



Delivering valuable
process data from
HART[®] field devices

Crouse-Hinds
by **EAT•N**



MTL, a leader in reliability, efficiency and safety

MTL HART® Connection Systems

MTL, part of Eaton's Crouse-Hinds business, is recognized as a world leader in the development and supply of intrinsic safety solutions for harsh, hazardous and industrial environments. Distinguished by its global network of sales and support centres, MTL engineers and professionals are accessible wherever you are, providing experience and expertise to help solve your challenges.

Now combined with Eaton, we provide the world's largest portfolio of electrical equipment for explosive, classified, and industrial areas. With unsurpassed product reliability and quality, industry leading innovation and product efficiency, and products designed and certified for global specifications, Eaton's Crouse-Hinds solutions, including MTL products, delivers proven solutions for harsh and hazardous environments.

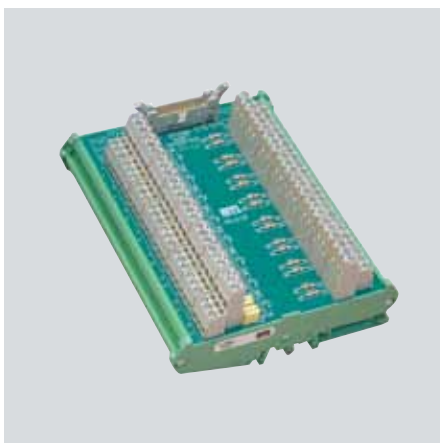
MTL's solutions for HART® connection systems include a comprehensive range of reliable products, software, services and training

MTL's HART connection solutions are designed to optimize productivity, reduce plant costs, increase safety and enable better management of plant assets.

MTL provide the HART connection between your field devices, your control system and instrument management software packages. Our HART connections strip the HART digital signal from the analogue 4-20mA signal (which passes to the control system unscathed) and sends it directly to your maintenance PC.

This gives you access to the benefits offered by the latest powerful configuration and predictive maintenance software.

The world's leading companies rely on MTL to protect their business and their personnel because MTL's high quality, reliable, HART solutions integrate easily with existing components and systems.



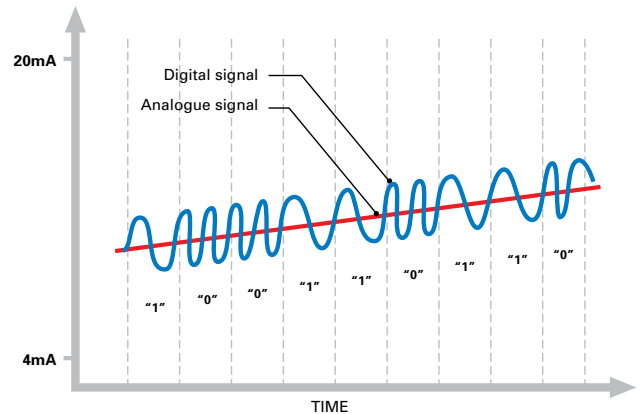
HART 
COMMUNICATION PROTOCOL

HART is a registered trademark of HART Communication Foundation

What is HART?

Introduced in 1989 "HART" is an acronym for Highway Addressable Remote Transducer. HART is an open protocol and makes use of the Bell 202 Frequency Shift Keying (FSK) standard to superimpose digital communication signals at a low level on top of the 4-20mA. This enables two-way field communication to take place and makes it possible for additional information beyond just the normal process variable to be communicated to/from a smart field instrument.

The HART protocol communicates without interrupting the 4-20mA signal and allows a host application (master) to get two or more digital updates per second from a smart field device. As the digital FSK signal is phase continuous, there is no interference with the 4-20mA signal.



What does HART give you?

