Technical description TD/Paperless_recorder/WirelessHART-EN Rev. B

SM500F
Field mountable paperless recorder

Using ABB´s paperless recorders to record data of a WirelessHART network

Measurement made easy

Introduction

This technical description describes how to connect one of ABBs paperless "Field mountable videographic recorder SM500F" with a WirelessHART gateway.

- Pepperl + Fuchs WHA-GW WirelessHART Gateway
- Emerson Process Management 1420 Smart Wireless Gateway

This gives an easy solution for any application where a fast-and-easy-to-implement solution is desired.

The technical description describes:

- Which data needs to be know from the gateway,
- how to configure the gateway Modbus mapping and
- how to configure the paperless recorder.

With a SM500F, 12 values could be recorded, viewable in 2 groups with 6 channels.

Contents

1 WirelessHART Gateway

1.1 Pepperl + Fuchs WHA WirelessHART Gateway

1.1.1 Log In

To get access to the gateway these data must be available:

	Default Value	Notes
IP-Address:	192.168.1.1	
User name:	admin	
Password:	admin	

1.1.2 Modbus Setup

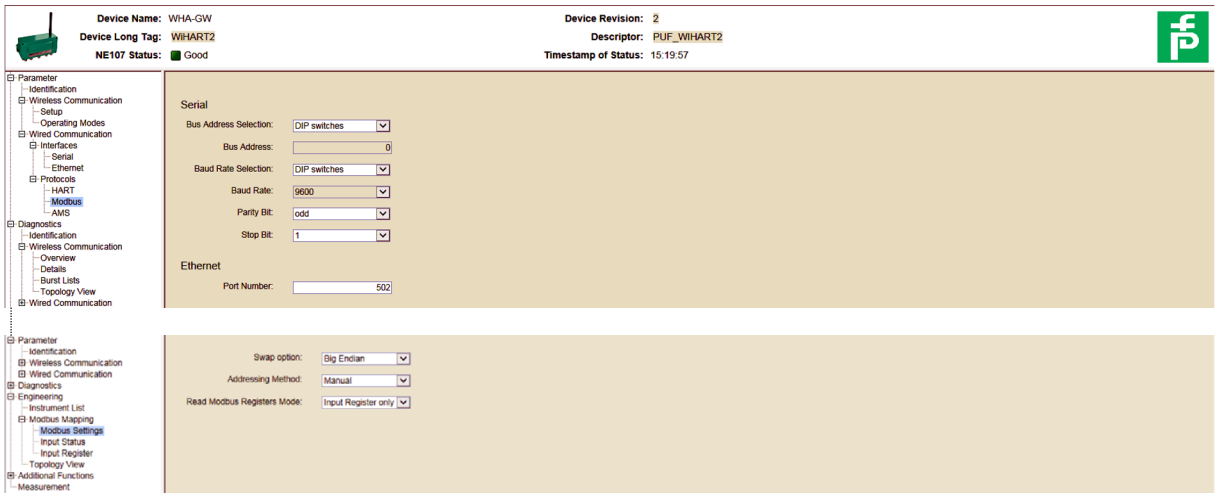

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Fig. 1: WHA WirelessHART Gateway - Modbus setup

Configure the Modbus settings as follows:

Parameter	Selection
Bus Address Selection	DIP switches
Bus Address	0
Baud Rate Selection	DIP switches
Baud Rate	9600
Parity Bit	odd
Stop Bit	1
Port Number	502
Swap option	Big Endian
Addressing Method	Manual
Read Modbus Registers Mode	Input Register only

1.1.3 Modbus Mapping

1. Identify the desired device in the gateway and make sure it is operational.

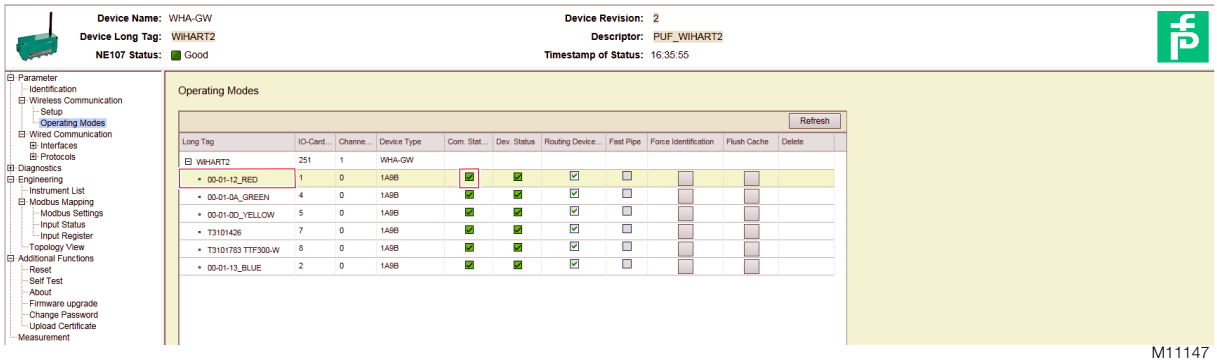

Fig. 2: Identify the desired device

2. Ensure the device is bursting the expected values. Refresh the site after three update cycles to ensure the number of received packets increase.

