

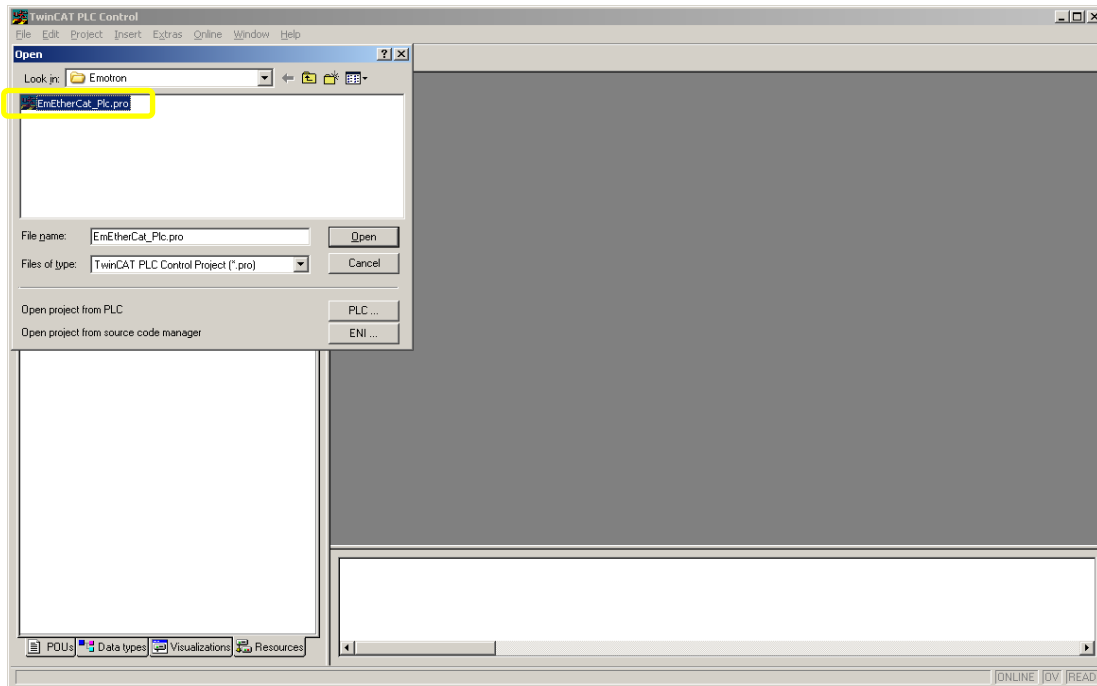
## TwinCAT PLC Controller

This quick start guide describes an example how to implement Emotron VSD device to TwinCAT PLC controller. An Emotron example application is used in this quick guide.

### Open the Example project

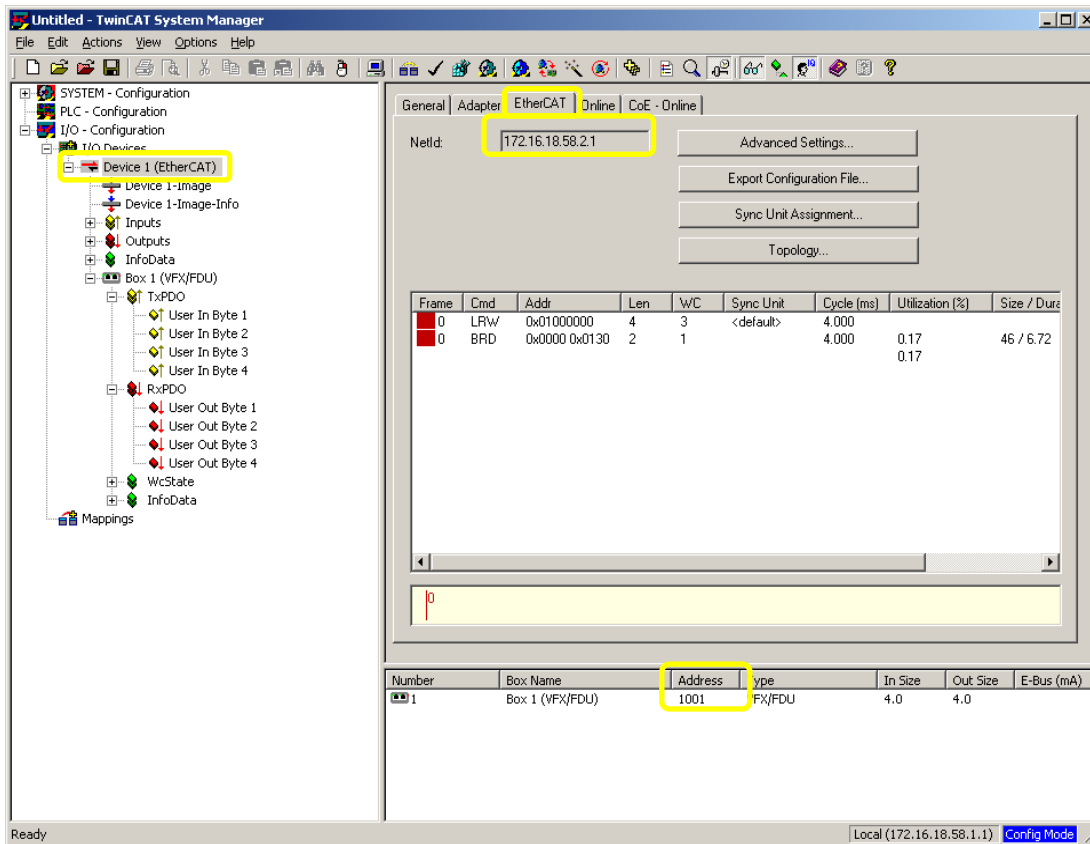
Copy the example project *EmEtherCat\_PLC.pro* into a library on the hard drive.

Start the TwinCAT PLC controller and select Menu: *File -> Open* select the project file.



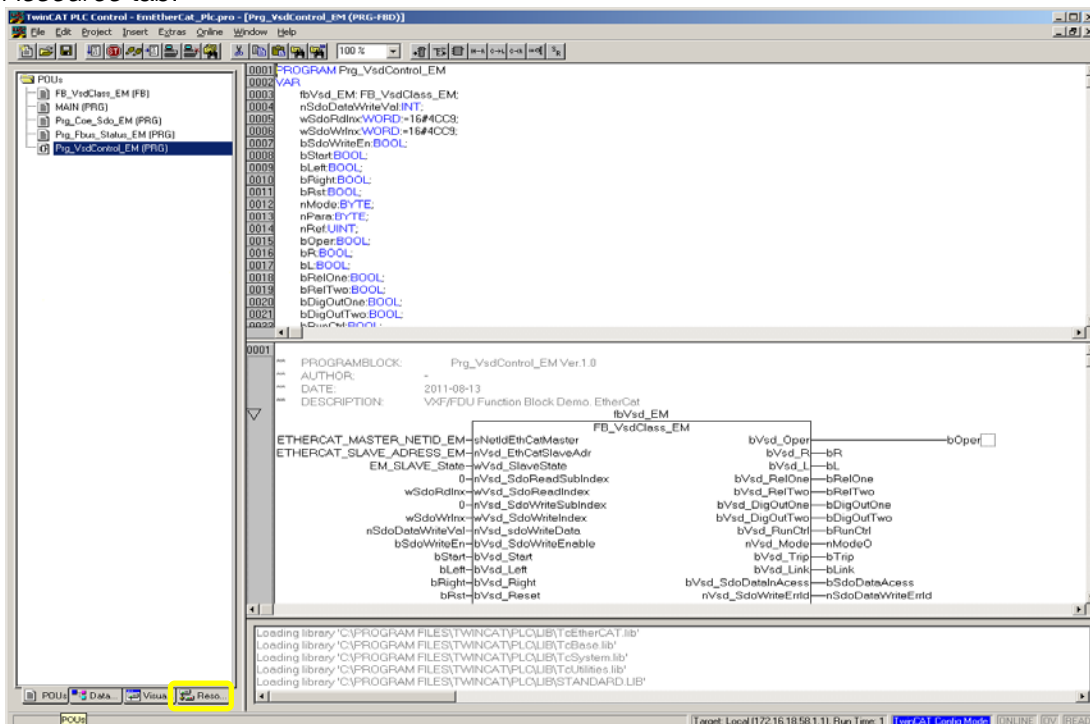
## Read the net id and slave address

Open the system manager to read the master EtherCAT net id and the slave address.  
Select the device from the node list and select the *EtherCAT* tab.

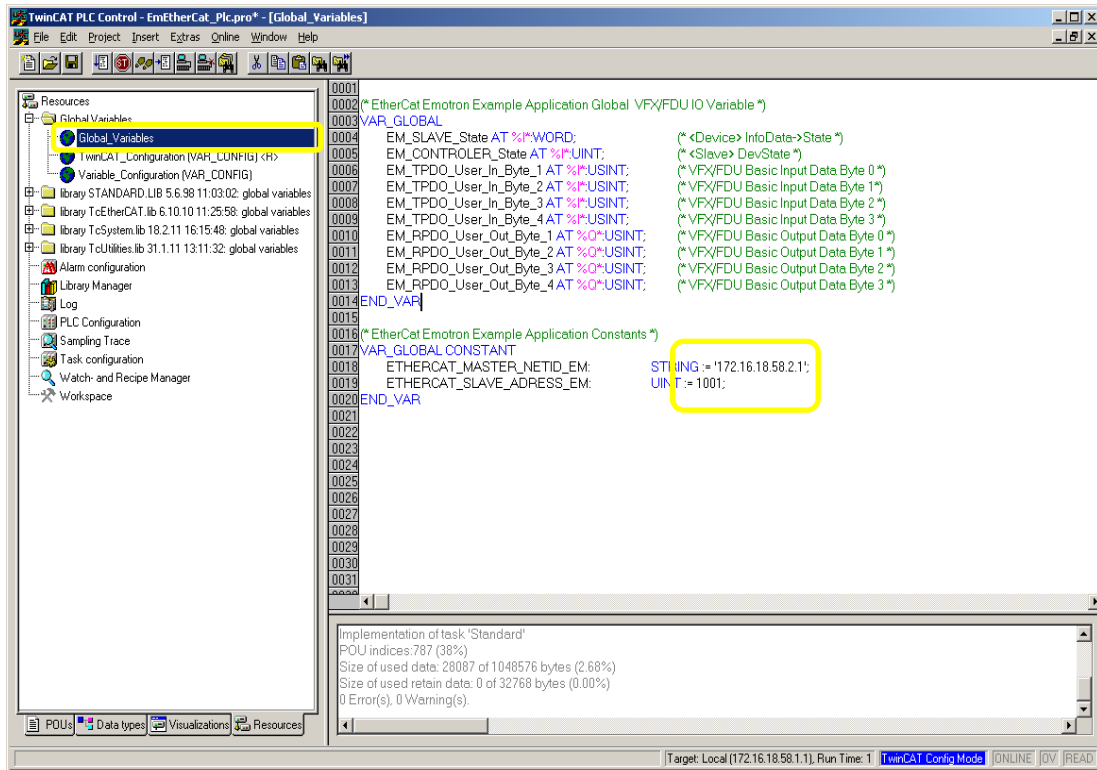


## Change the net id and slave address

To change the predefined net id and slave address in the example program select the *Resource* tab.

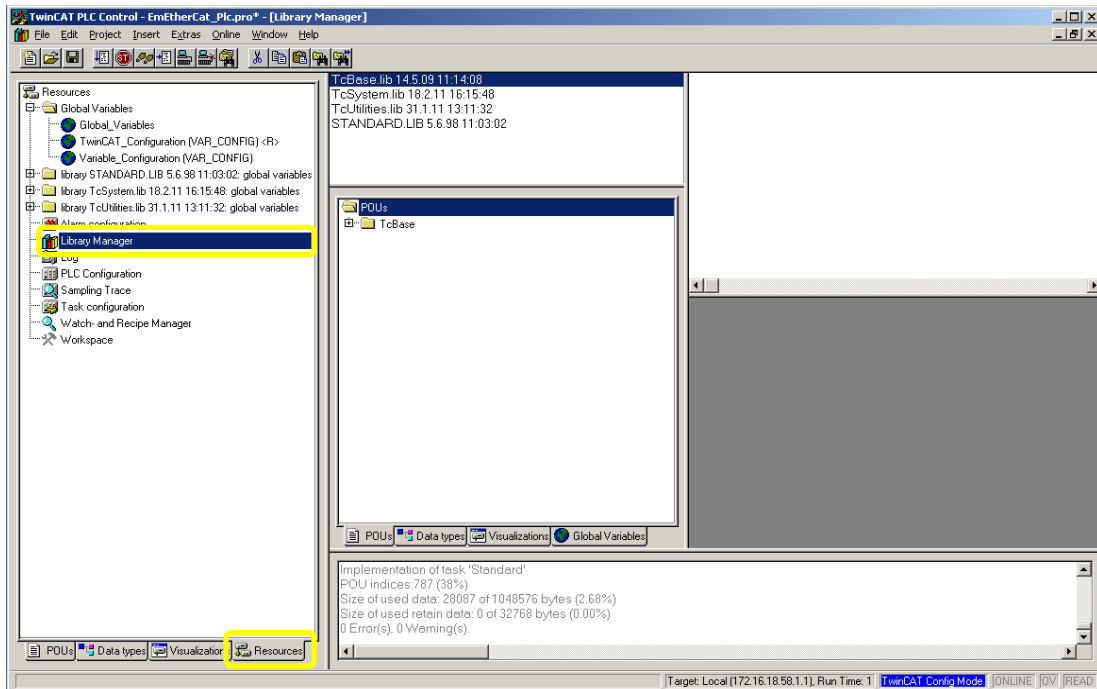


Select the Global Variable section and change the EtherCAT master net ID and the slave address. The default slave address is 1001.

