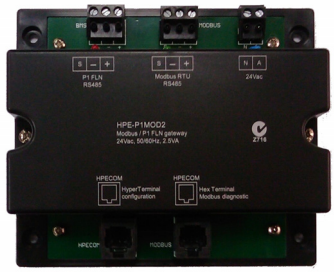

HPE-P1MOD2… – Modbus Integration to FLN

FW4

The HRW Point Expansion units, type HPE-P1MOD2…, are P1 FLN compatible devices for integration of Modbus RTU slave devices in to the FLN. Multiple Modbus RTU devices of any mix may be connected to the HPE-P1MOD2… for read/write access of up to 195 data-points.

HPE-P1MOD2 – 96 data points on one P1 address
HPE-P1MOD2-195 – 195 data points on two P1 addresses within a single device

The HPE-P1MOD2-195 has additional point storage capacity and the data is held in two memory segments, each having it's own P1 address. When a P1 address is assigned to this device a second sequential P1 address is automatically created to allow access to the full 195 available data points by polling the two P1 addresses contained within the device.

The first 96 points are associated with P1 address 1 and the additional 99 points are associated with P1 address 2 (P1 address 1 + 1)

Application Data

Primary network protocol:	P1	
Sub-network protocol:	Modbus RTU	
FLN Application No.:	161	
Administration points:	Point 1	- Diagnostic counter reset
	Point 2	- BACnet comms error count
	Point 3	- Modbus comms error count
	Point 1000	- Primary P1 address
	Point 1001	- BACnet baud rate
	Point 1002	- Modbus baud rate / config.
Modbus RTU data points:	**HPE-P1MOD2** • 96 total • Point 4…99 (P1 point 4…99) **HPE-P1MOD2-195** • 195 total • Point 4…99 on primary P1 address (P1 point 4…99) • Point 101…199 on secondary P1 address (P1 point 1…99 on secondary P1 address)	
Supported Modbus RTU functions:	01	- Read (write) Coil status
	02	- Read Discrete Input
	03	- Read (write) Holding Register
	04	- Read Input Register
Comm speed selection, FLN:	4800 (default), 9600 , 19200, 38400, 57600	
Comm speed selection, Modbus subnet:	9600 (default), 19200, 38400	
Modbus subnet comm configuration:	7/8 data bits – Odd/Even/No parity – 1/2 stop bits (default – 8N1)	

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Default Settings

The HPE-P1MOD2 is suitable for use with a wide range of Modbus RTU devices and is programmable by the user to suit the various connected devices. As a setup example the factory defaults include a number of points already configured. These default point settings relate to the Rail 350 Modbus RTU electricity meter (KR3502).

KR3502:

- kWh, kVArh, kVAh
- kW, kVAr, kVA
- Inductive VAr, Capacitive VAr
- Neutral current
- Volts, Amps, PF, Frequency
- Peak values, MD values
- %THD per phase V & I

If using the HPE-P1MOD2 for integration of devices other than the MR3002 the sample points may be overwritten or deleted.

Modbus RTU Addressing Structure

For the purpose of setting up the HPE-P1MOD2, the Modbus RTU point numbers are grouped in to sets of 256 points (0…255). Each set of 256 points is referred to as a **Table** (AddHi) and each point within a table is referred to as **Row** (AddLo).

Although there is some difference between individual manufacturers in the way that they refer to points within devices, the Modbus RTU addressing in the background of their devices are similar, generally following the Modicon Modbus RTU or J-Bus addressing structure.

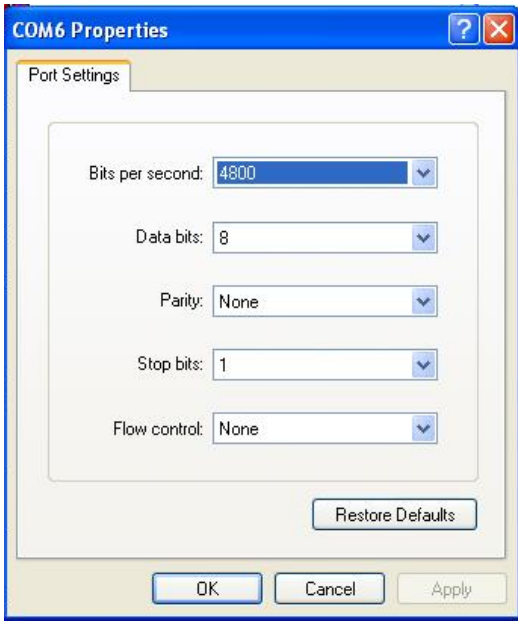
A conversion of Modbus RTU addresses to HPE-P1MOD2 Table & Row is as follows (based on Function 03):

MODBUS Addr Range		HPE-P1MOD	
		Table #	Row #
40001…	40256	0	0… 255
40257…	40512	1	0… 255
40513…	40768	2	0… 255
40769…	41024	3	0… 255
41025…	41280	4	0… 255
41281…	41536	5	0… 255
41537…	41792	6	0… 255
41793…	42048	7	0… 255
42049…	42304	8	0… 255
42305…	42560	9	0… 255
42561…	42816	10	0… 255
42817…	43072	11	0… 255
43073…	43328	12	0… 255
43329…	43584	13	0… 255
			and so on…