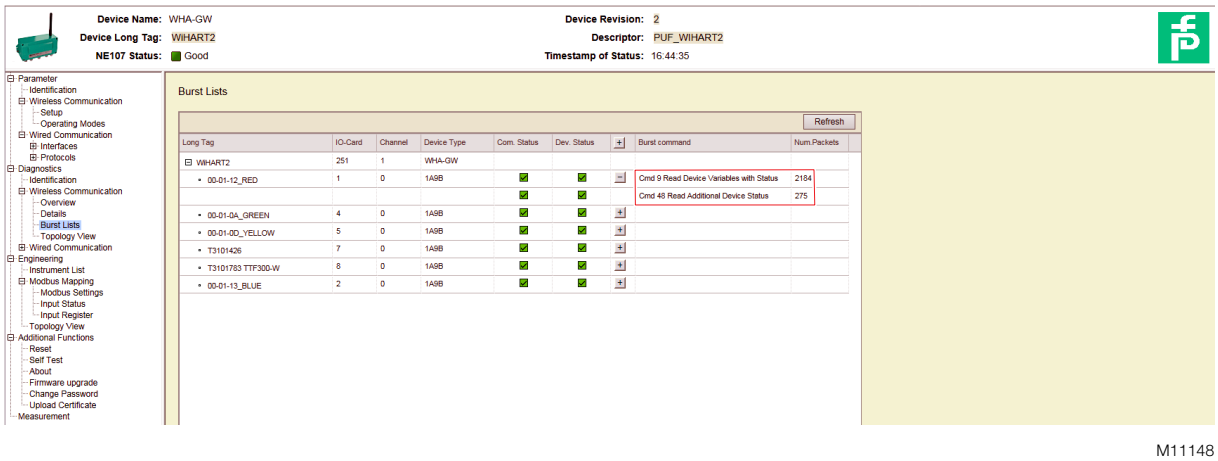

Fig. 3: Ensure the device is bursting the expected values

3. Map the Input Register. Select a starting register which has at least one free input registers following.

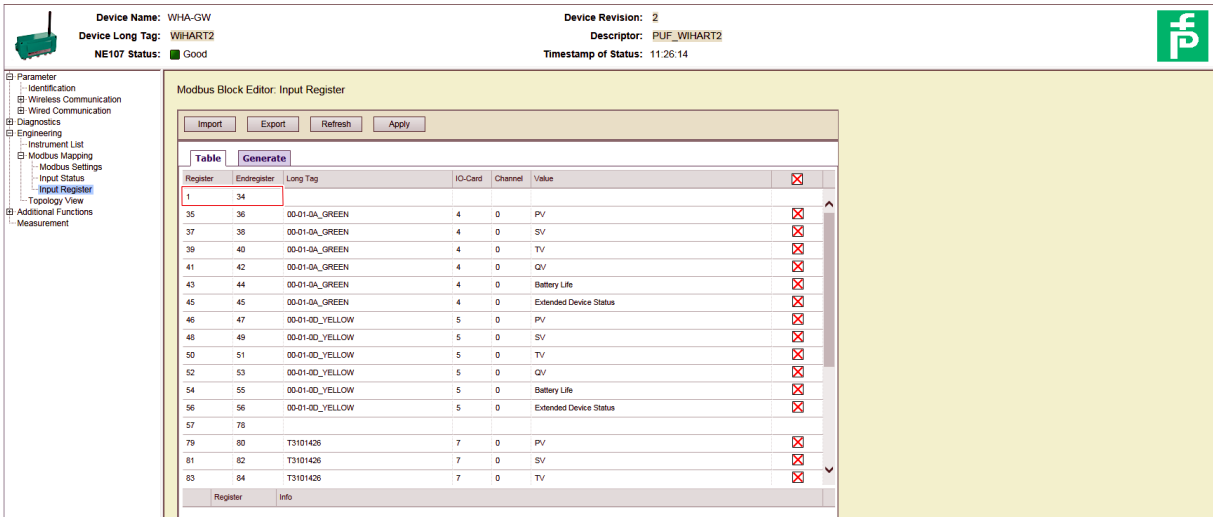

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Fig. 4: Map the Input Register

4. Click into the "**Long Tag**" cell and select the desired device from the drop-down list.

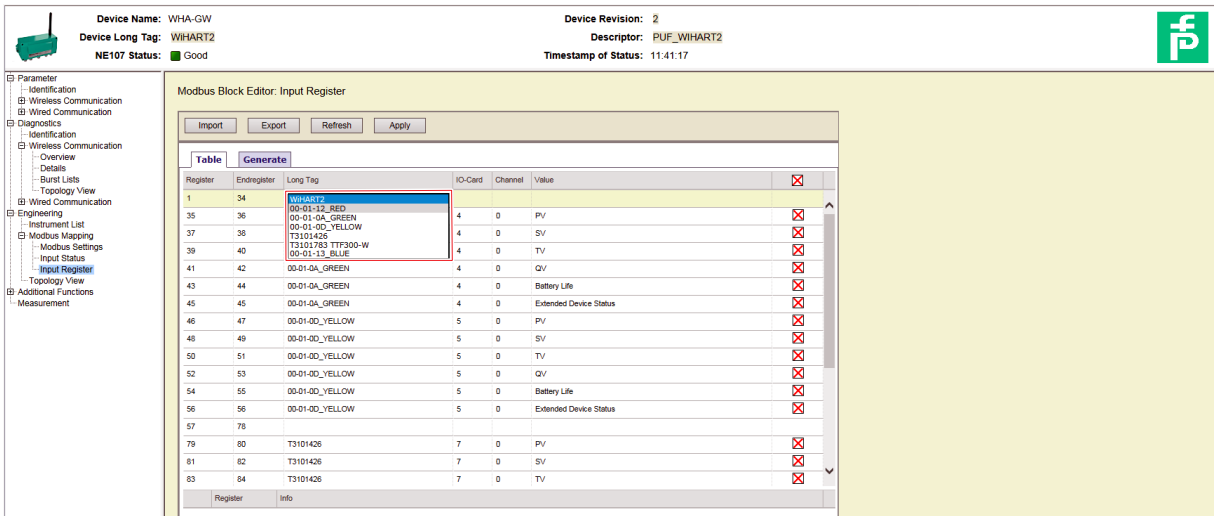

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Fig. 5: Select the desired device

5. Click into the "**Value**" cell and select a value you want to read.

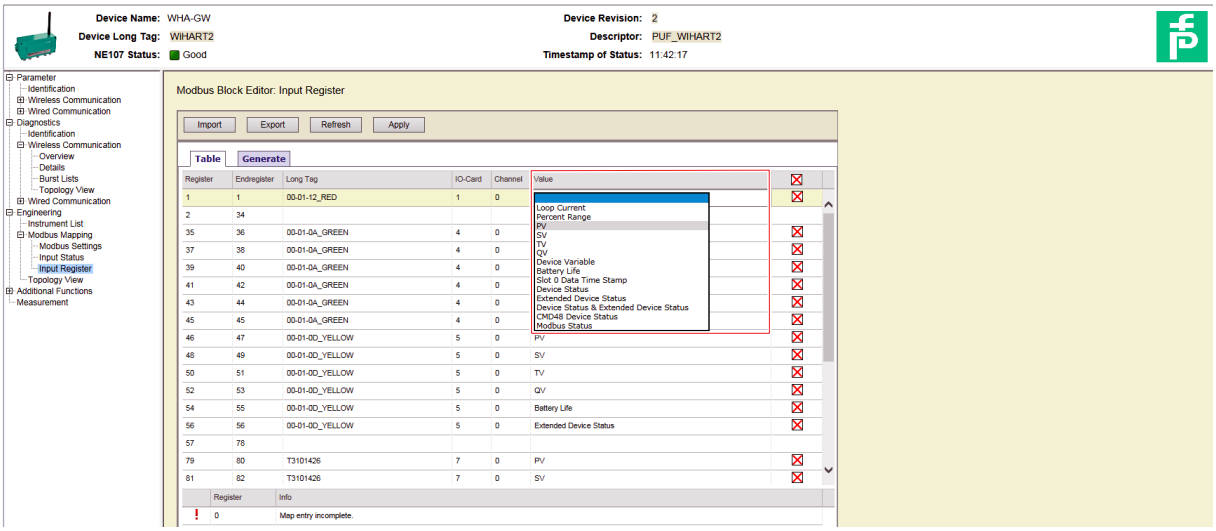

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Fig. 6: Select the value to read

6. After selecting device and value confirm the mapping by pressing enter.

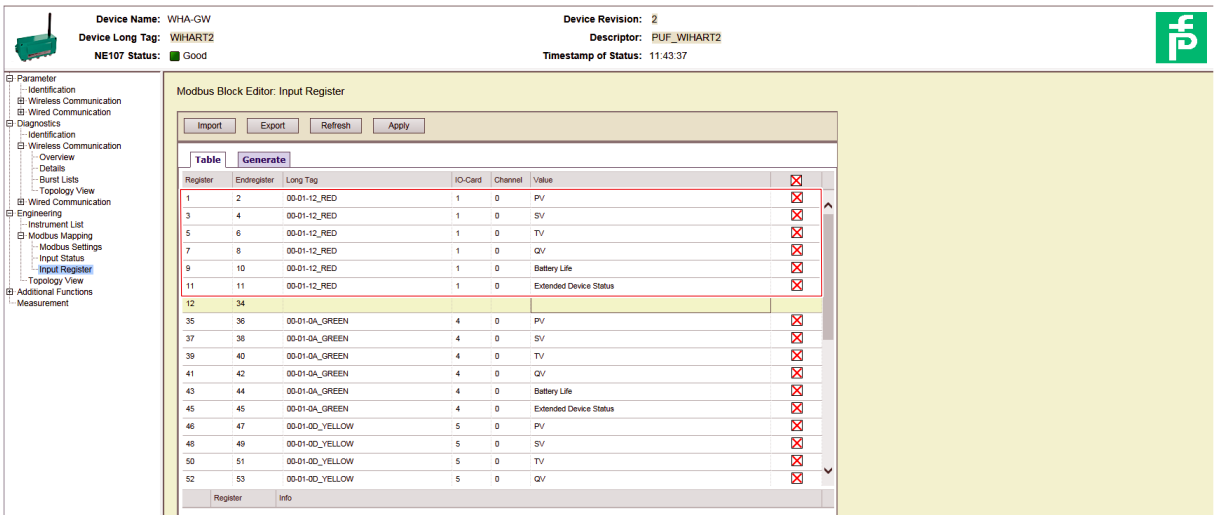

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Fig. 7: Modbus mapping

7. Repeat steps 4. to 6. for all devices and values which shall be accessible.
   Additional map for all used devices "Device Status & Extended Device Status".
8. To write the current mapping table to the WirelessHART gateway using the web interface, click "**Apply**".
   To view the active mapping table click "**Refresh**".
9. Note all mappings and the IP-address in the table in chapter "Mapped Modbus Input Register" on page 17.