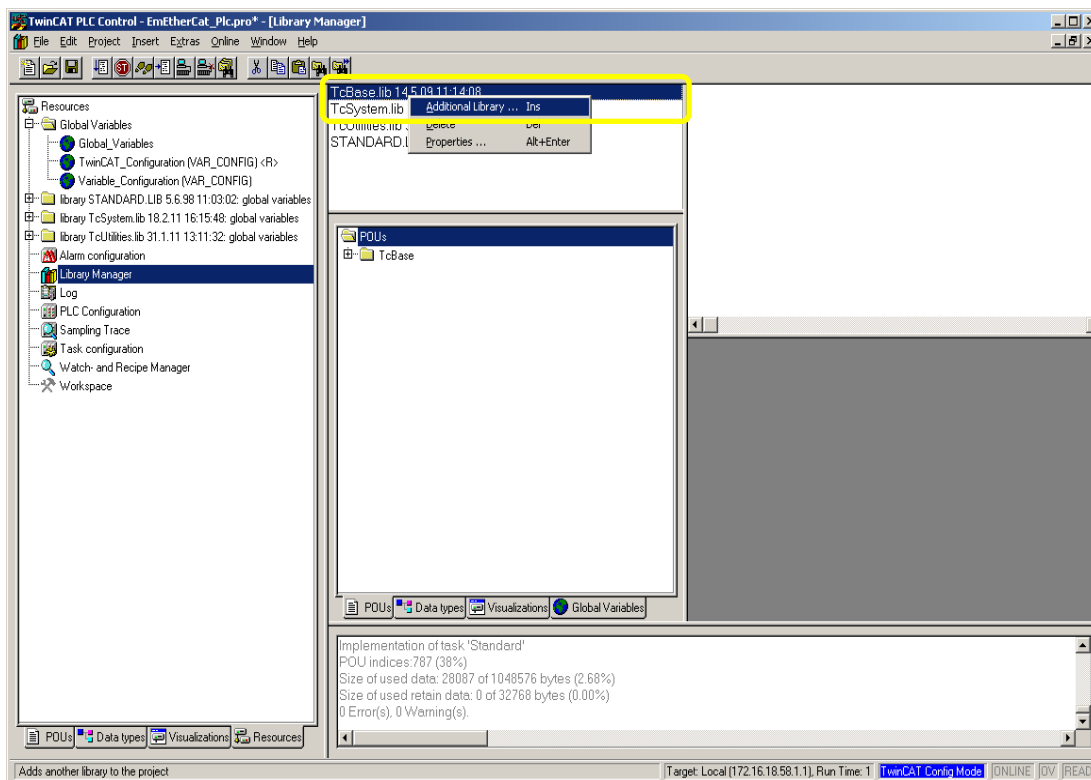


### TcEtherCAT library

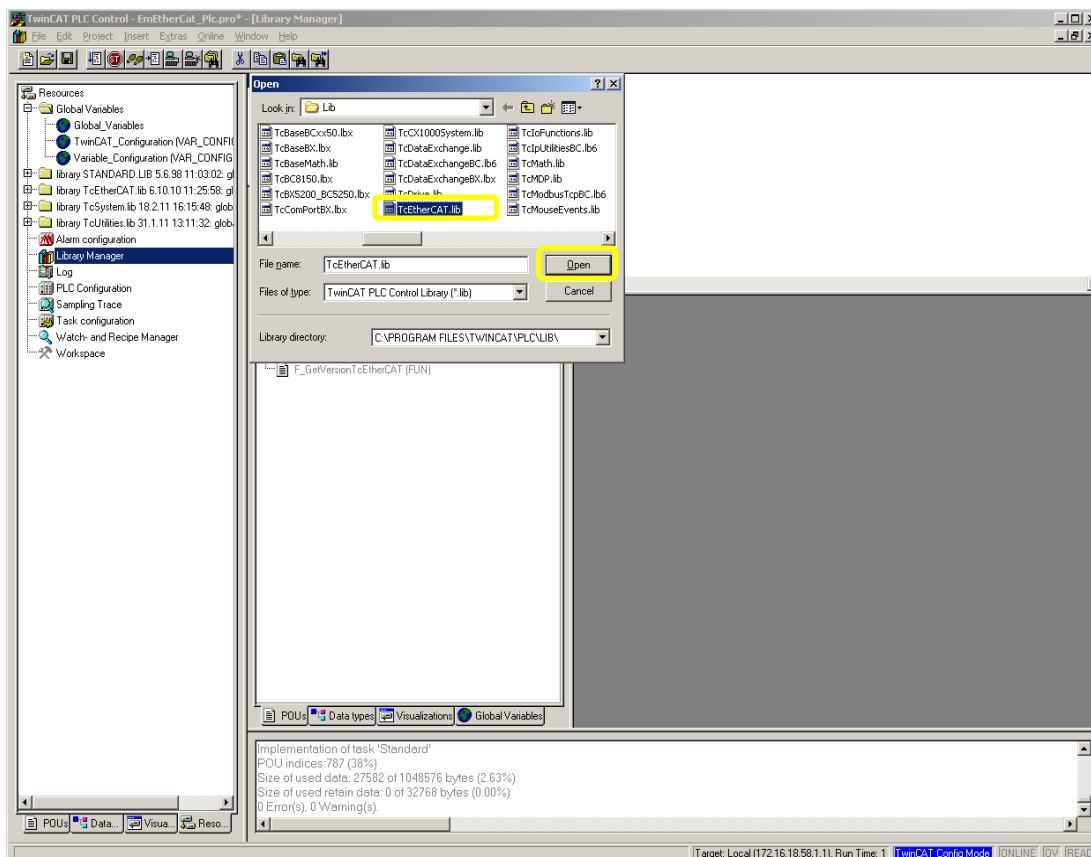
Open the TwinCAT PLC Controller and select the *Resources* tab and double click on the *Library Manager* (Check the TcEtherCAT library reference).



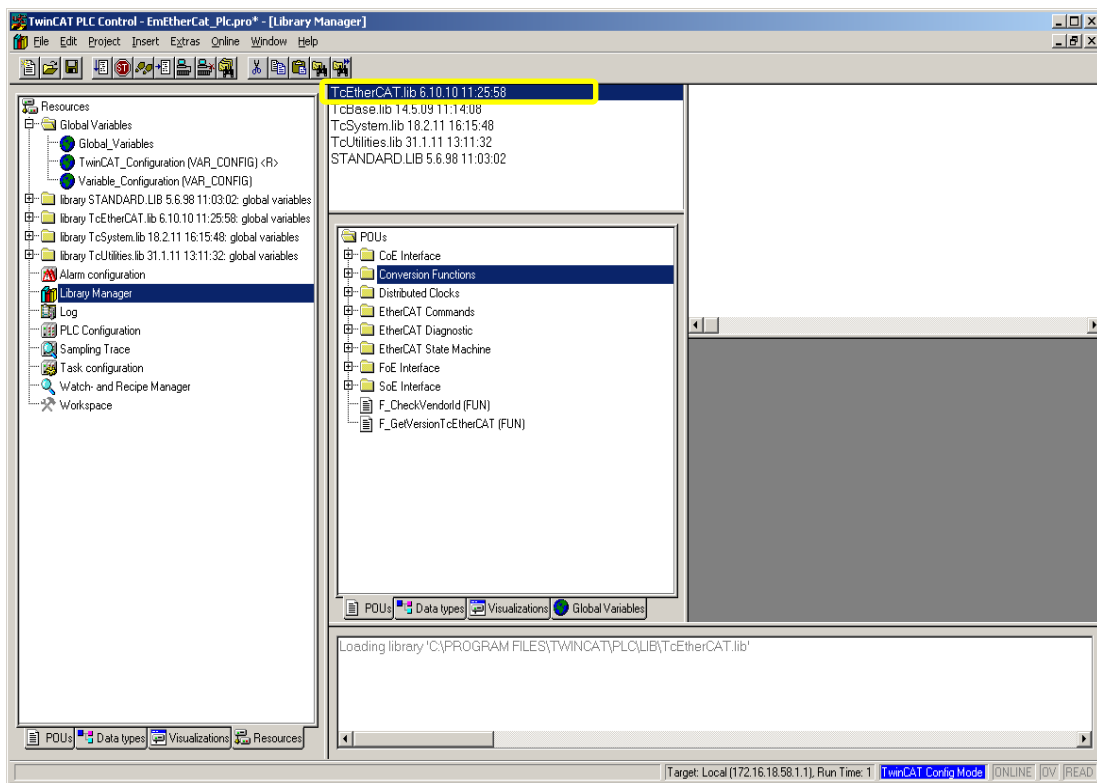
Make sure that the TcEtherCAT library exists as a reference, if not follow description below. Select the library panel and right click on the panel to add additional library.



Select the *TcEtherCAT.lib* file and click *Open*.

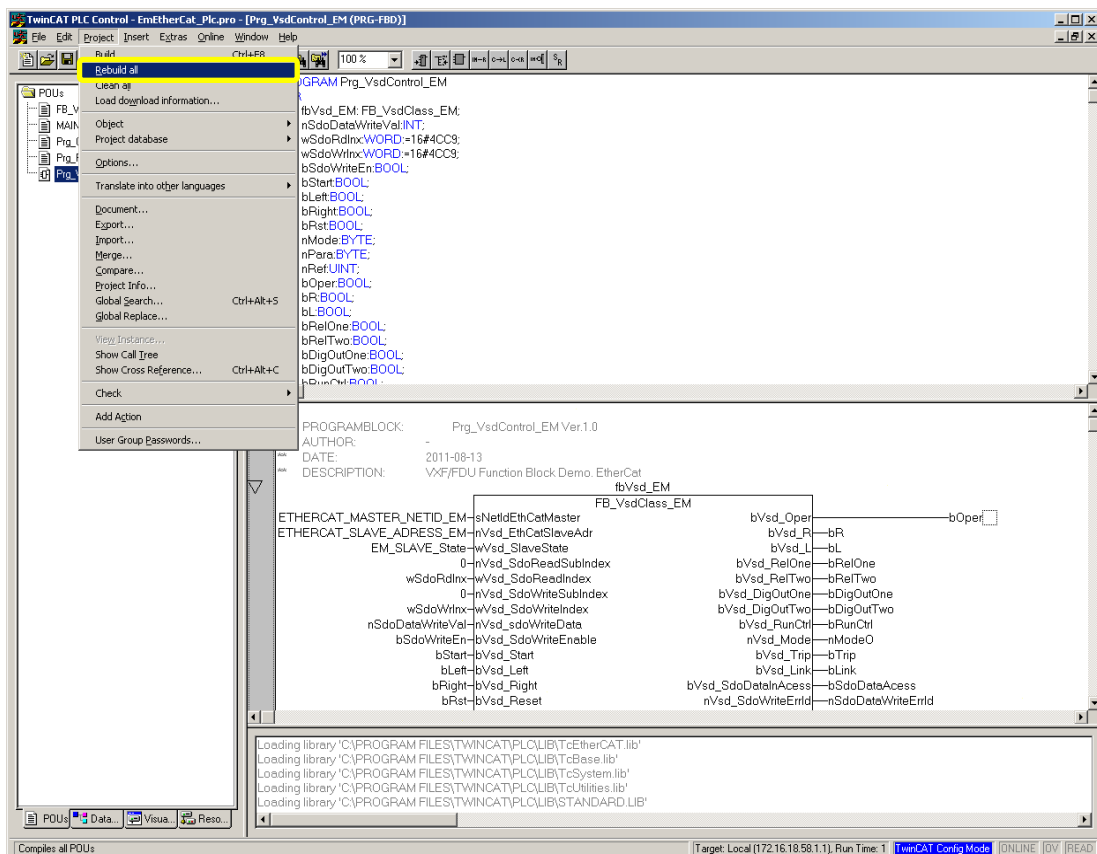


The EtherCAT library files are appended to the project.



