CANopen Getting Started

CANopen network on Premium and Micro PLCs

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Getting started

Presentation

Introduction

This is a Getting started guide for setting up a CANopen network on a Premium or Micro PLC.

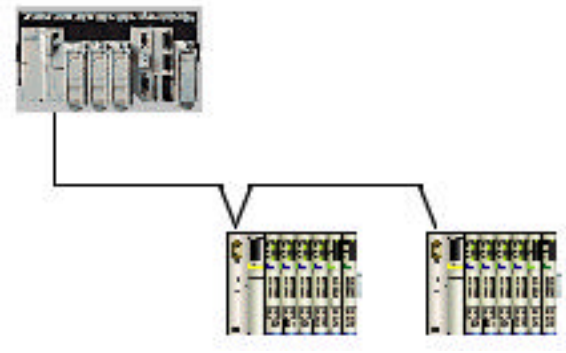
It is intended to support customers being not familiar with CANopen on their first steps to set up CANopen devices on a Premium or Micro PLC.

It will explain how to set up the hardware and which software tools must be used for which purpose during the process of software configuration. Default settings are kept wherever it is possible to facilitate the way through the configuration process and to prevent the user from loosing his orientation inside this guide.

Presentation of the configuration example

We set up the following CANopen network with two Advantys STB on a Premium PLC.

Note: Premium is chosen for this example, but all that is described in this guide also apply to Micro.



Node #2 Node #3

Node #2 consists of a STBNCO2212 CANopen interface module, a STBPDT310 power supply module, a STBDDI3410 4 bit input module, and a STBDDO3410 4 bit output module.

Node #3 is like Node #2, but has additionally 2 analog modules, the STBAVI1270 two channels analog input module and the STBAVO1250 two channels analog output module.

For both nodes, the outputs are wired to the inputs then:

- the digital input one goes on when output one is set, etc ...
- the analog inputs read back the value set from the analog outputs

Presentation

Required Equipment

Hardware:

- CANopen master : **TSX CPP 110** (PCMCIA card type III, DS 301 V4.01 standard)
    - On Premium P572xxx to 574xxx: CPU ≥ V5.0
    - On Premium P571xxx: CPU ≥ V5.6
    - On Micro : CPU (TSX 372x) ≥ V6.0
- 2 CANopen STB Network Interface Modules : **STB NCO 2212**
- 2 STB power supply modules **STB PDT 3100**
- STB I/O modules as listed in the description of the configuration example
- 3 CANopen connectors and cable
- Programming cable for PLC

Software :

- **Advantys** : to configure the STB island
- **SyCon V2.8** : to configure the CANopen bus
- **PL7 V4.4** : to configure the PLC

Main Steps of Configuration

The following list performs an overview for the steps required. A detailed description will follow in the chapters “Hardware Configuration” and “Software Configuration”.

Hardware Configuration

1. Set up the hardware
2. Prepare the CANopen cable

Software Configuration

3. Create the Advantys EDS files and Software Configuration (Advantys tool)
4. Create the CANopen configuration (SyCon tool)
5. Create the PLC application (PL7 pro tool)
6. Commissioning and Debugging

Basics of CANopen

CANopen specific terms

The following terms and abbreviations are helpful for understanding the communication principals in a CANopen network.

EDS files

EDS = Electronic Data Sheet. An EDS file is describing the communication properties of a device (baudrates, transmission types, I/O offer, ...). It is used in the configuration tool to configure a node (like a driver in a Windows operating system).

CO files

*.CO files are configuration files generated by the SyCon tool. They are imported into PL7 and contain all necessary information the TSXCPP110 needs to configure the CANopen nodes and to exchange I/O data.

PDO

PDO = Process Data Object. CANopen frame containing I/O data. We distinguish between:

- Transmit-PDOs (TxPDOs with data provided by a node) and
- Receive PDOs (RxPDOs with data to be consumed by a node).

The transmission direction is always seen from a node's point of view. A PDO does not necessarily contain the whole data image of a node (for both TxPDO and RxPDO). Normally, analog input data and discrete input data are divided onto different TxPDOs. The same is true for outputs.

SDO

SDO = Service Data Object. CANopen frames containing parameters. As the data of PDOs is automatically handled by the CANopen nodes (according to the configuration in SyCon) SDOs must be launched by function blocks through the application. As we can set up our example configuration without using SDOs, for further explanation refer to the TSX CPP100/CPP110 user manual (reference TSX DM CPP100/110 CAN open, available on PL7 documentation CD).

SDOs are typically used to read parameters from / write parameters to drives while the application is running.

Transmission Types

CAN open frames can be either sent cyclically, on change of state, or on remote request. For each PDO you can define a transmission type (in SyCon). This reduces the network load. (In this guide we use the default settings and do not go deeper into this subject. For more information refer to the TSX CPP100/CPP110 user manual).

COB-ID

COB-ID = Communication Object Identifier. Each CANopen frame starts with a COB-ID and plays herewith the role of the Identifier in a CAN frame. During the configuration phase each node is receiving the COB-ID(s) for the frame(s) he is providing and for the frames he has to consume.

In a CANopen PDO you won't find the node ID of a provider or consumer as it is common for other networks. This role is taken over by the COB ID and this enables to spread the I/O image of a node over more than one PDO.

Each of this PDO can be sent with a different transmission type and different priority. This also enables to have more than one consumer for a PDO (they only have to be sensitive to the same COB-ID).

For more details about COB-IDs assignment, refer to Appendix at the end of this document.

Hardware Configuration

Steps of Hardware configuration

- Assemble the modules incl. wiring and hardware settings (baud rate, network address, ...)
- Assemble the Premium PLC incl. TSX CPP 110 (for this example)
- Prepare and install the CANopen cable

Assemble the STB devices

Connect the STB hot swap bases and mount the modules in the sequence listed below. Changing the sequence of the I/O modules has an impact of the I/O addresses in the state RAM of the PLC.

Step 1
Assemble the modules

Node #2:

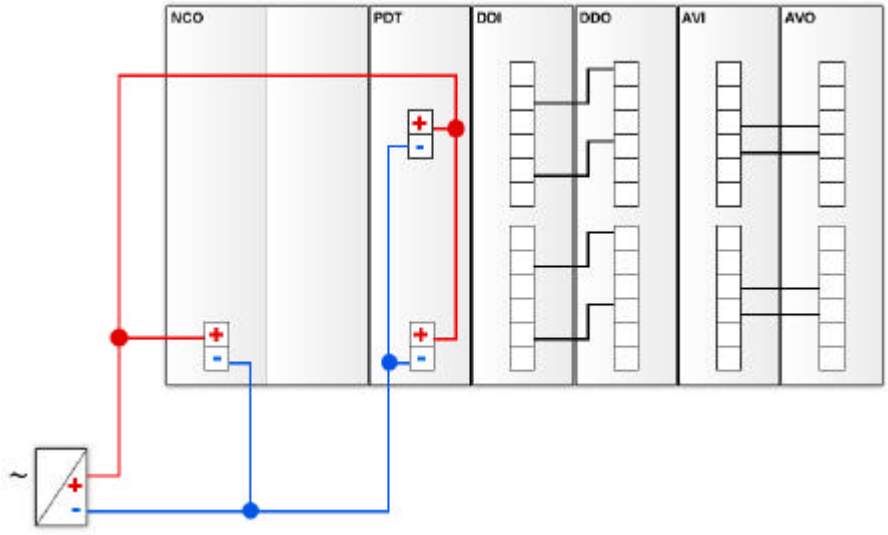
- Network interface *STBNCO2212*
- Power supply *STBPDT3100*
- Digital input module *STBDDI3420*
- Digital output module *STBDDO3410*
- Termination plate *STBXMP1100*

Node #3:

- Network interface *STBNCO2212*
- Power supply *STBPDT3100*
- Digital input module *STBDDI3420*
- Digital output module *STBDDO3410*
- Analog input module *STBAVI1270*
- Analog output module *STBAVO1250*
- Termination plate *STBXMP1100*

Step 2
Field wire the devices

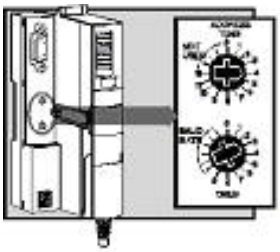
Wire the Advantys STB. The following illustration is showing the wiring of Node #3. The wiring of Node #2 is similar (only the last two modules are missing)



Note that we recommend to have a separate power supply for the outputs. For testing purpose, however, you can have one common power supply for inputs, outputs and logic supply (as shown in the figure above).

Hardware Configuration

Step 3
Set up the CANopen baud rate to 250 Kbit



Both baud rate and node address are set with the two rotary switches in the middle of the NCO module.

To set the baud rate, proceed as follows :
1. Check that the power is off
2. Set the upper rotary switch (***TENS***) to position 4
3. Set the bottom rotary switch (***ONES***) to “Baud Rate” (= any position after 9)
4. Power on

Note that the baud rate will be taken into account after power on and only when the bottom rotary switch is on position "Baud Rate". The baud rate is selected with the upper rotary switch (0 = 10 Kbit, 1 = 20 Kbit, 2 = 50 Kbit, 3 = 125 Kbit, 4 = 250 Kbit, 5 = 500 Kbit, 6 = 800 Kbit, 7 = 1 Mbit).

