

**GWY-800**  
**(HART Gateway)**

**USER'S MANUAL**

## ***COPYRIGHT NOTICE***

This manual is a publication of Renu Electronics Pvt. Ltd. and is provided for use by its customers only. The contents of the manual are copyrighted by Renu Electronics; reproduction in whole or in part, for use other than in support of Renu Electronics equipment, is prohibited without the specific written permission of Renu Electronics.

## ***SERVICE***

If service is required then pack the unit in its original packaging container or, if unavailable, any suitable rigid container. If a substitute container is used, surround the unit with shock absorbing material; damage in shipment is not covered by the warranty. Include a letter with the unit describing the difficulty and hardware revision and software version; send to the following address:

Renu Electronics Pvt. Ltd.  
Survey No. 2/6,  
Baner Road,  
Pune-411045

All returns will be tested to verify customer claims of noncompliance with the product warranty. Improper return packaging, which makes verification impossible, will void the warranty. If noncompliance is verified and is not due to customer abuse or the other exceptions described with product warranty, Renu Electronics will, at its option, repair or replace the Product returned to it, freight prepaid, which fail to comply with the foregoing warranty, provided REPL is notified of such noncompliance within the one-year warranty period.

## ***ASSISTANCE***

This manual is designed to provide the necessary information for trouble-free installation and operation of your new Gateway product. However, if you need assistance, please call Renu Electronics Pvt. Ltd. at 91-20-27292840 or visit our web site at [www.renuelectronics.com](http://www.renuelectronics.com)

## ***MANUAL REVISION***

If you contact us in reference to this manual, please include the following document number

Name : HART Gateway (GWY-800-B) User's Manual  
Part Number : URML205  
Document : UMAN\GWY-800-B\0706  
Revision : Revision 1

Revision Number	Date	Description
Revision 0	13/07/2006	
Revision 1	12/12/2011	System requirement for gateway setup software revised.

# Warranty Certificate

For New product: This product is warranted against defects in materials and workmanship for a period of 12 months from the date of shipment to Buyer.

For Rectified Products: Any product that will be replaced will have Warranty for 6 months or upto Original Product Warranty period whichever is greater.

The warranty is limited to repair or replacement of the defective unit at the option of the manufacturer. This warranty is void if the product has been altered, misused, dismantled, or otherwise abused.

ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, ARE EXCLUDED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

**MAINTENANCE & SERVICE :** There are no parts that can be serviced by the user. Service should be performed on a unit substitution basis only. Do not attempt to remove, replace or service any printed circuit board, components or any hardware/software related with display product. If problem within the display product occurs, contact the factory for service information or repair.

**NOTE :** Renu Electronics Pvt. Ltd. is dedicated to providing complete customer service and customer satisfaction. If you have any comments or criticisms about how to improve the product features/reliability, Please make a note of the problem/improvement and notify us. We are always open to new ideas and improvements. So please let us know your ideas and comments.

## IMPORTANT

Gateway Products are intended to be Protocol Converters/Data Sharer devices that can also take control actions on request of device being connected. It is assumed that user is well acquainted with the PLC / Inverters / Controllers being used.

**Any Mechanical or Electrical Modification to this Unit will void all Warranties.**

# Contents

<b><u>INTRODUCTION</u></b>	<b><u>5</u></b>
1.1 Purpose of this manual	6
1.2 Introduction to Gateway	6
1.3 GWY-800-B Specifications	7
<b><u>HARDWARE</u></b>	<b><u>8</u></b>
2.1 Dimensional Details and Mounting Instructions	9
2.2 Communication Port Details	10
2.3 LED Status	12
<b><u>GETTING STARTED</u></b>	<b><u>13</u></b>
3.1 Introduction To HART	14
3.2 Introduction To GWY-800-B	16
3.3 GWY-800-B Operation-Configuration And Communication	16
3.4 Configuration of GWY-800-B (IBM Download)	17
3.4.1 When GWY-800-B can accept configuration	18
<b><u>GWY-800-B FEATURES</u></b>	<b><u>19</u></b>
4.1 Gateway Modes	20
4.1.1 Master-Master Configuration	20
4.1.2 Master-Slave Configuration	22
4.2 Repeat Cycle	23
4.3 Control Word	23
4.4 Error Indication Bit	24
4.5 Communication Parameters	24
<b><u>TYPICAL PROJECTS AND APPLICATIONS</u></b>	<b><u>25</u></b>
5.1 Project Setup	26
5.2 Applications	27
<b><u>CONFIGURATION SOFTWARE</u></b>	<b><u>28</u></b>
6.1 System Requirements	29
6.2 Installation Instruction	29
<b><u>APPENDIX</u></b>	<b><u>30</u></b>
A Flexible Applications	31
B Connection of HART Gateway with the field device	34

## INTRODUCTION

In this chapter. . . .

- ◆ Purpose of this manual
- ◆ Introduction To Gateway
- ◆ GWY-800-B Specifications



## 1.1 Purpose of this manual

Thank you for purchasing GWY-800-B Product from Renu Electronics Pvt. Ltd..

The intention of this User Manual is to provide a guide for Safe installation, Configuration and operation of GWY-800-B. **Functionality of all the Gateway models is same.** Read this User manual thoroughly before installing and operating GWY-800-B.

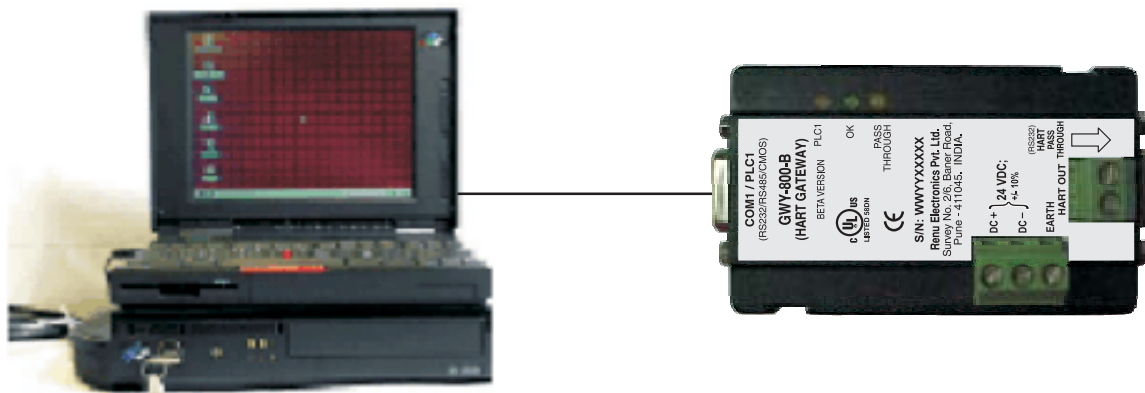
This document is based on information available at the time of its publication. While efforts have been made to be accurate, the information in this document may not cover all the details or variations in hardware or software. Features described herein may not be present in all hardwares. Renu Electronics Pvt. Ltd. reserves the right to update information in this publication without prior notice.

## 1.2 Introduction to Gateway

Gateway is a Protocol Converter / Data sharer for devices like PLCs, inverters (Adjustable Speed Drives), and other Controllers. Gateway has two serial ports that connect with two different devices. These devices share data through Gateway. Gateway communicates with a device to get the information required by the device connected on the other port. The device that requires data is called Destination Device and the device that provides data is called Source Device. Information could be,

- value of a PLC register.
- status of a PLC coil.
- Command from Source Device to Destination Device to perform any action at the destination end.

