process station

Functions:

- Analog value processing
- Binary value processing
- Closed-loop control
- Open-loop control, standard and freely programmable
- Logic and arithmetic processing
- Trend acquisition
- Disturbance course log
- Modbus coupling (master and slave)
- Send and receive blocks
- Phase logic interface (DigiBatch)

Task execution:

- Cyclical processing with selectable cycle times from 5 ms
- Fastest-possible processing (PLC mode)

Process interface constructed in racks:

- Flexible rack positioning
- Front-panel connection technique (codeable blocks and screw terminals)
- Replaceable during operation

Process interface for AC 800F:

- Flexible rack positioning for fieldbus modules
- Replaceable during operation

Signal update for the rack modules:

- Binary signals: selectable from 2 ms
- Analog signals: selectable from 10 ms

Power supply

- Alternating voltage:
 - 230 V, (-15%...+10%)
 - 115 V, (-15%...+10%)
- Direct voltage: 24 V, (-20%...+35%)
- Interruption: < 20 ms without function disturbance

Electromagnetic compatibility (EMC):

- Radio interference suppression according to EN 55022 and EN 55014
- Interference immunity according to IEC 801, EN 60801 and VDE 0843
- Security level 3 and NAMUR industrial standard

Ambient conditions

Operating conditions:

- Ambient temperature: 0...50 °C, 0...60 °C for AC 800F
- No fan required
- Permitted relative humidity: ≤ 75% annual average, no condensation; ≤ 95% for 30 days a year

Mechanical features:

- Shock: 30 g/18 ms / 18 shocks
- Vibrations: 3x5 cycles, 2 g/0.15 mm/5...150 Hz

Operator station

Functions:

- Plant-specific graphics:
 - Single displays with mini trend display
- Standardized displays:
 - Overview display
 - Group display
 - SFC display
 - Trend display
 - Time scheduler display
 - System display
 - Faceplates
 - Message list and operator hint list
 - System diagnosis
 - Control aspect (shows configuration)
- Archiving
- Logging

Display:

- Display update: approx. 1 s
- Display build-up time: 1...2 s

Capacity per operator station:

- Max. 1 overview display
- Max. 96 group displays
- Max. 42 trend displays
- Max. 12 logs
- Max. 2000 messages in the message list at any one time, further messages only stored temporarily in the process stations
- Number of graphic displays depends on hard disk capacity



Gross Automation, 1725 South Johnson Road, New Berlin, WI 53146, www.ssacsales.com, 800-349-5827