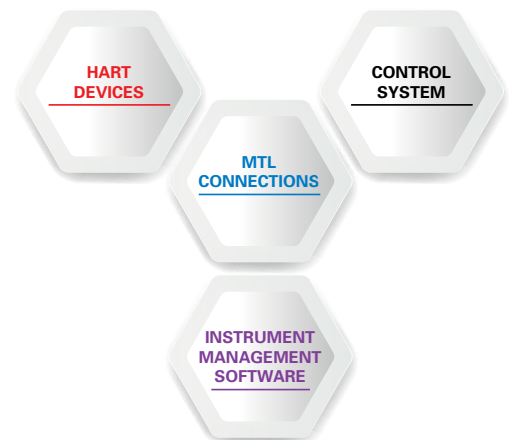
There are millions of HART devices installed in process plants worldwide and each contains valuable data which can enable better management of plant assets, helping to reduce commissioning, maintenance and documentation costs.

To communicate with HART devices and extract this data a wide range of powerful Instrument Management Software has been developed by a number of different manufacturers e.g. AMS, FieldCare, PACTware, PDM, Fieldmate, etc. These software packages offer online continuous communication with your HART devices simplifying configuration, calibration, diagnostics, predictive maintenance and automating documentation etc.



HART Connections

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HART Connections

For Traditional Point to Point Installations

A typical MTL485x HART Connection will consist of the following three components:

1. A HART Communication Board to provide a physical connection - HART Connection Unit for safe area applications or intrinsically safe backplane for hazardous area applications.
2. HART Multiplexer to route the communication between the maintenance PC and the HART devices.
3. HART Backplane to mount the HART multiplexer modules.

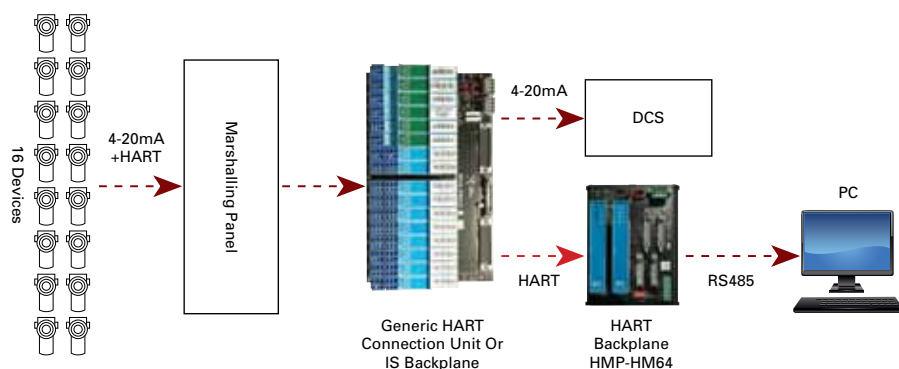
The HART Communication Board is the link between the HART field devices and the HART backplane. Normally a 16 channel board, it accepts either analogue input or output signals maintaining channel to channel isolation between each.

The HART multiplexer is the brains of the system. It provides the HART data interface between smart devices in the field and HART instrument management software run on a PC. The modules connect to the field devices via either HART connection units or Intrinsic Safety (IS) backplanes depending on the application.

The HART backplane is the backbone of the system. This small but vitally important board holds the MTL485x HART Modules which handle the HART multiplexing. Each board can communicate with a number of HART devices, typically from 16 to 64 per board.

The flexibility of the MTL485x and its ability to communicate with any of the instrument management software packages on the market today allows MTL the ability to offer the optimum solution for any application. Whether for general purpose or IS applications, retrofit or new installations, the versatile MTL485x system with its wide range of standard or customised backplanes and Hart Connection Units offers the best connection solution.

A simple system layout for a 16 channel system is illustrated below



1. HART Connection Unit



2. HART Interface Modules



3. HART Backplane

For Safe Area Applications

For safe area applications HART field devices are connected to the HART multiplexer via a range of HART Connection Units, the choice of HCU being dependent on the type and number of the HART field devices. The generic HART Communication Boards are generally mounted in series to the existing Field Termination Panel, see diagram 1, but in certain retrofit applications they can be mounted in parallel, see diagram 2 - Discuss with your MTL representative which is the most appropriate installation for your application.

