Application Note 012e

Commissioning CANOpen

I2126-1.0 en

Content

1 Introduction

The 3rd generation AED / FIT® has a CANopen interface.

This interface opens up new and powerful options for users and their technical weighing applications.

This document describes commissioning an AED / FIT® with a programmable controller (PLC). But there are so many different PLCs on the market, that it is only possible to give a general overview.

Thanks are due to Hilscher GmbH (www.hilscher.com), who have generously given us their permission to use screenshots from the SYCON Software.

2 General

DeviceNet is a CAN-based network, which has been standardized by CiA (Can in Automation). Specifications can be obtained from CiA (www.cia.org).

CanOpen defines a series of services for data transmission and network management:

SDO (Service Data Objects)

This service is provided for transmitting acyclic data and it is normally used to transmit configuration parameters.

PDO (Process Data Objects)

Are provided for the transmission of

- cyclic data (measured values and statuses)
- acyclic data (dosing and trigger results)
- PLC output data (control word)

Transmit PDOs are always transmitted whenever a measurement, trigger or dosing result is at hand.

The control word contains individual bits, with which the user can trigger functions such as zeroing and taring. The format of the PDOs can be found in the appendix to this document.

EMCY (Emergency objects)

EMCY objects are transmitted when error states occur. They comprise a normative and an application-specific part. More detailed information can be found in the AED / FIT® online Help.

3 Identification

Devices are identified by a vendor ID and a product code:

Device	Vendor ID	Product Code
AD103	$11d_{Hex}$	501_{Hex}
FIT®3	$11d_{Hex}$	502_{Hex}

EDS file

An EDS file is included among the items supplied with the devices. This is required for commissioning the AED / FIT® with a PLC. Import the EDS file associated with your firmware into your controller. Use your controller configuration tool to read out the firmware version of the AED / FIT®. EDS files can also be obtained from the HBM Website(www.hbm.com).

File name nomenclature:

PRODUCT_FIRMWAREVERSION_MAJORREV_MINORREV_COS.EDS

FIT®3_P73_1_01_COS.EDS

indicates a CANOpen EDS file of Version 1.01 for firmware version P73 of an FIT®3.

4 Planning the CANOpen network

The structure of a CANOpen network requires careful planning:

- Estimate the expected cables lengths; under no circumstances must you exceed the maximum values applicable to the selected bit rate. Avoid spur lines. This is why the AED / FIT® has separate pins or core pairs for CANin and CANout. Use multi-port taps, if necessary.

  Maximum cable lengths for CANOpen

Baud rate [kbits/s]	10	20	50	125	250	500	800	1000
Maximum cable length [m]	5000	2500	1000	500	250	100	50	25

- Use only standard-compliant cables with a characteristic impedance of 120 Ω.
- Estimate the expected bus load. The rule of thumb for estimating the bus load is:

  bus load[%] = 12000 ∗ AED_FIT®_count ∗ output rate[number per second] / bit rate.

  If the bus load exceeds 75 %, choose the next highest bit rate. If the bit rate cannot be increased any further, the network must be split into several segments, each with separate CANOpen connections.

- Check the dimensioning of the power supply with regard to voltage drops on the power supply lines.

5 Commissioning the network

- Check the bus termination. The bus needs a differential resistance of 120 Ω at both ends.

  The CANBus does not work without termination resistors.

- Check the node ID and the bit rates of the connected nodes.

  The factory settings for the AED / FIT® at the time of delivery are:

  - Bit rate: 125 kbit/s
  - Node ID: 63

  Node IDs must not be duplicated, as this would cause the entire network to malfunction. All the nodes used must have identical bit rates. If the bit rates are different, this can result in a "bus off" state for a node and possibly even the entire network. The only way to exit a "bus-off" state is by a reset or a power-on.

