



# CONTROL SYSTEM PARTS CATALOG

UICD690023



## Table of Contents

1.	Introduction.....	3
2.	BlueLine® Tools.....	4
3.	Configuration example .....	5
4.	Programmable processor – CP01 .....	6
5.	Analog output modules – AO01, AO02.....	7
6.	Binary output modules – BO01, BO02.....	8
7.	Analog input modules – AI01, AI02, AI03, AI04.....	9
8.	Binary input modules – BI01, BI02.....	10
9.	Binary input modules – BI03, BI04.....	11
10.	Serial interface module – SI01 .....	12
11.	Modbus Ethernet interface module – ME01.....	13
12.	Espresso® bus modules – DH01, DH02.....	14
13.	Bus traffic director & Bus end module – TD01, BE01 .....	15
14.	Bus isolation amplifier & Bus access module – IA01, BE02 .....	16
15.	Speed input module – SP01 .....	17
16.	Local bus rack (IDC) – RK01 .....	18
17.	Local bus rack signal cables for BlueLine® modules (IDC).....	19
18.	Local bus rack terminal blocks for binary and analog modules .....	20

# 1. Introduction

BlueLine<sup>®</sup> is a modular control system platform developed and provided by Alstom Power Inc, Power Automation and Controls (PAC). The system can be offered in both simplex and redundant configurations and is coupled with a state-of-the-art Human-Machine-Interface to provide user-friendly operations for the entire plant.

Designed with the needs of today's power plant personnel in mind, BlueLine<sup>®</sup> is a versatile, innovative and affordable control system that will protect all assets at the plant. BlueLine<sup>®</sup> is an ideal solution for retrofits. With a rapidly growing fleet of aging or obsolete control systems in various power plant applications, the system provides easy plug and play solutions to upgrade controls in the existing racks or replace the obsolete systems with 21st century technology. The BlueLine<sup>®</sup> platform covers turbine controls, DCS, machine protection, emergency shutdown applications (conforming to SIL3 standards) as well as distributed and substation control. Advanced controller technology, safety certification and standardized system design allow BlueLine<sup>®</sup> to meet and exceed the system requirements for new equipment projects making it an ideal choice for such applications.

The system is built up in standard 19" rack mounted modules. The BlueLine<sup>®</sup> flexibility makes it an ideal solution for upgrades where cabinet space and existing wiring limit the installation possibilities.

On the modular level, the programmable processor utilizes a fast, 64bit calculation engine, paired with two more processors for very fast execution times. In addition, redundancy is built into the system to ensure reliable and safe operations of the system on the module level and as an entire unit. A standby processor runs the same logic and application code as the primary processor and is synchronized with the primary processor's memory during operation using a high-speed dedicated link. This configuration allows for fast and safe transfer of signals to the standby processor at any time in the case of a primary processor failure.

The hardware configuration and processor programming is accomplished through a software application called BlueLine<sup>®</sup> Tools (BLT), that is running on a Windows based computer. The application program is developed in a function block editor style logic environment with a customized library and pre-configured complex functions for standard applications such as drive controllers, sequencer heads and more. This flexible and user-friendly programming environment allows for online debugging, tuning of parameters and logic editing.



## 2. BlueLine® Tools

BlueLine® tools (BLT) is a windows based engineering software application used for programming, configuration and debugging the BlueLine® system hardware.

BLT is a function block editor style logic developer with a powerful function block library. The software manages the system hardware, signal database and controller logic. It is also used for control system programming as well as system commissioning and maintenance.

BLT is designed such that system integrity is adhered to during coding or modification of a project. These built in test routines avoid problems such as tag inconsistencies and double address occupation. Additionally, BLT has the ability to import legacy products such as progress 1,2 and EDS/P3\* projects directly into BlueLine®, allowing for trouble free control system upgrades.

Robust search utilities make tracking of signals and system troubleshooting easy. One can do the forcing of signals and debugging of multiple processors on the logic pages which provides real-time data management and customization of the software to support the current needs of the plant operators.

The Ethernet based connectivity with the BlueLine® processors , allows for networking and subsequent maintenance of all processors on a plant from a central location. The BlueLine® I/O modules are configured via a serial connection.

The screenshot displays the BlueLine® Tools software interface. The main window shows a logic diagram with several function blocks: UMS 2, INT 4, PTL 3, and TEST 5. The UMS 2 block has two outputs, one labeled '1' and one labeled '2'. The INT 4 block has an input 'X' and an output 'X'. The PTL 3 block has an input 'X' and an output '>'. The TEST 5 block has an input 'X' and an output 'X'. The diagram also shows various signal values and connections, such as '100.000%', '39.996%', and '1.000K'. The Properties Window (read-only) is open, showing the properties of a selected block. The Properties Window has two sections: 'Local Connectio...' and 'Local Connectio...'. The first section shows properties like Pin Number (1), Direction (Source), Is saveable (False), Is constant (False), Can invert pin (True), and Inverted (False). The second section shows properties like Data Type (Percent), Processor A... (0xA703), Pin Type (Local), Is Macro Int... (False), and Owner Func... (2). At the bottom of the interface, there is a Watch Window with a table showing the status of various blocks.

