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Revision history

Rev	Date	Author	Comments
A1	2009-12-02	Tobias Andersson	
A2	2011-04-26	Markus Wallmyr	CC Systems to CrossControl changes

1. Introduction

1.1. Purpose

This document describes how to get started with developing applications for the CrossFire GX1 Controller. The following description assumes knowledge of CoDeSys.

1.2. References

[1] CrossFire GX1 - manual and reference handbook

2. CoDeSys Runtime

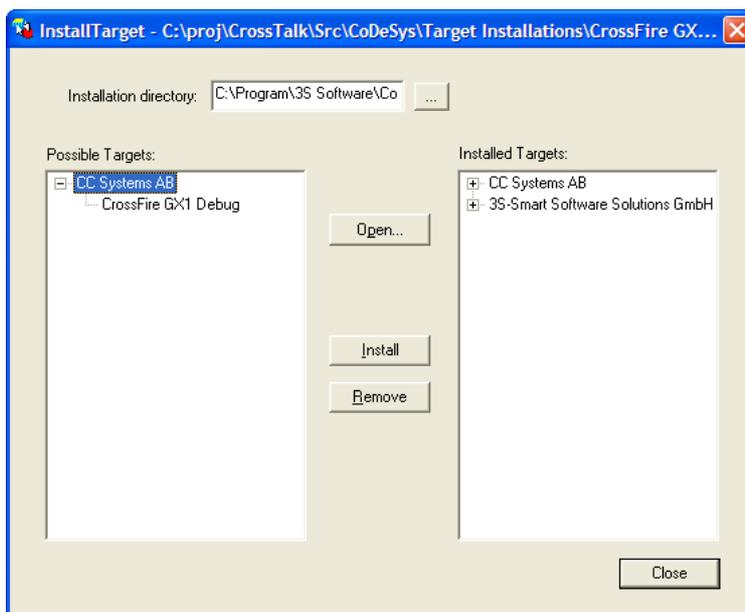
The CrossFire GX1 Controller is delivered with a CoDeSys runtime preinstalled. This runtime enables application development in IEC 61131-3 using CoDeSys and contains all necessary device drivers and software for communicating with the CoDeSys development editor. The communication is established between the unit and the CoDeSys development editor via RS232.

3. Target Installation

In order to start programming the runtime with the CoDeSys development environment, it is necessary to install a “target” for CrossFire GX1 Controller on the development computer. The target contains a description of the controller, e.g. number of inputs and outputs and size of the memory. The installation is done using the program ‘Install Target’, which is installed together with the CoDeSys development environment.

Follow these instructions:

1. Install the CoDeSys development environment. It can be downloaded from 3S web site. The target is delivered in form of a zip-file, so first of all unzip the folder to a temporary location
2. Start the program ‘Install Target’. It is found under the Windows start menu at Start -> Program → 3S Software → CoDeSys V2.3 → Install Target
3. In ‘Install Target’, choose ”Open”. Choose the target folder containing the CrossFire GX1 Controller target files that has been delivered to you
4. Choose the *.tnf file and open it
5. The screen should look like this:



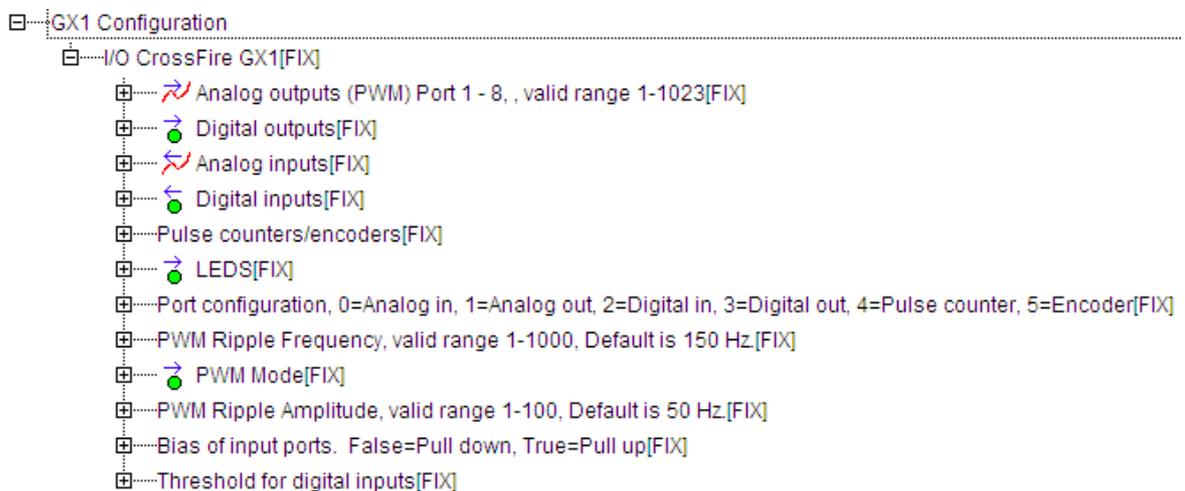
6. The installation folder, where all files will be put on your computer, can be changed by pressing the button “Installation directory”. However, it is recommended that you don’t change the default settings
7. Click Install
8. Your target for CrossFire GX1 is now installed

4. Creating a new project in CoDeSys

Start CoDeSys. In the first dialog that is shown you can choose your target. If you have followed the instruction for installing your target you should now be able to choose the CrossFire GX1 target. Normally you don’t have to change any of the target settings. Just click OK after choosing CrossFire GX1 Controller as your target.

5. Accessing the I/O on your CrossFire GX1 Controller

The I/O on CrossFire GX1 Controller can be found under PLC Configuration on the Resources tab in CoDeSys. It should look like this:



Under the I/O tree structure it is possible to access all I/O through variables. The variables are global and can thereby be accessed in all your code modules. It is recommended that these default variables are used without changing the names. Otherwise if the target installation is updated and variables are declared in PLC Configuration, the declarations will be lost.

5.1. I/O description

Below are descriptions of all the accessible I/O and the configuration that can be done for them.

5.1.1. Port configuration

With these variables it is possible to configure most of the ports. The possible values for each port are listed in the comments for the variables, as can be seen in the above figure. If a port is configured as an analog output, the variable under Analog outputs should be used to control the port. If a port is configured as analog input, the variable under Analog Input should be used for reading the AD value of the port. If a port is configured as Pulse counter input, the pulse counter value of the port can be read in the variables under Pulse counters/encoders.

5.1.2. Analog outputs (PWM)

The value range to set these outputs are 0 – 1023.

5.1.3. Digital outputs

The voltage range is 0 – 24 V.

5.1.4. Analog inputs

The value that can be read from the I/O variables has a 10 bit resolution and is in the range 0 – 1023 for all ports except 1 and 2, which has a 12 bit resolution and a range 0 - 4095. If a port has a 5 volt range, the value 1023 (4095) on the I/O variables corresponds to 5 volts. Some ports measure current in the range of 0-20mA, instead of voltage. 1023 (4095) in this case corresponds to 20mA and 0 corresponds to 0mA.

5.1.5. LEDS

The LEDs on the CrossFire GX1 Controller can be controlled with the I/O variables under LEDS. True means that the LED is on and FALSE means off.

5.1.6. PWM Ripple frequency

By setting a value to the pwm ripple frequency variables it is possible to configure the PWM ripple frequency for the PWM ports on left and right side. The valid range is 1 – 1000 Hz.

5.1.7. Pulse counters/Encoders

Port 8 and 10 can be configured as pulse counters. If configured as pulse counters the counter values are increased for each pulse on port 8 or port 10. The counter value can be converted to a frequency value by writing the proper software in a CoDeSys user application.

