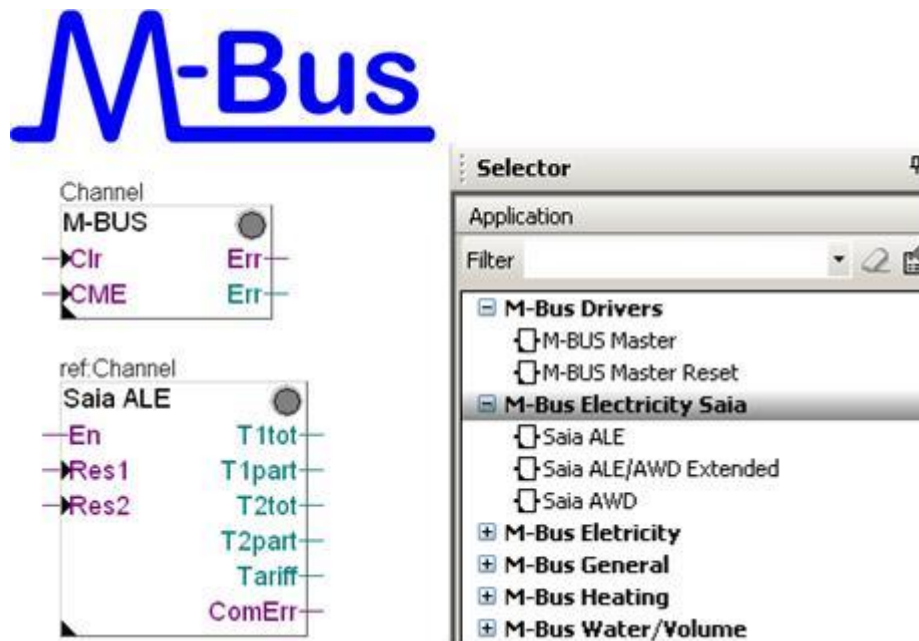


Getting started with M-Bus connected to a PCD



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Project history

Date	Author	Modification
08.09.2010	TCS / pni	V1 Editing of documentation (version 1) and project for PG5 2.0.150
17.11.2011	TCS / pni	V2 Editing of documentation (Version 2) using PG5 2.0.210 and PCD7.F271 Module
09.02.2012	TCS / pni	V3 Minor modifications in order to synchronize with the French version

1 Introduction

This document is intended to offer an easy way to start using the Saia M-Bus library. With the appropriate PG5 project, it can serve as a guide to implement an M-Bus application. The information contained in this document has been extracted from the corresponding manuals and online helps and should make getting started easier for you. For further information, please consult the relevant documents (see section “References”).

The first page of the Fupla file configure a F270(0) module, where the second page is designed for F271(0), F272(0) and F273(0) modules.

2 Hardware and software requirements

Hardware

This project has been configured with the following hardware:

- PCD3.M5540 firmware 1.16.52 or higher for PCD7.F271
- One USB cable (max. 1.8m) for programming the PCD
- A communication M-Bus Master module PCD3.F270 HW \$A FW 1.02.02
- Two 3-phases energy counter ALE3D5FM10C2A00

Instead of a PCD3.Mxxx0 it is also possible to use a PCD3.Mxx60 (Power CPU), a PCD3.T666 Smart Ethernet RIO, a PCD1.M2xx0 or a PCD2.M5xx0 system.

F27x modules are not supported on non Saia-NT systems (PCD2.M1x0, PCD1.M1xx and PCD2.M480). In case such a system needs to be connected to M-Bus a gateway such as the PW3 from Relay needs to be used (connected to the PCD using a serial line and programmed with the FBox library from Engiby).

Firmware update of the M-Bus module F27x

In case you own a module delivered during the pilot phase of the M-Bus modules it is recommended to use F27x module firmware version 1.02.02 (from November 2011, available on the [support page](#)) or later. The currently used firmware of the M-Bus module can be read using the online configurator from PG5 2.0 by clicking the button “Hardware info”. The update can be performed using PG5 2.0.210 Firmware Downloader. Please first update the PCD firmware to 1.16.52 or later and then update the M-Bus module firmware.