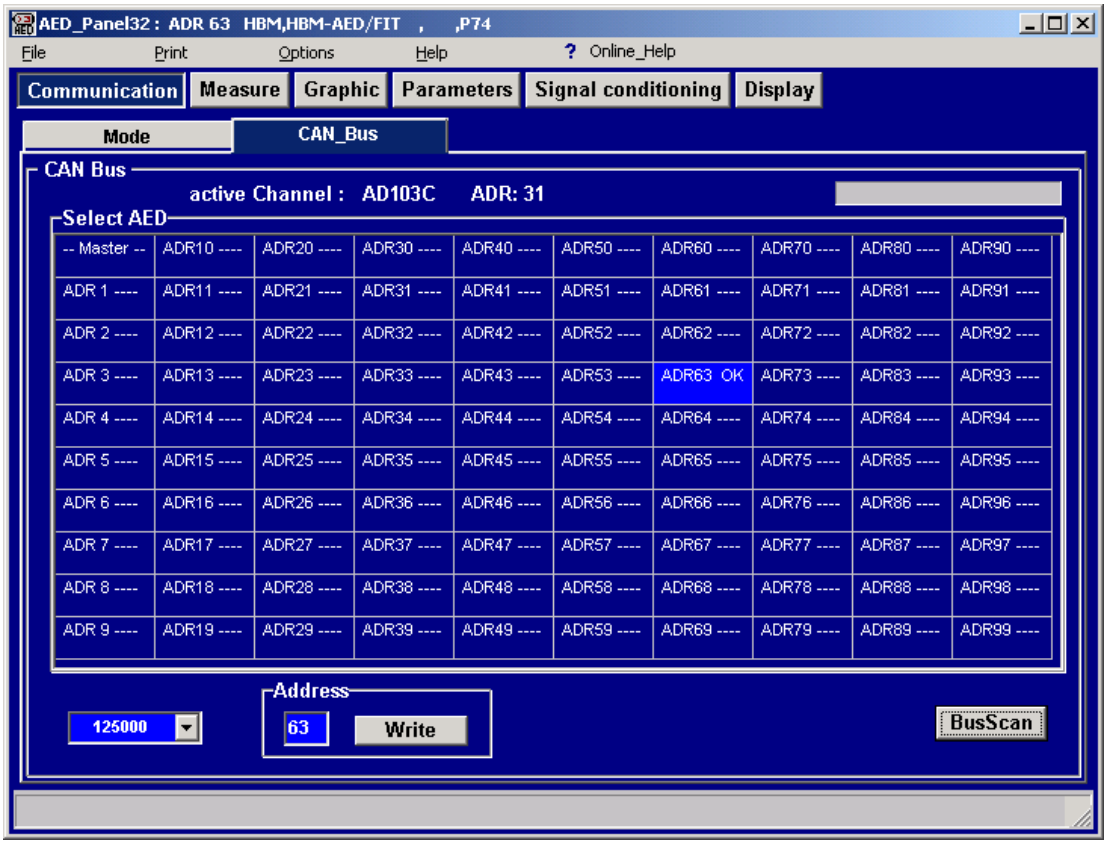
- A configuration tool is needed to change the node ID or the bit rate:

  - Sycon manufacturer Hilscher http://www.hilscher.com
  - Larcan manufacturer LARSYS http://www.larsys.com
  - CANOpener from Microcontrol http://www.microcontrol.net
  - *AED_Panel32* from HBM http://www.hbm.com
  - or the configuration tool that came with your controller.

  For further details, please see your documentation.

- The bit rate or the node ID can only ever be selected for a single AED / FIT®. All the other nodes must be disconnected from the bus. The AED9301 has a slide switch for bus disconnection.

6 Changing the bit rate and the node ID with AED_Panel32



Changing the node ID

- Run a bus scan
- Change the node ID in the input field
- Press the Write button
- The panel program now changes the node ID and stores it safe from power failure in the EEPROM of the AED / FIT®.

Changing the bit rate

- Change the setting in the panel.