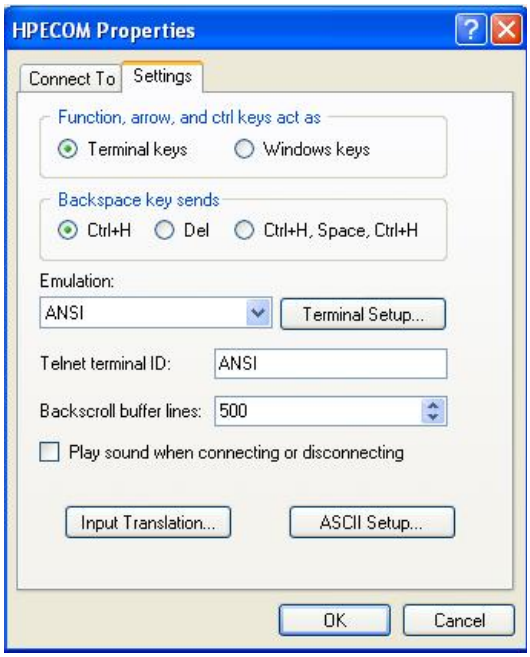
HyperTerminal configuration

For successful communication between HyperTerminal and the HPE device, initial Properties setup of HyperTerminal should be as follows:

'Connect To' Com Configuration:

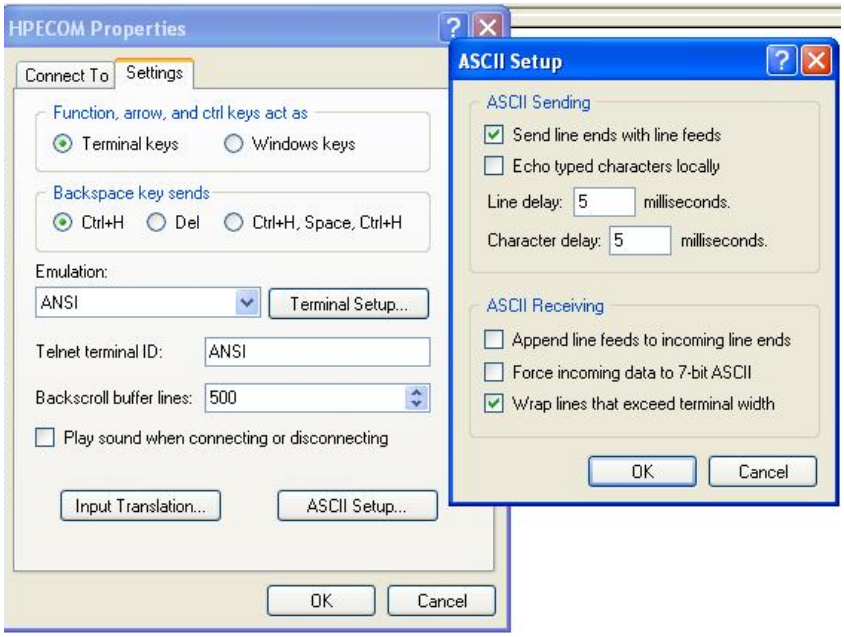


'Settings' General:



HyperTerminal configuration (cont…)

'Settings' ASCII Setup:



Note: If there are no Modbus devices connected, or they are incorrectly addressed, and the Modbus subnet comms is 'Enabled', then HyperTerminal communication response will be delayed at power-up of the HPE-P1MOD2 and during data refresh activity on the bus connection due to scanning and response-wait timeout for each point. This period of delay is indicated by slow flashing of the green LED at the Modbus connection. In such a case, press **TTTTT**… to break in to terminal mode and enter **E** to 'Disable' the subnet comms until the RTU devices are correctly configured.

Connecting to and communicating with the HPE-P1MOD2:

- Connect HPECOM via the left-hand RJ11 socket
- With the keyboard Caps Lock on, press **TTTTTT…** until communication begins (it is not necessary to press the enter key)
- **For successful FLN network communication Write any changes (W), eXit HyperTerminal (X) and disconnect the HPECOM cable at the RJ11 connector**

We strongly recommend you to save the HyperTerminal setup for each baud rate you may wish to use with an easily recognised configuration name. For example:

- HPECOM 48 (4800)
- HPECOM 96 (9600)
- HPECOM 19.2 (19200)
- HPECOM 38.4 (38400)
- HPECOM 57.6 (57600)

Saving one or more of these HyperTerminal configurations enables trouble free communication without having to repeat the HyperTerminal set up in future.