Alternatively customised HCUs can be utilised to replace the existing Field Termination Panel thereby reducing the number of connections and simplifying the installation (see custom solutions - page 9)

Diagram 1. HCU installed in series

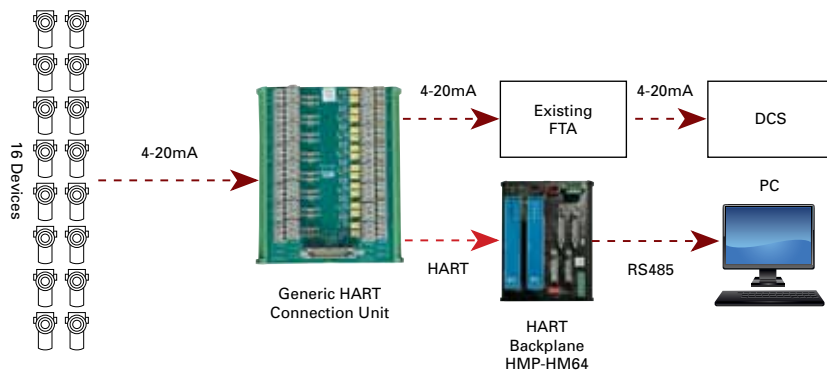
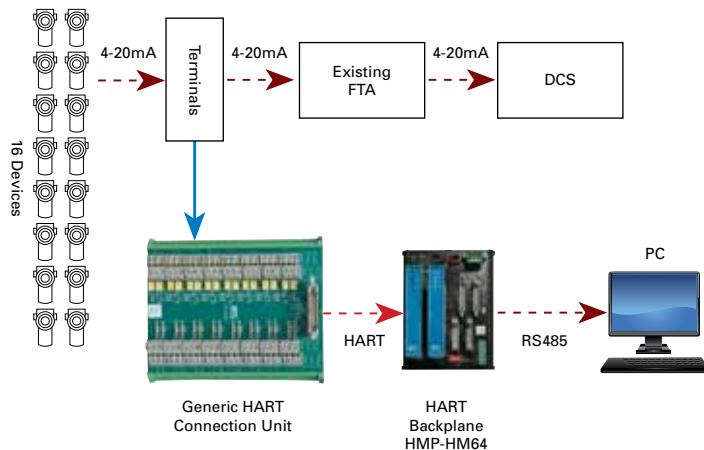
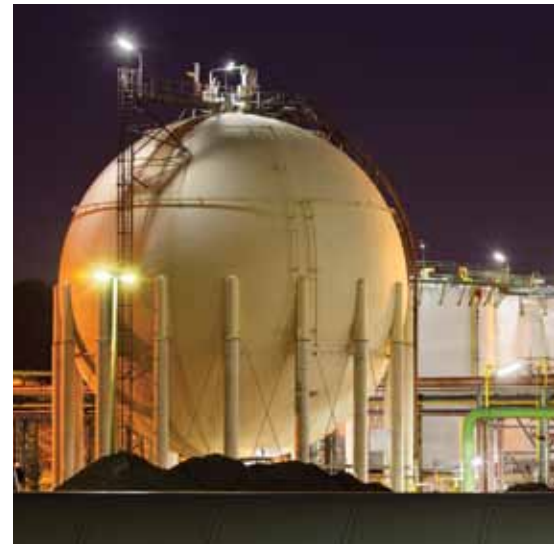


Diagram 2. HCU installed in parallel



Multiplexers offer an extremely flexible and reliable system which can handle anything from a handful to thousands of HART devices on one network



For Intrinsically Safe Applications

When HART field devices are mounted in the hazardous area the HART signal will have to pass through the IS Interface that is protecting the loop.

MTL offer a range of HART compatible zener barriers and galvanic isolators including:

- **MTL4500** - Galvanic Isolators - backplane mounting
- **MTL5500** - Galvanic Isolators - DIN rail mounting
- **MTL700 & MTL7700** - Zener Barriers

The MTL4850/51/52 are easily integrated with the MTL4500 range of backplane mounted galvanic isolators; connections and operation of this system is as simple as safe area applications.