Step 4
Set up the CANopen node address

The node address is set with the same two rotary switches:

1. Check that the power is off
2. Select 0 on the upper switch (***TENS***)
3. Select 2 on the lower switch (***ONES***) for the module with the CANopen address 2 and 3 for the module with the CANopen address 3
4. Power on

Note: The 2 switches represent the address value. For a CANopen address of 16: select 1 on upper switch (TENS) and 6 on lower switch (ONES).

Note that the node address will be taken into account only after power on. When changing the address without a power cycle, the module will keep the old address until the next power cycle takes place.

Step 5
Load the Advantys STB configuration

Use the Auto-Configuration feature (no SIM card) of the NCO module as follows:

1. Check that the power is on and remove the SIM card if inserted
2. Press the reset button which is located under the door in the bottom of the NCO module for about 5 seconds

Now the Advantys STB is booting. The hardware configuration is read from the backplane and stored into a flash memory.

Note that an Advantys STB is always trying to load the configuration from the SIM card. When no SIM card is inserted, the configuration is taken from the flash. When the current configuration is different from the one in the flash, push the reset button to update the flash. Always push the reset button after a configuration change or when the flash configuration is unknown.

Step 6
Last check

Now the Advantys STB is properly set up and the devices are ready to communicate with the CPP110 CANopen master.

The LEDs must show the following status:

- NCO module: "RUN" and "PWR" are set to on, "CANRUN" is blinking
- PDT module: "IN" and "OUT" are set to on
- I/O modules: "RDY" is set to on, on every I/O module

Possible Errors

- **Configuration mismatch**

When the configuration in the flash is different from the actual configuration, the LED status is as follows:

- NCO module: "RUN" and "PWR" are set to on, "CANRUN" is blinking green, "ERR" and "CANERR" are blinking red
- PDT module: "IN" and "OUT" are set to on
- I/O modules: "RDY" is blinking on every module which does not match with the configuration from flash, "RDY" is on for every other I/O module

- **Module Error**

Some modules can display an error condition (e.g. DDO3230, when output voltage supply is missing). In this case, "RDY" is on and "ERR" is blinking on the module, while the NCO module is healthy ("RUN" and "PWR" are set to on, "CANRUN" is blinking).

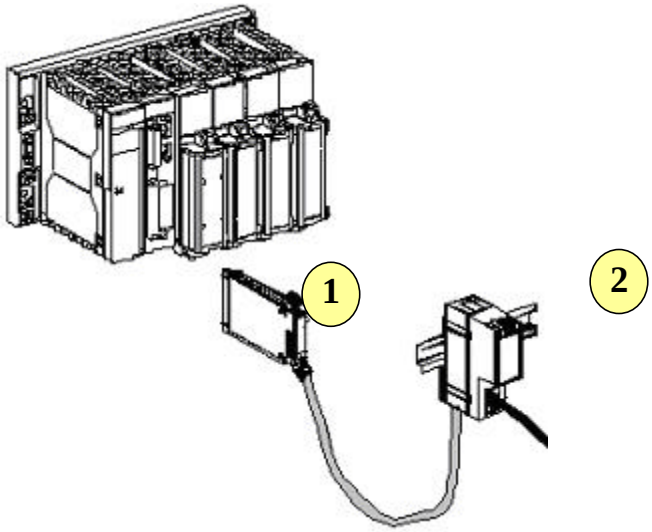
Assemble the Premium

Assemble the PLC as shown in the figure below.

- Ensure that the power supply module is powered off
- Mount all Premium modules in the backplane
- Insert the TSX CPP 110 card into the PCMCIA slot of the processor (1)
- Fix the TAP on a DIN rail (2)
- Wire the power supply module

It is mandatory for the PCMCIA card to be installed in the slot located in the processor module. As a result, only one CANopen bus is available for each PLC CPU.

Note that when the PCMCIA card is inserted the PLC must be powered off.

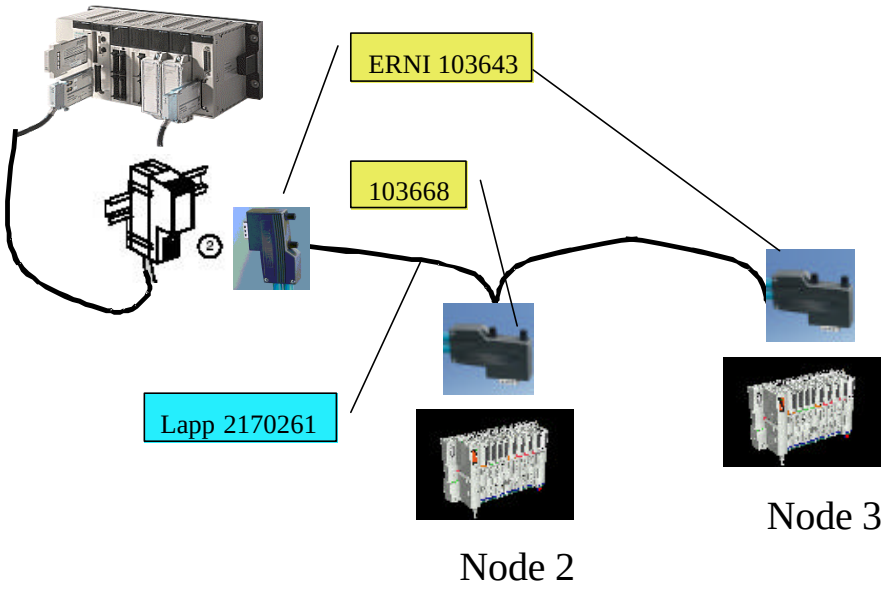


Now the Premium is properly set up and can be powered on and software configured.

Prepare and install the CANopen cable

For CANopen, special connectors and cable are available from the market (refer to CANopen cabling document).

For the present configuration, you need to prepare a cable with 3 female SUB D 9 connectors:



Example of CANopen cable is available by **Selectron** under the product ref:

- DCA 701 (article number 44170014)

For any additional information, consult http://www.selectron.ch/

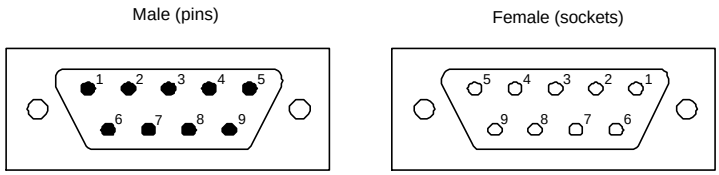
Example of cable from **Lapp**: http://www.lappcable.com/products/

- UNITRONIC BUS CAN 2170261: 120 Ohms shielded double twisted pair cable

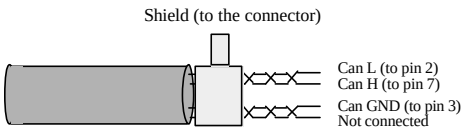
Example of connectors from **ERNI**: http://www.erni.com/

- 1 x ref 103668 for daisy chain (plugged on Node 2)
- 2 x ref 103643 for the end of the bus (includes the line termination; plugged on the TSXCPP110 tap and on Node 3)

CANopen connectors normally have screw type terminals and must be assembled manually, according to the following pin out:



Pin N°	Signal	Description
2	CAN_L	CAN_L bus Line
3	CAN_GND	CAN ground
7	CAN_H	CAN_H bus Line



Pin 2, 3, and 7 must be connected.

Software Configuration

Steps of Software configuration

The software configuration consists of three major steps:

1. Create the Advantys STB configuration and generate an EDS file for each node (Advantys software)
2. Create the CANopen configuration (SyCon software)
3. Create the PLC application (PL7 software) and transfer the project to the PLC.

Hereafter, the whole system is running and you can write outputs to / read inputs from the CANopen devices.

Create the Advantys STB configuration

The main purpose of the Advantys tool is:

- To modify the default parameters of the I/O modules (i.e. switching off behavior of outputs, ...)
- To load the Advantys configuration into the SIM card (if any)
- To generate the EDS files

As we work in our example with the modules' default settings and we already have loaded a configuration from flash (refer to section Hardware configuration), we only use this tool to generate an EDS file for each of our nodes. These EDS files are providing all information on the nodes needed by SyCon to configure the bus.

Note that the Advantys tool is not mandatory. You can also use the generic EDS file, which is available in SyCon. This, however, requires deeper CANopen knowledge and advanced usage of the SyCon software. EDS files created from the Advantys software are dedicated to the individual configuration of each node and reduce the configuration work to a minimum.

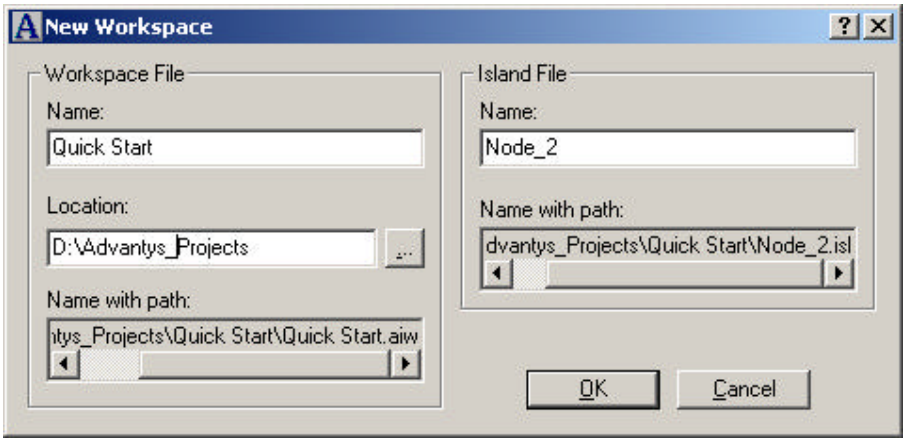
Note: In case you want to load the configuration through the Advantys tool, use the menu Online/Connect then Online/Download into the island (in this case, specific cable is required).