Administration Point Summary

Function	Enter	Result	Options / *Comments*
Start communication	TTTTT…	Display of configuration and data-point status	*With the Caps Lock on, hold the T key down until the screen updates with HPE data. It is not necessary to press the enter key*
Download point database text file	DE	HPE-P1MOD2 is 'Ready' for download of text file	*Go to HyperTerminal 'Transfer' menu, select 'Send Text File' and browse to the required point text file and select the file. After download the data will be checked and the device will restart. If there is any discrepancy the original database will be restored*
Clear data base	DE / 10000=1	Delete existing points	*Enter DE to prepare Download ready state then enter 10000=1*
Set P1 network address	1000=1…99	Individual network address is assigned	*Example: 1000=10*
Set P1 network baud rate	1001=…	Primary network comms speed is set	**4800**, 9600, 19200, 38400, 57600 *Example: 1001=9600* ***After changing comm. reconnect with HyperTerminal at the new comm. speed then save (Write) the change!***
Set Modbus RTU subnet baud rate	1002=…	Subnet comms speed is set	2400, 4800, **9600**, 19200 *Example: 1002=9600*
Set Modbus RTU subnet comms configuration	1002=…	Subnet comms data configuration is set	7N1, 7N2, 8N1, 8N2 7O1, 7O2, 8O1, 8O2 7E1, 7E2, 8E1, 8E2 *Example: 1002=8N1*
Zero the Reset counters	1=0	All Reset counters are zeroed	*Factory diag. In order as displayed:* *Rx timeout, Tx timeout, Hardware reset*
Zero the P1 comms error counter	2=0	P1 comms error counter is reset	*Example: 2=0*
Zero the Modbus comms error counter	3=0	Modbus comms error counter is reset	*Example: 3=0*
Diagnostic display	D	Point by point response codes are displayed	*For data stream analysis between the HPE and the Modbus RTU devices.*
Find Modbus point detail	F	Point data structure is revealed from a specified starting point	*Refer to the description on page 10*
Scroll page display	P=1…10	Scroll to specific page if more data-points are present than can be displayed on one screen	*Example: P=2* *The second page of database settings are displayed*
Enable Modbus RTU subnet communication	E	Toggles Enabled/Disabled of Modbus RTU Subnet communication	*Default Disabled to allow easy configuration when no Modbus devices are connected.* ***Always 'Enable' when Modbus devices are connected and points are configured!***
IEEE Reverse Low/High	IR=1	Changes expected Word relationship from Low/High to High/Low	*IR=0 will revert to Low/High order*
Write values as default	W	Changes written	***Always do this after making changes that you wish to be permanent including Enabling the Modbus comms!***
Exit communication	X	Communication with HyperTerminal no longer active	***Always do this when finished with configuration and disconnect the HPECOM cable!*** *HyperTerminal comms is automatically exited after a power reset.*

Point Types

Each data point must be configured to access the relevant Modbus network device and data register within the device. The Function Types associated with Modbus devices is a key part of locating the correct data location within each device. Below is a summary of the point type settings available

HPE Point Type	Programming Value	Description
N/A	0	Not Used
Read/Write Input Coil (RIC)	1	Function 01 (F01) 1 Word (2 bytes)
Read Input Discrete (RID)	2	Function 02 (F02) 1 Word (2 bytes)
Read/Write Holding Register (RHR)	3	Function 03 (F03) 1 Word (2 bytes)
Read Input Register (RIR)	4	Function 04 (F04) 1 Word (2 bytes)
RHR - IEEE 754 (RHE x 2)	5	F03 2 Word IEEE converted to unsigned integer
RIR - IEEE 754 (RIE x 2)	6	F04 2 Word IEEE converted to unsigned integer
RHR 2 Word Pair (RHR+RHRP)	7	F03 2 Word in standard format
RIR 2 Word Pair (RIR+RIRP)	8	F04 2 Word in standard format
RHR +I*S - IEEE 754 (RHE+RHEP)	13	F03 2 Word IEEE converted to scaled integer
RIR +I*S - IEEE 754 (RIE+RIEP)	14	F04 2 Word IEEE converted to scaled integer

Using a point type 5 or 6 will generate two data points with in the HPE device of either F03 or F04 respectively for registers using IEEE floating-point data format which are always 2 Word registers. However, these points are internally converted to unsigned integer values before being made available for polling by the field station, therefore no external IEEE conversion is required. The first point address is entered in the point configuration string and the second point is automatically generated.

We have fixed global data configuration of type 5 and 6 points as follows:

	Point 1	Point 2
Intercept	0	0
Slope	1	65536

For values expected to be < 65536 then only the first point of the pair need be polled. If the data value is ever expected to be > 65536 then both points should be polled and the Value calculated in the field panel using the following formula:

V= Point1 + (Point2 * 65536)

Using a point type 7 or 8 will generate two data points with in the HPE device of either F03 or F04 respectively for registers using standard data format which are 2 Word (typically energy registers in electricity meters). The first point address is entered in the point configuration string and the second point is automatically generated.

These two points are then always read together when the Modbus network is polled. When the points are generated as type 7 or 8 the first of the pair has a normal type tag, such as RHR, whereas the second of the pair has a 'P' tag suffix, for instance RHR**P**, to indicate that the second point is being read together with the preceding point as a **P**air.

Point Types (cont…)

Using a point type 13 or 14 will generate two data points with in the HPE device of either F03 or F04 respectively for registers using IEEE floating-point data format which are always 2 Word registers. However, these points are internally converted to scaled integer values before being made available for polling by the field station, therefore no external IEEE conversion is required. The first point address is entered in the point configuration string and the second point is automatically generated.

By default we have set global data configuration of type 13 and 14 points as follows:

IEEE Slope (IS) = 10
IEEE Intercept (II) = 1000

These values may be set by the user with the following HyperTerminal commands:

IEEE Intercept: **II=*n***
IEEE Slope: **IS=*n***

These settings will apply to all type 13 and type 14 points within the device.