Many general purpose and custom backplanes for analogue I/O signals are fitted with the HART connector to give simple connection to the HART backplane.



CPH-SC16 and HART modules



CPM16-SM331

MTL4500 Series backplanes provide both mechanical and electrical connections through the backplane. The advantages they offer include:

Integrated solutions incorporate	Benefits seen
Power distribution / Dual Supply connection / Power fail relay	Saves on wiring and installation time, Less chance of wiring error, Higher reliability, Peace of mind
Optional system connector	Saves money, no marshalling panel needed Easy integration gives less chance of wiring errors
Removable connectors	Easier maintenance
16mm module width to give high packing density	Saves money and panel space (Dual channel options)
Mechanical and electrical connection	Saves installation time, Less wiring, Less chance of wiring errors

All of the analogue input and analogue output interface modules in the MTL4500 and MTL4600 backplane mounted series, and the corresponding modules in the DIN rail mounted MTL5500 Series, pass HART communications. For example, any modules in the MTL454x range can be used to provide an Intrinsic Safety interface for signals to be connected to the HART multiplexers. Single and dual channel modules provide comprehensive options to match the particular application requirements.

Generic HART connection boards:

I/O Card Type	General Purpose Applications	Intrinsic Safety Applications
16ch Analogue inputs	HCU16	CPH-SC16 - fitted with screw connectors
16ch Analogue outputs	HCU16AO	CPH-SC16 - fitted with screw connectors
Mix of analogue inputs/outputs	HCU16AO	CPH-SC16 - fitted with screw connectors
16ch Analogue inputs	HTP-SC16	CPH-SC16 - fitted with screw connectors
32ch Analogue inputs/outputs	HTP-SC32	CPH-SC32

Custom Solutions

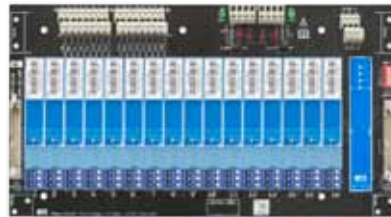
Some applications only require the use of a few HART field devices in a single location e.g. pipe line monitoring for RTU's. For these applications MTL can mount the HART multiplexer directly onto the HCU or IS Backplane.

Whatever the application, MTL have, or can design, an integrated solution to allow simple, flexible and space effective connection to your control system. Installations worldwide show that users everywhere recognise the quality and reliability of MTL Integrated Solutions.



HTP-SC32 and HTP-SC16

For general purpose applications of up to 32 analogue in or analogue out loops.



CPH-SC16/CPH-SC32

For IS applications, the interface modules can be mounted directly on the backplane alongside the IS isolators.

One of the simplest and most cost effective methods of integrating HART connections into a traditional point to point Process I/O solution is to install a customised HART connection board in place of the normal DCS Field Termination Panel. MTL manufacture a wide range of customised backplanes and HART connection units to replace the standard DCS termination boards and provide direct pickup of the HART signal. The MTL HART connection units have all the features of the standard DCS termination board with the addition of the HART multiway connector which links the board to the HART backplane. Additional features can be added as required.

- Channel to channel isolation
- Customised field and system connectors
- HART signal conditioning
- Variable number of channels
- Channel labelling
- HART filters for use in systems where the analogue output signal either interferes with HART data or may become unstable with the presence of the HART signal
- Variable number of channels

For Functional Safety Applications

Approved for applications to IEC61508:2010 edition 2, the MTL4850 HART multiplexers are ideal for use in safety related sub systems connected to loops up to SIL3.

MTL is an accredited Functional Safety Management company and the safety system designer is able to apply the MTL HART multiplexer equipment without concern as to suitability in safety systems.



