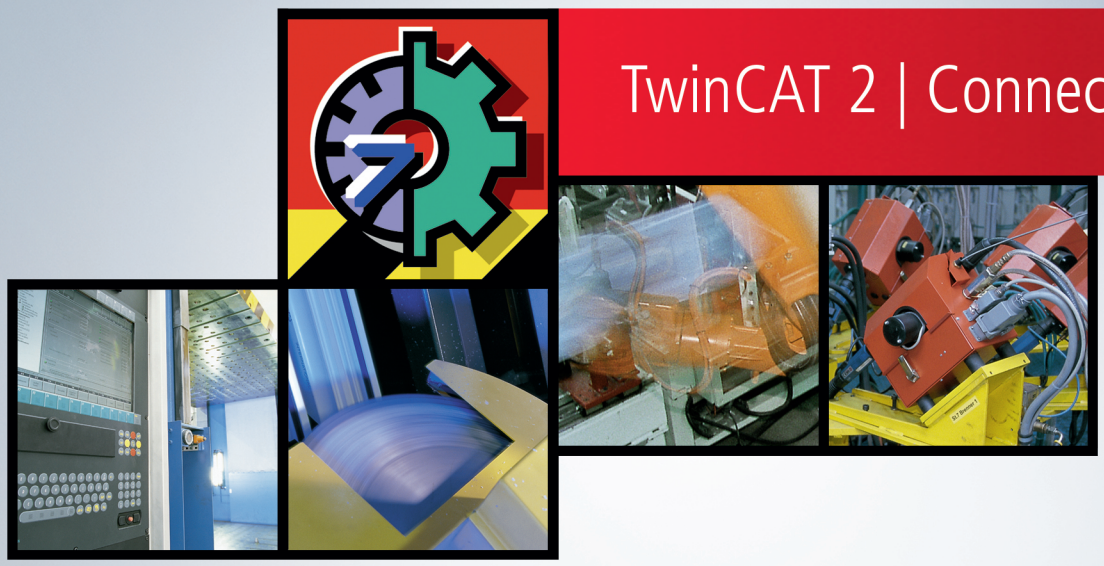
BECKHOFF New Automation Technology

Manual | EN

TX1000

TwinCAT 2 | ADS-COM-Server for ControlNet



TwinCAT 2 | Connectivity

2022-08-04 | Version: 1.0

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1 Foreword

1.1 Notes on the documentation

This description is only intended for the use of trained specialists in control and automation engineering who are familiar with applicable national standards.
It is essential that the documentation and the following notes and explanations are followed when installing and commissioning the components.
It is the duty of the technical personnel to use the documentation published at the respective time of each installation and commissioning.

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

Disclaimer

The documentation has been prepared with care. The products described are, however, constantly under development.
We reserve the right to revise and change the documentation at any time and without prior announcement.
No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams and descriptions in this documentation.

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Patent Pending

The EtherCAT Technology is covered, including but not limited to the following patent applications and patents:
EP1590927, EP1789857, EP1456722, EP2137893, DE102015105702
with corresponding applications or registrations in various other countries.

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1.2 Safety instructions

Safety regulations

Please note the following safety instructions and explanations!
Product-specific safety instructions can be found on following pages or in the areas mounting, wiring, commissioning etc.

Exclusion of liability

All the components are supplied in particular hardware and software configurations appropriate for the application. Modifications to hardware or software configurations other than those described in the documentation are not permitted, and nullify the liability of Beckhoff Automation GmbH & Co. KG.

Personnel qualification

This description is only intended for trained specialists in control, automation and drive engineering who are familiar with the applicable national standards.

Description of symbols

In this documentation the following symbols are used with an accompanying safety instruction or note. The safety instructions must be read carefully and followed without fail!

⚠ DANGER

Serious risk of injury!

Failure to follow the safety instructions associated with this symbol directly endangers the life and health of persons.

⚠ WARNING

Risk of injury!

Failure to follow the safety instructions associated with this symbol endangers the life and health of persons.

⚠ CAUTION

Personal injuries!

Failure to follow the safety instructions associated with this symbol can lead to injuries to persons.

NOTE

Damage to the environment or devices

Failure to follow the instructions associated with this symbol can lead to damage to the environment or equipment.

Tip or pointer

This symbol indicates information that contributes to better understanding.

1.3 Notes on information security

The products of Beckhoff Automation GmbH & Co. KG (Beckhoff), insofar as they can be accessed online, are equipped with security functions that support the secure operation of plants, systems, machines and networks. Despite the security functions, the creation, implementation and constant updating of a holistic security concept for the operation are necessary to protect the respective plant, system, machine and networks against cyber threats. The products sold by Beckhoff are only part of the overall security concept. The customer is responsible for preventing unauthorized access by third parties to its equipment, systems, machines and networks. The latter should be connected to the corporate network or the Internet only if appropriate protective measures have been set up.

In addition, the recommendations from Beckhoff regarding appropriate protective measures should be observed. Further information regarding information security and industrial security can be found in our https://www.beckhoff.com/secguide.

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To stay informed about information security for Beckhoff products, subscribe to the RSS feed at https://www.beckhoff.com/secinfo.

2 Installation

Installing TwinCAT

Please refer to the appropriate TwinCAT documentation for details of its installation

Installing the SST Programs

The installation versions of the SST device driver for the 5136-CN PC card (DeviceDriver directory) and of the SST configuration tool (ConfigTool directory) are located in the Unsupported Utilities/Sst directory. Use the following procedure for installation:

Installing the SST Device Driver

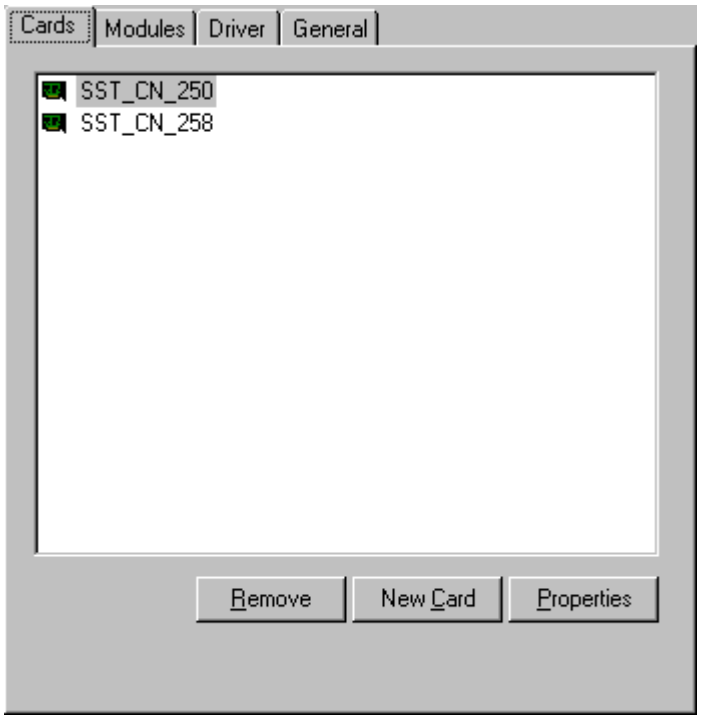
Run the setup program from the Unsupported Utilities/Sst/DeviceDriver directory, and follow the instructions given by the program.

Installing the SST Configuration Tool

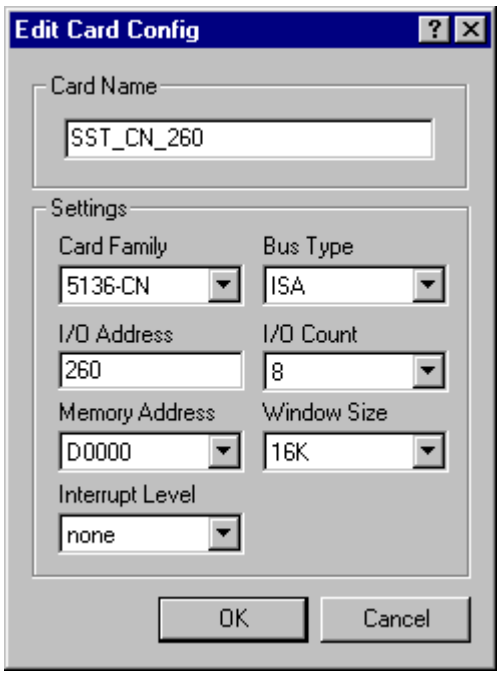
Run the setup program from the Unsupported Utilities/Sst/ConfigTool directory, and follow the instructions given by the program.

Performing the 5136-CN Hardware Settings (*not necessary for the 5136-CN PCI*)

Run the SST Card Configuration program, found under Programs->SST Card Config. Normally a window will appear with two default entries:

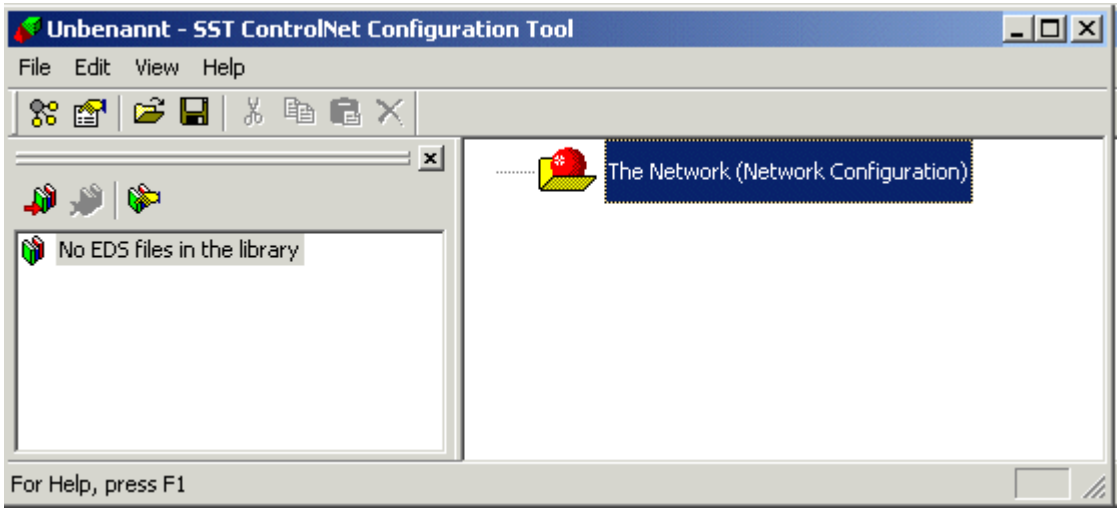


One entry should be deleted (using the Remove button), and the other should be edited (using Properties). A new dialog appears in which the I/O address of the 5136-CN is to be set in accordance with the DIP switch and where the memory address and the name can be adjusted.



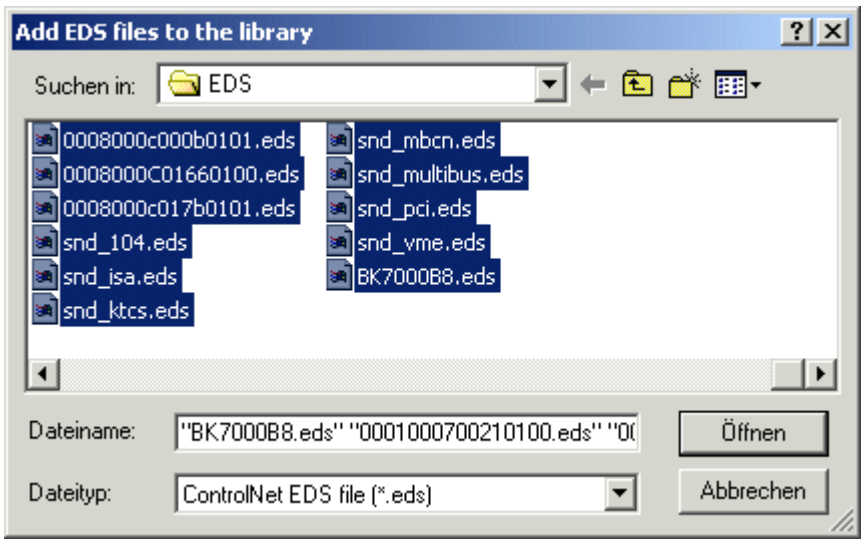
Linking the EDS Files to the SST Configuration Tool

The program "CN Config Tool", found under "Programs->SST CN", should be run. If a BK7000 is to be used, the EDS file for the BK7000 (BK7000B8.eds, found under EDS Files on the CD) should be copied to the "Programs/SST/CN/CN Config Tool/EDS" directory.