Build the project

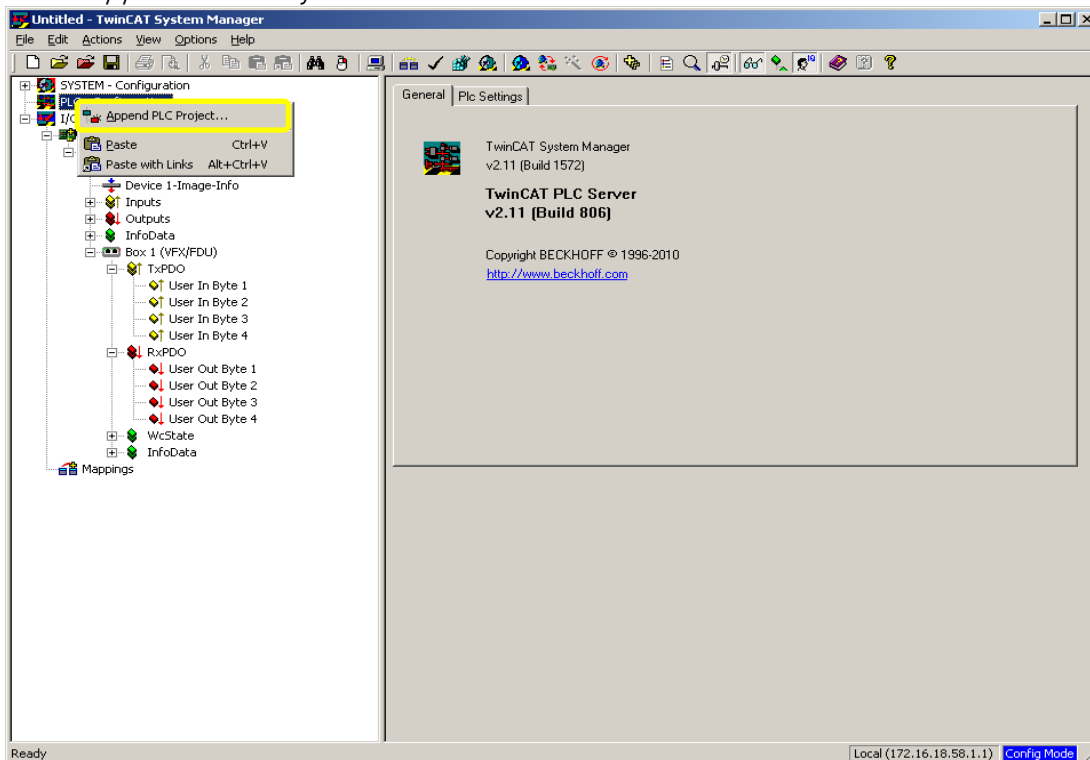
Select menu: *Project -> Rebuild all*



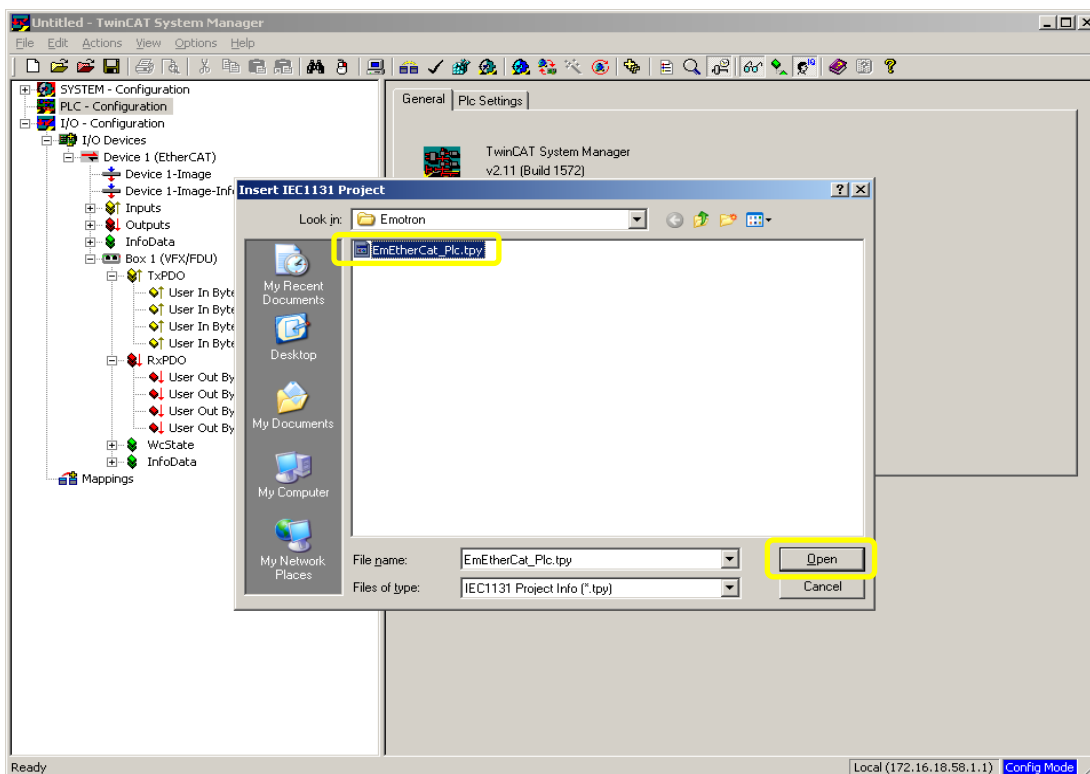
## Append the project to System Manager

Open system manager and right click on the PLC-Configuration in the node list.

Select *Append PLC Project...*

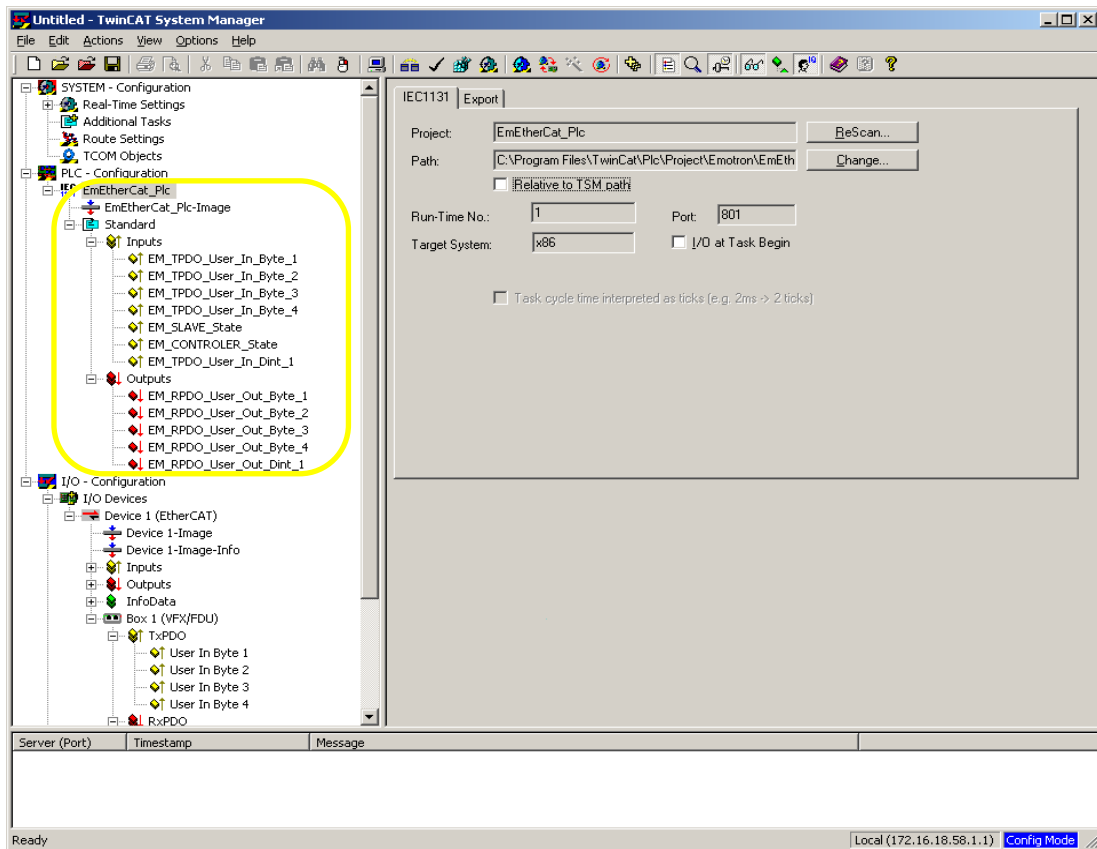


Select the file *EmEtherCAT\_PLC.tpy* from the project library and click open. The “.tpy” file is the symbolic file for the project and describes the PLC project. The file is created when building the project.

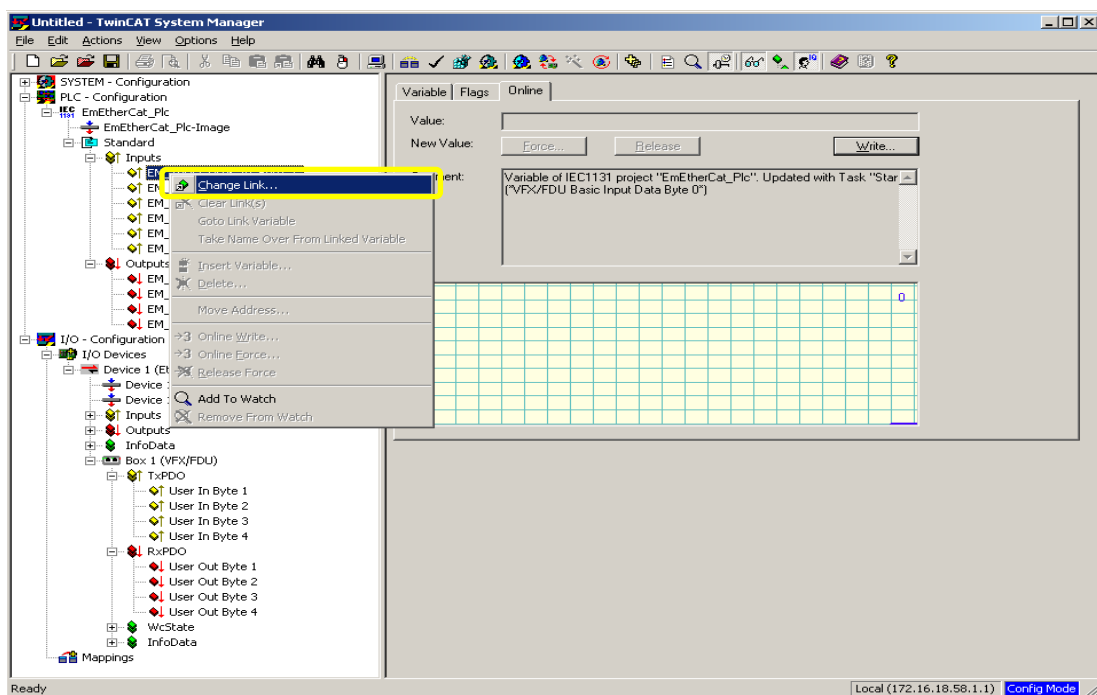


## Bind Variable to PDO

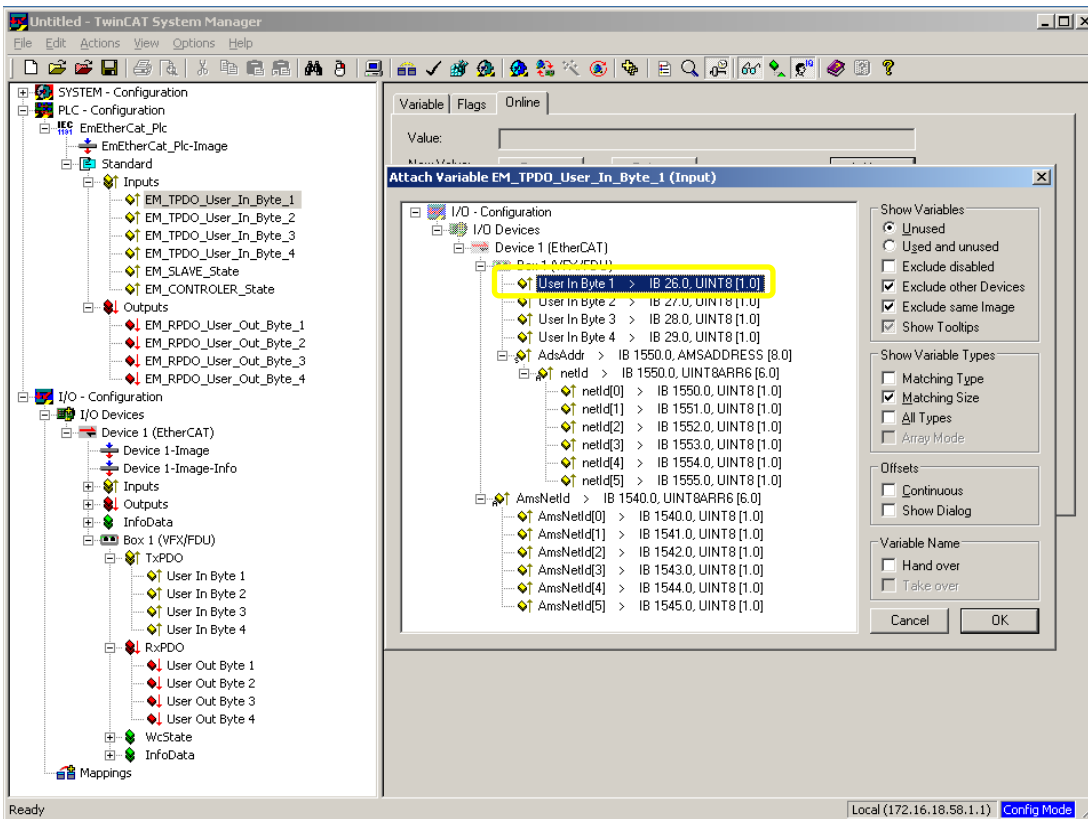
Explore the inputs from device and outputs to device in the node list.



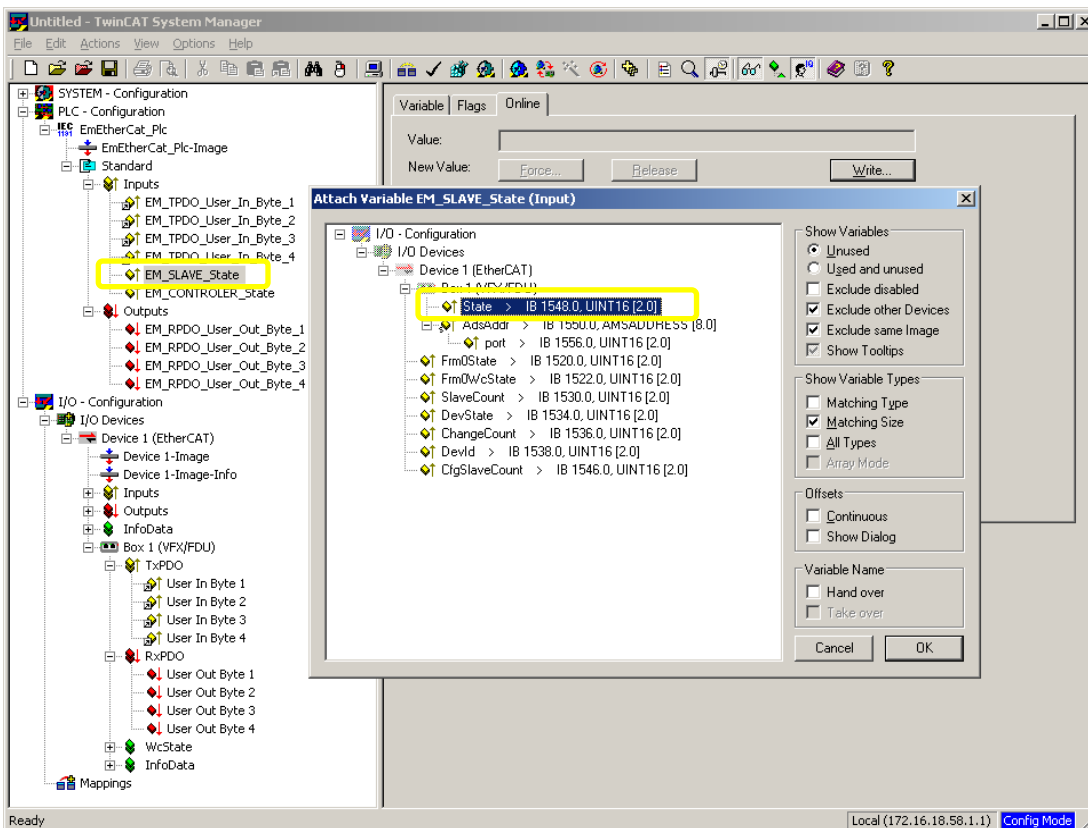
Select input variable from the node list and right click on *Change link* (binding) or double click on the variable name.



