


# Create a TwinCAT Project from Scratch

How to create a new TwinCAT3 Project from scratch

 Difficulty **Hard**

 Duration **4 hour(s)**

## Contents

Introduction

Step 1 - Install Visual Studio / TwinCAT XAE Shell (if required)

Step 2 - Add the latest Device Description Table

Step 3 - Add Drive Manager 2 for AX8000 drives (if not installed already)

Step 4 - Start a new project

Step 5 - Clone the Repository

Step 6 - "Add" the clone if an error is thrown

Step 7 - Enter Git Credentials (if required)

Step 8 - Add The tc3Multi then PLC\_Reset Project

Step 9 - Check PLC Ports 851 and 852 correct

Step 10 - Ensure Correct Machine Commented in tcMulti project

Step 11 - Add TwinSAFE project

Step 12 - Add the route to the Target System

Step 13 - Scan for Devices

Step 14 - Check EtherCAT validity

Step 15 - Name all EtherCAT devices according to network

Step 16 - Map all IO References

Step 17 - Map Analogue Input references

Step 18 - Double check all IO references with someone else

Step 19 - Install Drive Manager 2 Project

Step 20 - Add Axis Task

Step 21 - Add Axes

Step 22 - Map Axes

Step 23 - Add PLC\_Reset to tc3Multi Link

Step 24 - Activate configuration

Step 25 - Set up Drives

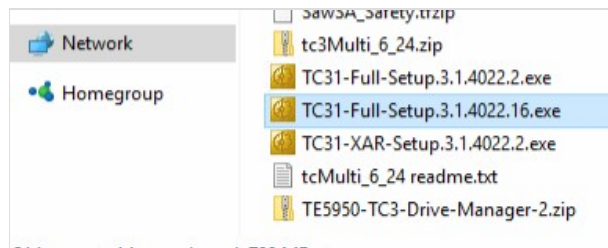
Step 26 - Add The PC types to Monday Log

Comments

## Introduction

## Step 1 - Install Visual Studio / TwinCAT XAE Shell (if required)

**i** ...This now applies to all installations. The "CNC" standard PCs used for the front end on Flowlines and ZXs have Visual Studio already installed but the TwinCAT version needs to be upgraded from 4022 to 4024



1. Uninstall all references to Visual Studio 2013 and Beckhoff TwinCAT3. If this is needed, restart the PC
2. Copy the install file from g:\Design\TwinCAT3\TC31-Full-Setup.3.1.4024.32.exe to the desktop of the Beckhoff PC
3. Run the install as Administrator
4. Delete the setup zip file and unzipped directory to save hard drive space

**i** ..."Specified account already exists" error will happen if the Visual Studio 2013 or Beckhoff TwinCAT is not fully uninstalled and PC restarted. Use Revo uninstaller to completely remove it

**💡** ...From version 3.1.4024 onwards, it is not called visual studio, it is called "TwinCAT XAE Shell"

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## Step 2 - Add the latest Device Description Table

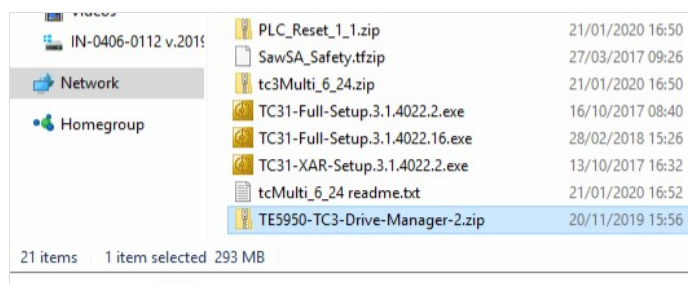
Copy the contents of g:\design\twincat3\Beckhoff\_EtherCAT\_XML.zip to C:\TwinCAT\3.1\config\lo\EtherCAT and overwrite all the .xml files in this folder

**i** ...This allows the Beckhoff system to identify the latest version of the AX8000 drives

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## Step 3 - Add Drive Manager 2 for AX8000 drives (if not installed already)


**i** ...This step needs to be done for the AX8000 drives only

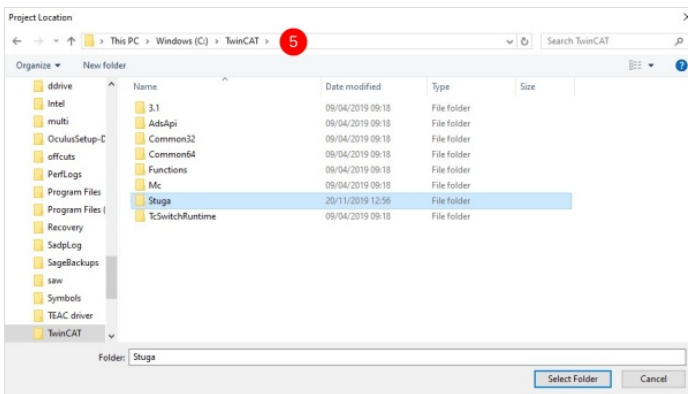
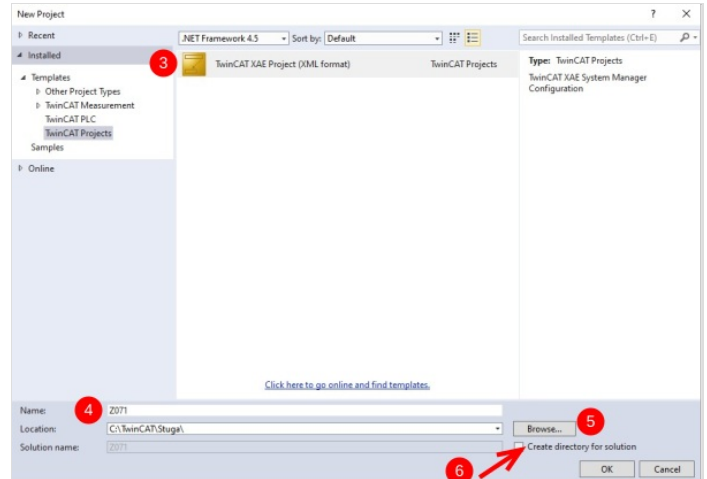
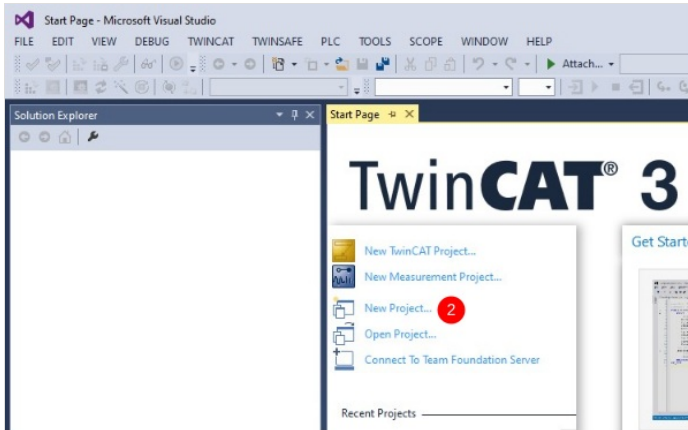


