

Beckhoff AX5000: Homing**Probe Unit function**

A probe unit is a hardware-oriented functional group that can store the current axis position for a parameterisable event. The event may be an edge of a digital input in the drive, for example. The position is stored immediately without significant delay for subsequent evaluation by the control system.

The probe unit of the drive can be used for event-driven position sensing through the application program (*MC_TouchProbe*), or for registering a reference position during homing (*MC_Home*) if the NC referencing mode is set to *hardware latch*.

In any case, the probe unit has to be parameterised before it can be used. The following parameterisation description refers to an AX5000 drive (SoE), although it can also be used more generally for the parameterisation of a SERCOS drive.

Parameter overview**SERCOS parameters**

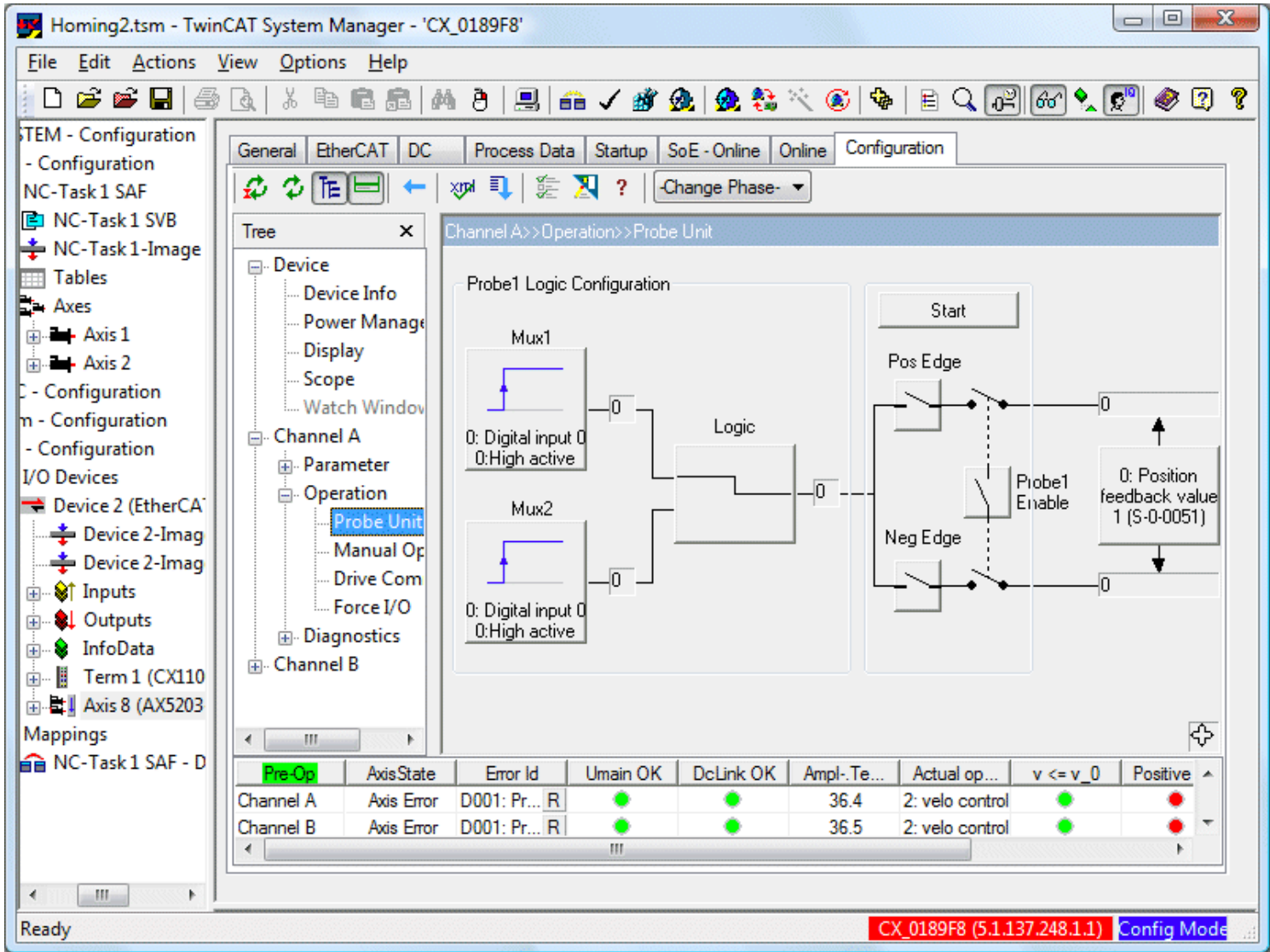
Parameter	Value	EtherCAT transition (startup)	Description
S-0-0303	405	P -> S	Allocation of real-time Control bit 2
S-0-0307	409 or 410	P -> S	Allocation of real-time Status bit 2
S-0-0169	1, 2, 3	P -> S	Probe control parameter
S-0-0170	3	S -> O	Probing cycle procedure command