Bind the variables to PDO data object. Select input byte and click *OK*. Do the same procedure to all PDO input bytes.

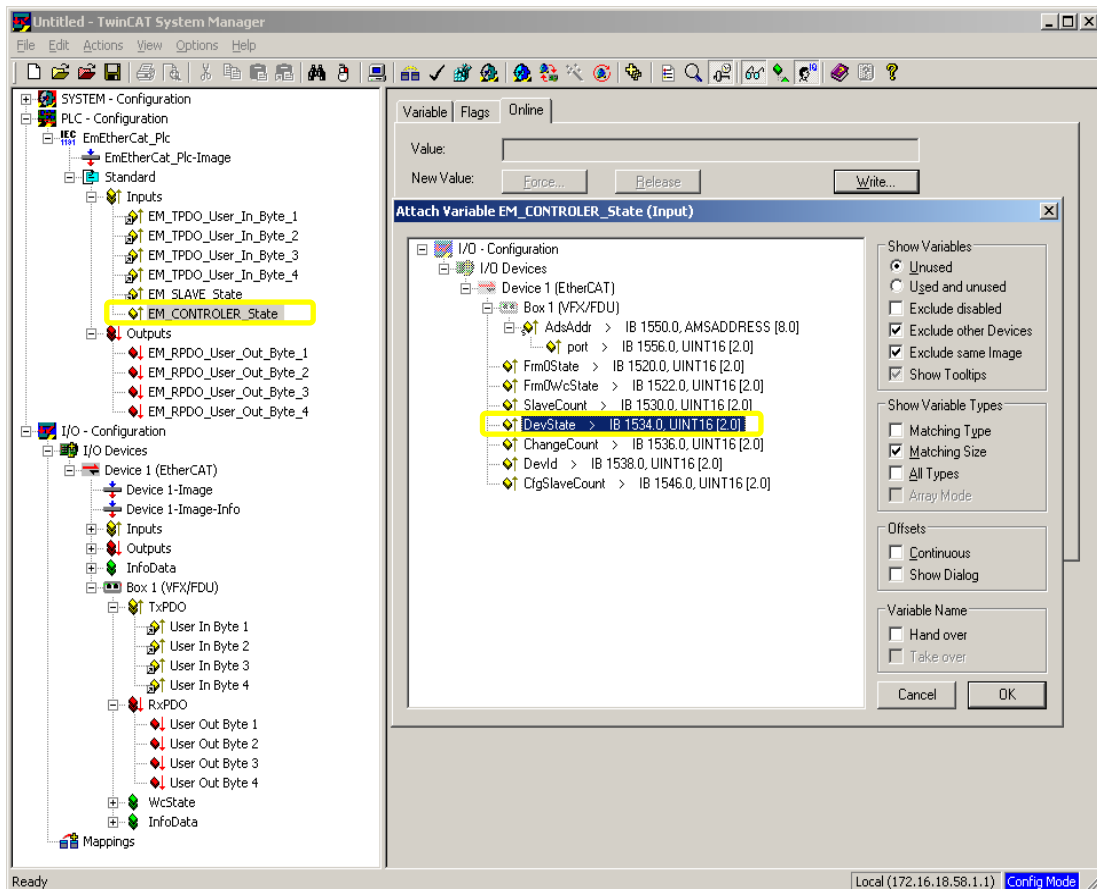


Bind the slave state variable to Box 1 *State* object as shown below.

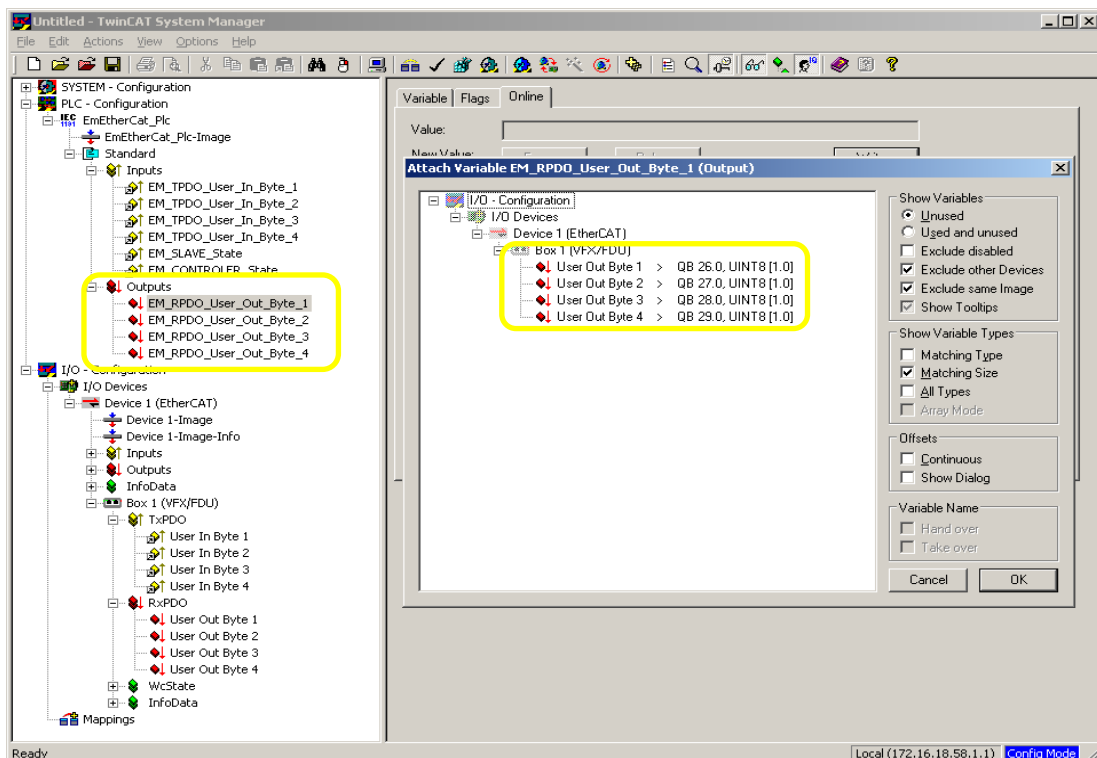




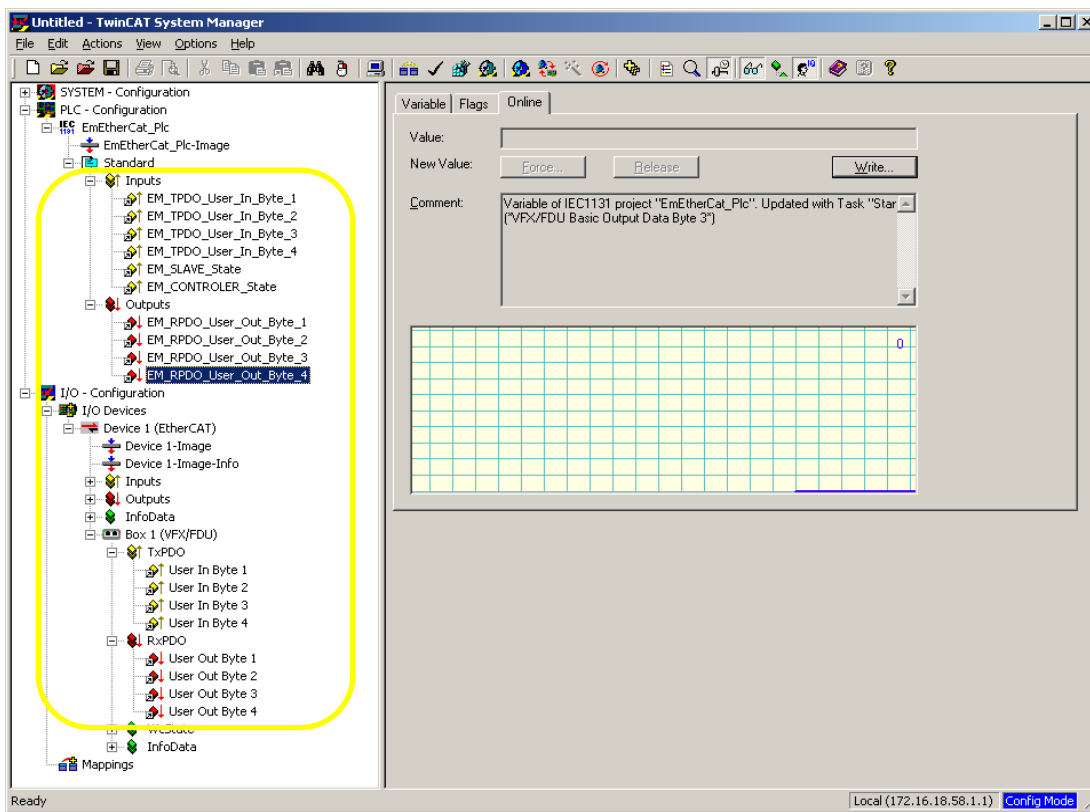
Bind the Controller state variable to Device 1 *DevState* object. The controller status can be used to monitor the status in HMI.



Do the same procedure to bind all the output variables.

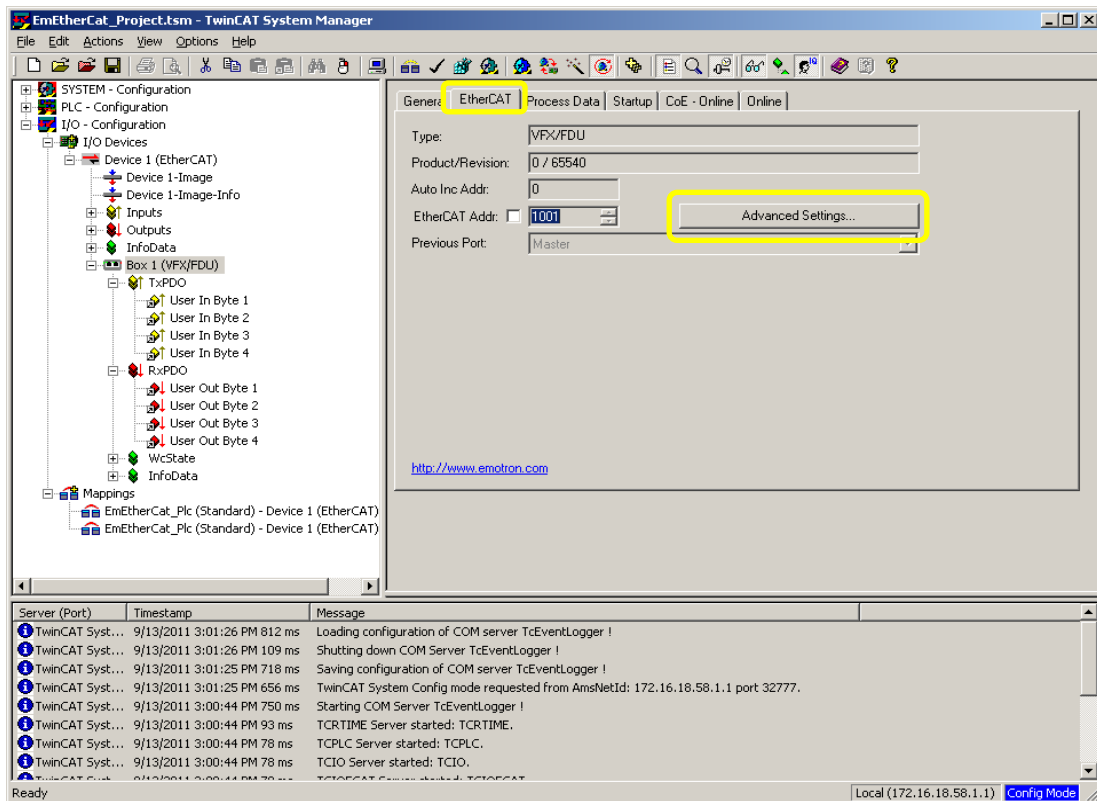


When all the bindings are done the explorer view should look as shown below.



