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Abstract	This Document gives answers on typical questions on ProCANopen application.

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1.0 Overview

The ProCANopen user manual gives hints for using ProCANopen. Anyhow, a manual is not intended to discuss every possible application. This document has the task to close this gap step by step.

2.0 Questions and Answers

2.1 PDOs and Connections

Q1.	Does ProCANopen change COB-IDs?
A1.	ProCANopen checks the settings in the EDS file. If the COB-ID entries are read-only it takes them. Dependencies on the Node-ID are described with a formula of the style \$NODEID+0x180 . If the entry has the attribute read-write, ProCANopen assumes that it has the freedom of assigning COB-IDs according to an internal complex set of rules.

Q2.	Can I assign priorities to PDOs?
A2.	ProCANopen offers the possibility to assign priorities to PDOs. This is similar to the concept of the CANopen® predecessor CAL. Synchronous PDOs are always assigned a priority of 2, whilst asynchronous PDOs can be assigned a priority of 3-5. Besides some other rules, ProCANopen takes the priorities as decision base for assigning the COB-IDs.

Q3.	What are the rules for assigning COB-IDs?
A3.	ProCANopen observes the access attribute of PDO entries, the priority rules and has an algorithm for distributing COB-IDs for finding a solution for the requested set of connections. How this is done in detail is not published.

Q4.	How do I force ProCANopen to use the pre-defined connection set?
A4.	To use the pre-defined connection is only possible in pure Master-Slave-Architectures. For this the Master has to fulfill the definitions of CiA DS-302. If that is the case, the graphical connection dialog shows an additional button [Insert PDOs] . On that button ProCANopen will assign the pre-defined COB-IDs for the slave and create network variables according to the mentioned DS-302. In the case that all connections shall apply to the pre-defined connection set, refer to chapter 0.
Q5.	How can I change the COB-ID assignment?
A5.	The COB-IDs assigned by ProCANopen are thought as a proposal for one possible solution. Of course there are many different solutions. In order to change the COB-IDs, the Device Access dialog should be used. There the values can be edited directly. Once the graphical connection is opened again, all these values could be changed by ProCANopen again. In order to avoid this, it is possible to “fix” the PDOs. This is done with in the PDO list that can be displayed with the command View PDO List .
Q6.	Do I need to use the graphical connection?
A6.	The graphical connection dialog has the purpose to provide a very comfortable way of creating connections between several devices. It is specifically helpful (and optimized) for distributed systems with slave to slave communication. But assigning PDOs can also be done by the traditional way – directly entering the values for the PDO entries in the object dictionary. This is a more painful work, but has the advantage of more transparency.
Q7.	How do I have to interpret the error messages of the connection generation report?
A7.	There can be many reasons for error reports here. Often the background is missing mapping facilities of the device or an invalid EDS description of the device. For a list of the most important reports refer to chapter 0.

2.2 Master Device

Q8.	What is a CANopen Master?
A8.	This is discussed in detail in the application note Master and Slave in the CANopen World .
Q9.	How do I model a slave with NMT-Master functionality?
A9.	A Master with an object dictionary is described in its EDS file. ProCANopen has full knowledge about all features of an EDS and of the CiA DS-302 that describes the behavior of a Master. Concerning PDO communication nothing specific has to be considered. If the pre-defined connection set shall be use, read the chapters in 2.1. The configuration of node guarding and heartbeat can be done in pages of the Device Access dialog that show-up only if the EDS states that the used Master supports these features.

Q10. What do I have to do for ProCANopen to recognize a node as the NMT Master?

A10. Open the dialog **Options | Settings... | Configuration Settings** and select your NMT Master as the CANopen Manager (see Figure 1). If it is a real CANopen Manager you have to open the **Device Access** dialog of this device and define it on page **CANopen Manager** (see Figure 2).

