UniOP Connection Options in CANopen

This document provides a description of the UniOP connection options available using the SCM03 CANopen interface, programmable with the EXOR ISaGRAF package.

Contents

1. Connection Internal Controller to UniOP CANopen protocol

This chapter provides a description about how an SCM03 module can be configured in ISaGRAF to talk with a UniOP panel equipped with the CANopen protocol (TCM09 communication module) working on the same bus.

1.1 Concepts

Let's consider first the UniOP CANopen protocol running on the TCM09 communication module.

UniOP running CANopen protocol has been modeled as a "More skilled simple HMI" according to the classification introduced in the CiA draft standard DSP-403 V.1.0; the device profile is described in the Tn133. Supported objects in the profile are listed in Appendix 3 of the mentioned tech note.
What is important for the current application is the 2nd transmit PDO mapped to the Object 9000h.
Every time a variable of the UniOP internal database is changed, the Slave notifies the Master with a PDO message containing the Object 9000h.
The Object 9000h is called "New Data Ready Transmit" and it is described in Table 1.

The Object 9000h contains enough information for the Master to know which is the modified object in the UniOP database and which is the Index of the changed object.
New value of the changed object is not transmitted together with Object 9000h, but it has to be requested to the Slave with an SDO reading operation initiated by the Master (i.e. SCM03).

INDEX	9000h
Name	New Data Ready
Object Code	RECORD
Data Type	Unsignwed8, Unsigned16

Sub-index	0
Description	New Data Ready
Access	Read Only
PDO Mapping	Yes
Value range	Boolean
Mandatory Range	Boolean
Default Value	No

Sub-index	1
Description	Index
Access	Read Only
PDO Mapping	Yes
Value range	Unsigned16
Mandatory Range	No
Default Value	No

Sub-index	2
Description	Sub-Index
Access	Read Only

PDO Mapping	Yes
Value range	Unsigned8
Mandatory Range	No
Default Value	No

Table 1

The CANopen Master can capture the object 9000h sent by the Slave device counting the number of the received PDO messages. The Master will then have the chance to understand when a certain variable is changed in the panel.

From the Master point of view a write operation to the Internal UniOP database can be performed using an SDO write operation.
In case one item of the internal integer database has to be changed, the Object 8100h has to be used in the SDO write operation. In case one item of the internal floating-point database has to be changed, the Object 8500h has to use in the SDO write operation.

Read and write operations using SDO messages can be performed using EXOR ISaGRAF function blocks provided together with the ISaGRAF package.

1.2 ISaGRAF configuration

1.2.1 The I/O Connection Tool

The Workbench I/O connection tool should be configured like show in the next Figure 1.
The CANOCFG board has to be inserted to enable the SCM03 CANopen interface.

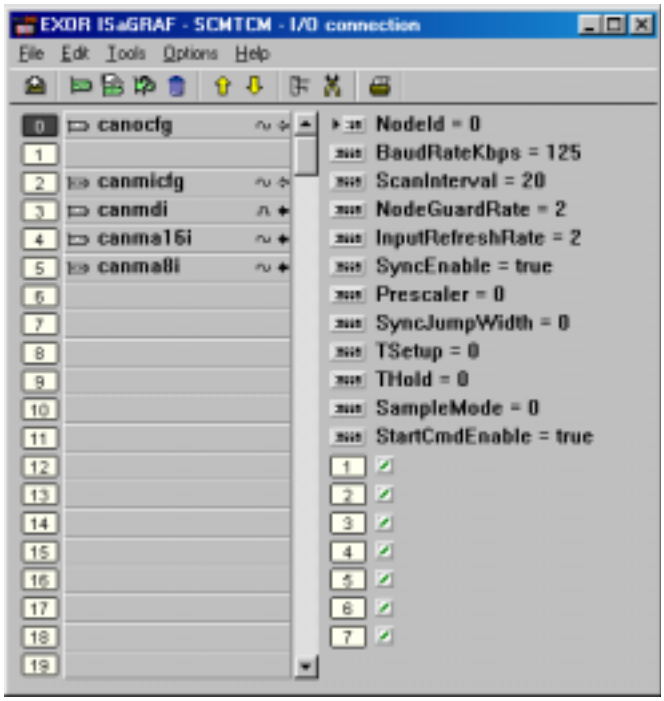

Figure 1

The master, configuring a Mixed Input board matching the structure of the Object 9000h, can capture the PDO messages, received from the UniOP CANopen unit.

