NX Safety Standalone Programming Quick Start Guide

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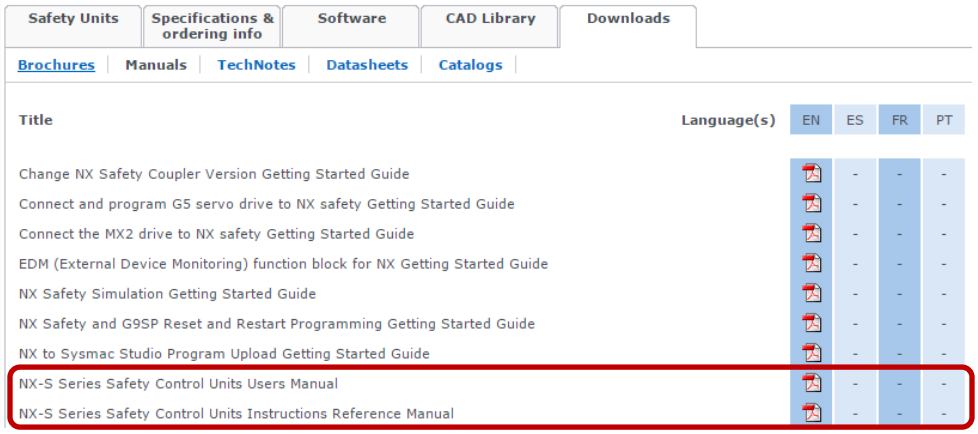
QSG-NX-S-STANDALONE - Version 3.2 Feb. 27, 2015

Quick Links

Manuals

http://industrial.omron.us/en/products/catalogue/automation_systems/integrated_safety/nx_safety_distributed/default.html

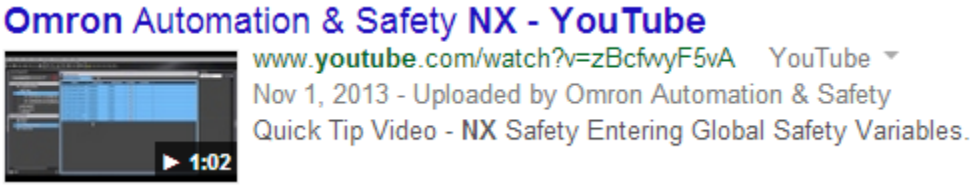
Scroll to the tab section, select “Download”, select “Manuals”, download pdf file under the EN column.



Sysmac Studio Software and Registration

http://industrial.omron.us/en/products/software-registration-downloads

Videos

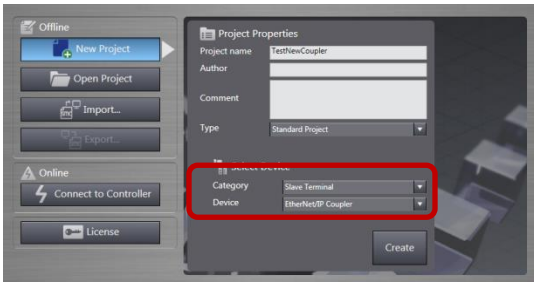


Convert NJ/NX Program to NX Standalone

December 2014, Sysmac Studio version 1.11

Hardware

Replace the coupler, NX CPU and SIH400 input modules.



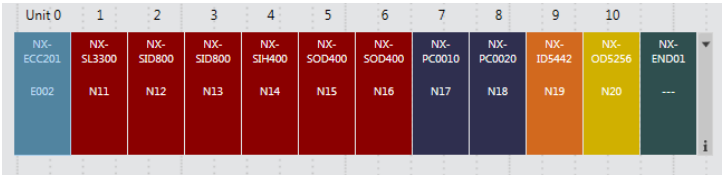
Open up a new project

1.) This is available with Sysmac Studio version 1.10 and higher. (Released Sept. 2014)

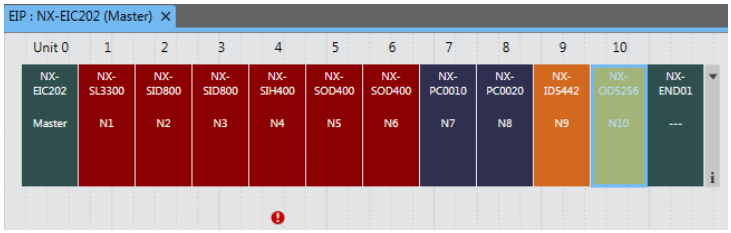
Category: Slave Terminal
Device: EtherNet/IP Coupler

Hardware set-up without actual hardware

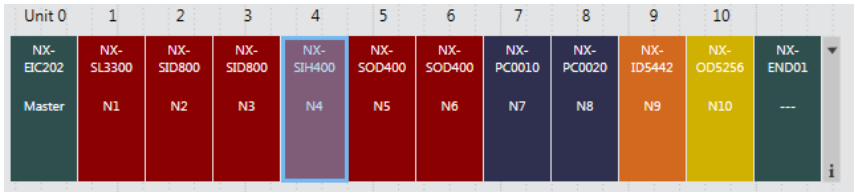
1.) Use schematics or take a snap shot of the original equipment. If you have multiple screens, you can open Sysmac Studios up for both projects.



2.) In this case, the SIH400 safety input module is version 1.0. The Safety stand-alone CPU requires at least a 1.1 version SIH400 module. This will need to be upgraded.



(To change: right click on module -> change model -> select the new model -> ok)



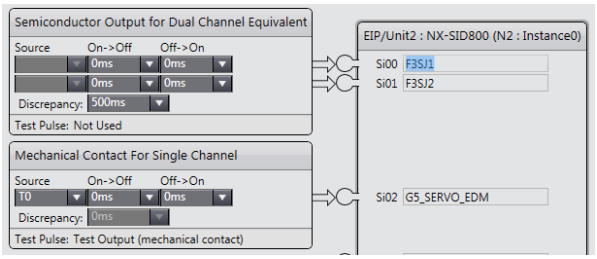
Node Configuration

3.) From the CPU drop down list, select “new_SafetyCPU0”

4.) Multiview Explorer -> Configurations and Setup -> Communications -> Safety -> Safety I/O -> EIP/Unit2: (Module type) (Instance) -> Parameter -> click on the white X in the upper right corner to view all nodes.

5.) Copy and paste the comments from the NJ/NX program into the NX standalone program. You need to do one at a time, and you can use the cut and paste function on your PC. (Note: Copy and pasting the comments is an option.)

6.) From the toolbox, drag and drop the device type



Global Variables

7.) Copy and paste the global variables.
8.) Mutiview Explorer -> Programming -> Data -> Global Variables
9.) In NJ/NX Program -> Right click -> select all – right click -> copy
10.) In the NX Stand Alone project -> Global Variable -> right click -> paste

Global Variables

Name	Data Type	Initial Value	Constant	Comment
UNITS_RDY	BOOL	FALSE	☐	
E_STOP_1_2	SAFEBOOL	FALSE	☐	A22EL 2NC co...
G7SA1_EDM	SAFEBOOL	FALSE	☐	P7SA Socket T...
G7SA2_EDM	SAFEBOOL	FALSE	☐	P7SA Socket T...
G7SA_OUT_1_2	SAFEBOOL	FALSE	☐	P7SA Terminal...

11.) (Optional) If you have the original list with the variable names and if they are inputs or outputs, skip these optional steps.
Easy way to enter the standard variables (BOOL) into the exposed variable list.) Copy and Paste the global variable list into Excel.
12.) (Optional) In Excel, click on upper left box to select the entire table -> “Data” in the top menu -> Sort -> column B. (The BOOL variables are at the top of the list.)
13.) (Optional) -> add a column to the Excel spreadsheet.
14.) (Optional) Open up programs in Sysmac Studio to determine if they are inputs or outputs.
15.) Hint: If you can’t find them easily, Cntr + F, and enter the variable name in the “search what” field, select the “search and replace results” tab at the bottom of the screen, then double click on one of the search results.