Process data - cyclic data between drive and NC axis

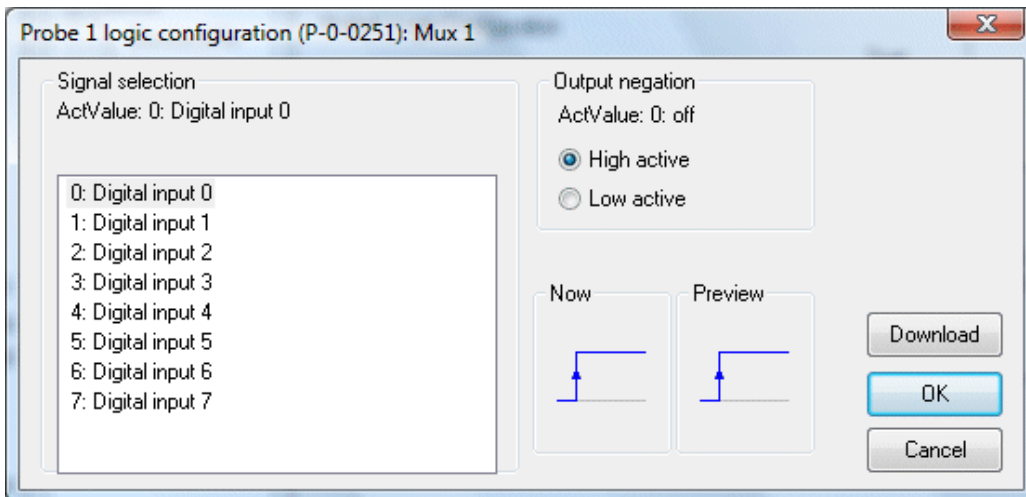
Parameter	Description
S-0-0130	Probe value positive edge
S-0-0131	Probe value negative edge

Probe unit parameterisation

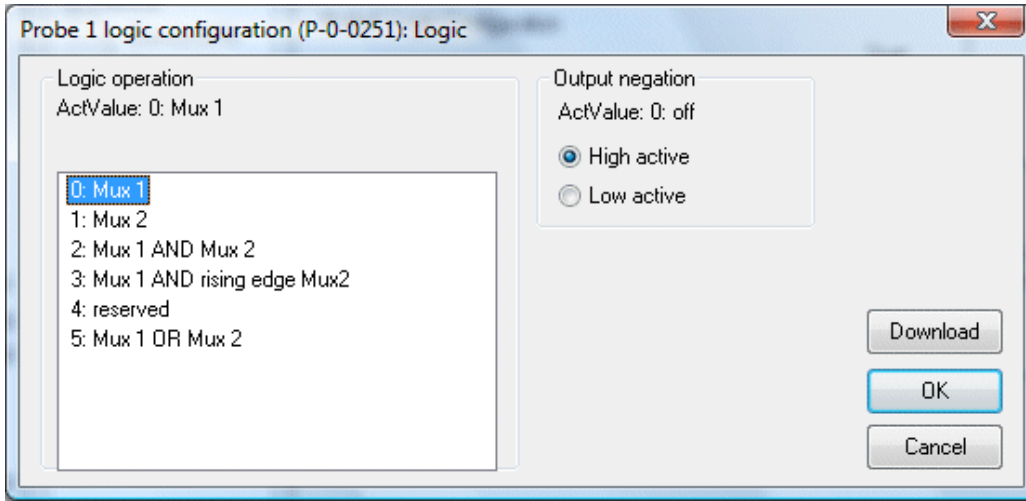
The probe unit is controlled via an AX5000 configuration dialog. In multi-channel devices a probe unit is available for each channel.



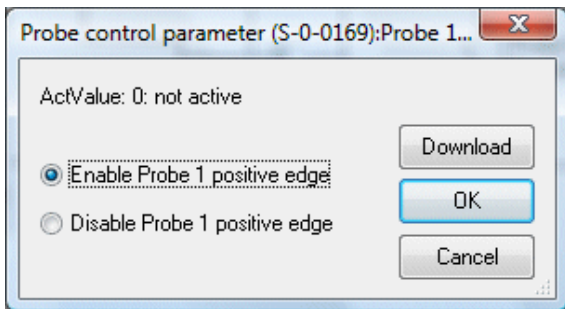
In the first step a signal source (*Mux1*) for triggering the probe unit is selected. Digital drive inputs 0 to 7 are available for selection. To parameterise the probe unit for homing with evaluation of the encoder zero track, select *Mux 2*, which is the only option offering *reference signal feedback*.