Configuration Of Gateway



**Note:** Please refer 'IBM Download' in section 3.4.



### 1.3 GWY-800-B Specifications

Power	:	+24V DC + 10%, 100mA max
LED's	:	3 LEDs for status indication.
Communication Ports	:	3 Communication port with
COM1	:	RS232 / RS422 / RS485 / CMOS
COM2	:	HART Out
COM3	:	RS232 (Pass Through Port)
Operating Temperature	:	0° to 60°C
Storage Temperature	:	-20° to 80°C
Humidity	:	10% to 90% (Non condensing)
Mounting	:	DIN rail or back panel mounting
Dimensions (DIN rail)	:	105mm(L) X 40mm(D) X 51mm(W)
Weight	:	125 gm approx.
Certifications	:	CE with UL
Immunity to ESD	:	Level 3 as per IEC1000-4-2
Immunity to Transients	:	Level 3 as per IEC1000-4-4
Immunity to Radiated RF	:	Level 3 as per IEC1000-4-3
Immunity to Conducted RF	:	Level 3 as per IEC1000-4-6
Emissions	:	EN55011 CISPR A



## HARDWARE

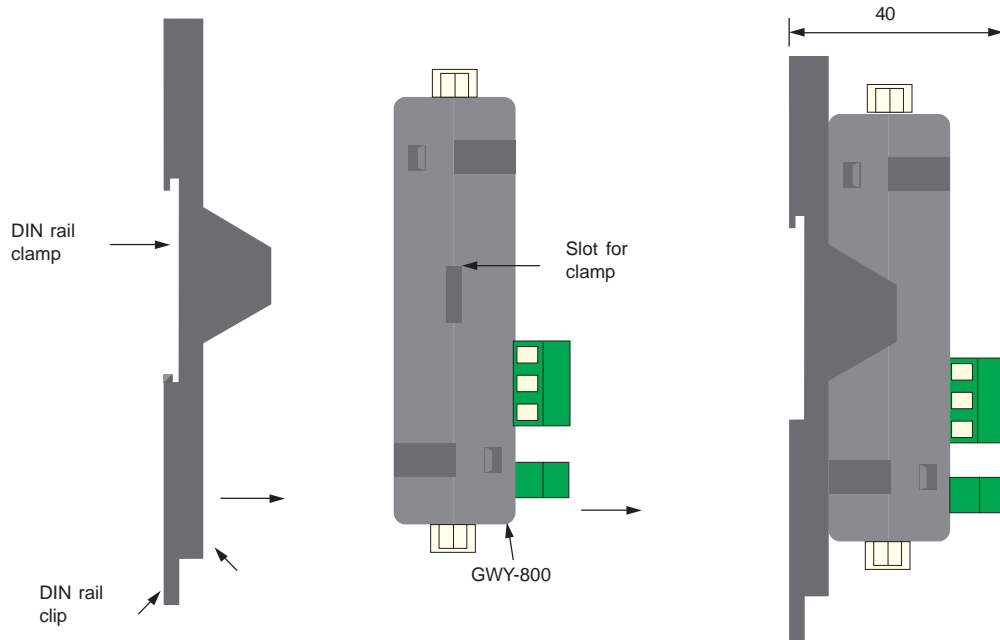
In this chapter. . . .

- ◆ Dimensional Details and Mounting Instructions
- ◆ Communication Port Details
- ◆ LED Status



## 2.1 Dimensional Details and Mounting Instructions

GWY-800 -B unit can be mounted on a back panel or on a DIN rail or can be left hanging. It comes with a separate DIN rail plate when it is packed. User will have to attach the DIN rail plate to the unit if it has to be mounted on a panel or DIN rail. If it has to be left hanging, make sure to screw the cables to the DB9 connectors on the Gateway unit. DIN rail plate also has the provision to screw the unit to the back panel. Following drawing shows how to attach the DIN rail plate to the unit:

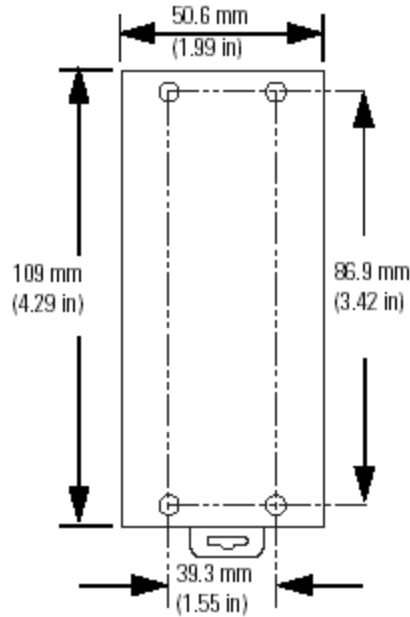


Follow instructions given below:

1. Attach the DIN rail plate to the unit using the clamps on the DIN rail plate.
2. Pull out the clip of the plate.
3. Put the unit on the DIN rail.
4. Push the clip in to secure the unit on the DIN rail.

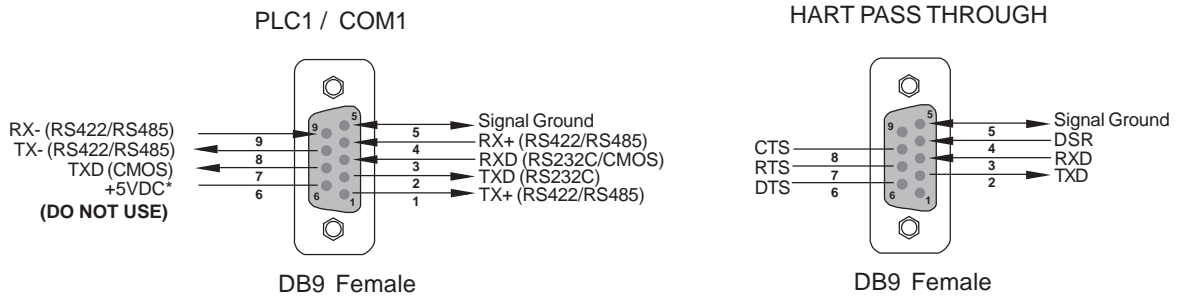
GWY-800-B unit is shipped with a separate DIN rail plate which has to be attached to the unit, if needed. User can use the unit with or without the DIN rail plate. Following sketch shows mounting details of GWY-800-B with the DIN rail plate.



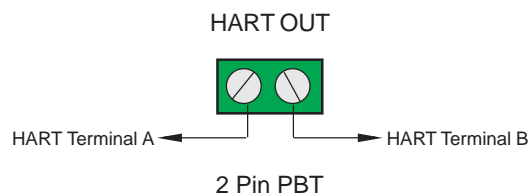


## 2.2 Communication Port Details

GWY-800-B has three communication ports COM1, HART OUT and Pass Through Port. COM1 port is compatible to RS232/ RS422/ RS485; HART OUT is a HART Port and Pass Through Port is a serial RS232 Port. Pinout of these ports are as shown below:



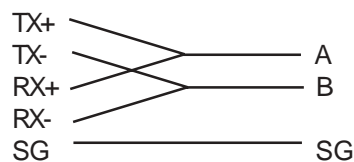
*\*Do not use pin no. 6 of PLC1 / COM1.*



## Pin Description for COM 1 / PLC 1

Pin	Name	Signal Level	Description
1.	TX+	RS422 / RS485	Differential Transmit +, also referred as TXA
2.	TXD	RS232	Transmit
3.	RXD	RS232 / CMOS	Receive
4.	RX+	RS422 / RS485	Differential Receive +, also referred as RXA
5.	GND	-	Signal Ground common to all signals.
6.	+5VDC	-	<b>DO NOT USE</b>
7.	TXD	CMOS	Transmit
8.	TX-	RS422 / RS485	Differential Transmit -, also referred as TXB
9.	RX-	RS422 / RS485	Differential Receive -, also referred as RXB

User can convert RS485 4 wire + Signal Ground system to a 2 Wire + Signal Ground system by shorting following signals in the communication cable:



**Note:** If user has attached shield to Earth on Device end, leave the shield open on Gateway end. If user has connected shield to Signal Ground on Device end, connect shield to Signal Ground on Gateway end.