In the field panel the actual Value may be obtained with the following formula:

V = (Point1 / IS – II) + (Point2 * 65536 / IS)

Or

Configure point 1 with slope = 0.1 and intercept -1000
Configure point 2 with slope = 6553.6 and intercept 0
Add point 1 & point 2

Note for Long Integers:

You must check whether the first point of the pair or the second point of the pair is the Low Word or the High Word as different Modbus device manufacturers may have the High Word first.

When IEEE types are used, if the High Word is first then reconfigure with the command **IR=1** so that the HPE-P1MOD2 will correctly read and reconfigure the values for transmission over the P1 network.

Point Programming

The structure for manual entry of point configuration over HyperTerminal is as follows:

<Point #>=<Modbus Device Addr>,<Table #>,<Row #>,<Point Type>
(Address) (AddHi) (AddLo) (Data)

Following this structure, in reference to the MR3002 meter's defaults included in a new HPE device as an example, you will see that the kW register, point 6, is on Modbus RTU #1 and the kW data is found in the register located at Table 11, Row 0, and the point type is 4 which is an Input Register as 1 Word:

6=1,11,0,4

HPE-P1MOD2 Point #	KR3502 Register ♣	Point #=Modbus Data
4	kWh (Hi)	4=1,2,2,4
5	kWh (Lo)	5=1,2,3,4
6	kW	6=1,11,0,4
7	PF	7=1,11,3,4
8	Hz	8=1,11,4,4
9	Volts L1	9=1,11,5,4
10	Amps L1	10=1,11,6,4
11	Volts L2	11=1,11,8,4
12	Amps L2	12=1,11,9,4
13	Volts L3	13=1,11,11,4
14	Amps L3	14=1,11,12,4
15	Vpeak L1 *	15=1,13,3,4
16	Vpeak L2 *	16=1,13,4,4
17	Vpeak L3 *	17=1,13,5,4

** Vpeak points are read/write, therefore, while the point is in OPER override (as commanded from the DDC Field Panel), Vpeak registers may be reset/preset by writing the register value.*

♣ To delete any of the default example points – point 17 for instance: 17=0,0,0,0 (enter)
To delete all point data please refer the 'Download Procedure' section on page 10.

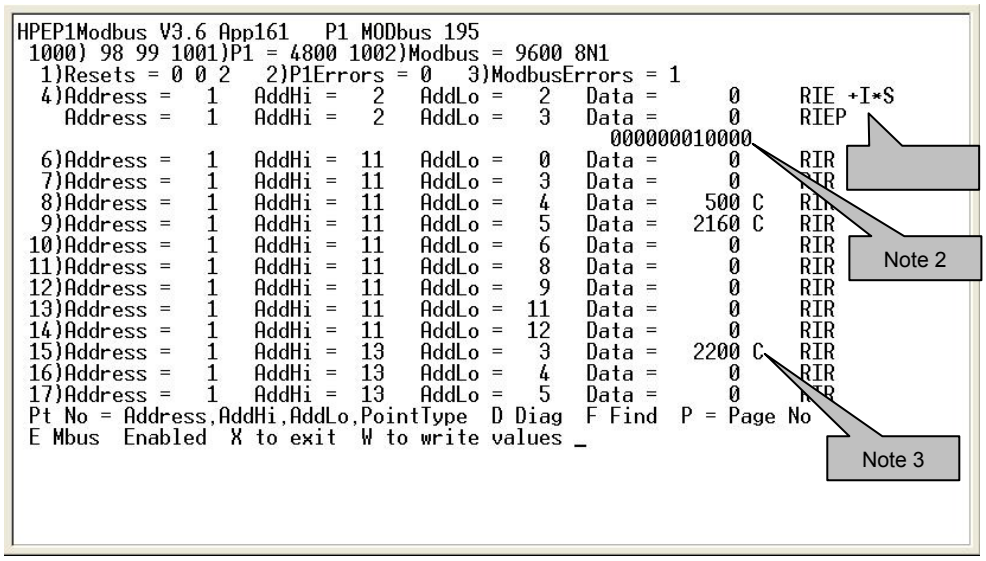
When using the MR3002 meter the data-point numeric values relating to the Device Address, Table Number and Table Row may be taken directly from the documentation supplied with the device.

For other Modbus RTU devices the point data can be converted according the table on page 2 or by using our calculator tool which creates the point database for copying to a text file (*.txt using Notepad) and automatic download over HyperTerminal connection with the HPECOM cable.

HyperTerminal Display

Below is the factory default configuration for the **HPE-P1MOD2-195** as displayed in HyperTerminal after breaking in to Terminal mode by entering **TTTTTTT**….

Point 8, as an example, is configured to read the Modbus meter's frequency register and the read data indicates 50.0 Hz. Point 9 is the L1 voltage (Ph-N) and the read data indicates 216.0Vac.



Point 1000 indicates the P1 address as being 98 (factory default) and because this is the 195 point version then address 99 is also automatically assigned for allocation of points 101…199 (P1 Addr 99, points 1…99).

The second P1 address is automatically assumed as being the address set at point 1000 + 1. Therefore, if 1000=20 was entered in an HPE-P1MOD2-195 then the point 1000 display would be **20 21** indicating that it was configured as P1 address 20 for the first 96 data points and P1 address 21 is automatically created for the remaining 99 data points.