Expose Variables on Safety Side

16.) Multiview Explorer -> Configurations and Setup -> Communications -> Standard -> Slave I/O -> Exposed Variable
17.) Right click on “Name” field -> create new -> start typing name (pull down list will appear so you can select the full name)
18.) Change the “In / Out” as needed.
19.) Repeat the steps for all of the standard variable names.

Exposed Variables

Name	In / Out	Data Type
UNITS_RDY	Input	BOOL
RESET_BUTTON	Input	BOOL
REQ_TO_ENTER_BUTTON	Input	BOOL
REQ_TO_ENTER_IND	Output	BOOL
RESET_IND	Output	BOOL
RUN_IND	Output	BOOL
STOP_IND	Input	BOOL
START_UP_IND	Output	BOOL
START_BUTTON	Input	BOOL
STOP_BUTTON	Input	BOOL
ESTOP_IND	Output	BOOL
ERROR_STATE	Input	BOOL

Assign Variables Location on Standard Side

20.) Multiview Explorer -> Configurations and Setup -> Communications -> Standard -> Standard I/O

21.) Manually assign the device and linked port. (Hint: If you have multiple screens with a copy of the original and new programs open, look at the I/O map of the original program. NJ controller -> Configurations and Setup -> I/O Map)

Standard I/O | Exposed Variables

Exposed Variable	In / Out	Data Type	Co	Device	Linked Port
RESET_IND	Output	BOOL		Unit10:NX-OD5256(N10)	Output Bit 01
RUN_IND	Output	BOOL		Unit10:NX-OD5256(N10)	Output Bit 00
START_UP_IND	Output	BOOL		Unit10:NX-OD5256(N10)	Output Bit 02
ESTOP_IND	Output	BOOL		Unit10:NX-OD5256(N10)	Output Bit 05
REQ_TO_ENTER_IND	Output	BOOL		Unit10:NX-OD5256(N10)	Output Bit 03
UNITS_RDY	Input	BOOL		Not assigned	Not assigned
RESET_BUTTON	Input	BOOL		Unit9:NX-ID5442(N9)	Input Bit 02
REQ_TO_ENTER_BUTTON	Input	BOOL		Unit9:NX-ID5442(N9)	Input Bit 03
STOP_IND	Output	BOOL		Unit10:NX-OD5256(N10)	Output Bit 04
START_BUTTON	Input	BOOL		Unit9:NX-ID5442(N9)	Input Bit 00
STOP_BUTTON	Input	BOOL		Unit9:NX-ID5442(N9)	Input Bit 01
ERROR_STATE	Input	BOOL		Not assigned	Not assigned

I/O Map

22.) Multiview explorer -> Configurations and Setup -> I/O Map

Notice: Depending on the versions of NX CPUs you were using, the comments from the original NJ/NX program may be ones that were manually created. The NX Standalone program will reuse the comments created in the nodes in the I/O map.

NJ/NX

NX-SID800					
Safety Inputs					
Si00 Logical Value	R	SAFEBOOL	F3SJ_1_2	F39-JC3A Receiver Cable Green and White Wire	Global Variables
Si01 Logical Value	R	SAFEBOOL		F3SJ2	
Si02 Logical Value	R	SAFEBOOL	G5_SERVO_EDM	G5 Servo Cable Green and Blue (T0)	Global Variables
Si03 Logical Value	R	SAFEBOOL			
Si04 Logical Value	R	SAFEBOOL	E_STOP_1_2	A22EL 2NC contacts	Global Variables
Si05 Logical Value	R	SAFEBOOL		ESTOP2	
Si06 Logical Value	R	SAFEBOOL	G7SA1_EDM	P7SA Socket Terminals 11 and 12	Global Variables
Si07 Logical Value	R	SAFEBOOL	G7SA2_EDM	P7SA Socket Terminals 11 and 12	Global Variables
Status					
Safety Connection Status	R	SAFEBOOL	UNIT2_STATUS		Global Variables
Safety Input Terminal Status	R	SAFEBOOL			

NX Standalone

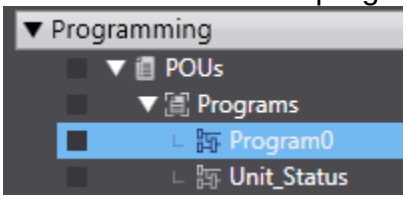
NX-SID800				
Safety Inputs				
Si00 Logical Value	R	SAFEBOOL		F3SJ1
Si01 Logical Value	R	SAFEBOOL		F3SJ2
Si02 Logical Value	R	SAFEBOOL		G5_SERVO_EDM
Si03 Logical Value	R	SAFEBOOL		
Si04 Logical Value	R	SAFEBOOL		ESTOP1
Si05 Logical Value	R	SAFEBOOL		ESTOP2
Si06 Logical Value	R	SAFEBOOL		G7SA1_EDM
Si07 Logical Value	R	SAFEBOOL		G7SA2_EDM
Status				
Safety Connection Status	R	SAFEBOOL		
Safety Input Terminal Status	R	SAFEBOOL		

23.) Most efficient way to enter the variable names is to use the pull down list. Cut and Pasting the entire list did not transfer all of them correctly.

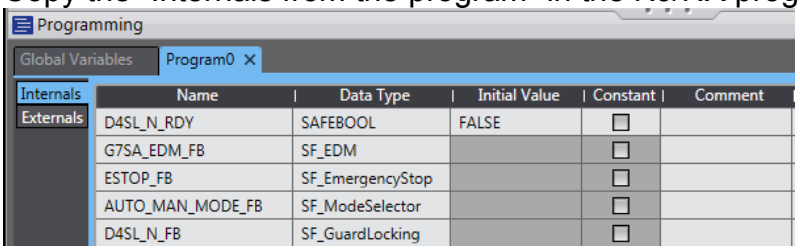
NX-SID800				
Safety Inputs				
Si00 Logical Value	R	SAFEBOOL	A22S_LEFT	A22RS Left NO contact
Si01 Logical Value	R	SAFEBOOL	A22S_RIGHT	A22RS Right NO contact
Si02 Logical Value	R	SAFEBOOL	A22TK_NC1_NO1	A22TK NC and NO contact
Si03 Logical Value	R	SAFEBOOL		A22TK NC
Si04 Logical Value	R	SAFEBOOL		D4SL-N Gate Mon
Si05 Logical Value	R	SAFEBOOL		D4SL-N Gate Mon
Si06 Logical Value	R	SAFEBOOL		D4SL-N Sol Mon
Si07 Logical Value	R	SAFEBOOL		D4SL-N Key Mon

NX (Safety) Programs

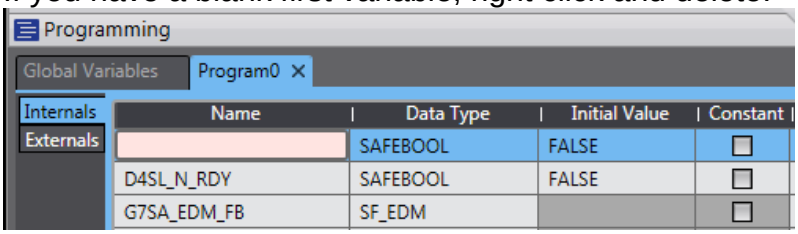
24.) In the NX Standalone program, create the same program names as the NJ/NX program.



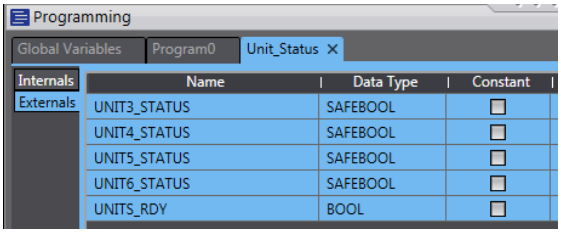
25.) Copy the “Internals from the program” in the NJ/NX program.



