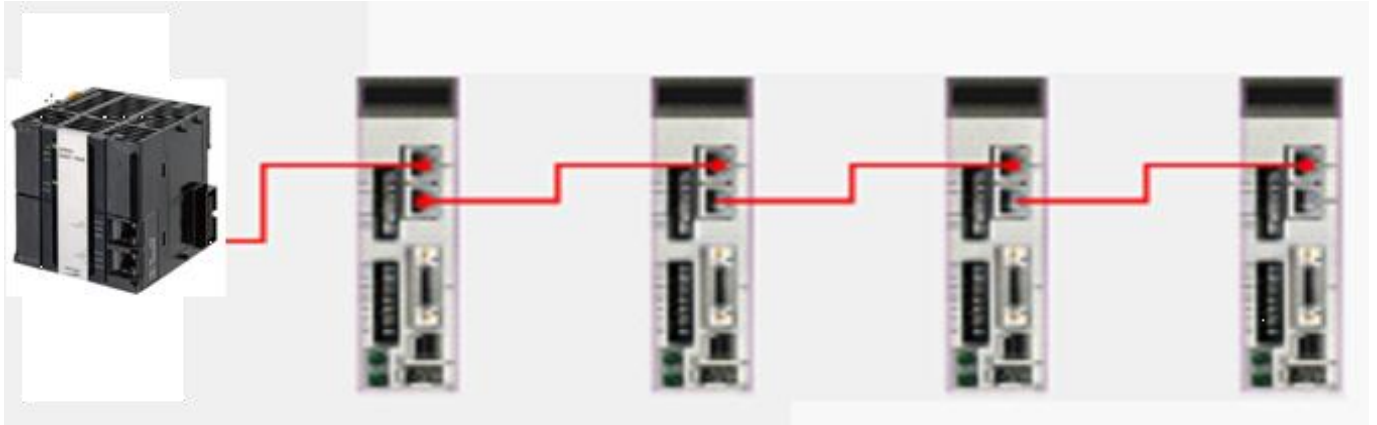


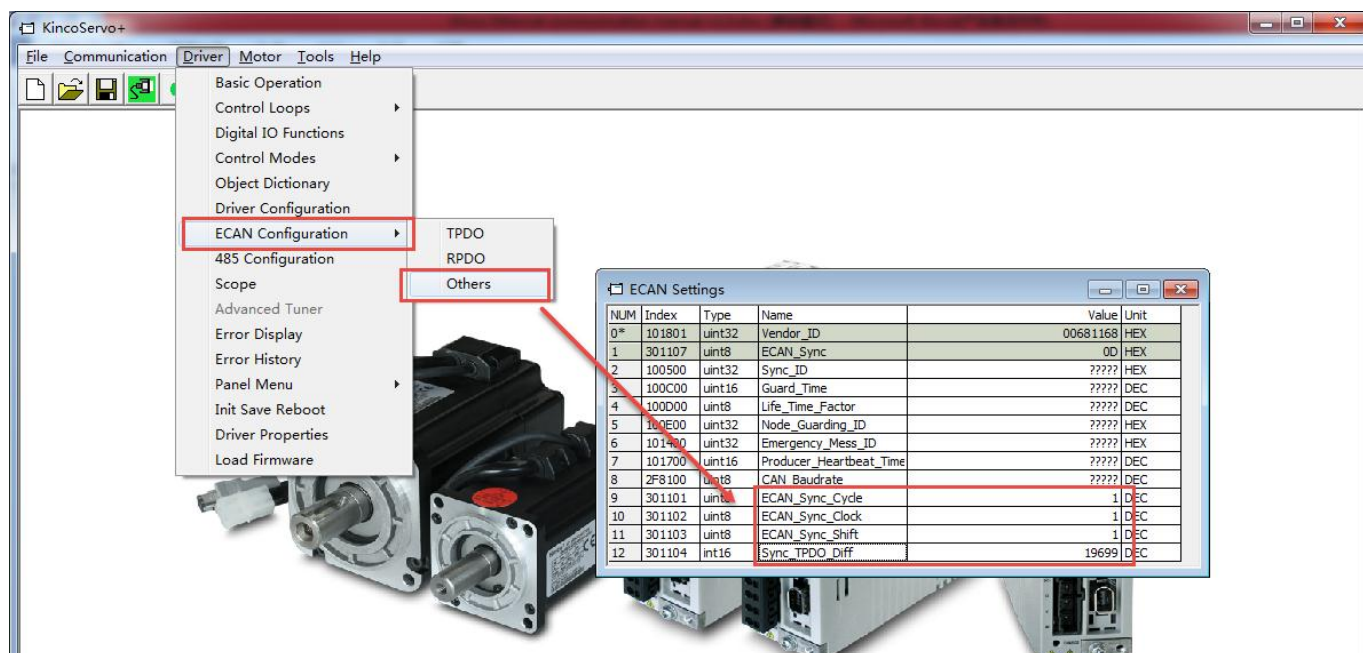
Ethercat communication guide between OMRON NJ Series and Kinco Servo

1. Devices connection

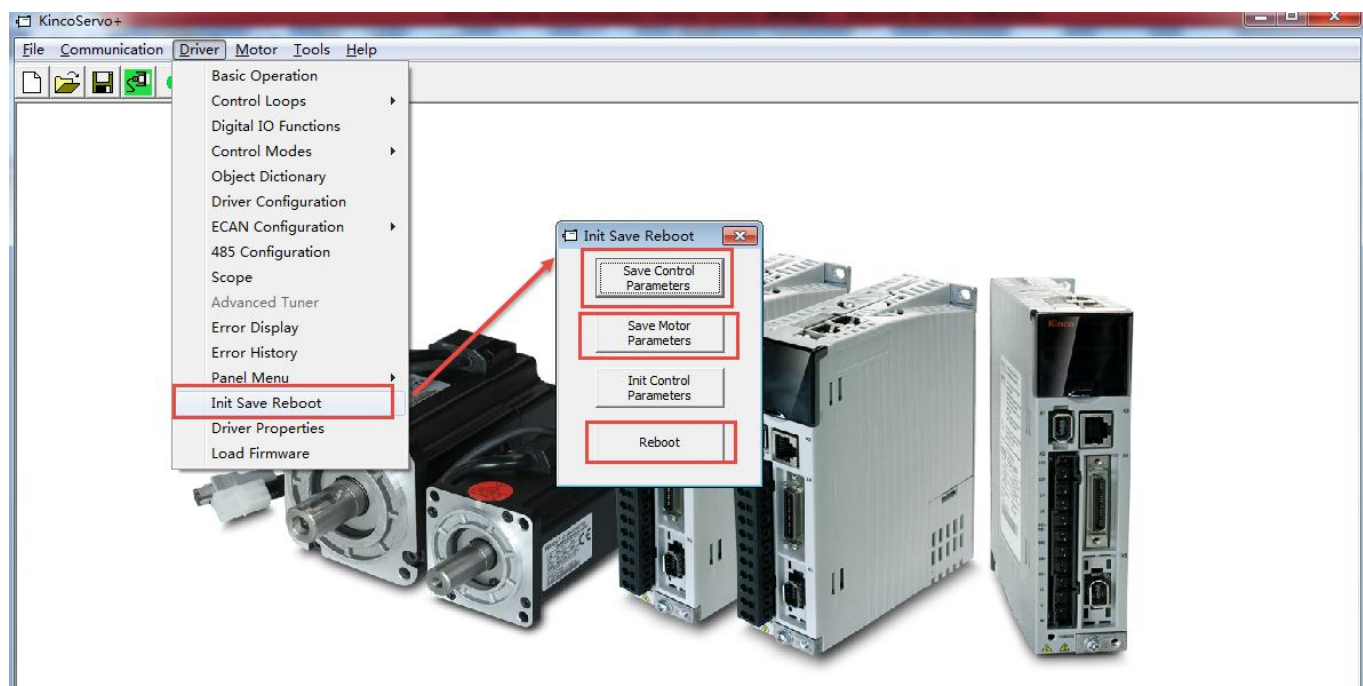


2. Servo setting

Set synchronizing period of servo driver first. Make sure synchronous clock mode (ECAN_Sync_Clock) is opened and synchronous cycle (ECAN_Sync_Cycle) = 2ms (value=1). Recommend to use 1ms (value=0) or 2ms (value=1). For 4ms and 8ms, they lose the signification of using Ethercat. Servo supports 1,2,4,8 ms synchronizing period only, even controller can support more. Synchronous point offset (ECAN_Sync_Shift) is used to adjust the shaking phenomenon when synchronous signal of controller is different with command signal. Normally, recommend to set to 1. It means 62.5us synchronous signal shift at servo side after received command signal. The last parameter is synchronous signal lost counting. It counts the times of synchronous signal from controller to servo.



Above all parameters setting are valid only after saving control parameters and motor parameters and reboot.