1. Copy the Drive Manager 2 setup g:\design\TwinCAT3\TE5950-TC3-Drive-Manager-2.zip to Install Files or the desktop on the PC running Visual Studio
2. Close Visual Studio if it is open
3. Extract the Zip File
4. Run the Setup File
5. Delete the setup zip file and unzipped directory to save hard drive space


## Step 4 - Start a new project

1. Open Visual Studio
2. Click on New project
3. Choose TwinCAT projects->TwinCAT XAE Project (xml format)
4. Name is build number (no Suffix)
5. Location is c:\TwinCAT\Stuga\  
6. Untick "Create Directory for solution"
7. This may take some time - a long delay sometimes "Rebuilding Device Description Cache"

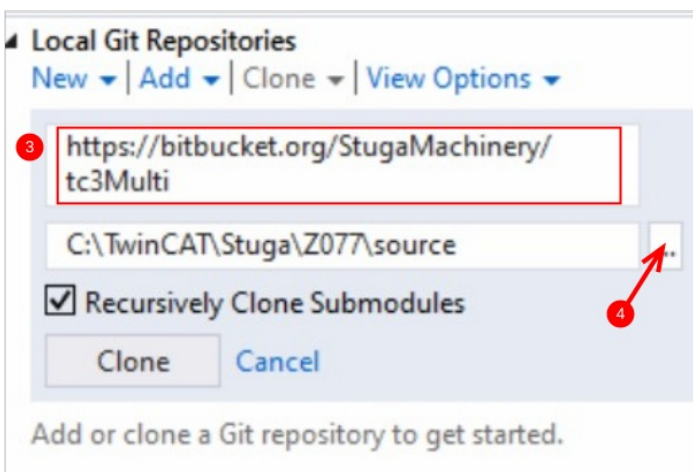
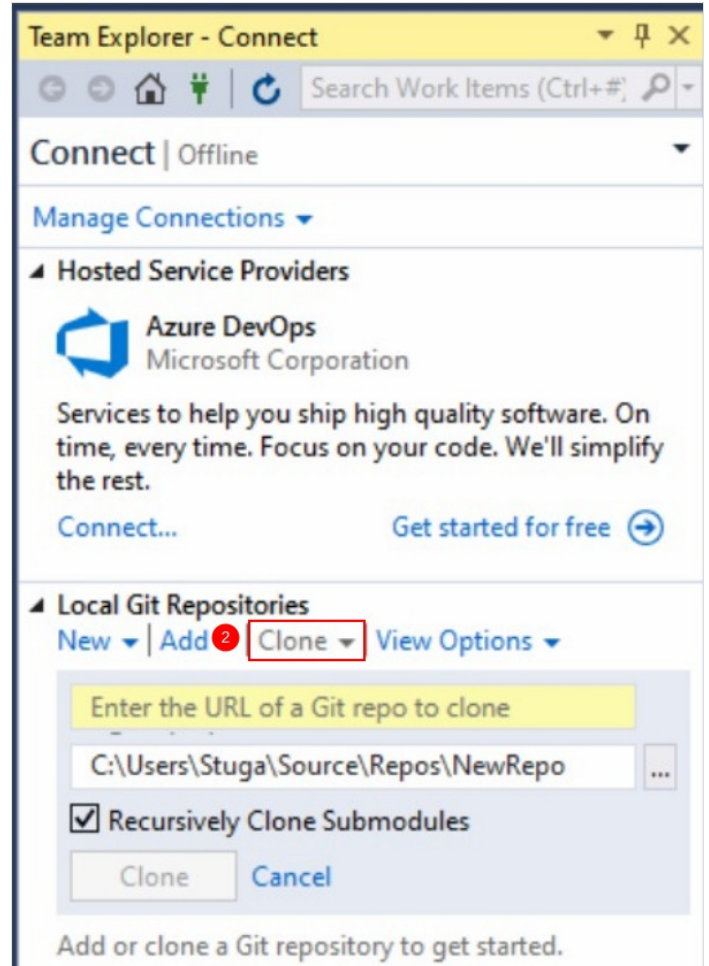
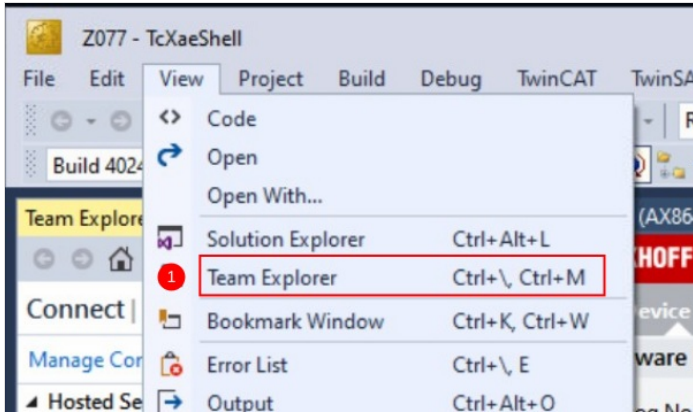
 ...This creates an empty template to build your project for the machine

