HM Configurator

Installation & Operation

with Field Device HART Addresser

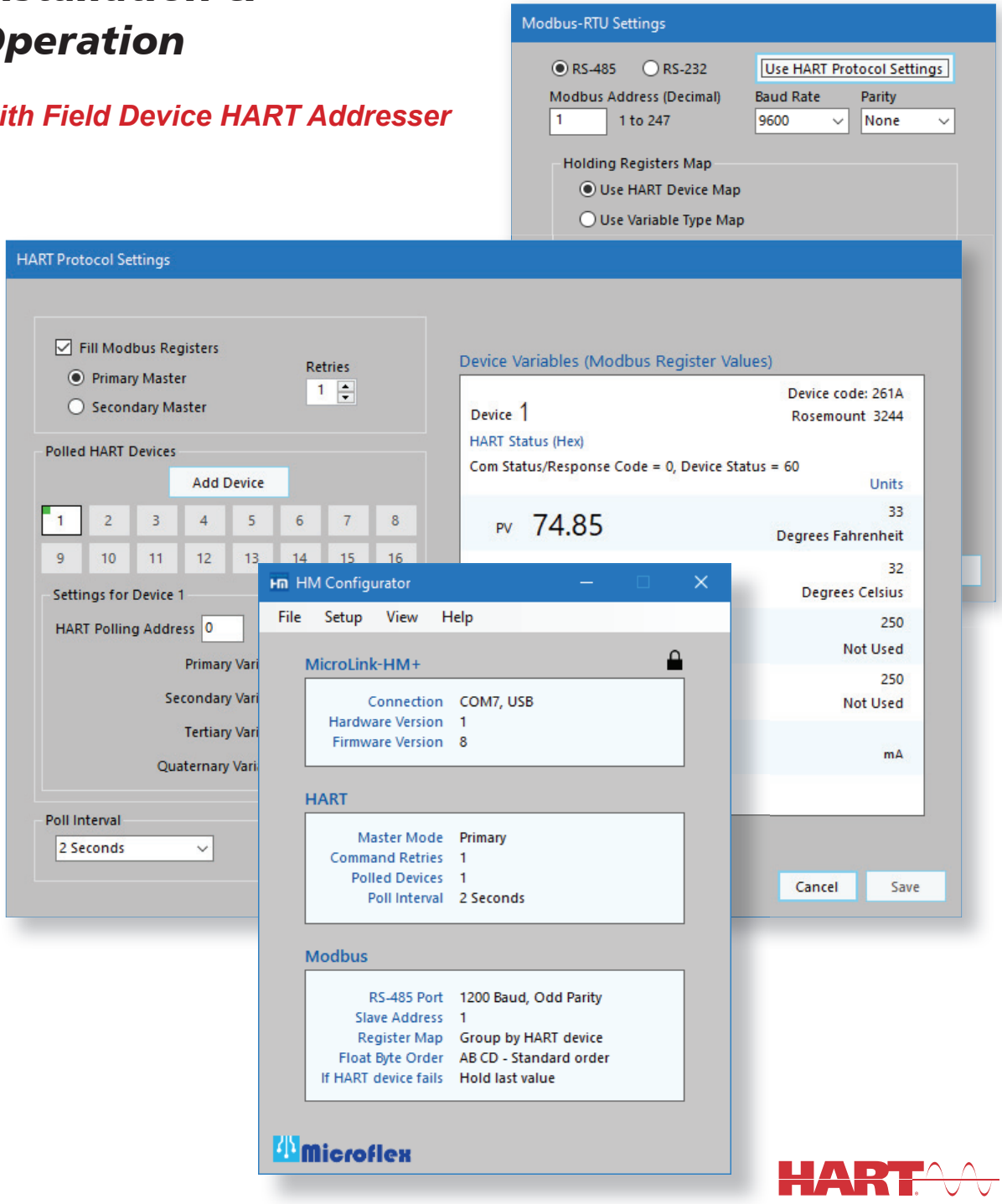

Table of Contents

Overview

The HM Configurator app is a Microsoft Windows software based tool for configuring the Microflex HM series of HART protocol modems. In addition to functioning as standard HART protocol modems, HM modems can also poll 1 to 16 HART field devices and store the HART device variable data into modbus registers. This software tool provides a simple way to configure the HM modems to fit your requirements. Included is a HART Device Addresser software tool used to set the HART polling address in field devices for multi-drop applications.