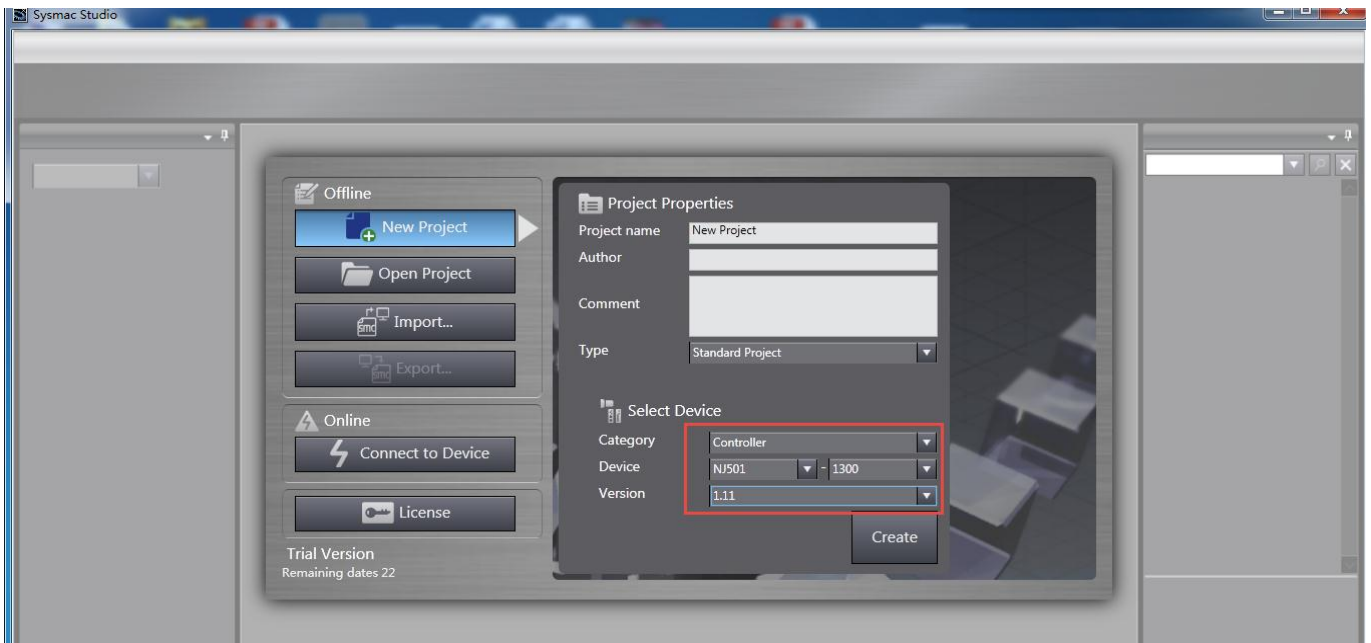
During control servo, if it needs to adjust the performance of servo PI parameters and other parameters, please refer to servo user manual.

3. Parameters setting in controller

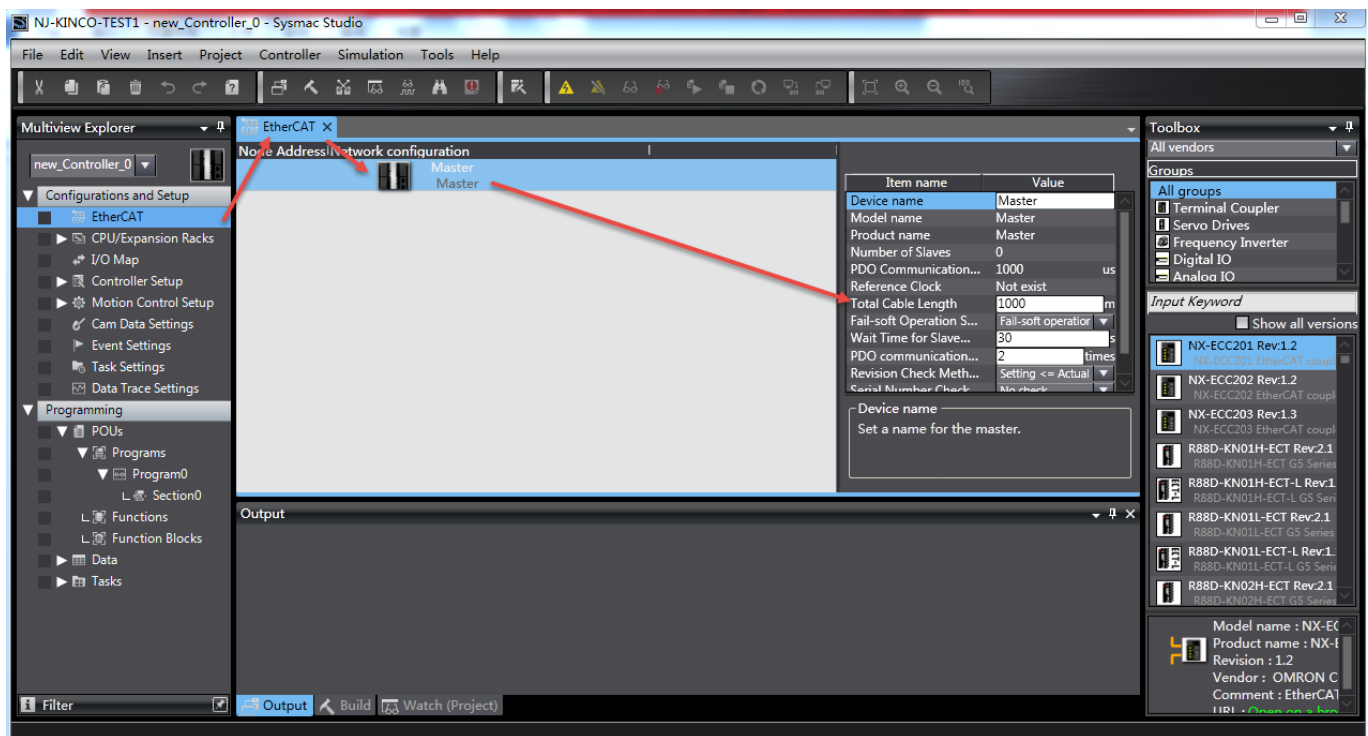
Copy Kinco servo device file Kinco_servo.xml to the installation folder of Sysmac Studio software of NJ series controller. For example:

C:\Program Files\OMRON\Sysmac Studio\IODeviceProfiles\EsiFiles\SystemEsiFiles

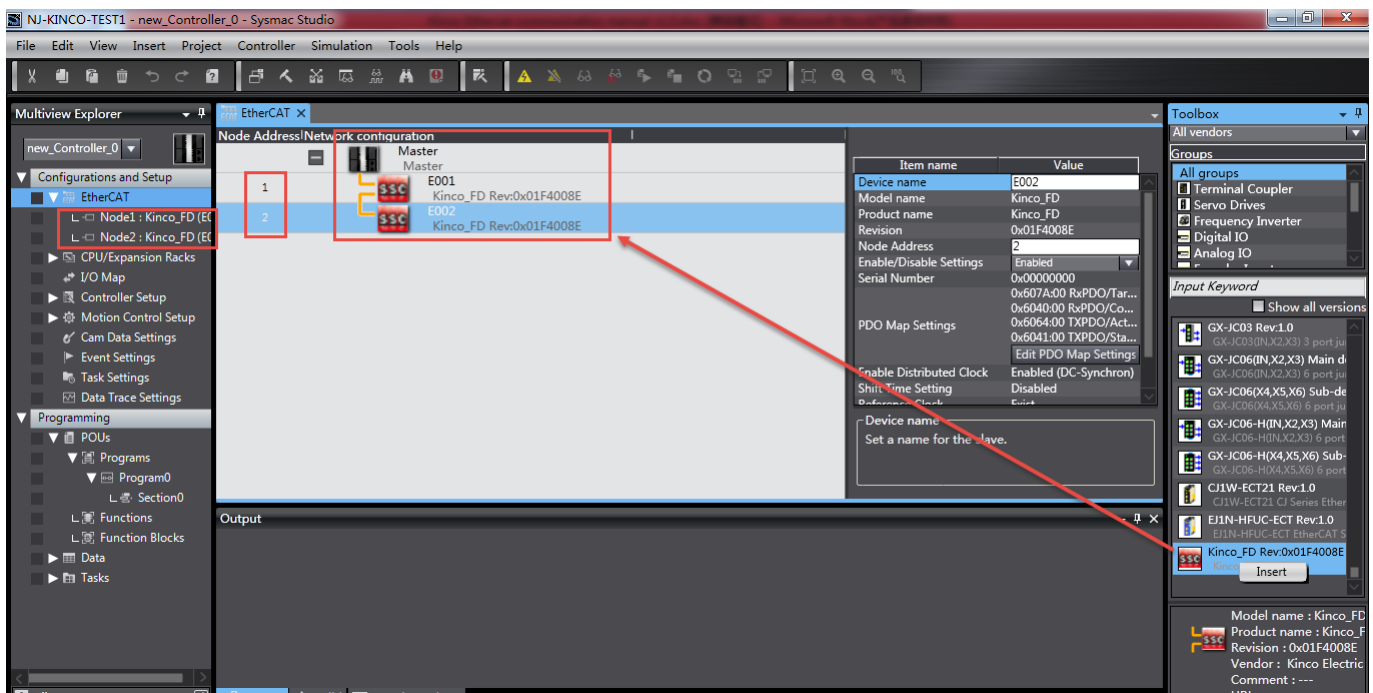
Use a standard Ethernet cable to connect PC and NJ controller. Open Sysmac Studio software to create a new project. Choose the model and version information. They can be found on the product label of controller.



