

WWW.INFOPULSAS.LT / sales@infopulsas.lt

INTELLIGENT HART GATEWAY PLUS (HG1+)

USER GUIDE

Revision 4.0

© RAP Systems Ltd, 2000-2023. All rights reserved.

While this information is presented in good faith and believed to be accurate, RAP Systems does not guarantee satisfactory results from reliance upon such information. *Nothing contained herein is to be construed as a warranty or guarantee, express or implied, regarding the performance, merchantability, fitness or any other matter with respect to the products, nor as a recommendation to use any product or process in conflict with any patent.* RAP Systems reserves the right, without notice, to alter or improve the designs or specifications of the products described herein.

1 CONTENTS

2	GETTING STARTED	4
2.1	INTRODUCTION	4
2.2	SOFTWARE INSTALLATION	5
2.2.1	DOWNLOADING SOFTWARE FROM HG1	5
2.2.2	DOWNLOADING SOFTWARE FROM WEBSITE	5
2.2.3	VIRTUAL SERIAL PORT DRIVERS	5
2.2.4	AUTOMATIC UPDATES	5
2.3	HARDWARE INSTALLATION	6
3	CONFIGURATION TOOL OVERVIEW	8
4	BASIC SETUP - SETTING THE IP ADDRESS	10
5	HART MODEM	12
6	MODBUS GATEWAY	14
6.1	ADDING SMART DEVICES	15
6.2	CONFIGURING THE COMMAND TABLE	16
6.3	CHOOSING THE POLLING DEFERRAL MODE	16
6.4	SAVING AND UPLOADING THE CONFIGURATION	17
6.5	VIEWING LIVE DATA	18
7	OTHER CONFIGURATION OPTIONS	19
7.1	SPECIFYING TCP PORT NUMBERS	19
7.2	SPECIFYING A TIME SERVER	19
8	USING THE MODBUS INTERFACE	20
9	REMOTE ACCESS	21
10	FACTORY RESET	22
11	USE WITH KFD2-HMM-16 MULTIPLEXER	23
11.1	CONNECTION	23
11.2	CONFIGURATION	23

- 11.2.1 WIZARD CONFIGURATION 23
- 11.2.2 MANUAL CONFIGURATION 25
- 11.3 UNIQUE ADDRESS 25

2 GETTING STARTED

2.1 INTRODUCTION

This document applies only to system using the following software versions
RAP HGX software suite V 1.0.0

The HG1+ is a versatile device that provides convenient and reliable access to field instrument data for instruments that support the HART interface standard.

The HG1+ can be used as a HART Modem, allowing industry standard or proprietary software to talk directly to the instruments via a real or virtual serial port, or it may be used as a Modbus interface to the field instruments in support of SCADA, DCS, PLC or other Modbus capable hosts.

The HG1 provides the following functionality:

1. HART Modem over serial interface, selectable as RS232, RS422 or RS485.
2. HART Modem over Ethernet using a Virtual Serial Port for remote access.
3. HART_IP over Ethernet
4. Modbus RTU gateway over serial interface, selectable as RS232, RS422 or RS485.
5. Encapsulated (via TCP) RTU Modbus over Ethernet.
6. TCP/IP Modbus gateway over Ethernet.

The HART modem and Modbus gateway facilities may be used at the same time with the HG1+ automatically arbitrating access to the HART loop ensuring each function has a fair share of the available bandwidth. This concurrent functionality allows for applications in which the HG1+ primarily provides access for SCADA or DCS systems via the Modbus TCP/IP interface and simultaneously allows system engineers to run field maintenance packages such as PACTware, FieldCare or RadarMaster etc. on the real or virtual serial port without interrupting the principal data acquisition activity.

When used as a Modbus Gateway, the HG1+ fully supports all mandatory and common practice HART commands and all data embodied in these commands is available to be read or written via Modbus registers. Furthermore, the HG1+ can implement any device specific command using additional configuration files (device templates).

This remainder of this document gives details of how the HG1+ should be installed and configured.

2.2 SOFTWARE INSTALLATION

To configure the HG1 you must first install the product support software onto your PC. The installation files for this can be downloaded directly from the HG1 itself, or from RAP Systems website. We recommend that you check our website periodically for any updates to your products firmware of the PC configuration tools.

To download and install the product support software please follow the instructions below.

2.2.1 DOWNLOADING SOFTWARE FROM HG1

- Connect the HG1 to a 24V DC power supply (see section 2.3 – hardware installation)
- Connect the HG1 to your local network via the Ethernet connector – Note that the HG1 is supplied with a default IP address of 192.168.1.250 (this may be changed later if desired)
- Open a browser on your computer and navigate to 192.168.1.250 – this will take you to the products home page from where you can download the required installation files.
- Restart your PC once all files have been installed.

2.2.2 DOWNLOADING SOFTWARE FROM WEBSITE

You can download the same installation files from the RAP Systems website and doing so ensures that you have the latest versions of the utilities. To do so visit the RAP Systems Website and navigate to the product support downloads page. You will need to login using the username and password that you obtained when you registered with RAP Systems. If you haven't already registered, you will need to do so to gain access to the downloads.

Download, unzip and install the latest version of HGX software suite onto your PC following any onscreen prompts.

2.2.3 VIRTUAL SERIAL PORT DRIVERS

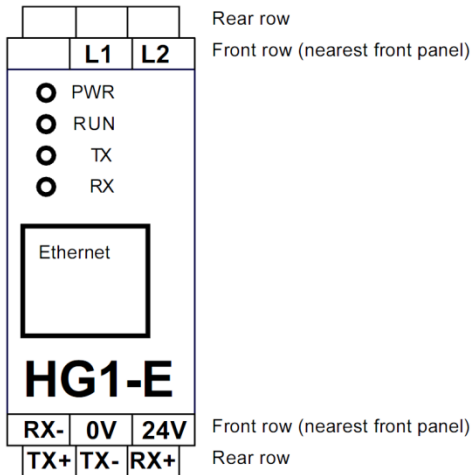
The software installation process automatically installs drivers to allow remote access to the HG1 from third party field device management software packages such as PACTware, permitting offsite monitoring and maintenance of HART devices.

2.2.4 AUTOMATIC UPDATES

RAP systems periodically publish updated device firmware and PC tools. When you run the HGX configuration tool your PC will automatically check if there are updates available (requires connection to the internet). When you attempt to download a configuration to the HG1, the tool checks if a firmware update is required and will perform this update for you.

2.3 HARDWARE INSTALLATION

The HG1+ uses screw terminals for power, loop and serial connections. Ethernet is via an RJ45 connector.



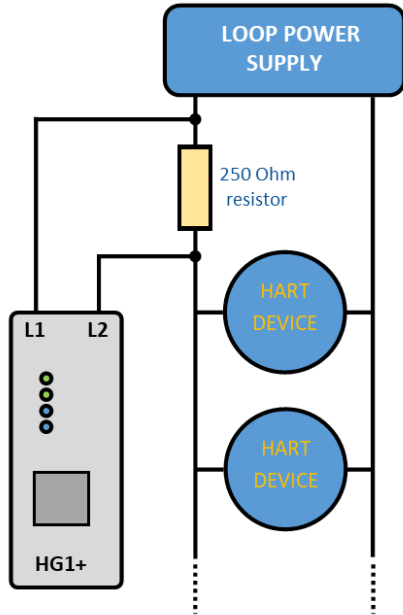
There are four LEDs on the HG1+ front panel:

- PWR** Illuminates when the device is powered.
- RUN** Illuminates when the device has successfully started up. A flashing run LED indicated a problem with the configuration or firmware version.
- TX** Illuminates when transmitting HART data.
- RX** Illuminates when receiving HART data.