Name	Location	F	M	D	LR Value	Actual Value	Format
Block 2 "UMS": Source pin 0 ("A703)	C.L.C. MYB21D...				100.000%		Percent
Block 3 "PTI": Source pin 0 ("A702)	C.L.C. MYB21D...				100.000%		Percent
Block 4 "INT": Source pin 0 ("A701)	C.L.C. MYB21D...				39.996%		Percent
Block 1 "UMS": Source pin 0 ("A704)	C.L.C. MYB21D...				100.000%		Percent
Block 1 "UMS": Sink pin 2 (Parameter: 6300)	C.L.C. MYB21D...				1B		Binary

BlueLine® Tools

\* Requires the use of additional EDS/P3 import tool.

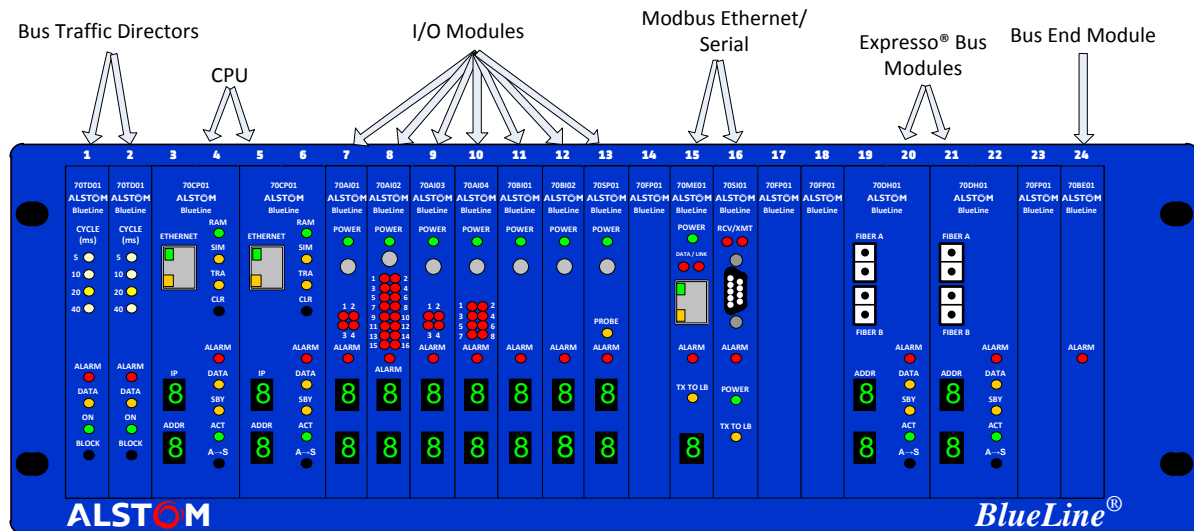
### 3. Configuration example

The basic physical building blocks of the BlueLine<sup>®</sup> system are standard width 19" racks with 24 single slots that are interconnected by bus cables.

The basic logical building blocks of the BlueLine<sup>®</sup> system are so-called local busses (LB's), which extend over one or several racks. Typically, each LB is housed in a cabinet, or a section of a cabinet. If need be, LB's can be extended across different cabinets, by using bus amplifier modules. Each rack is powered from an external 24 VDC power supply unit.

The logical entity on an LB is referred to as an address. Each address consists of sixteen bits; these bits can be used for discrete points or they can represent one analog value including sign bit (bit F) and data quality bit (bit 0). Depending on the selected bus speed, which may be different for each LB in a system, the number of available addresses on a bus varies between 0x3F (64 addresses) and 0x1FF (512 addresses). The adjustable bus cycle times of the bus traffic director are 5, 10, 20 and 40 milliseconds and the resulting available addresses are accordingly 64, 128, 256 and 512.

In the configuration example shown below, a set of redundant bus traffic directors organize traffic on the local bus system. All functional logic is handled by redundant processors (CPU). A set of five I/O modules are responsible to convert the physical field signals to digitized format. A set of serial interface or ethernet based modules accommodate inputs and outputs from other systems or a DCS interface. A set of redundant Espresso<sup>®</sup> bus modules establish communication with other local busses or to an HMI over fiber optic cables. Finally, a bus end module completes the bus with the correct termination resistors. In case of single rack bus systems, the use of the bus end module is not mandatory.



BlueLine<sup>®</sup> configuration example

If the local bus system extends over several racks then only the first rack requires a set of redundant bus traffic directors in slot position 1 and 2 and only the last rack requires the bus end module.