Steps to create the Advantys configuration

Advantys tool - Step 1

Create a new workspace

Start the Advantys tool, create a new workspace and enter name and path.

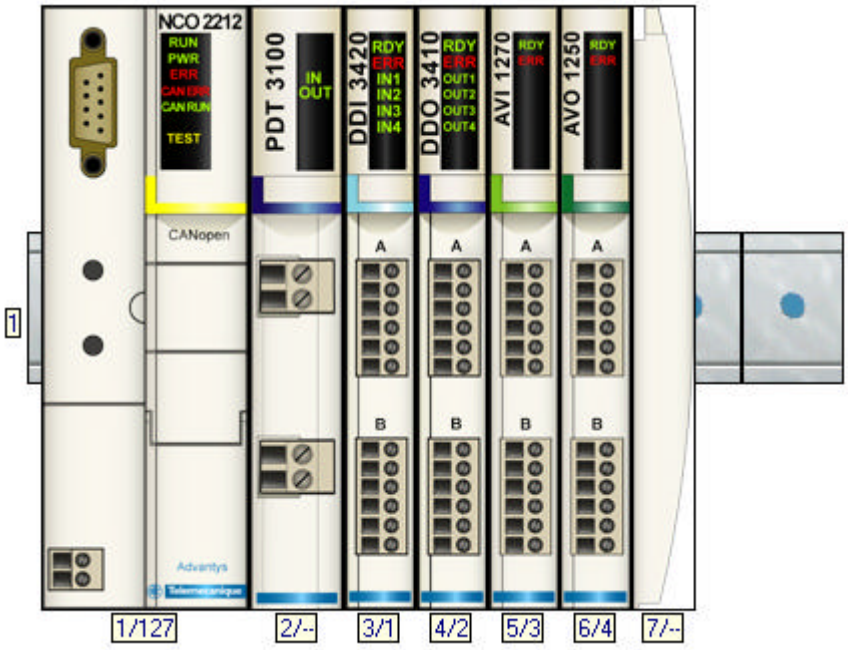


In our example, we have chosen the path D:\Advantys_Projects\Quick Start. The name of the project file is Quick Start.aiw and the name of the Advantys STB is Node_2 (referring to its CANopen node address). All the Advantys STB on the same bus must be declared in the same workspace. Default workspace path is C:\program Files\Schneider Electric\Advantys\Project\

Advantys tool - Step 2
Configure the STB nodes

After that, a workspace with a DIN rail for Node #2 is opened. Now configure Node #2 according to its hardware configuration by drag and drop the modules from the hardware catalog on the right side of the screen. Do not forget the Termination plate (Ref STB XMP 1100). Then, create a new node (“Add new Island” from the “File menu”), name it Node_3 and configure it according to the hardware configuration of Node #3.

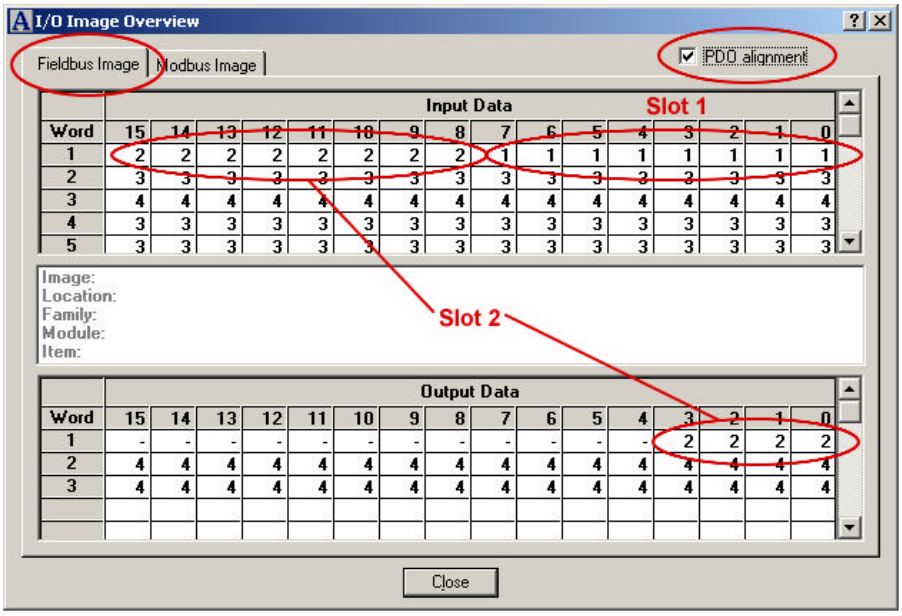
The following figure is showing the Node #3 properly configured.



Note: You can also read out the configuration when you are in online mode. In this case, the power supply module and the termination plate are missing as they cannot be detected on the island’s backplane. You must add them manually.

Advantys tool - Step 3
Display the Fieldbus I/O image

Open the fieldbus I/O image from the menu I/O image overview. Select Node #3, click on the TAB “Fieldbus image” and select PDO alignment as shown in the screen below.



Do the same for Node #2. Make a print screen from both screens as it helps to understand the IO mapping.

In the PLC memory, Node #3 assigns 3 words of output data and 5 words of input data. The table is read as follows: You can find the input of slot 1 (DDI module) in the input word 1 (low byte), the I/O of slot 2 (DDO module) in input word 1 and output word 1, ...

General mapping rules are:

- First a block with discrete I/O, then the block with analog I/O
- Within the blocks, the I/O points are sorted by the physical sequence of the I/O modules.
- Discrete I/O points are mapped into the discrete block, sorted by number. First the I/O points, after, the echo (outputs only) and then the status. Analog channels are sorted by number. The input/output values are mapped into the analog input/output block, the status bytes are mapped into the discrete input block.

Detailed mapping interpretation of Node #3

Input Data				
Word	15..12	11..8	7..4	3..0
1	Status bits- slot 2	Echo bits- slot 2	Status bits- slot 1	Input bits- slot 1
2	Status bytes- slot 3		Status bytes- slot 3	
3	Status bytes- slot 4		Status bytes- slot 4	
4	Input channel - slot 3			
5	Input channel - slot 3			
Output Data				
Word	15..12	11..8	7..4	3..0
1				Output bits- slot 2
2	Output channel- slot 4			
3	Output channel- slot 4			

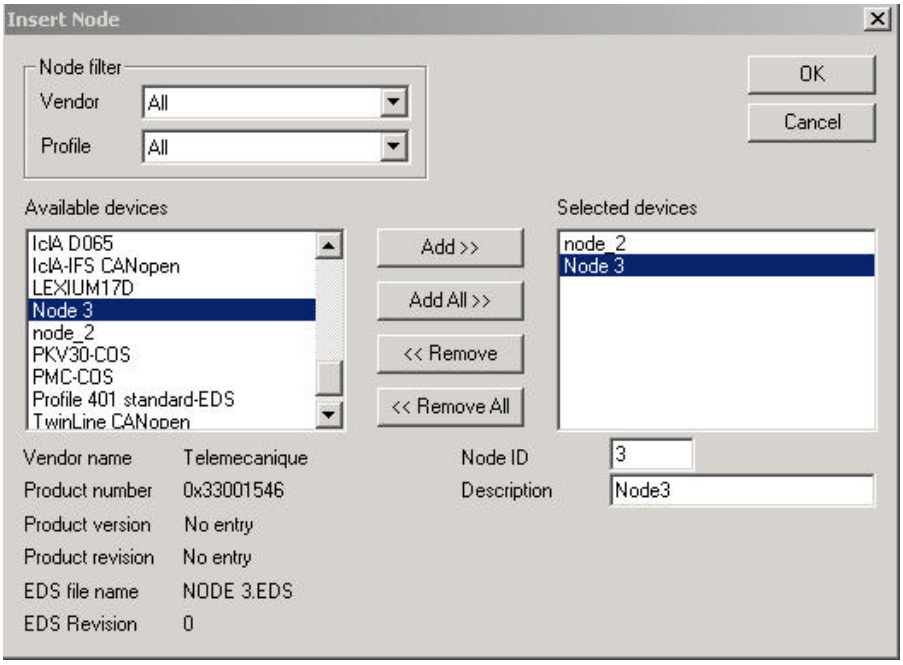
Software Configuration

Advantys tool - Step 4 Create the EDS files	Select node 2 and create the EDS file by “File” ->”Export ...”. Select “Node_2” as name for the EDS file. Do the same for node 3. In our example the files will be exported on the following directory : D:\Advantys_Projects\Quick Start*.eds.
	Now the Advantys STB configuration is complete. You have generated the EDS files as output and you are now ready to start the CANopen configuration with SyCon.
Create the CANopen configuration	With the CANopen configuration, we generate an electronical description of the CANopen fieldbus. This description contains all information that PL7 needs to configure the CPP110 CANopen master. Perform the following steps:
SyCon tool - Step 1 Create a new SyCon project	Start the SyCon tool (it can be opened from the PL7 configuration screen, see: PL7 tool – Step 1) and open a new CANopen project. Save the empty project as ...\Demo_cfg.co. The default path is ...\SyCon\Project\. You will have to know the path and the filename as PL7 needs it during the PLC configuration.
SyCon tool - Step 2 Import the EDS files	From Menu "File" then "Copy EDS", Copy the EDS files node_2.eds and node_3.eds you have generated with the Advantys tool. Refuse the import of the bitmap file (those files don’t exist). Files to be imported are localized in this example into the following directory (refer to Advantys tool - Step 4) : D:\Advantys_Projects\Quick Start*.eds.
SyCon tool - Step 3 Insert the TSX CPP 110	Insert the CANopen master TSX CPP 110 (Insert -> Master ...). Keep the node address #1. SyCon is offering as a default value.