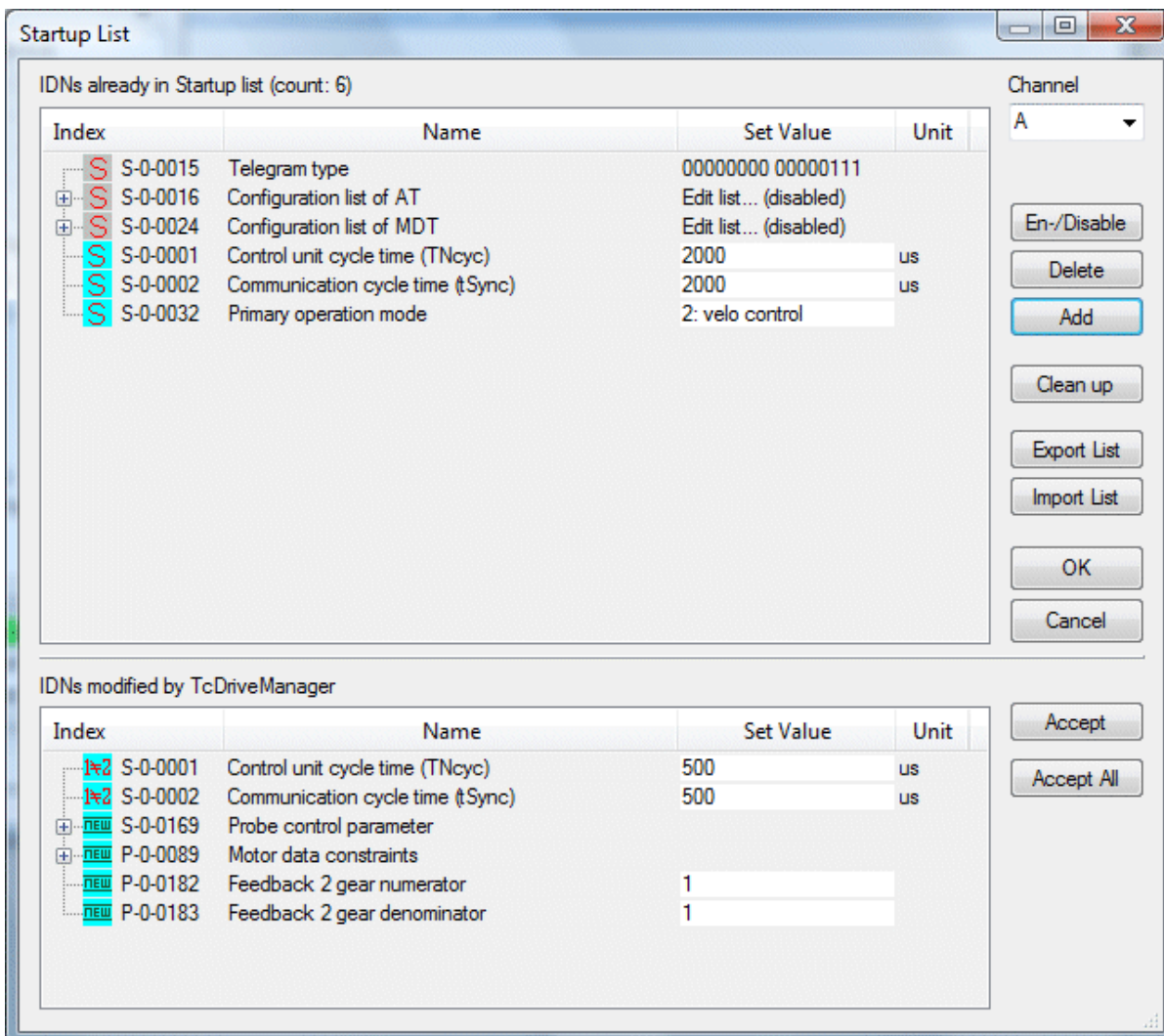
The trigger signal can be linked with a further signal source (*Mux 2*). In the simplest case only one signal source is used, and the linkage *logic* is set accordingly.