The processors can be deployed redundantly to provide for bumpless transfer in case the active processor fails. Also, the number of processors in each local bus can be anywhere from none at all (in case the bus is designed for the sole purpose of an I/O system) up to fifteen. It is one of the unique design characteristics of the BlueLine<sup>®</sup> system that no processor is needed to control I/O modules.

## 4. Programmable processor – CP01



The programmable processor is a dual slot board BlueLine<sup>®</sup> process controller CPU and can be deployed for various process control and industrial automation applications. The module mounts into a local bus rack and receives communications and power from the local bus. Up to 15 programmable processors can be operated per local bus.

The processor operates based on stored user programs written in the BlueLine<sup>®</sup> function block oriented programming language using BlueLine<sup>®</sup> Tools software. These programs resolve their solutions based on information exchanged with the local bus.

Communications settings and I/O access for the processor can be managed through the Ethernet port on the front using BlueLine<sup>®</sup> Tools software or via legacy back plane service traffic.

The processor is primarily composed of an Alstom custom local bus UART chip (Universal Asynchronous Receiver / Transmitter), various volatile and non-volatile memory, two digital signal processors and a 32-bit communications processor.

The programmable processor may be operated individually, in conjunction with other processing modules as redundant pairs. The processor synchronizes on a timing beacon generated from the BlueLine<sup>®</sup> bus traffic director.

Part Number	<b>70CP01</b>
Description	Programmable processor
Program Memory	32 k x 16 bits user, 64 k x 16 bits complex instructions
I/O points	256 x 16 bits process signals & 240 x 16 bit special signals
Type of memory storage	NVRAM
Fault indication	Front alarm LED & bus signal
Communication ports	1 Ethernet port (RJ-45) on the front
Software programming	BlueLine <sup>®</sup> Tools
Program language	Function block diagram
Power voltage supply	19.5 to 30 VDC
Power consumption	3.0 W max

## 5. Analog output modules – AO01, AO02

The analog output modules provide an interface between the local bus and external analog output devices. The modules mount into a local bus rack and receive communications and power from the local bus.

At the core of these modules is the Alstom custom local bus UART and digital signal-processing engine. The core interfaces with four independent digital to analog front-end circuits. Each of these analog outputs utilizes precision signal conditioning and advanced sigma delta based technology to produce voltage outputs with 16-bit resolution. The output state is commanded via messages received on the local bus.

Disturbances in the processing section or any failure of the local bus data flow are indicated as a fault signal with the front alarm LED, and a logic 'true' signal will appear at pin 11 of the output connector. Disturbances on the process side are individually alarmed using channel alarm LED's on the front.

The analog output modules can be configured to operate in the extended bus address range when operating in a 40 millisecond local bus, thus providing an additional 240 local bus addresses for process signaling and control.

Using the front panel RS-232 port and the BlueLine<sup>®</sup> Configurator software tool, the modules can be monitored and configured for different operating modes and fault conditioning.

Part Number	<b>70AO01</b>	<b>70AO02</b>
Description	Analog output module, voltage	Analog output module, current
Channels	4 (independent)	4 (independent)
Analog signal output	+/- 10 VDC	0 to 20 mA, 4 to 20 mA
Resolution	16 bit	16 bit
Available address range	256 bus addresses at 20ms 496 bus addresses at 40ms	256 bus addresses at 20ms 496 bus addresses at 40ms
Fault indication	Front alarm LED & bus signal, front channel alarm LED	Front alarm LED & bus signal, front channel alarm LED
Communication ports	1 RS-232 front panel port	1 RS-232 front panel port
Configuration programming	BlueLine <sup>®</sup> Tools, BlueLine <sup>®</sup> Configurator	BlueLine <sup>®</sup> Tools, BlueLine <sup>®</sup> Configurator
Power voltage supply	19.5 to 30 VDC	19.5 to 30 VDC
Power consumption	2.1 W typical, 5.3 W max	2.1 W typical, 5.3 W max
Maximum source current	n/a	22 mA

## 6. Binary output modules – B001, B002



The binary output modules provide an interface between the local bus and external binary output devices. The modules mount into a local bus rack and receive communications and power from the local bus.

At the core of these modules is the Alstom custom local bus UART. The local bus UART system is composed of a custom integrated circuit and the necessary discrete circuits to properly interface with the analog communications signals used on the local bus. The output state is commanded via messages received on the local bus.

Disturbances in the processing section or any failure of the local bus data flow are indicated as a fault signal with the front alarm LED, and a logic 'true' signal will appear at pin 11 of the output connector.

The binary output modules can be configured to operate in the extended bus address range when operating in a 40 millisecond local bus, thus providing an additional 240 local bus addresses for process signaling and control.

Using the front panel RS-232 port and the BlueLine® Configurator software tool, the modules can be monitored and configured for different operating modes and fault conditioning.

