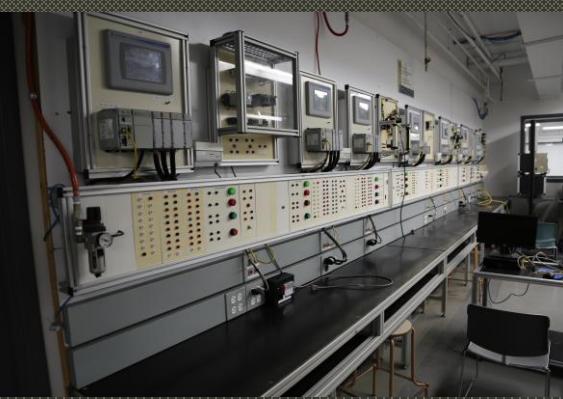


PROGRAMMABLE LOGIC CONTROLLERS

MENG 3500



HUMAN-MACHINE INTERFACE (HMI)

PLC software on a personal computer can be divided into two main types:

Programming and Documentation Software:

- Enables users to write PLC programs using ladder logic or other languages.
- Allows detailed documentation and explanation of the program.

Human Machine Interface (HMI) Software:

- Facilitates monitoring and control of processes.
- Provides a graphical representation on a screen/monitor.
- Enables machine operation, trend analysis, and alerts for conditions.

PLCs and HMIs can integrate, but they require separate programming software.



Figure 1-22 Human Machine Interface (HMI).
Source: Image Courtesy of Rockwell Automation, Inc.

HUMAN-MACHINE INTERFACE (HMI)

In the past, control systems used physical panels with switches and gauges.

Now, digital systems replace these with computer/touch panel screens for process graphics and keyboard commands.

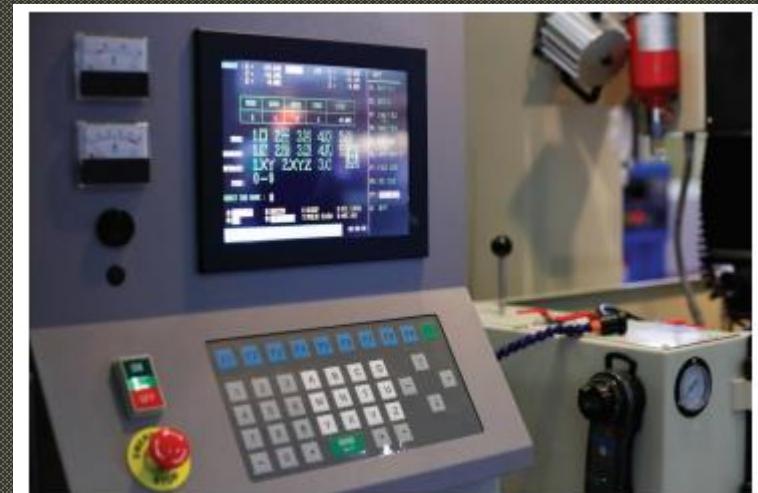


Figure 2-38 Human Machine Interface (HMI).

3

Tech Briefs - HMI | Library.AutomationDirect

Standard 30A Electric Brewery Control Panel (Pre-Assembled) - The Electric Brewery

Frank D. Petruzzella Programmable Logic Controllers 6th edition

HUMAN-MACHINE INTERFACE (HMI)

Human-Machine Interfaces (HMIs) provide operators and management with real-time visibility into system operations, enhancing monitoring and control. Using setup software on a personal computer, you can configure display screens to:

- Replace physical pushbuttons and pilot lights with touch-activated icons.
- Present operations graphically for better visibility.
- Enable operators to adjust timer and counter presets using a touch-sensitive numeric keypad.
- Display alarms with timestamps and locations.
- Demonstrate changing variables over time.

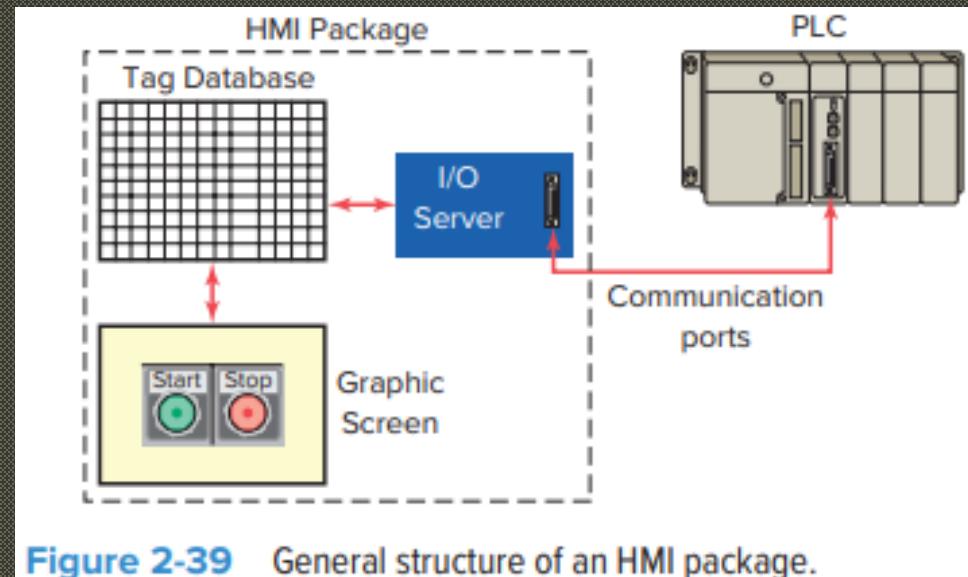


Idec - HG3G-8JT22MF-B – empirewc.com

HUMAN-MACHINE INTERFACE (HMI)

Developing an HMI application involves:

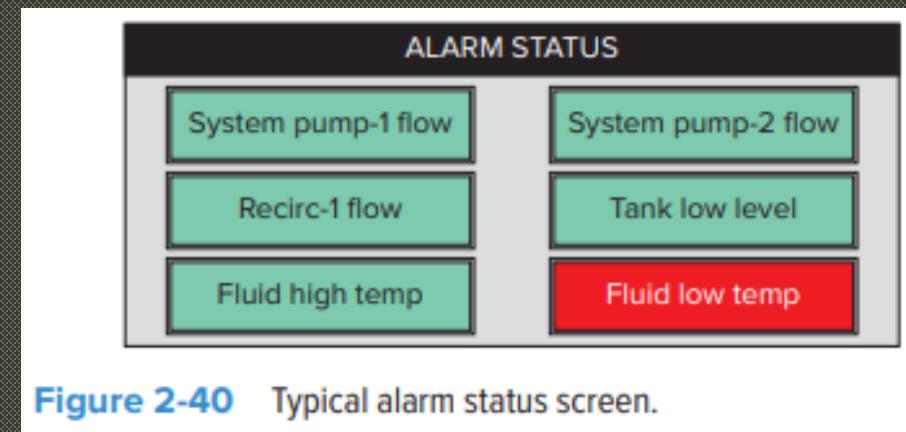
- Set up PLC communication by configuring software and hardware.
- Create the tag database, often importing tags from PLC programming software.
- Place graphical objects on the screen, drawn or imported from a library.
- Animate objects, with two types: user input (changing tag values) and display (showing values and altering shape, position, and color).



HUMAN-MACHINE INTERFACE (HMI)

Alarms are messages indicating a fault. An alarm summary lists timestamped active alarms. They can be:

- Inactive: No faults, no waiting alarm messages.
- Active: Fault present, unacknowledged.
- Acknowledged: Fault present, acknowledged.
- OK: Fault no longer active, acknowledgment pending.



HUMAN-MACHINE INTERFACE (HMI)

- Events:

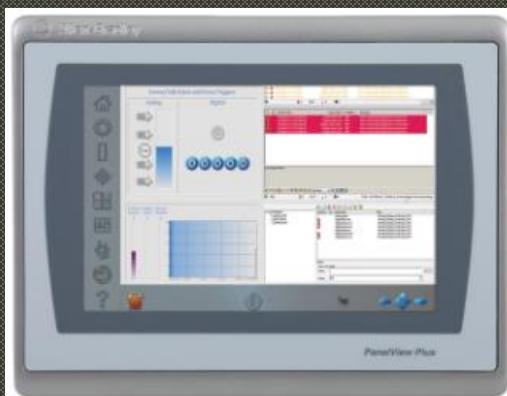
An event history displays a time-stamped list of significant process events. It helps diagnose problems, especially when unmonitored or intermittent, providing a record of past issues.

- Trend:

This display graphs key process variables like flow, temperature, and production rate over time, like a real-time strip chart recorder.

- Library

It includes buttons, lights, switches, sliders, meters, and more. It saves time by offering ready-made graphics for various control devices, allowing easy resizing, color changes, and customization.



2711P PanelView Plus 7 Graphic Terminals | Allen-Bradley (rockwellautomation.com)

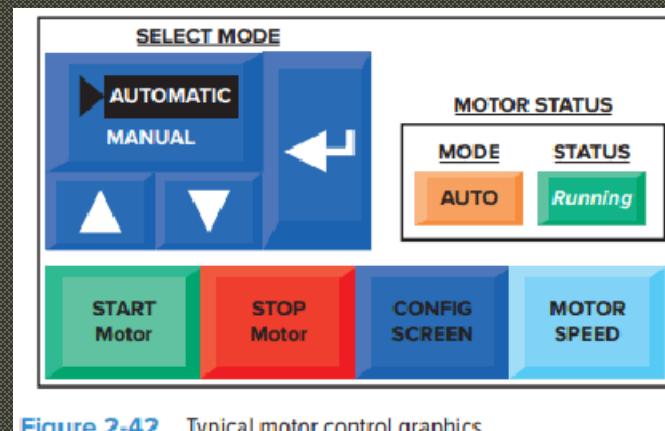


Figure 2-42 Typical motor control graphics.

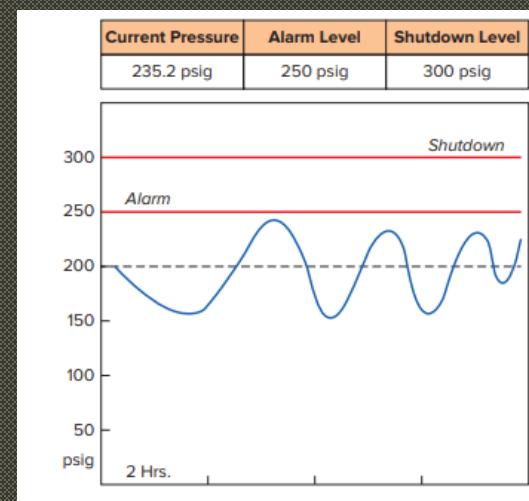


Figure 2-41 Trend monitoring of a pressure gauge.

HUMAN-MACHINE INTERFACE (HMI)

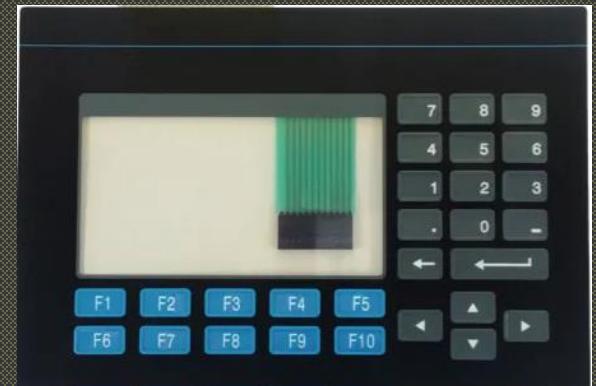
PLC based control systems use graphical displays as the primary operator interface.

The HMI is called by various other names:

- Operator Interface (OI)
- Man-machine interface (MMI)
- Touch panel

The panels may be:

- Small or large scrolling text displays
- Graphic displays
- HMI software on a computer, with more objects than graphic displays
- Open-software based systems such as Visual Basic.



The screen may or may not be touch-sensitive. If not touch sensitive, the screen is surrounded by function keys or other buttons allowing operator input.

The systems often communicate directly with the PLCs to read and write memory locations.

HUMAN-MACHINE INTERFACE (HMI)

HMI operator panels are 256-color display screens that communicate directly with the PLC to read or write memory locations.

Some of the specifications include:

- Color displays enhance process clarity and system aesthetics.
 - Red: Alarm, danger, stop
 - Yellow: Caution, risk of danger
 - Green: Ready, running, safe condition
- Screen resolution: width × height in pixels.
- Screen memory: Megabytes (MB).
- Environmental certification: dust, liquids, and extreme temperatures.
- Touch-sensitive screen: Displays more devices and data in a smaller area.
- Serial or Ethernet connections are commonly used to connect an HMI to a PLC.

HUMAN-MACHINE INTERFACE (HMI)

Screen Design General Considerations

- Screens should be arranged to facilitate easy scanning
- Number of colors should be kept to a minimum
- Keep the displays simple. Too much details on the graphical display make it difficult to determine important information
- Text should not be difficult to read. Select a common font that will exist on all computers. Minimize the amount of text
- Data values should be logically grouped on the screen. They should be displayed as numbers as well as analog indicators (bars, graphs, etc.)
- Graphs of the values are very useful. They come as real time and historical trends
- Alarm messages informing about abnormal conditions

FACTORY TALK VIEW STUDIO

ME - MACHINE EDITION

FACTORY TALK VIEW STUDIO ME

- Configure the communication between the Application and PLC
- Creating HMI Tags
- Display settings
- Creating Multistate Indicator to monitor bit status
- Creating Momentary Push Buttons
- Create Display Navigation (GoTo)
- Creating Real-time trend
- Create Run-time Application
- Backup and restore the application

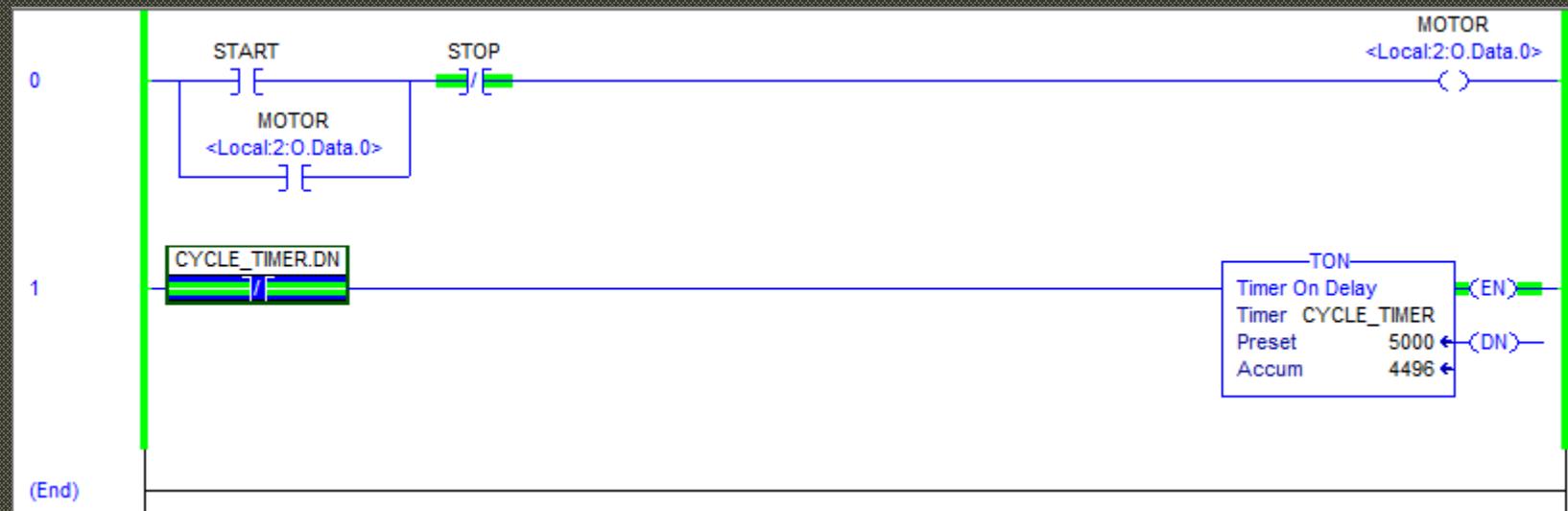
FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Create screens to control and monitor a DC motor using Panelview Plus 700 touchpanel.

Number of screens: 2

- Screen 1: Main screen. Contains N.O. START, N.O. STOP pushbuttons, Motor Running Indicator and Go to TRENDS pushbutton.
- Screen 2: Real-time trend and Go to MAIN pushbutton.

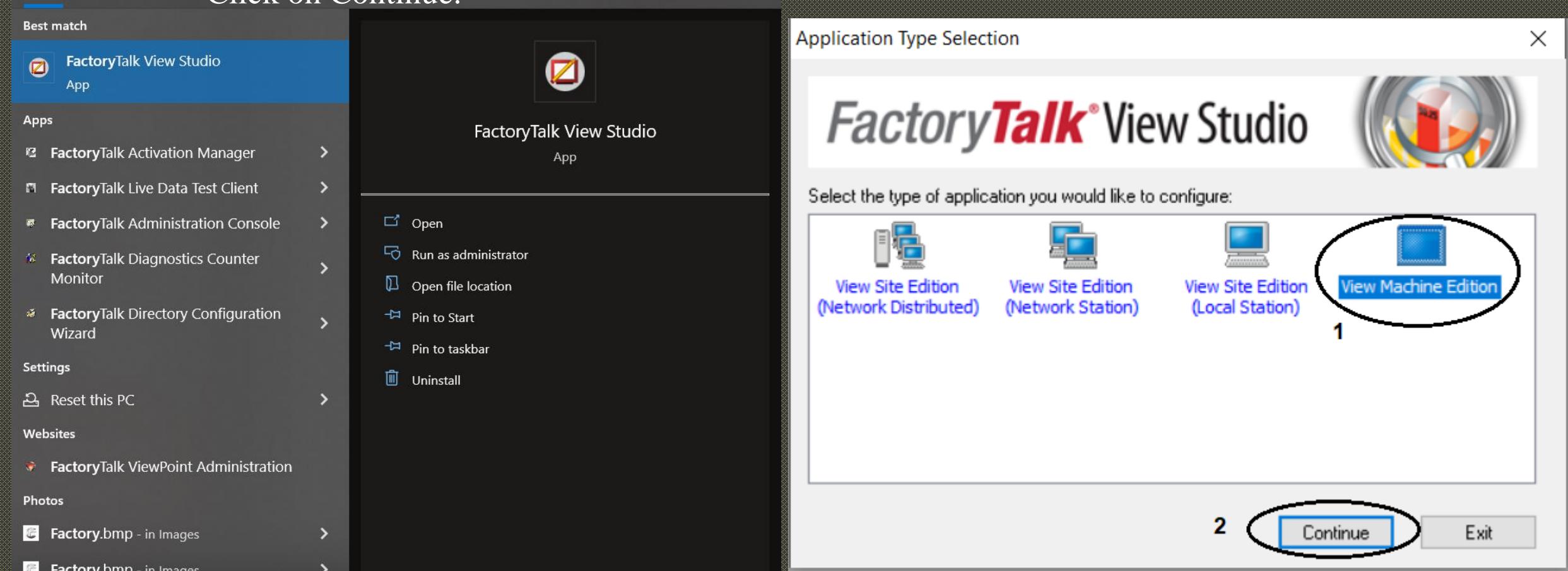
Implement the PLC program, download it, and stay Online



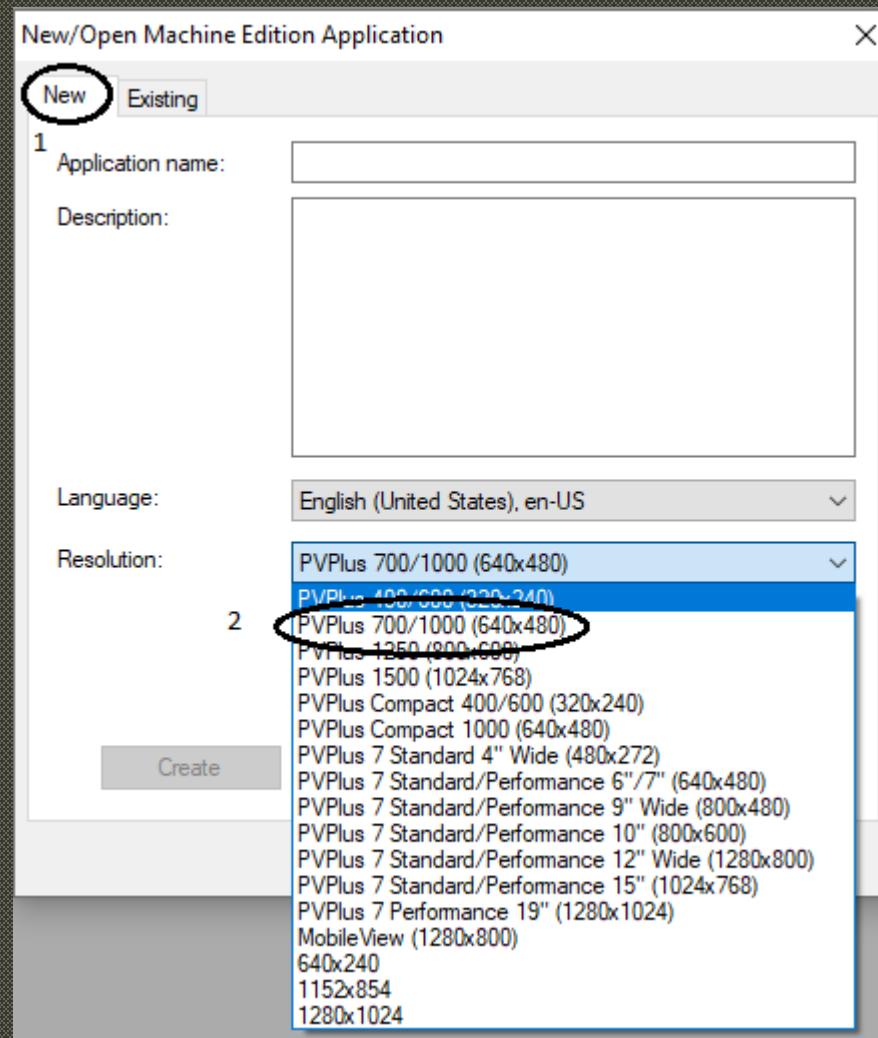
FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Create FactoryTalk View Studio Machine Edition screens

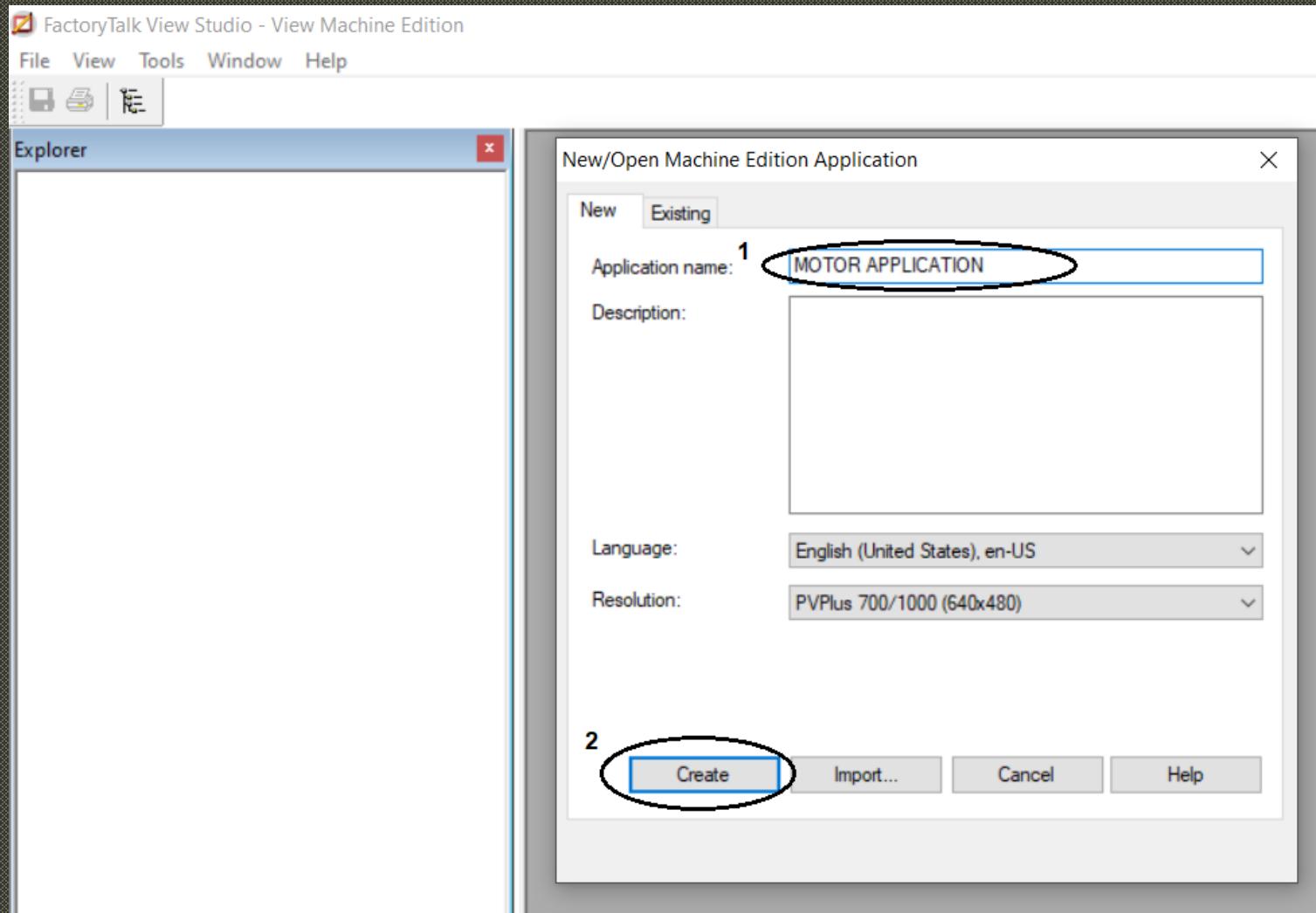
- Click on FactoryTalk View Studio
- Select the View Machine Edition
- Click on Continue.



Select New and PVPlus 700/1000 (640x480) model



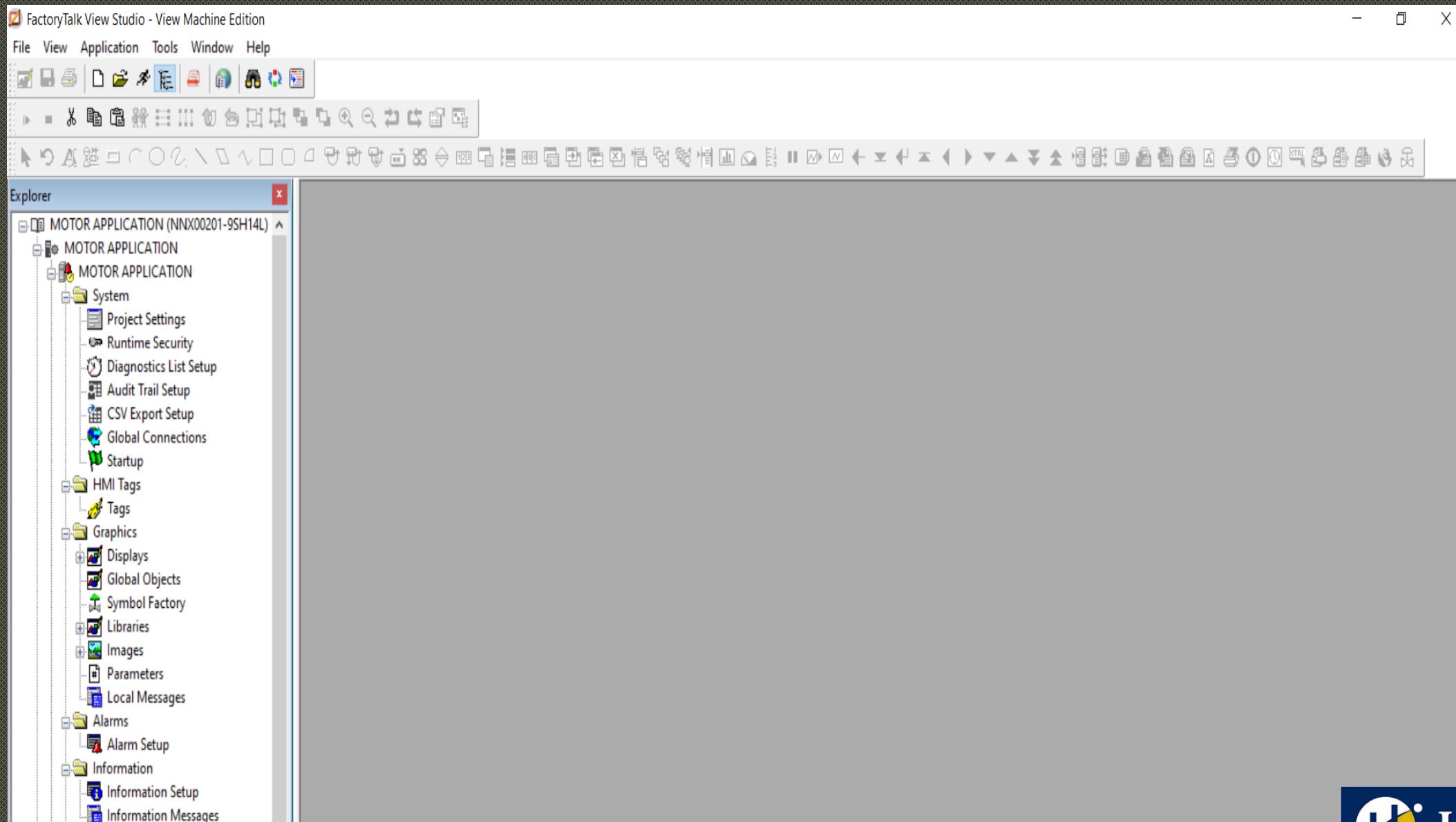
FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL



- Type the Application name
- Click on Create

FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

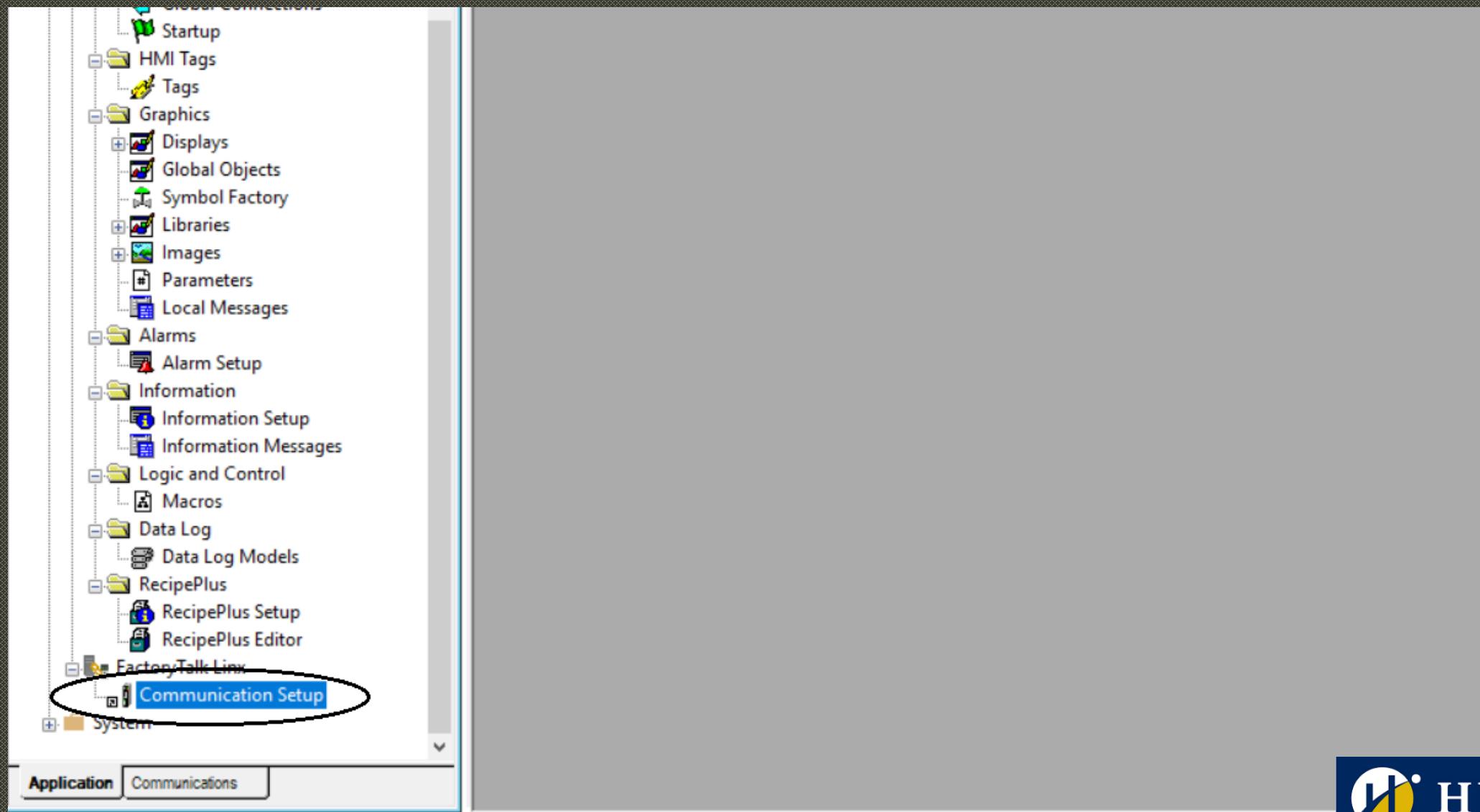
The following screen will appear:



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

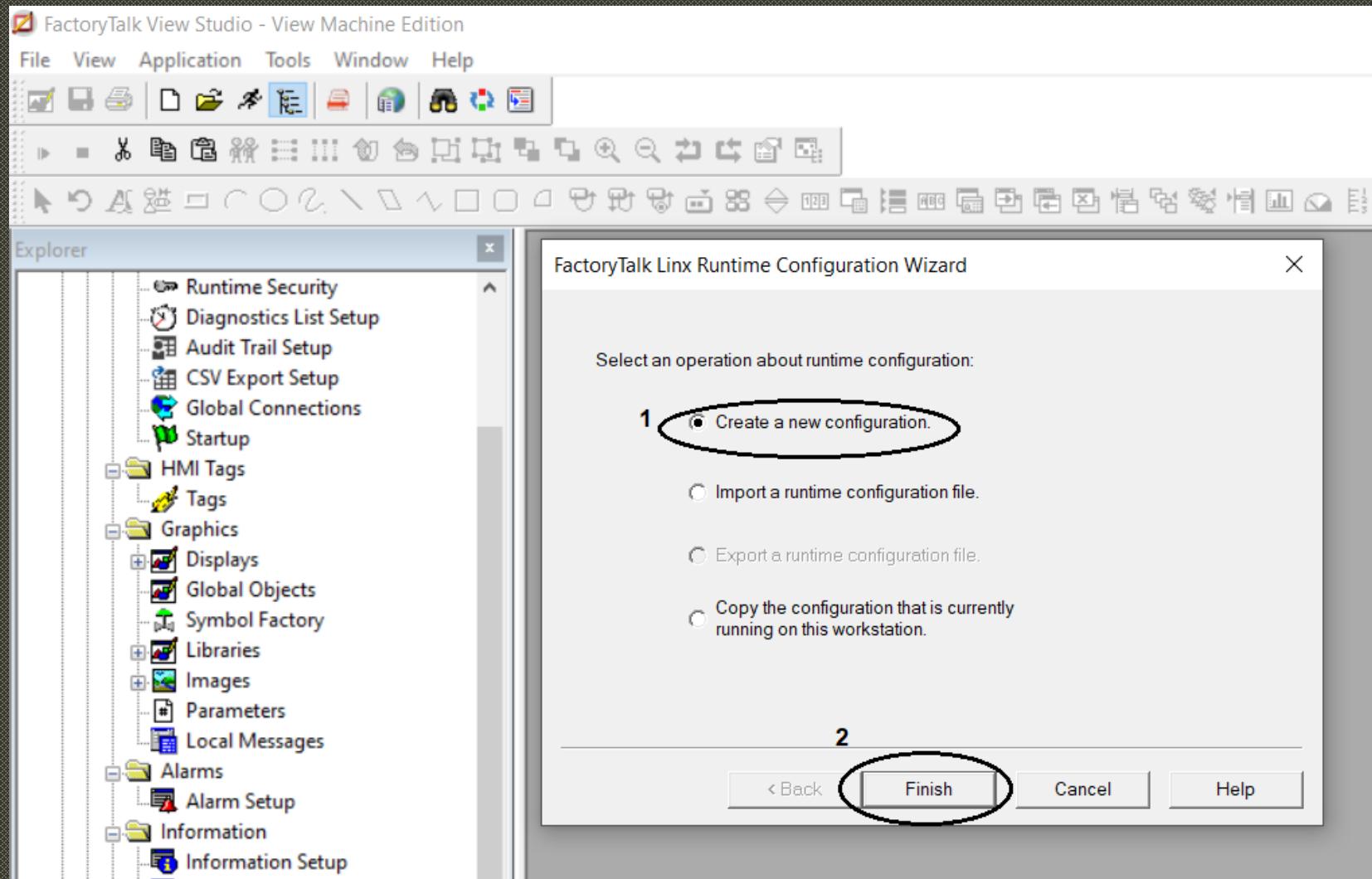
Step 1: Communication setup

Scroll down and double click on Communication Setup



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

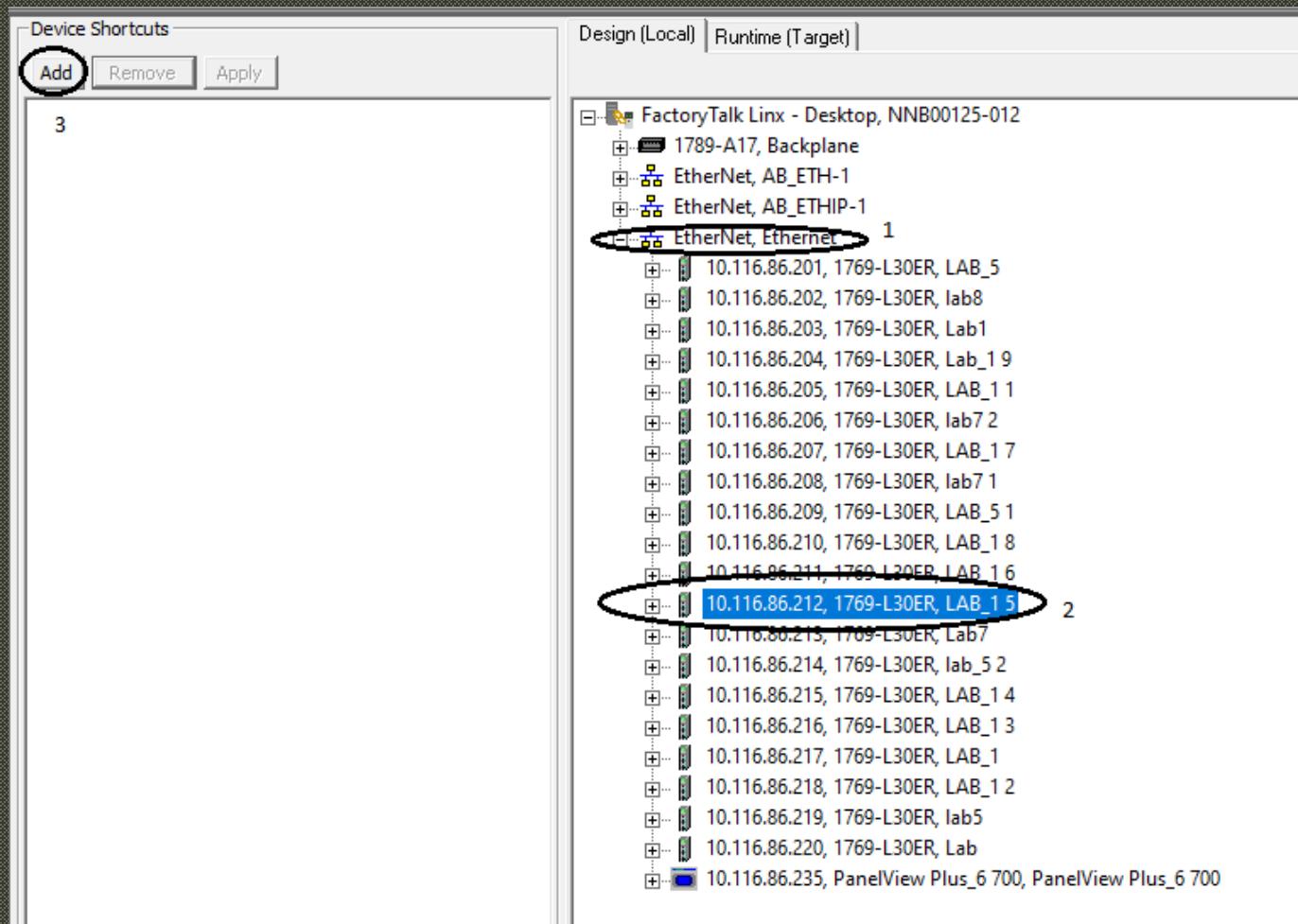
- Step 1: Communication setup
- Select Create a new configuration
 - Click on Finish



Step 1: Communication setup

Establish communication between the Application and the PLC data base

Highlight PLC driver and click on Add

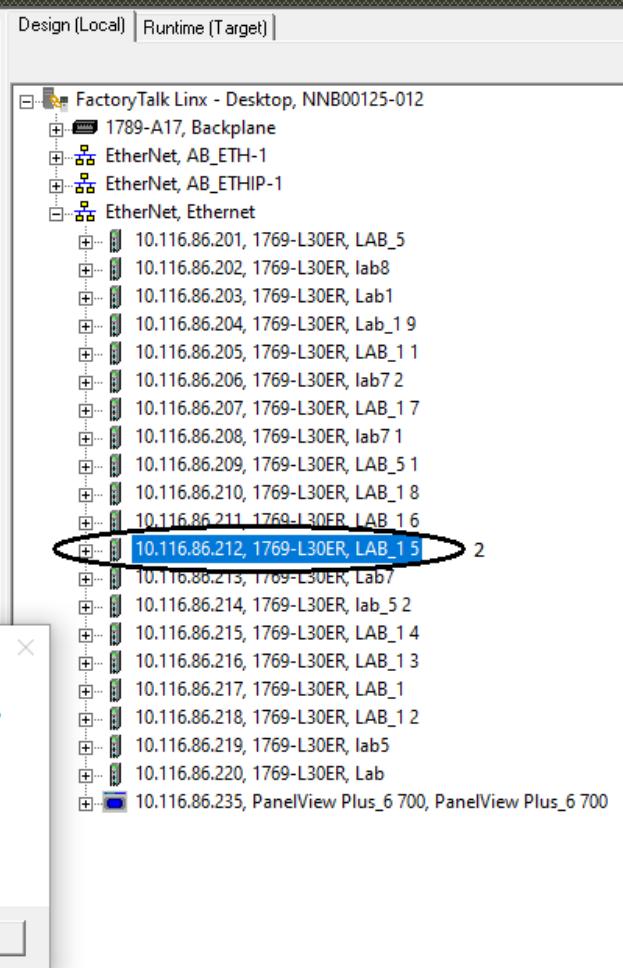
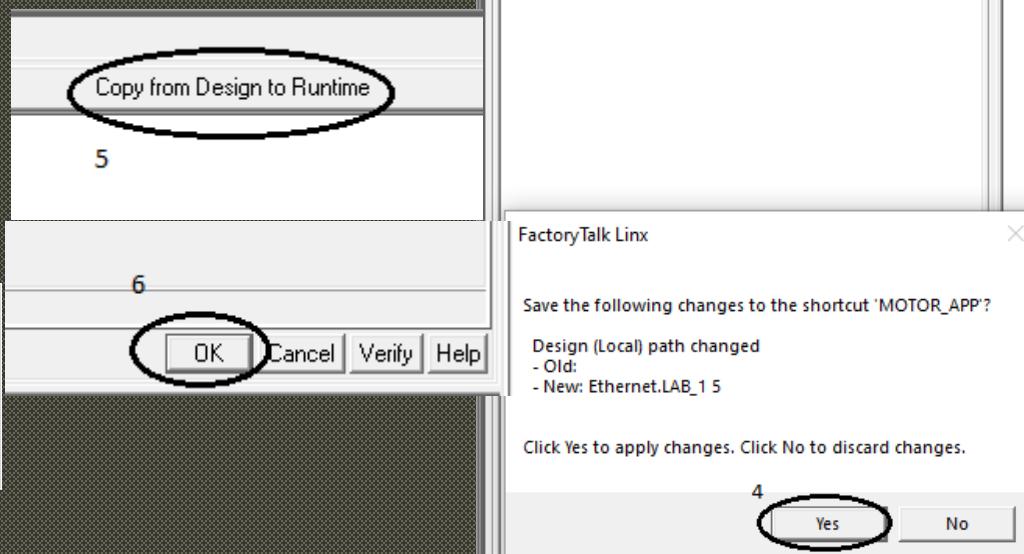


FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 1: Communication setup

Establish communication between the Application and the PLC data base

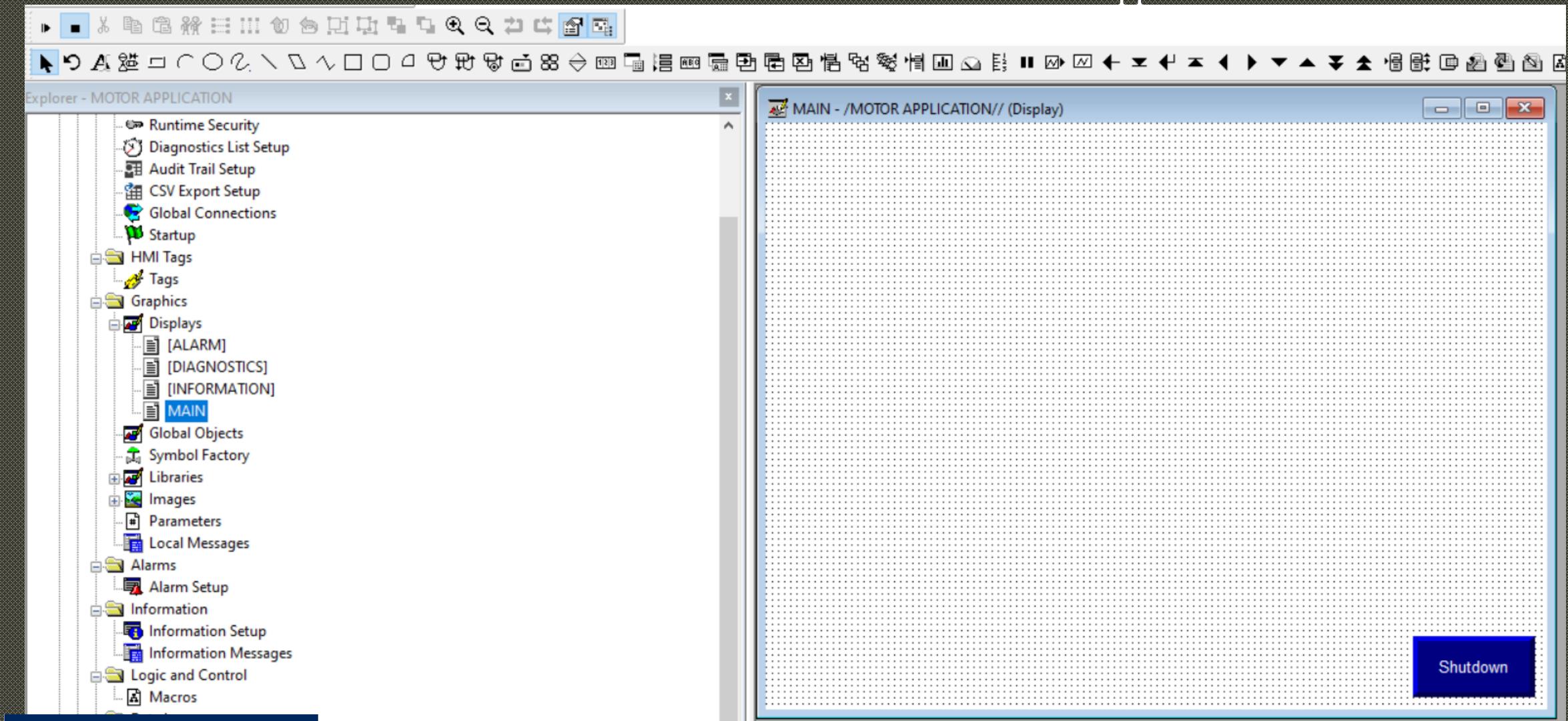
- Type the name of the Shortcut: MOTOR_APP
- Highlight MOTOR_APP and the PLC driver
- Click on Apply,
- Yes
- Click on Copy from Design to Runtime, Yes
- Click on OK



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 2: Screen design

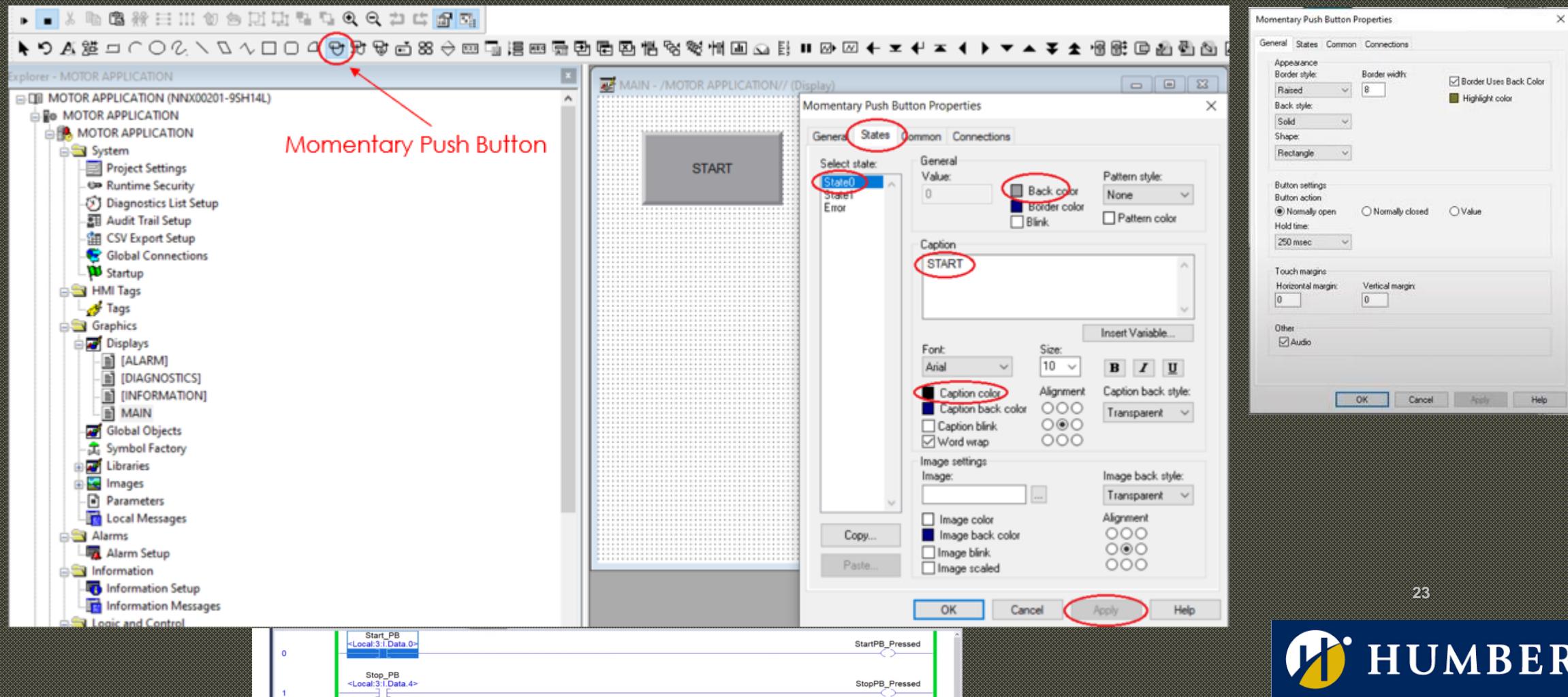
Double click on MAIN. The MAIN screen will appear.



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 2: Screen design

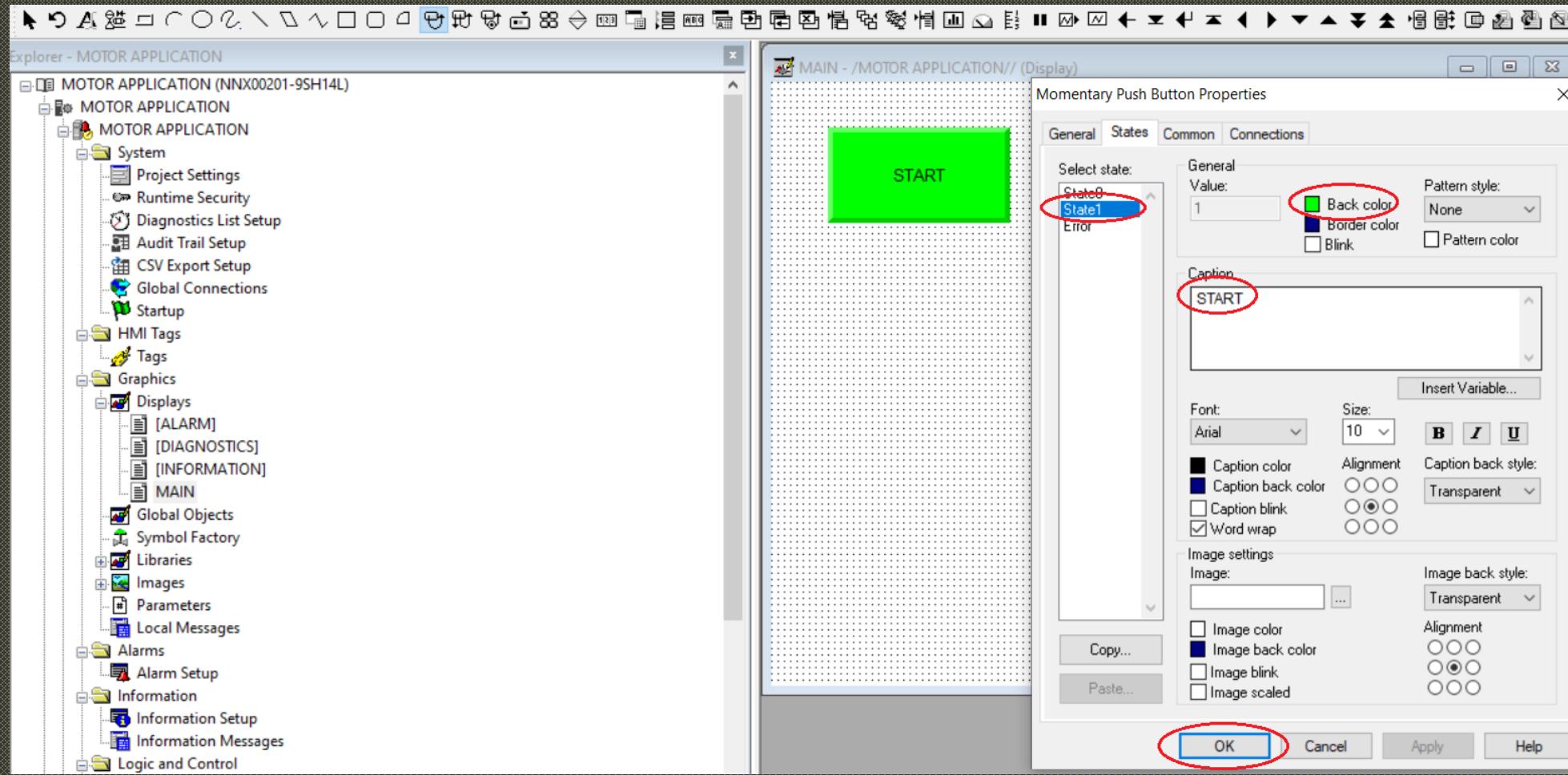
Click on Momentary Push button, select States tab, set the State0, type the caption START, set the Back color and the Caption color. Click on Apply.