Software

To program the PCD the following software is needed:

- PG5 2.0.210
- Saia M-Bus library vers. 2.6.104 (available on the [support page](#)) or alternatively the M-Bus library 2.6.104 from the company Engiby



In case you work with any version of the M-Bus Library from Engiby, do not install the « Saia M-Bus FBox » library in parallel! Instead please update the M-Bus library from Engiby to version 2.6.104 or later in order to avoid inconsistent library files.

Remarks

- This document it is designed for the Saia M-Bus ALE/AWD energy meters, but in case the FBox library from Engiby is used any other M-Bus device can be used, too
- The first page of the example can be used with the PCD3.F270 interface modules but also with an RS232 – M-Bus Gateway (such as the product PW3 from the company Relay); only the serial line type in the FBox is to be adapted.

3 Basic principles of M-Bus

3.1 Definition

M-Bus (Meter-Bus) is a European standard (EN 13757-2 physical and link layer, EN 13757-3 application layer) for the remote reading of gas or electricity meters. M-Bus is also usable for other types of consumption meters. The M-Bus interface is made for communication on two wires, making it very cost effective.

The M-Bus was developed to satisfy the requirement of a system for the networking and remote reading of utility meters, for example to measure the consumption of gas or water in the home. This bus fulfils the special requirements of remotely powered or battery driven systems, including consumer utility meters. When interrogated, the meters deliver the data they have collected to a common master, such as a hand-held computer, connected at periodic intervals to read all utility meters of a building.

Up to 250 M-Bus slaves can be connected to one line (which is single-master). A two-wire standard telephone cable (JYStY N*2*0.8 mm) is used as the transmission standard medium for the M-Bus. M-Bus is not polarity dependent, does not require termination resistors and a free topology can be used with the exception of a ring topology.

Type of plant (data given apply to 1 segment)	Maximum distance	Total cable length	Cable diameter	Number of M-bus devices	Max. rate of transmission*
Smaller residential buildings	350 m	1,000 m	0.8 mm	250	9,600 Baud
Larger residential buildings	350 m	4,000 m	0.8 mm	250	2,400 Baud
				64	9,600 Baud
Smaller housing estates	1,000 m	4,000 m	0.8 mm	64	2,400 Baud
Larger housing estates	3,000 m	5,000 m	1.5 mm ²	64	2,400 Baud
Town, city district	5,000 m	7,000 m	1.5 mm ²	16	300 Baud
Point-to-point connection	10,000 m	10,000 m	1.5 mm ²	1	300 Baud

* Max. cable capacitance 150 nF/km

Lightning protection

Lightning protection is needed whenever the bus cables leave the buildings.

Addressing

- The primary addresses (max. 250) can be assigned to the M-Bus devices during commissioning.
- Within the system, each primary address may occur only once.



For some M-Bus slave devices the device address is to be configured using a software which is running on the PCD. In this case a gateway device is required to connect the PC to the M-Bus; it is not possible to connect a PC to the M-Bus line over the PCD equipped with a PCDx.F27x(0) module.

3.2 Baud rates, number of devices per line

Using the Master module PCD3.F270 the following baud rates are supported:
1200, **2400**, 4800, **9600** (in bold, the standard baud rates for M-Bus)

The baud rate 300 is only supported when using the frame protocol (option “Serial line type” of the “M-Bus Driver” FBox must be set to “M-Bus/F27xx”).

The PCD3.F27x and PCD2.F27x0 M-Bus Master modules do have 2 channels. The following modules are available:

- PCD2|3.F270(0) for up to 240 slave devices per module
- PCD2|3.F271(0) for up to 20 slave devices per module
- PCD2|3.F272(0) for up to 60 slave devices per module
- PCD2|3.F273(0) for up to 120 slave devices per module

3.3 Technology to connect PCDs to M-Bus

There are several ways to connect a PCD system as M-Bus master to an M-Bus line:

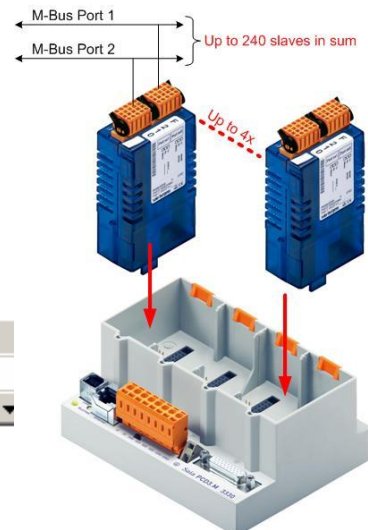
- **Framing protocol**

Using an M-Bus module PCD2.F27x0 or a PCD3.F27x (e.g. a PCD3.F271 as in this example on Fupla page 2).

