

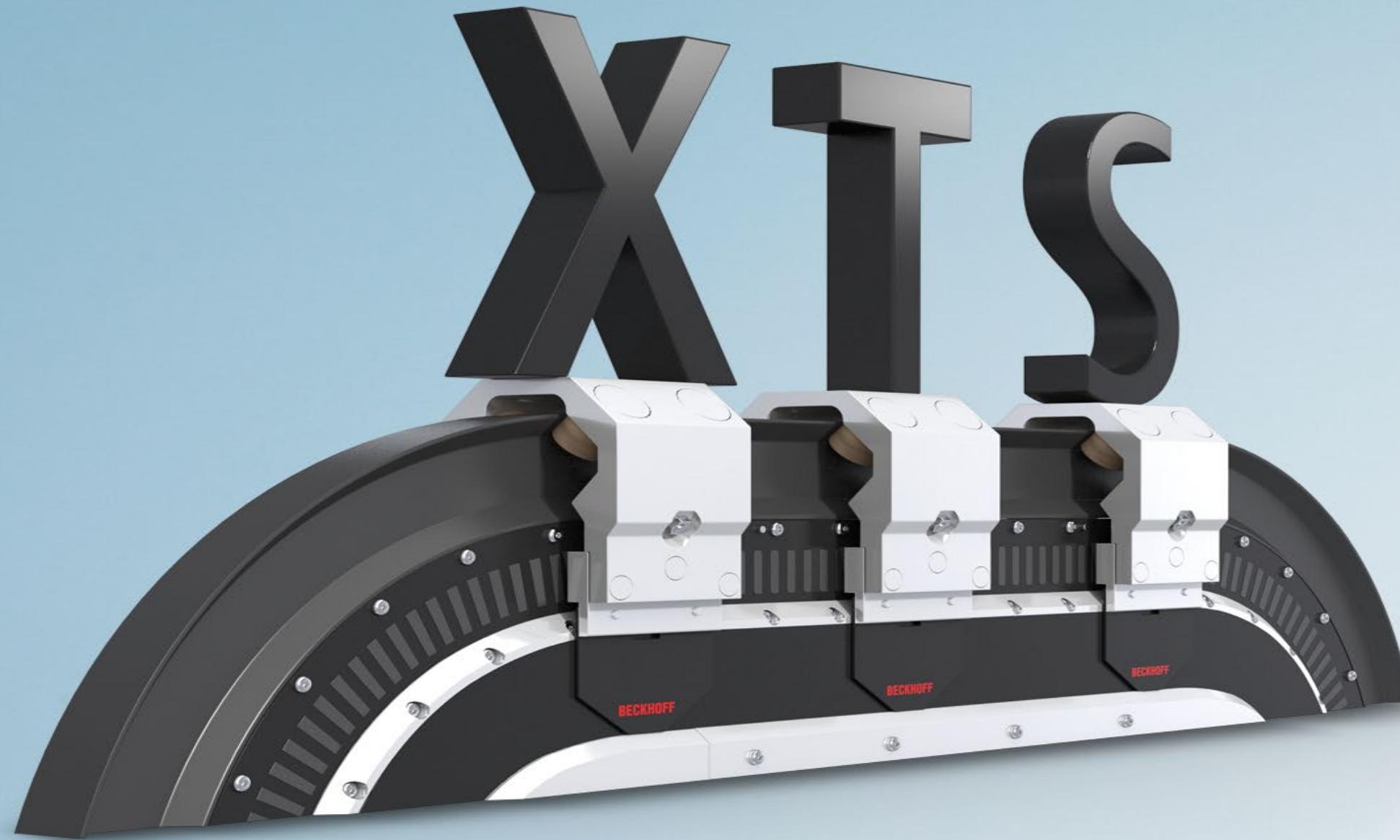
New Automation Technology

Beckhoff Automation

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BECKHOFF





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XTS – TcloXtsProcessingUnit (XPU)



Agenda | XTS- TcloXtsProcessingUnit (XPU)

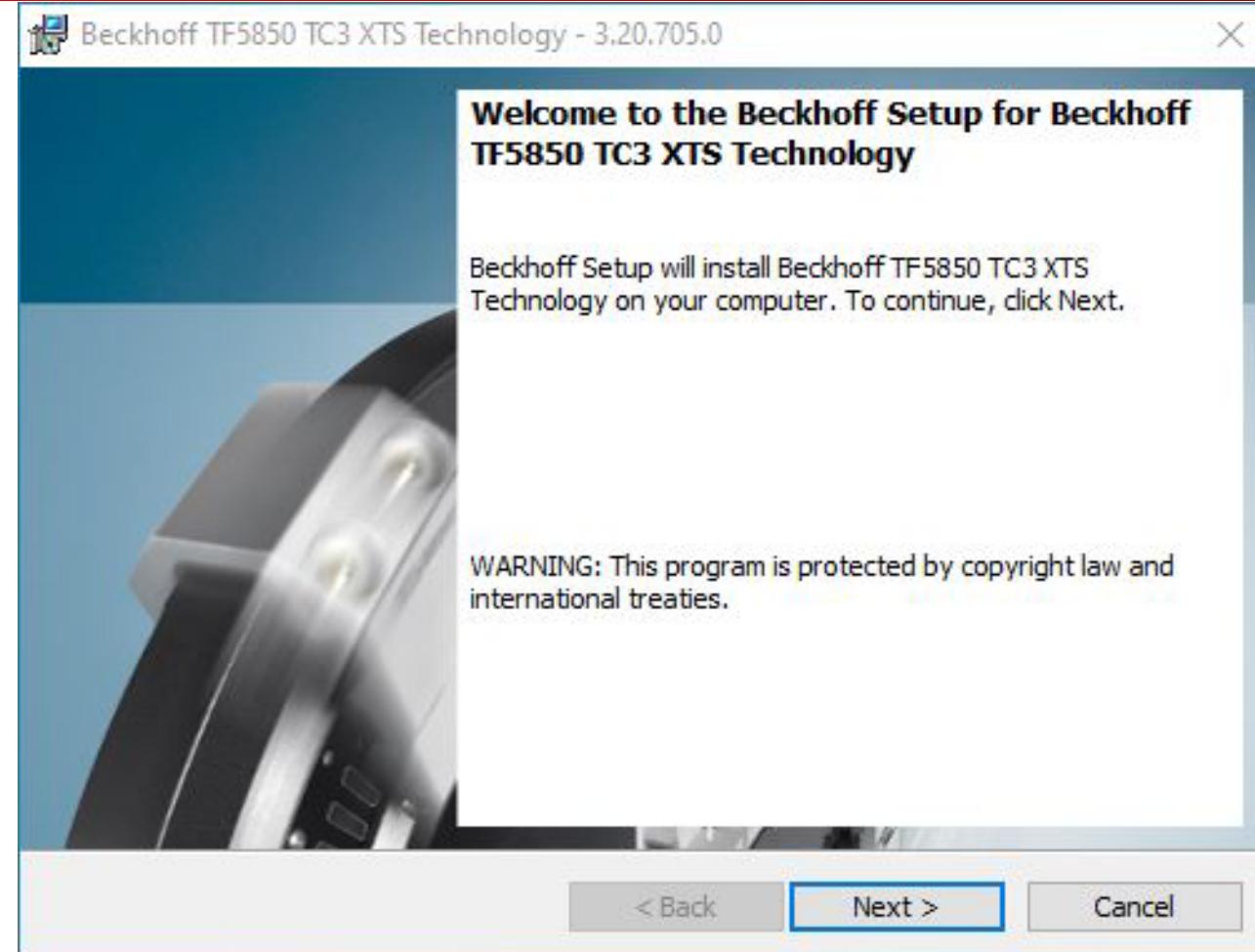
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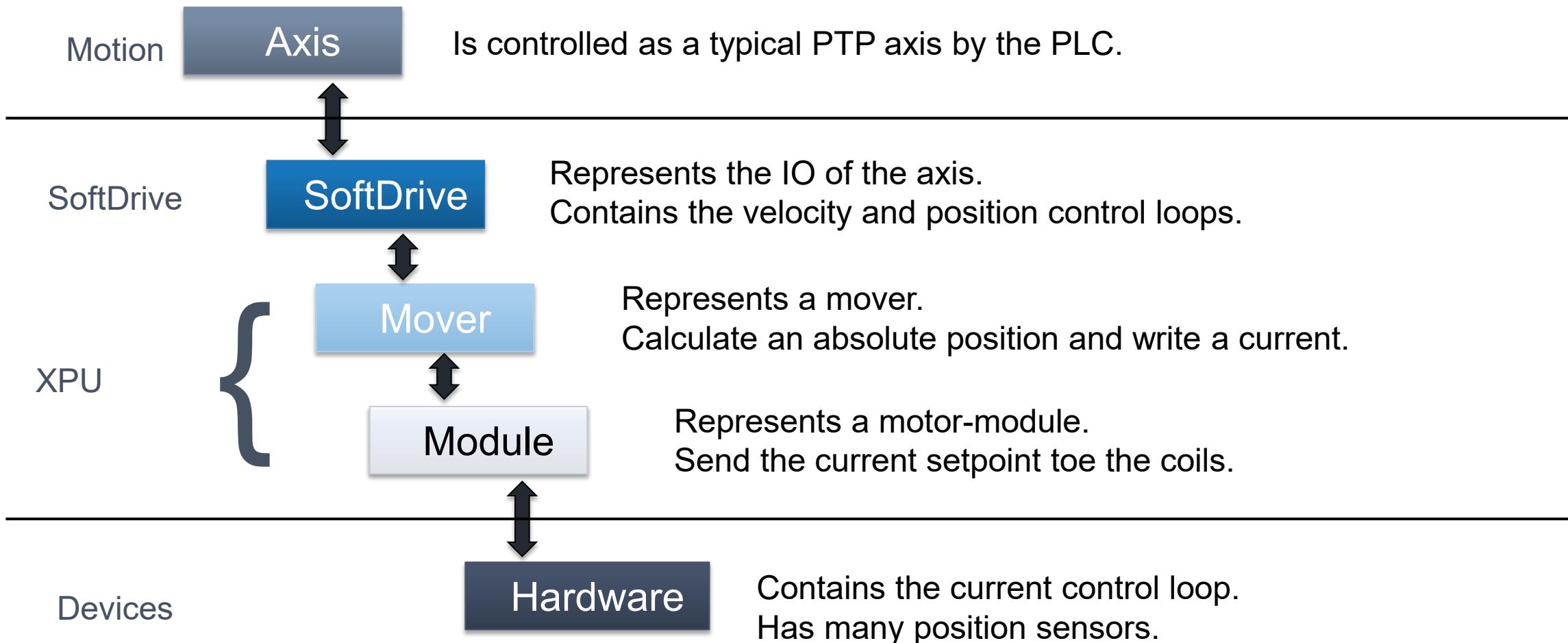
1. XPU Introduction
2. XTS Configuration Process
3. XPU – Deep Dive
4. XTS Viewer
5. Mover 1
6. Simulation Mode



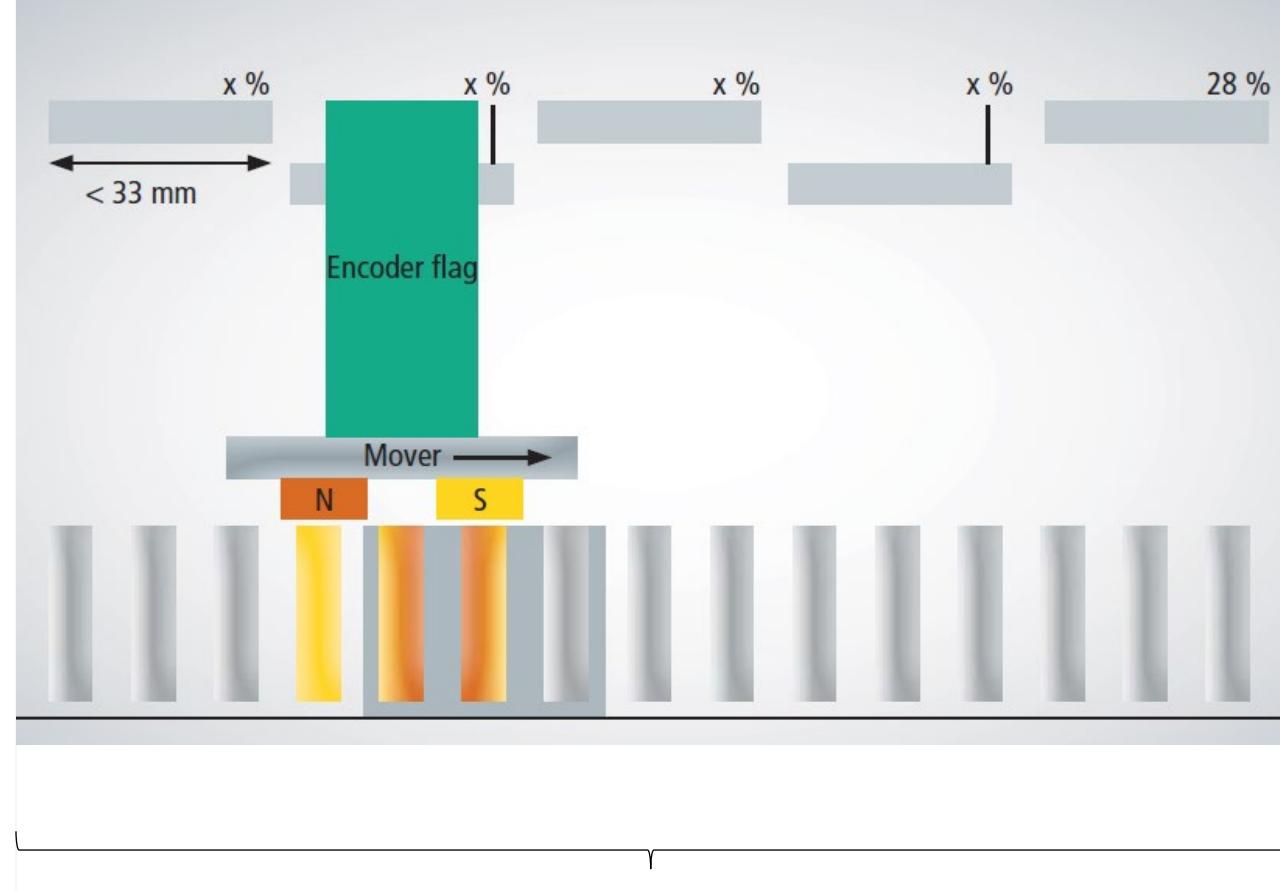
- TcloXtsProcessingUnit as TcCOM Module (TwinCAT Component Object Models)
- TF5850 | TC3 XTS Extension
 - Included
 - TcloXtsProcessingUnit
 - TcloXtsDrv (obsolete)
 - SoftDrive
- TF5400 | TC3 Advanced Motion Pack
 - Included
 - TC3 Collision Avoidance



- `TcloXtsProcessingUnit` is the link between the Motion and the hardware.



- Collects the input channels of all terminals and calculates an absolute position for each mover.
(It knows the XTS topology.)
- Forwards the current output of the controller (SoftDrive) to the individual coils which are activated by a mover.
- Handles module boundaries smoothly.



The abstract components of one XTS module

Agenda | XTS- TcloXtsProcessingUnit (XPU)

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1. XPU Introduction
2. XTS Configuration Process
3. XPU – Deep Dive
4. XTS Viewer
5. Mover 1
6. Simulation Mode



XTS Configuration Process...

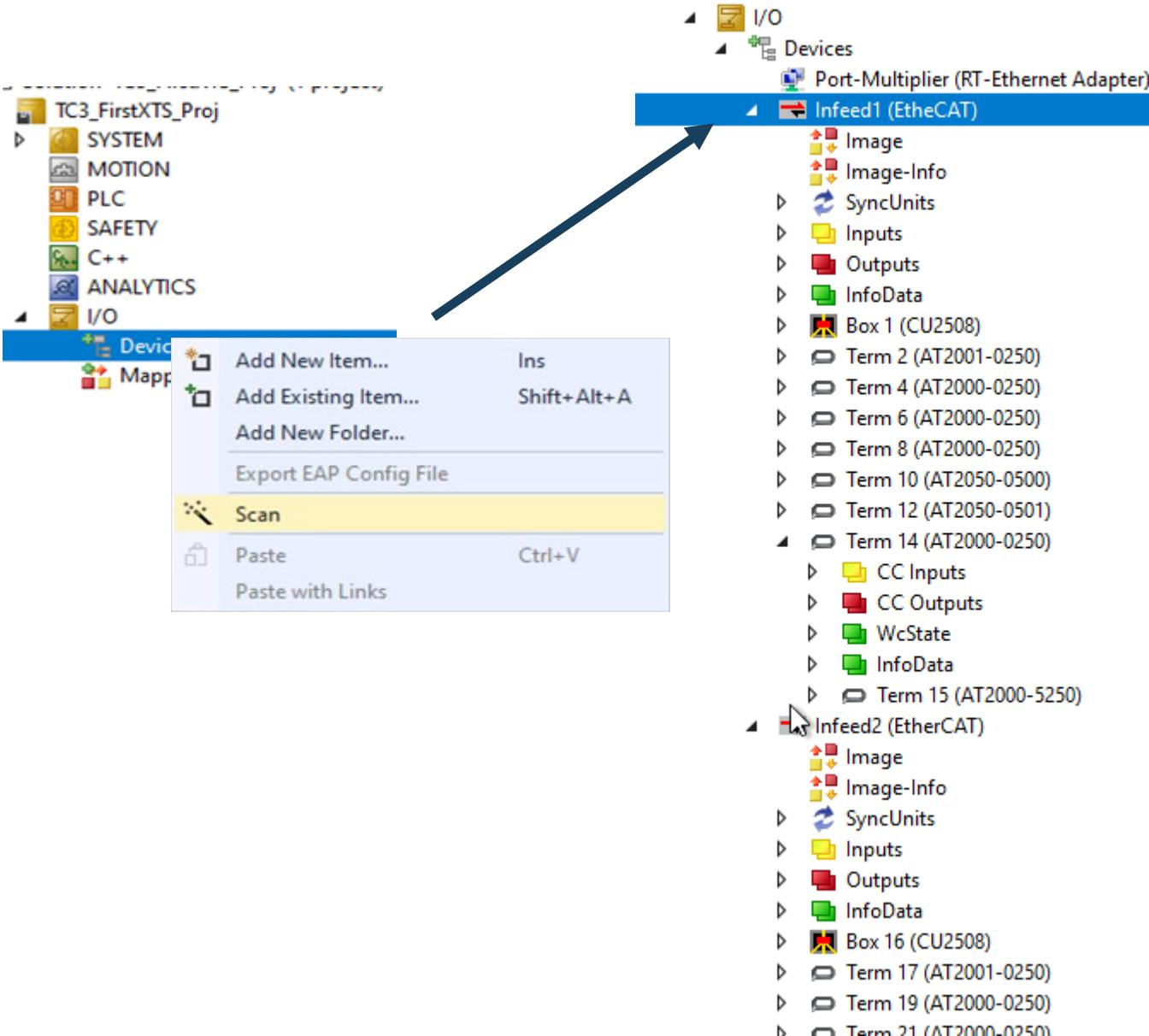
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- Start with a new project.
- Perform a ‘Scan’ of the IO...

▪ TIP

After scan, change to
Free-Run mode and have a look at the
signals,
the values should be changing
continuously.

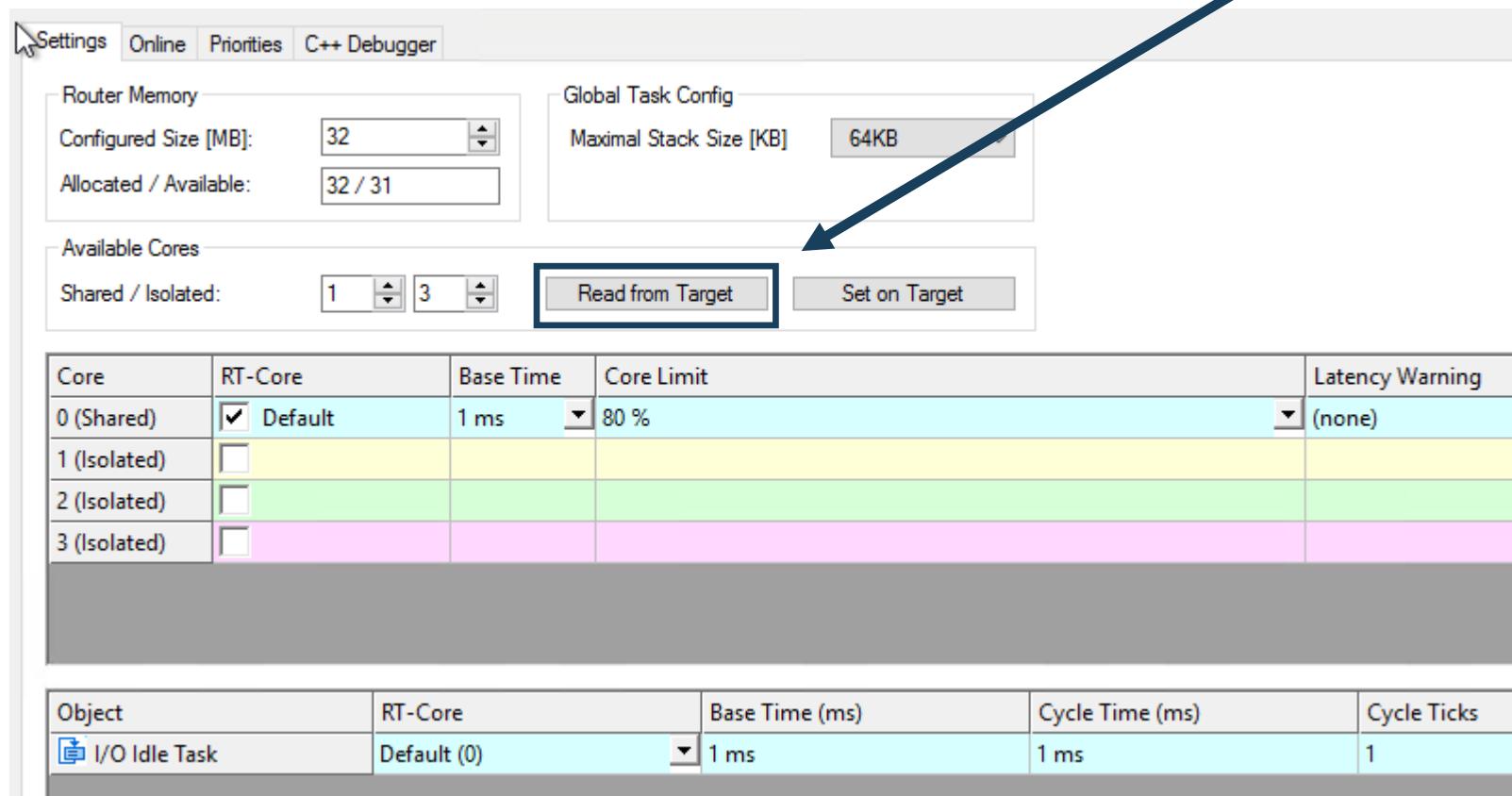


XTS Configuration Process...

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- Read actual Core Settings

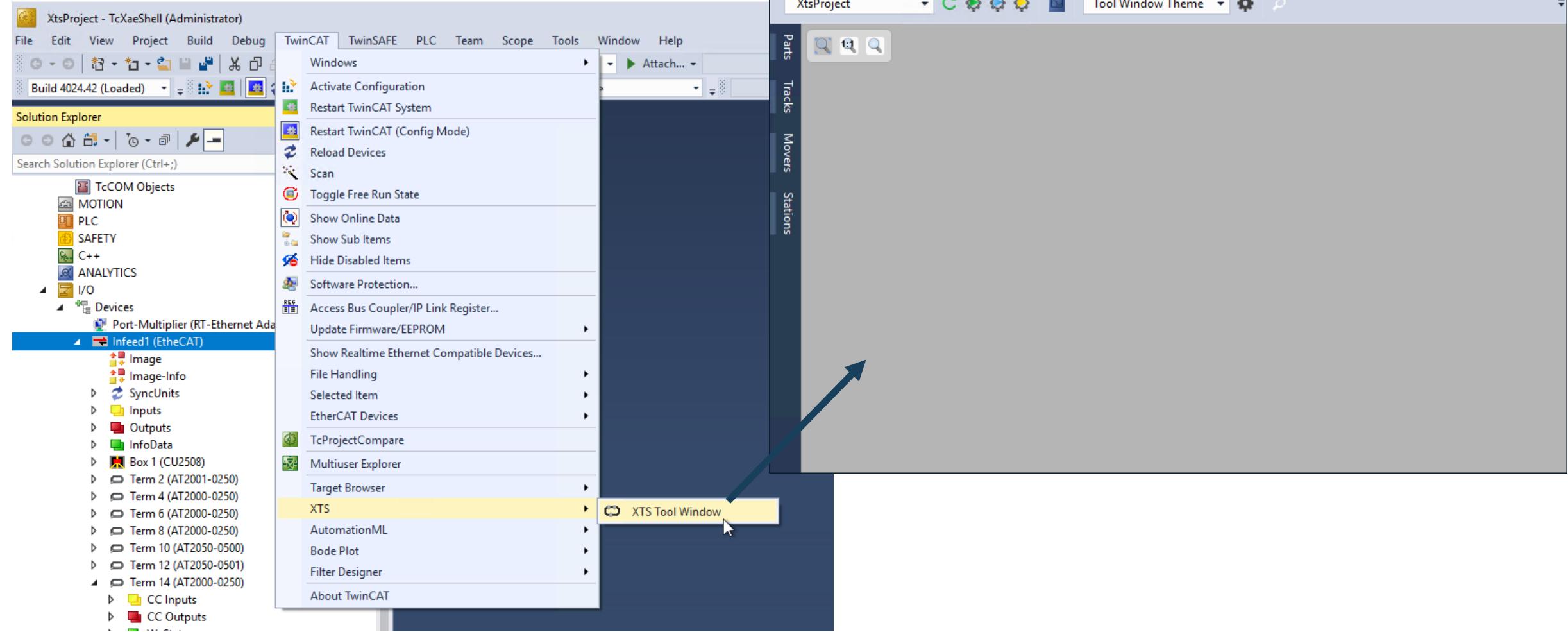


XTS Configuration Process...

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- Open XTS Tool Window

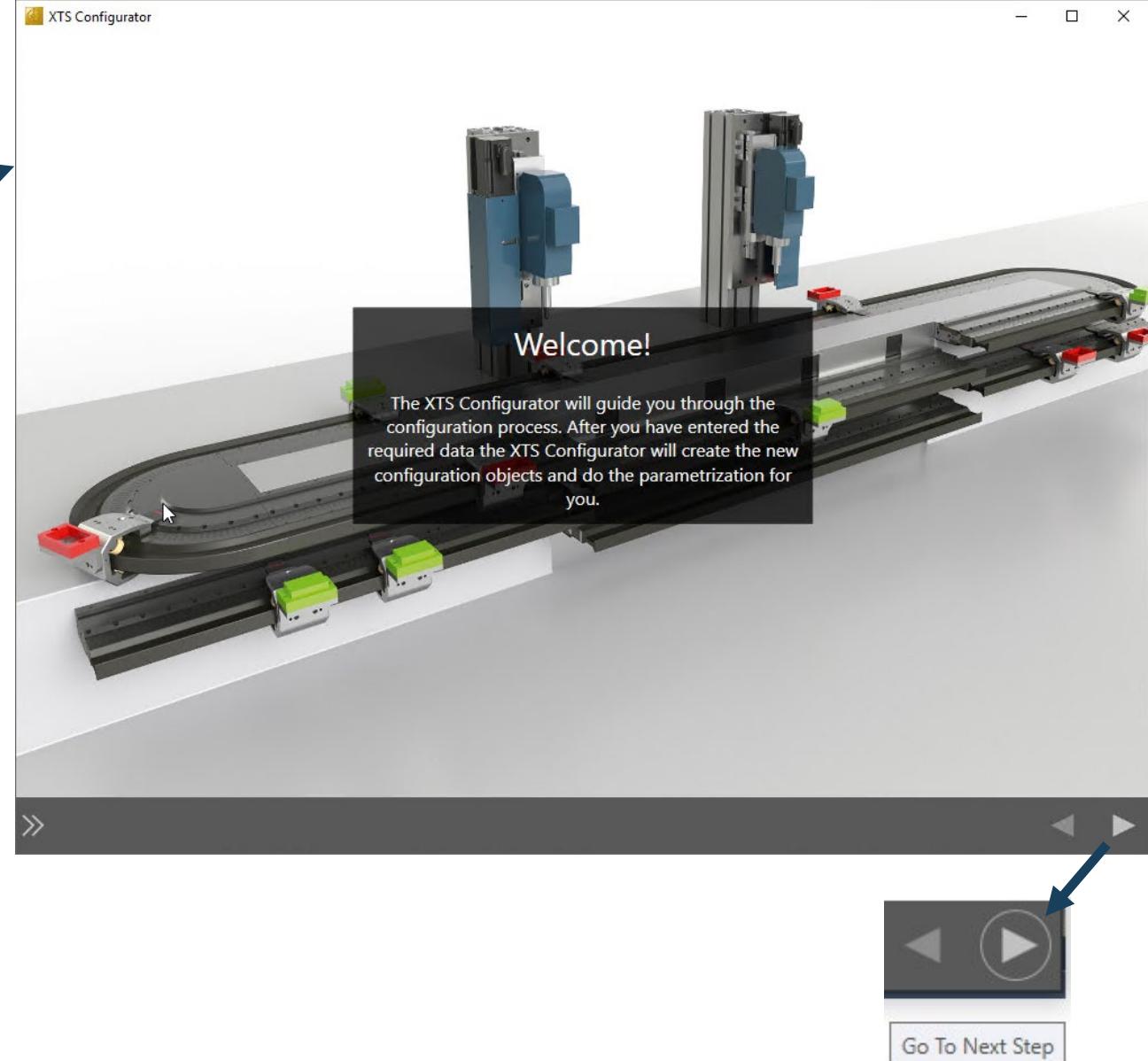
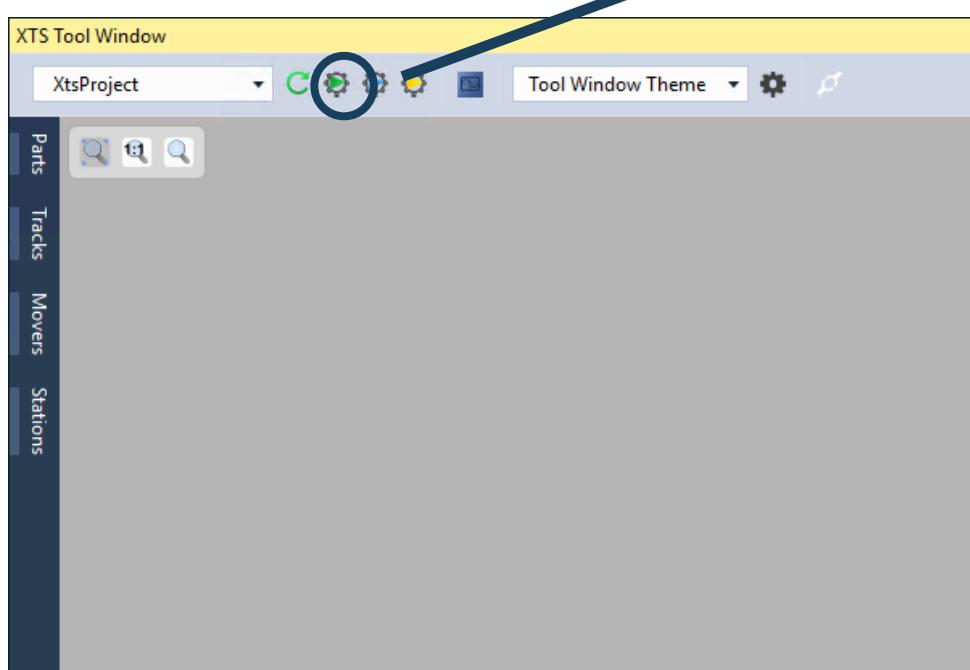


XTS Configuration Process...