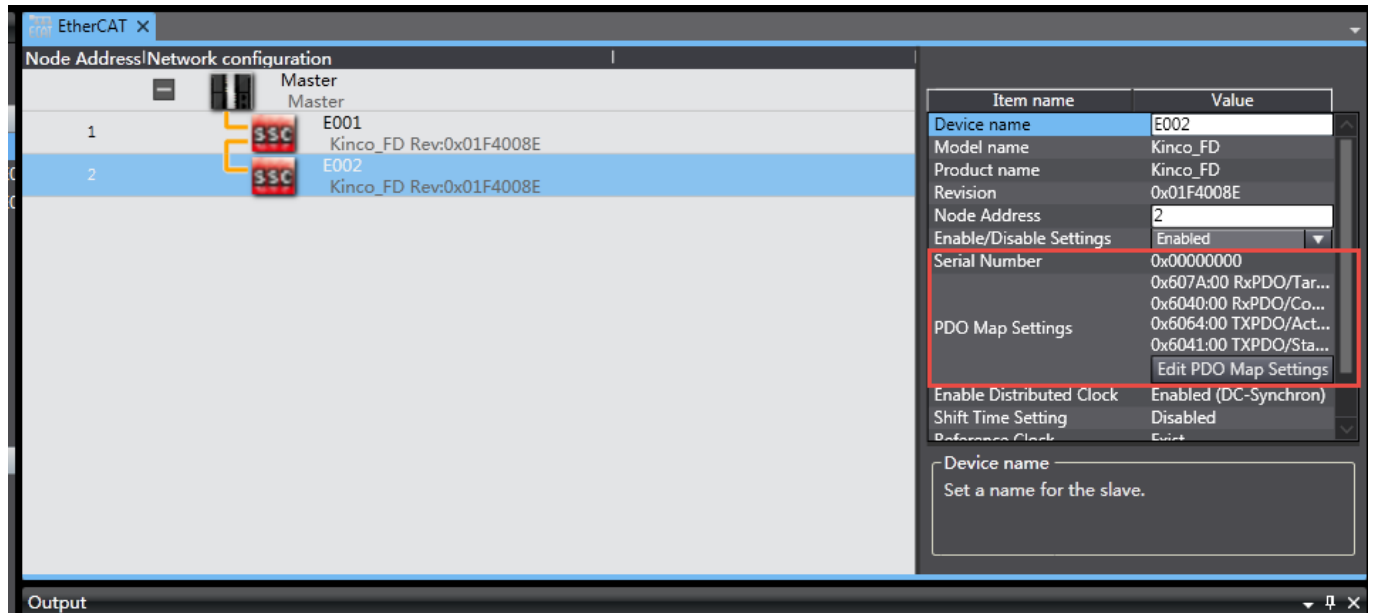
After created project, double click Configurations and Setup at left side, and then set the parameters of master station at right side (normally use default values).



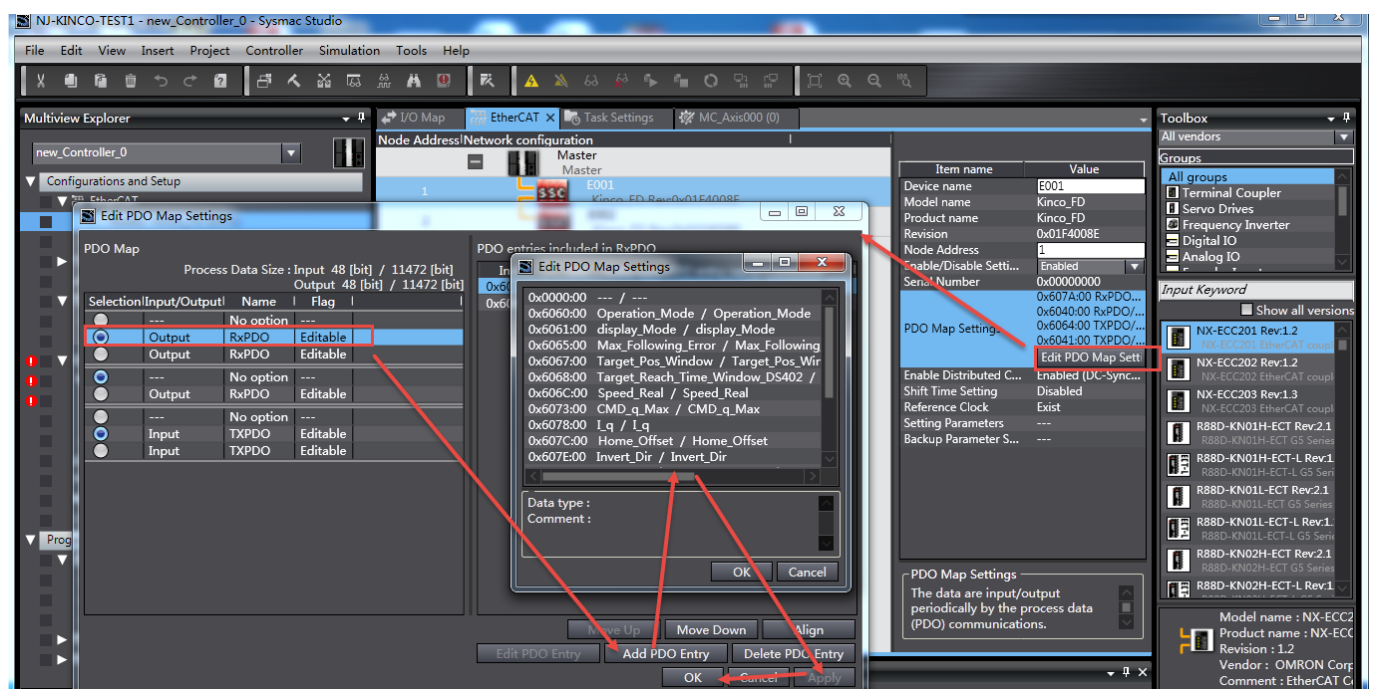
Find Kinco_FD in toolbox and right click to insert slave station of Kinco servo (insert the pieces that you real use). After inserted, the slave stations will be shown in Network configuration interface and distributed the address automatically.



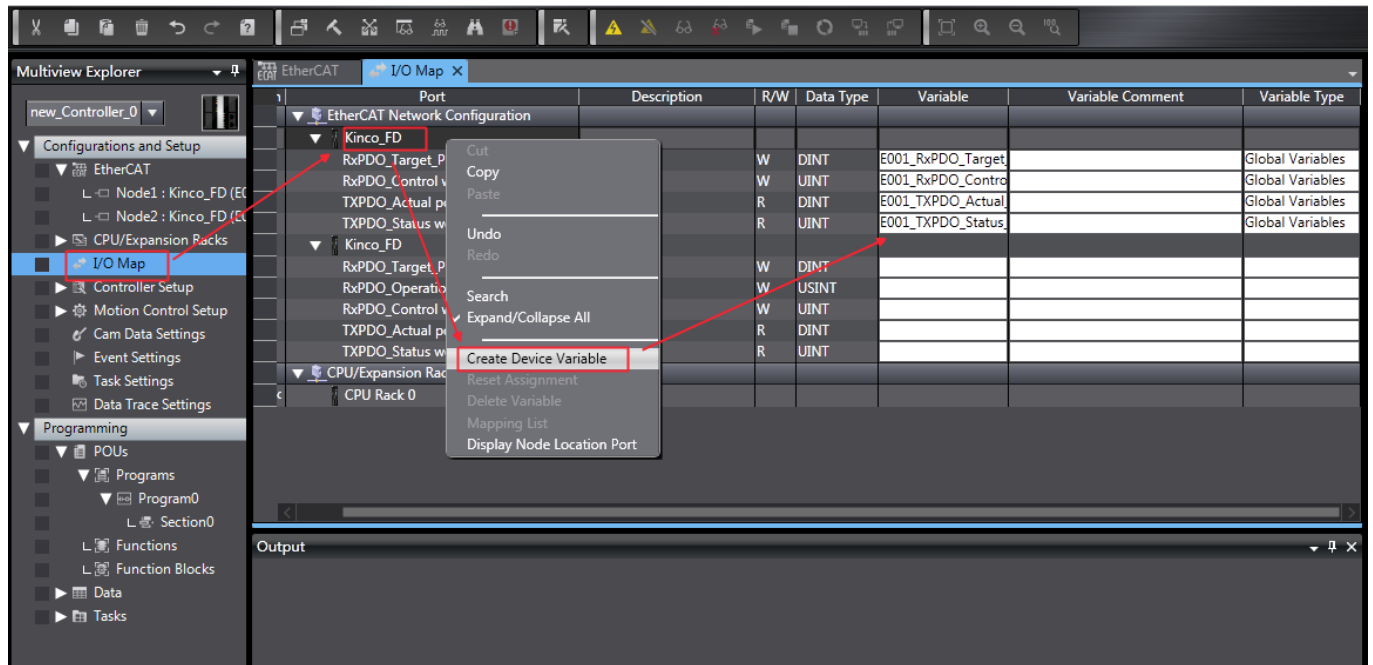
Click slave station to set its parameters. Usually, the default values in below frame are able to meet the requirements of motion control system. If setting parameters for many slave stations, it is a smart way to copy and paste from the finished one via right clicks.