26.) Paste it into the NX Standalone program.
If you have a blank first variable, right click and delete.

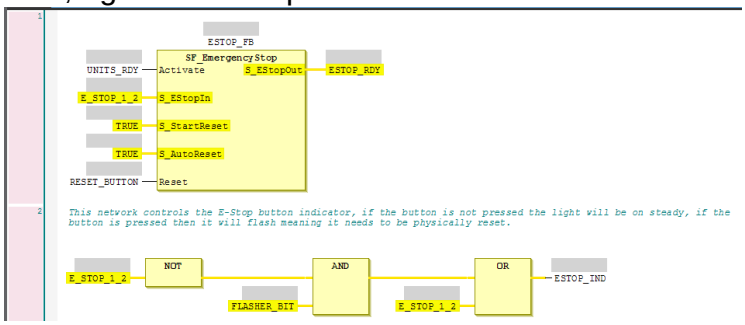


27.) Repeat steps 14 and 15 for the External variables in the program



28.) In the NJ/NX program, Select the left column to highlight, then scroll down and hold the shift key on the computer keyboard while selecting the last line. Right click -> copy.

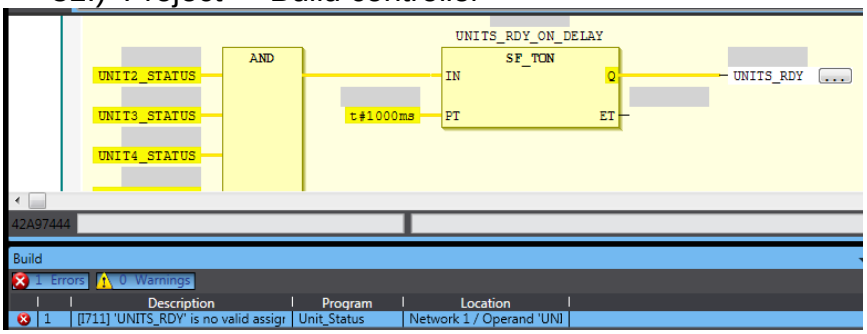
29.) In the NX Standalone program, open up the program, click on the left column to highlight the line, right click and paste. Scroll down to the bottom and delete the last line if it is empty.



30.) Repeat these steps for all of the programs.

Build

31.) Project -> Build controller

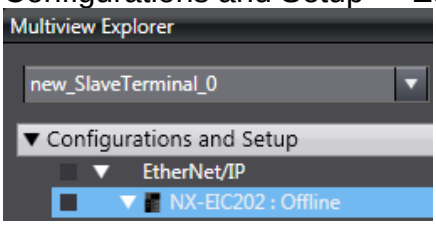


Download

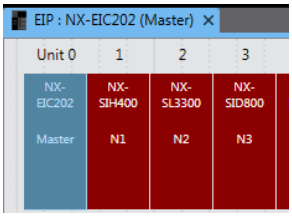
1.) Go Online. 

2.) Select “new_SlaveTerminal_0” (or the name it was changed to for the coupler)from the device pulldown menu.

3.) Configurations and Setup -> EtherNet/IP -> NX-EIC202



4.) Double click on NX-EIC202



5.) Right click on “EIC202” -> Coupler Connection (USB) -> Transfer to Coupler
6.) Select “new_SafetyCPU0” (or the name it was changed to for the Safety CPU)from the device pulldown menu.

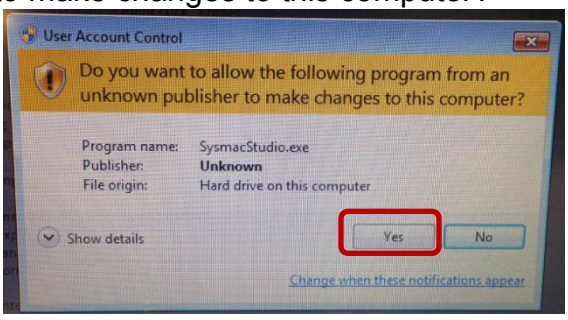
7.) Controller -> Mode -> Program
8.) Controller -> Mode -> Debug
9.) Controller -> Safety Validation
10.) Controller -> Mode -> Run

Program for current sales demo is “Sales Demo Converted to Stand Alone.smc2”.

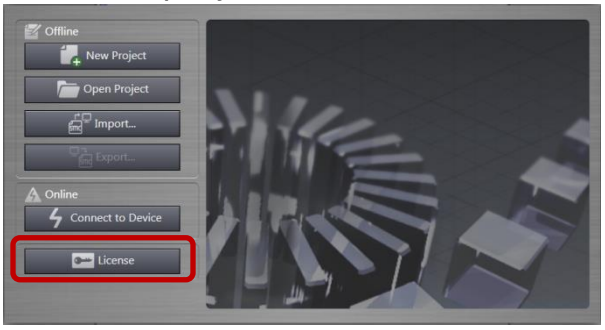
First Time Users Quick Start Guide

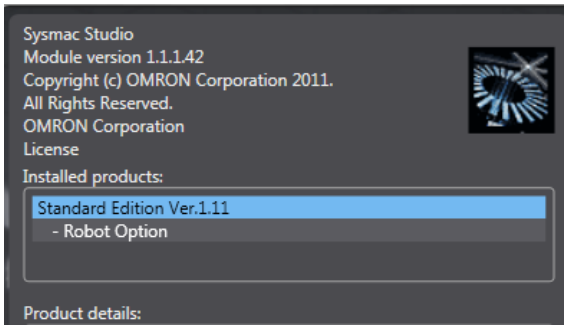
Open up a new project (Video)

1.) Double click on the Sysmac Studio icon.
2.) Select “Yes” when the ‘’Do you want to allow the following program from an unknown publisher to make changes to this computer?”



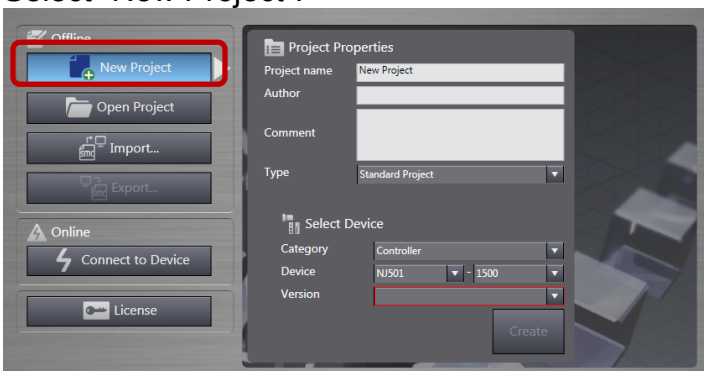
3.) Select “License”, enter the license number, and select “Register License”.
The software has a 30-day limited trial period. If you do not yet have your license, skip this step. Once the license is registered, the Sysmac Studio version, installed products, user name, company name, license and license type will be displayed.



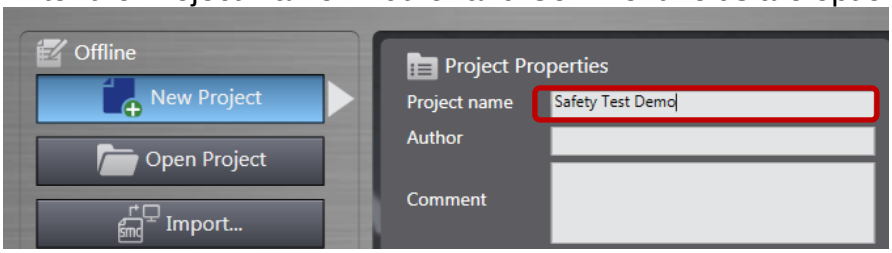


(Note: not all information is shown for the license information.)