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- Start the configuration process

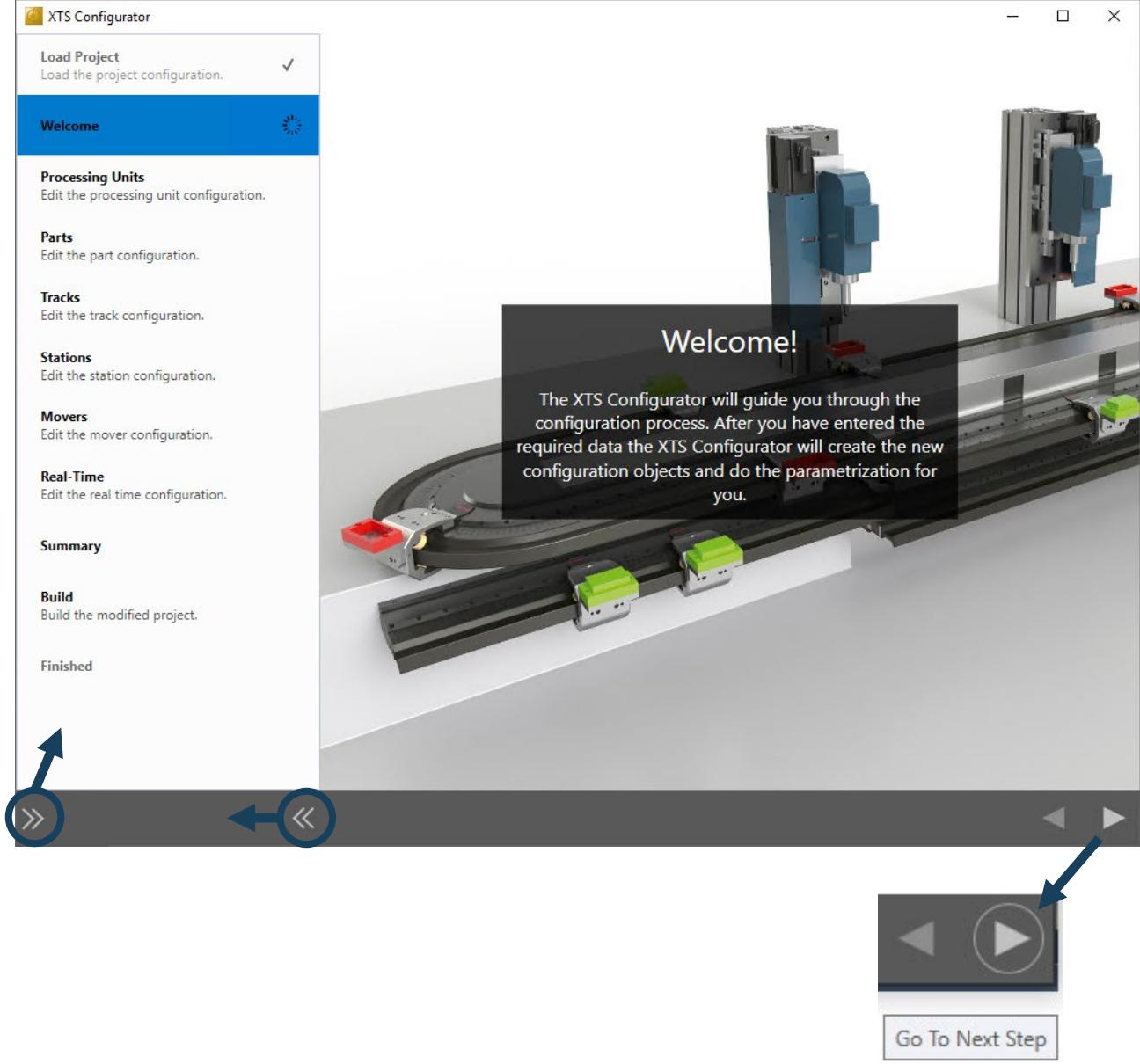


XTS Configuration Process...

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■ Configuration process



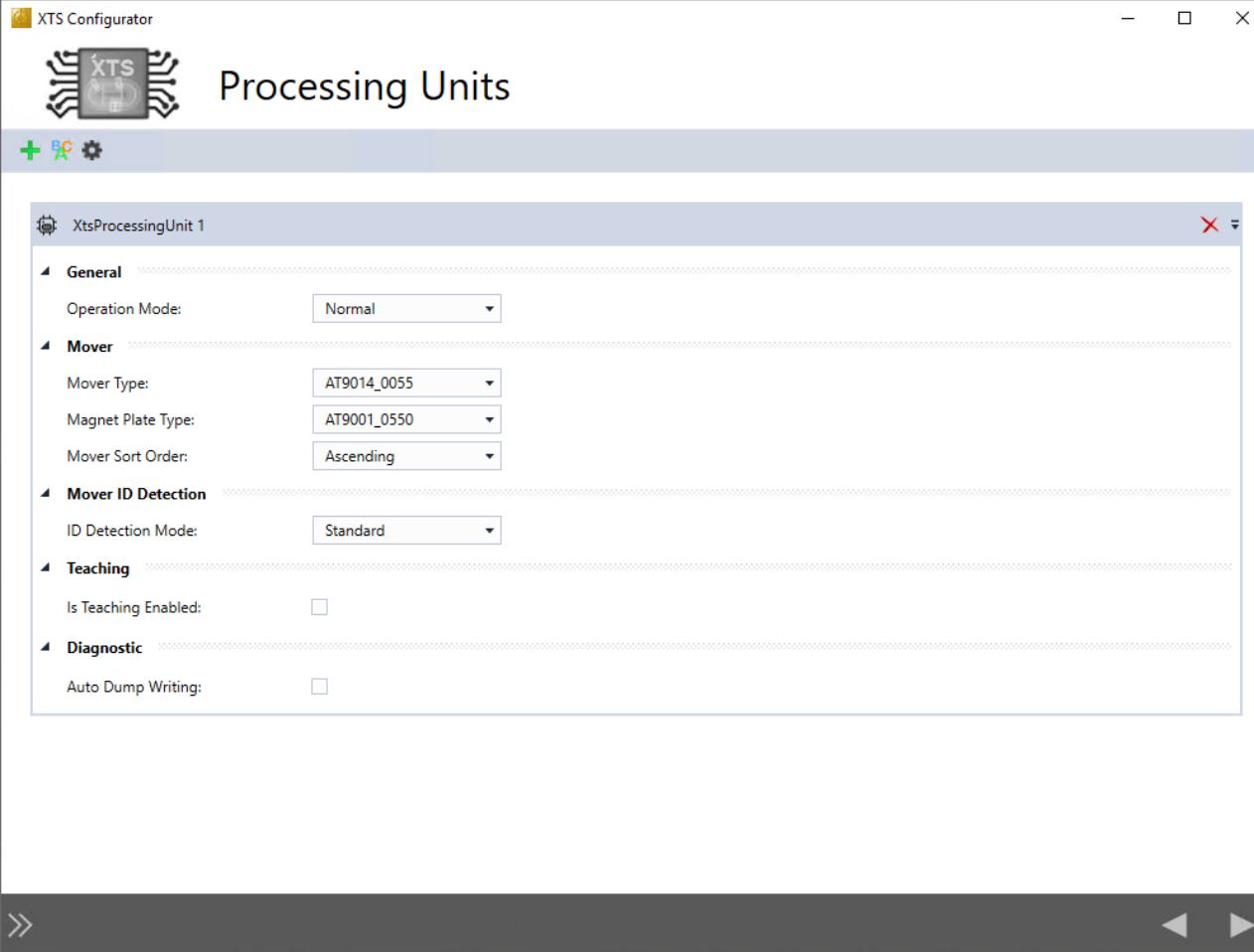
XTS Configuration Process...

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■ Setup XtsProcessingUnit

- Operation Mode
- Mover
- Mover ID Detection
- Diagnostic



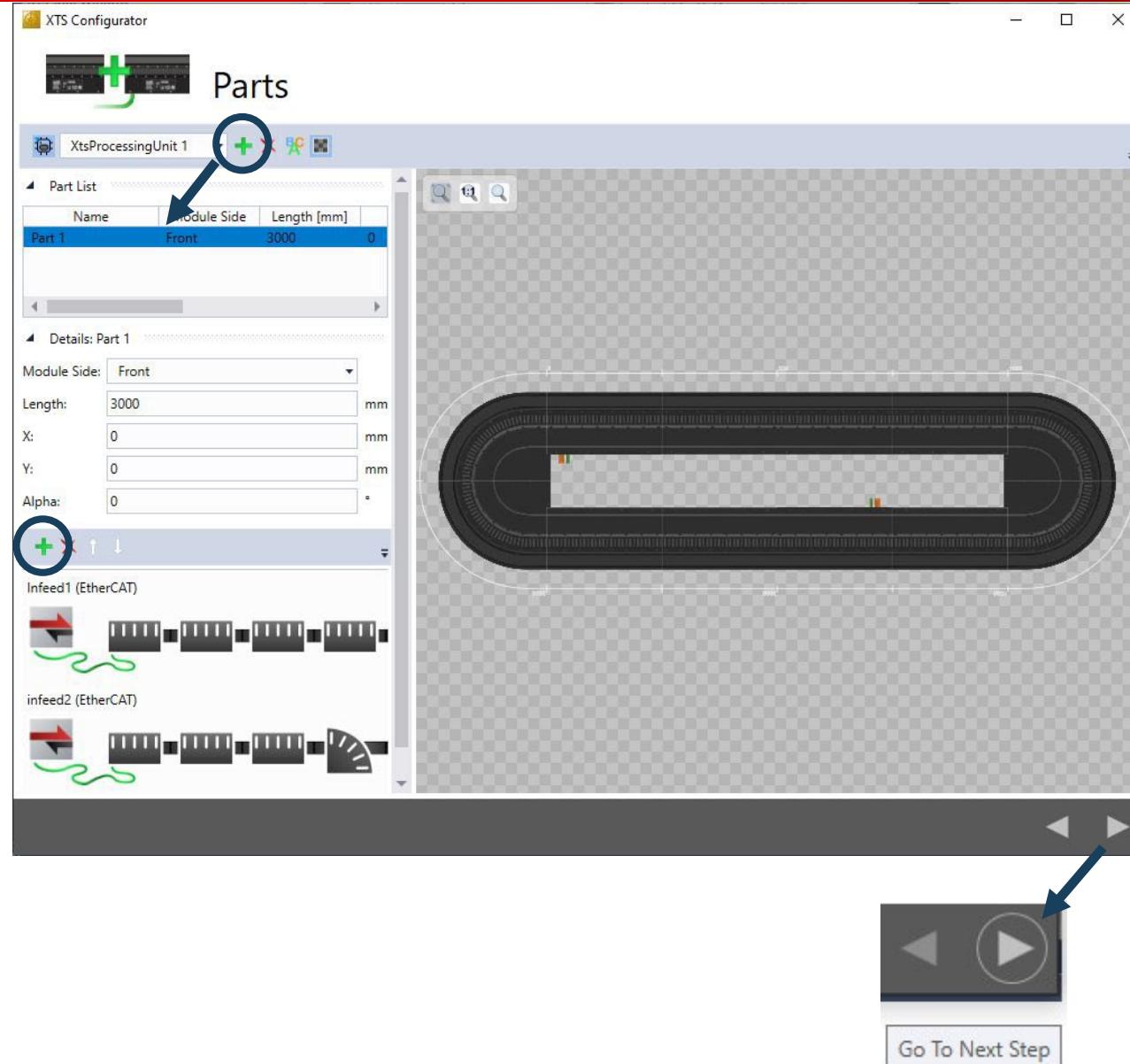
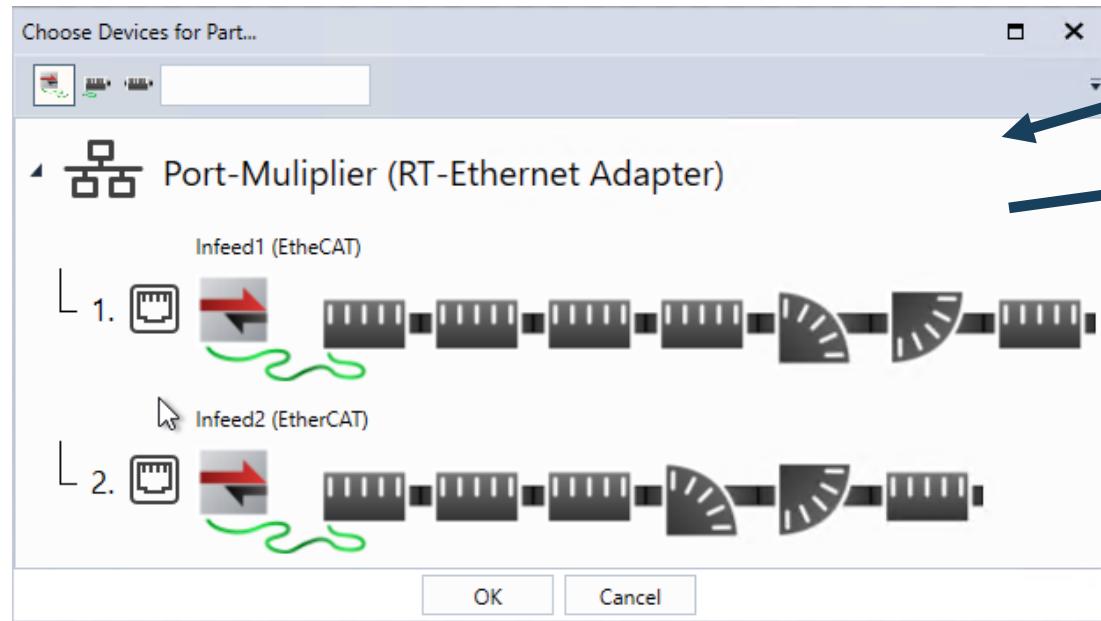
Go To Next Step

XTS Configuration Process...

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■ Add XTS Parts



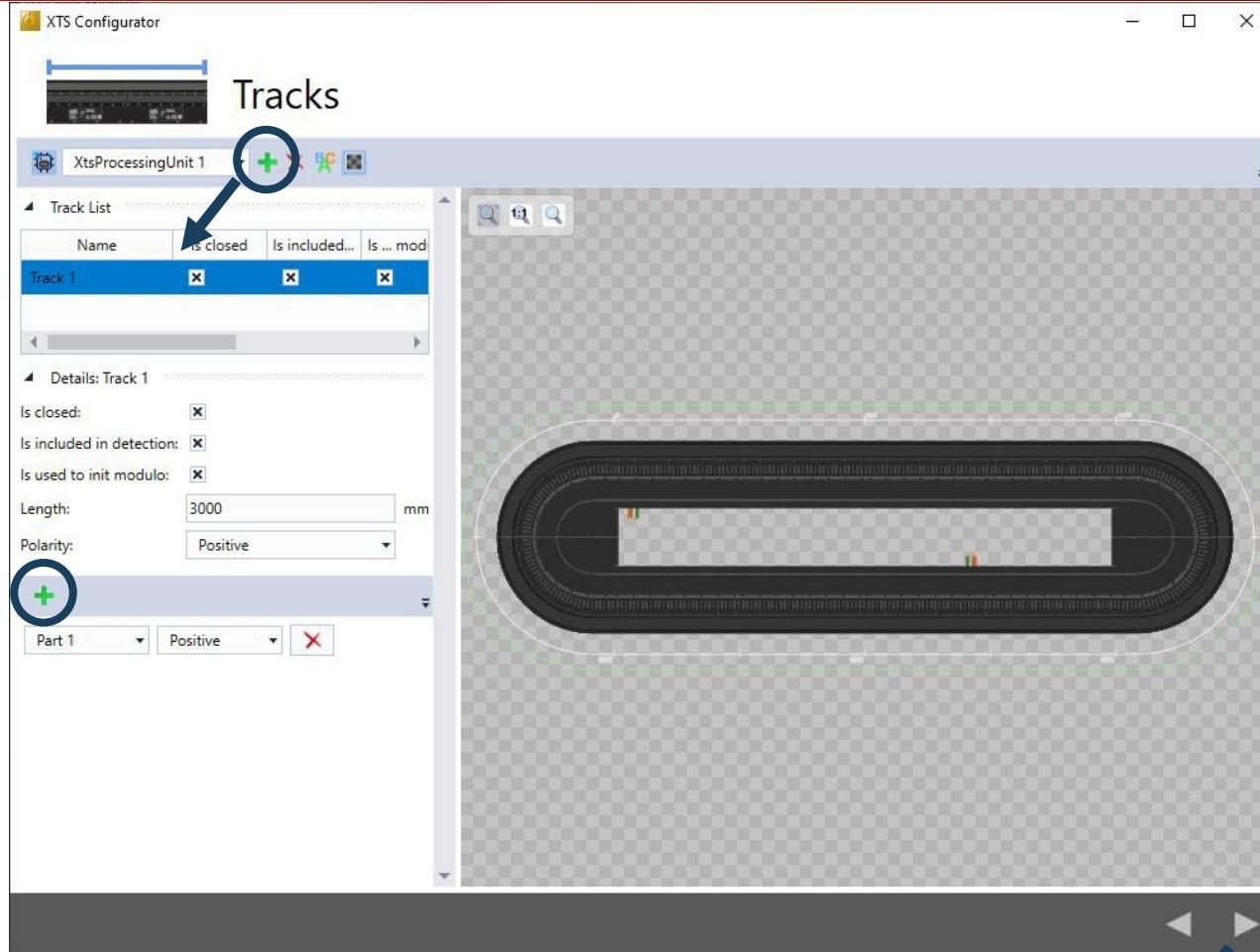
XTS Configuration Process...

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- Add XTS Tracks
(one track minimum)

- Add Parts to the track



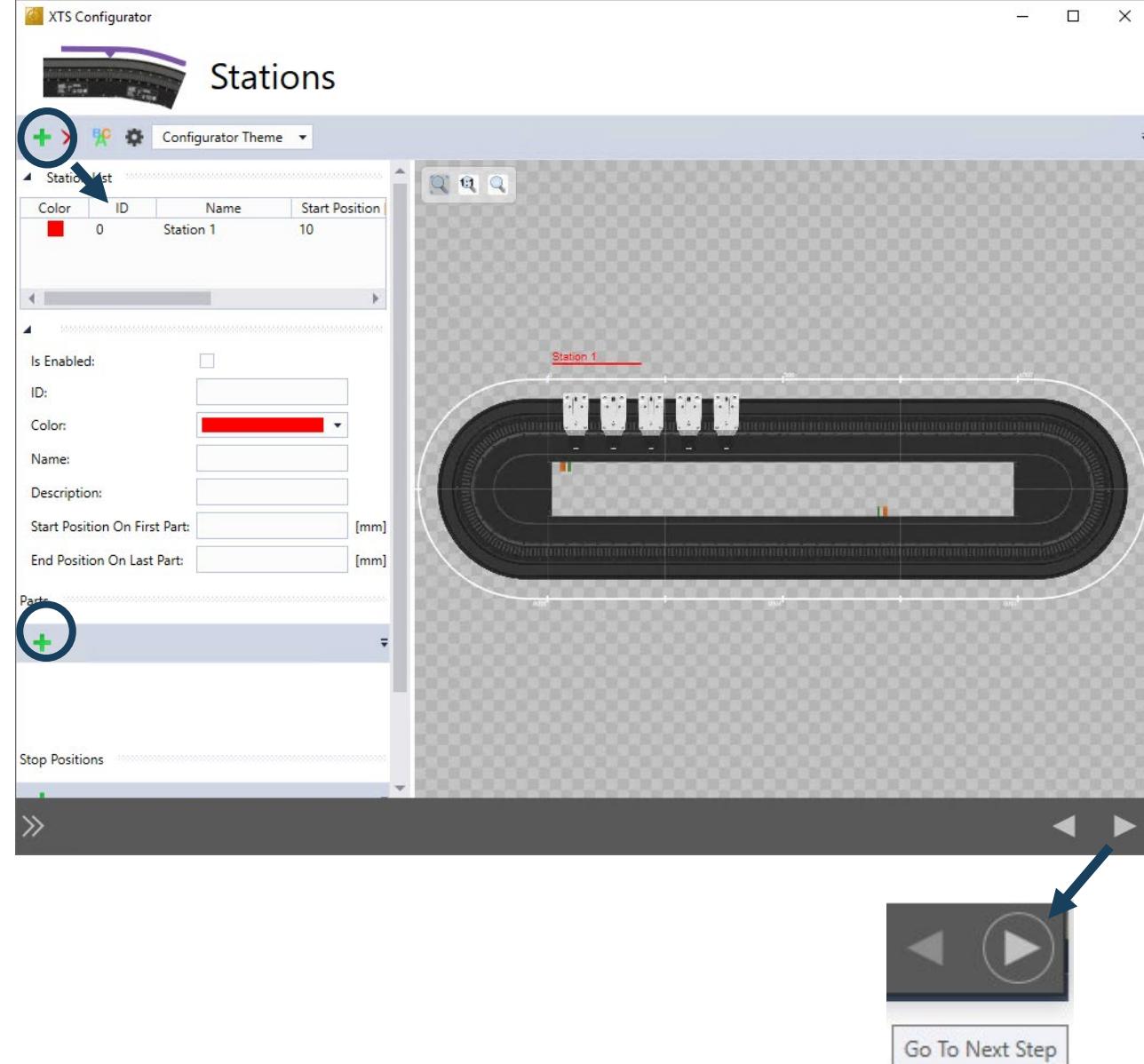
Go To Next Step

XTS Configuration Process...

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- Add XTS Station
(only display at the moment)



XTS Configuration Process...

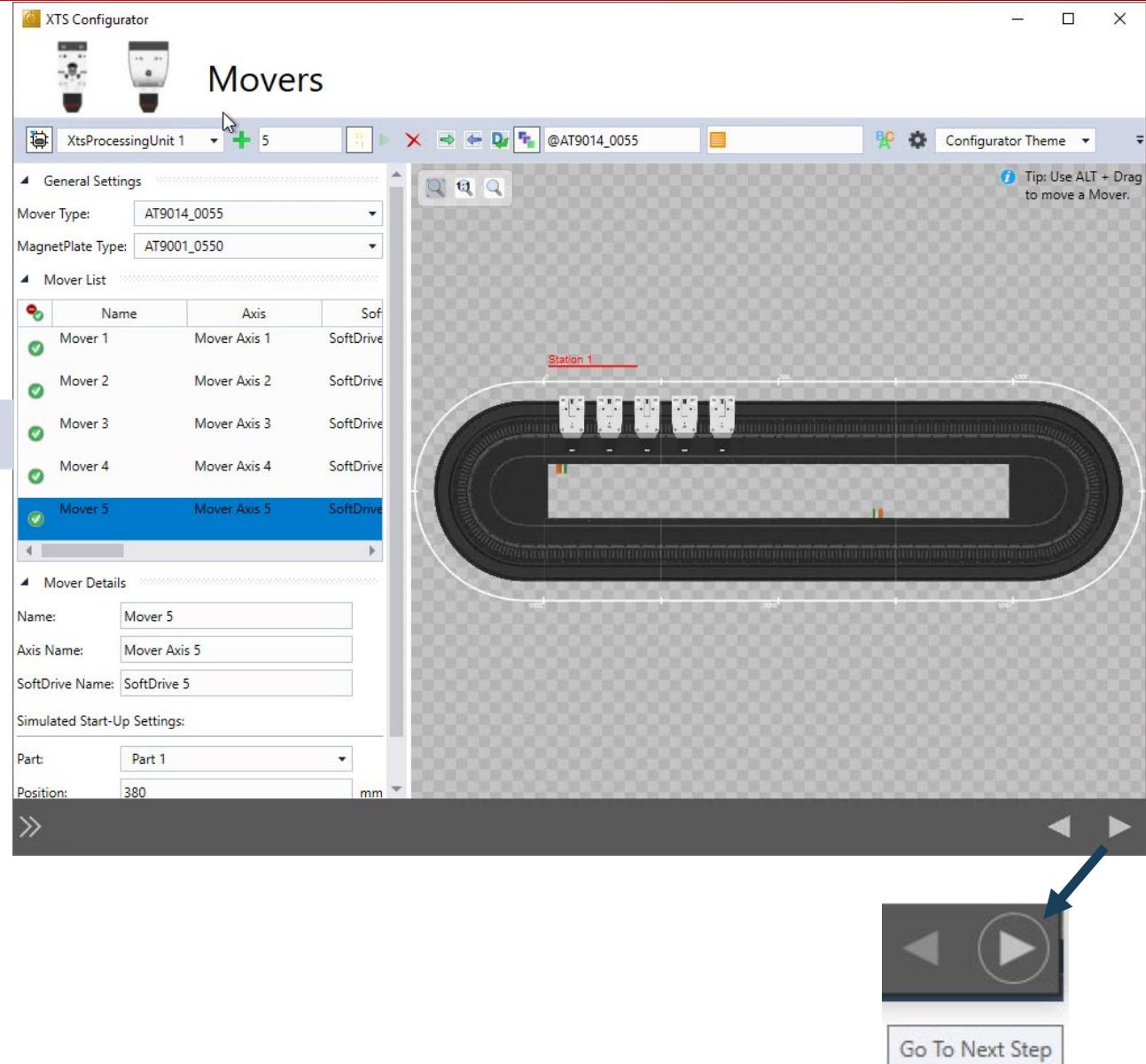
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■ Add XTS Mover

The screenshot shows the XTS Configurator software interface. The main window displays a 3D model of a conveyor system with stations labeled 'Station 1' and 'Station 2'. The 'Movers' tab is selected. In the top left, there's a toolbar with icons for adding, deleting, and saving. The 'Mover List' table shows five movers assigned to different axes:

	Name	Axis	SoftDrive
1	Mover 1	Mover Axis 1	SoftDrive 1
2	Mover 2	Mover Axis 2	SoftDrive 2
3	Mover 3	Mover Axis 3	SoftDrive 3
4	Mover 4	Mover Axis 4	SoftDrive 4
5	Mover 5	Mover Axis 5	SoftDrive 5



XTS Configuration Process...