SyCon tool - Step 4
Insert the nodes “Node_2” and “Node_3”

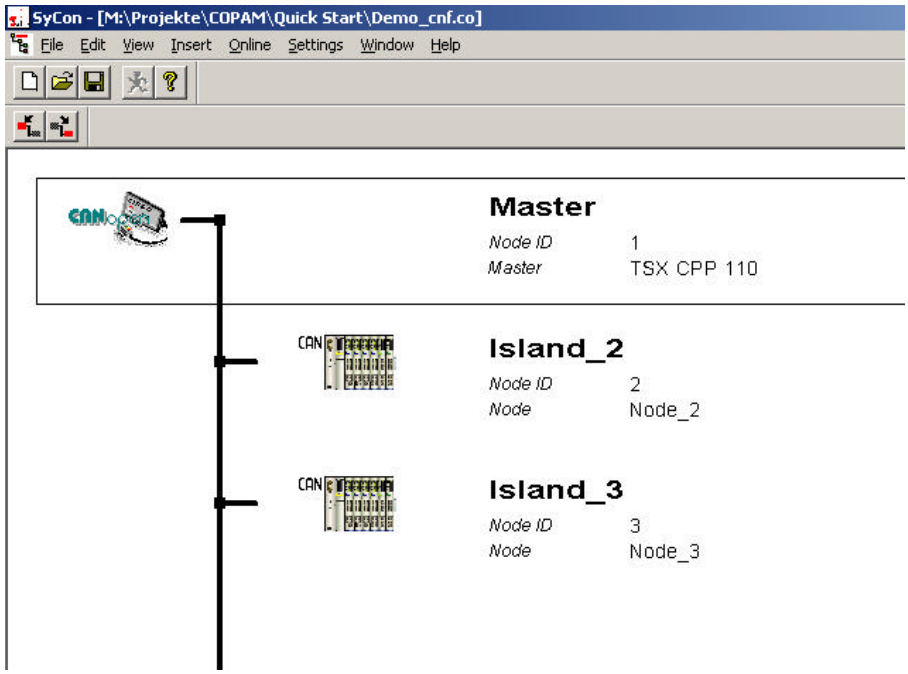
Insert Node #2 (Insert -> Node ... and choose Node_2 from the list of available devices). Keep the node address #2 SyCon is offering as default value then click on "Add>>" button and valid the screen by OK.

Do the same for Node #3.



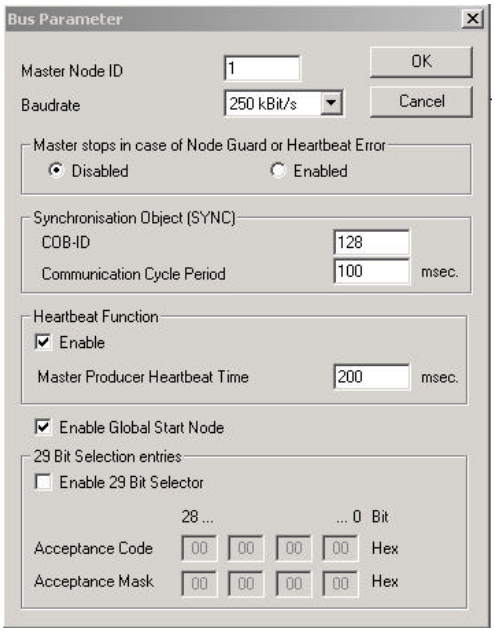
Configuration screen in SyCon

Now SyCon is showing the following CANopen configuration screen. SyCon has taken the names Node_2 and Node_3 from the names of the EDS files.



SyCon tool - Step 5
Set the Baud rate to 250 kBit

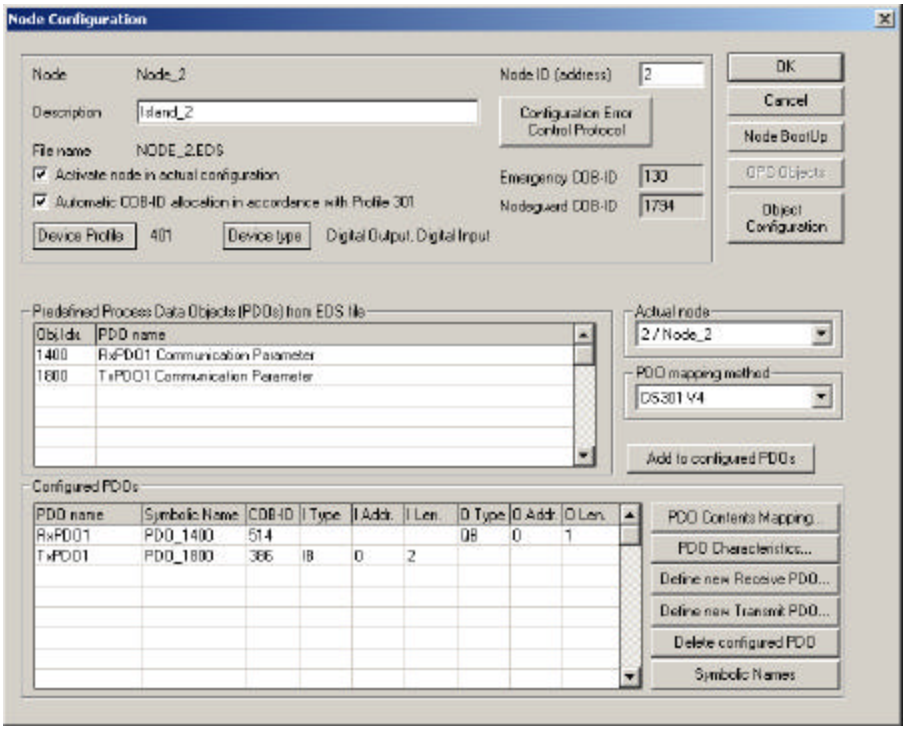
Simple click on the TSX CPP 110 and then select “Settings” -> “Bus Parameter” in the menu. Adapt the Baud rate to 250 kBit/s (value previously set on the Advantys STB hardware.).



SyCon tool - Step 6
Configure the PDOs for Node #2

Double click on Node_2. The Node configuration screen opens and is showing two PDOs in the “Predefined Process Data” grid. The first PDO is a Receive-PDO (RxPDO) to configure the output data for Node #2, the second is a Transmit-PDO (TxPDO) to configure the input data from Node #2. (The transmission direction is always seen from the node’s point of view.)

Double click on the first PDO and validate the transmission type window. (We use the predefined settings from this screen.) Now you have configured the first PDO SyCon has got all necessary information from the EDS file you have created with the Advantys tool. Do the same for the second PDO and you have finished the PDO mapping for Node #2. Now the screen is looking as follows:



Click on "OK" to valid and close the node configuration window.

SyCon tool - Step 7
Configure the PDOs for Node #3

Do the same with Node #3. For Node #3, SyCon is offering four predefined PDOs, two Receive PDOs and two Transmit PDOs.

- RxPDO1 is defining the PLC digital output data
- RxPDO2 is defining the PLC analog output data
- TxPDO1 is defining the PLC digital input data
- TxPDO2 is defining the PLC analog input data

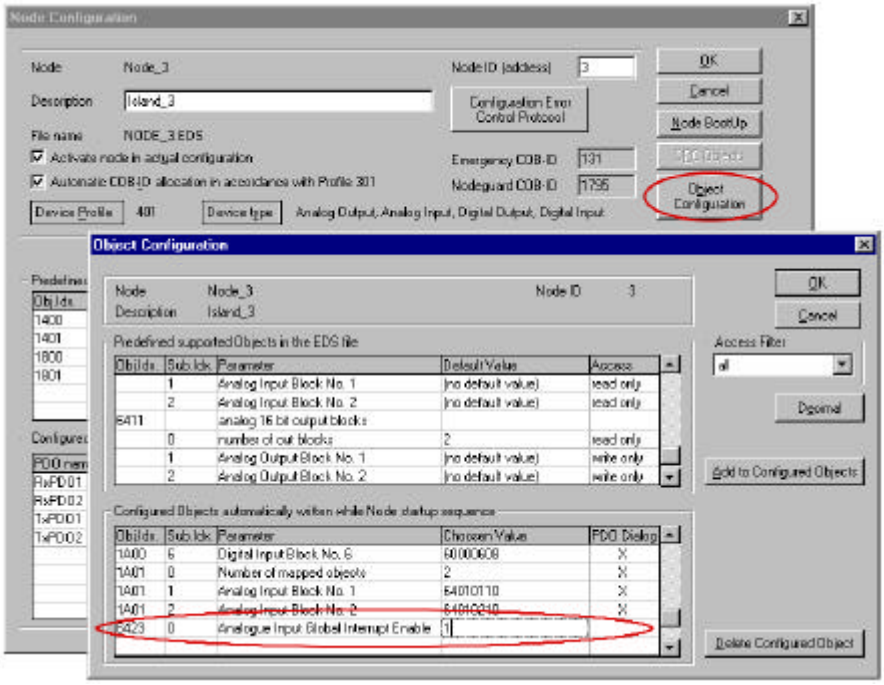
Configure all 4 PDOs in the same way as you did it with Node #2.