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 2: Screen design

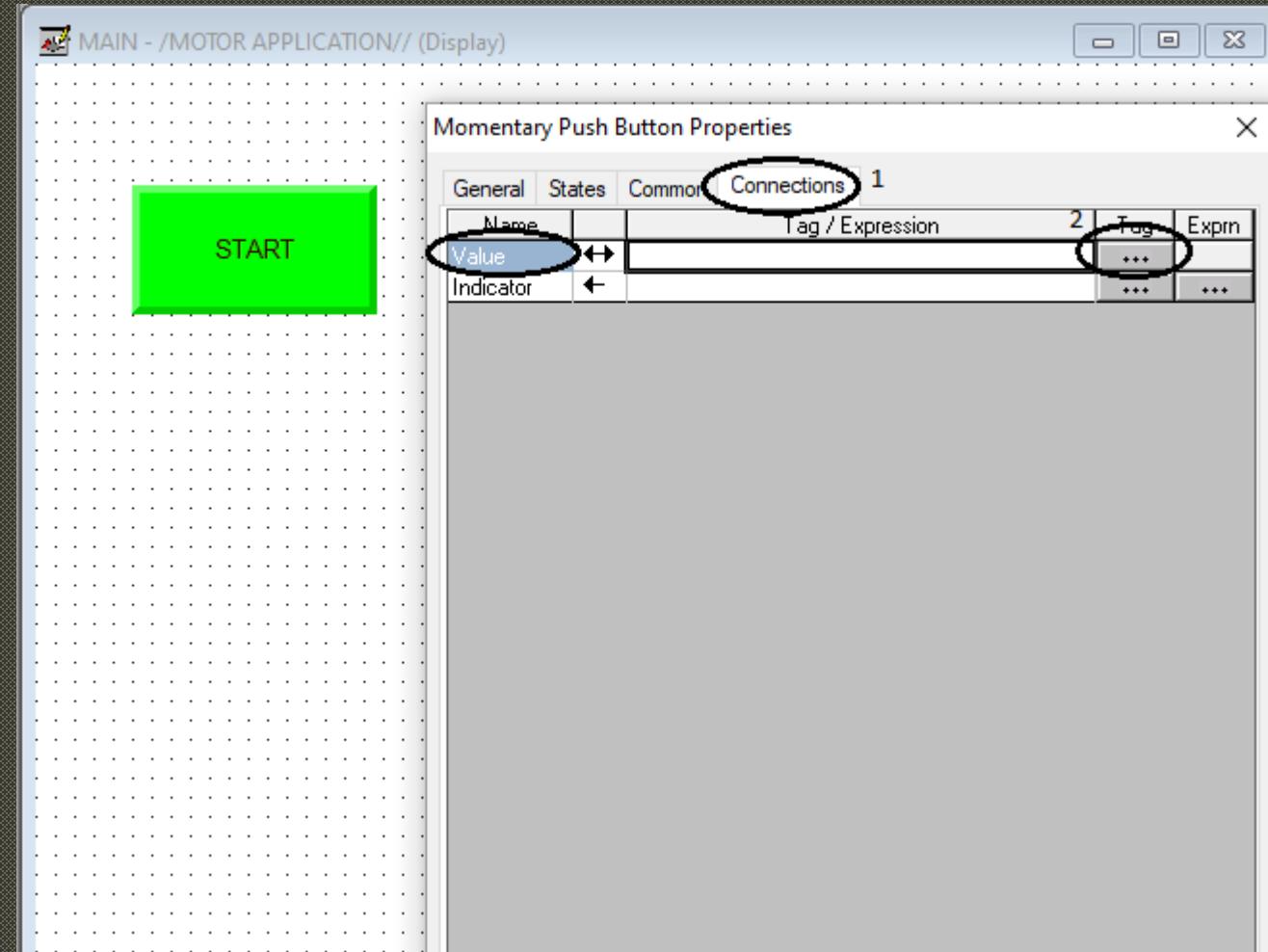
For State1, type the caption START, set the Back color and the Caption color.
Click on OK.



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 2: Screen design

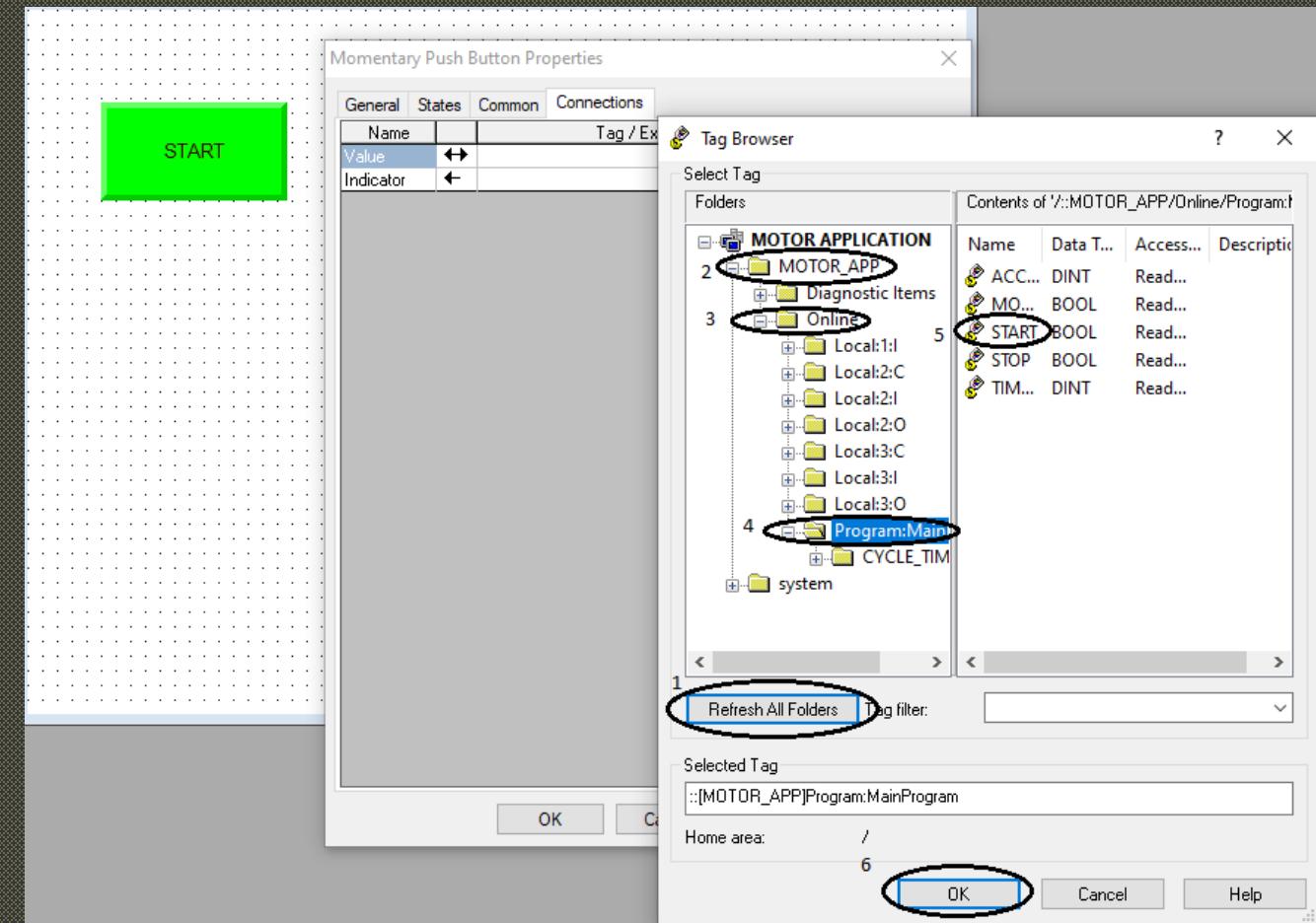
- Double click on START pushbutton
- Click on the Connections tab
- For Value click Tag



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 2: Screen design

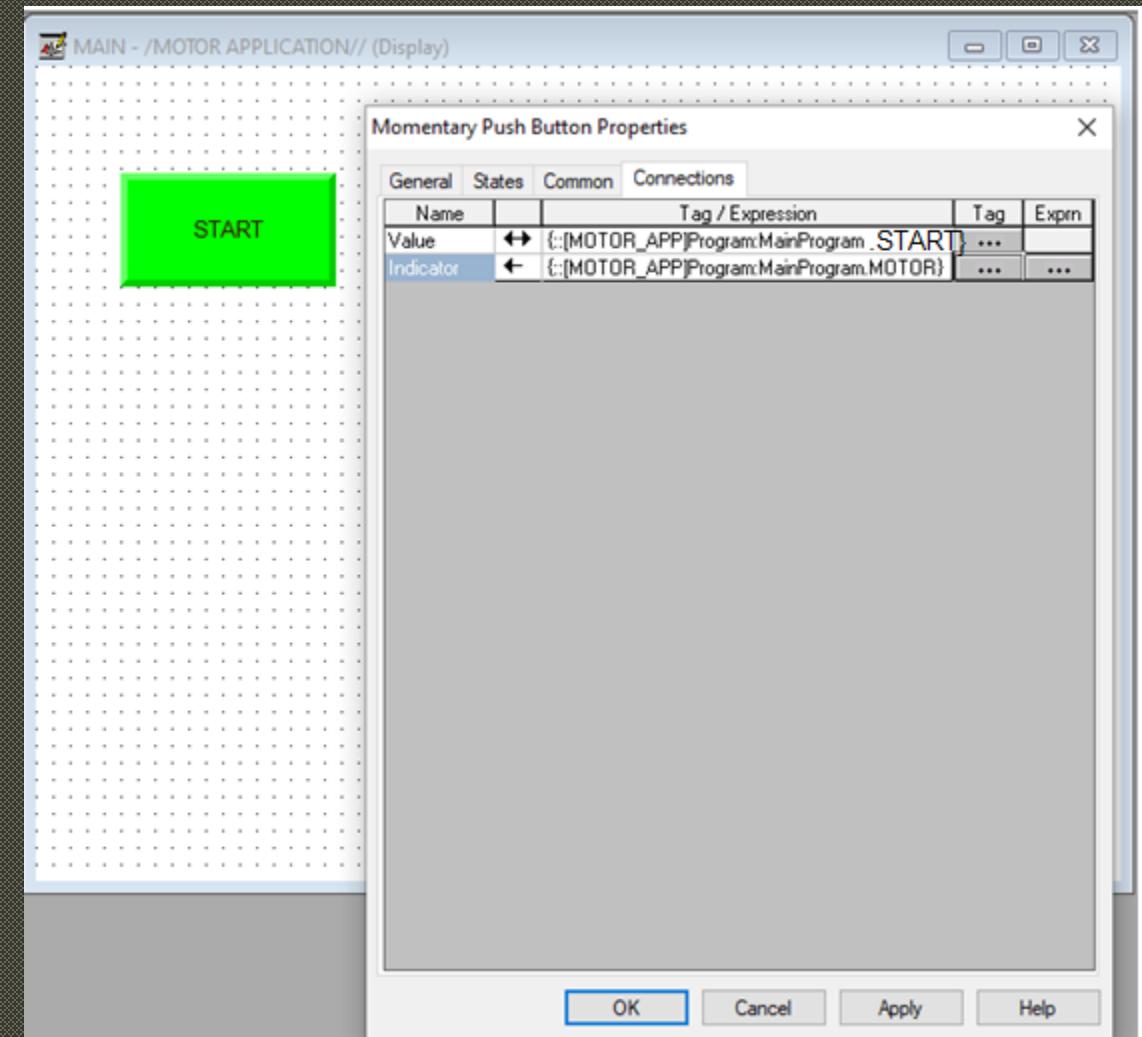
- Click on Refresh All Folders
- Open the MOTOR_APP folder,
- Open Online folder,
- Open the Program: MainProgram folder. You can see all the tags in the PLC program.
- Click on START tag and
- Press OK.



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 2: Screen design

- Select the tag for Indicator. It will be MOTOR since the START button indication will depend on the state of the MOTOR (1 or 0).
- Click on Apply and OK.



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FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 2: Screen design

Repeat the same for STOP pushbutton:

The image displays two identical 'Momentary Push Button Properties' dialog boxes side-by-side, illustrating the configuration for two different pushbuttons: 'START' and 'STOP'. Both dialogs have four tabs: General, States, Common, and Connections. The 'General' tab is selected in both.

START Pushbutton Properties (Left Dialog):

- Select state:** State0 (selected)
- Value:** 0
- Pattern style:** None
- Blink:**
- Caption:** START
- Font:** Arial
- Size:** 10
- Font styles:** **B**, *I*, U
- Color settings:** Caption color, Caption back color, Caption blink, Word wrap
- Alignment:** ○○○, ○●○, ○○●
- Image settings:** **Image:** [Empty], **Image back style:** Transparent, **Image color:** Image color, **Image back color:** Image back color, **Image blink:** Image blink, **Image scaled:**
- Image alignment:** ○○○, ○●○, ○○●

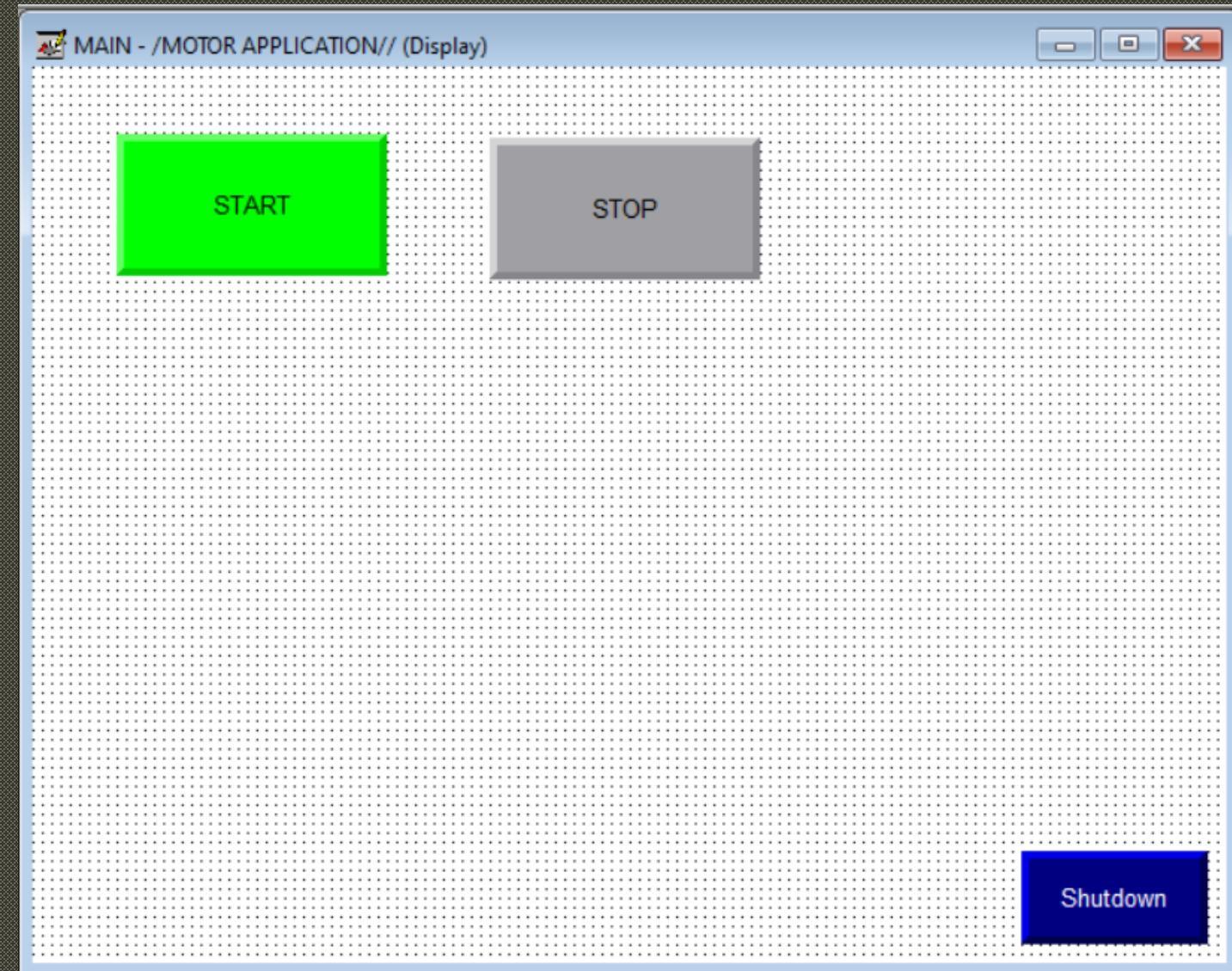
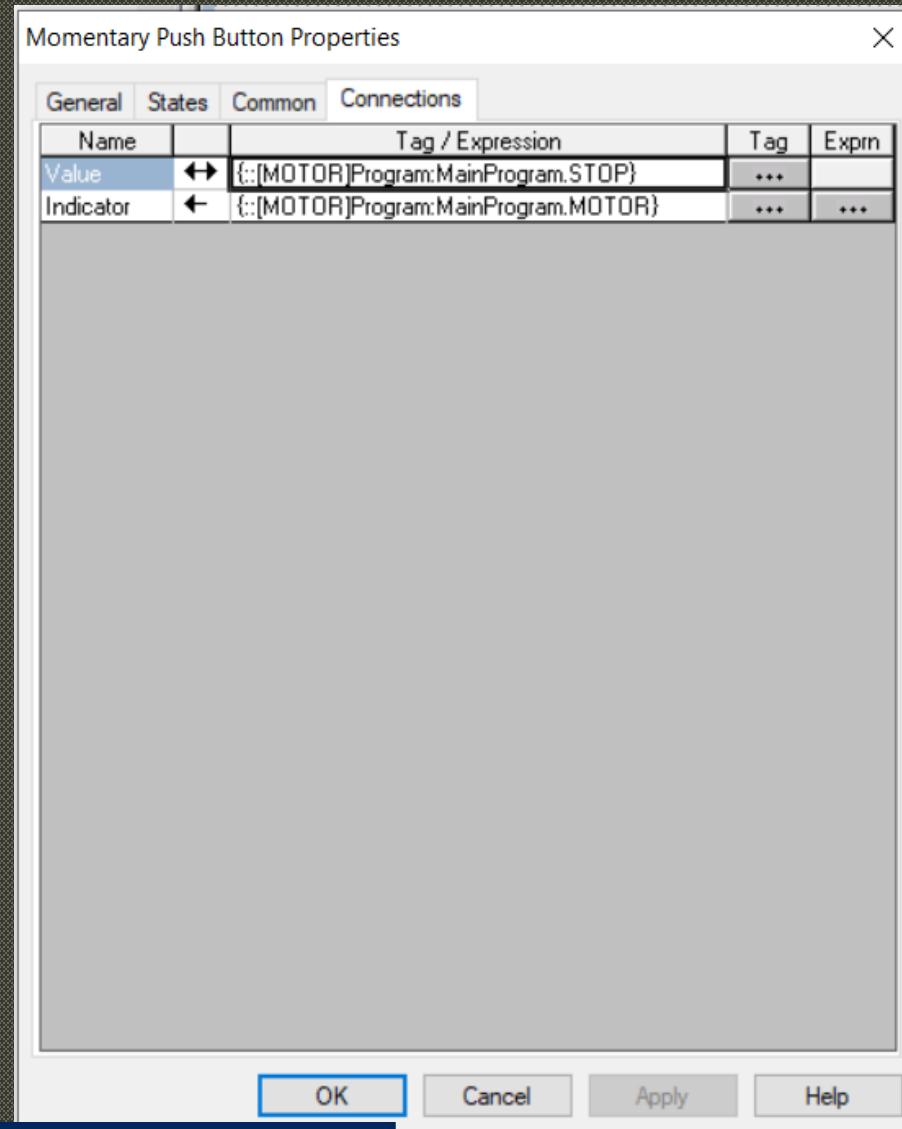
STOP Pushbutton Properties (Right Dialog):

- Select state:** State0 (selected)
- Value:** 1
- Pattern style:** None
- Blink:**
- Caption:** STOP
- Font:** Arial
- Size:** 10
- Font styles:** **B**, *I*, U
- Color settings:** Caption color, Caption back color, Caption blink, Word wrap
- Alignment:** ○○○, ○●○, ○○●
- Image settings:** **Image:** [Empty], **Image back style:** Transparent, **Image color:** Image color, **Image back color:** Image back color, **Image blink:** Image blink, **Image scaled:**
- Image alignment:** ○○○, ○●○, ○○●

Both dialogs include 'Copy...', 'Paste...', 'OK', 'Cancel', 'Apply', and 'Help' buttons at the bottom.

FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

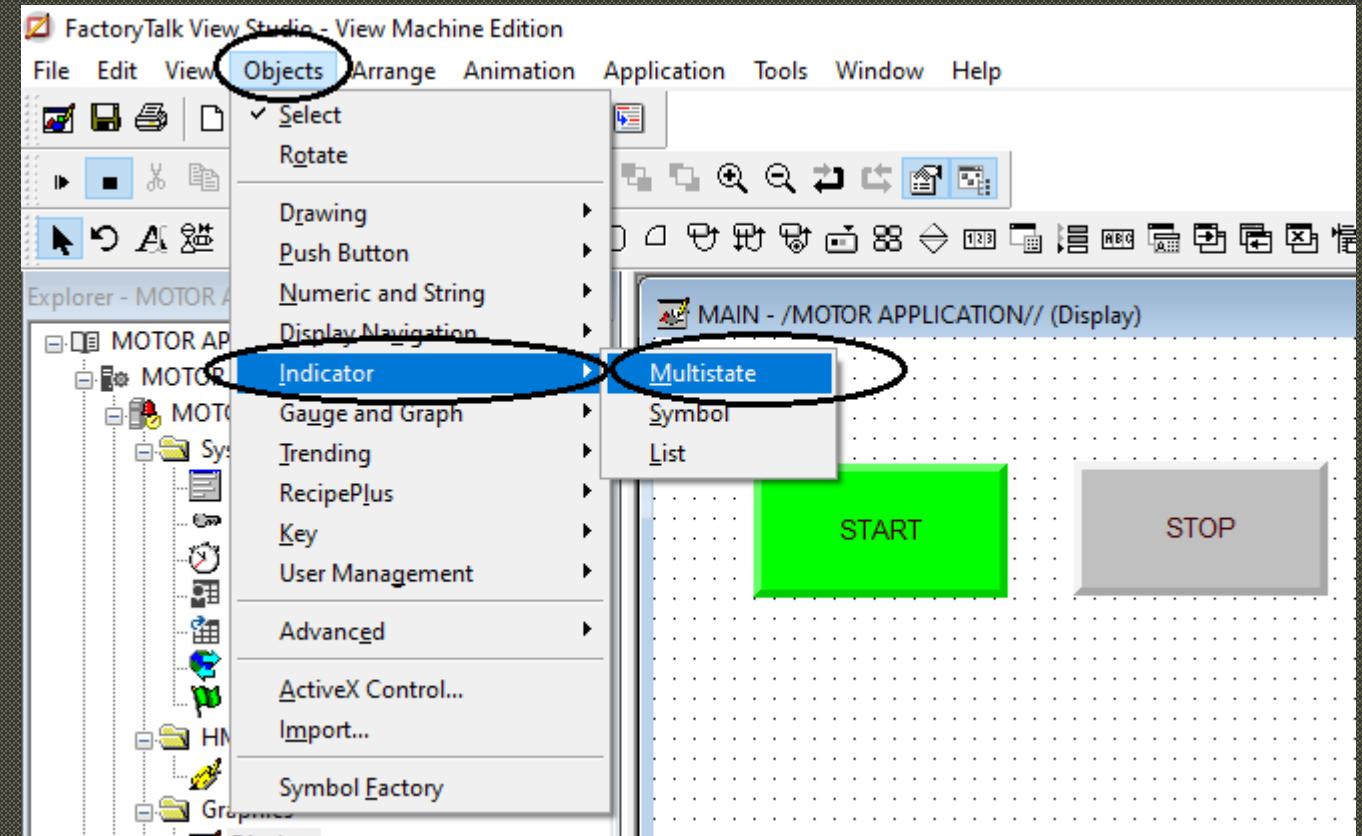
Step 2: Screen design



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 2: Screen design

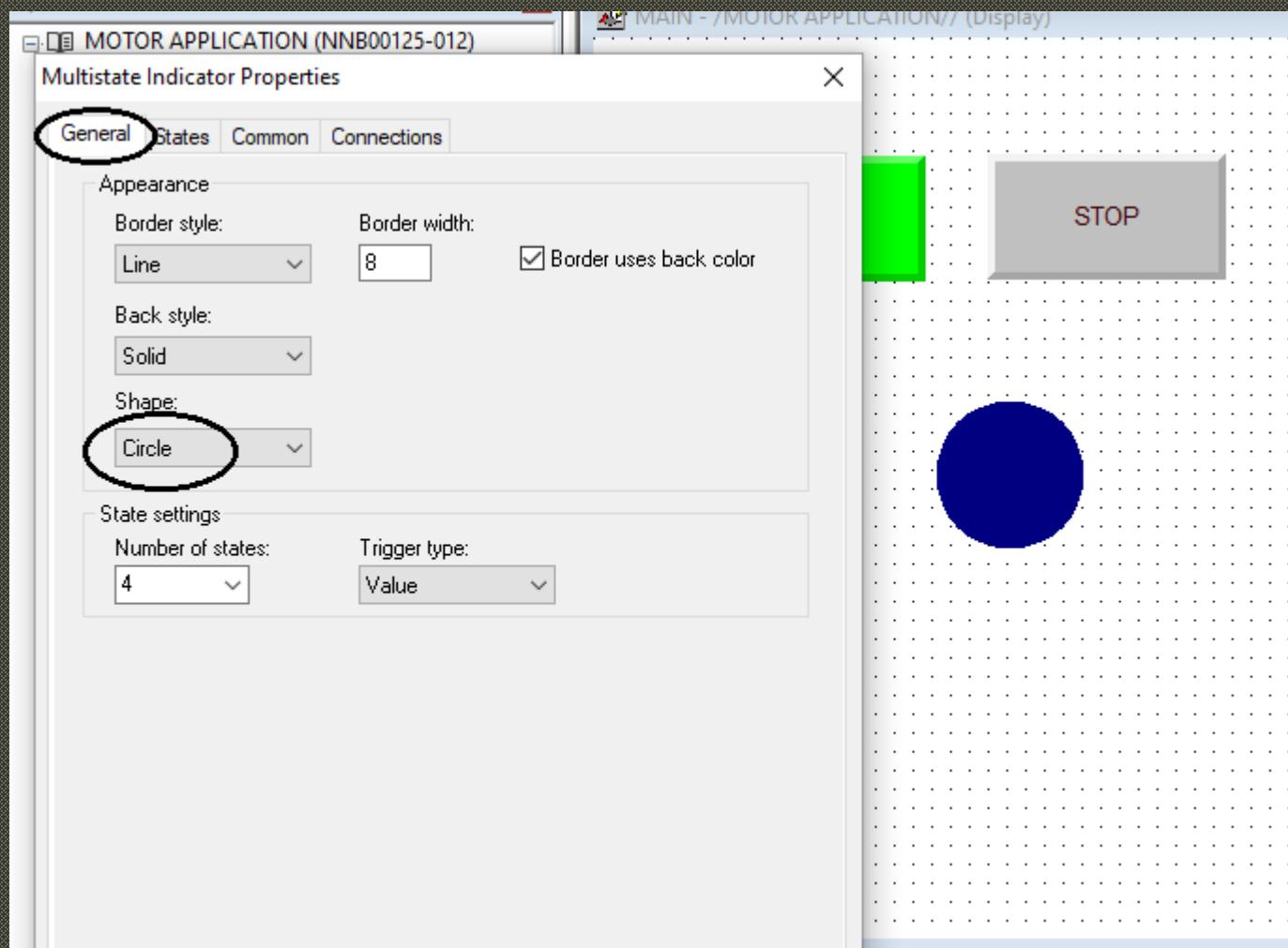
- Create a Multistate Indicator:
- In Objects, select Indicator, Multistate



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 2: Screen design

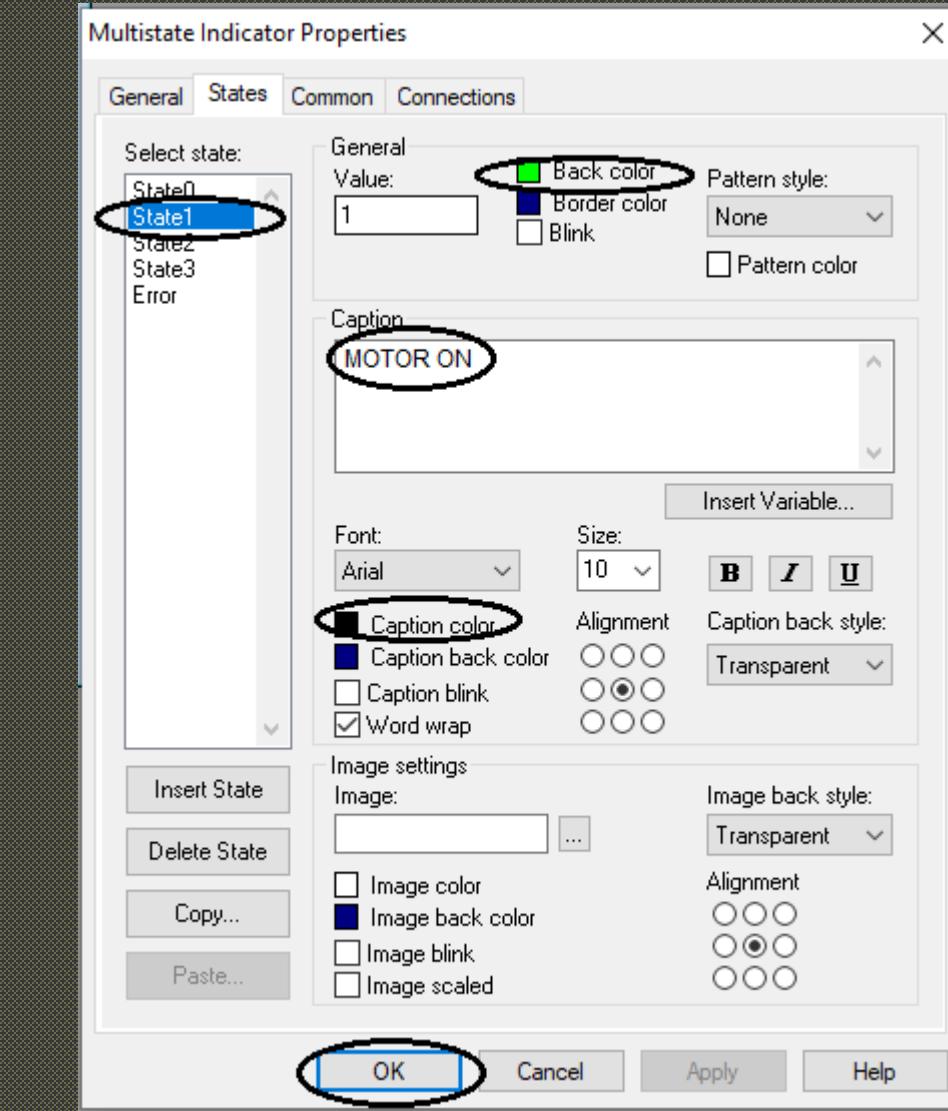
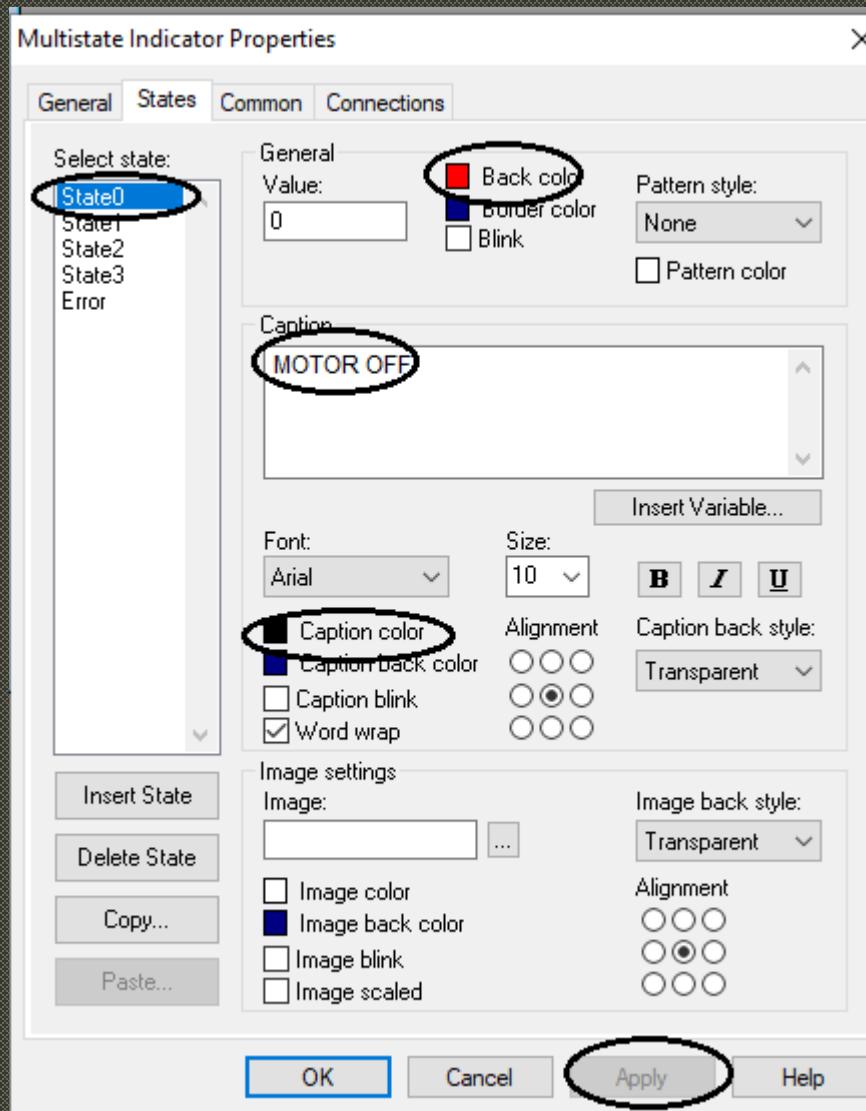
In General, select Shape as Circle



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 2: Screen design

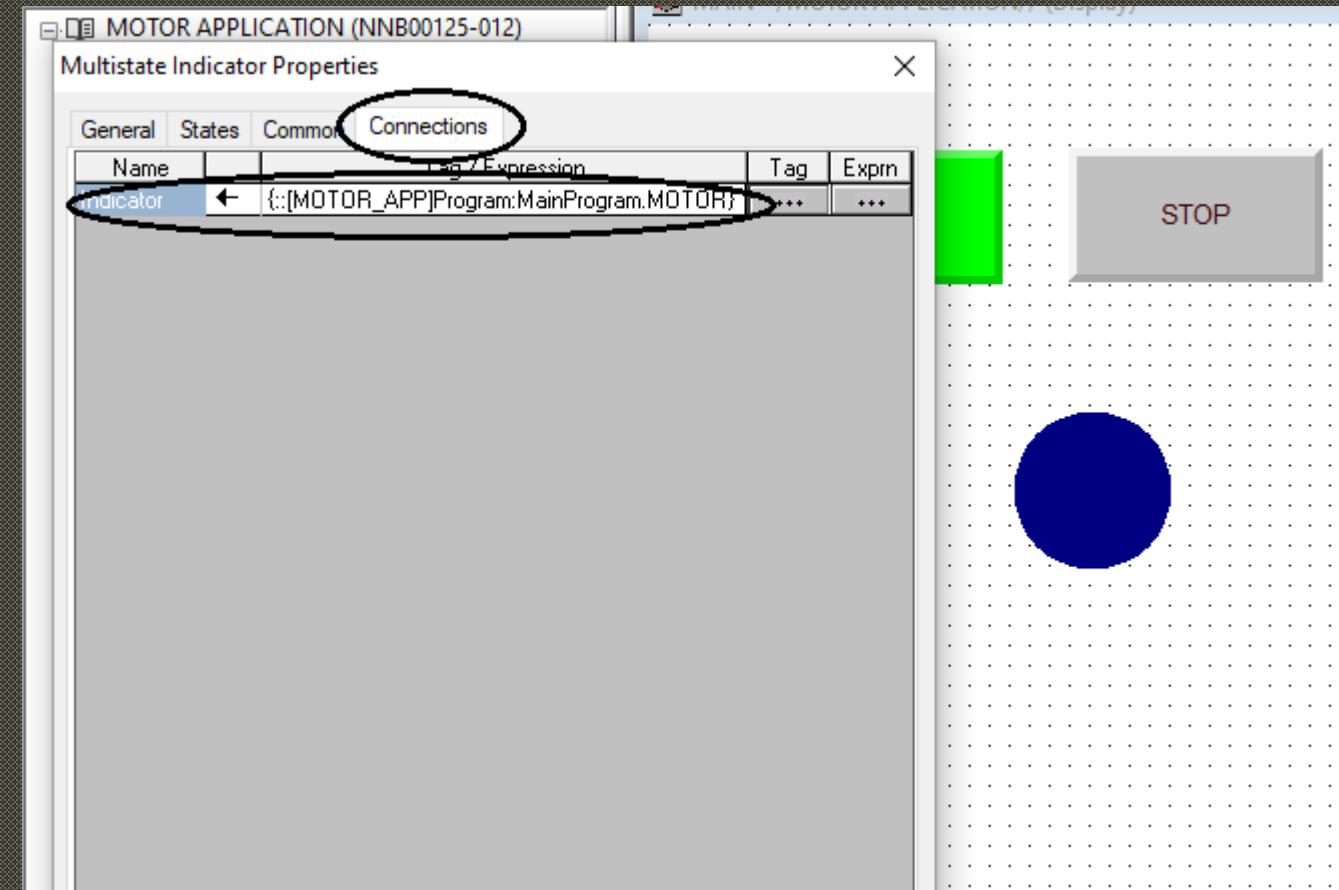
In States, for State 0 and State 1



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 2: Screen design

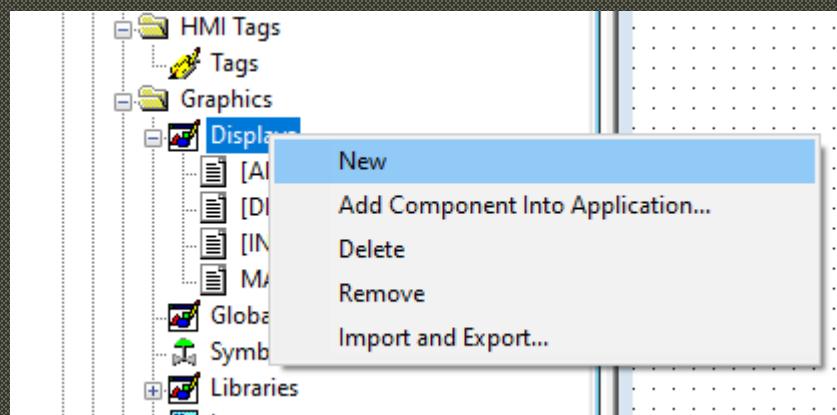
In Connections, select MOTOR for Indicator



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 2: Screen design

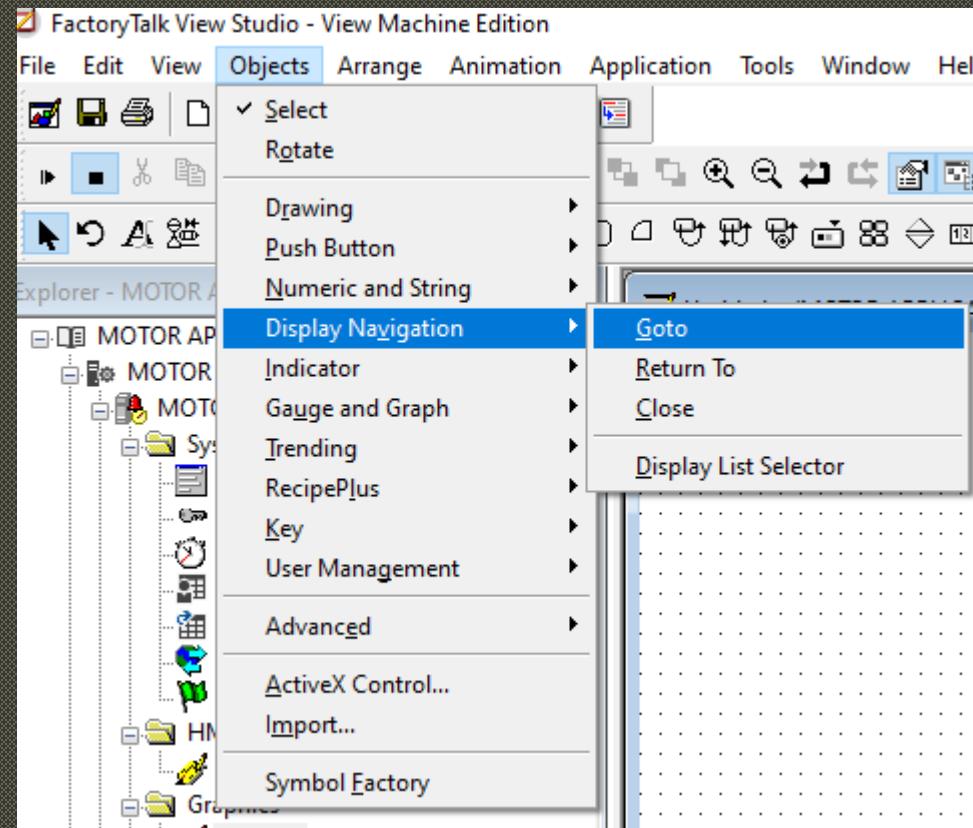
Create a new Display, you will save it as TRENDS later



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 2: Screen design

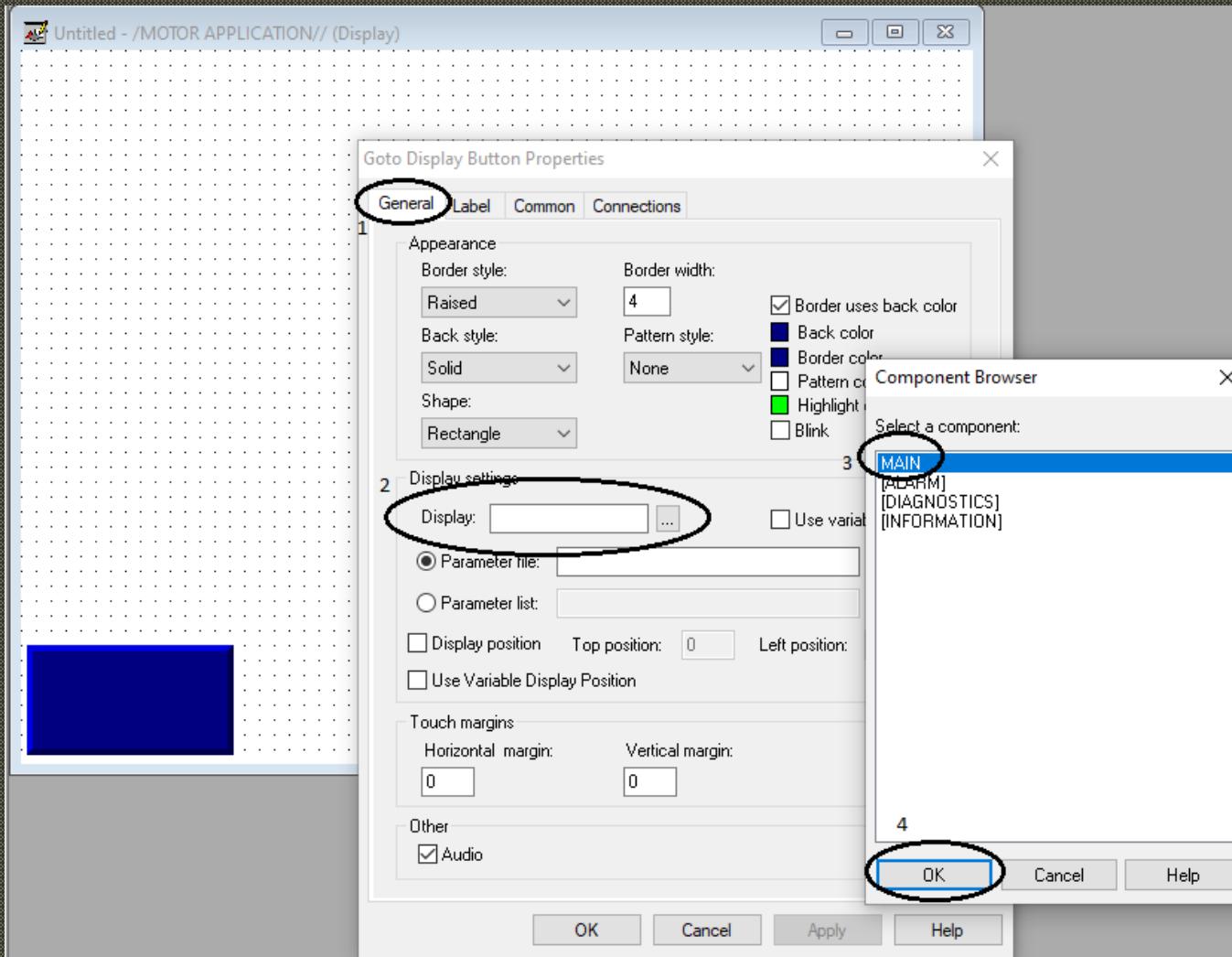
Create a Display Navigation (GoTo) button



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 2: Screen design

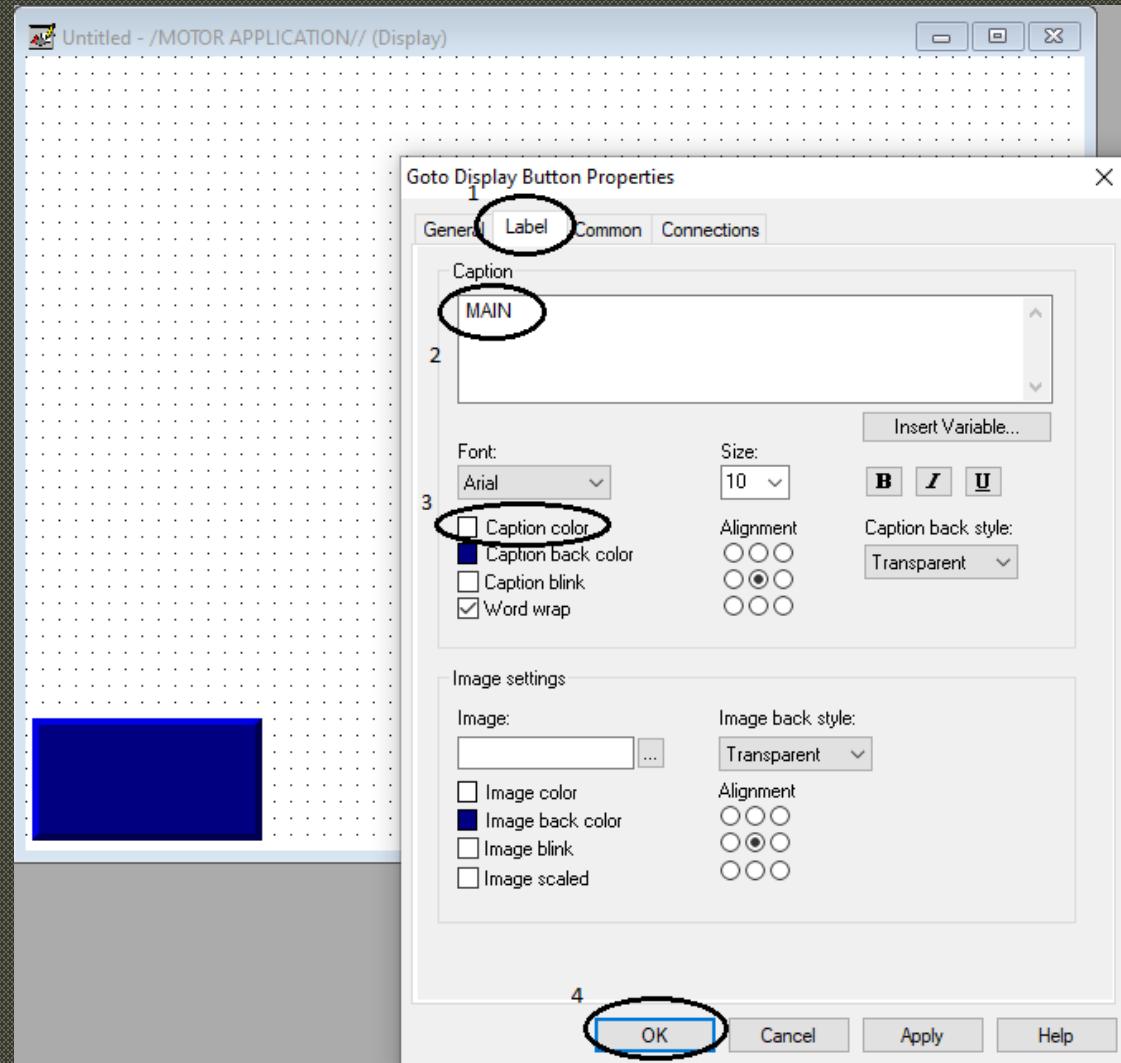
In General, select Display, MAIN, OK



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 2: Screen design

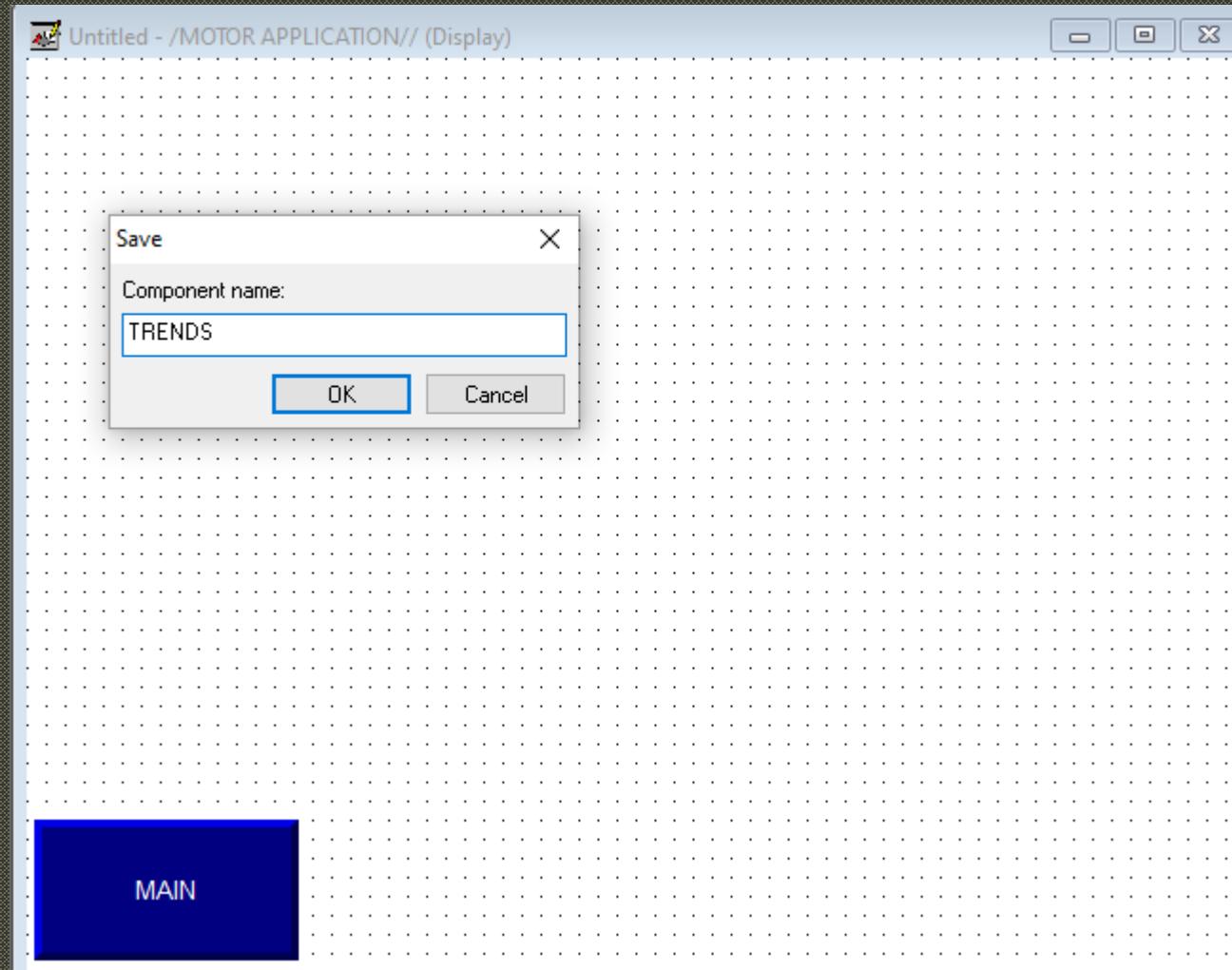
In Label, type Caption MAIN, Caption color – White, OK



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 2: Screen design

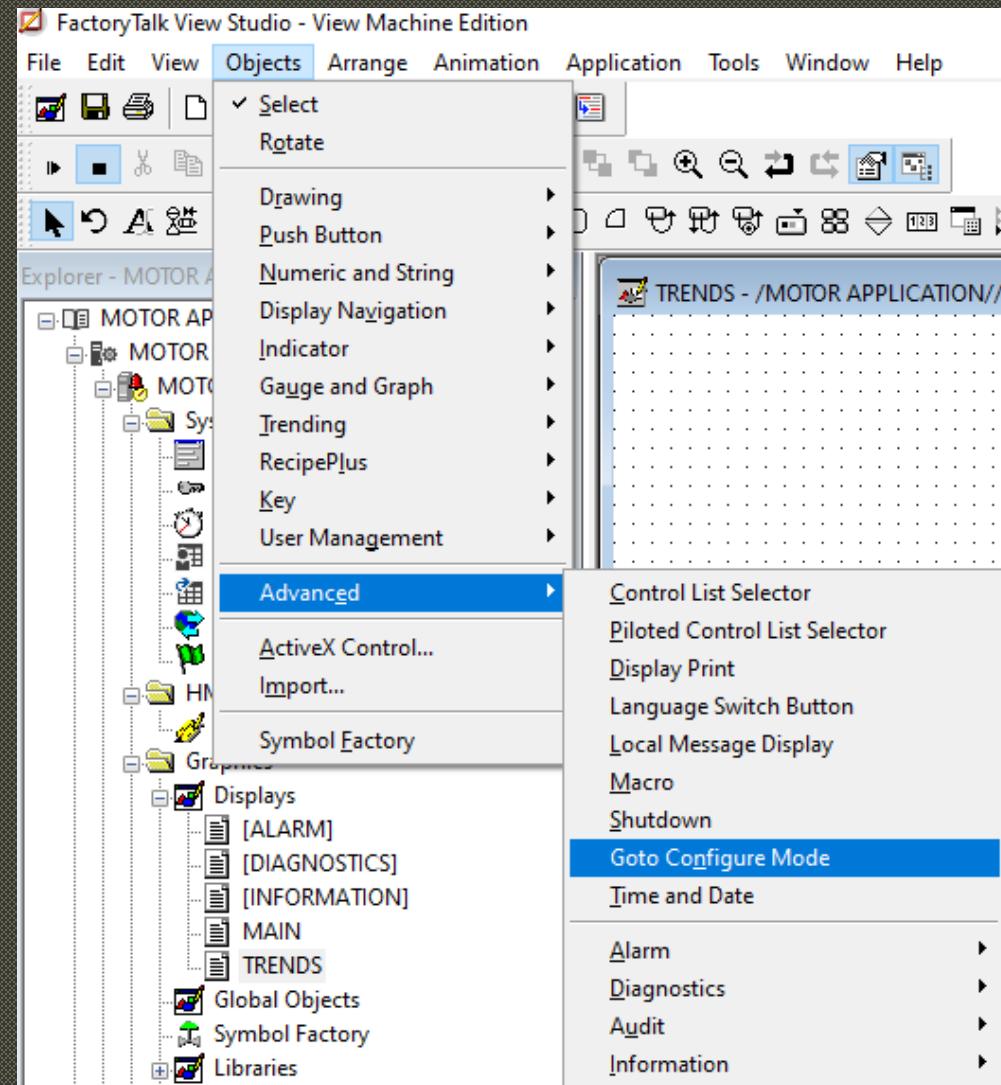
Save this screen as TRENDS.