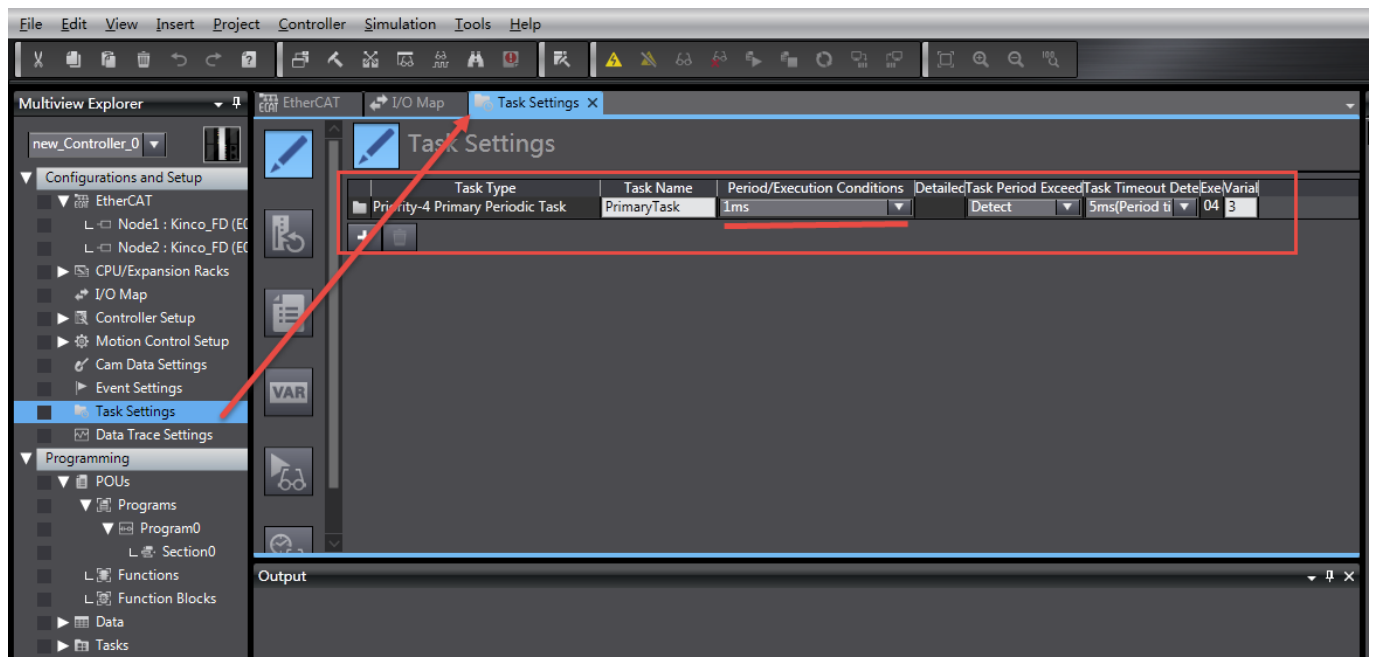
For more control demand, for example to use Ethercat as an ordinary slave station instead of motion control, it needs to add and configure more PDO. Click Edit PDO Map Settings to choose output RPDO or input TPDO channel and then add PDOs. Last, click Apply and Ok to be available.



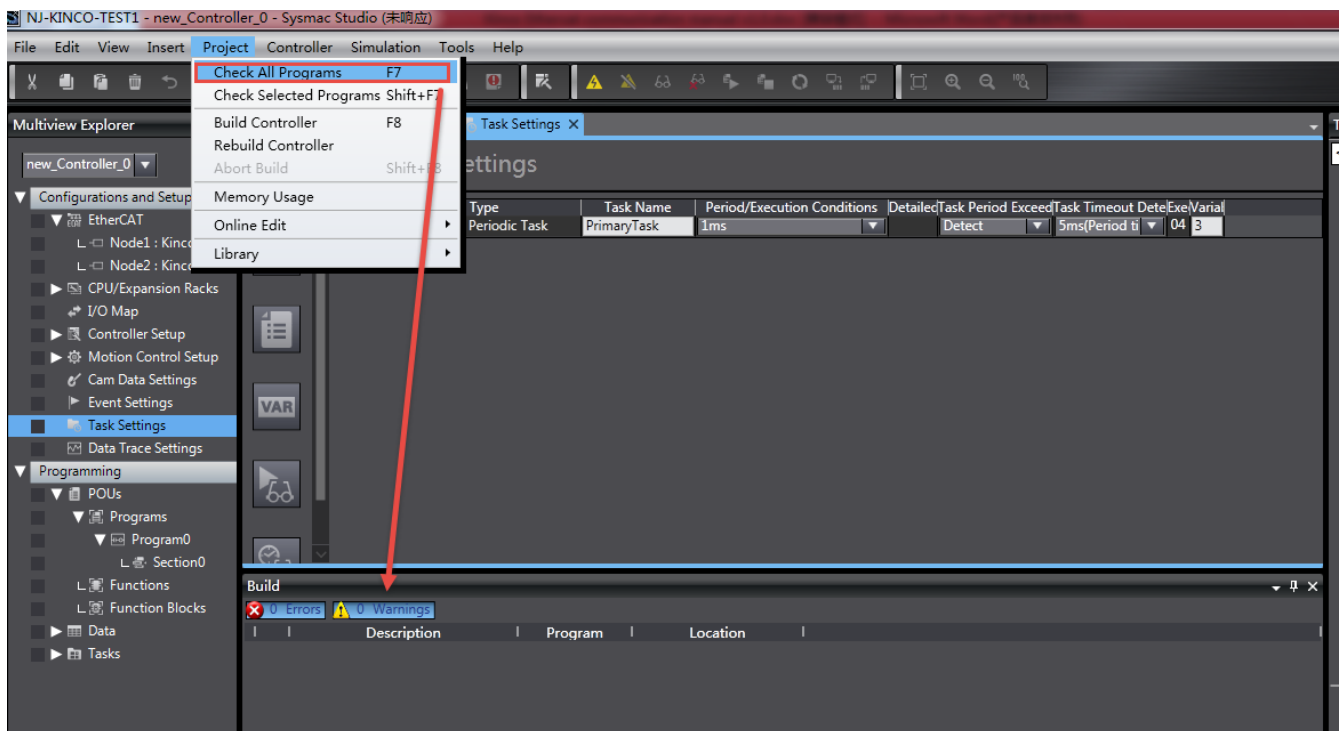
Map slave station's PDO to controller's local IO: double click I/O Map at left side and then choose a slave station (the stations have to be configured one by one and all stations must be configured) to create device variable. The system will distribute a local variable IO automatically.



Set period in Task Settings and set period of Primary Periodic Task. Please note that it is unable to delete this task and the period must be same with the synchronous period in servo.



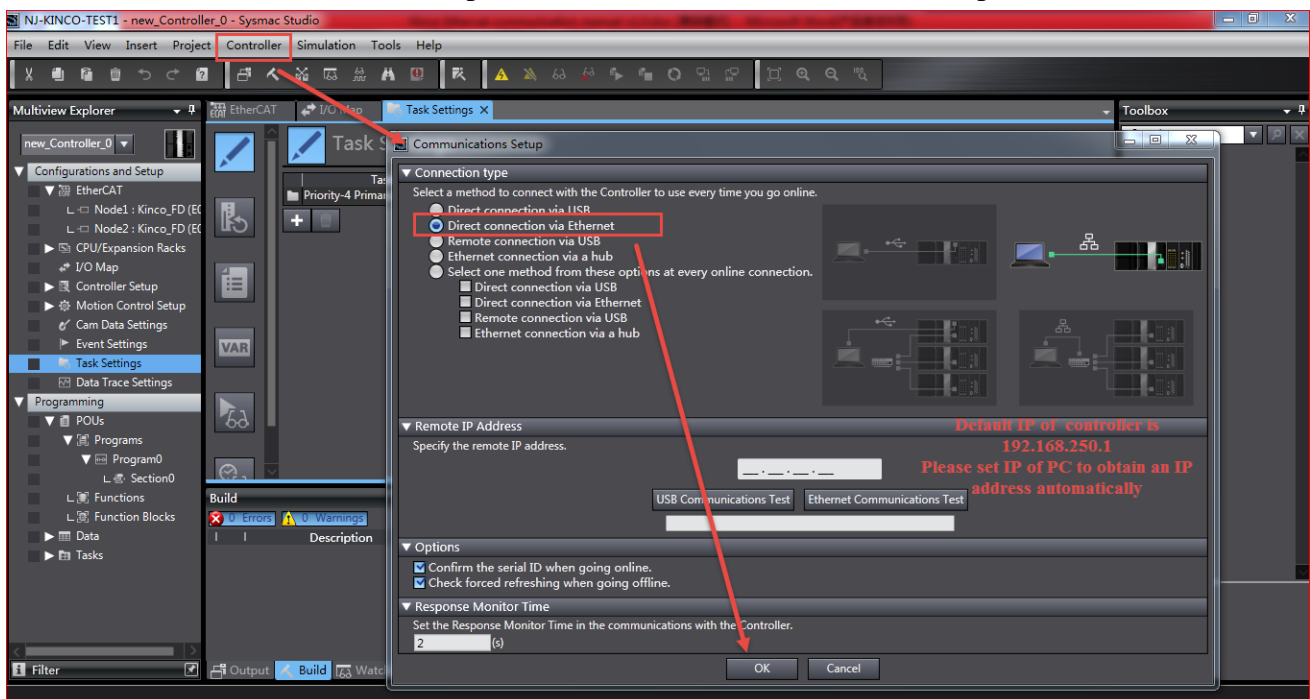
Click project and check all programs to see if there are mistakes or not.