A signal parameter determines whether the positive or negative signal edge is evaluated (*Pos Edge* or *Neg Edge*). The decision to use a particular signal edge is therefore made during drive parameterisation and cannot be made later in the control program.



The modifications entered during these initial configuration steps can be stored in the startup list for the drive, so that they are transferred to the drive on system startup. In the *Startup List* dialog save the modified parameters by clicking *Accept All* and or exit the dialog with *OK*.

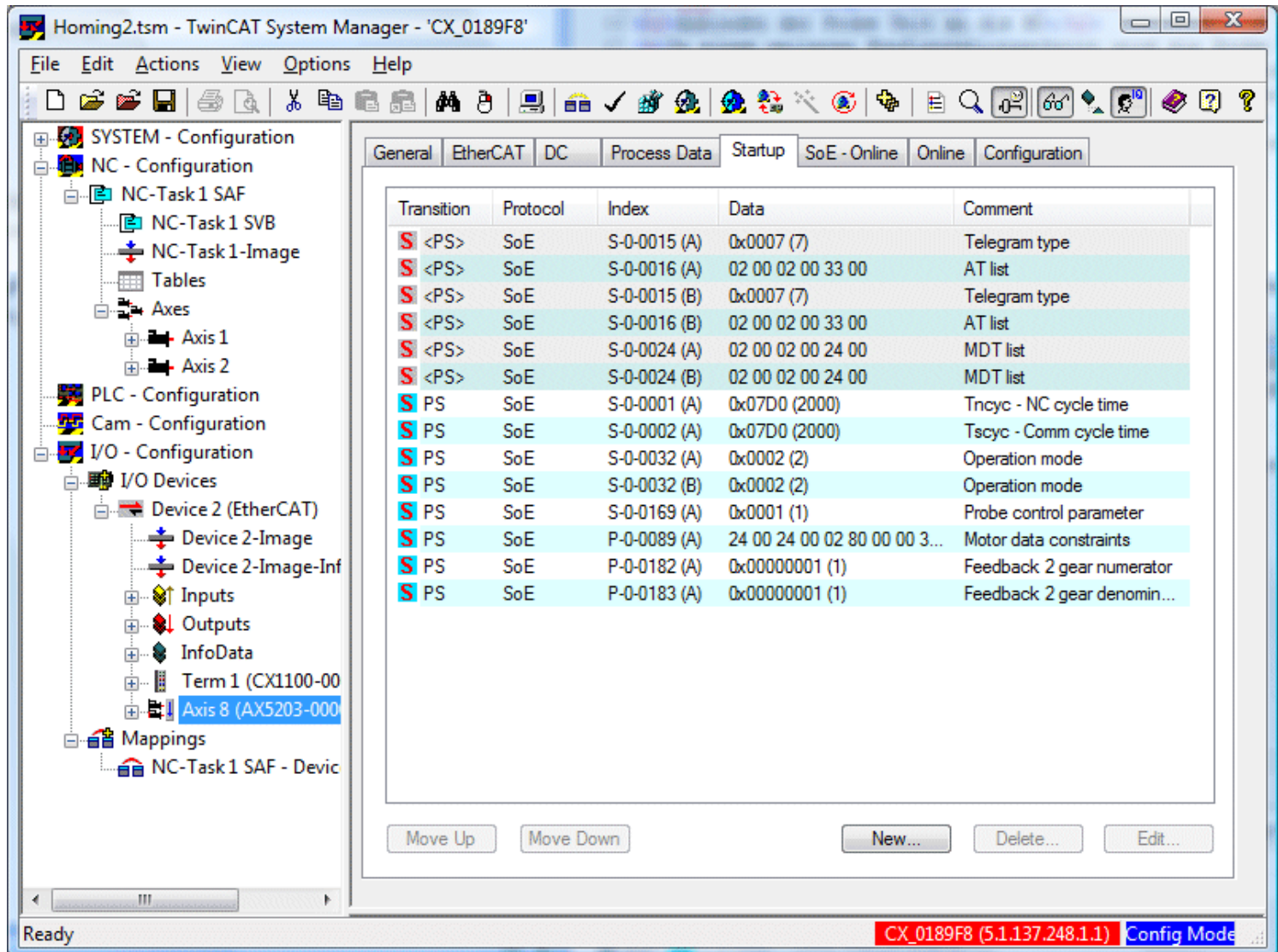


Linking the probe unit with the NC

In a further configuration step the probe unit for the drive is linked with the NC controller. The control system operates the probe unit via the SERCOS real-time bits in the master control word and the drive status word and retrieves the latch position from the drive process data.