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■ Add XTS Mover

— Mover List and Mover Details

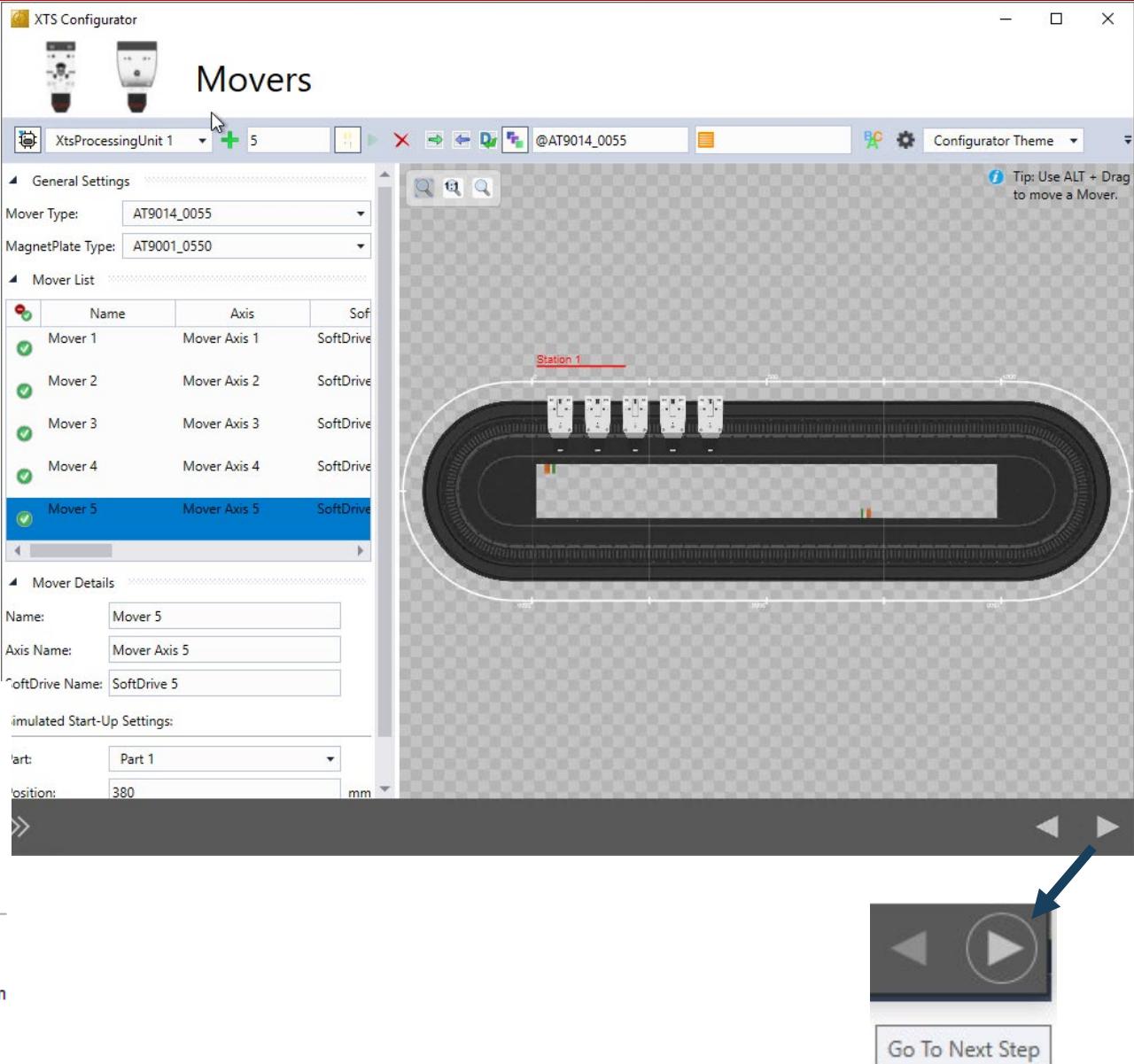
	Name	Axis	SoftDrive	Source Set	Parameter Set	Simulated Start-Up Settings
✓	Mover 1	Mover Axis 1	SoftDrive 1		@D	Part 1
✓	Mover 2	Mover Axis 2	SoftDrive 2		@D	Part 1
✓	Mover 3	Mover Axis 3	SoftDrive 3		@D	Part 1
✓	Mover 4	Mover Axis 4	SoftDrive 4		@D	Part 1
✓	Mover 5	Mover Axis 5	SoftDrive 5		@D	Part 1

◀ Mover Details

Name: Mover 1
Axis Name: Mover Axis 1
SoftDrive Name: SoftDrive 1

Simulated Start-Up Settings:

Part: Part 1
Position: 60 mm
ID: 1



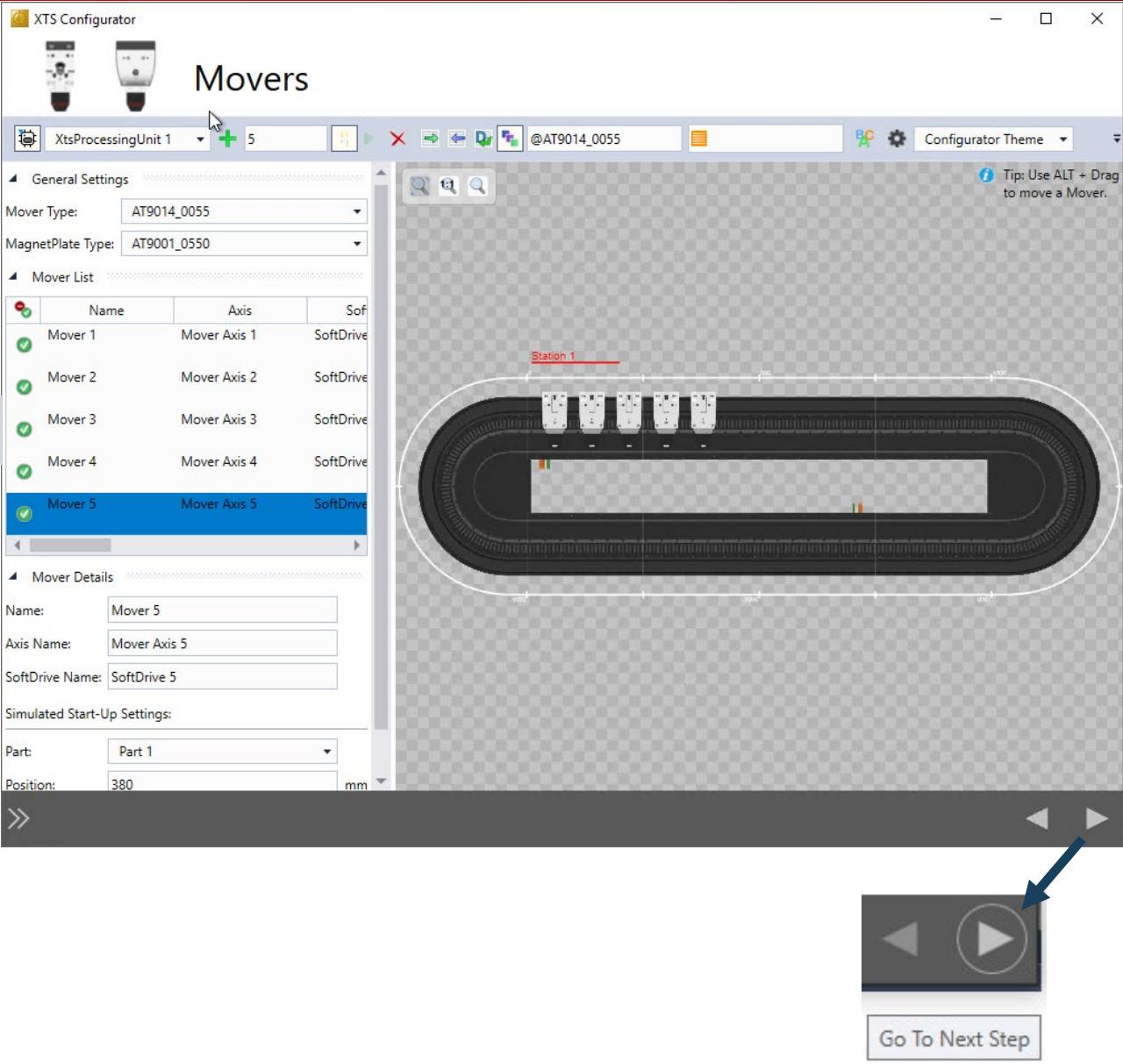
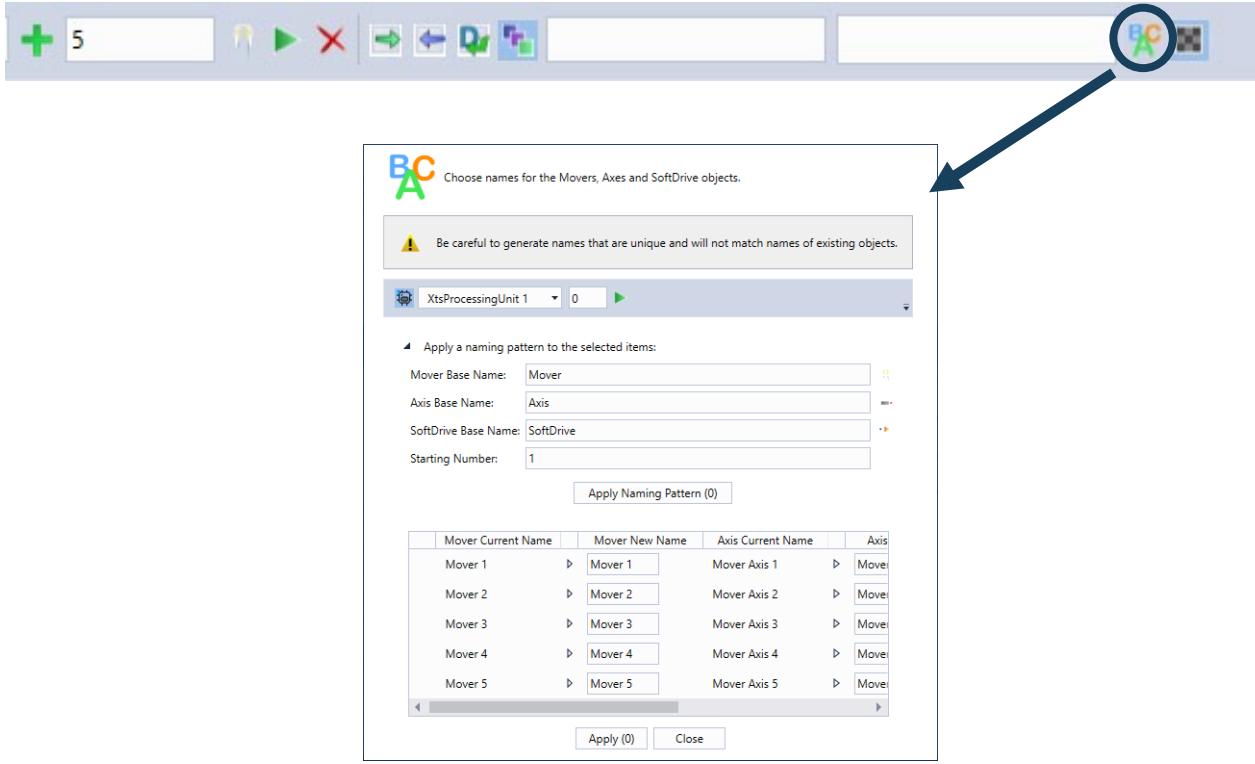
XTS Configuration Process...

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■ Add XTS Mover

- choose names for Mover, Axis and Softdrive



Go To Next Step

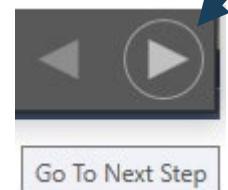
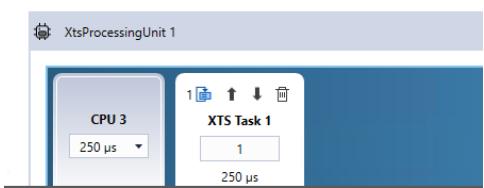
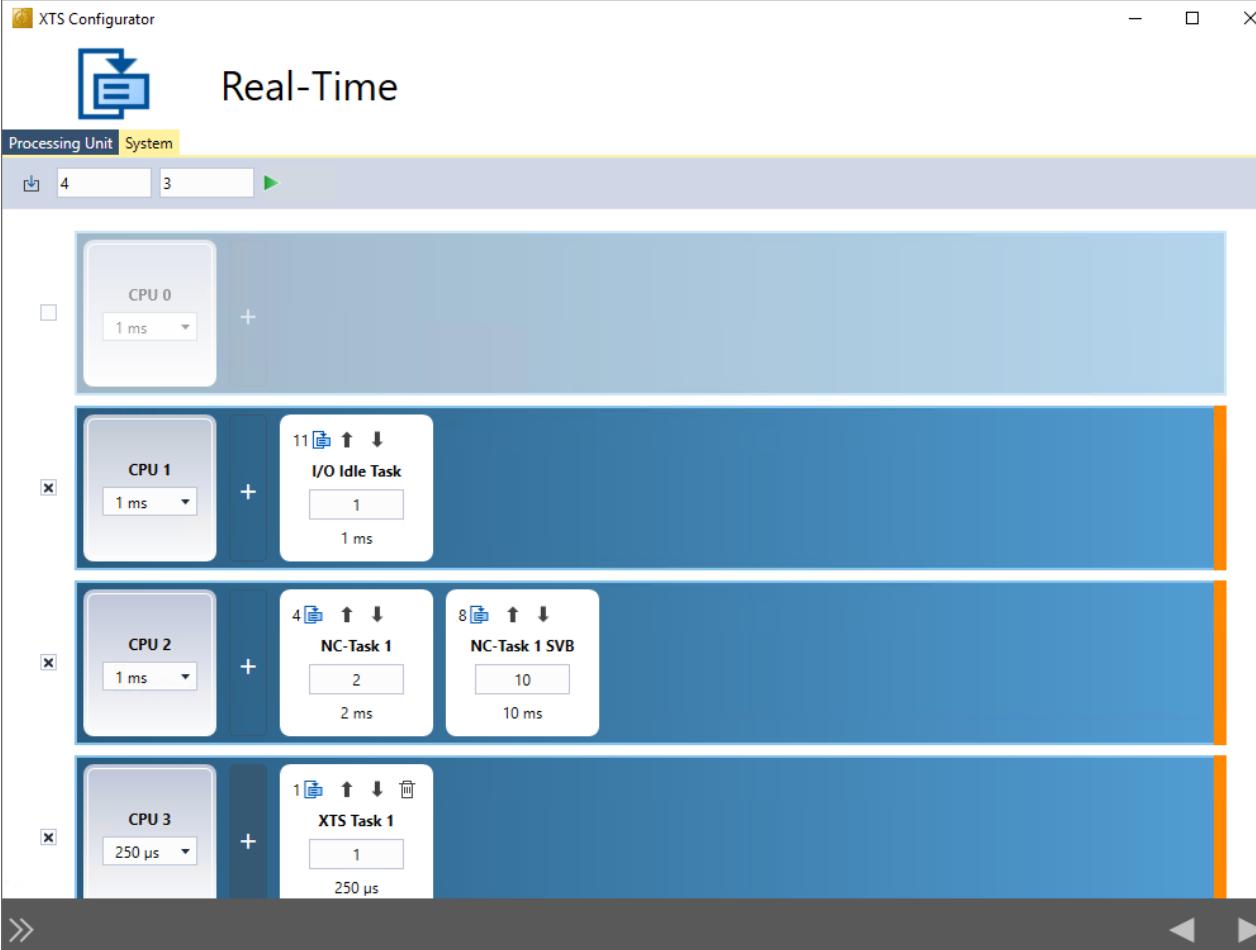
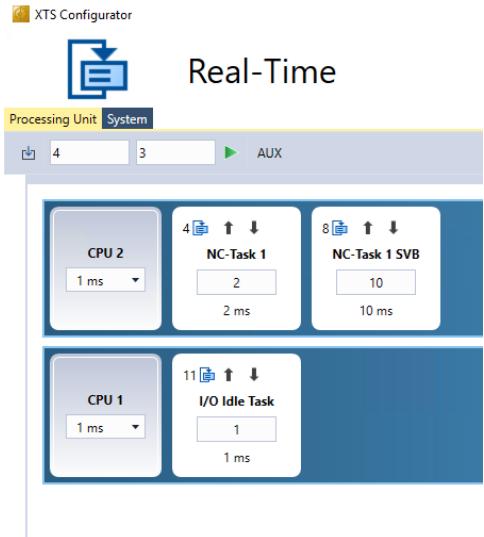
XTS Configuration Process...

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■ Setup Real-Time

- Used CPU
- BasTime CPU
- Task assignment to CPU

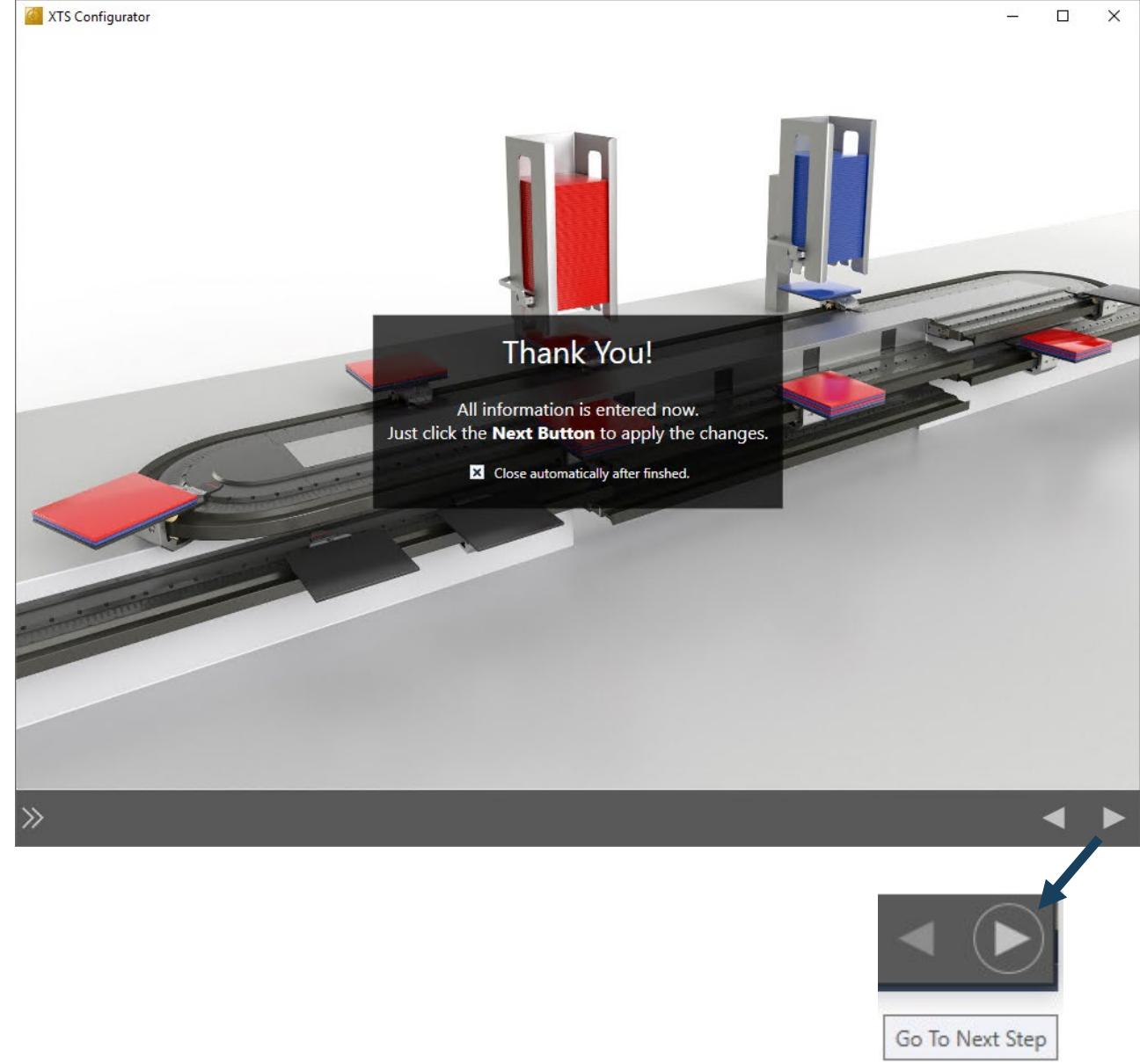


XTS Configuration Process...

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BECKHOFF

▪ Summary Configuration process



XTS Configuration Process...

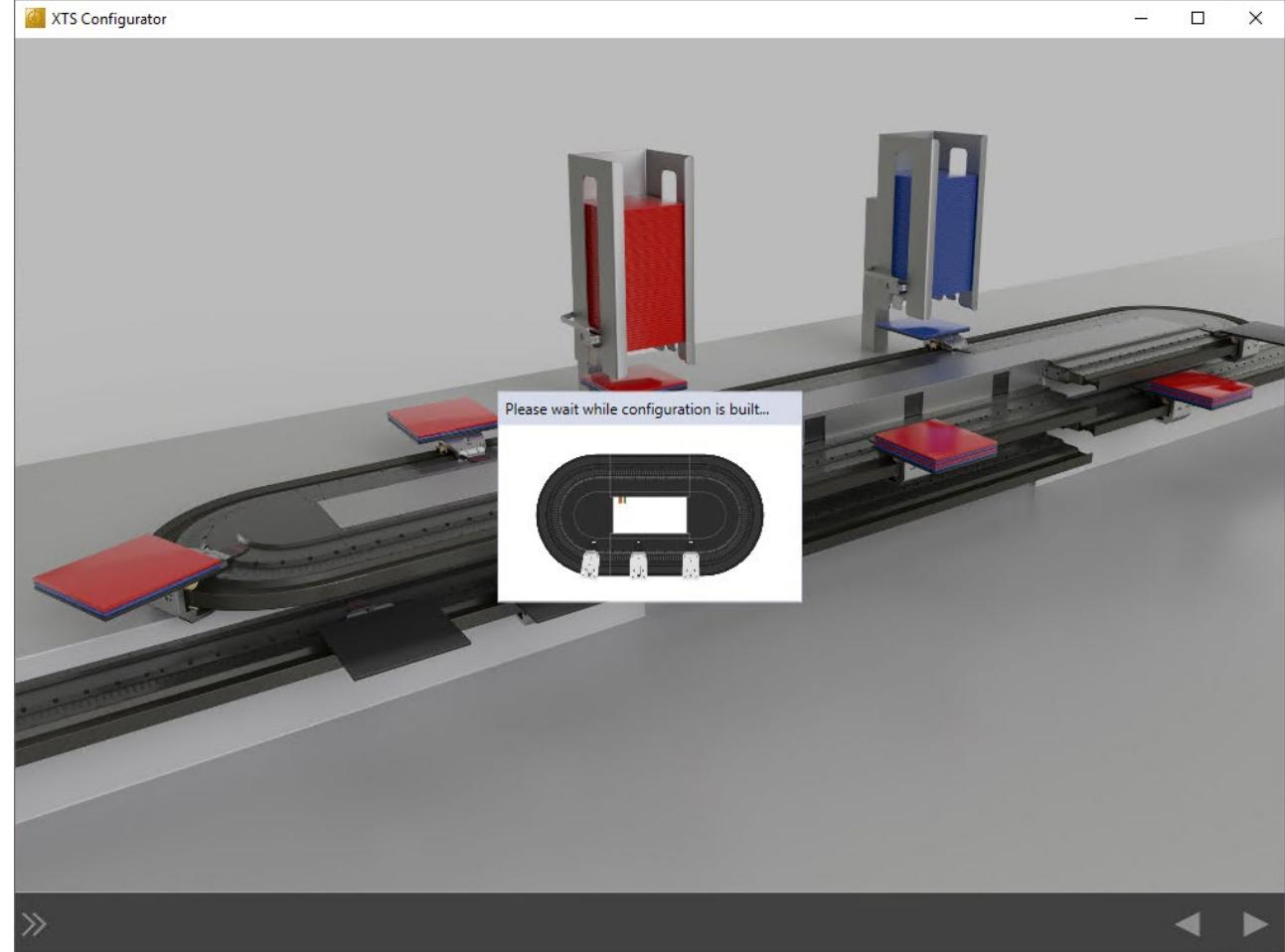
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▪ Build Configuration process

The manager creates the configuration of the system:

- Creates the XTS task.
- Creates the child objects of the TcloXtsProcessingUnit (modules & movers)
- Adds the Movers to the NC configuration (with a SoftDrive object for each mover)
- Context (task) of all XPU objects and SoftDrive objects are set.

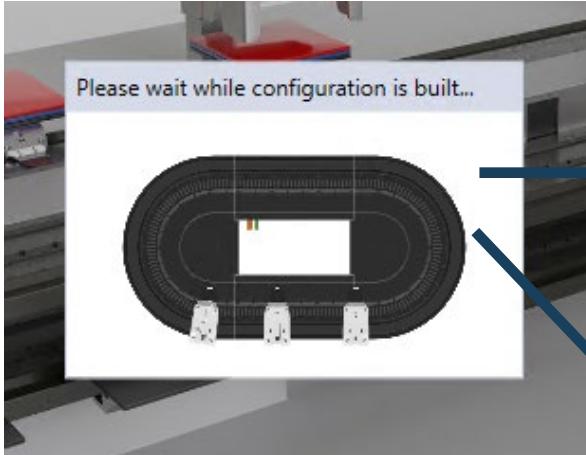


XTS Configuration Process...

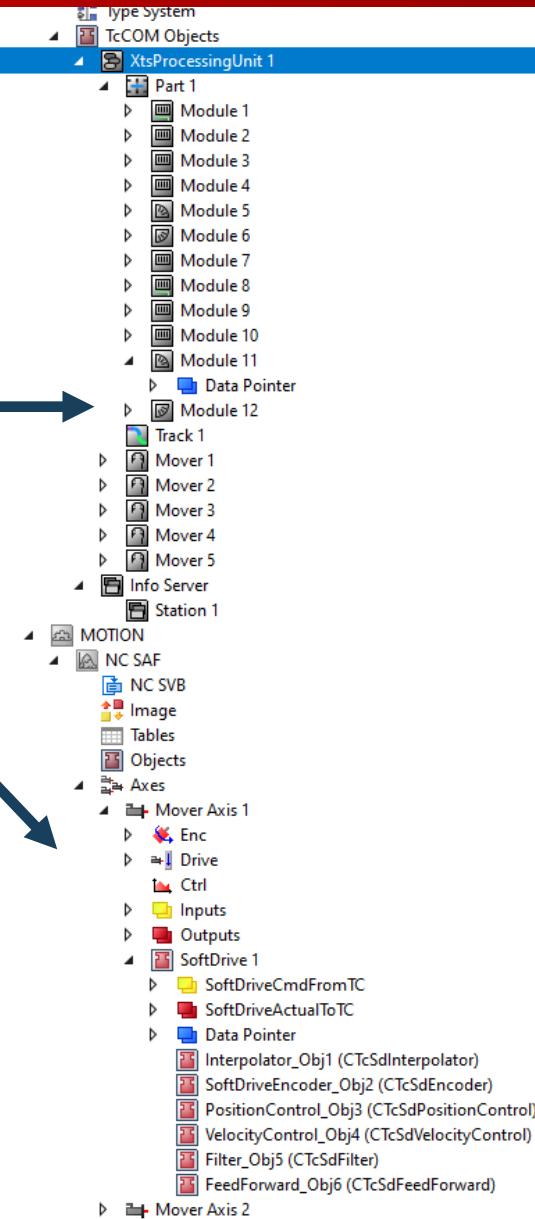
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- Complete the configuration



- Info
 - Module objects are linked with the IO.
 - Mover objects are linked with the SoftDrive.

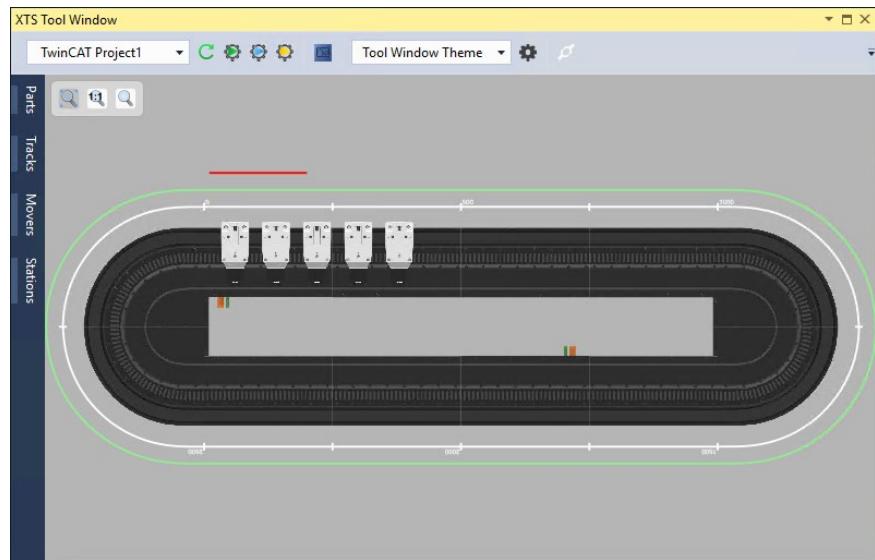


XTS Configuration Process...

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- Configuration finished



	XTS Configurator
Load Project	✓
Load the project configuration.	
Welcome	✓
Processing Units	✓
Edit the processing unit configuration.	
Parts	✓
Edit the part configuration.	
Tracks	✓
Edit the track configuration.	
Stations	✓
Edit the station configuration.	
Movers	✓
Edit the mover configuration.	
Real-Time	✓
Edit the real time configuration.	
Summary	✓
Build	✓
Build the modified project.	
Finished	

Finished!

The configuration has finished.