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 2: Screen design

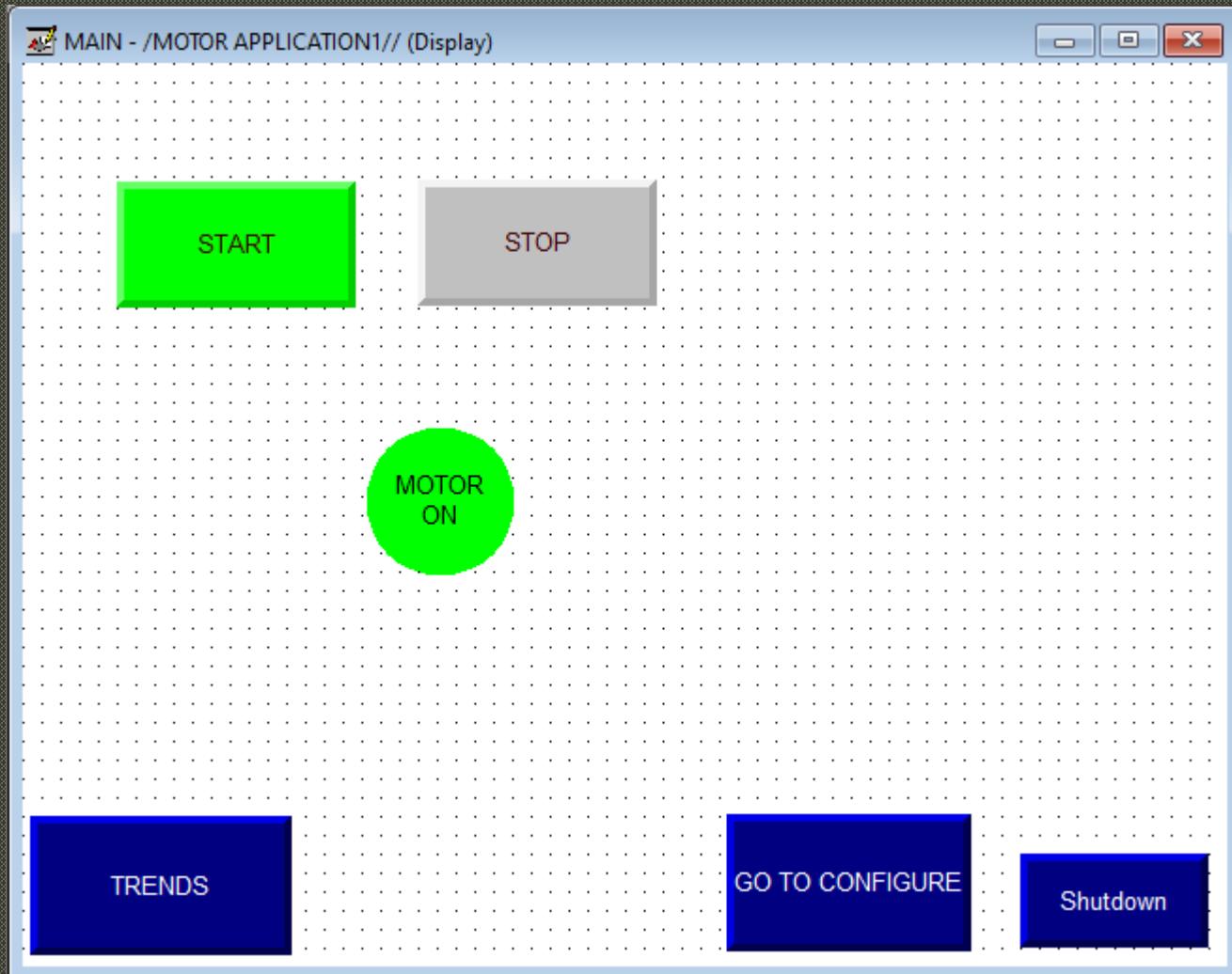
Include the Goto Configure Mode button to the both screens.



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 2: Screen design

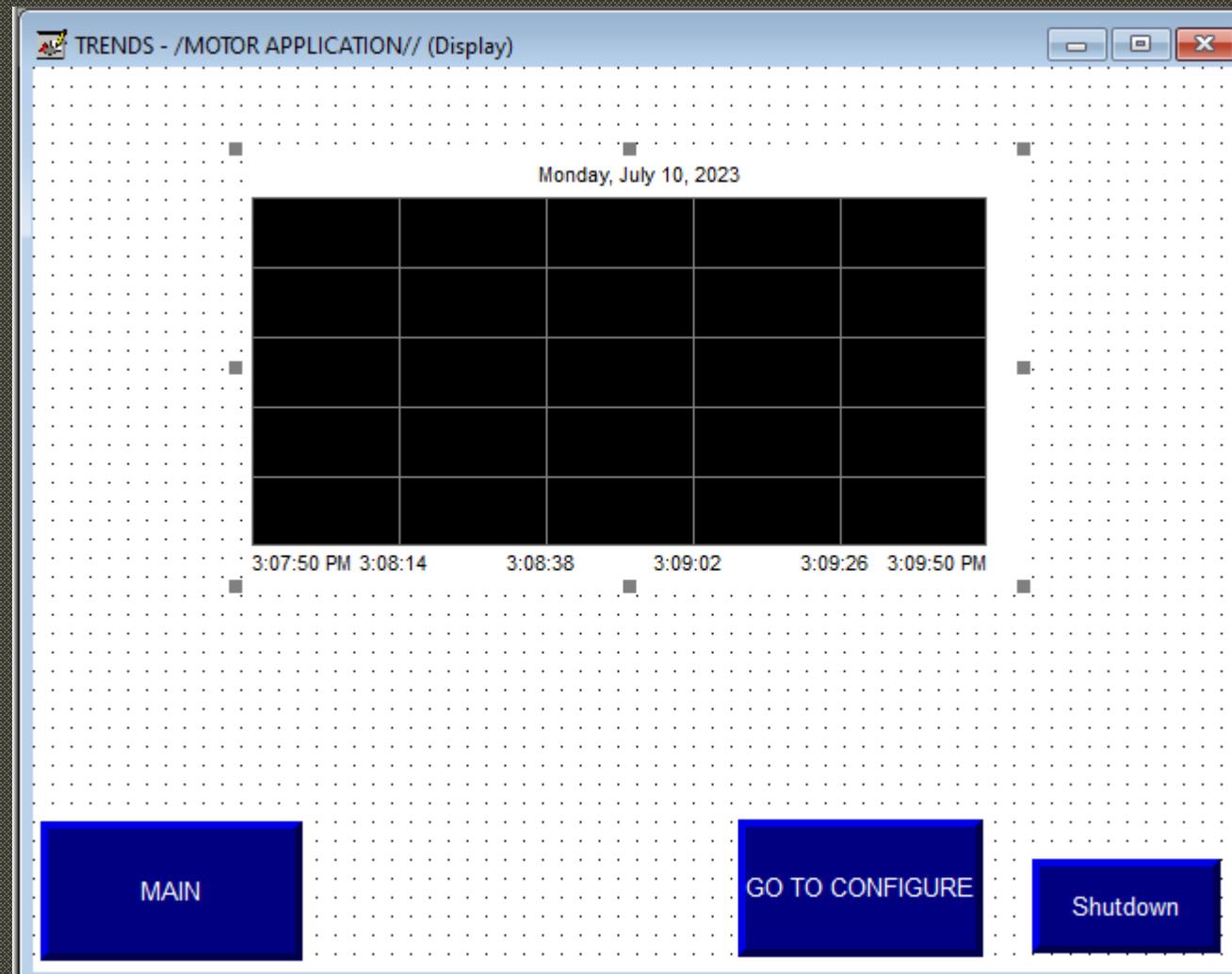
Create TRENDS navigation button on the MAIN screen



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 2: Screen design

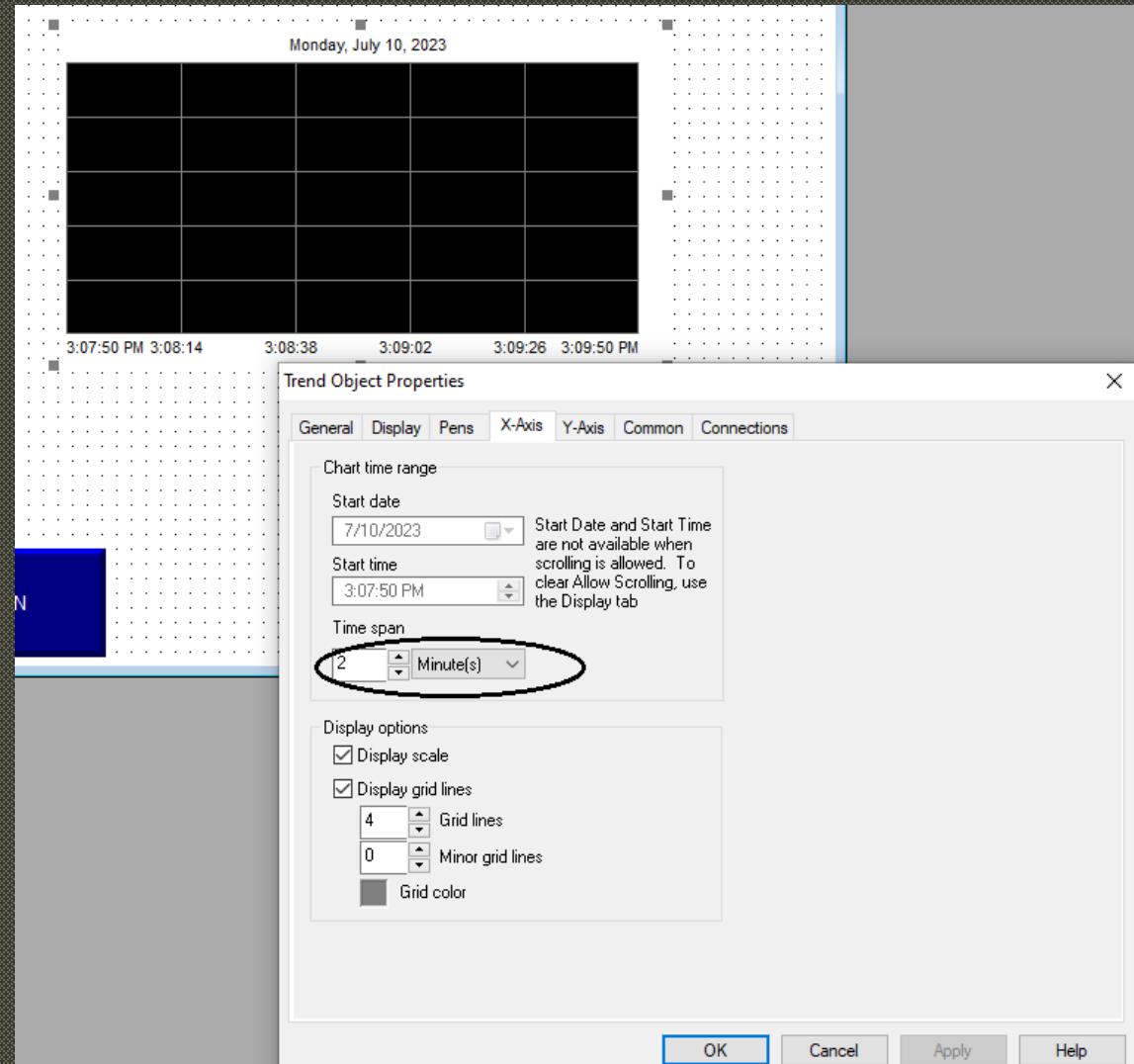
In TRENDS screen, create the Trend object.



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 2: Screen design

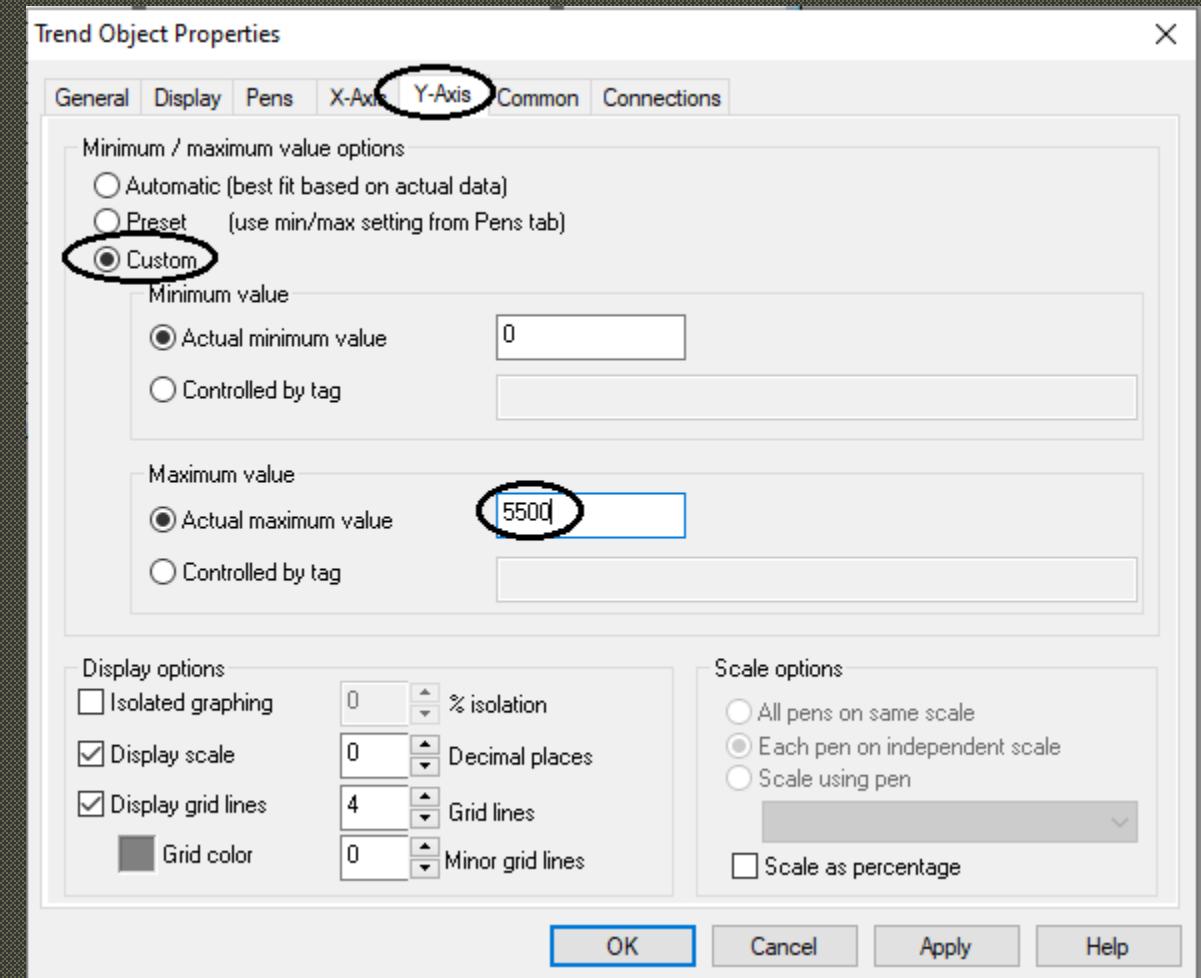
Double click on the trend. In X-Axis, leave Time span = 2 minutes.



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 2: Screen design

In Y-Axis, Custom, Max value 5500.



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 2: Screen design

In Connections, for Pen 1, select ACCUMULATION tag, click on OK.

The image shows two overlapping windows from FactoryTalk View Studio ME:

- Trend Object Properties Dialog (Left):** This dialog is titled "Trend Object Properties". It has tabs for General, Display, Pens, X-Axis, Y-Axis, Common, and Connections. The Connections tab is selected and highlighted with a yellow oval. A row in the table is also highlighted with a yellow oval. The table columns are Name, Tag / Expression, Tag, and Exprn. The row highlighted in yellow contains the value "Pen 1" in the Name column.
- Select Tag Dialog (Right):** This dialog is titled "Select Tag". It shows a tree view of "Folders" and a list of "Contents".
 - The tree view shows "MOTOR APPLICATION" expanded, with "MOTOR_APP" selected. "MOTOR_APP" has sub-folders like "Diagnostic Items", "Online", and "Program:Main". "Program:Main" contains a folder "CYCLE_TIM".
 - The "Contents" list shows items under "MOTOR_APP":

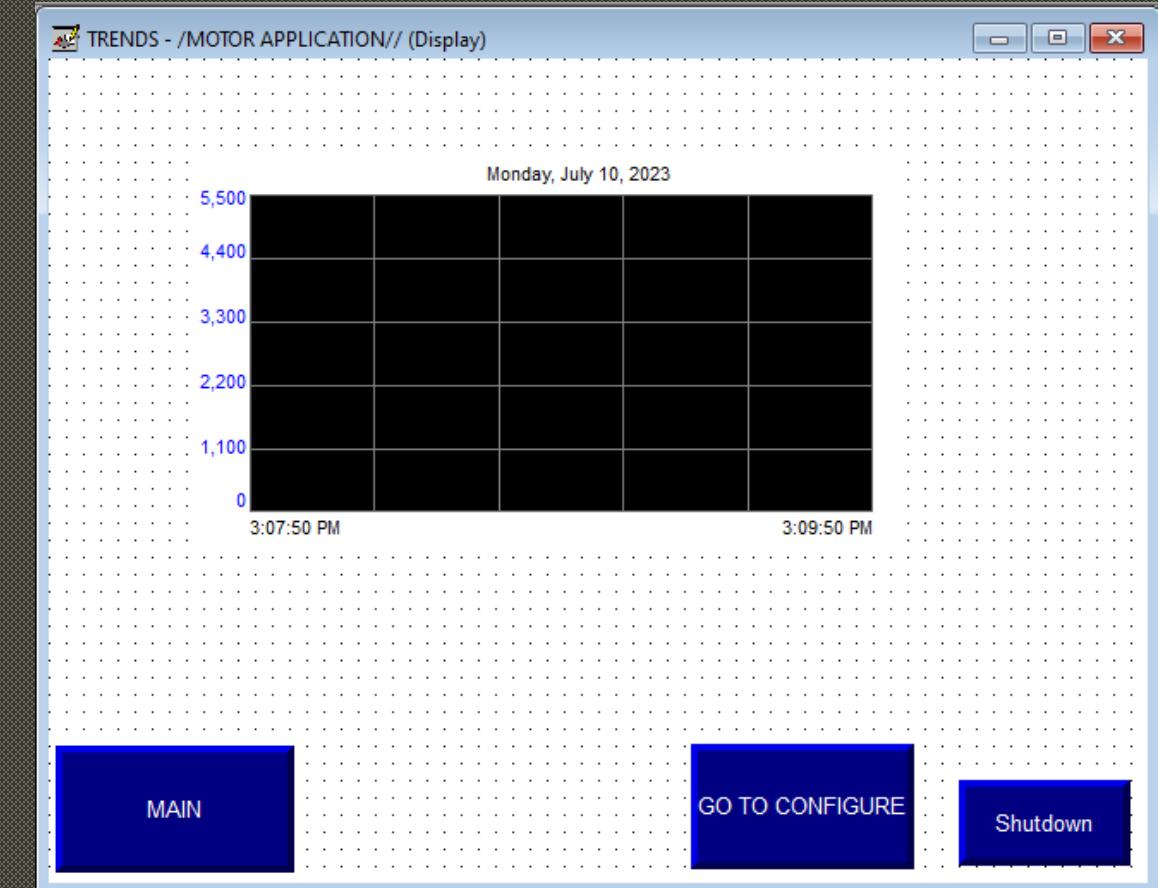
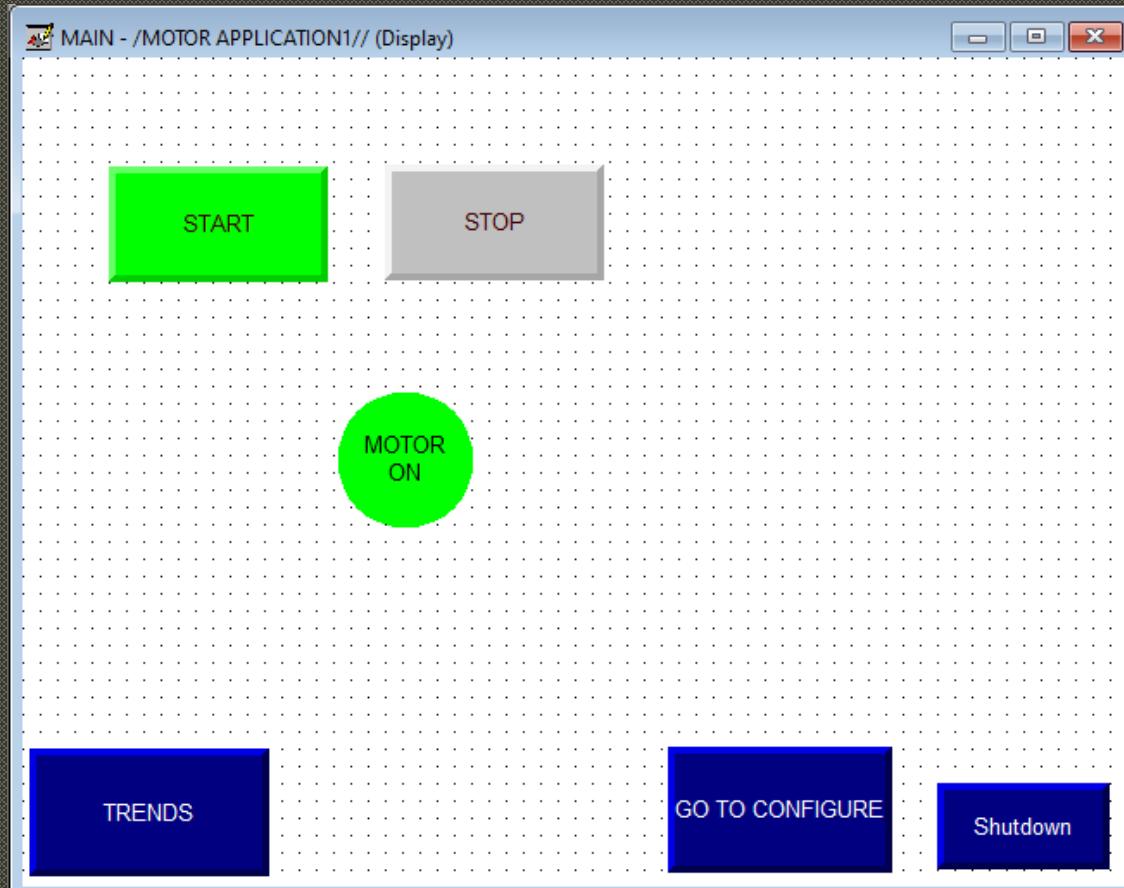
Name	Data T...	Access...	Description
ACC...	DINT	Read...	
MO...	BOOL	Read...	
START	BOOL	Read...	
STOP	BOOL	Read...	
TIM...	DINT	Read...	

Below the dialogs, there is a large gray area representing the screen design canvas.

FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 2: Screen design

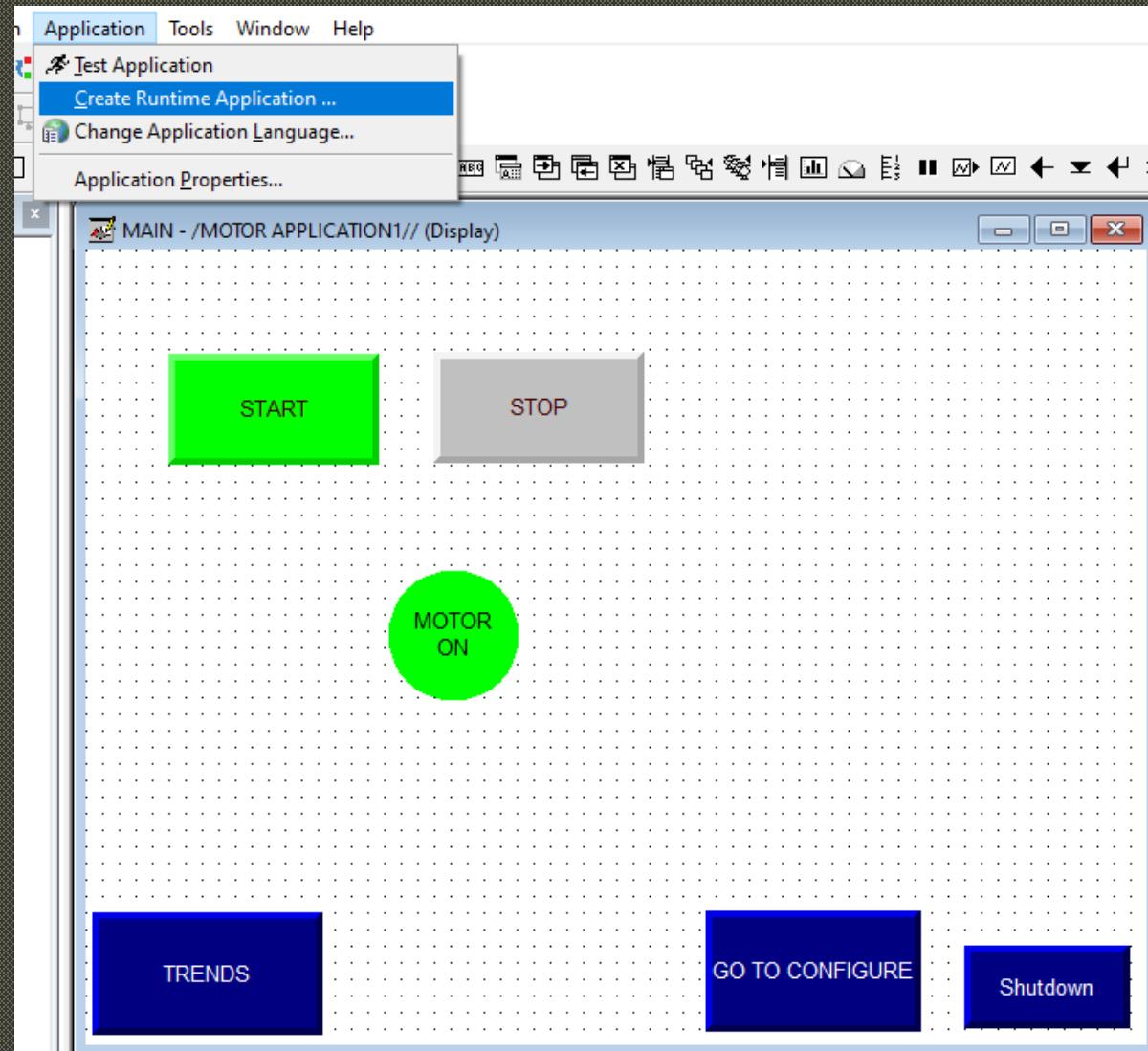
Save the TRENDS and MAIN screens



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 3: Runtime Application

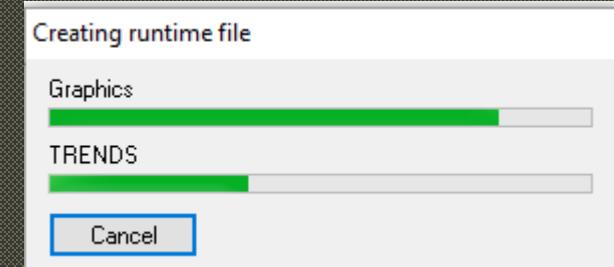
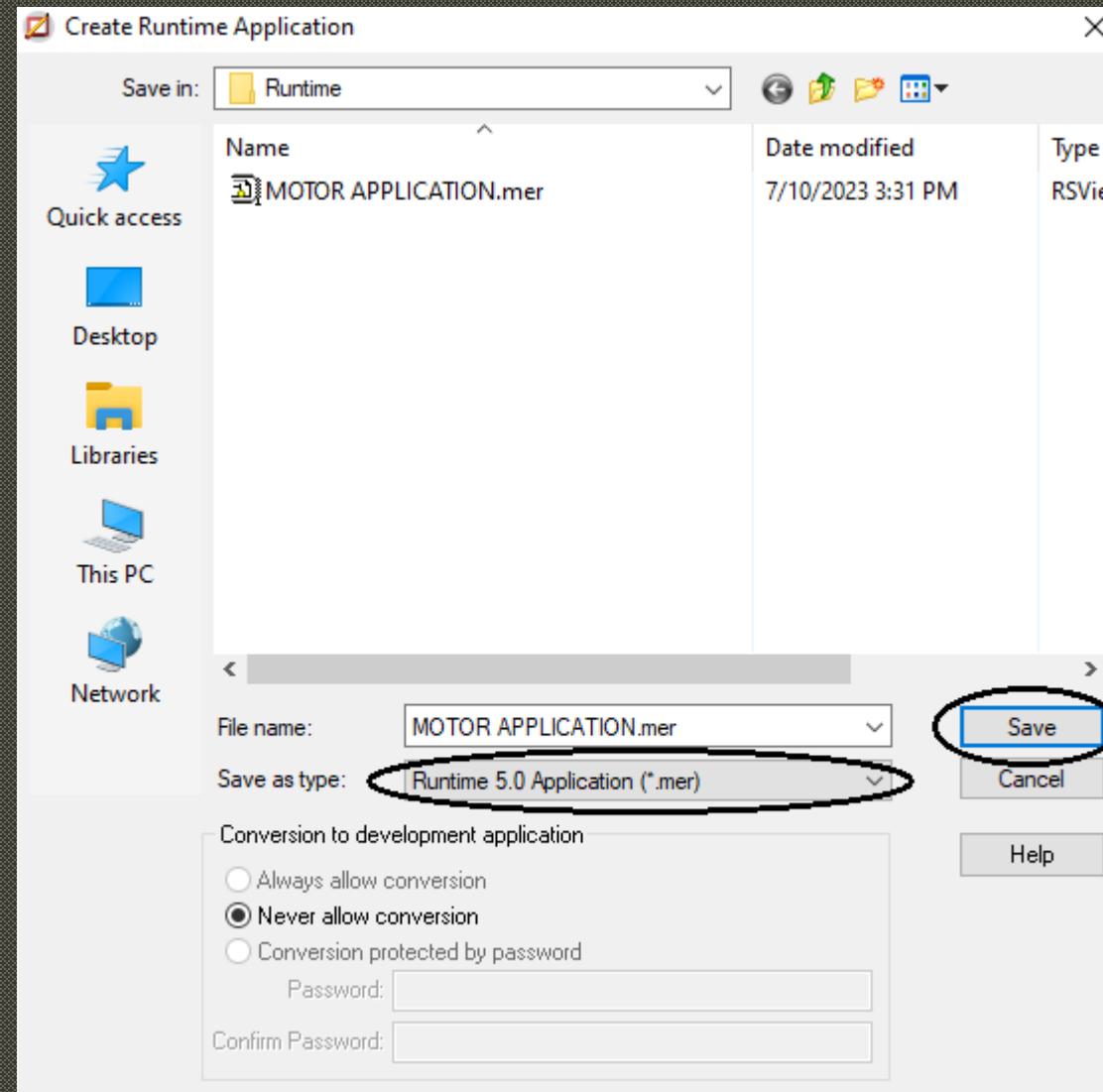
In Application, click on Create Runtime Application



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 3: Runtime Application

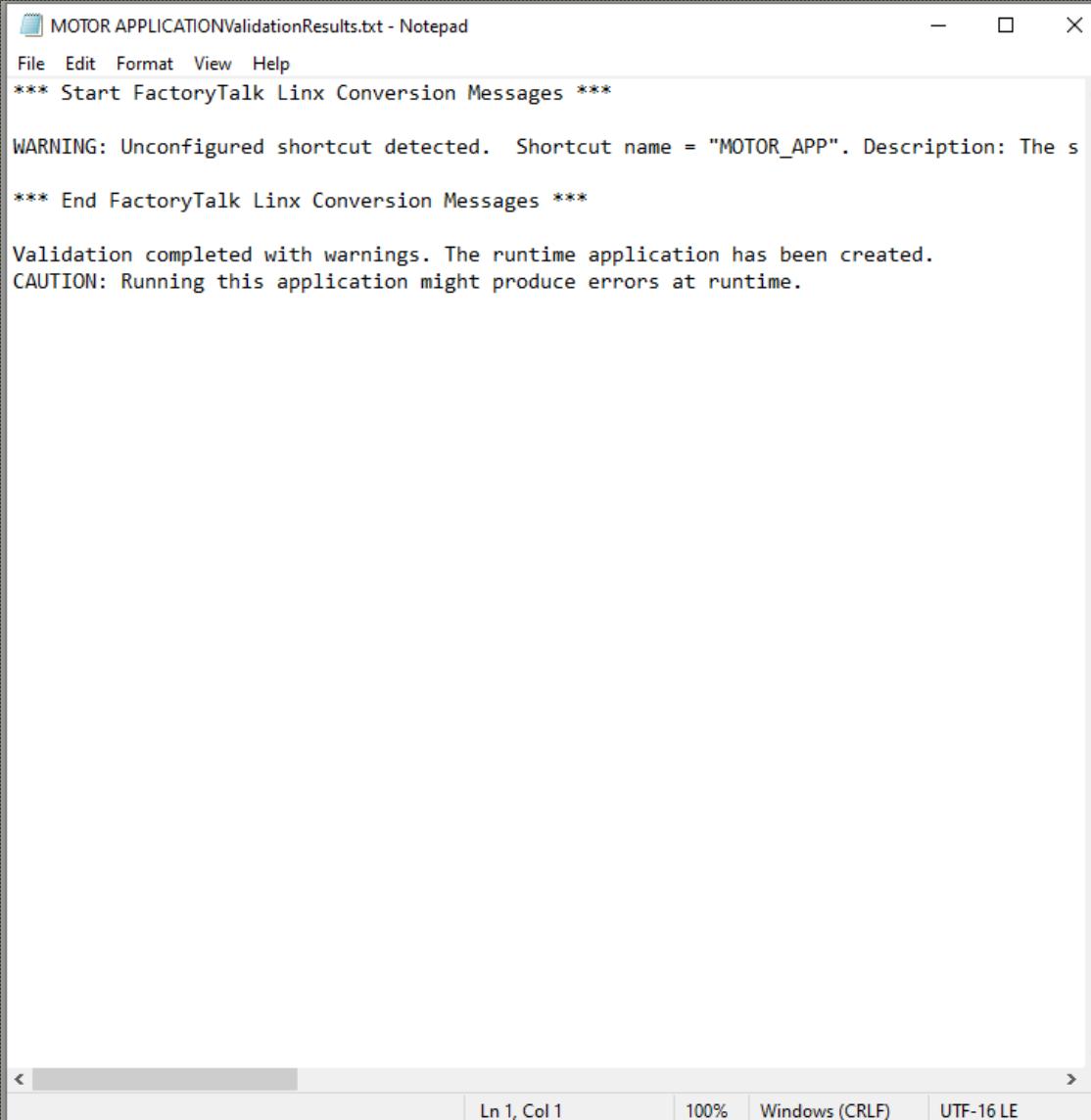
Select the type as Runtime 5.0 Application. Click on Save.



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 3: Runtime Application

If you see this window, just close it.



MOTOR APPLICATIONValidationResults.txt - Notepad

File Edit Format View Help

*** Start FactoryTalk Linx Conversion Messages ***

WARNING: Unconfigured shortcut detected. Shortcut name = "MOTOR_APP". Description: The s

*** End FactoryTalk Linx Conversion Messages ***

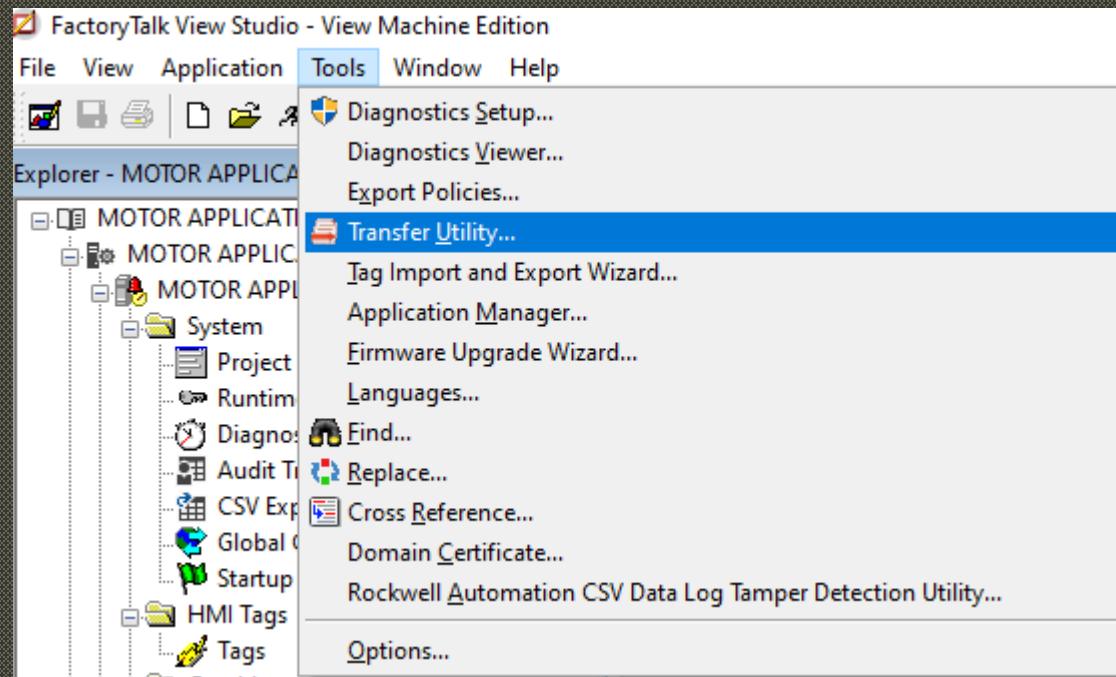
Validation completed with warnings. The runtime application has been created.
CAUTION: Running this application might produce errors at runtime.

Ln 1, Col 1 100% Windows (CRLF) UTF-16 LE

FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 4: Transfer Application

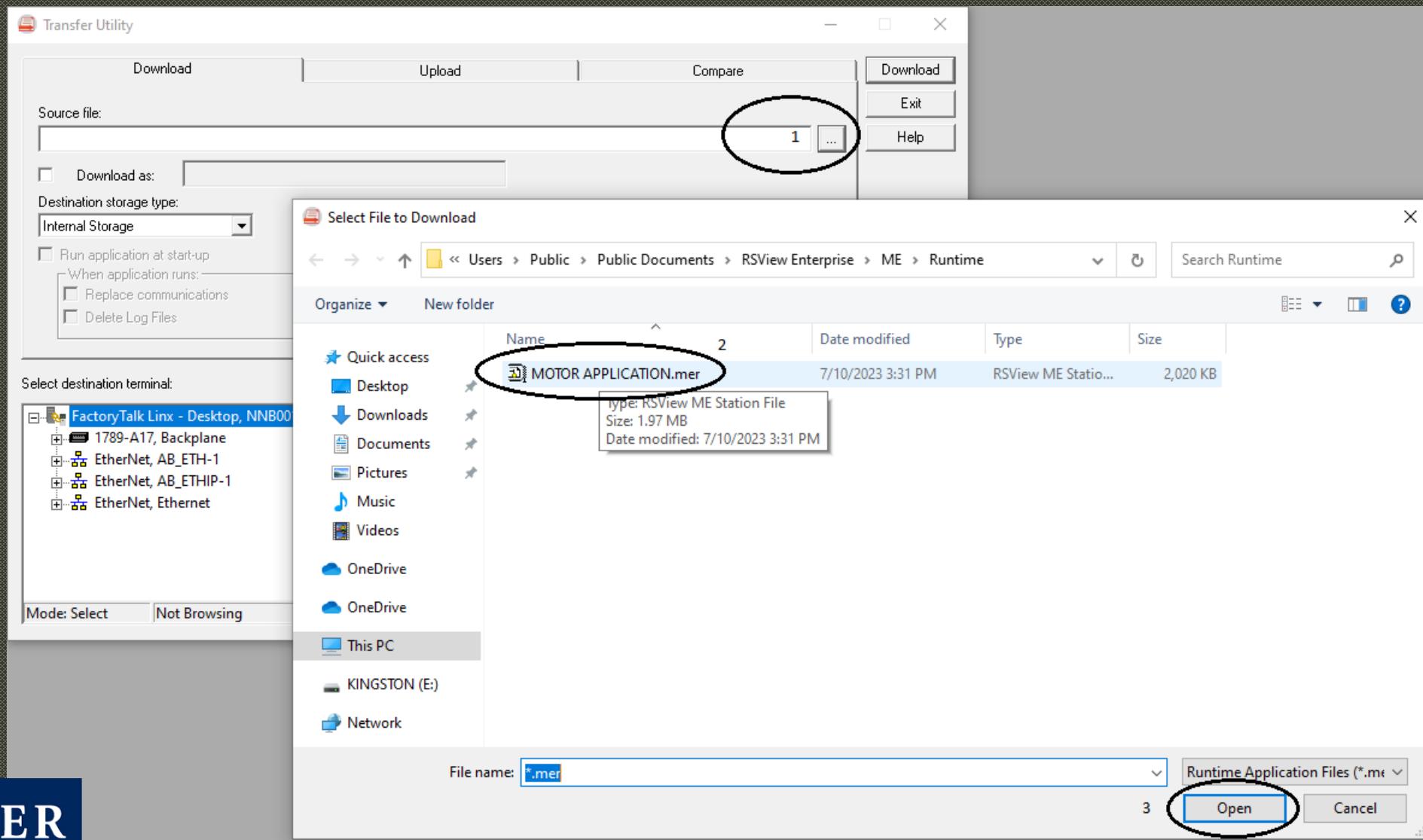
In Tools, click on Transfer Utility.



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 4: Transfer Application

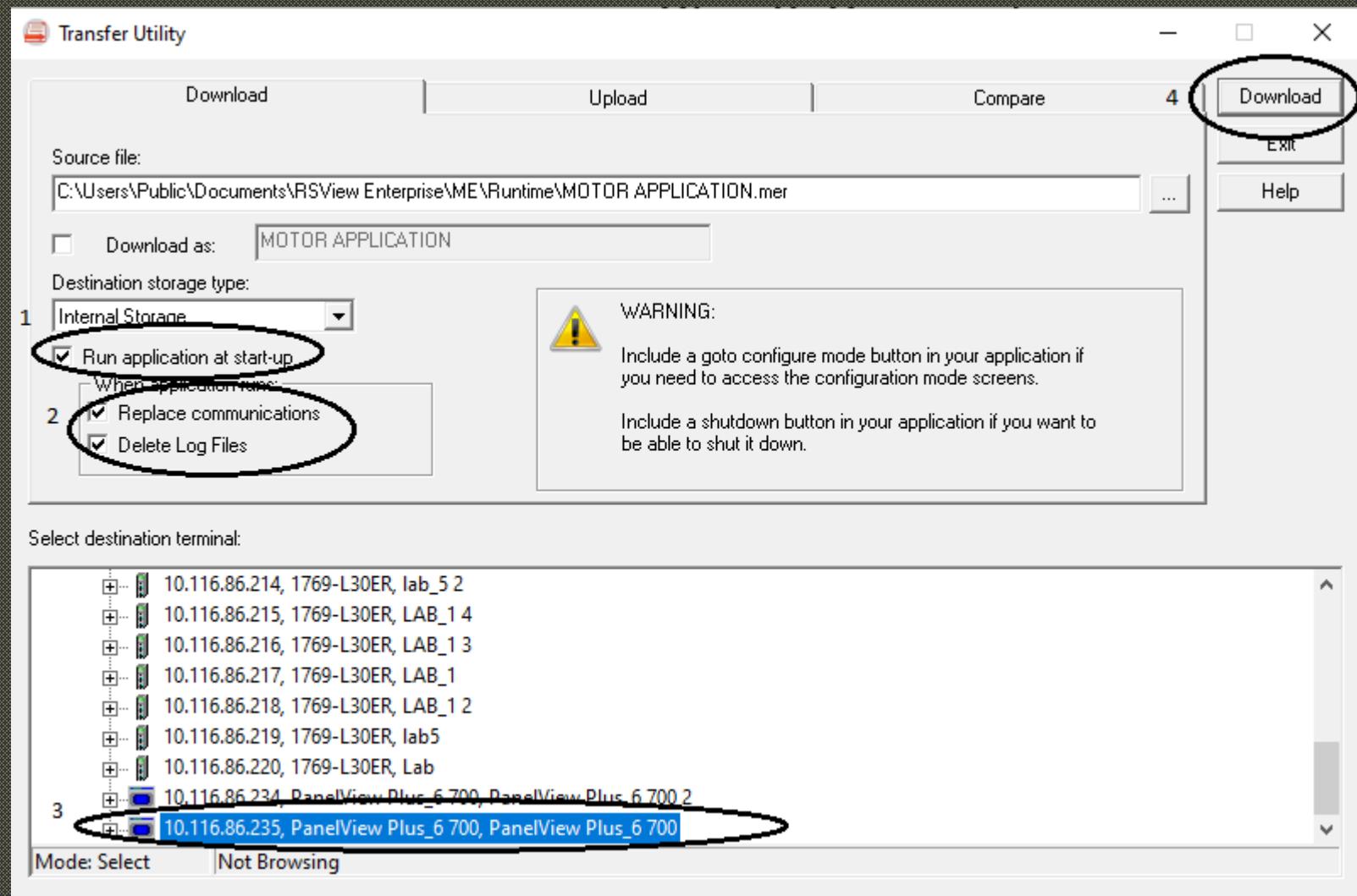
Select Source file – MOTOR APPLICATION and click on Open.



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 4: Transfer Application

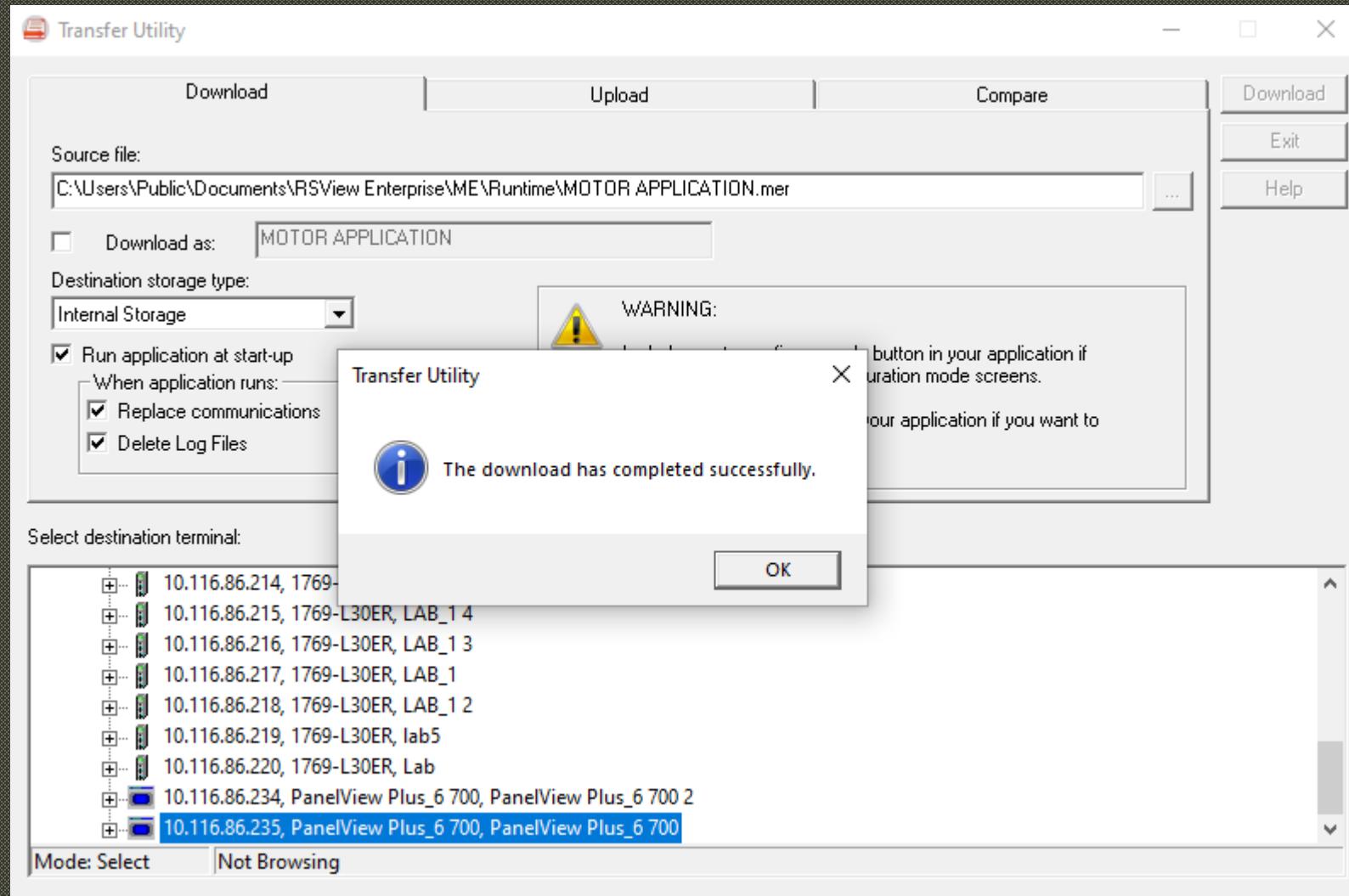
- Check Run application at start-up.
- Check Replace communications and Delete Log Files.
- Select the terminal.
- Press Download.



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

Step 4: Transfer Application

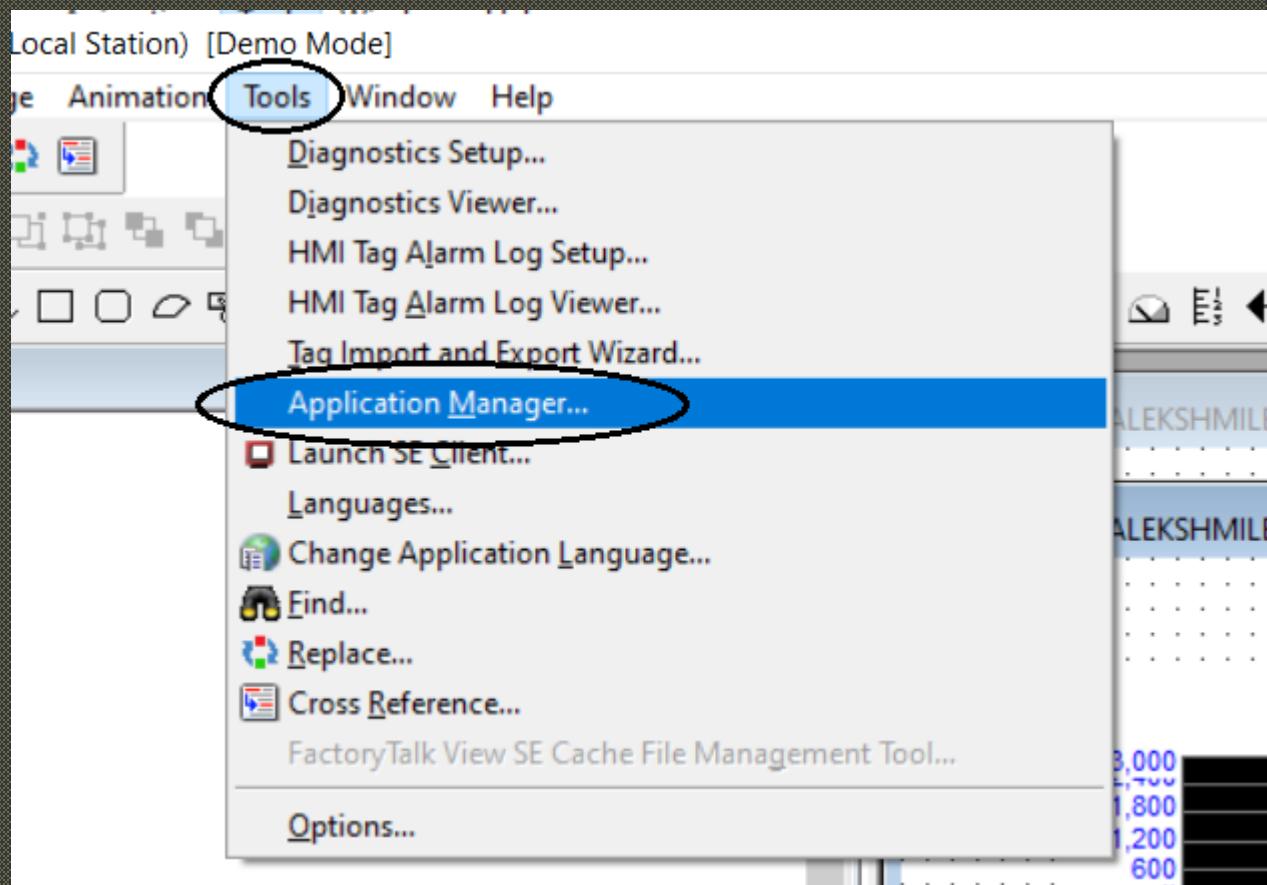
Download completed successfully



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

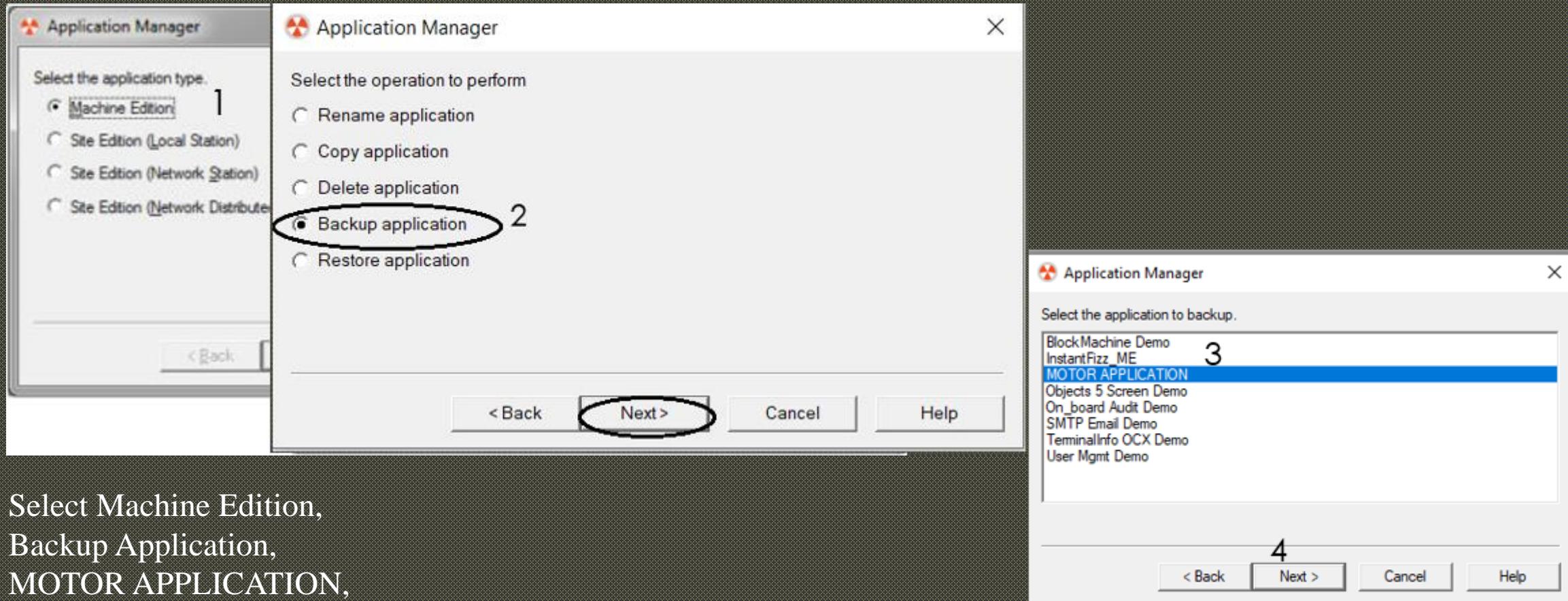
Step 5: Backup Application

In Tools, open Application Manager.