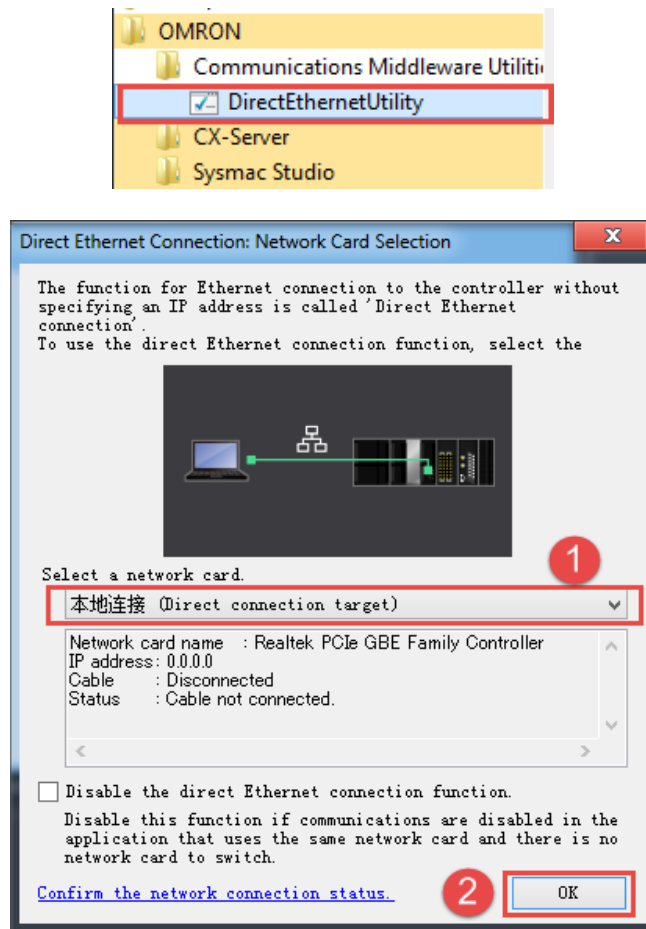
All basic parameters are setting finished until this step.

It is able to download programs and debugging as next step:

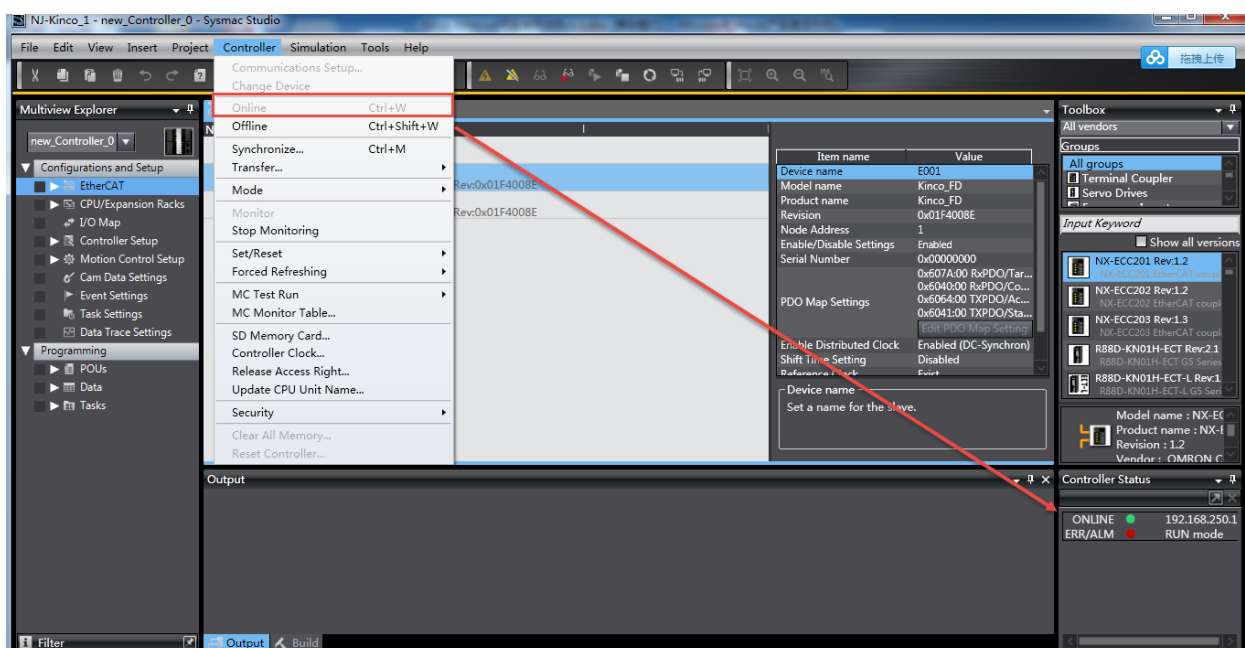
Controller-Communications Setup, select a connection method, for example via Ethernet.



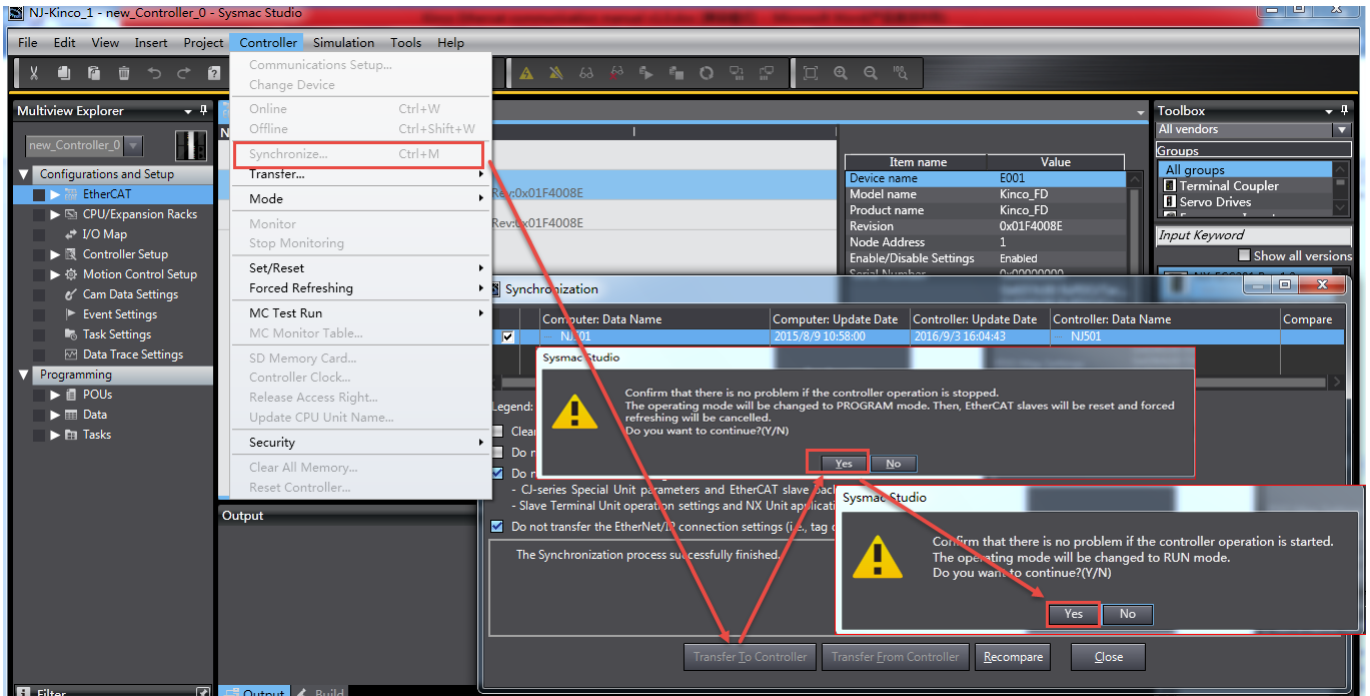
Open software Direct Ethernet Utility and choose Direction connect target.



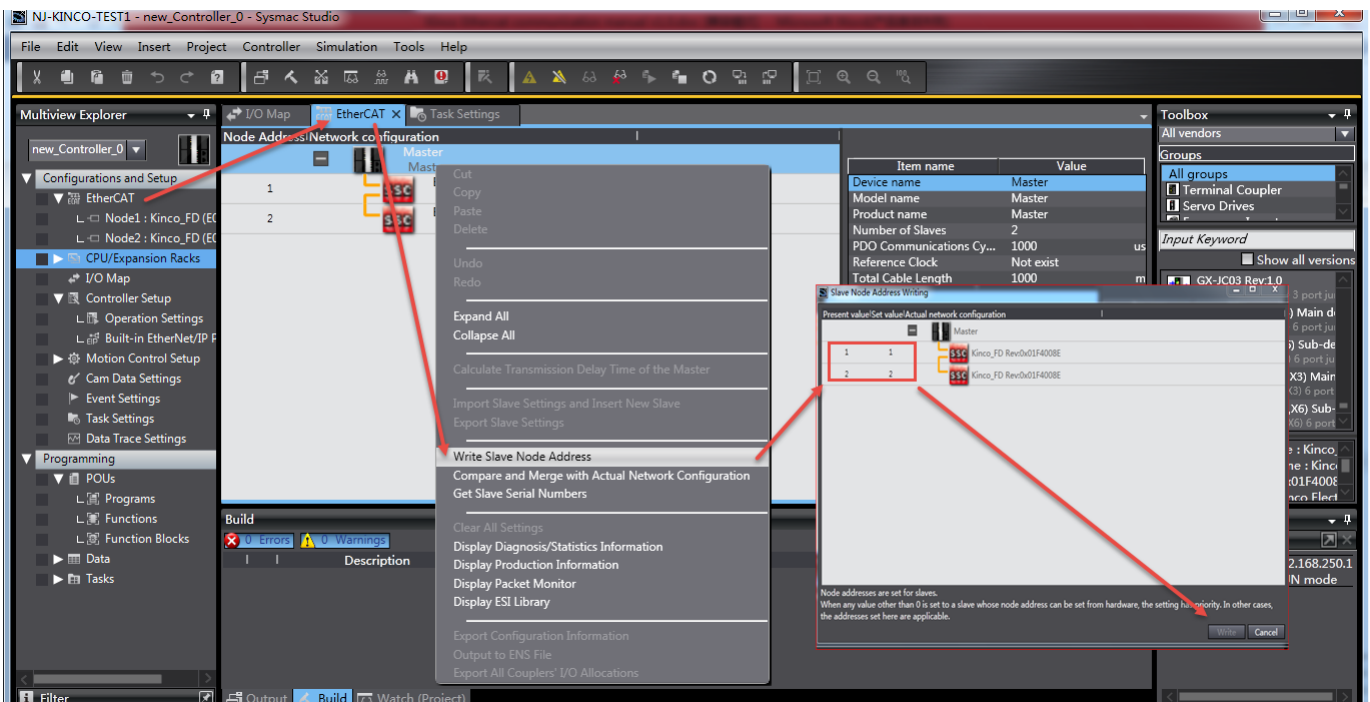
Controller-Online, if online success, it will show state at right bottom corner.