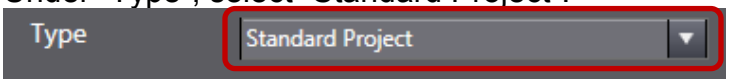
4.) Select “New Project”.



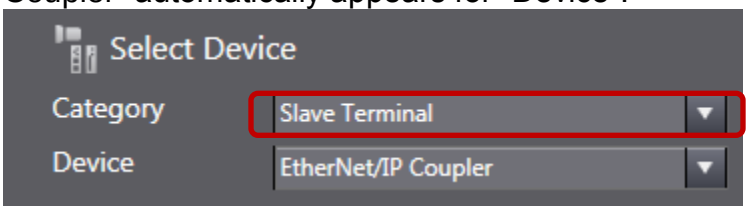
5.) Enter the Project Name. Author and Comment fields are optional.



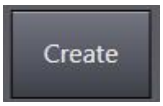
6.) Under “Type”, select “Standard Project”.



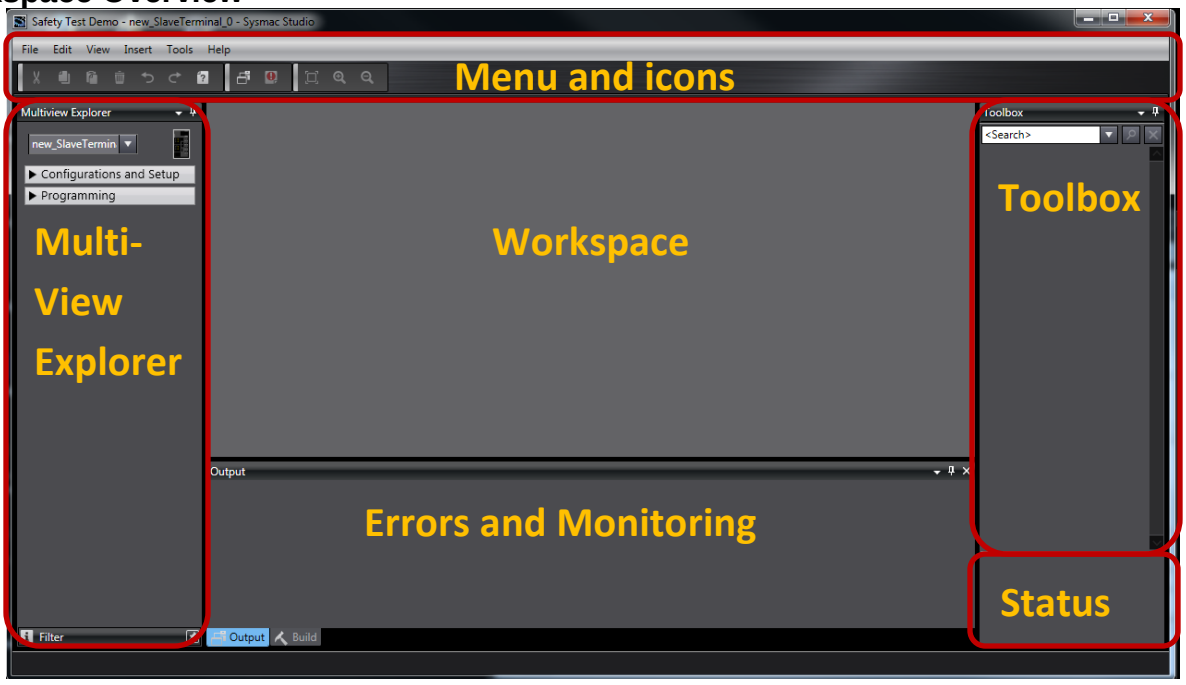
7.) Under “Select Device” section, for category select “Slave Terminal”. Verify “EtherNet/IP Coupler” automatically appears for “Device”.



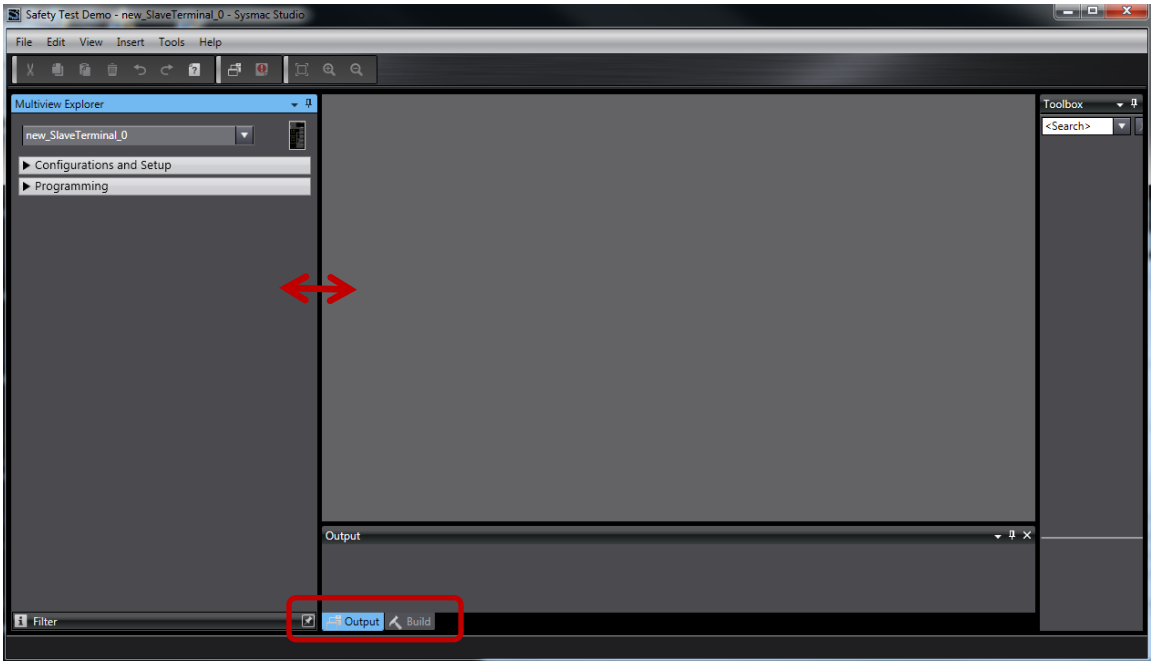
8.) Select “Create”.



Workspace Overview



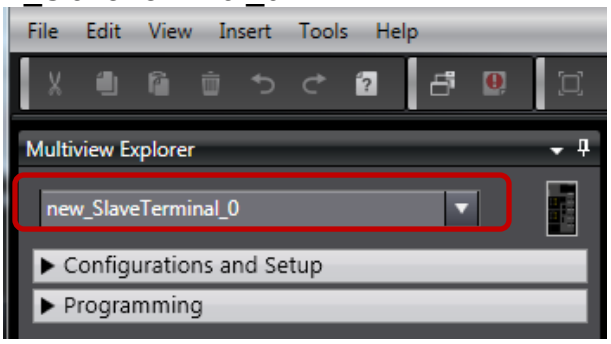
Each section can be dragged to change its size by moving the mouse over the black solid bar that separates each section, hold down the left mouse button and drag the screen edge.



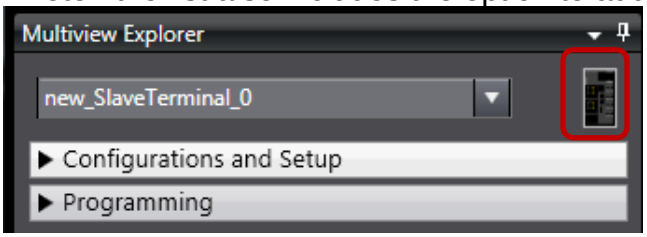
Tabs are used to switch between multiple screens opened with the same section.