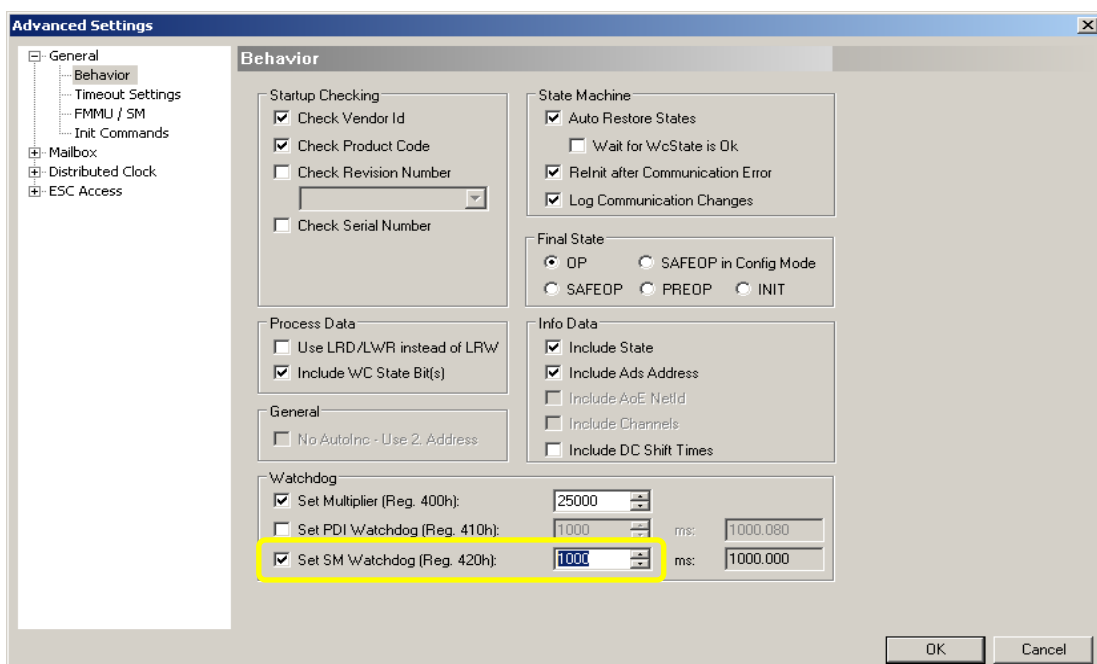
## Watchdog

Select Box 1 from the explorer panel and choose the EtherCAT tab and click on the *Advanced Settings* button. The watchdog needed to be set to detect com fault in VSD Menu [264] and to activate the SUP-bit indication in menu [2692].

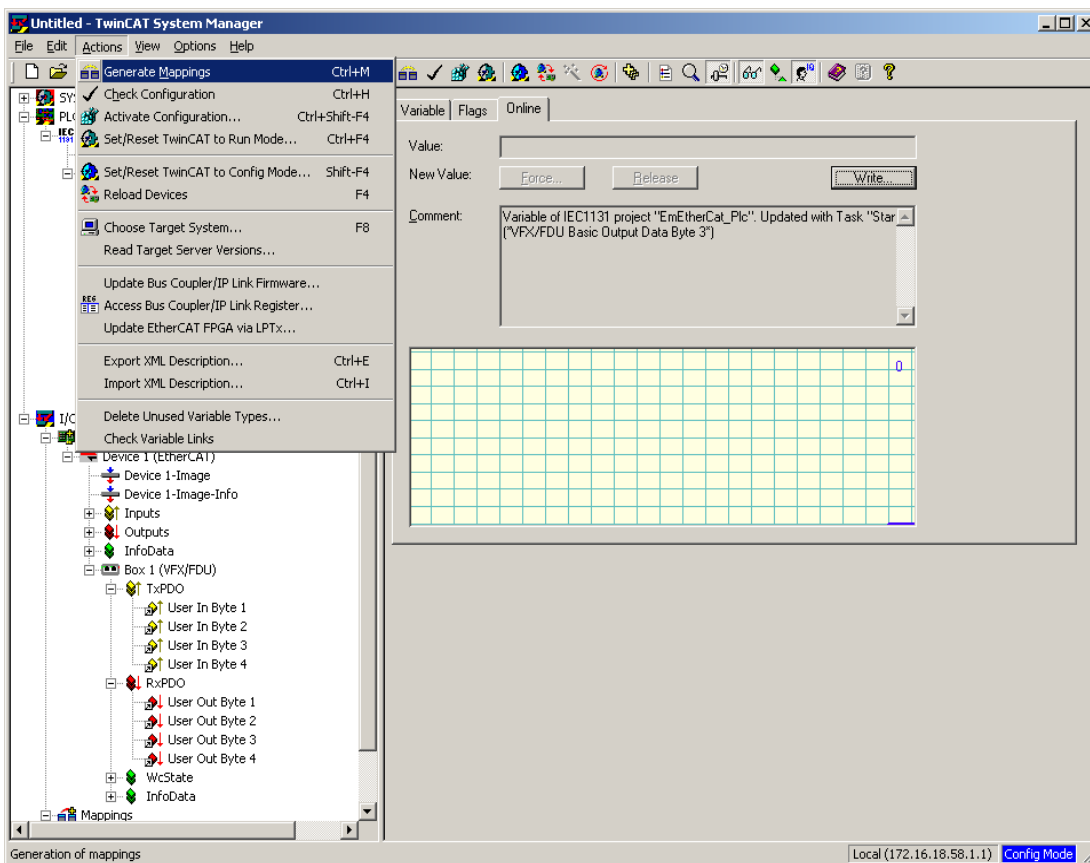


## Watchdog Time Setting

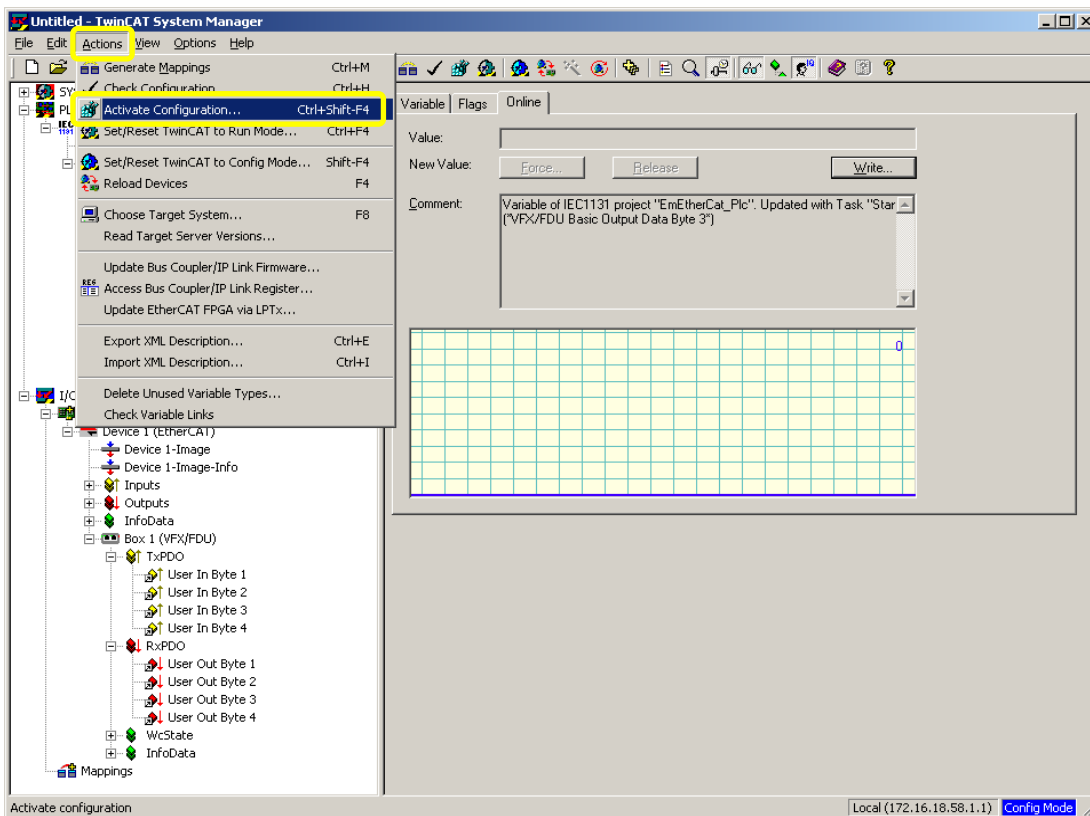
Highlight the *Set SM Watchdog* value and type an appropriate value into the field. Read the Beckhoff EtherCAT documentation for more detailed information about the watchdog setting.



Generate mappings, select Menu: *Action -> Generate Mappings*.



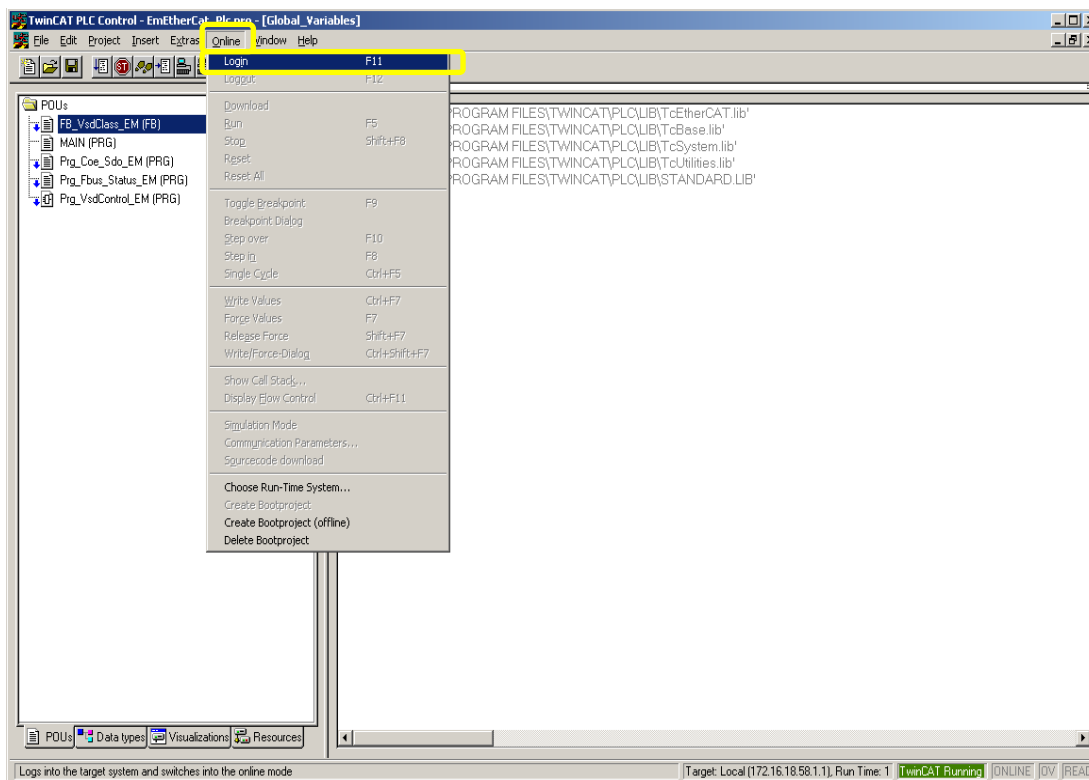
Activate the configuration, select Menu: *Action -> Activate Configurations*.



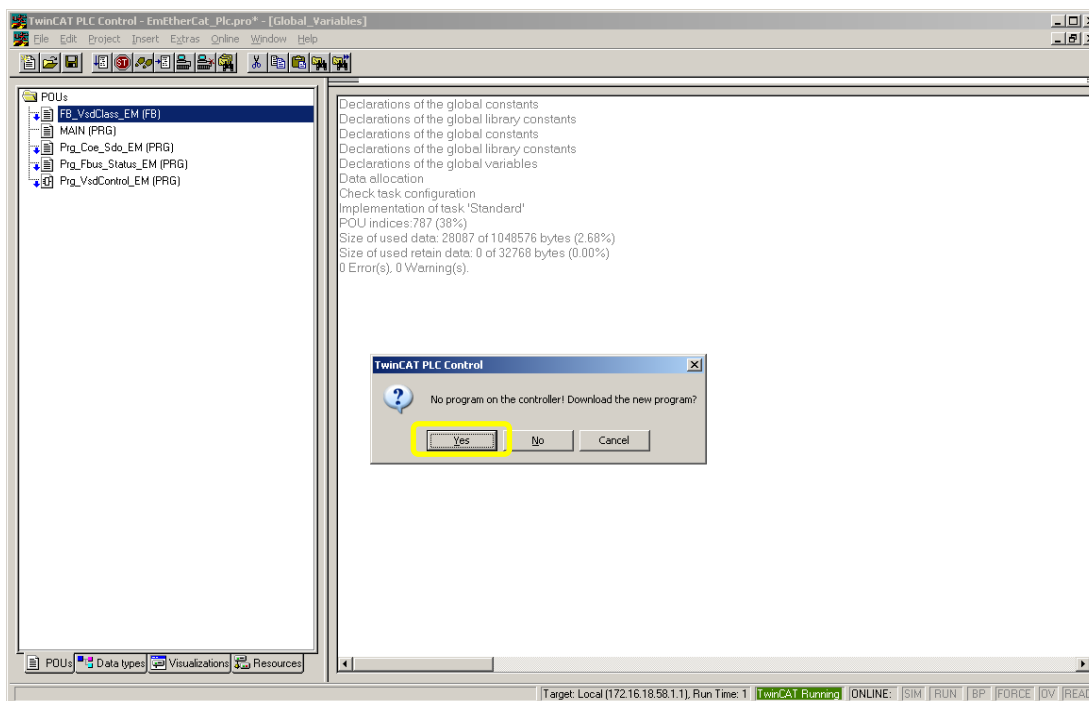
Press *OK* button.