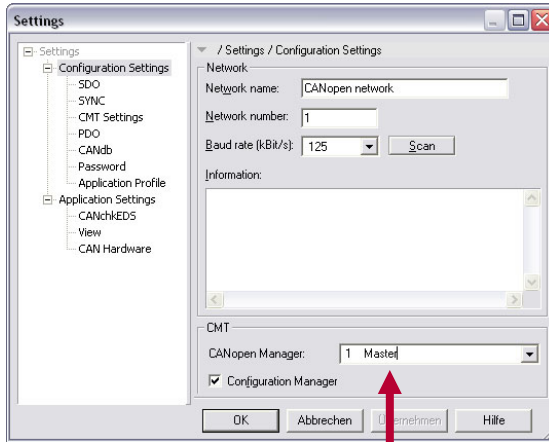


Figure 1 - Set the NMT Master

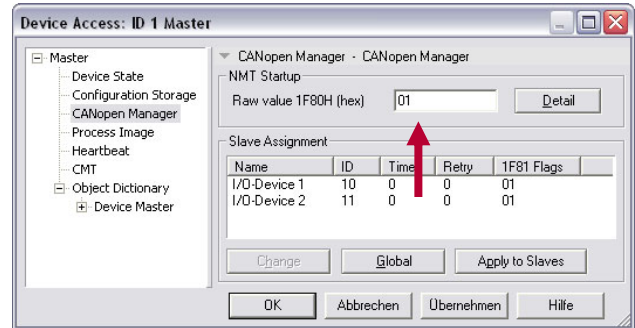


Figure 2 - Configure the CANopen Manager

2.3 Centralistic Master-Slave-Systems

Q11. What is a centralistic Master-Slave-System in this context?

A11. This term applies for systems with a dedicated CANopen Manager. All connections in the system are connections between the Master and the Slaves. There is no Slave-to-Slave communication.

Q12. How do I treat a centralistic Master-Slave-System in ProCANopen with lowest effort?

A12. If it is a Master providing dynamic network variables, follow the steps below. Otherwise treat it as a normal device in a Multi-Master-System. This description is valid for ProCANopen Version 5.0 SP2 and later.

- Create a project.
- In the **Options | Settings... | PDO** enable the option **PDO COB-IDs, which are described in EDS, should not be invalidated on loading**.
- Insert the node for the Master device.
- Open page **Configuration Settings** and select your NMT Master as the CANopen Manager (see Figure 1). If it is a real CANopen Manager you have to open the **Device Access** dialog of this device and define it on page **CANopen Manager** (see Figure 2).
- Insert all other devices.
- Perform the command **Project | Master Slave System**.

Dependent on the Master you can now follow the steps that are required by this Master. Refer to the hints in the user manual.

Q13.	How do I treat centralistic Master-Slave-System with a Schneider PLC BCAN259?
A13.	Follow the steps listed in A12. Afterwards configure the object 1F80H in the Device Access dialog.

Q14.	How do I have to continue if I want to insert further devices later on?
A14.	Just insert these devices and continue at the point Project Master Slave System .

2.4 Miscellaneous

Q15.	How do I model two or more CAN lines?
A15.	For each CAN line create an own project. It is possible to open ProCANopen with several instances in parallel.

Q16.	Can I simulate several CAN lines?
A16.	Yes. Treat each CAN line separately in ProCANopen and generate the corresponding model for CANoe. In CANoe you can enter several busses. How to define the device common to both lines is described in the CANoe online help. Search for the entry Gateway .

Q17.	How do I control, on which CAN line ProCANopen works?
A17.	The following is true for all Vector CAN cards. It is explained for the example of the CANcardX. Correspondingly it is also true for CANsetter. • Start the CAN Driver Configuration Tool. You will find it in Windows System CAN Hardware. • With the menu Edit Add application you can open the application settings dialog. If the entry ProCANopen does not already exist, enter ProCANopen in the field Application name. Ensure the number of CAN channels to be set on 1. • Return with the button [OK]. • Below CANcardX 1 you can open the channels. If you right-click with the mouse on the Channel 2 a local menu appears. Select the entry ProCANopen. • Afterwards you can start ProCANopen and connect to the bus. That's it. • You may also switch this afterwards between the channels again and again by simply right clicking on the channel and selecting ProCANopen. What you need to do is always to disconnect from the bus, then switch and then connect again.

Q18.	How do I change the Node-ID of a module in the project?
A18.	Changing a Node-ID is a process with more impacts than can be imagined on the first view. For example, what happens with the COB-IDs? Some may be pre-configured and depend on the Node-ID. Others may be configured by the user and will not change when changing the Node-ID. In order to avoid insecure behavior, ProCANopen does not allow changing the Node-ID directly. With the following steps a new node with the requested Node-ID can be created without losing all information: 1. Copy the node into the clipboard. 2. Insert it again with paste. Enter the new Node-ID.