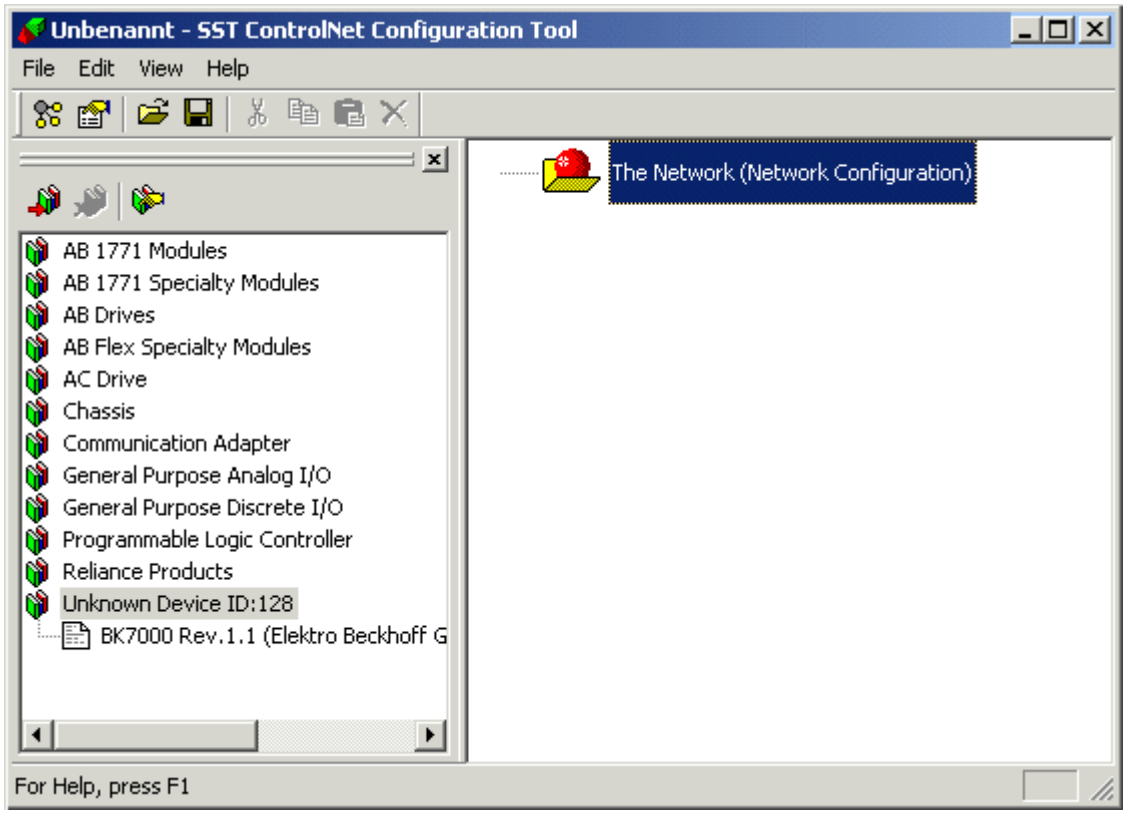


EDS files can be added to the EDS library by means of the Add icon (on the far left).

A file selection dialog appears in which it is best to select all the files.



The EDS library is then loaded, and projects can be created.



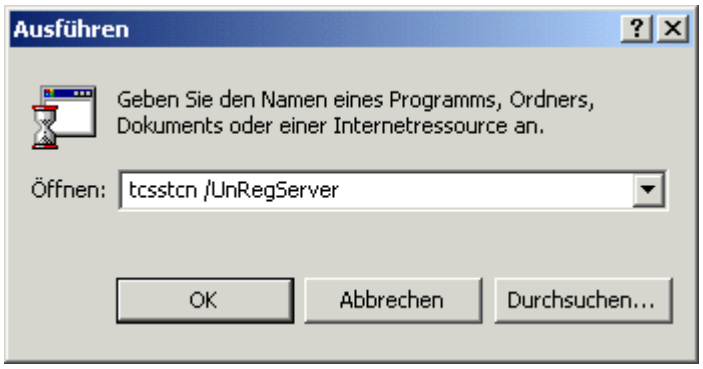
2.1 Install/uninstall TcSstCN Com Server

Installing

It is necessary under TwinCAT 2.7 for the TcSstCN-COM server to be manually registered. To do this, the file TcSstCN\TcSstCN.exe must first be copied from the CD into the WINNT/system32 directory. The server must then be registered (choose Start->Run, type TcSstCN /TcServer into the command box, then press OK).

Removing

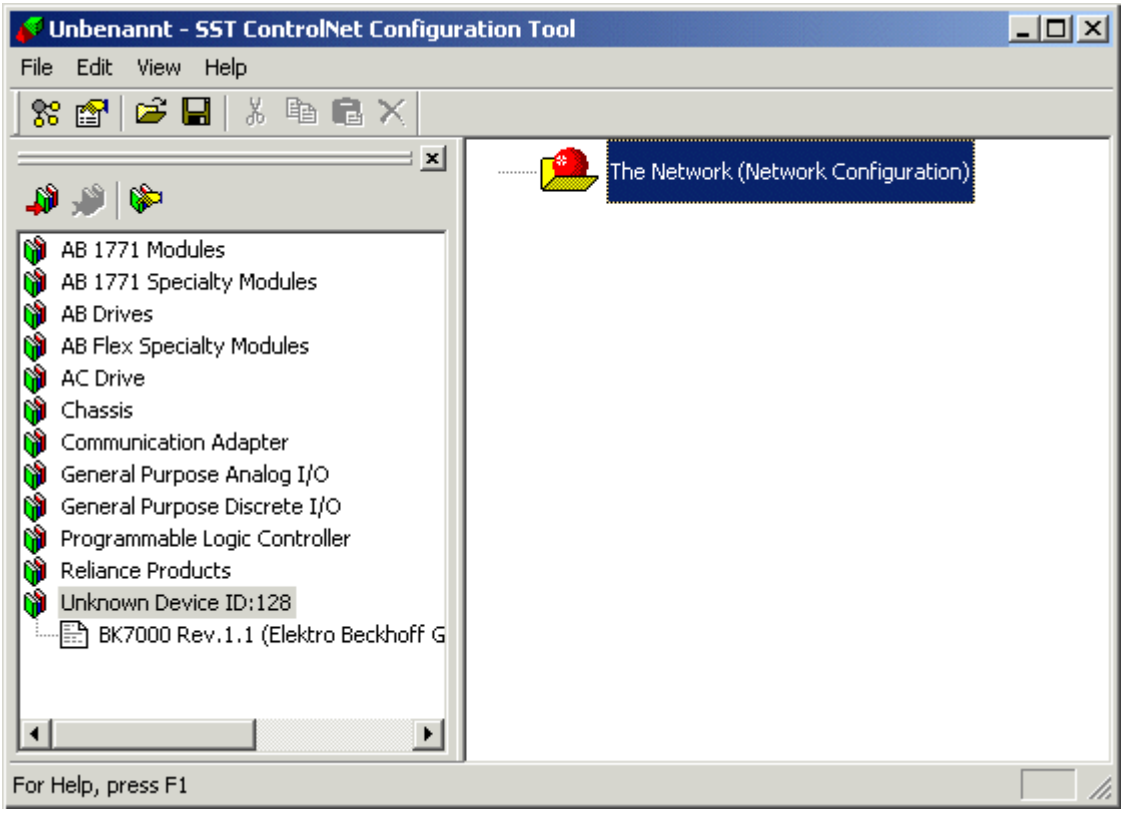
To uninstall the TcSstCN-COM server it is again necessary to select "Start->Run". Then type in TcSstCN / UnRegServer, and press OK. The server is then removed from the system.



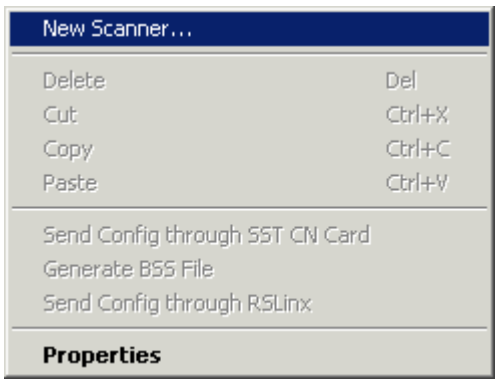
3 Configuration

The ControlNet configuration must be generated using the SST-Configuration-Tool.

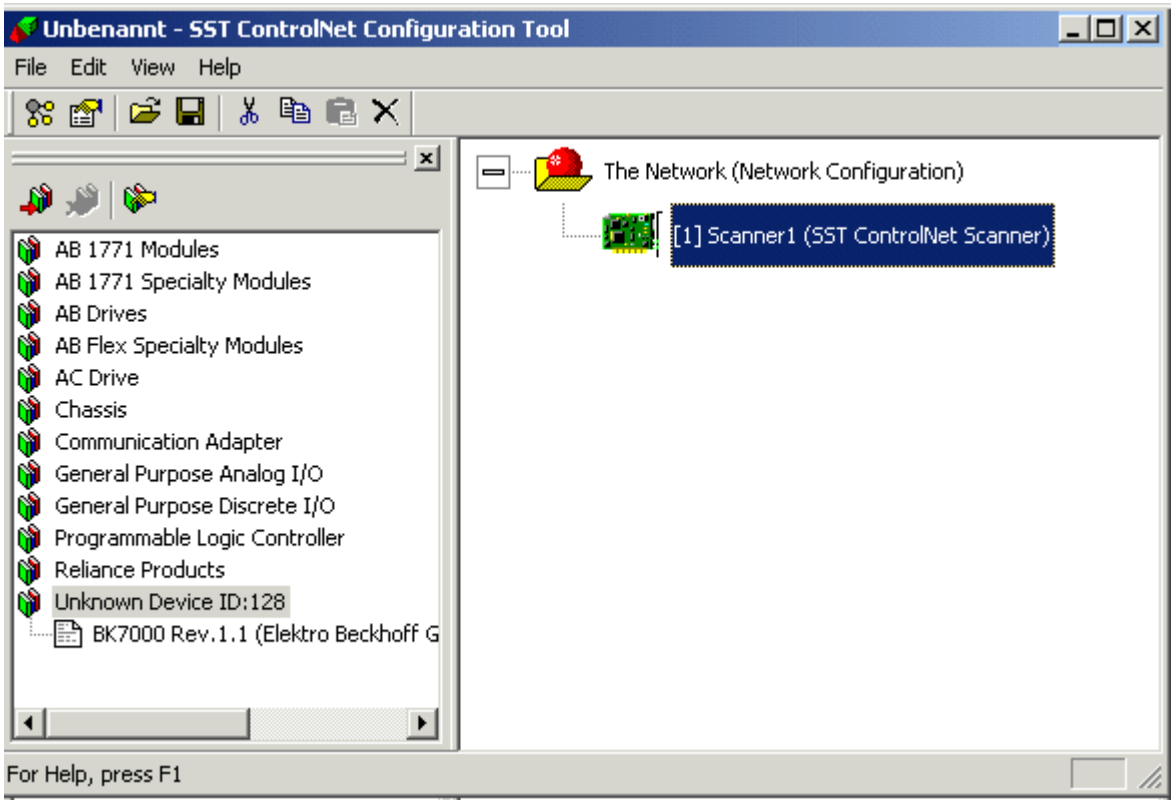
The program "CN Config Tool" under "Programs->SST CN" is called for this purpose.



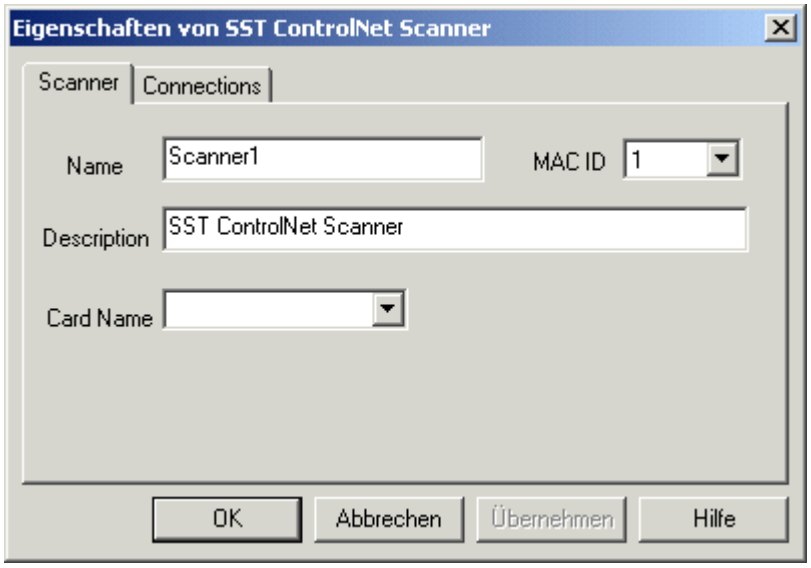
The 5136-CN PC card is first entered as the scanner. This is achieved by clicking on "The Network (Network Configuration)" with the right mouse button and selecting "New Scanner".



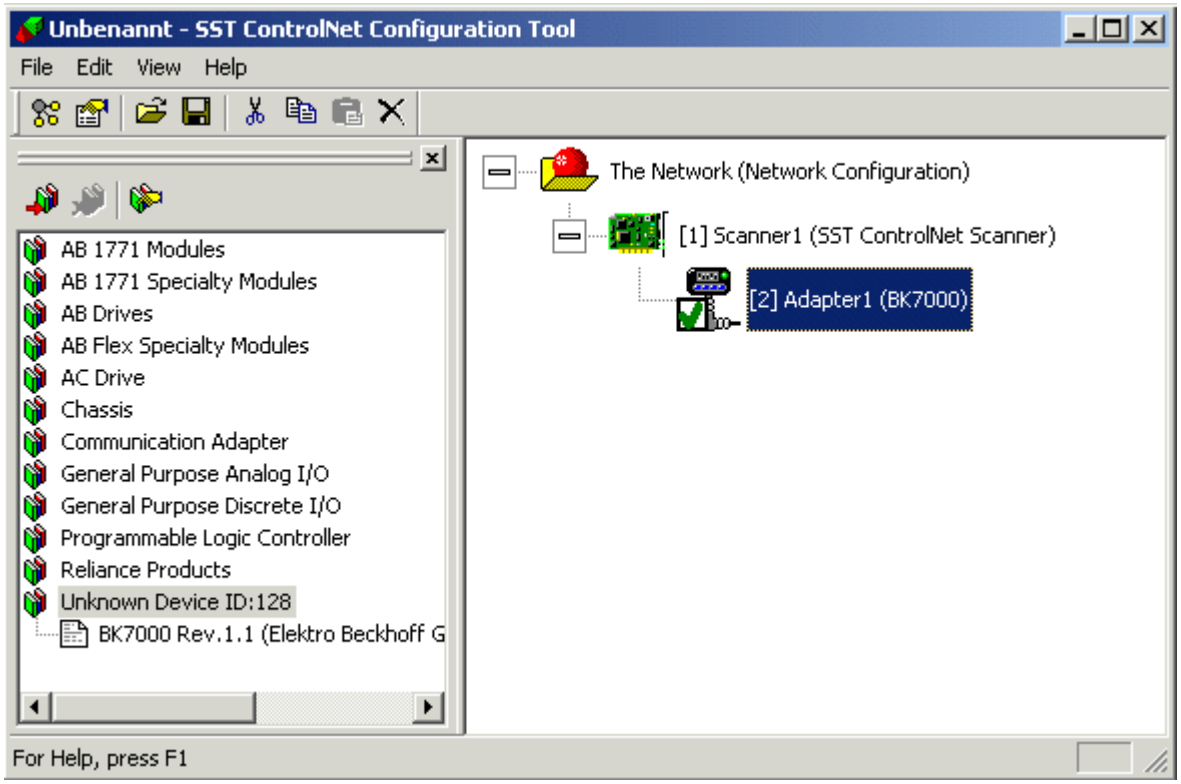
The new scanner then appears in the right-hand window:



The scanner's properties can be set by double-clicking on it. As a rule, only the card concerned must be entered under "Card Name", along with the Mac-ID if appropriate.