FACTORY TALK VIEW STUDIO ME – MOTOR CONTROL

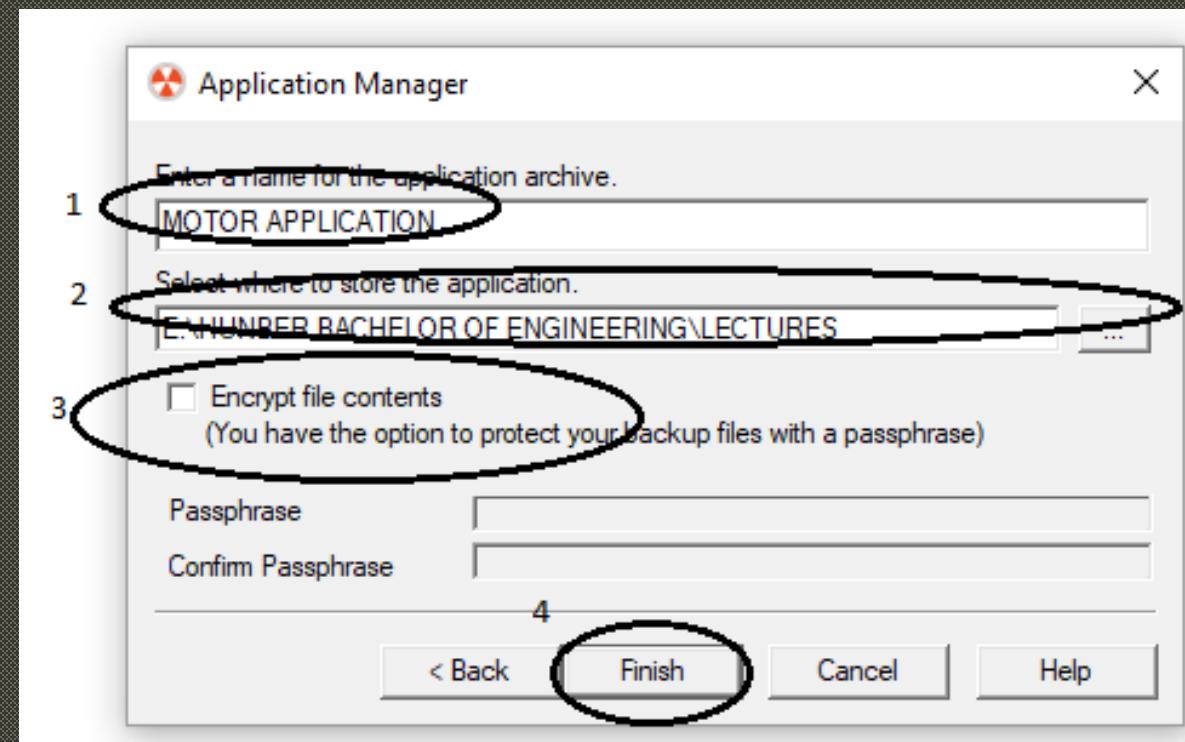
Step 5: Backup Application



- Select Machine Edition,
- Backup Application,
- MOTOR APPLICATION,
- Click on Next.

Step 5: Backup Application

For selected application (1),
select where to save (2),
remove the check mark from
Encrypt the contents (3),
click on Finish (4).



SUPERVISORY CONTROL AND DATA ACQUISITION - SCADA

A PLC not only controls operations but also gathers data, processes it, and organizes it for report generation. For instance, a PLC might count parts and then send that data directly to an Excel file on a PC.

The additional supervisory control output capabilities allow you to tweak your processes accurately for maximum efficiency.

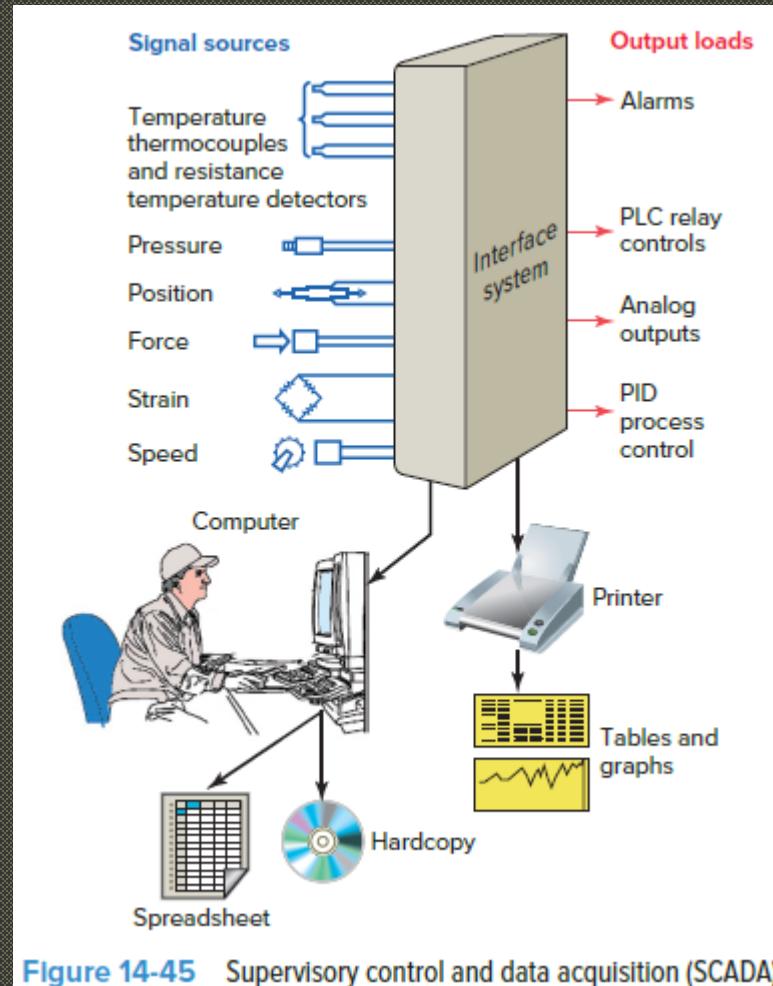


Figure 14-45 Supervisory control and data acquisition (SCADA).

Sending data from the factory floor to a supervisory computer enables tasks like data logging, display, trend analysis, recipe downloading, parameter setting, and accessing production data.

SUPERVISORY CONTROL AND DATA ACQUISITION - SCADA

- Unlike Distributive Control Systems - DCS, SCADA supervises processes without direct real-time control.
- PLCs handle field devices, while SCADA/HMI software oversees them from a host computer.

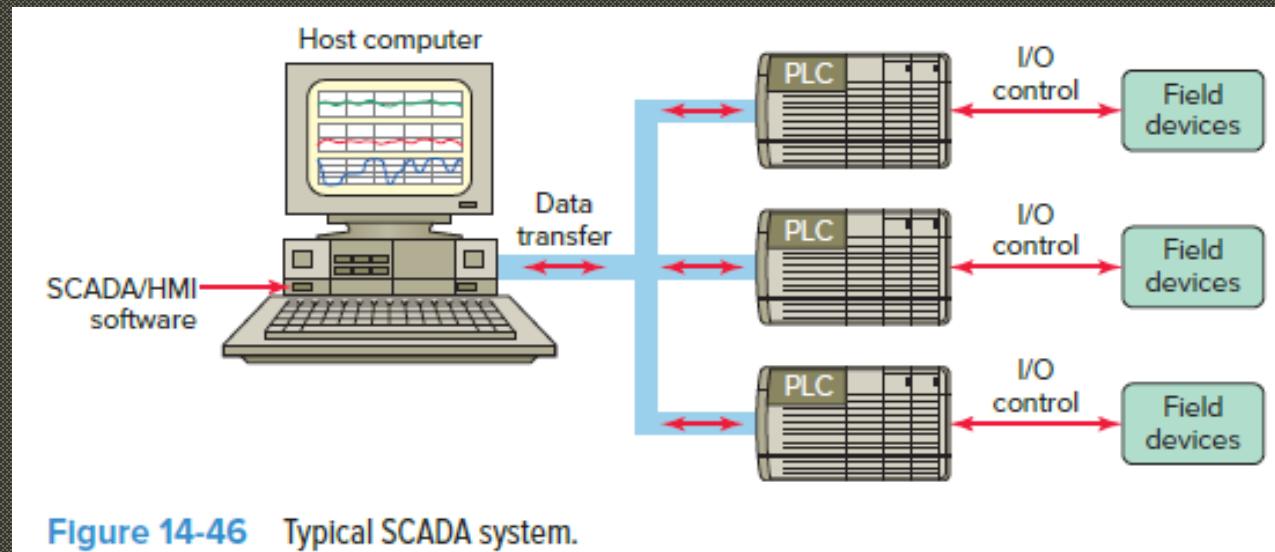


Figure 14-46 Typical SCADA system.

SUPERVISORY CONTROL AND DATA ACQUISITION - SCADA

- Operators supervise PLC operation on the host computer and send control commands to the PLCs as needed.
- SCADA systems automatically store data for later analysis, saving time and minimizing errors.

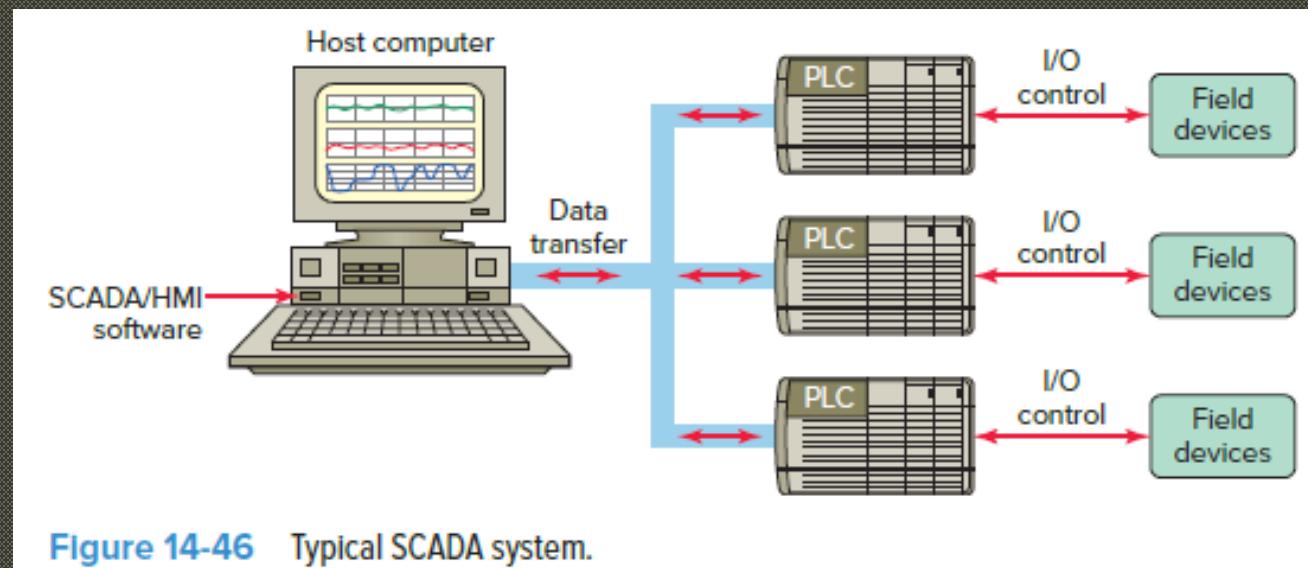


Figure 14-46 Typical SCADA system.

SUPERVISORY CONTROL AND DATA ACQUISITION - SCADA

- Alarm Handling in SCADA: Essential for process safety.
- Alarm Function: Alerts operators when a variable exceeds a set limit using sounds, lights, and messages.
- Delay Mechanism: Prevents false alarms by allowing process stabilization.
- Alarm vs. Alert: Alarms need action; alerts warn but may not require immediate response.

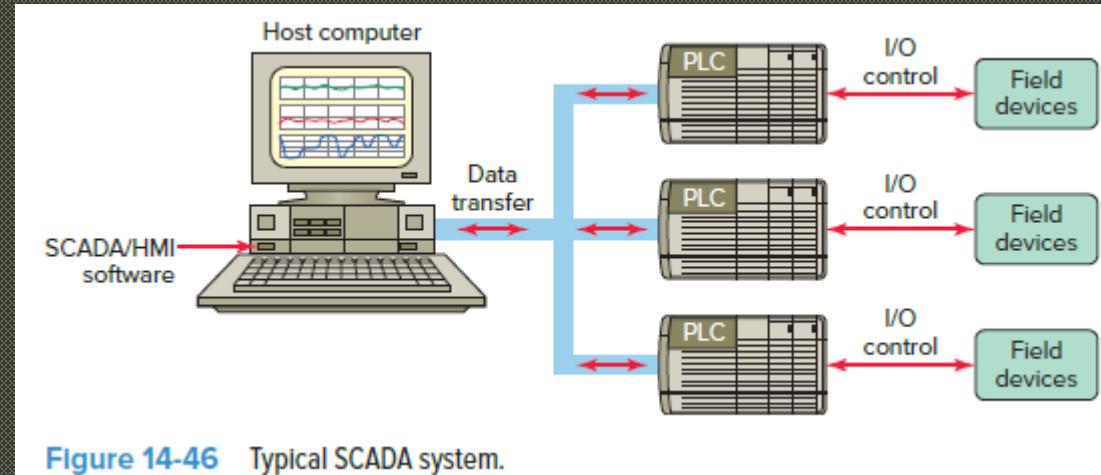
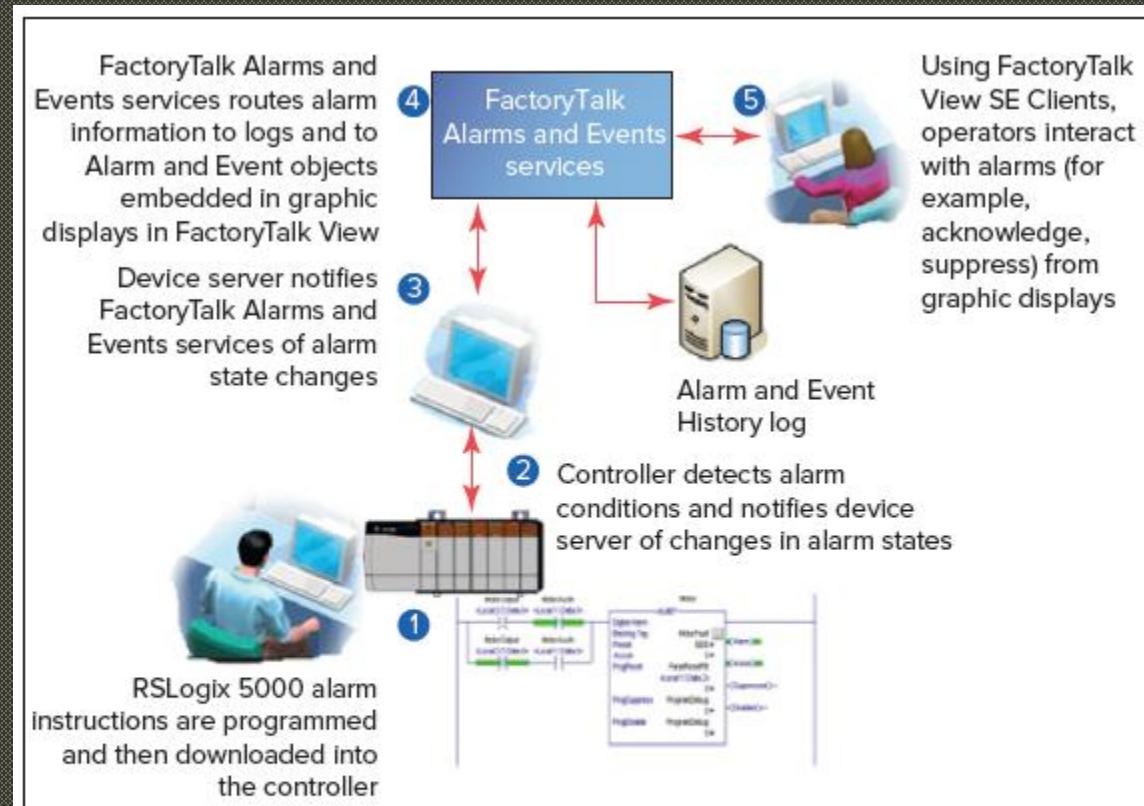


Figure 14-46 Typical SCADA system.

SUPERVISORY CONTROL AND DATA ACQUISITION - SCADA

Pre-made alarm instructions are programmed in a Logix 5000 project, then downloaded into a Logix controller. The controller detects alarm conditions, sends event information for display and logging.



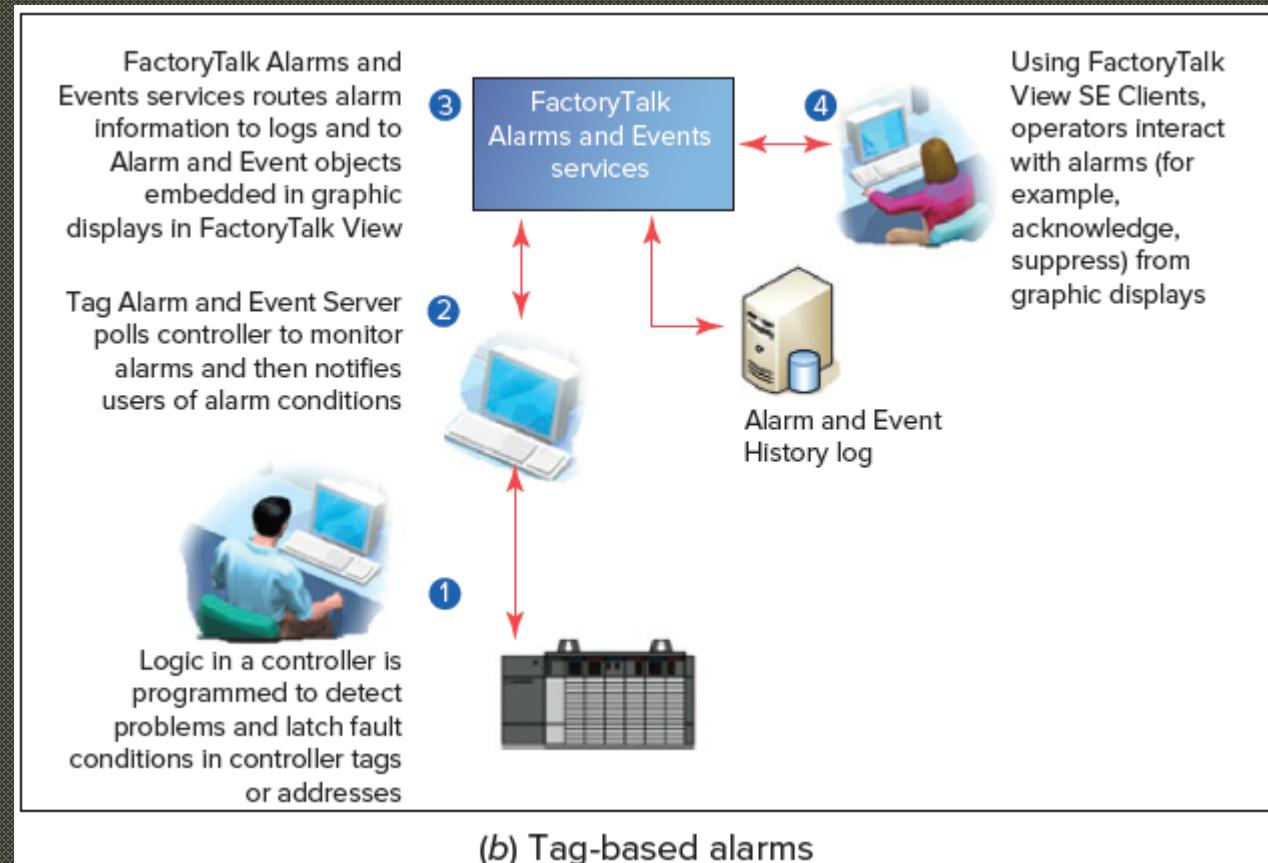
(a) Device-based alarms

Figure 14-47 FactoryTalk alarm monitoring.

Source: Image Courtesy of Rockwell Automation, Inc.

SUPERVISORY CONTROL AND DATA ACQUISITION - SCADA

Software-based tag servers monitor data tags for alarm conditions and provide event information for display and logging.

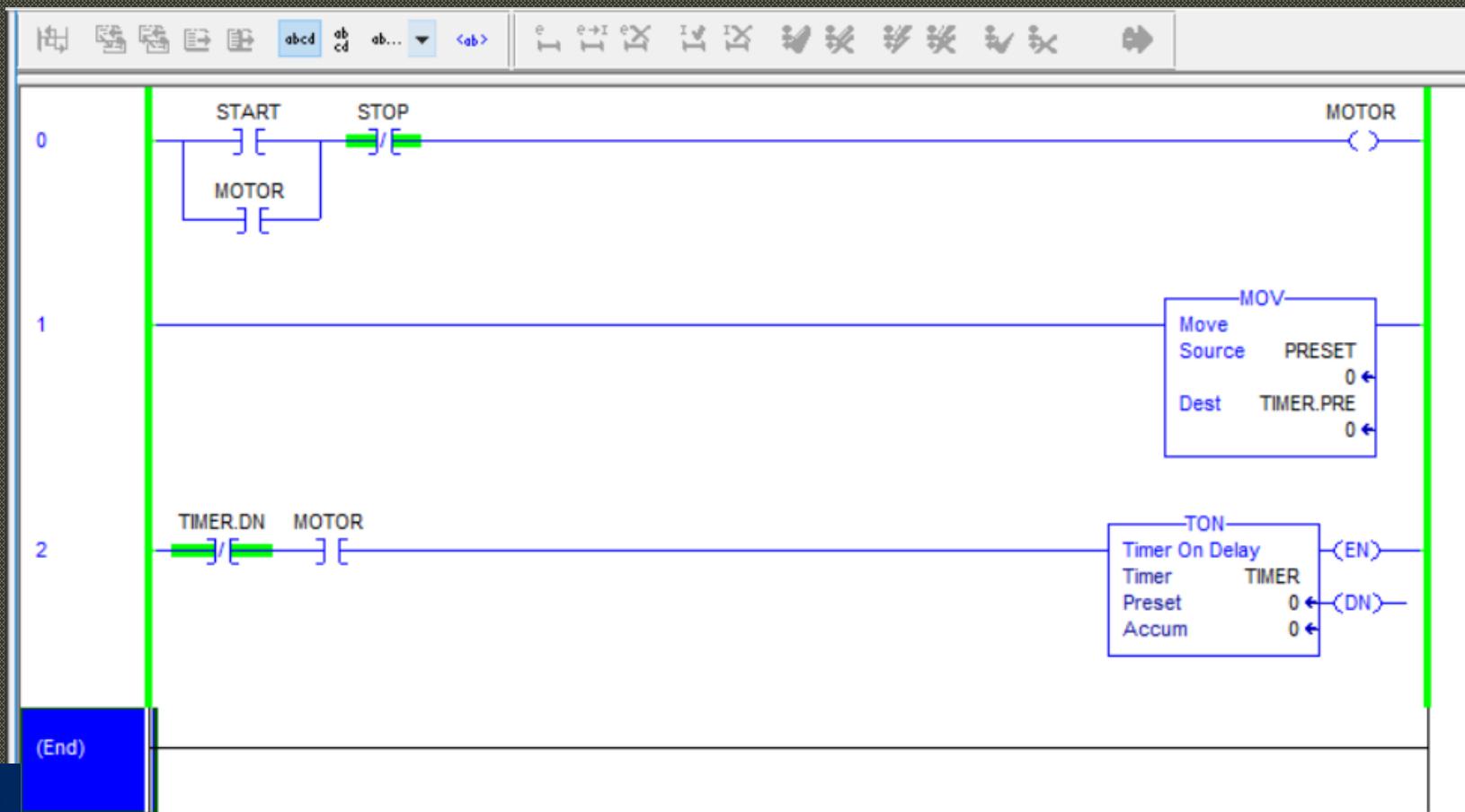


FACTORY TALK VIEW STUDIO

SE - SITE EDITION

FACTORY TALK VIEW STUDIO SE

- Develop a program using the FactoryTalk View Studio Site Edition to run the control application containing START-STOP motor control and timer.
- We will be using computer to monitor and control the motor through FactoryTalk View Studio SE Client.

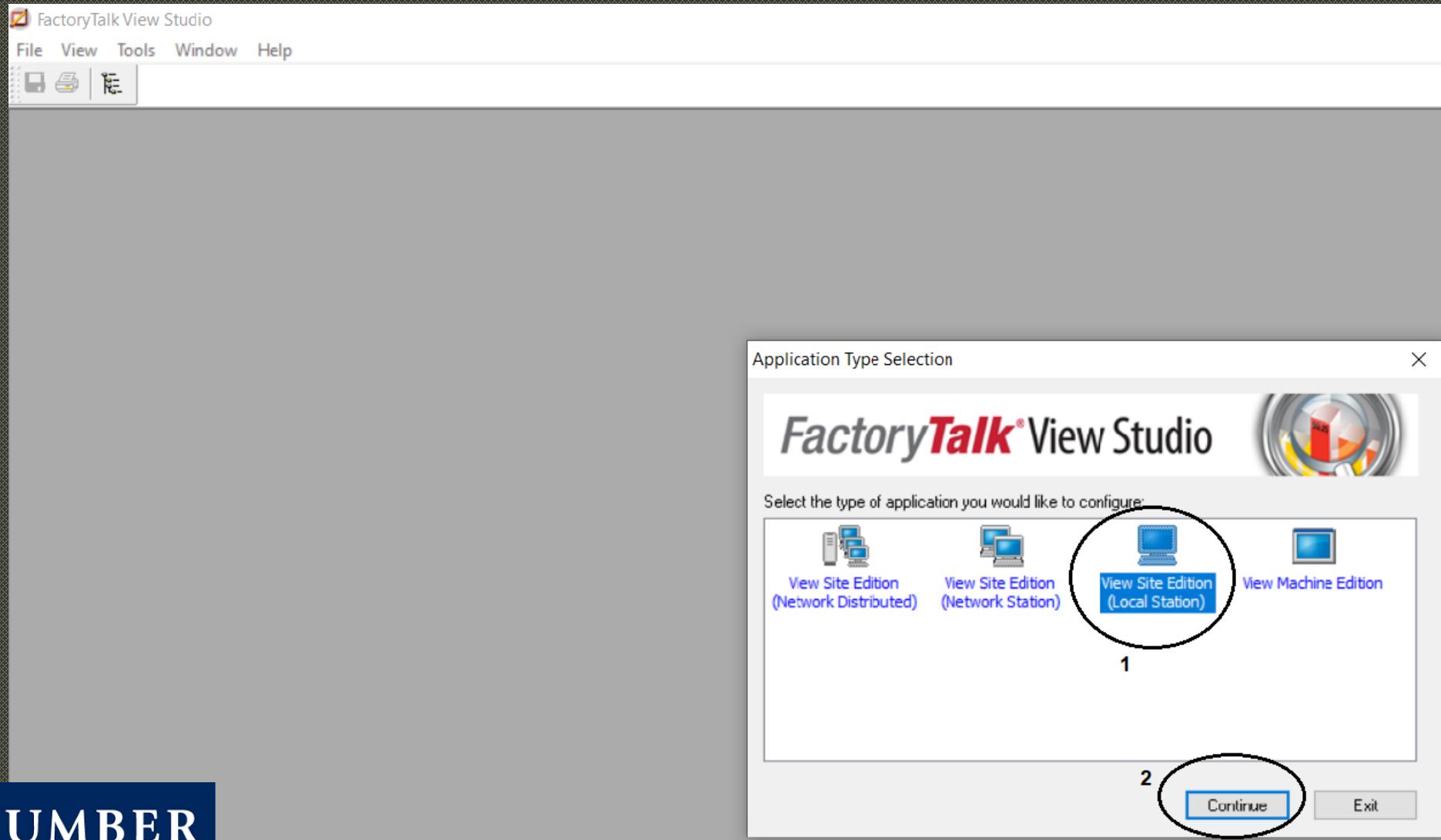


FACTORY TALK VIEW STUDIO SE

- Creating a FactoryTalk Linx server
- Configure the communication between the server and PLC
- Creating HMI Tags
- Display settings
- Creating Multistate Indicator to monitor bit status
- Creating Momentary Push Buttons
- Creating Real-time and Historical trends
- Launch SE Client
- Backup and restore the application

FACTORY TALK VIEW STUDIO SE

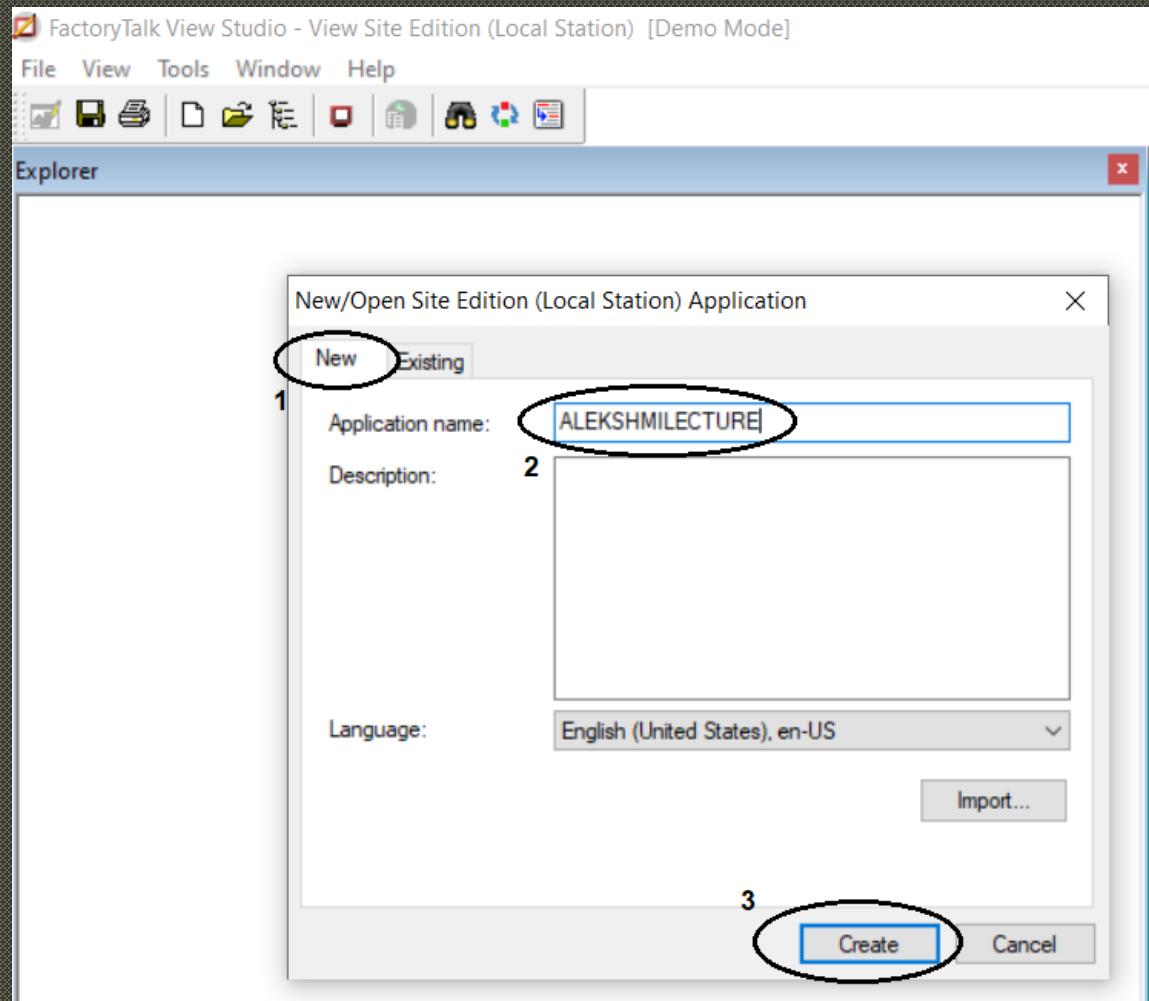
- Open the program FactoryTalk View Studio
- Choose FactoryTalk View SE (Local Station)



FACTORY TALK VIEW STUDIO SE

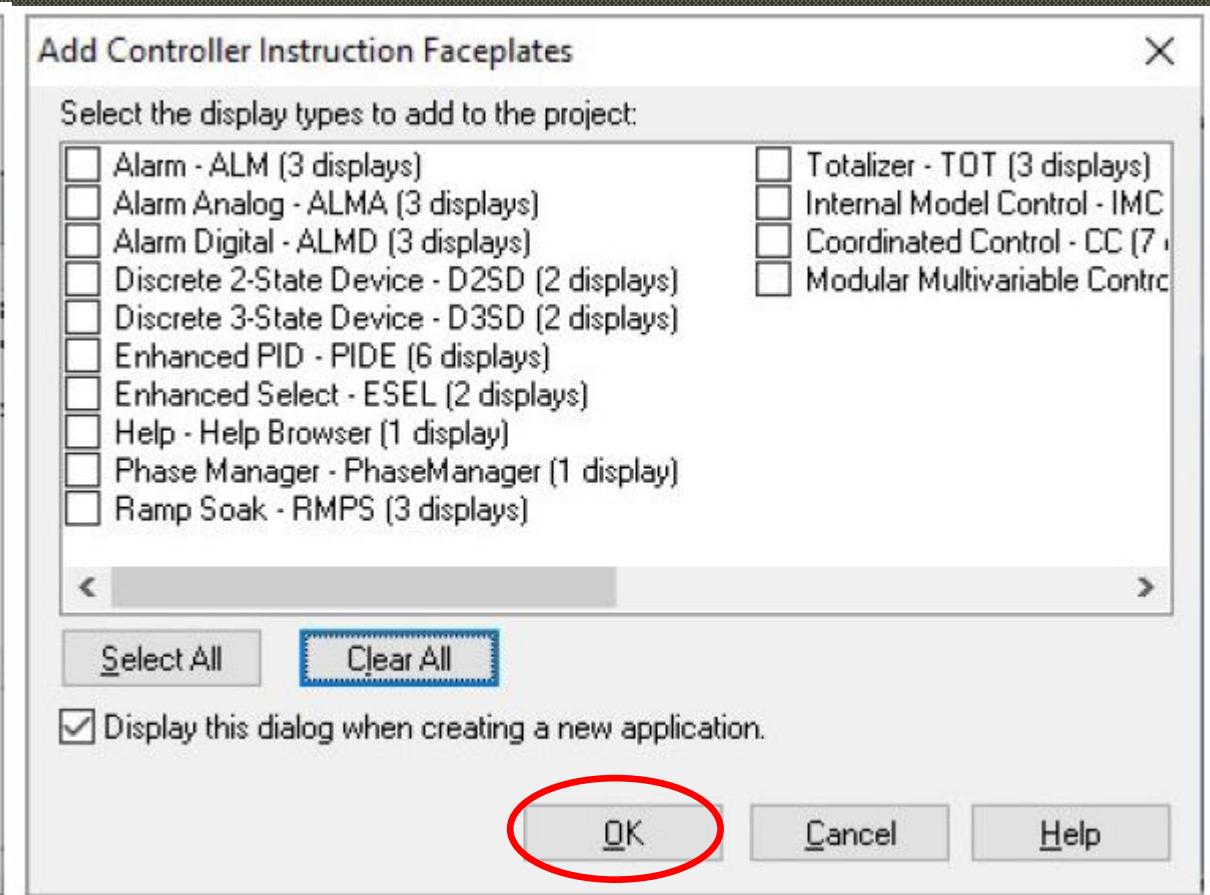
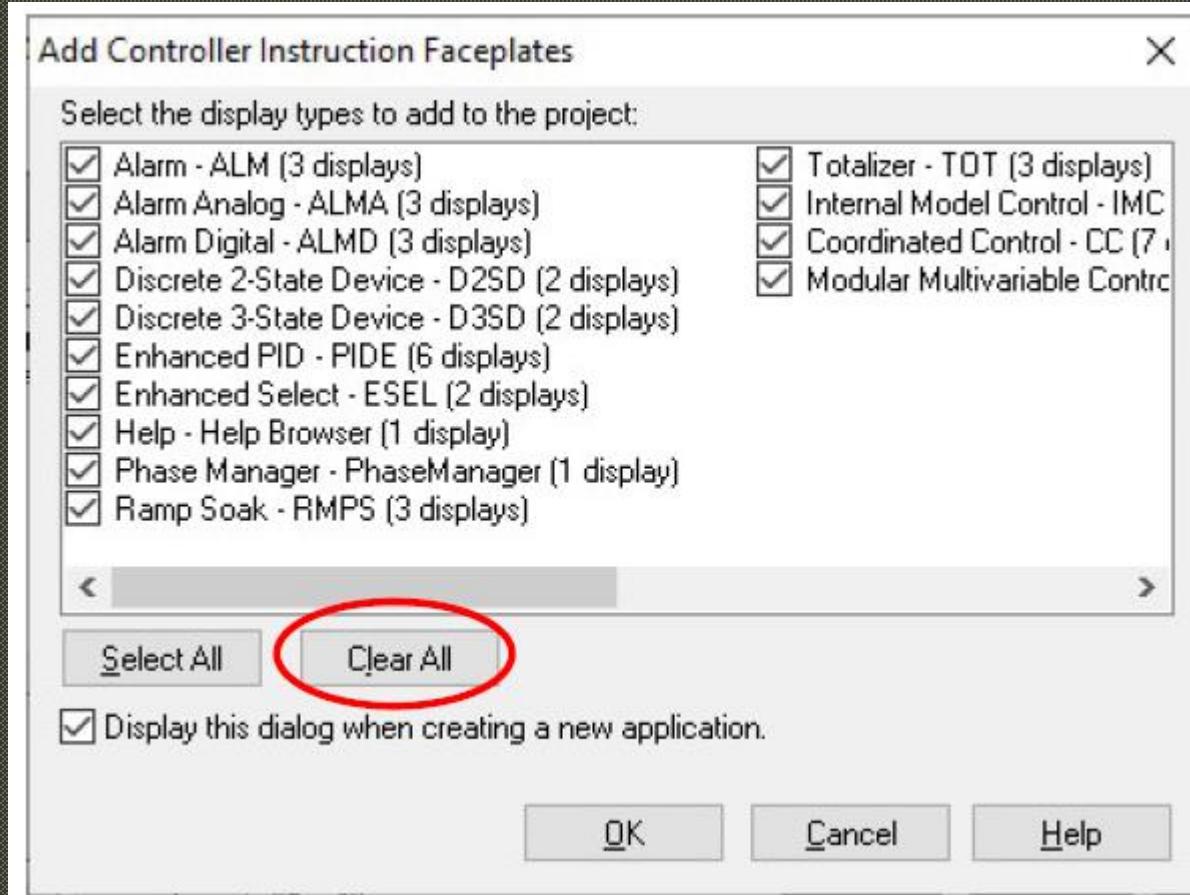
In the starting options:

- Choose New and
- Type an Application name with your Name included in it.
- Click on Create.



FACTORY TALK VIEW STUDIO SE

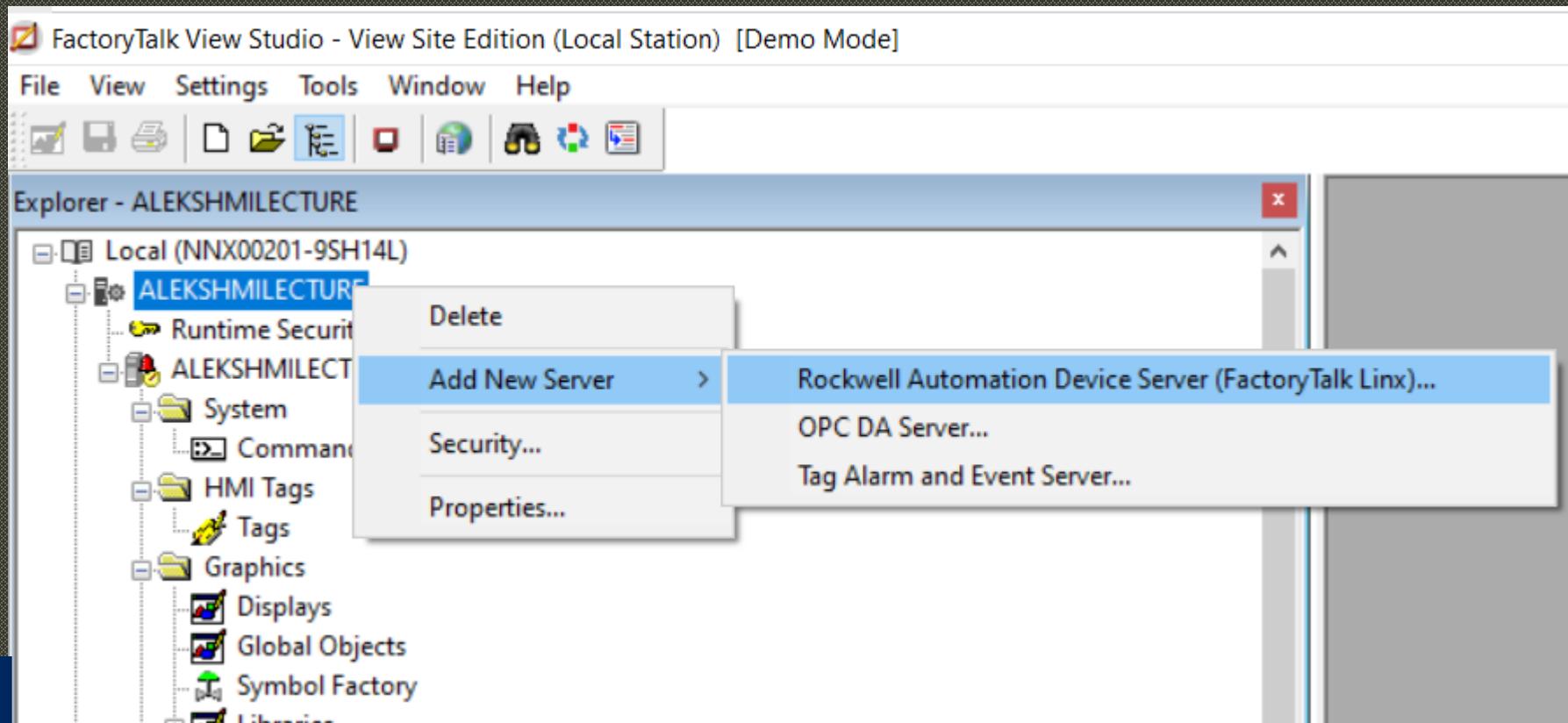
Press the Clear All to avoid many pre-configured displays on the project and press OK



FACTORY TALK VIEW STUDIO SE

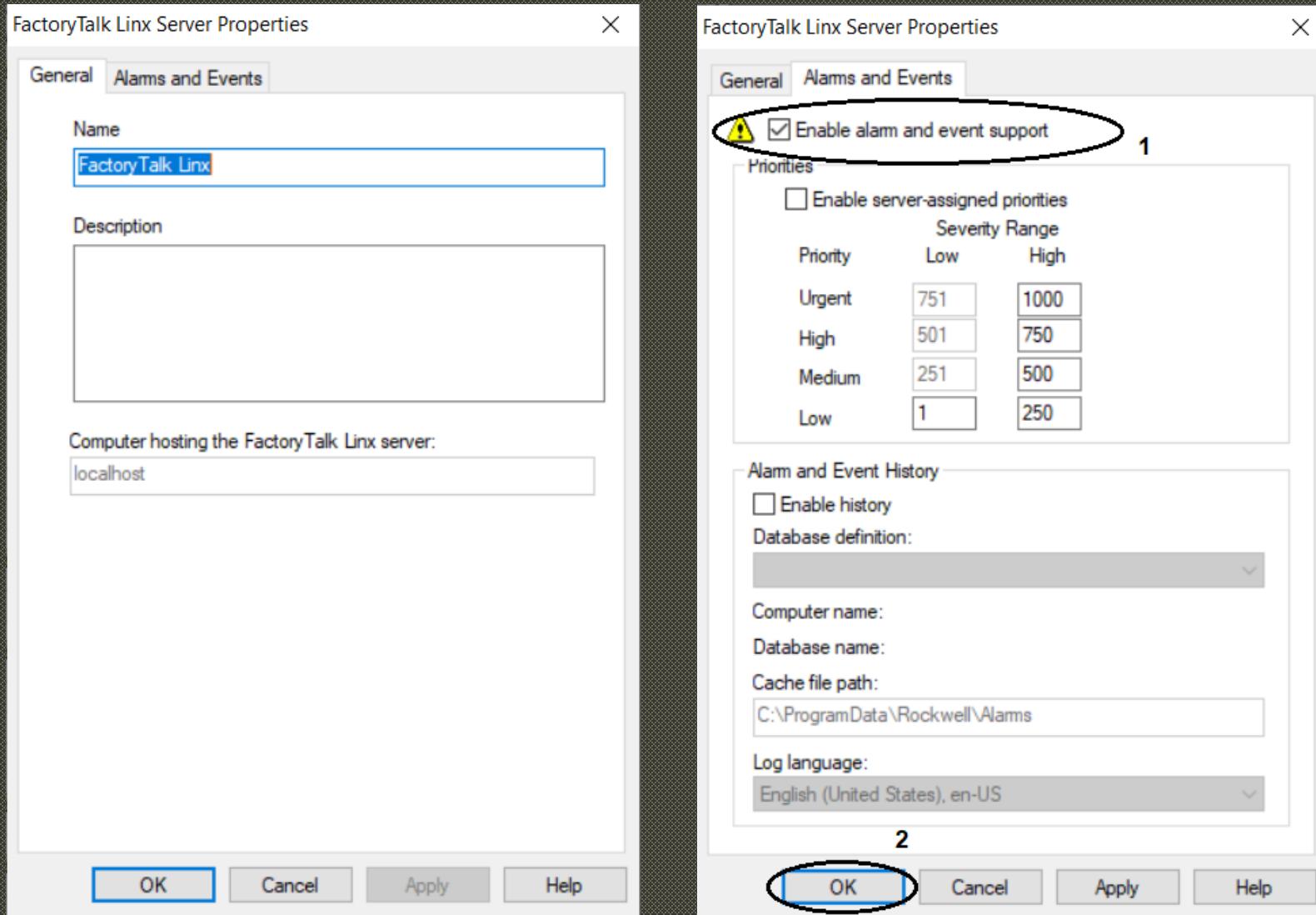
Network Configuration:

- Once the Factory Talk View Studio Software opens, Right click ALEKSHMILECTURE, hover over Add New Server, and select Rockwell Automation Device Server.
- You can change the Name of the server as you wish or leave the name of the server as it is (FactoryTalk Linx).



FACTORY TALK VIEW STUDIO SE

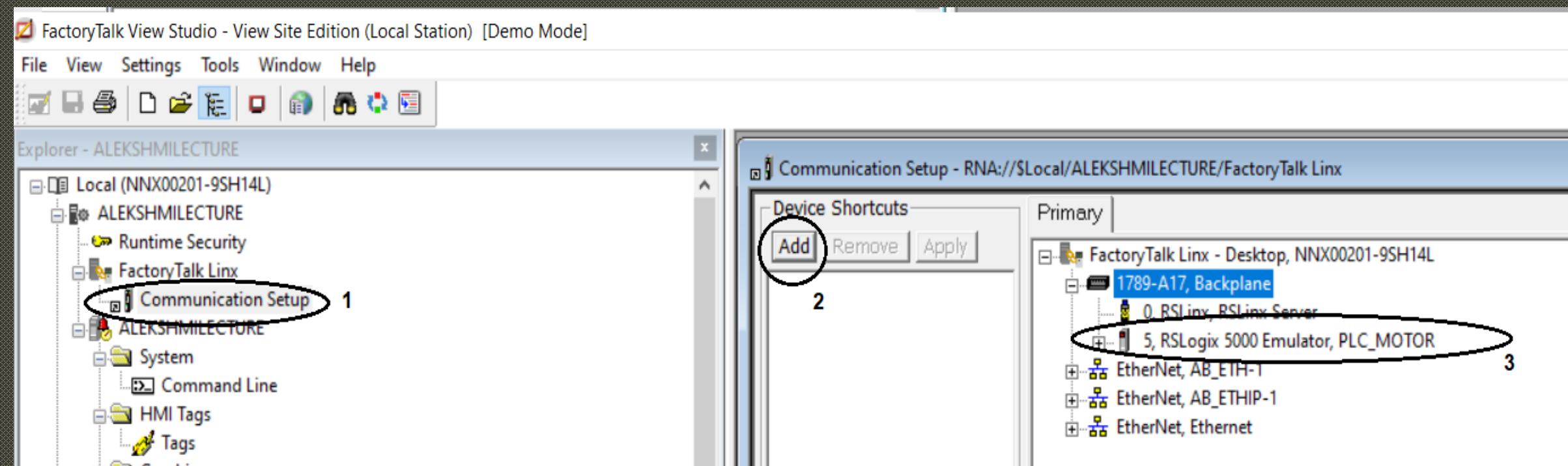
In Alarms and Events tab select Enable alarms and event support and click on OK



FACTORY TALK VIEW STUDIO SE

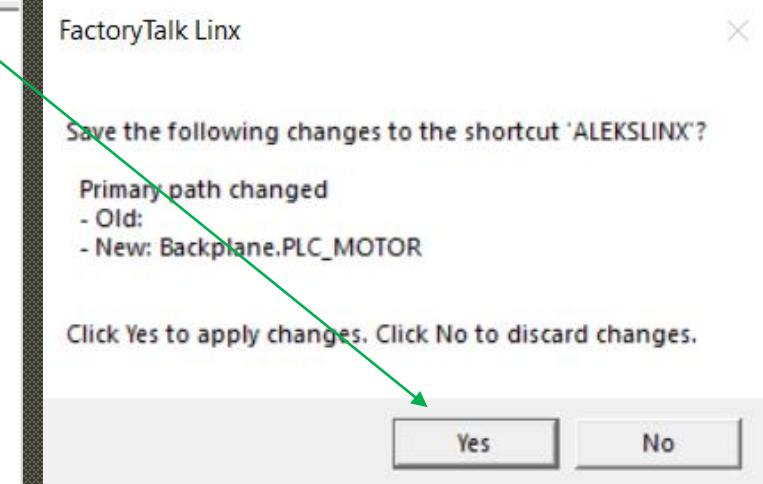
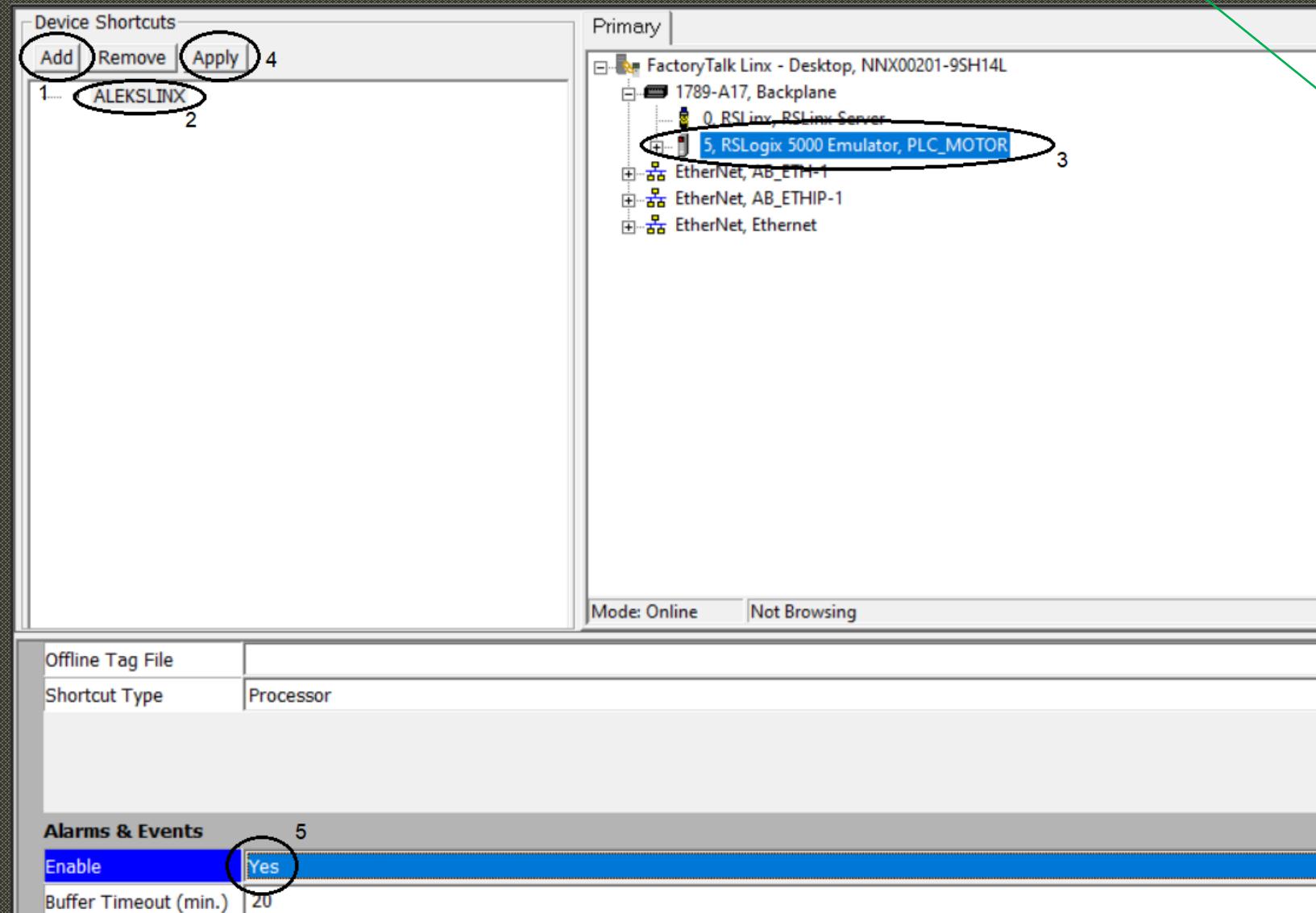
Adding the PLC to the Network:

- Double click on Communication Setup under FactoryTalk Linx
- First Add a Device shortcut with your name in it
- Then Right click on 1789-A17, Backplane and select 5, RSLogix 5000 Emulator, name of the PLC application