Mixed Input board is shown in Figure 2.
The CAN Identifier (COD-ID) has been set in this example to 281h; the value is obtained by adding the node number (1 in the example) to the standard COB-ID 280h assigned to the 2nd transmit PDO message of a standard CANopen device.

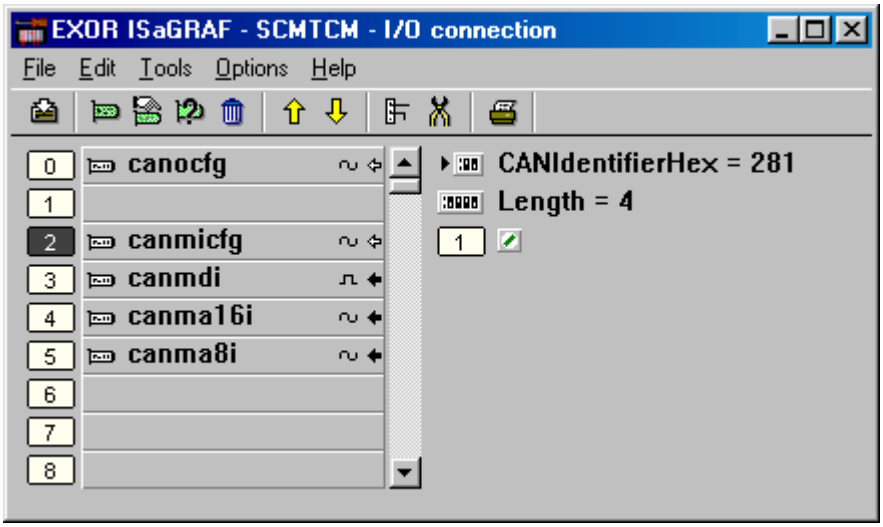

Figure 2

The length of the PDO message is set to 4 bytes. This is in fact the minimum size where the Object 9000h can fit.

The first element of the Object 9000h that the Master has to detect, is the Sub-Index 0 containing Boolean information called “New Data Ready” (see Table 1). Figure 3 shows the CANopen Mixed Digital input board configured at offset 0; the first channel of the board is already connected to an Input ISaGRAF variable called “NewDataReady”. UniOP sets new Data Ready the first time it sends a PDO message and it is maintained to TRUE.

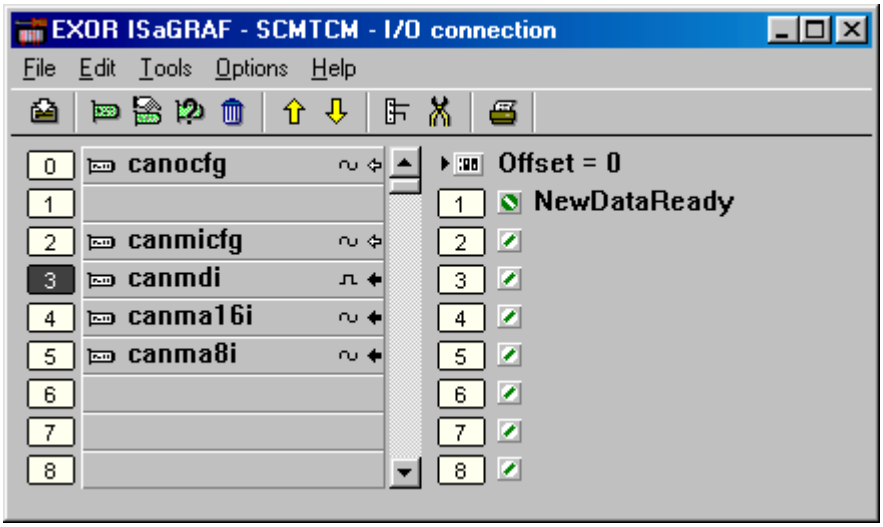

Figure 3

The second element of the Object 9000h the Master has to detect is the Sub-Index 1 containing integer information called “Index” according with Table 1. Figure 4 shows the CANopen Mixed Analog input board configured at offset 1; the input is already linked to an Input ISaGRAF variable called “Index”. The Index of the PDO message contains the Object number changed in the panel database. Object numbers are described in Appendix 3 of Tn133.

