

# ControlWave<sup>®</sup> Micro HART<sup>®</sup> / BTI Interface Module

The HART<sup>®</sup> (Highway Addressable Remote Transducer) / BTI (Bristol Transmitters) Interface Module is a plug-in I/O module allowing the ControlWave Micro (firmware version 5.0 or later) to communicate with both HART field devices (employing the HART protocol) and Bristol brand 3508 and 3808 multivariable transmitters (using the BSAP protocol).

The HART/BTI Interface module provides the following features and benefits:

- Improved measurement accuracy.
- Simultaneous analog and digital communication.
- Uses existing 4 to 20 mA current loop wiring.
- Digital communication handles multi-variable devices.
- Reduced cost per channel through multi-drop loops on single twisted pair cable.
- Point-to-point mode with 1-second update meets API 21 requirements.
- Plug-in I/O module supports both analog and digital communication to HART devices and analog devices.
- HART serial protocol communication support for devices with RS-485 ports.

The HART/BTI Interface Module has eight independent channels supporting HART, BTI (Bristol brand 3508 & 3808 transmitters), and 4 to 20 mA inputs. In addition, two of the channels may be configured for 4 to 20 mA analog output.

When configured as an input, a channel typically connects to a transmitter to receive pressure, temperature, or other measurements and is configured for use in point-to-point or multi-drop mode. When configured as an output, the channel can only be configured for use in point-to-point mode. The output supports a Digital Valve Controller (DVC).

In point-to-point mode, HART digital communications are superimposed on the 4 to 20 mA analog signal using the Frequency Shift Keying (FSK) technique. This mode allows communications with one HART device per analog channel. The 4 to 20 mA analog input can also be used to accurately read the primary process variable in control applications requiring a fast measurement update rate. The analog input may be read in addition to the digital values in that channel. The analog value is scanned ten times per second while the digital value is updated once per second.

In multi-drop mode, up to five HART devices can be connected (in parallel) to each analog input channel. As with the point-to-point mode, digital communications are superimposed on the 4 to 20 mA signal. However, the analog signal is not used for variable measurement. The HART/BTI module polls all eight channels simultaneously. If more than one device is connected to a channel in a multi-drop configuration, the module polls one device per channel at a time. The module polls each device at least once per second, so with five devices per channel the maximum poll time for the channel is five seconds for all five devices.

A ControlWave Micro equipped with a HART/BTI module is considered to be a HART Host (primary master) interface with a Conformance Class 1 (CC1) classification. This also allows a secondary master (typically a PC or hand held calibrator) to communicate simultaneously to the field device.



*ControlWave HART/BTI Interface Module*

Most Universal and some Common Practice commands are supported.

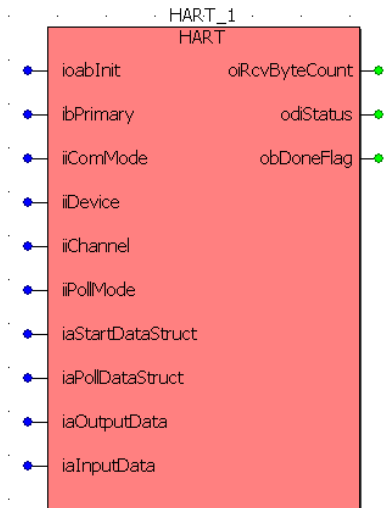
- Universal commands are implemented in all HART field devices.
- Common practice commands are implemented in most, but not necessarily all HART field devices.

The supported commands conform to HART Universal Command Specification Revision 5.1 and Common Practice Command Specification Revision 7, (HCF SPEC 127 & 151). Refer to [www.hartcomm2.org](http://www.hartcomm2.org) for more information on the specifications.

## Interfacing to HART devices

ControlWave Designer includes an ACCOL III HART Function Block as the interface for accessing data from HART devices. The HART function block operates as a master to the remote HART devices and can be used to provide communications through a serial communication port or through a HART/BTI module. The HART communications provided by this function block are based on Revision 7 of the HART Protocol Specification.

### HART Function Block



*Preconfigured HART Function Block*

The HART Function Block is preconfigured to return the common parameters shown below:

- Device type
- ID
- Write and read Tagname
- Serial number
- Write and read User message
- Write and read Descriptor
- Four process variables
- Transducer limits and span
- Units
- Variable limits and ranges
- Loop current
- Damping value
- Update interval
- Communication status

User-defined messages can be configured to read and write additional parameters beyond what is pre-configured in the data structure.

## Interfacing to 3508 and 3808 multi-variable transmitters

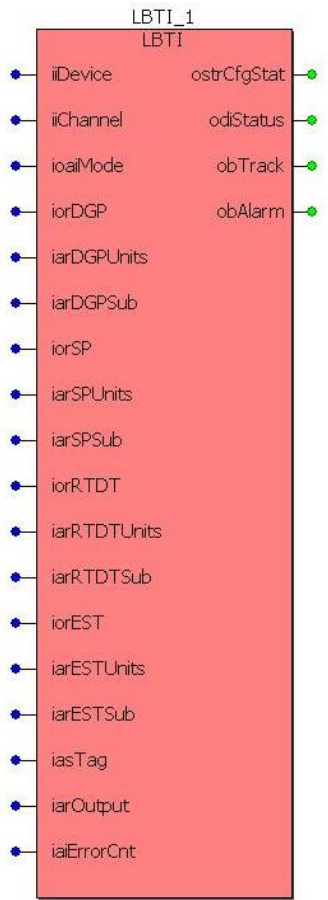
ControlWave Micro can communicate in point-to-point mode to 3508 and 3808 transmitters through the HART/BTI module and also through a RS-485 serial communication port. In both cases, there are two ControlWave Designer Function Blocks available to read and write to the transmitters.