Installation

The HM Configurator app software is included on a CD shipped with MicroLink-HM modems and is available as a download from www.microflx.com.

Simply insert the CD and follow the on-screen prompts to install the software. If AutoRun is not configured to run the CD file when the CD is inserted you will need to navigate to the SetupHM.exe file on the CD and double-click the file name to run it.

Figure 1. HM Configurator icon.

After Installation the HM Configurator and the HART Addresser icons will be added to your system.

If you do not have a CD Rom device on your computer, contact sales@microflx.com to inquire about a digital download version of the software. You can also copy all the CD files onto a USB drive and run the SetupHM.exe utility from the drive.

Home Screen

The home screen displays a summary of the HM's status, HART modem settings, and Modbus settings. Use the top drop-down menus to access the HM settings for HART and modbus.

Manuals are available in PDF format under the **Help** menu option.

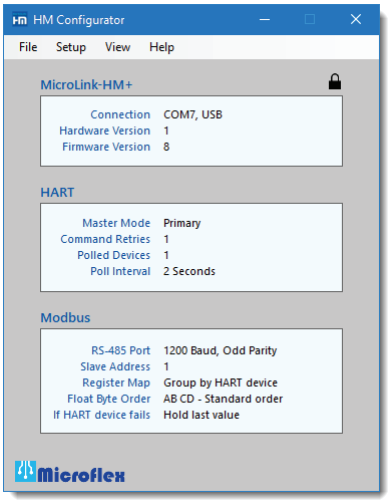

Figure 2. HM Configurator Home Screen.

Setting COM Port

The HM Configurator software must be set to use the same COM port that the modem is connected to.

From the top menu select **Setup>Com Port**. Choose the COM port number from the list of available ports. After choosing, click **Connect** to attempt to communicate using the settings selected.

The connection process will first try the last good baud rate and parity settings. If it fails to connect the app will work through other settings to try to find the correct settings for communications. If it still does not connect, verify that you have chosen the correct COM number, connections are correct, and DC power is applied before trying again.

The MicroLink-HM+ includes a USB port. When you connect the USB port to your PC for the first time USB drivers will be installed that make the USB port appear as a serial comm port. Use the Microsoft Device Manager tool to view the assigned com port number.

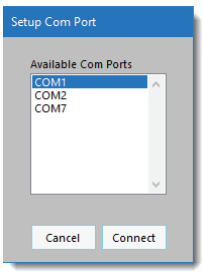

Figure 3. Select Com Port.

HART Protocol Settings

With **Fill Modbus Registers** unchecked, the HM modem will function as a standard HART protocol modem and not poll HART devices to fill Modbus registers. In this mode HART packets are received and then retransmitted at the HART 1200 baud, odd parity. Received reply packets are retransmitted at the selected baud rate. RTS timing and carrier detect are handled internally by the HM modem allowing communications at higher than 1200 baud. HART loop data is handled at the standard HART protocol 1200 baud, odd parity but because HM modems buffers the data the serial port can be set for higher rates as well as odd, even, or no parity. Port settings can be set in the Modbus Settings section of the HM Configurator app.

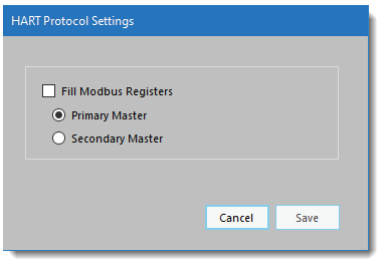

Figure 4. HART settings with modbus fill.

Since HM modems manage network timing it needs to be configured for either a primary or secondary master. Portable configuration modems are typically set to be secondary masters.

With **Fill Modbus Registers** checked the dialog will add the configuration settings for polling HART devices and filling registers.

Polling HART Devices - Fill Modbus Registers

To enable Modbus register accumulation, check the **Fill Modbus Registers** option. The Hart Protocol Settings window will expand to show the Polled Devices settings. After you save the settings the HM modem will continuously poll using HART command 3 to read HART variables at the selected Poll Interval.

Retries

If a HART devices is polled but does not respond, or errors are detected, the HM modem can retry up to 3 times before indicating a bad device. If a device is not responding the Modbus values are filled with Hart Device Failed register values - set in the Modbus configuration section.

