ECS-PCIe/1100

EtherCAT®

Slave Interface for PCs

Quickstart Manual

to Product E.1100.01

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Document History

The changes in the document listed below affect changes in the hardware as well as changes in the description of the facts, only.

Revision	Chapter	Changes versus previous version	Date
1.0	-	First Release	2012-05-14
1.1	-	Table of contents corrected.	2014-05-15

Technical details are subject to change without further notice.

Safety Instructions

- When working with ECS-PCIe/1100 follow the instructions below and read the manual carefully to protect yourself from injury and the ECS-PCIe/1100 from damage.
- The device is a built-in component. It is essential to ensure that the device is mounted in a way that cannot lead to endangering or injury of persons or damage to objects.
- The device has to be securely installed in the control cabinet before commissioning.
- Protect the ECS-PCIe/1100 from dust, moisture and steam.
- Protect the ECS-PCIe/1100 from shocks and vibrations.
- The ECS-PCIe/1100 may become warm during normal use. Always allow adequate ventilation around the ECS-PCIe/1100 and use care when handling.
- Do not operate the ECS-PCIe/1100 adjacent to heat sources and do not expose it to unnecessary thermal radiation. Ensure an ambient temperature as specified in the technical data.
- Do not use damaged or defective cables to connect the ECS-PCIe/1100.
- In case of damages to the device, which might affect safety, appropriate and immediate measures must be taken, that exclude an endangerment of persons and objects.
- Current circuits which are connected to the device have to be sufficiently protected against hazardous voltage (SELV according to EN 60950-1).
- The ECS-PCIe/1100 may only be driven by power supply current circuits, that are contact protected. A power supply, that provides a safety extra-low voltage (SELV or PELV) according to EN 60950-1, complies with this conditions.

Attention !
Electrostatic discharges may cause damage to electronic components.
To avoid this, please perform the steps described on page 7 *before* you touch the ECS-PCIe/1100, in order to discharge the static electricity from your body.

Qualified Personal
This documentation is directed exclusively towards qualified personal in control and automation engineering. The installation and commissioning of the product may only be carried out by qualified personal, which is authorized to put devices, systems and electric circuits into operation according to the applicable national standards of safety engineering.

Conformity
The ECS-PCIe/1100 meets the demands of the EU regulations and EMC standards printed in the conformity declaration at the end of this manual.

Intended Use
The intended use of the ECS-PCIe/1100 is the operation as EtherCAT Slave interface for PCs.
The guarantee given by esd does not cover damages which result from improper use, usage not in accordance with regulations or disregard of safety instructions and warnings.

- The ECS-PCIe/1100 is a PC board designed for the installation in PCI Express slots only.
- The operation of the ECS-PCIe/1100 in hazardous areas, or areas exposed to potentially explosive materials is not permitted.
- The operation of the ECS-PCIe/1100 for medical purposes is prohibited.

Service Note
The ECS-PCIe/1100 does not contain any parts that require maintenance by the user. The ECS-PCIe/1100 does not require any manual configuration of the hardware.

Note on Environmental Protection
Devices which have become defective in the long run have to be disposed in an appropriate way or have to be returned to the manufacturer for proper disposal. Please, make a contribution to environmental protection.

Table of contents

1. Overview

This document describes first steps with the ECS-PCIe/1100. It uses an esd EtherCAT Slave Stack sample application and the esd EtherCAT Workbench to show the functionality of the ECS-PCIe/1100.

1.1 Requirements

- EtherCAT knowledge. The ETG (EtherCAT Technology Group, http://ethercat.org) has several brochures/introductions that should be studied first
- Windows PC
  - with esd EtherCAT Workbench*
  - with network interface card (100 Base-TX capable) dedicated to EtherCAT
  - with PCI Express slot for the ECS-PCIe/1100
  - with ANSI C compiler etc. (Makefile/Project for Microsoft Visual Studio and GCC included)
- esd EtherCAT Slave Stack*
- Network cable to connect the ECS-PCIe/1100 to the PC's NIC

* Demo version of the EtherCAT Workbench and full version of the EtherCAT Stack for Windows and Linux are included in ECS-PCIe/1100 delivery

2. Steps

Following steps have to be performed:

1. Install the ECS-PCIe/1100 into your PC, see section 3.
2. Install the esd EtherCAT Slave Stack according to its manual
   (Usually this is just running its "setup.exe" etc.)
3. Install the ECS-PCIe/1100 driver, see section 4.
   (It's within the Stack installation's "driver" folder)
4. Install the esd EtherCAT Workbench according to its manual
   (Usually this is just running its "setup.exe" etc.)
5. Connect the EtherCAT port "IN" of the ECS-PCIe/1100 to the NIC of the PC
   (The port furthermost from the LEDs, verify in ECS-PCIe/1100 hardware manual)
6. Start the Sample Slave Application, see section 5.
7. Start the Workbench and run the tests, see section 6.