In this case, the amount of M-Bus devices to be connected is limited by the firmware of the M-Bus module PCDx.F27x(0), and the so-called “Framing protocol” is used internally between the PCD and the M-Bus module. This possibility requires firmware 1.16.52 on the PCD system

Adjust Parameters	
Channel	Slot 1-Ch 1
Serial line type...	M-Bus/F27xx

Note: the framing protocol has been designed for the use in Saia FBoxes exclusively and can not be used for general purpose (e.g. in IL programs).



- **Character mode**

Using an M-Bus module PCD2.F2700 or a PCD3.F270 such as in page one of the Fupla in this example.

In this case the so-called “Character Mode” is used for the communication between the PCD and the M-Bus module. Only the PCDx.F270(0) modules do support this possibility.

In this case, the FBox is to be configured to

Adjust Parameters	
Channel	Slot 1-Ch 1
Serial line type...	RS 485/F270

- **Using a gateway (with character mode)**

Using a gateway from a serial line to M-Bus (e.g. the PW3 from the company Relay). In this case the PCD is connected via RS232 or RS485 to the gateway device. The FBox is to be configured according to the serial line port used.

This mode can also be used with non Saia-NT systems (PCD1.M1xx, PCD2.M1x0, PCD2.M480) and with PG5 1.4



(given the FBox library from Engiby is used).

4 Energy meters instructions

4.1 Wiring

Refer to the provisory manual delivered with ALE/AWD energy counter and the PCD3.F270 manual.

The PCD2|3.F27x(0) needs a 24VDC power supply. The M-Bus lines are not polarity dependent and the topology is free with the exception that a ring topology is not allowed.

Remark

As there is no polarity, the two M-Bus wires can be inverted. No termination resistors are needed.

4.2 Change of M-Bus energy meter address

The address of the ALE/AWD energy meters can be modified using the configuration buttons:

- Hold the button >.
- In the following menu, press > to increase the address by 1
Press v to increase the address of 10
- When the desired address is set , wait until the main display appears again.