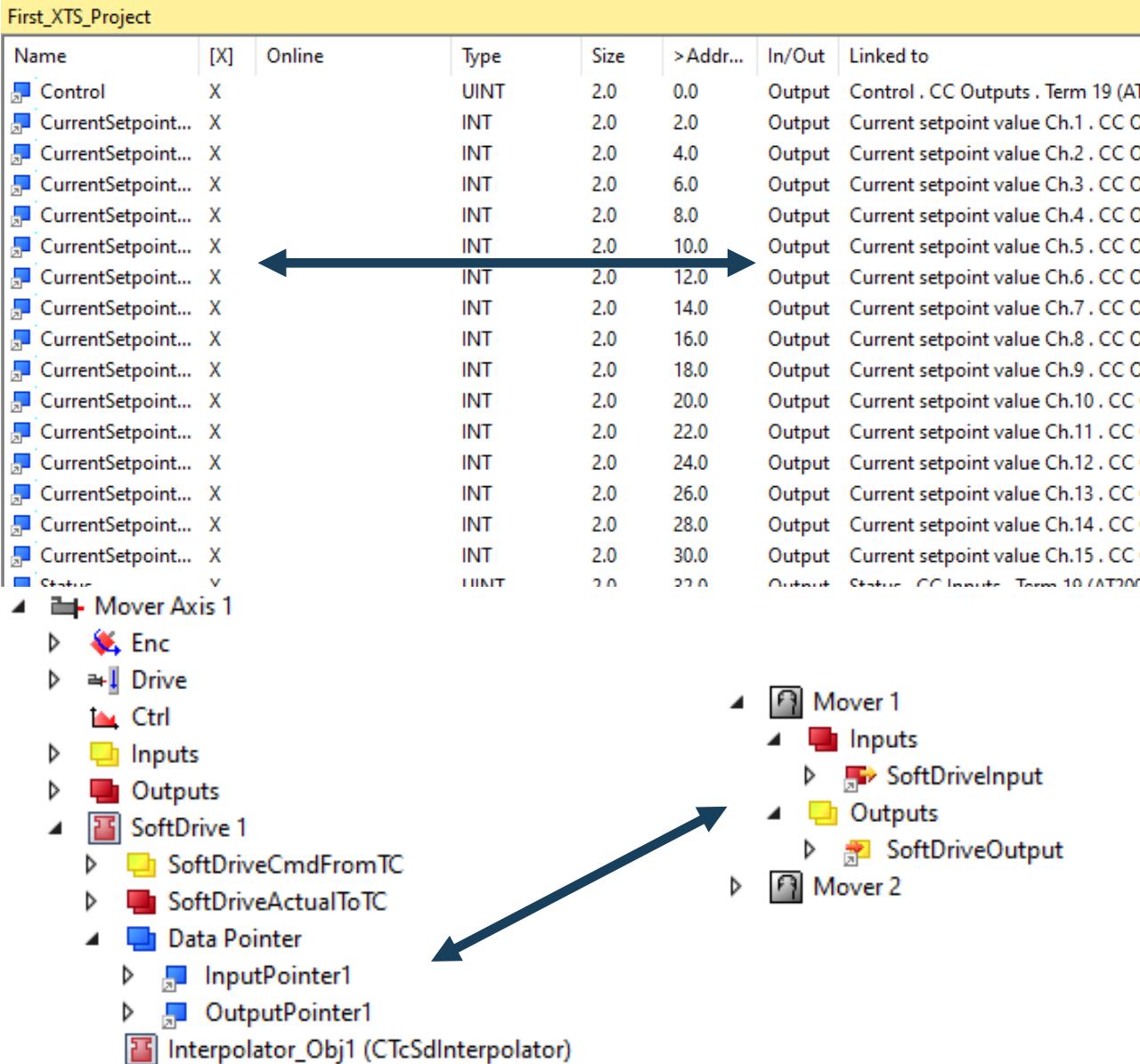
XTS Configuration Process...

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- Communication between the Modules:
 - via Data Pointers
 - No mapping object
 - No copy process

- Warning
 - Use of data pointers is very fast but if used incorrectly data may be corrupted...



XTS Configuration Process...

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■ Real-Time settings

- base time to 250 µs.
- XTS task assignment

The screenshot shows the Beckhoff XTS configuration interface. At the top, there's a navigation tree:

- First_XTS_Project
- SYSTEM
- License
- Real-Time (selected)
- Tasks
- PlcTask
- XTS Task 1
- Routes

The main window has several tabs at the top: Settings, Online, Priorities, and C++ Debugger. The Settings tab is active. It contains sections for Router Memory and Global Task Config. In the Router Memory section, 'Configured Size [MB]' is set to 32 and 'Allocated / Available' is 32 / 31. In the Global Task Config section, 'Maximal Stack Size [KB]' is set to 64KB. Below these are sections for Available Cores and Core Configuration.

Available Cores:
Shared / Isolated: 1 [down] 3 [up] Read from Target Set on Target

Core Configuration:

Core	RT-Core	Base Time	Core Limit	Latency Warning
0 (Shared)	[checkbox]			
1 (Isolated)	<input checked="" type="checkbox"/> Default	1 ms	100 %	(none)
2 (Isolated)	<input checked="" type="checkbox"/>	1 ms	100 %	(none)
3 (Isolated)	<input checked="" type="checkbox"/>	250 µs	100 %	(none)

Object Configuration:

Object	RT-Core	Base Time (ms)	Cycle Time (ms)	Cycle Ticks
XTS Task 1	Core 3	250 µs	0.250 ms	1
NC-Task 1	Core 2	1 ms	2 ms	2
I/O Idle Task	Core 1	1 ms	1 ms	1

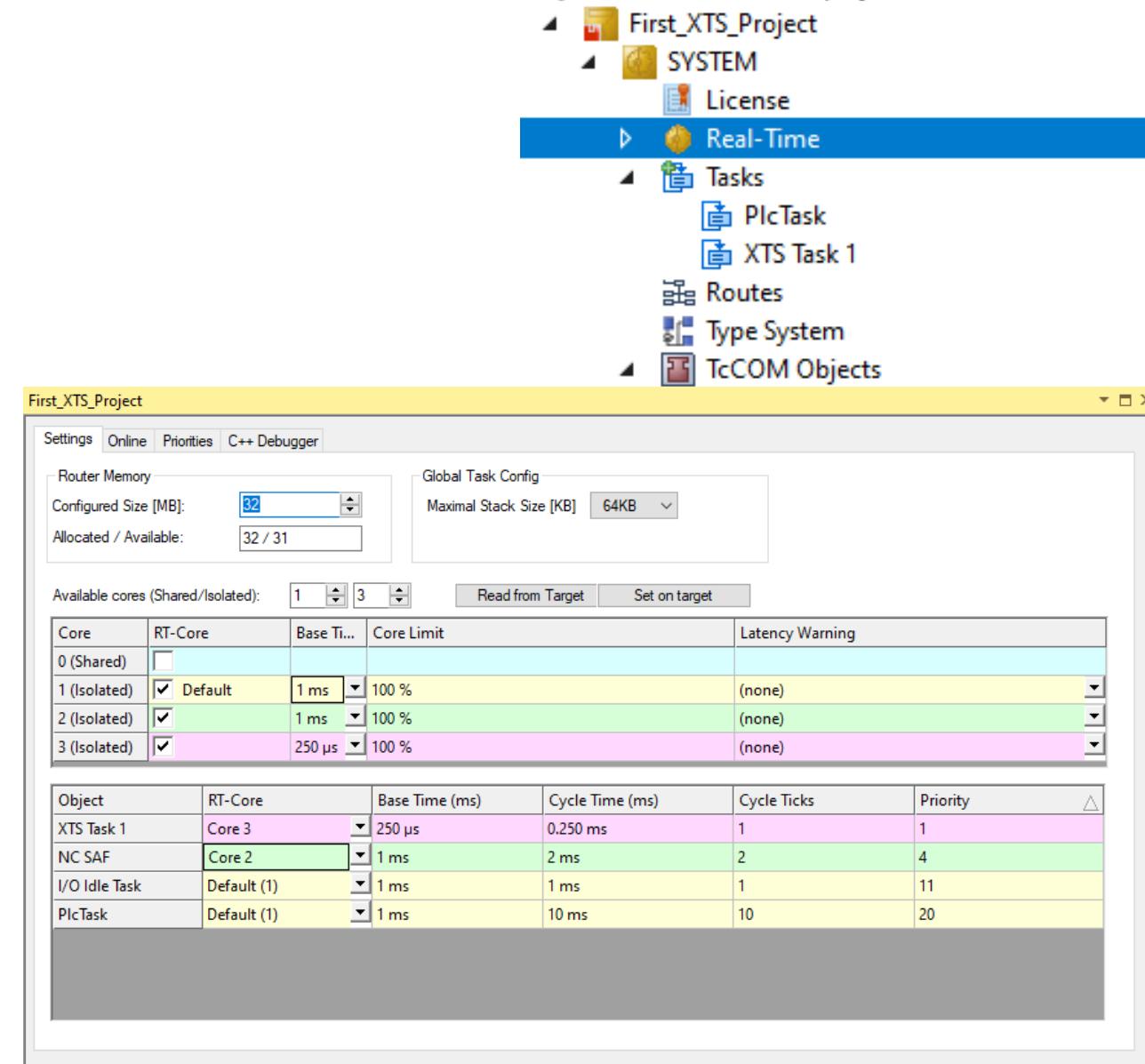
XTS Configuration Process...

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- Suggested settings Real-Time
(small XTS-Systems)

- It is suggested to use one core just for the fast 250 µs XTS task (100% isolated).
- use 1 core just for windows and three cores as isolated real time cores



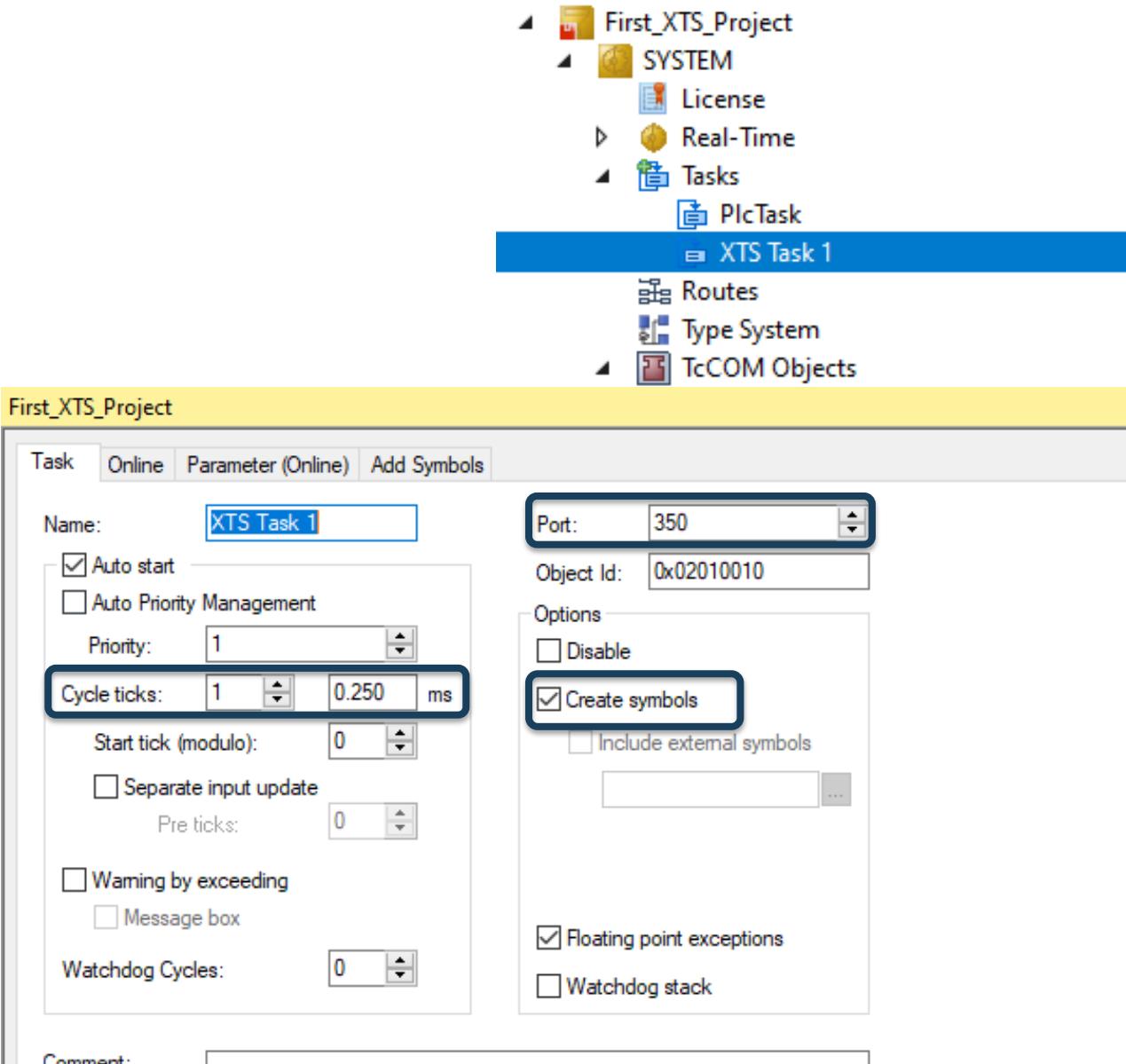
XTS Configuration Process...

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■ XTS Task settings

- Cycle time 250 µs
- Port 350
- ‘Create symbols’ is useful to simplify measurements with TC3 Scope



XTS Configuration Process...

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- First activation...



General Settings Parameter Dynamics Online Functions Coupling Compensation

144.3394

Lag Distance [min/max]: [mm] Actual Velocity: [mm/s]
0.0000 (0.000, 0.000) -0.1154

Override: [%] Total / Control Output: [%]
0.0000 % 0.00 / 0.00 %

Error: 0 (0x0)

Status (log.) Status (phys.) Enabling

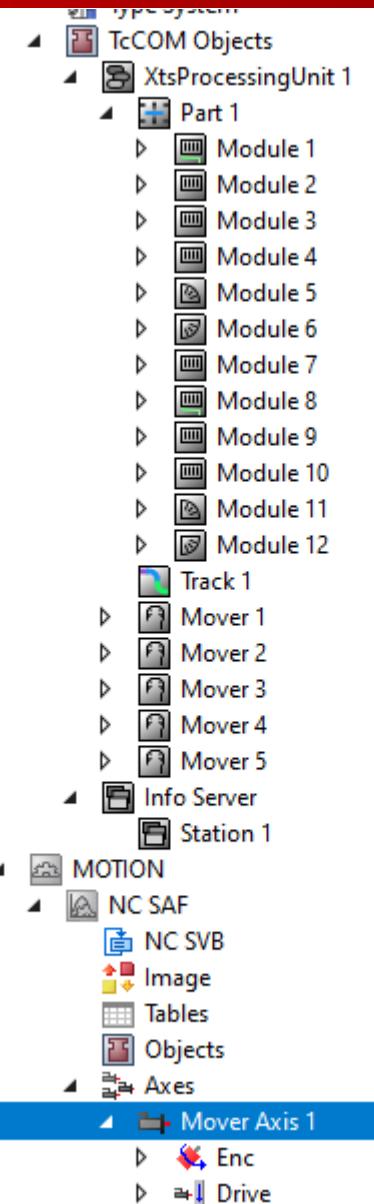
<input type="checkbox"/> Ready	<input checked="" type="checkbox"/> NOT Moving	<input type="checkbox"/> Coupled Mode	<input type="checkbox"/> Controller
<input type="checkbox"/> Calibrated	<input type="checkbox"/> Moving Fw	<input type="checkbox"/> In Target Pos.	<input type="checkbox"/> Feed Fw
<input type="checkbox"/> Has Job	<input type="checkbox"/> Moving Bw	<input type="checkbox"/> In Pos. Range	<input type="checkbox"/> Feed Bw

Set

Controller Kv-Factor: [mm/s/mm] Reference Velocity: [mm/s]
1 2200

Target Position: [mm] Target Velocity: [mm/s]
0 0

F1 F2 F3 F4 F5 F6 F8 F9



XTS Configuration Process...

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■ First activation...

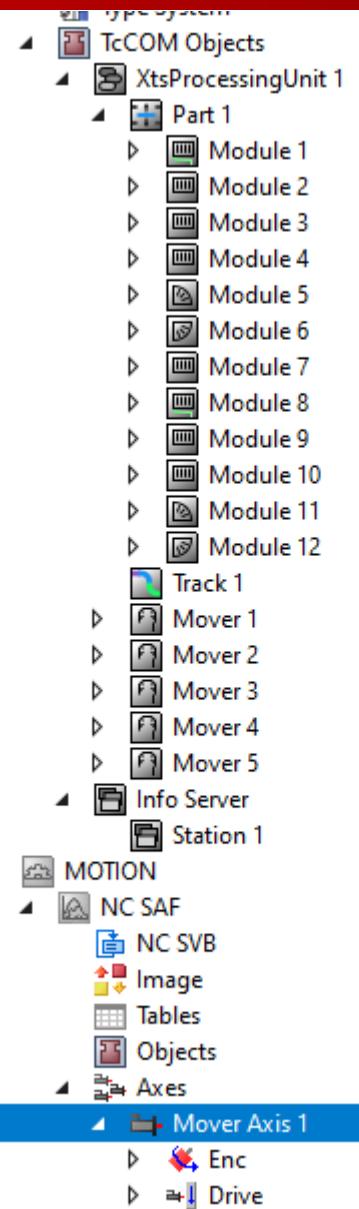
– Output Window

Output

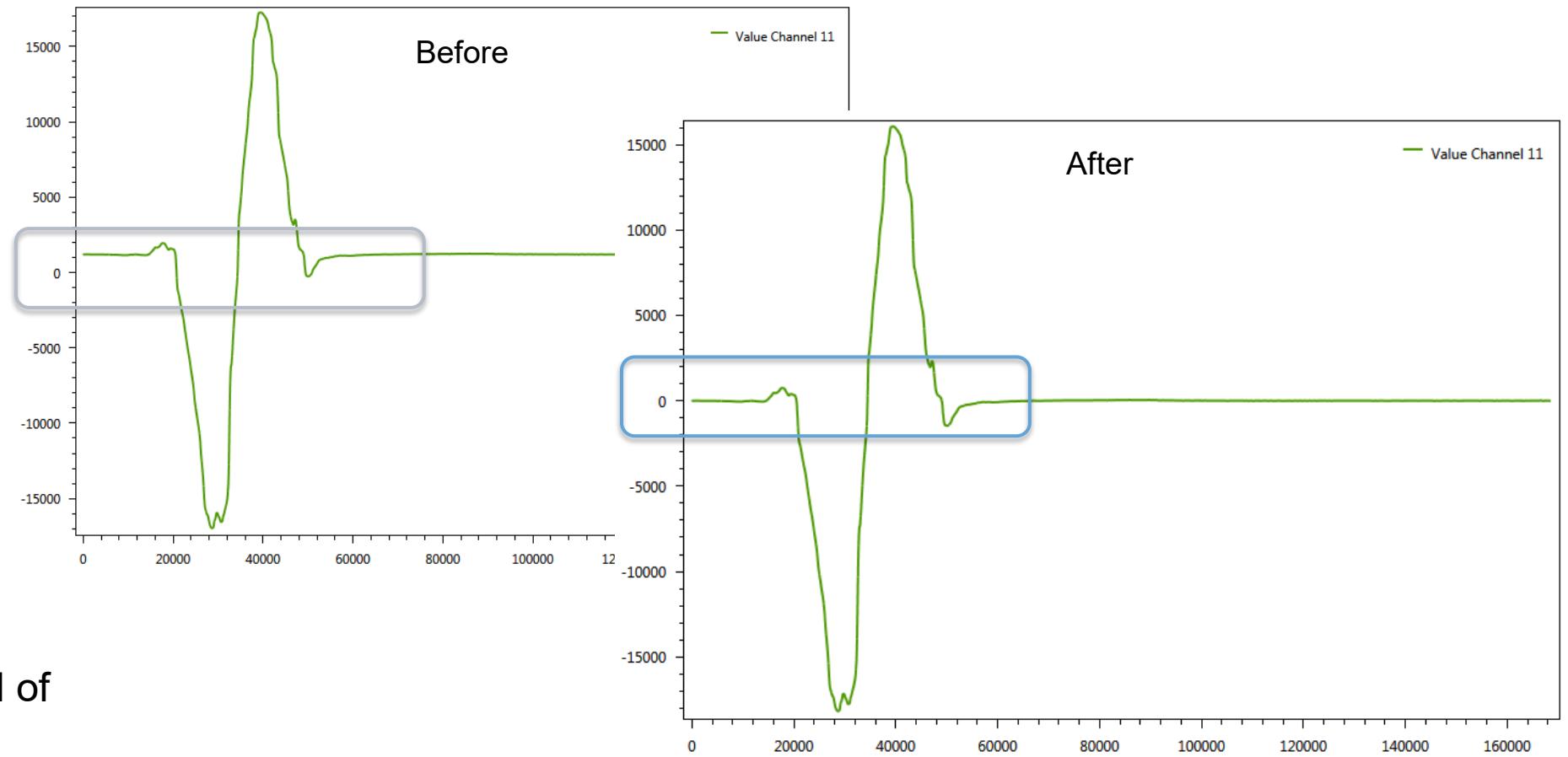
Show output from: TwinCAT

```
MSG | 03/01/2021 12:15:49 029 ms | XtsProcessingUnit 1 (0x01010010): Version 3.20.711.0 Build date: Dec 17 2020 Build time: 14:22:27
MSG | 03/01/2021 12:15:49 029 ms | XtsProcessingUnit 1 (0x01010010): 12 XTS module(s) are loaded.
MSG | 03/01/2021 12:15:49 029 ms | XtsProcessingUnit 1 (0x01010010): 5 XTS mover(s) are loaded.
MSG | 03/01/2021 12:15:49 029 ms | XtsProcessingUnit 1 (0x01010010): Path length is 3000.000000 mm.
WRN | 03/01/2021 12:15:53 516 ms | XtsProcessingUnit 1 (0x01010010): Teaching data TcIoXts.TeachingData.202102001 is missing.
MSG | 03/01/2021 12:15:54 045 ms | XtsProcessingUnit 1 (0x01010010): 12 modules will be initialized...
MSG | 03/01/2021 12:15:54 467 ms | XtsProcessingUnit 1 (0x01010010): 768 DataPointers are initialized.
MSG | 03/01/2021 12:15:54 467 ms | XtsProcessingUnit 1 (0x01010010): Is registered by all tasks as IO driver.
MSG | 03/01/2021 12:15:54 467 ms | XtsProcessingUnit 1 (0x01010010): Enable time is set.
WRN | 03/01/2021 12:15:54 472 ms | XtsProcessingUnit 1 (0x01010010): IO Processing Unit (ID = 1) is waiting for infeed2 (EtherCAT) (3010070) to start up.
MSG | 03/01/2021 12:15:54 496 ms | 'TCOM Server' (10): Cu2508 fifo sizes: 1:16 2:8 3:8 4:8 5:16 6:8 7:8 8:8
WRN | 03/01/2021 12:15:55 472 ms | XtsProcessingUnit 1 (0x01010010): IO Processing Unit (ID = 1) is waiting for Infeed1 (EtherCAT) (3010060) to start up.
MSG | 03/01/2021 12:15:56 144 ms | XtsProcessingUnit 1 (0x01010010): IO Processing Unit (ID = 1): EtherCAT is ready now (2 device(s) are checked).
MSG | 03/01/2021 12:15:56 219 ms | 'TwinCAT System' (10000): Starting COM Server TcEventLogger !
MSG | 03/01/2021 12:15:56 441 ms | XtsProcessingUnit 1 (0x01010010): Teaching data Default is loaded.
MSG | 03/01/2021 12:15:56 457 ms | XtsProcessingUnit 1 (0x01010010): All XTS mover(s) are detected.
```

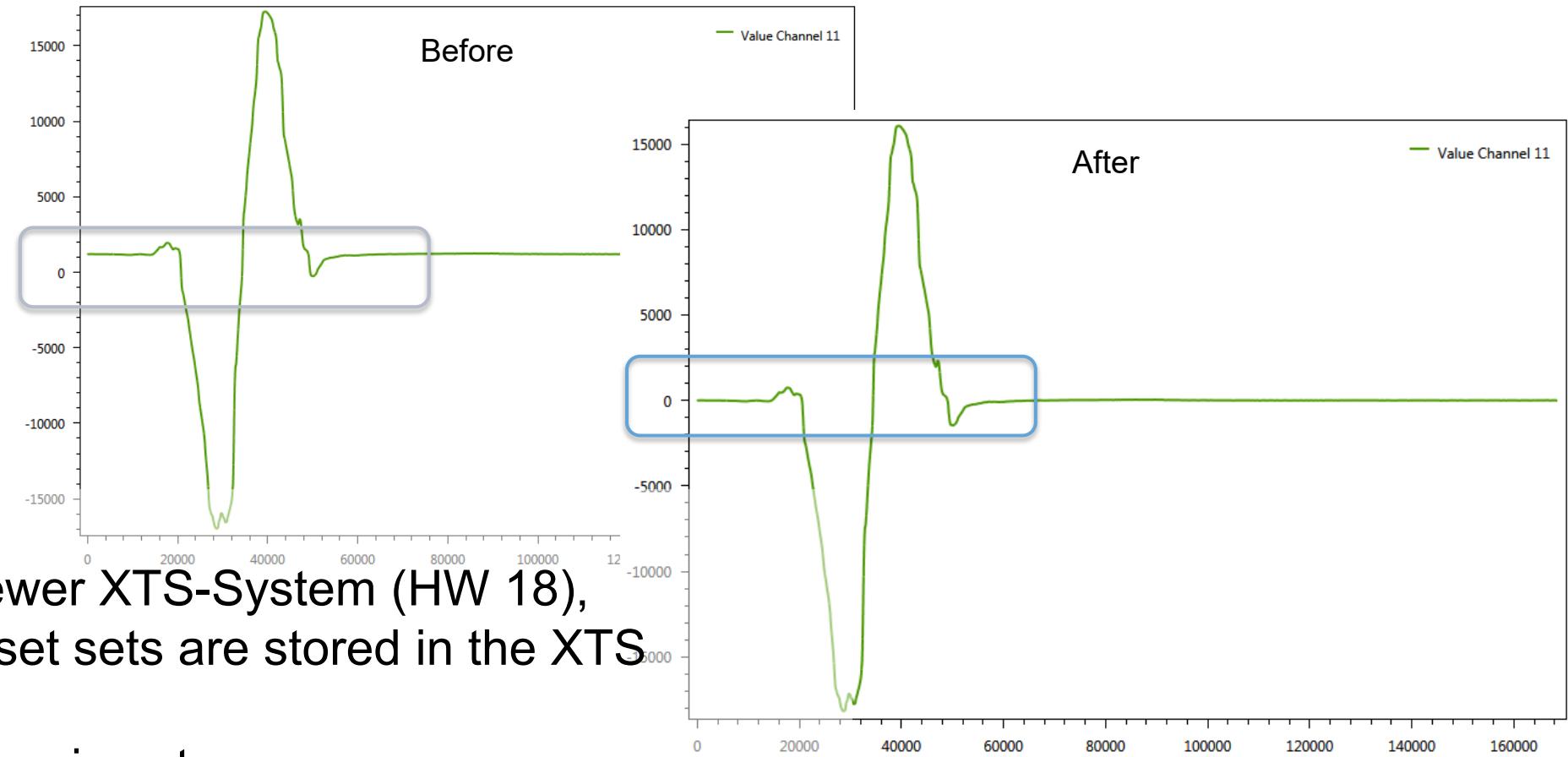
Error List Output



- Teaching Process



- Teaching Process



Info

In the case of newer XTS-System (HW 18),
the analogue offset sets are stored in the XTS
modules.
A teaching process is not necessary

XTS Configuration Process...

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■ Teaching Process | first Step

- set a number for the teaching file which represents the current date.
- Enable Teaching

■ Info

Changes to the ‘TeachingFileNameNumber’ are not recognized until after an ‘Activate Configuration’ is performed.

Before the teaching procedure is started, it must be activated so that the teaching data is saved in the correct file

Name	Value	CS	Unit	Type	P...	Comment
General						
Mover						
Mover Detection						
Mover ID Detection						
Teaching						
TeachingFileNameNumber	20230322			UDINT	0x...	The num...
TeachingMappingMode	Automatic			XTS.Teach...	0x...	Specifies ...
+ StartStandStillTeaching	...				0x...	On down...
+ StartMovementTeaching	...				0x...	On down...
StopMovementTeaching				StopMo...	0x...	On down...
IsAbortOnTeachingWarningsEnabled	TRUE			BOOL	0x...	If set to tr...
IsTeachingCheckSumCheckEnabled	FALSE			BOOL	0x...	If set to f...
IsTeachingEnabled	TRUE			BOOL	0x...	If set to f...
+ TeachingCheckSum	FALSE	16 (A...)			0x...	Specifies ...
TeachingWarningLevel	TRUE			XTS.Teach...	0x...	Specifies ...
TriggerTeachingFileFormatUpdate				TriggerT...	0x...	Triggers t...
Diagnostics						
Advanced						
Simulation						

☐ Show Online Values ☐ Show Hidden Parameter

XTS Configuration Process...