HART 
COMMUNICATION PROTOCOL

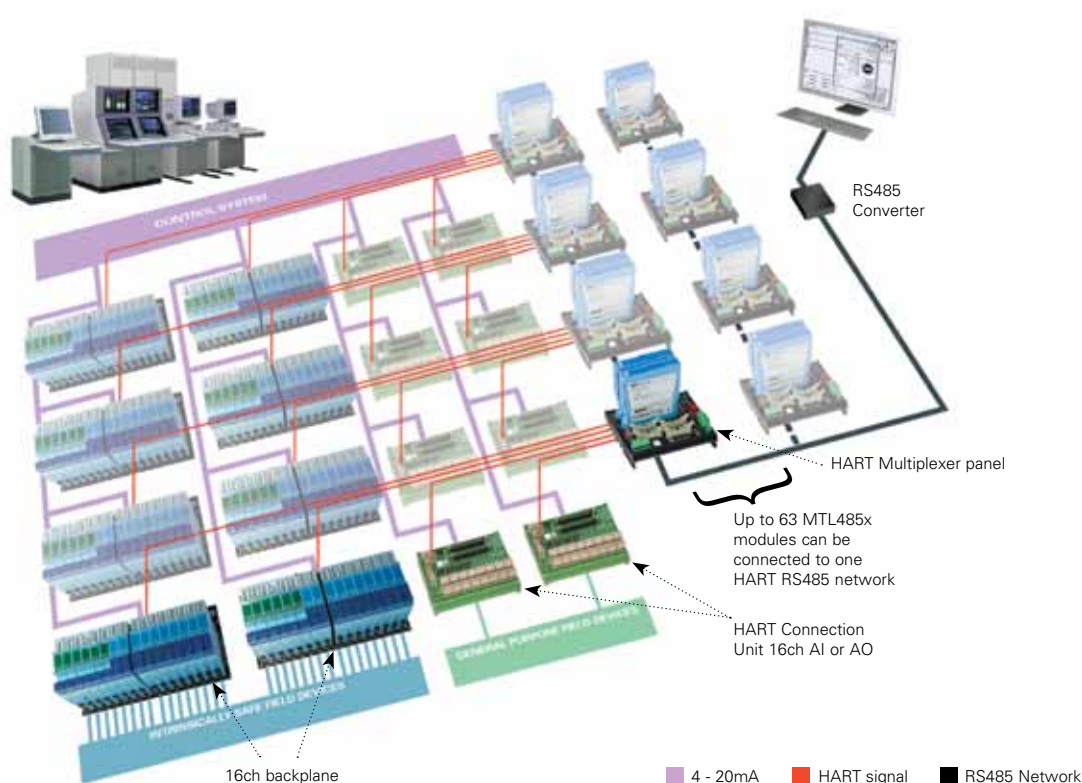
HART System overview

Integrating Devices and Systems

The MTL485x HART connection system provides the link between HART field instruments, the control system and the instrument management software package.

The MTL systems strip the HART digital signal from the 4-20mA signal (which passes to the control room unscathed) and sends it directly to a maintenance PC, thus giving access to the benefits offered by the latest powerful configuration and predictive maintenance software.

The illustration shows the architecture of the system and how it can be built to monitor either a few devices or many devices on one network. The connection boards detailed are our generic solution, however we offer a wide variety of connection units to allow full integration of the system whichever DCS, ESD or PLC is used on site.



MTL HART Multiplexer Series

There are three types of MTL HART multiplexer to meet different application requirements.

- **MTL4850** - 32 channel module, ideally suited for connection with safety shutdown signals.
- **MTL4854** - 32 channel multi-modem module, optimised for valve partial-stroke testing.
- **MTL4851/52** - 16 channel, modular, master/secondary format for larger control system use.