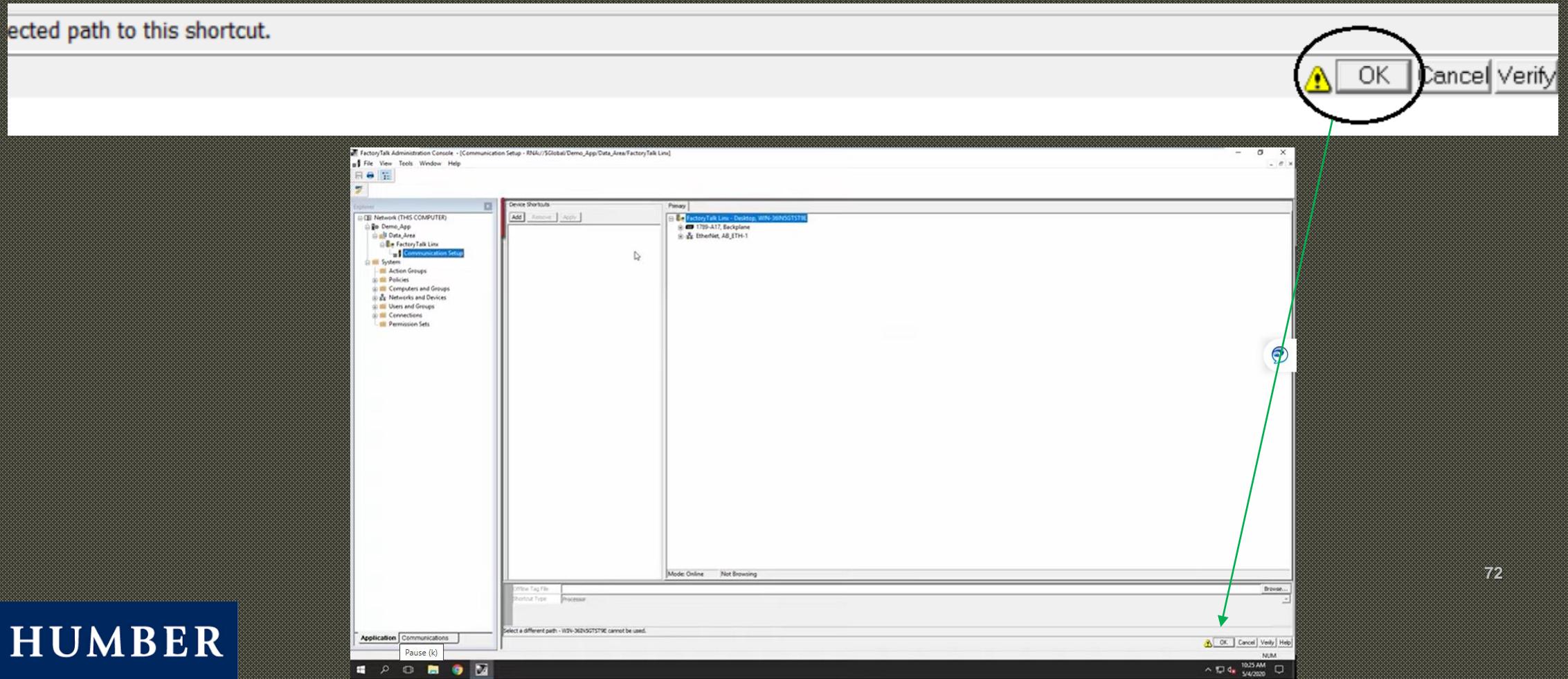
FACTORY TALK VIEW STUDIO SE

Complete the assigned sequence (1, 2, 3 already done), Press Apply and Click Yes



FACTORY TALK VIEW STUDIO SE

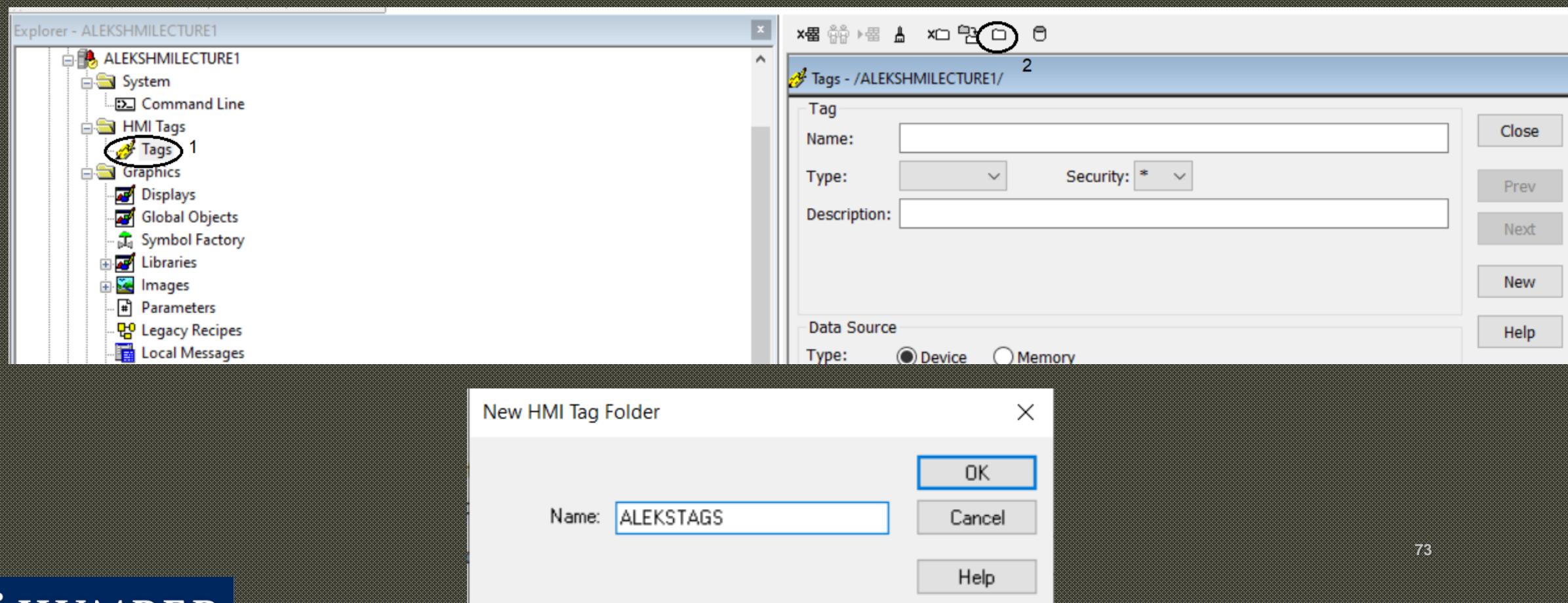
Click on OK in the bottom right corner to complete settings



FACTORY TALK VIEW STUDIO SE

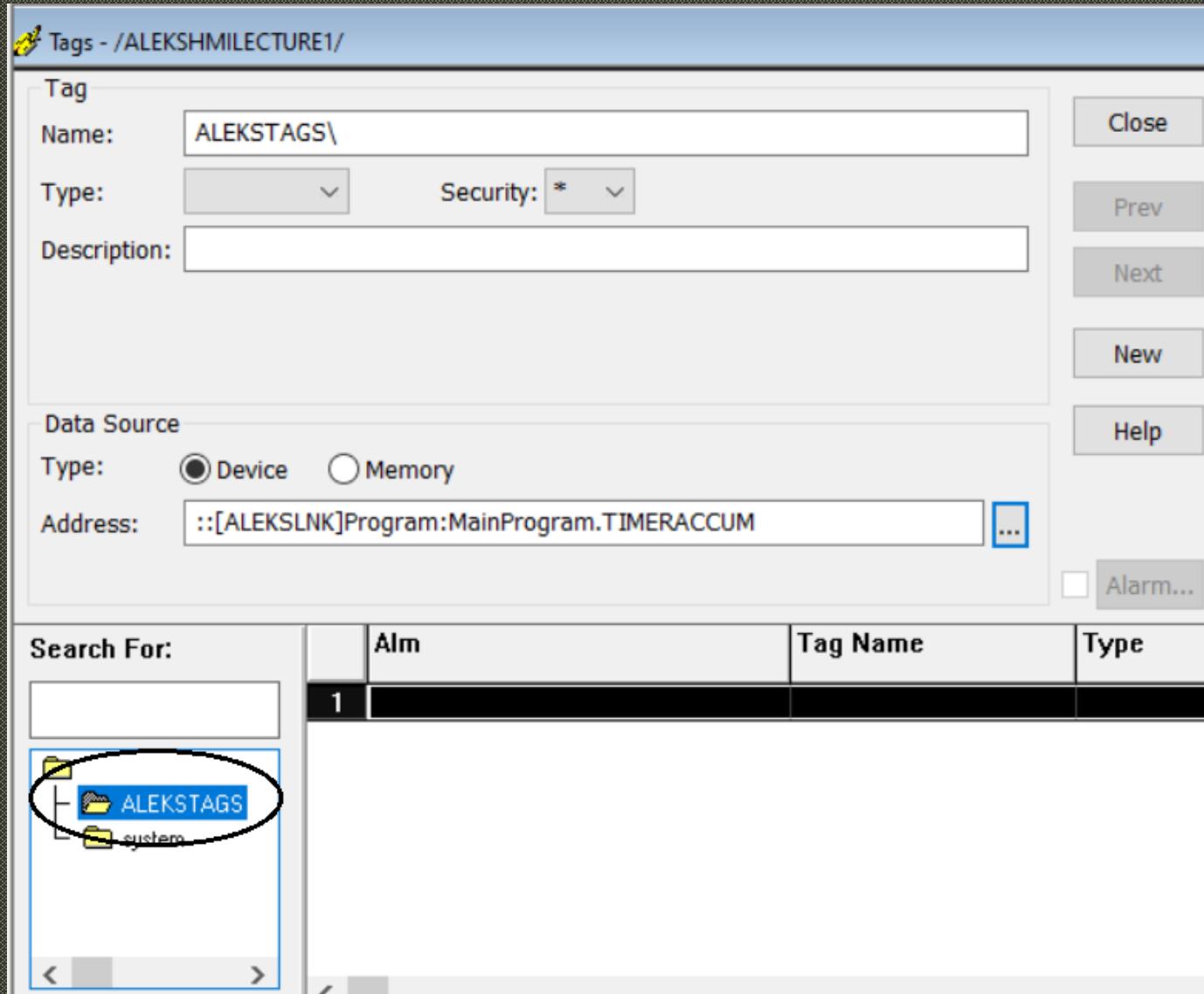
Creating Tags

- Open the Tags under HMI Tags and
- Create a new folder with your name.
- Click OK



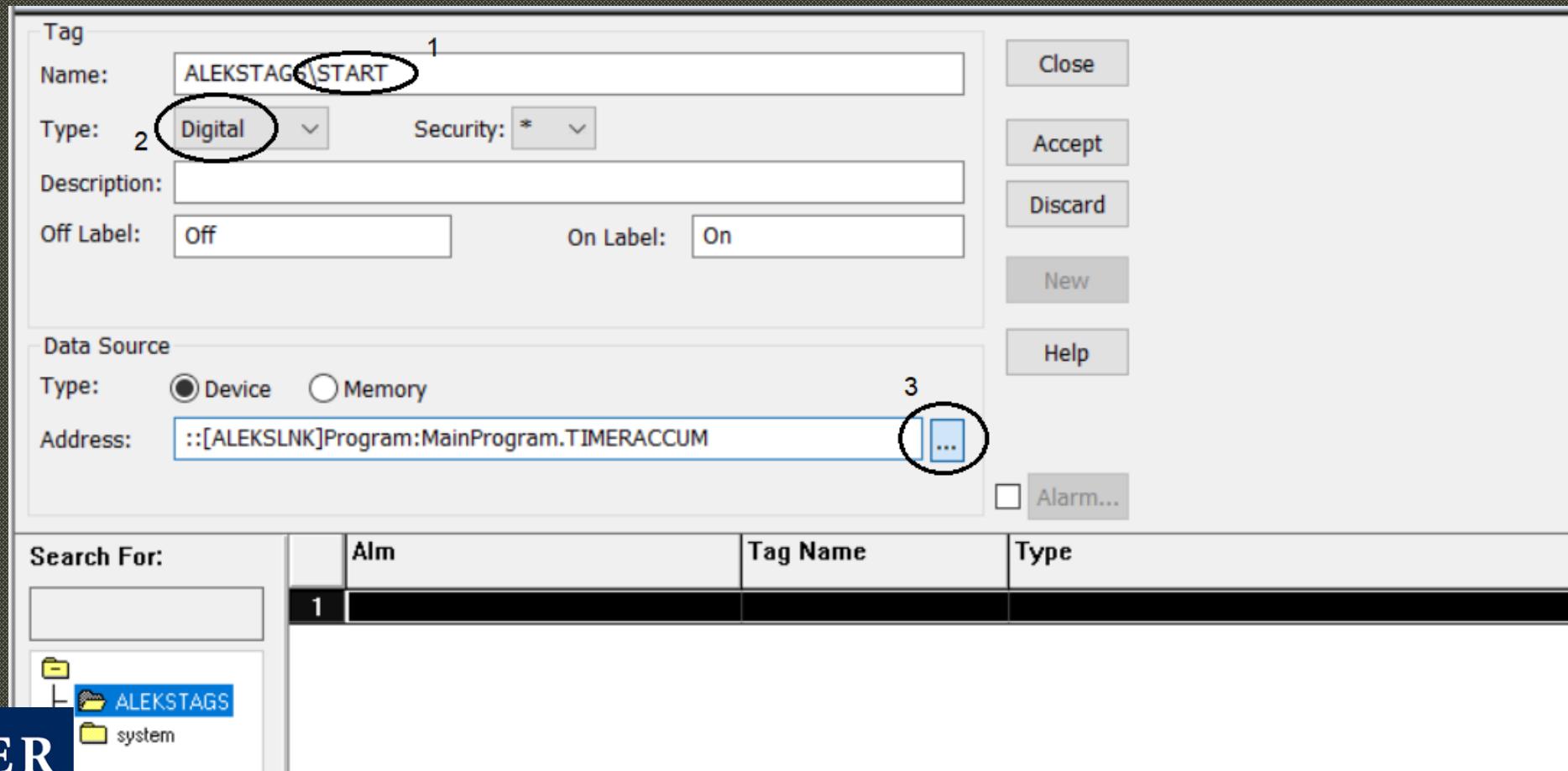
FACTORY TALK VIEW STUDIO SE

You will see a result similar to the one shown below.



FACTORY TALK VIEW STUDIO SE

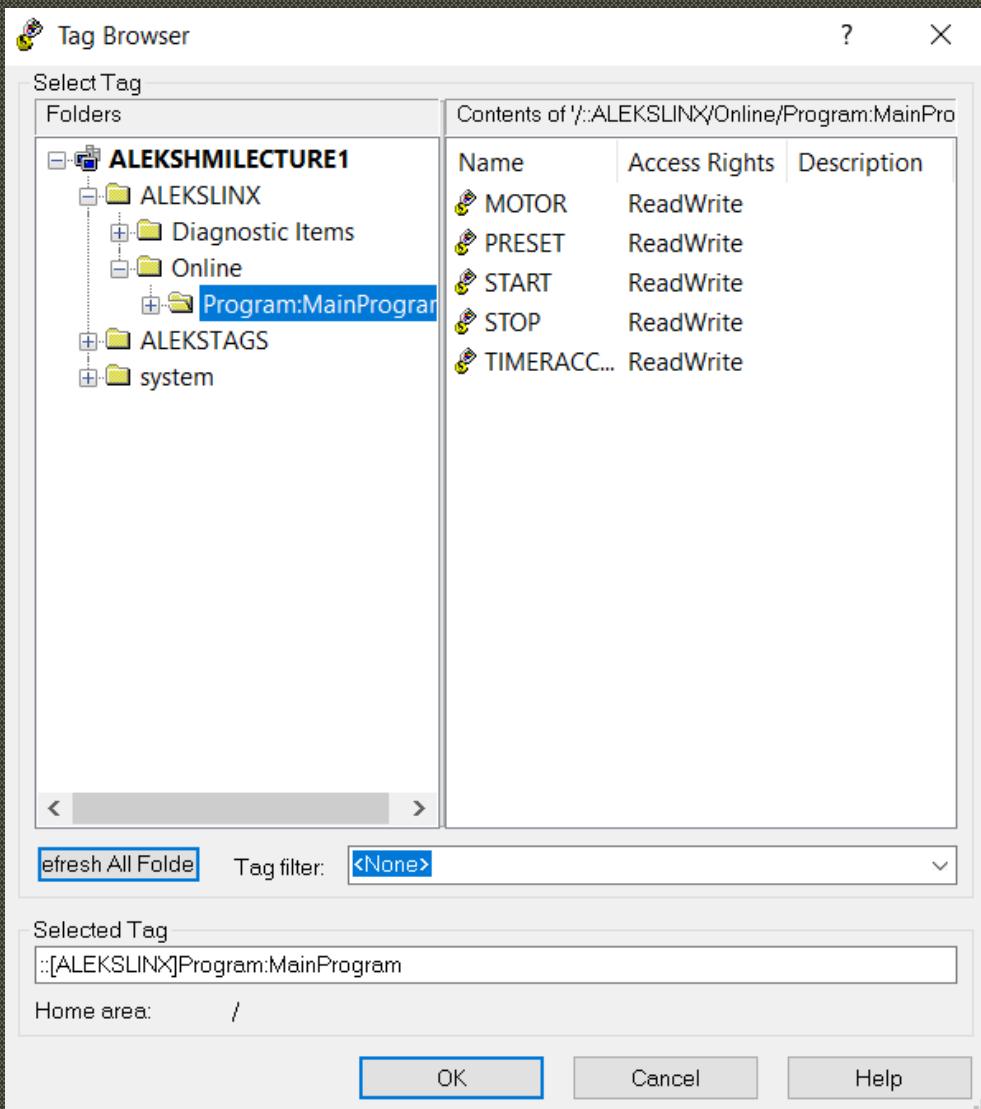
- Type the name of the tag,
- Assign the Type as Digital,
- Browse the address, select ALEKSLINK, Program:MainProgram.



FACTORY TALK VIEW STUDIO SE

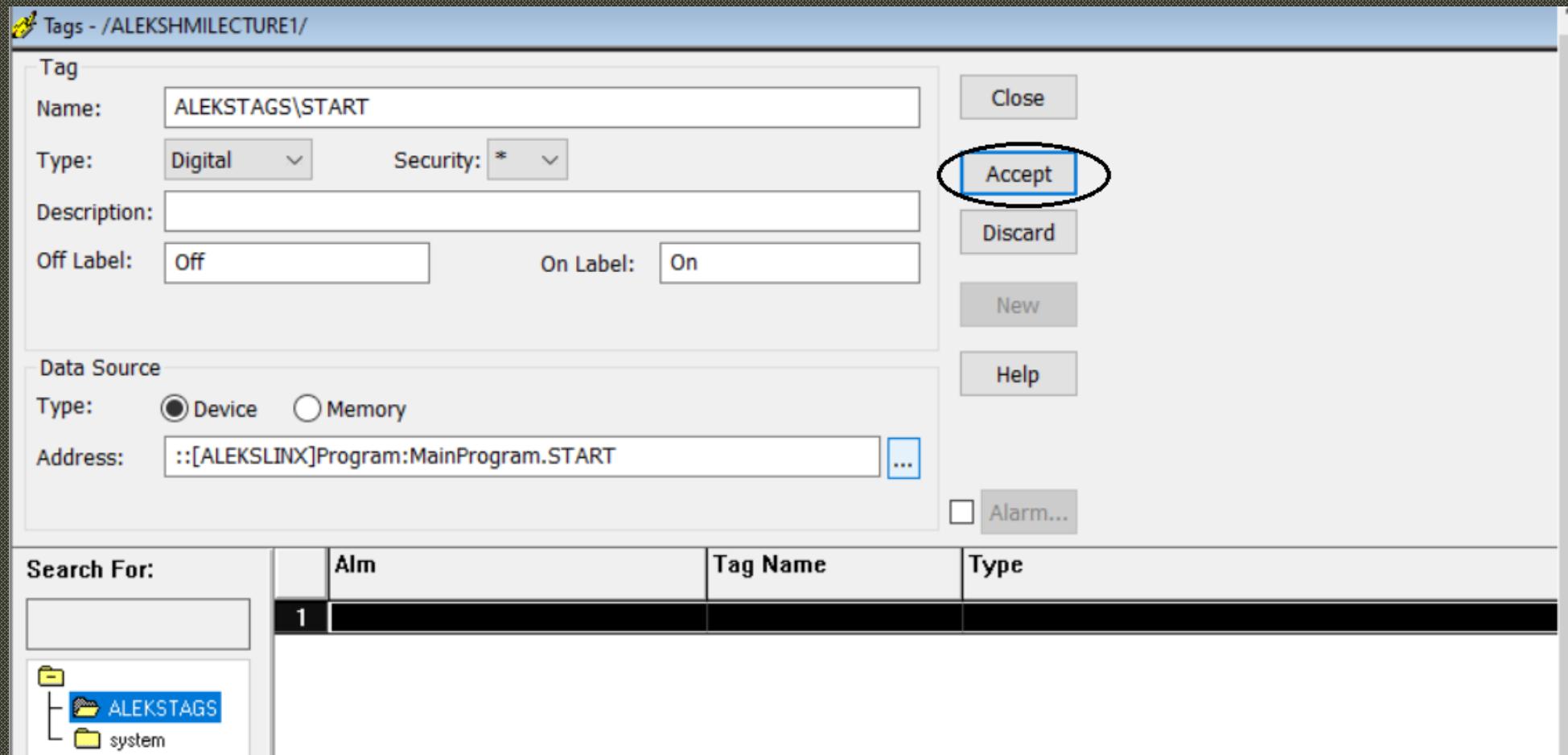
Refresh All Folders.

You will see all available tags of your program.
Click on “START” tag and OK.



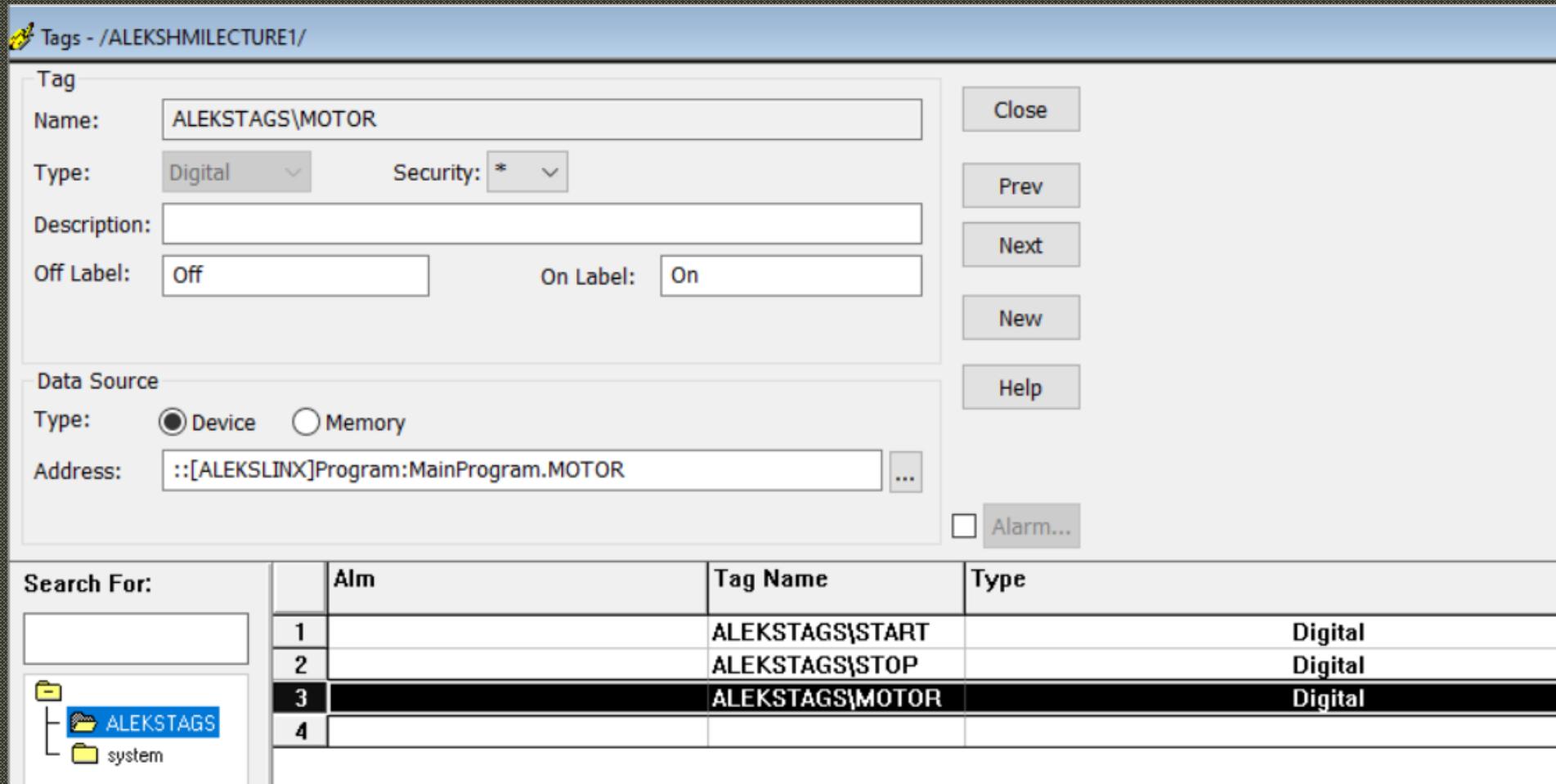
FACTORY TALK VIEW STUDIO SE

Click on Accept.



FACTORY TALK VIEW STUDIO SE

Similar way create the STOP and MOTOR tags.



FACTORY TALK VIEW STUDIO SE

To create a PRESET tag with a maximum timer preset value of 3 seconds, follow these steps:

Define the Tag:

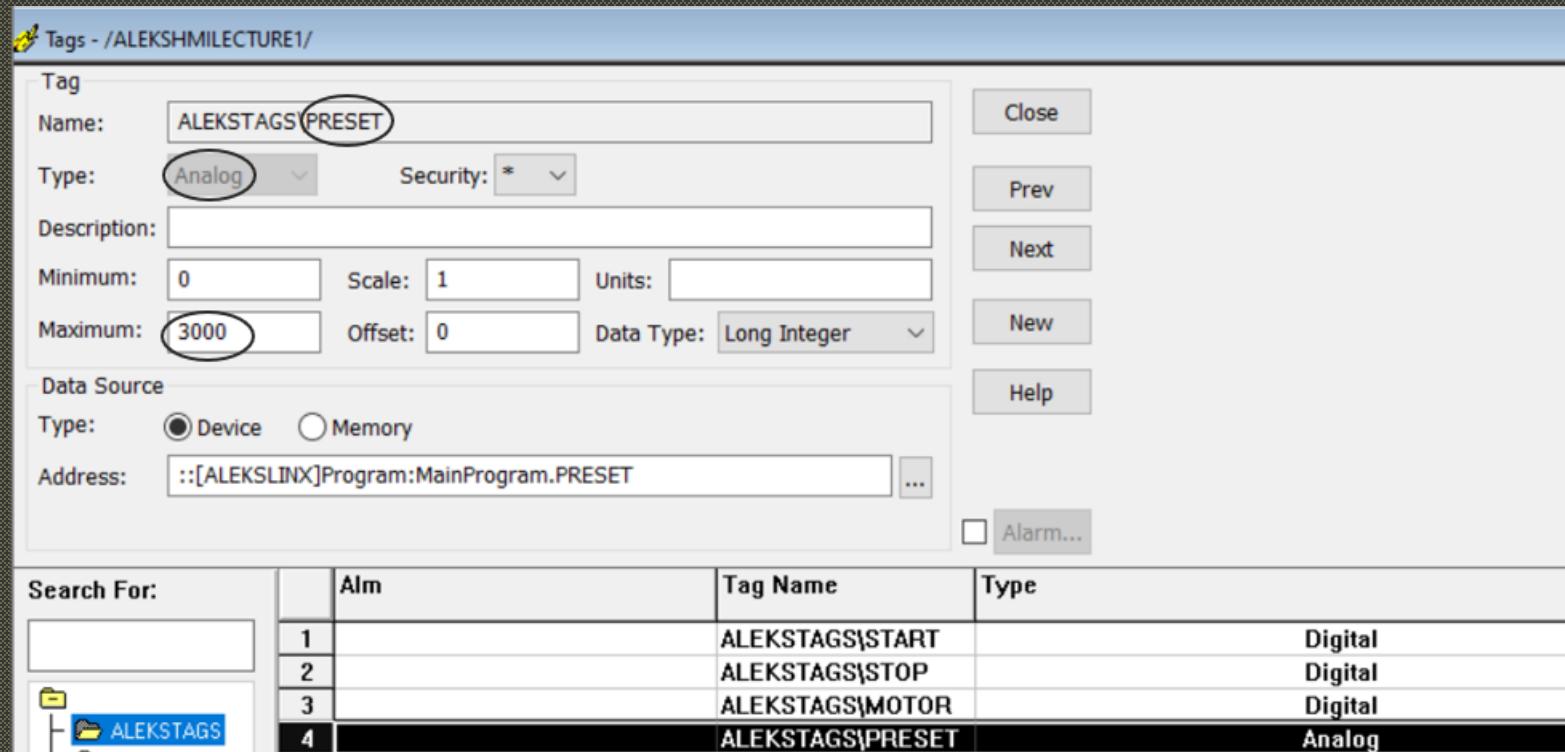
- Name: PRESET
- Type: Analog

Set the Maximum Value:

- Since timer presets are typically in milliseconds, set the max value to 3000 ms (3 seconds).

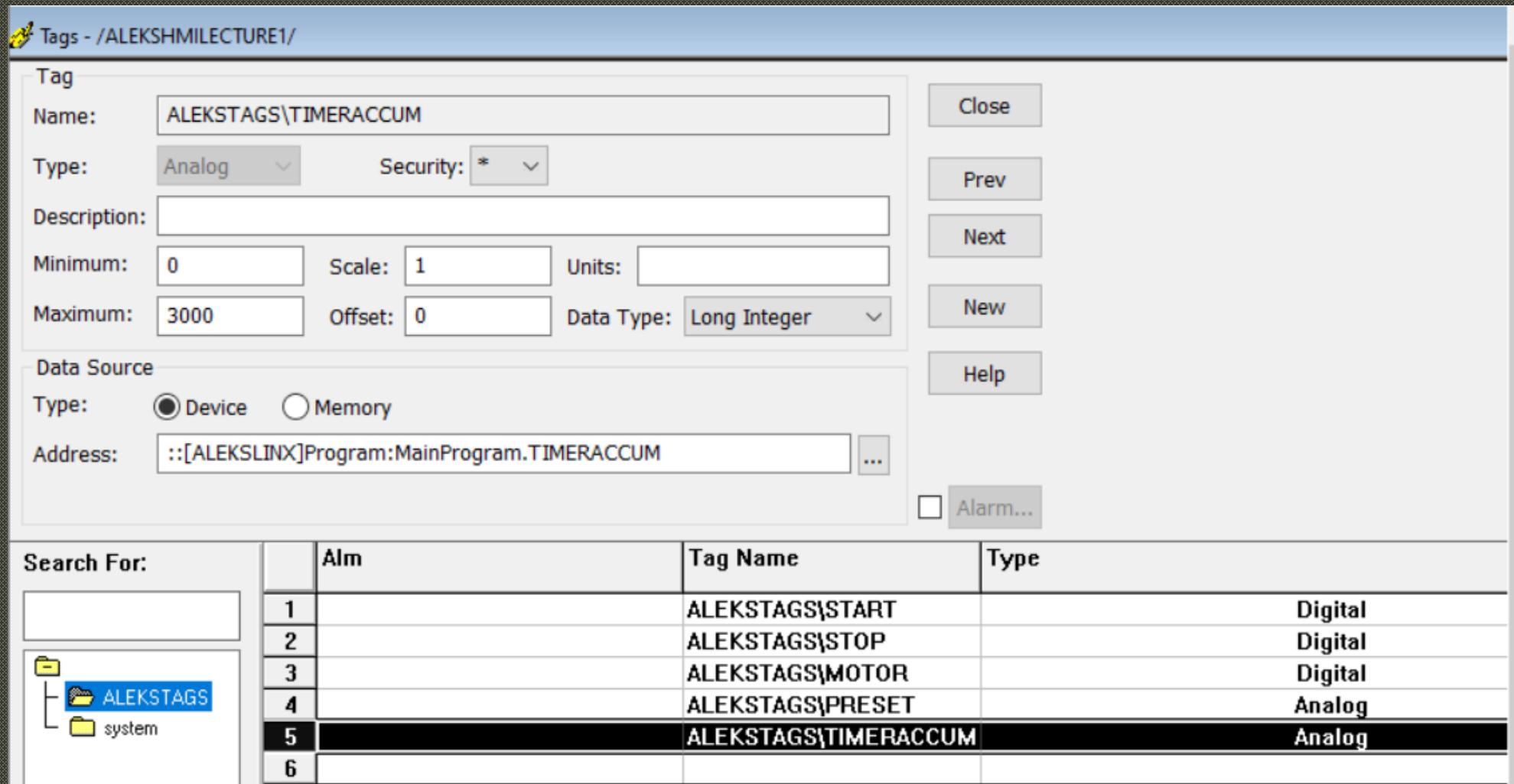
Save the Tag:

- Click Accept to confirm and store the tag.



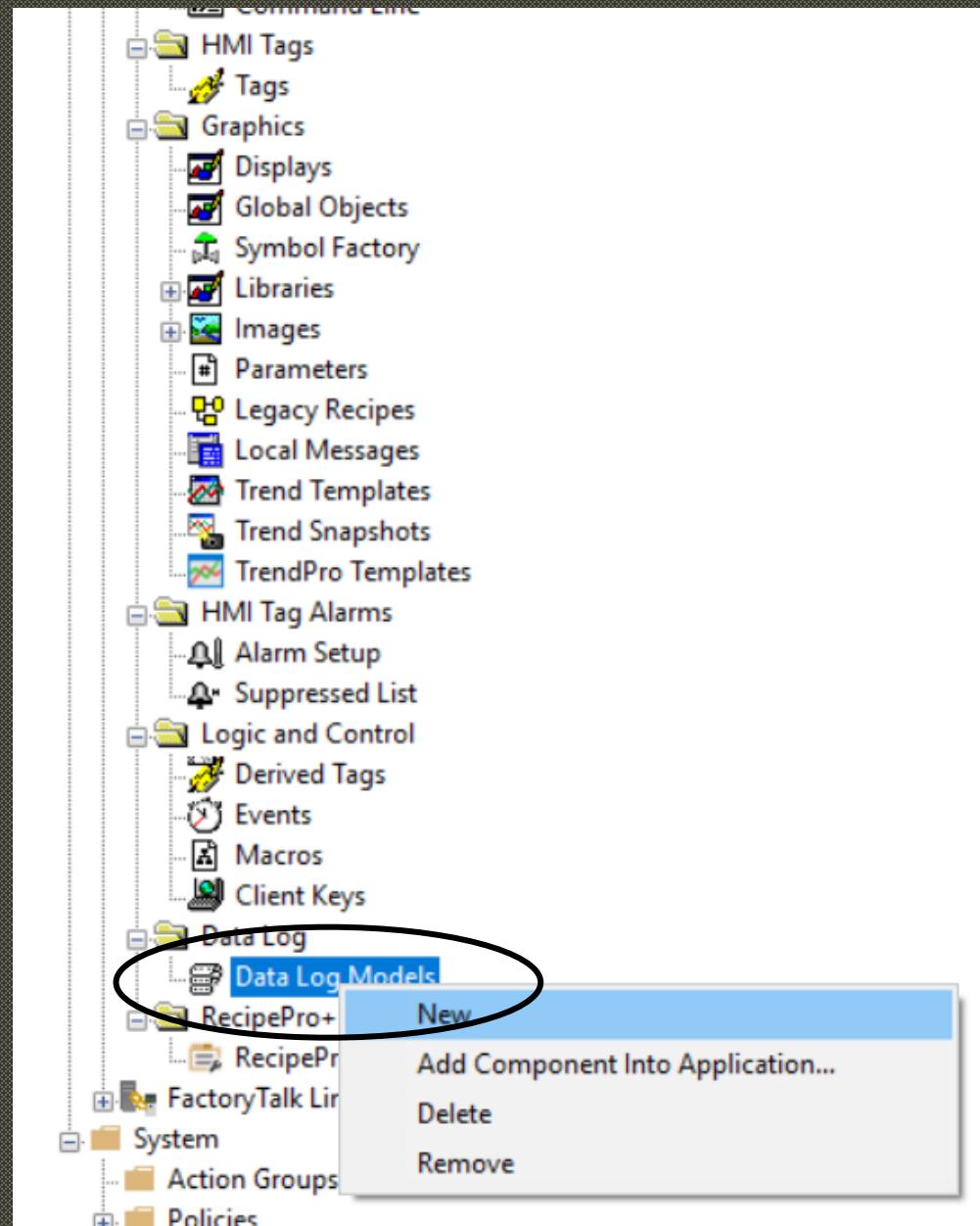
FACTORY TALK VIEW STUDIO SE

Similar way create the TIMERACCUM tag.



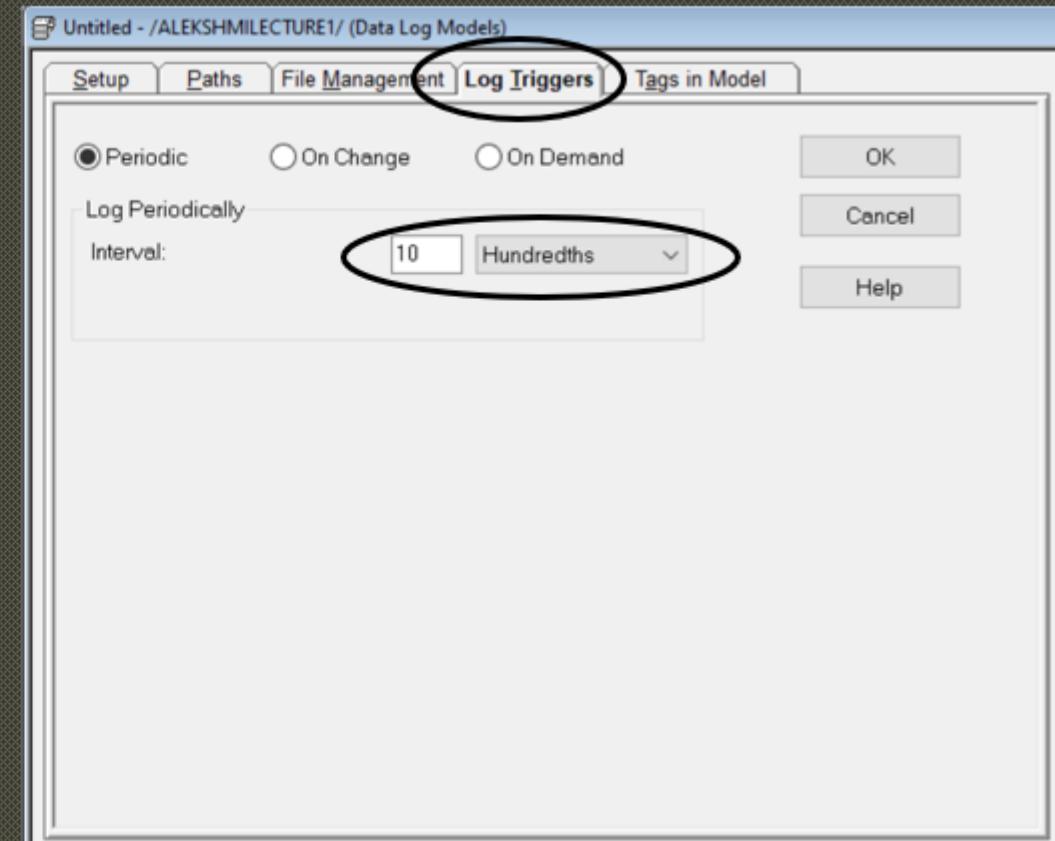
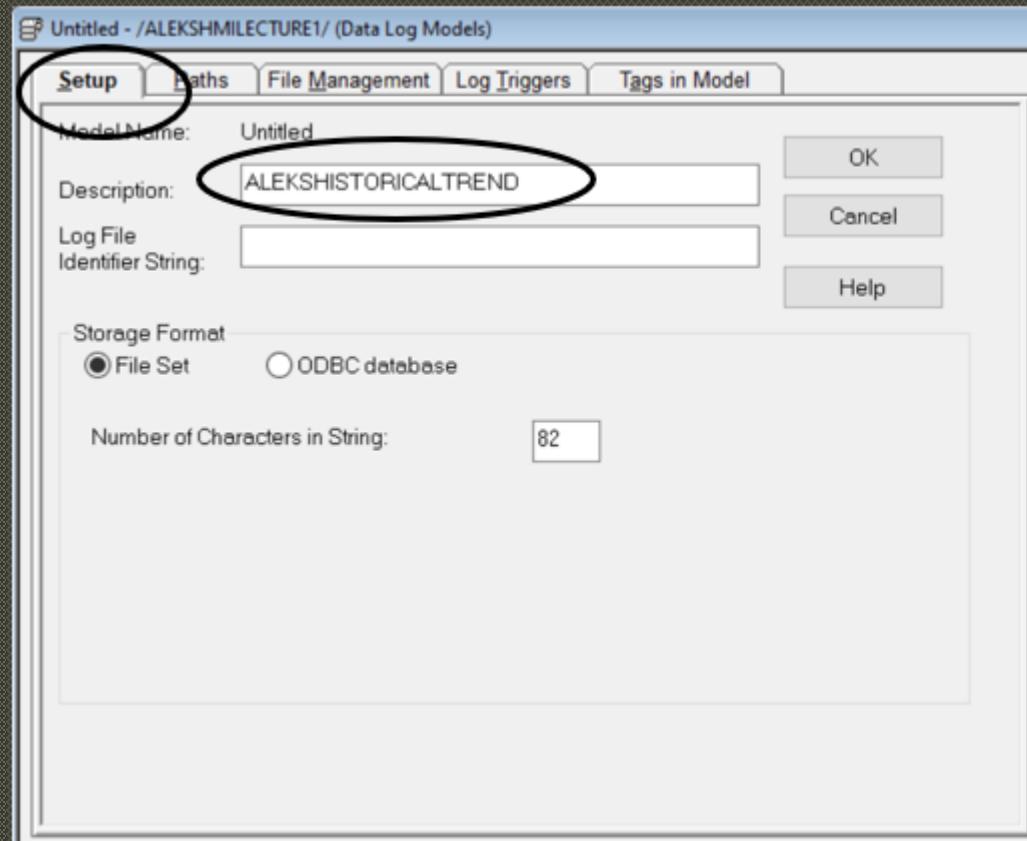
FACTORY TALK VIEW STUDIO SE

Create a Data Log Model
for the later use in historical trends.



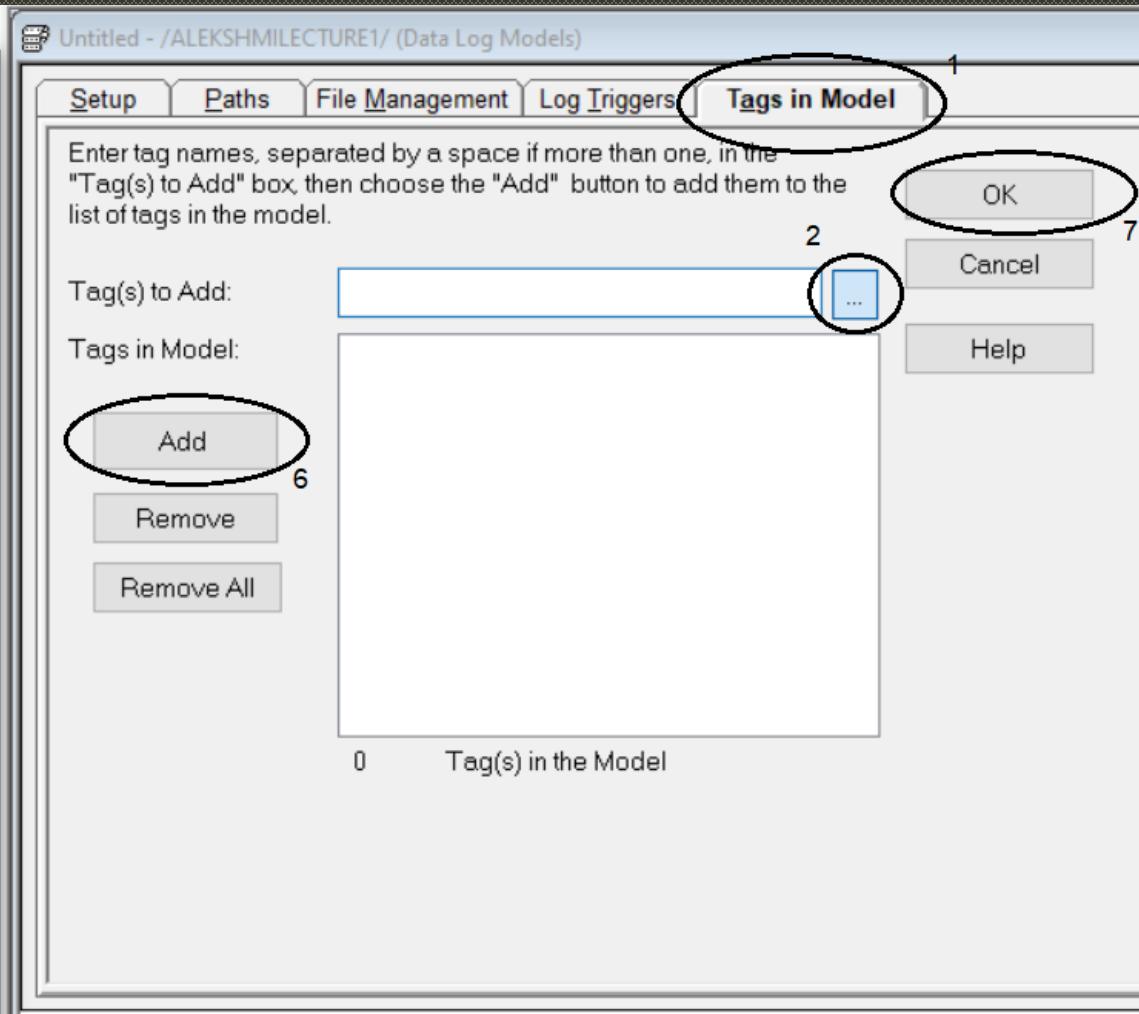
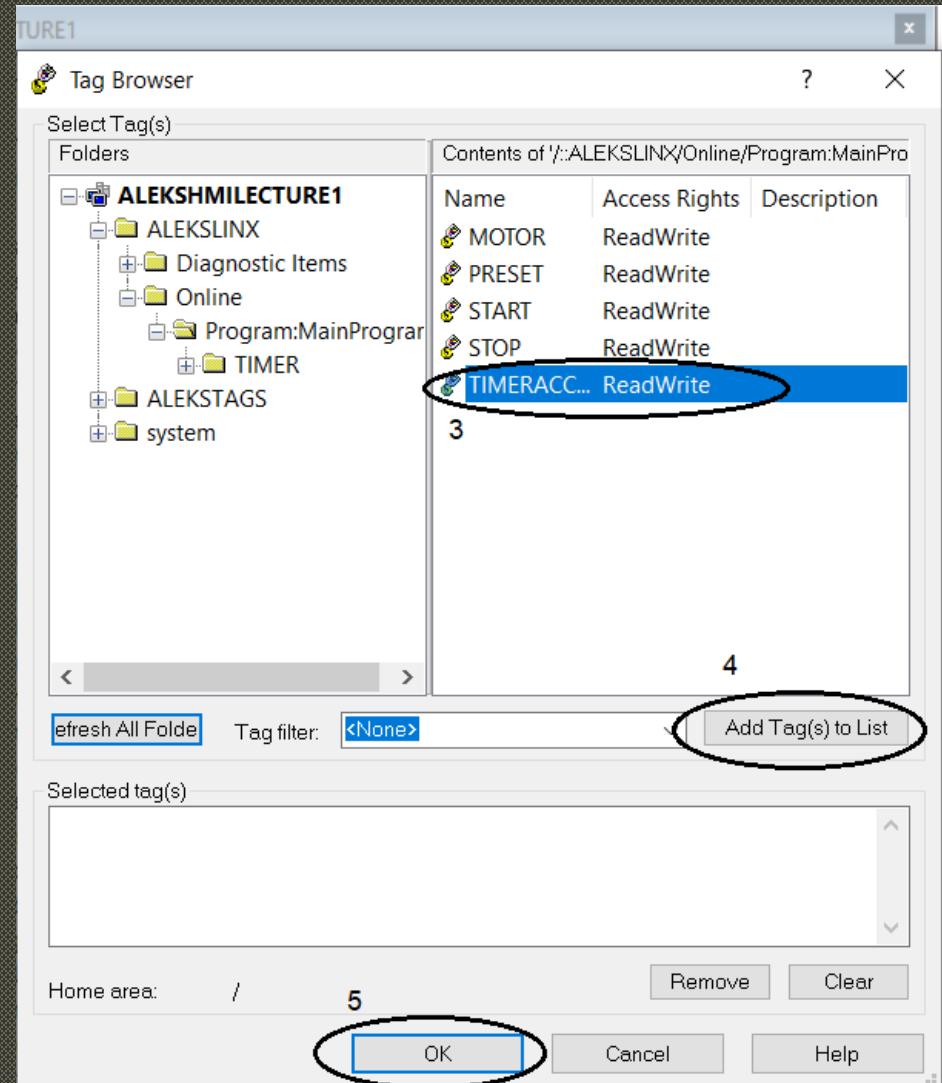
FACTORY TALK VIEW STUDIO SE

Settings regarding the description and Log Triggers refreshments for the model.



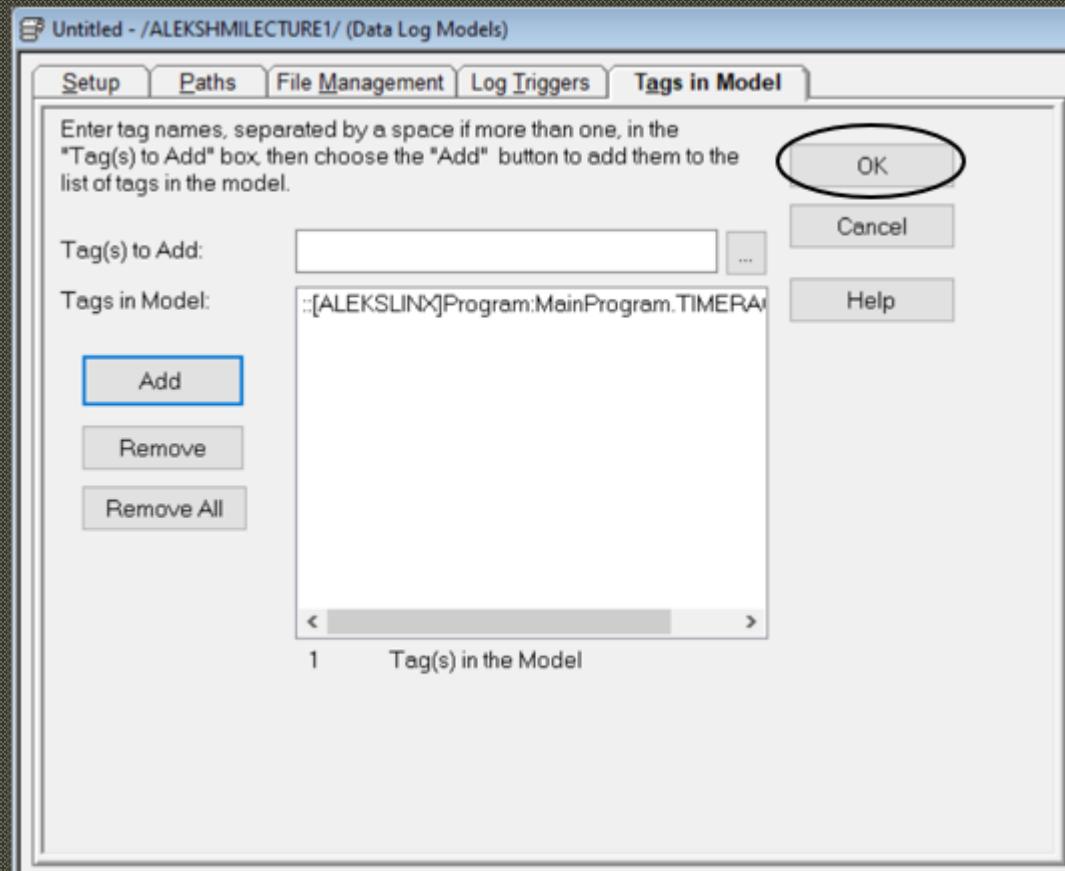
FACTORY TALK VIEW STUDIO SE

Settings for the trends in the model. Complete the sequence 1-7.

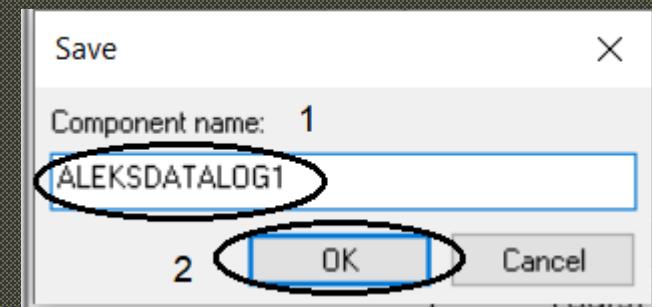


FACTORY TALK VIEW STUDIO SE

For more Data Logs, you can add more tags.

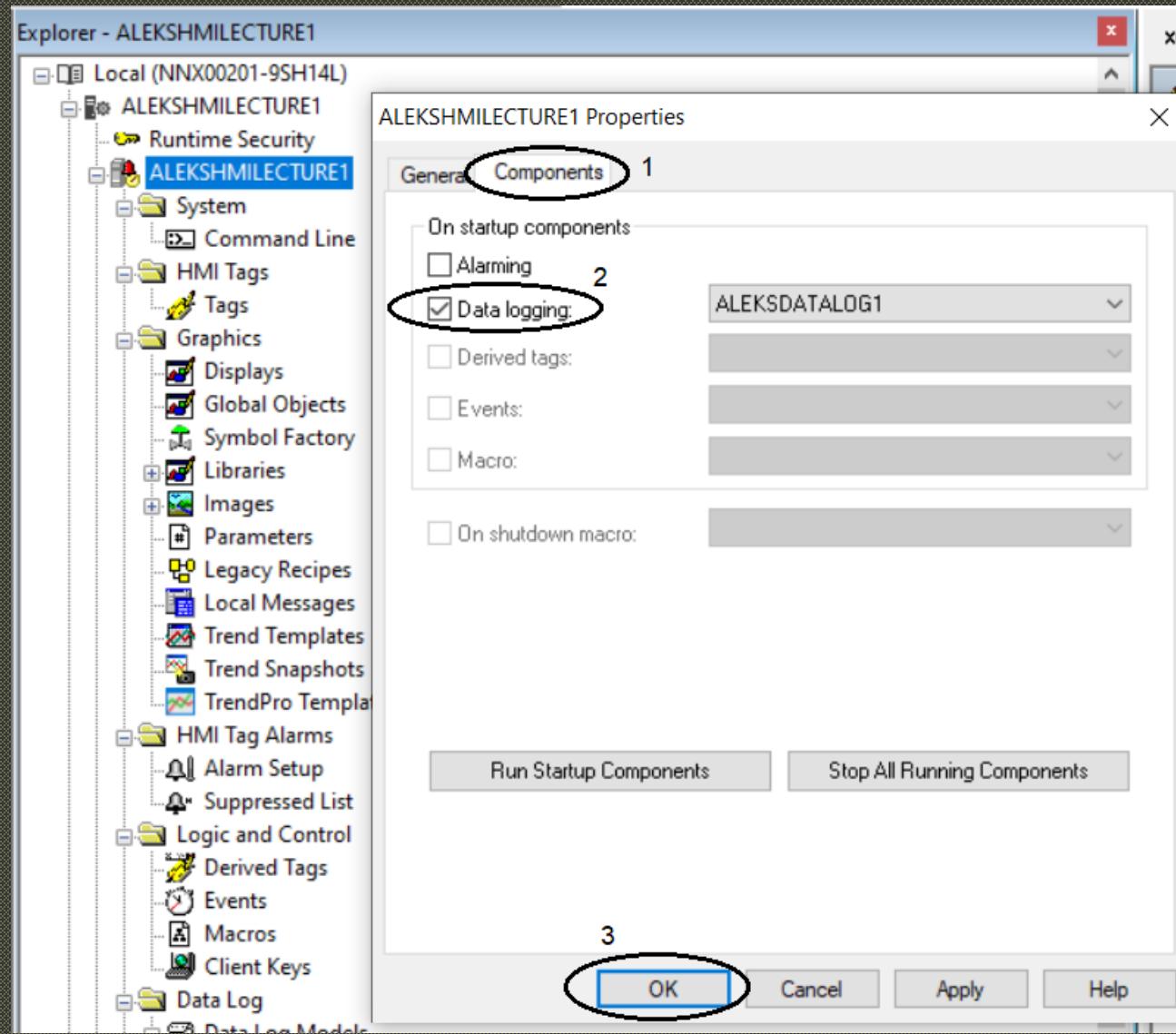


After pressing OK, you are prompted to give a name to the Model created. Give it a name related to you.



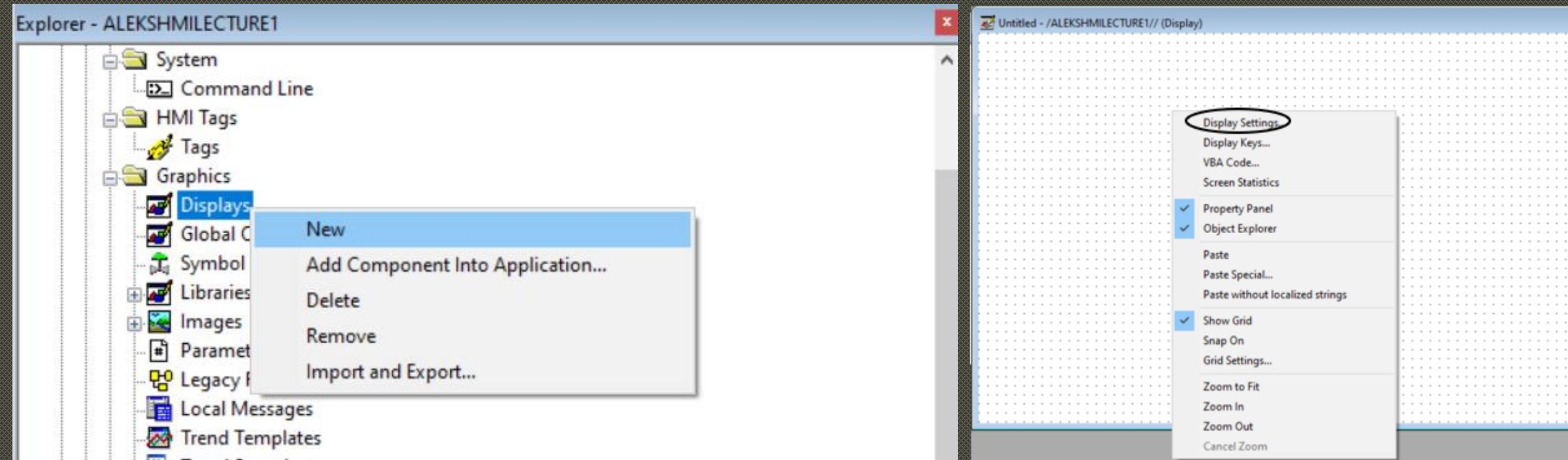
FACTORY TALK VIEW STUDIO SE

Right click on the HMI server and select Properties. Follow the sequence 1-3.