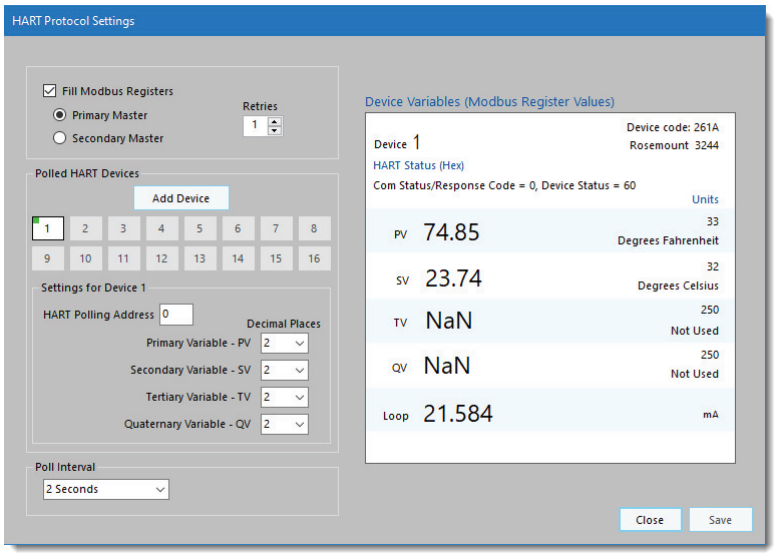

Figure 5. HART Protocol Settings (Fill Modus Registers checked).
Poll one HART field device, polling address 0, every 2 seconds.

Polled Devices

In the example screen shot (Figure 5), the HM modem is set to poll one HART device, using polling address 0, and will retry 1 time before reporting a communications error.

The **Device Variables (Modbus Register Values)** box, on the right, displays the register values for the active polled device. Click **Add Device** to add a another polled HART field device. Be sure to set the **Polling Address** for each device. Each device must have a unique HART polling address. Polling addresses must be setup for each HART device before it can be connected to a multi-drop HART loop. HART polling address can be set from 0 to 63 (0-15 for HART rev 5). Address 0 can only be used when one device is in the HART loop. Polling addresses 16-63 should only be used with HART revisions 6 and higher. For HART revision 3-5 use addresses 1-15 for multi-drop systems.

Decimal Places

When device data is stored into a 16 bit signed Modbus register the value can range from -32768 to 32767. To allow the 16 bit integer to represent a smaller number and include fractional information, the number of decimal places is stored in a separate Modbus register and applied later. The number of decimal places can be set from 0 to 5. Decimal places can be set for each variable. The **Device Variables** box shows the effect of the decimal place setting. Decimal place settings are not used for the Modus floating point register values.

Modbus-RTU Setup

Modbus-RTU Settings can be accessed and changed by clicking **Setup>Modbus** from the top drop-down menu.

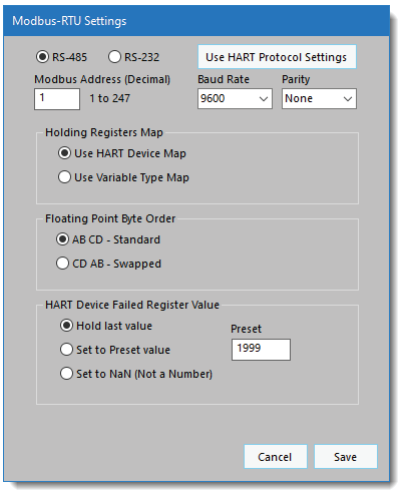

Figure 6. Modbus port settings.

RS-485, RS-232

MicroLink-HM+ devices have a configurable serial port. To choose the port type you must be connected to the MicroLink-HM+ USB port. All other HM modems have a fixed port type.

Modbus Address

Each device on a Modbus network must have a unique slave address. Set this to match the address that your Modbus master will use to communicate with the HM modem. The Modbus address can be set to any value from 1 to 247. The HM Configurator software will discover this address as part of the connection process.

Baud Rate & Parity

The HM modems baud rate and parity must be set to the same settings as your Modbus master. If you are using the HM modem as a HART protocol modem these should be set to 1200 baud, odd parity. Click **Use HART Protocol Settings** to set the correct values for a HART modem.

Holding Registers Map

Accumulated data is stored in Modbus registers that are grouped or mapped by HART device or by variable type. Choose the register map that best fits your application. Register maps can be viewed using the HM Configurator software by selecting **View -> Modbus Registers Maps** from the top menus.