## TwinCAT PLC Control

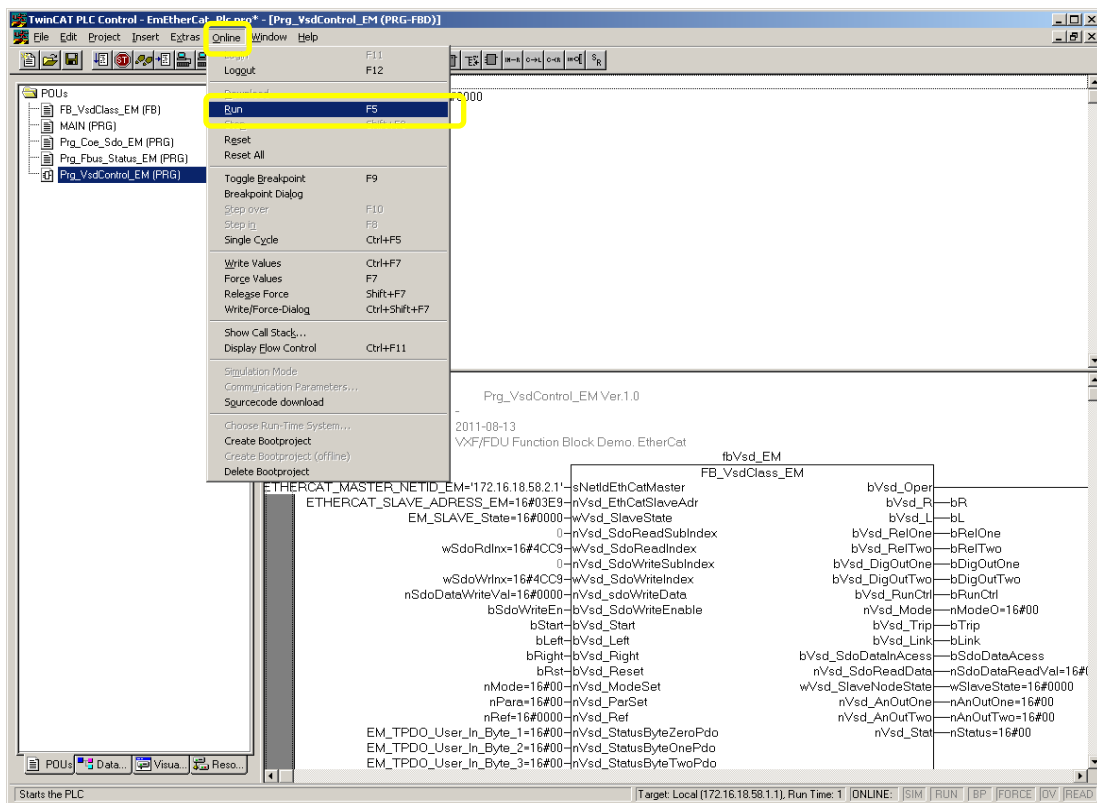
Open TwinCAT PLC Control and login, select Menu: *Online -> Login*.



If the dialog form “No Program on the controller Down Load New Program?” is shown, then press Yes Button.

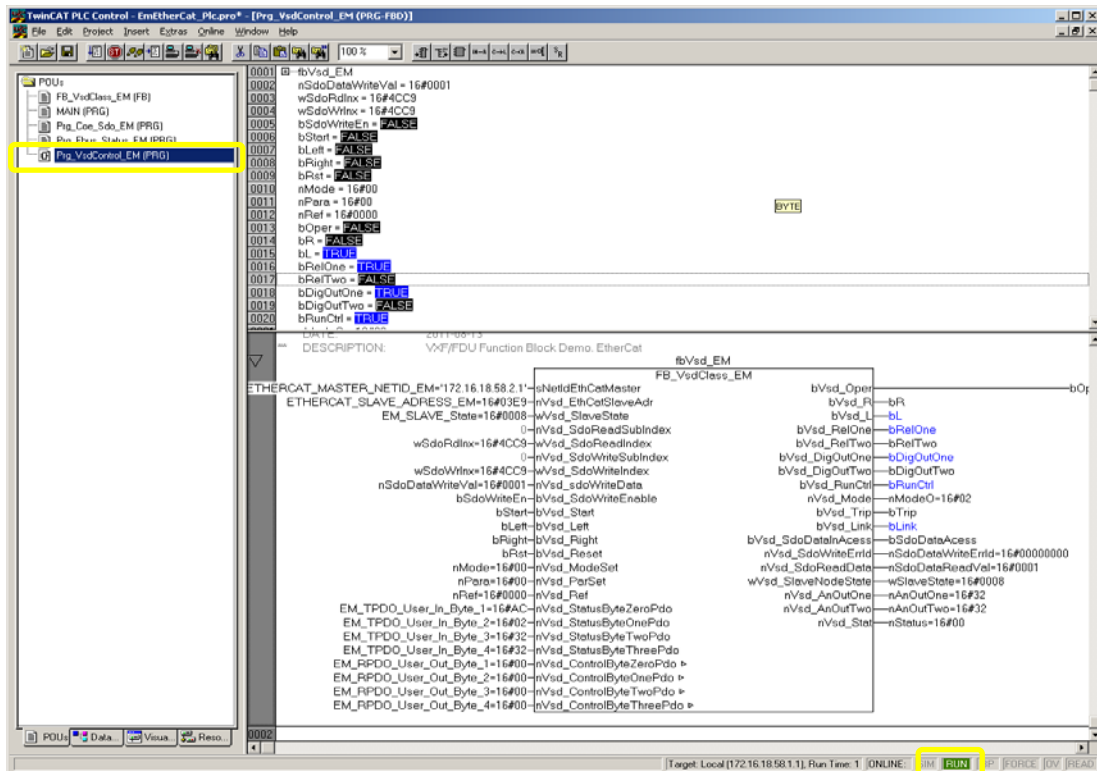


Runtime, Select Menu: *Online -> Run (F5)*.



## Function Block

The system is in run time to view VSD status select *Prg\_VsdControl\_EM*.

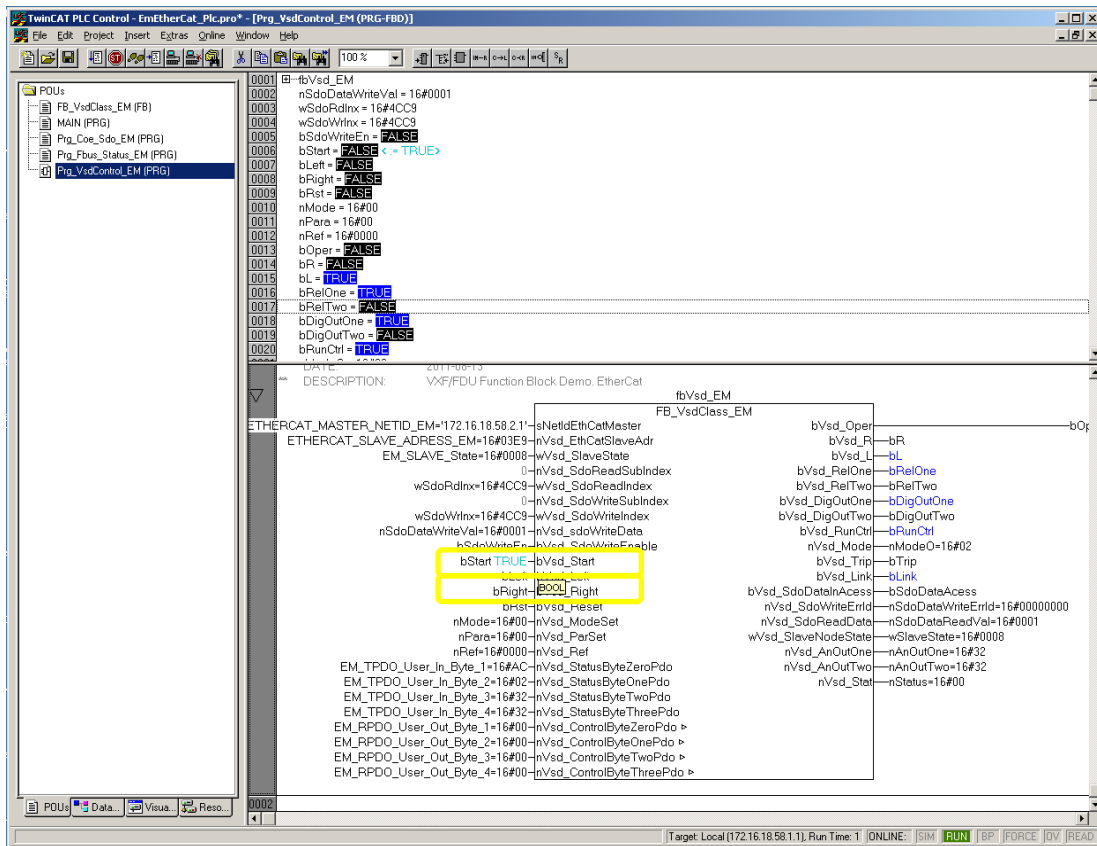


## Description of the properties

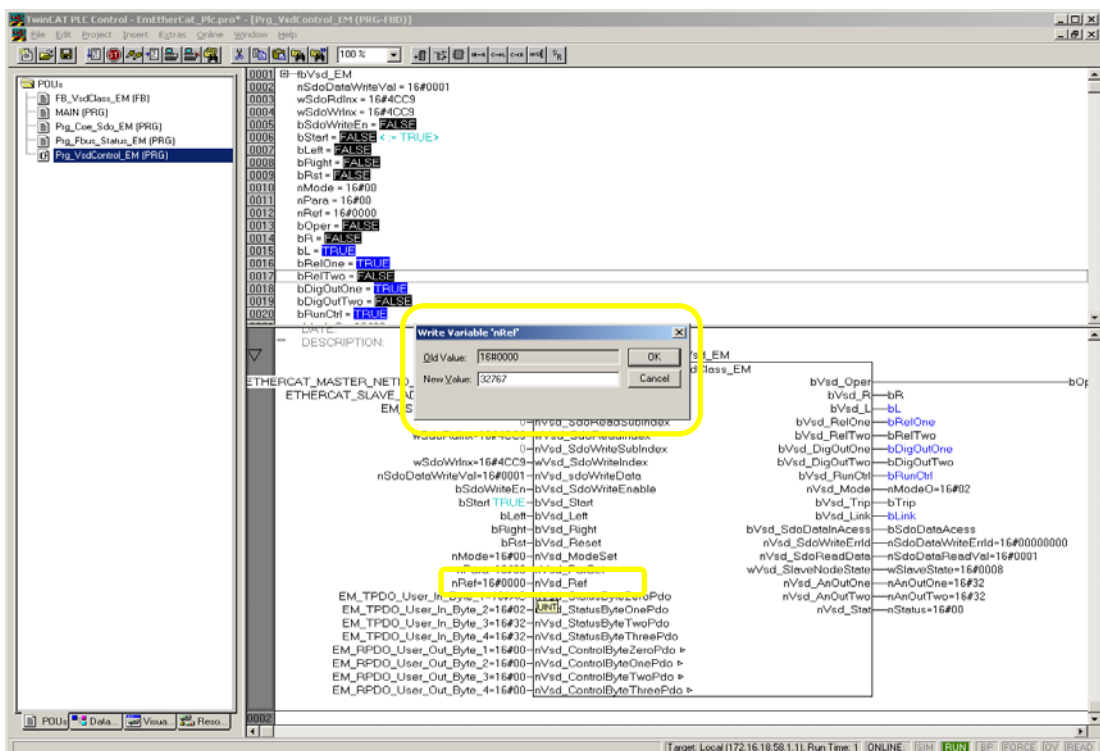
Property	Name	Description
Input	sNetIdEthCATMaster	EtherCAT Master Net ID
Input	nVsd_EthCATSlaveAdr	EtherCAT Slave Address
Input	wVsd_SlaveState	Slave Status Word InfoData->State
Input	nVsd_SdoReadSubIndex	CoE SDO Read Object Sub Index
Input	wVsd_SdoReadIndex	CoE SDO Read Object Index
Input	nVsd_SdoWriteSubIndex	CoE SDO Write Object Sub Index
Input	wVsd_SdoWriteIndex	CoE SDO Write Object Index
Input	nVsd_sdoWriteData	CoE SDO write Object Data Value
Input	bVsd_SdoWriteEnable	CoE SDO Write To Object <b>note !</b> Enable 0->1 edge
Input	bVsd_Start	Start Of The Drive / Frequency converter = com
Input	bVsd_Left	Direction "Left" (One direction must be Set =True)
Input	bVsd_Right	Direction "Right" (One direction must be Set =True)
Input	bVsd_Reset	Reset Error Status Of The Device <b>note !</b> Enable 0->1 edge
Input	nVsd_ModeSet	Drive Mode 0=Speed, 1= Torque, 2=V/Hz, 3=Control Panel
Input	nVsd_ParSet	Parameter set 0=A, 1=B, 2=C, 3=D
Input	nVsd_Ref	Speed/Frequency Reference Value (0...65535) Eng.Unit 0-100%
Input	nVsd_StatusByteZeroPdo	Status Byte 0 VSD Status Basic Data
Input	nVsd_StatusByteOnePdo	Status Byte 1 VSD Status Basic Data
Input	nVsd_StatusByteTwoPdo	Status Byte 2 VSD Status Basic Data
Input	nVsd_StatusByteThreePdo	Status Byte 3 VSD Status Basic Data
Output	bVsd_Oper	VSD Is In Operation
Output	bVsd_R	Rotation Right Activated
Output	bVsd_L	Rotation Left Activated
Output	bVsd_RelOne	State Relay 1 (Default Function = Trip)
Output	bVsd_RelTwo	State Relay 2 (Default Function = Run)
Output	bVsd_DigOutOne	State Dig Out 1 (Default Function= Ready)
Output	bVsd_DigOutTwo	State Dig Out 2 (Default Function =Brake)
Output	bVsd_RunCtrl	VSD Control Via Bus is Activated 0=run/stp Via Remote/Keyboard/Option 1=run/stp Via Com
Output	nVsd_Mode	Drive Mode (00=Speed, 01=Torque, 10=V/Hz, 11=Control Panel
Output	bVsd_Trip	VSD Trip Bit
Output	bVsd_Link	VSD Link 1=OK, I/O device link established
Output	bVsd_SdoDataInAccess	VSD SDO Data Write In Access
Output	nVsd_SdoWriteErrId	VSD SDO Write Error ID, (See ADS Error Codes, in Beckhoff documentation)
Output	nVsd_SdoReadData	VSD SDO Data Read Value
Output	wVsd_SlaveNodeState	VSD Node Slave Status 0x01 Init , 0x02 PRE OP, 0x03 Bootstrap, 0x04 SAFE OP, 0x08 OP State, 0x1nnn messages (nnn=message ID, see Beckhoff EtherCat documentation )
Output	nVsd_AnOutOne	VSD Default=Speed Is Selected For Speed Mode, 0-10V=0-255d,4-20mA=50-255d
Output	nVsd_AnOutTwo	VSD Default=Torque Is Selected For Torque Mode, 0-10V=0-255d,4-20mA=50-255d
Output	nVsd_Stat	Error And Warnings (see in manual)
In/Out	nVsd_ControlByteZeroPdo	Control Byte 0 VSD Control Basic Data
In/Out	nVsd_ControlByteOnePdo	Control Byte 1 VSD Control Basic Data
In/Out	nVsd_ControlByteTwoPdo	Control Byte 2 VSD Control Basic Data
In/Out	nVsd_ControlByteThreePdo	Control Byte 3 VSD Control Basic Data