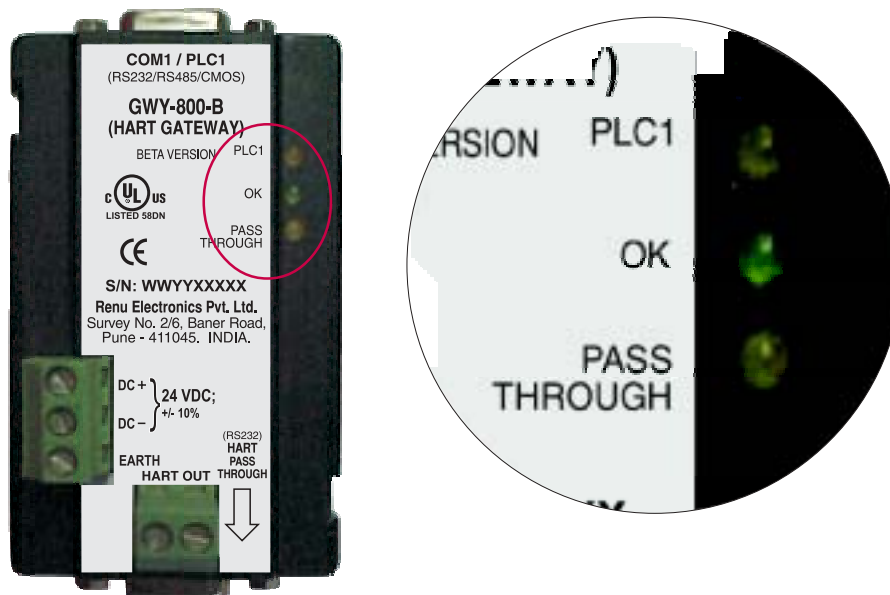
A and B are polarity insensitive. Twisted pair cable should be used for Rs485 Network.

*Upto 31 Devices can be multi-dropped on RS485 port of Gateway.*



### 2.3 LED Status

There are 3 LEDs for status indication.



LEDs status:

LED			
PLC1	Yellow	OFF	No data receive on PLC port
		ON / Flashing	COM1 / PLC1 side communication OK
OK	Green	OFF	No Firmware
		Slow Flashing	IBM Download
		Fast Flashing	Polling HART Devices
		ON	Device OK
PASS THROUGH	Yellow	OFF	No data received on Pass Through Port
		Flashing	Receiving data on Pass Through Port Port



## GETTING STARTED

In this chapter. . . .

- ◆ Introduction To HART
- ◆ Introduction To GWY-800-B
- ◆ GWY-800-B Operation



### 3.1 Introduction To HART

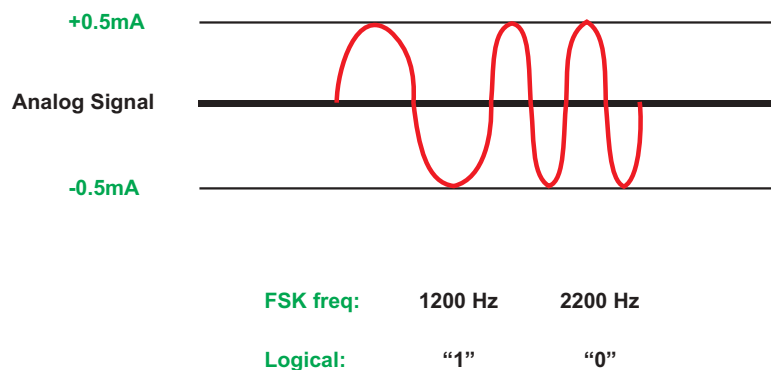
HART® Field Communications Protocol is widely recognized as the industry standard for digitally enhanced 4-20 mA smart instrument communication. Use of the technology is growing rapidly, and today virtually all major global instrumentation suppliers offer products with HART communication.

The HART protocol provides a uniquely backward compatible solution for smart instrument communication as both 4-20 mA analog and digital communication signals are transmitted simultaneously on the same wiring. HART provides many benefits promised by field bus, while retaining the compatibility and familiarity of existing 4-20 mA systems.

#### Analog and Digital communication at the same time:

For many years, the field communication standard used by process automation equipment has been a milliamper (mA) analog current signal. In most applications the milliamper signal varies within a range of 4-20 mA in proportion to the process variable being represented. Virtually all installed plant instrumentation systems use this international standard to communicate process variable information.

#### Simultaneous Analog + Digital Communication



*HART uses Frequency Shift Keying to encode digital information on top of the 4-20 mA analog signal*

The HART protocol enables two-way digital communication with smart instruments without disturbing the 4-20 mA analog signal. Both the 4-20 mA analog and HART digital communication signals can be transmitted simultaneously over the same wiring. Primary variable and control signal information is carried at the 4-20 mA (if desired), while additional measurements, process parameters, device configuration, calibration, and diagnostics information is accessible through the HART protocol over the same wires at the same time. Unlike other "open" digital communication technologies for process instrumentation, HART is compatible with existing systems.

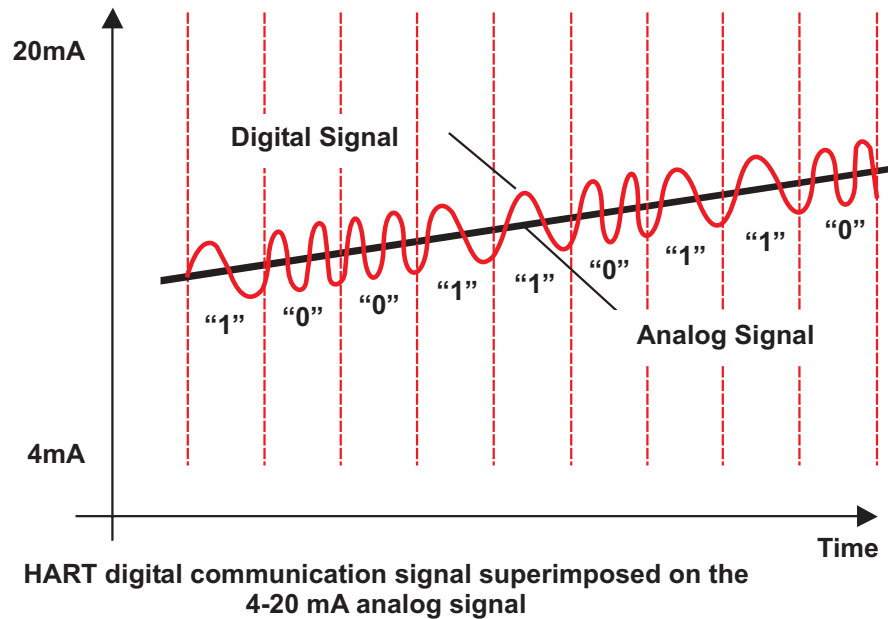
These enhanced communication characteristics of this technology are reflected in the protocol name, HART which stands for "Highway Addressable Remote Transducer".

#### About HART Technology:

The HART protocol makes use of the Bell 202 Frequency Shift Keying (FSK) standard to superimpose digital communication signals at a low level on top of the 4-20 mA. Since the digital FSK signal is phase continuous, it does not interfere with the 4-20 mA signal. A logical "1" is represented by a frequency of 1200 Hz and a logical "0" is represented by a frequency of 2200 Hz as shown in Figures 1 and 2.



The HART FSK signaling enables two-way digital communication and makes it possible for additional information beyond just the normal process variable to be communicated to or from a smart field instrument. The HART protocol communicates at 1200 bits per second without interrupting the 4-20 mA signal and allows a host application (master) to get two or more digital updates per second from a field device.



### 3.2 Introduction To GWY-800-B

GWY-800 is a protocol converter as well as the HART modem. This converts the HART digital signal to a serial communication protocol (e.g. MODBUS). This allows various HART field devices to interface directly with serial protocol (MODBUS) based monitoring and control systems. Serial protocol can be master or slave configurable from the set up software. At the same time it allows to communicate the PC based configuration software with HART field devices. Gateway operates in point to point as well as in multi drop HART network mode. All HART process information, including primary, second, third and fourth process variable data is converted to serial protocol (MODBUS) and available to the host system. Using the Field Device Status Byte data that is available in HART's digital information, the gateway can transmit, via serial link, diagnostic data including smart device configuration changed; primary and non primary variables out of limits; primary variable analog output fixed; cold start; field device malfunction; and more HART status data available.