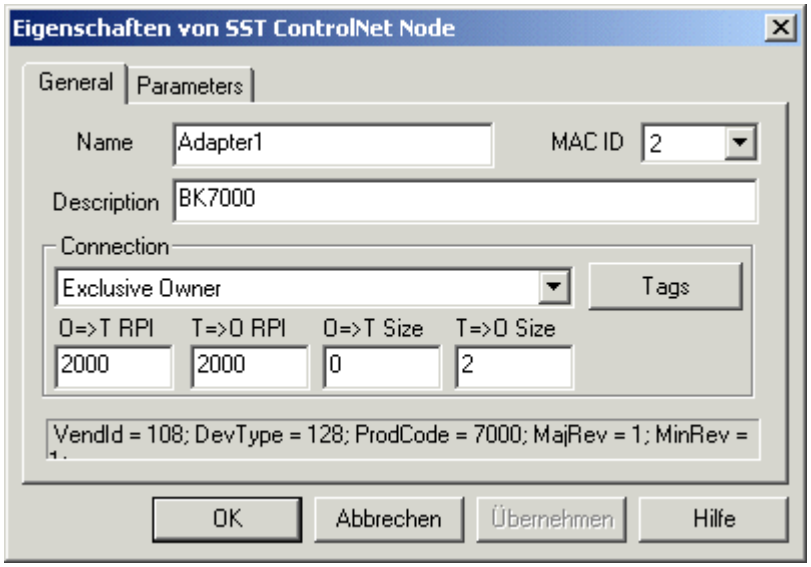


ControlNet devices can now be dragged to the scanner from the EDS library using the left mouse button.



3.1 BK7000 Configuration

The BK7000 is found in the EDS library under the entry "Unknown Device ID: 128". The BK7000 is dragged with the left mouse button out of the EDS library to the scanner in the right hand window. It will then appear in the right-hand window. The properties of the BK7000 can be set by double-clicking on it in the right-hand window.



The "O=>T Size" (the length of the output in words) and the "T=>O Size" (the length of the input in words + 2) are to be set in the dialog in accordance with the terminal configuration. In order to calculate the output and input lengths, the BK7000 supports four mapping schemes, which are set automatically in accordance with the selected size:

Compact mapping: A KL3xx2 requires 4 input bytes, a KL3xx4 requires 8 input bytes, a KL4xx2 requires 4 output bytes, a KL4xx4 requires 8 output bytes, a KL1501 requires 5 input and output bytes, a KL5001 requires 4 input bytes, a KL2502 or KL51x1 requires 6 input and output bytes, a KL6xx1 requires 4 input and output bytes in alternative format and 6 input and output bytes in standard format. For digital terminals, only the total is calculated and rounded up for word alignment

Compact mapping wit WORD alignment: A KL3xx2 requires 4 input bytes, a KL3xx4 requires 8 input bytes, a KL4xx2 requires 4 output bytes, a KL4xx4 requires 8 output bytes, a KL1501 requires 6 input and output bytes, a KL5001 requires 4 input bytes, a KL2502 and KL51x1 requires 8 input and output bytes, a KL6xx1 requires 4 input and output bytes in alternative format and 6 input and output bytes in standard format. For digital terminals, only the total is calculated and rounded up for word alignment

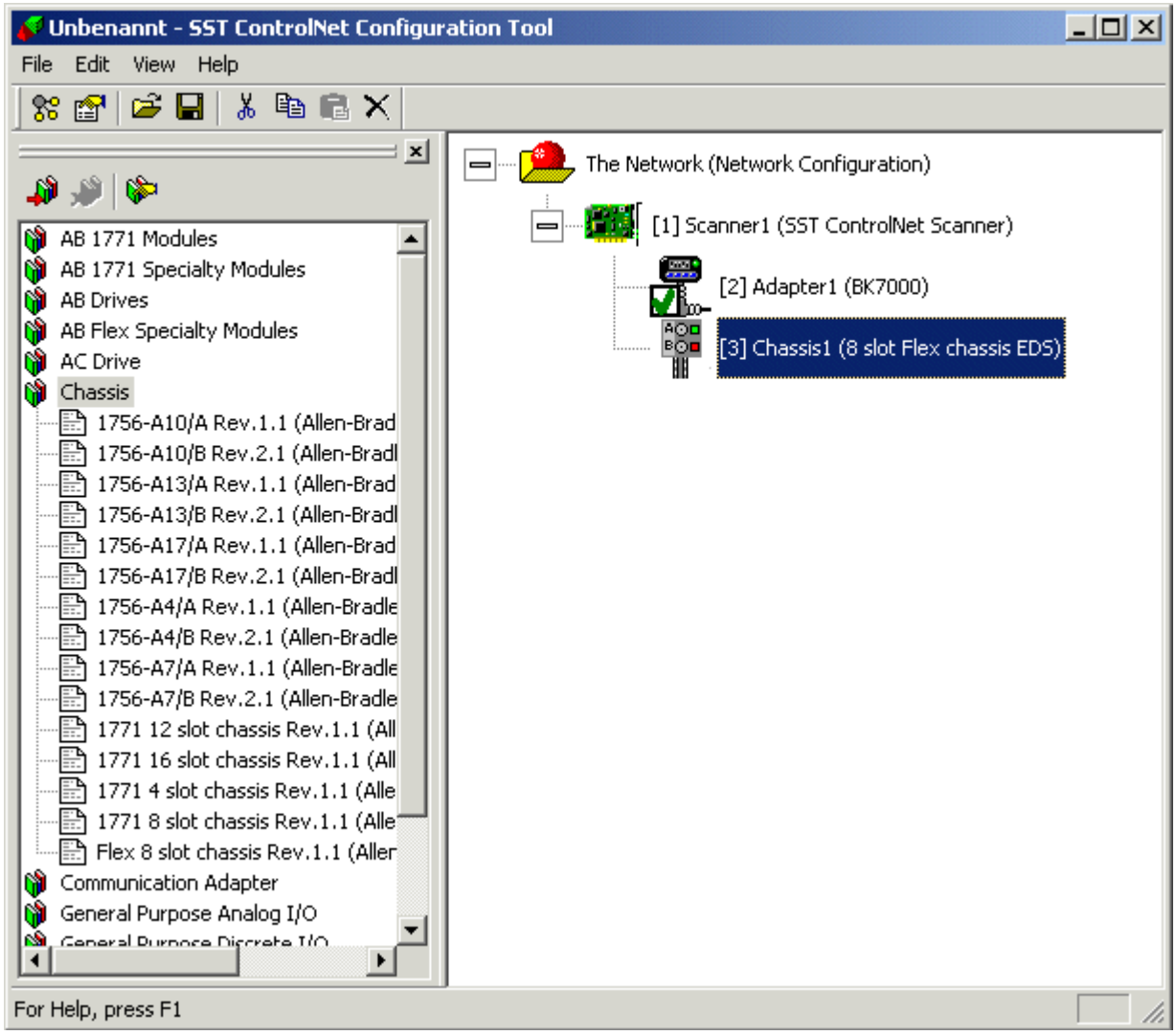
Complex mapping: A KL3xx2 requires 6 input and output bytes, a KL3xx4 requires 12 input and output bytes, a KL4xx2 requires 6 input and output bytes, a KL4xx4 requires 12 input and output bytes, a KL1501 requires 5 input and output bytes, a KL5001 requires 5 input and output bytes, a KL2502 or KL51x1 requires 6 input and output bytes, a KL6xx1 requires 6 input and output bytes in alternative format and 6 input and output bytes in standard format. For digital terminals, only the total is calculated and rounded up for word alignment

Complex mapping wit WORD alignment: A KL3xx2 requires 8 input and output bytes, a KL3xx4 requires 16 input and output bytes, a KL4xx2 requires 8 input and output bytes, a KL4xx4 requires 16 input and output bytes, a KL1501 requires 6 input and output bytes, a KL5001 requires 6 input and output bytes, a KL2502 or KL51x1 requires 6 input and output bytes, a KL6xx1 requires 8 input and output bytes in alternative format and 6 input and output bytes in standard format. For digital terminals, only the total is calculated and rounded up for word alignment

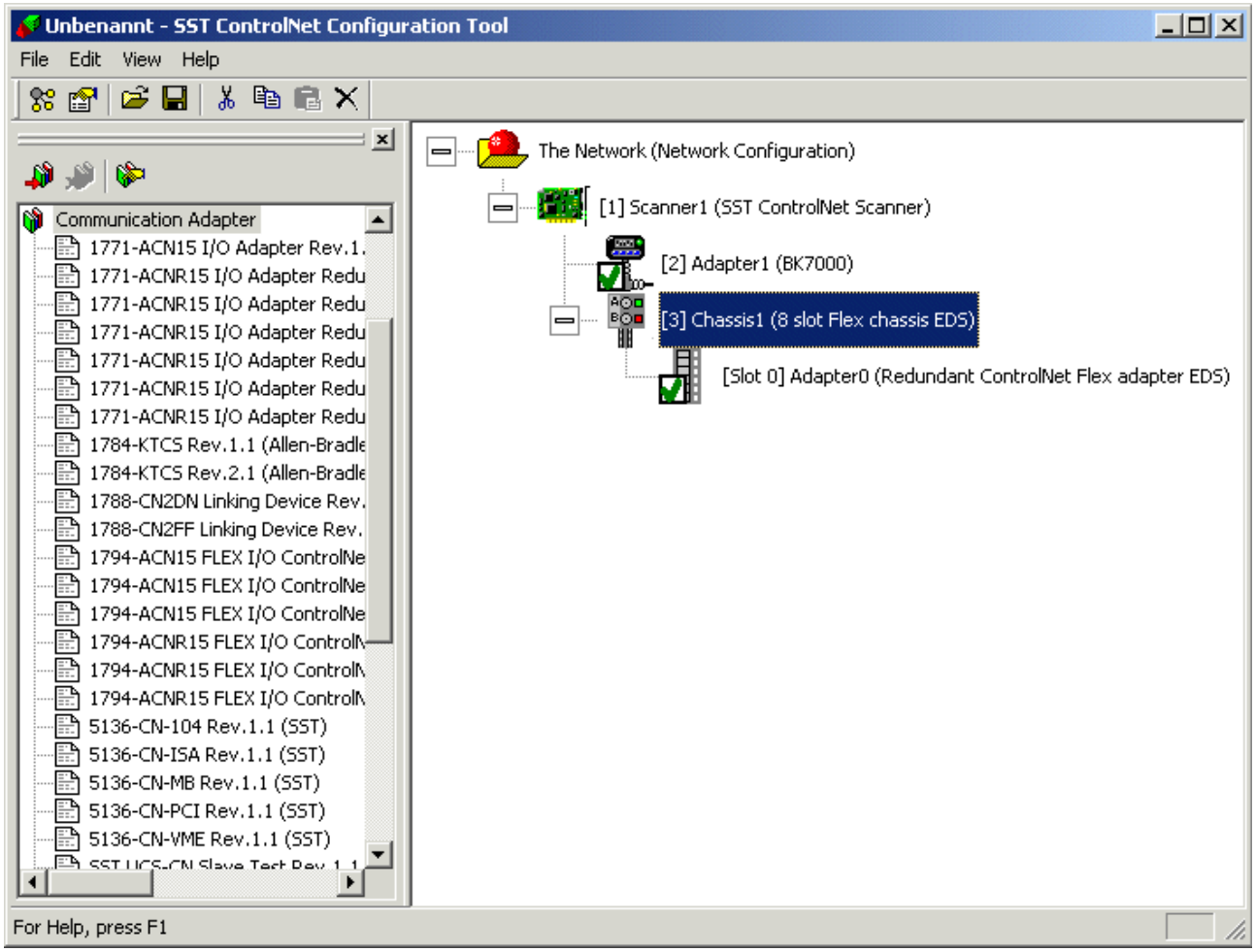
It may also be necessary for the Mac-ID and the "O=>T RPI" or the "T=>O RPI" to be set (these values must be greater than or equal to the network settings for the NUT interval).