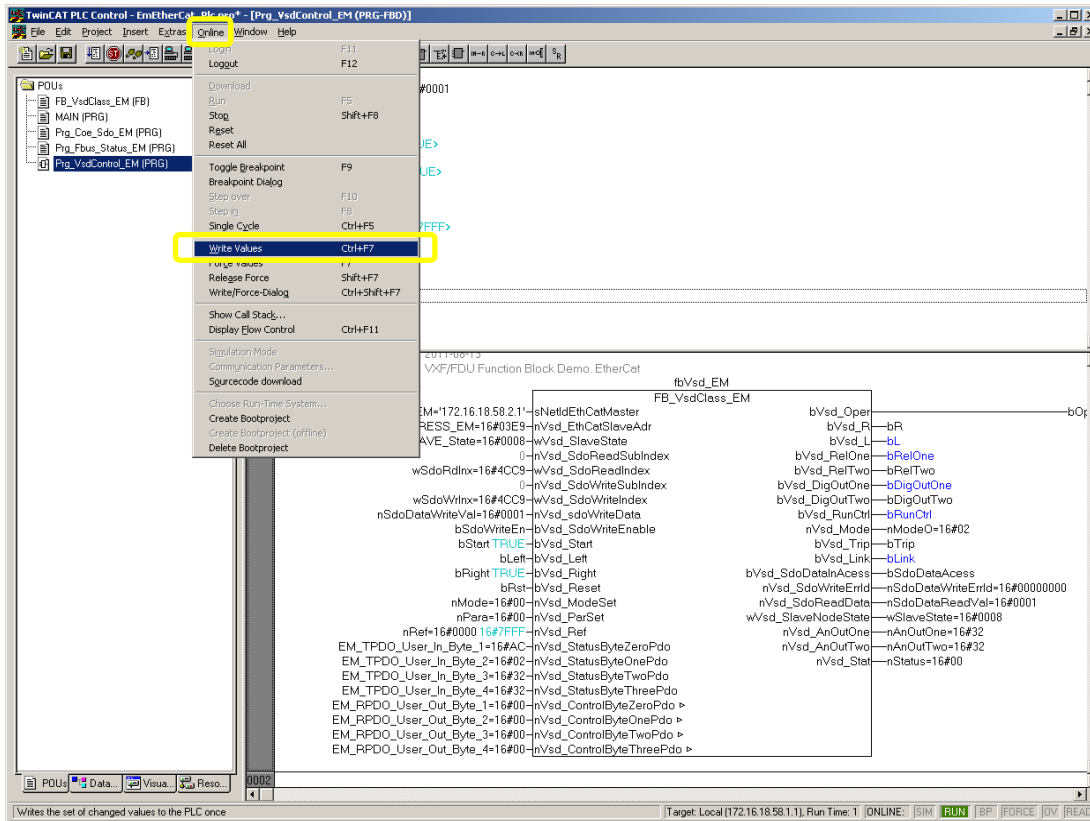
Change property value, double click on the property *bStart* to change the value to TRUE, change also the variable value *bRight* to TRUE.



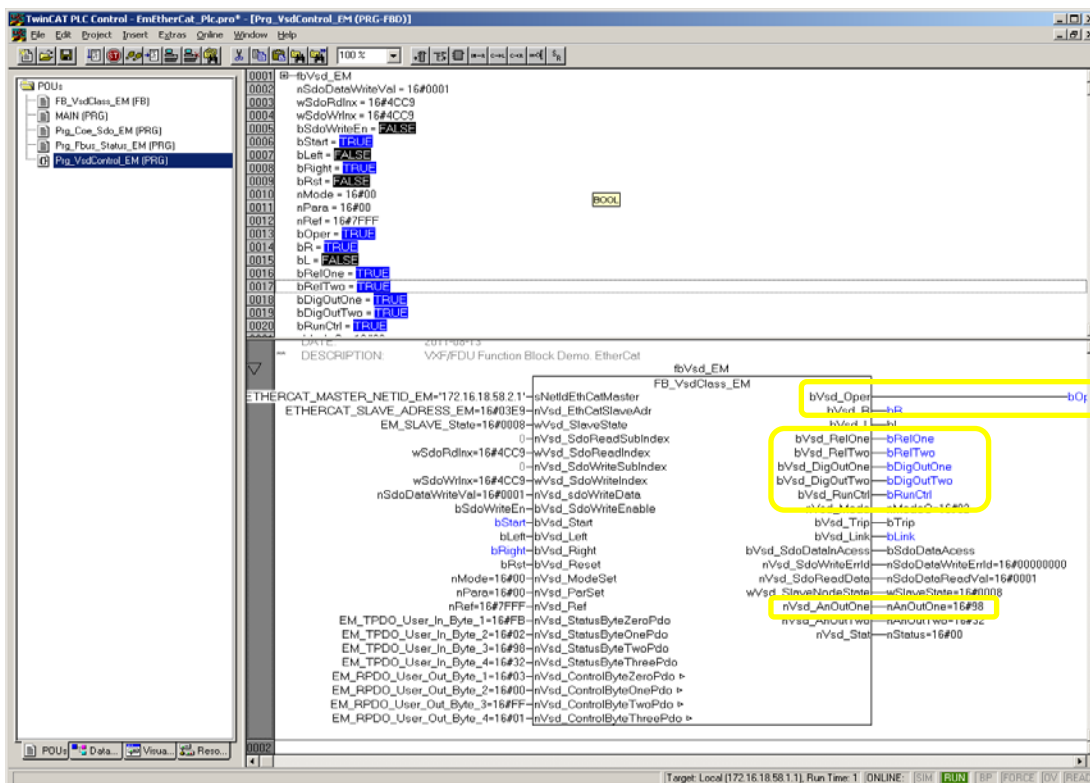
Double click on *nRef* to change VSD reference value, type in the reference value and click *OK*. The reference presents 50% eng. unit of the speed set in the example below.



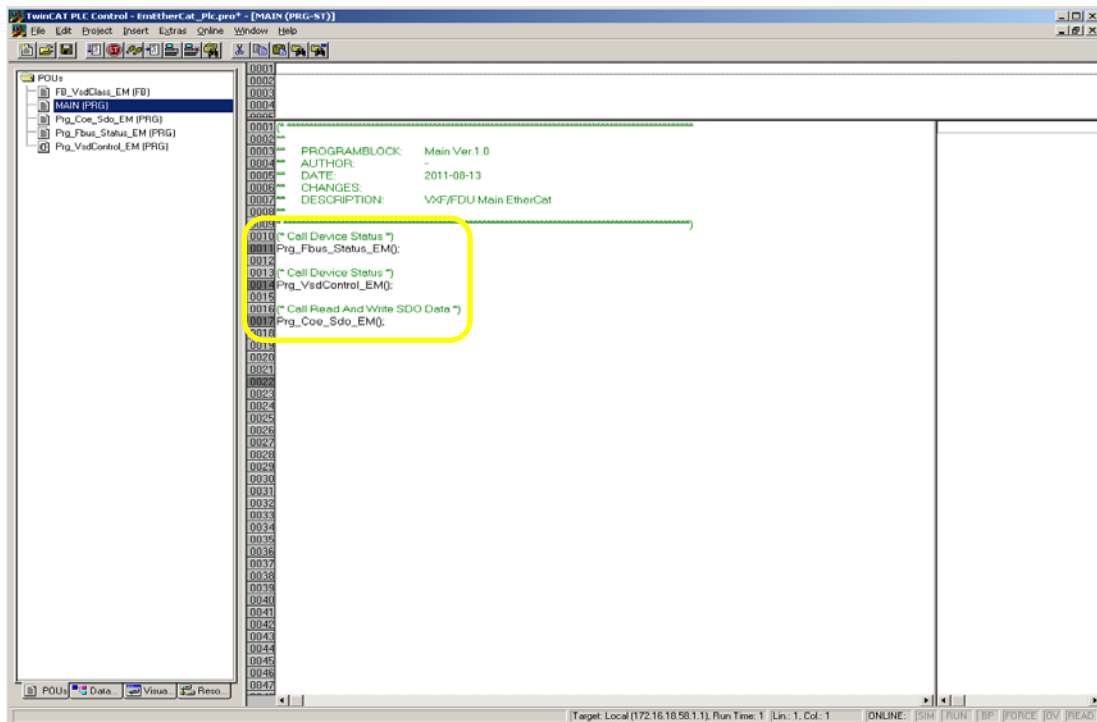
Write values to controller, select Menu: *Online -> Write Values* (Ctrl+F7).



When write of values is performed to the VSD block, the operation status for the outputs should indicate following: The rotation direction, Relay 2 (Default Run), the digital output 2 releases the brake as default setting and Analog out 1 (where speed is default setting).

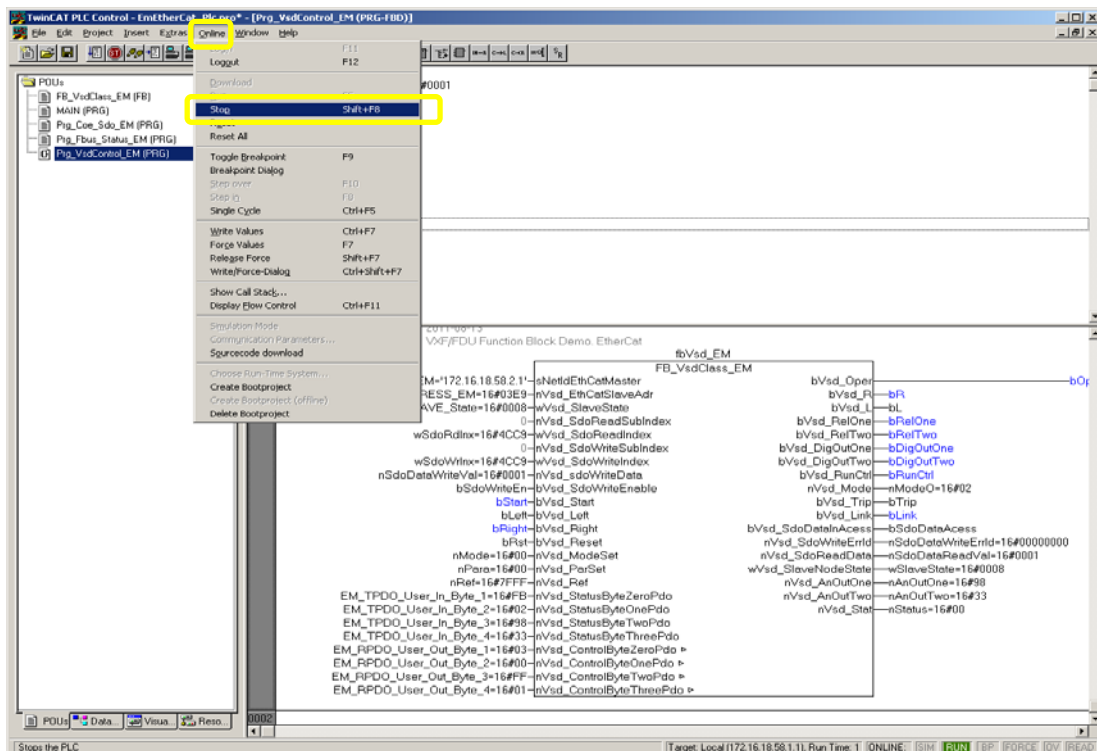


The Main program structure (The project is running in one task only).  
 Prg\_Fbus\_Status\_EM, example to monitor the EtherCAT device status.  
 Prg\_VsdControl, example to control the VSD.  
 Prg\_Coe\_Sdo\_EM, example to read write service data objects.