3. Hardware Installation

Read the safety instructions at the beginning of this document carefully, before you start with the hardware installation!

Danger!
Electric shock risk. Never carry out work while power supply voltage is switched on!

Attention !
Electrostatic discharges may cause damage to electronic components.
To avoid this, please perform the following steps *before* you touch the ECS-PCIe/1100, in order to discharge the static electricity from your body, :

- Switch off the power of your computer, but leave it connected to the mains until you have discharged yourself.
- Please touch the metal case of the computer now to discharge yourself.
- Furthermore, you should prevent your clothes from touching the computer, because your clothes might be electrostatically charged as well.

Procedure:

1. Switch off your computer and all connected peripheral devices (monitor, printer, etc.).
2. Discharge your body as described above.
3. Disconnect the computer from the mains.
   If the computer does not have a flexible mains cable, but is directly connected to mains, disconnect the power supply via the safety fuse and make sure that the fuse cannot switch on again unintentionally (i.e. with caution label).

   Danger!
   Never carry out work while power supply voltage is switched on!
4. Open the case.
5. Insert the ECS-PCIe/1100 board into the selected PCIe slot. Carefully push the board down until it snaps into place.
6. Close the computer case again.
7. Connect the EtherCAT interfaces via the connectors in the front panel of the ECS-PCIe/1100.
8. Connect the computer to mains again (mains connector or safety fuse).
9. Switch on the computer and the peripheral devices.
10. End of hardware installation.
11. Set the interface properties in your operating system. Refer to the documentation of the operating system.

4. Driver Installation

4.1 Windows

Open the “Device Manager”, select the device, and choose “Update Driver Software” as shown in Illustration 1:

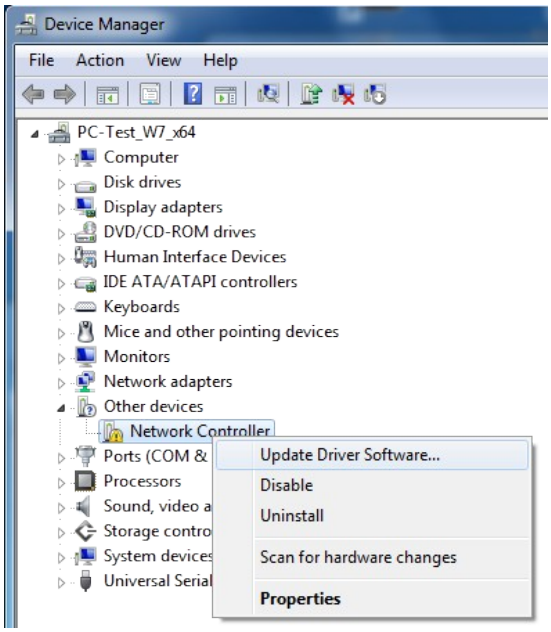
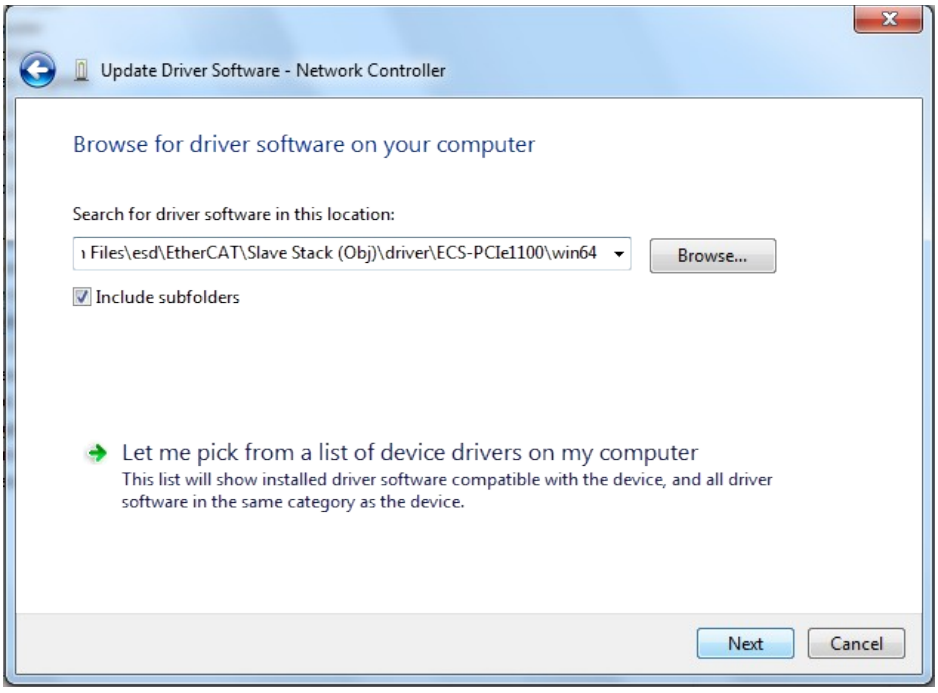