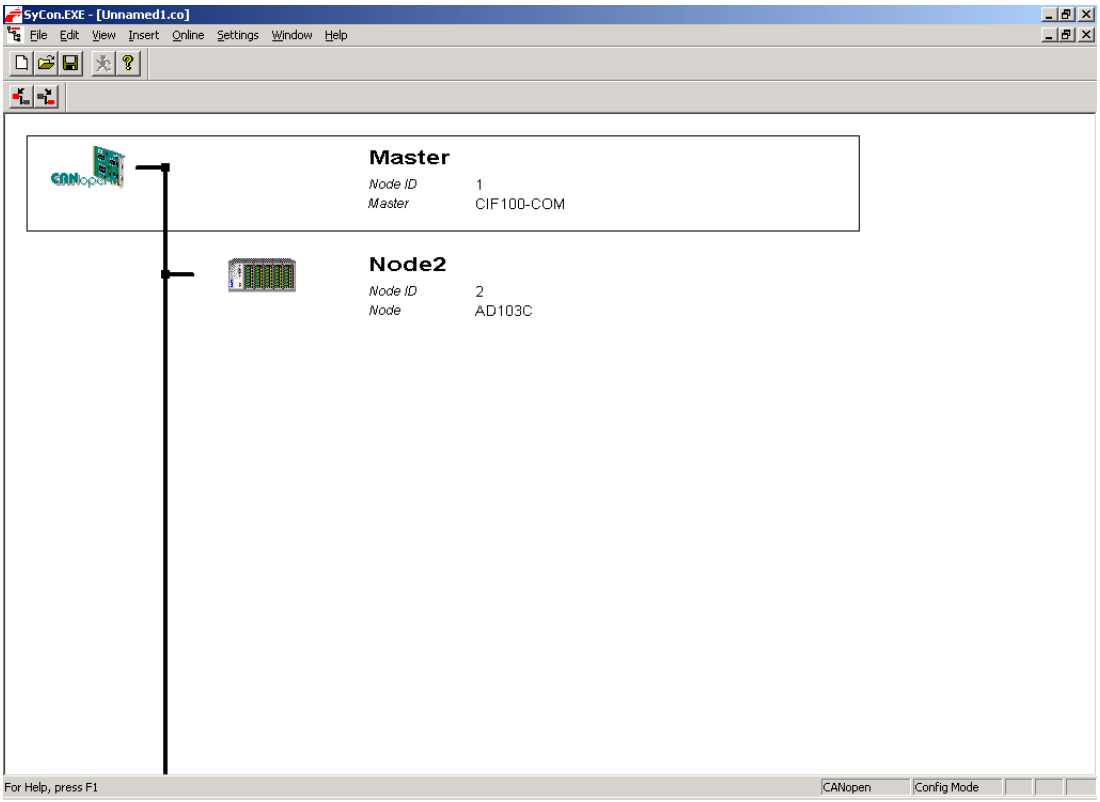
  The panel program now changes the bit rate and stores it safe from power failure in the EEPROM of the AED / FIT®.

As the *AED_Panel32* program does not have multi-master capability, the PLC may have to be brought to the stop state.