Warning: You have to map all offered PDOs and perform no changes on these PDOs, otherwise your I/O mapping in PL7 doesn’t correspond to the address table from Advantys tool.

SyCon tool - Step 8
Enable analog input transmission for Node #3

By default, the transmission of analog input values is disabled on the modules. Perform the following steps to enable analog input transmission:

1. Open the ***Node configuration*** window for Node #3
2. Press on the ***Object Configuration*** button
3. Double click on the object ***6423 : Analog Input Global Enable*** in the list of Predefined supported Objects
4. Enter ***1*** in the ***Chosen Value*** to validate the analog input



Close the window and save the project. You have now finished the CANopen configuration with SyCon and created all necessary data PL7 needs to configure the TSX CPP110 module.

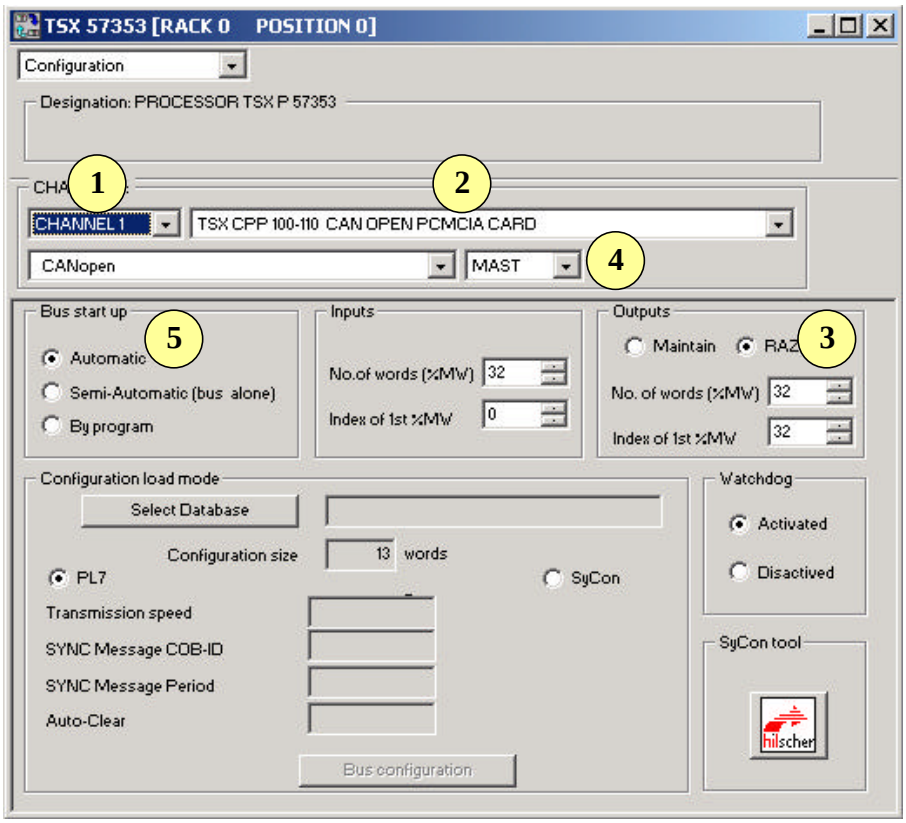
The information is available in a database, the default path for our example is ....\SyCon\Projects\demo_cfg.co.

You are now ready to start with the PL7 application.

Software Configuration

Create the PL7 Application

PL7 tool – Step 1



Start PL7, create the hardware configuration and double click on the PCMCIA slot of the CPU

1. Select the ***Channel 1***
2. Select the ***TSX CPP100 - 110*** card
3. Define the output behavior in case of PLC stop: Maintain or Reset

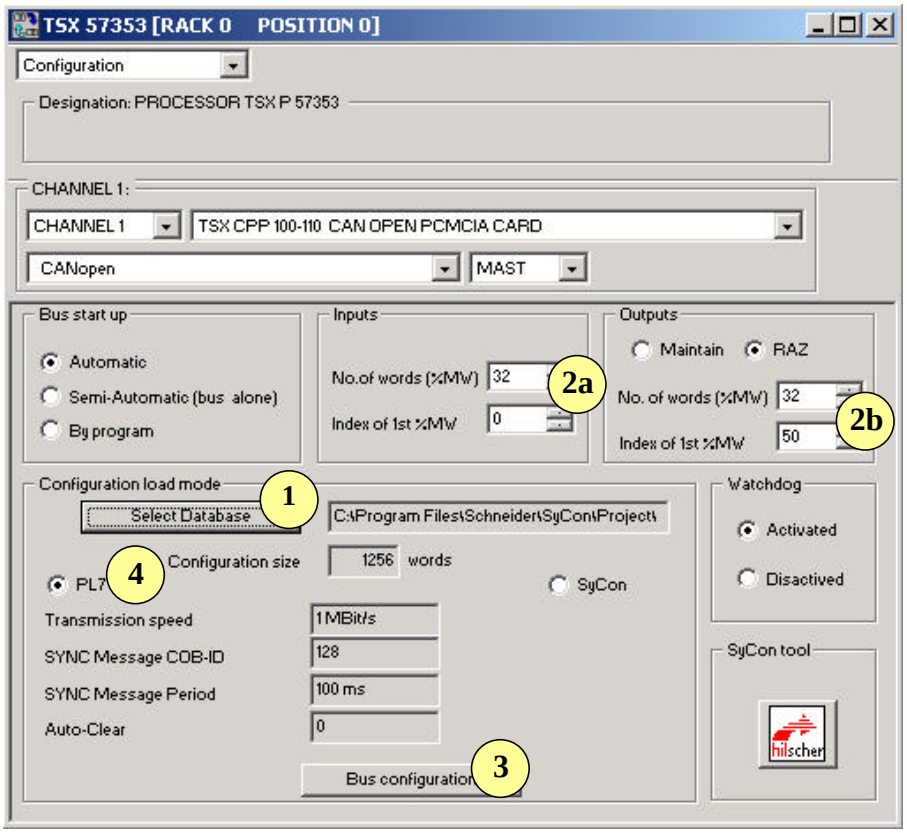
By default:

4. "Mast" task is selected as rate of update of the storage area associated with the I/O
5. "Automatic" bus start up mode is selected

Note that SyCon tool could be launched from this screen.

Software Configuration

PL7 tool – Step 2



1. Click on ***Select Database*** to import the *.co file into PL7 (example : Demo_cfg.co)
2. Define the addresses of the Inputs and Outputs:
   Example:
   - 2a : Inputs: Array of 32 words (from %MW0 to %MW31) We keep default values.
   - 2b : Outputs: Array of 32 words (from %MW50 to %MW81).
3. Press on ***Bus configuration*** to see the list of nodes configured on the bus.

By default:

4. "PL7" mode is selected to have the CANopen configuration loaded together with the PL7 application into the PLC

Close the window, confirm all changes and save the project. You have now finished the PLC application with PL7 and created all necessary data the PLC needs to start the communication with the CANopen nodes.

You have now reserved 32 words as well as for inputs than for outputs. The input words start at %MW0, the output words at %MW50. As Node #2 is using one input word and one output word and Node #3 five input words and three output words, we have the following address assignment:

- Inputs Node #2: %MW0
- Outputs Node #2: %MW50
- Inputs Node #3: %MW1 to %MW5
- Outputs Node #3: %MW51 to %MW53

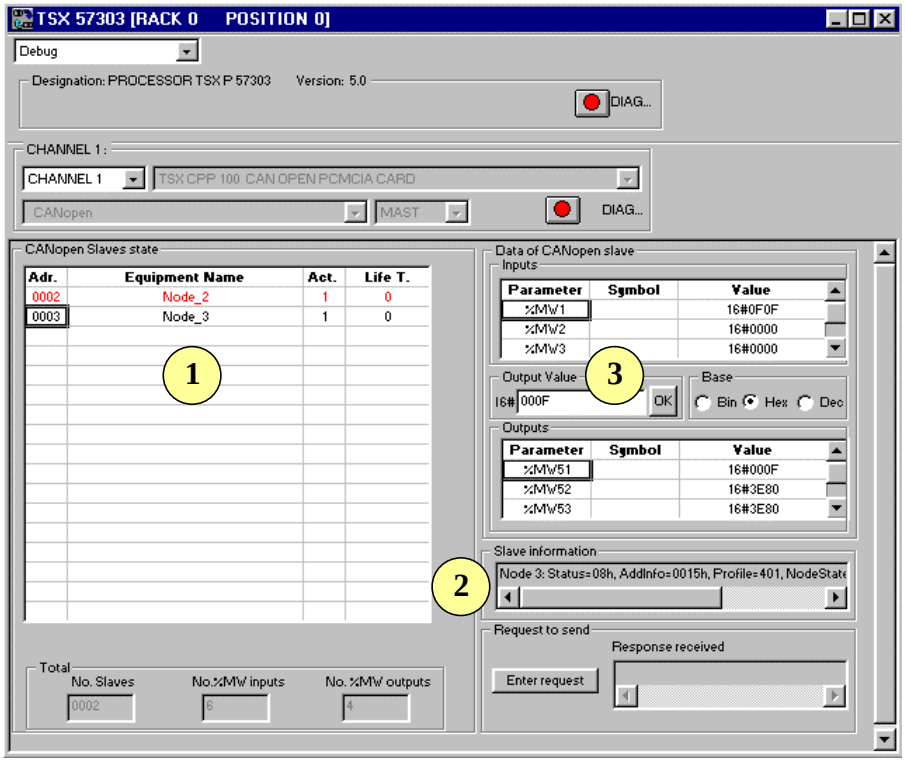
(Refer to Advantys tool – Step 3)

Transfer the application to the PLC and start the program.