Part Number	70BO01	70BO02
Description	Binary output module, voltage	Binary output module, relay
Channels	16	16
Binary signal output	24 VDC	Relay
Available address range	256 bus addresses at 20ms 496 bus addresses at 40ms	256 bus addresses at 20ms 496 bus addresses at 40ms
Fault indication	Front alarm LED & bus signal	Front alarm LED & bus signal
Communication ports	1 RS-232 front panel port	1 RS-232 front panel port
Configuration programming	BlueLine® Tools, BlueLine® Configurator	BlueLine® Tools, BlueLine® Configurator
Power voltage supply	19.5 to 30 VDC	19.5 to 30 VDC
Power consumption	2.1 W typical, 5.3 W max	2.1 W typical, 5.3 W max
Maximum source current	100 mA	n/a
Maximum switching current	n/a	1 A
Maximum switching voltage	n/a	60 VDC

## 7. Analog input modules – AI01, AI02, AI03, AI04



The analog input modules provide an interface between the local bus and external analog input devices. The modules mount into a local bus rack and receive communications and power from the local bus.

At the core of these modules is the Alstom custom local bus UART and digital signal-processing engine. The core interfaces with four or eight independent digital to analog front-end circuits. Each of these analog inputs utilizes precision signal conditioning and advanced sigma delta based technology to produce voltage inputs with 16-bit resolution. The output state is commanded via messages received on the local bus.

Disturbances in the processing section or any failure of the local bus data flow are indicated as a fault signal with the front alarm LED, and a logic 'true' signal will appear at pin 11 of the output connector. Disturbances on the process side are individually alarmed using channel alarm LED's on the front.

The analog input modules can be configured to operate in the extended bus address range when operating in a 40 millisecond local bus, thus providing an additional 240 local bus addresses for process signaling and control.

Using the front panel RS-232 port and the BlueLine® Configurator software tool, the modules can be monitored and configured for different operating modes and fault conditioning.

Part Number	70AI01	70AI02	70AI03	70AI04
Description	Analog input module, voltage / current	Analog input module Current	Analog input module, RTD	Analog input module, thermocouple
Channels	4 (independent)	16 (independent)	4 (independent)	8 (independent)
Analog signal input	+/-20 mA, +/- 10VDC, 4 to 20 mA	4 to 20 mA	RTD (PT100)	Thermocouple types: E, J, K, N, S and T
Resolution	16 bits internal, 15 bits local bus	16 bits internal, 15 bits local bus	20 bits internal, 15 bits local bus	20 bits internal, 15 bits local bus
Available address range	256 bus addresses at 20ms 496 bus addresses at 40ms			
Fault indication	Front alarm LED & bus signal, front channel alarm LED	Front alarm LED & bus signal, front channel alarm LED	Front alarm LED & bus signal, front channel alarm LED	Front alarm LED & bus signal, front channel alarm LED
Communication ports	1 RS-232 front panel port	1 RS-232 front panel port	1 RS-232 front panel port	1 RS-232 front panel port
Configuration programming	BlueLine®Tools, BlueLine® Configurator	BlueLine®Tools, BlueLine® Configurator	BlueLine®Tools, BlueLine® Configurator	BlueLine®Tools, BlueLine® Configurator
Power voltage supply	19.5 to 30 VDC	19.5 to 30 VDC	19.5 to 30 VDC	19.5 to 30 VDC
Power consumption	2.1 W typical, 5.3 W max	2.1 W typical, 5.3 W max	2.1 W typical, 5.3 W max	2.1 W typical, 5.3 W max
Maximum input in current mode	100 mA	100 mA	n/a	n/a

## 8. Binary input modules – BI01, BI02



The binary input modules provide an interface between the local bus and external binary input devices. The modules mount into a local bus rack and receive communications and power from the local bus.

At the core of these modules is the Alstom custom local bus UART. The local bus UART system is composed of a custom integrated circuit and the necessary discrete circuits to properly interface with the analog communications signals used on the local bus. The output state is commanded via messages received on the local bus.

The binary voltage input module BI01 converts 0/24 VDC signals into digital local bus signals. It can be used for proximity switches and control room contacts.

The binary contacts input module BI02 generates a 48 VDC auxiliary voltage for the contact interrogation. It is recommended to use this board for the acquisition of field inputs or inputs in contaminated or corrosive environments; the higher contact voltage will improve sensing reliability.

Disturbances in the processing section or any failure of the local bus data flow are indicated as a fault signal with the front alarm LED, and a logic 'true' signal will appear at pin 11 of the output connector.

The binary input modules can be configured to operate in the extended bus address range when operating in a 40 millisecond local bus, thus providing an additional 240 local bus addresses for process signaling and control.

Using the front panel RS-232 port and the BlueLine® Configurator software tool, the modules can be monitored and configured for different operating modes and fault conditioning.