Floating Point Byte Order

Modbus 32-bit floating point numbers are stored in two consecutive 16-bit registers using the IEEE-754 standard big endian byte order (AB-CD). The most significant byte (A) is sent first. For compatibility with some modbus systems you may need to use the word swapped format (CD-AB).

HART Device Failed Register Value

If a polled HART device fails to respond, or has communications errors it will retry for the number of times set in the HART Protocol Settings dialog. If after retries the device does not respond you can choose to hold the last value, set to a preset number, or set to the IEEE-754 NaN floating point value. This can help the modbus master determine when a HART device is no longer responding.

Setup Registers

The HM modem configuration can be changed using the setup and configuration software or by writing to modbus registers using modbus-RTU commands 6 or 16. Command 6 writes to a single register and command 16 writes to a range of modbus registers. The configuration register values are saved in nonvolatile memory and are not lost when the HM modem power is removed.

Modbus Register	Description (high byte, low byte)
772	HART Failed Code Preset Value
773	HART Mode Settings
774	Modbus Settings
775	Modbus Port Settings
776	Hardware Rev, Software Rev
777	Polled device status

HART Settings, Register 773

773 - HART Settings

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
HART Poll Interval			Write Locked	Low Supply Volts		HART Failed Mode (Bit 1)	HART Failed Mode (Bit 0)	HART Retries (Bit 1)	HART Retries (Bit 0)	0=Fill Registers, 1=HART Modem	1=Primary, 0=Secondary Master	Number of polled devices - 1 0 = 1 Polled Device (0 to 15)			

Bits 15-13 HART Poll Interval
1 = 1 Second
2 = 2 Seconds
3 = 5 Seconds
4 = 10 Seconds
5 = 20 Seconds
6 = 60 Seconds

Bit 12 Write Lock — 1 = Settings registers are read only, 0 = Settings registers write enabled

Bit 11 Low Supply Volts — Less than 6 Volts DC Supply (MicroLink-HM+ only)

Bits 9, 8 HART failed mode
0 = Hold last value after HART retries
1 = Preset to register 772 value after HART retries
2 = Preset to IEEE-754 NaN (0 for integers)

Bits 7, 6 HART poll retries — Sets number of HART device poll retries from 1 to 3.
After poll retries, the HART failed mode value is stored in the variable register.

Bits 3-0 Number of polled devices -1 — Range is 0 to 15. 0 = 1 polled device. 15 = 16 polled devices.

Mode Settings, Register 774

774 - Mode Settings

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
		Device Type Code				0=AB CD float byte order, 1=CD AB	0=by Device Map, 1=by Variable Map	Modbus Status							

Bits 13-10 Device Type Code
1 = MicroLink-HM
2 = MicroLink-HM+
3 = InLink-HM

Bit 9 - Floating point value byte order
0 = Standard byte order (AB - CD)
1 = Swapped words (CD - AB)

Bit 8 - Modbus device map
0 = Map register data by HART device
1 = Map register data by variable type

Serial Port Settings, Register 775

775 - Modbus Port Settings

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	RS-232/RS-485	1 = Odd parity	1 = Even parity	Baud (bit 3)	Baud (bit 2)	Baud (bit 1)	Baud (bit 0)	Modbus Slave Address (1-247)							

Bits 14
0 = RS-485 Serial Port
1 = RS-232 Serial Port

Bits 13, 12
00 = No parity
01 = Even
10 = Odd

Bits 11 - 8
1 = 1200 Baud
2 = 2400
3 = 4800
4 = 9600
5 = 14400
6 = 19200
7 = 38400
8 = 57600
9 = 115200

Polled HART Devices Long Address Table

Device ID information is read from each polled field device using the devices polling address and HART command 0. The reply to command 0 for each polled device is used to populate the HART long-address table. When the HM modem needs to poll for the device variables, using HART command 3, this table holds the information needed to build the 5-byte long address. Table values can be read using modbus-RTU command 3. Only the polled device you have configured will contain valid information.