Startup list

To configure the real-time bits the drive startup list is extended (New...).



To enable activation of the probe unit set S-0-0303 to 405 (95 01).

Edit SERCOS Startup Entry

Transition: I → P P → S S → 0

Disable Entry

IDN: S-0-0303

Channel: A

Validate

OK Cancel

Data (bin): 95 01

Validate Mask:

Comment: Allocation of real-time control bit 2

IDN	Name	Unit	Value
S-0-0267	Password	--	*****
S-0-0273	Maximum drive off delay time	ms	10000
S-0-0274	Received drive addresses	--	(list)
S-0-0292	List of supported operation modes	--	(list)
S-0-0295	Drive enable delay time	ms	0
S-0-0296	Velocity feed forward gain	%	100.00
S-0-0301	Allocation of real-time control bit 1	--	S-0-0000
S-0-0303	Allocation of real-time control bit 2	--	S-0-0405
S-0-0305	Allocation of real-time status bit 1	--	S-0-0000
S-0-0307	Allocation of real-time status bit 2	--	S-0-0409
S-0-0347	Velocity error	inc/(1...	-1024
S-0-0372	Drive Halt acceleration bipolar	rad/s ²	6283.18
S-0-0374	Procedure command error list	--	(list)
S-0-0375	Diagnostic numbers list	--	(list)
S-0-0380	DC bus voltage	V	290.0

The drive response is signalled in a status bit. To this end S-0-0307 is set to 409 (99 01) for a positive signal edge and 410 (9A 01) for a negative signal edge.

Edit SERCOS Startup Entry

Transition: I → P P → S S → 0

Disable Entry

IDN: S-0-0307

Channel: A

Validate

OK Cancel

Data (bin): 99 01

Validate Mask:

Comment: Allocation of real-time status bit 2

IDN	Name	Unit	Value
S-0-0267	Password	--	*****
S-0-0273	Maximum drive off delay time	ms	10000
S-0-0274	Received drive addresses	--	(list)
S-0-0292	List of supported operation modes	--	(list)
S-0-0295	Drive enable delay time	ms	0
S-0-0296	Velocity feed forward gain	%	100.00
S-0-0301	Allocation of real-time control bit 1	--	S-0-0000
S-0-0303	Allocation of real-time control bit 2	--	S-0-0405
S-0-0305	Allocation of real-time status bit 1	--	S-0-0000
S-0-0307	Allocation of real-time status bit 2	--	S-0-0409
S-0-0347	Velocity error	inc/(1...	-1024
S-0-0372	Drive Halt acceleration bipolar	rad/s ²	6283.18
S-0-0374	Procedure command error list	--	(list)
S-0-0375	Diagnostic numbers list	--	(list)
S-0-0380	DC bus voltage	V	290.0

Finally the probe unit function must be activated. This can be achieved by setting the command S-0-0170 to 3 during startup.

Please note that the drive only accepts this value during the EtherCAT transition S->O.

