MOST Ethernet™ BIM

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8521-EB-MT

The MOST Ethernet Bus Interface Module (EBIM) is a rugged, field-mountable platform intended for remote I/O mounting in harsh and hazardous process applications. The Ethernet BIM supports full redundant operation, with provisions for redundant communications and automatic switchover to the standby EBIM if required. The EBIM supports a HART pass-through capability, which can be used for remote maintenance of HART field devices.

Overview

The EBIM can be used in two communications modes: with MODBUS TCP as remote I/O to another host system, or with high-speed peer to peer communications as remote I/O in a MOST Control system.

When using MODBUS TCP, the EBIM acts as a slave, communicating over Ethernet in RTU mode at speeds of 10/100MB. Combined with the MTL 8000 Process I/O™ system components, it offers cost savings over control-room mounted systems as well as flexible system design and high system availability. An EBIM can utilize off-the-shelf HMI packages, including Wonderware, Intellution and Cimplicity.

In a MOST Control system, an EBIM system can be used as remote I/O node to a MOST system Controller. When used in a MOST Control system, all remote EBIM nodes are configured as if part of a local I/O system, providing a single integrated configuration of all I/O nodes in the system, whether local or remote. Data is passed efficiently to the controller from the EBIM using high-speed peer to peer communications.

Applications

The remote-mounted EBIM node is an ideal solution for all types of process applications, including the following industries: chemicals, petrochemicals, water and waste water, oil and gas (especially off-shore applications), pipeline, power generation, electrical distribution, food and beverage, cement and pulp and paper.

Benefits

Reduced cable costs

Instrumentation cable pairs terminate locally instead of being run across the plant to the control room. Heavy, expensive sensor cables are replaced by the LAN cable.

Reduced termination costs

Field wiring goes directly to the I/O terminals in the local field enclosure – no addition-al cross wiring to marshalling panels. Integrated IS capability mixed with general-purpose signals, together with integral tagging and fusing options, dramatically reduce engineering and design costs.

Flexible system design

Combine analog and discrete modules for maximum flexibility and use of space.

High system availability-easy maintenance

Maximize up-time by incorporating redundant EBIMs, power supplies and net-work connections. 'Hot swap' modules, without affecting system operation or reconfiguring, even in hazardous areas.

On-line changes

The EBIM allows on-line configuration changes during testing, start-up, and maintenance phases. This significantly accelerates system start-up and reduces operation downtime.

The Ethernet BIM platform

The Ethernet BIM incorporates a rigorous redundancy model, HART® capability and a fault tolerant Ethernet implementation to manage communications on the process network and deliver reliable system operation in your application. Process I/O™ is a field-mounted distributed I/O system that provides an intelligent interface between field-mounted instrumentation and the Host system. Process I/O™ interfaces to virtually all process signals including HART®, providing a complete solution for your I/O needs. The complete platform has an environmental specification capable of surviving conditions out in the plant. It is built for harsh process applications, being shock and vibration resistant, operating over the industrial -40°C to +70°C temperature range that is typically associated with field transmitters, and meeting ISA's stringent G3 corrosion resistance requirements. The EBIM and I/O components can all be mounted directly in Division 2/Zone 2 hazardous areas and, when required, can provide a cost effective intrinsic safety solution. Because the system can be mounted in the field, it can also provide extensive cost savings by eliminating the need to wire all sensors back to a central controller. With the EBIM and its I/O mounted in the field, the only wiring back to a control room is the high-speed network.

Redundancy

Redundant EBIMs can be used for critical applications. The master/standby pair operate in a rendezvous redundancy mode with frequent status checks to assure a rapid and bumpless transfer to the standby if required. The redundancy model supports on-line configuration and on-line firmware changes, where any updates are shared between controllers in real-time, resulting in an easy to use redundant system.

The EBIM also supports LAN redundancy. A fully redundant local area network (LAN) can be provided where each EBIM has two independent Ethernet ports connected to two separate independent networks. The EBIMs monitor the networks' health and will switch between networks when they detect a problem.

Redundant power supplies are available to provide power for critical applications that must not shut down if a power supply malfunctions.

Peer to peer communications

The EBIMs can communicate with MOST Controllers on a peer-to-peer basis, removing the need for all data to be passed through the control room.