3. Remove the old node.
4. Check all settings.
5. Create new connections.

3.0 Connection Generation Error Codes

The connection generation mechanism tries to resolve possible problems autonomously. Anyhow in many cases this is not possible. The following list gives an overview about the most important error codes. Some of the texts occur more than once, but with different codes – this is intended. Some of the messages are generated dynamically. Therefore the list can give only samples. The exact texts sometimes may differ slightly.

No.	Sample Message English	Sample Message German	Description / Workaround
3401	Devices without remapping capability do not support broadcast to multiple channels within a receiver node!	Geräte ohne Remapping-Fähigkeit unterstützen keinen Broadcast zu mehreren Kanälen innerhalb eines Empfangsknotens!	Transfer the data to a central programmable ECU, copy the data to several locations of a new PDO and redistribute it to the target device.
3402	This device does not support broadcast to multiple channels within a receiver node (or only with limitations)!	Dieses Gerät unterstützt den Broadcast zu mehreren Kanälen innerhalb eines Empfangsknotens nicht (oder nur eingeschränkt)!	Transfer the data to a central programmable ECU, copy the data to several locations of a new PDO and redistribute it to the target device.
3403	Constant dummy mapping in receiver not supported	Konstantes Dummy-Mapping wird vom Empfänger nicht unterstützt.	The PDO shall be linked to a receiver including an already existing Dummy-Mapping-Entry on the receiver side. It is not known, which data should be transmitted on the sender side, because the CANopen® specification explicitly forbids mapping Dummy-Entries in TPDOs.
3910	Number of RX/TX-PDO is 0. Therefore mapping is not possible. Possible error in EDS?!	Anzahl der RX/TX-PDO ist 0. Es kann daher nicht gemappt werden. Eventuell liegt ein Fehler im EDS vor?!	Verify the settings in the EDS file.
3914	Index error in determining mapping structure	Index-Fehler beim Ermitteln der Mapping Structure	Verify the correctness of the EDS file. If this is not the reason, report the problem to the support team.
3915	Index error in determining mapping structure: Device has too few COB-ID entries	Index-Fehler beim Ermitteln der Mapping Structure: Gerät hat zu wenig COB-ID-Einträge	Verify the correctness of the EDS file. If this is not the reason, report the problem to the support team.
3916	Mapping length error:	Mapping length error:	Two PDOs shall be linked, but have different mapping sizes. If none of the devices support more PDOs with variable mapping, proceed by transferring the data to a central programmable ECU. Then redistribute it to the target device.

3917	Device has too few COB-ID entries	Gerät hat zu wenig COB-ID-Einträge	The device's facilities are not sufficient to provide the requested mapping. Control the device directly from a central ECU.
3918	Cannot map to xyz, since the former is already assigned to another node.	Kann nicht auf xyz abbilden, da ersterer bereits einem anderen Knoten zugeordnet ist.	Control the device directly from a central ECU.
3921	Cannot map to xyz: Different TransmissionTypes	Kann nicht auf xyz abbilden: Unterschiedliche TransmissionTypes.	Verify the settings of the transmission types. Select same transmission type for sender and receiver.
3924	Cannot map to xyz, since the former is already entered at another point in the mapping.	Kann nicht auf xyz abbilden, da ersterer bereits an einer anderen Stelle im Mapping eingetragen ist.	In this case the broadcast is not possible or not supported. Transfer the data to a central programmable ECU and redistribute it to the target device.
3927	- Dissimilar TransmissionTypes assigned!	- Ungleiche TransmissionTypes vergeben!	Several objects shall be transported in the same PDO with different transmission types. Select same transmission type for all these objects at the sender and the receiver sides.
3928	No PDO available for communication parameters	Kein freier PDO für Communication Parameter	No free COB-ID found. Potentially the PDOs are marked as reserved in the DBT-List.
3929	The following channels are constant or ReadOnly. Therefore no new value will be assigned to them:	Folgende Kanäle sind konstant oder ReadOnly. Ihnen wird daher kein neuer Wert zugewiesen:	This can occur in several cases: One case could be that some attributes have been set manually. Another case could be a problem of the EDS. This will happen i.e. if the EDS states that the device supports variable mapping, but the PDO entries are marked as constant or ReadOnly.
3930	No available mapping entry found for xyz	Kein freier Mapping Eintrag gefunden für xyz	The device's facilities are not sufficient to provide the requested mapping. Control the device directly from a central ECU.
3931	Serious error in DCF (EDS?): Number of mapping entries for	Schwerer Fehler im DCF (EDS?): Anzahl der Mapping-Einträge bei ...	Verify the validness of the EDS.
3933	Illegal mapping entry	Ungültiger Mapping-Eintrag	Verify the validness of the EDS. If this is correct, it could be the case that mapping entries have been defined manually by using inconsistent values.