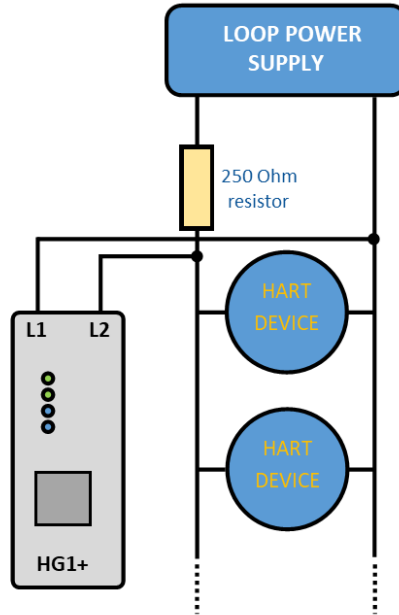
Loop connections are via the L1 and L2 screw terminals and are polarity insensitive. The HG1+ does not embed a loop sense resistor, this must be provided externally.

The diagram on the following page shows how to connect the HG! To either a powered or non-powered loop, and how to connect the serial interface depending on what interface standard is chosen (RS232, RS422 or RS485).

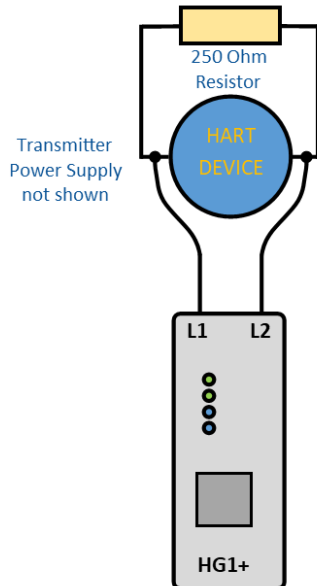
Loop powered transmitters Option A:
HG1 CONNECTED ACROSS SENSE RESISTOR



Loop Powered transmitters Option B:
HG1 CONNECTED ACROSS LOOP



Active Transmitter
HG1 CONNECTED ACROSS LOOP



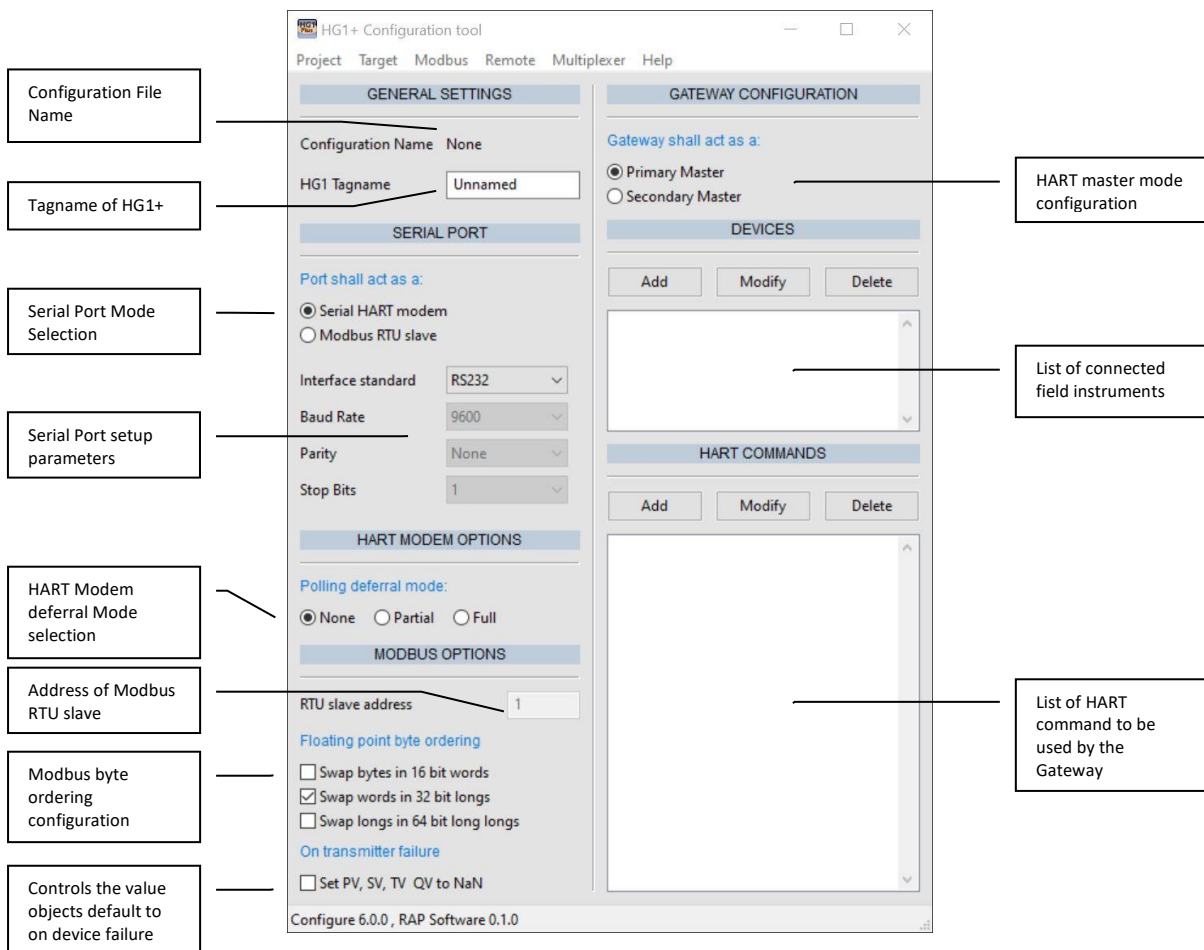
SERIAL INTERFACE CONNECTIONS

	SIGNAL	HG1 TERMINAL
RS232	TX DATA	TX-
	RX DATA	RX-
RS422	TX DATA +	TX+
	TX DATA -	TX-
	RX DATA +	RX+
	RX DATA -	RX-
RS485	DATA +	TX+
	DATA -	TX-

3 CONFIGURATION TOOL OVERVIEW

The HG1+ is managed using the HGx configure tool which allows the user to create and download a configuration to the device. The configuration can be saved to a file on the PC as part of system archiving and may be loaded and restored at will. The configuration tool provides a menu driven graphical interface outlined below, detailed use of this tool is given in the remainder of this document:

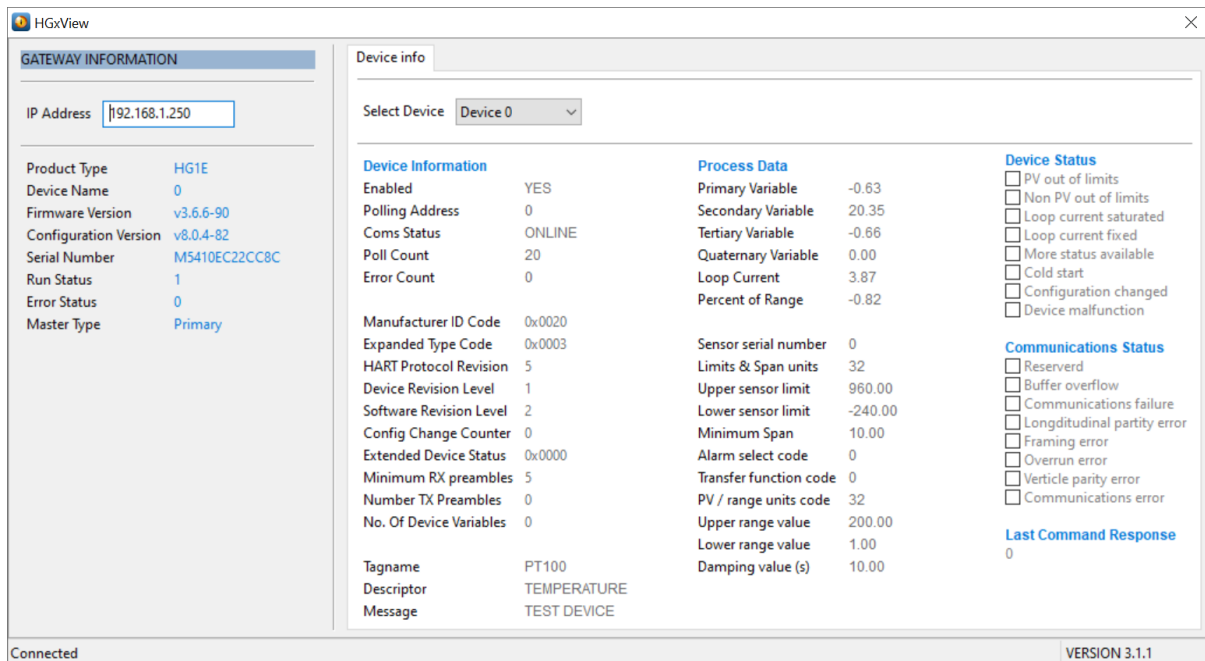
When first run, HGxConfigure presents a blank window with a simple top level menu bar with **PROJECT, TARGET, MODBUS, REMOTE, MULTIPLEXER** and **HELP**, once a new project is created, or an existing project is opened using the Project menu then the following is displayed:



The tool provides several drop-down menus - **PROJECT**, **TARGET**, **MODBUS**, **REMOT**, **MULTIPLEXER** and **HELP** - used to control the application:

Project	New		Creates a new, default configuration for the HG1+ which can be modified to meet actual application needs.
	Load from Disk		Load a previously saved configuration from the PC's hard disk
	Load from HG1		Load the configuration currently in the HG1 itself
	Save		Saves a configuration to the hard disk.
	SaveAs		Saves a configuration to the hard disk with a given name
	Close		Closes the currently open configuration
	Exit		Exits the program
Target	Configure		Upload the current configuration the HG1
	Change Network Settings		Change HG1 network setting (such as IP address and DHCP)
	Update Firmware		Update the firmware in the HG1
	Reboot		Restarts the HG1
	View Live Data		Display live data from the HG1
	Options		Change default port numbers and configure time server.
Modbus	Save Modbus Map	As Text File	Saves the HG1+ Modbus map as a text file on the PC
		As CSV	Saves the HG1+ Modbus map as a comma separated file on the PC suitable for use in Excel.
		For Citect	Saves the HG1+ Modbus map as a comma separated file on the PC in a format that can be imported directly into a Citect SCADA application.
Remote	Remote COM port settings		Configure virtual COM port for remote access to HG1
Multiplexer	Scan		Initiates the Multiplexer configuration wizard
Help	Documentation		Provides access to HG1+ product documentation
	About		Displays information about the tool.
	Diagnostics	Backup	Takes a diagnostic backup image of the HG1 configuration

The **View Live Data** Menu option opens a separate application that displays live data from the HG1+, useful for confirming the device status and communications to the field instruments.



4 BASIC SETUP - SETTING THE IP ADDRESS

Whether you intend to use the HG1+ as a Modem or as a Modbus gateway you need to configure the devices' IP address.

The HG1+ is supplied with a pre-configured static IP address of 192.168.1.250 which may be changed to any desired static IP, or the HG1+ maybe instructed to obtain its IP on start-up via a DHCP server. The IP address is changed using from the **Target → Change Network Settings** menu of the HGx Configuration tool as described below.

Connection from the module to the host computer is via the Ethernet interface port. The device should be connected to the host PC either directly (using a cross-over cable) or via the local network through a suitable Ethernet switch.

The following method will work even if your local subnet is different from the default provided with the HG1+. However, if this is the case then you should widen your subnet mask as required.

1. Start the HGx Configuration Tool.
2. Ensure the HG1+ is connected to the host PC and is powered.
3. Choose **Target/Change Network Settings** menu option. The device scanner program will start and automatically search for any connected devices, showing the results in a table.
4. Highlight the desired device from the table (even if only one device exists)

5. Click on the **Edit** button.
6. Select either DHCP or enter you own choice of static IP and subnet mask (it is a good idea to also complete the default gateway setting)
7. Click on **OK**
8. Wait while the HG1 network settings are changed and the device is rebooted. This process could take up to 1 minute.
9. Close the program.

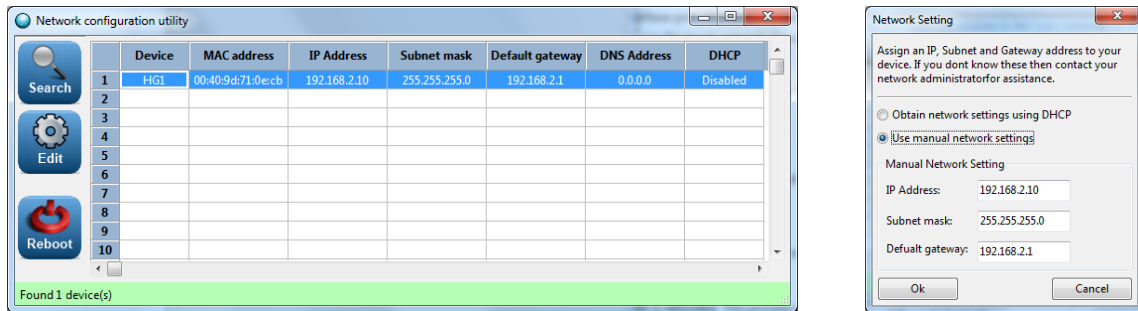


Figure 1 Using the Device scanner program

5 HART MODEM

This section applies to users who wish to use the HG1+ as a Hart Modem. Modbus Gateway users can ignore this and jump straight to section 6. Note that the HG1+ can be used as a Hart Modem and Modbus gateway simultaneously, in which case both sections are relevant.

As a Hart modem the HG1+ accepts raw Hart data from the serial interface or the virtual serial port via the Ethernet interface. This raw data is converted by the HG1+ into an FSK (Frequency Shift Keyed) signal and placed on the instrument loop.

Data returned to the HG1+ from instruments on the loop is transmitted out of the serial or virtual serial interface back to the host computer, the HG1+ does not alter the contents of the transmitted or receive data in any way and it is up to the host computer to properly form and decode the Hart packets.

The physical serial interface can be configured to use RS232, RS422 or RS485 signal levels. The baud rate, data length, parity and stop bits are not configurable; they are fixed at 1200 baud, 8 data bits, odd parity and one stop bit as per the Hart standard.

The HG1+ provides two services to simplify use with Hart communications loops.