Illustration 1: Windows Device Manager with ECS-PCIe/1100 displayed as “Network Controller”

When you’re asked where to look for the driver files select “Browse my computer for driver software”. Select the folder that matches your operating system (e.g. “...\driver\ECS-PCIe1100\win64\” when using 64 bit Windows) and click “Next”:



4.2 Linux

The Linux driver for the ECS-PCIe/1100 is delivered as source code. Please refer to ".../driver/ECS-PCIe1100/linux/README" from the extracted Slave Stack Linux archive.

5. Sample Slave Application

The EtherCAT Slave Stack installation contains a few sample applications. This document refers to the "complex" application. The sample applications are installed as source code only – see Slave Stack manual for details on how to build it.

This sample application contains input and output variables: Input variables are set by the application, i.e. they will be read by the Workbench. Output variables are written by the Workbench (and the sample application displays them when changed).

The Slave and all its variables etc. are described in the Slave's ESI (EtherCAT Slave Information). This ESI exists as binary within the ECS-PCIe/1100's EtherCAT EEPROM and as .xml file for configuration tools such as the EtherCAT Workbench.

In case of changes to the application the EEPROM content and .xml ESI file have to be adapted accordingly.

6. Testing the Sample App. with the Workbench

At first the .xml ESI has to be imported into the Workbench:
(It's installed in the Slave Stack's "driver\ECS-PCIe1100\ESI\" folder.)

When the Workbench is running, this can be done by the menu entry "Copy ESI file(s) to slave library" (Under "Tools"), see Illustration 2. Otherwise the Workbench's start menu entry "Open slave library folder" can be used to copy the file manually.

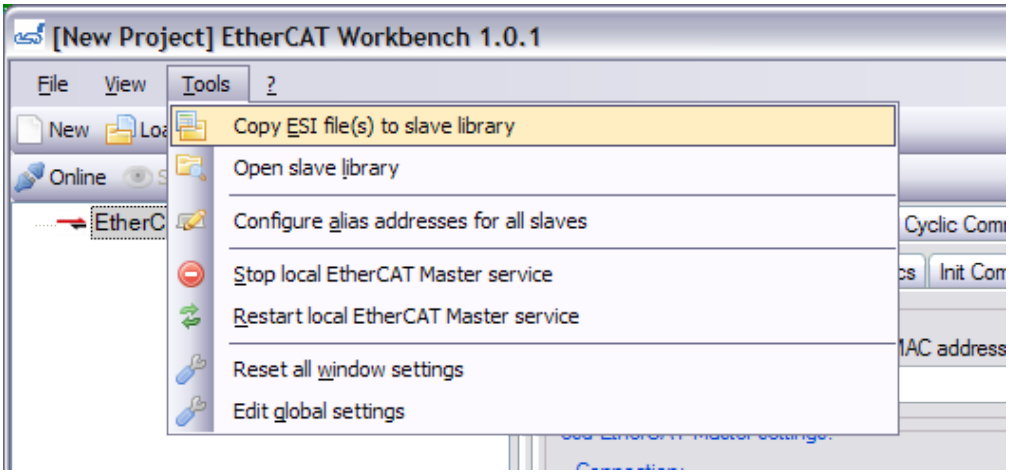


Illustration 2: Installing ESI to EtherCAT Workbench

After the Workbench was (re)started a slave scan can be performed. Use the button "Online" to let the Workbench connect to its included Master and click the "Scan" button then:

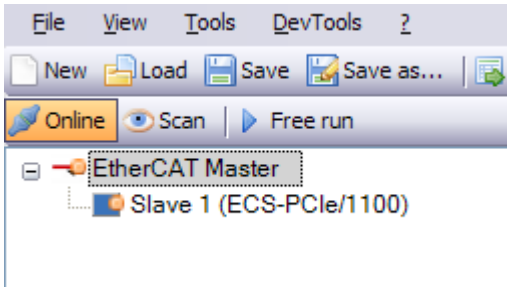


Illustration 3: Scan result showing the ECS-PCIe/1100

After switching to online mode all slaves are in “Pre-Operational” state. In this state (indicated e.g. by the orange symbol in Illustration 3) no process data is exchanged. Use the “Free run” button to switch your slave to “Operational” mode, see Illustration 4.