3.2 AB Flex I/O Device Configuration

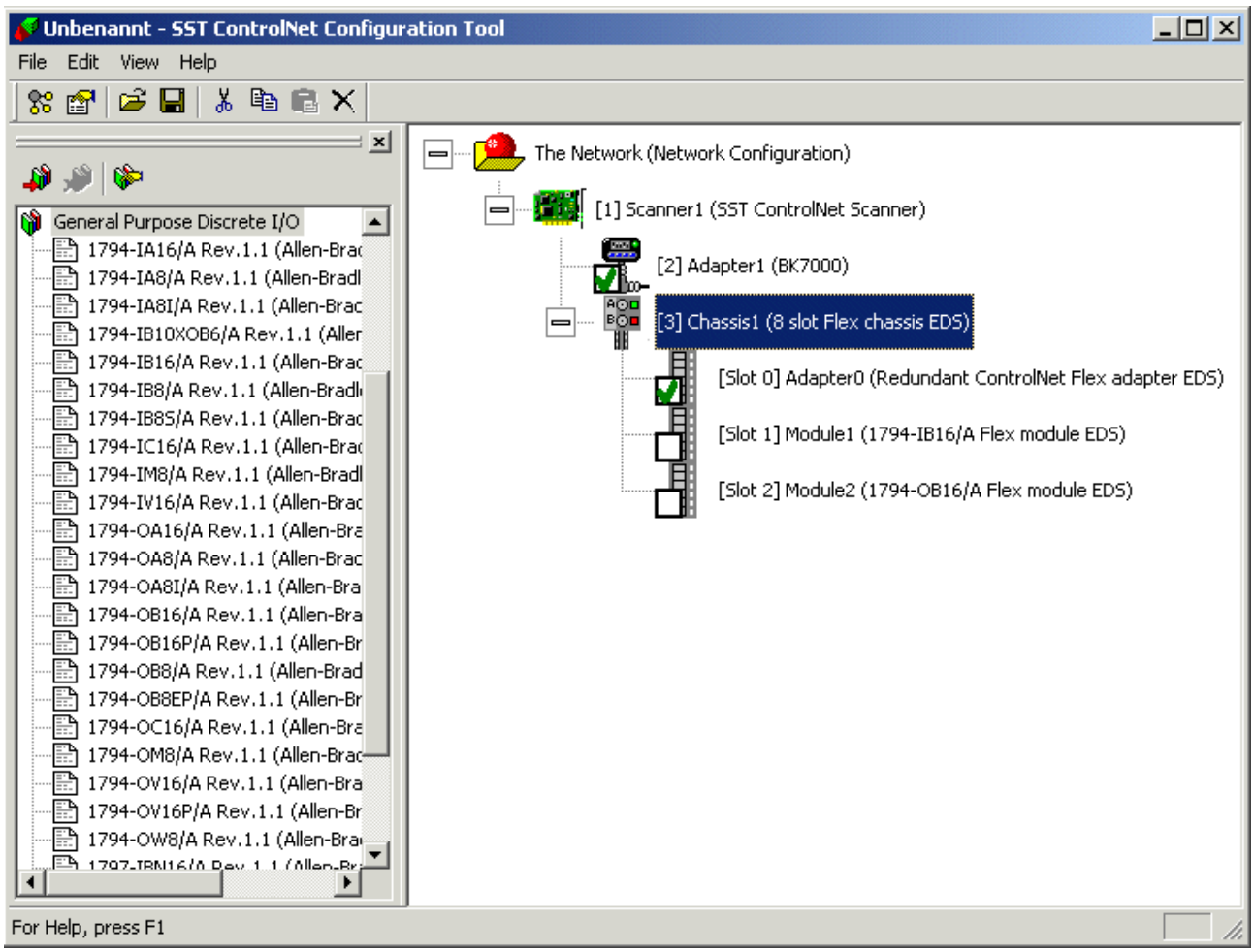
First of all, a "Flex 8 Slot Chassis" must be dragged with the left mouse button from the EDS library's "Chassis" entry to the scanner in the right hand window. The AB Flex I/O chassis then appears in the right hand window.



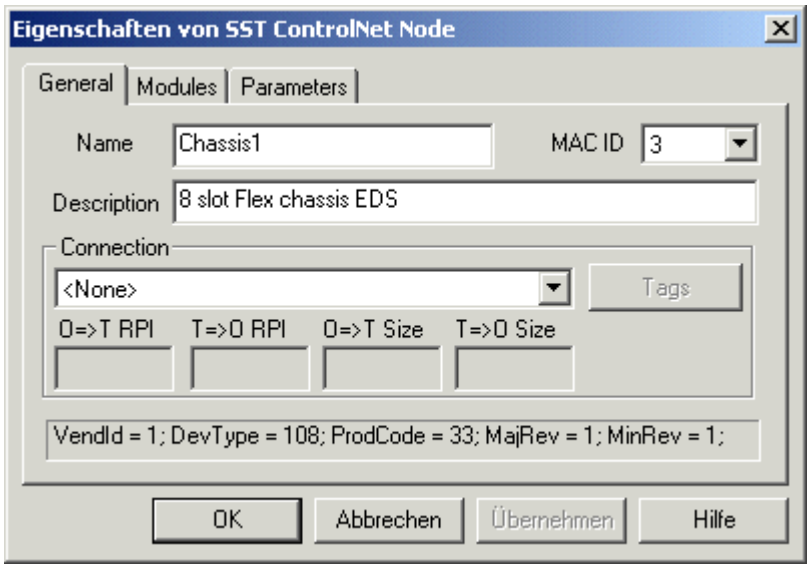
Next, the corresponding Flex I/O adapter is to be dragged with the left mouse button from the EDS library's "Communication Adapter" entry, across to the chassis in the right hand window - a field appears with 0 for the slot number, which is to be selected. The Flex-I/O adapter then appears in the right hand window.



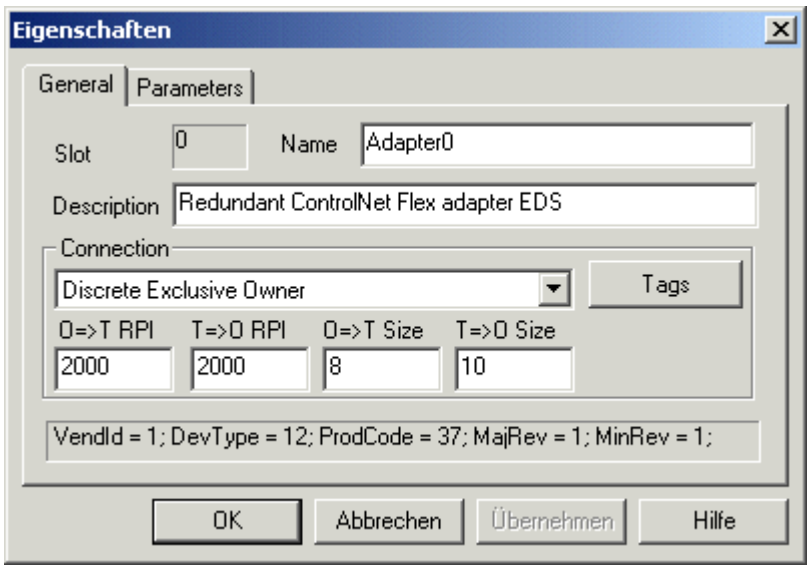
It is finally necessary for the appropriate modules for the Flex-I/O device to be added by dragging them with the left mouse button from the "General Purpose Analog IO" or "General Purpose Digital IO" entries, across to the chassis in the right-hand window. A field with the slot number, which has to be selected, appears.



The Mac-ID can be set in the dialog which appears by double-clicking the chassis.

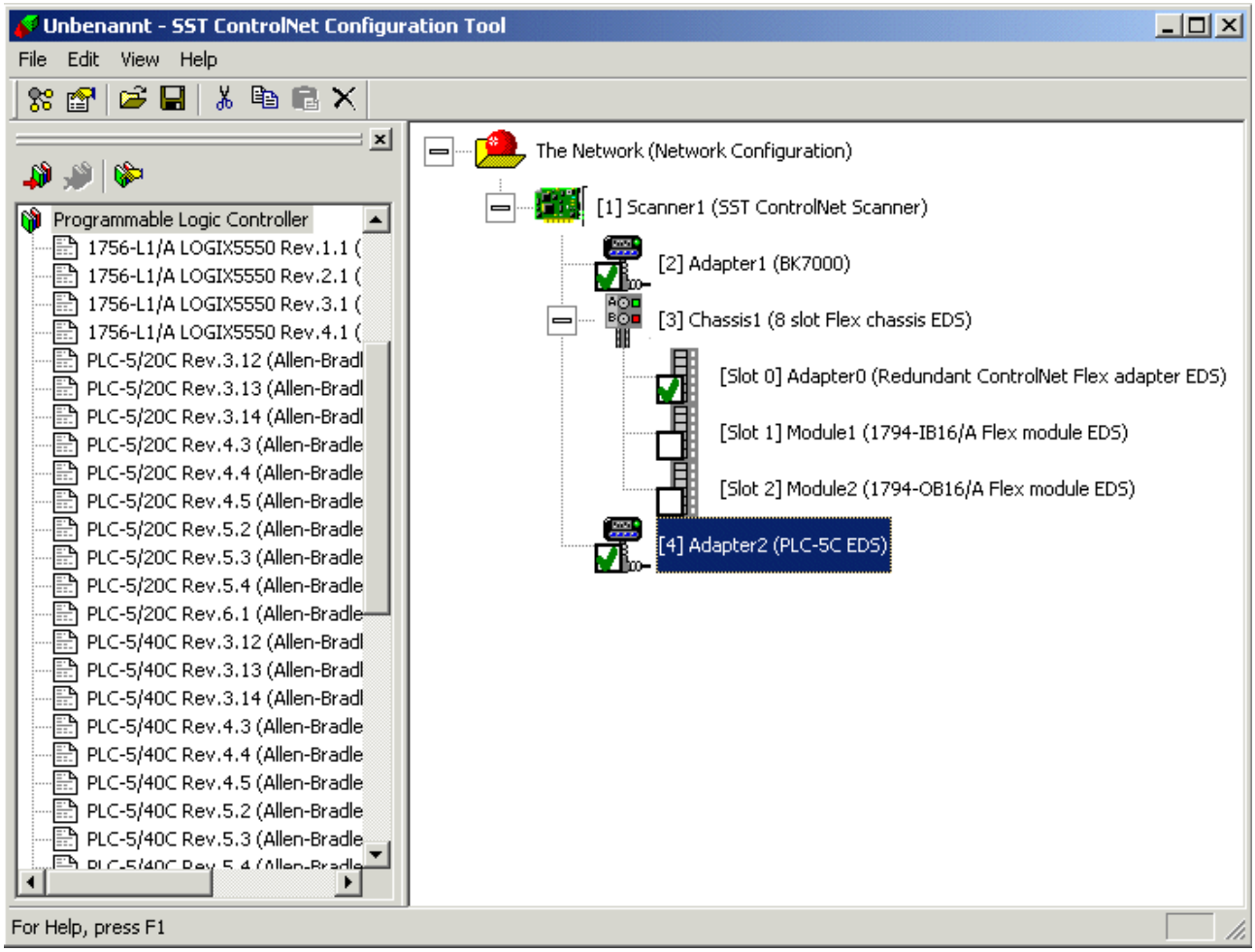


Double-clicking the Flex I/O adapter allows the "O=>T RPI" or "T=>O RPI" values to be set. These values must be greater than or equal to the network settings for the NUT interval.

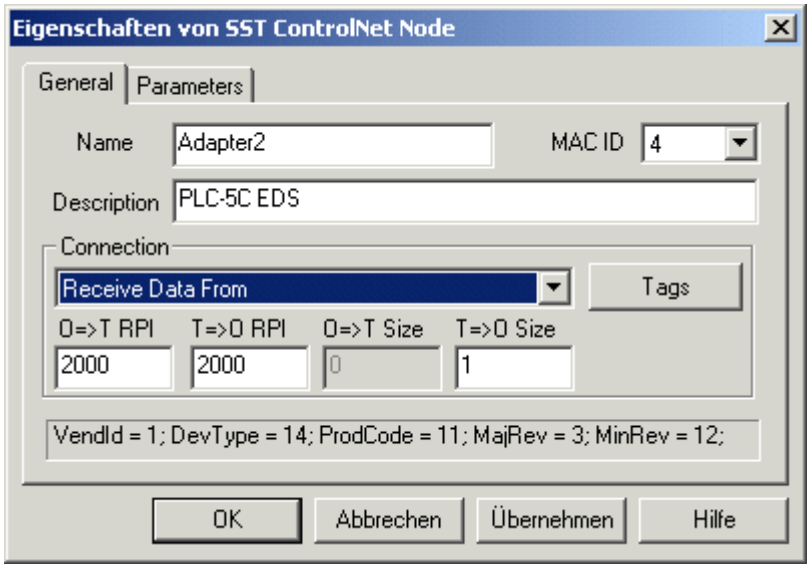


3.3 PLC 5 Configuration

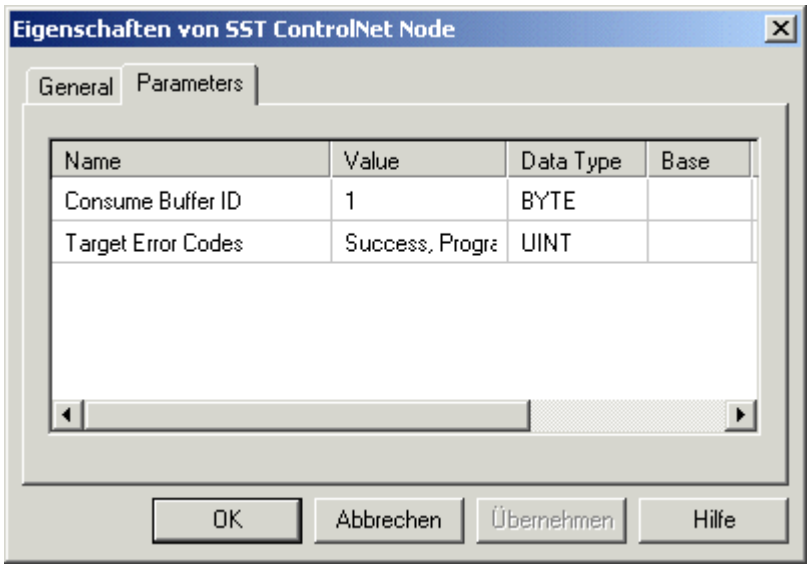
The appropriate PLC 5 is to be dragged with the left mouse button from the "Programmable Logic Controller" entry across to the scanner in the right-hand window. The PLC5 then appears in the right-hand window.