3934	Does not have any assigned partner, but is in the default mapping	Hat keinen zugeordneter Partner, ist aber im Default-Mapping	The attributes of the PDOs are in way that the channel has to be transferred together with other channels. This can happen i.e. with ReadOnly PDOs or if no variable mapping is supported. To do: Select appropriate mapping partners for all channels. If this is not possible for the connection between the two devices, then the data should be transferred (mapped) to a central ECU which then has to redistribute it to all the recipients.
3935	Dissimilar TransmissionTypes:	Unterschiedliche TransmissionTypes:	Verify the settings of the transmission types. Select same transmission type for sender and receiver.
3936	Receiver does not have any COB-ID entry	Empfänger hat keinen COB ID Eintrag	Verify the validness of the EDS.
3937	The receiver COB is already being used by another sender!	Der Empfänger-COB wird bereits durch einen anderen Sender benutzt!	One COB-ID can always be transmitted only by one device. It is absolutely forbidden, that two or more devices transmit data to control one same receiver object. If the application requires this, then transmit the data to a central ECU, which can logically combine the data and then controls the target device.
3939	No (or incomplete) mapping entry exists. It is assumed that the mapping only consists of xyz	Kein (oder unvollständiger) Mapping-Eintrag vorhanden. Es wird angenommen, dass das Mapping nur aus xyz besteht.	The mapping entries are described in an inconsistent way. This can happen, if some entries have been edited manually and inconsistent or if the EDS is not correct.
3941	Variable sizes do not match	Variablengrößen passen nicht zusammen:	Two objects with different sizes have been mapped. Normally this happens only in some few cases: Mapping has been read on-line from the devices Mapping has been manipulated by external influences Mapping has been edited manually. If the application requires to map exactly this way, the the automatic generation cannot be used. One work-around may be to mark the PDO as fixed. The other possibility is to define all mappings manually.

3942	xyz is already mapped. More than one sender cannot write to a receiver!	xyz ist bereits gemappt. Es können nicht mehrere Sender einen Empfänger beschreiben!	It is absolutely forbidden, that two or more devices transmit data to control one same receiver object. If the application requires this, then transmit the data to a central ECU, which can logically combine the data and then controls the target device.
3943	xyz cannot be mapped, since the number of mapping entries is 0 and the device doesn't support remapping. (Error in the EDS?!)	xyz kann nicht gemappt werden, da die Anzahl der Mapping-Einträge 0 ist und das Gerät kein Remapping unterstützt.(Fehler im EDS?)	Verify the validness of the EDS.
3944	xyz cannot be mapped, since the number of mapping entries for the node is inconsistent with the number for the receiver and both nodes do not support remapping!	xyz kann nicht gemappt werden, da die Anzahl der Mapping-Einträge des Knotens nicht mit der Anzahl beim Empfänger übereinstimmt und beide Knoten kein Remapping unterstützen!	The mapping facilities of the devices are not sufficient for this connection. Control the devices directly from a central ECU.
3945	Mapping entries inconsistent!	Mapping-Einträge inkonsistent!	Verify the correctness of the EDS file.
3946	Illegal mapping entries!	Ungültige Mapping-Einträge!	Verify the correctness of the EDS file.
3947	xyz is in the default mapping but should not be received by the partner station!	xyz ist im Default-Mapping, soll aber von der Gegenstation nicht empfangen werden!	The attributes of the PDOs are in way that the channel has to be transferred together with other channels. This can happen i.e. with ReadOnly PDOs or if no variable mapping is supported. To do: Select appropriate mapping partners for all channels. If this is not possible for the connection between the two devices, then the data should be transferred (mapped) to a central ECU which then has to redistribute it to all the recipients.
3948	Mapping entries inconsistent!	Mapping-Einträge inkonsistent!	Verify the correctness of the EDS file.