Remark

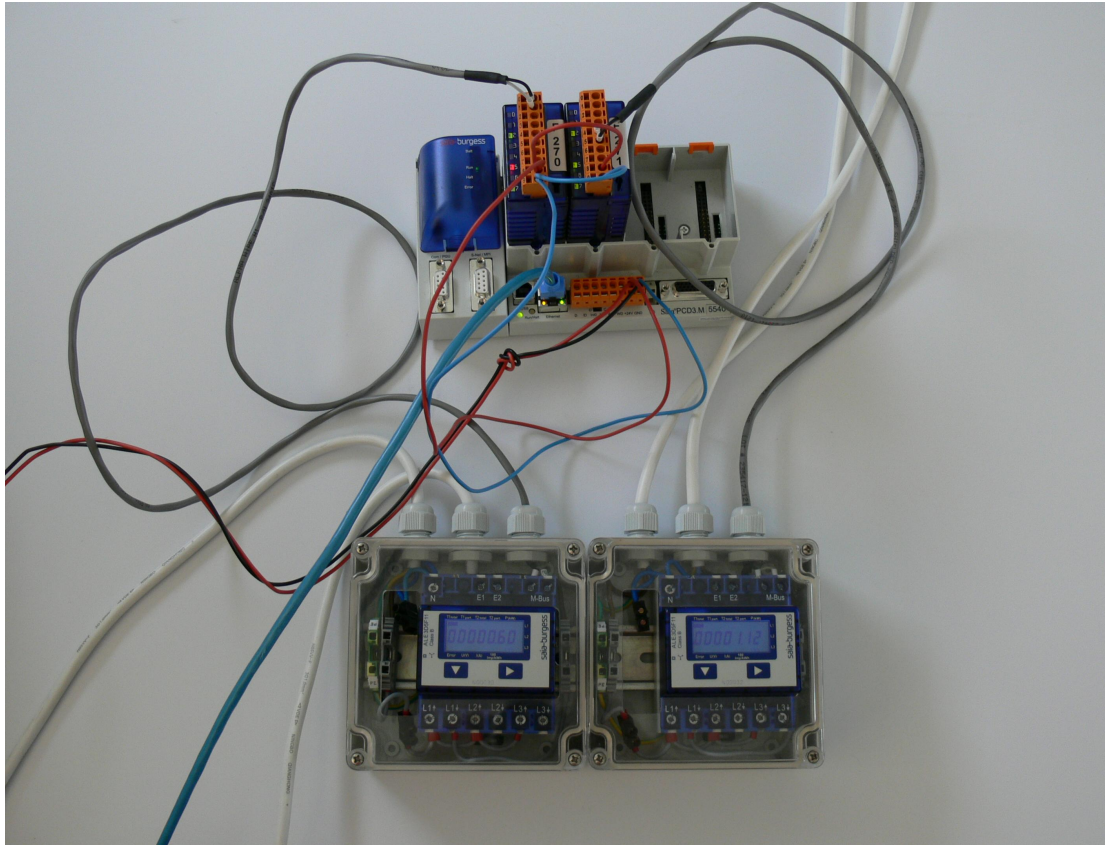
In our example the first energy meter ALE3 on channel 0 has the address 1 and the second on channel 1 has also the address 1!

5 Description of project example

The project example consists of a PCD3.M5540. The M-Bus Master PCD3.F270 interface is mounted on slot0.

The channel 0 of the PCD3.F270 on slot 0 is used to connect to an ALE3D5FM10C2A00 Saia energy counter via a two-wire cable.

The channel 1 of the PCD3.F271 on slot 1 used to connect to another ALE3D5FM10C2A00 Saia energy counter via a two-wire cable.



6 Preparation of the project example

To import the project into the PG5, the “Restore” function from the “Project” menu in the PG5 Project Manager may be used. Or create your own programme following the instructions below!

6.1 PCD configuration

Hardware configuration

In the “Device Configurator” select the communication modules PCD3.F27x as follows (the rest of the configuration is done as usual):

Onboard I/O Slots		
Slot	Type	Description
Slot 0	PCD3.F270	M-Bus communication module with 2 interfaces M-Bus master, for communication with up to 240 slaves.
Slot 1	PCD3.F271	M-Bus communication module with 2 interfaces M-Bus master, for communication with up to 20 slaves.
Slot 2		

This information can be used as documentation of the project and in order to calculate the current consumption of the modules from the internal power supply.

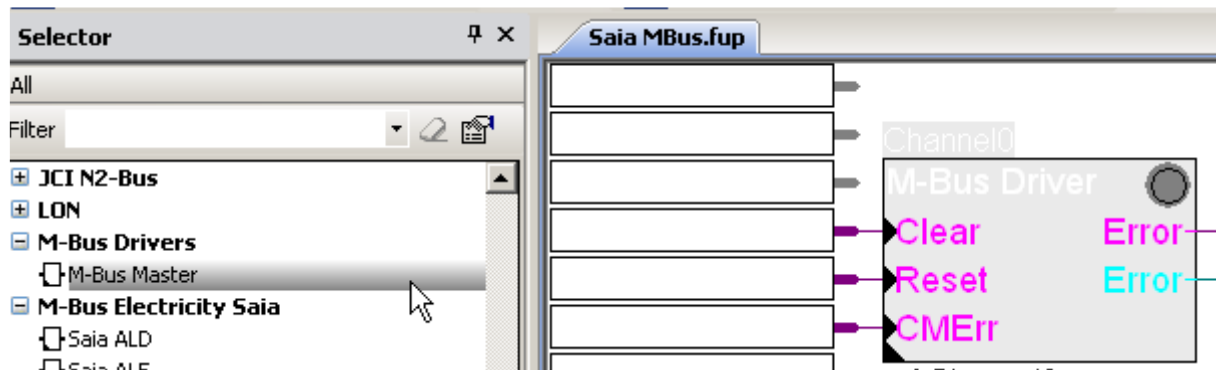
7 Programming the PCD

This section includes a short description of the application.