If both port 7 and 8 or 43 and 44 are configured as encoder inputs, the port pins work together as encoder inputs. The counter will count either upwards or downwards depending on the direction of the encoder shaft.

Note. The behavior of the ports is not defined if only one of port 7 and 8 or 43 and 44 is configured. It is therefore important that both ports are configured as encoder inputs.

5.1.8. Bias of inputs

In this section of PLC Configuration you can configure some ports input characteristics to be either pulled-up or pulled-down.

5.1.9. Threshold for Digital Inputs

In this section of PLC Configuration you can configure at what voltage the port value will go from zero to one or the opposite. The default value places the threshold at about 60 percent of the full range.

6. Accessing the EEPROM

In order to access the eeprom of the unit, the library `EEPROM_DRV.lib` has to be loaded. This is done under the Resource Tab in CoDeSys. Choose Library manager. Chose Insert->Additional Library from the menu in CoDeSys. Now, a dialog should appear with all the libraries that were installed with the target. Choose the `EEPROM_DRV.lib` library.

The library is now loaded and the functions `EEProm_Init`, `EEProm_Write`, `EEProm_Read` and `EEProm_GetSize` are ready for use.

The explanation of parameter and return values of the functions can be found in the library manager within CoDeSys.

Note that if power to the unit is lost during a write operation to the EEPROM, the content of the EEPROM may be corrupted. However, it is possible to write mechanisms in the CoDeSys software to recover from corrupted EEPROM. This can for example be done by always writing to two different areas. At startup these areas can be compared, and thereby corruption of the EEPROM can be detected and corrected.

7. Accessing the CAN bus

The CAN bus is accessed using the library `3S_CanDrv.lib`. This library is described in the CoDeSys documentation. Normally the user does not access the CAN bus directly using this library. Instead a `CANopen` master or `CanDevice` is added in the PLC configuration. For more information please read the CoDeSys documentation.

8. Program loading

The CrossFire GX1 Controller can be programmed via RS232. A special programming cable can be purchased from your reseller. To connect the cable:

1. Unscrew the screw under the X23 connector
2. Insert the connector with the marker pointing towards the text “X23”



Be careful to connect the cable correctly.

When powering up with the cable connected, the +24 V LED should be green. If the LED is red, the switch is in the wrong position, switch it and cycle power.

8.1. Connecting to the target

When you have your CoDeSys project ready to use on the CrossFire GX1 Controller, you need to download it to your hardware. This is done with the following steps:

- Configure the communication parameters. This is done in the menu Online → Communication parameters in CoDeSys. In the dialog, click New and then choose Serial (RS232). Click Ok. Now you are ready to download your project.
- Choose Online → Login. CoDeSys will ask you if you want to download your application. Click Yes. Now your application should start downloading. When it is downloaded you can start and debug your program.
- To start the execution choose Online → Run or press F5.

For more information, consult your CoDeSys documentation.

8.2. Creating a boot project

When you download your project to your hardware it is only downloaded to the RAM memory. If you turn off power to your hardware the project will be lost, and you have to download it again.

In order to save the project in the flash memory of the hardware you have to create a boot project. When you're logged in to the hardware choose Online → Create boot project.

The project will now be copied from the RAM memory to the flash memory. The next time the unit starts; it will automatically load the program from the flash memory to the RAM memory and start executing the code.

9. Writing an application in CoDeSys

How to write an application in CoDeSys is not described in this document. For more information on programming, please see the manuals, provided by 3S, which were installed together with CoDeSys.

10. Technical support

Contact your reseller or supplier for help with possible problems with your CrossFire GX1 Controller. In order to get the best help, you should have access to your CrossFire GX1 Controller and be prepared with the following information before you contact support.

- Part number and serial number of the unit, which you find on the brand label
- Date of purchase, which is found on the invoice
- The conditions and circumstances under which the problem arises
- Description of external equipment which is connected to the CrossFire GX1 Controller

11. Trade Mark, etc

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