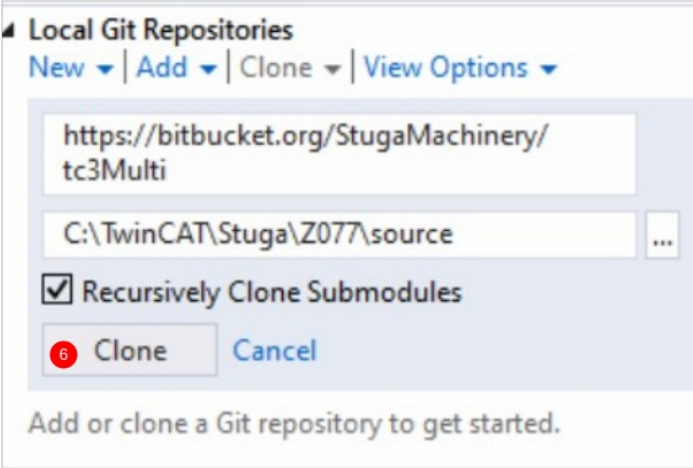
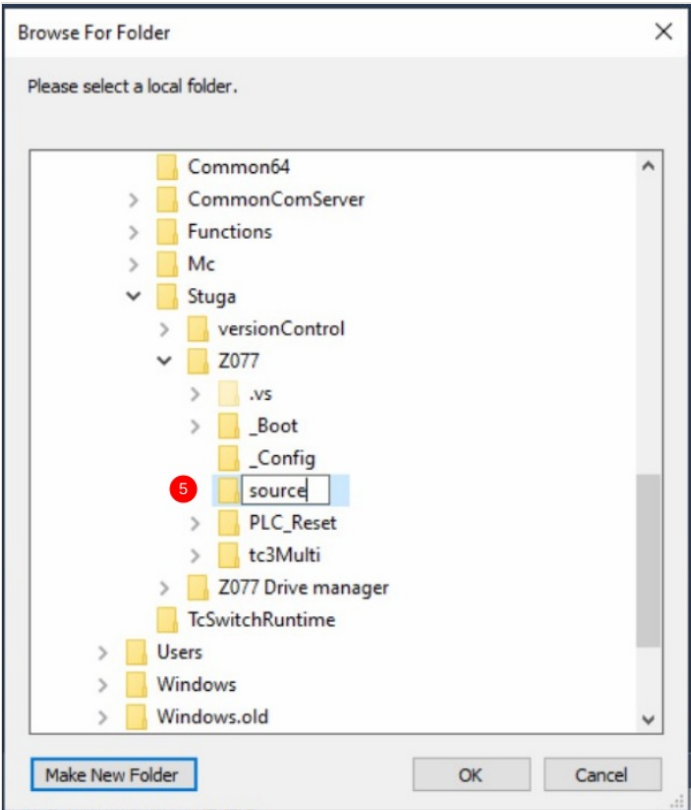


## Step 5 - Clone the Repository

 ...A Repository or "Repo" is a storage area for the source code versioning system. In our case we use an online system called "bitbucket"

1. Open Team Explorer
2. Clone a new Git Repository
3. URL to clone: <https://bitbucket.org/StugaMachinery/tc3Multi>
4. Click on the destination setup
5. Create a new folder under the machine build folder called "source"
6. Click 'Clone'

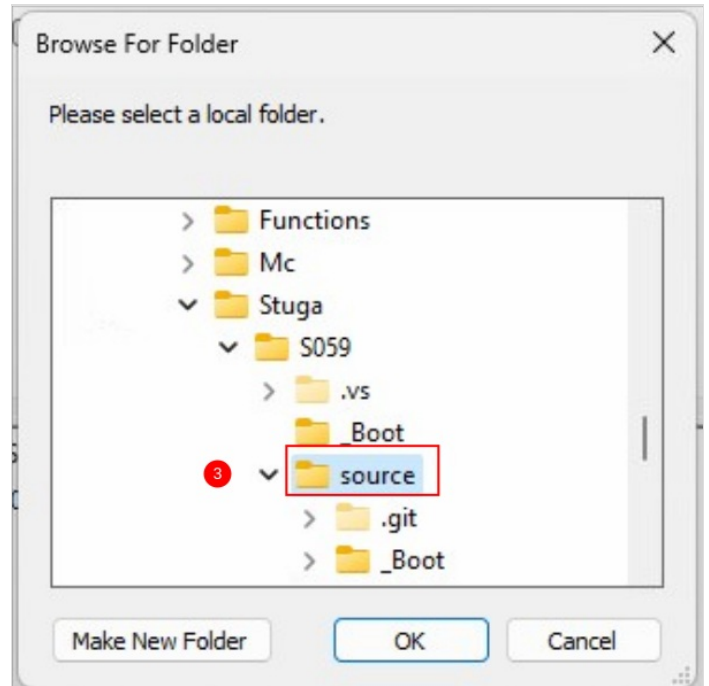
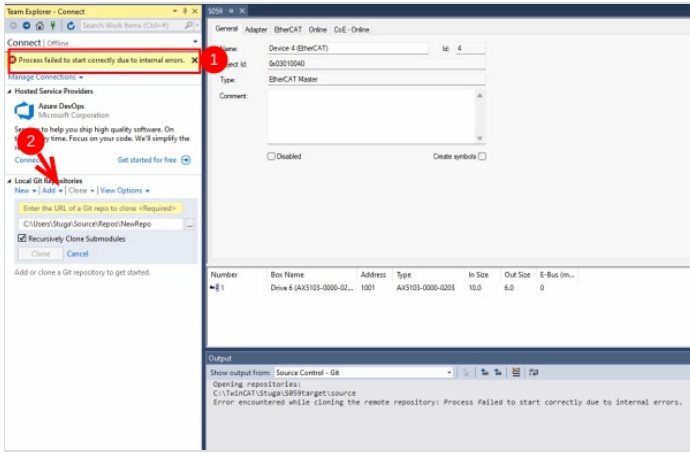




## Step 6 - "Add" the clone if an error is thrown

On later versions (2022+) an error is thrown by the system

1. Error Message
2. Click Add
3. Browse to the source folder and add




## Step 7 - Enter Git Credentials (if required)

Atlassian Username is StugaMachinery

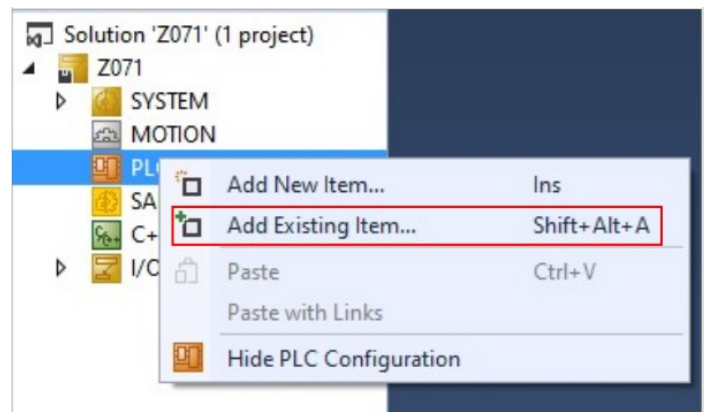
Password is stored in the file

G:\IT Department\SourceTree BitBucket App Password.txt

 ...Sometimes, the password credentials are already stored and the password entry is not necessary