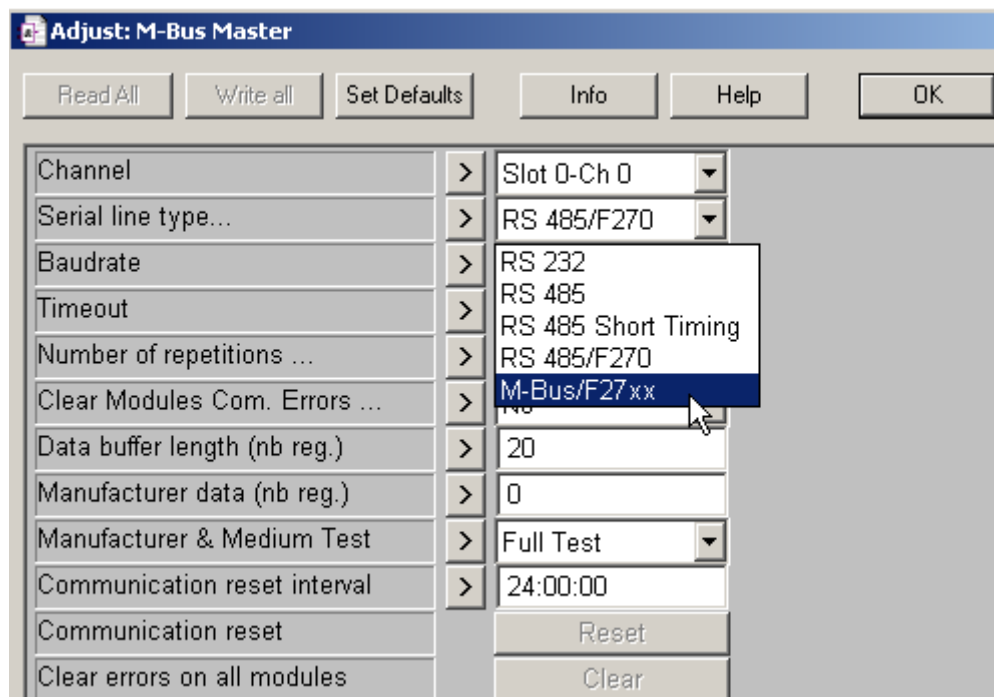
7.1 Preparing the program for the controller

7.1.1 Programming channel 0 for the 1st counter

First the FBox M-Bus Master must be placed.



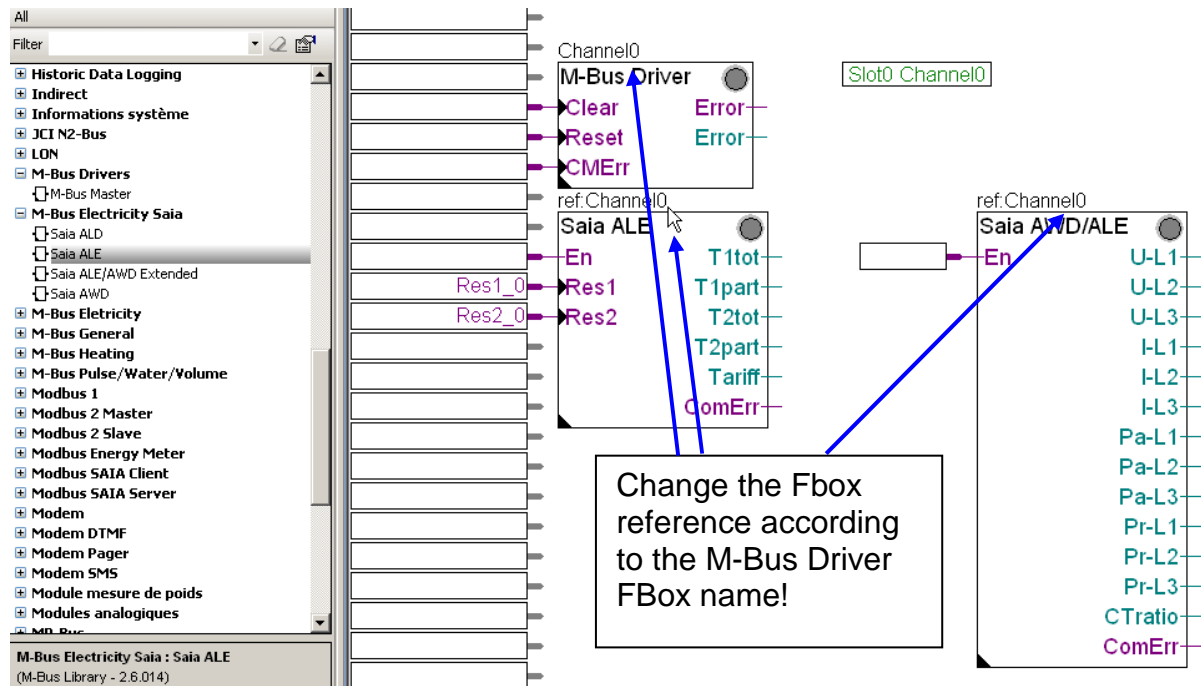
Adjust the channel according to the position where the PCD3.F270 is placed. Here on I/O module slot 0 and channel 0!