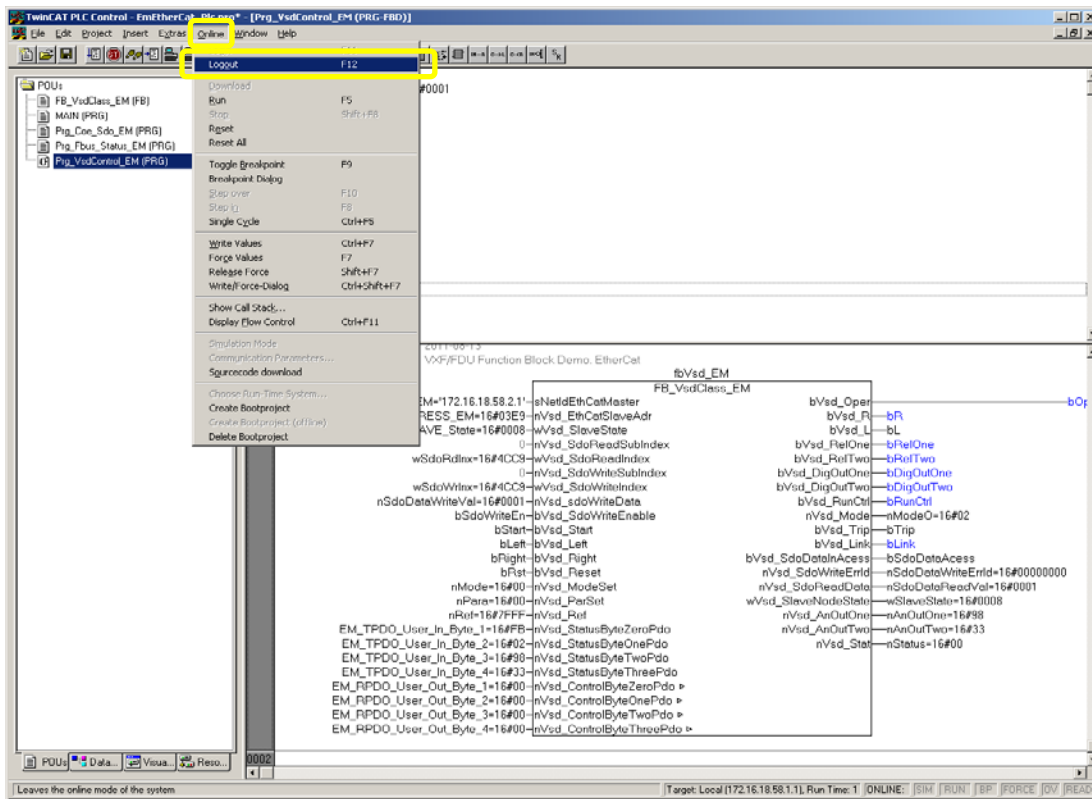


### How to Stop PLC Controller and return to free run mode

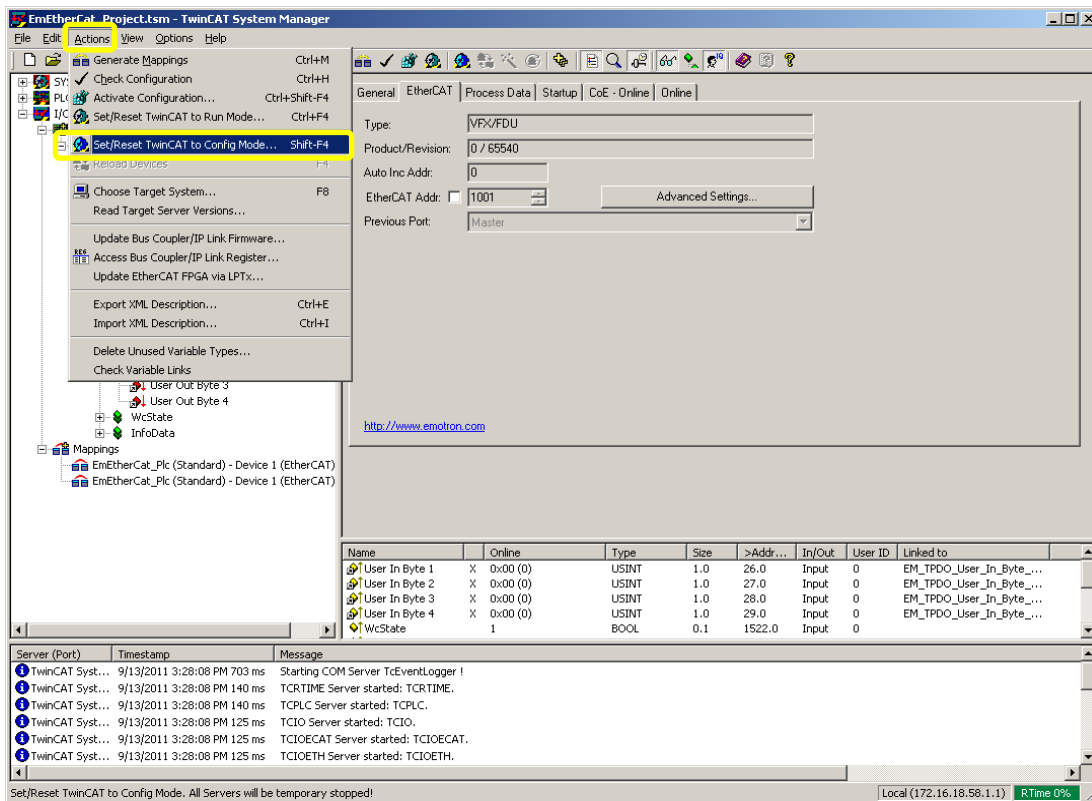
To change status of the controller from run to stop mode, select Menu: *Online -> Stop* (Shift+F8).



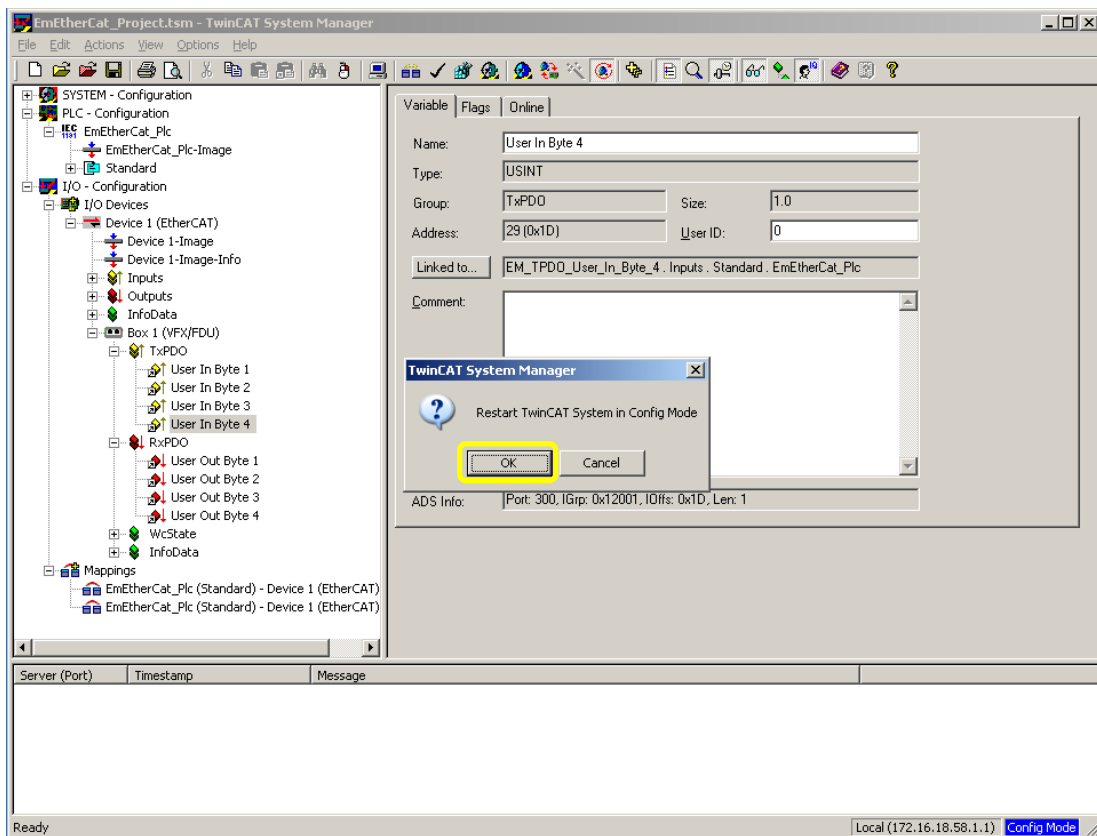
Logout from the controller, select Menu: *Online -> Logout (F12).*



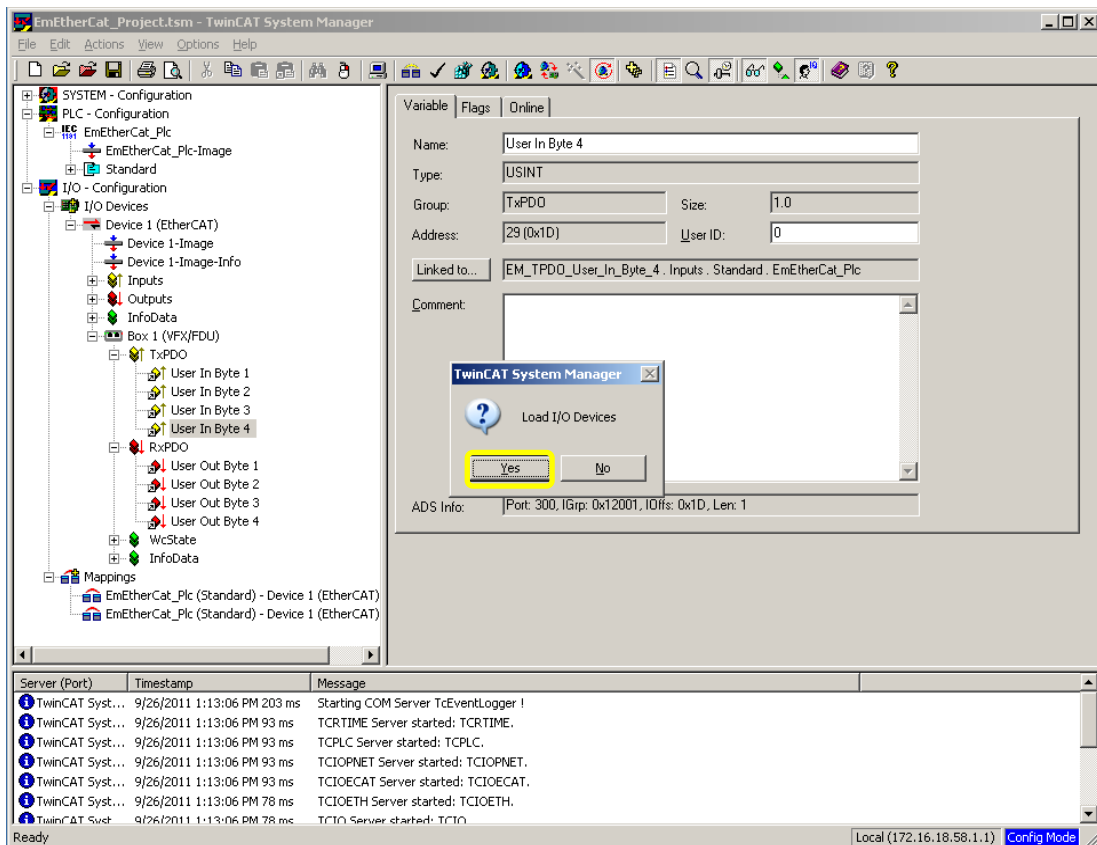
Change system state back to free run mode. Open System Manager and select Menu: *Action -> Set/Reset TwinCAT to Config Mode.*



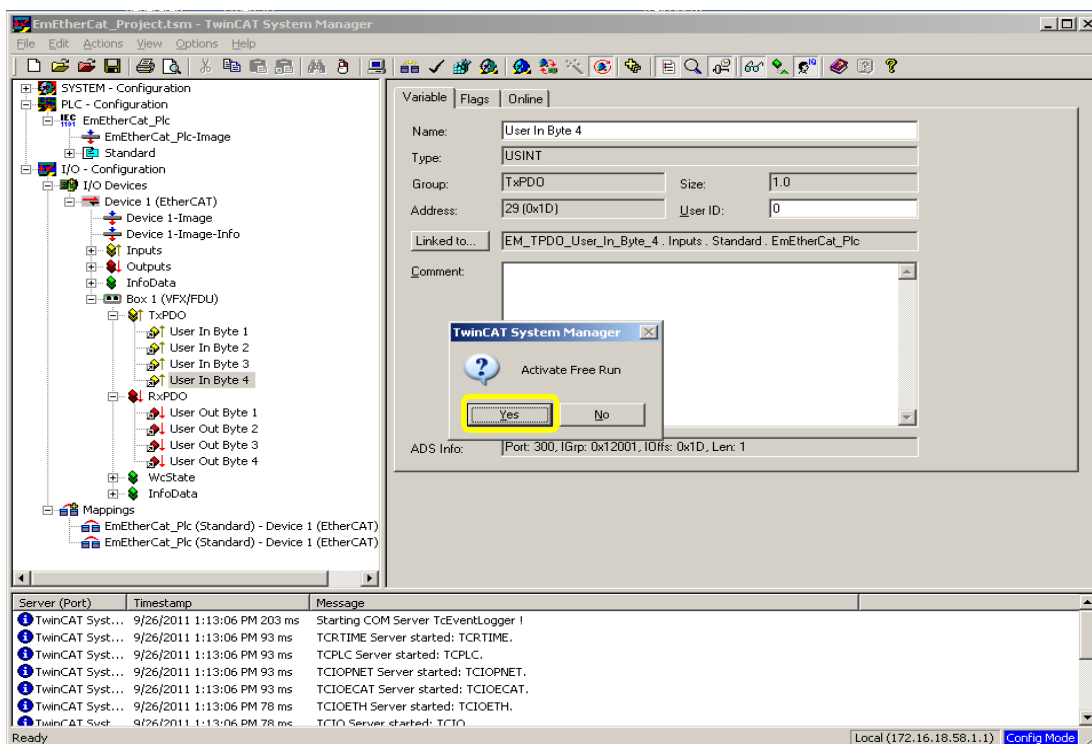
Click on *OK* button.



Click on *Yes* button to load I/O device.



Click on **Yes** button to activate free run mode.



The system is in free run mode.