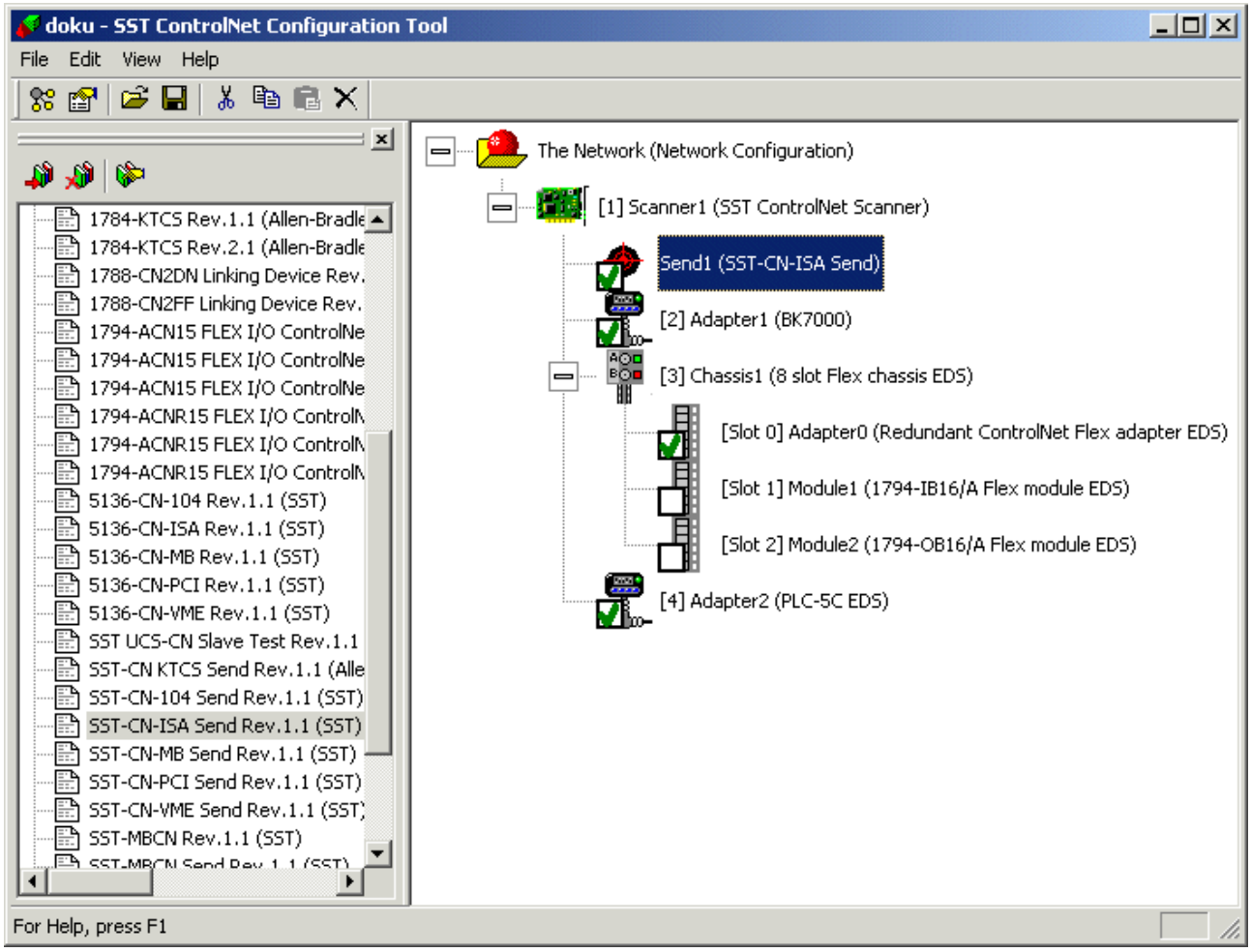
A double-click on the PLC 5 will bring up a dialog in which the "T=>O Size" (inputs, PLC 5 send data) in Words and, when appropriate, the Mac-ID and the "O=>T RPI" or the "T=>O RPI" can be set. These values must be greater than or equal to the network settings for the NUT interval.



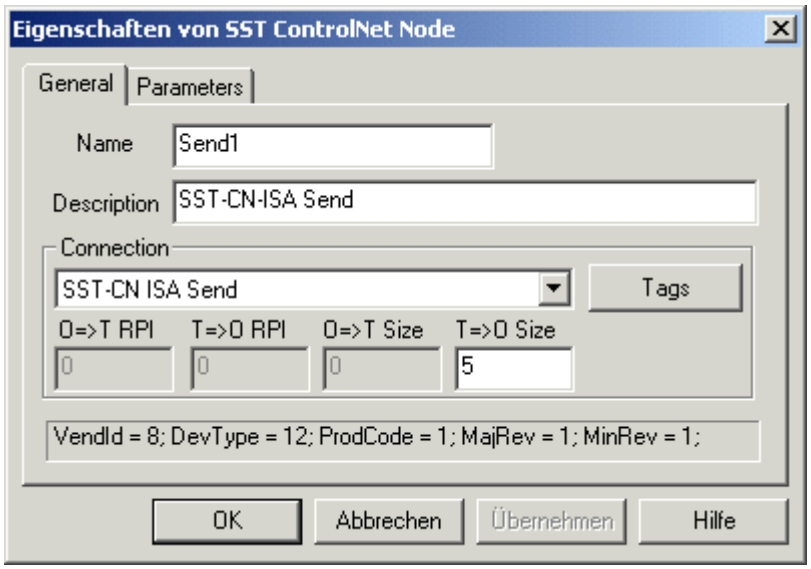
It is also possible for the Consume Buffer-ID to be set, under parameters. This must agree with the Produce Buffer ID set in the PLC 5.



The outputs (PLC 5 receive data) are added by dragging a 5136-CN send adapter from the "Communication Adapter" entry in the EDS library across to the scanner with the left mouse button.



Double-clicking on the send connection that has been inserted brings up a dialog in which the T=>O Size (outputs, PLC 5 receive data), is set.

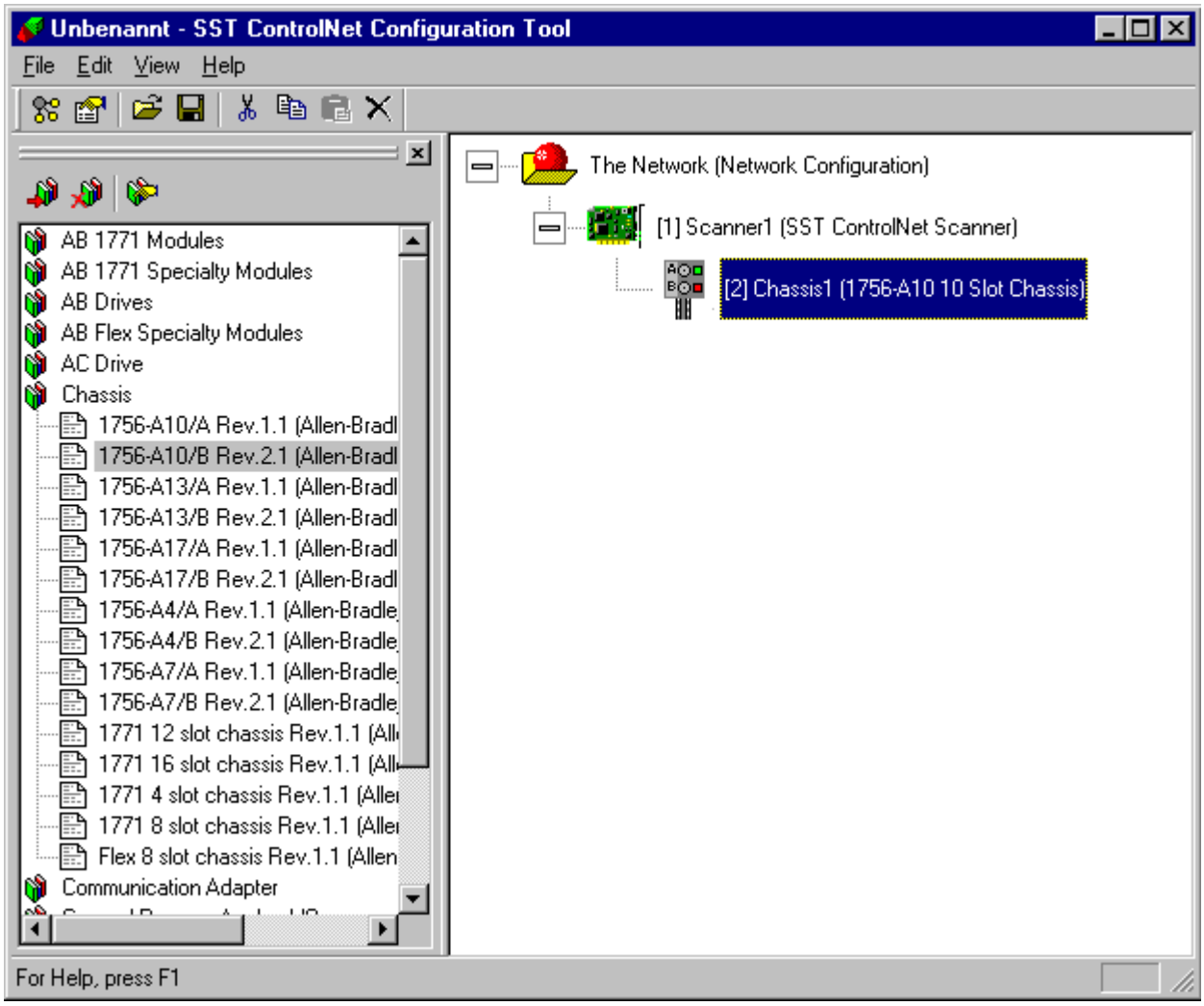


It is also possible for the Produce Buffer ID to be set, under parameters. This must agree with the Consume Buffer ID set in the PLC 5. **This Produce Buffer ID is also used for addressing the process data from TwinCAT (->** Process data [▶ 27] **send connection)**

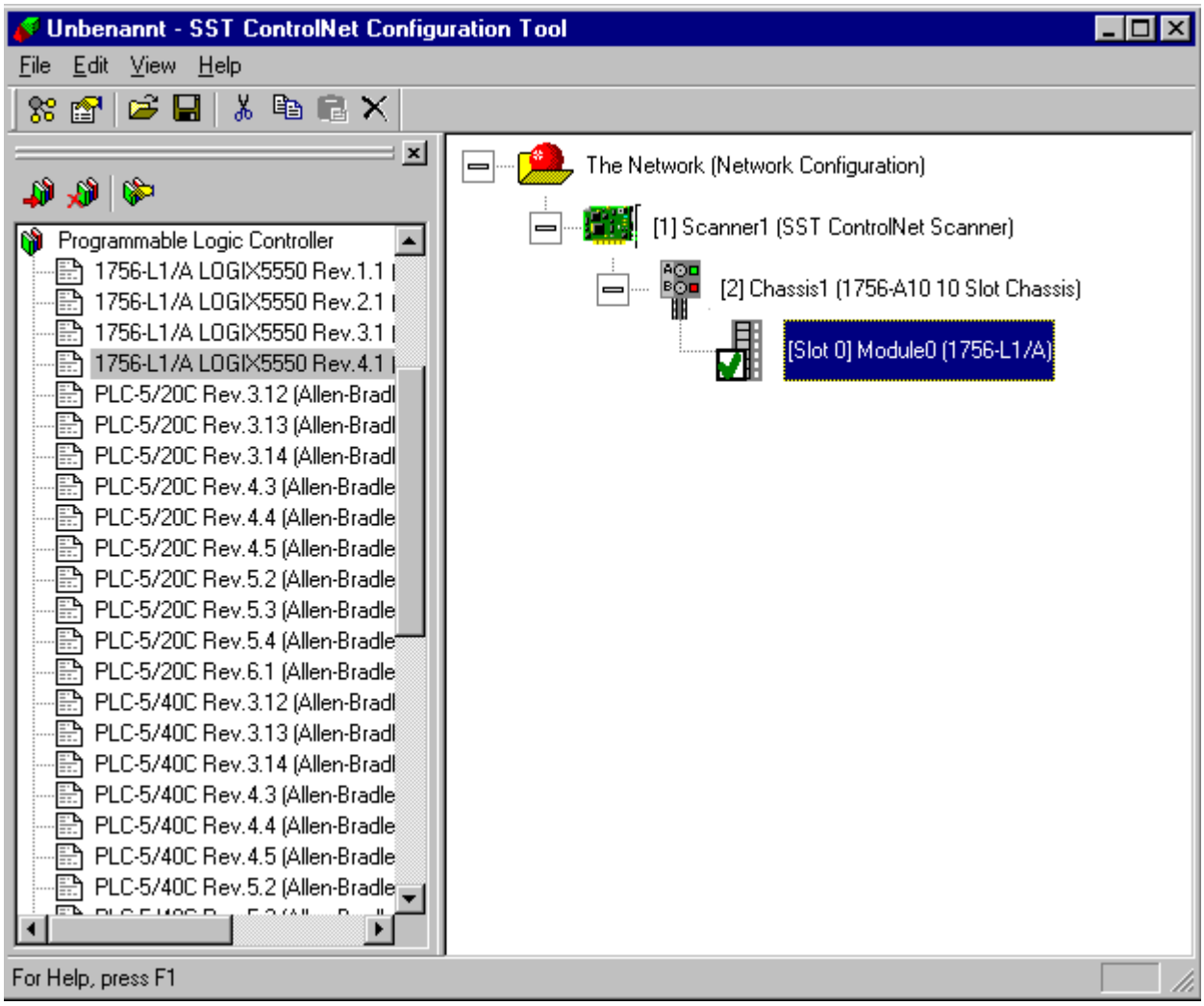
Please refer to the PDF file https://infosys.beckhoff.com/content/1033/tcsstcn/Resources/12495602443/.pdfhttps://infosys.beckhoff.com/content/1033/tcsstcn/Resources/12495602443/.pdf for the settings in RS Networx.