FACTORY TALK VIEW STUDIO SE

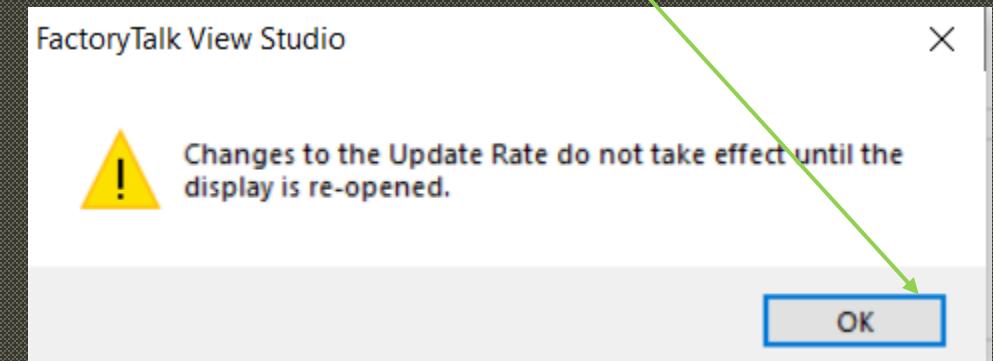
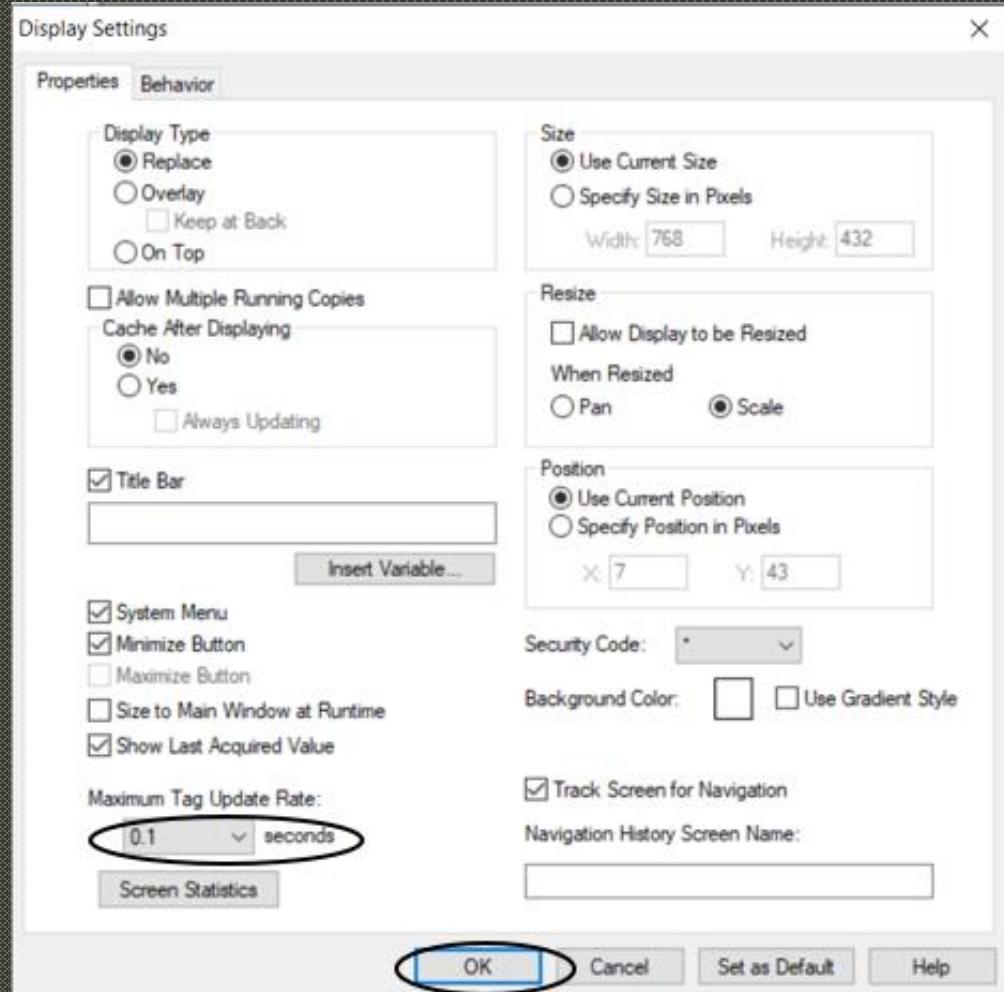
Create a new display: Go to Display Settings.



FACTORY TALK VIEW STUDIO SE

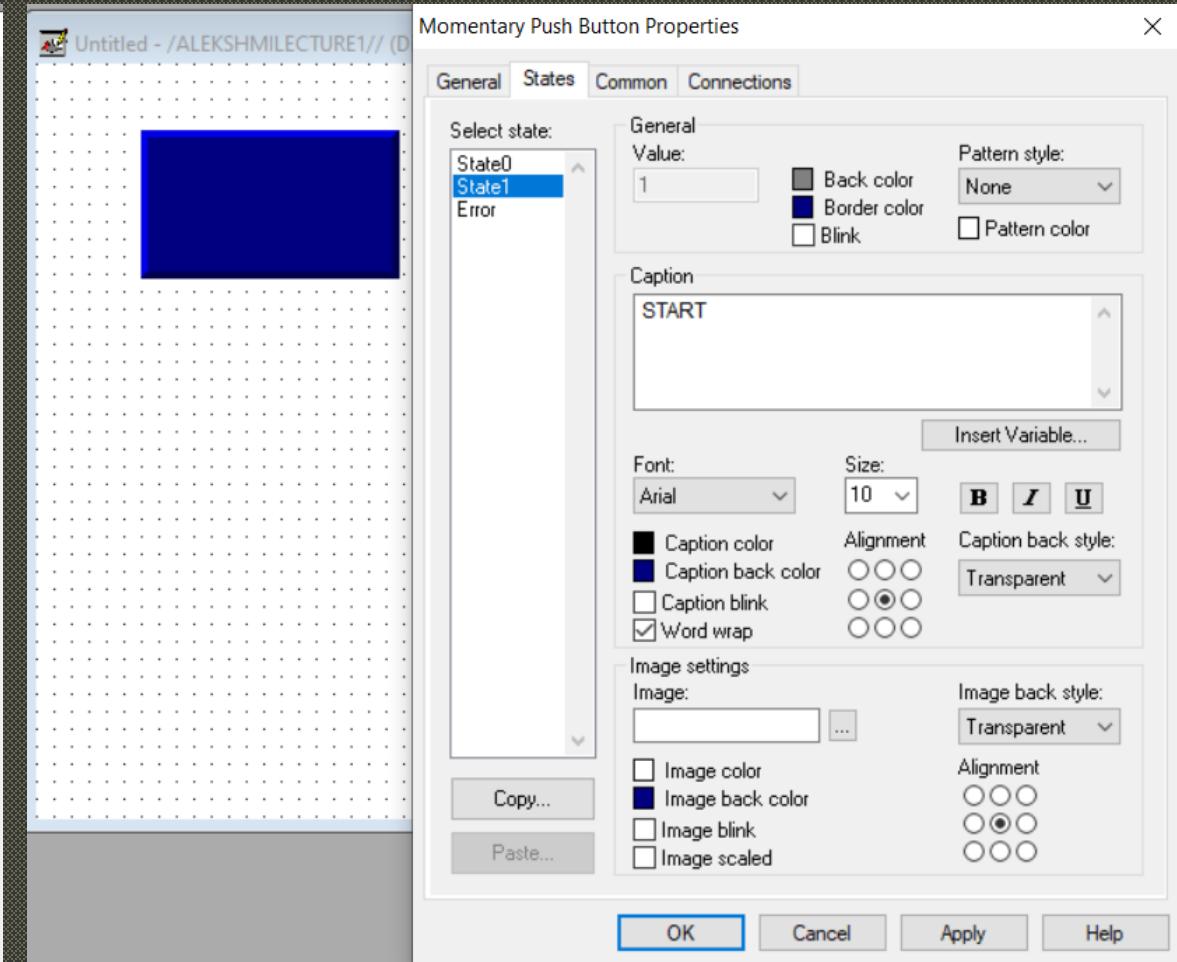
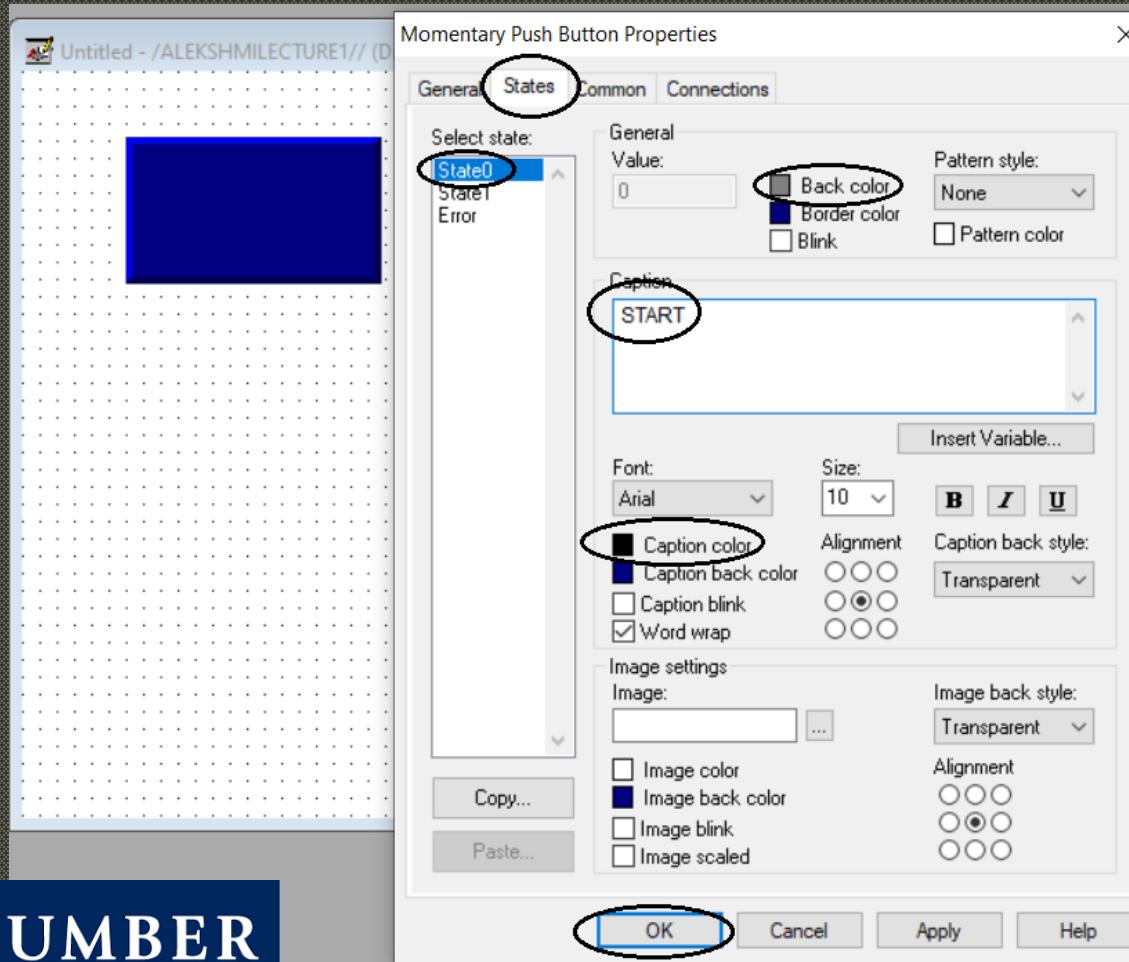
Display Settings:

Adjust the Maximum tag Update Rate to 0.1 seconds and click on OK. Confirm OK



FACTORY TALK VIEW STUDIO SE

- Click on Momentary START push button and drag & drop it to the screen.
- In States START pushbutton: For State 0 and State1: Caption - START
- Back Color – Grey; Caption Color – Black; click on OK.

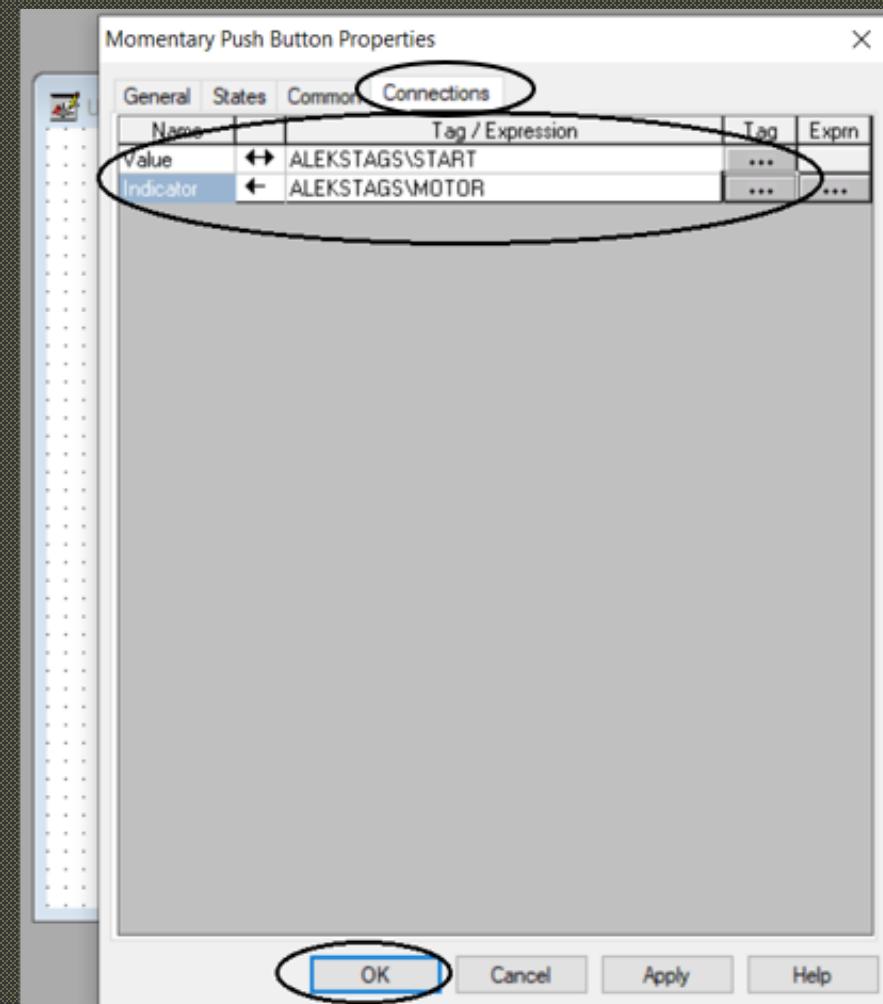


FACTORY TALK VIEW STUDIO SE

In Connections tab:

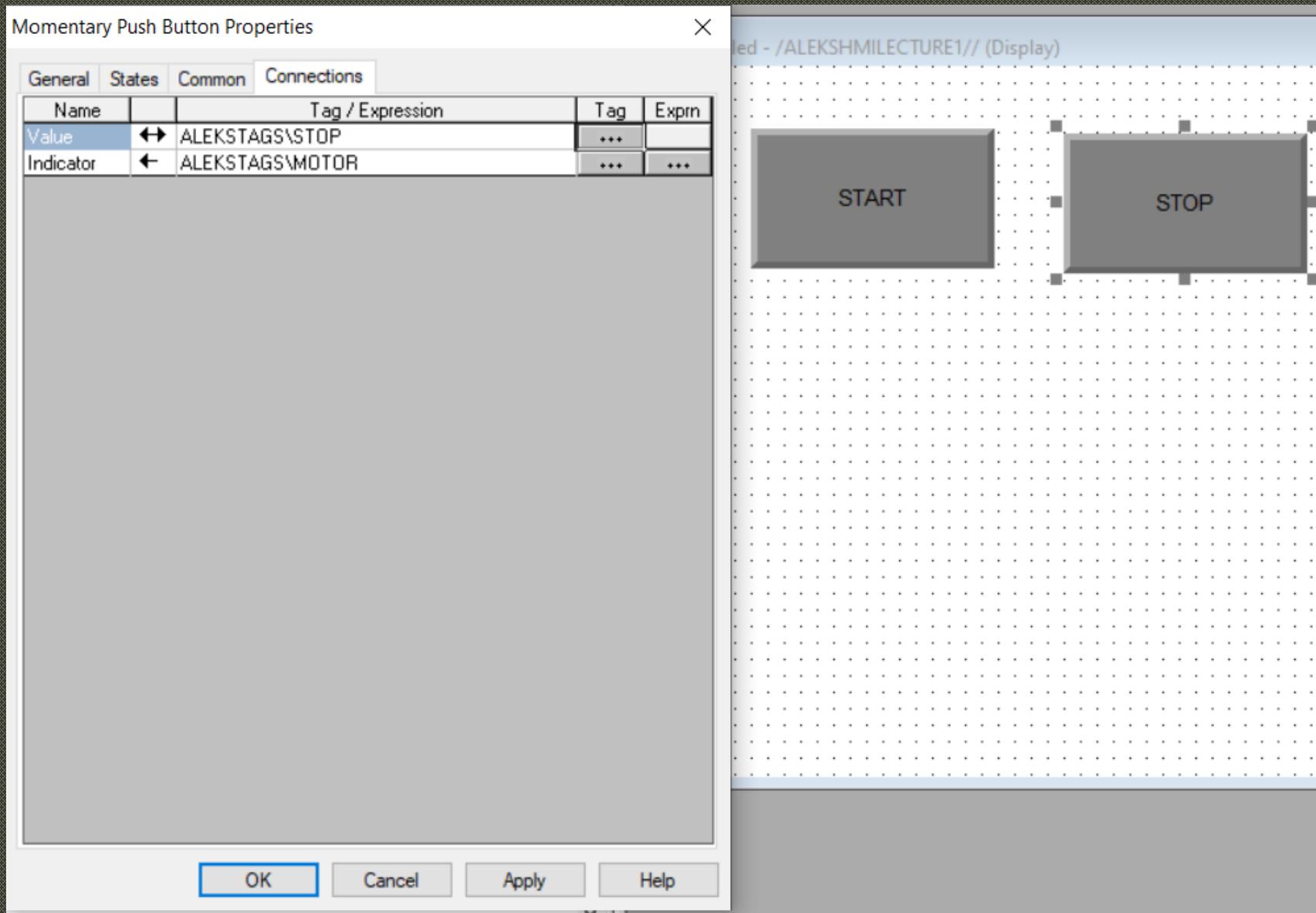
After making sure to Refresh “All Folders” in “ALEKSTAGS” folder, in Connections tab, for Value double click on START tag: for Indicators double click on MOTOR.

Click on OK.



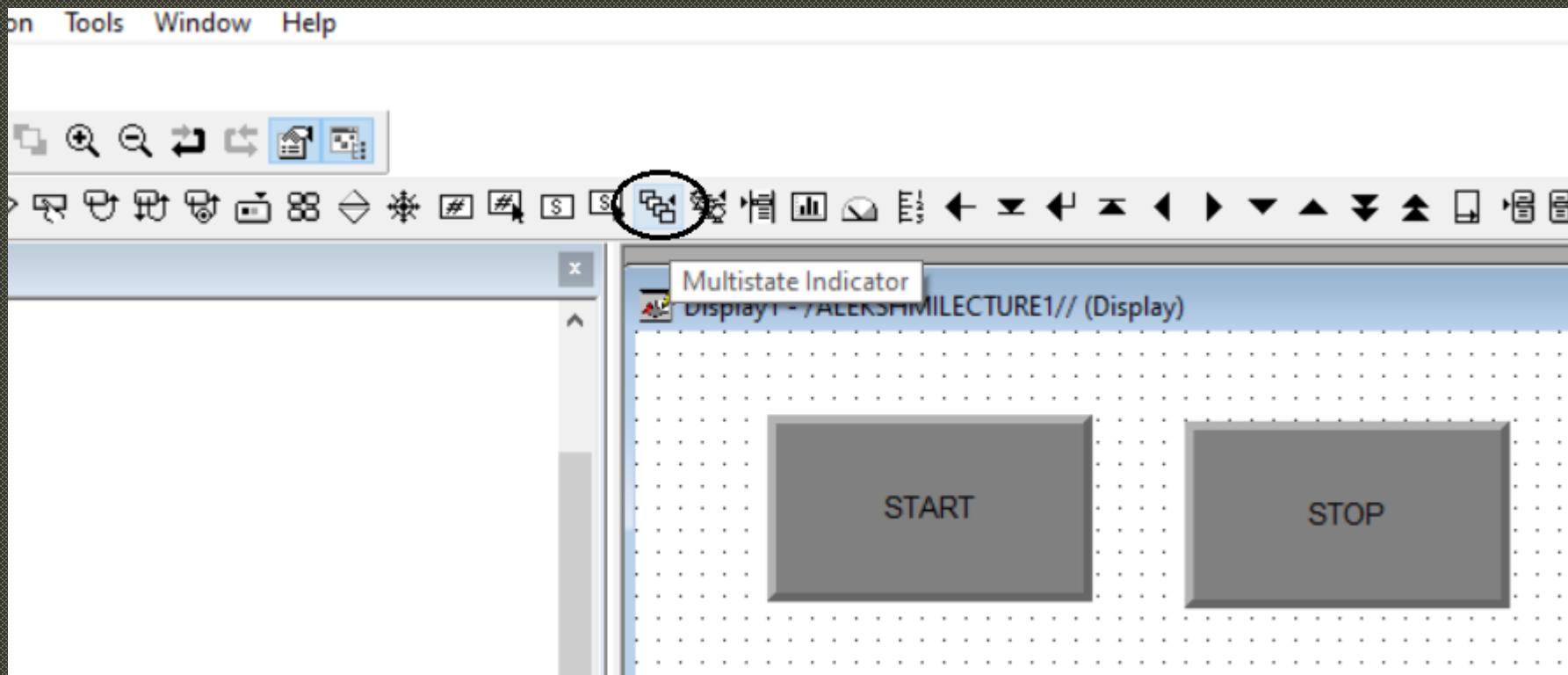
FACTORY TALK VIEW STUDIO SE

STOP pushbutton: In similar way, create the STOP momentary push button.



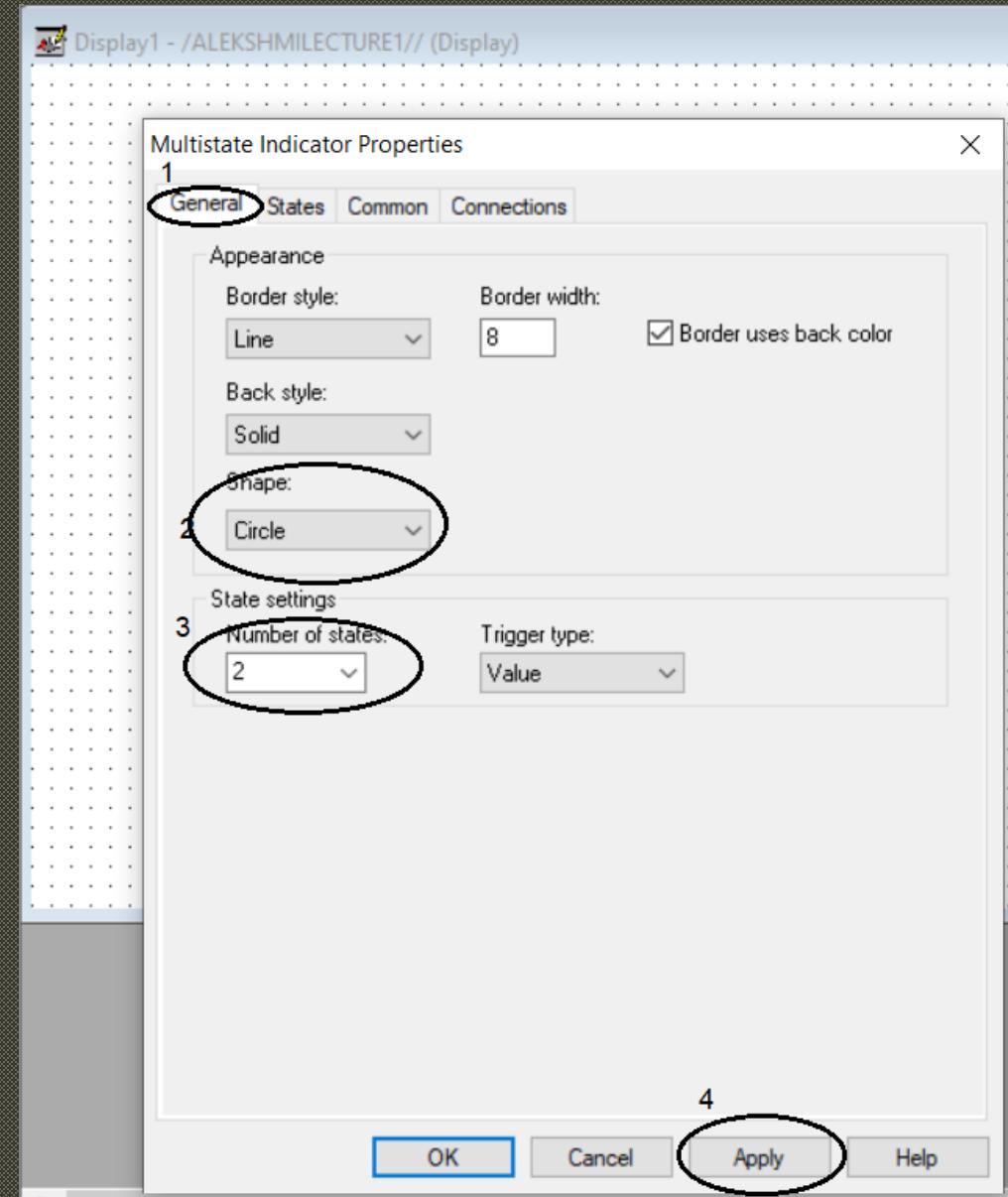
FACTORY TALK VIEW STUDIO SE

Multistate Indicator: Click on Multistate Indicator.



FACTORY TALK VIEW STUDIO SE

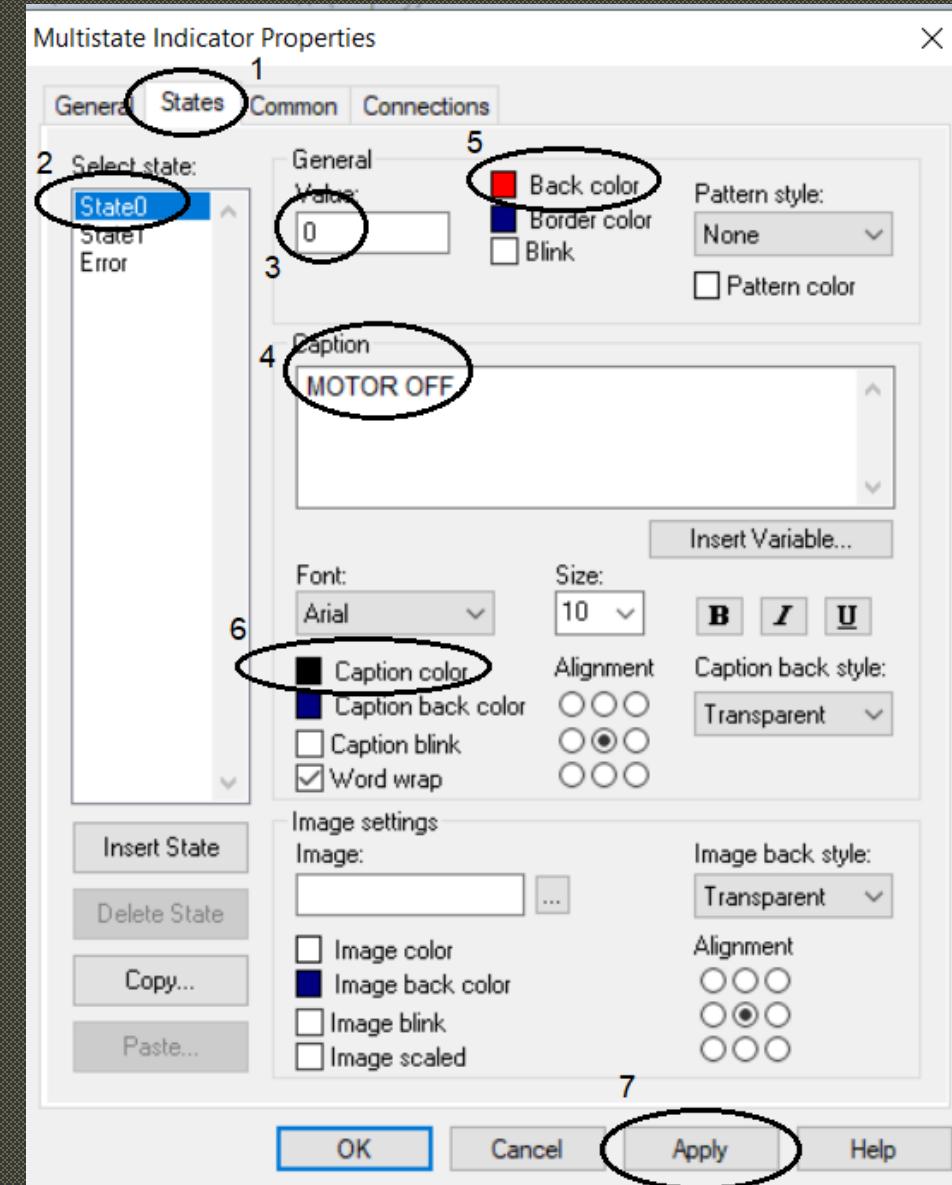
Multistate Indicator:
For General tab, follow the sequence 1-4.



FACTORY TALK VIEW STUDIO SE

Multistate Indicator:

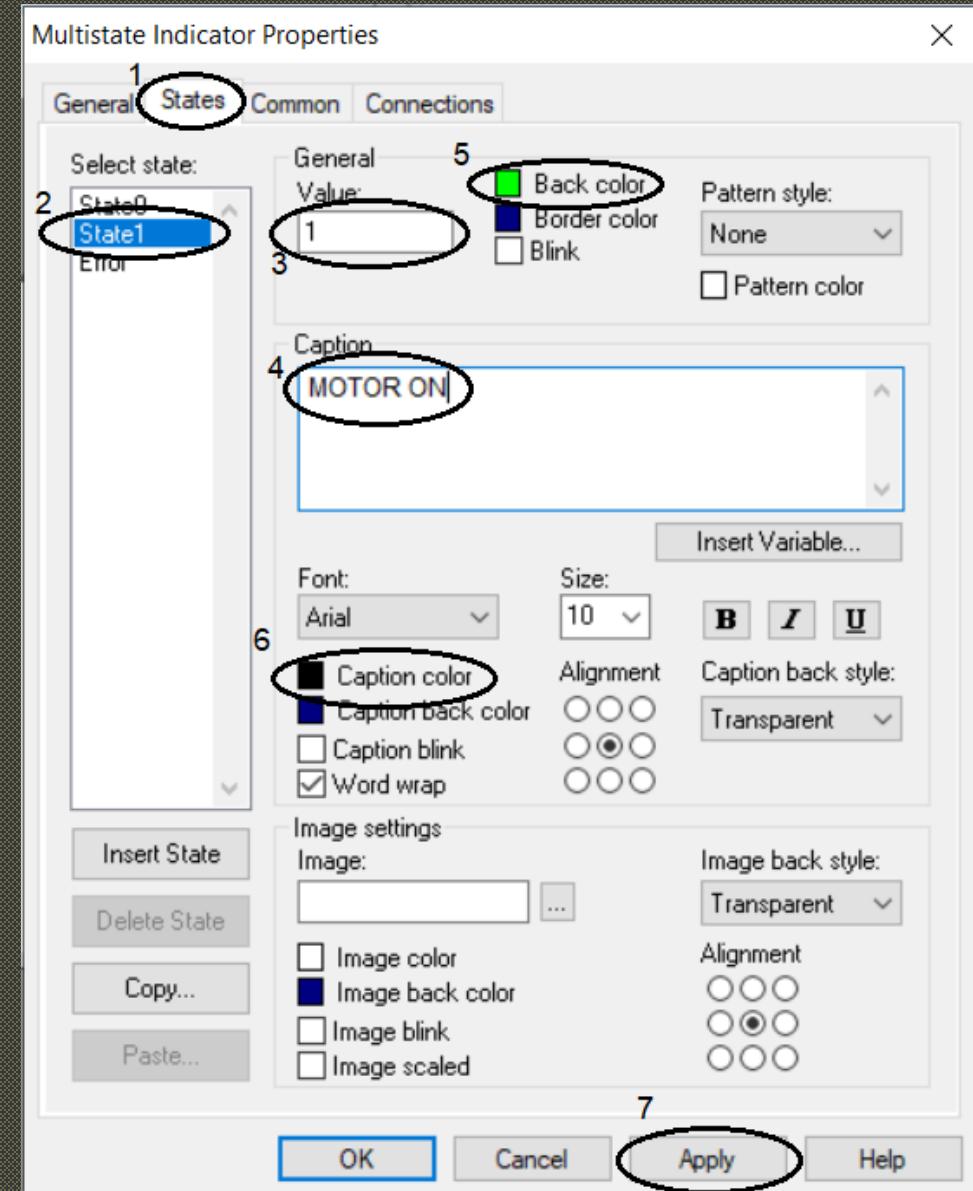
For States tab, for State0, follow the sequence 1-7.



FACTORY TALK VIEW STUDIO SE

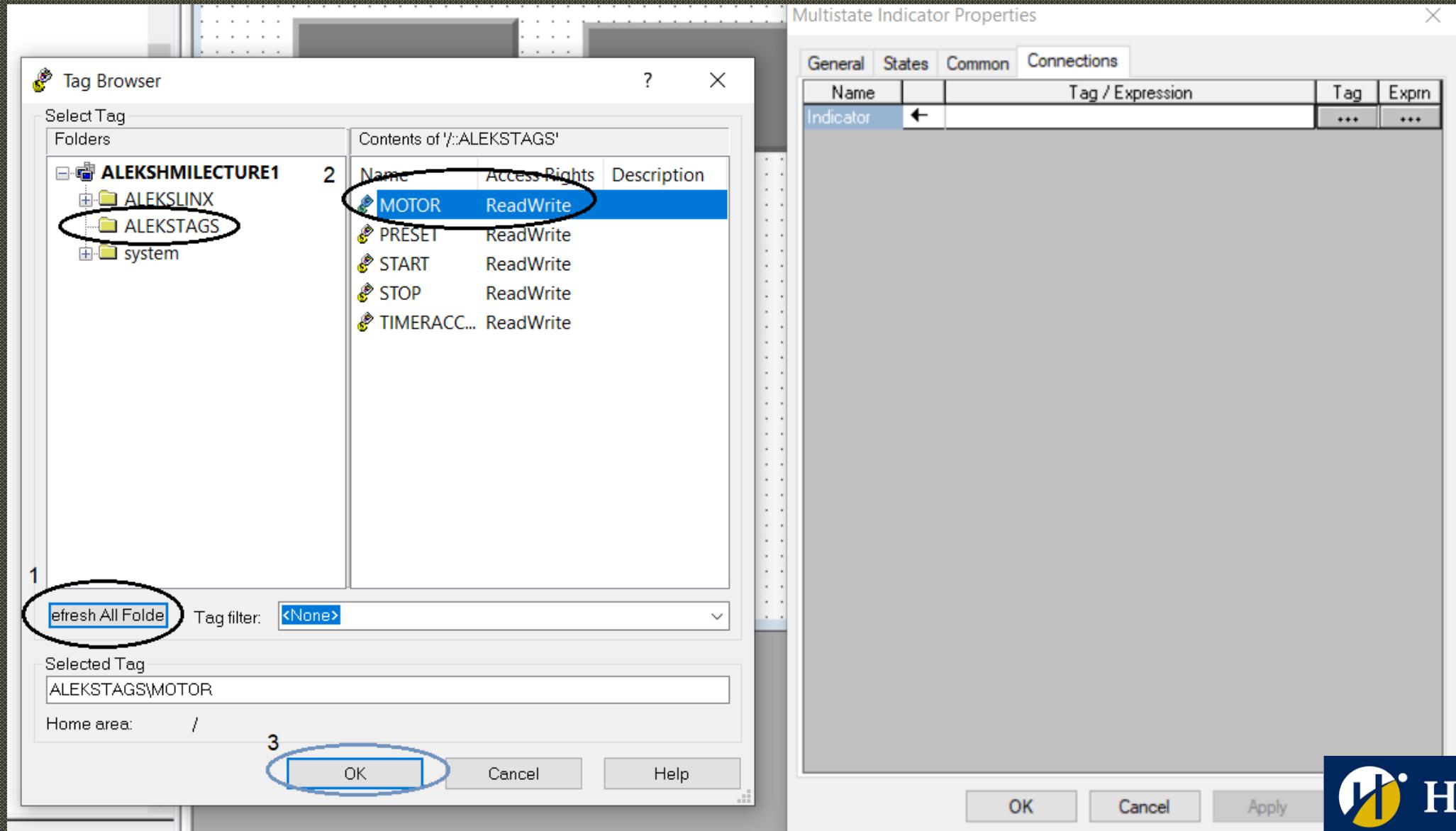
Multistate Indicator:

For States tab, for State1, follow the sequence 1-7

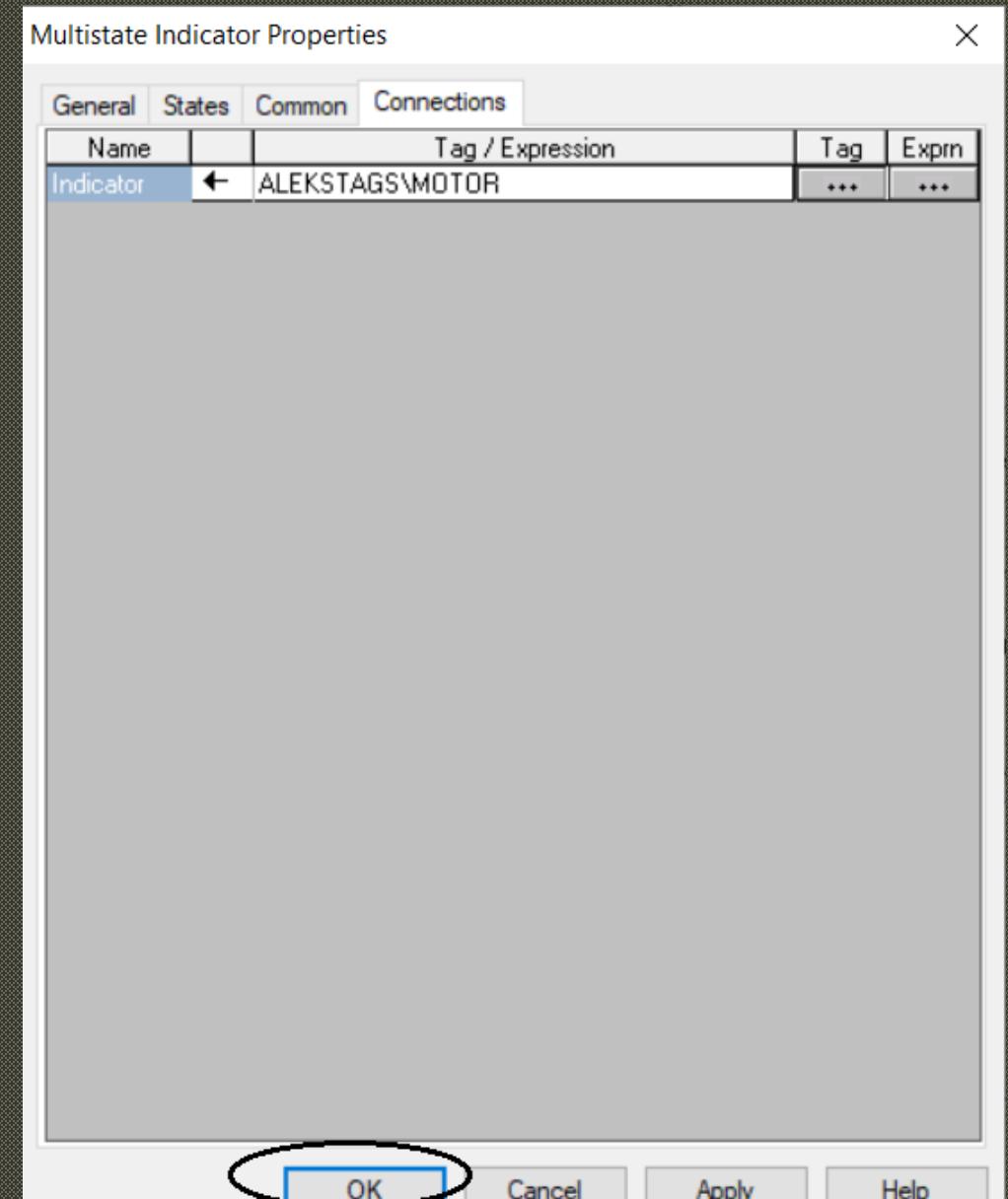


FACTORY TALK VIEW STUDIO SE

Multistate Indicator: For Connections tab, for Indicator, follow the sequence 1-7 from the previous slide.

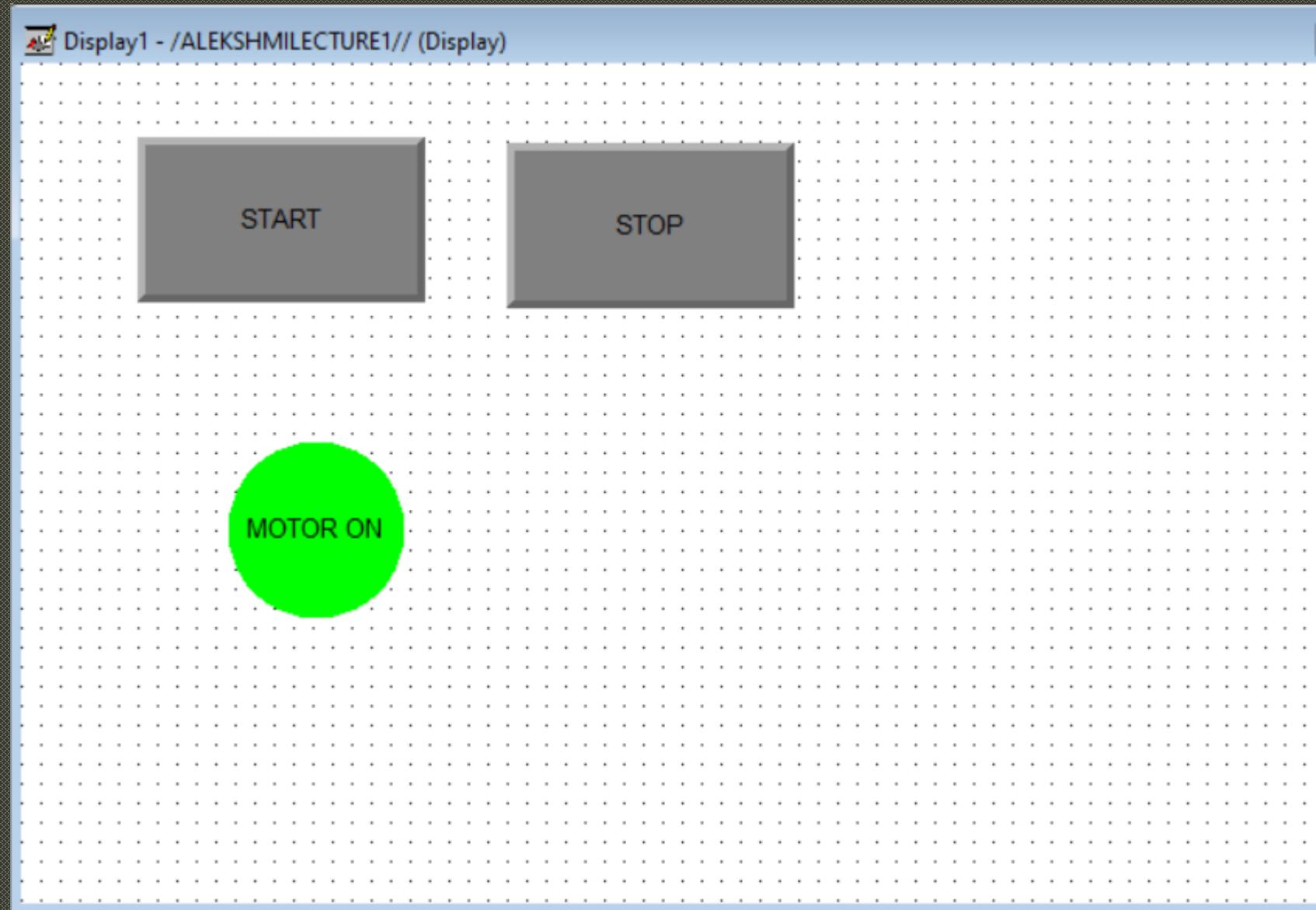


FACTORY TALK VIEW STUDIO SE



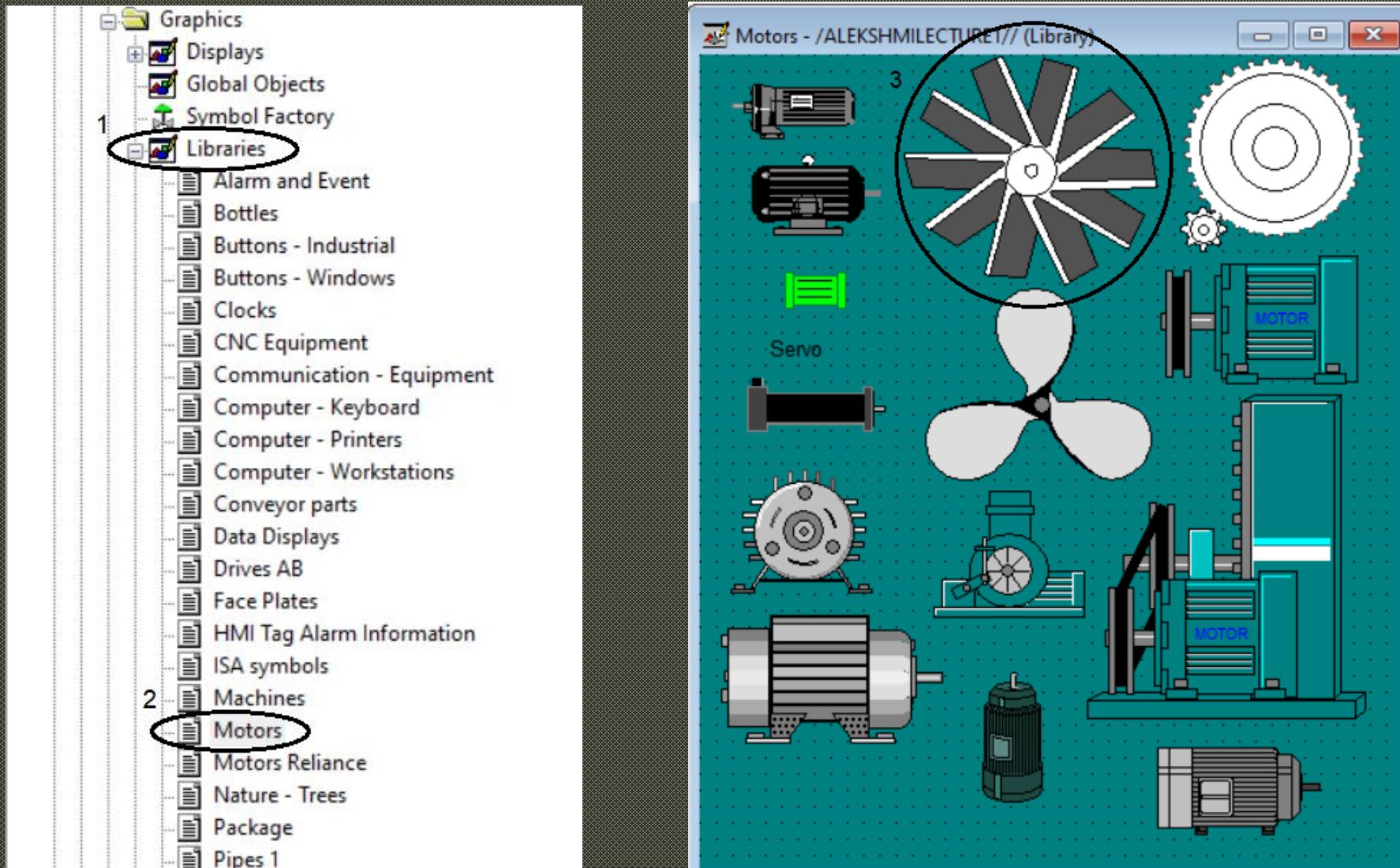
FACTORY TALK VIEW STUDIO SE

Multistate Indicator:
Screen Display



FACTORY TALK VIEW STUDIO SE

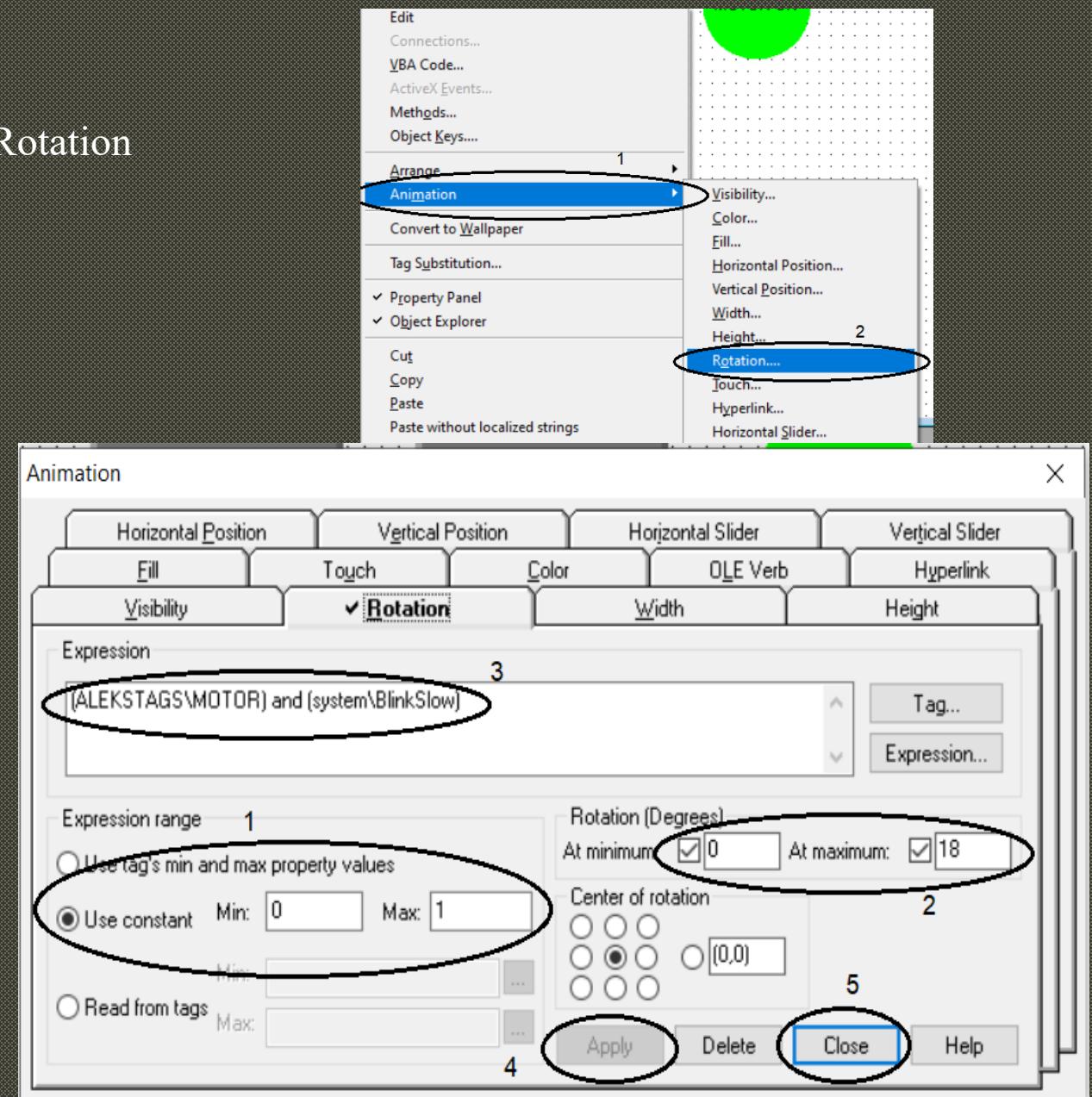
Motor Animation: Expand the Libraries tab as shown below and go to Motors. Then select a motor with the Fan Blades. Copy and paste on the display.



FACTORY TALK VIEW STUDIO SE

Motor Animation Setup:

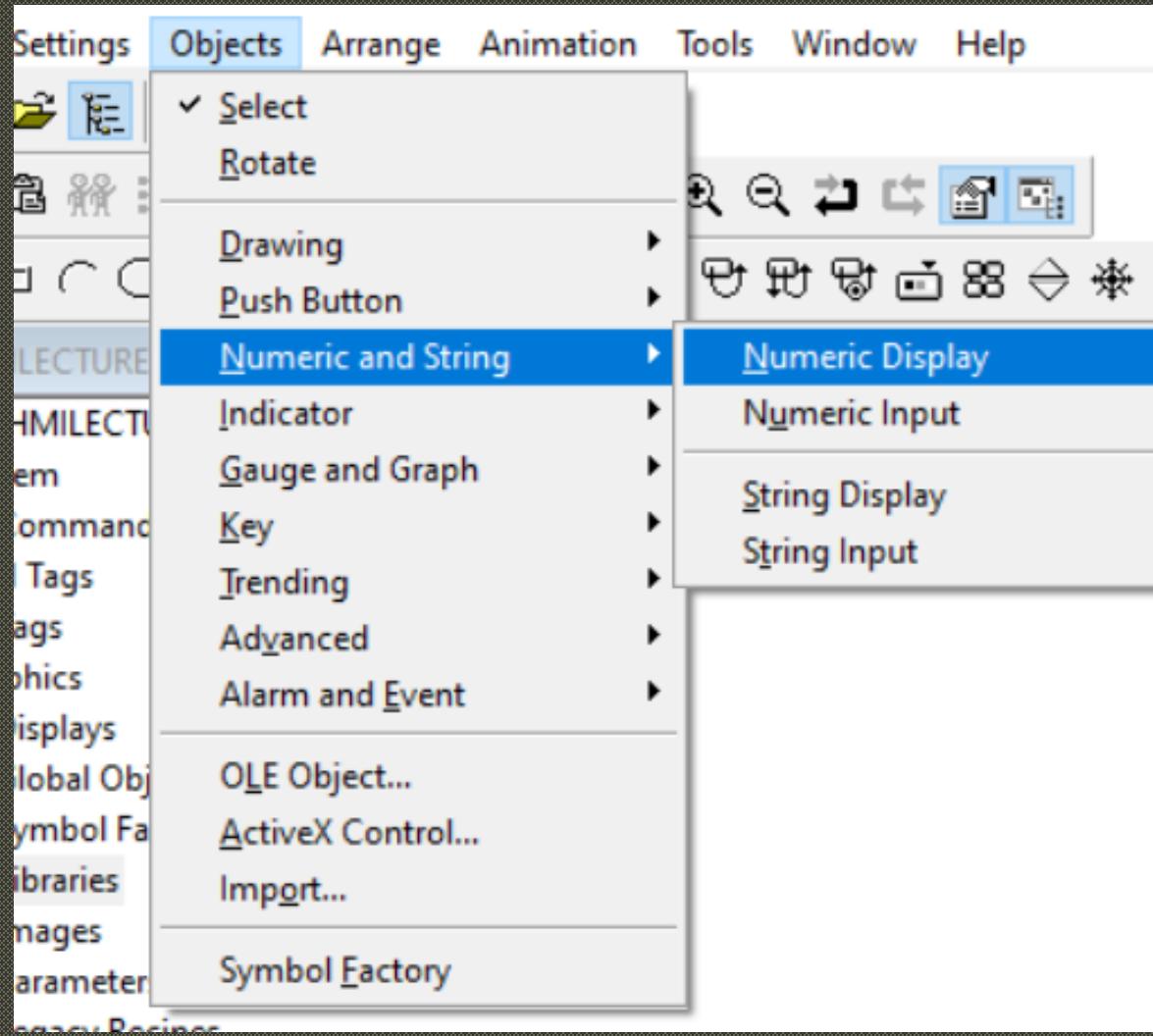
- Right-click the object → Go to Animation → Select Rotation
- Set Expression Range:
 - Use Constant: Min = 0, Max = 1
- Determine Max Rotation Angle:
 - Blades: 10
 - Angle Between Blades: 36°
 - Max Rotation: $36 \div 2 = 18^\circ$
- Configure Expression:
 - Select Tags:
 - MOTOR (to activate fan)
 - BlinkSlow (from system tags, to rotate fan)
- Click Accept to apply changes.