3949	xyz is in the default mapping. The counterpart station cannot set up the partner channel due to lack of mapping support!	xyz ist im Default-Mapping. Die Gegenstation kann aufgrund fehlender Map-Unterstützung nicht den zugehörigen Partner einrichten!	The attributes of the PDOs are in way that the channel has to be transferred together with other channels. This can happen i.e. with ReadOnly PDOs or if no variable mapping is supported. To do: Select appropriate mapping partners for all channels. If this is not possible for the connection between the two devices, then the data should be transferred (mapped) to a central ECU which then has to redistribute it to all the recipients.
3950	xyz is already in the mapping, but should not be received by the counterpart station	xyz ist bereits im Mapping, soll aber von der Gegenstation	The attributes of the PDOs are in way that the channel has to be transferred together with other channels. This can happen i.e. by an inconsistent previous manual mapping. To do: Select appropriate mapping partners for all channels. If this is not possible for the connection between the two devices, then the data should be transferred (mapped) to a central ECU which then has to redistribute it to all the recipients.
3952	No mapping entry found. Incomplete DCF?	Kein Mapping-Eintrag gefunden. Unvollständiges DCF?	Verify the correctness of the EDS file.
3953	No COB entry found. Incomplete DCF?	Kein COB-Eintrag gefunden. Unvollständiges DCF?	Verify the correctness of the EDS file.
3954	Index error while determining the mapping structure	Index-Fehler beim ermitteln der Mapping Structure	Verify the correctness of the EDS file.
3955	... has no available COB-ID entry (anymore). The following connection cannot be made:	... hat keinen freien COB-ID-Eintrag (mehr). Folgende Verbindung kann nicht hergestellt werden:	The mapping facilities of the devices are not sufficient for this connection. Control the devices directly from a central ECU.
3956	The mapping is incompatible. The following connection cannot be made:	Das Mapping passt nicht zusammen. Folgende Verbindung kann nicht hergestellt werden:	The mapping facilities of the devices are not sufficient for this connection. Control the devices directly from a central ECU.
3957	... has already been mapped. The following connection cannot be made:	... ist bereits gemappt. Folgende Verbindung kann nicht hergestellt werden:	The mapping facilities of the devices are not sufficient for this connection. Control the devices directly from a central ECU.
3958	... cannot be made due to dissimilar mapping sizes	... kann nicht hergestellt werden wegen unterschiedlicher Mapping-Größen	The mapping facilities of the devices are not sufficient for this connection. Control the devices directly from a central ECU.

3959	Illegal mapping entries	Ungültige Mapping-Einträge	Verify the validity of the EDS.
3960	... do not match due to dissimilar mappings	... passen nicht zusammen wegen unterschiedlicher Mappings	The mapping facilities of the devices are not sufficient for this connection. Control the devices directly from a central ECU.
3961	The following connection cannot be made due to lack of device resources:	Folgende Verbindung kann aufgrund fehlender Gerätere Ressourcen nicht hergestellt werden:	The mapping facilities of the devices are not sufficient for this connection. Control the devices directly from a central ECU.
3992	If a node does not support remapping it cannot broadcast to multiple receive channels within another node!	Wenn ein Knoten kein Remapping unterstützt, kann er keinen Broadcast zu mehreren Empfangskanälen innerhalb eines anderen Knotens!	The mapping facilities of the devices are not sufficient for this connection. Control the devices directly from a central ECU.
3993	If a node does not support remapping it cannot broadcast to multiple receive channels within another node!	Wenn ein Knoten kein Remapping unterstützt, kann er keinen Broadcast zu mehreren Empfangskanälen innerhalb eines anderen Knotens!	The mapping facilities of the devices are not sufficient for this connection. Control the devices directly from a central ECU.
3994	WARNING: The following connection does not contain a real sender?!?!?	WARNING: Die folgende Verbindung enthält keinen Sender?!?!?	It is not possible to map a receiver to receiver or a sender to a sender. Verify the validity of the EDS. One common error is to mark a RW channel as mappable. In this case the attributes RWW or RWR have to be used. More information is given in the CiA DS-306 EDS specification.
3995	Timer not supported	Timer nicht unterstützt	The device does not support the Event Timer. Select another transmission type or set the timer to 0.

Table 1 - Connection Generation Error Codes

4.0 Additional Resources

VECTOR APPLICATION NOTE

AN-AON-1-1103 Master and Slave in the CANopen World

5.0 Trademarks

All mentioned names are either registered or unregistered trademarks of their respective owners.

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