Part Number	70BI01	70BI02
Description	Binary input module, binary	Binary input module, contacts
Channels	16 single throw, 8 double throw	16 single throw, 8 double throw
Binary signal input	24 VDC binary signals	48 VDC contacts
Available address range	256 bus addresses at 20ms 496 bus addresses at 40ms	256 bus addresses at 20ms 496 bus addresses at 40ms
Fault indication	Front alarm LED & bus signal	Front alarm LED & bus signal
Communication ports	1 RS-232 front panel port	1 RS-232 front panel port
Configuration programming	BlueLine® Tools, BlueLine® Configurator	BlueLine® Tools, BlueLine® Configurator
Power voltage supply	19.5 to 30 VDC	19.5 to 30 VDC
Power consumption	2.1 W typical, 5.3 W max	2.1 W typical, 5.3 W max
Remarks	Used for proximity switches and control room contacts	Used for field inputs Short circuit proof

## 9. Binary input modules – BI03, BI04



The binary input modules provide an interface between the local bus and external binary input devices. The modules mount into a local bus rack and receive communications and power from the local bus.

At the core of these modules are the Alstom custom local bus UART. The local bus UART system is composed of a custom integrated circuit and the necessary discrete circuits to properly interface with the analog communications signals used on the local bus. The output state is commanded via messages received on the local bus.

The binary input module BI03 is a sixteen channel input module. The intended use for this module is SIL-3 rated shutdown applications, which require field input monitoring, or loop health monitoring. The nominal differential voltage for each input is 48VDC. Each channel is provided with loop diagnostic information such as open loop, short circuit and over range.

The binary input module BI04 is a five channel input module with contact supervision. The intended use for this module is for monitoring single or double throw field contacts for change of state, open loop or short circuit. Double throw contacts are also tested for antivalency. The nominal differential voltage for each input is 48VDC

Disturbances in the processing section or any failure of the local bus data flow are indicated as a fault signal with the front alarm LED, and a logic 'true' signal will appear at pin 11 of the output connector.

The binary input modules can be configured to operate in the extended bus address range when operating in a 40 millisecond local bus, thus providing an additional 240 local bus addresses for process signaling and control.

Using the front panel RS-232 port and the BlueLine® Configurator software tool, the modules can be monitored and configured for different operating modes and fault conditioning.

Part Number	70BI03	70BI04
Description	Binary input module, contacts	Binary input module, contacts
Channels	16 single throw contacts	5 single or double throw contacts
Binary signal input	48 VDC binary signals	48 VDC contacts
Available address range	256 bus addresses at 20ms 496 bus addresses at 40ms	256 bus addresses at 20ms 496 bus addresses at 40ms
Fault indication	Front alarm LED & bus signal	Front alarm LED & bus signal
Communication ports	1 RS-232 front panel port	1 RS-232 front panel port
Configuration programming	BlueLine® Tools, BlueLine® Configurator	BlueLine® Tools, BlueLine® Configurator
Power voltage supply	19.5 to 30 VDC	19.5 to 30 VDC
Power consumption	2.1 W typical, 5.3 W max	2.1 W typical, 5.3 W max
Remarks	SIL-3 rated applications with loop health monitoring	Single or double throw field contacts with loop supervision

## 10. Serial interface module – SI01



The serial interface module SI01 allows a host controller to exchange I/O data with the local bus system. The module mounts into a local bus rack and receives communications and power from the local bus.

The serial interface module card is primarily composed of a custom local bus UART chip, a digital signal processor and host serial communications circuits. In addition to the circuits the card interfaces to the front panel via a standard nine pin DIN connector, and a series of status LED's.

The serial interface module abstracts the host computer from the local bus through electronic interface circuits and an RS-232/422/485 serial communications port.

Communications settings and I/O access for the module can be controlled through the onboard jumpers and the BlueLine<sup>®</sup> configuration software.

The serial interface module is available in four operational modes, V1: Modbus Slave, V2: Bus to bus communication (word marshalling in conjunction with a V1 module), V3 TC57 version and V4: Modbus Master version.

The serial interface module can be configured to operate in the extended bus address range when operating in a 40 millisecond local bus, thus providing an additional 240 local bus addresses for process signaling and control

The serial port on the module utilizes the Modbus (RTU) application protocol to exchange data with the host. When configured, local bus input data is cached up internally in the module and is available for access via standard Modbus (RTU) commands.

Part Number	<b>70SI01</b>
Description	Serial interface module
Transmission protocol	Modbus (RTU mode)
Transmission standard	RS-232, RS-485 or RS-422
Transmission rates	Software Selection for 4,8K, 9.6K, 19.2K, 38.4K, 57.6K, 115.2K bits/s
Available address range	256 bus addresses at 20ms 496 bus addresses at 40ms
Fault indication	Front alarm LED & bus signal
Communication ports	1 RS-232 front panel port
Configuration programming	BlueLine <sup>®</sup> Tools, BlueLine <sup>®</sup> Configurator
Power voltage supply	19.5 to 30 VDC
Power consumption	2.1 W typical, 5.3 W max

## 11. Modbus Ethernet interface module – ME01



The Modbus Ethernet interface module ME01 is a Modbus TCP protocol based bus coupler allowing a host controller to exchange I/O data with the local bus system. The module mounts into a local bus rack and receives communications and power from the local bus.