FACTORY TALK VIEW STUDIO SE

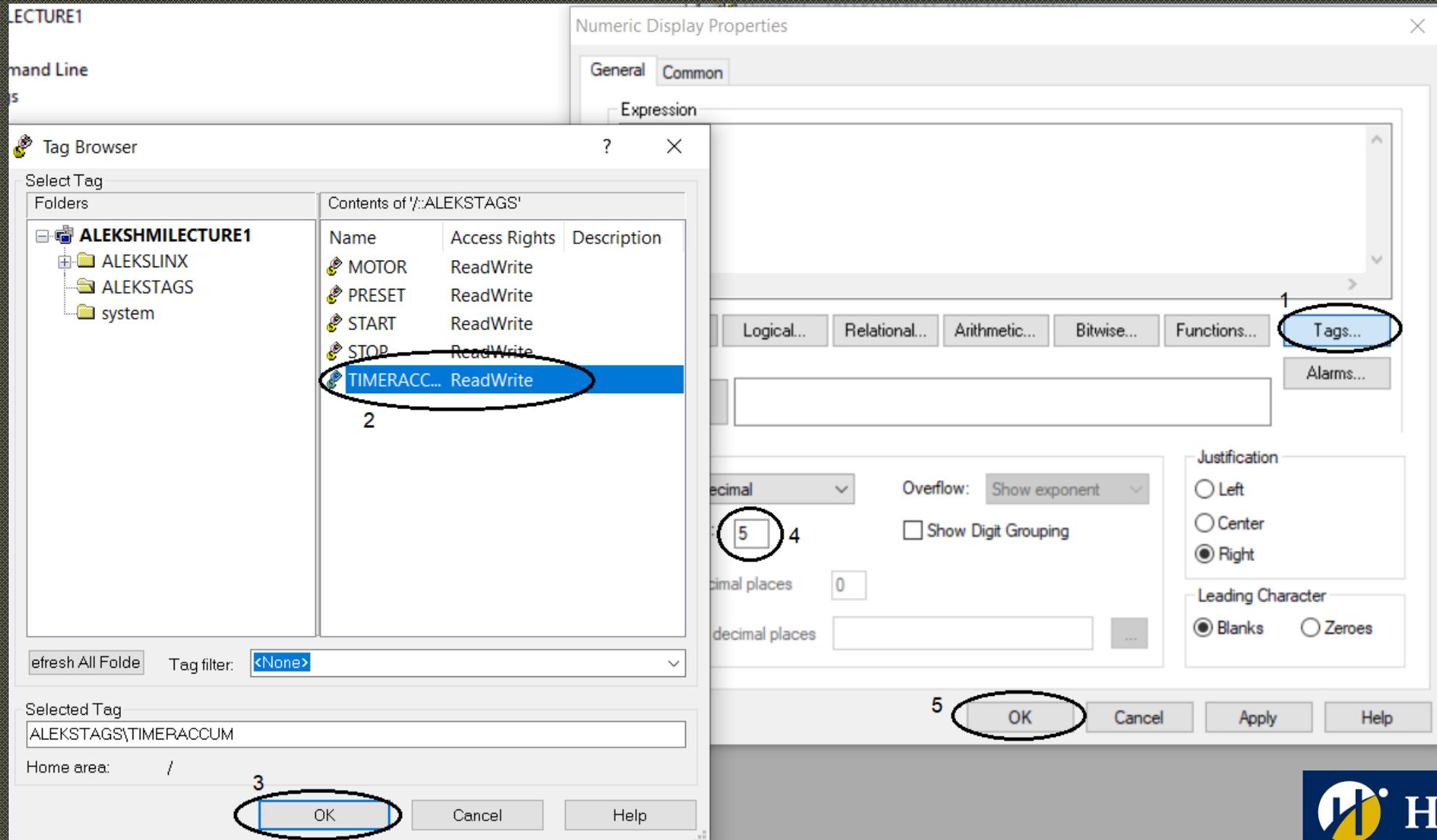
Numeric Display:

- From Objects select Numeric and String
- Select Numeric Display
- Drop to the display



FACTORY TALK VIEW STUDIO SE

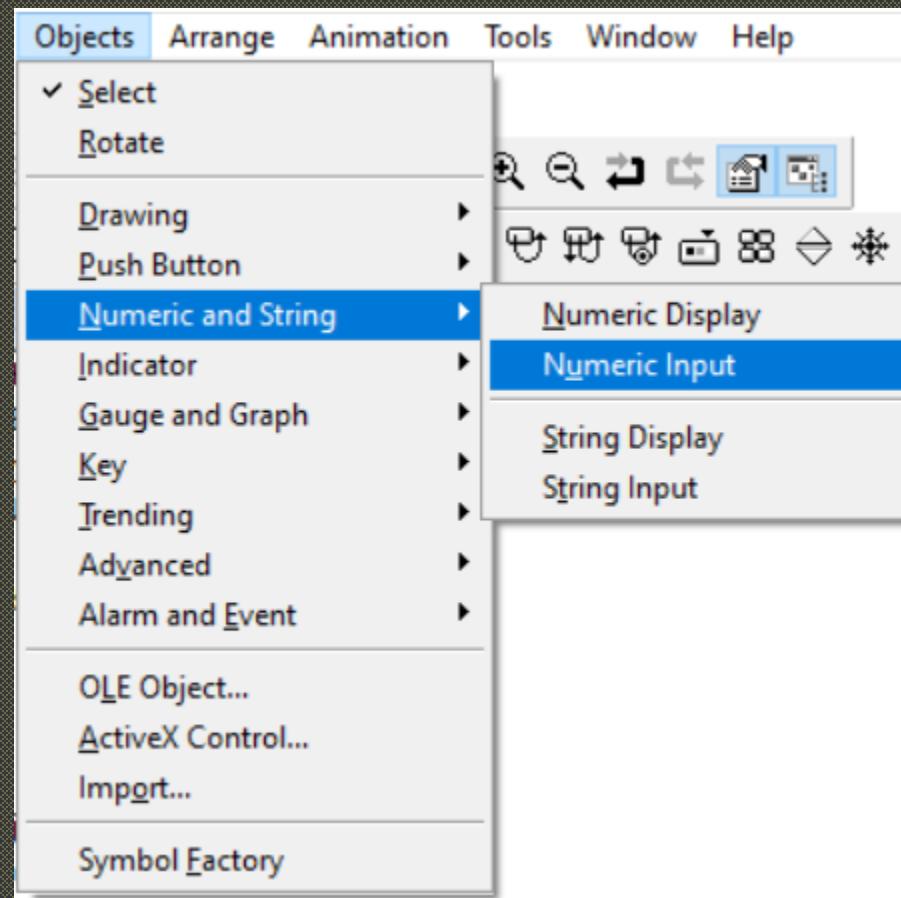
Numeric Display: Follow the sequence 1 - 5.



FACTORY TALK VIEW STUDIO SE

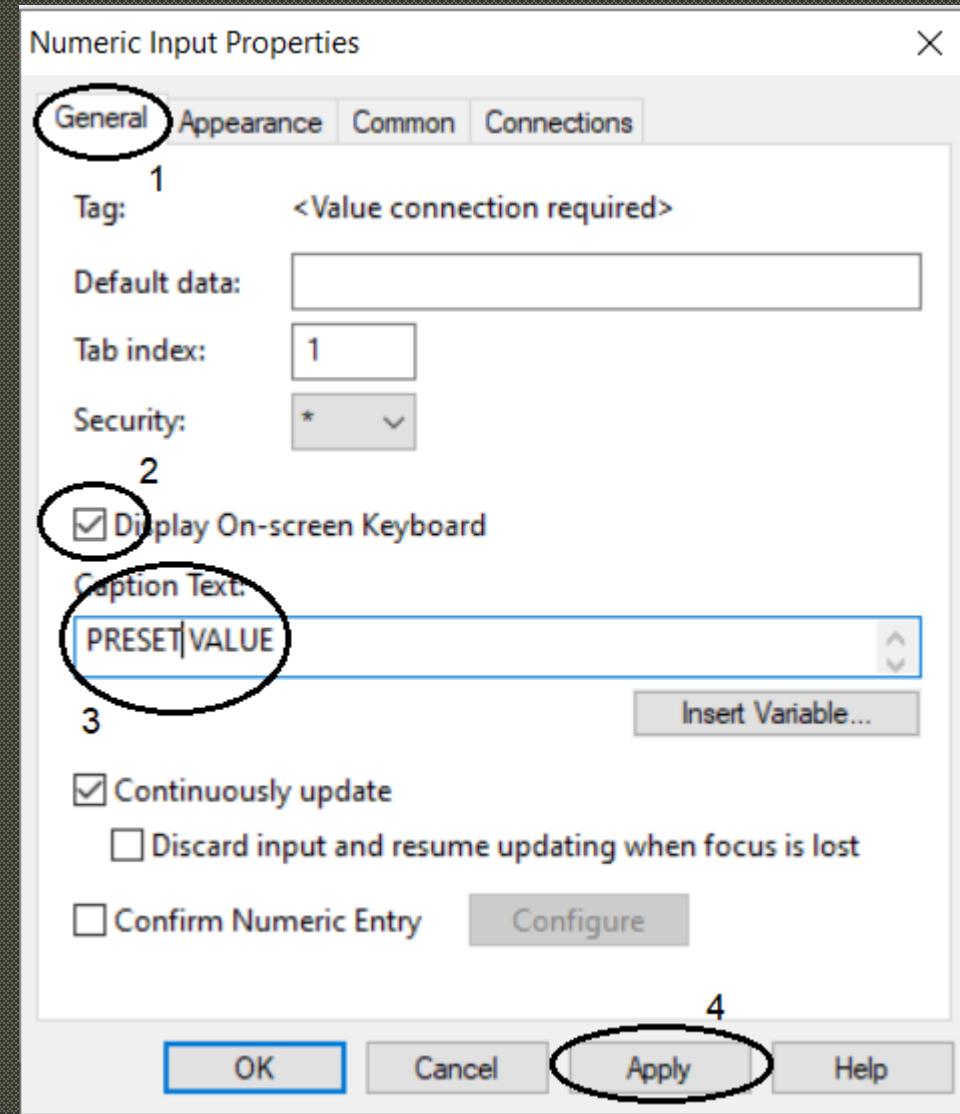
Numeric Input:

- From Objects select Numeric and String
- Numeric Display
- Drop to the display



FACTORY TALK VIEW STUDIO SE

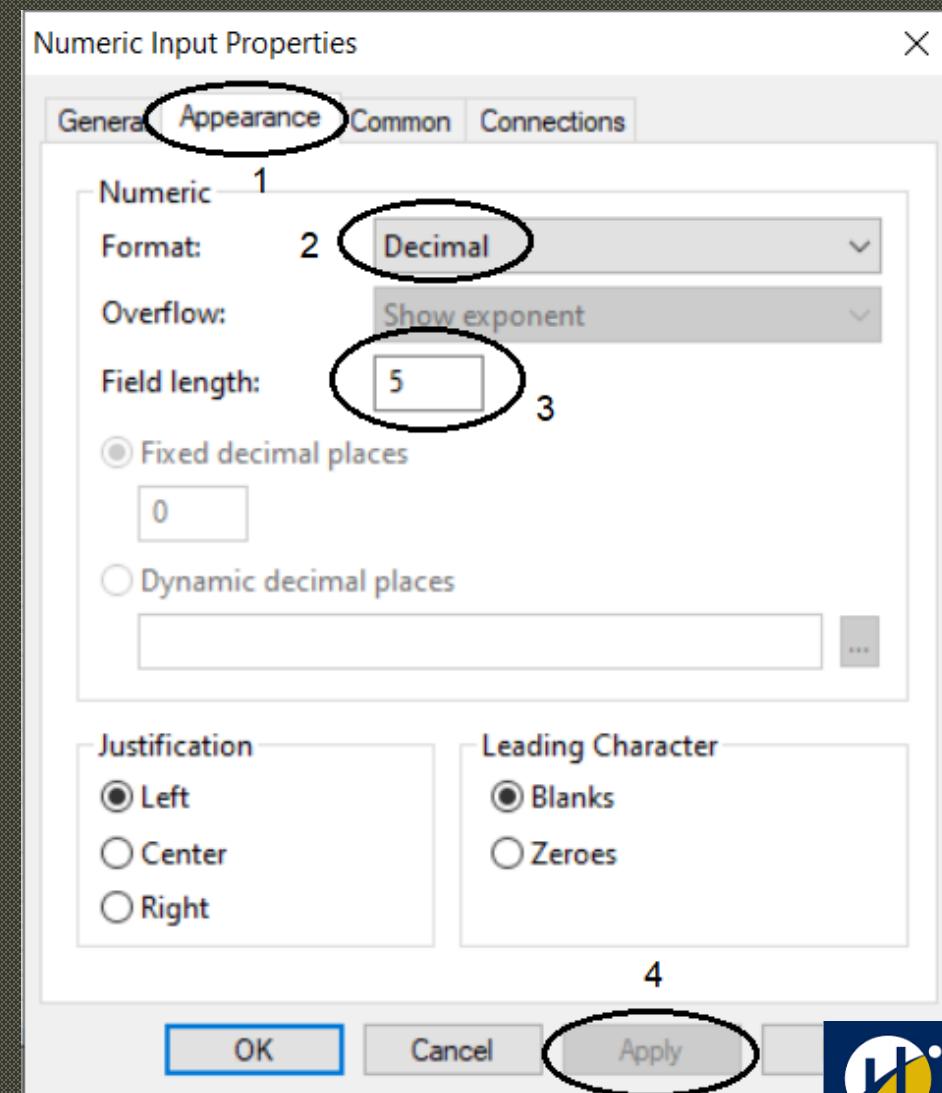
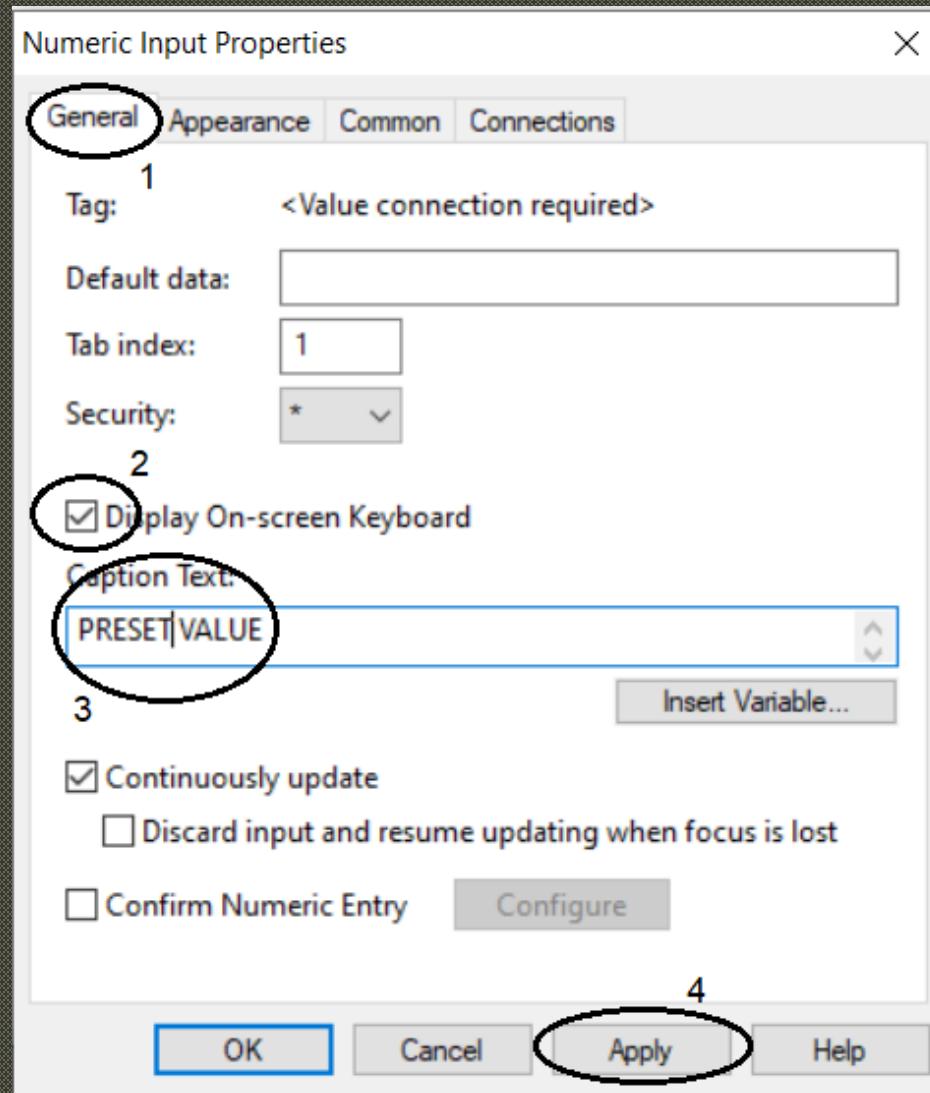
Numeric Input:
Follow the sequence 1 – 4



FACTORY TALK VIEW STUDIO SE

Numeric Input:

Follow the sequence 1 – 4



FACTORY TALK VIEW STUDIO SE

Numeric Input: Follow the sequence 1 – 5

The screenshot illustrates the configuration of a numeric input tag in FactoryTalk View Studio SE. It consists of two main windows:

- Tag Browser (Left Window):** Shows the "Select Tag" interface. A folder tree on the left includes "ALEKSHMILECTURE1", "ALEKSLINX", "ALEKTAGS", and "system". The "ALEKTAGS" folder is expanded, displaying a list of tags:

Name	Access Rights	Description
MOTOR	ReadWrite	
PRESET	ReadWrite	
START	ReadWrite	
STOP	ReadWrite	
TIMERACC...	ReadWrite	

A blue oval labeled "3" highlights the "PRESET" tag. Below the list are buttons for "Refresh All Folders" and "Tag filter: <None>".

Selected Tag: ALEKTAGS\PRESET

Home area: /
- Numeric Input Properties Dialog (Right Window):** Shows the "Connections" tab of the properties dialog. It lists three connections:

Name	Tag / Expression	Tag	Exprn
1	↔
2	←
3	←

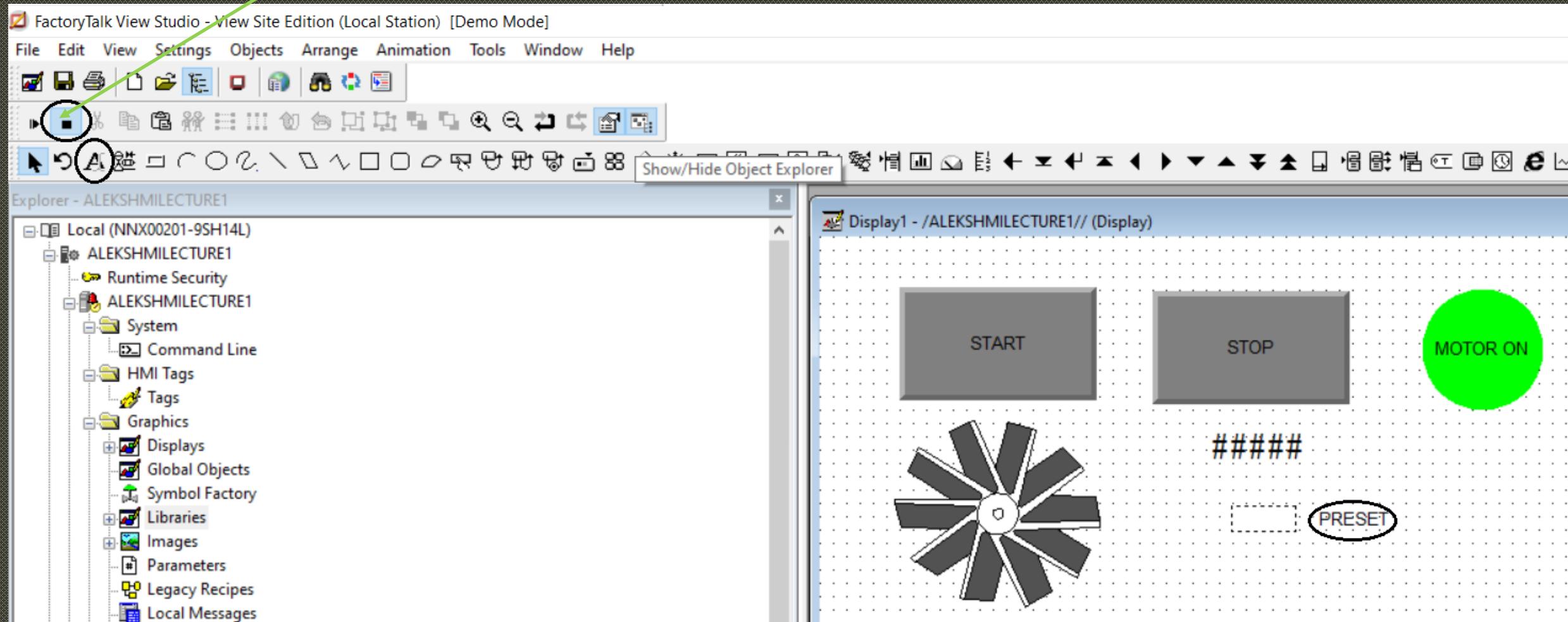
A blue oval labeled "2" highlights the second connection row. The "Connections" tab is circled in red.

Numbered callouts indicate the steps:

- 1: Circles the "Connections" tab in the properties dialog.
- 2: Circles the second connection row in the properties dialog.
- 3: Circles the "PRESET" tag in the Tag Browser.
- 4: Circles the "OK" button in the Tag Browser.
- 5: Circles the "OK" button in the properties dialog.

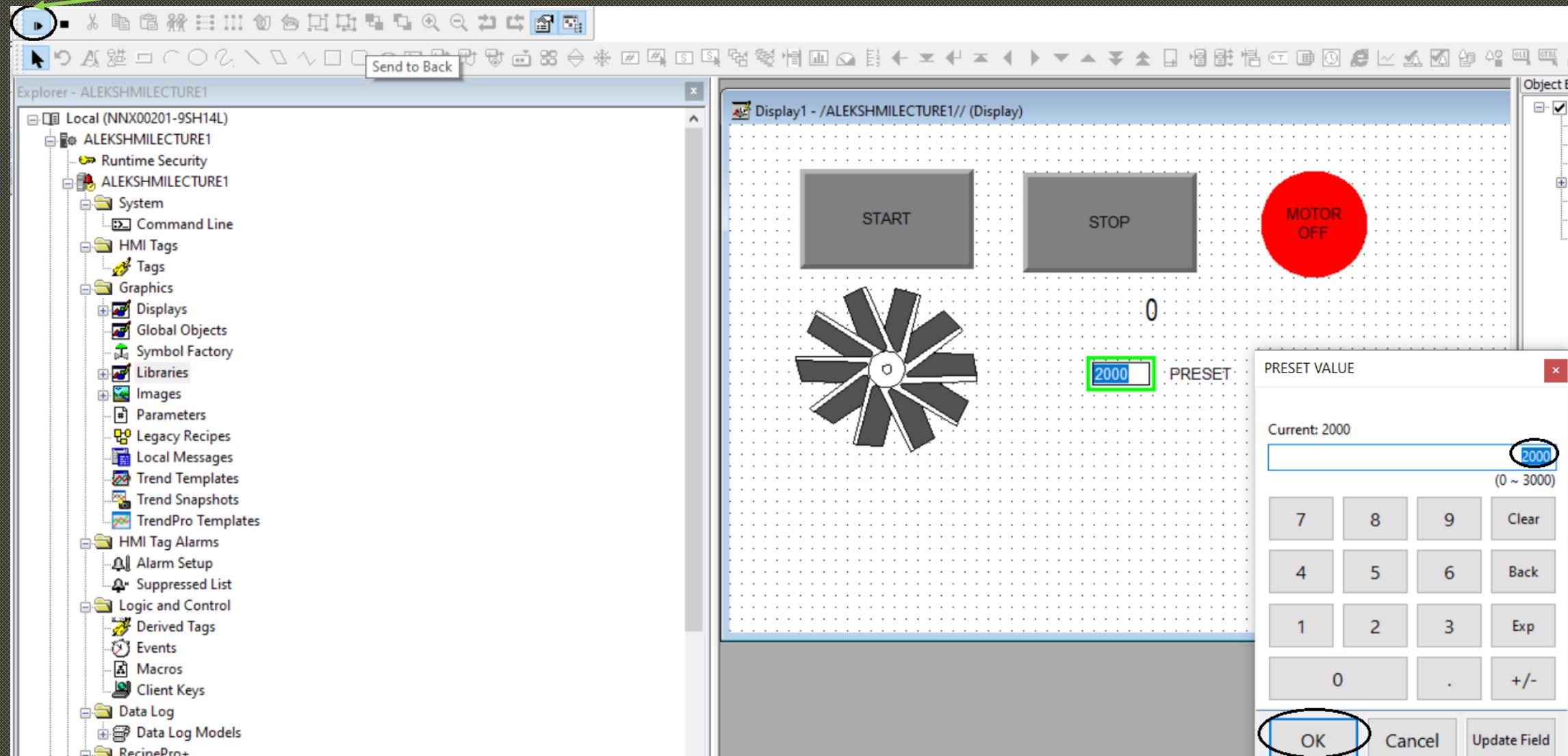
FACTORY TALK VIEW STUDIO SE

Numeric Input: Offline mode



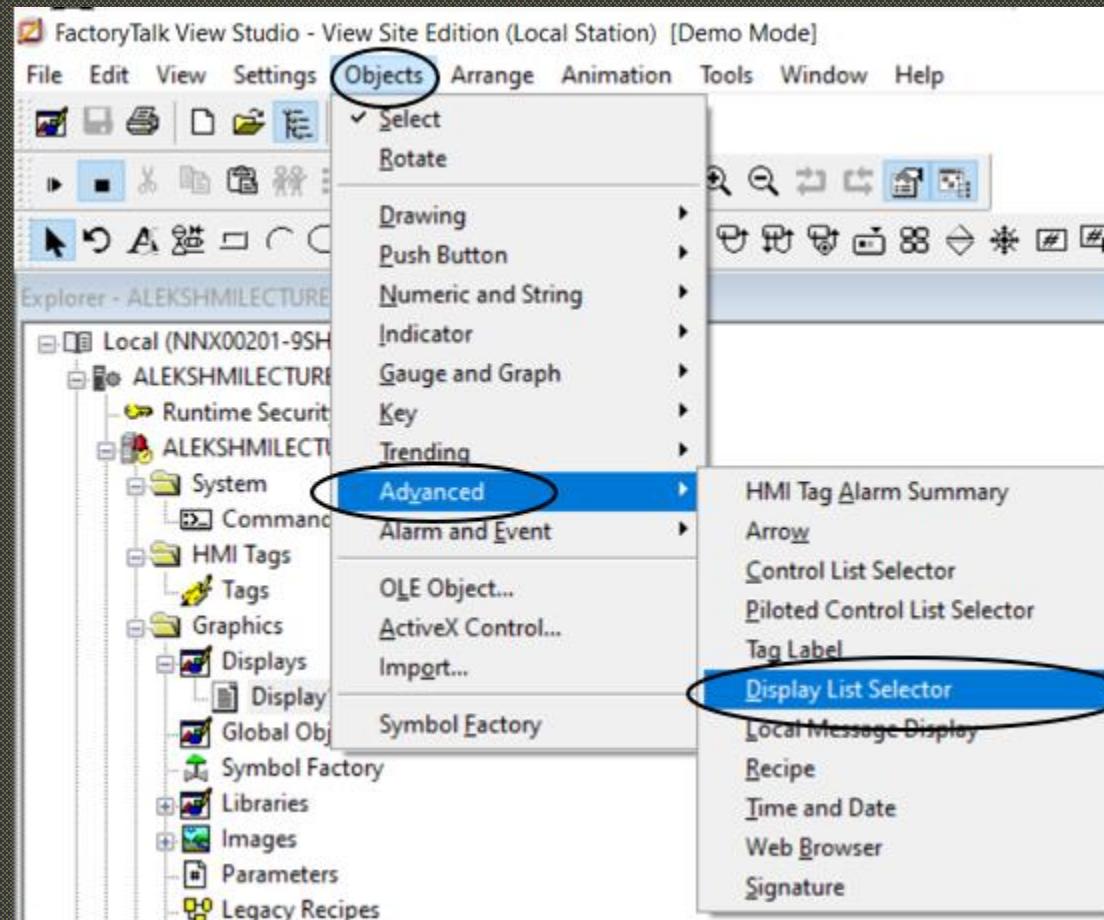
FACTORY TALK VIEW STUDIO SE

Numeric Input: Run mode.



FACTORY TALK VIEW STUDIO SE

Display Selector: Select the Display and Caption for each State.



FACTORY TALK VIEW STUDIO SE

Display Selector: Select the Display and Caption for each State. For the State0, select Display1.
Use display name MOTOR SCREEN.

Display List Selector Properties

- General** **States** **Common**

Appearance

Border style:	RaisedInset	Border width:	8	<input checked="" type="checkbox"/> Border uses back color
Back style:	Solid	Pattern style:	None	<input type="checkbox"/> Back color <input type="checkbox"/> Border color <input type="checkbox"/> Pattern color <input type="checkbox"/> Selection back color <input type="checkbox"/> Selection fore color <input type="checkbox"/> Blink

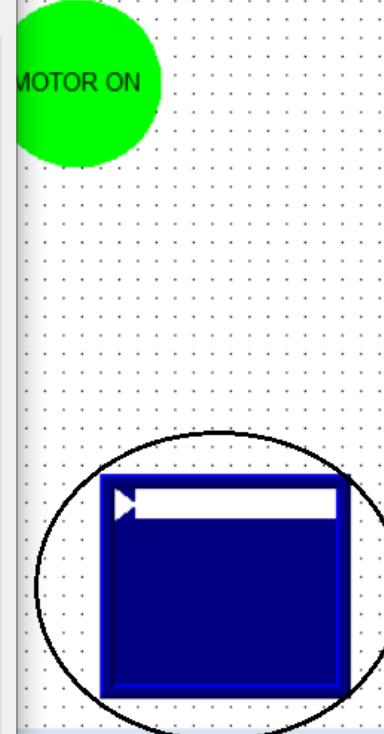
Text

Font:	Arial	Size:	10	<input type="checkbox"/> Use display name
B I U				<input type="radio"/> Word <input type="radio"/> Character

Number of states

Other

<input checked="" type="checkbox"/> Key navigation	<input checked="" type="checkbox"/> Wrap around	Tab index:	2
--	---	------------	---



Display List Selector Properties

- General** **States** **Common**

Select state:

- State0** **State1**

Display Settings

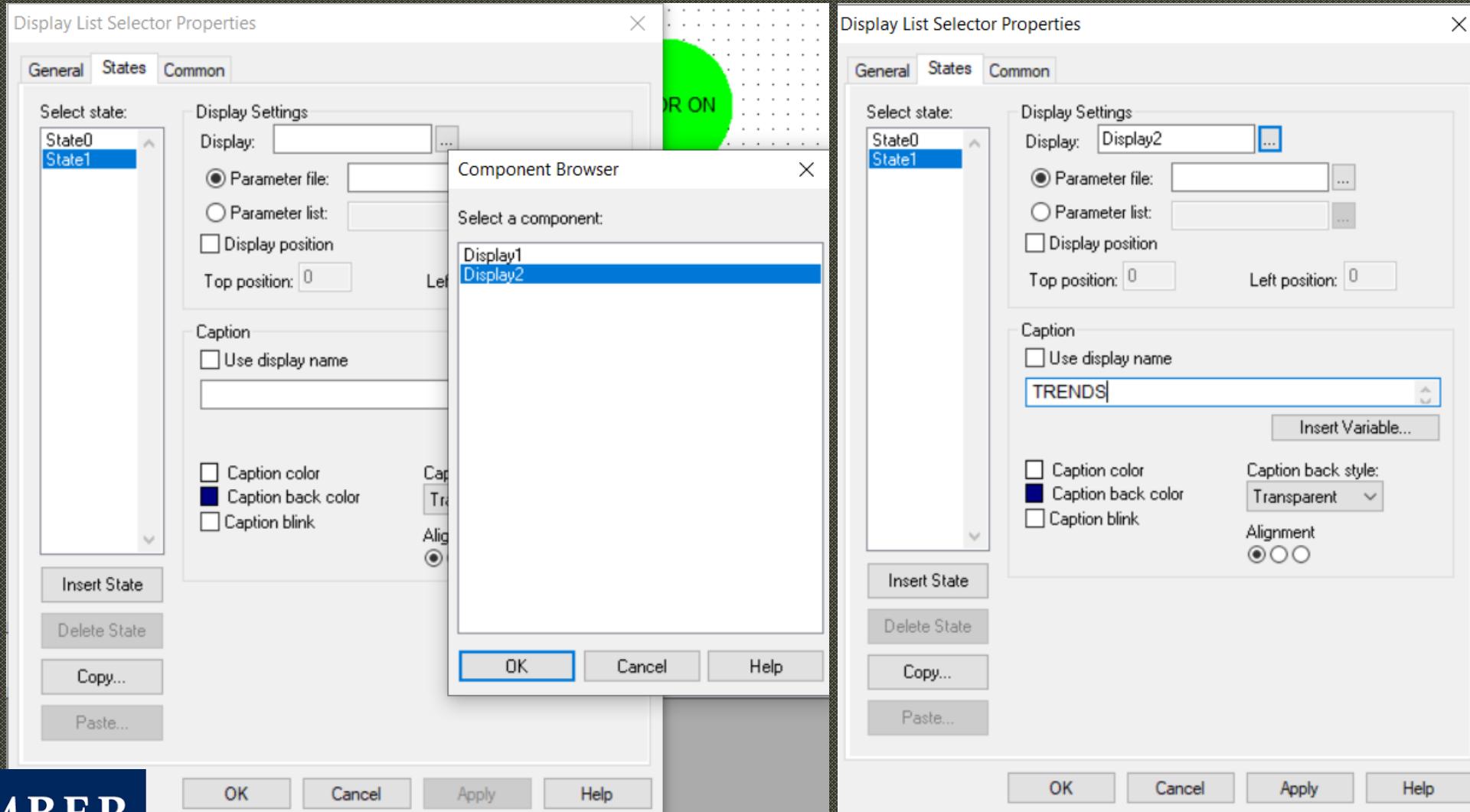
Display:	Display1	<input style="width: 20px; height: 20px;" type="button" value="..."/>
<input type="radio"/> Parameter file:	<input type="text"/>	<input style="width: 20px; height: 20px;" type="button" value="..."/>
<input type="radio"/> Parameter list:	<input type="text"/>	<input style="width: 20px; height: 20px;" type="button" value="..."/>
<input type="checkbox"/> Display position	Top position: 0	Left position: 0

Caption

<input type="checkbox"/> Use display name	<input style="width: 150px;" type="text" value="MOTOR SCREEN"/>	<input style="width: 20px; height: 20px;" type="button" value="Insert Variable..."/>
<input type="checkbox"/> Caption color	<input type="checkbox"/> Caption back color	<input type="checkbox"/> Caption blink
		Caption back style: Transparent
		Alignment: <input type="radio"/> <input type="radio"/> <input type="radio"/>

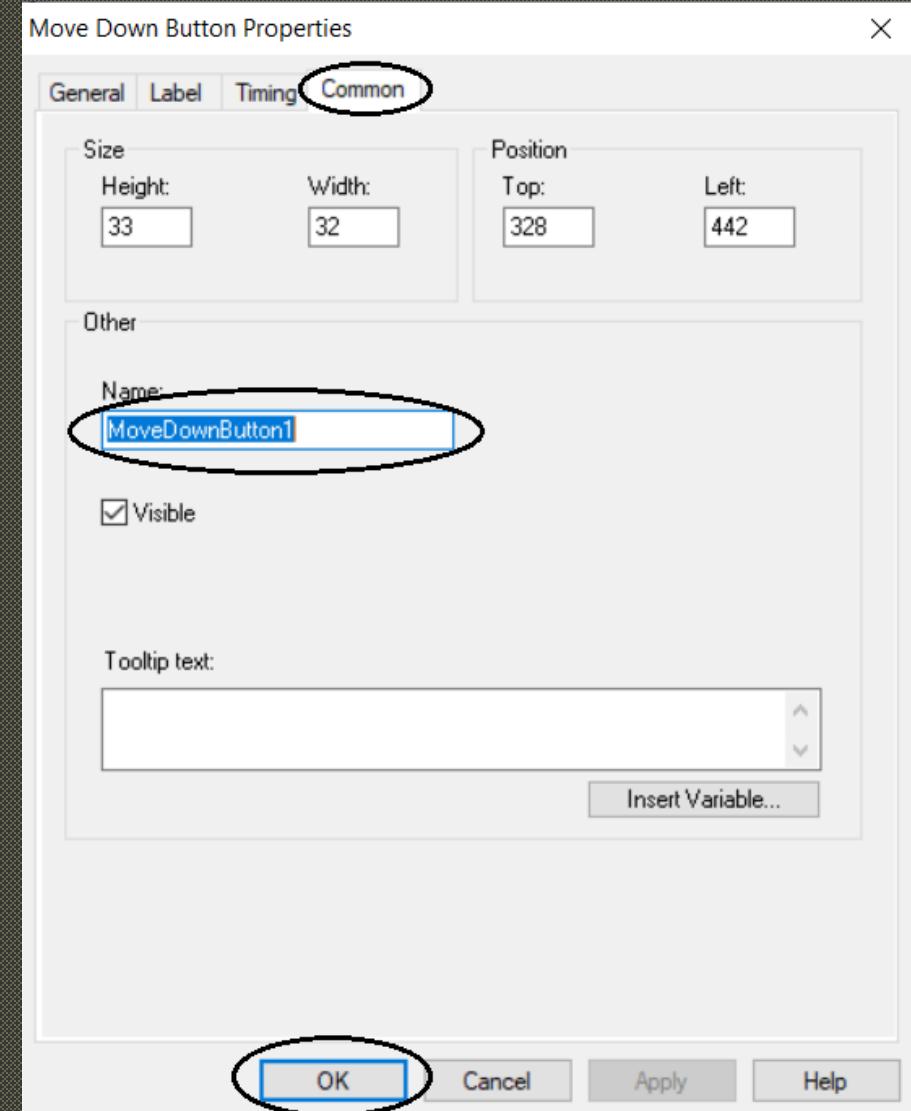
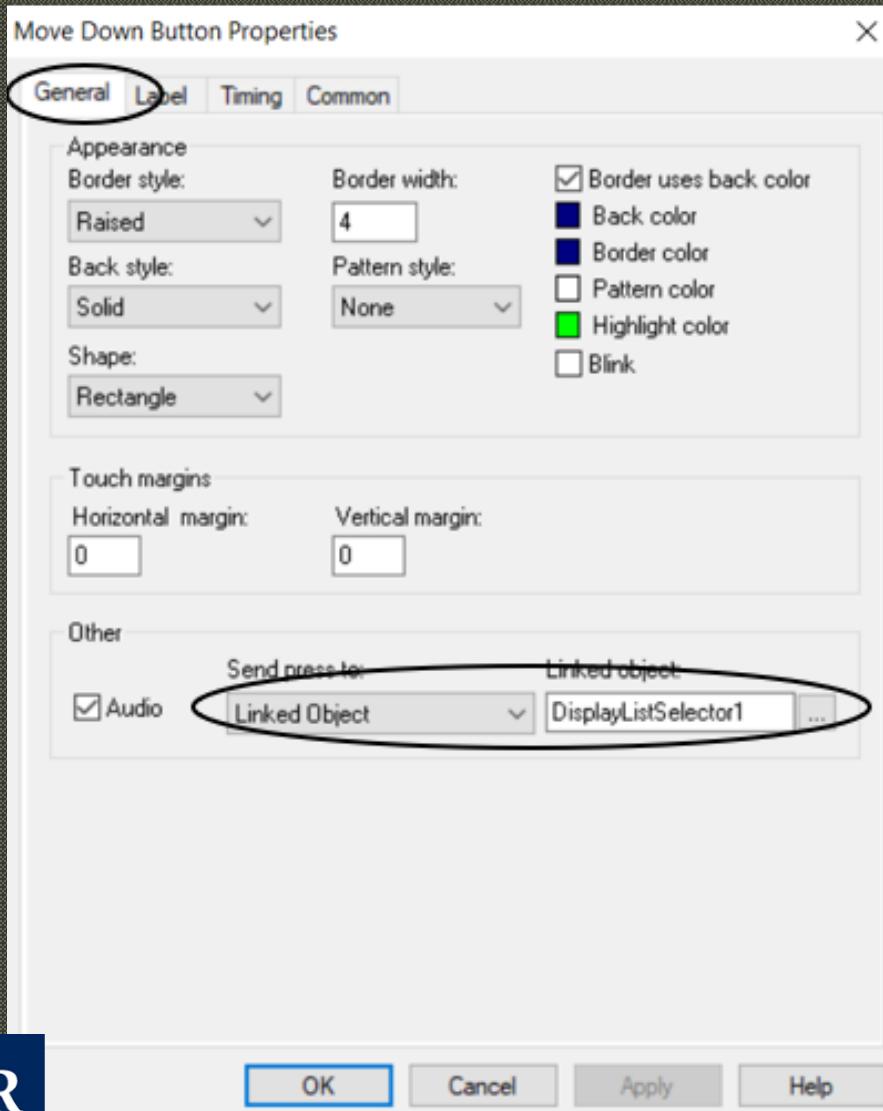
FACTORY TALK VIEW STUDIO SE

Display Selector: Create another Display2 with same settings as for the Display1.
Go back to the Display1 and select Display2 for the Display settings for the State1.



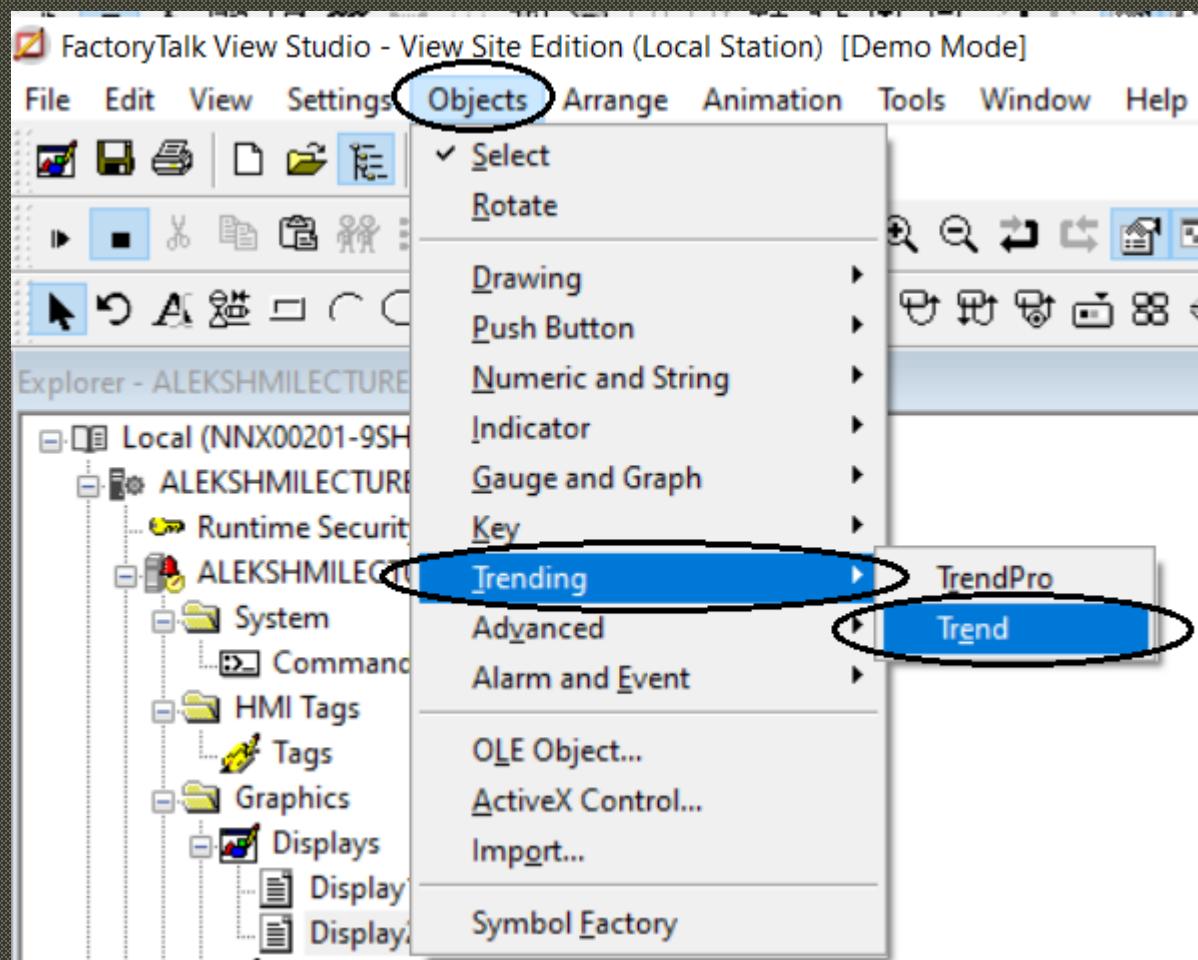
FACTORY TALK VIEW STUDIO SE

Display Selector: Create the scroll UP, DOWN and ENTER buttons linked to the object.
Copy created objects and paste to the Display2.



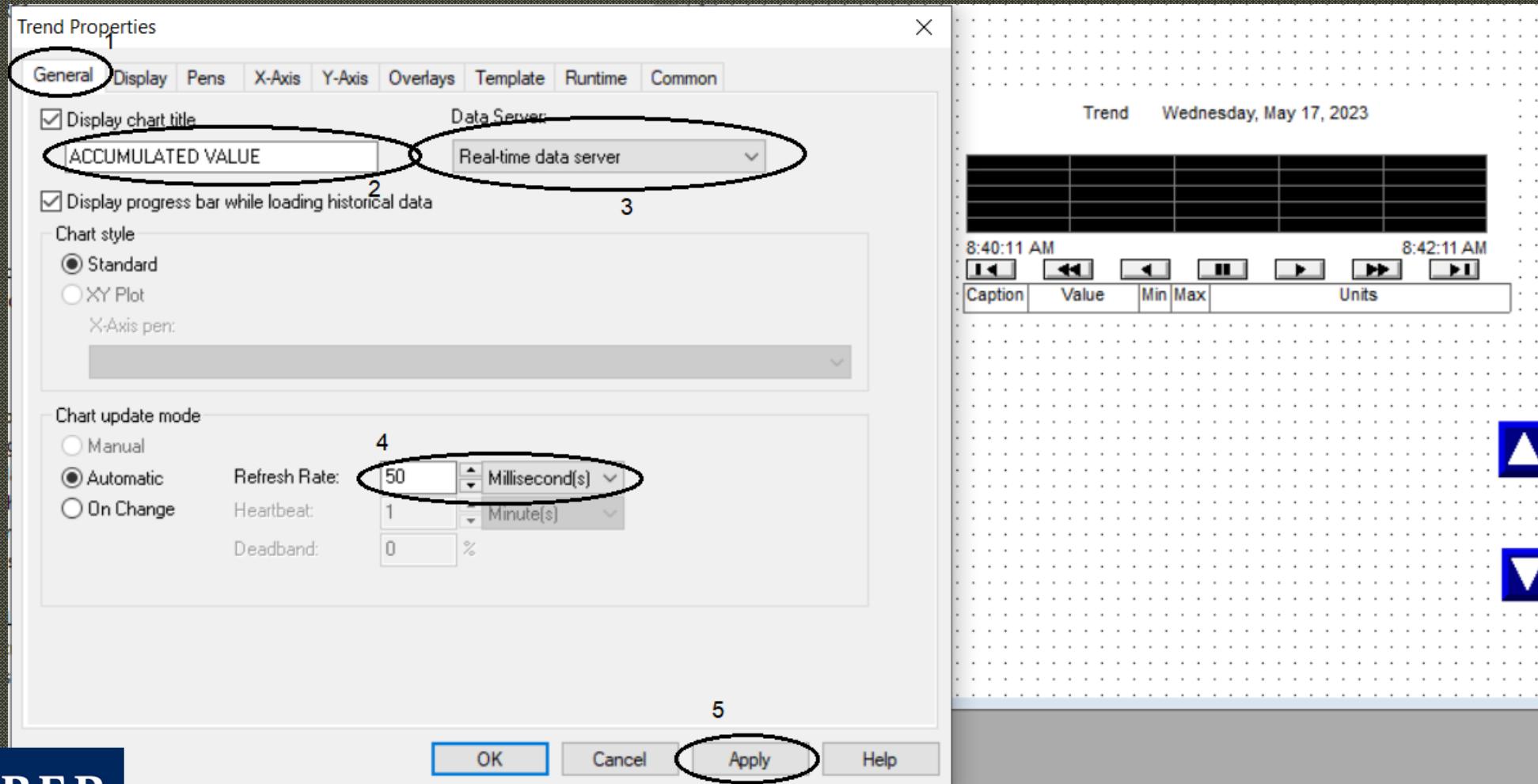
FACTORY TALK VIEW STUDIO SE

Real-time Trend: For Display2, from Objects, select Trending, Trend.



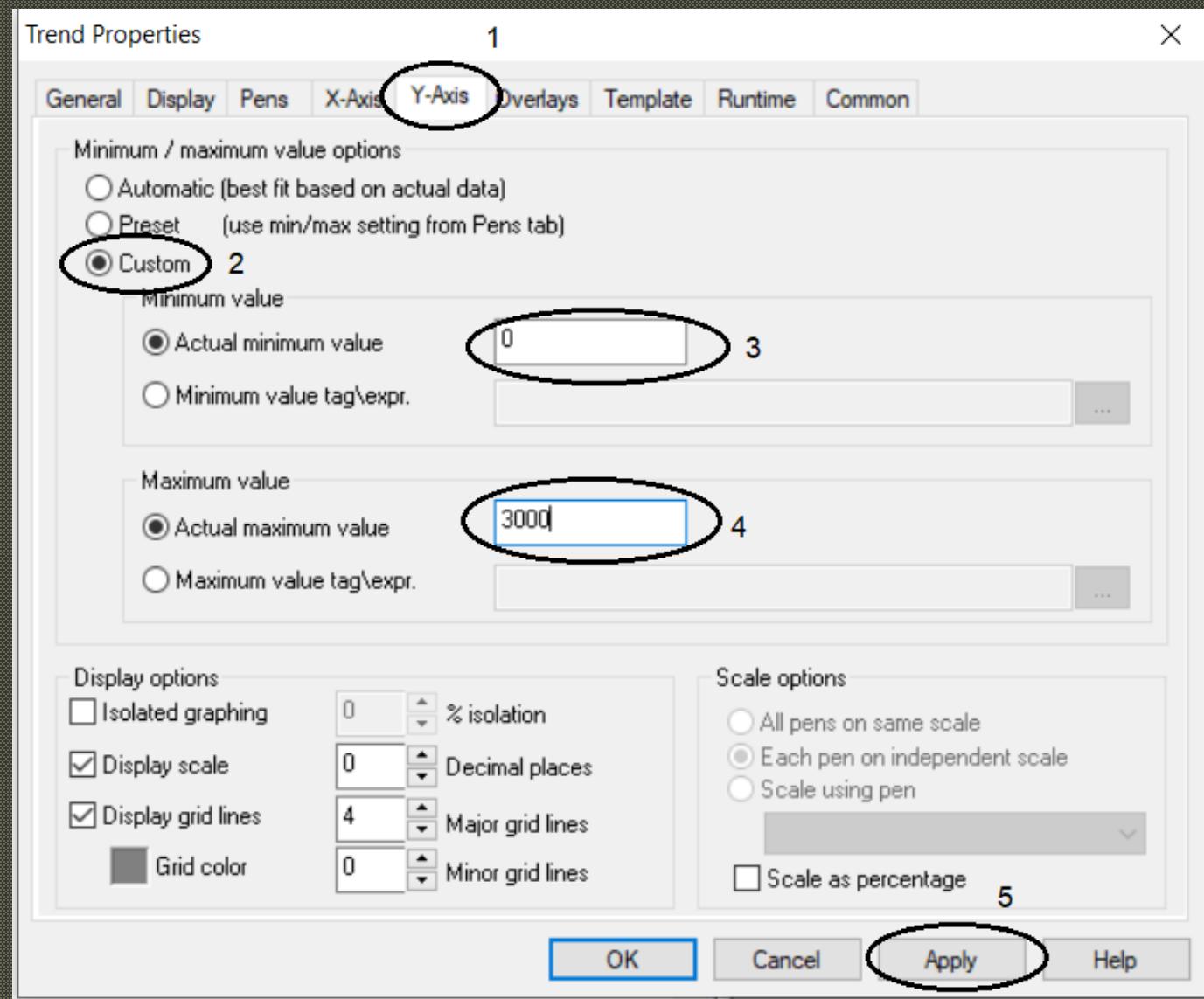
FACTORY TALK VIEW STUDIO SE

Real-time Trend: For Display2, from Objects, select Trending, Trend.



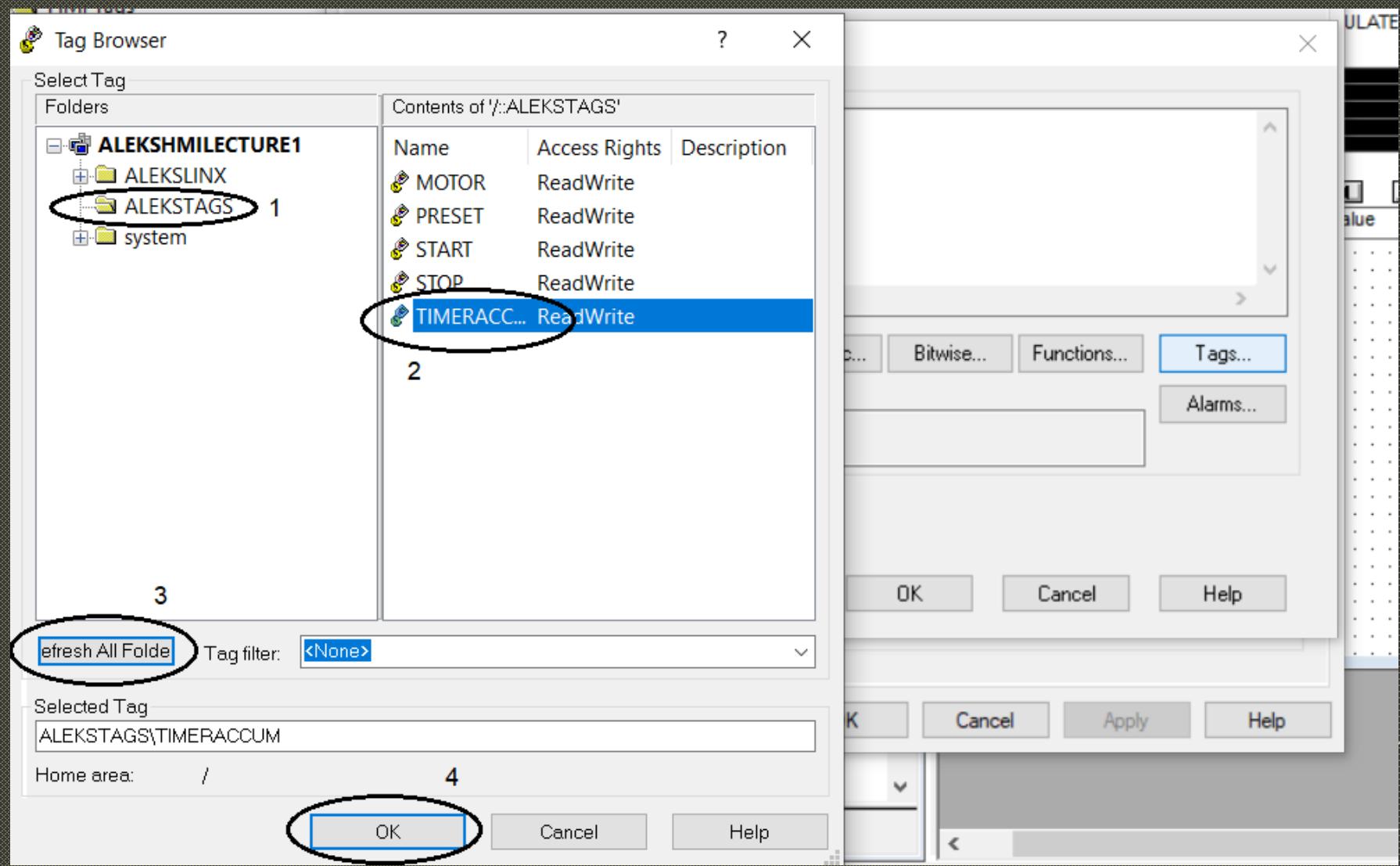
FACTORY TALK VIEW STUDIO SE

Real-time Trend: Follow
the sequence 1 - 5.