1.2 Emerson Process Management 1420 Smart Wireless Gateway

1.2.1 Log In

To get access to the desired data these must be available:

	Default Value	Notes
IP-Address:	192.168.1.10	
User name:	admin	
Password:	default	

1.2.2 Modbus Setup

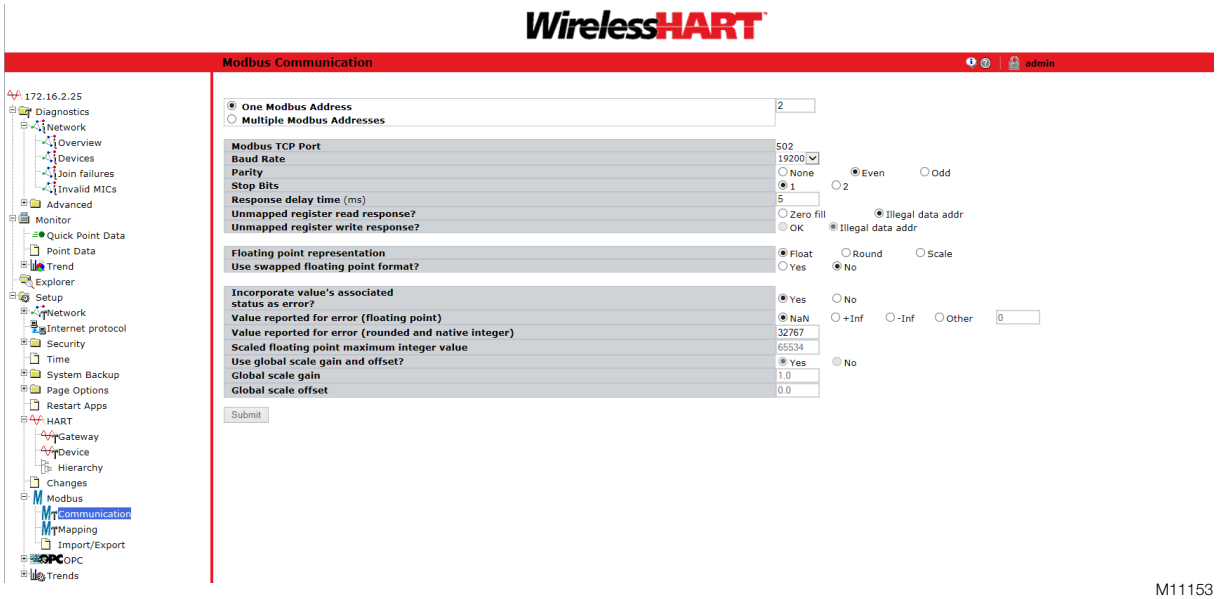

Fig. 8: Modbus Setup

Configure the Modbus settings as follows:

Parameter	Selection
One Modbus Address	2
Modbus TCP Port	502
Baud Rate	9600
Parity	odd
Stop Bits	1
Response delay time (ms)	5
Unmapped register read response?	Illegal data address
Unmapped register write response?	Illegal data address
Floating point representation	Float
Use swapped floating point format?	No
Incorporate value's associated status as error?	Yes
Value reported for error (floating point)	NaN
Value reported for error (rounded and native integer)	32767
Scaled floating point maximum integer value	65534
Use global scale gain and offset?	Yes
Global scale gain	1.0
Global scale offset	0.0

1.2.3 Modbus Mapping

1. Identity the desired device in the gateway and make sure it is operational.

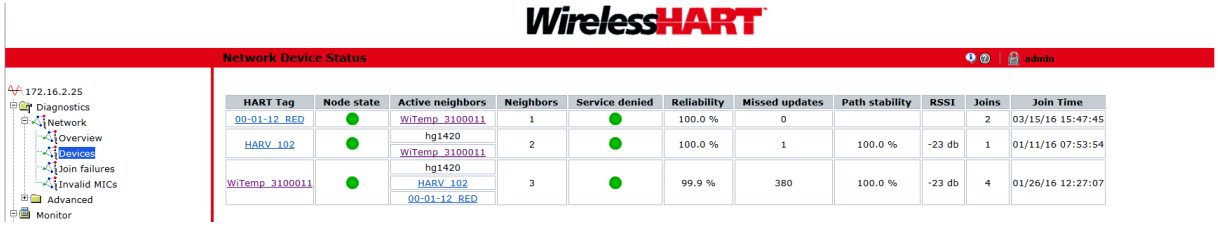

Fig. 9: Identity the desired device

2. Ensure the device is bursting the expected values. Wait at least three update cycles to ensure the number of updates. The available variables can be found in the "**Explorer**", see Fig. 11.