## Step 8 - Add The tc3Multi then PLC\_Reset Project

1. Right click PLC
2. Select Add Existing Item
3. Navigate to the repository you have created in Step 6  
c:\TwinCAT\Stuga\BuildNo\source\tc3Multi\tc3Multi.plcproj
4. Repeat for the PLC\_Reset project



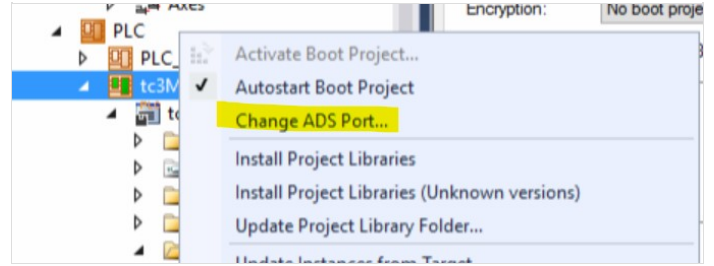
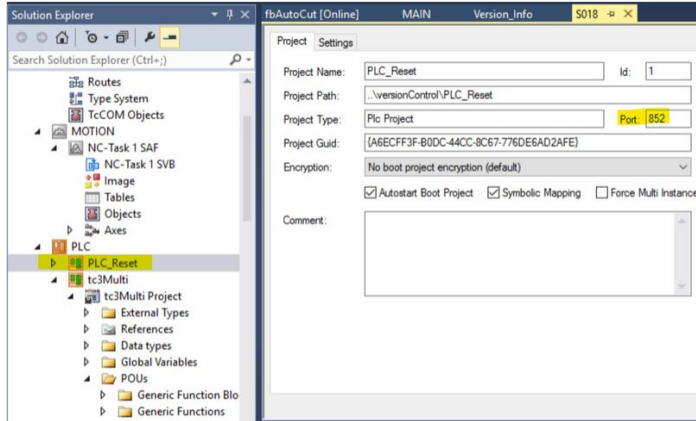
## Step 9 - Check PLC Ports 851 and 852 correct

Check that

tcMulti - Port 851


PLC\_Reset - Port 852

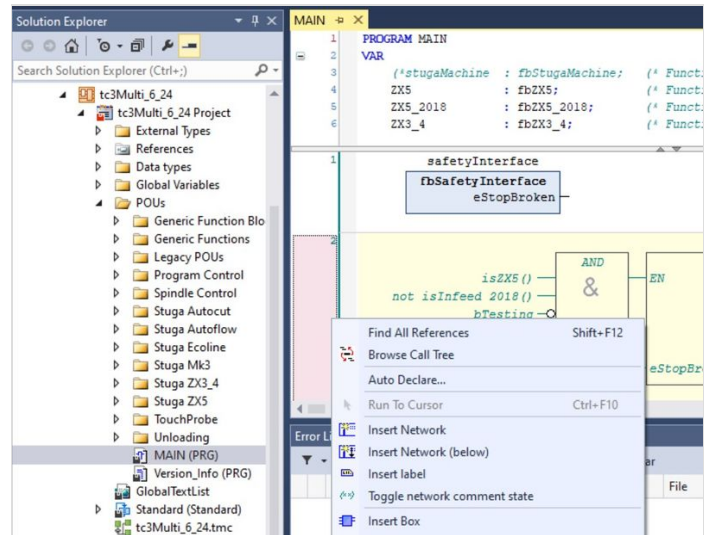
If not you can change the port assignment by right clicking the PLC project - you will need to change one to a "spare" port 853 first




## Step 10 - Ensure Correct Machine Commented in tcMulti project

1. Navigate to tcMulti project->POUs->MAIN
2. Scroll down to the machine types. The "comment State" can be toggled on and off by right clicking next to the step number on the left
3. Your goal is to ensure the correct machine is highlighted and the incorrect ones are commented out (in green)
4. Click Save All

 ...Check the date next to the machine types - you will want the latest one



## Step 11 - Add TwinSAFE project

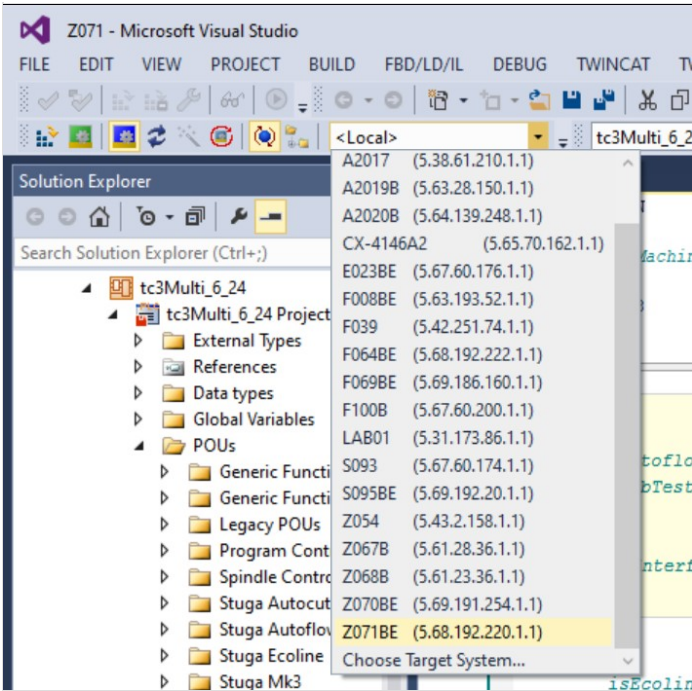
 ...From Z071 there is no twinSAFE project as the Estop circuit is hard wired