Note that with HPE-P1MOD2-195 point 100 is not used.

When using the **HPE-P1MOD2** (96 point version) then address point 1000 would only indicate **98** because the 96 point version only requires one P1 address, for data points 4…99.

Note 1: The RIE +I*S tag indicates the Low Byte of an IEEE pair, converted to scaled integer (Function 04, Point Type 14). The following line's tag of RIEP indicates the High Byte pair to the Low Byte.

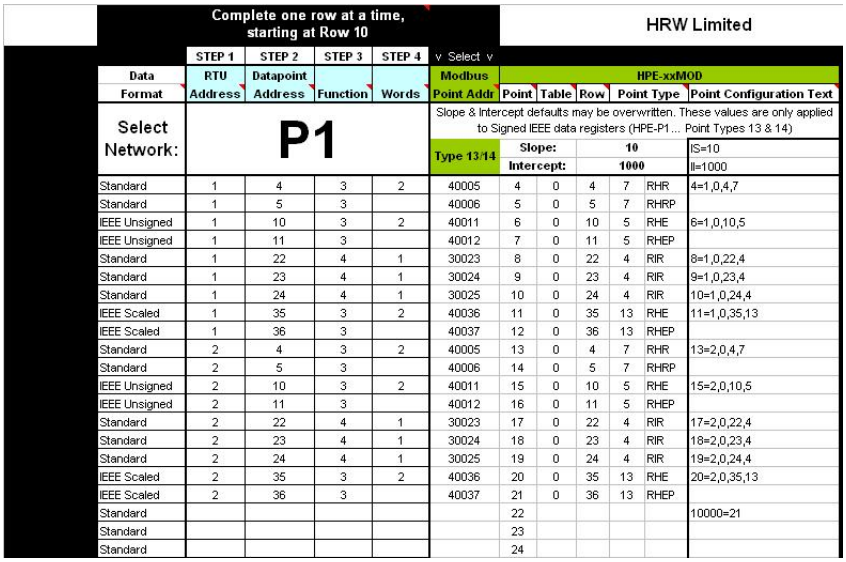
Note 2: With the Diag function active we see the result of the default Intercept 1000 and Slope 10; 10000 representing the 0 intercept. When the register is live then this field will show the actual register value after conversion of the original IEEE floating point data, < 10000 being a –ve result and > 10000 being a +ve result.

Note 3: As an always active diagnostic, after scanning, a data value that has Changed since previous scan is tagged with 'C'.

Address Calculator

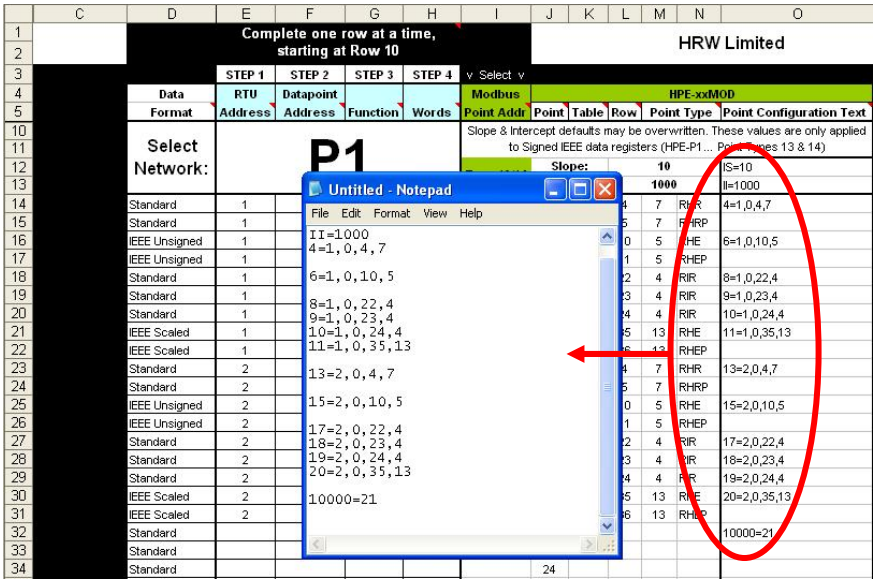
The address calculator tool is an MS Excel tool designed to assist in building the point database in conjunction with a Modbus RTU's technical manual.

Consult the Modbus RTU's manual for register address and data format information and enter the detail in the tool as instructed in the tool notes.