Serial Hart modems typically require the host computer to control the RTS signal on the serial interface (this is used to control direction of data flow to or from the loop). The HG1+ does this automatically; the top end has simply to send the TX data and wait for a reply from the transmitter. This permits the use of two wire communications standards where the RTS signal is unavailable.

To properly comply with the HART protocol specification, there can be a maximum of two master devices simultaneously using a single HART loop, these are nominated as primary master and secondary master. The HG1 is a master device and its type (either primary or secondary) is set as part of the HG1 configuration. Any external master using the HG1 HART Modem interface must be of the opposite type to HG1, for instance if the HG1 is configured as a primary master, the external device must be a secondary master. If the HG1 detects that the external master is of the same type as itself, it will ignore the incoming data and will raise a 'master type clash' error which can be seen on the status bar when using the "LiveView" application.

Configuring the HG1+ as a Hart Modem required the following steps:

1. Install the Configuration tools as described in section 2.2
2. If you intend to use the HG1+ as a Hart modem over Ethernet via the virtual serial port, you should configure the virtual serial port driver on your PC as described in section 7.0
3. Configure the HG1+ Ethernet address as described in section 4.0
4. Select the either Primary or Secondary master as the HG1 gateway Master type (see diagram on next page)

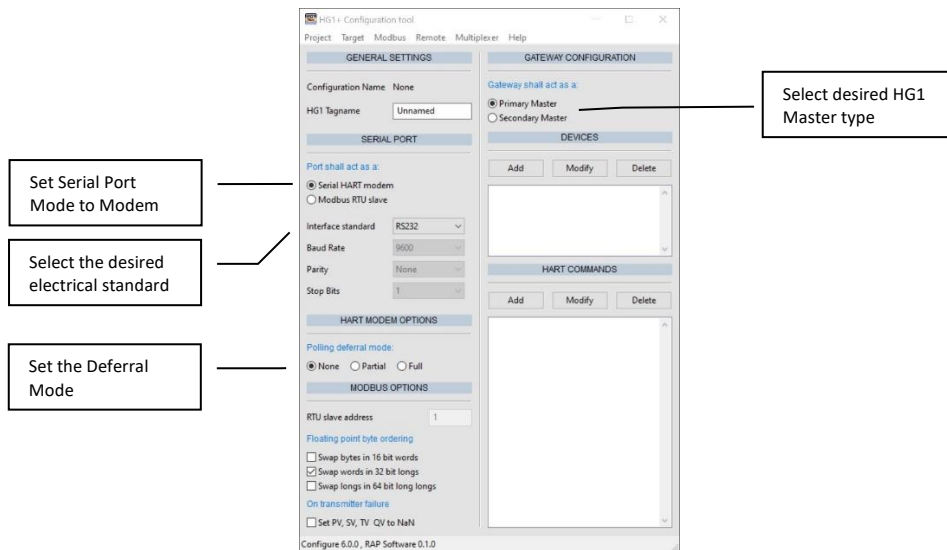
- If the HG1 is to be used simultaneously as a HART modem and Modbus gateway, then you should select the appropriate deferral mode from the configuration tool as described in section 6.3

If you intend to communicate with the HG1+ via the virtual serial port then nothing further is required, it is ready for use.

If you wish to use the physical serial interface you must follow these additional steps to configure the serial port interface type (e.g. RS232, 422 or 485).

Start the HGx Configure tool

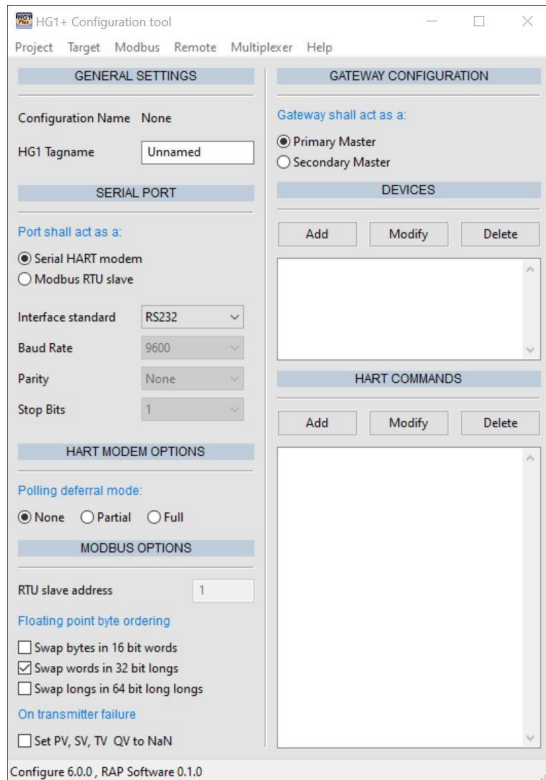
- Select **Project**→**New** from the menu bar.
- Select the serial interface standard you wish to use from the drop-down selection box marked **Interface Type**
- Save the configuration using the **Project**→**SaveAs** menu item, use any suitable name.
- Select the **Target**→**Configure** menu item. You will be asked to provide the IP address or domain name of the target HG1 after which the tool will configure and restart the HG1+. The process takes about 30 seconds. Once the HG1+ has restarted it is ready for use.



The other facilities of the configuration tool are used to configure the Modbus Gateway functionality and are not relevant when using the HG1+ as a simple modem.

6 MODBUS GATEWAY

Configuring the HG1+ Modbus Gateway is quick and simple and starts by creating a new project using **Project → New**. You will be presented with the following screen:



- If desired, enter the HG1+ **Tagname** – this is used only for documentation purposes and has no functional effect.
- Choose if the **serial port** is to be used as a Modem or as an RTU Modbus slave interface.
- Select the electrical **Interface standard** for the serial port (RS232, RS422 or RS485). If you selected RTU Modbus slave then also specify the additional serial port parameters including **Baudrate**, **Parity** and **Stopbits** (the data length is fixed at 8 bits)
- Choose the preferred **polling deferral mode** (see section 6.3)
- If RTU Modbus Slave has been selected, then specify the **RTU slave address**
- If any RTU or TCP/IP Modbus slave is to be used, then specify the appropriate **floating point byte ordering** required by the host system

Ticking the box under **On transmitter failure** causes the HG1 to set the primary, secondary, tertiary and quaternary process variables to a value of NaN (Not a Number) if the attached HART transmitter fails. When left un-ticked the HG1 returns the last good values for these objects under failed conditions.

Primary or **Secondary master** selection specifies the mode of operation of the HG1+ on the HART loop. The HG1+ is a HART master device that communicates with HART slave devices (the hart transmitters). The HART protocol specification allows a maximum of two HART master devices on the same HART loop, these are called the Primary master and the Secondary master. The HG1+ can be configured to be either a primary or secondary master device.

You should configure the HG1+ to be a primary master if:

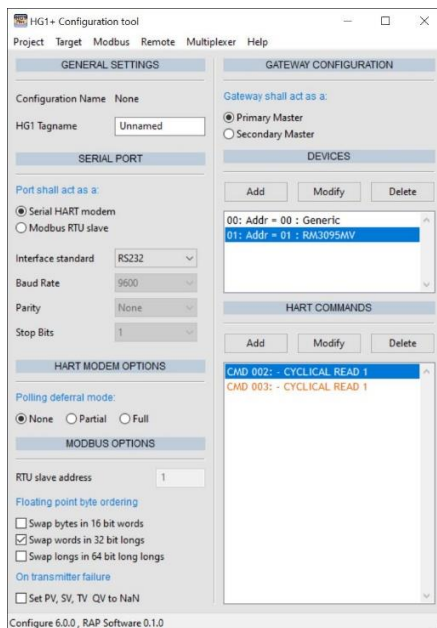
- It is the only master device connected to the loop, or
- You intend to connect a secondary master device to the loop such as a hand-held configuration device.