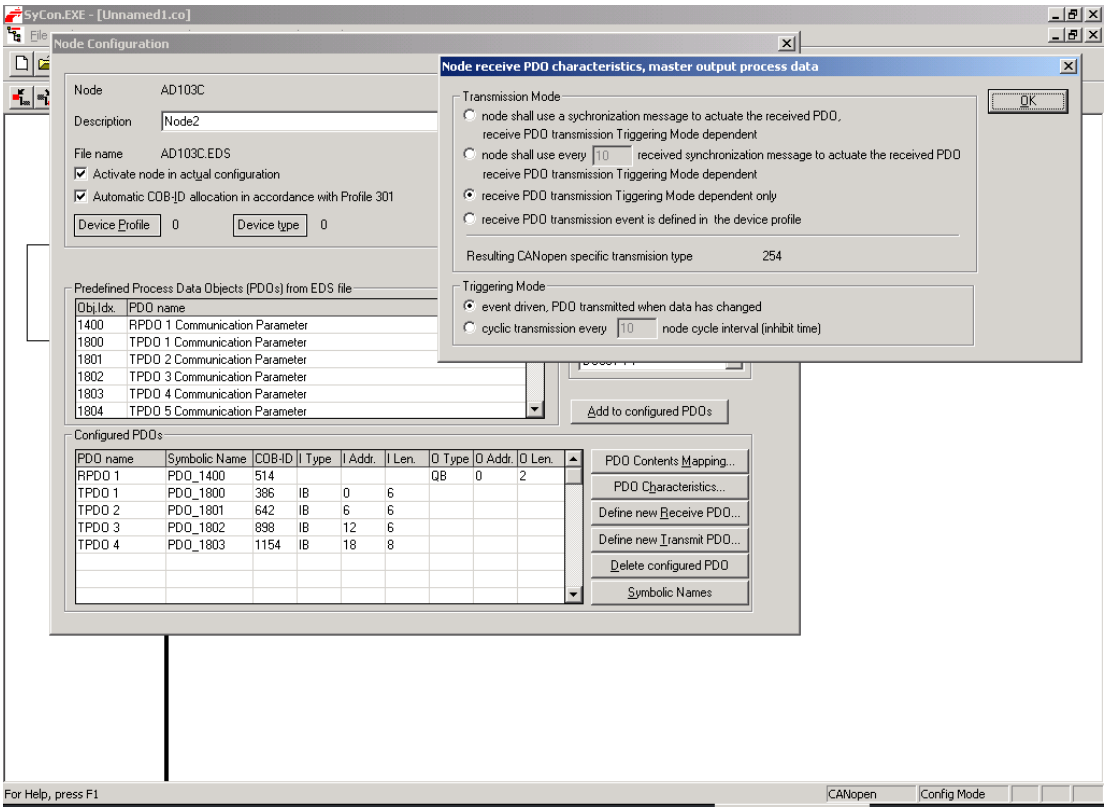
7 Commissioning the AED / FIT®

Use the configuration tool provided with your controller to do this.

The following screenshots show a typical configuration with the Sycon tool from Hilscher.



- First import the EDS file of the AED / FIT® into your configuration tool.
- Create a new project
- Enter a master and the requisite slave devices.
- Assign node IDs and meaningful names to the devices.



- Now edit the node configuration
- Add the required Transmit and Receive PDOs
- The AED / FIT® supports the following PDOs:
  - RPDO1 Control word
  - TPDO1 Measured value and status / **MSV**
  - TPDO2 Trigger value and status / **MAV**
  - TPDO3 Dosing result and status / **FRS**
  - TPDO4 Peak values / **PVA**
  - TPDO5 Alarm status

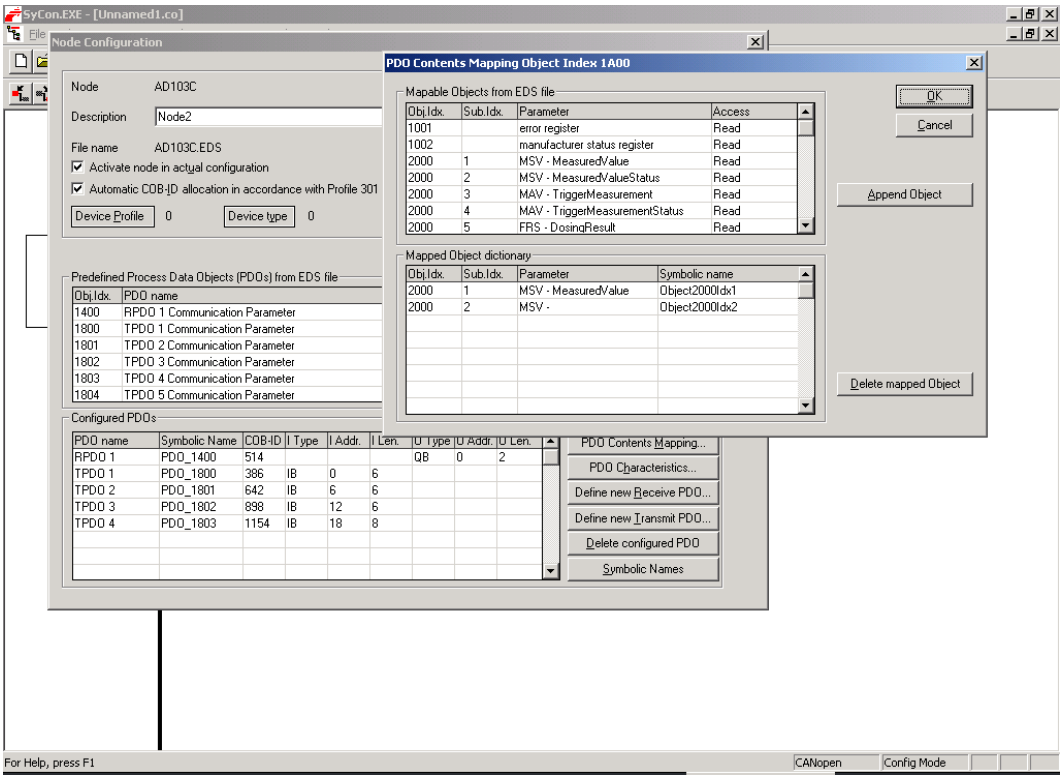
The format for the PDOs can be found in the AED / FIT® / PW20i online Help or in the appendix.