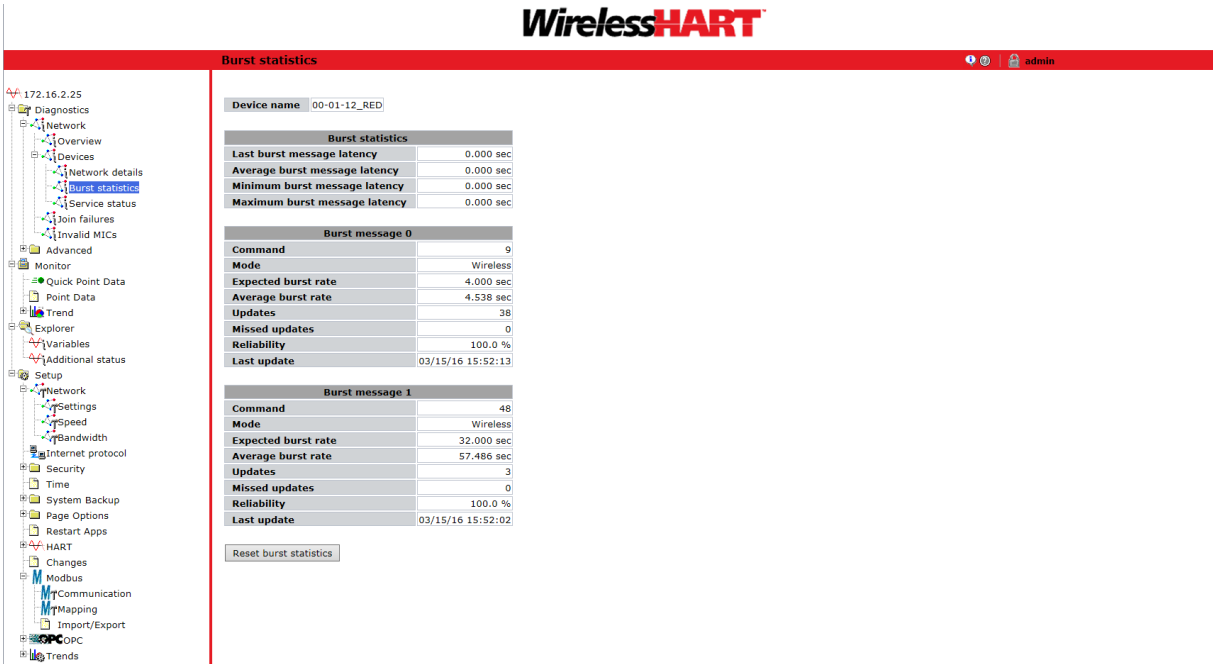

Fig. 10: Ensure the device is bursting the expected values

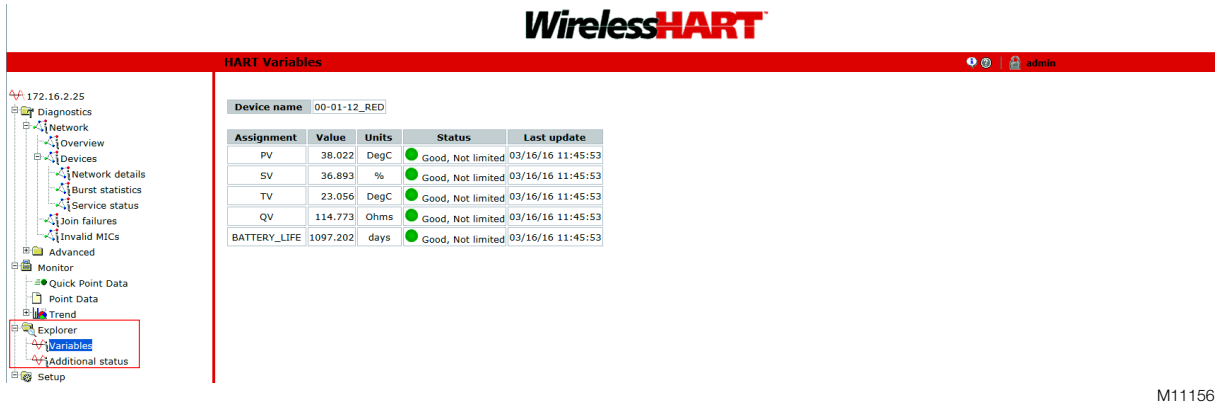

Fig. 11: Explorer - HART-Variables

3. Map the Input Register. Click on "**New entry**" and enter an odd starting register which has at least one free input registers following. Start with an offset of "**40000**" for the first register. Click on the menu of "**Point Name**" and select the desired device and variable. The "**Point Name**" is a two-part name for the data point. The first part is the HART Tag of the wireless field device which is producing the data. The second part is the parameter of the wireless field device.

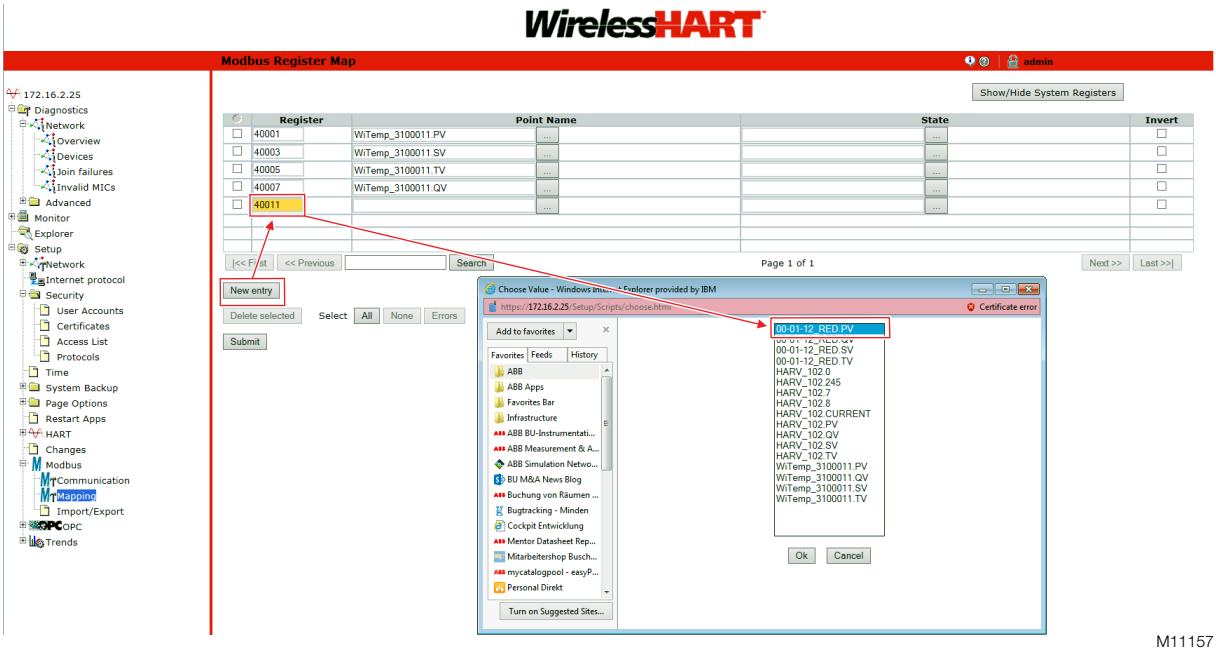

Fig. 12: Map the Input Register

4. Repeat step 3. for all devices and values which shall be accessible.
5. Click on "**Submit**" and wait until the operation is the gateway is finished. Now refresh the web page to see the result of the mapping.

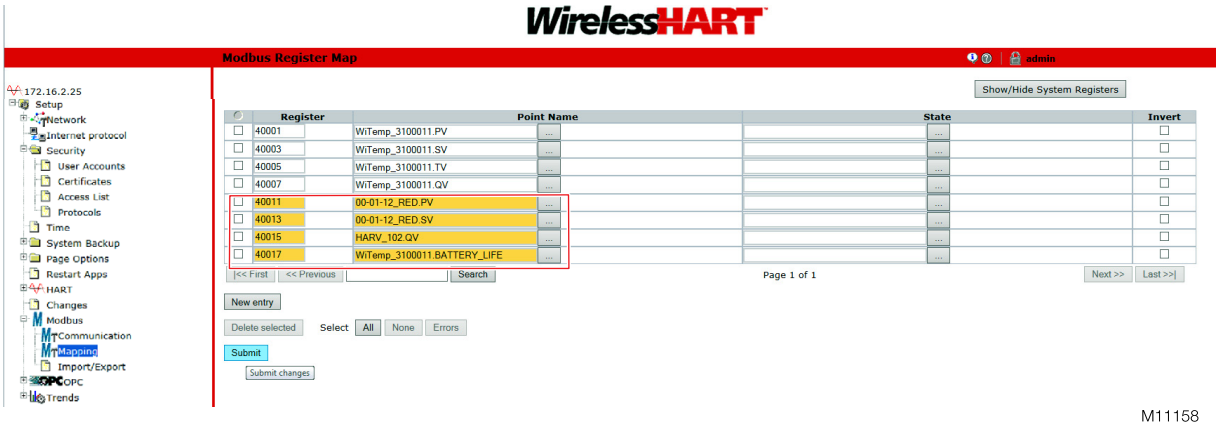

Fig. 13: Mapping result

6. Note all mappings and the IP-address in the table in chapter "Mapped Modbus Input Register" on page 17.

NOTICE

After changing the Modbus mapping in the Emerson Process Management 1420 Smart Wireless Gateway a recorder reading its register may need a power cycle to implement the new mapping.

2 SM500F

2.1 Connection

The Ethernet module fitted to the recorder contains an embedded web server enabling the recorder's data and status to be viewed remotely using an internet browser on a PC. The web server supports up to eight independent connections. Use a crossover Ethernet cable for the connection.