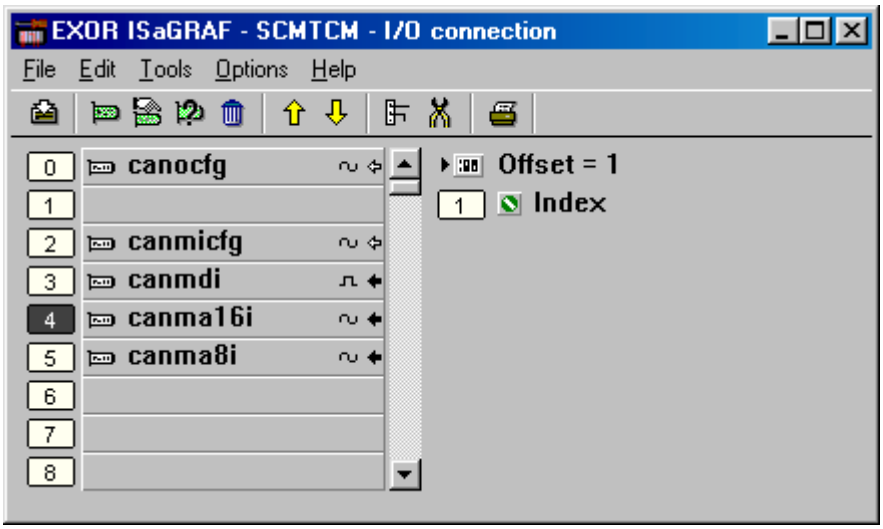

Figure 4

The third element of the Object 9000h that the Master has to detect is the Sub-Index 2 containing byte information called “Sub-Index” according with Table 1. Figure 5 shows the CANopen Mixed Analog input board configured at offset 3; the board channel is already connected to an Input ISaGRAF variable called “Subindex”. The Sub-Index of the PDO message contains the index of the changed item in the Object specified by the Index value. In other words this is the variable number changed in one of the UniOP internal databases. The data base type is specified by the Index value (see Figure 4)

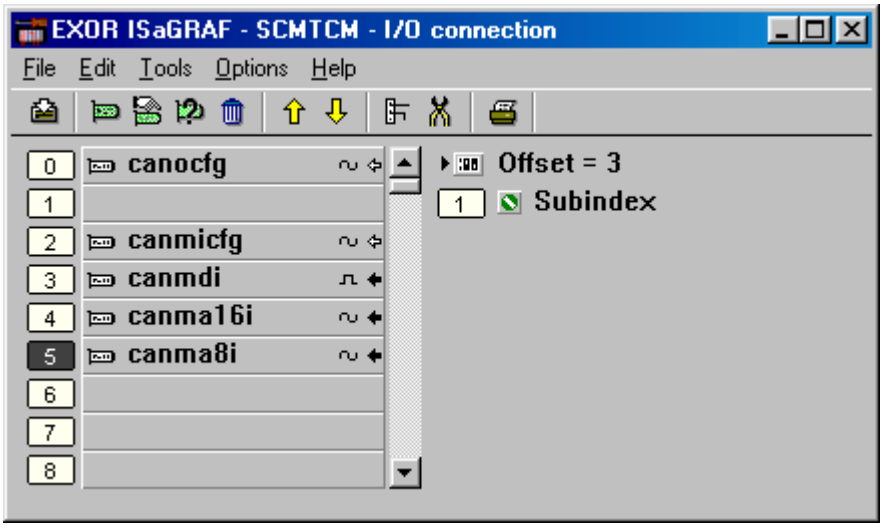

Figure 5

1.2.2 ISaGRAF Programming

The Mixed Input board configured in ISaGRAF can be used to check the contents of the PDO messages received by the slave unit, but it does not have any information regarding when a new PDO message is received.
In order to detect when a new PDO message is received from the slave the OPERATE function has to be programmed in ISaGRAF. When the OPERATE function is called with Function Code 3 and it is attached to a variable of the Mixed Input Board, it returns the number of received PDO messages since the last call of the same OPERATE function.