# Step 12 - Add the route to the Target System

If the front and back end PLCs are the same, the Target System is <Local>

If this is a separate Front End PC

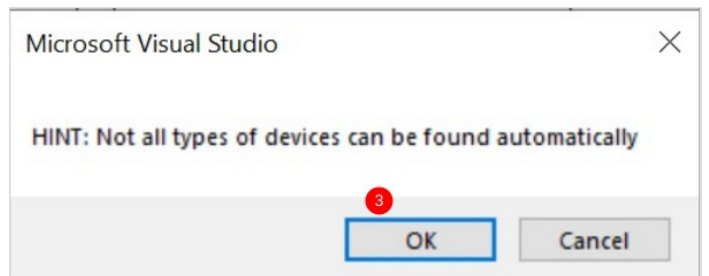
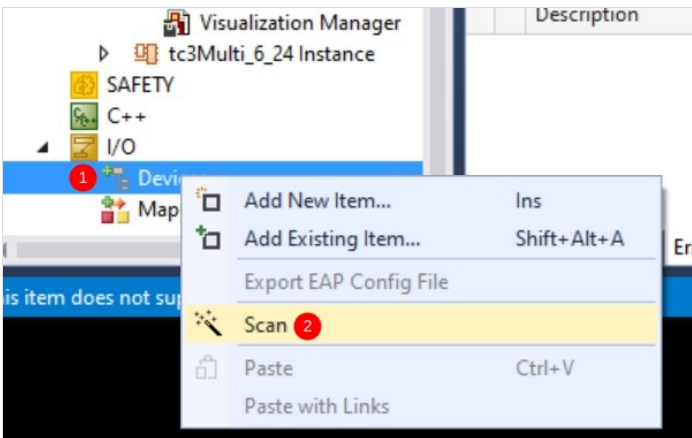
1. From Dropdown box select the Build number (If it does not exist we will need to add a new route)
2. If there is a request for a platform change, click Yes
3. On success, the Route dropdown will not read Error



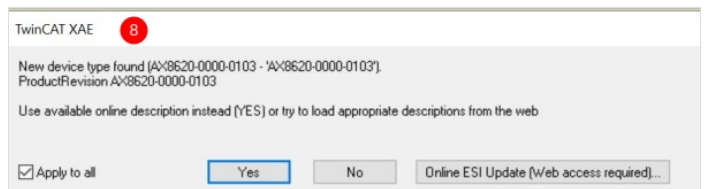
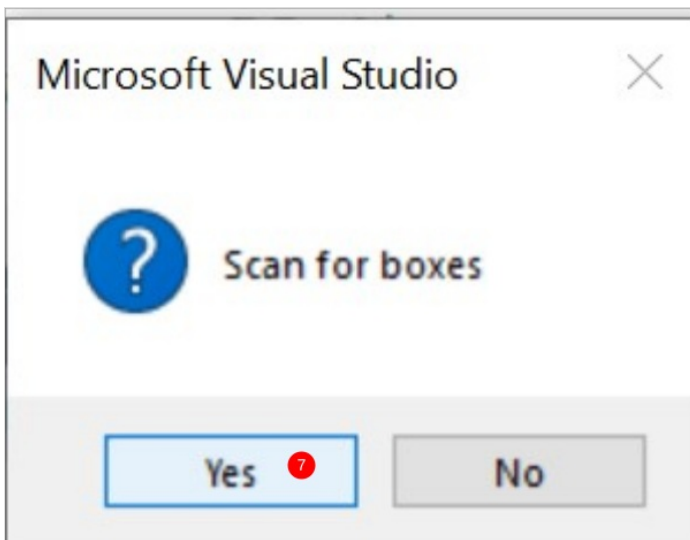
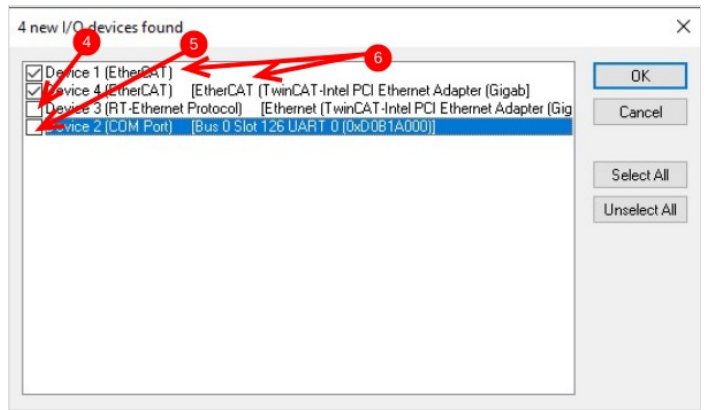
# Step 13 - Scan for Devices

1. Expand IO
2. Right click on devices, Scan
3. Click OK on the Hint:
4. Untick RT-Ethernet
5. Untick COM-Port
6. Just have the EtherCAT ports
7. Scan for boxes - Yes
8. If there is a request for New Device Type, Click Apply to All, Click Yes

If the scan does not work, a potential root cause could be missing EtherCAT drivers for the network adapter. See Updating Realtime Drivers for EtherCAT







## Step 14 - Check EtherCAT validity

Check the Devices and boxes match the expected EtherCAT setup

💡 ...Check the green lights on the etherCAT boxes for connection status. Flickering Green means it is OK

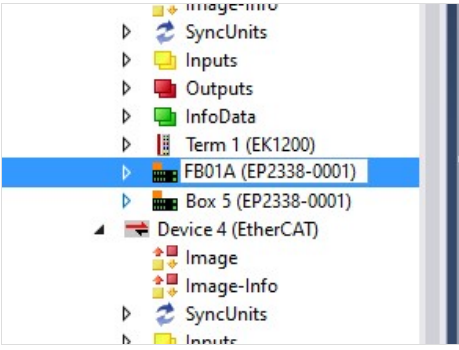
Repeat steps 7 and 8 until the physical network matches the scanned network

You may need to Right Click->scan Boxes on the second device if the EtherCAT boxes do not appear

💡 ...If the boxes do not appear in the right order, there could be an EtherCAT In /Out crossover

# Step 15 - Name all EtherCAT devices according to network

**!** ...Do not start this step until the EtherCAT network is fully verified. You will waste a lot of time if you ignore this!