GWY-800 has three serial ports; 3 ports; COM1 / PLC1 is compatible to RS232/RS422/RS485/CMOS levels, which can be connected to device like PLCs, Inverters, HMIs and controllers. "Pass Through Port" is serial RS232 port. "HART OUT" port is HART protocol compatible.

GWY-800-B communicates with the HMI using HART protocol. This allows gateway to access various process parameters from HART port. Gateway provides these parameters to third party serial devices like PLCs, controllers. The PLC can then make decisions based on the parameters values.

Gateway setup software allows different process parameters to be mapped to any register on the other side PLC/ Device.

Microsoft Windows® based configuration software, Gateway Setup, helps user to configure Gateway unit. 'Configuration' means making the Gateway unit work as per the system requirements. The complete configuration for a unit is termed as 'Project'. Project comprises of device names, Register addresses, condition for block execution etc.

Block may contain information like copy number of words from one device to other device and conditions for copy, if any.

Gateway transfers data between two devices by execution of blocks.

After the Project is defined, Drivers for required devices and Project should be downloaded. Gateway can now communicate with the HART devices and serial devices(e.g. PLC or SCADA).

### 3.3 GWY-800-B Operation-Configuration And Communication

Gateway can communicate with serial and HART devices using appropriate cables and configuration. Microsoft Windows® based configuration software, Gateway Setup, configures the Gateway unit. 'Configuration' means making the Gateway unit work as per system requirements. In this, user need to configure only "PLC1 / COM1" port and "HART Out" port. Complete configuration for a Gateway using the Gateway Setup is termed as a 'Project'.

Gateway can now communicate with the specified devices without any change in the Gateway hardware. To communicate with a device, Gateway needs Communication Drivers for the devices and 'Gateway - Device' communication cables.

Each Device has a unique and predefined protocol for communication. Gateway driver has this protocol to communicate with the desired device. As two devices are connected on Gateway, it requires two drivers for communication (Serial "Pass through port" (RS232) is just a data transfer part).

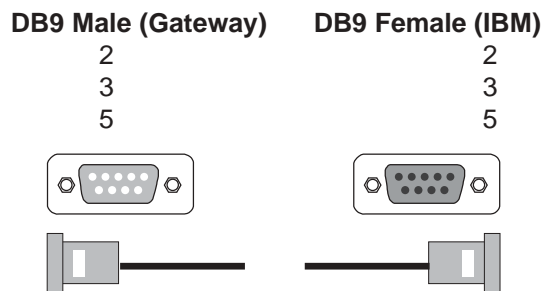


### 3.4 Configuration of GWY-800-B (IBM Download)

User **MUST** download Project, PLC1 driver and HART in Gateway before installing any system using Gateway. Gateway can accept drivers and configuration data on COM1 port. User needs a special IBM download cable for downloading configuration in Gateway. All configurations can be downloaded only form Serial port (Port 1). The other port is dedicated for HART.

*If any change in the current / working project is made, user must download the changed project in Gateway.*

Pin details of IBM download cable for GWY-800-B are as follows:



1. For downloading Firmware, drivers and project switch off the GWY-800-B unit.
2. Power ON the unit again.

#### For Master-Master mode:

OK LED is on at power on, it checks if the HART device is attached. If HART device is not attached then it goes in IBM download mode for 10 sec. In IBM download mode OK LED flashes in slow mode. While scanning HART device at power on unit will flash the OK LED in **fast mode** (approx. 15 seconds). So If user want to configure the gateway, he/she should disconnect the HART device. Also after checking the HART device connection, it continuously checks the if device is present on the PLC1/ COM1. Block execution will be started only after both the devices will be present.

#### For Master-Slave Mode:

OK LED is on at power on, it checks if the HART device is attached. If HART device is not attached then it goes in IBM download mode for 10 sec. In IBM download mode OK LED flashes in **slow mode**. While scanning HART device at power on unit will flash the OK LED in **fast mode** (approx. 15 seconds). Only in IBM download mode firmware, drivers and project can be downloaded.

At power on, if OK LED does not glow indicating that the downloaded firmware, drivers or project CRC are not correct or either of them is not present.

#### IMPORTANT NOTE:

**AS GATEWAY HAS MULTIPLE SIGNALS ON ITS COMMUNICATION PORTS, IBM CABLE FOR GATEWAY MUST HAVE ONLY THREE RS232 SIGNALS (TXD, RXD AND GND) AS MENTIONED ABOVE. 9-9 PIN CORE CABLE SHOULD NOT BE USED.**

**USER CAN FORCE GATEWAY IN THE IBM DOWNLOAD MODE.**

- 1) Power on the gateway unit.
- 2) Short pins 3 and 4 of PLC1/COM1 port.



**3) Power off the unit (Keep the pins shorted)**

**4) And Power on the unit again. This procedure will force the gateway go into the IBM download mode.**

### **3.4.1 When GWY-800-B can accept configuration**

#### **If current driver present for PLC1 port is Master (e.g. Modbus (Gateway as Master))**

First, it is checked that whether device is connected on HART Port (fast "OK" LED flashing)

If device is connected, it continues normal operation

If device is not connected, it checks for IBM download mode for 10seconds (slow "OK" LED flashing).

This sequence continues until either is satisfied.

#### **If current driver present for PLC1 port is Slave (e.g. Modbus (Gateway as Slave))**

First, it is checked that whether device is connected on HART Port (fast "OK" LED flashing)

If device is connected, it continues normal operation

If device is not connected, it checks for IBM download mode for 10sec (slow "OK" LED flashing).

This sequence continues until either is satisfied.



## GWY-800-B FEATURES

In this chapter. . . .

- ◆ Gateway Modes
- ◆ Repeat Cycle
- ◆ Control Word
- ◆ Error Indication Bits
- ◆ Communication Parameters



## 4.1 Gateway Modes

Gateway has two modes of operation: Master-Master and Master-Slave. Before explaining these modes further Master and Slave concept should be explained.

Master:

Master is a Device / device driver which initiates communication.

Slave:

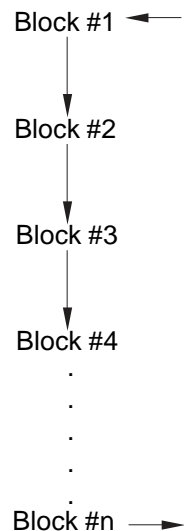
Slave is Device / Device driver which processes Master's query, takes necessary action and responds to the query, if necessary.

### 4.1.1 Master-Master Configuration

In this mode both Gateway ports are master in nature and devices connected on these ports are slave. Gateway ports initiate communication when the proper Gateway-Device communication cable is attached. Data is transferred in blocks. This transfer can either be a continuous process or as per requirement. A control word (Section 4.3), present in device on either side, enabled from Gateway Setup Software, can control the block execution.

When control word is disabled, then block transfer is a continuous process. A block of data is fetched from one device and transferred to the other device. The amount of data to be transferred (Number of words) depends on Block definition in "Block Definition Area" in Configuration Software. One block is executed at a time. A cycle consists of execution of blocks from #1 to #n.