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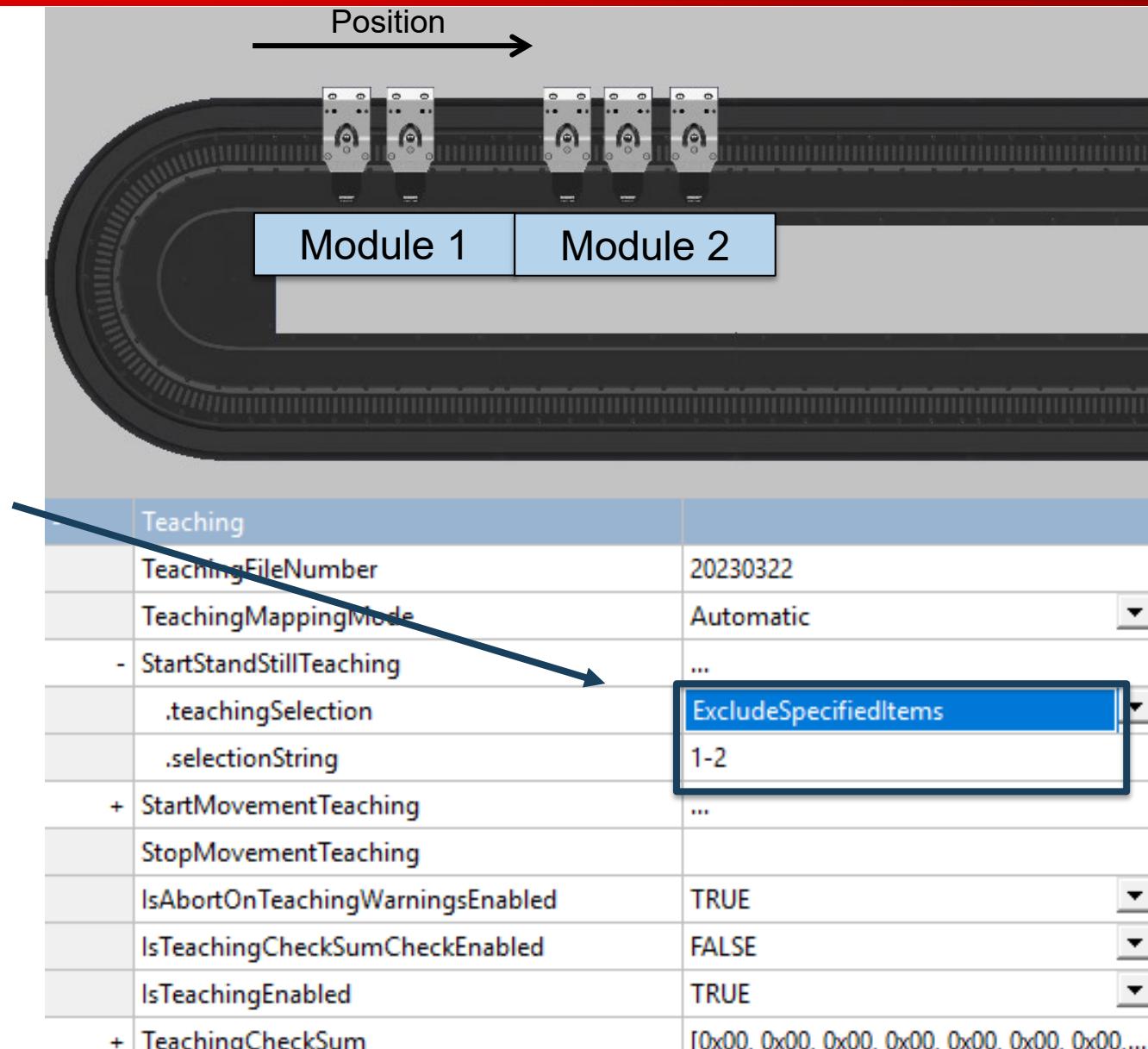
BECKHOFF

- Teaching Process | next Step

1. Move the Mover to a defined Position
 2. Define Exclude Specified Items.

▪ Info

.selectionString Format
X, Y, Z or X-Z



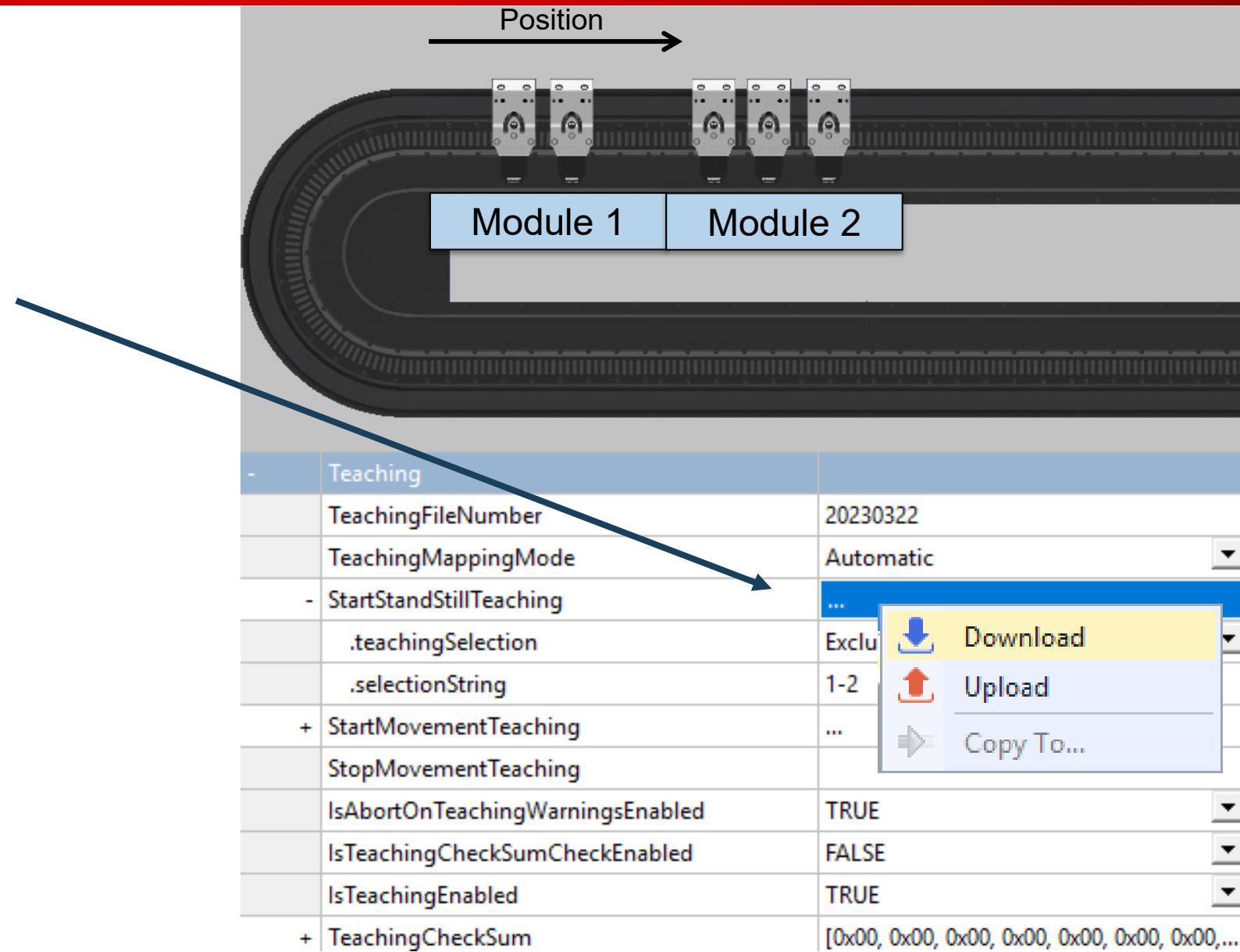
XTS Configuration Process...

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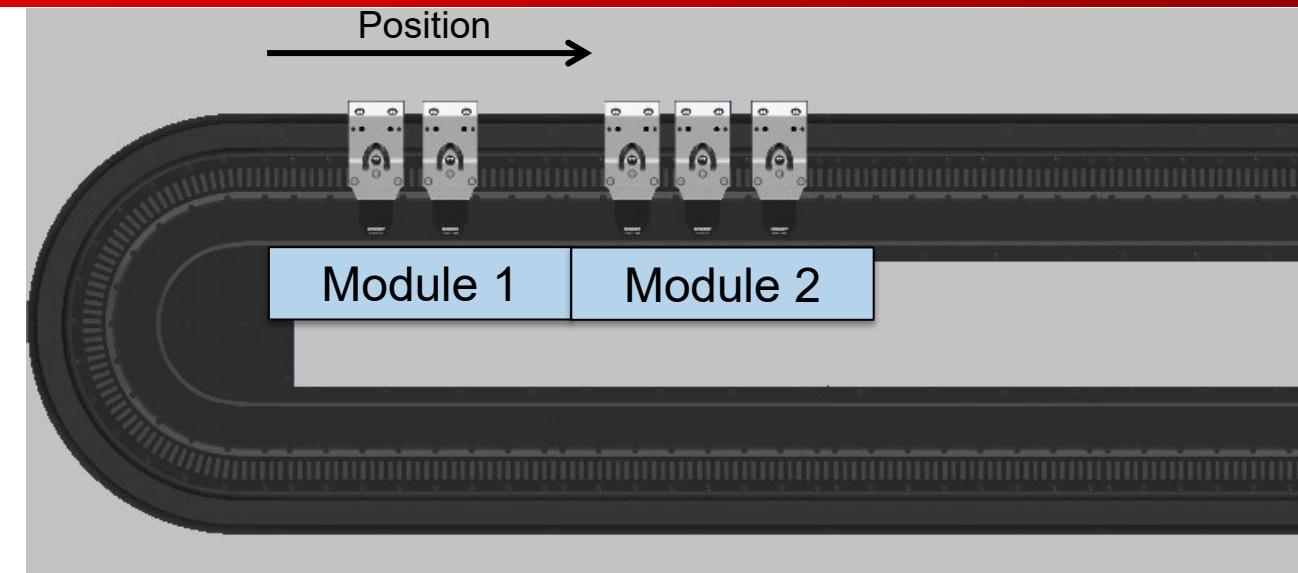
- Teaching Process | next Step

3. StartStandStillTeaching



- Teaching Process

- Teaching Stops automatically



Output

Show output from: TwinCAT



```
| XtsProcessingUnit 1 (0x01010010): Teaching is started on 10 modules.  
| XtsProcessingUnit 1 (0x01010010): Teaching is stopped on 10 modules.  
| XtsProcessingUnit 1 (0x01010010): Teaching data plausibility check is passed successfully.
```

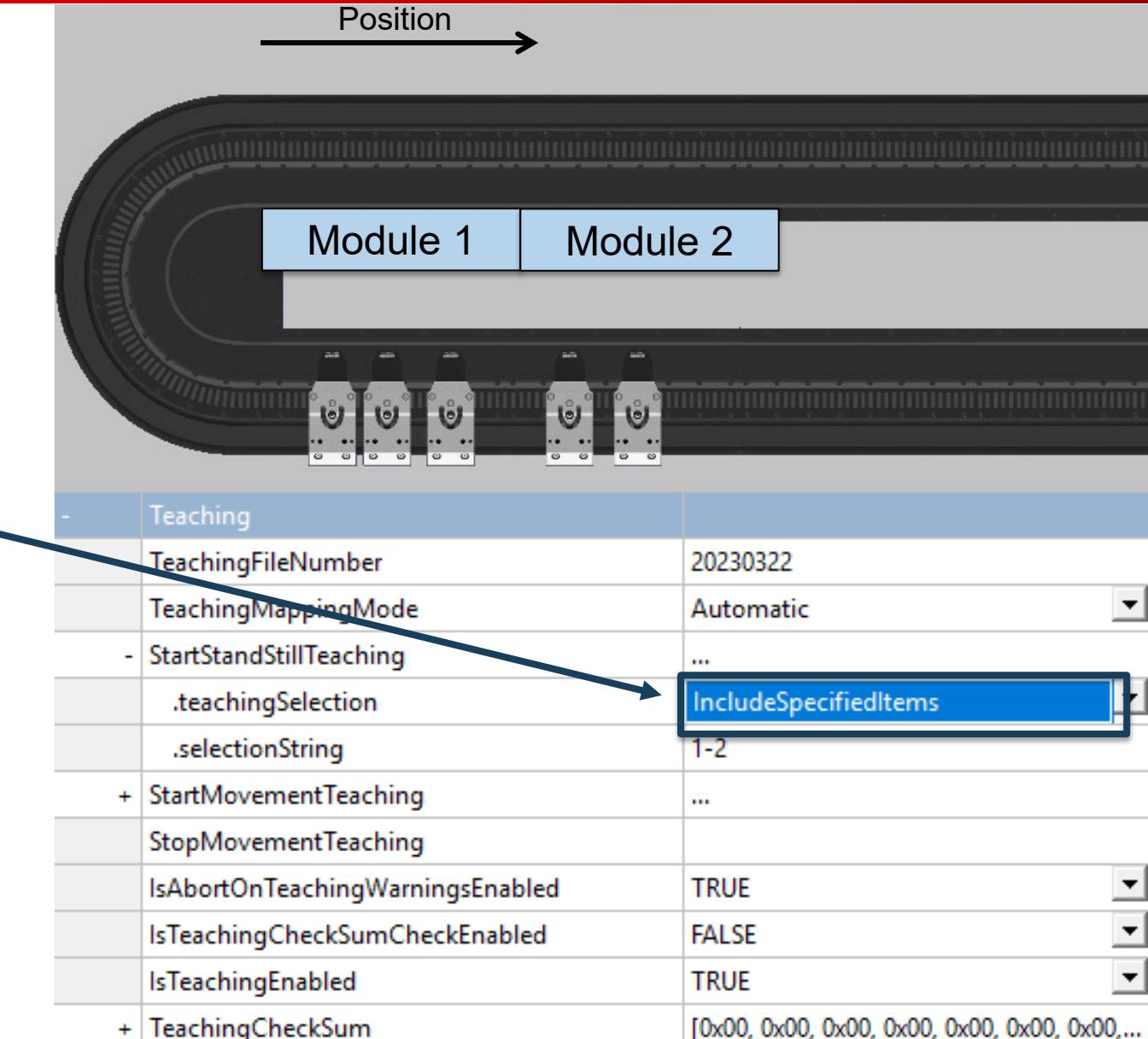
- Teaching Process | next Step

5. Move the Mover to a different defined Position

6. Change “.teachingSelection”

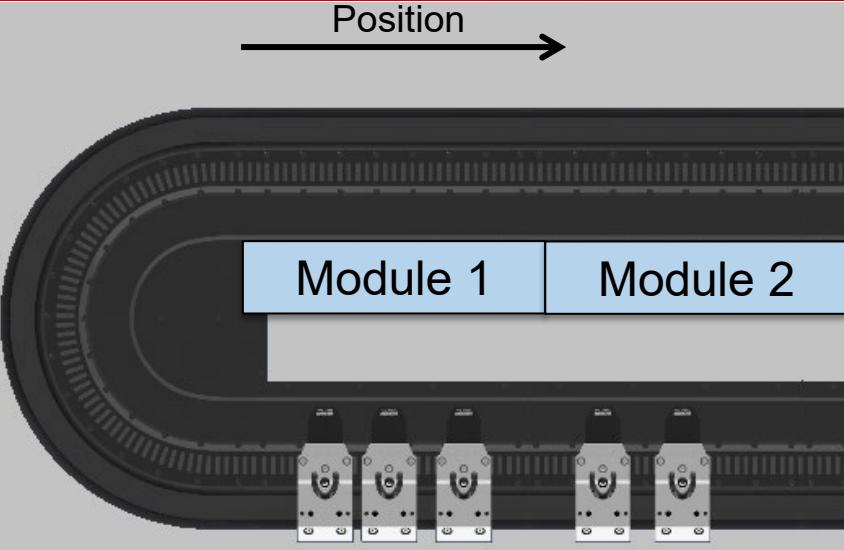
- Warning

Do not place movers at crossings where the module is active during teaching. Otherwise, the feedback system will not work correctly.



- Teaching Process | next Step

7. StartStandStillTeaching



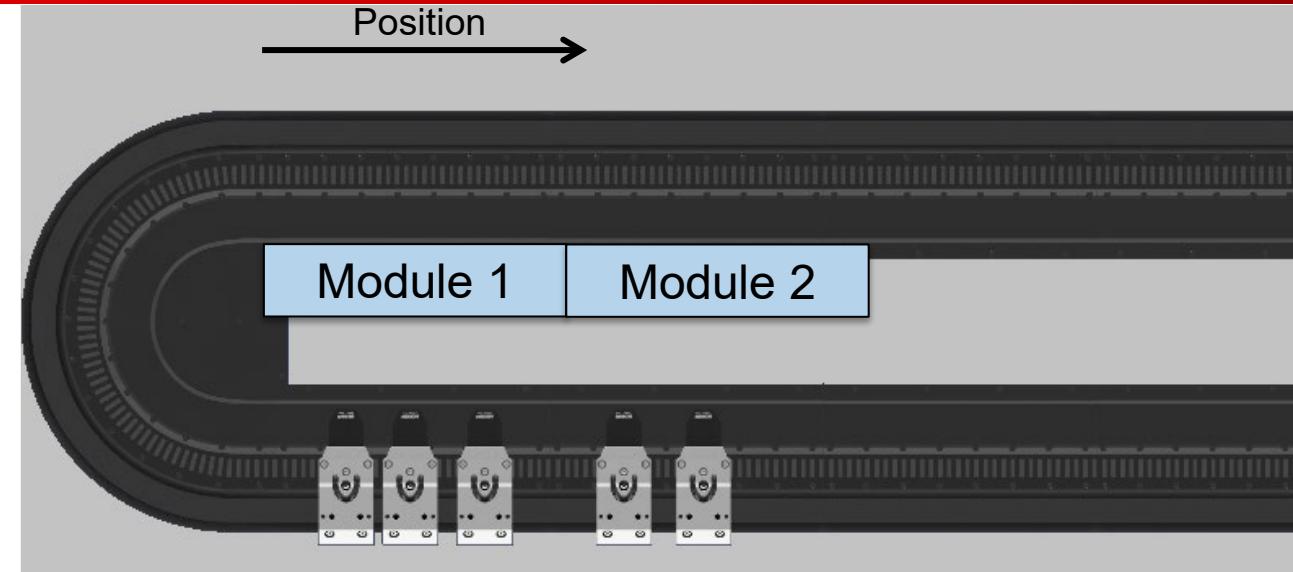
The diagram shows a robotic arm with two main modules, Module 1 and Module 2, positioned above a track. A horizontal arrow labeled "Position" points to the right, indicating the direction of movement or configuration.

Teaching		
TeachingFileNumber	Incl.	20230322
TeachingMappingMode	Incl.	Automatic
- StartStandStillTeaching	...	
.teachingSelection	Incl.	Download
.selectionString	Incl.	Upload
+ StartMovementTeaching	...	
StopMovementTeaching		
IsAbortOnTeachingWarningsEnabled		TRUE
IsTeachingCheckSumCheckEnabled		FALSE
IsTeachingEnabled		TRUE
+ TeachingCheckSum		[0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,...]

A context menu is open on the right side of the table, showing options: Download (highlighted in yellow), Upload, and Copy To... .

- Teaching Process

8. Teaching Stops automatically



Output

```
Show output from: TwinCAT
```

XtsProcessingUnit 1 (0x01010010): Teaching is started on 10 modules.
XtsProcessingUnit 1 (0x01010010): Teaching is stopped on 10 modules.
XtsProcessingUnit 1 (0x01010010): Teaching data plausibility check is passed successfully.
XtsProcessingUnit 1 (0x01010010): Teaching is started on 2 modules.
XtsProcessingUnit 1 (0x01010010): Teaching is stopped on 2 modules.
XtsProcessingUnit 1 (0x01010010): Teaching data plausibility check is passed successfully.

Output

- Teaching Process



- Set TwinCAT in Config Mode

Name	Date modified	Type	Size
TcloXts.A3CD1B10DC0A.bootdata	9/12/2019 11:59 AM	BOOTDATA File	135 KB
TcloXts.AFAE087DBF89.bootdata	9/12/2019 11:59 AM	BOOTDATA File	164 KB
TcloXts.C651730AF406.bootdata	9/12/2019 11:59 AM	BOOTDATA File	164 KB
TcloXts.2V4K917S3FL2.bootdata	12/17/2020 2:20 PM	BOOTDATA File	99 KB
TcloXts.2X3Y3P08Q6E4.bootdata	12/17/2020 2:20 PM	BOOTDATA File	97 KB
TcloXts.3F7E6515353E.bootdata	12/17/2020 2:20 PM	BOOTDATA File	110 KB
TcloXts.6B7B5CB523B6.bootdata	12/17/2020 2:20 PM	BOOTDATA File	93 KB
TcloXts.7B1EB9C21232.bootdata	12/17/2020 2:20 PM	BOOTDATA File	99 KB
TcloXts.49F4D228F523.bootdata	12/17/2020 2:20 PM	BOOTDATA File	136 KB
TcloXts.395324E19C62.bootdata	12/17/2020 2:20 PM	BOOTDATA File	143 KB
TcloXts.99158292150F.bootdata	12/17/2020 2:20 PM	BOOTDATA File	108 KB
TcloXts.A66B5237F36C.bootdata	12/17/2020 2:20 PM	BOOTDATA File	105 KB
TcloXts.B0D0D28B259A.bootdata	12/17/2020 2:20 PM	BOOTDATA File	130 KB
TcloXts.B098B31198B5.bootdata	12/17/2020 2:20 PM	BOOTDATA File	103 KB
TcloXts.D162E74EC647.bootdata	12/17/2020 2:20 PM	BOOTDATA File	97 KB
TcloXts.DD5A57E33B16.bootdata	12/17/2020 2:20 PM	BOOTDATA File	126 KB
TcloXts.H411R3FB475.bootdata	12/17/2020 2:20 PM	BOOTDATA File	119 KB
TcloXts.HYGH411R3F00.bootdata	12/17/2020 2:20 PM	BOOTDATA File	174 KB
TcloXts.HYGH411R3F01.bootdata	12/17/2020 2:20 PM	BOOTDATA File	168 KB
TcloXts.TL_XtS_HVGH411R3F01.bootdata	12/17/2020 2:20 PM	BOOTDATA File	106 KB
TcloXts.TeachingData.202102001.bootdata	3/1/2021 1:27 PM	BOOTDATA File	2 KB

- Advice: Make a backup after the teaching file is created the first time

- Teaching Process



- Set TwinCAT in Run-Mode

Output

Show output from: TwinCAT

```
| XtsProcessingUnit 1 (0x01010010): Version 3.20.711.0 Build date: Dec 17 2020 Build time: 14:22:27
| XtsProcessingUnit 1 (0x01010010): 12 XTS module(s) are loaded.
| XtsProcessingUnit 1 (0x01010010): 5 XTS mover(s) are loaded.
| XtsProcessingUnit 1 (0x01010010): Path length is 3000.000000 mm.
| XtsProcessingUnit 1 (0x01010010): Teaching data TcIoXts.TeachingData.202102001 is loaded. (This line is highlighted)
| XtsProcessingUnit 1 (0x01010010): 12 modules will be initialized...
| XtsProcessingUnit 1 (0x01010010): 768 DataPointers are initialized.
| XtsProcessingUnit 1 (0x01010010): Is registered by all tasks as IO driver.
| XtsProcessingUnit 1 (0x01010010): Enable time is set.
| XtsProcessingUnit 1 (0x01010010): IO Processing Unit (ID = 1) is waiting for infeed2 (EtherCAT) (3010070) to start up.
| 'TCOM Server' (10): Cu2508 fifo sizes: 1:16 2:8 3:8 4:8 5:16 6:8 7:8 8:8
| XtsProcessingUnit 1 (0x01010010): IO Processing Unit (ID = 1) is waiting for Infeed1 (EtherCAT) (3010060) to start up.
| XtsProcessingUnit 1 (0x01010010): IO Processing Unit (ID = 1): EtherCAT is ready now (2 device(s) are checked).
| 'TwinCAT System' (10000): Starting COM Server TcEventLogger !
| XtsProcessingUnit 1 (0x01010010): Module identity check for teaching is passed successfully.
| XtsProcessingUnit 1 (0x01010010): Teaching data plausibility check is passed successfully.
| XtsProcessingUnit 1 (0x01010010): All XTS mover(s) are detected.
```

Agenda | XTS- TcloXtsProcessingUnit (XPU)

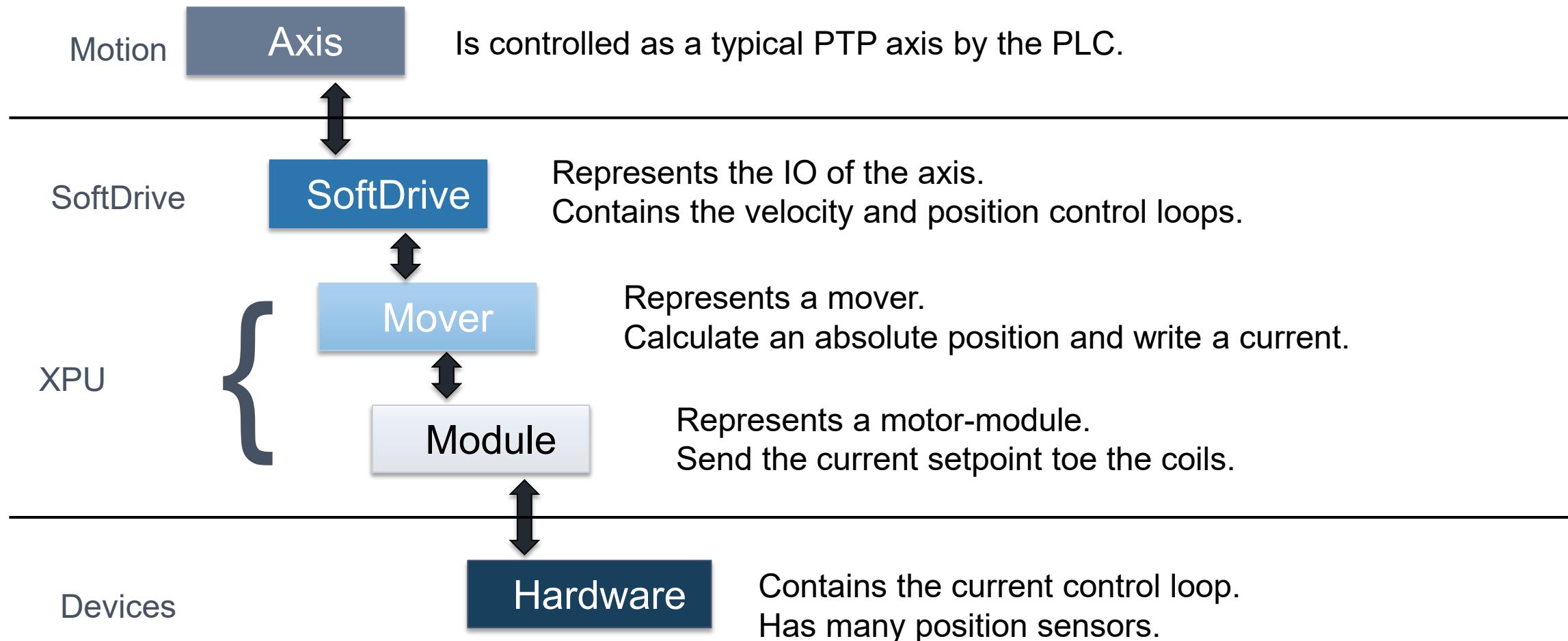
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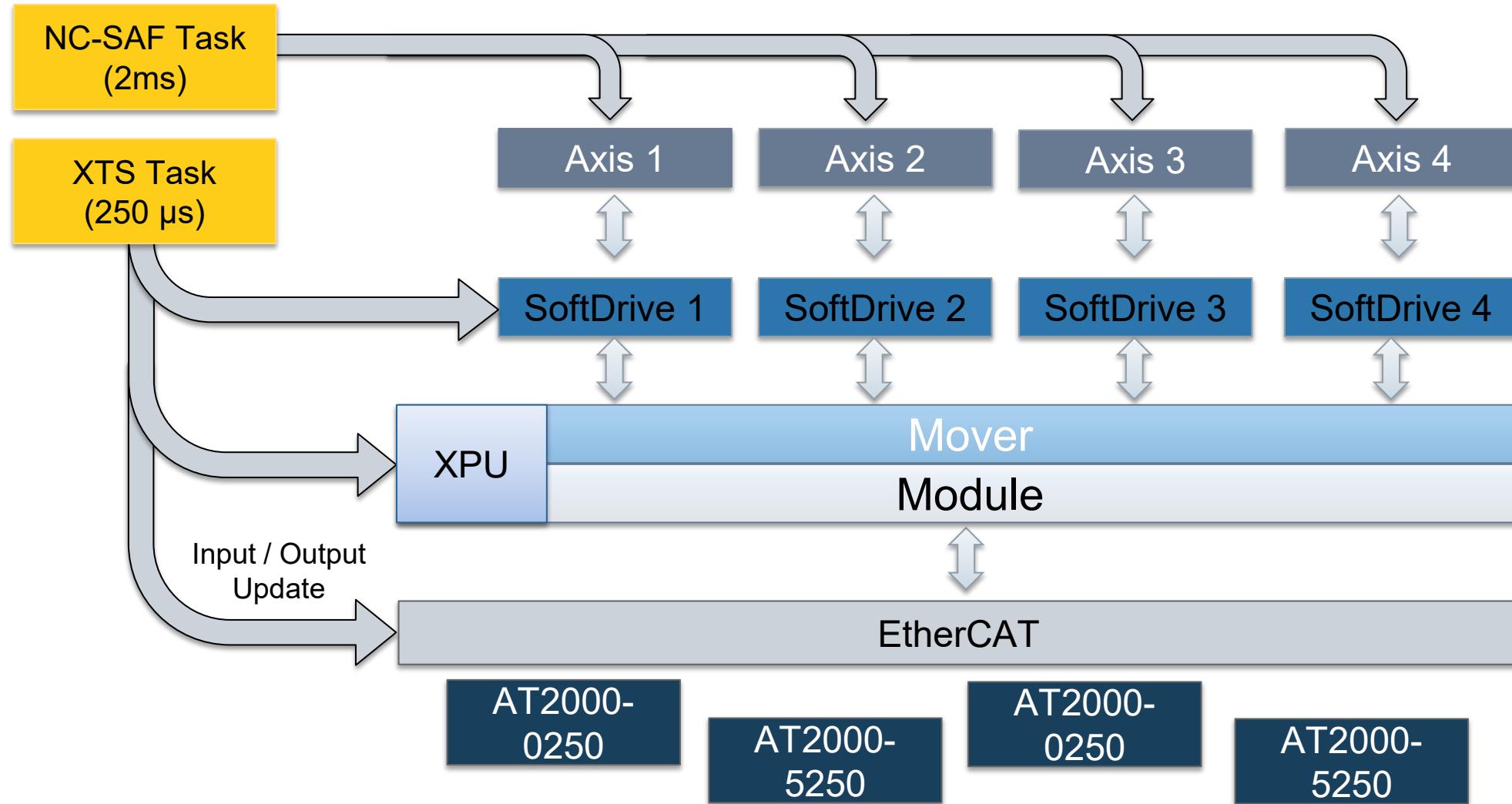
- 1. XPU Introduction
- 2. XTS Configuration Process
- 3. XPU – Deep Dive**
- 4. XTS Viewer
- 5. Mover 1
- 6. Simulation Mode



- `TcIoXtsProcessingUnit` is the link between the Motion and the hardware.