Click twice on each device (not double click) to enable the device to be renamed  
 rename to convention

# Step 16 - Map all IO References

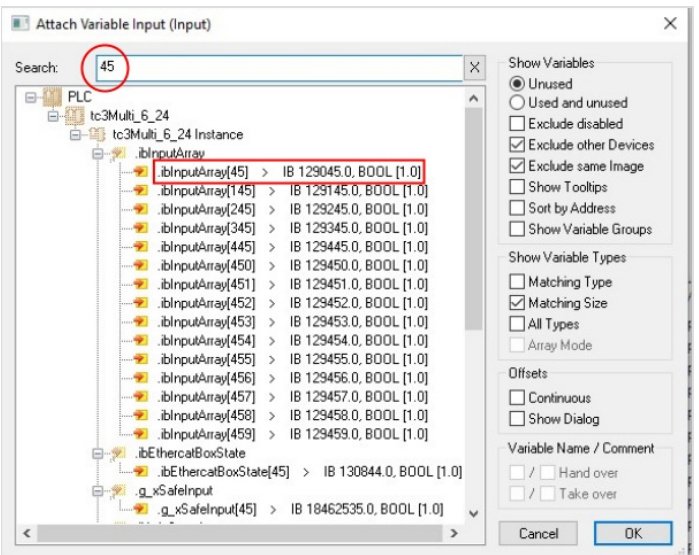
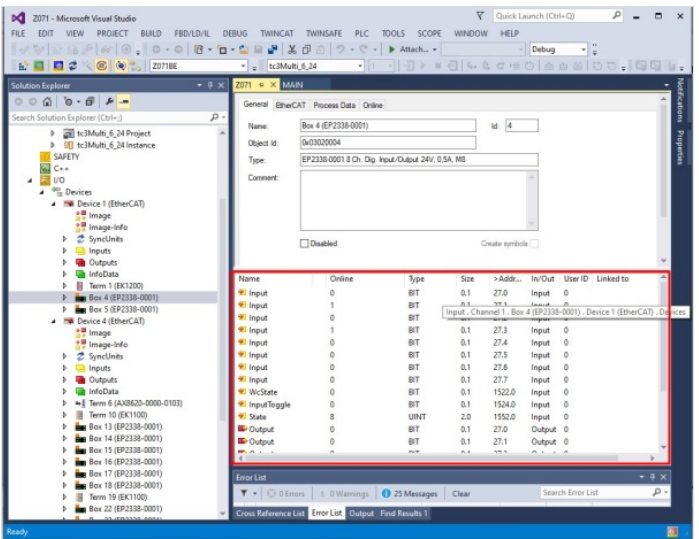
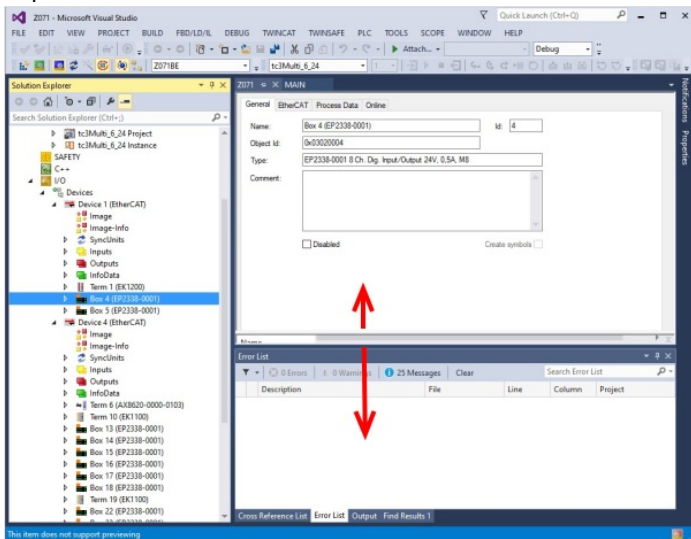
Using the circuit diagrams, map all the IO ref numbers to the associated IO channels

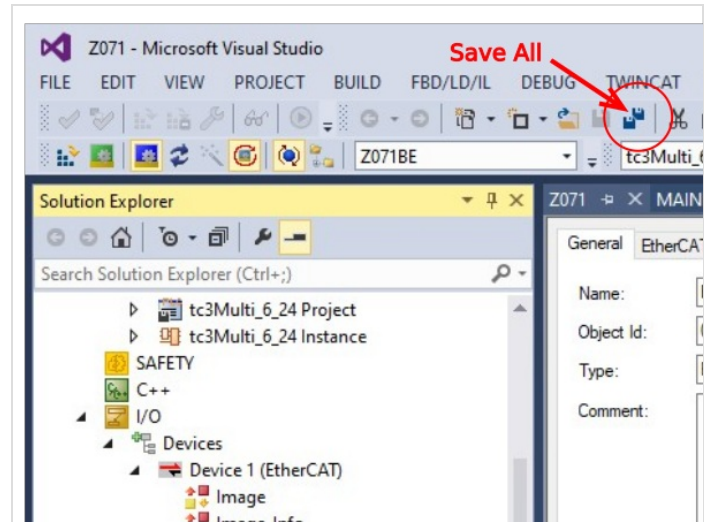
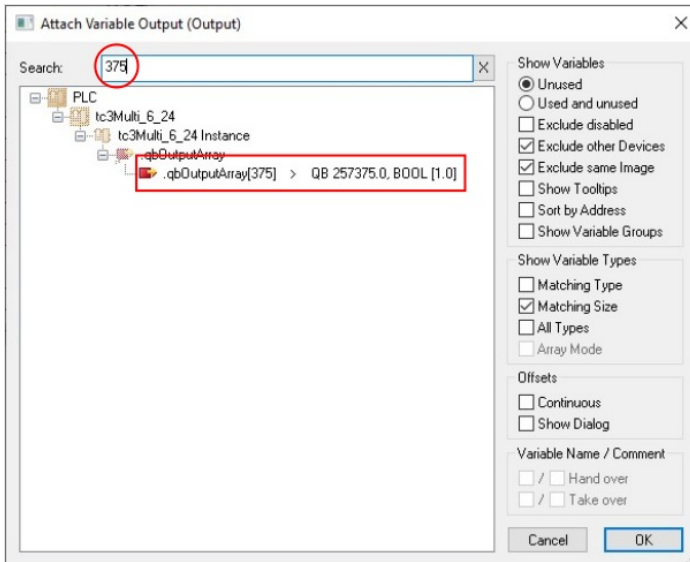
1. Double click a field-bus box or slice
2. Ensure you can see the input / Output list (may need some screen resizing)
3. Double click an IO channel
4. Enter the number in the search box
5. Double click the associated IO Ref number from `ibInputArray(inputs)` or `qbOutputArray(outputs)`