HART Device	Modbus Register	Description (high byte, low byte)
1	700	Preambles, Man. Code or Type
	701	Device Type, ID 1
	702	ID 2, ID3
2	703	Preambles, Man. Code or Type
	704	Device Type, ID 1
	705	ID 2, ID3
3	706	Preambles, Man. Code or Type
	707	Device Type, ID 1
	708	ID 2, ID3
4	709	Preambles, Man. Code or Type
	710	Device Type, ID 1
	711	ID 2, ID3
5	712	Preambles, Man. Code or Type
	713	Device Type, ID 1
	714	ID 2, ID3
6	715	Preambles, Man. Code or Type
	716	Device Type, ID 1
	717	ID 2, ID3
7	718	Preambles, Man. Code or Type
	719	Device Type, ID 1
	720	ID 2, ID3
8	721	Preambles, Man. Code or Type
	722	Device Type, ID 1
	723	ID 2, ID3
9	724	Preambles, Man. Code or Type
	725	Device Type, ID 1
	726	ID 2, ID3
10	727	Preambles, Man. Code or Type
	728	Device Type, ID 1
	729	ID 2, ID3
11	730	Preambles, Man. Code or Type
	731	Device Type, ID 1
	732	ID 2, ID3
12	733	Preambles, Man. Code or Type
	734	Device Type, ID 1
	735	ID 2, ID3
13	736	Preambles, Man. Code or Type
	737	Device Type, ID 1
	738	ID 2, ID3
14	739	Preambles, Man. Code or Type
	740	Device Type, ID 1
	741	ID 2, ID3
15	742	Preambles, Man. Code or Type
	743	Device Type, ID 1
	744	ID 2, ID3
16	745	Preambles, Man. Code or Type
	746	Device Type, ID 1
	747	ID 2, ID3

HART Device Polling Address Table

The polling address for each polled device is stored in this table. Two polling addresses in each 16 bit register. If address 0 is used then only one device can be polled and Device 1 should be set to 0. Address 0 is not valid in multi-drop systems. For HART devices with HART revision 3 through 5 you should use polling addresses 1 - 15. Addresses 16-63 require HART revision 6 or higher.

Modbus Register	HART Device Polling Address (high byte, low byte)
748	Device 1, Device 2
749	Device 3, Device 4
750	Device 5, Device 6
751	Device 7, Device 8
752	Device 9, Device 10
753	Device 11, Device 12
754	Device 13, Device 14
755	Device 15, Device 16

Number of Decimal Places Table

When storing the HART variable data in 16-bit modbus registers the maximum range is -32768 to 32767. To increase the possible resolution, the variable value read from the HART device is decimal position adjusted before being saved in the 16-bit register. When the register is read, the value must be corrected by the number of decimal placed to produce the correct value. The number of decimal places for each variable occupies 4-bits in the register with one register for each polled device.

HART Device	Modbus Register	Number of Decimal Places Description (high byte, low byte)
1	756	PV-SC, TV-FV
2	757	PV-SC, TV-FV
3	758	PV-SC, TV-FV
4	759	PV-SC, TV-FV
5	760	PV-SC, TV-FV
6	761	PV-SC, TV-FV
7	762	PV-SC, TV-FV
8	763	PV-SC, TV-FV
9	764	PV-SC, TV-FV
10	765	PV-SC, TV-FV
11	766	PV-SC, TV-FV
12	767	PV-SC, TV-FV
13	768	PV-SC, TV-FV
14	769	PV-SC, TV-FV
15	770	PV-SC, TV-FV
16	771	PV-SC, TV-FV

Decimals	Variable Range
0	-32768 to 32767
1	-3276.8 to 3276.7
2	-327.68 to 327.67
3	-32.768 to 32.767
4	-3.2768 to 3.2767
5	-0.32768 to 0.32767

Register	Description
7	Loop Current Integer
254, 255	Loop Current Float

Device 1

Register	Description
0	PV Integer
1	SV Integer
2	TV Integer
3	FV Integer
4	HART Status
5	MSB = PV UOM, LSB = SV UOM
6	MSB = TV UOM, LSB = FV UOM
256, 257	PV Float
258, 259	SV Float
260, 261	TV Float
262, 263	FV Float

Device 2

8	PV Integer
9	SV Integer
10	TV Integer
11	FV Integer
12	HART Status
13	MSB = PV UOM, LSB = SV UOM
14	MSB = TV UOM, LSB = FV UOM
264, 265	PV Float
266, 267	SV Float
268, 269	TV Float
270, 271	FV Float