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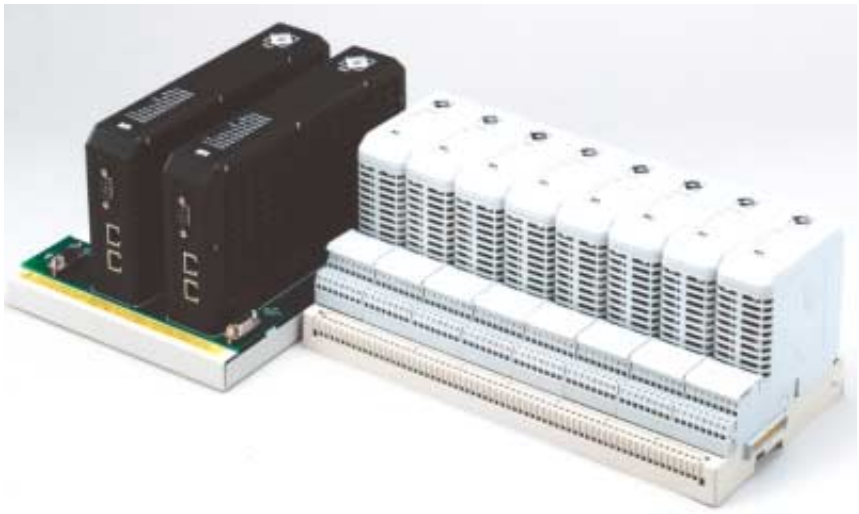
- *redundancy with bumpless transfer*
- *dual-redundant high-speed Ethernet™ connections*
- *field mountable in harsh process environments*
- *peer to peer communications*
- *on-line configuration and reconfiguration*
- *HART® passthrough of process and status variables*
- *integrated general-purpose and IS signals*



EBIM redundancy

Redundant EBIMs can be used for critical applications. The redundant EBIM pair operates in parallel, checking status multiple times through the processing loop enabling the backup EBIM to continuously monitor the health of the master EBIM, assuring a rapid and bumpless transfer to the standby EBIM.

Network redundancy

In addition to EBIM redundancy, the MOST EBIM has two high-speed Ethernet ports to provide security of communication. Each port can be connected to an independent LAN, which is continuously monitored for its integrity. If the primary port detects a network failure, traffic is immediately switched to the other LAN to maintain full communication.

Downloadable configurations

The EBIM is configured over Ethernet with a PC running MOST Workbench Software. The configurations are held in non-volatile memory to enable them to be restored automatically after power cycling of the EBIM. The use of a redundant EBIM also enables a new configuration to be downloaded to the standby unit while the process continues. When the download has been completed and verified, the standby can be switched to master status to employ the new configuration.

Serial control interfaces

The MOST EBIM is equipped with two serial ports for the exchange of data with HMI Servers, typically as a MODBUS slave, and with HART® management applications.

Failsafe and automatic cold start

In the event of complete loss of communication the EBIM and I/O will adopt user-defined failsafe states. Each output channel can be set to maintain last value or drive to a specific value (e.g. high or low when fail safe mode is adopted). In the event of power loss, the EBIM will perform a cold restart, which restores the system to a predefined status.

Peer to peer communications

EBIMs can communicate with MOST Controllers on a peer to peer basis, enabling them to share data with each other. This capability ensures that critical information can be efficiently shared between controllers instead of requiring data to be passed to each EBIM from the control room.

I/O module configuration

The EBIM receives full details of all the I/O modules in the node and stores the information in non-volatile memory. At start-up, the EBIM downloads to the modules their configuration details, which also include the failsafe states they should adopt in the event of communication failure.

Firmware updates

In keeping with its ability to maintain operations on a continuous basis, a redundant EBIM is also capable of receiving a firmware upgrade while in the field. When the upgrade has been confirmed as successful, the EBIM can be returned to full operation as a master or as a protective standby.

HART® passthrough

The MOST EBIM has the ability to pass smart HART® information from field devices to a separate PC workstation, which allows you to readily interface to asset management software applications, to remotely manage the HART® information contained in your HART®-based field instruments. The MOST EBIM works with a variety of asset management packages, including Applied System Technologies' Cornerstone software or Emerson's Asset Management

Solutions. HART® passthrough is supported via a serial port and will soon be available over the Ethernet control network. Consult MTL for availability of the Ethernet solution.

Environmental stability

Like all of the MTL 8000 series equipment, the MOST EBIM is designed for use in harsh environments. It operates over a temperature range of -40°C to +70°C and is resistant to shock, vibration and corrosive environments.

Hazardous area operation

The MOST EBIM is designed also to operate in Class I, Division 2 and Zone 2 hazardous areas and its I/O modules can have field wiring extending into the more hazardous Division 1, Zone 1 and Zone 0 areas.

Grows as your needs grow

The system is scaleable to your needs. You can add modular I/O to your system as your needs increase. Redundant controllers can be added without the need to power off your system the backup controller powers up automatically and is seamlessly brought online.