2.2 Initial Setup

2.2.1 Configuration Level Access – New Configuration

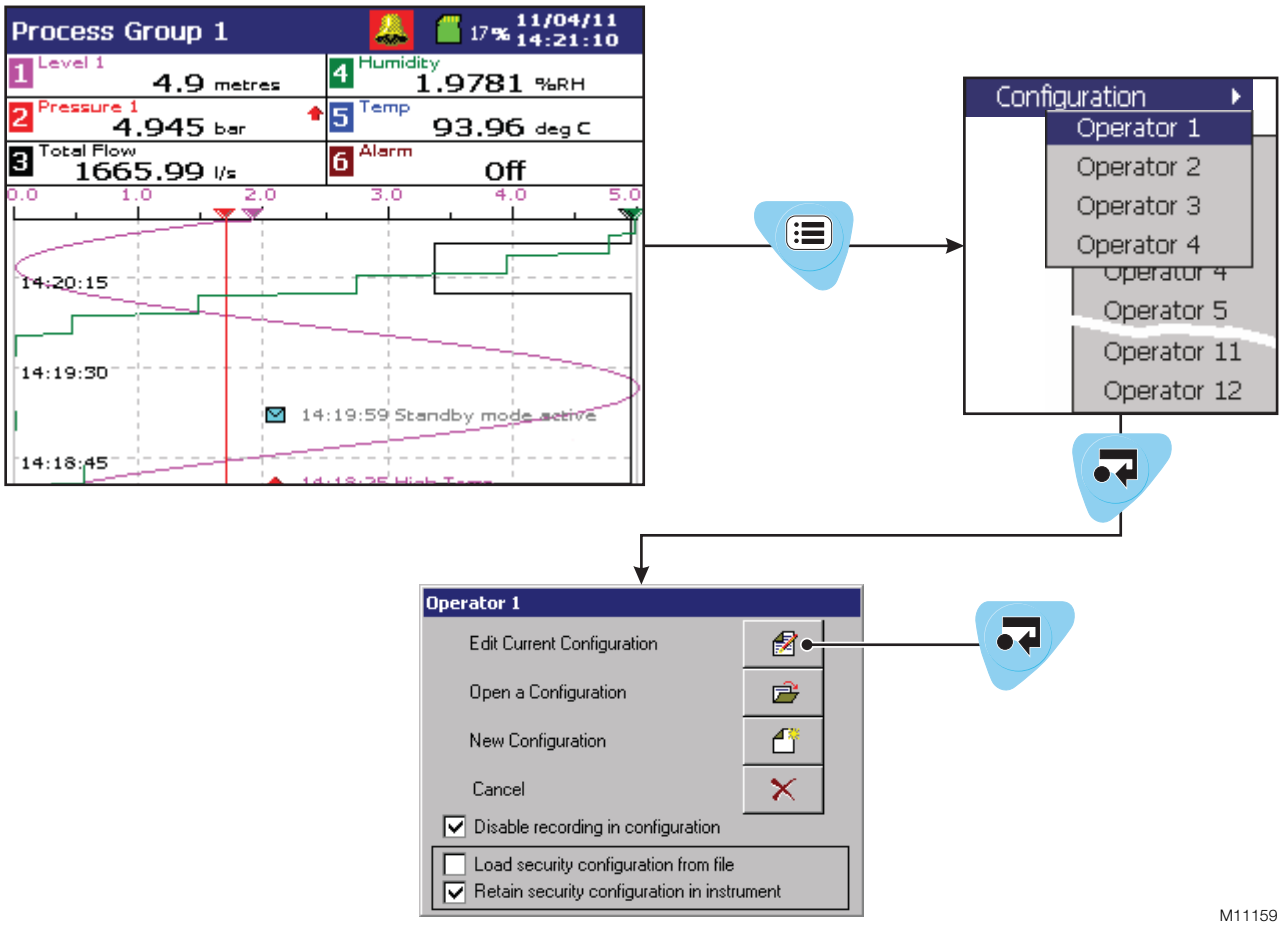

Fig. 14:

1. To configure the recorder, press the "**Menu Key**" and select "**Configuration**" and "**Operator 1**" respective the operator which shall be used.
2. If no password is configured just select "**OK**", otherwise enter the password.
3. Select "**New Configuration**" and press the **"Enter Key**".

2.2.2 Common Configuration

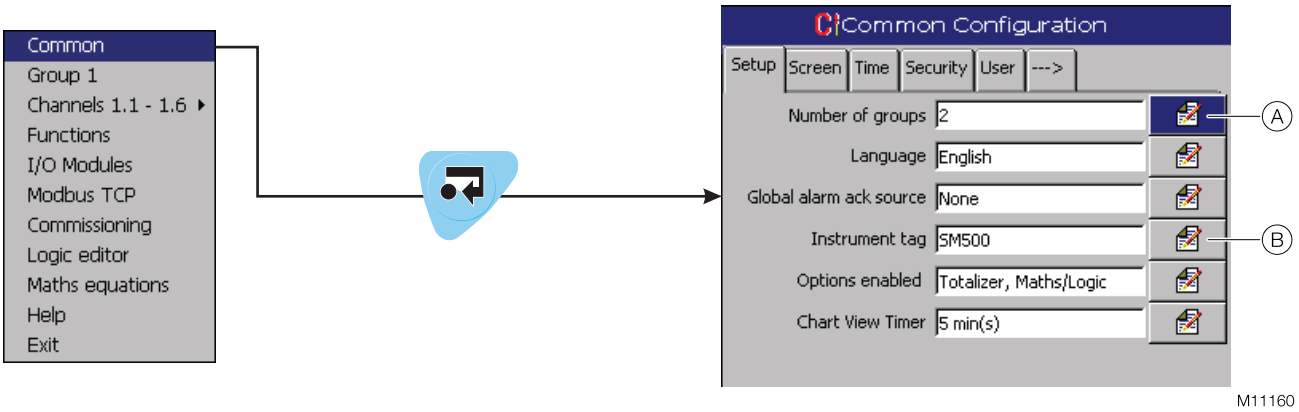

Fig. 15: Common configuration

1. Open the menu via the "**Menu Key**" and select "**Common Configuration**".
2. Configure the number of process groups desired Ⓐ. Each process group can have up to 6 recording channels assigned to it.
3. Enter the instrument tag Ⓑ to be used to identify the recorder on configuration and audit log files. When reviewing data, the instrument tag is used to identify the source of the data, therefore it is important to ensure that the instrument tag is unique to each recorder.

2.2.3 Process Group Configuration

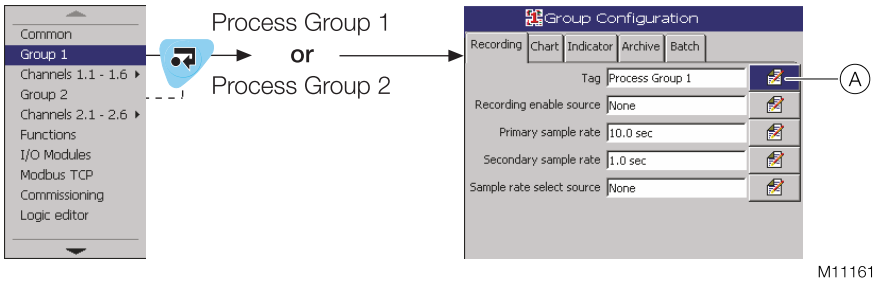

Fig. 16: Process Group Configuration

1. Open the menu via the "**Menu Key**" and select "**Group 1**" resp. "**Group 2**".
2. Enter the process group tag Ⓐ (maximum 20 characters) that appears in the title bar when any operator views from that group are displayed. Each process group tag must be unique.

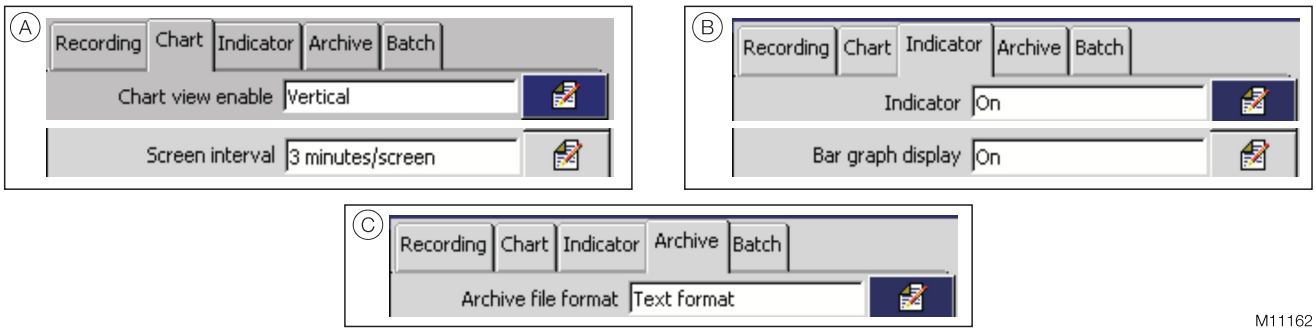

Fig. 17: Configuring the Chart view, the Indicator view and archiving

3. Switch to the tab "**Chart**" (A) and configure the following parameters:
   - Select "**Horizontal -->**" (chart runs left to right with scale bar on left), "**Horizontal <--**" (chart runs right to left with scale bar on right) or "**Vertical**" chart view.
   - Set "**Screen interval**" to the amount of historical data to be displayed on the screen. Available selections are limited by the sample rate selected.
4. Switch to the tab "**Indicator**" (B) and configure the following parameters:
   - Set "**Indicator**" to "**On**" to enable the operator to display the Indicator view.
   - Set "**Bar graph display**" to "**On**" to add the bar graph display to the Indicator view.
5. Switch to the tab "**Archive**" (C) and select the archive file format required. The selected archive file format is applied automatically to both process groups.
   - Text format archived data is stored in a comma separated value (*.csv).
   - Binary format archived data is stored in a secure binary encoded format.