Manually Add Hardware (Video)

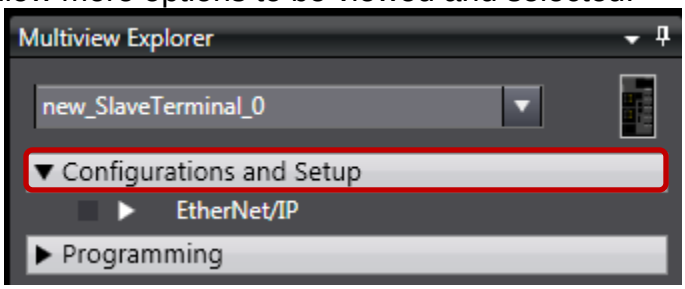
11.) In the Multiview Explorer section, verify the CPU listed in the pull down box is "new_SlaveTerminal_0."



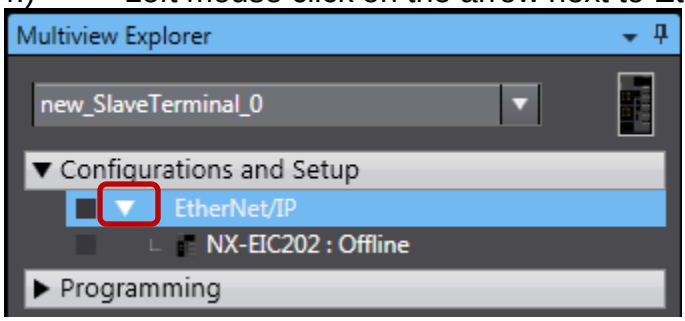
12.) To change rename the CPU, right click on the CPU icon and select "rename" from the list. Note: the list also includes the option to add device and delete.



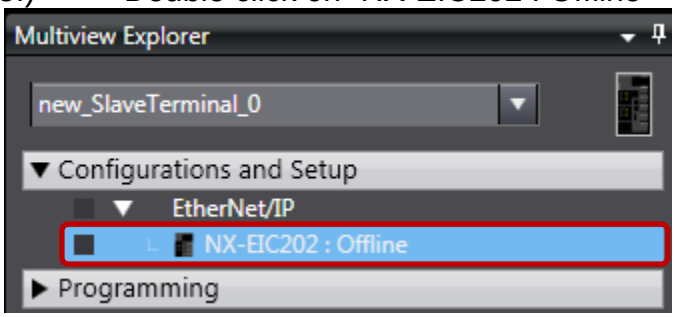
13.) In the Multiview Explorer, left click on the mouse for “Configuration and Setup”. This will allow more options to be viewed and selected.



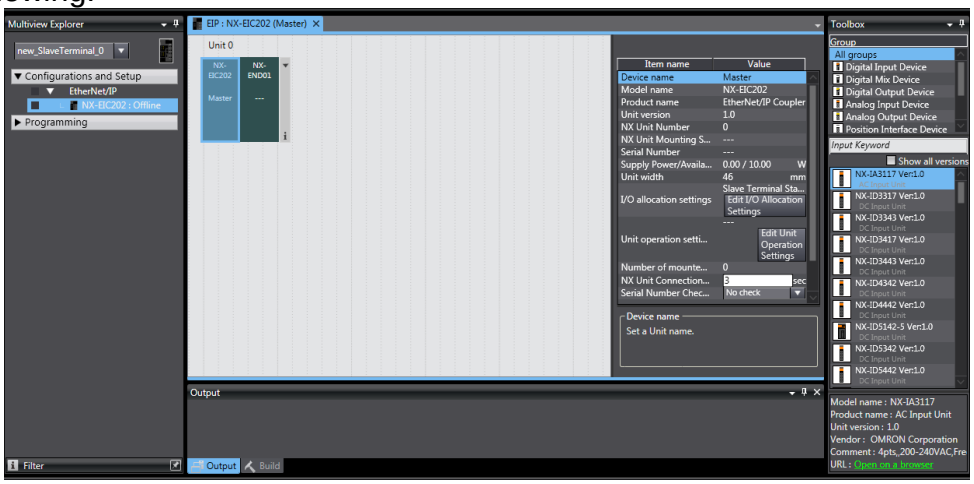
14.) Left mouse click on the arrow next to EtherNet/IP.



15.) Double click on “NX-EIC202 : Offline

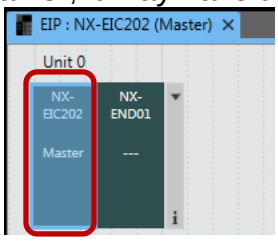


16.) The screen will look similar. Some of the areas may need to be adjusted for better viewing.



Hardware set-up with actual hardware installed and connected

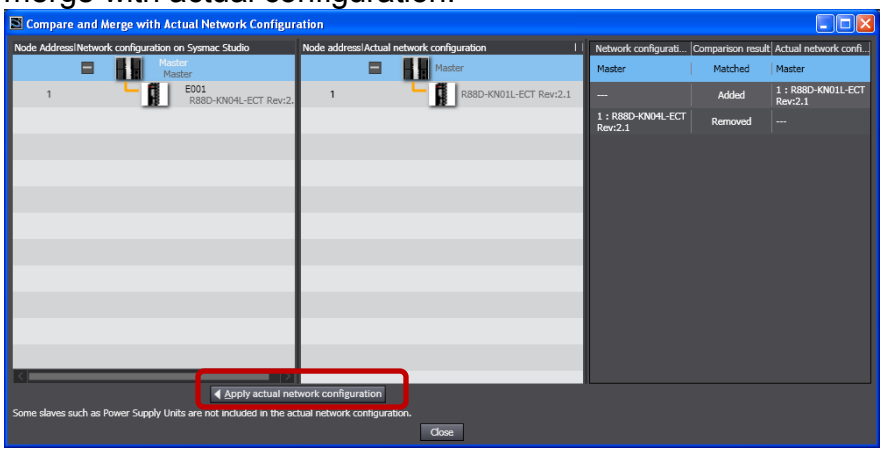
17.) Right click on the master coupler “NX-EIC202 Master.” You the name was change earlier, it may have that name here instead.



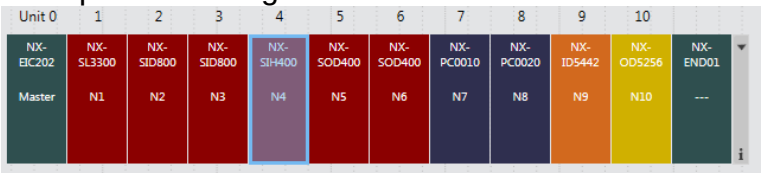
18.) Connect the Ethernet cable from the computer to the coupler.

19.) Right click on the master coupler “NX-EIC202 Master”, select “Coupler Connection (USB)” at the bottom of the pulldown list, then select “Online”

20.) Right click again on the master coupler “NX-EIC202 Master”, the select “Compare and merge with actual configuration.”



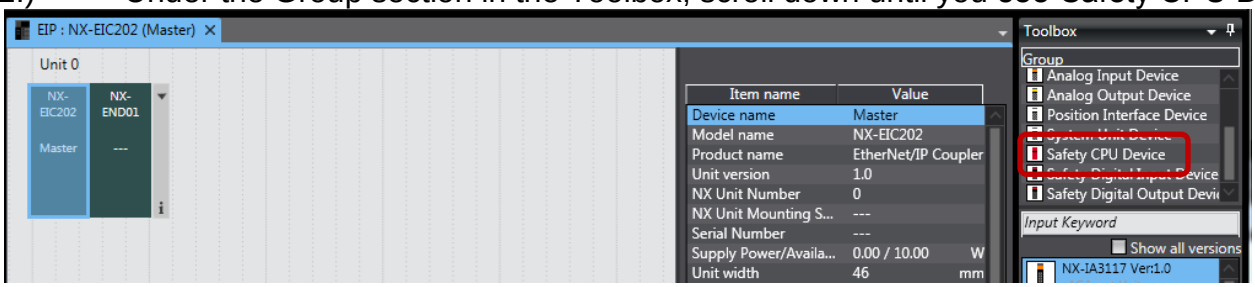
21.) Select “Apply actual network configuration” and then “Okay.” Close the box. Here is an example of a configuration.