Execution of blocks is performed as follows,

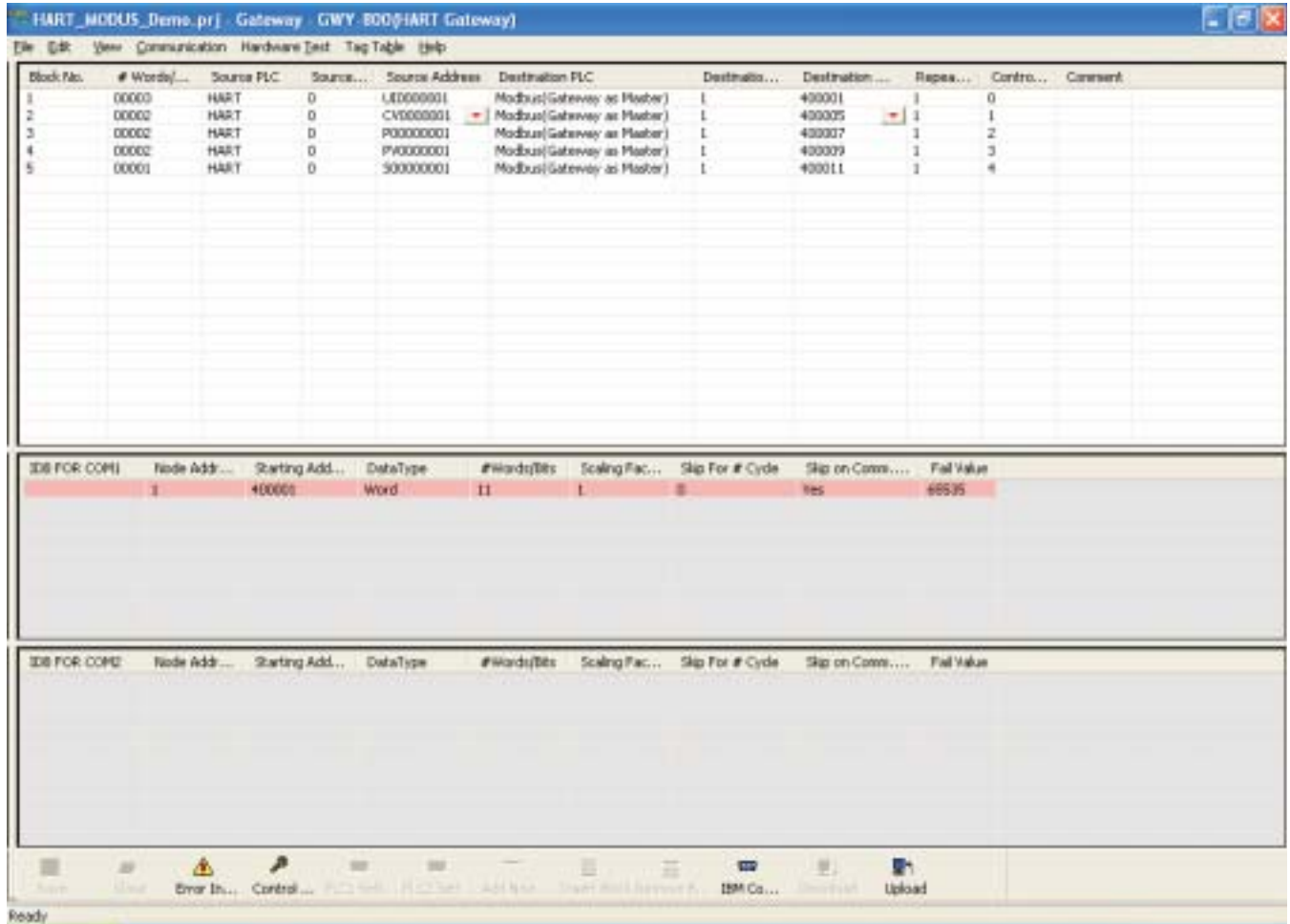


When Control word is enabled, it decides which block has to be executed by writing a specific data in the control word.



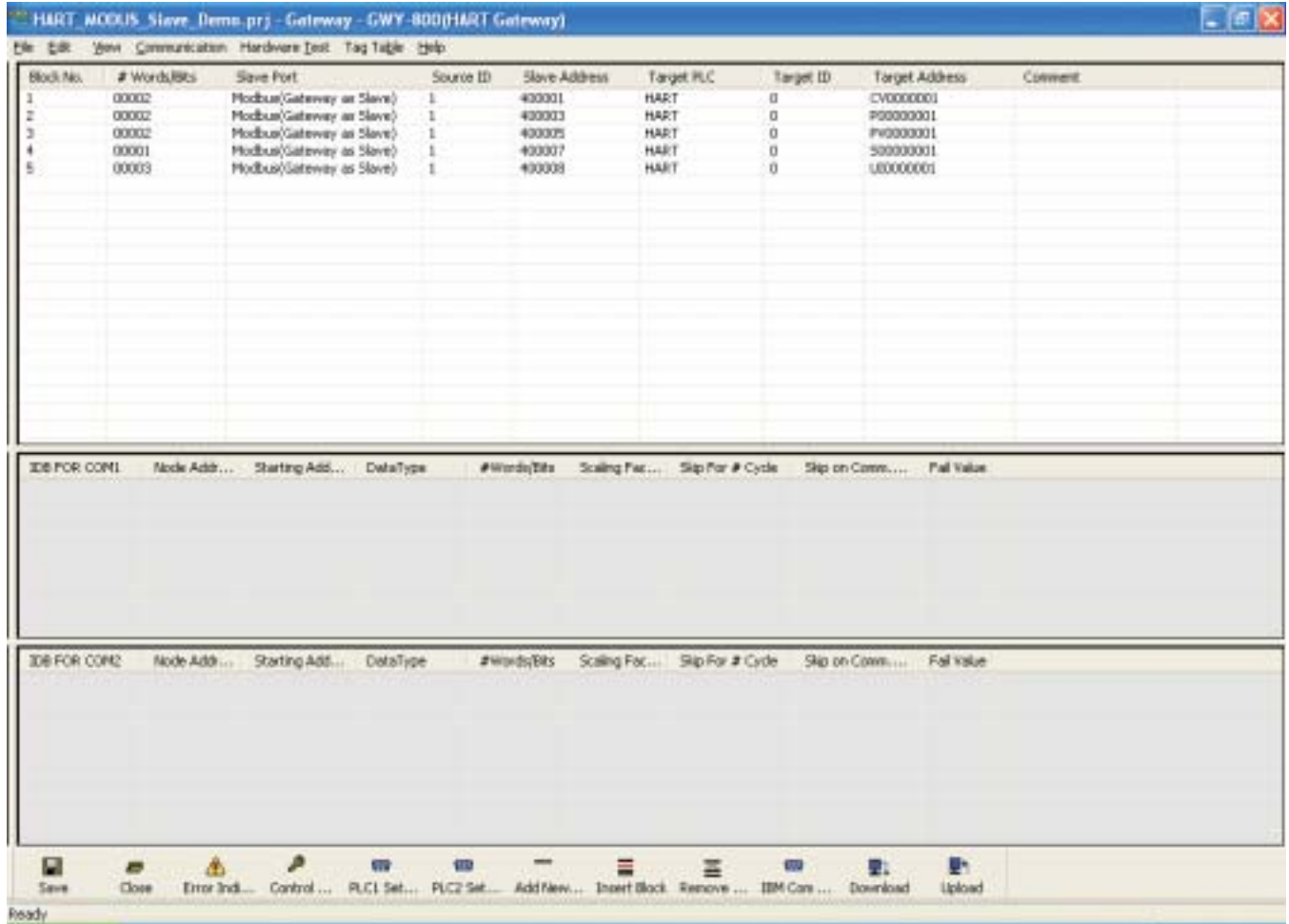
Let us see the example of Master-Master mode as shown in the picture below:

Configure Gateway ports as: PLC1 Protocol: Modbus (Gateway as Master)  
 PLC2 Protocol: HART



### 4.1.2 Master-Slave Configuration

In this mode, one of the Gateway ports is a master and other is the slave so the devices connected on these ports are slave and master respectively. Blocks do not control data transfer in this mode. Data transfer takes place only when Master Device, connected on slave port of Gateway, sends a request to read / write data. This mode requires mapping registers for data transfer. Mapping means defining one or multiple registers in the Slave Device corresponding to one or multiple registers in the Master Device. Mapping can be done using the Block definition area, so in this mode, any Block is used for mapping registers of the two devices.