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MTL Process I/O™ hardware

Overview

MTL8000 is a completely modular I/O solution for both general purpose and hazardous area applications. It is based on a carrier system that supports a range of modules and offers a wide variety of I/O functions, including AC mains and intrinsic safety signals, even within the same node.

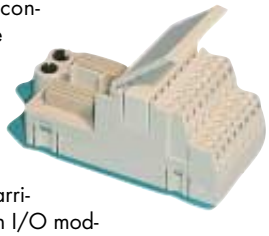
I/O Modules

I/O modules transfer signals to and from field instruments. Input modules receive signals from transmitters and sensors and convert them into a digital form for presentation to the Controller.

Output modules receive commands from the Controller and transfer them to actuators. A wide range of modules is available, including types for low-level instrumentation, AC mains and intrinsically safe signals. I/O modules typically have 4, 8 or 16 field channels.

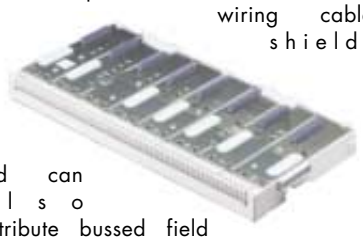
Field terminals

Field terminals provide the interface between the I/O modules and the field wiring. They include fusing and loop-disconnect as options. A mechanical keying system prevents an I/O module from being connected to the wrong type of field terminal. Field terminals mount onto the module carrier, one to each I/O module. They are clamped firmly by the I/O module to form an electrical and mechanical assembly of high integrity. They may be replaced in service without removing carriers or disturbing the operation of other modules.



Carriers

Carriers form MTL8000's physical and electrical backbone by providing a mounting to support and interconnect the EBIM, power supplies, I/O modules and field terminals, and carry the address, data and power lines of the internal Railbus. They provide termination points for the LAN and field wiring cable shields and can also distribute bussed field power to the I/O modules. I/O module carriers are available to support four or eight I/O modules.



System power supplies

System power supplies are available for the node to convert local AC or DC supplies to power the node or provide field power for I/O modules. MTL's innovative Bussed Field Power scheme for distributing field power avoids complex wiring at the field terminal and minimizes the carrier wiring.

'HART-ability'

The use of 'smart' instruments on process plants is growing but this investment is not always fully exploited. Whether it is for a new installation, or the upgrade of an existing one, MTL has solutions that provide the connections between the HART field instruments, the control systems and the process automation maintenance software. Specifically, the MTL8000 Process I/O system has been designed to be transparent to HART signals, thus allowing the host control software and any HART field instruments to communicate directly with each other. In addition, MTL's HART connection system provides on-line access from a PC to the HART field devices for monitoring device performance. HART devices may be selected for regular status monitoring and alerts can be issued if the status changes.

The benefits from this approach are:

- reduced commissioning time and cost
- reduced process downtime through status monitoring
- power loop maintenance costs by using field device diagnostics

MTL8000 in your system

Each node can address up to 64 I/O modules which, depending upon the number of channels per module, can provide up to 1024 I/O points at a single node! A node can consist of a mixture of analog and discrete modules, giving maximum flexibility to the system designer. Full HART pass-through is provided, making the MTL8000 appear "transparent" and thus allowing the inquiring "agent" to access the HART capabilities of field instruments.

Minimum downtime

MTL8000 has been designed to increase availability and minimize downtime. As mentioned earlier, redundant controllers, LAN Channels and power supplies can be specified as options to increase system availability. Possible downtime is further reduced by ensuring that the system components that use active circuitry can be removed and replaced quickly and easily. Even the field terminals can be replaced without interrupting the operation of adjacent I/O modules. Carriers have no active circuitry and are unlikely to need replacement.

Hazardous area applications

The MTL8000 is a truly field mountable system even in areas where flammable gases are present. It is available in versions to suit different area classification schemes:

a) Equipment and field wiring located in general purpose areas, Class 1, Division 2 hazardous locations or Zone 2 hazardous areas.

b) Equipment mounted in general purpose areas, Class 1, Division 2 hazardous locations or Zone 2 hazardous areas, with field wiring located in Division 1 hazardous locations or Zone 0 hazardous areas.