3.4 ControlLogix Configuration

The appropriate Control-Logix chassis is to be selected and dragged with the left mouse button from the "Chassis" entry across to the scanner in the right hand window. The Control-Logix chassis then appears in the right hand window.

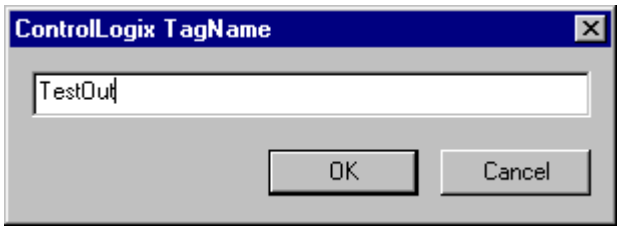


The appropriate Control-Logix CPU is to be dragged with the left mouse button from the "Programmable Logic Controller" entry across to the chassis in the right-hand window. The slot number of the CPU (not of the ControlNet interface) must be selected here. The Control-Logix CPU then appears in the right-hand window.

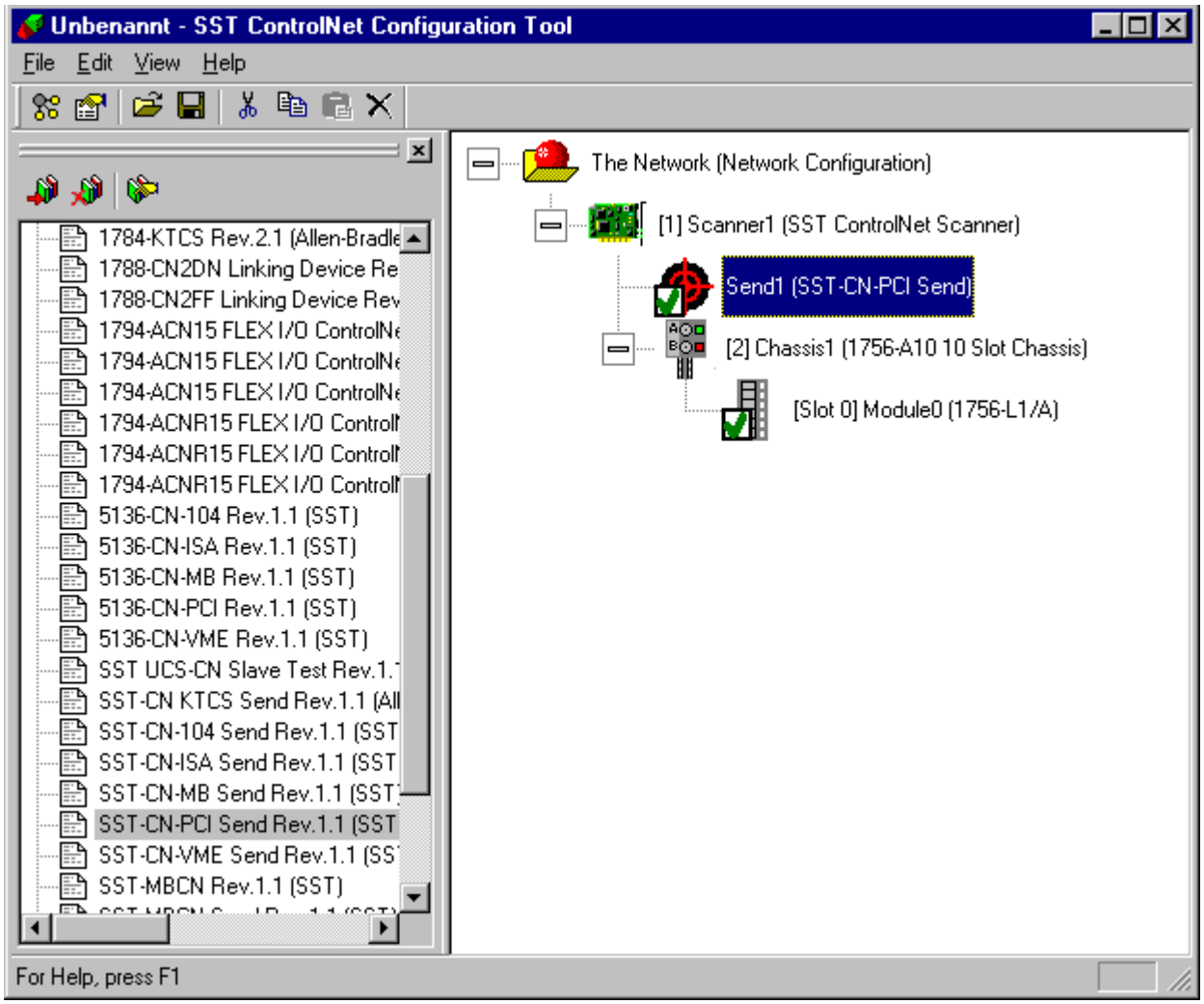


A double-click on the Control-Logix CPU will bring up a dialog in which the "T=>O Size" (inputs, Control-Logix send data (Producer must be clicked on the corresponding tag)) in Words and, when appropriate, the Mac-ID and the "O=>T RPI" or the "T=>O RPI" can be set. These values must be greater than or equal to the network settings for the NUT interval.

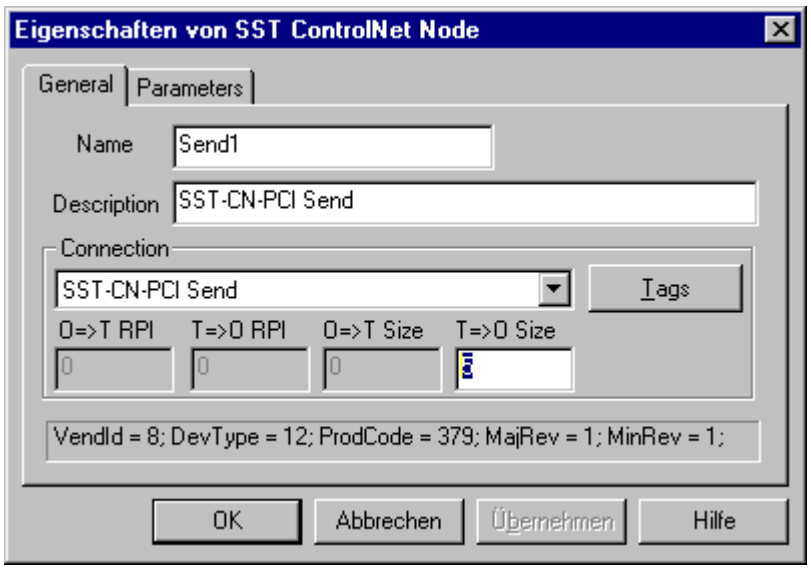
Under the "Control Logix Tag Name" button it is still necessary for the tag name of the corresponding Control-Logix output tag to be stated.



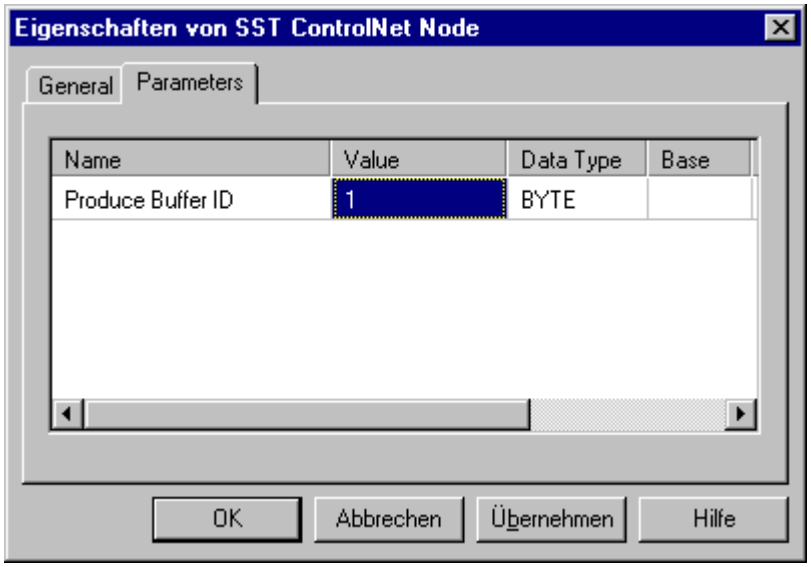
The outputs (Control-Logix receive data) are added by dragging a 5136-CN send adapter from the "Communication Adapter" entry in the EDS library across to the scanner with the left mouse button.



Double-clicking on the send connection that has been inserted brings up a dialog in which the T=>O Size (outputs, Control-Logix receive data (Consumed must be selected for the corresponding tag), is set.



It is also possible for the Produce Buffer ID to be set, under parameters. This must agree with the instance of the input tag set in the Control-Logix. **This Produce Buffer ID is also used for addressing the process data from TwinCAT (->** Process data [▶ 27] **send connection):**

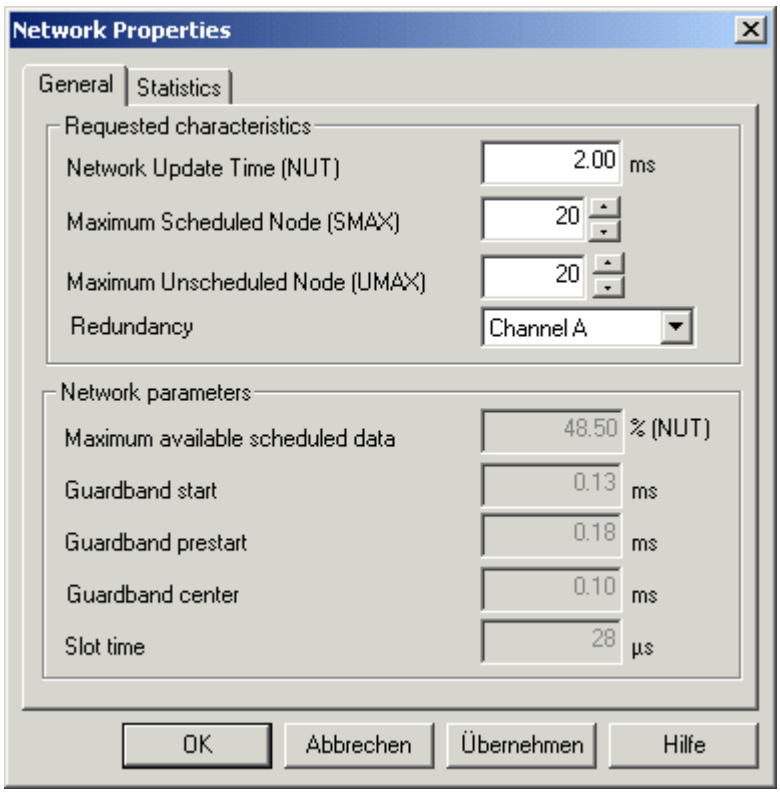


Please refer to the PDF file https://infosys.beckhoff.com/content/1033/tcsstcn/Resources/12495603851/.pdfhttps://infosys.beckhoff.com/content/1033/tcsstcn/Resources/12495602443/.pdf for the settings in RS Networx and in RS Logix 5000.

So that the ControlLogix establishes the send connection (the SST card is the producer, Control-Logix the consumer), the scheduling list must be loaded using RS Networx. This requires the network project to be developed offline in RS Networx and then downloaded. If it does not work, the PC should be rebooted, and the procedure repeated.

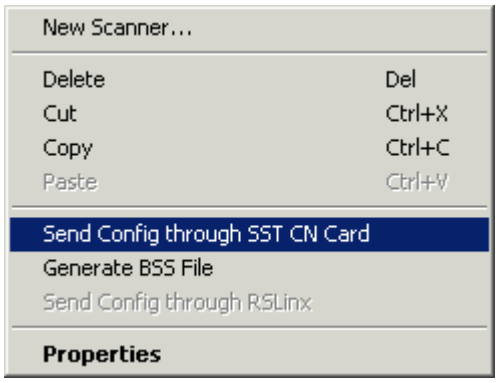
Network Configuration

Double-clicking on network configuration allows the NUT interval and the maximum scheduled and unscheduled Mac-IDs to be set.



Saving the Configuration on the 5136-CN PC Card

By clicking on the scanner in the right-hand window with the right mouse button, a pop-up menu appears, with which the current ControlNet configuration is saved on the 5136-CN PC card under "Send Config through SST CN Card".