The AED / FIT® does not support re-mapping of PDO content or COB IDs.

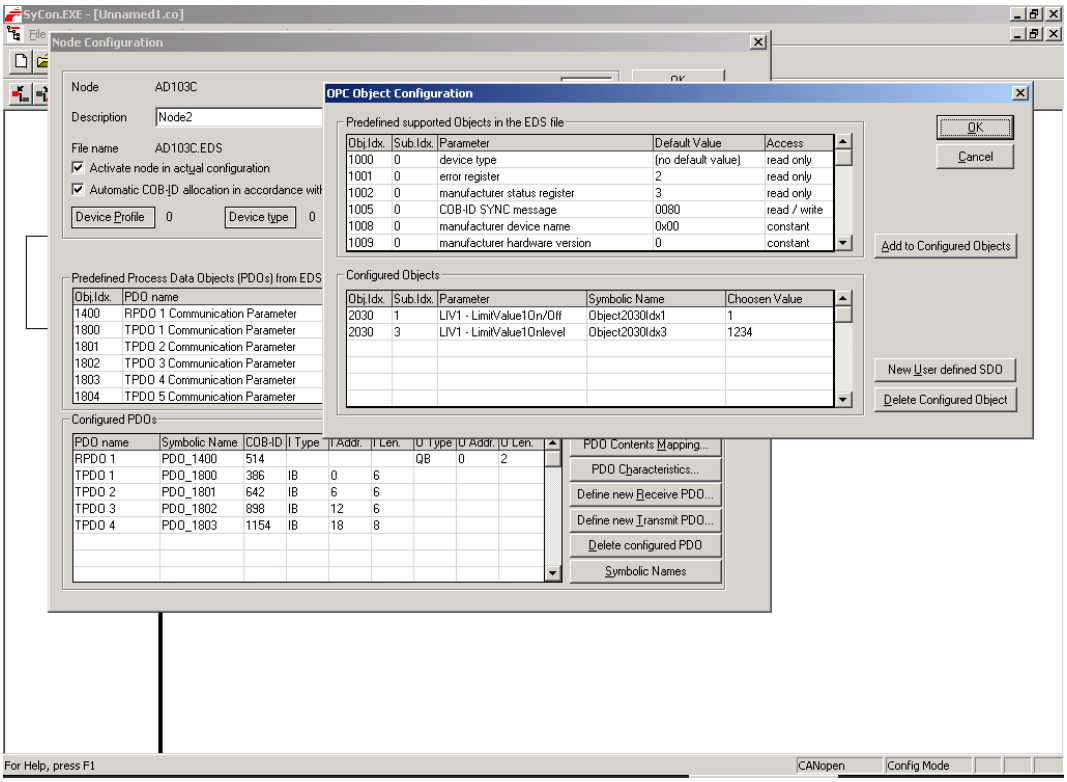
- Edit the PDO parameters.

  Set the transmission method for the PDO to "manufacturer-specific".

  With this setting, you get a PDO for each newly formed measured value. There is no point in making other settings.



- Check the PDO content assignment



- Run parameterization. The parameters selected here are written to the AED / FIT® each time the network is started up. This process is not suitable for all parameters; see Note. The alternative option is to run parameterization via the *AED_Panel32*. The parameter set can be stored with index 0 ∗ 2450 sub-index 2 or the *AED_Panel* in the EEPROM of the AED / FIT®, where it is safe from power failure.