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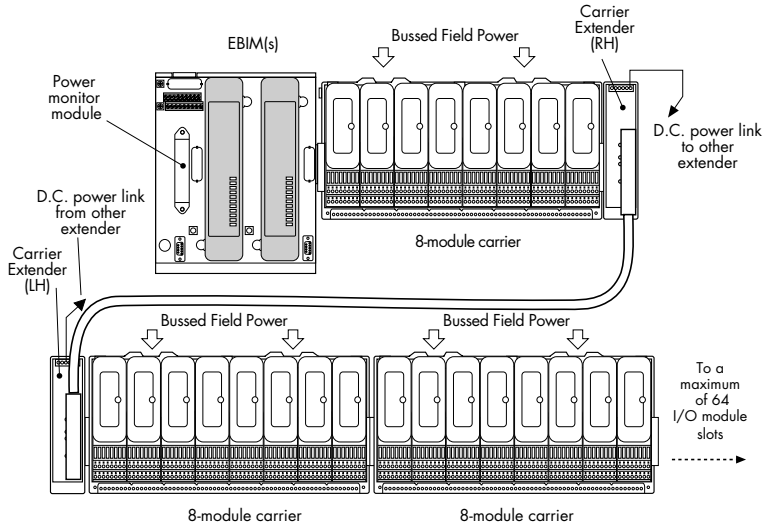

Figure 1 General purpose & Div 2 node configuration

MODBUS SOFTWARE

The implementation of the Modbus protocol in the Ethernet BIM is according to Revision 1.0 of the Open MODBUS/TCP specification. Only RTU mode is supported. The BIM supports the Modbus function codes that are required to read and write input, output and status data, and also supports a number of special features which have been implemented to allow high integrity system operation and in-situ maintenance.

MODBUS FUNCTIONS

Read Coil Status (Function 01)

Reads a range of single-bit flags that show the status of Discrete Output channels. This allows the host to confirm the states to which the BIM has set the Discrete Outputs.

Read Input Status (Function 02)

Reads a range of single-bit flags that show the status of Discrete Input channels. This allows the host to monitor the latest reported state of the Discrete Inputs.

Read Holding Registers (Function 03)

Reads a range of 16-bit registers that contain the status of Analog Outputs. This allows the host to confirm the states to which the BIM has set the Analog Outputs.

Read Input Registers (Function 04)

Reads a range of 16-bit registers that contain the status of Analog Input channels. This allows the host to monitor the latest reported state of the Analog Inputs.

Force Single Coil (Function 05)

Requests the BIM to force a specified coil to a '1' or a '0'. This could be used, for example, to switch a DO channel or make it pulse.

Preset Single Register (Function 06)

Writes a 16-bit value to a specified BIM register - either to set an Analog Output or to preset a DI counter.

Return Diagnostic Register (Function 08)

Requests that the slave reads the contents of its diagnostic register and returns the binary data values to the master, according to the specified sub-function code; i.e. Return Query Data (00) or Return Diagnostic Register (02).

Force Multiple Coils (Function 15)

Requests the BIM to force a specified range of coils to a '1' or a '0'. This could be used, for example, to switch DO channels or make them pulse.

Preset Multiple Registers (Function 16)

Writes a 16-bit value to a specified range of BIM registers - for example to set Analog Outputs.

Report Slave ID (Function 17)

The Report Slave ID function permits the user to obtain information on the slave type and 'RUN' status.

ETHERNET BIM SPECIFICATION

LAN INTERFACE

Transmission medium .....100BaseTX or 10BaseT Ethernet™
Transmission protocol
....Modbus™ over high-speed Ethernet™
Transmission rates .....10 - 100 Mbits/s
LAN connector type (x2) .....RJ 45 (8-pin)
LAN isolation (dielectric withstand) .....1500 V
Action on software malfunction .....Halt CPU / Reset CPU

SERIAL INTERFACES (COM 1 & COM 2)

Transmission rates.....1.2 – 115.2 kbits/s (async.)
Transmission standard .....RS485 half-duplex
COM 1 connector (on carrier).....9-pin D-type connector (F)
COM 2 connector (on controller)...9-pin D-type connector (M)

POWER SUPPLIES

Voltage .....10.9 – 12.6 V dc
Current .....0.4 A (typ.)
.....0.5 A (max.)
Railbus (12 V) via carrier.....15 mA (max.)

HAZARDOUS AREA APPROVALS

Location of equipment ..... Zone 2, IIC T4 hazardous area
.....or Class 1, Div 2, Groups A, B, C, D T4 hazardous location

Applicable standards:

- Factory Mutual Research Co., Class No. 3611 for Class I, Division 2, Groups A, B, C, D hazardous locations
- CSA Std C22.2 No.213 for Class I, Division 2, Groups A, B, C, D hazardous locations
- ATEX Category 3 (for Zone 2 installation) to EN50021:1999 protection type n.

See System Specification Guide for other parameters

MECHANICAL

Module dimensions .....69 (w) x 232 (l) x 138 (h) mm
Weight (approx.) .....1.35 kg

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