The 70ME01 is based on dual processor architecture. An Ethernet communications engine is fueled by an ADI BF537 digital signal processor. The BlueLine® I/O bus UART is composed of a TMS320LF2407A digital signal processor. Onboard communications is achieved using a dual ported RAM architecture.

The card interfaces to the front panel via a standard RJ-45 connector and is IEEE 802.3u compliant, additionally data flow, power and annunciation LEDs are provided.

The ME01 can support up to four client connections and supports the following functions codes 01, 02, 03, 04, 05, 06, 15, 16, 20, 21. Both regular and extended address ranges as well as service addresses can be accessed. The module is capable of communication with Modbus TCP OPC servers

The Modbus Ethernet interface module can be configured to operate in the extended bus address range when operating in a 40 millisecond local bus, thus providing an additional 240 local bus addresses for process signaling and control

Communications settings and I/O access for the module can be controlled through RJ-45 connector and the BlueLine® configuration software.

Part Number	<b>70ME01</b>
Description	Modbus Ethernet module
Transmission protocol	Modbus TCP
Transmission standard	IEEE 802.3u Ethernet
Client connections	4
Available address range	256 bus addresses at 20ms 496 bus addresses at 40ms
Fault indication	Front alarm LED & bus signal
Communication ports	1 RJ-45 front panel port
Configuration programming	BlueLine® Tools, BlueLine® Configurator
Power voltage supply	19.5 to 30 VDC
Power consumption	2.1 W typical, 5.3 W max

## 12. Espresso® bus modules – DH01, DH02



The Espresso® bus is a deterministic peer-to-peer communications link used for signal exchange between local busses and any connected HMI through a gateway module.

For connectivity between local busses the left pictured DH01 module is utilized, which resides in the respective local bus. The Espresso® bus is a fiber optic based communication system.

At the physical layer, the bus forms a ring, interconnecting all devices on the bus, including the HMI gateway. In case the ring is opened due to damage to the fiber, or because a module has been removed from a rack, communications are self-healing. There is no master present on the bus. In order to achieve even greater availability, a 2<sup>nd</sup> ring can be added, which functions independently from the 1<sup>st</sup> ring. Thus, even large-scale interruptions of the physical layer will not lead to any noticeable degradation of availability.

The Espresso® bus may be deployed in both a simplex or redundant configuration up to 64 nodes.

Configuration of the module is through BlueLine® Tools with the capability of configuring the entire network from one central location.

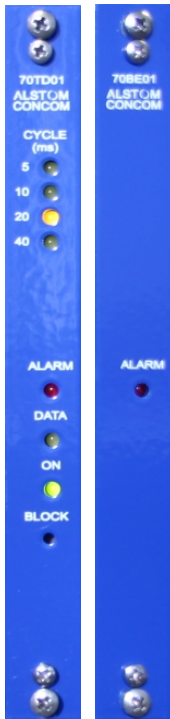
The Espresso® bus is the backbone of complete system upgrade in terms of bus-to-bus communication.



The Espresso® DH02 HMI gateway module is a stand-alone, din rail mountable electronic assembly. Communications on the Espresso® Bus are based on fiber optic media offering a throughput speed of 100 Mbit/s. Connectivity to the HMI utilizes a traditional Ethernet network interface, allowing up to 4 connections to one DH02 module. The DH02 module is also utilized for configuration and programming of all DH01's on the Espresso® network via BlueLine® Tools.

Part Number	70DH01	70DH02
Description	Fiber optic communications module	HMI Gateway module
Fiber Port Type	100 BASE-FX, MM-LC cable	100 BASE-FX, MM-LC cable
Ethernet Port Type	n/a	100 BASE-TX, RJ45
Transmission rates	100Mbit/s	100Mbit/s
Available address range	256 bus addresses at 20ms 496 bus addresses at 40ms	256 bus addresses at 20ms 496 bus addresses at 40ms
Fault indication	Front alarm LED, Status word & diagnostic disturbance word	Front alarm LED
Configuration programming	BlueLine® Tools	BlueLine® Tools
Power voltage supply	19.5 to 30 VDC	19.5 to 30 VDC
Power consumption	2.1 W typical, 5.3 W max	2.1 W typical, 5.3 W max
Fiber cable spec	LC fiber connector 62.5/125 or 50/125 mm multimode fiber / uses 1300 nm led Communications	

### 13. Bus traffic director & Bus end module – TD01, BE01



The bus traffic director TD01 is the address and clock signal generator card for the local bus. The modules mount into a local bus rack and receive communications and power from the local bus.

The local bus speed or local bus cycle time can be set with the bus traffic director to 5, 10, 20 or 40 ms. The bus cycle time determines the amount of available addresses on the local bus and is for 5 ms 64 addresses, for 10 ms 128 addresses, for 20 ms 256 addresses and for 40 ms 512 addresses.