You should configure the HG1+ to be a secondary master if:

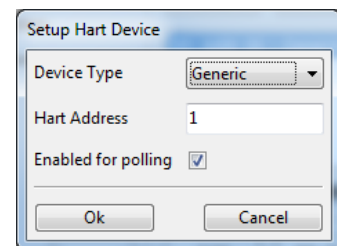
- There is already a primary master connected to the loop, such as a DCS, SCADA or PLC HART master.

6.1 ADDING SMART DEVICES

Once the basic setup has been completed it is necessary to declare which devices will be connected to the HG1+ via the HART loop interface. Devices may be added, modified and deleted from the device list using the **Add**, **Modify** and **Delete** (note 1) buttons under the Devices section of the right-hand panel. This image shows the configuration tool with initial configuration complete and one generic and one Rosemount device added:



When you add a device, you will be presented with a dialogue box asking for Device Type, Device Address and an Enable option. By default, all newly added devices are *Generic* i.e. they support the mandatory and



common practice HART commands – this device type will work with all HART devices and will allow the HG1+ to read and write all common data points. If you require the HG1+ to access device specific, non-standard data, then you should select your transmitter type from the drop down menu labelled **Device Type** on the top right. If your transmitter is not listed, then contact RAP Systems for a template file for your device.

The polling address of the transmitter should be entered in the **Hart Address** field.

When checked, the **Enabled** checkbox tells the HG1+ that the device is present and may be polled. This control is useful for temporarily disabling a device that has failed or under maintenance. Devices can be modified by double clicking the device in the list or by using the Modify button.

6.2 CONFIGURING THE COMMAND TABLE

The HG1+ automatically polls the field instruments for their **offline** data as required to ensure that this data is always available and valid in the Modbus data map. Offline data is obtained from the field instrument under the following conditions:

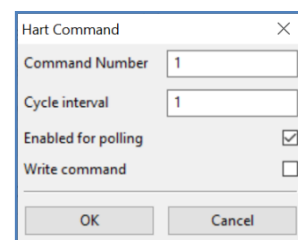
- At start-up
- After a communications failure
- After the field instrument indicates that some aspect of its configuration has changed

Offline data objects are always valid and can be read from the Modbus interface at any time. Section 8 explains how to download the Modbus map from the HG1 and how to identify which objects are offline data.

Online data (i.e. measured process variables or other data that changes in response to the process) are polled according to the entries in the HG1+ command table. By default, this table contains Hart commands 2 and 3 which pull back the four primary variables PV, SV, TV and QV along with loop current and percentage of range. For most applications, this is sufficient and no changes to the default command table are required.

Advanced users may wish to modify the default command list to access data from instruments that implement device specific hart commands. Up to 20 commands may be specified per instrument. These commands will be executed repeatedly at a rate defined by the **Cycle interval** setting associated with the command; a command with a cycle interval of 1 will be executed every cycle (i.e. as fast as possible), a cycle interval of 10 would be executed every tenth cycle and so on. High priority commands should be given a low cycle time.

Commands are added, modified and deleted from the command list using the **Add**, **Modify** and **Delete** buttons under the HART COMMANDS section of the right-hand panel. Commands can also be edited by double clicking on a command in the list. Clicking the **Add** button will bring up a dialog box as shown here in which you can enter the desired Hart command number, the required execution cycle interval and choose to enable or disable the command. The Write Command Checkbox is used to indicate that the given command is used to write data to the HG1 instead of reading data from it. Commands of this type do not get executed cyclically, instead they are executed only when their associated Modbus data points are written to by a Modbus master. See the section on Modbus for further information.



Hart Command	
Command Number	1
Cycle interval	1
Enabled for polling	<input checked="" type="checkbox"/>
Write command	<input type="checkbox"/>
OK Cancel	

- ❖ NOTE: On start-up, or after recovering from a communications failure, or on discovering a transmitter for the first time, the HG1+ will execute all configured commands once before adopting the specified timings.

6.3 CHOOSING THE POLLING DEFERRAL MODE

When the HG1+ is used as a Hart Modem to allow third party software to communicate with the field instruments, it may be necessary to consider the polling deferral mode setting. This setting controls how the HG1+ allocates access to the Hart loop between the needs of the automatic polling mechanism and the needs of the third-party software using the Hart Modem interface.

None (Equal Access) shares the loop equally between the polling and the Hart Modem interface.

Partial causes the polling mechanism to defer, to some extent, to the Hart Modem, the Hart Modem will get most the available bandwidth (about 75%) and the polling will get the remaining.

Full causes the polling mechanism to stop entirely whilst the Hart Modem is being used.

The reason this setting may be of importance is related to the effect sharing the Hart loop has on the timing of instrument responses to a third-party application using the Hart Modem facility. In the **None** deferral mode the third-party application may have to wait a small amount of time (approx. 0.5 seconds) before its message gets placed on the Hart loop as the loop may be in use by the automatic polling mechanism. Depending on how the third-party software has been designed this may cause it to think the field instrument communications have failed with a timeout. If such a problem is apparent, then the first steps to a solution are to check the software configuration options to see if there is a setting for the Hart timeout. This should be set to 2 seconds if available. If this is no mechanism to change the timeout settings, then the problem can be avoided by selecting either **Partial** or **Full** deferral. **Full** deferral should be used only if the other two options do not produce the required results as it inhibits the automatic polling (and therefore the Modbus data remain static) during the period that the third-party software is active.

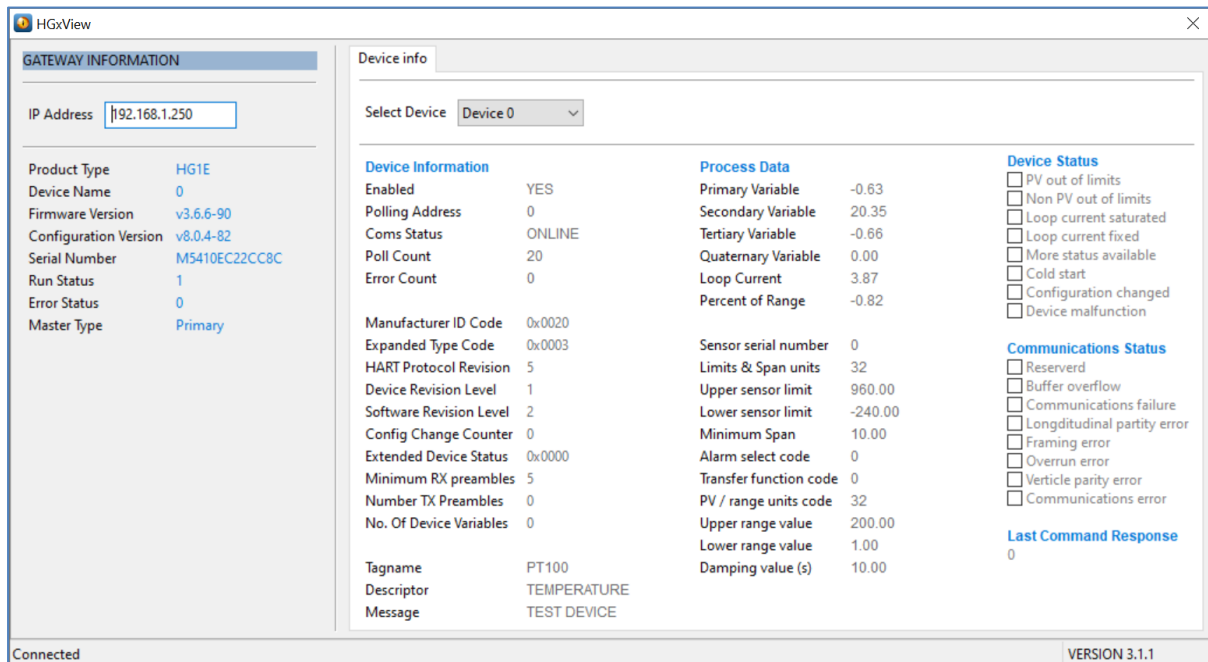
6.4 SAVING AND UPLOADING THE CONFIGURATION