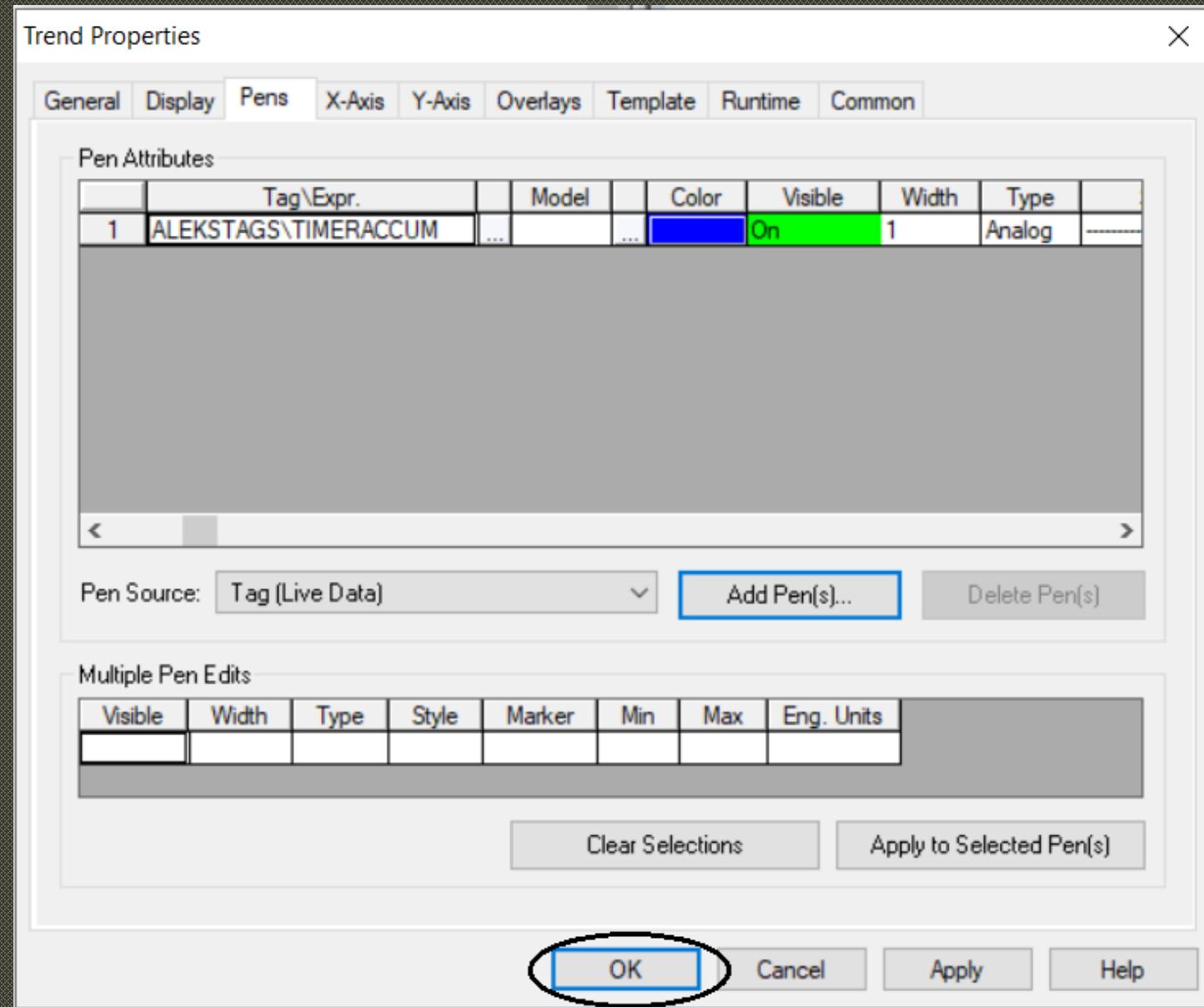
FACTORY TALK VIEW STUDIO SE

Real-time Trend: Follow the sequence 1 - 4. Click on OK and OK.



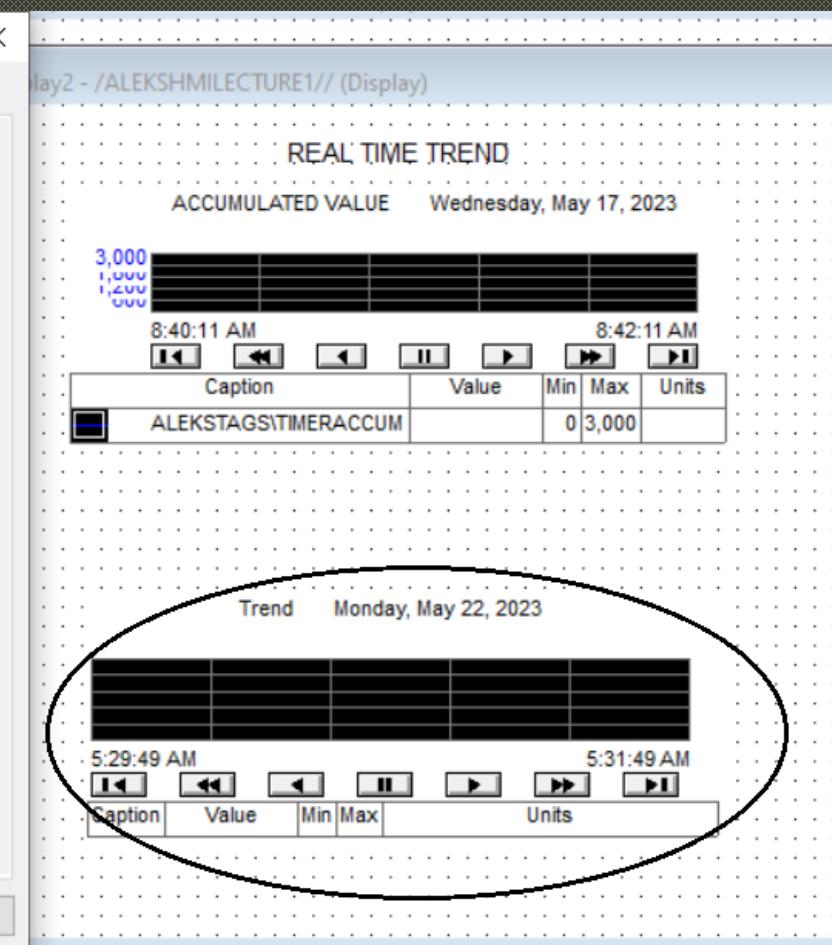
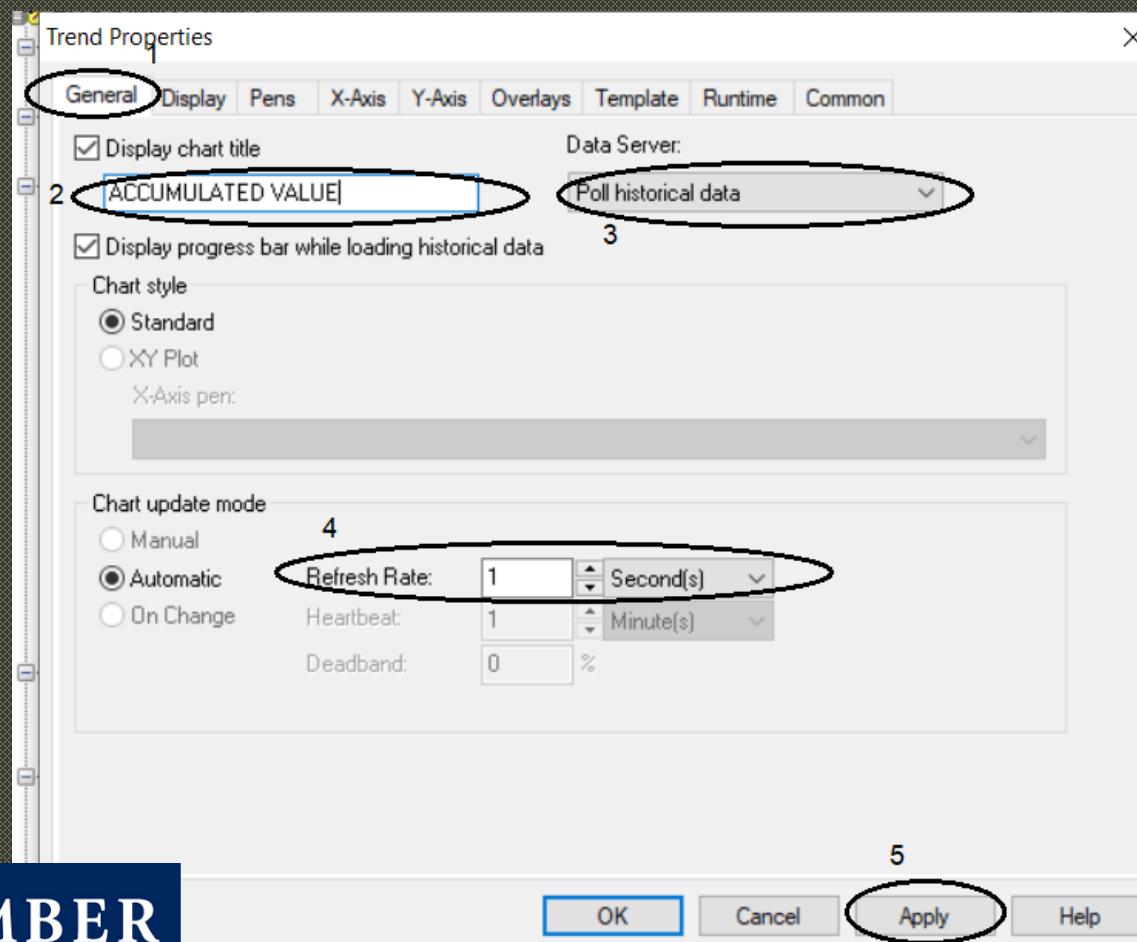
FACTORY TALK VIEW STUDIO SE

Real-time Trend: You will see the following. Click on OK.



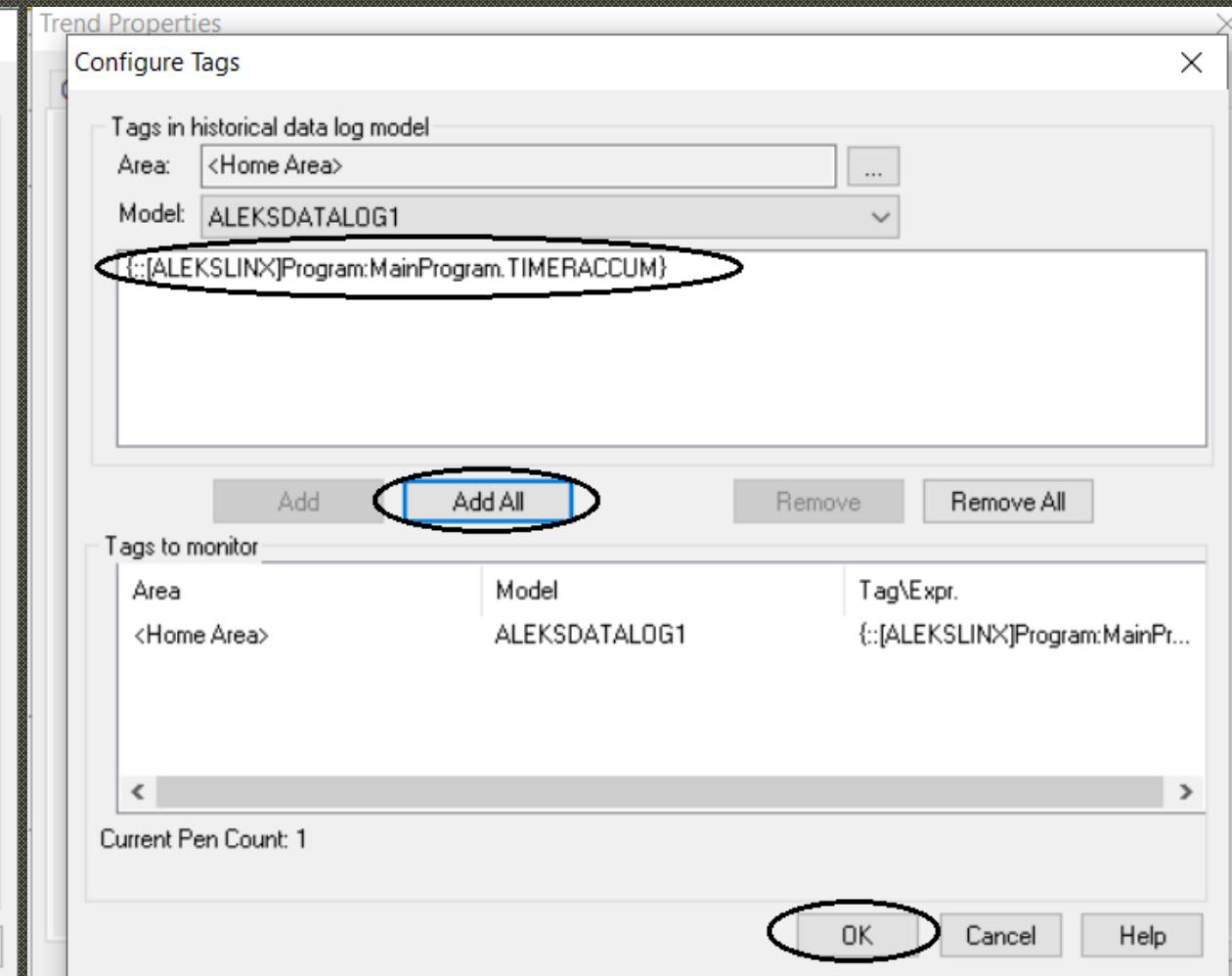
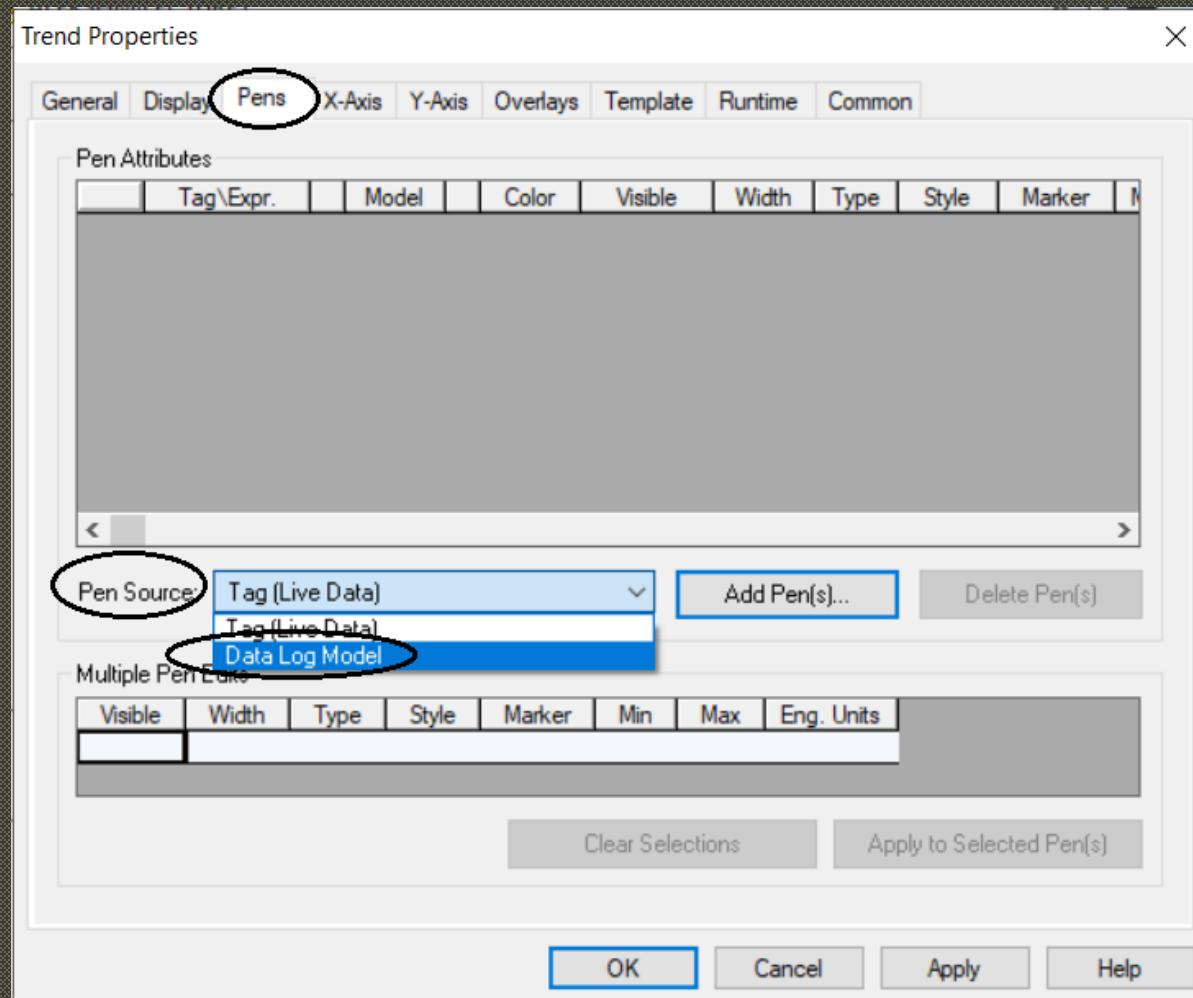
FACTORY TALK VIEW STUDIO SE

Historical Trend: From Object, Advanced, select Trends. Draw Trends and fill in the configuration as shown. Change the refresh rate to 1 second and select Poll Historical data under General tab. Then go to Pens and select Data Log Model as the Pen Source.



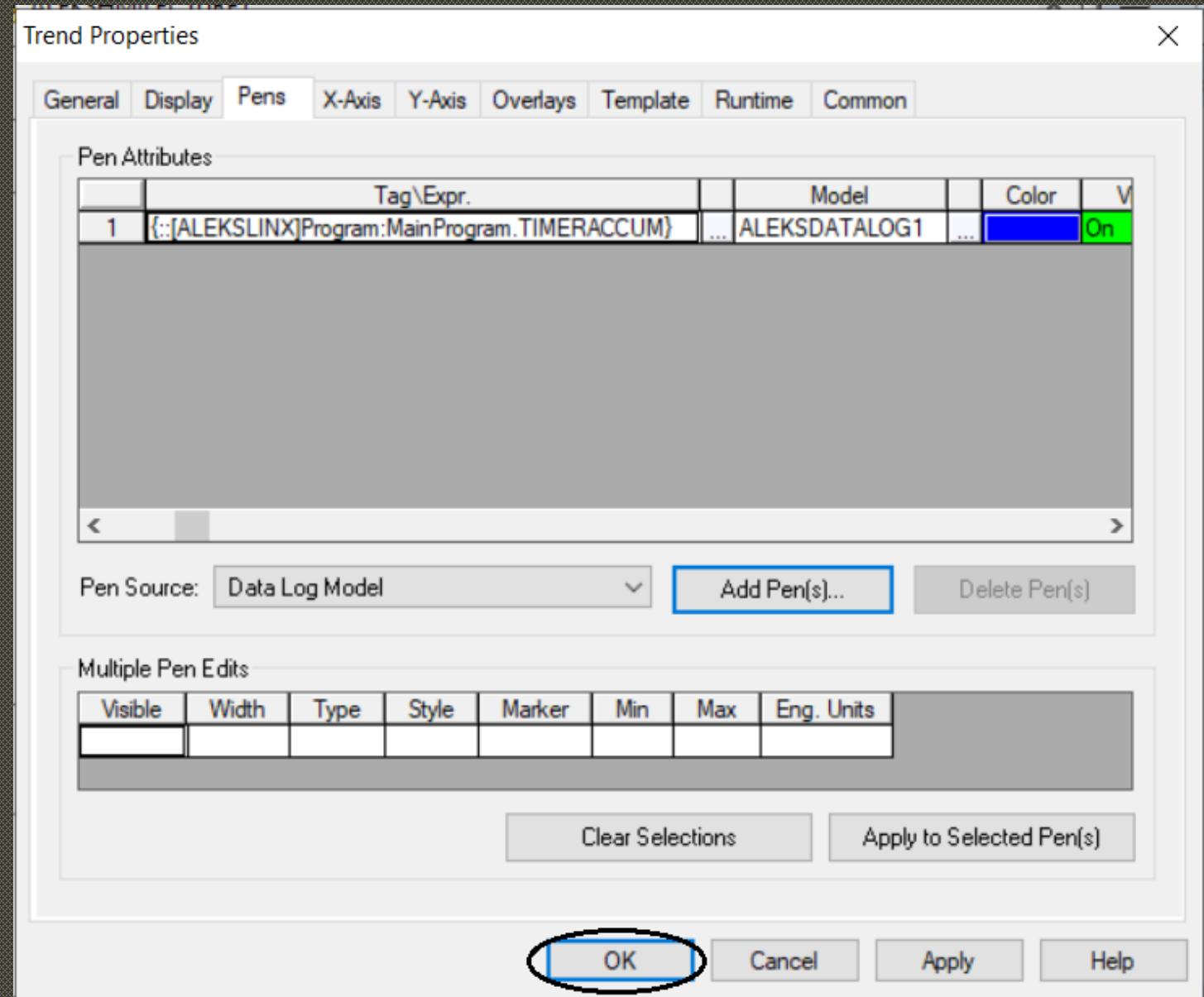
FACTORY TALK VIEW STUDIO SE

Historical Trend: Click Add Tags button to add an appropriate Tag.



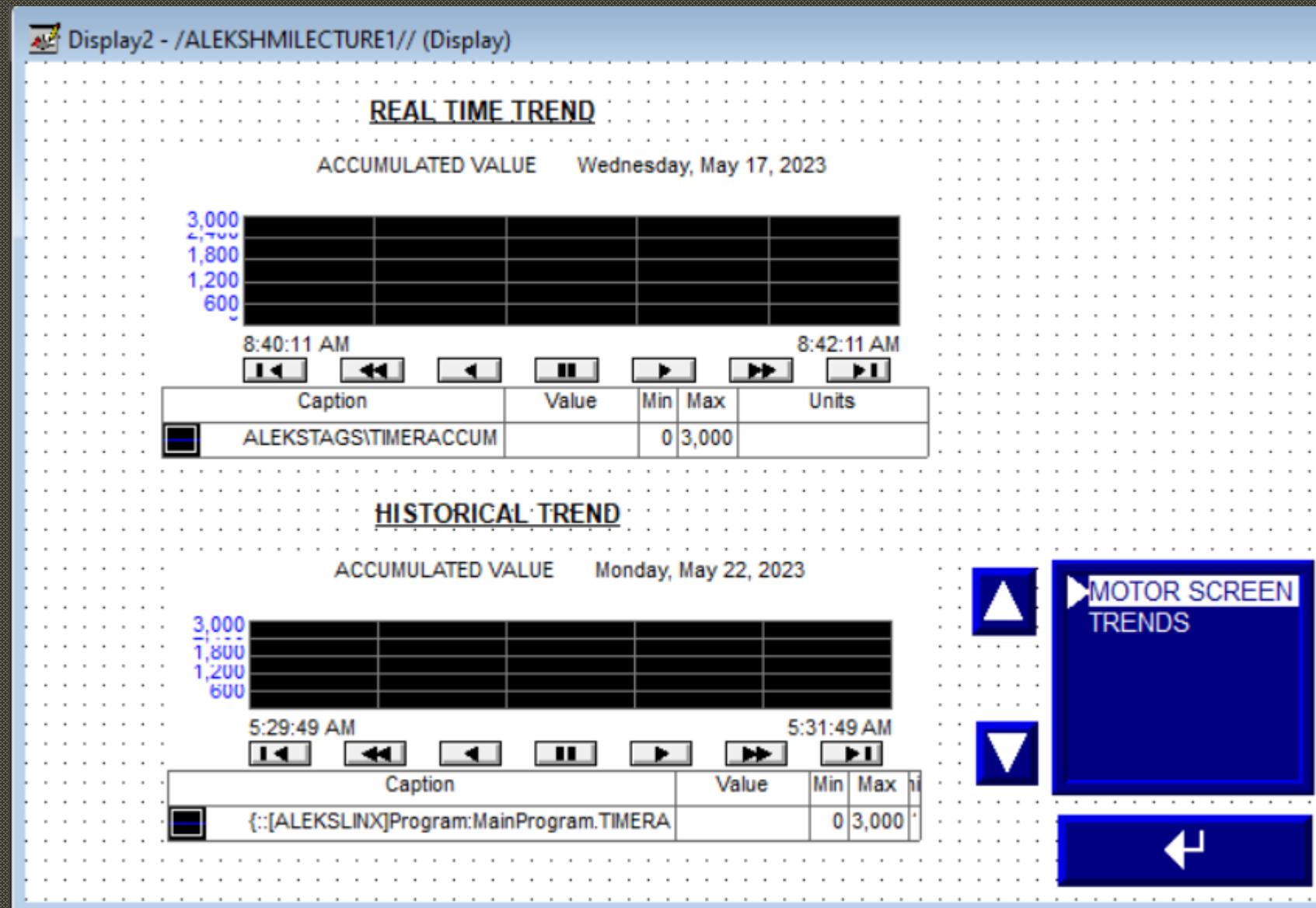
FACTORY TALK VIEW STUDIO SE

Historical Trend:



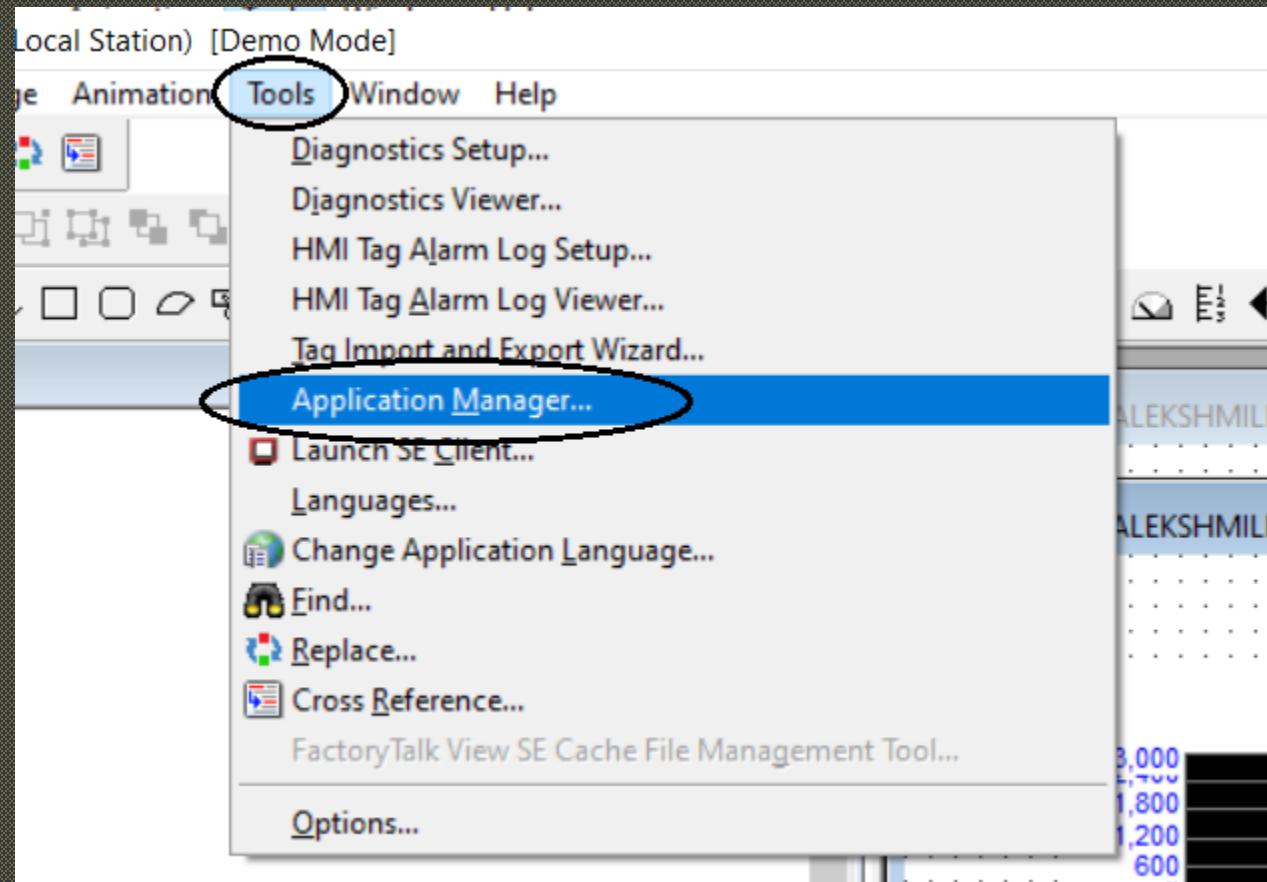
FACTORY TALK VIEW STUDIO SE

Historical Trend:



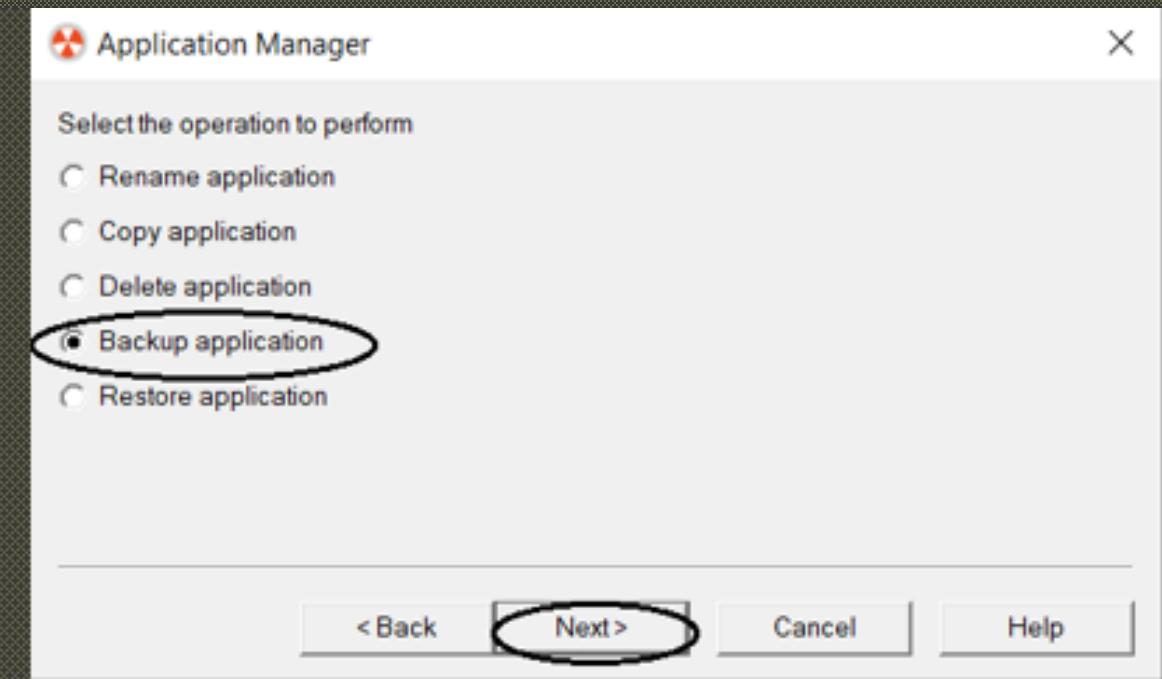
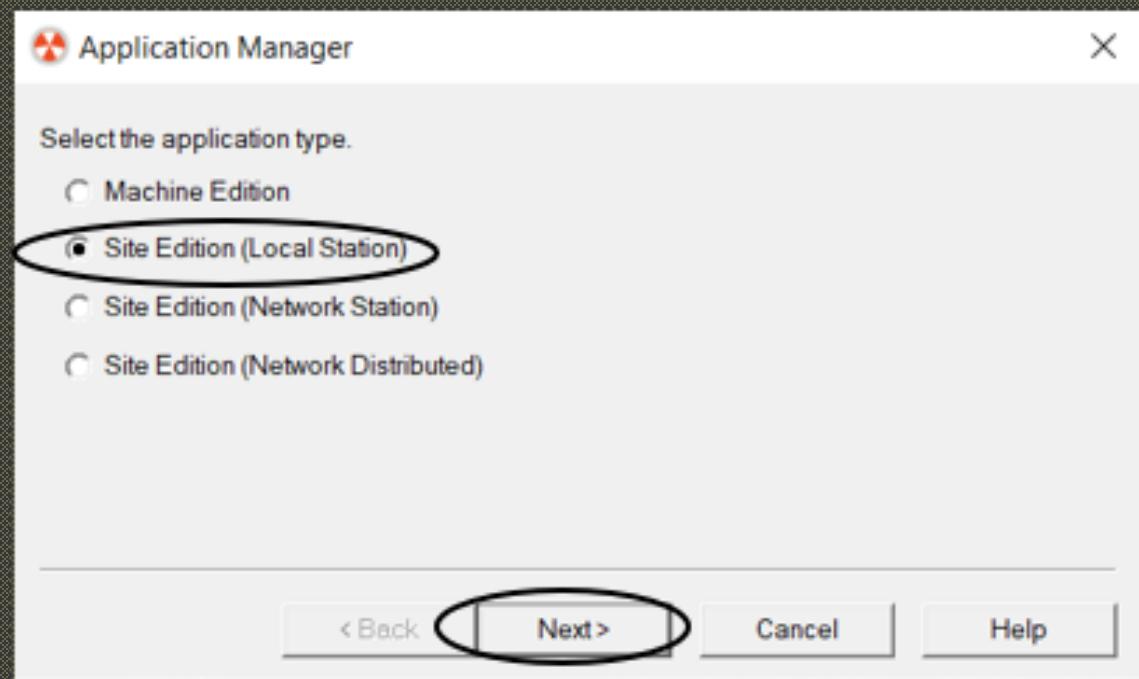
FACTORY TALK VIEW STUDIO SE

Backup the Application: Open Application Manager from select Application Manager.



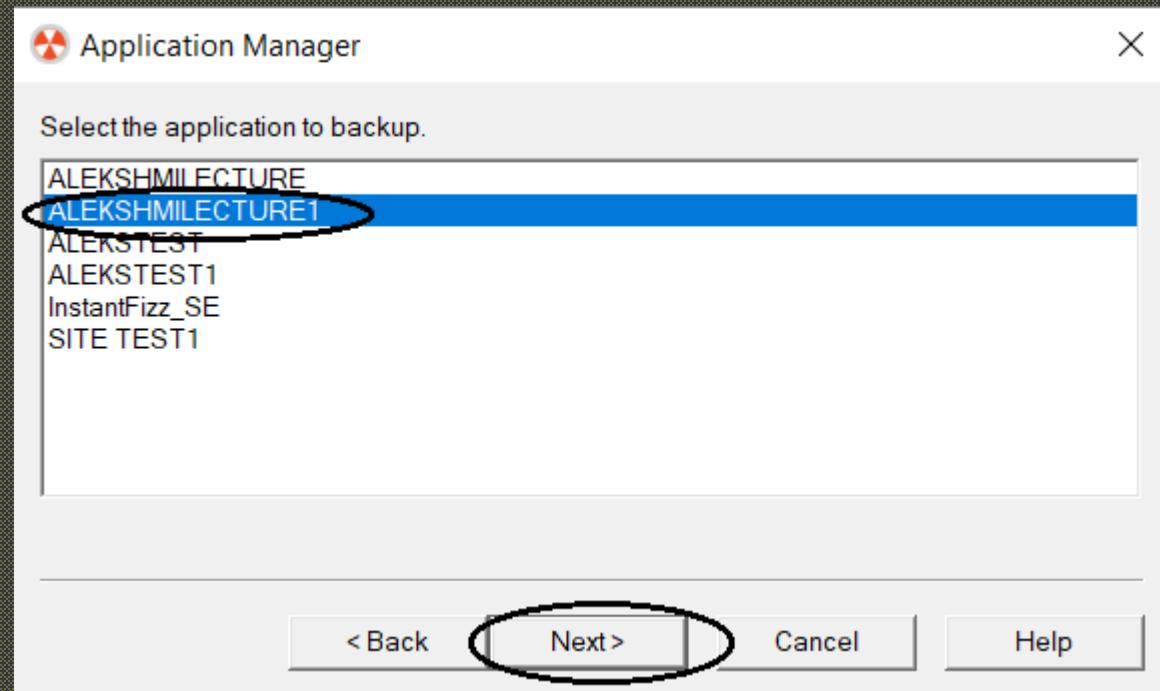
FACTORY TALK VIEW STUDIO SE

Backup the Application: Select.



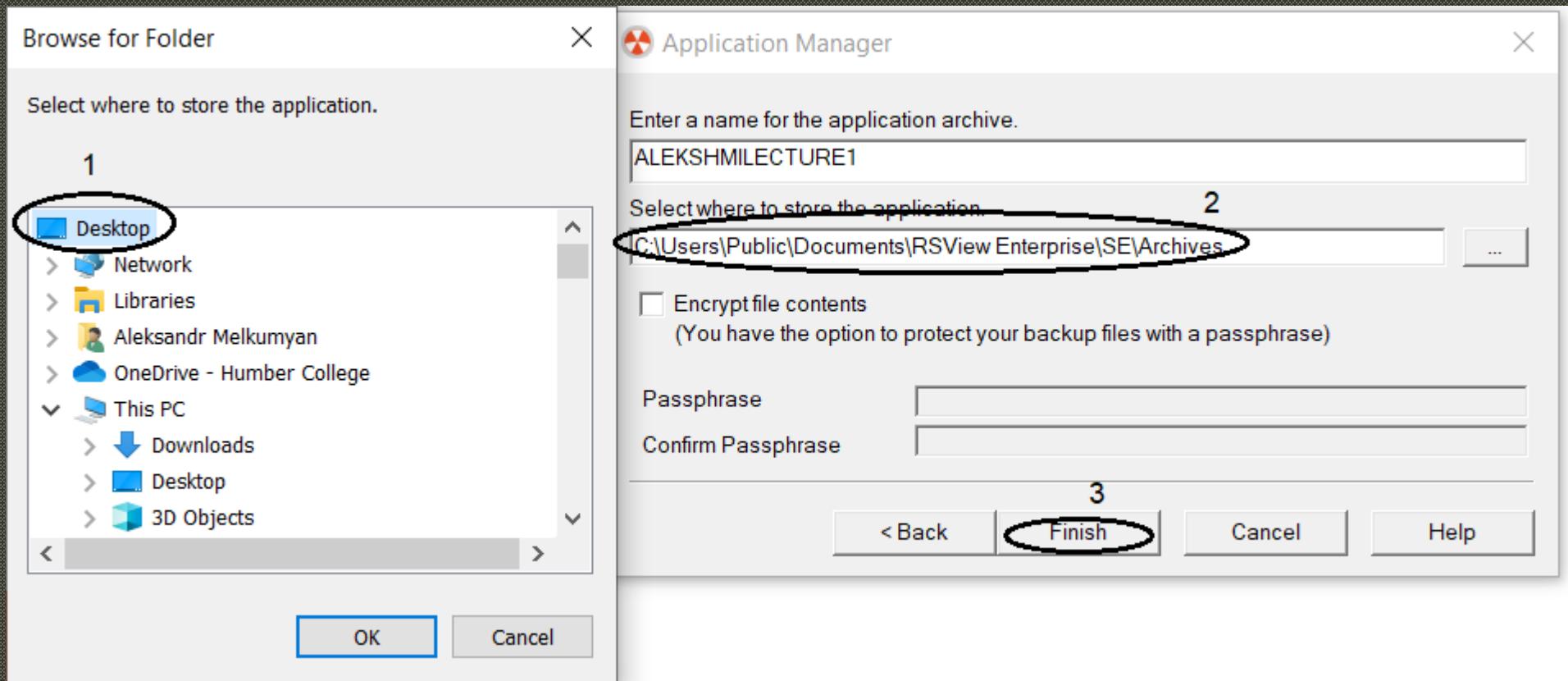
FACTORY TALK VIEW STUDIO SE

Backup the Application: Select.



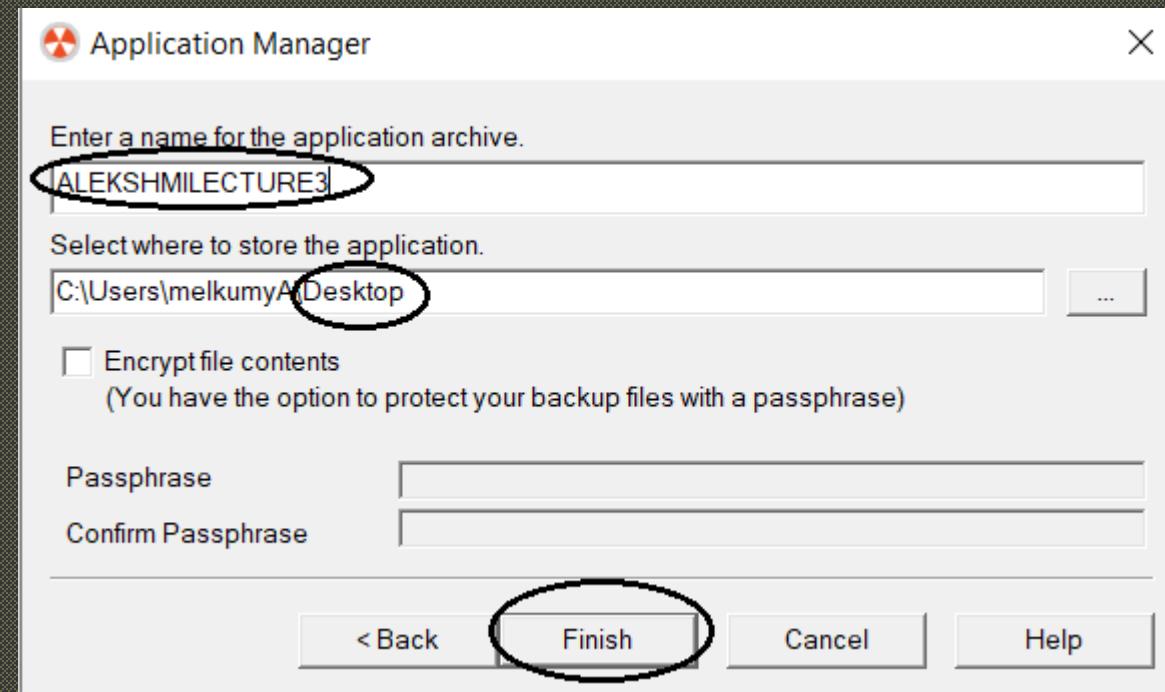
FACTORY TALK VIEW STUDIO SE

Backup the Application: Follow the sequence 1 - 3.



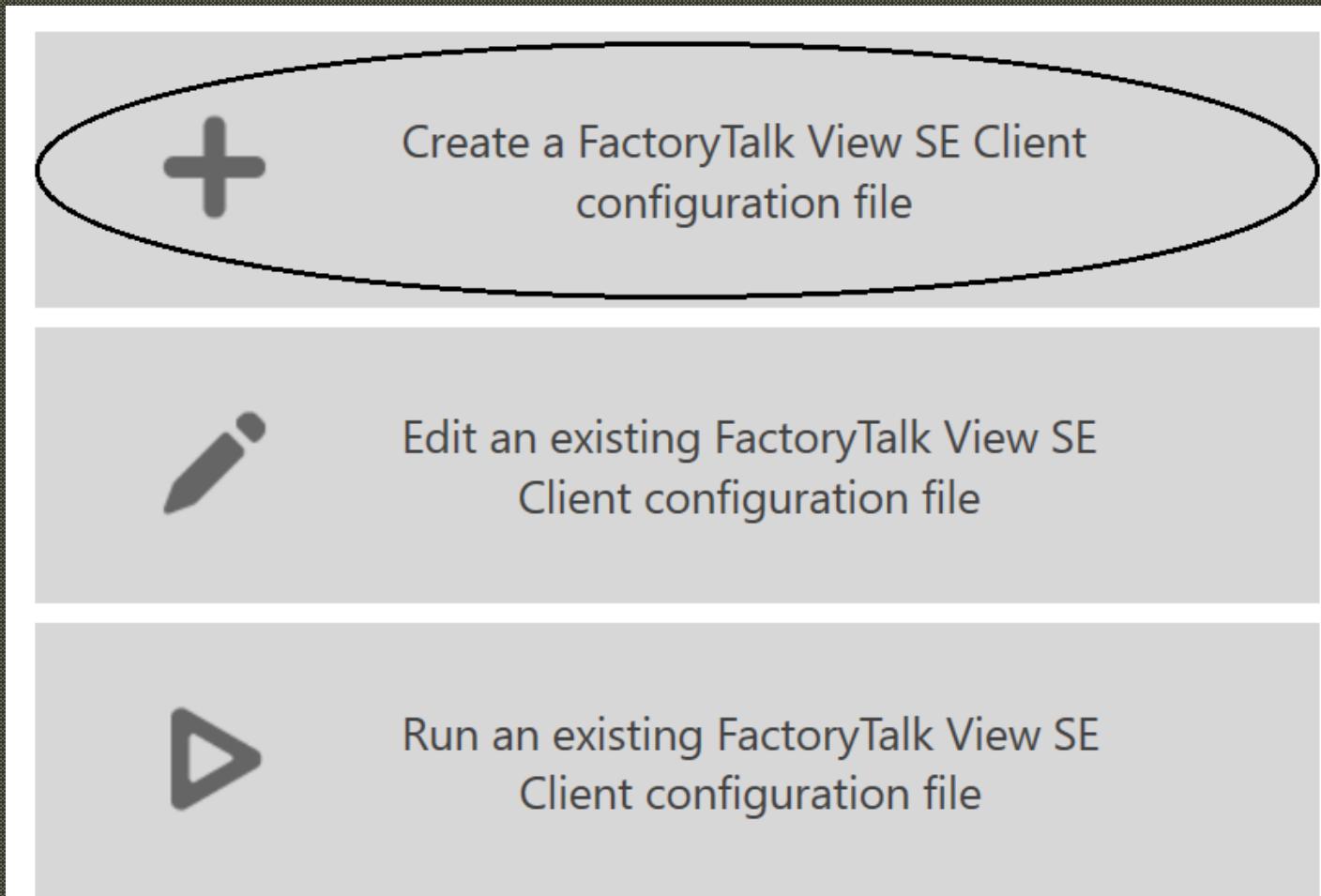
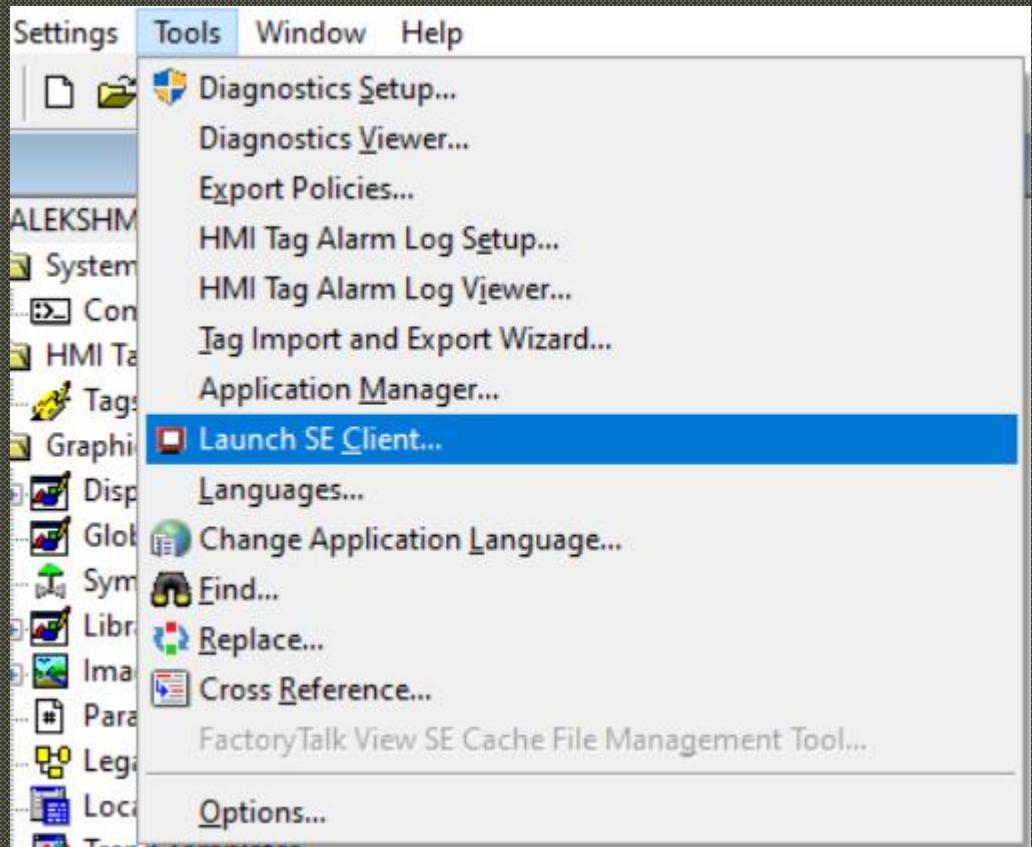
FACTORY TALK VIEW STUDIO SE

Backup the Application: Enter another name and click on Finish.



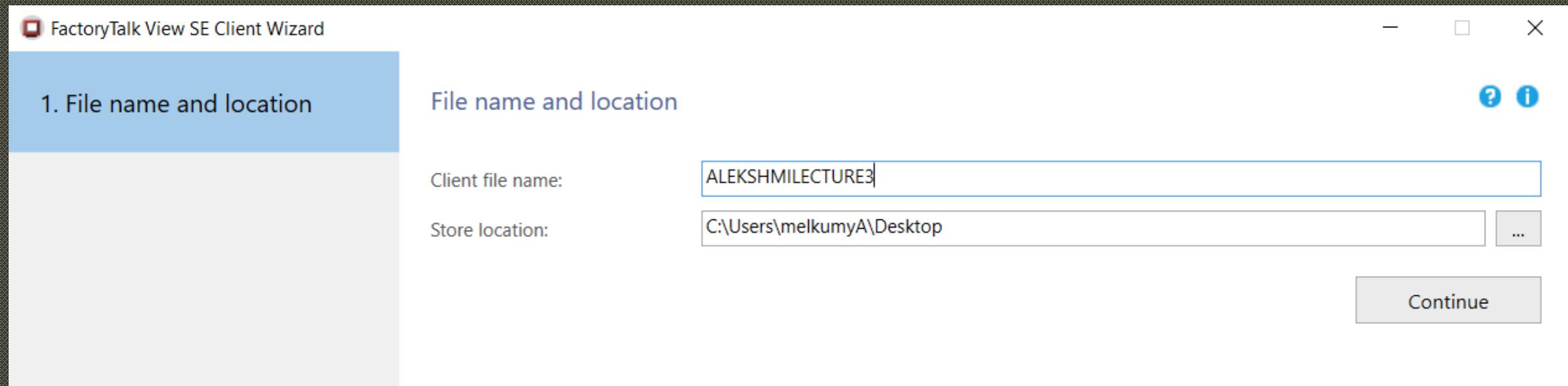
FACTORY TALK VIEW STUDIO SE

Launching SE Client: Go to Launch SE Client under Tools, and then follow the wizard.



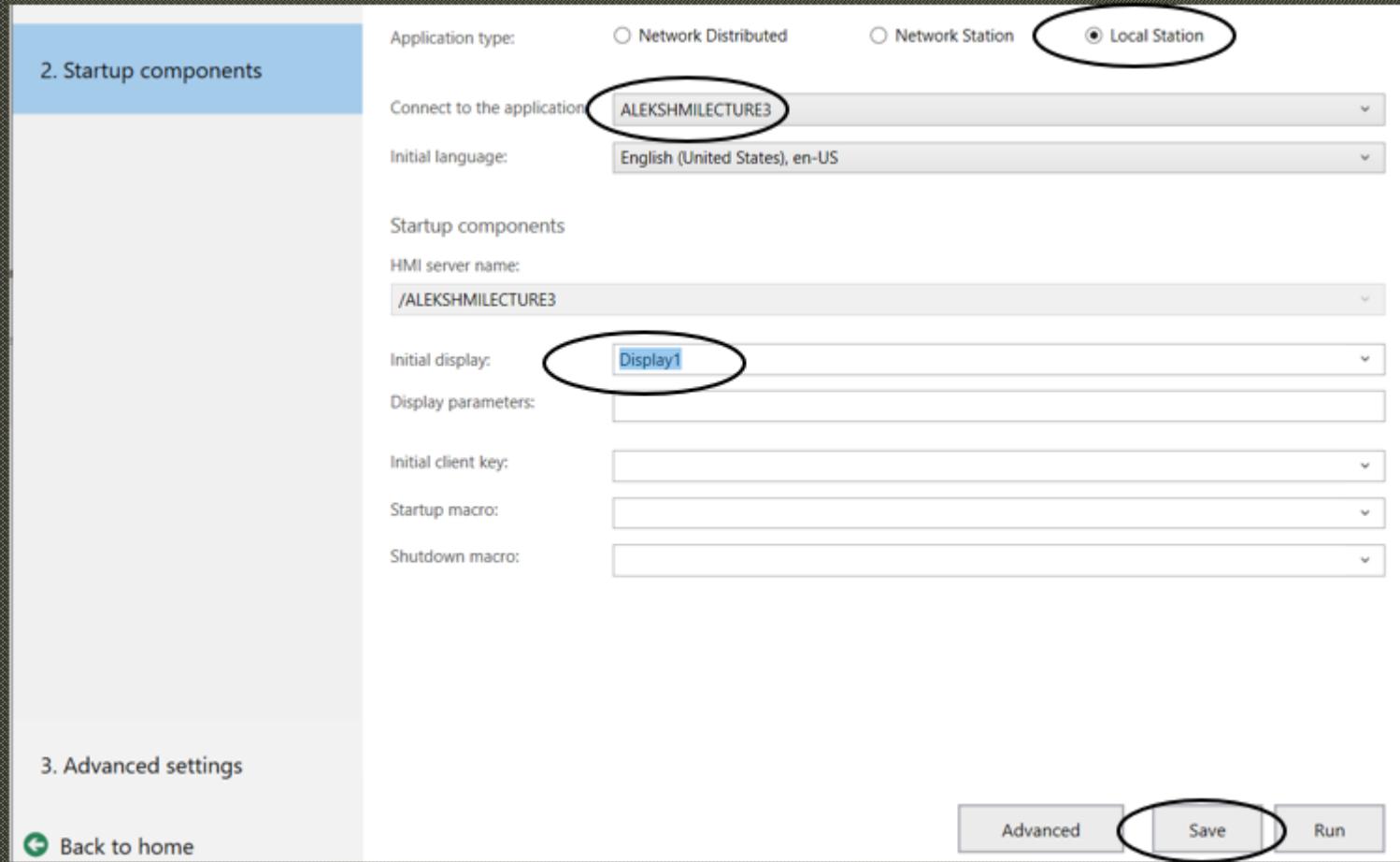
FACTORY TALK VIEW STUDIO SE

Launching SE Client: Go to Launch SE Client under Tools, and then follow the wizard.
Type the name and select the location.



FACTORY TALK VIEW STUDIO SE

Launching SE Client: Go to Launch SE Client under Tools, and then follow the wizard.



HUMAN-MACHINE INTERFACE (HMI)

Erickson, K. (2016) Programmable logic controllers: An emphasis on design and application (3rd edition). Rolla MO: Dogwood Valley Press.

Chapter 18

PROGRAMMABLE LOGIC CONTROLLERS

MENG 3500

Thank you!

Discussions?