Device 3

16	PV Integer
17	SV Integer
18	TV Integer
19	FV Integer
20	HART Status
21	MSB = PV UOM, LSB = SV UOM
22	MSB = TV UOM, LSB = FV UOM
272, 273	PV Float
274, 275	SV Float
276, 277	TV Float
278, 279	FV Float

Device 4

Register	Description
24	PV Integer
25	SV Integer
26	TV Integer
27	FV Integer
28	HART Status
29	MSB = PV UOM, LSB = SV UOM
30	MSB = TV UOM, LSB = FV UOM
280, 281	PV Float
282, 283	SV Float
284, 285	TV Float
286, 287	FV Float

Device 5

32	PV Integer
33	SV Integer
34	TV Integer
35	FV Integer
36	HART Status
37	MSB = PV UOM, LSB = SV UOM
38	MSB = TV UOM, LSB = FV UOM
288, 289	PV Float
290, 291	SV Float
292, 293	TV Float
294, 295	FV Float

Device 6

40	PV Integer
41	SV Integer
42	TV Integer
43	FV Integer
44	HART Status
45	MSB = PV UOM, LSB = SV UOM
46	MSB = TV UOM, LSB = FV UOM
296, 297	PV Float
298, 299	SV Float
300, 301	TV Float
302, 303	FV Float

Device 7

Register	Description
48	PV Integer
49	SV Integer
50	TV Integer
51	FV Integer
52	HART Status
53	MSB = PV UOM, LSB = SV UOM
54	MSB = TV UOM, LSB = FV UOM
304, 305	PV Float
306, 307	SV Float
308, 309	TV Float
310, 311	FV Float

Device 8

56	PV Integer
57	SV Integer
58	TV Integer
59	FV Integer
60	HART Status
61	MSB = PV UOM, LSB = SV UOM
62	MSB = TV UOM, LSB = FV UOM
312, 313	PV Float
314, 315	SV Float
316, 317	TV Float
318, 319	FV Float

Device 9

64	PV Integer
65	SV Integer
66	TV Integer
67	FV Integer
68	HART Status
69	MSB = PV UOM, LSB = SV UOM
70	MSB = TV UOM, LSB = FV UOM
320, 321	PV Float
322, 323	SV Float
324, 325	TV Float
326, 327	FV Float

Device 10

Register	Description
72	PV Integer
73	SV Integer
74	TV Integer
75	FV Integer
76	HART Status
77	MSB = PV UOM, LSB = SV UOM
78	MSB = TV UOM, LSB = FV UOM
328, 329	PV Float
330, 331	SV Float
332, 333	TV Float
334, 335	FV Float

Devicer 11

80	PV Integer
81	SV Integer
82	TV Integer
83	FV Integer
84	HART Status
85	MSB = PV UOM, LSB = SV UOM
86	MSB = TV UOM, LSB = FV UOM
336, 337	PV Float
338, 339	SV Float
340, 341	TV Float
342, 343	FV Float

Device 12

88	PV Integer
89	SV Integer
90	TV Integer
91	FV Integer
92	HART Status
93	MSB = PV UOM, LSB = SV UOM
94	MSB = TV UOM, LSB = FV UOM
344, 345	PV Float
346, 347	SV Float
348, 349	TV Float
350, 351	FV Float

Device 13

Register	Description
96	PV Integer
97	SV Integer
98	TV Integer
99	FV Integer
100	HART Status
101	MSB = PV UOM, LSB = SV UOM
102	MSB = TV UOM, LSB = FV UOM
352, 353	PV Float
354, 355	SV Float
356, 357	TV Float
358, 359	FV Float

Device 14

104	PV Integer
105	SV Integer
106	TV Integer
107	FV Integer
108	HART Status
109	MSB = PV UOM, LSB = SV UOM
110	MSB = TV UOM, LSB = FV UOM
360, 361	PV Float
362, 363	SV Float
364, 365	TV Float
366, 367	FV Float

Device 15

Register	Description
112	PV Integer
113	SV Integer
114	TV Integer
115	FV Integer
116	HART Status
117	MSB = PV UOM, LSB = SV UOM
118	MSB = TV UOM, LSB = FV UOM
368, 369	PV Float
370, 371	SV Float
372, 373	TV Float
374, 375	FV Float