Debugging

PL7 Debug Screen

For debugging open the CPP110 debug screen



PL7 Debug - Step 1
Node overview

1. The node list provides an overview over all configured nodes. Node #2 is shown in red because it is not connected to the bus. Node #3 is working properly and therefore is black.

If one or more nodes are red, the DIAG button (and the CPP error led) is red too. The Premium resets error led and DIAG button automatically when the faulty condition has gone. For the TSX Micro, it must be reset by a positive edge on bit %QW0.1:X2.

PL7 Debug - Step 2
Node diagnostic

2. Node diagnostic. To get more details, click on the red listed node. The diagnostic field is showing the string : *Node 2: Status=01h, AddInfo=0000h, Profile=0, NodeState=127, Error= 34, EmcyEntries= 0*
   Status = 01 indicates that Node #2 does not answer.

   The diagnostic string of Node #3 is showing *Node 3: Status=08h, AddInfo=0015h, Profile=401, NodeState=5, Error= 0, EmcyEntries= 0*
   Status=8 indicates that the node is controlled by the TSX CPP 110.

   For more details refer to the TSX CPP 100/110 user manual.

PL7 Debug - Step 3
Set I/O points

3. Set output word %MW51 to 16#000F, all four outputs will go on. You can see the echo of the outputs in the MSB (Most Significant Byte) of %MW1. As the outputs are wired to the inputs, you also see the inputs in the LSB (Less Significant Byte) of %MW1 too.

   Set output word %MW52 and %MW53 to 16000 (=16#3E80). The output channels put out 5 VDC and feed them back to the analog input channels. You can read this value back in the input words %MW4 and %MW5 (by using the scroll bar).

   Input word %MW2 is containing one Status byte for each of the two analog input channels, Input word %MW3 the Status bytes for the two analog output channels.

   Refer Advantys tool - Step 4, where I/O mapping is described.

Appendix – Configuration of Altivar 58

Configuration of Altivar 58

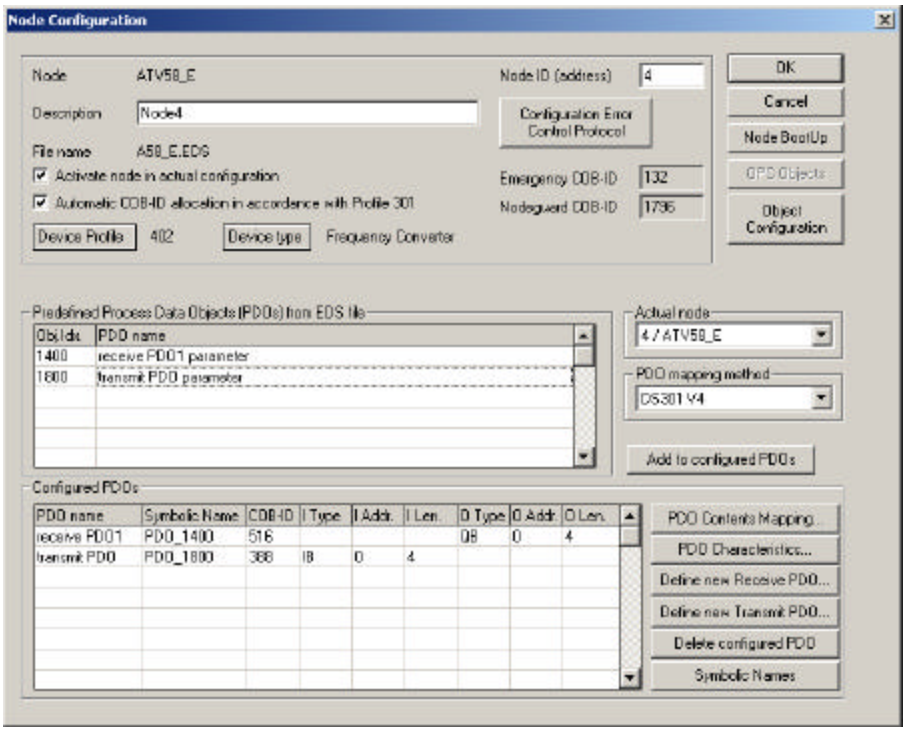
Insert the Altivar 58 into the CANopen configuration.

In the Insert Node screen, you find 4 ATV58 devices:

- ATV58_E Altivar 58, EDS file is in English
- ATV58_F Altivar 58, EDS file is in French
- ATV58F_E Altivar 58F, EDS file is in English
- ATV58F_F Altivar 58F, EDS file is in French

Select the EDS file that corresponds to your Altivar device and your language preference, click on Add and then on OK.

In the Node configuration window, configure both PDO and click on OK to use the default transmission types.



You have configured now two PDOs containing two words each:

- Transmit PDO: 1 word for the status, 1 word for the actual speed
- Receive PDO: 1 word for the command register, 1 word for commanded speed

Check that the baudrate and the node ID fit to the settings you have selected on the Altivar. If the Altivar is the last node, activate the termination resistor (switch on the Altivar's CANopen communication card).

Now save the Sycon project, import it into your PLC application and download it into the PLC (same steps as described above).

Appendix – Configuration of Altivar 58

For debugging and testing, open the TSX CPP 110 debug screen in PL7 and select the Altivar in the grid of configured nodes. In the right part of the screen, you can see the two input and output words the Altivar is using.

You can start the motor when you put the sequence 6, 7, 15 into the command register (1st output word) and a speed value into the second output word. If the Altivar is in error, you must reset the Altivar first (128 in the command register), then continue with the sequence 6, 7, 15.

The CANopen configuration of the Altivar 31 is described in a separate user manual: Altivar 31, Protocol CANopen.

Appendix – Configuration of Lexium

General- Lexium communication Wiring

The Lexium wiring can be made through an adaptator (**AM0 2CA 001 V000**):

- screwed on the drive
- and connected to the CANopen cable(s)

(This adaptator includes a line termination)

For any other type of wiring refer to the Lexium CANopen documentation (available on “Motion tools” CD).

General- Lexium communication PDO

PDOs allow the implicit data management between the Micro or Premium PLC and the Lexium drive (by read/write words in the PLC).

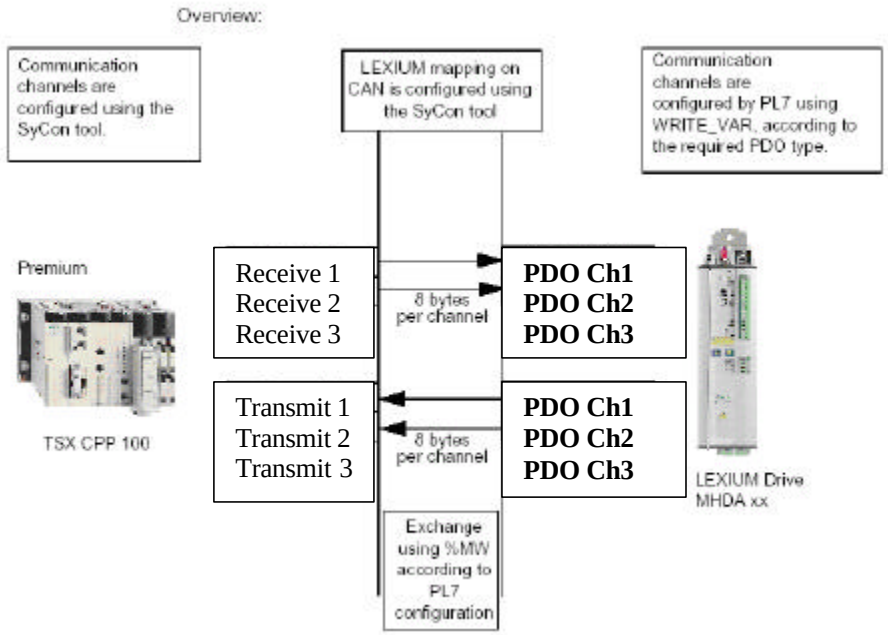
Lexium drives use two kinds of PDOs:

- Predefined PDOs:
  These PDOs are premapped in the Lexium with specific commands.
  Ex : PDO 22 of this appendix is mapped with :
  The request H6040 => Control word
  The request H2060 => Current or speed setpoint
- Free PDOs:
  These PDOs are not mapped with specific commands, the configuration will be done by the application. Free PDOs are not described in this guide.