Once all the required devices have been added to the configuration, and their respective command tables populated as needed, the configuration should be saved on your PC. For this you use the **SaveAs** or **Save** option from the Projects menu; this is a required step before the configuration can be uploaded to the HG1+. You will be asked to provide a filename for the saved project. You may reload saved projects at any time for examination, modification or to upload to another HG1+ using the **Load from Disk** menu option.

After saving the project the configuration can be uploaded to the HG1+ by choosing the **Configure** item from the **Target** menu. The process takes a short while and the HG1+ will be re-started once complete. The HG1+ is now fully configured and ready for use.

6.5 VIEWING LIVE DATA

It is possible to use the configuration tool to view live data from the HG1+, this includes information about the HG1+ itself, the status and health of connected smart devices and values of primary data from the devices. Select the **View Live Data** item from the Target menu to start the viewer:



The left-hand panel provides information about the HG1+, including its operational status and version numbers.

The right-hand panel shows data, in real time, being obtained from connected smart devices. Use the **Select Device** drop down to choose which devices data is displayed.

The condition of the communications link to the device can be assessed by examining the Coms Status, Poll Count and Error Count fields.

7 OTHER CONFIGURATION OPTIONS

7.1 SPECIFYING TCP PORT NUMBERS

The HG1 uses several different TCP port numbers to facilitate communications to and from the device. These default to the values shown below but may be changed using the **Target / Options** menu. If changes are made it is necessary to upload the new configuration the HG1.

Port Name	Default	Description
Virtual Serial Port	772	Used to pass serial data between PC and HG1
Modbus TCP/IP	502	Modbus over TCP/IP
Modbus encapsulated	1100	Modbus RTU encapsulated over TCP/IP
Intercom	503	Live View and debug communications
Syslog	50000	System debug communications
HART IP	5094	HART IP interface

7.2 SPECIFYING A TIME SERVER

The HG1 can be configured to obtain the current time and date from a specified time server.

Settings for the server address and an enable / disable option can be found under the **Options** item from the **Target** menu as shown below.

The screenshot shows a dialog box titled "Options" with a close button (X) in the top right corner. It is divided into two sections: "Port numbers" and "Time Server".

Port numbers section:

- Virtual Serial Port: 5094
- Modbus TCP/IP: 502
- Modbus Encapsulated: 1100
- Intercom: 503
- Syslog: 50000

Time Server section:

- Time server address: pool.ntp.org
- Use time server:

At the bottom of the dialog are two buttons: "OK" and "Cancel".

The HG1+ provides three types of Modbus slave interface to cover the needs of any master application:

Modbus TCP/IP: This interface is available via the Ethernet port and conforms to the Modbus TCP/IP standard. The HG1+ defaults to using Port number 502 for this interface; however, this may be changed by the user through the Target/Options menu of the configuration tool. Multiple Modbus TCP master devices can connect to the HG1 at the same time.

Modbus RTU: This interface provides Modbus RTU functionality over the HG1+ serial port. The port may be configured as to use RS232, RS422 or RS485 interface standards. There can be only one Modbus RTU (serial) master connected to the HG1+

Encapsulated Modbus RTU: This interface provides standard Modbus RTU framing; however the data is sent via the Ethernet port encapsulated in TCP frames. The HG1+ defaults to using port number 1100 for this interface; this may be changed by the user through the Target/Options menu of the configuration tool. Multiple encapsulated Modbus RTU master devices can connect to the HG1 at the same time.

All three Modbus slave interfaces may be used at the same time.

Each HART device configured in the HG1 has an associated set of Modbus registers which may be used by any Modbus master device to gain access to the transducer data for the device. The Modbus map which specifies the Modbus address of each database point is downloaded directly from the HG1 itself using the configuration tool.

The Modbus map generated by the HG1 is not fixed, rather it depends on the specific configuration downloaded to the device. Thus, it is important to finalise the HG1 configuration prior to using the map as changing the configuration will change the map. The map includes data objects for each HART command entered in the command list for each configured HART device. After configuring the HG1 download the map using the **Modbus/Save Modbus Map** menu option.

Modbus/Save Modbus Map/As Text file saves the Modbus map as a text file that can be opened with notepad or other text editors.

Modbus/Save Modbus Map/As CSV file saves the Modbus map as a comma separated value file suitable for importing into excel or other spreadsheet packages.

Modbus/Save Modbus Map/For Citect generates a CSV file suitable for import directly into the Citect SCADA package.

Objects in the Modbus map which have {D} at the end of their description are *write through* objects which are automatically transferred to the field instrument when the Modbus point is written to. Objects with a {U} are offline data which are automatically downloaded from the HART device at

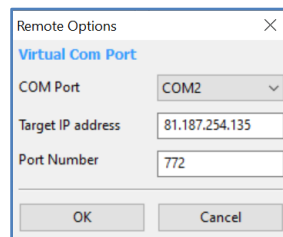
startup, or after a configuration change has been detected in the device. All other objects are downloaded cyclically according to the cycle time specified in the command list configuration.

9 REMOTE ACCESS

The HG1 can be accessed remotely over a LAN using the Virtual COM port facility.

The HGX installation software includes a COM port driver which creates a virtual serial port on the PC accessible by any software that would normally use a traditional COM port, including PACTware, FieldCare, RadarMaster etc. The virtual com port 'connects' to the HG1 over the Ethernet network, allowing the host PC to be located remotely from the HG1 itself.

To configure the virtual com port, open the HGX configure tools and select the **Remote→Remote COM Port Settings** menu. This will open a dialog box in which you can specify the virtual COM port name, and the IP address of the target HG1 and the port number.



Changes to these setting take effect immediately, and the settings remain in effect even if the PC is restarted. Once configured, it is not necessary to open the HGX configure application to use the com port.

10 FACTORY RESET

It is possible to force the HG1 to revert to factory settings. This may be needed in circumstances such as when the configured IP address of the unit has been lost or forgotten.