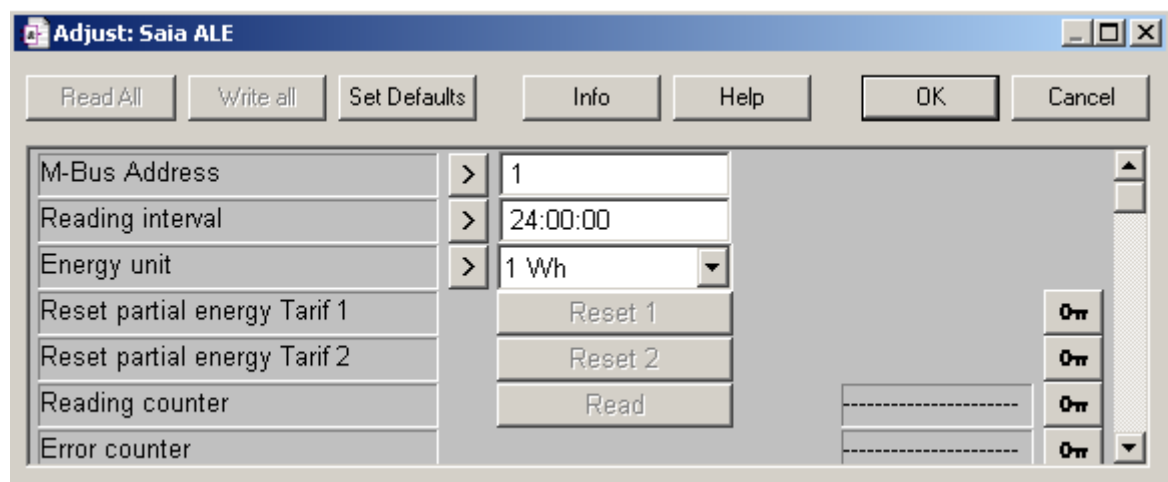
The PCD3.F270 works with “M-Bus/F27xx” (framing protocol) or “RS 485/F270” (mode C) as serial line type setting.
The PCD3.F271-F273 support only “M-Bus/F27xx” (framing protocol) as serial line type setting.