Edit SERCOS Startup Entry

Transition: I -> P P -> S S -> O

Disable Entry

IDN: S-0-0170

Channel: A

Validate

OK Cancel

Data (bin): 03 00

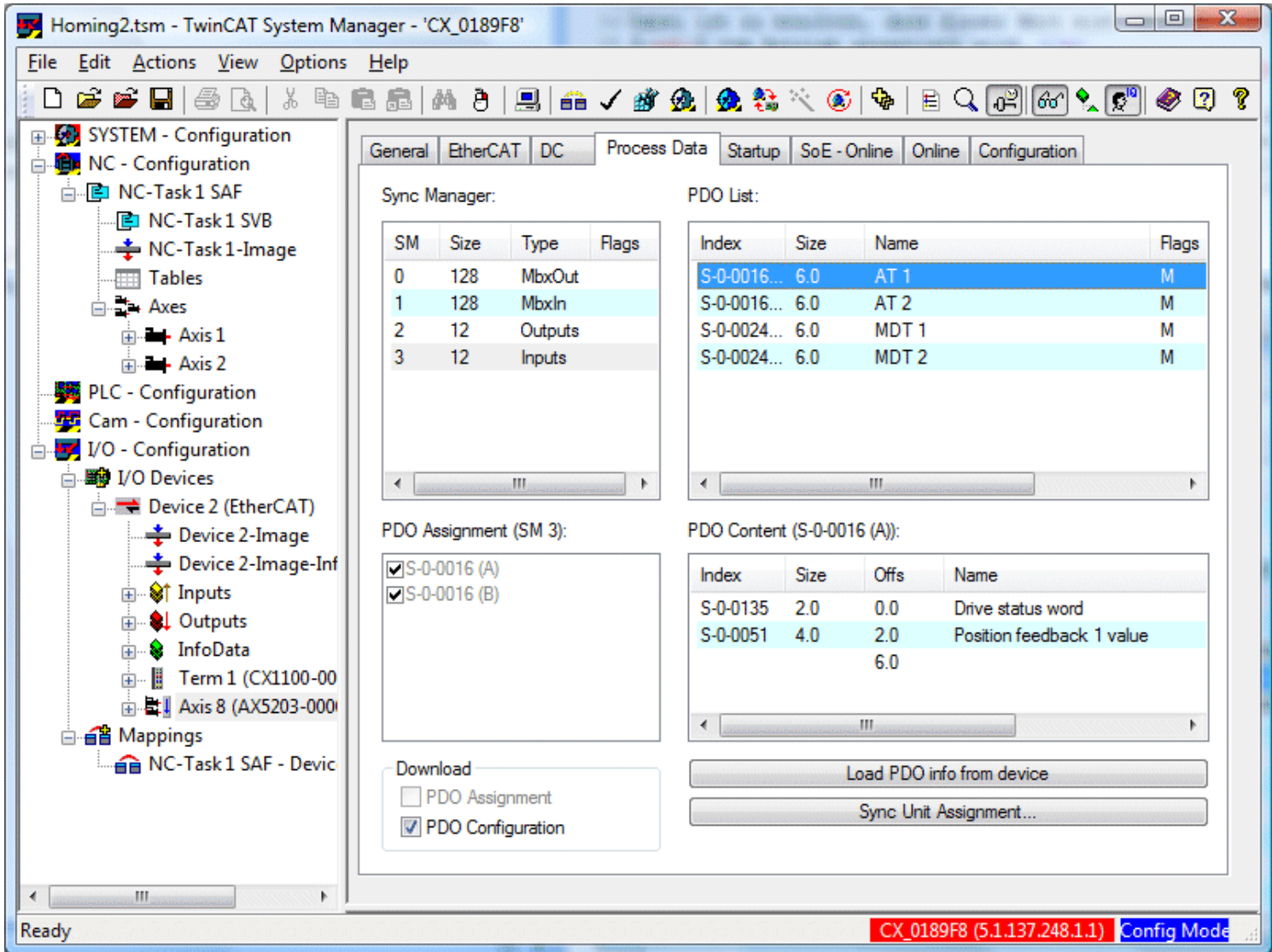
Validate Mask:

Comment: Probing cycle procedure command (pc)

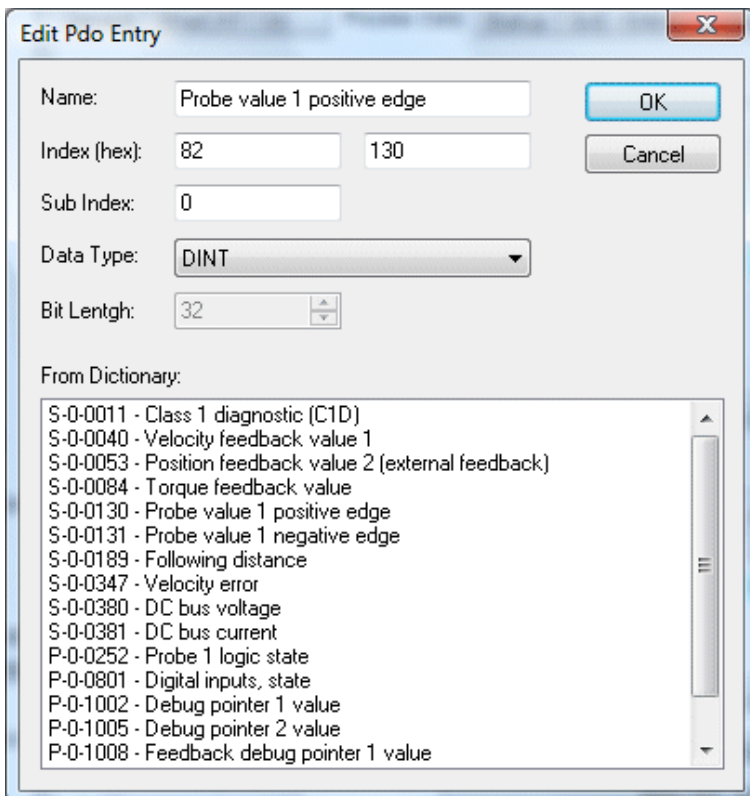
IDN	Name	Unit	Value
S-0-0137	Negative acceleration limit value	rad/s ²	6283.18
S-0-0143	Sercos interface version	--	V02.03
S-0-0159	Monitoring window	inc	50.00
S-0-0160	Acceleration data scaling type	--	00000000 00001010
S-0-0161	Acceleration data scaling factor	--	1
S-0-0162	Acceleration data scaling exponent	--	-2
S-0-0169	Probe control parameter	--	00000000 00000011
S-0-0170	Probing cycle procedure command (pc)	--	00000000 00000011
S-0-0179	Probe status	--	00000000 00000000
S-0-0185	Length of the configurable data recor...	byte	20
S-0-0186	Length of the configurable data recor...	byte	12
S-0-0187	IDN-list of configurable data in the AT	--	(list)
S-0-0188	IDN-list of configurable data in the MDT	--	(list)
S-0-0189	Following distance	--	0
S-0-0200	Amplifier warning temperature	°C	70.0