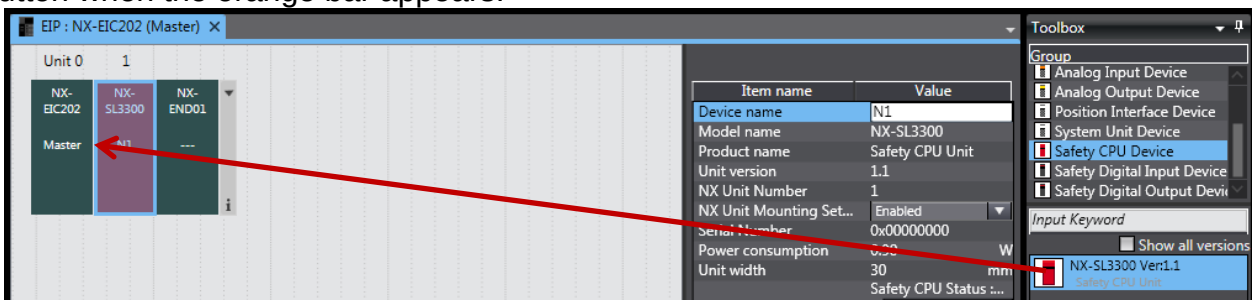
Note: END01 is the end cap. Sysmac Studio automatically added it to the configuration. The actual piece should have come with the coupler.

Hardware set-up without actual hardware

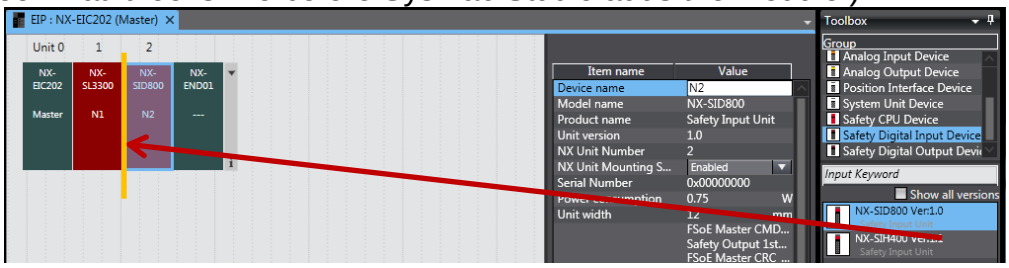
22.) Under the Group section in the Toolbox, scroll down until you see"Safety CPU Device."



23.) Under the "Input Keyword" section, left click on(and hold) the "NX-SL330 Ver1.1" Safety CPU while dragging this next to the master coupler "NX-EIC202 Master." Release the left mouse button when the orange bar appears.



24.) In the "group" section, scroll to the I/O modules being used. Follow the previous step for the I/O modules. Example shows the SID800 input module. (Added orange bar so you can see what it looks like before Sysmac Studio adds the module.)

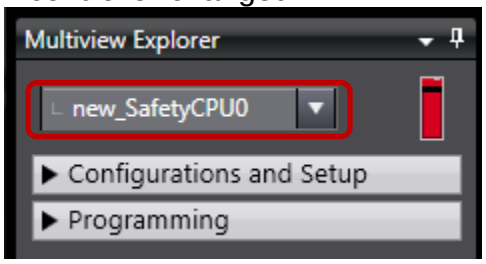


25.) Up to 32 safety input and output modules can be added. Up to 63 total (safety and standard input and output modules can be added. Symbols will appear below the module if incorrect version of modules is selected, power unit is exceeded, and too many modules have been added.

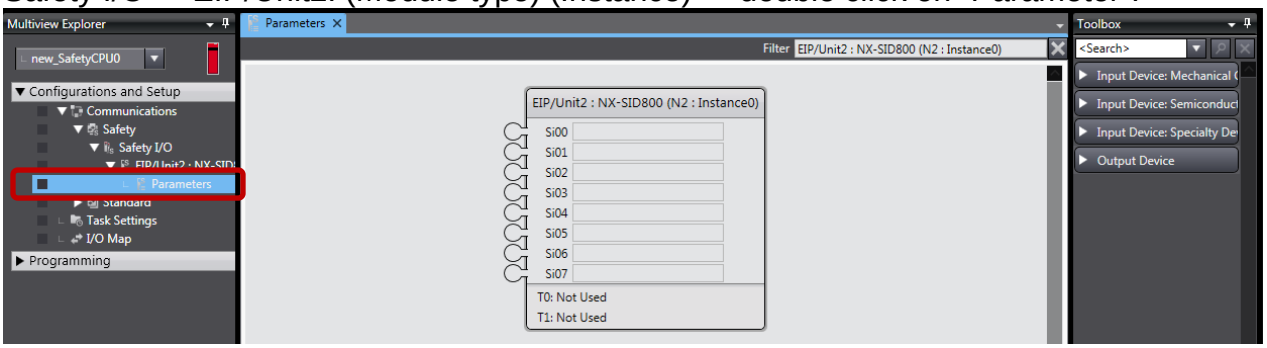
26.) Right click on the module for options such as delete, copy, cut, paste, undo, change model, edit unit operation settings, etc.

Node Configuration (Video)

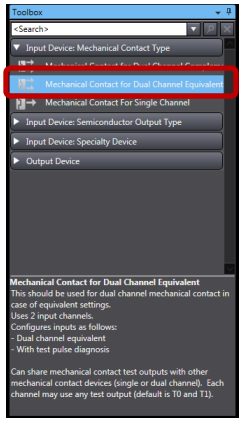
27.) From the CPU drop down list, select “new_SafetyCPU0”. Notice that the icon for the controller changed.



28.) In Multiview Explorer -> Configurations and Setup -> Communications -> Safety -> Safety I/O -> EIP/Unit2: (Module type) (Instance) -> double click on “Parameter”.

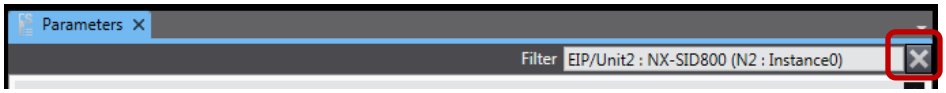


29.) In the toolbox, open up the type of safety device that will be wired into I/O module. The bottom area has a description of the device.

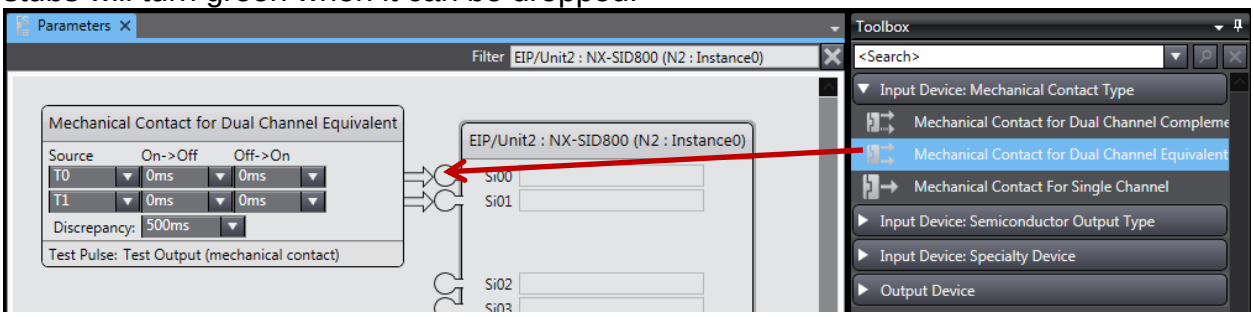


30.) If you don’t know what device configuration is needed, contact your Omron distributor or Omron Account Manager for a copy of the “NX Safety Selection Setup and Programming Guide”.