According to the Saia energy counter place the appropriate Fbox. It is also possible to place the 2 following different FBox per Saia counter:

1. The Saia ALE or AWD FBox (depending of the energy counter used) in order to read the total and partial energy
2. The Saia AWD/ALE FBox in order to read the voltage, current, apparent power, reactive power and the CT ratio



Modify the M-Bus Address according to the energy counter address configured. By default the counter is read once every 24 hours:

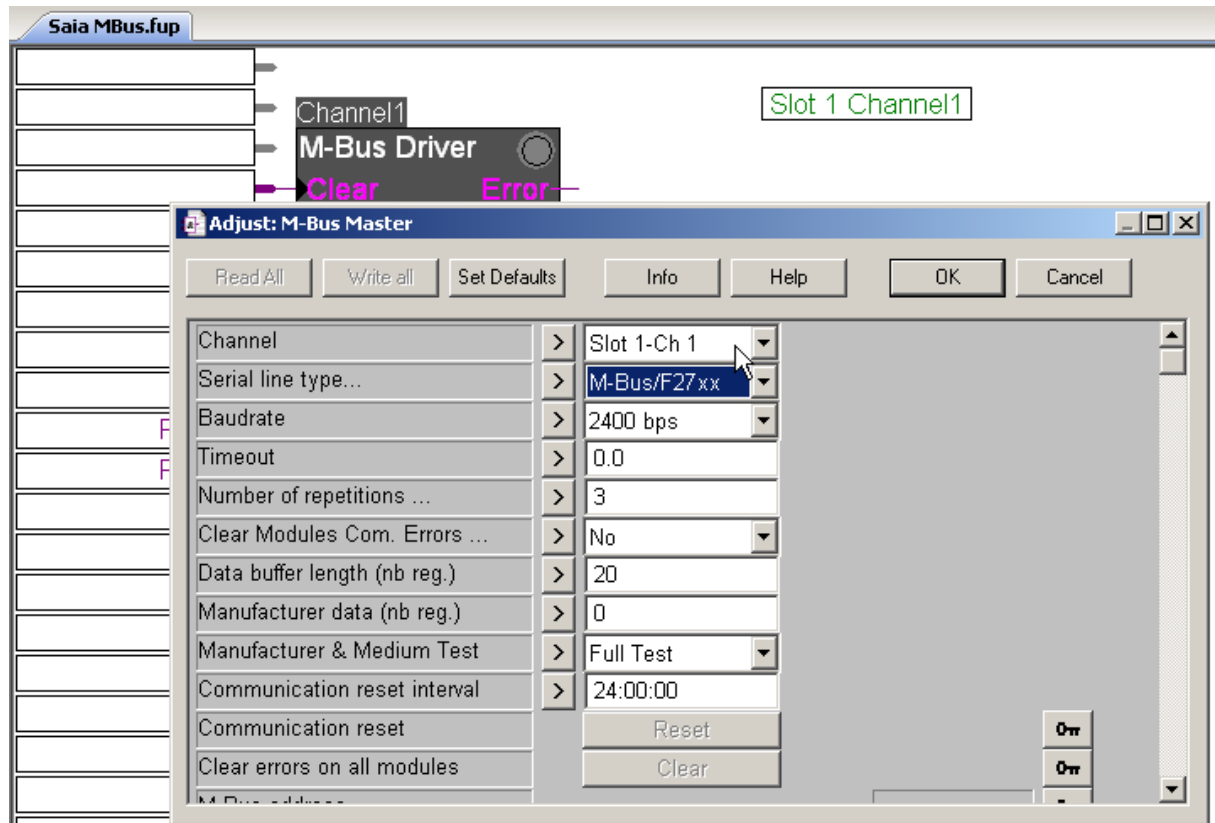


“Read” button allows the reading of the counter even if the “Enable” input is low!