Process data

In order to enable the control system to evaluate the measured value, the value is included in the process data and linked with the NC axis. On the drive side one measured value is available for the positive signal edge and one for the negative signal edge.

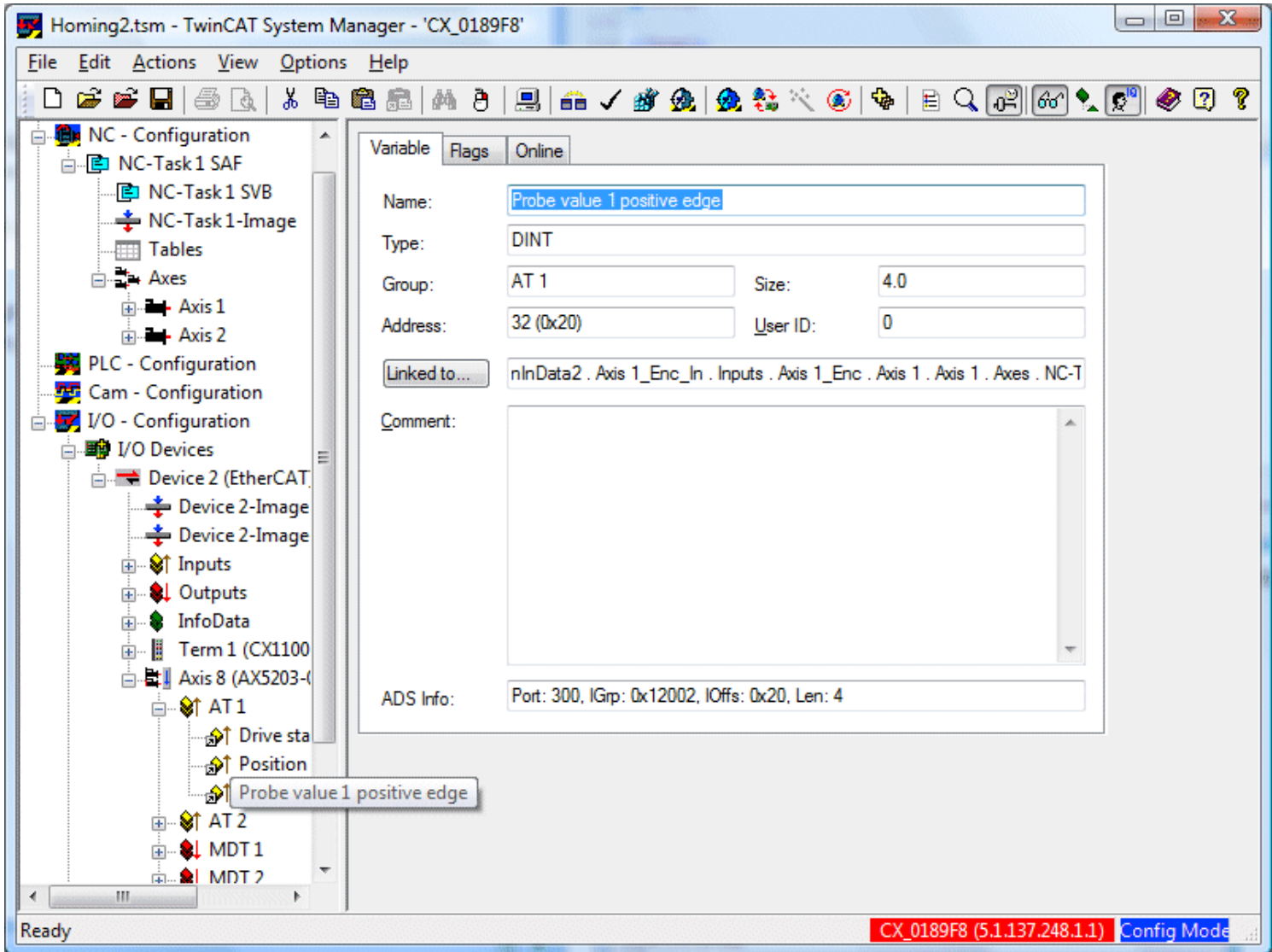


Right-click in the *PDO Content* list to add a new value. Depending on the configuration the value of S-0-0130 or S-0-0131 is stored in the process data.