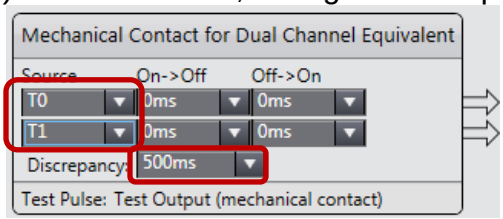
31.) Note: Click on the white X in the upper right corner to view all of the nodes.



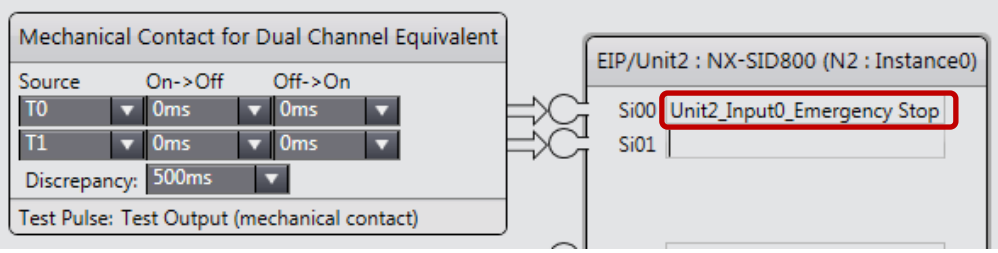
32.) Drag and drop the device type from the tool box and attach it to the node. The node stubs will turn green when it can be dropped.



33.) If needed, change the test pulses and discrepancy time.



34.) Optional: Enter a comment.
Note: This comment will be reused elsewhere in the program.

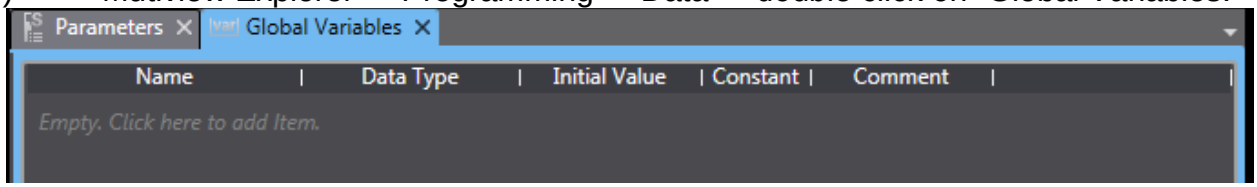


35.) Complete this for the rest of the devices.

Global Variables (Video)

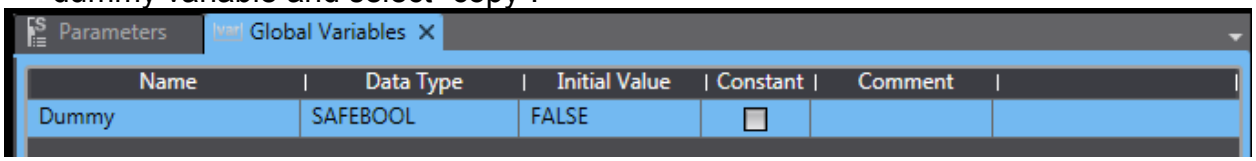
36.) Some people create their initial global variable list in Excel.
Note: Variable names have a list of rules, such as no spaces, not starting with a number, etc.)

37.) Mutiview Explorer -> Programming -> Data -> double click on "Global Variables."



38.) Either double click or right click on "Empty. Click here to add items," then select "create new". Type the variable name.

39.) If the variable list was created in Excel, create a dummy global variable. Right click on the dummy variable and select "copy".



40.) In the Excel spreadsheet, paste the dummy variable into a blank row.

Dummy	SAFEBOOL	FALSE	FALSE
Hild_a_brand			
stop			
mouse			

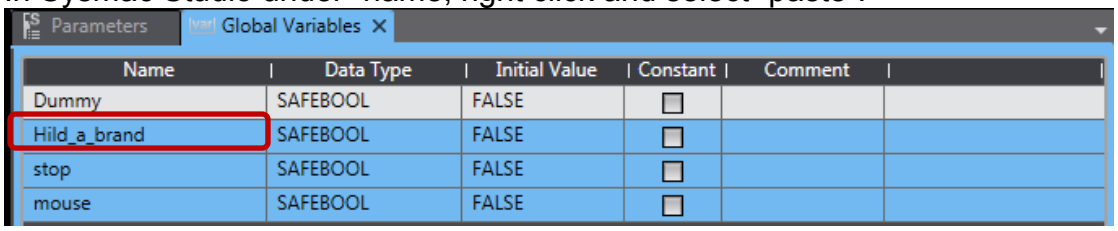
41.) Copy the three new fields the dummy variable added and paste into the other global variables.

Dummy	SAFEBOOL	FALSE	FALSE
Hild_a_brand	SAFEBOOL	FALSE	FALSE
stop	SAFEBOOL	FALSE	FALSE
mouse	SAFEBOOL	FALSE	FALSE

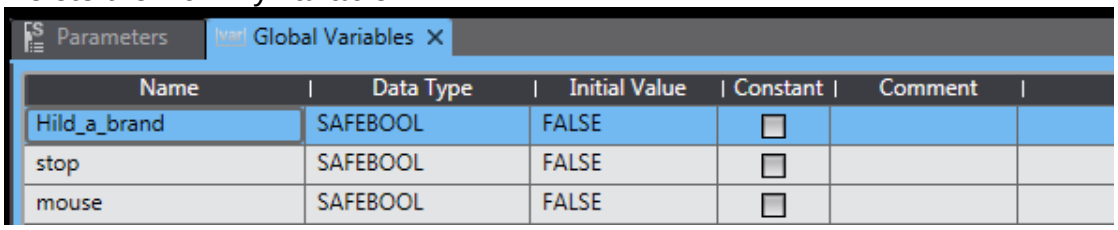
42.) Copy the rest of the global variables.

Dummy	SAFEBOOL	FALSE	FALSE
Hild_a_brand	SAFEBOOL	FALSE	FALSE
stop	SAFEBOOL	FALSE	FALSE
mouse	SAFEBOOL	FALSE	FALSE

43.) In Sysmac Studio under “name, right click and select “paste”.



44.) Delete the Dummy variable.



45.) (Optional) If you have the original list with the variable names and if they are inputs or outputs, skip these optional steps.

46.) Note: Safety variable have a data type of “SAFEBOOL”. Non safety variable have a data type such as “BOOL”.

Expose Variables on the Safety Side (Video)

47.) Multiview Explorer -> Configurations and Setup -> Communications -> Standard -> Slave I/O -> Exposed Variable
48.) Right click on “Name” field -> create new -> start typing name (pull down list will appear so you can select the full name)
49.) Change the “In / Out” as needed.
50.) Repeat the steps for all of the standard variable names.