4 ADS Interface

The various ControlNet services are represented through ADS-Read and ADS-Write. The Net-ID of the PC is to be given as the Net-ID, with 16000 as the port number. In the IndexGroup, the Mac-ID that is to be addressed (or the Produce Buffer-ID in the case of send connections (e.g. to a PLC5 or ControlLogix)) is to be given, along with the desired data. The IndexOffset specifies the offset within the data.

IndexGroup	Data
0x000000yy	Process data [▶ 27] I/O or receive connection (yy: Mac-ID)
0x000100yy	Process data [▶ 27] send connection (yy: Produce Buffer ID)
0x000001yy	ID_Object [▶ 28] (Read only, yy: Mac-ID)
0x000002yy	Diagnostic_Counter [▶ 28] (Read only, yy: Mac-ID)
0x000003yy	Keeper_Info [▶ 29] (Read only, yy: Mac-ID)
0x00000400	CCO_Directory [▶ 30] (Read only)
0x00000500	Card_State [▶ 30] (Read only)

If a 5136CN card is not found, the ADS-Error-Code 0x70C (Files, etc. not found) is returned. In the NT System32 directory there are also debug files named "sststartup.txt", "sstcyclic.txt" and "sstshutdown.txt". The last two only contain data after the TwinCAT system has been halted.

4.1 Process Data

If the scanner is not yet in its RUN state when process data is accessed (CCO Directory [▶ 30], offset 0x14), error code 0x0708 (Device not ready) is returned.

I/O Connection

An I/O connection is established to ControlNet adapters (e.g. BK7000, AB-Flex-I/O).

Receive Data (ADS Read Response)

Offset	Attributes
0x00	General status (0: ok, 1: error (Status of the connection [▶ 31])
0x01	reserved
0x02	Extended Status (0: ok, > 0: error (Status of the connection [▶ 31])
0x04	Update counter (is incremented by the sender whenever new data is transmitted)
0x06	Adapter status (is transmitted)
0x0A	Input data (see device description)

Send Data (ADS Write Request)

Offset	Attributes
0x00	Scanner status (is transmitted)
0x04	Output data (see device description)

Receive Connection

A receive connection is established to other ControlNet scanners (e.g. ControlLogix, PLC5).

Receive Data (ADS Read Response)

Offset	Attributes
0x00	General status (0: ok, 1: error (Status of the connection [▶ 31])

Offset	Attributes
0x01	reserved
0x02	Extended Status (0: ok, > 0: error (Status of the connection [▶ 31])
0x04	Update counter (is incremented by the sender whenever new data is transmitted)
0x06	Input data (see device description)

Send Connection

A send connection is established to other ControlNet scanners (e.g. ControlLogix, PLC5).

Send Data (ADS Write Request)

Offset	Attributes
0x00	Output data

Receive Data (ADS Read Response)

Offset	Attributes
0x00	General status (0: ok, 1: error (Status of the connection [▶ 31])
0x01	reserved
0x02	Extended Status (0: ok, > 0: error (Status of the connection [▶ 31])

4.2 ID Object

The following data is returned in the ADS read response when the ID object is read:

Offset	Attributes
0x00	Vendor-ID
0x02	Device-Type
0x04	Product-Code
0x06	Major-Revision
0x07	Minor-Revision
0x08	Status
0x0A	Serial-Number
0x0E	Length of the product name
0x10	Product-Name

4.3 Diagnostic Counter

The following data is returned in the ADS read response when reading the Diagnostic Counter (ControlNet Spec. Part 10, Section 240 "ControlNet Object", Table 10-223, Attribute ID 0x82):

Offset	Attributes
0x00	Number of Errors in Error-Log
0x02	Error-Log[8]
0x0A	Good Tx-Counter
0x0D	Good Rx-Counter
0x10	Framing-errors detected on active selected Channel
0x11	Framing-errors detected on Channel A
0x12	Framing-errors detected on Channel B

Offset	Attributes
0x13	Tx-Abort-Counter
0x14	LLC transmit underflow and LLC receive overflow
0x15	no unscheduled time in NUT
0x16	more scheduled data queued for one NUT than allowed by the SchedMaxFrame-parameter
0x17	single L_packet-size exceeds SchedMaxFrame-parameter
0x18	two or more nodes could not agree whose turn it is to transmit
0x19	Rx-Abort-Counter
0x1A	number of times nothing heard on the network for 8 or more NUTs
0x1B	Duplicate Node-Counter
0x1C	Noise-Hits-Counter
0x1D	Collision-Counter
0x1E	Mac ID of the current moderator node
0x1F	Moderator frames heard from non-lowman nodes
0x20	rogue events detected
0x21	MAC frames being heard but no no moderators being heard
0x22	Reserved

4.4 Keeper Info

The following data is returned in the ADS-Read-Response when the Keeper-Info (ControlNet-Spec. Part 10, Section 241) is read:

Offset	Attributes
0x00	Keeper-State (ControlNet-Spec. Part 10, Section 241, Table 10-229)
0x01	Reserved
	Current Network Parameters (ControlNet-Spec. Part 10, Section 241, Table 10-228, Attribute ID 255)
0x02	NUT-Interval
0x04	Maximum Scheduled Mac ID
0x05	Maximum Unscheduled Mac ID
0x06	Slot-Time
0x07	Blanking-Time
0x08	Guard Band Start
0x09	Guard Band Center
0x0A	Reserved
0x0C	Interval Count Modulus
0x0D	Guard Band Pre-Start
	current Table Unique Identifier (ControlNet-Spec. Part 10, Section 241, Table 10-228, Attribute ID 258)
0x0E	TUI-Unique ID
0x12	TUI-Status flag (ControlNet-Spec. Part 10, Section 241, Table 10-231)
0x14	MAC-Id of the node broadcasting the TUI
0x15	reserved
0x16	Vendor-Id of object holding the network resource
0x18	Serial Number of object holding the network resource
0x1C	Class of object holding the network resource
0x20	Instance of object holding the network resource

4.5 CCO Directory

The following data is returned in the ADS-Read-Response when the CCO directory is read:

Local scanner

Offset	Attributes
0x00	Revision
0x02	State (Bit 0: all I/O and scheduled receive connections are ok, Bit 8: all scheduled send messages are ok)
0x04	Maximum number of instances (127)
0x08	Number of instances currently configured
0x0C	Implementation defined revision
0x0E	Number of Scanner Instances (O-T)
0x10	Edit Signature for current CCO configuration
0x14	Current Scanner State (0: no connections are active,1: the scanner is in Prog-Mode, 2: the scanner is in Run-Mode)
0x16	Current Adapter State (0: all scheduled send messages are disabled, 1: scheduled sends are enabled)
0x18	Total size in bytes of all Tx Data
0x1A	Total size in bytes of all Rx Data
0x1C	Next available offset for variable length parameters
0x1E	CCO/Scheduling Object Options (Bit 0: ALLOW_CCO_BREAK_IN_RUN, Bit 1: DISALLOW_CCO_OPEN, Bit 8: ALLOW_SCHED_BREAK_IN_RUN, Bit 9: DISALLOW_SCHED_OPEN, Bit 10: ALLOW_SCHED_REMOTE_SET_PROG)
0x20	Schedule Object Connection Originator Password
0x24	Flags Indicating various CCO conditions (Bit 0: CCO_FLAG_RES_HELD)
0x26	Size of Implementation Defined Attribute (in bytes)
0x28	Scanner Global User Handle
0x2C	Adapter Global User Handle

Remote scanner

Offset	Attributes
0x00	Revision
0x02	Maximum number of instances (127)
0x06	Number of instances currently configured
0x0A	Format number
0x0C	Edit Signature for current CCO configuration

4.6 Card State

The following data is returned in the ADS-Read-Response when the status of the CN card is read (values that are OK are printed bold):

Offset	Attributes
0x00	Card-State: OFFLINE (0x41), **ONLINE** (0x42), FATAL ERROR (0xE1)
0x02	NAM-State: GO_OFFLINE (0x00), BAD (0x01), WAIT_FOR_OFFLINE (0x02), GO_ONLINE (0x03),

Offset	Attributes
	CHK_FOR_CABLE (0x04), WAIT_TO_ROGUE (0x05), WAIT_FOR_ONLINE (0x06), SEND_ALIVE (0x07), WATCH (0x08), LISTEN (0x09), **ATTACHED** (0x0C)
0x04	Reserved

4.7 Status of the Connection

When the process data is read, the status of the connection (both the General Status and the Extended Status) are returned in the first four bytes. The following values are possible here (in accordance with the ControlNet specification V2.0, Section 4.4):

Requirements

General Status	Extended Status	Meaning
0x00		Connection established, everything OK
0x01	0x0100	Connection already established
0x01	0x0103	Transport Class and trigger combination is not supported
0x01	0x0106	Owner conflict (e.g. if an attempt is made to use a second connection to access the outputs of the first)
0x01	0x0107	Connection not present
0x01	0x0108	Invalid Connection type
0x01	0x0109	Incorrect Connection Size
0x01	0x0110	Device not ready
0x01	0x0111	RPI supervision is not supported
0x01	0x0113	Maximum number of connections has been reached
0x01	0x0114	Vendor ID or Product Code in the Electronic Key do not agree
0x01	0x0115	Product type in the Electronic Key is not consistent
0x01	0x0116	Major or minor revision in the Electronic Key is not consistent
0x01	0x0117	Invalid Connection Point
0x01	0x0118	Invalid configuration format
0x01	0x0119	No Control connection available
0x01	0x011A	No further connection in the device's application
0x01	0x0203	Connection monitoring has activated, so connections can not be made
0x01	0x0204	Timeout during Unconnected Send
0x01	0x0205	Parameter error during Unconnected Send
0x01	0x0206	Data is too long for Unconnected Send
0x01	0x0301	No more memory available
0x01	0x0302	Network bandwidth not sufficient for this connection's data
0x01	0x0303	Screener no longer available
0x01	0x0304	Device can not send real time data
0x01	0x0311	Port in the Path Segment is not available
0x01	0x0312	Link address in the Path Segment is not available
0x01	0x0315	Incorrect segment type or segment value in the Path
0x01	0x0316	Path and Connection not consistent when closing the connection
0x01	0x0317	Segment not present, or Encoded Value in the Network Segment is invalid **(usually disappears after TwinCAT is restarted)**

General Status	Extended Status	Meaning
0x01	0x0318	Link address that points to the device itself is invalid
0x01	0x0319	Second Resource in a redundant system is not available
0x10	0x0206	Occurs in a Consumer connection to Control-Logix if the network project was not yet developed with RS Networx

5 ADS Return Codes

Grouping of error codes:
Global error codes: ADS Return Codes [▶ 33]... (0x9811_0000 ...)
Router error codes: ADS Return Codes [▶ 33]... (0x9811_0500 ...)
General ADS errors: ADS Return Codes [▶ 34]... (0x9811_0700 ...)
RTime error codes: ADS Return Codes [▶ 35]... (0x9811_1000 ...)

Global error codes

Hex	Dec	HRESULT	Name	Description
0x0	0	0x98110000	ERR_NOERROR	No error.
0x1	1	0x98110001	ERR_INTERNAL	Internal error.
0x2	2	0x98110002	ERR_NORTIME	No real time.
0x3	3	0x98110003	ERR_ALLOCLOCKEDMEM	Allocation locked – memory error.
0x4	4	0x98110004	ERR_INSERTMAILBOX	Mailbox full – the ADS message could not be sent. Reducing the number of ADS messages per cycle will help.
0x5	5	0x98110005	ERR_WRONGRECEIVEHMSG	Wrong HMSG.
0x6	6	0x98110006	ERR_TARGETPORTNOTFOUND	Target port not found – ADS server is not started or is not reachable.
0x7	7	0x98110007	ERR_TARGETMACHINENOTFOUND	Target computer not found – AMS route was not found.
0x8	8	0x98110008	ERR_UNKNOWNCMDID	Unknown command ID.
0x9	9	0x98110009	ERR_BADTASKID	Invalid task ID.
0xA	10	0x9811000A	ERR_NOIO	No IO.
0xB	11	0x9811000B	ERR_UNKNOWNAMSCMD	Unknown AMS command.
0xC	12	0x9811000C	ERR_WIN32ERROR	Win32 error.
0xD	13	0x9811000D	ERR_PORTNOTCONNECTED	Port not connected.
0xE	14	0x9811000E	ERR_INVALIDAMSLENGTH	Invalid AMS length.
0xF	15	0x9811000F	ERR_INVALIDAMSNETID	Invalid AMS Net ID.
0x10	16	0x98110010	ERR_LOWINSTLEVEL	Installation level is too low –TwinCAT 2 license error.
0x11	17	0x98110011	ERR_NODEBUGINTAVAILABLE	No debugging available.
0x12	18	0x98110012	ERR_PORTDISABLED	Port disabled – TwinCAT system service not started.
0x13	19	0x98110013	ERR_PORTALREADYCONNECTED	Port already connected.
0x14	20	0x98110014	ERR_AMSSYNC_W32ERROR	AMS Sync Win32 error.
0x15	21	0x98110015	ERR_AMSSYNC_TIMEOUT	AMS Sync Timeout.
0x16	22	0x98110016	ERR_AMSSYNC_AMSERROR	AMS Sync error.
0x17	23	0x98110017	ERR_AMSSYNC_NOINDEXINMAP	No index map for AMS Sync available.
0x18	24	0x98110018	ERR_INVALIDAMSPORT	Invalid AMS port.
0x19	25	0x98110019	ERR_NOMEMORY	No memory.
0x1A	26	0x9811001A	ERR_TCPSEND	TCP send error.
0x1B	27	0x9811001B	ERR_HOSTUNREACHABLE	Host unreachable.
0x1C	28	0x9811001C	ERR_INVALIDAMSFRAGMENT	Invalid AMS fragment.
0x1D	29	0x9811001D	ERR_TLSSEND	TLS send error – secure ADS connection failed.
0x1E	30	0x9811001E	ERR_ACCESSDENIED	Access denied – secure ADS access denied.