The XMTR\_Interface ACCOL III module also provides read/write access to additional transmitter parameters such as DP and static pressure ranges, zeros and spans, local address, tag name, units, and more.



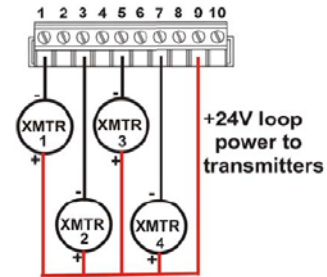
*Preconfigured XMTR Function Block*

The LBTI function block provides peer-to-peer list data transfer allowing access to the DP, P, T, sensor temperature, and status signal variables in the transmitters.

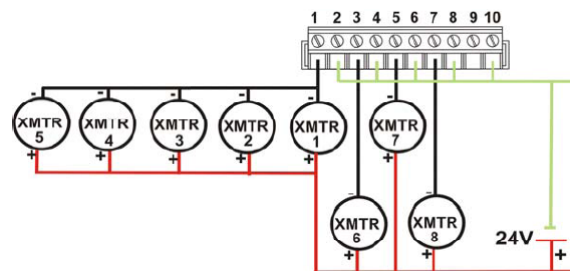


Preconfigured LBTI Function Block

## HART/BTI Interface Module Wiring Diagrams



Internally sourced Point-to-Point wiring diagram



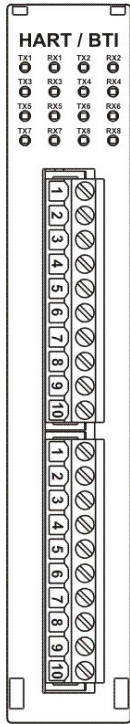
Externally sourced Point-to-Point and Multi-drop wiring diagram

## Compatibility

The HART/BTI interface is compatible with all versions of ControlWave Micro CPUs, system controller modules, and base chassis. It may also reside in the 2-, 4-, and 8-slot expansion bases. However, it is not supported in the Distributed I/O Expansion chassis containing the Communication CPU.

# ControlWave Micro HART/BTI Interface Module

## Field Wiring Terminals



Terminal	Label	Definition
(TB1) 1	1	CHANNEL 1
(TB1) 2	2	ISOGND
(TB1) 3	3	CHANNEL 2
(TB1) 4	4	ISOGND
(TB1) 5	5	CHANNEL 3
(TB1) 6	6	ISOGND
(TB1) 7	7	CHANNEL 4
(TB1) 8	8	ISOGND
(TB1) 9	9	+24V
(TB1) 10	10	24VRET
(TB2) 1	1	CHANNEL 5
(TB2) 2	2	ISOGND
(TB2) 3	3	CHANNEL 6
(TB2) 4	4	ISOGND
(TB2) 5	5	CHANNEL 7
(TB2) 6	6	ISOGND
(TB2) 7	7	CHANNEL 8
(TB2) 8	8	ISOGND
(TB2) 9	9	+24V
(TB2) 10	10	24VRET

### Inputs/Outputs

Quantity	Inputs	8 total channels selectable as HART, BTI, or 4 to 20 mA inputs.
	Outputs	2 channels can be selected for 4 to 20 mA output.

### HART Channels

Protocol	Serial HART and FSK over 4 to 20 mA current loop.
Connection	Multi-drop up to five HART devices per channel.
Baud Rate	1200 baud.
Update Rate	1 second update per primary device.

### BTI Channels

Protocol	Serial BSAP and FSK over 4 to 20 mA current loop.
Connection	Point-to-point to 3508 or 3808 transmitters.
Update Rate	1 second update per primary device.

### Analog Inputs

Type	Internally or Externally sourced 4 to 20 mA current loop.
Resolution	14 bit.
Loop Power	160 mA loop supply for up to 8 transmitters.

Input impedance	250 $\Omega$ - 4 to 20 mA.	
Input Filtering	2 Hz to filter FSK signal.	
Conversion Time	20 ms/channel.	
Settling time	600 ms to 0.1% of input.	
Input accuracy	0.1% of span at 25°C (77°F). 0.2% of span -40°C to 70°C (-40°F to 158°F).	
Normal Mode Rejection	30 db at 60 Hz.	
<b>Analog Outputs</b>		
Quantity	2 selectable.	
Type	4 to 20 mA current sink (650 maximum drive).	
Resolution	10 bit.	
Accuracy	2% of span at 25°C (77°F). 3.0% of span -40°C to 70°C (-40°F to 158°F).	
Settling Time	200 ms to 99.9% of setpoint.	
<b>Power</b>		
Consumption	0.82 watt plus 0.57 watt/transmitter @ 20 mA.	
Surge Suppression	30 Vdc transorb between signal and ground.	
Isolation	500 Vdc channel to bus.	
<b>Physical</b>		
LED Indicators	XMIT & REC per channel.	
Terminations	Local	Two 10-point terminal block assemblies
	Remote	Two 14-pin mass termination headers
Dimensions	152.4 mm H by 25.4 mm W by 88.9 mm L (6 in. H by 1 in. W by 3.5 in. L).	
Weight	159 g (5.6 oz).	
Wiring	Up to 16 gauge wire size at the terminal block.	
<b>Environmental</b>		
Same as the ControlWave Micro in which it is installed.		
<b>Approvals</b>		
Same as the ControlWave Micro in which it is installed.		

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