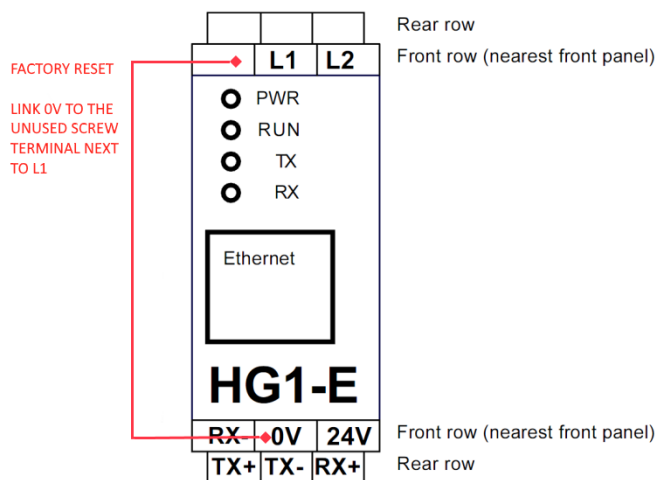
Performing a factory reset will have the following effect.

- The current device configuration will be erased
- The Network settings will revert to
 - o IP 192.168.1.250
 - o Network mask 255.255.255.0

Following a factory reset, a new configuration must be downloaded to the unit.

To perform a factory reset take the following steps.

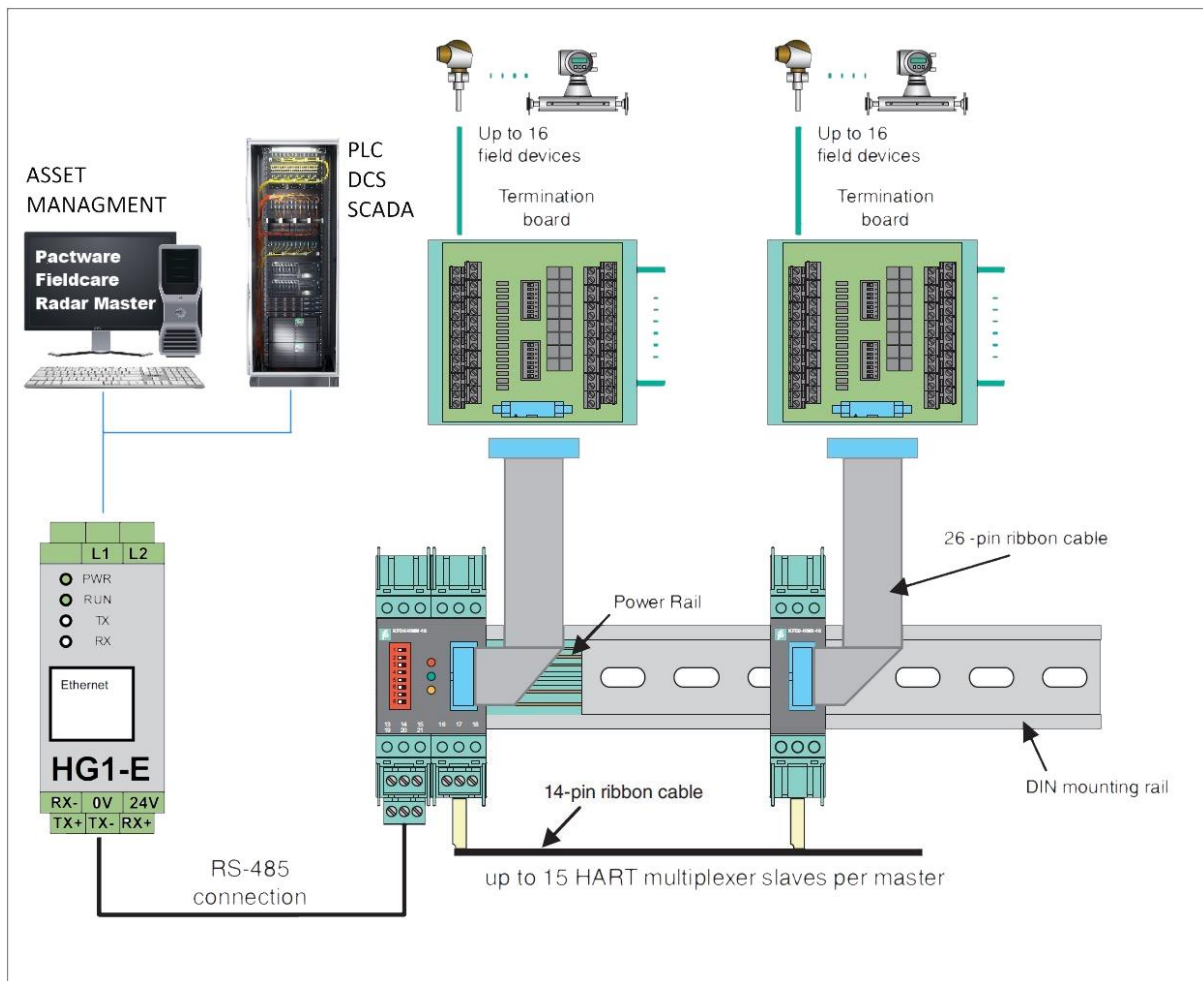
1. Power OFF the unit
2. Using a wire, short together the 0v screw terminal to the unused screw terminal next to the two loop terminals – see diagram below
3. Power ON the unit and wait two minutes
4. Remove power and remove the wire link
5. Repower the unit and re-configure as needed.



11 USE WITH KFD2-HMM-16 MULTIPLEXER

11.1 CONNECTION

The HG1 may be used in conjunction with a KFD2-HMM-16 Pepperl+Fuchs multiplexer. The HG1 must be connected to the multiplexer using its RS485 interface. The loop terminals L1 and L2 are not used.



11.2 CONFIGURATION

The HG1 can be configured to work with a multiplexer using either a wizard, which simplifies the process, or it can be done manually. Both methods are described below.

11.2.1 WIZARD CONFIGURATION

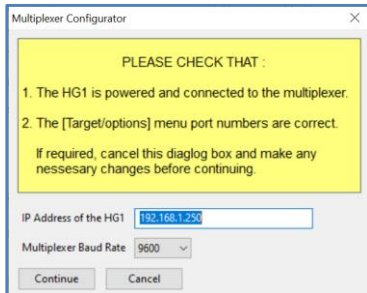
This wizard will do the following:

1. Configure the HG1 with a minimal setup to allow the HG1 to communicate with the multiplexer.
2. Interrogate the multiplexer to discover connected HART devices.

3. Re-configure the HG1 with the users choice of devices discovered in step 2.

Before running the wizard, please ensure that the HG1 is properly connected to the multiplexer using the RS485 interface, and that both the HG1 and multiplexer are powered.

To start the wizard, select the Multiplexer/scan menu from the configuration tool. This will bring up a dialog box asking for the IP address (or domain name) of the HG1, as well as the baudrate of the multiplexers RS485 link (default 9600). Once these two fields have been configured click on the Continue button.



The wizard will attempt to contact the HG1 and configure it with a minimal setup that will allow it to talk to the multiplexer, after which it will reboot the HG1. When the HG1 has restarted, the wizard will use the HG1 to talk to the multiplexer to download a list of attached devices. When complete the list will be presented to the user as shown below:

TYPE	TAGNAME	DESCRIPTION	ADDRESS
Multiplexer	-	-	1DEF100BEE
Device	TMT182-1	LINE-TEMP	11C88A802A
Device	TMT182-2	HEADER-TEMP	11C864024A

Buttons: Add All, Add Selected, Rebuild Loops, Close

You must now choose which devices you want included in the HG1 configuration. You may click on *Add All Devices* to include everything that was found, or you may select only those devices you are interested in by clicking them in the table to select them and then clicking on *Add Selected Devices* (holding down the CTRL key allows selection of multiple items). Once *Add All Devices* or *Add Selected Devices* has been clicked, the HG1 configuration display will be updated to reflect your choice, with the addresses of the multiplexer and devices automatically added. At this point you can make any other changes to the configuration if needed, such as adding command to the command lists etc.