The bus traffic director contains the source resistances at the beginning of a local bus. It is installed at the very beginning of a local bus, either singular (1 module) or in redundant mode; if latter, the two modules must be installed immediately next to one another, in slot 1 and 2 of the rack.

At the end of the local bus, a bus end module BE01 must be installed, as long as the bus extends over the length of more than one rack. Using the bus end module is recommended, but not mandatory for a single bus rack.

Part Number	70TD01	70BE01
Description	Bus traffic director	Bus end module
Bus cycle time (ms)	5, 10, 20 or 40 ms programmable	n/a
Fault indication	Front alarm LED & bus signal	Front alarm LED & bus signal
Configuration	Jumper settings	n/a
Power voltage supply	19.5 to 30 VDC	19.5 to 30 VDC
Power consumption	2.8 W typical, 4 W max	2 W typical, 3 W max

## 14. Bus isolation amplifier & Bus access module – IA01, BE02



The bus isolation amplifier module IA01, and bus extension module BE02 are designed to be inserted into separate local bus racks for the purpose of extending a bus beyond the standard 10ft / 3m maximum bus length, or when the total module count of a single bus exceeds 64 boards.

A pre-fabricated cable with terminations is used to connect to the front connectors on the two modules. The maximum length of this extension cable is 120 ft.

The resulting configuration is equivalent to a single bus with all addresses and data being shared among all connected racks in the bus.

The isolation feature of the IA01 module allows the local and remote racks to be powered independently.

Part Number	70IA01	70BE02
Description	Bus isolation amplifier	Bus access module
Fault indication	Front alarm LED & bus signal	n/a
Power voltage supply	19.5 to 30 VDC	19.5 to 30 VDC
Power consumption	3.5 W typical, 4.5 W max	n/a
Cable	12 Conductors (6 twisted pair), 24 AWG, Foil or Braid Shield with Drain Wire, Example Cable: Belden 1423A	
Connectors	D-Sub 15 Male, examples: AMP P/N 205206-9 & 1658540-2 or AMP P/N 747908-2	
Connectors Backshell	Backshell: AMP P/N 5748676-2 Spring Clip: AMP P/N 745255-2	
Twisted pair connections	1-2, 3-4, 5-6, 7-8, 9-10, 11-12	
Cable length	120 feet maximum	

## 15. Speed input module – SP01



The speed input module SP01 processes the pulse signals from the speed sensor, calculates the speed of the turbine, then based on user defined criteria outputs the speed measurement and other indications to the local bus. The module also provides two relay contacts for overspeed protection.

The speed input module provides:

- Overspeed detection with configurable overspeed limits and hysteresis
- Configurable stand-still supervision
- Acceleration supervision
- Loss of frequency detection
- Board/Module fault and Processor/Sensor fault detection
- Two 3NO/1NC potential-free change-over relay contacts, safety rated
- Relay contact testing feature
- Two analog speed output signals to the local bus for full range and zoomed range
- One binary output signal to the local bus for faults and supervisions alarms
- Non sequential bus addressing

The speed input module supports speed sensors from Jaquet type FTG 1087.00 xxx / FTG 1087.01 xxx, ABB XT 8160/ XT 8163, and Bentley Nevada 3300 series.

The speed input module can be configured to operate in the extended bus address range when operating in a 40 millisecond local bus, thus providing an additional 240 local bus addresses for process signaling and control

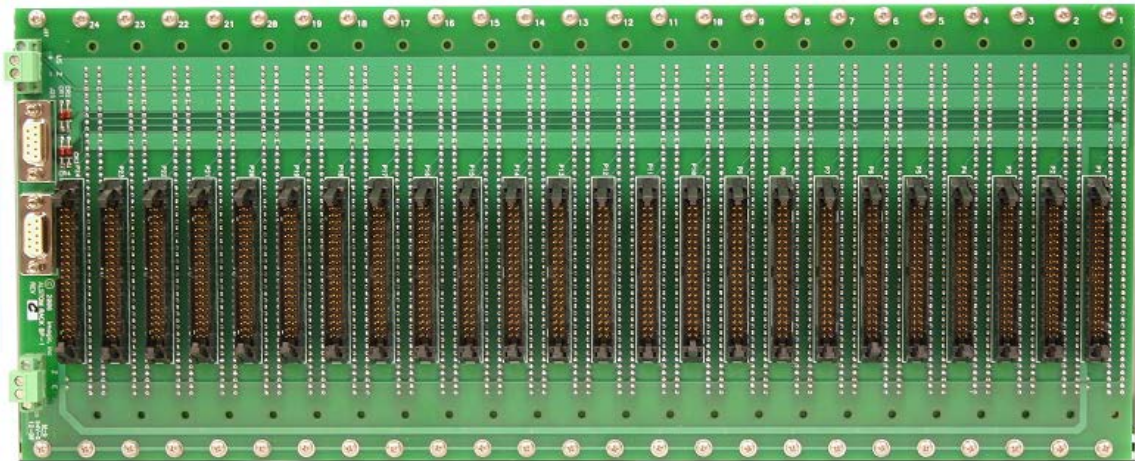
Using the front panel RS-232 port and BlueLine® Tools or the BlueLine® Configurator software tool, the modules can be monitored and configured for different operating modes and fault conditioning.