Device 16

120	PV Integer
121	SV Integer
122	TV Integer
123	FV Integer
124	HART Status
125	MSB = PV UOM, LSB = SV UOM
126	MSB = TV UOM, LSB = FV UOM
376, 377	PV Float
378, 379	SV Float
380, 381	TV Float
382, 383	FV Float

Loop Current - Integer	112
Loop Current - Float	254, 255

	16-bit Signed Registers				16-bit Unsigned		
HART Device	PV Integer	SV Integer	TV Integer	FV Integer	HART Status	UOM PV, SV	UOM TV, FV
1	0	16	32	48	64	80	96
2	1	17	33	49	65	81	97
3	2	18	34	50	66	82	98
4	3	19	35	51	67	83	99
5	4	20	36	52	68	84	100
6	5	21	37	53	69	85	101
7	6	22	38	54	70	86	102
8	7	23	39	55	71	87	103
9	8	24	40	56	72	88	104
10	9	25	41	57	73	89	105
11	10	26	42	58	74	90	106
12	11	27	43	59	75	91	107
13	12	28	44	60	76	92	108
14	13	29	45	61	77	93	109
15	14	30	46	62	78	94	110
16	15	31	47	63	79	95	111

	32-bit Float Registers			
HART Device	PV Float	SV Float	TV Float	QV Float
1	256, 257	288, 289	320, 321	352, 353
2	258, 259	290, 291	322, 323	354, 355
3	260, 261	292, 293	324, 325	356, 357
4	262, 263	294, 295	326, 327	358, 359
5	264, 265	296, 297	328, 329	360, 361
6	266, 267	298, 299	330, 331	362, 363
7	268, 269	300, 301	332, 333	364, 365
8	270, 271	302, 303	334, 335	366, 367
9	272, 273	304, 305	336, 337	368, 369
10	274, 275	306, 307	338, 339	370, 371
11	276, 277	308, 309	340, 341	372, 373
12	278, 279	310, 311	342, 343	374, 375
13	280, 281	312, 313	344, 345	376, 377
14	282, 283	314, 315	346, 347	378, 379
15	284, 285	316, 317	348, 349	380, 381
16	286, 287	318, 319	350, 351	382, 383

HART Device Addresser

The HART Device Addresser software tool is used to change the HART polling address in a HART field device. It can be used with any HM modem or any HART protocol modem that uses a serial COM port for communications, including USB HART modems that use virtual serial port drivers.

The HART Device Addresser app is installed as part of the HM Configurator app setup.

Figure 7. HART Device Addresser icon.

Operation

The addresser software is intended to be used on one transmitter at a time. For multiple field devices in a multi-drop loop, configure each device separately before connecting the multi-drop loop.

1. Connect one HART field device loop to a HART modem and apply power.
2. Run the device addresser application.
3. Choose the same Serial Interface (COM number) that your HART modem is connected to.
4. Click **Scan...** to locate the polling address for the attached device. When the polling address is located the address setting dialog will open to allow you to type in a new polling address for the field device.

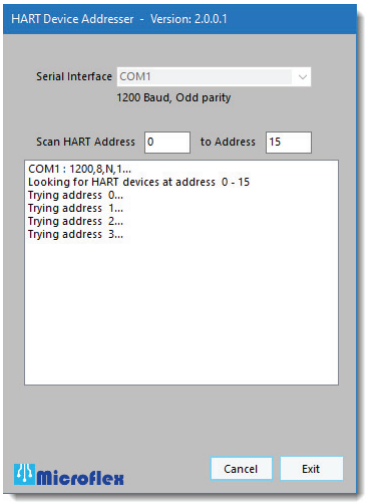

Figure 8. Scanning for a field device.

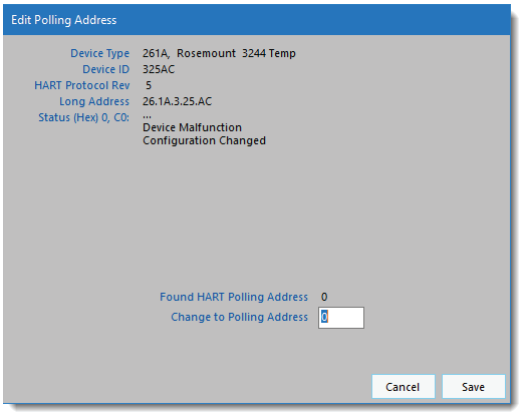

Figure 9. Changing a field devices HART polling address.

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