   The files can be read on a PC using ABB's DataManager data analysis software.

2.2.4 I/O Modules

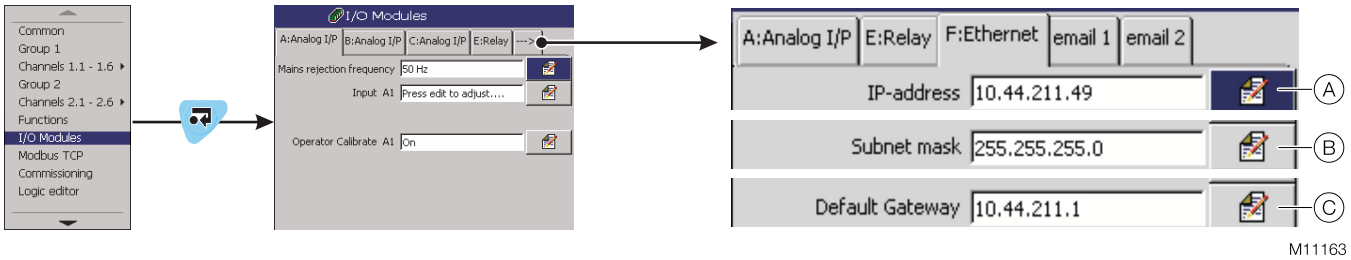

Fig. 18: Setup I/O modules

1. Open the menu via the "**Menu Key**" and select "**I/O Modules**".
2. Switch to the tab "**F:Ethernet**".
3. Enter the IP-address (A) assigned to the recorder. The IP address is used by the TCP/IP protocol to distinguish between different devices. Select a not used IP-address in the IP-range of the gateway. If the default IP-address of the gateway is used select "192.168.1.5".
4. Enter the subnet mask (B) assigned to the recorder. The subnet mask is used to indicate which part of the IP address is for the network ID and which is for the host ID. If the default IP-address of the gateway is used select 255.255.255.0.
5. Enter the IP address (C) for the default gateway (router, switch etc.) required to communicate with other networks. This setting may not be required. The default setting is 0.0.0.0.

NOTICE

Changes to the IP address, subnet mask and default gateway are implemented only after the recorder has been power cycled. See also chapter "Exiting Configuration Mode" on page 13.

2.2.5 Modbus TCP configuration

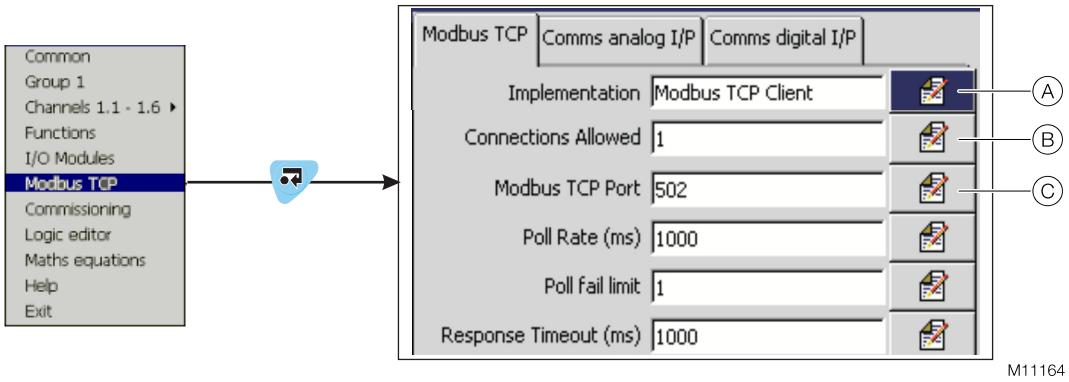

Fig. 19: Modbus TCP configuration

1. Open the menu via the "**Menu Key**" and select "**Modbus TCP**".
2. Set "**Implementation**" (A) to "**Modbus TCP Client**". The recorder acts as a Modbus Master.
3. Set "**Connections Allowed**" (B) to "**1**". This is the number of maximum simultaneous TCP/IP connections.
4. Set "**Modbus TCP Port**" (C) to "**502**". This is the TCP/IP port used by the Modbus TCP network, default port is 502.

2.2.6 Exiting Configuration Mode

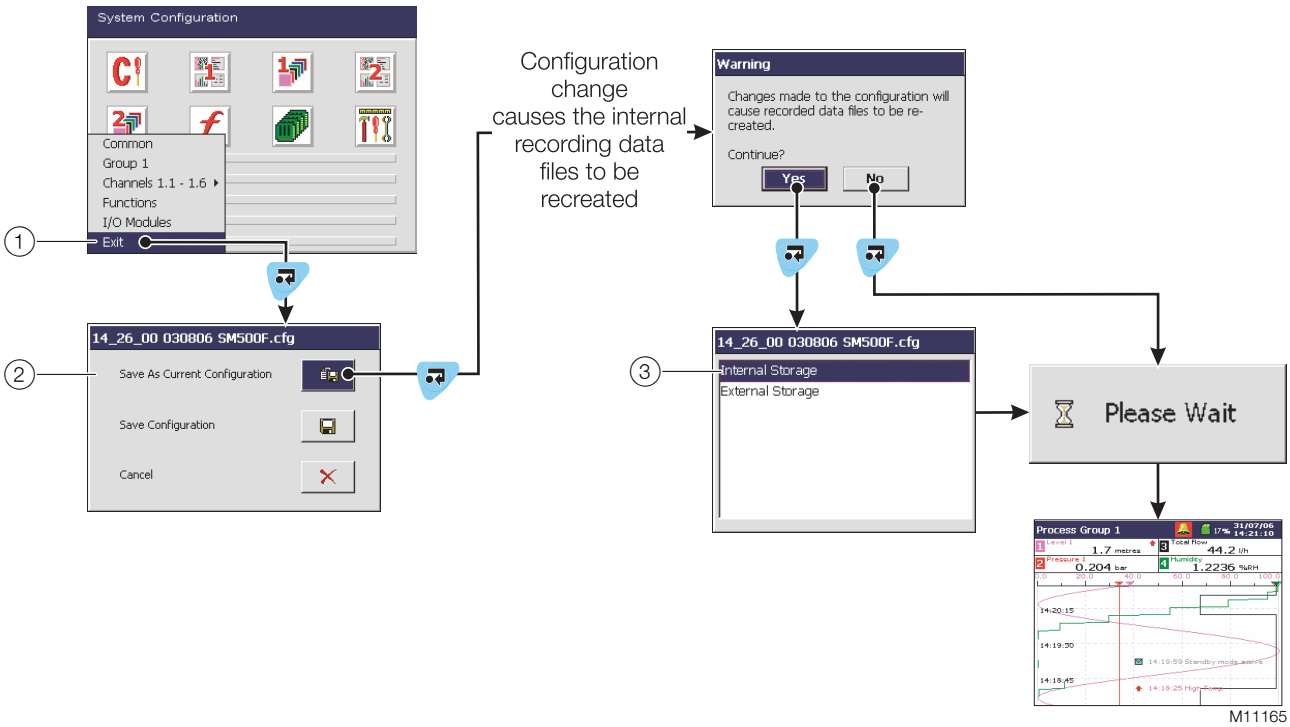

Fig. 20: Exiting Configuration Mode

1. Open the menu (1), select "**Exit**" and press the "**Enter Key**".
2. Select "**Save as Current Configuration**" (2).
3. Save the configuration in the internal storage (3).
4. Wait until the "**Please Wait**" message disappears then power down and restart the recorder.