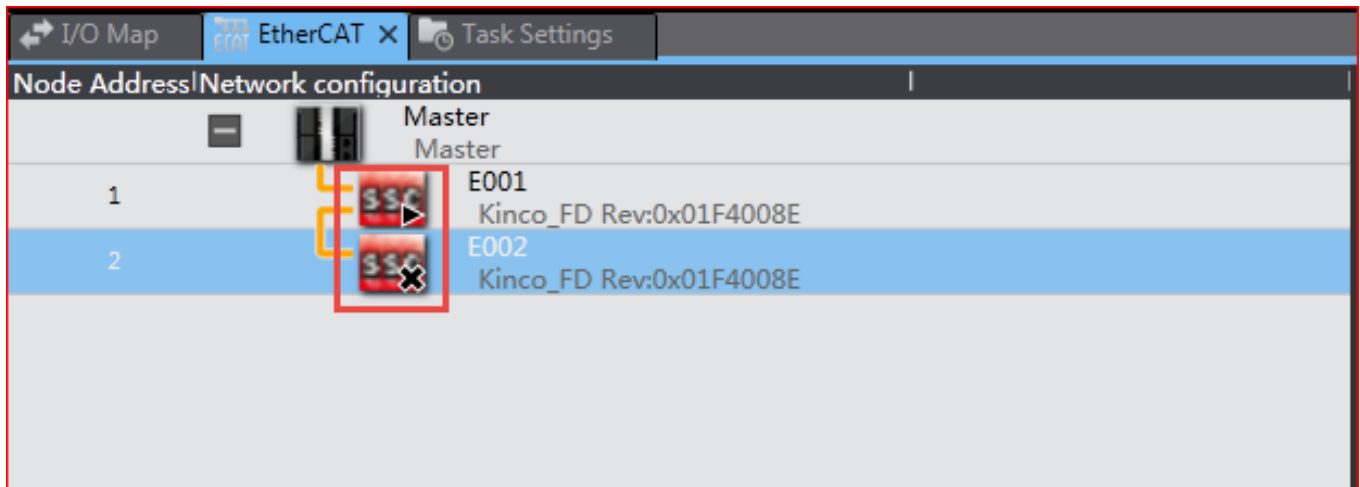
Controller-Synchronize. After synchronization, it will show what the different is by comparing with program and parameters of controller inside and local program in PC. Click Transfer To Controller and click Yes into program mode and then click Yes into run mode.



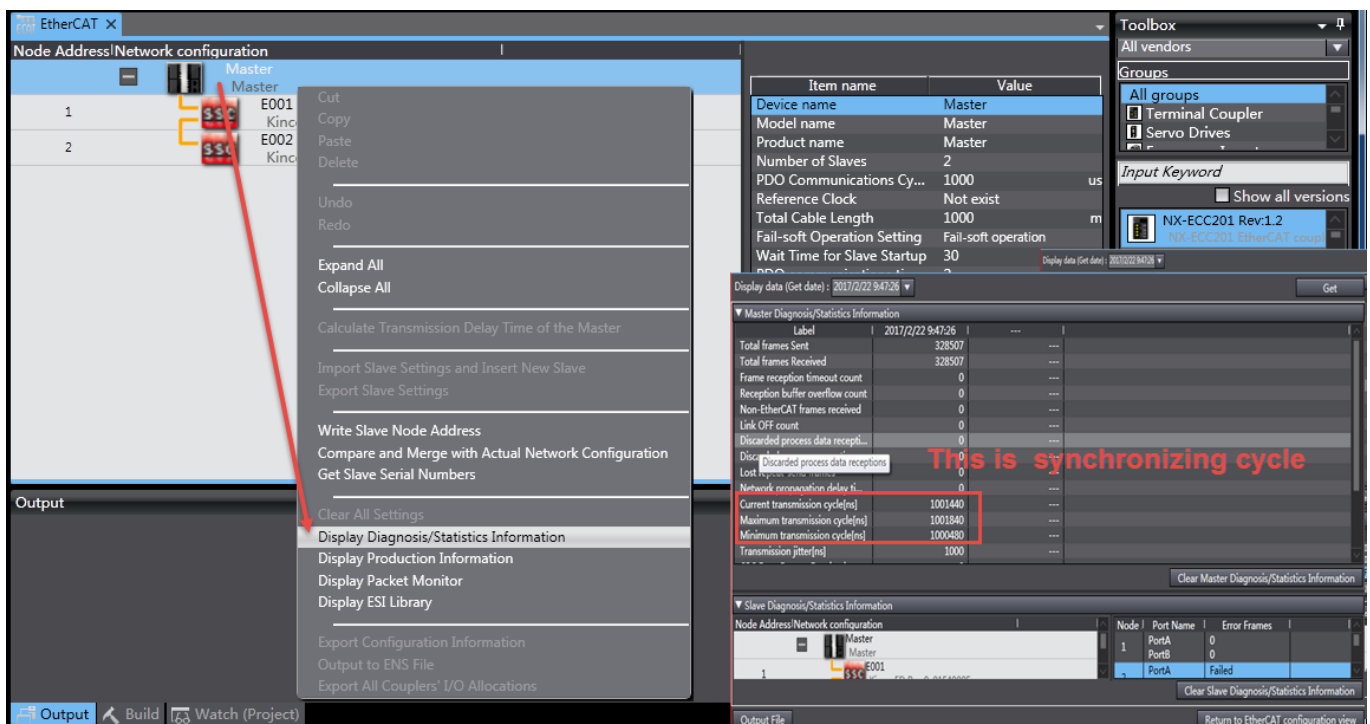
Back to Ethercat frame, right click Master and choose Write Slave Node Address and write slave mode at pop up window. Normally, write it from 1 to 32 ect.in sequence. Finally, write and confirm.



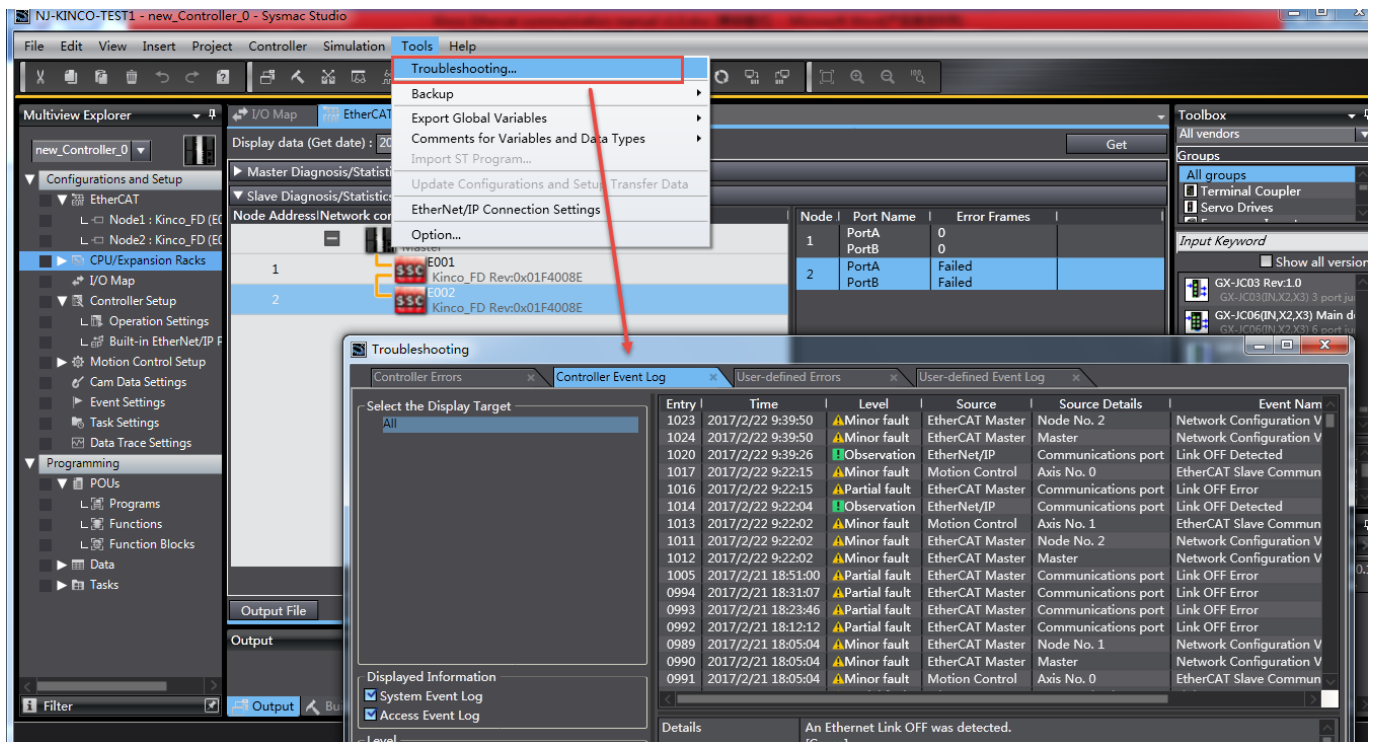
Reboot controller and servo driver to online again. We can see the servos are connected correctly in EtherCAT frame. If connected wrong, it will show X mark instead of triangle.