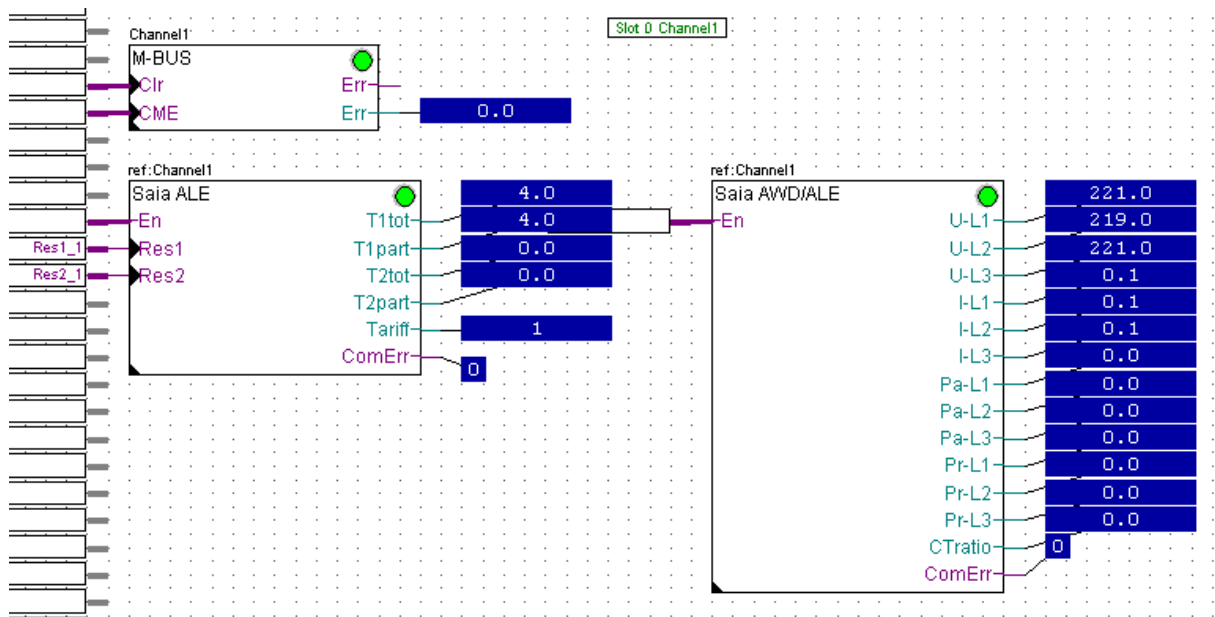
7.1.2 Programming channel 1 for the 2nd counter

Copy and paste the same page.

Then modify the channel: Slot 1-ch 1 and also the FBox Reference to Channel1!



The PCD3.F271-F273 support only "M-Bus/27xx" (framing protocol) as serial line type setting.



7.2 Build and Download

As usual download the Hardware setting (Device Configuration) then build, download the programme.

8 Troubleshooting

Symptom	Possible cause	Solution
The M-Bus Master FBox is red	Bad communication. Bus wires not connected	<ul style="list-style-type: none"> - Check FBox error code - Check wiring and correct if necessary. - Make sure that the correct "Serial line type" is selected (RS485/F270 in case of an F270, or "M-Bus/F27xx" for F271, F272 or F273 module)
If also the status LED of the PCD3.F270 module is flashing green - red	<ul style="list-style-type: none"> - No connection with PCD3.M - Port isn't assigned 	<ul style="list-style-type: none"> - Check the contact - Check that the right port has been chosen for the FBox M-Bus Master - Read PCD3.F270 HW manual for more details
After downloading the project the PCD goes in halt with the error message "SF not loaded"	The PCD firmware does not support the framing protocol	<ul style="list-style-type: none"> - Update the PCD firmware to version 1.16.52 - If this is not possible, do not select "M-Bus/F27xx" as "Serial line type" in the "M-Bus Driver" FBox (note that in this case only PCD2 3.F270(0) modules can be used)
The M-Bus module F27x blocks after a short circuit or after several re-configurations of the module	A firmware older than 1.02.02 is installed on the M-Bus module PCD2 3.F27x(0) (The firmware of the module can be read using the online configurator from PG5 2.0 by clicking the button "Hardware info")	<ul style="list-style-type: none"> - Please update the firmware of the M-Bus module to version 1.02.02 or later (the updating procedure requires PG5 2.0.210 and PCD firmware 1.16.52)
It isn't possible to place a PCD3.F27x module on a PCD3.T666 in the PG5 Device Configurator	PG5 2.0.210 does not accept this configuration	Don't place the module in the Device Configuration (the functionality is not affected)

Remark

If a PCDx.F27x(0) module isn't power supplied the communication LEDs are lighting correctly (green) but the module won't communicate (Power supply LED is off)!

9 References

Topic	Document	No.
PCD3.F270 Misc.	Hardware Manual PCD3.F270	27/603
Engiby	www.engiby.ch	
Relay	www.relay.de	
Misc.	Saia® FAQ Manager www.sbc-support.ch/faq	