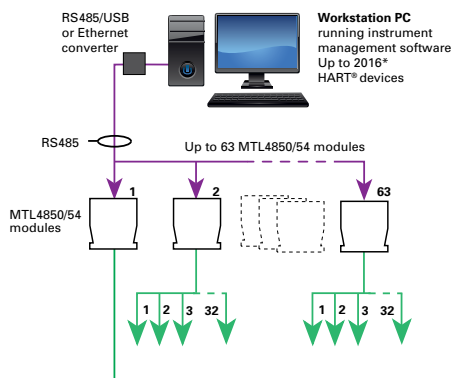
MTL4850 HART Multiplexer

MTL's HART multiplexers enable a communication channel to be created between PC-based plant asset monitoring or control systems and HART enabled field equipment through a simple modular approach. The certification for the SIL3 rated MTL4850 HART multiplexer means that

it can be connected to safety related systems in various applications, without interfering with the analogue signals. MTL4850 is the preferred HART multiplexer to choose for functional safety applications and approved to the latest standards of IEC61508.



HMP-HM64 multiplexer panel and module



The module has a compact self-contained structure which enables optimised and repeatable performance due to fixed capacity, 32 channels, per module. The unit is ideally suited to enhance existing and new installations.

Connection Options

HMP-HM64

Designed to be connected to remote connection units via ribbon cables the HMP-HM64 HART interface provides the user with a building block easily configurable and expandable to meet the system requirements. Each HMP-HM64 accommodates two MTL4850/54 HART multiplexers and any of the MTL connection modules can be linked to this board.

HTP-SC32

This self-contained item is a 32 channel connection unit with screw terminals for the field devices and the instrument system, and carries an MTL4850/54 multiplexer. Apart from an RS485 to USB or Ethernet protocol converter, no other external hardware is required.

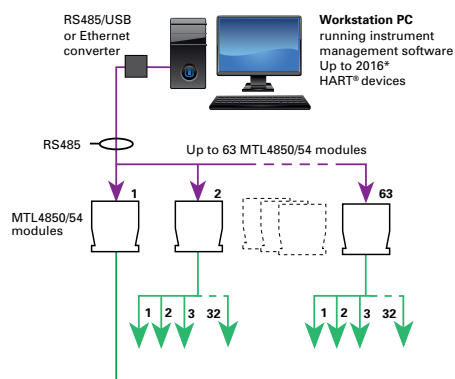


MTL4854 Multi-Modem HART Multiplexer

The New MTL4854 multiplexer has the same 32 channel capacity as the MTL4850 module but includes four HART modems rather than one. This enables simultaneous communication channels to be established, which permits continued monitoring of other field signals even when one channel is being heavily utilised. Typically this would be the case when partial-stroke testing is in progress for a valve positioner.



HTP-SC32



The module has the same compact structure as the MTL4850 with 32 channels per module. However now there is one HART modem for each 8 channels and this increased throughput makes it ideal for high load applications such as valve testing.

Connection Options

The MTL4850 and MTL4854 use the same backplane mounting. Thus the HMP-HM64 or HTP-SC32 can be used for this module as previously described.

When you need simultaneous access to several field devices, such as when testing valve positioners, then the new MTL4854 is the multiplexer to use

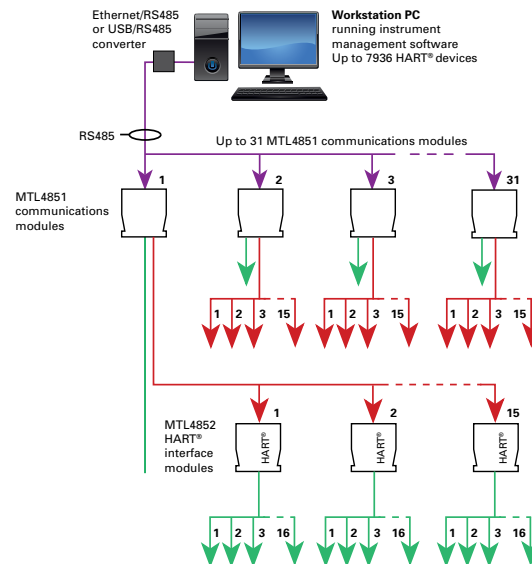


MTL4851/52 HART Connection System

The New MTL4851 and MTL4852 modules provide an extensible modular architecture for various applications. The system consists of a primary module MTL4851 which include 16 channels to which secondary modules, MTL4852, can be added with additional 16 channels (256 channels maximum capacity). Up to 31 MTL4851 modules can be used on one RS485 bus. The primary/secondary concept is ideally suited for larger applications with DCS systems due to its flexible and extensible structure. The highest channel capacity provides a lowest cost per channel option with obvious benefits for bigger projects.