The PDOs are exchanged using predefined channels:

- 3 receiving channels* (H2600, H2601, H2602)
- 3 transmitting channels* (H2A00, H2A01, H2A02)

The maximum size for data is 8 bytes per channel



(*) Available on the LEXIUM with a version >= SV5.51

Appendix – Configuration of Lexium

Lexium communication PDO 22

The PDO configuration will be done in 3 different steps:

1. PDO configuration with SyCon tool: definition of the channel, the exchange, the size and the PDO used
2. CANopen configuration with PL7 tool: Database selection and definition of Input/Output exchange variables
3. Lexium drive control through PL7 debug screen

In this example we will define the different steps to use the Receive PDO 22 on the channel 1.
When these steps will be done the drive values will be available directly in the CPU variables (%MW).

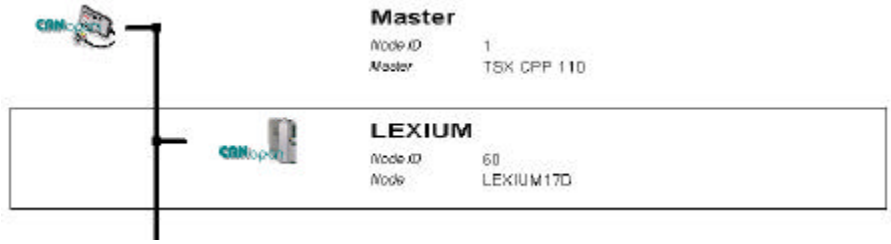
SyCon tool – Step 1
Insert Lexium Node

PDO 22 is used on the Receive 1 channel.

PDO 22 predefined configuration:

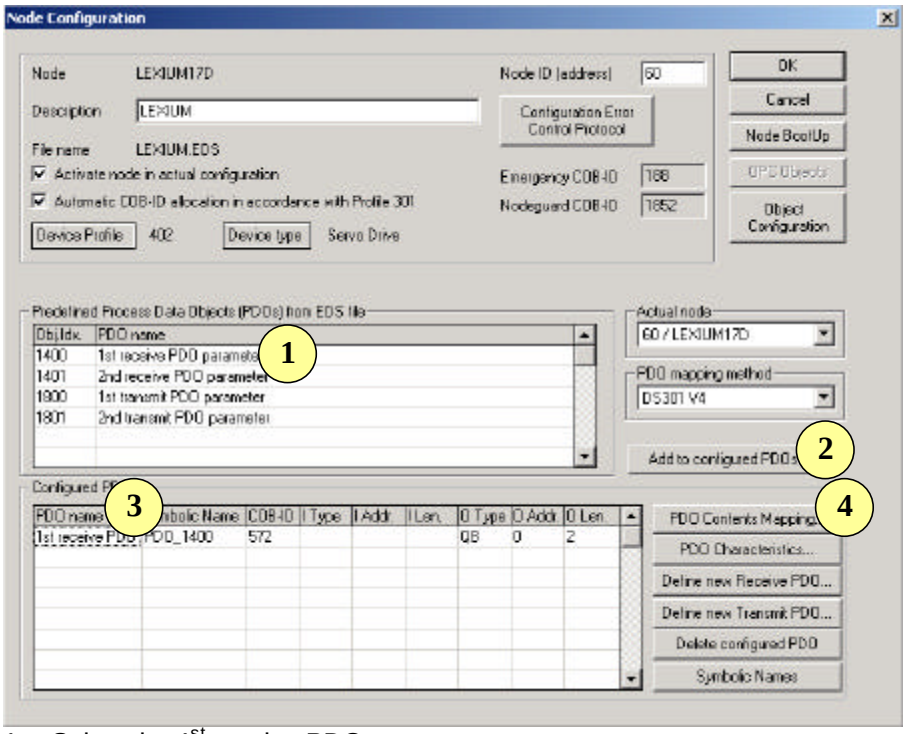
- Control word
- Current or speed setpoint

With SyCon, Insert the Lexium into the CANopen configuration:



Appendix – Configuration of Lexium

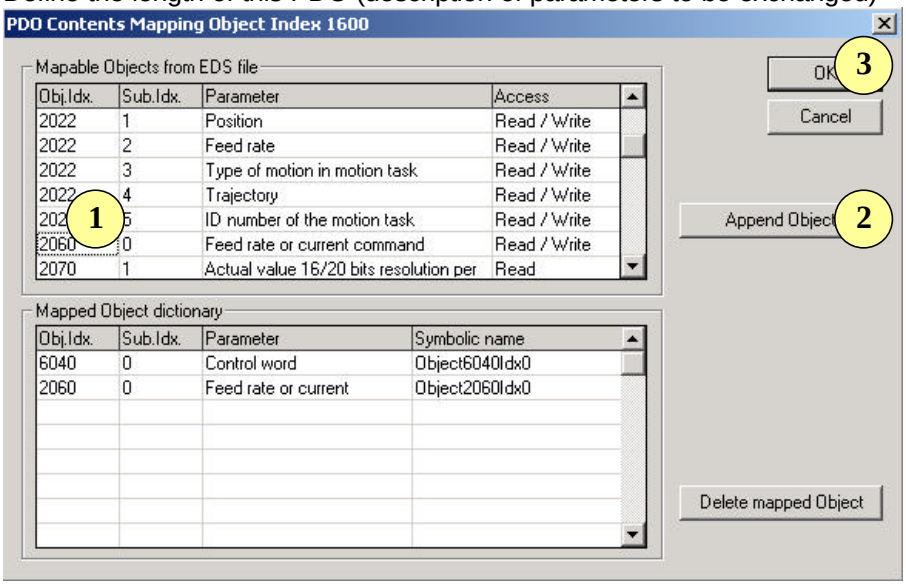
SyCon tool – Step 2
Configuration of 1st receive PDO



1. Select the 1st receive PDO
2. Click on ***Add to configured PDOs***
3. Select PDO name “1st receive PDO”
4. Click on ***PDO contents Mapping***…

SyCon tool – Step 3
Configuration of PDO parameters

Define the length of this PDO (description of parameters to be exchanged)

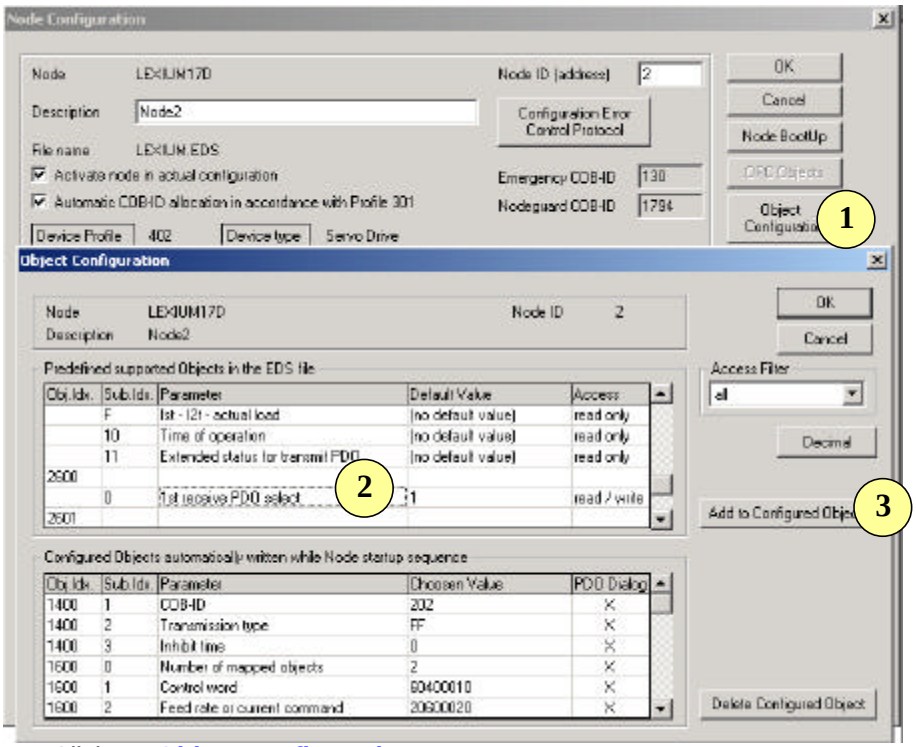


1. Select the parameter to be exchanged
2. Click on ***Append Object***
3. Click on ***OK***

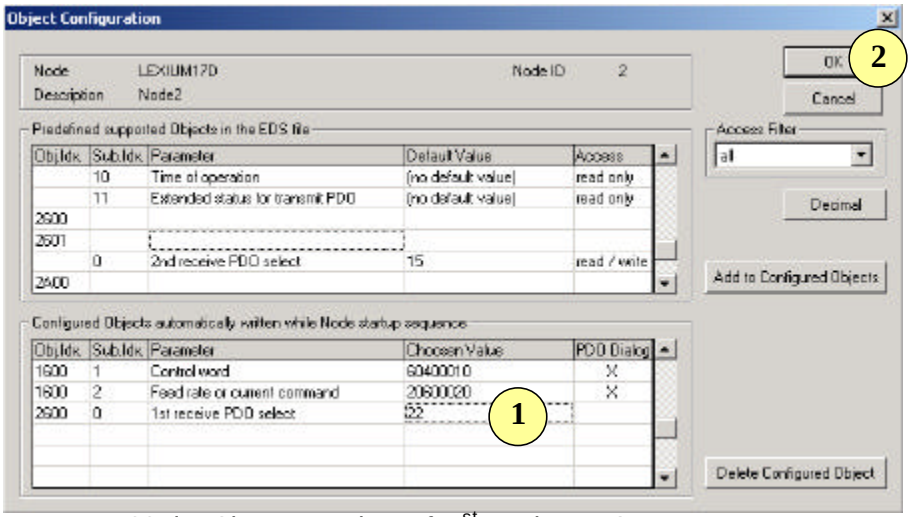
Note: In this example we describe a receive PDO configuration. To see the status of the drive in the PLC you have to configure a Transmit PDO additionally.