2.3 Modbus Mapping

2.3.1 Configuration Level Access – Edit current configuration

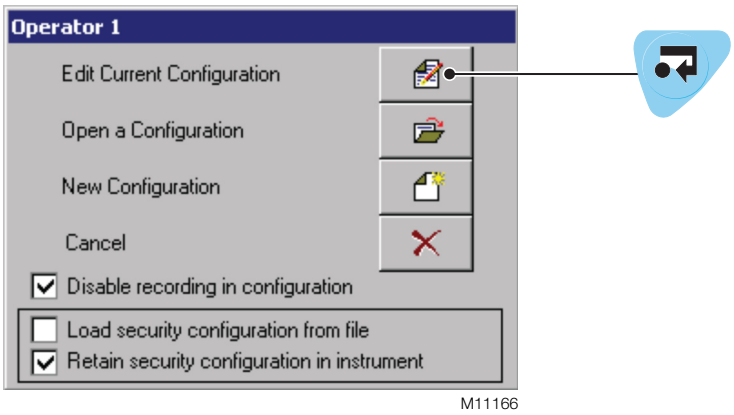

Fig. 21: SM500F - Configuration level

To configure the recorder, press the "**Menu Key**" and select "**Configuration**" and "**Operator 1**" resp. the operator which shall be used. Select "**Edit Current Configuration**" and press the "**Enter Key**".

2.3.2 Comms Analog Input Value

1. Open the menu via the "**Menu Key**" and select "**Modbus TCP**".

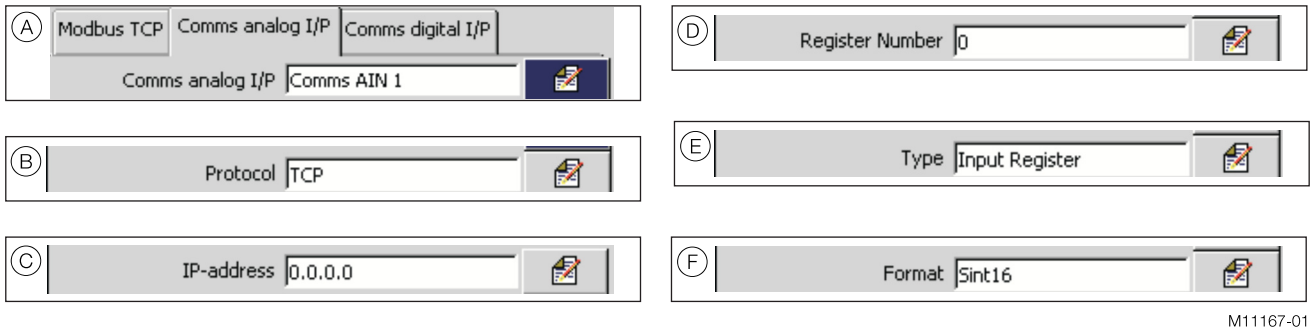

Fig. 22: SM500F - Menu "Comms analog I/P"

2. Select the input (A) "**Comms analog input**" to hold the data from the nominated slave device. (The nominated slave device is the WirelessHART gateway).
3. Select the communications protocol (B) "**TCP**" (Modbus Transmission Control Protocol).
4. Enter the "**IP address**" (C) which is assigned to the WirelessHART gateway, "Log In" on page 3 or "Log In" on page 7.
5. Enter the register number (D) to be read out from the WirelessHART gateway. See examples "Example for Pepperl + Fuchs WHA WirelessHART Gateway" on page 15 and "Example for Emerson Process Management 1420 Smart Wireless Gateway" on page 15.

6. Select the register type (E) to be read from the WirelessHART gateway:
   - For use with Pepperl + Fuchs WHA WirelessHART Gateway select "**Type**": "**Input Register**".
   - For use with Emerson Process Management 1420 Smart Wireless Gateway select "**Type**": **Holding Register**".

7. Select the format (F) of the data to be read from the WirelessHART gateway.
   - For use with Pepperl + Fuchs WHA WirelessHART Gateway select "**Format**": "**IEEE**".
   - For use with Emerson Process Management 1420 Smart Wireless Gateway select "**Format**": "**Rev. IEEE**".
8. Note the mapping in the table in chapter "Mapped Modbus Input Register" on page 17.
9. Repeat steps 1. to 8. for all devices and values which shall be accessible.

Example for Pepperl + Fuchs WHA WirelessHART Gateway

1. Take a look into mappings in the table in chapter "Mapped Modbus Input Register" on page 17.
2. Calculate the correct register number as follows:
   "SM500F Register number" = "Start register – 1".
3. Enter the calculated register number in the SM500F (see Fig. 22, Pos. Ⓓ).
   For example:
   — Start register is: 1
   — Enter register number: 0

Example for older Pepperl + Fuchs device revisions

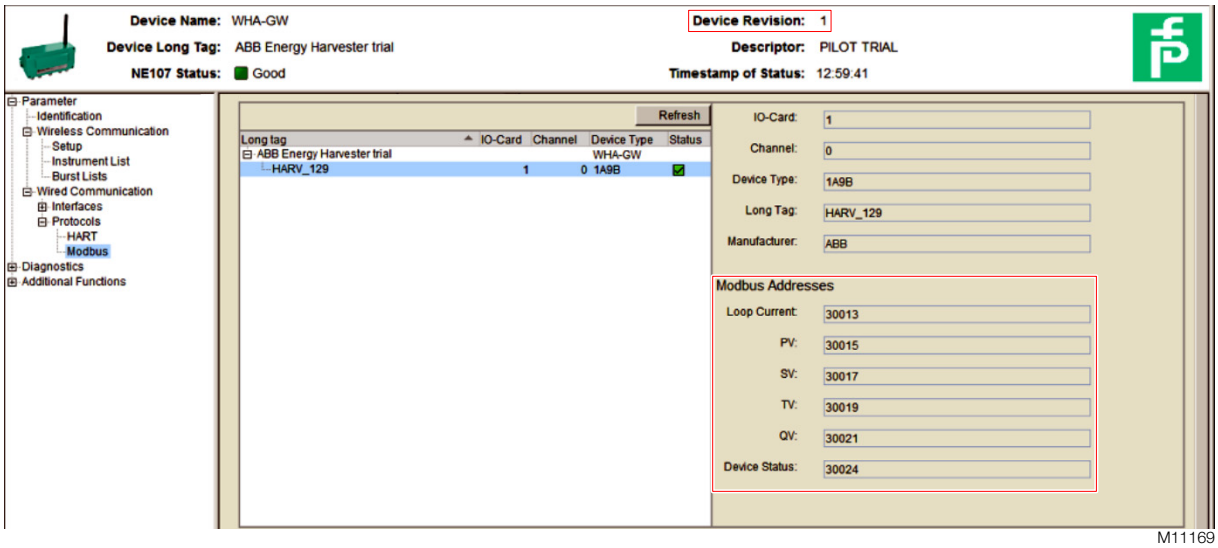

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Fig. 23: Example with address offset "30000" for older device revisions

NOTICE

Older gateway revisions may show the Modbus addresses with an offset of "30000"!