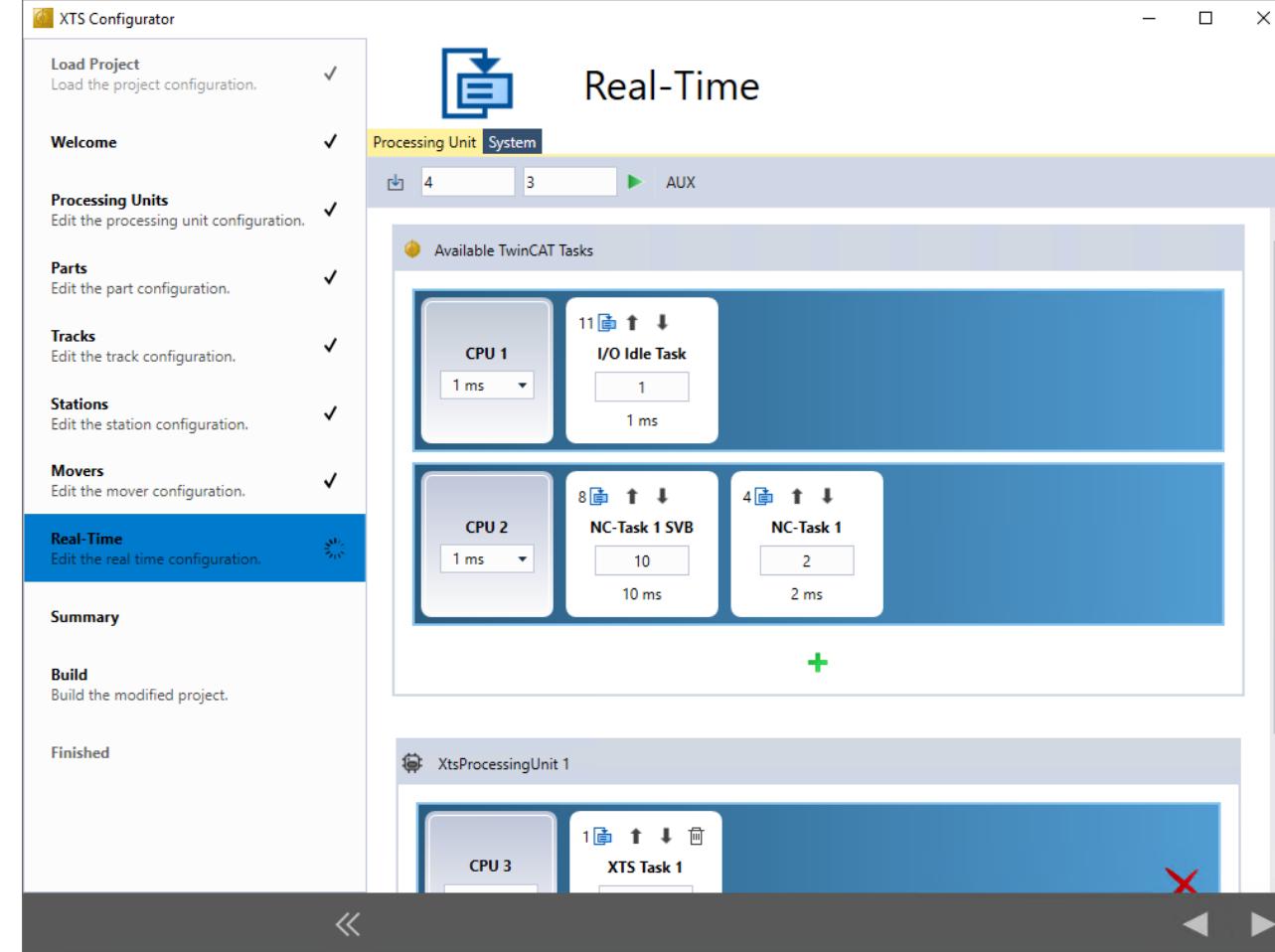


■ Cycle Update of SoftDrive & Axis



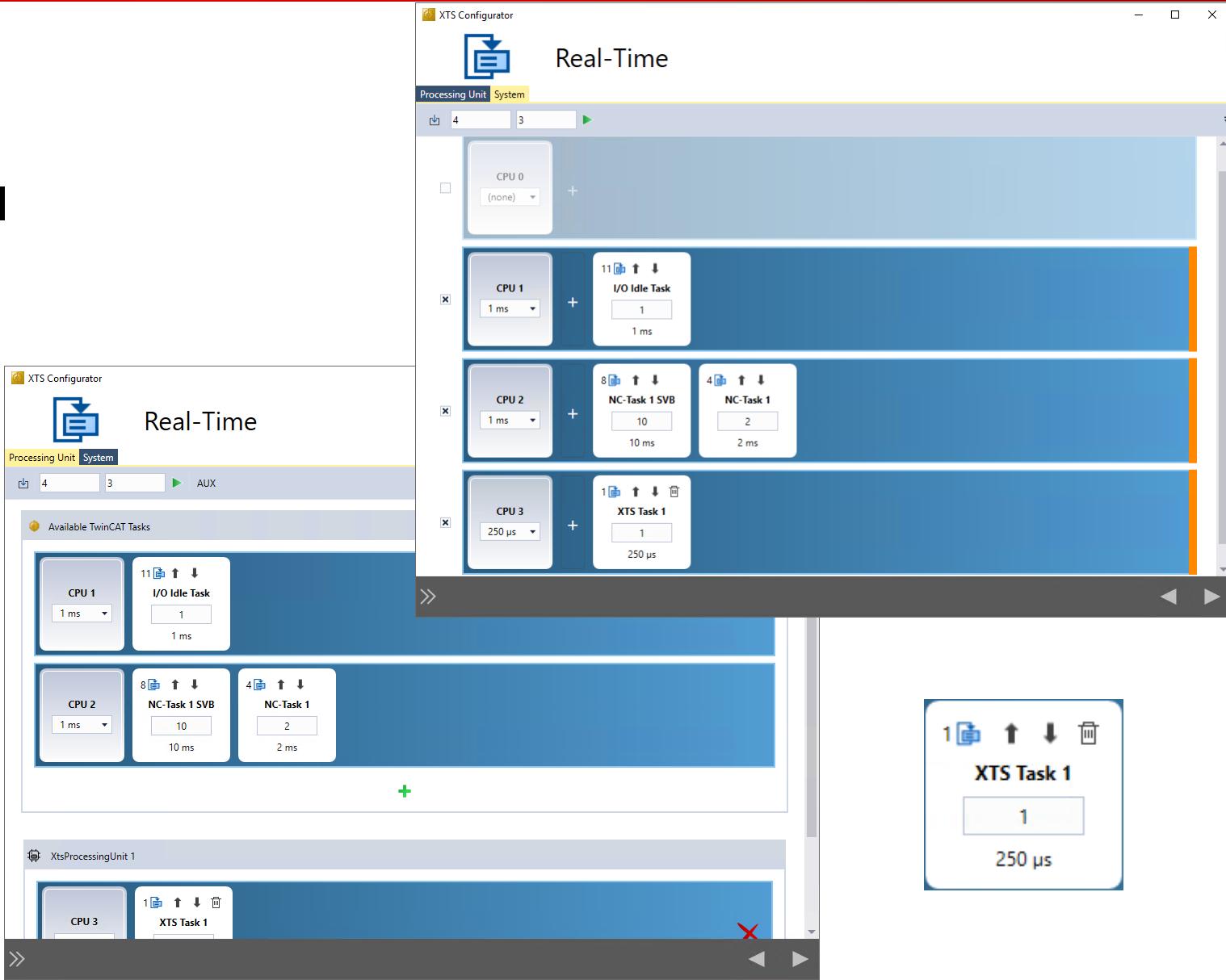
■ Real-Time Model

- Part of the configurator

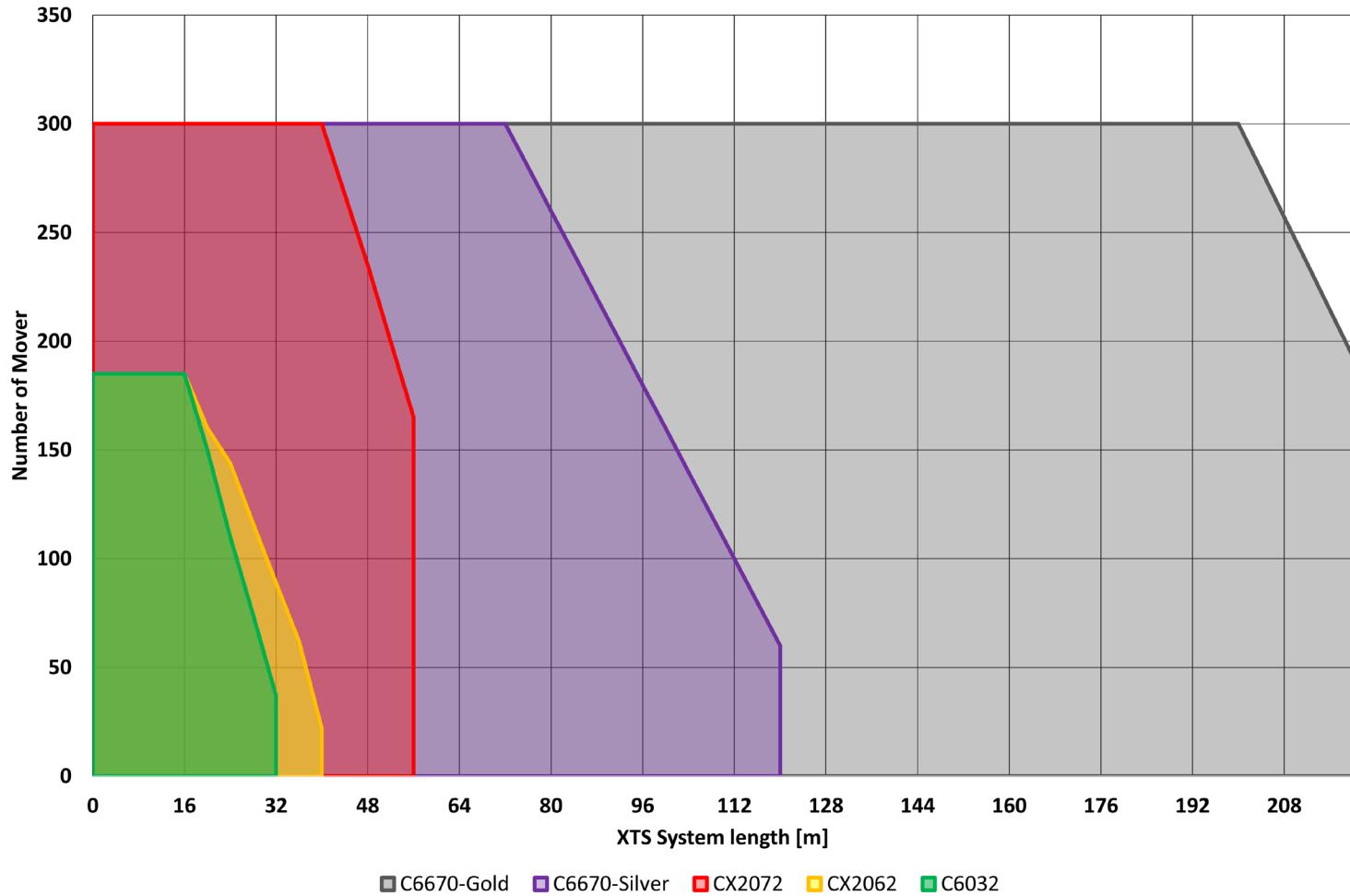
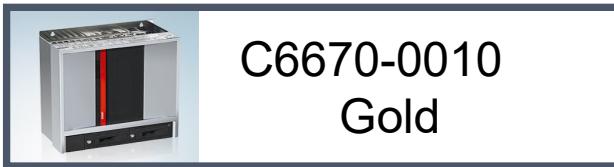
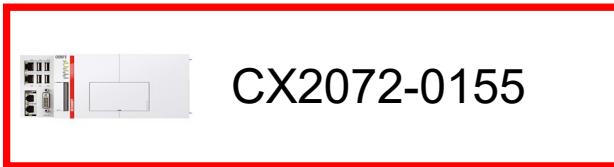
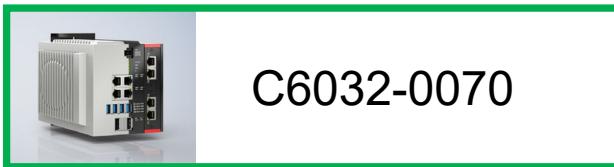


■ Real-Time Model

- Show the act. Real-Time Model
- Used for assignment of
 - Used Core
 - Base Time
 - Task assignment to Core
 - CycleTime of the Task

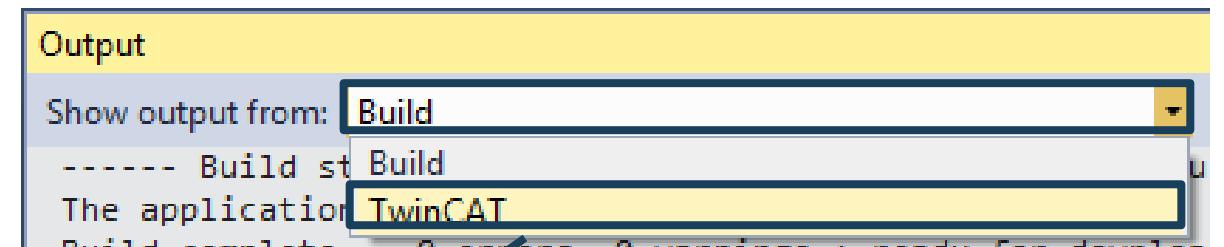


▪ Real-Time Model



■ Diagnosis

- output Window from Visual Studio



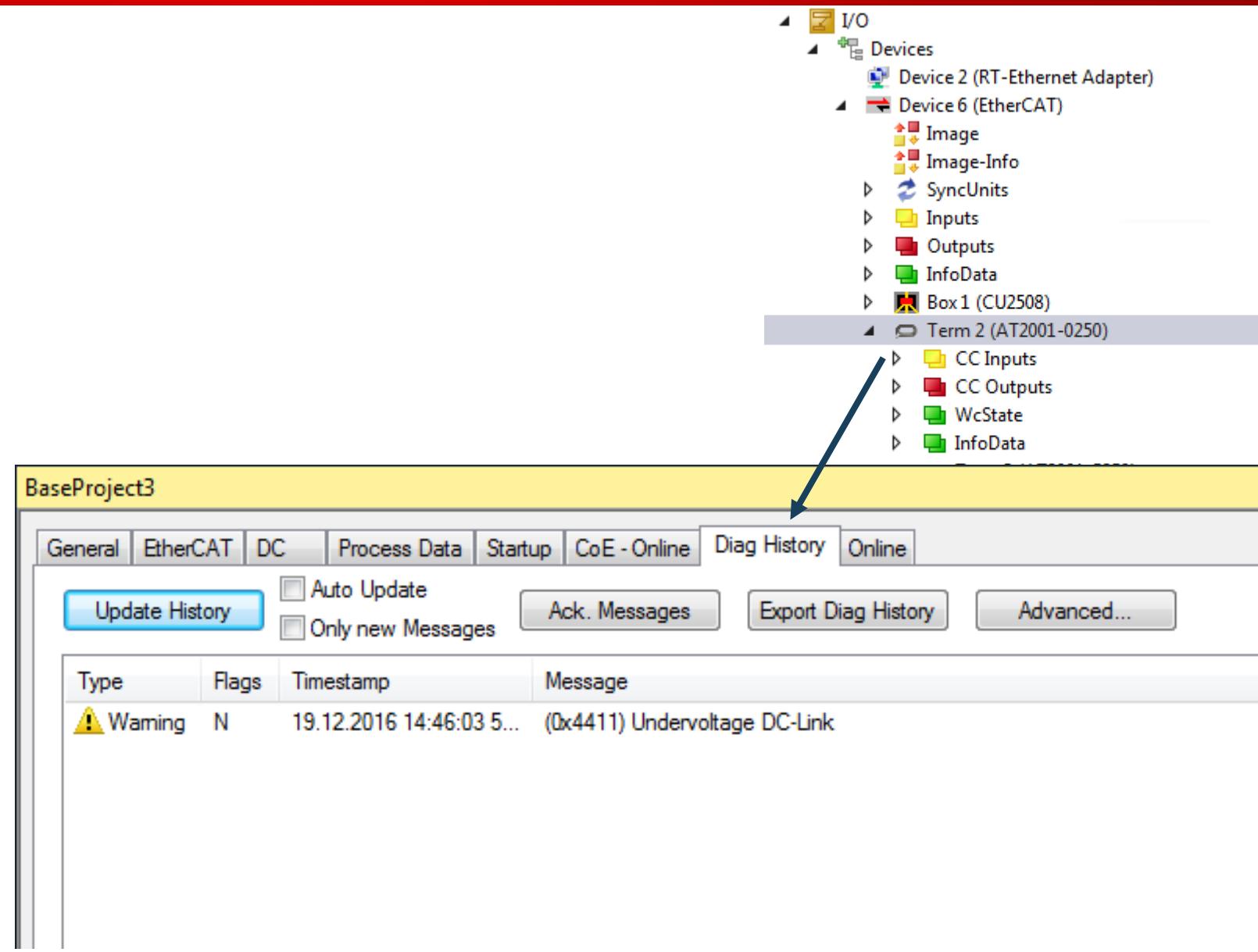
A screenshot of the Visual Studio Output window with the title 'Output'. The 'Show output from:' dropdown is set to 'TwinCAT'. The window displays the following log messages:

```
MSG | 02/23/2021 13:56:43 160 ms | XtsProcessingUnit 1 (0x01010010): Version 3.20.711.0 Build date: Dec 17 2020 Build time: 14:22:27
MSG | 02/23/2021 13:56:43 160 ms | XtsProcessingUnit 1 (0x01010010): 12 XTS module(s) are loaded.
MSG | 02/23/2021 13:56:43 160 ms | XtsProcessingUnit 1 (0x01010010): 5 XTS mover(s) are loaded.
MSG | 02/23/2021 13:56:43 160 ms | XtsProcessingUnit 1 (0x01010010): Path length is 3000.000000 mm.
WRN | 02/23/2021 13:56:43 502 ms | XtsProcessingUnit 1 (0x01010010): Teaching data TcIoXts.TeachingData.0 is missing.
MSG | 02/23/2021 13:56:43 668 ms | XtsProcessingUnit 1 (0x01010010): Is registered by all tasks as IO driver.
MSG | 02/23/2021 13:56:43 668 ms | XtsProcessingUnit 1 (0x01010010): Enable time is set.
MSG | 02/23/2021 13:56:43 673 ms | XtsProcessingUnit 1 (0x01010010): All XTS mover(s) are detected.
MSG | 02/23/2021 13:56:43 717 ms | 'TwinCAT System' (10000): COM Server TcpIpServer wird gestartet!
MSG | 02/23/2021 13:56:43 729 ms | 'TwinCAT System' (10000): COM Server TcEventLogger wird gestartet!
```

The bottom tabs show 'Error List' and 'Output'.

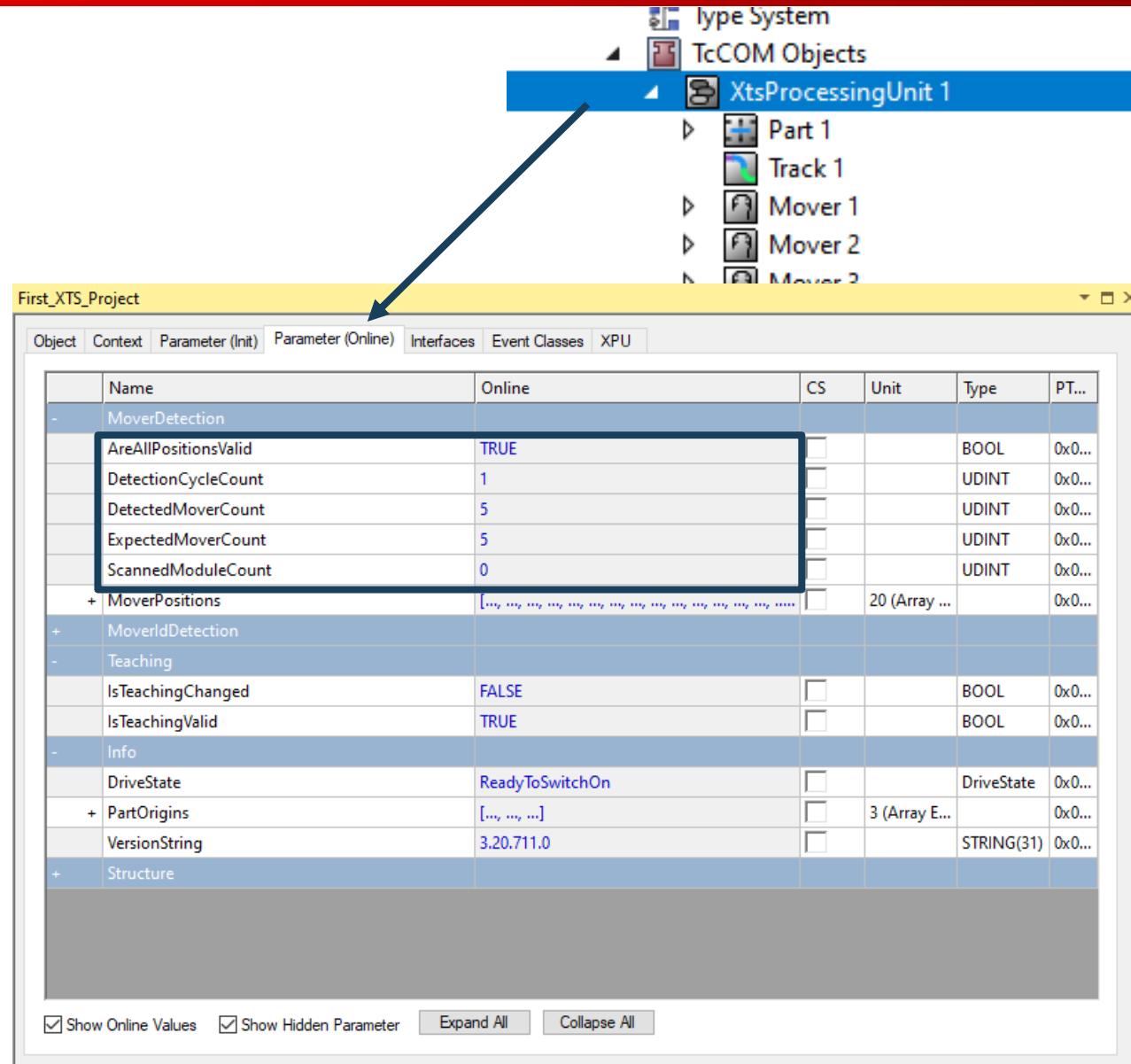
■ Diagnosis

– Module Diagnostic History



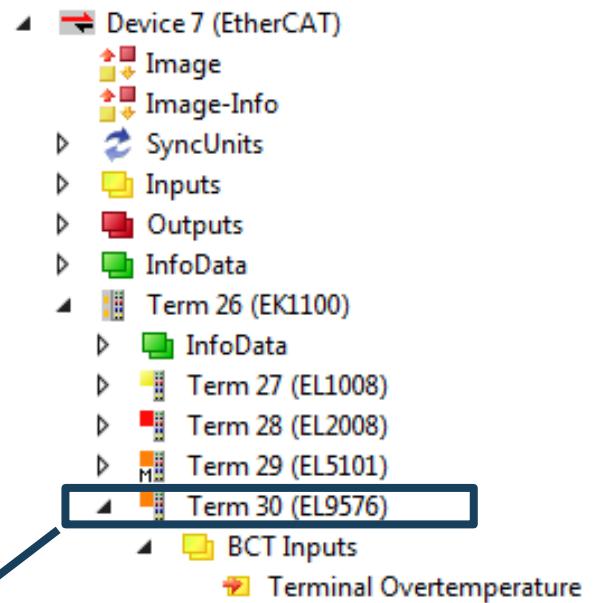
■ Diagnosis

– Parameter (Online)



■ Diagnosis

- Info's from EL9576
(Break Chopper Terminal)



Name	Online	Type	Size	> Addr...	I
Terminal Overtemperature	0	BIT	0.1	70.0	I
I2T error	0	BIT	0.1	70.1	I
I2T warning	0	BIT	0.1	70.2	I
Overtoltage	0	BIT	0.1	70.3	I
Undervoltage	0	BIT	0.1	70.4	I
Chopper on	0	BIT	0.1	70.5	I
Input cycle counter	0x2 (2)	BIT2	0.2	71.6	I
DC link voltage	48021	UDINT	4.0	72.0	I
Resistor Current	0	DINT	4.0	76.0	I
Duty Cycle	0	USINT	1.0	80.0	I

■ Error Moverdetection

- Too few movers detected

Output

Show output from: TwinCAT

```
MSG | 03/01/2021 14:12:29 905 ms | XtsProcessingUnit 1 (0x01010010): Enable time is set.
WRN | 03/01/2021 14:12:29 910 ms | XtsProcessingUnit 1 (0x01010010): IO Processing Unit (ID = 1) is waiting for infeed2 (EtherCAT) (3010070) to start up.
MSG | 03/01/2021 14:12:29 934 ms | 'TCOM Server' (10): Cu2508 fifo sizes: 1:16 2:8 3:8 4:8 5:16 6:8 7:8 8:8
WRN | 03/01/2021 14:12:30 910 ms | XtsProcessingUnit 1 (0x01010010): IO Processing Unit (ID = 1) is waiting for Infeed1 (EtherCAT) (3010060) to start up.
MSG | 03/01/2021 14:12:31 578 ms | XtsProcessingUnit 1 (0x01010010): IO Processing Unit (ID = 1): EtherCAT is ready now (2 device(s) are checked).
MSG | 03/01/2021 14:12:31 652 ms | 'TwinCAT System' (10000): Starting COM Server TcEventLogger !
MSG | 03/01/2021 14:12:31 876 ms | XtsProcessingUnit 1 (0x01010010): Module identity check for teaching is passed successfully.
MSG | 03/01/2021 14:12:31 876 ms | XtsProcessingUnit 1 (0x01010010): Teaching data plausibility check is passed successfully.
WRN | 03/01/2021 14:12:34 928 ms | XtsProcessingUnit 1 (0x01010010): Too few movers are detected. Expected = 5, Detected = 4
WRN | 03/01/2021 14:12:39 944 ms | XtsProcessingUnit 1 (0x01010010): Too few movers are detected. Expected = 5, Detected = 4
WRN | 03/01/2021 14:12:44 960 ms | XtsProcessingUnit 1 (0x01010010): Too few movers are detected. Expected = 5, Detected = 4
WRN | 03/01/2021 14:12:49 976 ms | XtsProcessingUnit 1 (0x01010010): Too few movers are detected. Expected = 5, Detected = 4
```

