

Modbus protocol

8505-BI-MB

- ◆ links MTL8000 node to Modbus host LAN
- ◆ LAN speeds of up to 115.2 kbaud
- ◆ supports up to 32 I/O modules
- ◆ HART process and status variables via Modbus
- ◆ module status & channel status flags
- ◆ automatic scan optimisation
- ◆ configuration data held in non-volatile memory
- ◆ software configurable via local port or LAN B
- ◆ HART® maintenance via comms adaptor

MODBUS SOFTWARE

The implementation of the Modbus protocol in the MTL8000 Series is according to Revision G of the Modicon Specification. Only RTU mode is supported.

Communication speeds of up to 115k baud are possible with single LAN systems, 57k baud with twin connections. The LAN node address is set by configuration.

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.

DUAL LAN OPERATION

While LAN-A is the primary port for host communications, a second host may be connected to LAN-B as either an active or a passive standby in a redundant configuration. This is intended to provide fault tolerance against failure of either the primary host or its associated LAN connection.

Active Standby mode is intended for use with a simple pair of duplicated hosts.* Passive Standby mode is for a "redundant host pair" where Host B is capable of detecting the failure of Host A or LAN-A and taking action to assume active control.

A further mode of operation "Dual Comms" allows two hosts simultaneous read/write privileges. This is appropriate for manual control via duplicate HMI/SCADA workstations.

LAN-B may also be used for remote configuration and maintenance of both an MTL8000 sub-system and intelligent (HART) field devices connected to the I/O modules.

DIAGNOSTIC AND STATUS INFORMATION

The BIM provides detailed information relating to the status of the BIM, the health of I/O modules and the status of I/O channels. Depending on the I/O module type, information such as high and low alarm, open circuit and line fault is reported.

AUTOMATIC SCAN OPTIMISATION

The gathering of input data from the I/O modules and the issuing of output data to them is not determined by a fixed scan rate. A scan optimisation algorithm is used to gather and distribute data virtually as soon as it becomes available. A maximum scan period can be set for each module to ensure that the data is collected within this defined time period.

*In this mode of operation, writes to outputs are inhibited on the secondary LAN during normal operation but enabled if the BIM detects failure of the primary LAN.



PACKED DATA MAPPING

The dynamic data that is exchanged with the host application is mapped to consecutive memory locations. This eliminates the need for piecemeal read and write commands to separate data locations. A single Modbus read instruction will gather all of the current data from the BIM, resulting in a rapid interchange of information between the node and the host. Writes to the BIM's database can similarly be made with a single command.

HART DEVICE MAINTENANCE

Pass through messaging to HART devices is available via the local configuration port and the 8512 HART Comms interface. This allows multi-dropping of a number of BIMs on an RS485 link to a PC running AMS, Cornerstone™ and other instrument management software.

BUILT-IN NON VOLATILE MEMORY

The BIM contains a section of non volatile memory (NVM) in which the configuration is stored. At switch on, the configuration is copied from NVM into working memory and the BIM can then initialise itself together with the I/O modules.

NODE SERVICES MODULE OPTION

The BIM also supports the use of the 8510-MO-NS - Node Services Module - which can store a BIM's configuration. This enables the BIM to be swapped with another and, at switch on, the configuration from the NSM will be uploaded to the BIM and will overwrite its previous contents.

In addition, the NSM will monitor the dc supplies that power the node. If any power supply fail signal becomes active, the BIM receives a fault signal; a particularly important feature for systems having redundant power supplies. The failed PSU can then be identified quickly and replaced, restoring fault tolerant operation.

AUTOCONFIGURATION

The BIM has an autoconfiguration mode that can be triggered by a software command or by switches on the Node Services Module. This causes the BIM to delete its current configuration and reset the modules to their default values. The BIM then scans the Railbus and creates a new configuration file based upon the module types fitted and using their default values, which is then saved to NVM.

HART® is a registered trademark of the HART Communications Foundation. Cornerstone™ is a trademark of Applied System Technologies

Modbus protocol

8505-BI-MB

MODULE SPECIFICATION

LAN INTERFACE

Transmission protocolModbus (RTU mode)

Transmission rates1.2 - 115.2 kbits/s

By mode

Single LAN mode115.2 kbit/s (max.)

Passive standby mode115.2 kbit/s (max.)

Active standby mode.....19.2 kbit/s (max.)

Dual comms. mode19.2 kbit/s (max.)

Remote config mode19.2 kbit/s (max.)

Transmission standardRS485 or RS422

Bus Insulation.....500 V

Action on software malfunction

.....Halt CPU / Reset CPU

CONFIGURATION

The BIM can be configured either by using MTL's 8455-SW-CF software running on a PC or by transfer of a configuration from the 8510-NS-MO Node Services Module. An autoconfiguration option is also provided.

Address settingsoftware settable in BIM or

.....switch settable using 8510-NS-MO Node Services Module.

RESPONSE TIMES

Modbus message response time < 4 ms

LED INDICATORS

Power (green)

OFF	ON	Flashing
Power fail	Power OK	-

Fault (red)

OFF	ON	Flashing
Normal	Failsafe or fault	Configuration required

LAN A & LAN B (yellow)

OFF	ON	Flashing
LAN disconnected	Internal Comms. OK	No comms. or fault

Config. (yellow)

OFF	ON	Flashing
Configurator not connected	Configurator connected to local port	Configuring via LAN

Railbus (yellow)

OFF	ON	Flashing
Railbus fault	Railbus OK	-

POWER SUPPLIES

Railbus (12V) current260 mA (typ.)

.....300 mA (max.)

MECHANICAL

Module width63 mm

Weight (approx.).....320 g

See System Specification for other parameters.

MODBUS FUNCTIONS SUPPORTED

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.