Pick on Master, right click and choose Display Diagnosis/Statistics Information to monitor all network status.



If there is error, click Tools--->Troubleshooting to check what error is in details.



Or at I/O Map frame, if see value which is read from slave stations, it means communication successful.

I/O Map




EtherCAT

Task Settings

Position	Port	Description	R/W	Data Type	Value	Variable
	EtherCAT Network Configuration					
Node1	Kinco_FD					
	RxPDO_Target_Position_607A_00		W	DINT	0	001_RxPDO_Targ
	RxPDO_Control word_6040_00		W	UINT	0	001_RxPDO_Cont
	TXPDO_Actual position_6064_00		R	DINT	-2147481032	001_TXPDO_Actu
	TXPDO_Status word_6041_00		R	UINT	18032	001_TXPDO_Statu
Node2	Kinco_FD					
	RxPDO_Target_Position_607A_00		W	DINT	0	
	RxPDO_Operation_Mode_6060_00		W	USINT	0	
	RxPDO_Control word_6040_00		W	UINT	0	
	TXPDO_Actual position_6064_00		R	DINT	0	
	TXPDO_Status word_6041_00		R	UINT	0	
	CPU/Expansion Racks					
CPU Rac	CPU Rack 0					

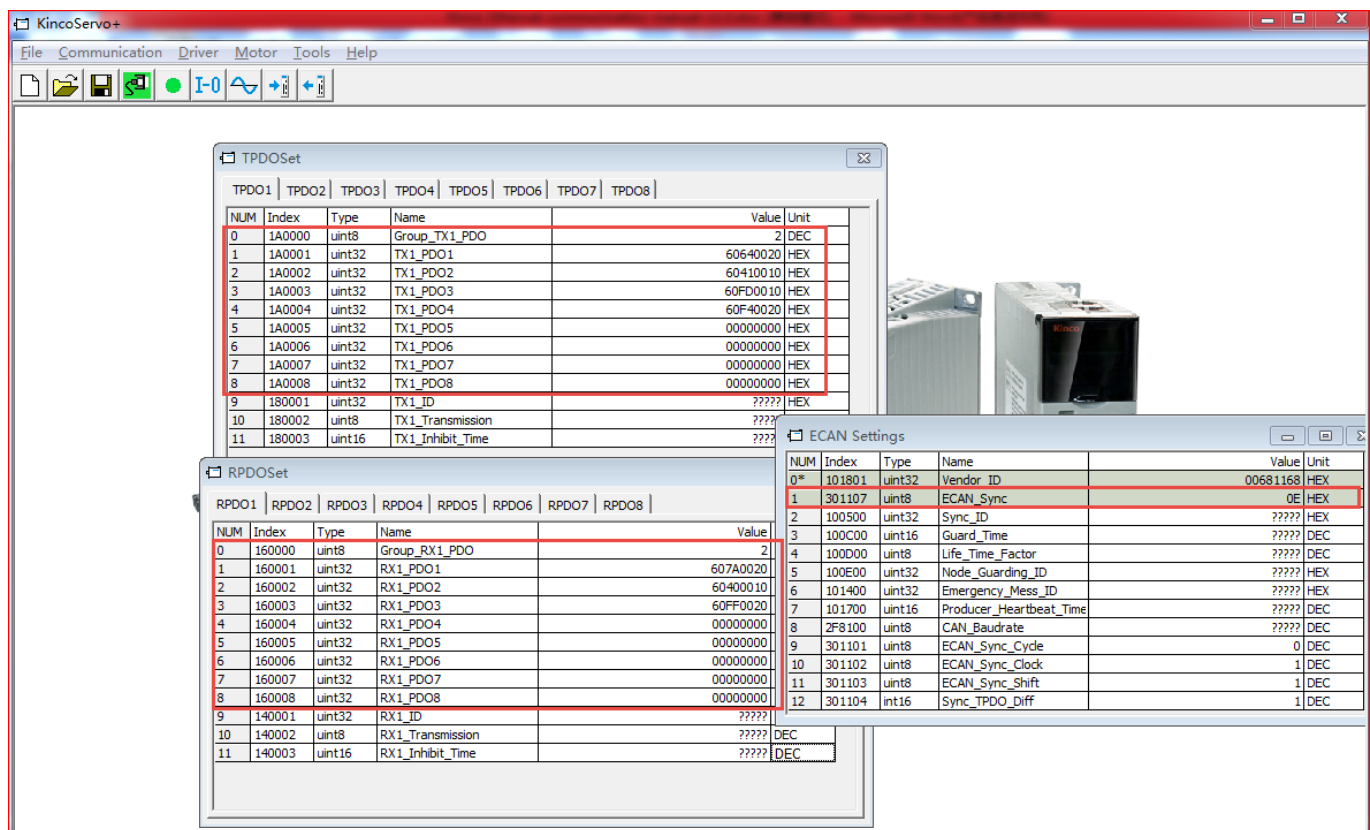
Else, according to the status of three LEDs at the right bottom corner of hardware controller, we can know if it is successful or not.

The operating status corresponding to colors and status of the built-in EtherCAT port indicators are shown below.

Label	Color	Status	Meaning
NET RUN	 Green	Lit	EtherCAT communications are in progress. • Inputs and outputs for I/O data are in operation.
		Flashing	EtherCAT communications are being established. This indicator shows either of the following conditions. • Only message communications are in operation. • Only message communications and I/O data inputs are in operation.
		Not lit	EtherCAT communications are stopped. • The power supply is OFF or the CPU Unit was reset. • A MAC Address Error, Communications Controller Error, or other error occurred.
NET ERR	 Red	Lit	A hardware error or unrecoverable error occurred, such as for exception processing.
		Flashing	A recoverable error occurred.
		Not lit	There are no errors.
LINK/ACT	 Yellow	Lit	A link was established.
		Flashing	Data communications are in progress after establishing link. Flashes every time data is sent or received.
		Not lit	The link was not established.

At the same time, in the software of servo driver, check driver-ECAN configuration to see the PDO information. In “others”, we can check if it is synchronizing data or not. If the non-zero data is changing, that means synchronizing and updating data.

If the Ethercat LED on servo driver is constant on, it means working.



Comprehensive above information, we can know if the driver connects successfully with Ethercat network or not.