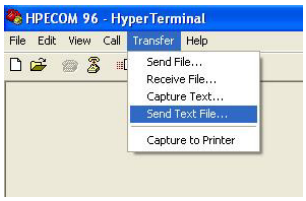
	Complete one row at a time, starting at Row 10				HRW Limited						
	STEP 1	STEP 2	STEP 3	STEP 4	v Select v						
Data Format	RTU Address	Datapoint Address	Function	Words	Modbus Point Addr	Point	Table	Row	Point Type	Point Configuration Text	
Select Network:	P1				Slope & Intercept defaults may be overwritten. These values are only applied to Signed IEEE data registers (HPE-P1... Point Types 13 & 14)						
					Type 13/14	Slope:		10		IS=10	
						Intercept:		1000		II=1000	
Standard	1	4	3	2	40005	4	0	4	7	RHR	4=1,0,4,7
Standard	1	5	3		40006	5	0	5	7	RHRP	
IEEE Unsigned	1	10	3	2	40011	6	0	10	5	RHE	6=1,0,10,5
IEEE Unsigned	1	11	3		40012	7	0	11	5	RHEP	
Standard	1	22	4	1	30023	8	0	22	4	RIR	8=1,0,22,4
Standard	1	23	4	1	30024	9	0	23	4	RIR	9=1,0,23,4
Standard	1	24	4	1	30025	10	0	24	4	RIR	10=1,0,24,4
IEEE Scaled	1	35	3	2	40036	11	0	35	13	RHE	11=1,0,35,13
IEEE Scaled	1	36	3		40037	12	0	36	13	RHEP	
Standard	2	4	3	2	40005	13	0	4	7	RHR	13=2,0,4,7
Standard	2	5	3		40006	14	0	5	7	RHRP	
IEEE Unsigned	2	10	3	2	40011	15	0	10	5	RHE	15=2,0,10,5
IEEE Unsigned	2	11	3		40012	16	0	11	5	RHEP	
Standard	2	22	4	1	30023	17	0	22	4	RIR	17=2,0,22,4
Standard	2	23	4	1	30024	18	0	23	4	RIR	18=2,0,23,4
Standard	2	24	4	1	30025	19	0	24	4	RIR	19=2,0,24,4
IEEE Scaled	2	35	3	2	40036	20	0	35	13	RHE	20=2,0,35,13
IEEE Scaled	2	36	3		40037	21	0	36	13	RHEP	
Standard						22					10000=21
Standard						23					
Standard						24					

Once the information is properly entered in the tool the resultant point configuration data, in Column O, may be copied to Notepad for saving as a text file and download to the HPE-P1MOD2



The last row of the download data, 10000=21, is a line count for a validity check as part of the download process. 10000=*n* is not required if manually entering the data configuration lines.

Download Procedure



To download a new data base text file:

- Prepare the HPE device to receive the text file by entering **DE**
- Select 'Send Text File' from the HyperTerminal Transfer menu item
- Browse to the folder containing the required database text file and select the relevant file

After the download process you will see a check of line numbers expected and line numbers actually received and the HPE device will indicate 'restarting' should the line check be correct.

After a successful download enter **E** to toggle between Disabled/Enabled Modbus communication. Once toggled to Enabled press enter again to invoke a live scan of the Modbus network. Enter **W** to Write the enabled state to ensure the comms remains enabled after a power reset.

Note that if there are a number of points wrongly configured (nonexistent devices or data points on the Modbus network) the live scan may take longer than usual to complete. In this situation you may TTTTTTT… to stop the scanning activity and **E** to toggle to Disabled for checking point setups.

To delete all existing point data without downloading a new text file enter **DE** then enter **10000=1**

Find Function

If the Modbus RTU documentation is not clear, then the **Find** function of the HPE device may be used to reveal the Modbus RTU point addresses together with detail required to enter the points in to the HPE device. The Find function is linked to point # 4 and is activated by keystroke **F** (enter). *It is recommended to set HyperTerminal to buffer the maximum 500 lines of displayed data to assist in reviewing the data received during activation of the Find function.*

Example 1: If you wish to reveal the point detail and activity of all points starting from Modbus address 30001, Read Input Register (Table 0/Row 0, F04) of a connected Modbus RTU device with address 1 then set up point 4 as follows:

4=1,0,0,4 (enter)

Example 2: If you wish to reveal the point detail and activity of all points starting from 32817 (Table 11/Row 0, RIR/F04) of a connected Modbus RTU device with address 25 then set up point 4 as follows:

4=25,11,0,4 (enter)

Once you have set up point 4 according your search criteria then enter **F** the points from the starting Table/Row will be sequentially displayed as in the example on page 11.

To Exit the Find sequence enter TTTTTTTT… to revert back to the normal point listing.

Note: When you exit the Find sequence the Table/Row detail at the scanning point at which you exit will be inserted in to the point data of point 4. Please ensure the setup of point 4 is as you require it before Writing (W) the configuration.

Find Function (cont…)

```
15)Address =   1    AddHi =  13    AddLo =   3    Data =   2170    RIR
16)Address =   1    AddHi =  13    AddLo =   4    Data =      0    RIR
17)Address =   1    AddHi =  13    AddLo =   5    Data =      0    RIR
Pt No = Address,AddHi,AddLo,PointType D Diag  F Find  P = Page No
E Mbus  Enabled  X to exit  W to write values F

4)  1, 2, 2,V =  30515 D =      0 RIR
4)  1, 2, 3,V =  30516 D =      0 RIR
4)  1, 2, 4,V =  30517 D =      0 RIR
4)  1, 2, 5,V =  30518 D =     58 RIR
4)  1, 2, 6,V =  30519 D =      0 RIR
4)  1, 2, 7,V =  30520 D =     29 RIR
4)  1, 2, 8,V =  30521 D =      0 RIR
4)  1, 2, 9,V =  30522 D =     22 RIR
4)  1, 2,10,V =  30523 D =      0 RIR
4)  1, 2,11,V =  30524 D =      0 RIR
4)  1, 2,12,V =  30525 D =      0 RIR
4)  1, 2,13,V =  30526 D =    119 RIR
4)  1, 2,14,V =  30527 D =      0 RIR
4)  1, 2,15,V =  30528 D =      0 RIR
4)  1, 2,16,V =  30529 D =      0 RIR
4)  1, 2,17,V =  30530 D =      0 RIR
4)  1, 2,18,V =  30531 D =  24577 RIR
4)  1, 2,19,V =  30532 D =    381 RI
```

You will see that even without adequate Modbus RTU device documentation, in parallel with checking against the Modbus device's own displayed readings, it is possible to integrate your devices using the HPE-P1MOD2's Find function to reveal the point data of a series of point addresses.