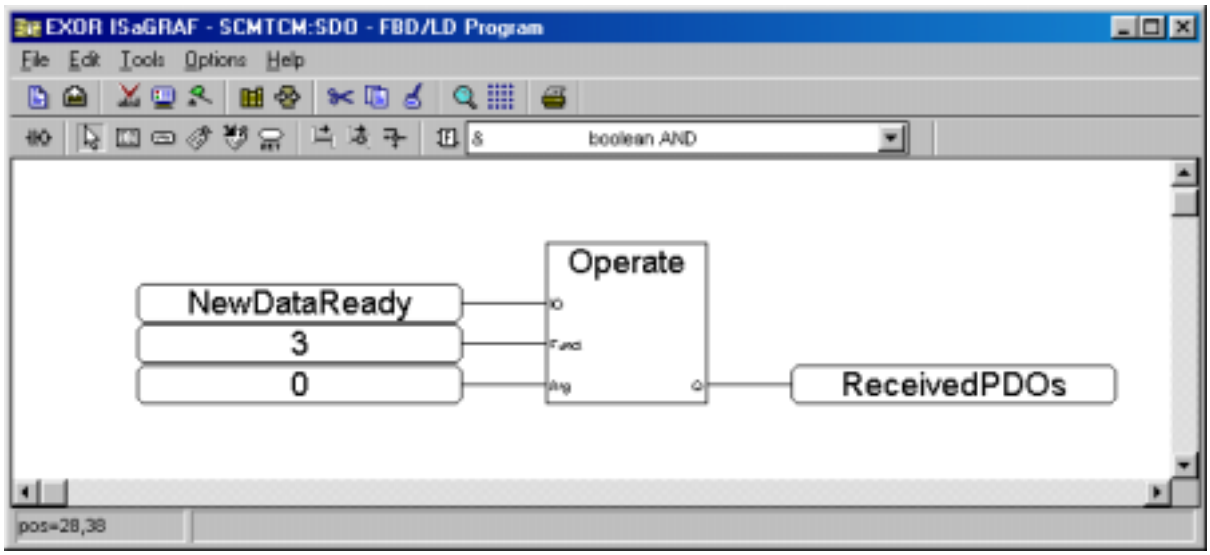

Figure 6

Please note that if the CANopen configuration board (see Figure 1) has enabled the Input Refresh option, UniOP running CANopen protocol will send PDO messages at each polling operation done by the Master. This can generate confusion in the described application because the counter of received PDO messages will include also messages sent after a polling of the master and not only after a variable change.

In order to disable the automatic input refresh only for the UniOP panel, the OPERATE function can be called with function code 4 like shown in Figure 7; the OPERATE should have as I/O parameter a variable connected to the Mixed Input Board.

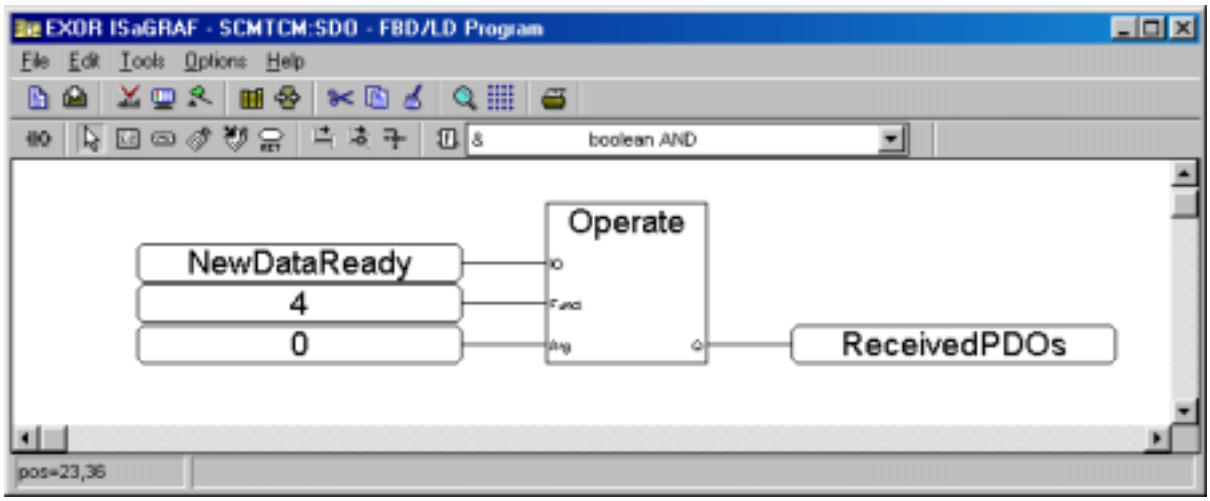

Figure 7

***Note**: This call has to be placed in the ISaGRAF program before the call done with function code 3.*

1.2.2.1 Application Example

Consider a Designer project created using the CANopen protocol with one variable on the first page; consider this variable configured at address INT32-1.
When the operator modifies the value of this variable on the UniOP panel a PDO message is sent to the Master and the corresponding Mixed Input board will appear like presented in Figure 8, Figure 9 and Figure 10.