HMM64 and HTP-SC16M



The system is based on 16-channel modularity to provide a compact, easily configurable and expandable system. Using a standard RS485 serial link up to 7936 HART devices can be connected on a single network.

Connection Options

HMM64

For medium to large scale installations, the HMM64 'master' and HMS64 'secondary' HART backplanes are the method of choice to handle the HART maintenance signals passing to and from the field devices. The HMM64 'master' backplane accommodates 1 x MTL4851 'master' module (16 loops) and up to 3 x MTL4852 'secondary' modules (an additional 3x16 loops) for a total of 64 loops. One MTL4851 'master' module can however support up to 15 x MTL4852 modules, and so the system has been designed to expand easily through additional HMS64 backplanes, each carrying 4 x MTL4852 'secondary' modules.

HTP-SC16M and HTP-SC16S

HTP-SC16M and the HTP-SC16S are master and secondary backplanes mounted on carriers. Each backplane will provide for 16 field loops. These are linked in chain beginning with the HTP-SC16M followed by up to four HTP-SC16S backplanes.

For process control systems using traditional I/O installations, the new MTL4851 and MTL4852 HART® Connection System is the ideal solution



Instrument Management Software

Providing detailed process and maintenance information

Powerful instrument management software is being widely adopted by the process industry to provide detailed process and maintenance information for a broad range of HART field devices.

The online access to the information contained within HART devices allows users to diagnose field device troubles before they lead to costly problems. Software such as AMS, Fieldcare and Cornerstone can capture and use diagnostic data from HART field instruments via the MTL HART connection hardware. This allows users to realise the full potential of their field devices to optimise plant assets, which results in significant operations improvement and direct maintenance savings.















The benefits of utilising these powerful software packages online include:

Reduced commissioning time and costs
 Reduced documentation
 Reduced maintenance costs
 Reduced process downtime

The MTL HART Connection System offers connectivity to a comprehensive range of both

- general instrument management software packages and
- dedicated software packages for optimising valve positioner performance and maintenance including:

	AMS Device Manager	Emerson Process Management
	Cornerstone	Applied System Technologies
	FDM	Honeywell
	FieldCare	Endress & Hauser/Metso Automation
	HART OPC Server	HART Communication Foundation
	PACTware	PACTware Consortium
	PDM	Siemens
	Fieldmate	Yokogawa
	SmartVision	ABB
	SoftTools	Flowserve
	ValveLink	Emerson Process Management
	Valvue	Masoneilan



For software packages that are based on a FDT frame i.e FieldCare, PACTware etc communication with the MTL HART multiplexer system requires the MTL Generic Communications DTM. This can be downloaded from the MTL website.



An aerial photograph of a complex industrial facility, likely a refinery or chemical plant. The image is dominated by a dense network of large, horizontal pipes wrapped in silver insulation. These pipes are supported by a metal framework and are connected by various valves and fittings. Some valves have blue handwheels, while others are orange. In the lower-left quadrant, a worker wearing a white hard hat, a dark jacket, and dark pants stands on a metal walkway or platform. The worker is leaning over, possibly inspecting or working on a piece of equipment. The background shows more industrial structures, including storage tanks and additional piping, under a clear sky. A semi-transparent blue rectangular box is overlaid on the left side of the image, containing white text.

A partner poised to meet your
HART communication needs,
letting you take control



Eaton's Crouse-Hinds

The safety you rely on.

See the complete HART interfacing product offering at www.mtl-inst.com

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