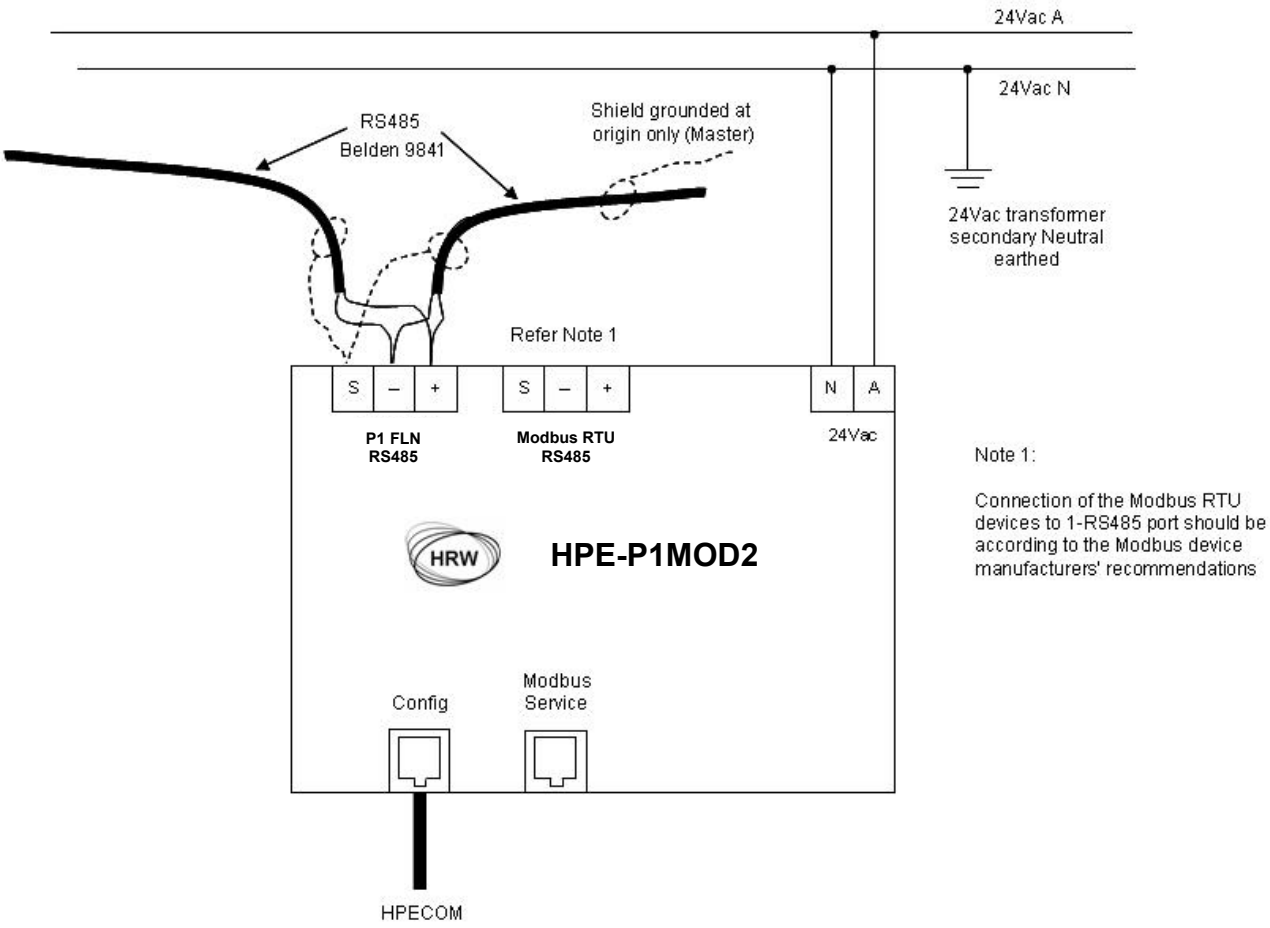
Diagnostic Function

For trouble shooting the Diagnostic function allows a clear view of the Modbus network data requests and replies. Enter **D** to activate the Diag function. Now, each time you force a scan with Enter you will see the full HEX request and reply including checksum detail or error messages if applicable. When a valid device/data register is communicated with then the point data value will also be displayed.