Clicking on *Rebuild Loops* will force the multiplexer to rescan all its loops and rebuild its list of devices. This is useful if devices have been added or removed from the multiplexer. Note that this process is quite slow and can take several minutes, and once started cannot be interrupted. Once the rebuild has completed, you can select the desired devices as describe in the previous paragraph.

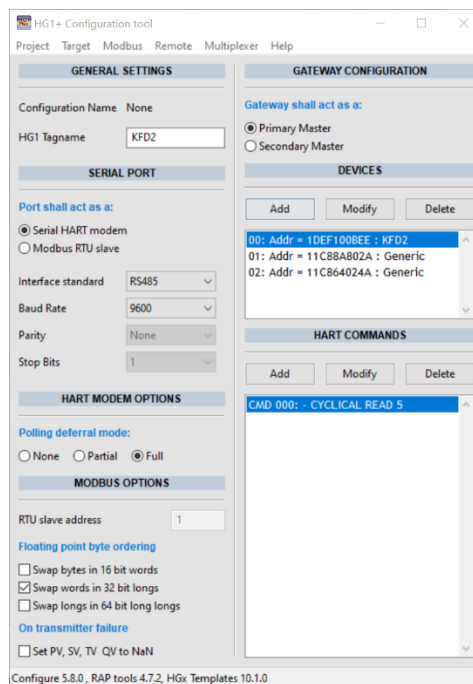
When you are happy with the configuration, save it to disk and then use the target/configure menu to send it to the HG1. The HG1 is now fully configured.

NOTE: if you intend to use this wizard on an HG1 that is located remotely, possibly across a WAN, please ensure that the communications port numbers are set correctly for your networking situation before running the wizard; these are found under the target/options menu.

11.2.2 MANUAL CONFIGURATION

When using a multiplexer, it is necessary to configure the HG1 with the Unique Address of each transmitter as well as the Unique Address of the multiplexer itself. This differs from the normal configuration of the HG1 where the transmitters short poll address is used. The procedure to determine the transmitters Unique Address is given later in this document.

1. Ensure the HG1 serial port is set to Serial HART Modem, RS485 (the baud rate, parity and stop bits are irrelevant as the HG1 will override these with appropriate values).
2. Deferral mode should be set to Full.
3. Add the multiplexer (using its Unique Address which must be exactly 10 hexadecimal characters in length) as the **first device** to the HG1 device list. Choose KFD2-HMM-16 as the device type and ensure that the only command associated with this device is command 0.
4. Add the transmitters as devices to the device list, again using their Unique Addresses (which must be exactly 10 hexadecimal characters in length). Configure the associated device type and command list as required.



5. Save configuration and configure target.

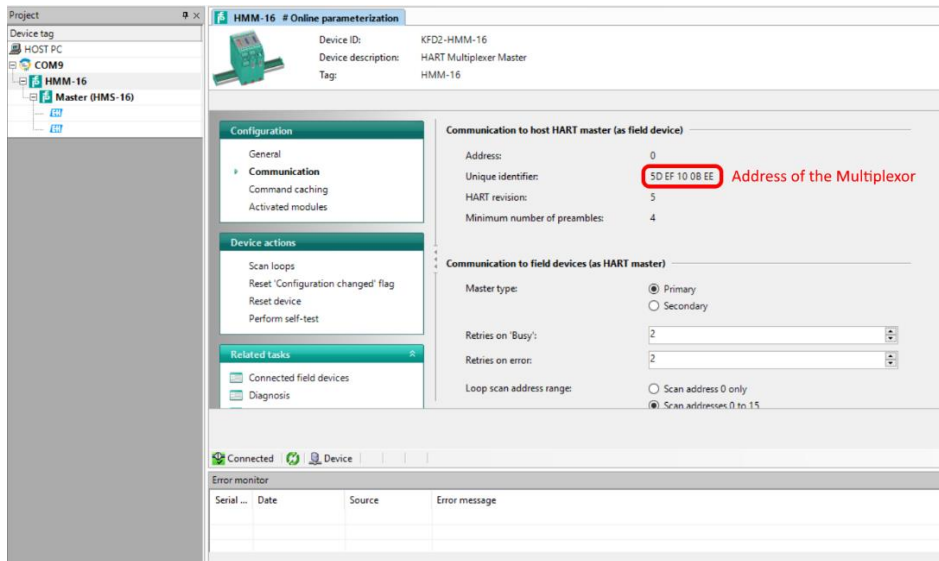
11.3 UNIQUE ADDRESS

Every HART transmitter (including the multiplexer itself) has an associated Unique Address which cannot be changed and uniquely identifies that device from every other HART device manufactured. This addressing

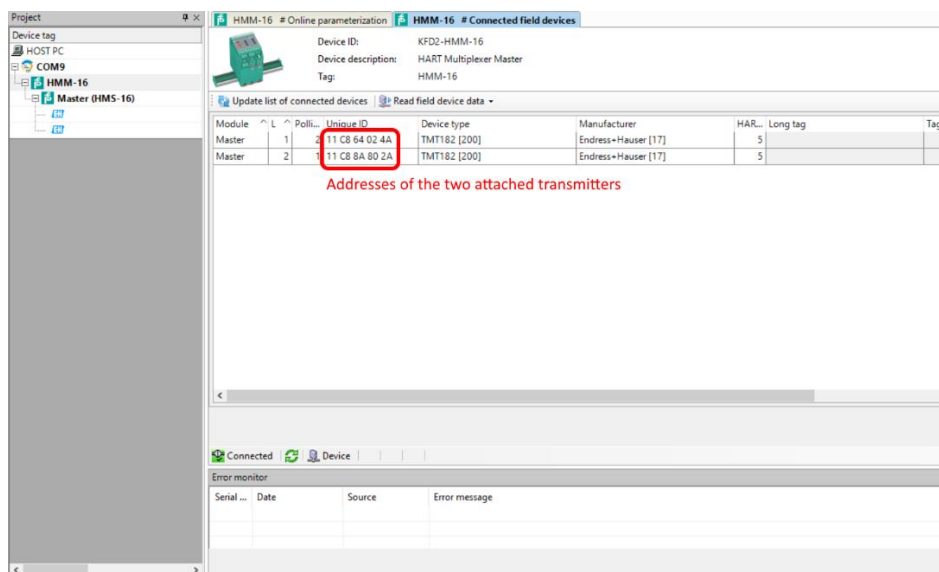
mechanism (instead of the short poll address) is necessary in a multiplexer environment as there may well be multiple transmitters connected with the same short poll address. Every Unique Address is exactly 5 bytes long which is 10 hexadecimal characters in length when written, example 1DF232EE70.

For devices supporting HART revision 5 and above the unique address is formed by combining the 14 least significant bits of the devices Expanded Device Type Code (two bytes in length) with the Unique Device Identifier (3 bytes in length).

The Unique Address can be obtained using asset management software such as PACTware or similar. The images below show the Unique Address of the multiplexer and two transmitters as found by PACTware.



Screen capture of PACTware showing the unique address of the HMM-16 Multiplexer



Screen capture of PACTware showing the unique addresses of the transmitters