Part Number	<b>70SP01</b>
Description	Speed input module
Fault indication	Front alarm LED & bus signal
Relay contacts	Two 3NO/1NC potential-free change-over contacts
Resolution local bus signal	15 bit max corresponding to 1:32,768
Speed wheel teeth	Variable from 1 to 255
Analog local bus output	One address for the full range speed signal and one address for zoomed range speed signal
Binary local bus output	One address for fault and supervision alarms
Available address range	256 bus addresses at 20ms 496 bus addresses at 40ms
Speed sensors	Jaquet type FTG 1087.00 xxx / FTG 1087.01 xxx ABB XT 8160/ XT 8163, Bentley Nevada 3300 series
Configuration	BlueLine® Tools, BlueLine® Configurator
Power voltage supply	19.5 to 30 VDC
Power consumption	3.7 W typical, 5 W max

## 16. Local bus rack (IDC) – RK01



Front view



Rear view

The local bus rack contains 24 single slots. It provides the power supply and communication to each BlueLine<sup>®</sup> module.

The rack requires an external 24VDC power supply.

A local bus can include several racks where the local bus of all racks needs to be interconnected with local bus cables.

The first rack will require a bus traffic director in slot 1 and the last rack will require a bus end module.

I/O's are connected to the back of the rack with standard IDC connectors (see also local bus rack signal cable).

Part Number	<b>70RK01</b>
Description	Local bus rack
Module slots	24 (single)
Power voltage supply	19.5 to 30 VDC
Power rating	10 A max

## 17. Local bus rack signal cables for BlueLine® modules (IDC)



To terminate to the IDC connectors at the back of the BlueLine® rack the following signal cables can be ordered:

UICD640013Rxxxx for all binary modules  
 UICD640014Rxxxx for all analog modules  
 UICD640015Rxxxx for serial connections  
 UICD640016Rxxxx for CP01/TD01/BE01 modules  
 UICD640017Rxxxx for Redundant processor connections  
 UICD640019Rxxxx for bus to bus marshalling with SI cards

The signal cable comes standard lengths as outlined below, however, can be ordered with custom lengths. For custom length orders; Rxxxx = xxxx feet

For each module one cable is required, for redundant processors and bus to bus marshalling one cable per pair of modules is required.

Rack Extension cables – 1ft DB9 M/M cable. (Can be ordered through 'Cables to go' Product # 25219)  
 Cable details – connectors DB9 Male to DB9 Male, fully shielded, fully molded connectors with thumbscrews, all lines are wired straight through

Part Number	<b>UICD640013R0010</b>	<b>UICD640014R0010</b>
Description	Signal cable for binary modules	Signal cable for analog modules
Length	10 feet	10 feet
Connectors	IDC (rack side) and IDC (terminal block side)	IDC (rack side) and IDC (terminal block side)
Remarks	One signal cable per binary module is required	One signal cable per analog module is required
Part Number	<b>UICD640015R0008</b>	<b>UICD640016R0008</b>
Description	Signal cable for SI01 serial connections	Signal cable for CP01/TD01/BE01 Module disturbance outputs
Length	8 feet	8 feet

Connectors	IDC (rack side)	IDC (Rack side)
Remarks	One signal cable per SI01 module Can be used for RS232 / RS422 / RS485 connections	One signal cable per module is required
Part Number	<b>UICD640017R0008</b>	<b>UICD640019R0004</b>
Description	Signal cable for a two processors in a redundant configuration	Signal cable for Bus to Bus marshalling using Serial interface cards
Length	8 feet	4 feet
Connectors	IDC both sides	IDC both sides
Remarks	One signal cable per processor pair	One signal cable per SI module pair

## 18. Local bus rack terminal blocks for binary and analog modules



Terminal block for binary modules  
FLKM34



Terminal block for analog modules  
FLKM20

To connect to the signal cables for the BlueLine® rack the following terminal blocks can be ordered:

Phoenix Contact® FLKM34 for all binary modules  
Phoenix Contact® FLKM20 for all analog modules

The terminal blocks can be mounted on a DIN rail.

Part Number	<b>Phoenix Contact® FLKM34</b>	<b>Phoenix Contact® FLKM20</b>
Description	Terminal block for binary modules	Terminal block for analog modules
Terminal	34 Pin with IDC Connector	20 Pin with IDC Connector
Mount	DIN rail	DIN rail
Remarks	One terminal block per binary module is required	One terminal block per analog module is required

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