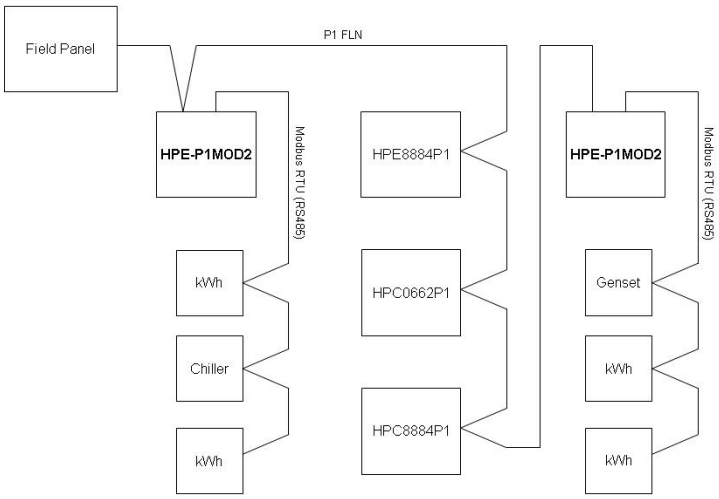
```
11)Address =   1    AddHi =  11    AddLo =   8    Data =      0  3    RIR
12)Address =   1    AddHi =  11    AddLo =   9    Data =      0  3    RIR
13)Address =   1    AddHi =  11    AddLo =  11    Data =      0  3    RIR
14)Address =   1    AddHi =  11    AddLo =  12    Data =      0  3    RIR
15)Address =   1    AddHi =  13    AddLo =   3    Data =   2162  3    RIR
16)Address =   1    AddHi =  13    AddLo =   4    Data =      0  3    RIR
17)Address =   1    AddHi =  13    AddLo =   5    Data =      0  3    RIR
Pt No = Address,AddHi,AddLo,PointType D Diag  F Find  P = Page No
E Mbus  Enabled  X to exit  W to write values

  4 =010402020002D1B3 R 01 04 04 00 00 00 00 FB 84 FB84 CRC OK 3
  4=     0   5=     0
  6 =01040B00000133EE R 01 04 02 00 00 B9 30 B930 CRC OK 3
  6=     0
  7 =01040B03000403ED R 01 04 08 00 00 01 F4 08 6F 00 00 A6 74 A674 CRC OK 3
  7=     0   8=   500   9=  2159  10=     0
 11 =01040B080002F22D R 01 04 04 00 00 00 00 FB 84 FB84 CRC OK 3
 11=     0  12=     0
 13 =01040B0B0002022D R 01 04 04 00 00 00 00 FB 84 FB84 CRC OK 3
 13=     0  14=     0
 15 =01040D0300034247 R 01 04 06 08 72 00 00 00 00 59 D0 59D0 CRC OK 3
 15=  2162  16=     0  17=     0
  4 =010402020002D1B3 R 01 04 04 00 00 00 00 FB 84 FB84 CRC OK 3
  4=     0   5=     0_
```

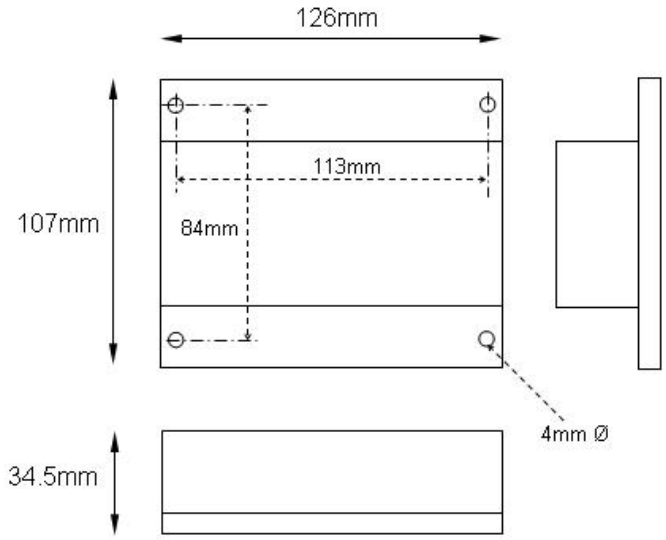
Connections



Network Configuration (example)



Dimensions



Ordering

HPE-P1MOD2	96 point gateway – P1 FLN integration of Modbus RTU devices - for control panel mounting
HPE-P1MOD2-195	195 point gateway – P1 FLN, two P1 addresses, for integration of Modbus RTU devices - for control panel mounting
Standard Packaging	40 units per carton

Accessories

HDA0002	DIN rail adapters factory fitted to HPE-P1MOD2
HPECOM	Config. data cable (DB9 <> RJ11)
U232-P9	RS232 (DB9) <> USB converter cable

Other HP-P1 Series Devices

HPC0662P1	12 point universal controller
HPC8884P1	28 point universal controller
HPD0460P1/C/T/CT	10 point universal controllers & room units
HPE8884P1	28 point I/O expansion
HPV0662P1	13 point VAV / universal controller
HPE-P1MBUS	P1 gateway for M-Bus devices, 96 point
HPE-P1MBUS-195	P1 gateway for M-Bus devices, 195 point

Technical data

Power supply:	24Vac
Power consumption:	2.5VA
P1 network:	RS485, 32 node over 1.2km without repeater
Modbus RTU network:	RS485, 32 node over 1.2km without repeater
Conformity:	
Dimensions:	126mm (W) x 107mm (H) x 34.5mm (D)

Notes