**NOTES:**

- 1) As Gateway Setup Software is common for both the Gateway Modes (as a master or slave), titles in the Block Definition Area, may not be appropriate when using Gateway in Master - Slave mode (e.g. Source ID, Source PLC, Destination PLC ).
- 2) In Master - slave mode, If anybody mapped read only registers at destination end to any registers at source end, it's users responsibility that these registers are not going to be written by master.



#### 4.2 Repeat Cycle

User can control Block execution by using the Repeat Cycle field. This number decides whether the Block will be executed in each cycle. Larger the number lower the priority of the Block. Range for Repeat Cycle setting is 1-99.

Repeat Cycle = 1 ..... Highest priority  
 Repeat Cycle =99 .....Lowest priority

Repeat cycle is important when using Gateway in Master - Master mode. **If Gateway is used in Master - Slave mode, Repeat Cycle field should be kept as '1'.**

Repeat cycle defines the number of times a Block will be skipped while executing Blocks in a sequential manner. Block will not be executed for [Repeat Cycle - 1] cycles. So if Repeat Cycle for a Block is 1, it will be executed in each cycle whereas if Repeat Cycle is 2, then this Block will NOT be executed in alternate cycles.

For example, suppose Blocks are defined with following Repeat Cycles:

Block #1	Repeat Cycle = 1
Block #2	Repeat Cycle = 2
Block #3	Repeat Cycle = 3
Block #4	Repeat Cycle = 4

After power up, Cycles will be executed as follows:

Cycle 1:

Block #1  
 Block #2  
 Block #3  
 Block #4

Cycle 2:

Block #1

Cycle 3:

Block #1  
 Block #2

Cycle 4:

Block #1  
 Block #3

Cycle 5:

Block #1  
 Block #2  
 Block #4

#### 4.3 Control Word

Another way of controlling Block execution is by use of the Control Words. 16 control words i.e. 256 control bits are available by which user can control 256 blocks. 0<sup>th</sup> Control bit corresponds 0<sup>th</sup> bit of control word 1, ..., 16<sup>th</sup> Control bit corresponds 0<sup>st</sup> bit of control word 2, ..., 255<sup>th</sup> Control bit corresponds 15<sup>th</sup> bit of control word 16. By default 0 to 255 control bits are mapped to 1 to 256 blocks. User can change value of the control bit. Control Word can be enabled or disabled in Gateway Configuration. Normally Control Word is disabled for a New project. It can be enabled just by clicking on check box in the setup software. Control Word can be chosen from any of the Devices connected.

**If the Control Word field is enabled, for the control bit chosen in the project block, accordingly the number of words in the control field should be taken.** For example, if 36<sup>th</sup> Control bit is chosen to control the block then number of words in the Control Word field should be 3.

Number of control bits / 16 = Number of control words.

If Number of control bits % 16 != 0 (Non-zero so add 1 in the number of words in the control field) then Number of control words = Number of control words + 1



In the above example, number of control bits are 36.

So  $36 / 16 = 2$  (Number of words in control field)

$36 \% 16 = 4$  (i.e. Non-zero so add 1 in the number of words in the control field), so number of words in control field are  $2+1 = 3$ . So number of words in the control field should be chosen as 3. For any block any control bit can be chosen.

Control Word can only be used in Master-Master mode since no continuous data transfer takes place in Master - Slave mode (data transfer only takes place on Master's request)

When the Control Word is disabled, Block execution is totally controlled by Repeat Cycle settings. When the Control Word is enabled, Block execution is controlled using discrete bits of that word.

Bit 0 in control word controls execution of Block #1

Bit 1 in control word controls execution of Block #2

:

Bit 15 in control word controls execution of Block #16

When a bit is high, '1', corresponding Block is executed depending on its Repeat Cycle. When a bit is low, '0', execution of corresponding Block is disabled.

#### **4.4 Error Indication Bit**

This feature enables detection of communication breaks during error free communication between Gateway and two devices. Communication breaks can occur due to no cable connection, wire faults, device power failure at both ends of Gateway. An Error bit can be designated in each external device connected to Gateway. Using this bit, fault at the PLC1 end can be reported to PLC2 Device and fault at PLC2 end can be reported to PLC1 Device. When communication error occurs on PLC1, Gateway sets error bit in PLC2 device. *Error Indication Bit can only be used in Master-Master mode. In Master-Slave mode any error can easily be detected by a communication time out on the Master.*

Error indication bit can be enabled using Gateway configuration software. Normally Error bit is disabled for a New project. It can be enabled just by clicking on the check box in the setup software. Error indication bit can be enabled in both or any one of the Devices connected to Gateway. Error Indication bit is "OFF" to indicate error free communication. In case of communication error on PLC2, Gateway sets error bit on PLC1 port and vice versa.

#### **4.5 Communication Parameters**

Communication Parameters of Gateway can be set from configuration Software. This enables Gateway to readily communicate with any device. Communication parameters for PLC1 and PLC2 ports can be configured independently. This feature allows changes in Baud rate, Number. of stop bits, Parity etc. at any time without downloading the driver for that particular device. After the driver for a particular device is downloaded, the communication parameters can be changed simply by selecting new communication parameters and downloading the same project.

**NOTE:**

***Default communication parameters for the HART are 1200-8-odd-1. So keep the PLC 2 settings as above. For the pass through port the communication parameters are fixed. to 1200-8-Odd-1.***



## **TYPICAL PROJECTS AND APPLICATIONS**

In this chapter. . . .

- ◆ Project Setup
- ◆ Applications



## 5.1 Project Setup

This Chapter explains, how a simple Gateway project can be created and tested. To develop a Gateway system, select appropriate Gateway model depending on the system requirements. A new project can be created as follows:

User should follow the given sequence to configure and use GWY-800-B unit:

1. Install Gateway Setup Software.
2. Select GWY-800-B from product list.
3. Create a project using gateway software. Set Baud rate through PLC settings. For HART baud rate is 1200Kbps.
4. Connect IBM cable and HART cable.
5. Power up the unit.

### **If current driver present for PLC1 port is Master (e.g. Modbus (Gateway as Master))**

First, it is checked that whether device is connected on port2 (HART Device)

If device is connected, it checks for the PLC1. If PLC1 is also connected then it continues the normal operation.

If HART device (*Note that, If PLC1 is not connected then unit does not enter into the IBM mode.*) is not connected, it checks for IBM download mode for 10sec.

This sequence continues until either is satisfied.

### **If current driver present for PLC1 port is Slave (e.g. Modbus (Gateway as Slave))**

If Port1 of Gateway is Slave, then unit only check for the HART device. If not present then enters into IBM mode else continues its normal operation.

6. Download Firmware, driver for the PLCs & project.

After downloading firmware, driver or project, software will ask to restart the unit. If user click on NO, then gateway will remain in Download mode. If user click on YES, then gateway unit is ready for application.