Appendix – Configuration of Lexium

SyCon tool – Step 4
Define PDO value
(PDO 22)



1. Click on ***Object configuration***
2. Select the “First receive PDO” of predefined object 2600 (refer to general Lexium paragraph)
3. Click on ***Add to Configured Objects***



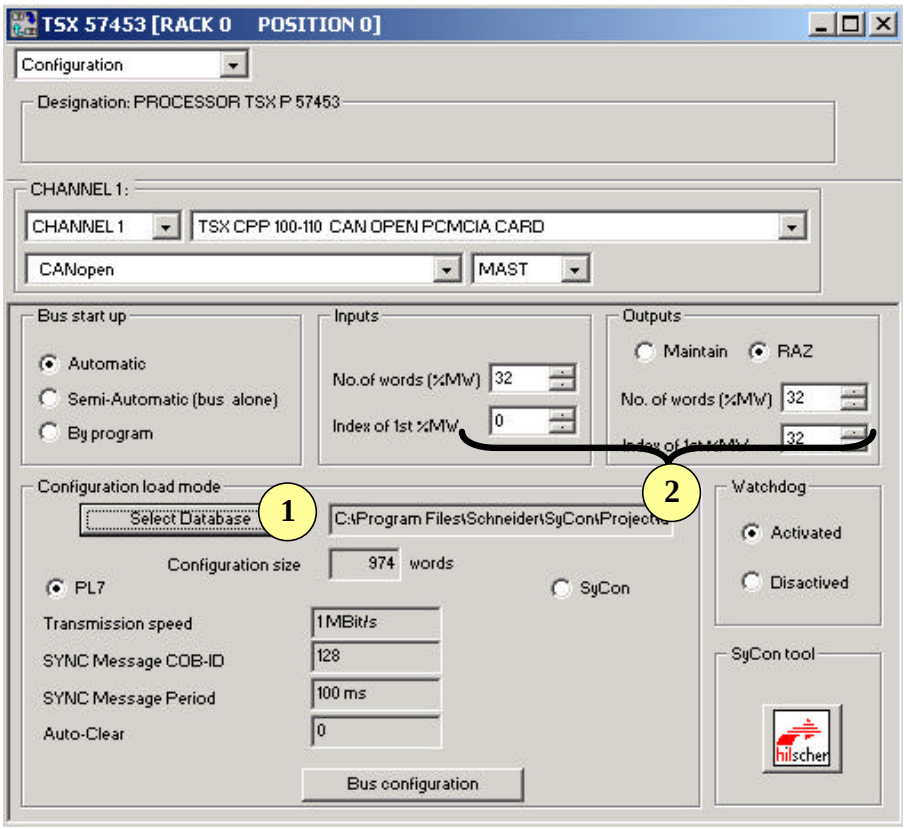
1. Type “22” in “Choosen Value” of “1st receive PDO”
2. Click on ***OK*** to validate
3. Save the configuration in “..\SyCon\Project\demo_lexium.co” file

You are now ready to start with the PL7 application.

Appendix – Configuration of Lexium

PL7 tool – Step 1
Lexium configuration

In PL7 configure your TSX CPP100-110 configuration.

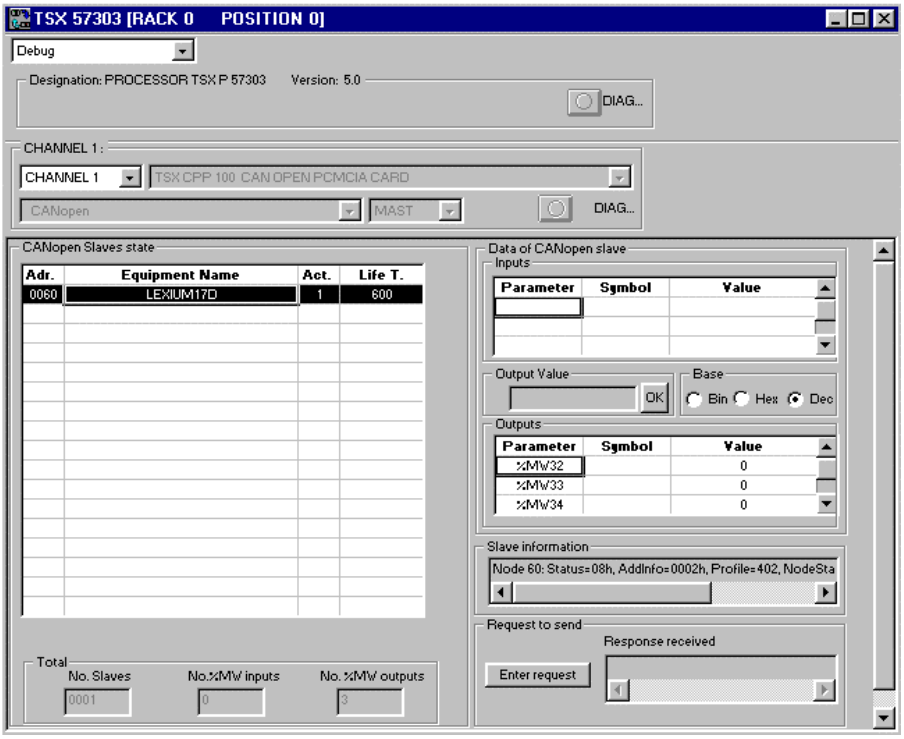


1. Click on ***Select Database*** to import the *.co file into PL7 (..\SyCon\Project\demo_lexium.co)
2. Default values are kept, Input/Output variables are configured in the words below:
   - Inputs: from %MW0 to %MW31 (not used, as no transmit PDO is configured)
   - Outputs: from %MW32 to %MW63

Appendix – Configuration of Lexium

PL7 tool – Step 2
Drive control through debug screen

Use the debug screen to control your drive.



The debug screen shows that the CANopen communication with the Lexium drive is running (ex "Status=08h" in the “Slave Information” field).

You can control the drive by changing the value of the output variables:

- %MW32: direct access to the operating modes of the drive (control word)
- %MD33: direct access to current or speed setpoint

Appendix – More than 4 PDOs required for a node

More than 4 PDOs required for a node

You can simply configure up to 4 PDOs per direction per node. When you want to have more, some additional steps are required. This due to the following:

How COB-Ids are assigned

COB-Ids for PDOs are in the range of 385 ... 1407 (hex 180 ... 57F). In general, the user is free in the choice of the COB-ID for a given PDO. But he has to take care to stay in this range and he should not use a COB-ID twice. CANopen configuration tools normally provide an automatic COB-ID allocation which is taking care of this.

Sycon is using the following algorithm which is in accordance with profile 301:

		Node #1 (decimal)	Node #2 (decimal)	.....	Node #127 (decimal)
1. TxPDO	16#180+Node-ID	385	386	.....	511
1. RxPDO	16#200+Node-ID	513	514	.....	639
2. TxPDO	16#280+Node-ID	641	642	.....	511
2. RxPDO	16#300+Node-ID	769	770	.....	895
3. TxPDO	16#380+Node-ID	897	898	.....	1023
3. RxPDO	16#400+Node-ID	1025	1026	.....	1151
4. TxPDO	16#480+Node-ID	1153	1154	.....	1279
4. RxPDO	16#500+Node-ID	1281	1282	.....	1407

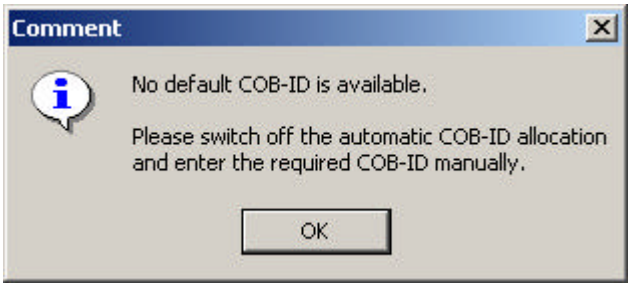
As the COB-ID is determining the priority of a frame (the lower the ID is, the higher the priority will be), this has the following consequence:

The first PDO of a node is more prior than the second or the third
Transmit PDO1 is more prior than Receive PDO1, Transmit PDO2 is more prior than Receive PDO2, ...
The lower the node ID is, the more prior PDOs will be.

Appendix – More than 4 PDOs required for a node

Steps to configure PDO5

Note that the range for COB-IDs allows each node to have 4 Transmit PDOs and 4 Receive PDOs. A 5th PDO cannot get its COB ID automatically as there are no more free numbers left.
Configure PDO5 in the Node configuration screen of Sycon. The following window opens:



Disable the automatic COB-ID allocation (node configuration screen). Now you can manually overwrite the COB-ID for PDO5, PDO6, ...

Use the following COB-IDs:

- Transmit PDO 5, 6, ... in the range of 1664 ... 1759 (Hex 680 ... 6DF)
- Receive PDO 5, 6, ... in the range of 1761 ... 1792 (Hex 6E1 ... 700)

Now you can close the node configuration screen and save your project.