Error List Output

■ Error Moverdetection

- Too many movers detected

Output

```
Show output from: TwinCAT
```

MSG 03/01/2021 14:04:59 858 ms XtsProcessingUnit 1 (0x01010010): Enable time is set.
WRN 03/01/2021 14:04:59 863 ms XtsProcessingUnit 1 (0x01010010): IO Processing Unit (ID = 1) is waiting for infeed2 (EtherCAT) (3010070) to start up.
MSG 03/01/2021 14:04:59 887 ms 'TCOM Server' (10): Cu2508 fifo sizes: 1:16 2:8 3:8 4:8 5:16 6:8 7:8 8:8
WRN 03/01/2021 14:05:00 863 ms XtsProcessingUnit 1 (0x01010010): IO Processing Unit (ID = 1) is waiting for Infeed1 (EtherCAT) (3010060) to start up.
MSG 03/01/2021 14:05:01 524 ms XtsProcessingUnit 1 (0x01010010): IO Processing Unit (ID = 1): EtherCAT is ready now (2 device(s) are checked).
MSG 03/01/2021 14:05:01 598 ms 'TwinCAT System' (10000): Starting COM Server TcEventLogger !
MSG 03/01/2021 14:05:01 823 ms XtsProcessingUnit 1 (0x01010010): Module identity check for teaching is passed successfully.
MSG 03/01/2021 14:05:01 823 ms XtsProcessingUnit 1 (0x01010010): Teaching data plausibility check is passed successfully.
WRN 03/01/2021 14:05:04 875 ms XtsProcessingUnit 1 (0x01010010): Too many movers are detected. Expected = 5, Detected = 6
WRN 03/01/2021 14:05:09 891 ms XtsProcessingUnit 1 (0x01010010): Too many movers are detected. Expected = 5, Detected = 6
WRN 03/01/2021 14:05:14 907 ms XtsProcessingUnit 1 (0x01010010): Too many movers are detected. Expected = 5, Detected = 6
WRN 03/01/2021 14:05:19 923 ms XtsProcessingUnit 1 (0x01010010): Too many movers are detected. Expected = 5, Detected = 6

Error List Output

■ Error Moverdetection

- Too few movers detected
- Too many movers detected

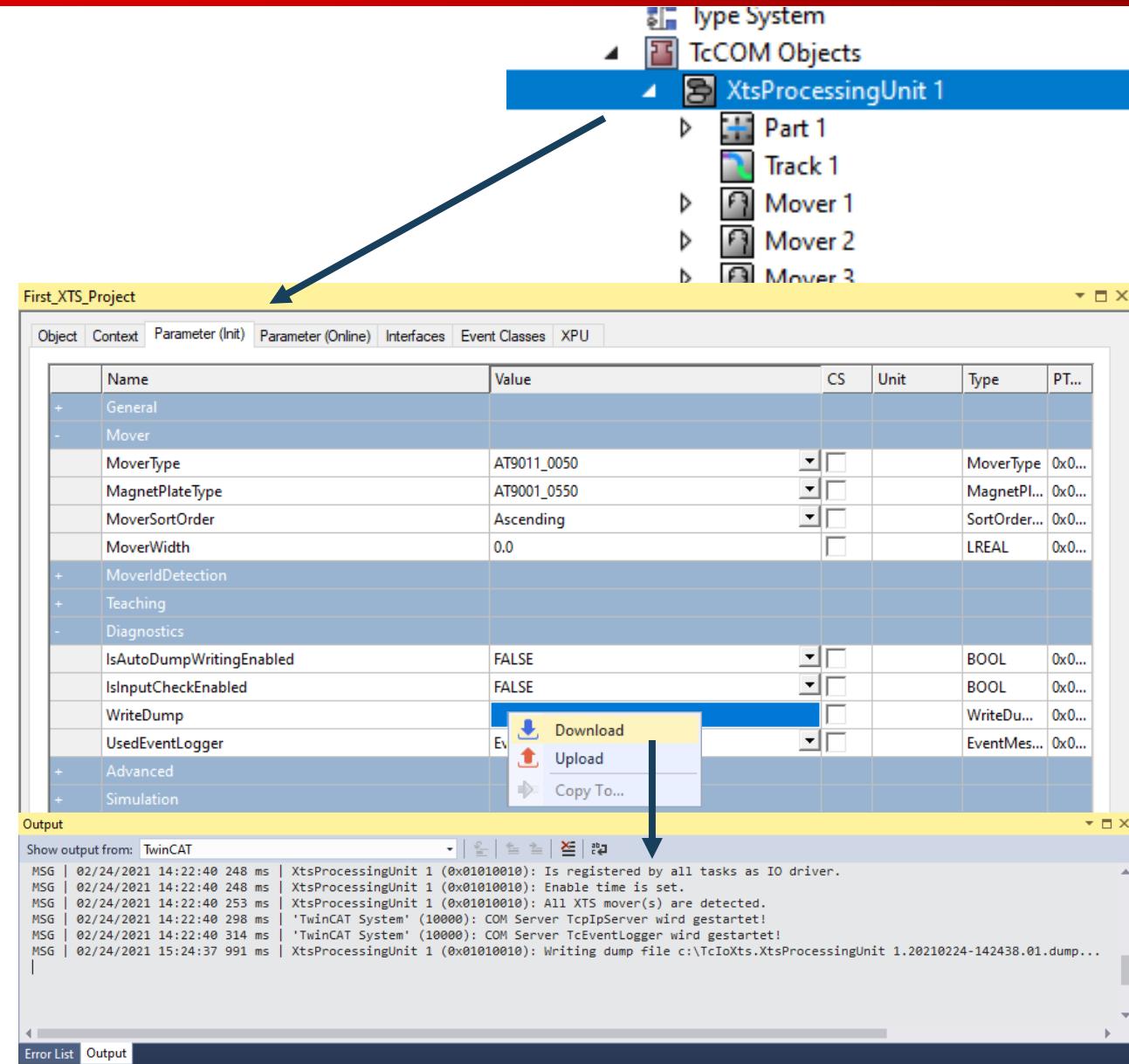
The screenshot shows the 'First_XTS_Project' window in the Beckhoff XTS software. At the top, there's a table titled 'Online' with columns for Name, Actual Pos., Setp. Pos., Lag Dist., Setp. Velo, and Error. The rows list 'Mover Axis 1' through 'Mover Axis 5', all with '0.0000' in the 'Actual Pos.' column. A red box highlights the 'Actual Pos.' column header, and a red arrow points from the 'Too many movers detected' bullet point to this highlighted area. Below the table are buttons for F1, F2, F3, F4, and F8, along with a 'Select Columns' button. The bottom part of the window contains another table with columns for Number, Axes, Link to I/O, and Link to PLC. It lists five entries: '1 (Id 1)' linked to 'Mover Axis 1' via 'SoftDrive 1'; '2 (Id 2)' linked to 'Mover Axis 2' via 'SoftDrive 2'; '3 (Id 3)' linked to 'Mover Axis 3' via 'SoftDrive 3'; '4 (Id 4)' linked to 'Mover Axis 4' via 'SoftDrive 4'; and '5 (Id 5)' linked to 'Mover Axis 5' via 'SoftDrive 5'. Navigation arrows are at the bottom of this table.

Name	Actual Pos.	Setp. Pos.	Lag Dist.	Setp. Velo	Error
Mover Axis 1	0.0000	0.0000	0.0000	0.0000	0x0
Mover Axis 2	0.0000	0.0000	0.0000	0.0000	0x0
Mover Axis 3	0.0000	0.0000	0.0000	0.0000	0x0
Mover Axis 4	0.0000	0.0000	0.0000	0.0000	0x0
Mover Axis 5	0.0000	0.0000	0.0000	0.0000	0x0

Number	Axes	Link to I/O	Link to PLC
1 (Id 1)	Mover Axis 1	SoftDrive 1	
2 (Id 2)	Mover Axis 2	SoftDrive 2	
3 (Id 3)	Mover Axis 3	SoftDrive 3	
4 (Id 4)	Mover Axis 4	SoftDrive 4	
5 (Id 5)	Mover Axis 5	SoftDrive 5	

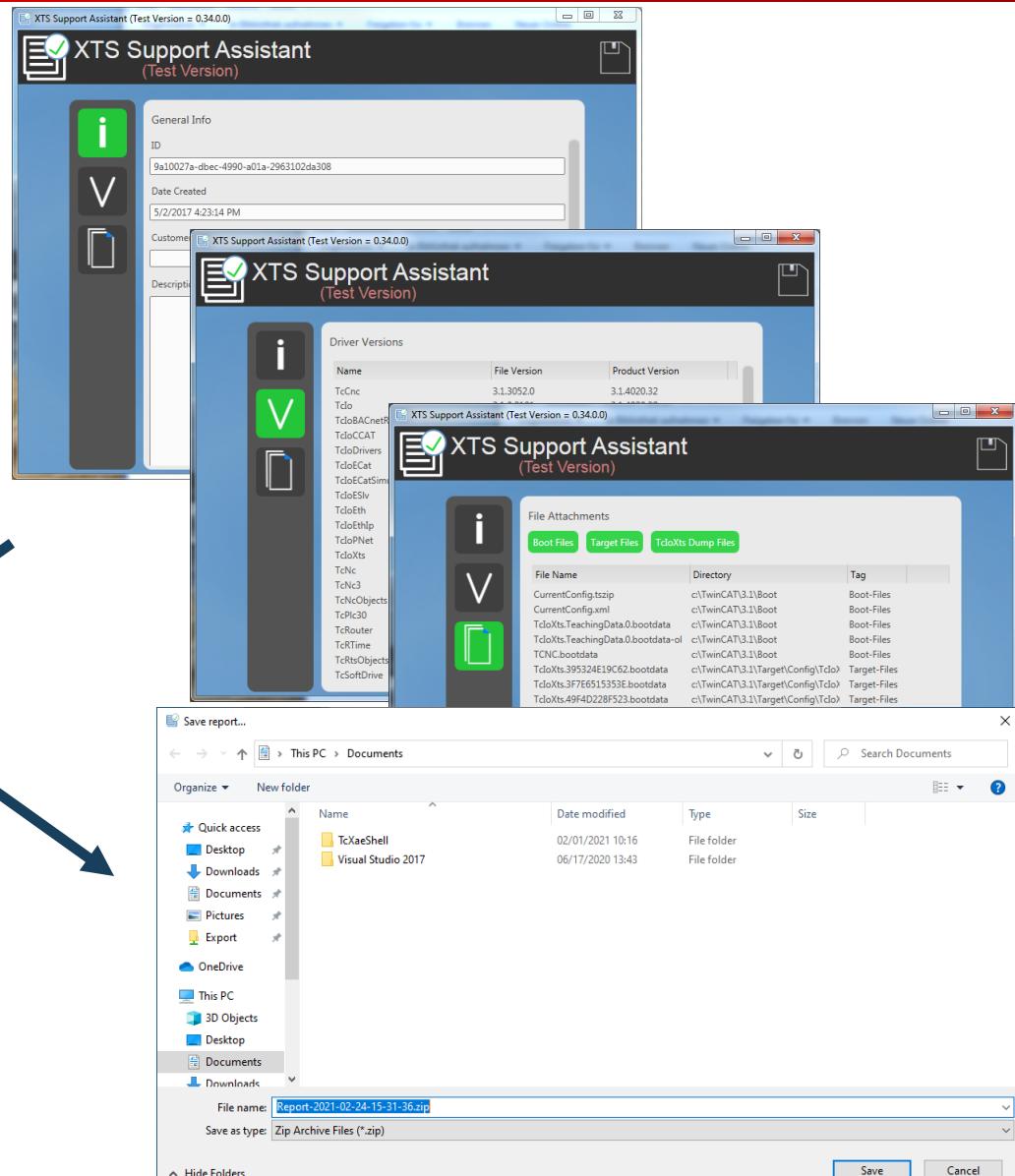
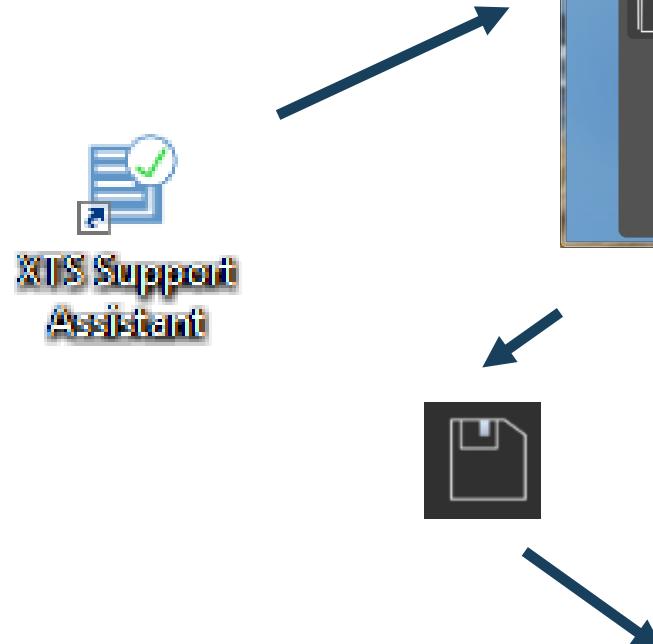
■ Collecting data...

– XTS-DUMP



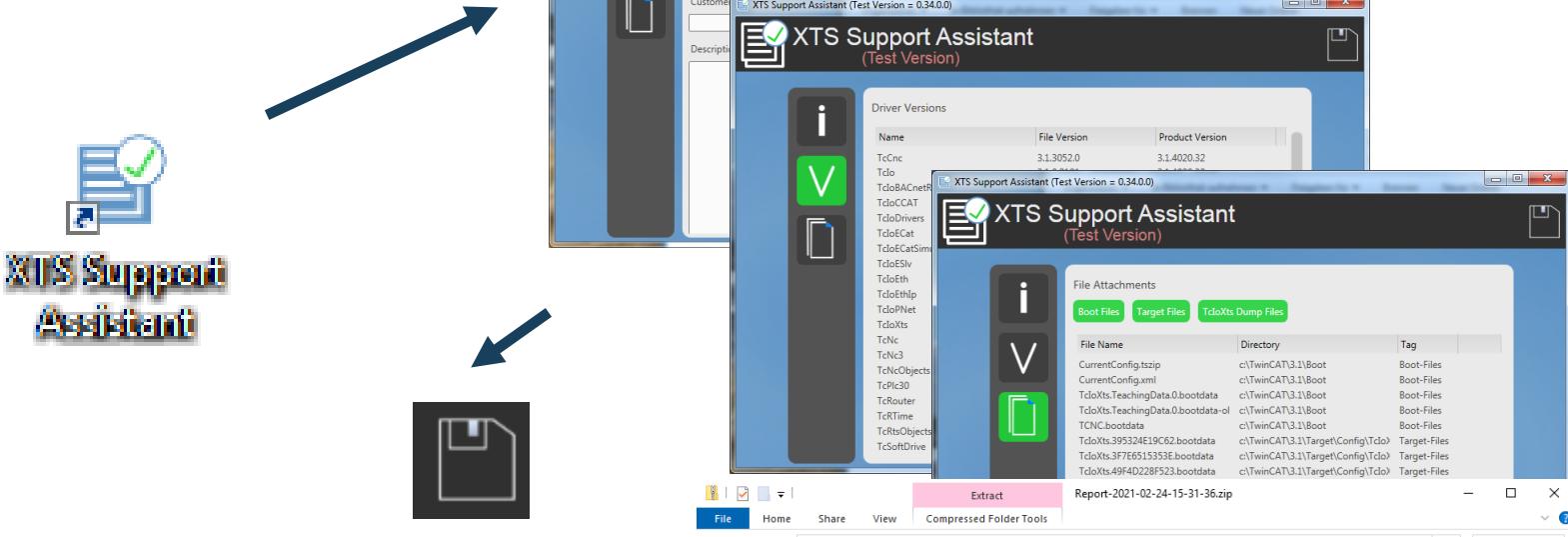
- Collecting data...

- XTS-SupportAssistant



- Collecting data...

- XTS-SupportAssistant



Name	Type	Compressed size	Password ...	Size
Application.evtx	Event Log	74 KB	No	1,092 KB
CurrentConfig.tszip	Compressed (zipped) Fol...	85 KB	No	95 KB
CurrentConfig.xml	XML Document	18 KB	No	259 KB
CurrentEventMessages.xml	XML Document	5 KB	No	39 KB
LoggedEvents.db	Data Base File	4 KB	No	120 KB
Report-2021-02-24-15-31-36.xml	XML Document	2 KB	No	20 KB
System.evtx	Event Log	49 KB	No	1,092 KB
TcloXts.2V4K917S3FL2.bootdata	BOOTDATA File	59 KB	No	99 KB
TcloXts.3F7E6515353E.bootdata	BOOTDATA File	58 KB	No	97 KB
TcloXts.6B7875CB52386.bootdata	BOOTDATA File	66 KB	No	110 KB
TcloXts.7B1EB9C21232.bootdata	BOOTDATA File	51 KB	No	93 KB
TcloXts.49F4D228F523.bootdata	BOOTDATA File	59 KB	No	99 KB
TcloXts.395324E19C62.bootdata	BOOTDATA File	66 KB	No	136 KB
TcloXts.9915B291250F.bootdata	BOOTDATA File	55 KB	No	54 KB
TcloXts.A3CD1B10DC0A.bootdata	BOOTDATA File	80 KB	No	108 KB
TcloXts.A66B5237F36C.bootdata	BOOTDATA File	62 KB	No	135 KB
TcloXts.AFAE087DBF89.bootdata	BOOTDATA File	105 KB	No	42 KB
TcloXts.B0DD28B259A.bootdata	BOOTDATA File	77 KB	No	105 KB
TcloXts.B0DD28B259A.bootdata	BOOTDATA File	55 KB	No	136 KB
TcloXts.B0DD28B259A.bootdata	BOOTDATA File	66 KB	No	103 KB
TcloXts.B0DD28B259A.bootdata	BOOTDATA File	55 KB	No	103 KB

Agenda | XTS- TcloXtsProcessingUnit (XPU)

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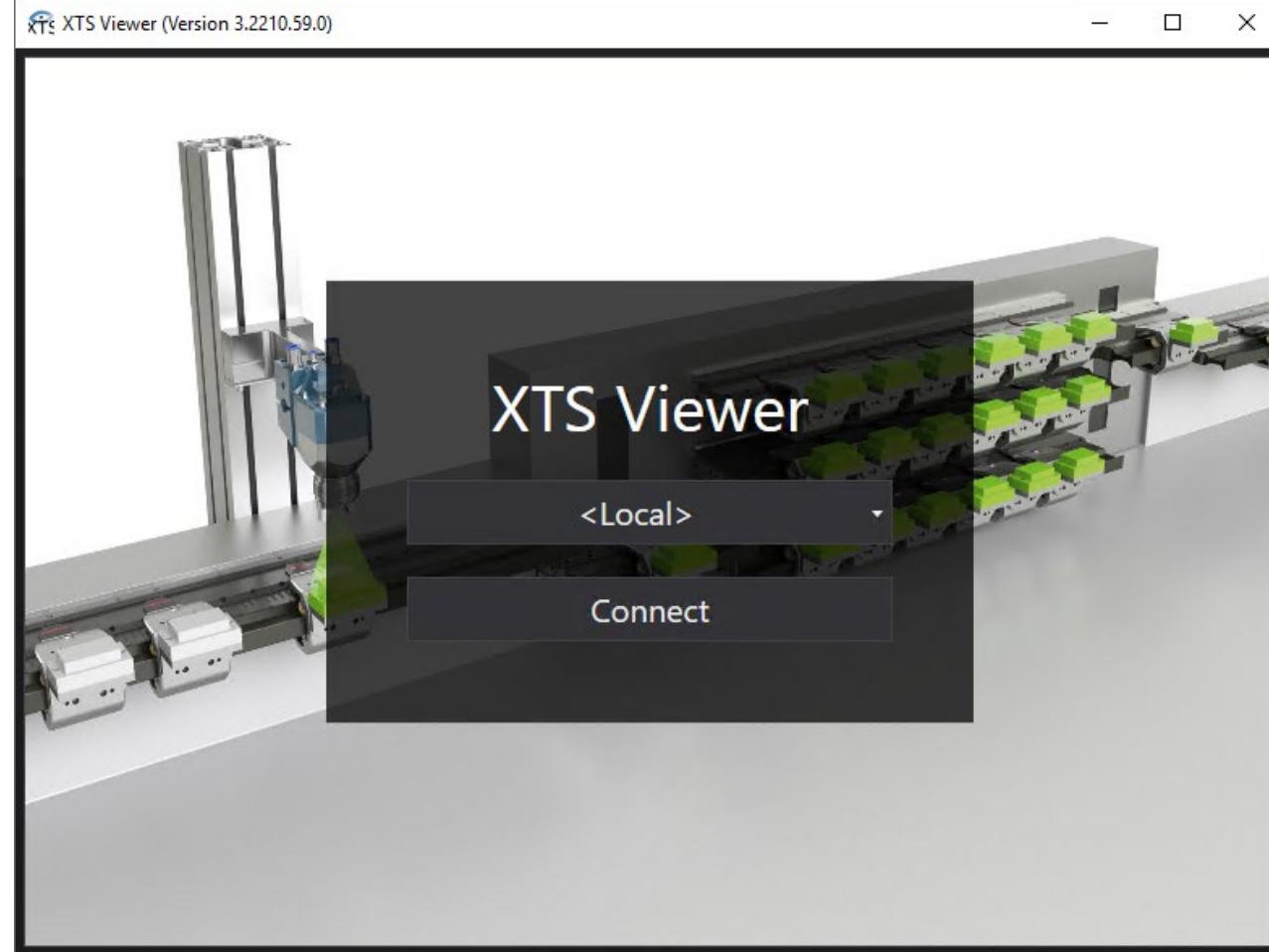
BECKHOFF

- 1. XPU Introduction
- 2. XTS Configuration Process
- 3. XPU – Deep Dive
- 4. XTS Viewer**
- 5. Mover 1
- 6. Simulation Mode

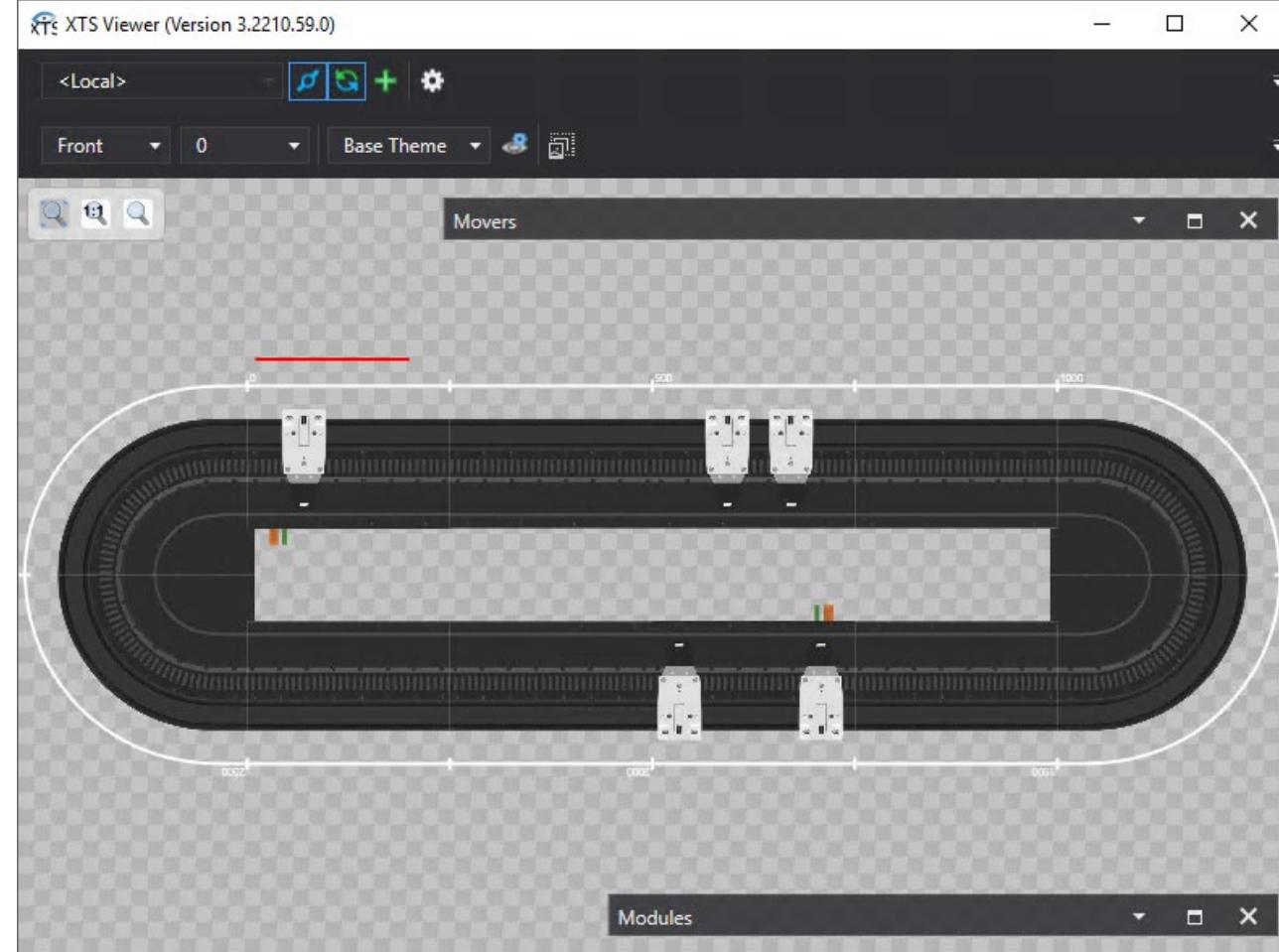


- XTS Viewer

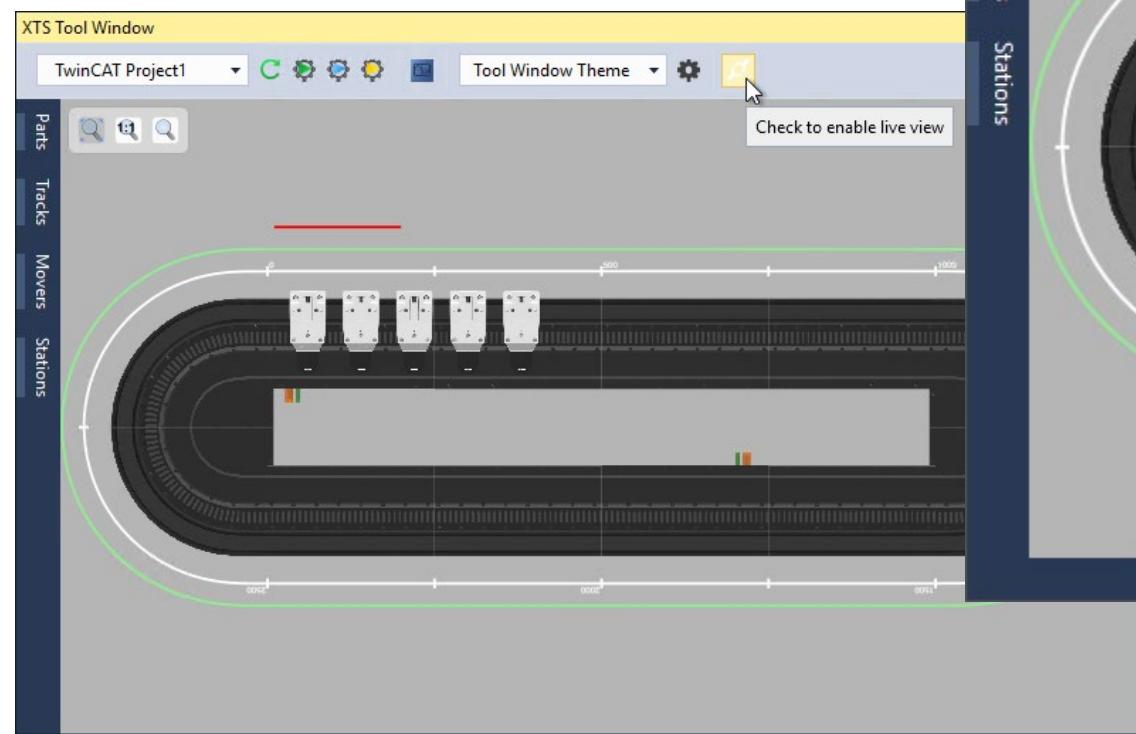
- Start



■ XTS Viewer



- XTS Life View
via XTS Tool Window



Agenda | XTS- TcloXtsProcessingUnit (XPU)

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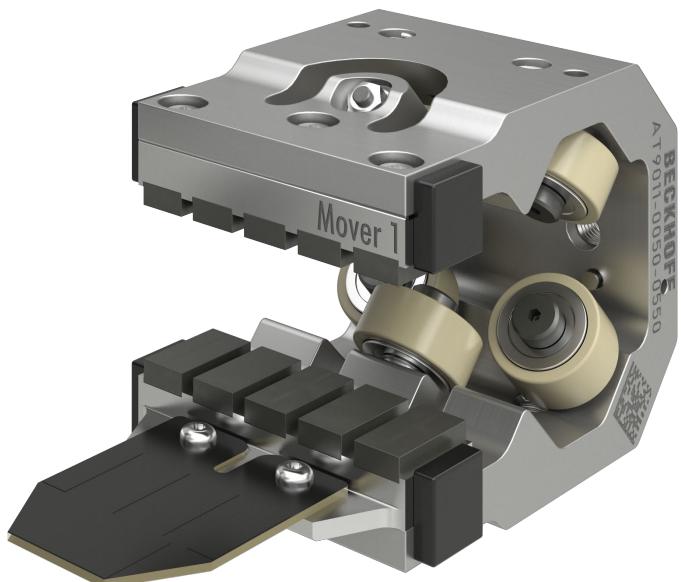
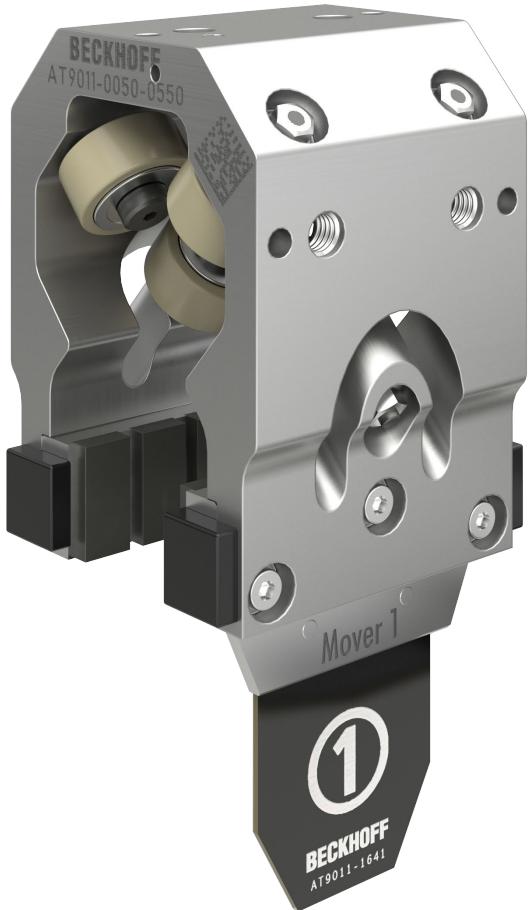
1. XPU Introduction
2. XTS Configuration Process
3. XPU – Deep Dive
4. XTS Viewer
5. Mover 1
6. Simulation Mode



- Mover 1 functionality

The purpose of the Mover 1 detection is to identify a mover as a main mover and to distinguish it from the subsequent movers.