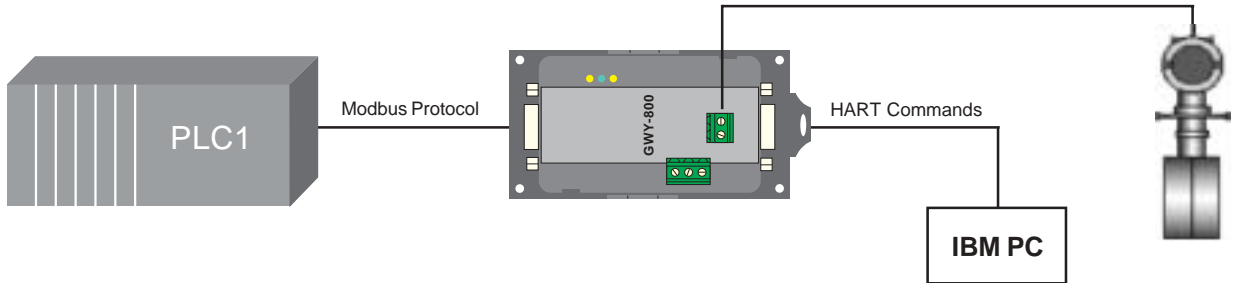
*It advisable to power cycle the unit after downloading.*



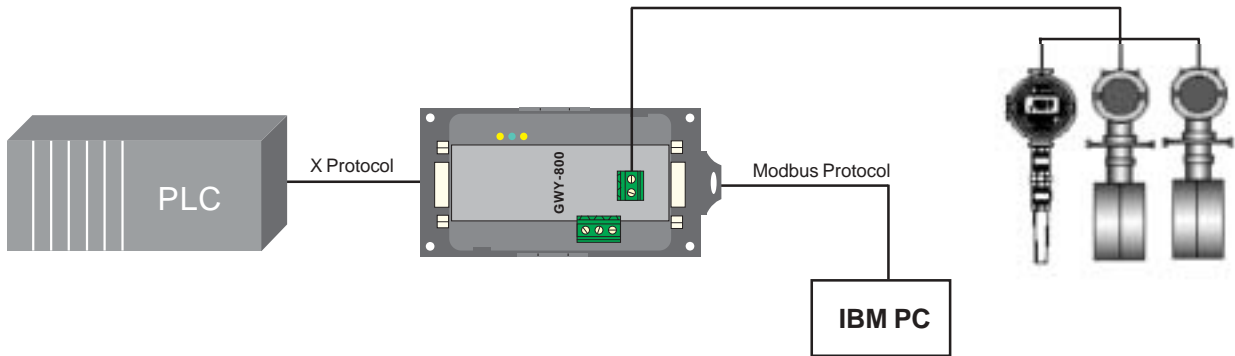
## 5.2 Applications

GWY-800 connects various HART field device to other serial devices irrespective of their protocols. At the same time user can connect configuration software for HART devices.

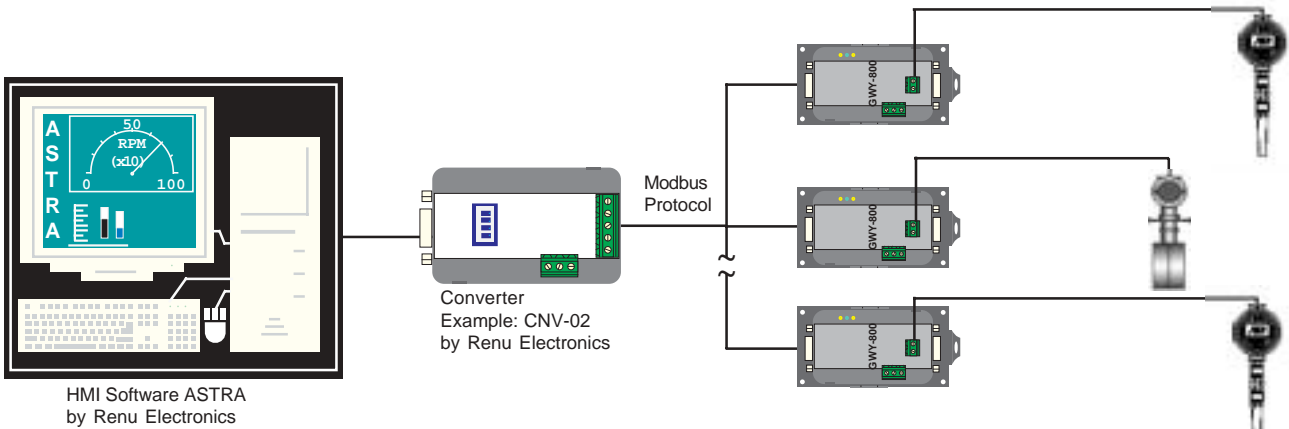
### 1. PLC to HART Transmitter Communication



### 2. Multi-dropped HART devices



### 3. HART Transmitters as a slave on Modbus network



## CONFIGURATION SOFTWARE

In this chapter...

- ◆ System Requirements
- ◆ Installation Instruction



## 6.1 System Requirements

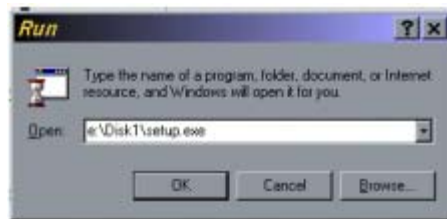
System Requirement for Gateway setup software are:

Windows Version:	Microsoft Windows XP / 2000, Windows 7 / VISTA (32/64 bits)
Processor:	PENTIUM or higher
Hard disk Space:	5 MB or more
Serial Mouse:	Required
RAM:	64 MB or more
Display resolution:	800 X 600 (VGA) or better
Display colors:	16 bit color

## 6.2 Installation Instruction

Use the following procedure to install the Microsoft Windows® based Gateway setup software This installation shows the procedure to install the software from a CD Disk on drive E. On machines with different drive configurations, change the names as needed. It is recommended that a backup disk of the Gateway setup software disk be created and stored in a safe place.

1. Launch the Windows operating system.
2. Insert the setup CD into CD-drive.
3. Point to the start button then click RUN
4. In the command line box enter E:\Disk1\setup.exe. Click OK. This will launch the Gateway installer.
5. Follow the instructions to complete setup.



Gateway Project:

Each Gateway must be configured before connecting it to the PLC. Gateway configuration software allows the following:

1. Create a new Gateway project
  - Select protocols for both communication ports of gateway.
  - Create blocks for data to be shared.
  - Set Communication Parameters for both the ports.
  - Set Control Word. (Optional)
  - Set Error Indication Bit, etc. (Optional)
2. Downloading.
  - Download Project
  - Download drivers
  - Download new firmware, if required (only for upgrading).
3. Upload Project.
  - The existing project in the gateway module can be viewed/edited.
4. Upload System Data.
  - This option enables viewing of version number, status of firmware, drivers used, and boot block.



## APPENDIX

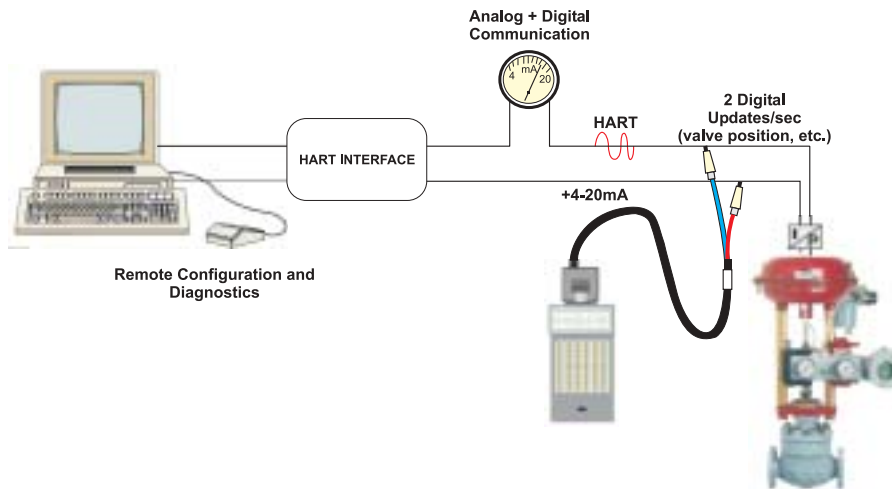
In this chapter. . . .