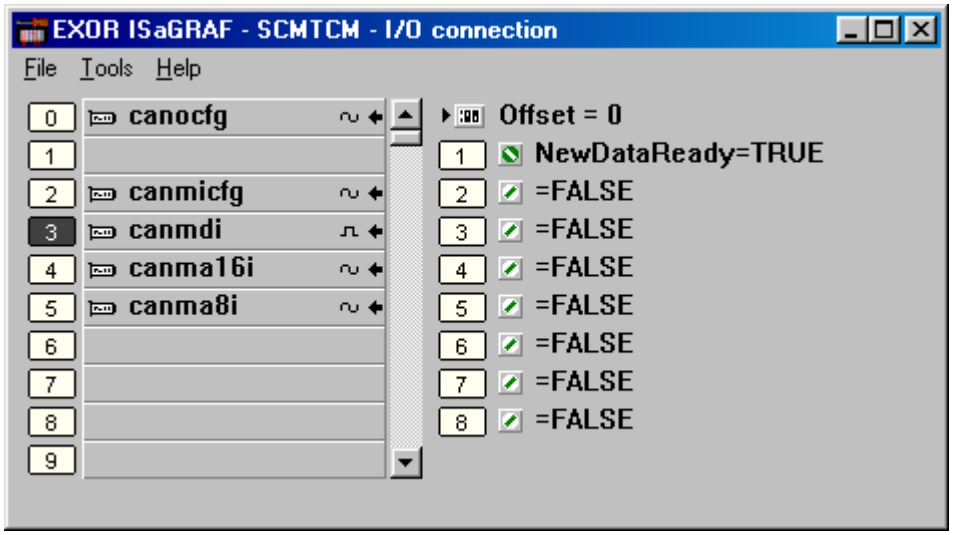

Figure 8

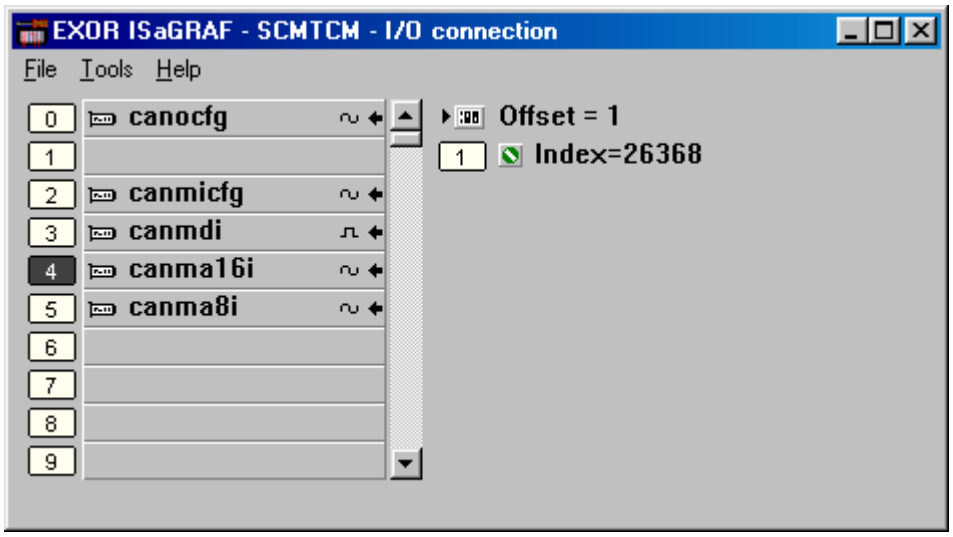

Figure 9

The Index value 26368d corresponds to the hexadecimal 6700h; it is the Object number assigned to the UniOP internal database of integer 32bits variables.