1. Take a look into mappings in the table in chapter "Mapped Modbus Input Register" on page 17.
2. Calculate the correct register number as follows:
   "SM500F Register number" = "Start register – 30000 – 1".
3. Enter the calculated register number in the SM500F (see Fig. 22, Pos. Ⓓ).
   For example:
   — Start register of "HARV_129 - PV": 30015
   — Enter Register Number: 14

Example for Emerson Process Management 1420 Smart Wireless Gateway

1. Take a look into mappings in the table in chapter "Mapped Modbus Input Register" on page 17.
2. Calculate the correct register number as follows:
   "SM500F Register number" = "Start register – 40000 – 1".
3. Enter the calculated register number in the SM500F (see Fig. 22, Pos. Ⓓ).
   For example:
   — Start register of "HARV_102 -PV": 40001
   — Enter Register Number: 0

2.4 Channel Configuration

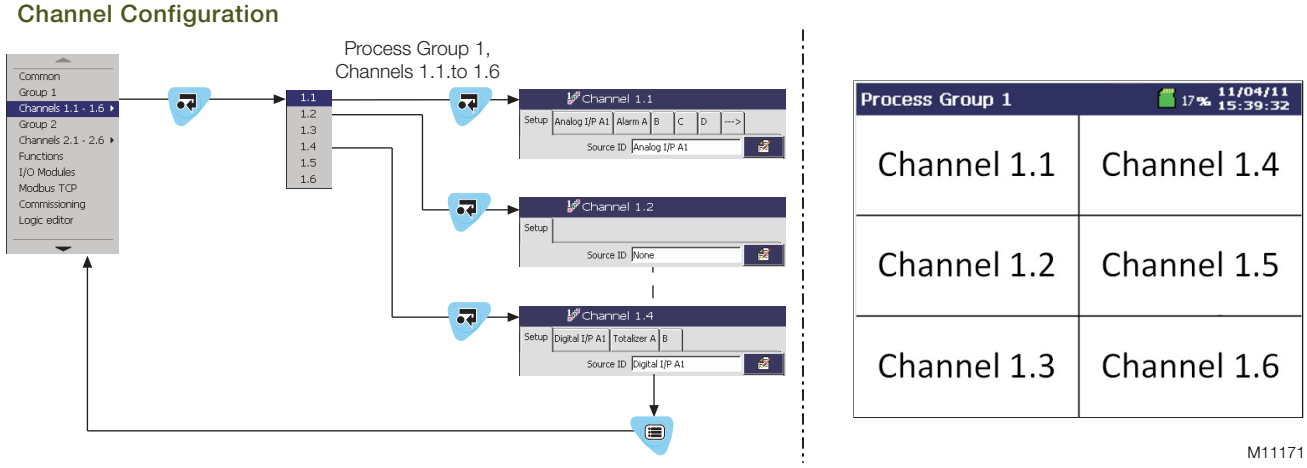

Fig. 24: Recording Channel Configuration

1. Open the menu via the "Menu Key" and select "**Channels 1.1 – 1.6**" resp. "**Channels 2.1 – 2.6**".
   The channels are sorted first by column, then by row.
2. Define which value shall be shown in which channel and note this in the table in chapter "Mapped Modbus Input Register" on page 17.
3. Select the channel to assign.

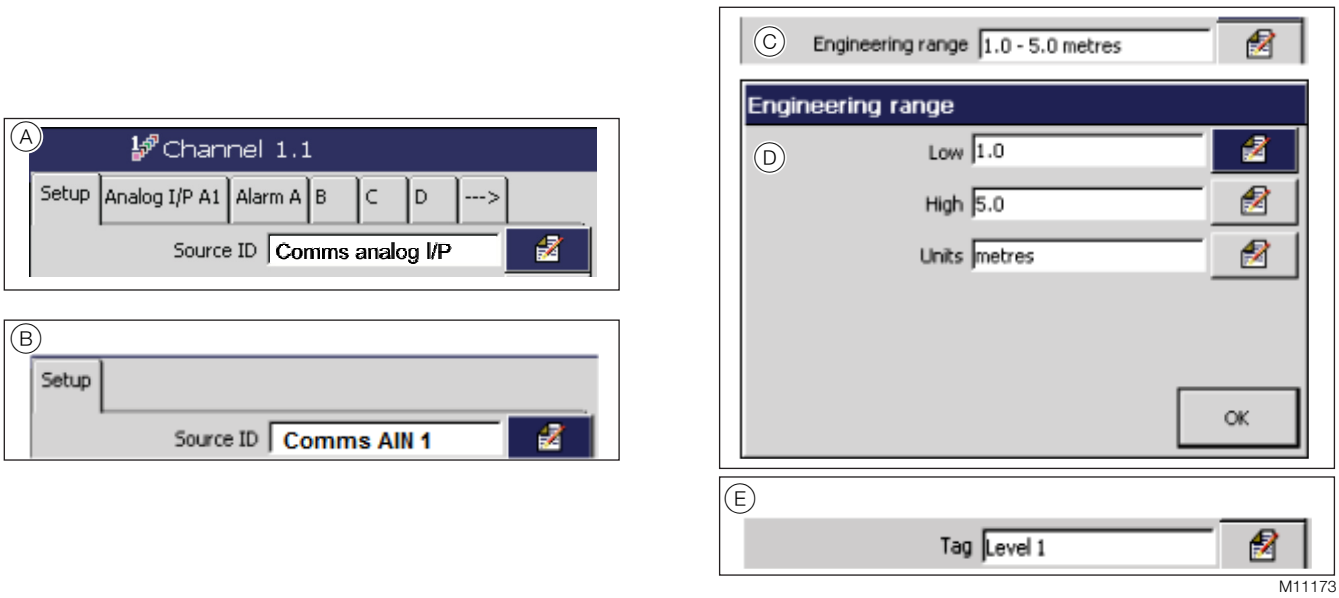

Fig. 25: Channel configuration

4. Select the signal source "**Comms analog I/P**" (A) for the selected channel. Choose "**Comms AIN 1**" to "**Comms AIN 12**" (B) as noted in in the table "Mapped Modbus Input Register" on page 17.
5. Switch to the tab "**Comms AIN**" and specify the display range (C) and units of the engineering value (D) corresponding to the electrical high and low values. Define the position after decimal point by entering the low value with the desired number. Select the unit to be shown.
6. Enter the tag name (E) to be displayed in the Chart and Indicator Views and used to identify the channel in archive files (20 characters maximum). Tags with a high percentage of capital letters and wide characters such as 'W' or 'M' may appear truncated in some Operator views. In such cases, use lower case letters or fewer characters.
7. Repeat steps 3. to 6. for all devices and values which shall be accessible.

2.5 Comms analog input failure

For each "Comms analog input" an "Analog Input Failure" is selectable. These "Comms AIN Fail" can be selected for each used "Comms AIN" and might be mapped as described in chapter "Mapped Modbus Input Register" on page 17.
The "Comms AIN Fail" will be set to "1" for failures on the mapped device variable and all device malfunctions.

3 Mapped Modbus Input Register

Gateway: ☐ Pepperl + Fuchs WHA WirelessHART Gateway

☐ Emerson Process Management 1420 Smart Wireless Gateway

IP-address: ___ ___ ___ . ___ ___ ___ . ___ ___ ___ . ___ ___ ___ .

Long Tag	Start-reg.	End-reg.	Value name	Unit	Comms AIN	Group & Channel
Example line: **00-01-12_RED**	**1**	**2**	**PV**	**°C**	**1**	**1.1**

4 ABB WirelessHART default network parameter

	Default		Notes
Network ID:	2747	decimal	
	0xABB	hexadecimal	
JoinKey[1]:	0x 57495245		
	0x 4c455353		
	0x 4649454c		
	0x 444b4559		

1) 0X = hexadecimal

5 Device Revisions

Pepperl + Fuchs WHA WirelessHART Gateway	
Device	WHA-GW-F2D2-0-AB-Z2-ETH
Device Revision	2
Website version	1.0.0.17
Device type	V224
Build	2012-11-20

Emerson Process Management 1420 Smart Wireless Gateway	
Device	1420A2A3A4
Device Revision	01420-1509-3401 Rev. AB
SW Rev.	3.9.9

Field mountable videographic recorder SM500F	
Type	SM501FC/B0E0020E/STD
System version	SM500 1002.02.033
Software Version	SM500 2001.04.035

6 Revision history

Rev.	Description of Version/Changes	Primary Author(s)	Date
A	Draft Version	Hendrik Deckert	2016-03-15
B	Ch. 2.3 Emerson Process Management 1420 Smart Wireless Gateway added	Hendrik Deckert	2016-03-16

Notes

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For more information visit:
www.abb.com/measurement

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