- There is no point in writing all the parameters of the AED / FIT®; only modify those parameters that are useful in your application.
- Some of the parameters must only be written in a specific sequence. If the rules are violated, error messages can result.
- Some of the parameters have minimum and maximum values and if these are exceeded, error messages result.
- Some parameters cannot be written in "legal for trade mode" (**LFT** ≥ 1).

Further details can be found in the online Help for the AED / FIT® or the EDS file.

8 PLC programming

The network can now be started up. The PLC parameterizes the AED / FIT® with the stored values and then starts cyclic operation. If the AED / FIT® has to be controlled or parameterized while cyclic operation is ongoing, there must be user programming in the PLC. There are so many different PLCs available on the market, that it is only possible to give a general overview.

CANOpen provides several options for control and parameterization in cyclic operation:

- Receive PDO 1

The bits defined in the input data (control word) of Receive PDO 1

are used to control functions such as zeroing, taring, starting the dosing process, etc. The stored functions are triggered when the relevant bit is

set. If the function is to be triggered again, the bit must first be cleared and then reset.

It is preferable to use PDO 1 for control, as this has a higher priority and so you can count on the defined response times.

- Accesses via SDOs (Service Data Objects)

  With SDOs, a control or re-parameterization can be performed during ongoing operation by writing individual indexes/sub-indexes. As the SDO connection has a low priority, response times can vary considerably. For the indexes and sub-indexes of the individual attributes, please see the EDS file or the AED / FIT® online Help.

  Some of the functions (such as **LDW**/**LWT**) have execution times of up to 4.5 seconds. Once these functions start, there is an immediate and positive acknowledgement. The user can query the function end and result with a busy flag (index 0 ∗ 2000 sub-index 0 ∗ 0c).

- Reading out variables in cyclic operation.

  The data transmitted via the cyclic connections are permanently stored in the firmware of the AED / FIT® and cannot be re-mapped.

  If required, the user can read out other interesting values, such as the actual dosing time, via the SDO connection. To do this, it is usually necessary to have user-programming in the PLC. PLC manufacturers make function blocks available for this.

9 Transmit PDOs

Transmit PDO 1 (measured value and status)

Offset	Byte	Content
0	LSB	**MSV** value (measured value)
1		**MSV** value (measured value)
2		**MSV** value (measured value)
3	MSB	**MSV** value (measured value)
4	LSB	**MSV** status (measurement status)
5	MSB	**MSV** status (measurement status)

Transmit PDO 2 (trigger value and status)

Offset	Byte	Content
0	LSB	**MAV** value (trigger value)
1		**MAV** value (trigger value)
2		**MAV** value (trigger value)
3	MSB	**MAV** value (trigger value)
4	LSB	**MAV** status (trigger status)
5	MSB	**MAV** status (trigger status)

Transmit PDO 3 (dosing result and status)

Offset	Byte	Content
0	LSB	**FRS** value (dosing result)
1		**FRS** value (dosing result)
2		**FRS** value (dosing result)
3	MSB	**FRS** value (dosing result)
4	LSB	**FRS** status (dosing status)
5	MSB	**FRS** status (dosing status)

Transmit PDO 4 (peak values)

Offset	Byte	Content
0	LSB	**PVA** min. value
1		**PVA** min. value
2		**PVA** min. value
3	MSB	**PVA** min. value
4	LSB	**PVA** max. value
5		**PVA** max. value
6		**PVA** max. value
7	MSB	**PVA** max. value

10 Receive PDOs

Receive PDO 1

Byte	Bit no.	Content
Offset		
0	0	**TAR** – Tare
	1	**TAS** – Gross/net selection
	2	**CSN** – Clear dosing result
	3	**RUN** – Start dosing process
	4	**BRK** – End dosing process
	5	**CTR** – Clear trigger result
	6	**CDL** – Zeroing
	7	**CPV** – Clear peak value
1	0	Reserved
	1	Reserved
	2	Output 1 desired state
	3	Output 2 desired state
	4	Output 3 desired state
	5	Output 4 desired state
	6	Output 5 desired state
	7	Output 6 desired state

For further details, please see the AED / FIT® online Help.

11 References

- CanOpen Specification

  Can in Automation (CiA)

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