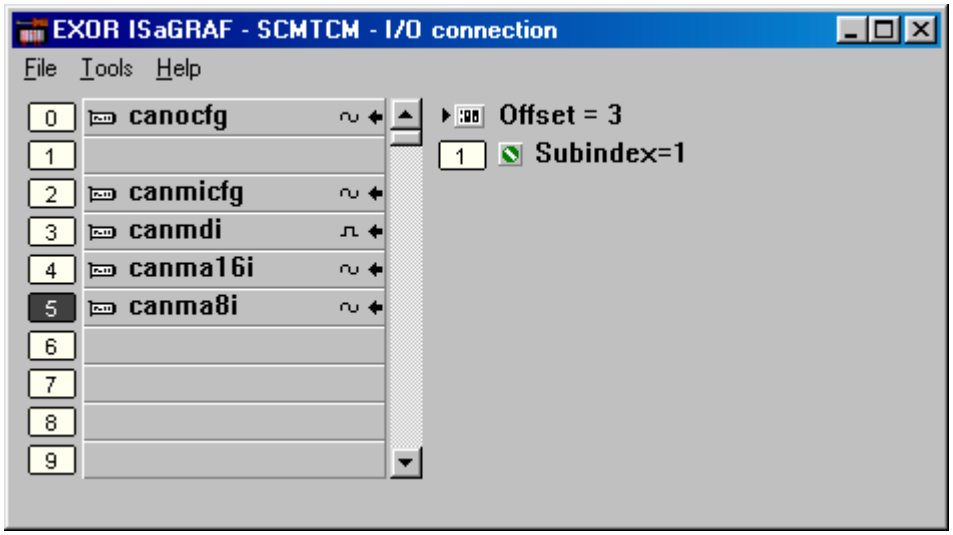

Figure 10

The Sub-Index 1 corresponds to the variable number inside the Integer database; this is the changed variable.

The OPERATE function called with Function Code 3 returns information about the number of received PDO messages; for the current example the result is presented in Figure 11.

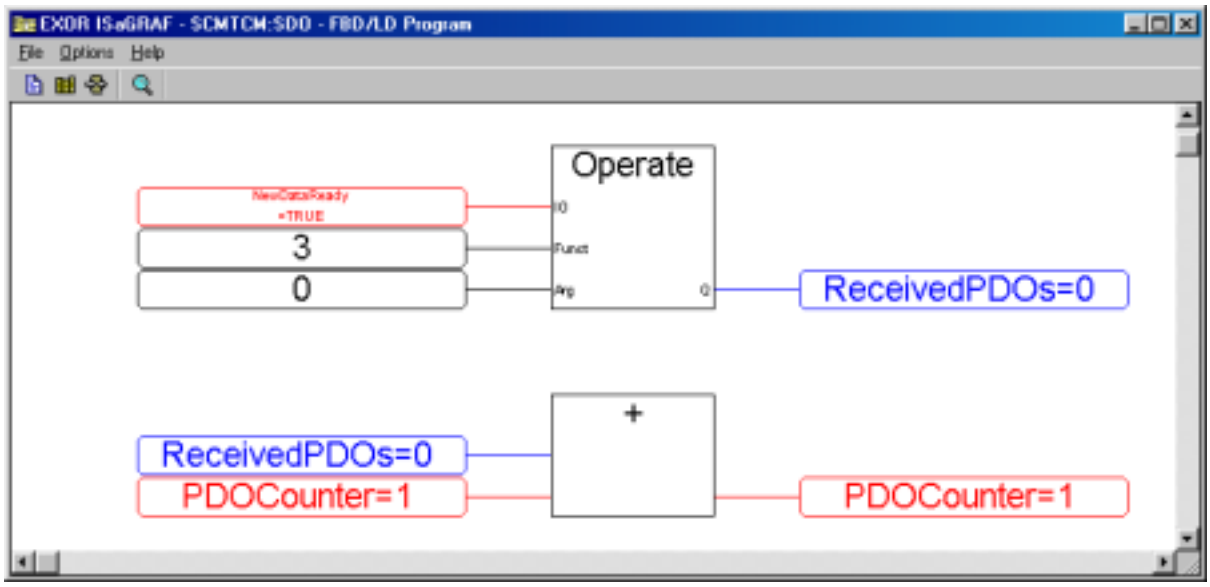

Figure 11

The PDOCounter variable keeps memory of all the received messages.

Using an SDO read operation the Master can now get from the slave the new value introduced for the INT32-1 UniOP variable; result is visible in Figure 12.

The integer value 117d correspond to the new value introduced by the operator for the INT32-1 variable.