This offers then advantage of a clear correlation between mover hardware and software axis.

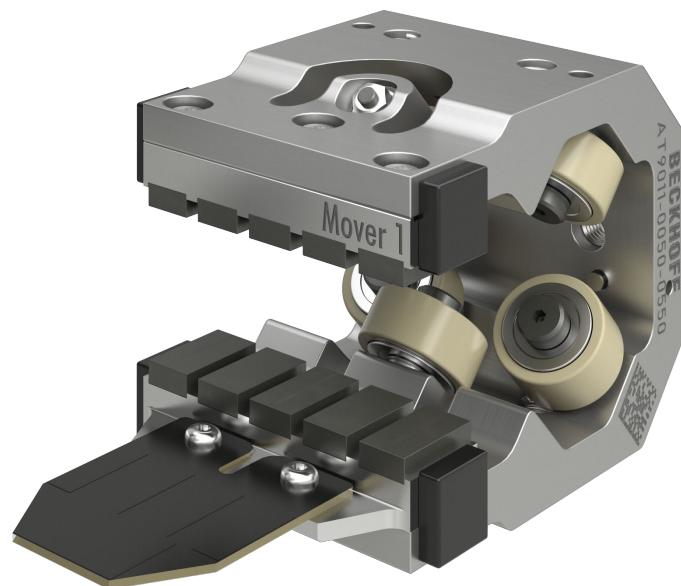


- Mover 1 functionality

Therefore one Mover with a special magnetic plate set is used (Mover1).

These magnets creates an inverted magnetic field.

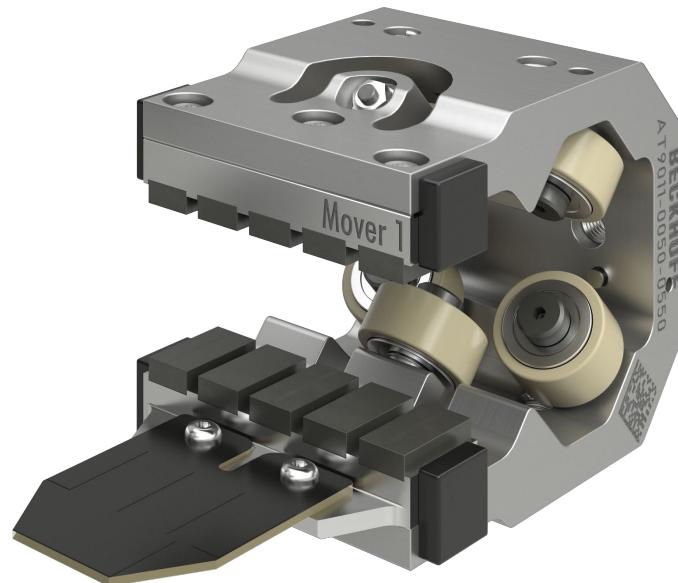
This magnetic plate set exhibits a different behavior when the Mover1 search is triggered (MoverIdDetection)



- MoverIdDetection

When MoverIdDetection is trigger, all Movers make a small movement like "Wake and Shake".

Therefore 48V power supply is required.



▪ MoverIdDetection

The mover detection across all movers is controlled via the Tc0XtsProcessingUnit (XPU) object.

You have the option to apply general detection parameters and to trigger the Mover 1 search manually.



First_XTS_Project

Name	Value	CS	Unit	Type	P...
General					
- Mover					
MoverType	AT9011_0050			MoverTy...	0x...
MagnetPlateType	AT9001_0550			Magnet...	0x...
MoverSortOrder	Ascending			SortOrd...	0x...
MoverWidth	0.0			LREAL	0x...
- MoverIdDetection					
IdDetectionMode	Mover1			MoverId...	0x...
MoverPositionAssignment	Standard			MoverP...	0x...
- ExpectedMoverIds	[...]			1 (Arr...	0x...
[0].Id	1			STRING(3)	
[0].Count	2			UDINT	
TriggerMoverIdDetection				Trigger...	0x...
+ Teaching					
+ Diagnostics					
+ Advanced					
- Simulation					
IsPositionNoiseEnabled	TRUE			BOOL	0x...
IsRandomStartUpEnabled	TRUE			BOOL	0x...
...					

Show Online Values Show Hidden Parameter Expand All Collapse All

▪ MoverIdDetection

To use Mover Id detection
the parameter "MoverIdDetectionMode"
has to change to "Mover1".

**WARNING**

When a Mover with the certain magnetic plate
is on the Track, this Parameter has to be
setup.
Otherwise this leads to unforeseen
movements of the mover.
Unforeseen movements can lead to injuries to
people and damage to tools and the
machine.



▪ MoverPositionAssignment

The absolute Position is setup regarding this parameter.

If the Parameter is set to "StartAtMover1" the mover has the lowest or highest position, dependent and the sorting order.



- MoverIdDetectionMode
- MoverPositionAssignment

Change of these parameters requires
at TwinCAT

→  Activate Configuration



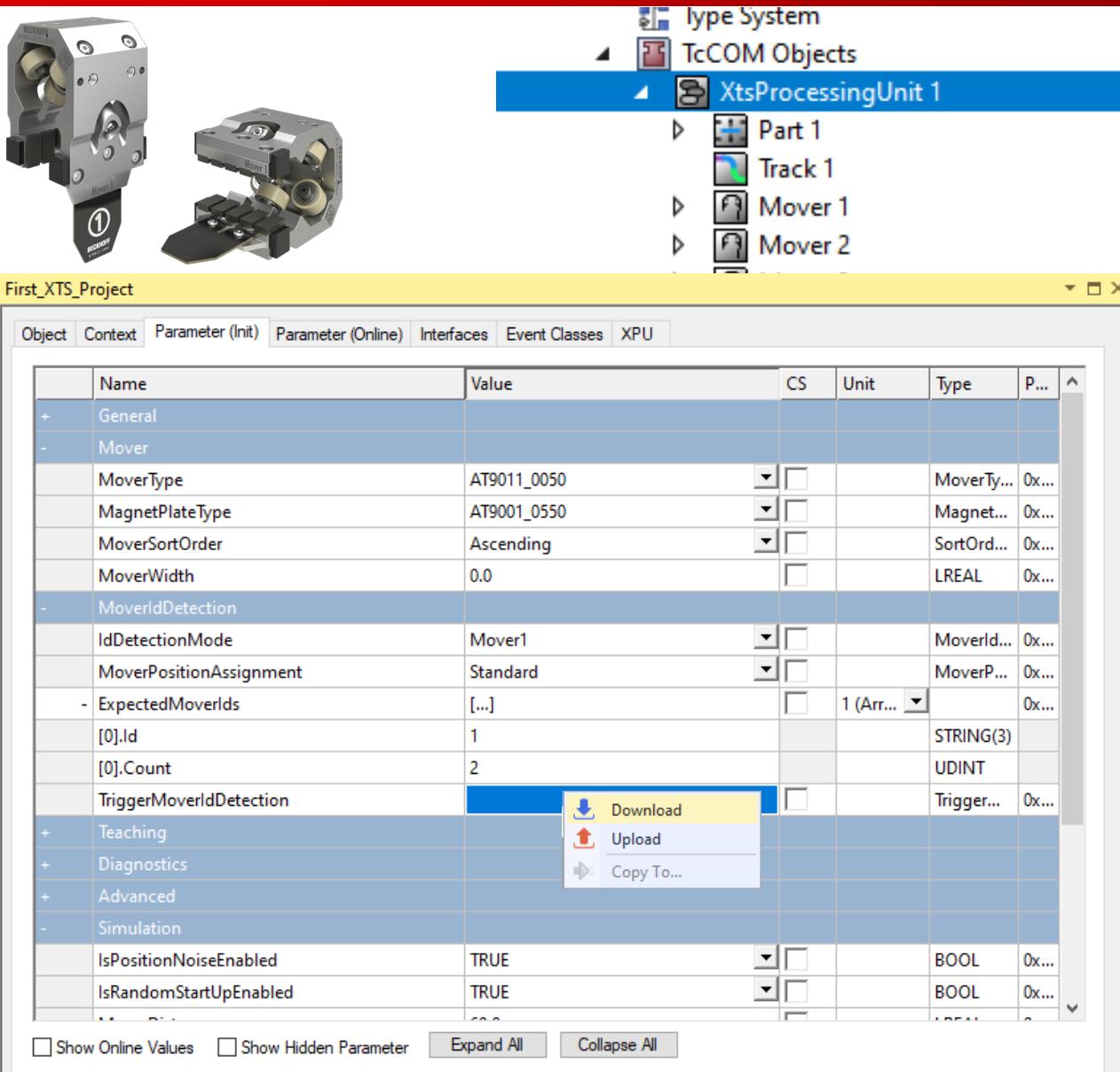
First_XTS_Project

Object	Context	Parameter (Init)	Parameter (Online)	Interfaces	Event Classes	XPU
Mover	Name		Value	CS	Unit	Type
	General					
	- Mover					
	MoverType	AT9011_0050			MoverTy...	0x...
	MagnetPlateType	AT9001_0550			Magnet...	0x...
	MoverSortOrder	Ascending			SortOrd...	0x...
	MoverWidth	0.0			LREAL	0x...
	- MoverIdDetection					
	IdDetectionMode	Mover1			MoverId...	0x...
	MoverPositionAssignment	Standard			MoverP...	0x...
	- ExpectedMoverIds	[...]			1 (Arr...	0x...
	[0].Id	1			STRING(3)	
	[0].Count	2			UDINT	
	TriggerMoverIdDetection				Trigger...	0x...
	+ Teaching					
+ Diagnostics						
+ Advanced						
- Simulation						
IsPositionNoiseEnabled	TRUE			BOOL	0x...	
IsRandomStartUpEnabled	TRUE			BOOL	0x...	
...	

Show Online Values Show Hidden Parameter Expand All Collapse All

- TriggerMoverIdDetection

By selecting the parameter "TrigerMoverIdDetection" and ,via right Mous-Click, download the Parameter, the Mover 1 detection is triggered manually



Name	Value	CS	Unit	Type	P...
General					
- Mover					
MoverType	AT9011_0050			MoverTy...	0x...
MagnetPlateType	AT9001_0550			Magnet...	0x...
MoverSortOrder	Ascending			SortOrd...	0x...
MoverWidth	0.0			LREAL	0x...
- MoverIdDetection					
IdDetectionMode	Mover1			MoverId...	0x...
MoverPositionAssignment	Standard			MoverP...	0x...
- ExpectedMoverIds	[...]		1 (Arr...		0x...
[0].Id	1			STRING(3)	
[0].Count	2			UDINT	
TriggerMoverIdDetection		Download		Trigger...	0x...
Upload					
Copy To...					
+ Teaching					
+ Diagnostics					
+ Advanced					
- Simulation					
IsPositionNoiseEnabled	TRUE			BOOL	0x...
IsRandomStartUpEnabled	TRUE			BOOL	0x...
...					

□ Show Online Values □ Show Hidden Parameter **Expand All** **Collapse All**

▪ Feedback Mover Id detection

Messages from the Mover Id detection
→ shown in the Output Window

State of Mover Id detection
→ as Parameter in "Parameter (Online)"

Output

Show output from: TwinCAT

```
MSG | 02/25/2021 11:34:29 400 ms | 'TwinCAT XAE': No deployment information found for class factory 'Clib_Tc3_System'
MSG | 02/25/2021 11:34:29 400 ms | 'TwinCAT XAE': No deployment information found for class factory 'Clib_Tc3_McCoord'
MSG | 02/25/2021 11:34:29 400 ms | 'TwinCAT XAE': No deployment information found for class factory 'Clib_Tc3_McCollide'
MSG | 02/25/2021 14:29:30 931 ms | XtsProcessingUnit 1 (0x01010010): The Mover ID Detection has been triggered.
MSG | 02/25/2021 14:29:30 931 ms | XtsProcessingUnit 1 (0x01010010): Mover ID is detected.
```

Error List Output



Type System

TcCOM Objects

XtsProcessingUnit 1

- Part 1
- Track 1
- Mover 1
- Mover 2

First_XTS_Project

	Name	Online	CS	Unit	Type	P...
-	MoverDetection					
	AreAllPositionsValid	TRUE			BOOL	0x...
	DetectionCycleCount	1			UDINT	0x...
	DetectedMoverCount	5			UDINT	0x...
	ExpectedMoverCount	5			UDINT	0x...
	ScannedModuleCount	0			UDINT	0x...
+	MoverPositions	[...]	20 (Arra...		0x...	
-	MoverIdDetection					
	HasIdDetectionError	FALSE			BOOL	0x...
	IsIdDetectionValid	TRUE			BOOL	0x...
	IsIdDetectionActive	FALSE			BOOL	0x...
-	MoverIds	[1,...]	5 (Array ...)		0x...	
	[0]	1			STRING(3)	
	[1]				STRING(3)	
	[2]				STRING(3)	
	[3]				STRING(3)	
	[4]				STRING(3)	
+	Teaching					
-	Info					

Show Online Values Show Hidden Parameter Expand All Collapse All

Agenda | XTS- TcloXtsProcessingUnit (XPU)

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BECKHOFF

1. XPU Introduction
2. XTS Configuration Process
3. XPU – Deep Dive
4. XTS Viewer
5. Mover 1
6. **Simulation Mode**



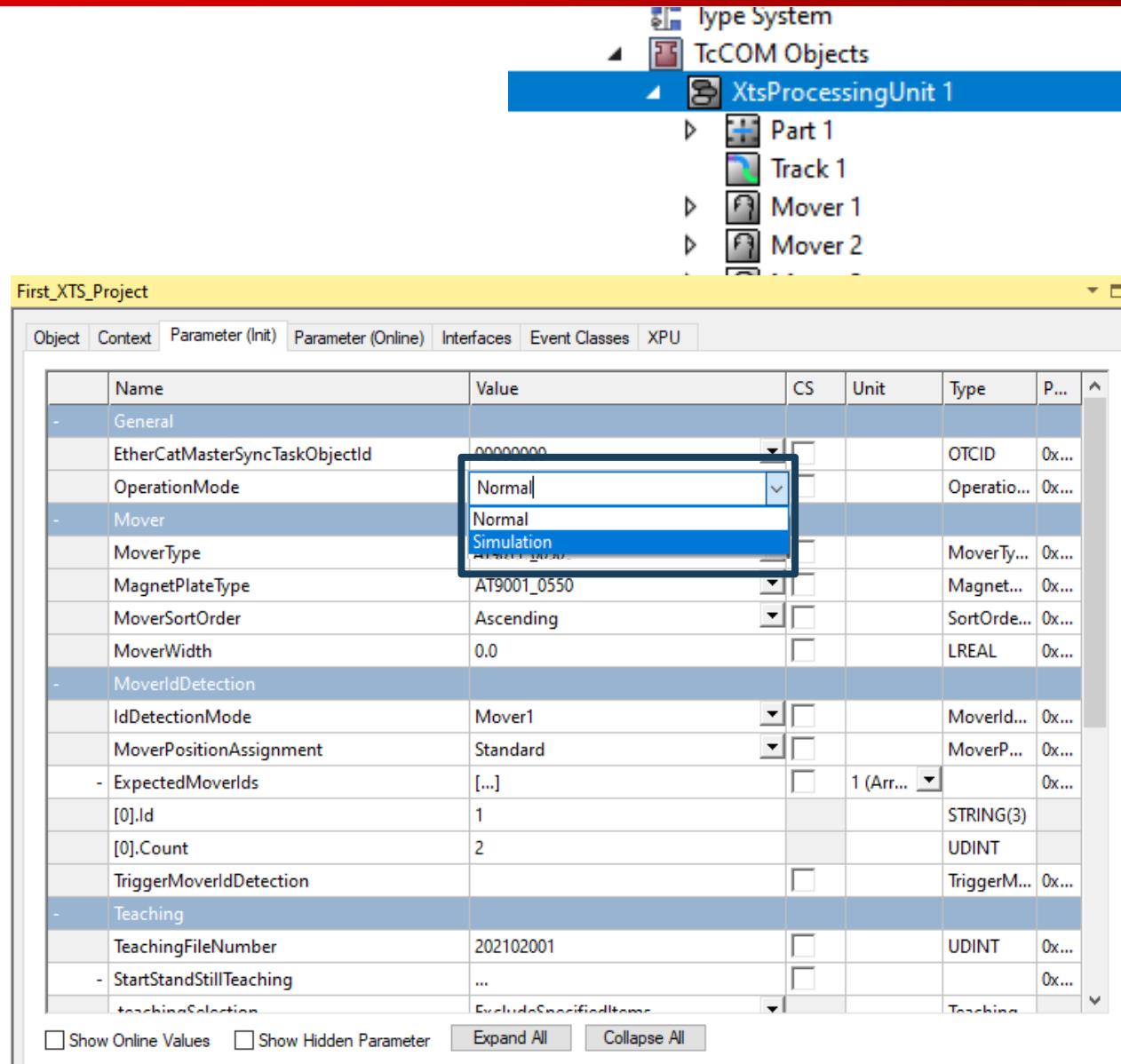
Simulation Mode

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▪ Simulation Mode

- Change Parameter „OperationMode“
- Setup Mover Simulation parameter
- Deactivate I/O Devices
- Activate Configuration



Simulation Mode

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■ Simulation Mode

– Setup Mover Simulation parameter

◀ Mover List

	Name	Axis	SoftDrive	Source Set	Parameter Set	Sim
<input checked="" type="checkbox"/>	Mover 1	Mover Axis 1	SoftDrive 1		@D	Part 1
<input checked="" type="checkbox"/>	Mover 2	Mover Axis 2	SoftDrive 2		@D	Part 1
<input checked="" type="checkbox"/>	Mover 3	Mover Axis 3	SoftDrive 3		@D	Part 1
<input checked="" type="checkbox"/>	Mover 4	Mover Axis 4	SoftDrive 4		@D	Part 1
<input checked="" type="checkbox"/>	Mover 5	Mover Axis 5	SoftDrive 5		@D	Part 1

◀ Mover Details

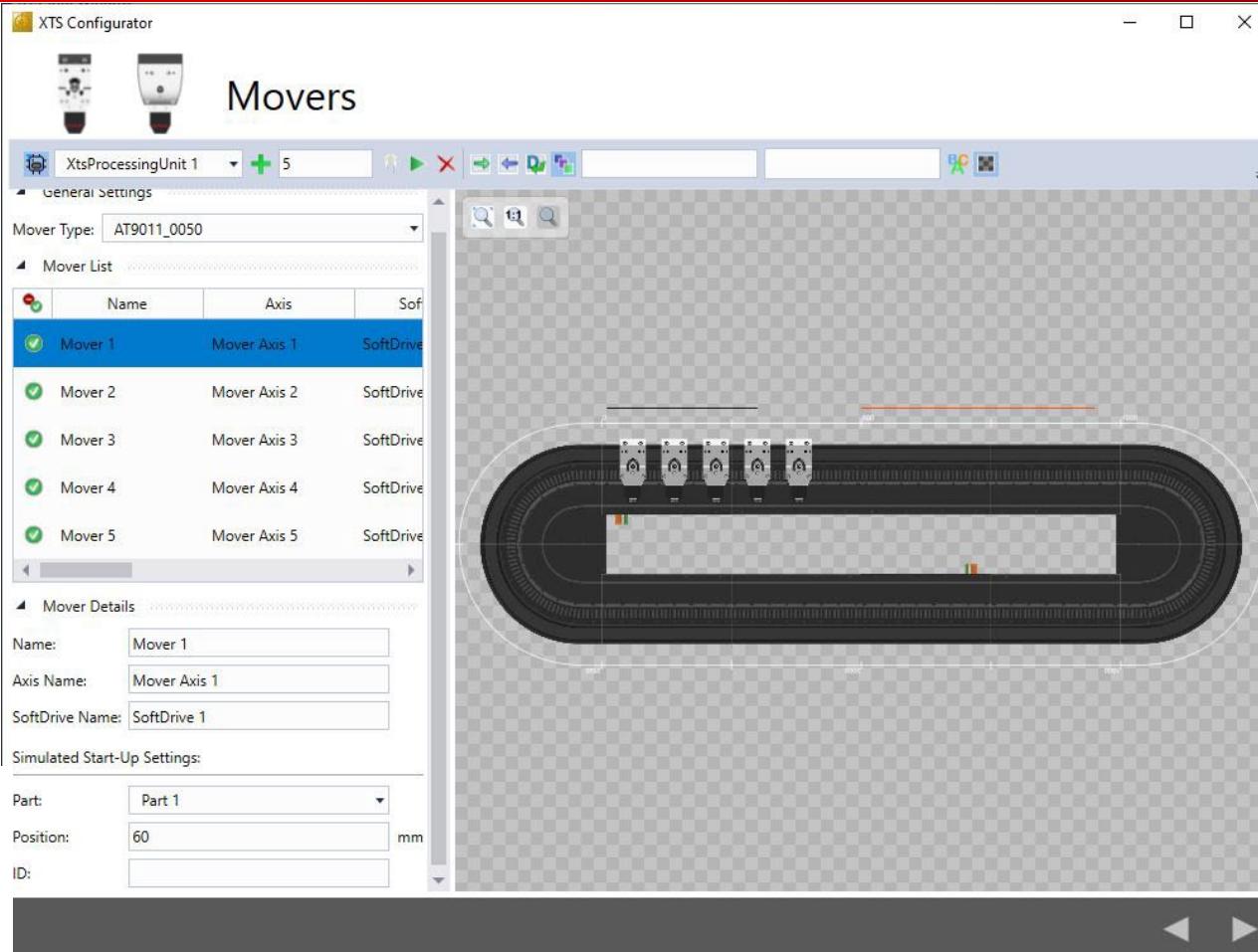
Name:

Axis Name:

SoftDrive Name:

Simulated Start-Up Settings:

Part:	<input type="text" value="Part 1"/>
Position:	<input type="text" value="60"/> mm
ID:	<input type="text" value="1"/>



Simulation Mode

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▪ Simulation Mode

– Simulation Mode Parameter

The screenshot shows the 'First_XTS_Project' window in the Beckhoff XTS software. The top navigation bar includes tabs for Object, Context, Parameter (Init), Parameter (Online), Interfaces, Event Classes, and XPU. The 'Parameter (Init)' tab is active.

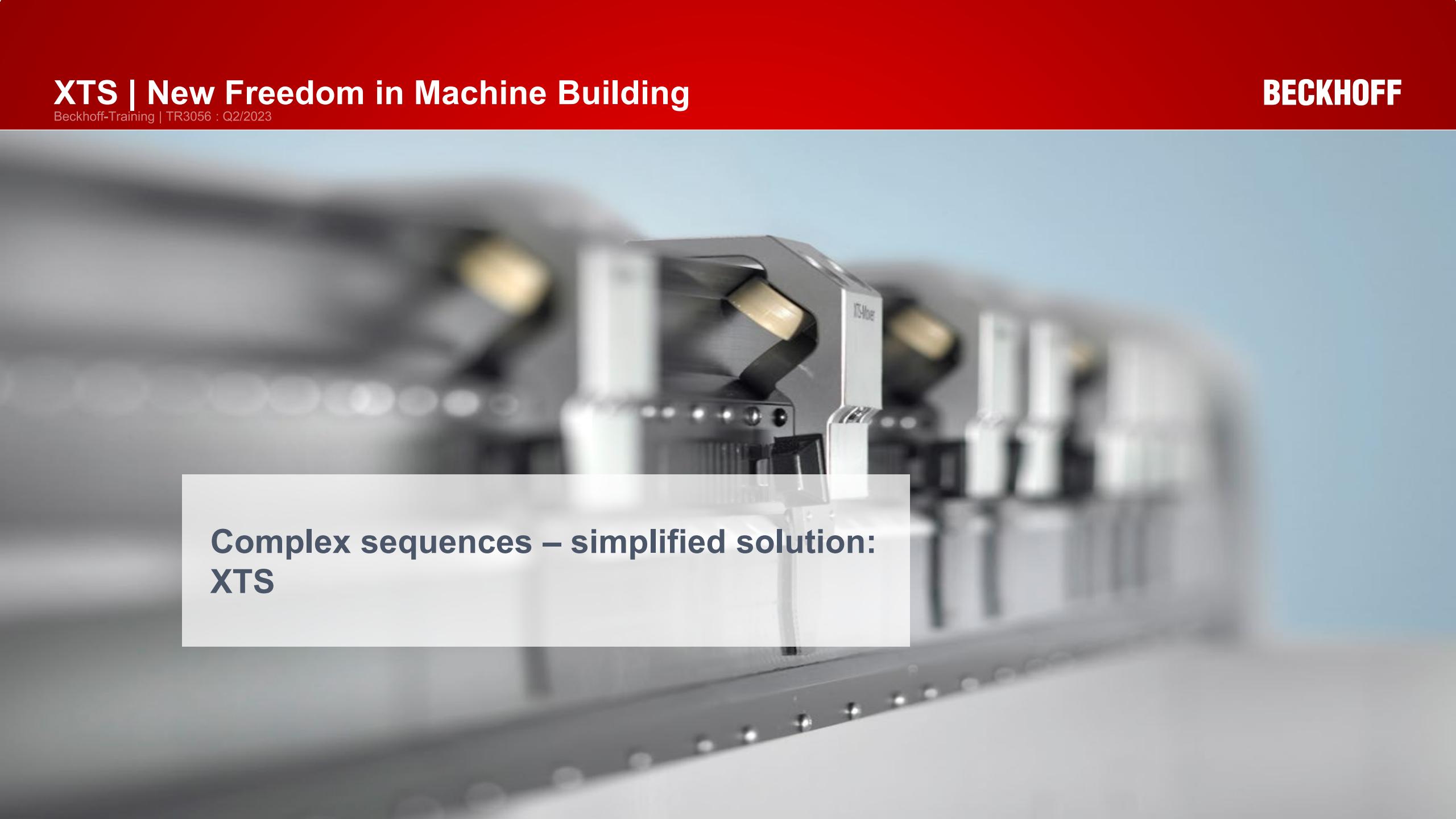
The left sidebar displays a tree view of objects:

- Type System
- TcCOM Objects
- XtsProcessingUnit 1
 - Part 1
 - Track 1
 - Mover 1
 - Mover 2

The main area is a table titled 'First_XTS_Project' showing parameters for the 'Simulation' mode. The table has columns for Name, Value, CS, Unit, Type, and P... (partial).

	Name	Value	CS	Unit	Type	P...
-	General					
	EtherCatMasterSyncTaskObjectId	00000000			OTCID	0x...
	OperationMode	Simulation			Operatio...	0x...
+	Mover					
+	MoverIdDetection					
+	Teaching					
+	Diagnostics					
+	Advanced					
-	Simulation					
	IsPositionNoiseEnabled	TRUE			BOOL	0x...
	IsRandomStartUpEnabled	TRUE			BOOL	0x...
	MoverDistance	60.0		mm	LREAL	0x...
	PositionOffset	40.0		mm	LREAL	0x...
	PositionNoiseBandwidth	0.02		mm	LREAL	0x...
	RandomStartUpBandwidth	10.0		mm	LREAL	0x...
	PositionStartUpSimulationMode	UseMoverParameters			Position...	0x...
	MoverIdStartUpSimulationMode	UseRandomDistribution			MoverId...	0x...
	RandomInitMode	UseSystemTime			Random...	0x...
	RandomInitSeed	56789			DINT	0x...

At the bottom of the table, there are buttons for 'Show Online Values', 'Show Hidden Parameter', 'Expand All', and 'Collapse All'.



Complex sequences – simplified solution:
XTS

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