**!** ...Click Save All regularly so you do not loose progress, as this process can take a considerable time

**!** ...Be very vigilant and ensure you only click on `ibInputArray` or `qbOutputArray`

Repeat for all IO





## Step 17 - Map Analogue Input references

Length and width sensors need to be mapped to their relevant EtherCAT boxes

- Width Sensor on Machining centre is `iAnalogueInputArray[0]`
- Length Sensor on Infeed table is `iAnalogueInputArray[1]`

Name	Online	Type	Size	>Addr...	In/Out	User ID	Linked to
Status	0x8000 (32768)	Status_DS2...	2.0	54.0	Input	0	
Value	X 22352	INT	2.0	56.0	Input	0	iAnalogueInputArray[1]...
Status	0x8000 (32768)	Status_DS2...	2.0	58.0	Input	0	
Value	-12	INT	2.0	60.0	Input	0	
Status	0x8000 (32768)	Status_DS2...	2.0	62.0	Input	0	
Value	-12	INT	2.0	64.0	Input	0	
Status	0x8000 (32768)	Status_DS2...	2.0	66.0	Input	0	
Value	0	INT	2.0	68.0	Input	0	
WcState	0	BIT	0.1	1522.2	Input	0	
InputToggle	1	BIT	0.1	1524.2	Input	0	
State	8	UINT	2.0	1556.0	Input	0	
AddrAddr	5.78.142.148.2.1:1005	AMSADDR	8.0	1558.0	Input	0	

Name	Online	Type	Size	>Addr...	In/Out	User ID	Linked to
Status	0x0000 (0)	Status_DS2...	2.0	1610.0	Input	0	
Value	X 20190	INT	2.0	1612.0	Input	0	iAnalogueInputArray[0]...
Status	0x0000 (0)	Status_DS2...	2.0	1614.0	Input	0	
Value	1	INT	2.0	1616.0	Input	0	
Status	0x0000 (0)	Status_DS2...	2.0	1618.0	Input	0	
Value	-2	INT	2.0	1620.0	Input	0	
Status	0x0000 (0)	Status_DS2...	2.0	1622.0	Input	0	
Value	3	INT	2.0	1624.0	Input	0	
WcState	0	BIT	0.1	3058.1	Input	0	
InputToggle	0	BIT	0.1	3060.1	Input	0	
State	8	UINT	2.0	3215.0	Input	0	

## Step 18 - Double check all IO references with someone else

Any mistakes made will save hours if spotted here

## Step 19 - Install Drive Manager 2 Project

1. Note which Device number has the drive in it
2. Left-click on *FILE*. A new context menu open
3. Move the mouse to *Add*.
4. Left-click on *New Project*.
5. Select TwinCAT Drive manager 2 on left
6. Click on TwinCAT Drive manager 2 Project on right
7. Save with filename "[BuildNo] Drive Manager" in the folder for the project (c:\TwinCAT\Stuga\{BuildNo})
8. EtherCAT master will be the device that has the drive in from Step 1
9. Leave the basic settings, click OK
10. This should link up the drives set in previous steps to a Drive Manager project



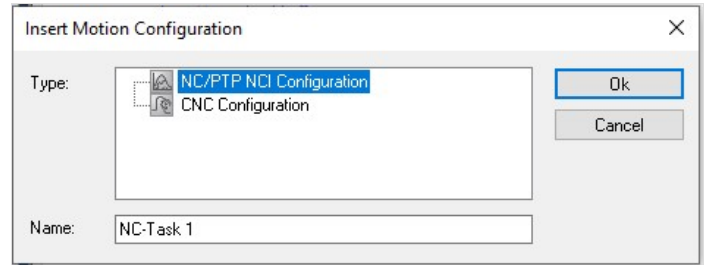
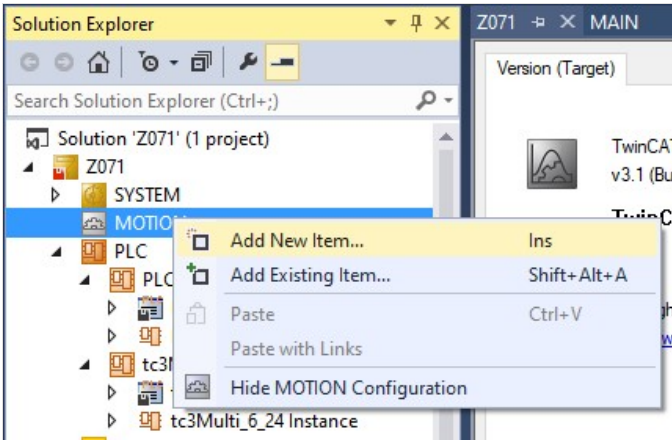
...More information from Beckhoff [https://infosys.beckhoff.com/english.php?content=../content/1033/ax8000\\_inbetriebnahme/3746354955.html&id=1243614138563339940](https://infosys.beckhoff.com/english.php?content=../content/1033/ax8000_inbetriebnahme/3746354955.html&id=1243614138563339940)

# Step 20 - Add Axis Task

A smooth setup will have detected the axes and added them under the MOTION tab already.

if not, an axis task may need to be added under the MOTION tree:

1. Add New Item
2. NC/PTP Configuration
3. Leave the Name as default



# Step 21 - Add Axes

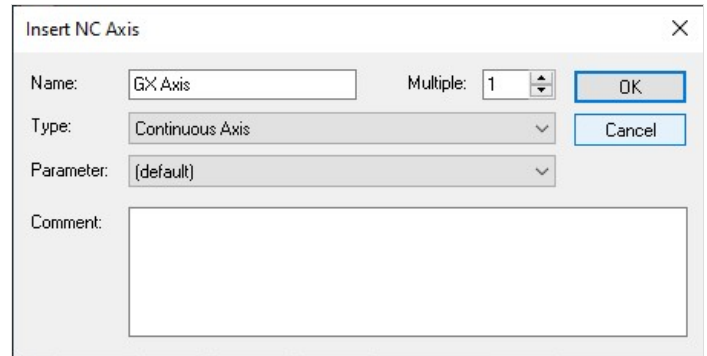
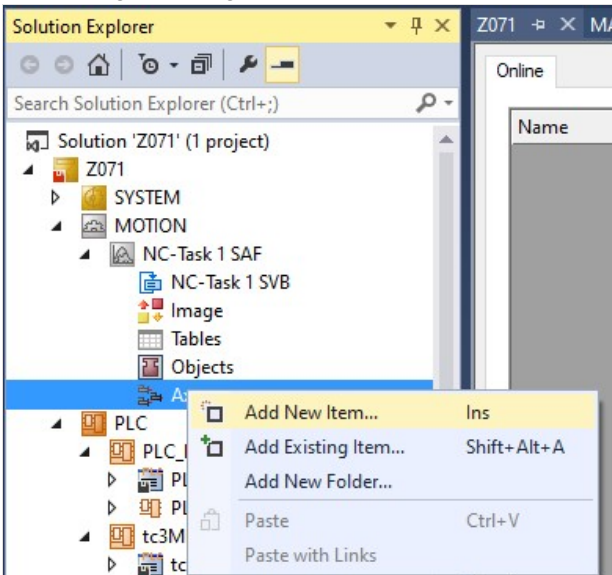
**i** ...This step may not be necessary if the Device scan added them automatically