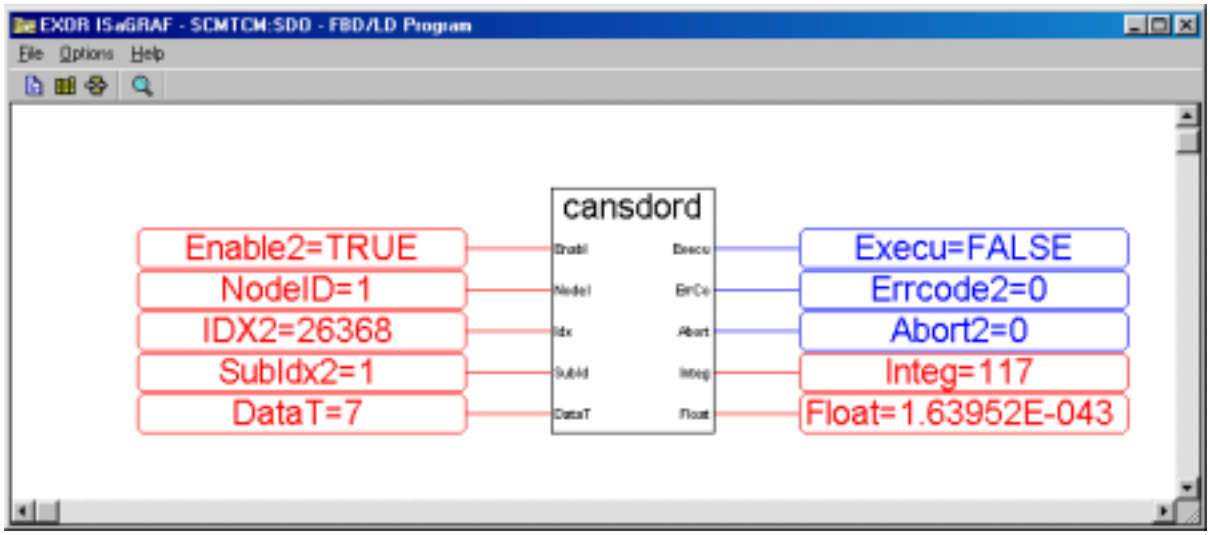

Figure 12

In case a write operation is required to the same variable, the SDO write function can be used like shown in Figure 13.

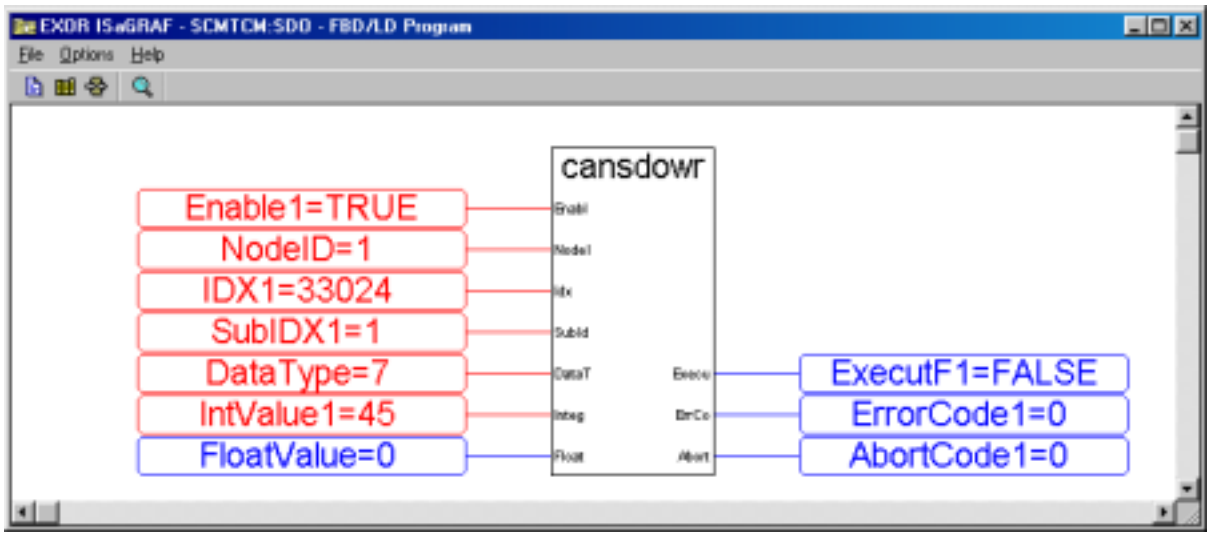

Figure 13

The Index 33024d corresponds to the hexadecimal 8100h that is the Object number to be used when executing a write operation to the integer 32bits database.