Router error codes

Hex	Dec	HRESULT	Name	Description
0x500	1280	0x98110500	ROUTERERR_NOLOCKEDMEMORY	Locked memory cannot be allocated.
0x501	1281	0x98110501	ROUTERERR_RESIZEMEMORY	The router memory size could not be changed.
0x502	1282	0x98110502	ROUTERERR_MAILBOXFULL	The mailbox has reached the maximum number of possible messages.
0x503	1283	0x98110503	ROUTERERR_DEBUGBOXFULL	The Debug mailbox has reached the maximum number of possible messages.
0x504	1284	0x98110504	ROUTERERR_UNKNOWNPORTTYPE	The port type is unknown.
0x505	1285	0x98110505	ROUTERERR_NOTINITIALIZED	The router is not initialized.
0x506	1286	0x98110506	ROUTERERR_PORTALREADYINUSE	The port number is already assigned.

Hex	Dec	HRESULT	Name	Description
0x507	1287	0x98110507	ROUTERERR_NOTREGISTERED	The port is not registered.
0x508	1288	0x98110508	ROUTERERR_NOMOREQUEUES	The maximum number of ports has been reached.
0x509	1289	0x98110509	ROUTERERR_INVALIDPORT	The port is invalid.
0x50A	1290	0x9811050A	ROUTERERR_NOTACTIVATED	The router is not active.
0x50B	1291	0x9811050B	ROUTERERR_FRAGMENTBOXFULL	The mailbox has reached the maximum number for fragmented messages.
0x50C	1292	0x9811050C	ROUTERERR_FRAGMENTTIMEOUT	A fragment timeout has occurred.
0x50D	1293	0x9811050D	ROUTERERR_TOBEREMOVED	The port is removed.

General ADS error codes

Hex	Dec	HRESULT	Name	Description
0x700	1792	0x98110700	ADSERR_DEVICE_ERROR	General device error.
0x701	1793	0x98110701	ADSERR_DEVICE_SRVNOTSUPP	Service is not supported by the server.
0x702	1794	0x98110702	ADSERR_DEVICE_INVALIDGRP	Invalid index group.
0x703	1795	0x98110703	ADSERR_DEVICE_INVALIDOFFSET	Invalid index offset.
0x704	1796	0x98110704	ADSERR_DEVICE_INVALIDACCESS	Reading or writing not permitted.
0x705	1797	0x98110705	ADSERR_DEVICE_INVALIDSIZE	Parameter size not correct.
0x706	1798	0x98110706	ADSERR_DEVICE_INVALIDDATA	Invalid data values.
0x707	1799	0x98110707	ADSERR_DEVICE_NOTREADY	Device is not ready to operate.
0x708	1800	0x98110708	ADSERR_DEVICE_BUSY	Device is busy.
0x709	1801	0x98110709	ADSERR_DEVICE_INVALIDCONTEXT	Invalid operating system context. This can result from use of ADS blocks in different tasks. It may be possible to resolve this through multitasking synchronization in the PLC.
0x70A	1802	0x9811070A	ADSERR_DEVICE_NOMEMORY	Insufficient memory.
0x70B	1803	0x9811070B	ADSERR_DEVICE_INVALIDPARM	Invalid parameter values.
0x70C	1804	0x9811070C	ADSERR_DEVICE_NOTFOUND	Not found (files, ...).
0x70D	1805	0x9811070D	ADSERR_DEVICE_SYNTAX	Syntax error in file or command.
0x70E	1806	0x9811070E	ADSERR_DEVICE_INCOMPATIBLE	Objects do not match.
0x70F	1807	0x9811070F	ADSERR_DEVICE_EXISTS	Object already exists.
0x710	1808	0x98110710	ADSERR_DEVICE_SYMBOLNOTFOUND	Symbol not found.
0x711	1809	0x98110711	ADSERR_DEVICE_SYMBOLVERSIONINVALID	Invalid symbol version. This can occur due to an online change. Create a new handle.
0x712	1810	0x98110712	ADSERR_DEVICE_INVALIDSTATE	Device (server) is in invalid state.
0x713	1811	0x98110713	ADSERR_DEVICE_TRANSMODENOTSUPP	AdsTransMode not supported.
0x714	1812	0x98110714	ADSERR_DEVICE_NOTIFYHNDINVALID	Notification handle is invalid.
0x715	1813	0x98110715	ADSERR_DEVICE_CLIENTUNKNOWN	Notification client not registered.
0x716	1814	0x98110716	ADSERR_DEVICE_NOMOREHDLS	No further handle available.
0x717	1815	0x98110717	ADSERR_DEVICE_INVALIDWATCHSIZE	Notification size too large.
0x718	1816	0x98110718	ADSERR_DEVICE_NOTINIT	Device not initialized.
0x719	1817	0x98110719	ADSERR_DEVICE_TIMEOUT	Device has a timeout.
0x71A	1818	0x9811071A	ADSERR_DEVICE_NOINTERFACE	Interface query failed.
0x71B	1819	0x9811071B	ADSERR_DEVICE_INVALIDINTERFACE	Wrong interface requested.
0x71C	1820	0x9811071C	ADSERR_DEVICE_INVALIDCLSID	Class ID is invalid.
0x71D	1821	0x9811071D	ADSERR_DEVICE_INVALIDOBJID	Object ID is invalid.
0x71E	1822	0x9811071E	ADSERR_DEVICE_PENDING	Request pending.
0x71F	1823	0x9811071F	ADSERR_DEVICE_ABORTED	Request is aborted.
0x720	1824	0x98110720	ADSERR_DEVICE_WARNING	Signal warning.
0x721	1825	0x98110721	ADSERR_DEVICE_INVALIDARRAYIDX	Invalid array index.
0x722	1826	0x98110722	ADSERR_DEVICE_SYMBOLNOTACTIVE	Symbol not active.
0x723	1827	0x98110723	ADSERR_DEVICE_ACCESSDENIED	Access denied.
0x724	1828	0x98110724	ADSERR_DEVICE_LICENSENOTFOUND	Missing license.
0x725	1829	0x98110725	ADSERR_DEVICE_LICENSEEXPIRED	License expired.
0x726	1830	0x98110726	ADSERR_DEVICE_LICENSEEXCEEDED	License exceeded.
0x727	1831	0x98110727	ADSERR_DEVICE_LICENSEINVALID	Invalid license.
0x728	1832	0x98110728	ADSERR_DEVICE_LICENSESYSTEMID	License problem: System ID is invalid.
0x729	1833	0x98110729	ADSERR_DEVICE_LICENSENOTIMELIMIT	License not limited in time.
0x72A	1834	0x9811072A	ADSERR_DEVICE_LICENSEFUTUREISSUE	Licensing problem: time in the future.
0x72B	1835	0x9811072B	ADSERR_DEVICE_LICENSETIMETOLONG	License period too long.

Hex	Dec	HRESULT	Name	Description
0x72C	1836	0x9811072C	ADSERR_DEVICE_EXCEPTION	Exception at system startup.
0x72D	1837	0x9811072D	ADSERR_DEVICE_LICENSEDUPLICATED	License file read twice.
0x72E	1838	0x9811072E	ADSERR_DEVICE_SIGNATUREINVALID	Invalid signature.
0x72F	1839	0x9811072F	ADSERR_DEVICE_CERTIFICATEINVALID	Invalid certificate.
0x730	1840	0x98110730	ADSERR_DEVICE_LICENSEOEMNOTFOUND	Public key not known from OEM.
0x731	1841	0x98110731	ADSERR_DEVICE_LICENSERESTRICTED	License not valid for this system ID.
0x732	1842	0x98110732	ADSERR_DEVICE_LICENSEDEMODENIED	Demo license prohibited.
0x733	1843	0x98110733	ADSERR_DEVICE_INVALIDFNCID	Invalid function ID.
0x734	1844	0x98110734	ADSERR_DEVICE_OUTOFRANGE	Outside the valid range.
0x735	1845	0x98110735	ADSERR_DEVICE_INVALIDALIGNMENT	Invalid alignment.
0x736	1846	0x98110736	ADSERR_DEVICE_LICENSEPLATFORM	Invalid platform level.
0x737	1847	0x98110737	ADSERR_DEVICE_FORWARD_PL	Context – forward to passive level.
0x738	1848	0x98110738	ADSERR_DEVICE_FORWARD_DL	Context – forward to dispatch level.
0x739	1849	0x98110739	ADSERR_DEVICE_FORWARD_RT	Context – forward to real time.
0x740	1856	0x98110740	ADSERR_CLIENT_ERROR	Client error.
0x741	1857	0x98110741	ADSERR_CLIENT_INVALIDPARM	Service contains an invalid parameter.
0x742	1858	0x98110742	ADSERR_CLIENT_LISTEMPTY	Polling list is empty.
0x743	1859	0x98110743	ADSERR_CLIENT_VARUSED	Var connection already in use.
0x744	1860	0x98110744	ADSERR_CLIENT_DUPLINVOKEID	The called ID is already in use.
0x745	1861	0x98110745	ADSERR_CLIENT_SYNCTIMEOUT	Timeout has occurred – the remote terminal is not responding in the specified ADS timeout. The route setting of the remote terminal may be configured incorrectly.
0x746	1862	0x98110746	ADSERR_CLIENT_W32ERROR	Error in Win32 subsystem.
0x747	1863	0x98110747	ADSERR_CLIENT_TIMEOUTINVALID	Invalid client timeout value.
0x748	1864	0x98110748	ADSERR_CLIENT_PORTNOTOPEN	Port not open.
0x749	1865	0x98110749	ADSERR_CLIENT_NOAMSADDR	No AMS address.
0x750	1872	0x98110750	ADSERR_CLIENT_SYNCINTERNAL	Internal error in Ads sync.
0x751	1873	0x98110751	ADSERR_CLIENT_ADDHASH	Hash table overflow.
0x752	1874	0x98110752	ADSERR_CLIENT_REMOVEHASH	Key not found in the table.
0x753	1875	0x98110753	ADSERR_CLIENT_NOMORESYM	No symbols in the cache.
0x754	1876	0x98110754	ADSERR_CLIENT_SYNCRESINVALID	Invalid response received.
0x755	1877	0x98110755	ADSERR_CLIENT_SYNCPORTLOCKED	Sync Port is locked.

RTime error codes

Hex	Dec	HRESULT	Name	Description
0x1000	4096	0x98111000	RTERR_INTERNAL	Internal error in the real-time system.
0x1001	4097	0x98111001	RTERR_BADTIMERPERIODS	Timer value is not valid.
0x1002	4098	0x98111002	RTERR_INVALIDTASKPTR	Task pointer has the invalid value 0 (zero).
0x1003	4099	0x98111003	RTERR_INVALIDSTACKPTR	Stack pointer has the invalid value 0 (zero).
0x1004	4100	0x98111004	RTERR_PRIOEXISTS	The request task priority is already assigned.
0x1005	4101	0x98111005	RTERR_NOMORETCB	No free TCB (Task Control Block) available. The maximum number of TCBs is 64.
0x1006	4102	0x98111006	RTERR_NOMORESEMAS	No free semaphores available. The maximum number of semaphores is 64.
0x1007	4103	0x98111007	RTERR_NOMOREQUEUES	No free space available in the queue. The maximum number of positions in the queue is 64.
0x100D	4109	0x9811100D	RTERR_EXTIRQALREADYDEF	An external synchronization interrupt is already applied.
0x100E	4110	0x9811100E	RTERR_EXTIRQNOTDEF	No external sync interrupt applied.
0x100F	4111	0x9811100F	RTERR_EXTIRQINSTALLFAILED	Application of the external synchronization interrupt has failed.
0x1010	4112	0x98111010	RTERR_IRQLNOTLESSOREQUAL	Call of a service function in the wrong context
0x1017	4119	0x98111017	RTERR_VMXNOTSUPPORTED	Intel VT-x extension is not supported.
0x1018	4120	0x98111018	RTERR_VMXDISABLED	Intel VT-x extension is not enabled in the BIOS.
0x1019	4121	0x98111019	RTERR_VMXCONTROLSMISSING	Missing function in Intel VT-x extension.
0x101A	4122	0x9811101A	RTERR_VMXENABLEFAILS	Activation of Intel VT-x fails.

Specific positive HRESULT Return Codes:

HRESULT	Name	Description
0x0000_0000	S_OK	No error.
0x0000_0001	S_FALSE	No error. Example: successful processing, but with a negative or incomplete result.
0x0000_0203	S_PENDING	No error. Example: successful processing, but no result is available yet.
0x0000_0256	S_WATCHDOG_TIMEOUT	No error. Example: successful processing, but a timeout occurred.

TCP Winsock error codes

Hex	Dec	Name	Description
0x274C	10060	WSAETIMEDOUT	A connection timeout has occurred - error while establishing the connection, because the remote terminal did not respond properly after a certain period of time, or the established connection could not be maintained because the connected host did not respond.
0x274D	10061	WSAECONNREFUSED	Connection refused - no connection could be established because the target computer has explicitly rejected it. This error usually results from an attempt to connect to a service that is inactive on the external host, that is, a service for which no server application is running.
0x2751	10065	WSAEHOSTUNREACH	No route to host - a socket operation referred to an unavailable host.
More Winsock error codes: Win32 error codes			

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