If the axes do not exist under MOTION->NC Task->Axes, add them


1. Right Click Add axis
2. Name to convention nn Axis

Repeat for each axis on machine

Axis naming and configuration for different machines can be found here




## Step 22 - Map Axes


 ...This step may not be necessary if the Device scan added them automatically

1. Double click an axis
2. Settings tab
3. Click Link To IO
4. Connect to associated Drive
5. Click Link to PLC
6. Use the reference here to get the Axis Numbers

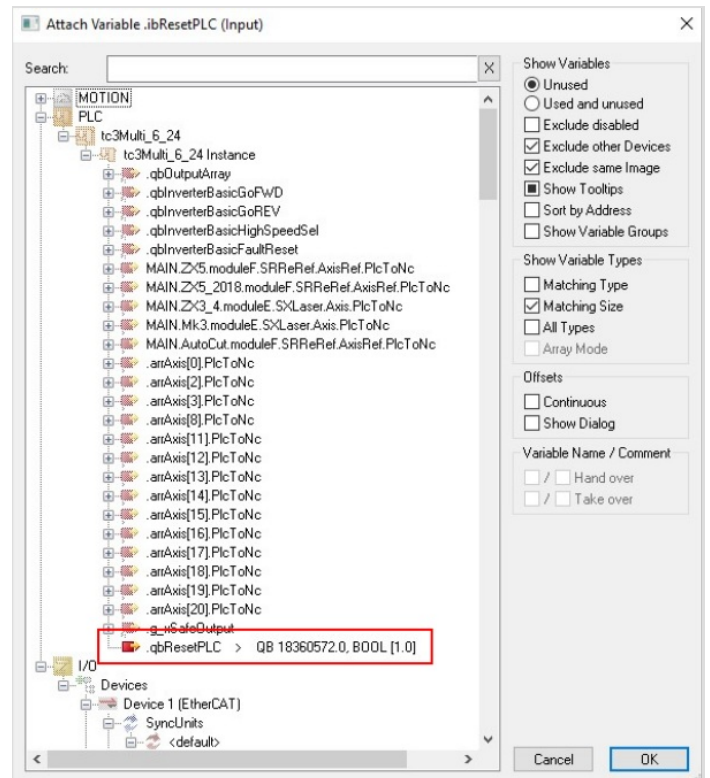
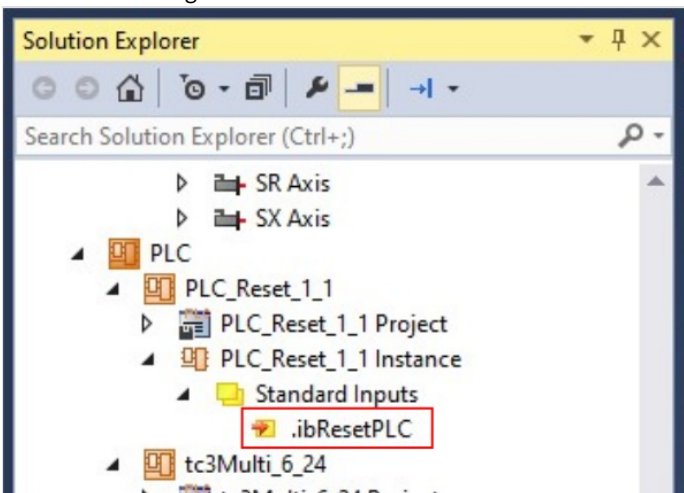
Repeat for each axis

 ...Make sure you select the correct channel number / letter if it is a dual drive

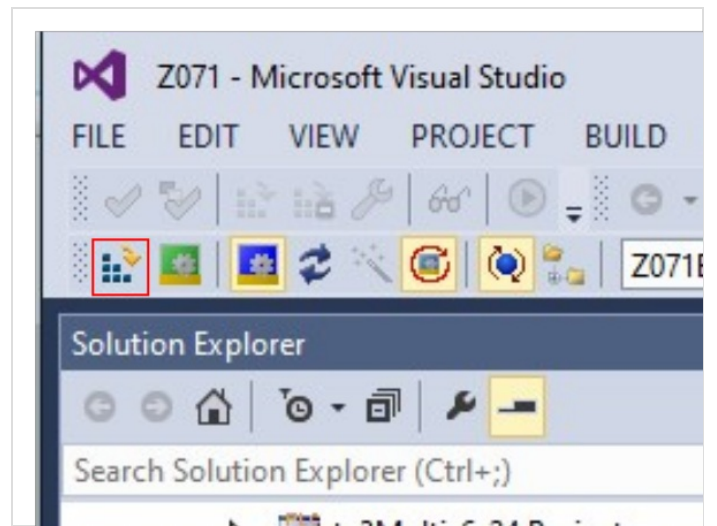
## Step 23 - Add PLC\_Reset to tc3Multi Link

 ...An output from tcMulti needs to be set up to an input on PLC reset to allow the PLC to reset itself. This is like a physical wire between two PLCs but just exists in the software

1. Expand PLC\_Reset Instance to get to ibResetPLC
2. Double Click ibResetPLC to open the properties
3. Link to qbResetPLC (this is very far down the list)
4. Activate configuration



## Step 24 - Activate configuration



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## Step 25 - Set up Drives

[https://stuga.dokit.app/wiki/Specialised\\_Settings\\_for\\_Beckhoff\\_Drives](https://stuga.dokit.app/wiki/Specialised_Settings_for_Beckhoff_Drives)

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## Step 26 - Add The PC types to Monday Log

The board "Control Systems Log" is setup to log all machine setups  
<https://stugaltd.monday.com/boards/304269981>

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