The measured value is automatically linked with the NC axis when a link is created between the axis and the drive. If the link

was already established before the configuration described here, the link can be cancelled and recreated in order to ensure that the measured value is linked.



Startup parameter overview

Homing2.tsm - TwinCAT System Manager - 'CX_0189F8'

File Edit Actions View Options Help

General EtherCAT DC Process Data Startup SoE - Online Online Configuration

Transition	Protocol	Index	Data	Comment
S <PS>	SoE	S-0-0015 (A)	0x0007 (7)	Telegram type
S <PS>	SoE	S-0-0016 (A)	04 00 04 00 33 00 82 00	AT list
S <PS>	SoE	S-0-0015 (B)	0x0007 (7)	Telegram type
S <PS>	SoE	S-0-0016 (B)	02 00 02 00 33 00	AT list
S <PS>	SoE	S-0-0024 (A)	02 00 02 00 24 00	MDT list
S <PS>	SoE	S-0-0024 (B)	02 00 02 00 24 00	MDT list
S PS	SoE	S-0-0001 (A)	0x07D0 (2000)	Tncyc - NC cycle time
S PS	SoE	S-0-0002 (A)	0x07D0 (2000)	Tscyc - Comm cycle time
S PS	SoE	S-0-0032 (A)	0x0002 (2)	Operation mode
S PS	SoE	S-0-0032 (B)	0x0002 (2)	Operation mode
S PS	SoE	P-0-0089 (A)	24 00 24 00 02 80 00 00 3...	Motor data constraints
S PS	SoE	P-0-0182 (A)	0x00000001 (1)	Feedback 2 gear numerator
S PS	SoE	P-0-0183 (A)	0x00000001 (1)	Feedback 2 gear denomin...
S PS	SoE	S-0-0303 (A)	0x0195 (405)	Allocation of real-time contr...
S PS	SoE	S-0-0307 (A)	0x0199 (409)	Allocation of real-time statu...
S PS	SoE	S-0-0169 (A)	0x0001 (1)	Probe control parameter
S SO	SoE	S-0-0170 (A)	0x0003 (3)	Probing cycle procedure c...

Move Up Move Down New... Delete... Edit...

CX_0189F8 (5.1.137.248.1.1) RTime 3%

Homing2.tsm - TwinCAT System Manager - 'CX_0189F8'

File Edit Actions View Options Help

General EtherCAT DC Process Data Startup SoE - Online Online Configuration

SYSTEM - Configuration
 NC - Configuration
 PLC - Configuration
 Cam - Configuration
 I/O - Configuration
 I/O Devices
 Device 2 (EtherCAT)
 Device 2-Image
 Device 2-Image
 Inputs
 Outputs
 InfoData
 Term 1 (CX1100)
 Axis 8 (AX5203-...)
 AT 1
 Drive status
 Position feedback
 Probe value
 AT 2
 MDT 1
 MDT 2
 WcState
 InfoData
 Mappings

Sync Manager:

SM	Size	Type	Flags
0	128	MbxOut	
1	128	MbxIn	
2	12	Outputs	
3	16	Inputs	

PDO List:

Index	Size	Name	Flags
S-0-0016...	10.0	AT 1	M
S-0-0016...	6.0	AT 2	M
S-0-0024...	6.0	MDT 1	M
S-0-0024...	6.0	MDT 2	M

PDO Assignment (SM 3):

- S-0-0016 (A)
- S-0-0016 (B)

Download

- PDO Assignment
- PDO Configuration

PDO Content (S-0-0016 (A)):

Index	Size	Offs	Name
S-0-0135	2.0	0.0	Drive status word
S-0-0051	4.0	2.0	Position feedback 1 value
S-0-0130	4.0	6.0	Probe value 1 positive edge
		10.0	

Load PDO info from device

Sync Unit Assignment...

CX_0189F8 (5.1.137.248.1.1) RTime 3%