- ◆ Flexible Applications
- ◆ Connection of HART Gateway with the field device



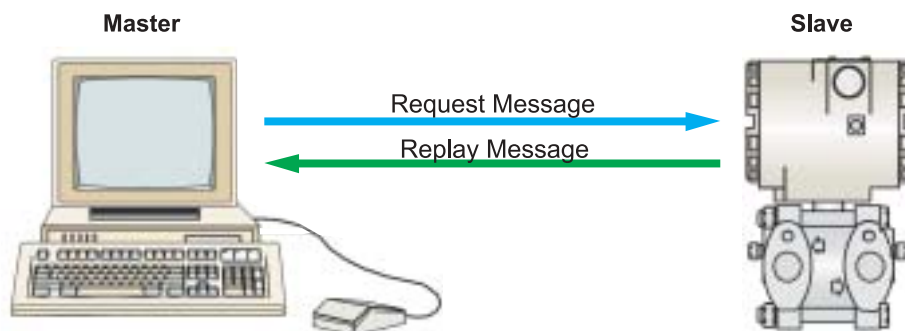
## A Flexible Applications

1. HART is principally a master/slave protocol which means that a field (slave) device speaks only when spoken to by a master. Two masters (primary and secondary) can communicate with slave devices in a HART network. Secondary masters, such as handheld communicators, can be connected almost anywhere on the network and communicate with field devices without disturbing communication with the primary master. A primary master is typically a DCS, PLC, or computer based central control or monitoring system. A typical installation with two masters is shown in Figure



The HART protocol allows two master devices to access information in slave (field) devices

2. The HART protocol can be used in various modes for communicating information to/from smart field instruments and central control or monitoring equipment. Digital master/slave communication simultaneous with the 4-20 mA analog signal is the most common. This mode, depicted in Figure 4, allows digital information from the slave device to be updated twice per second in the master. The 4-20 mA analog signal is continuous and can still carry the primary variable for control.

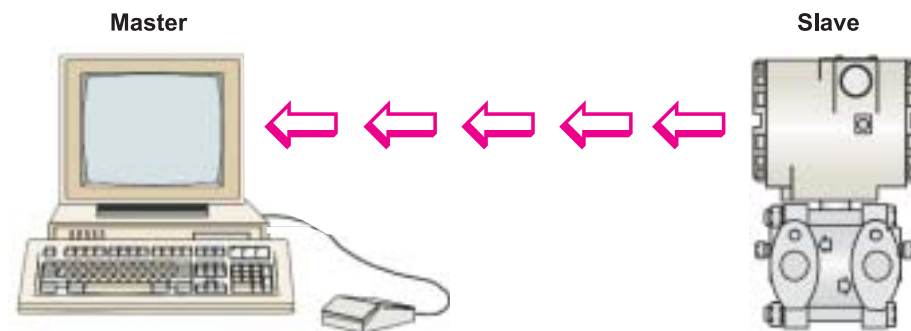


Analog + Digital or Digital Only Communication Analog signal is not interrupted  
 "Slave" responds to Commands/Requests from "Master" Typical 500 ms response (2 values per second)



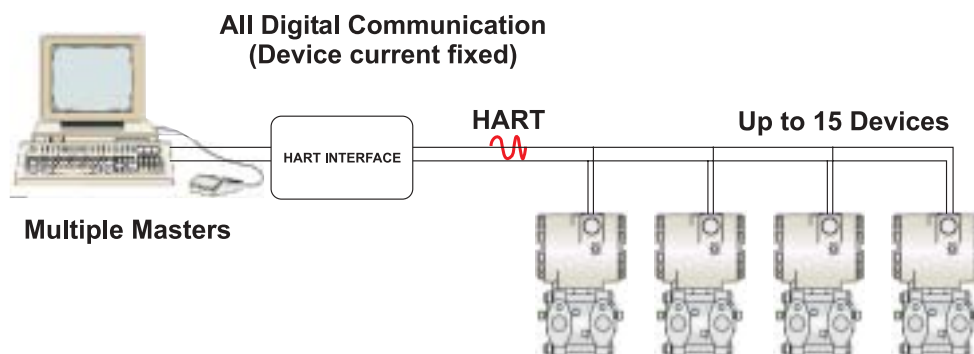
3. "Burst" is an optional communication mode (Figure 5), which allows a single slave device to continuously broadcast a standard HART, reply message. This mode frees the master from having to send repeated command requests to get updated process variable information.

The same HART reply message (PV or other) is continuously broadcast by the slave until the master instructs the slave to do otherwise. Data update rates of 3-4 per second are typical with "burst" mode communication and will vary with the chosen command. Burst mode should be used only in single slave device networks.



**All Digital Communication Mode.**  
 Continuous transmission of a Selected Standard Reply Message such as PV.  
 Gaps between Messages allow "Master" to change Command or mode  
 3 to 4 updates per second typical

4. The HART protocol also has the capability to connect multiple field devices on the same pair of wires in a multi-drop network configuration as shown in Figure 6. In multi-drop applications, communication is limited to master/slave digital only. The current through each slave device is fixed at a minimum value to power the device (typically 4 mA) and no longer has any meaning relative to the process.

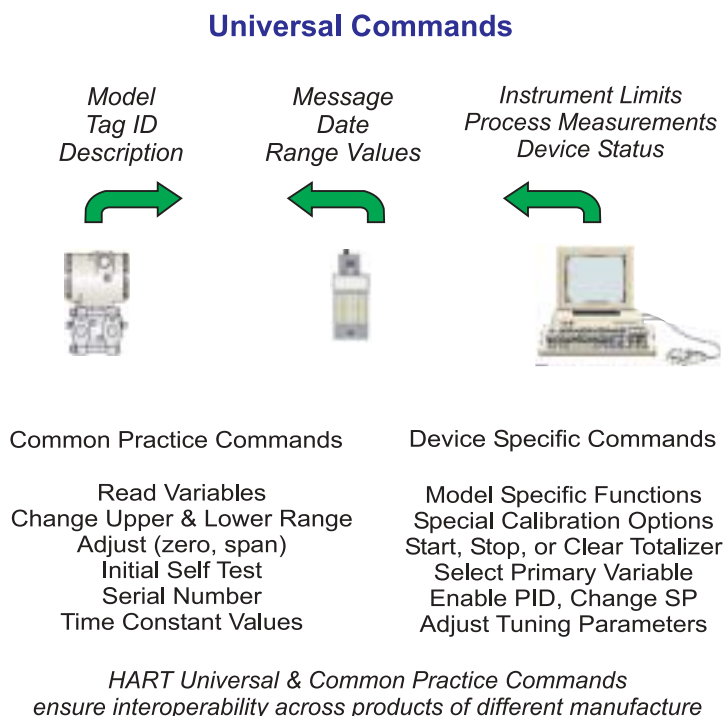


*The HART field devices can be connected in a Multidrop Network for some applications*



5. HART communication is command based, i.e., a master issues a command and the slave responds. Three types of HART commands provide read/write access to information available in HART-compatible field instruments. Universal and Common Practice Commands are defined in the HART protocol specifications. The third type, Device Specific Commands, provide freedom for product specific parameters or functions unique to a particular device.

Universal Commands ensure interoperability across the large and growing base of products from different suppliers, and provide access to information useful in normal plant operation, i.e., reading process measurements/variables, upper and lower range values, and other information such as manufacturer, model, tag, and description. A basic rule of the HART protocol is that HART-compatible slave devices must respond to all Universal Commands. These commands are powerful as for example, Universal Command 3 allows up to four dynamic variables to be read in a single command response.



Device status information included in every HART command response provides increased system integrity for critical loops. The device status bits in each reply message indicate device malfunctions or other problems such as analog output saturated, variable out of limits, or communication errors. Some HART-compatible devices can monitor the device status bits continuously and provide early warning alarms or shutdowns if problems are detected.

**Device Description Language:**

HART Device Description Language (DDL), extends interoperability beyond the Universal and Common Practice commands. A field device (slave) manufacturer uses DDL to create a software file with all relevant device characteristics, such that a DDL capable host can fully communicate with the device. A Device Description (DD) for a HART device is analogous to a printer driver in the personal computer world where the printer driver links an application to the printer such that it prints properly on the page. Universal hand-held communicators capable of configuring any HART-based instrument through DDL are available from several manufacturers. Other host applications that understand DDL are beginning to emerge. A central library of all HART-compatible Device Descriptions is managed by the HART Communication Foundation.



**B Connection of HART Gateway with the field device**