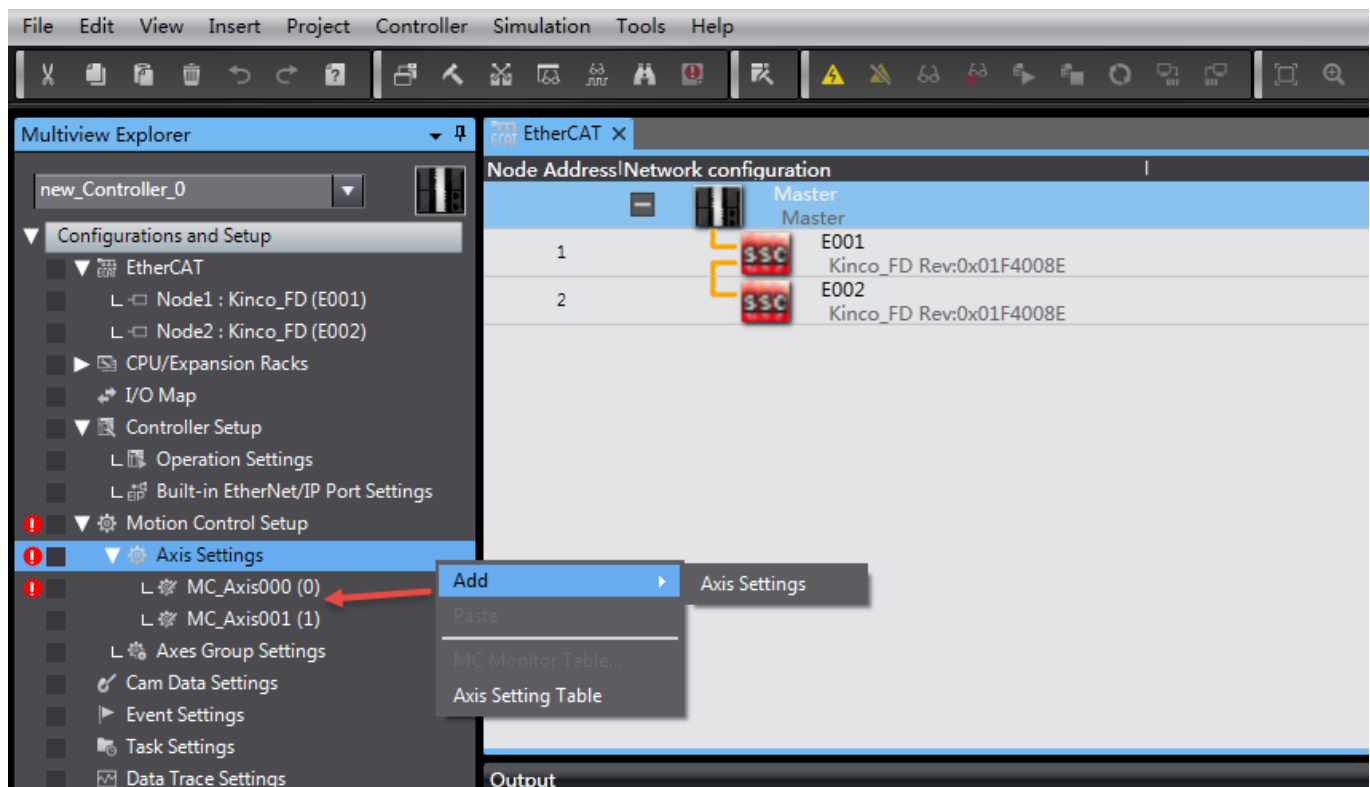
4. Control drivers to move

Point to Point (not interpolation control) control. After network communication success, use the variables in program by I/O Map to set values into drivers to control them moving. For example, set a value to target speed in driver, set control word to F and mode to 3 and then it is able to run driver under speed mode. For more information, please refer to user manual of driver and controller.

Interpolation control

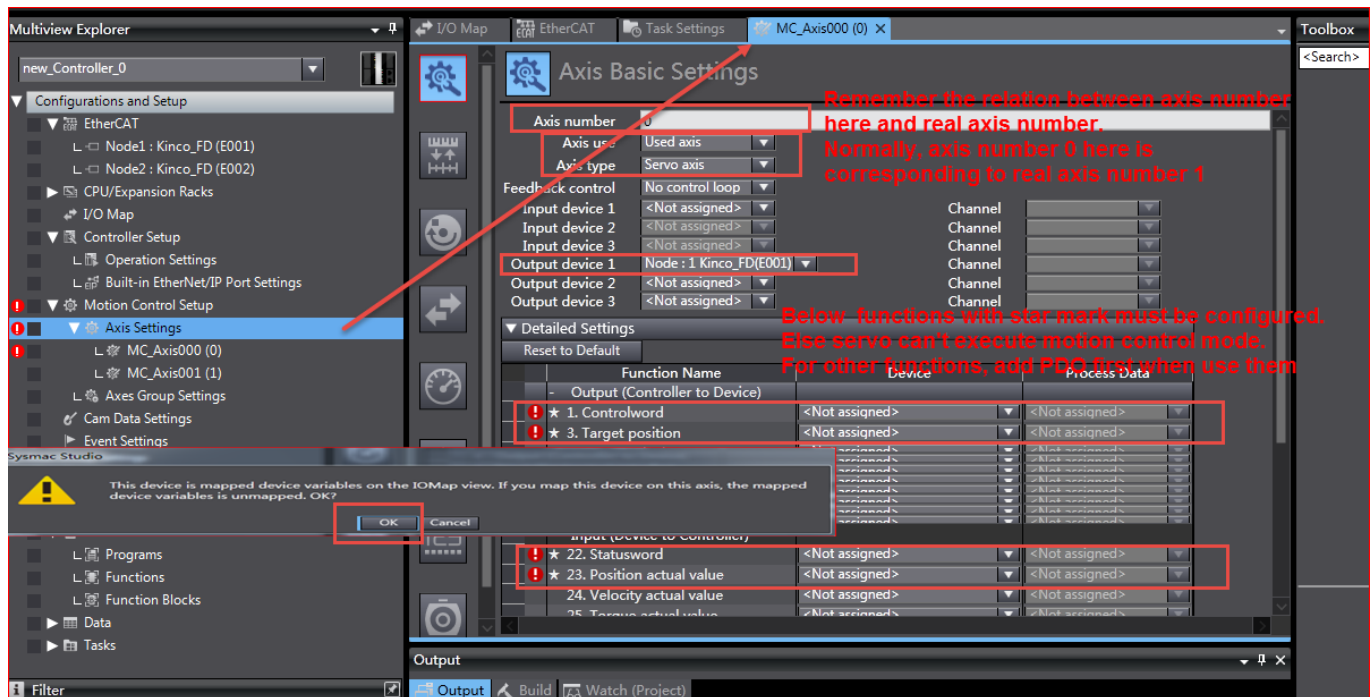
1) Add axis.

Double click Motion control setup and choose Axis settings-add. The added axis should be same with needed, else it will show error.



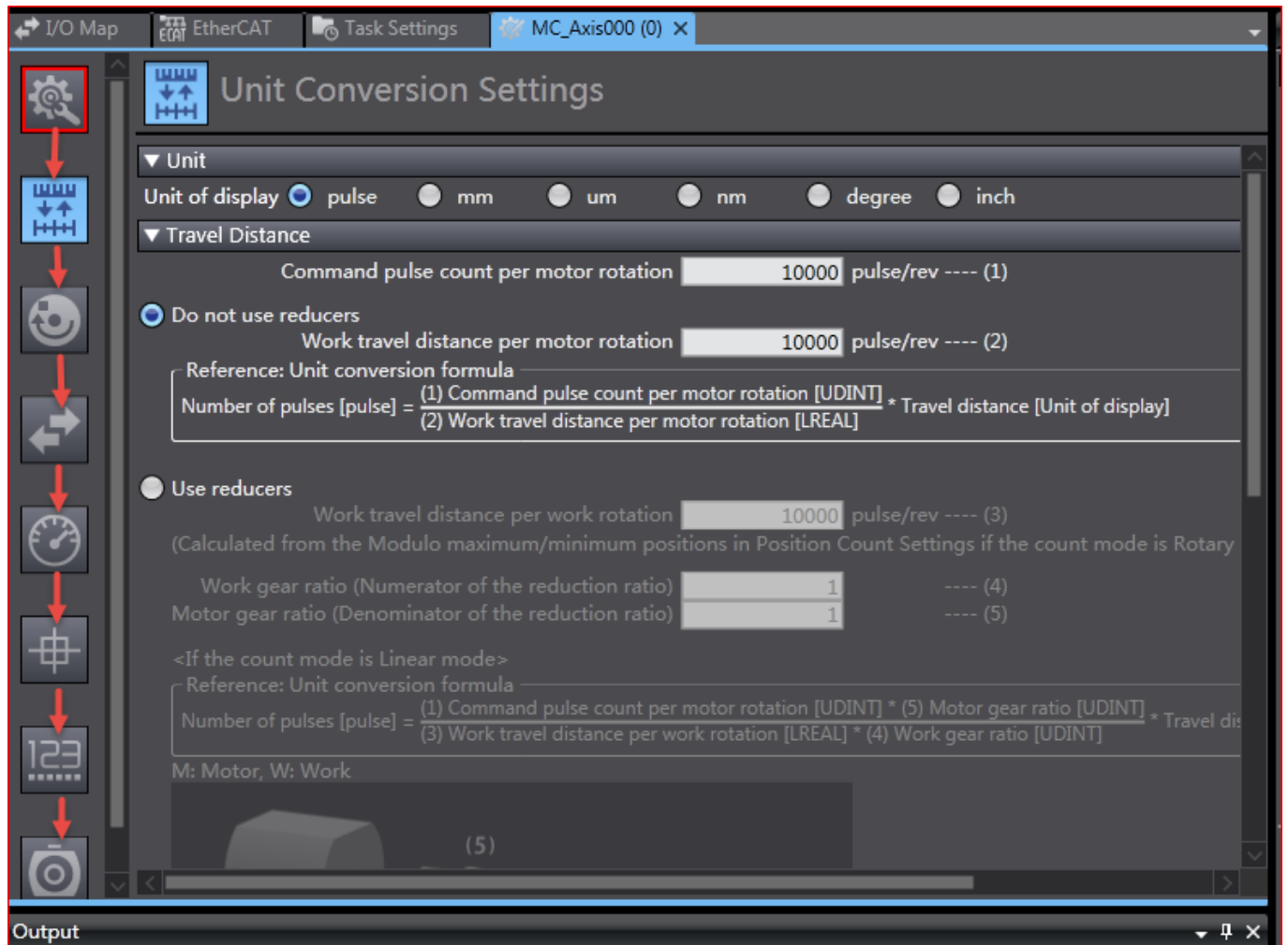
2) Map PDO to axis.

Double click the axis and configure it. Please note that one axis which is used as interpolation motion control can't be used as point to point control at the same time. The mapped I/O will be deleted by system automatically when configuring the axis.



3) Set parameters of axis.

Such as resolution of encoder, maximum speed, position limited etc. please refer to NJ user manual.



4) Program the project.

NJ series controllers are accord with standard motion commands of PLCopen. For more details, please refer to its user manual.

5. Programs save

The programs in NJ series can't be saved directly. It needs to export to save.