Then open the “Variables” tab of “Process Data/Image” as shown in Illustration 4. On this page you see all process variables of the EtherCAT network. For this sample the first two entries belong to the ECS-PCIe/1100.

As described earlier, outputs are written and inputs are read here. So click one of the two “Reread all” buttons to have the input (“Slave 1 (ECS-PCIe/1100).RxPDO1.Input1”) read.

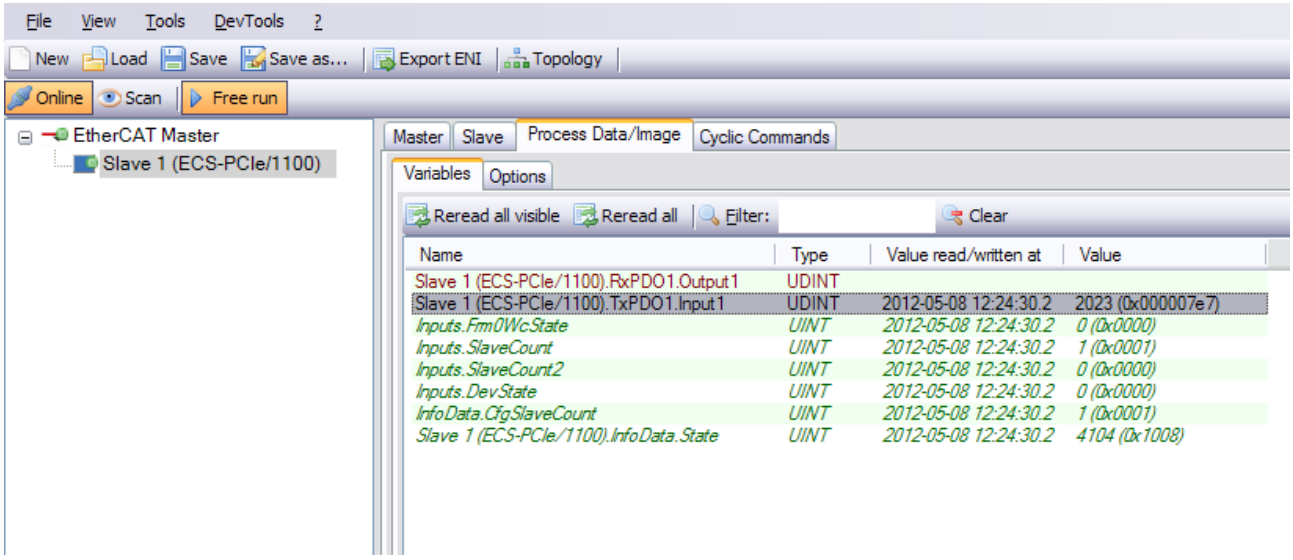


Illustration 4: Process data view with ECS-PCIe/1100

Double click the output (“Slave 1 (ECS-PCIe/1100).RxPDO1.Output1”) to write a new value to the slave. The Slave sample application shows the new value in its console output, e.g. “`[Application] *** output1 changed to 1234`”

The value for the input is changed every second by the sample application, but it becomes visible only by manual updates in the Workbench (the “Reread all” buttons etc.).

7. Further steps

Study the Workbench and Slave Stack manuals to get more details about the steps performed here – then try to map the other variables (that already exist in the application and ESI) too and finally add your own variables.

When you create a product based on the ECS-PCIe/1100 and the EtherCAT Slave Stack, don't forget to update the ESI accordingly. The binary ESI can be created by the .xml ESI, e.g. with the Workbench. The .xml ESI is described in the ETG.2000 document.

You also have to follow the ETG requirements defined in the EtherCAT Conformance Guide which can be downloaded for free from http:\\ethercat.org. This includes using your own EtherCAT vendor ID and testing the final product with the EtherCAT CTT (Conformance Test Tool).