Exposed Variables

Name	In / Out	Data Type
UNITS_RDY	Input	BOOL
RESET_BUTTON	Input	BOOL
REQ_TO_ENTER_BUTTON	Input	BOOL
REQ_TO_ENTER_IND	Output	BOOL
RESET_IND	Output	BOOL
RUN_IND	Output	BOOL
STOP_IND	Input	BOOL
START_UP_IND	Output	BOOL
START_BUTTON	Input	BOOL
STOP_BUTTON	Input	BOOL
ESTOP_IND	Output	BOOL
ERROR_STATE	Input	BOOL

Assign Variables Location on Standard Side

51.) Multiview Explorer -> Configurations and Setup -> Communications -> Standard -> Standard I/O
52.) Manually assign the device and linked port. (Hint: If you have multiple screens with a copy of the original and new programs open, look at the I/O map of the original program. NJ controller -> Configurations and Setup -> I/O Map)

Standard I/O | Exposed Variables

Exposed Variable	In / Out	Data Type	Co	Device	Linked Port
RESET_IND	Output	BOOL		Unit10:NX-OD5256(N10)	Output Bit 01
RUN_IND	Output	BOOL		Unit10:NX-OD5256(N10)	Output Bit 00
START_UP_IND	Output	BOOL		Unit10:NX-OD5256(N10)	Output Bit 02
ESTOP_IND	Output	BOOL		Unit10:NX-OD5256(N10)	Output Bit 05
REQ_TO_ENTER_IND	Output	BOOL		Unit10:NX-OD5256(N10)	Output Bit 03
UNITS_RDY	Input	BOOL		Not assigned	Not assigned
RESET_BUTTON	Input	BOOL		Unit9:NX-ID5442(N9)	Input Bit 02
REQ_TO_ENTER_BUTTON	Input	BOOL		Unit9:NX-ID5442(N9)	Input Bit 03
STOP_IND	Output	BOOL		Unit10:NX-OD5256(N10)	Output Bit 04
START_BUTTON	Input	BOOL		Unit9:NX-ID5442(N9)	Input Bit 00
STOP_BUTTON	Input	BOOL		Unit9:NX-ID5442(N9)	Input Bit 01
ERROR_STATE	Input	BOOL		Not assigned	Not assigned

I/O Map (Video)

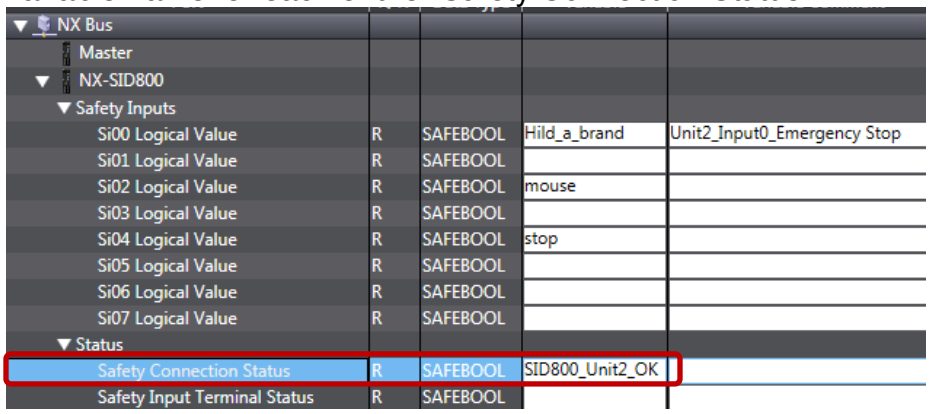
53.) Multiview explorer -> Configurations and Setup -> I/O Map
Note: The NX Stand Alone program will reuse the comments created in the nodes in the I/O map.

NX-SID800				
Safety Inputs				
Si00 Logical Value	R	SAFEBOOL		F3SJ1
Si01 Logical Value	R	SAFEBOOL		F3SJ2
Si02 Logical Value	R	SAFEBOOL		G5_SERVO_EDM
Si03 Logical Value	R	SAFEBOOL		
Si04 Logical Value	R	SAFEBOOL		ESTOP1
Si05 Logical Value	R	SAFEBOOL		ESTOP2
Si06 Logical Value	R	SAFEBOOL		G7SA1_EDM
Si07 Logical Value	R	SAFEBOOL		G7SA2_EDM
Status				
Safety Connection Status	R	SAFEBOOL		
Safety Input Terminal Status	R	SAFEBOOL		

54.) Most efficient way to enter the variable names is to use the pull down list, start typing, and select the variable name. It will only list variable already listed in the global variable list.

NX-SID800				
Safety Inputs				
Si00 Logical Value	R	SAFEBOOL	A22S_LEFT	A22RS Left NO contact
Si01 Logical Value	R	SAFEBOOL	A22S_RIGHT	A22RS Right NO contact
Si02 Logical Value	R	SAFEBOOL	A22TK_NC1_NO1	A22TK NC and NO contact
Si03 Logical Value	R	SAFEBOOL		A22TK NC
Si04 Logical Value	R	SAFEBOOL		D4SL-N Gate Mon
Si05 Logical Value	R	SAFEBOOL		D4SL-N Gate Mon
Si06 Logical Value	R	SAFEBOOL		D4SL-N Sol Mon
Si07 Logical Value	R	SAFEBOOL		D4SL-N Key Mon

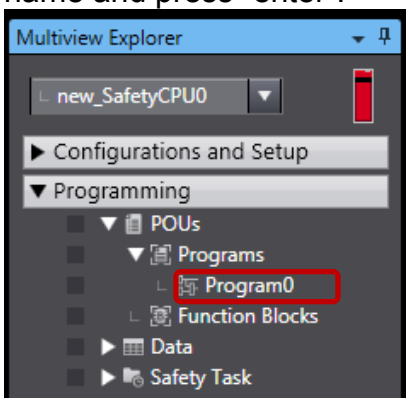
55.) Option for machine where I/O modules could be shut down for maintenance with zones, but still allow the machine in other zones to run. It is recommended to set this up. Enter a variable name for each of the “Safety Connection Status.”



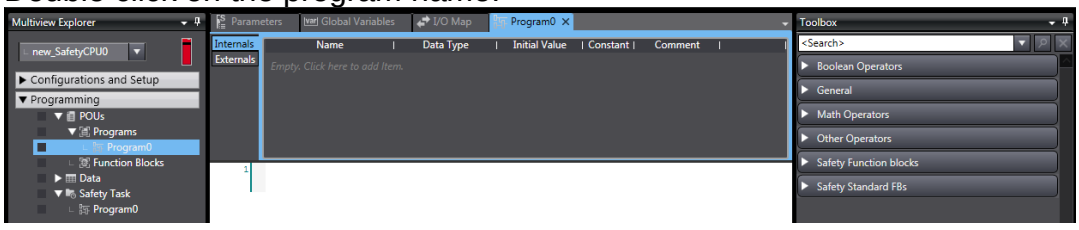
NX (Safety) Program

[Video - Insert New Line (network)] [Video - Create a basic program]

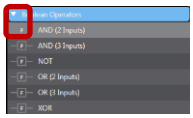
56.) Multiview Explorer -> Programming -> POUs -> Programs -> Program0.
Note: To change the name of program0, right click and select “rename”. Type in the new name and press “enter”.



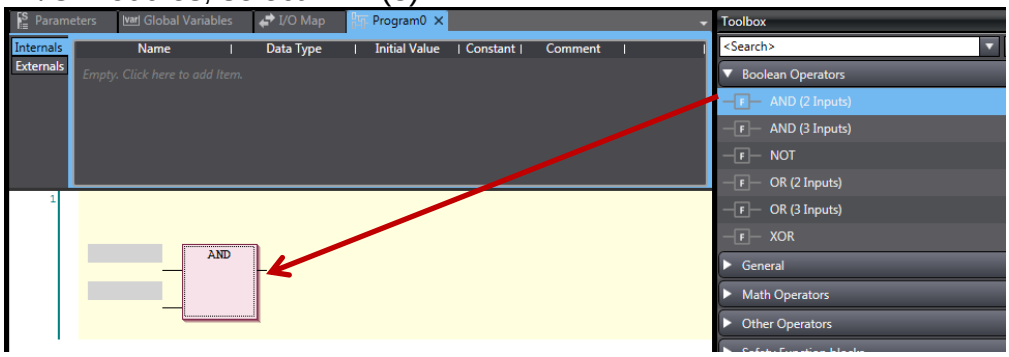
57.) Double click on the program name.



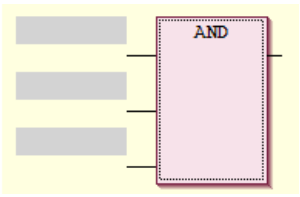
58.) In the toolbar (on the right side), open up the “Boolean Operator” section by clicking on the arrow.



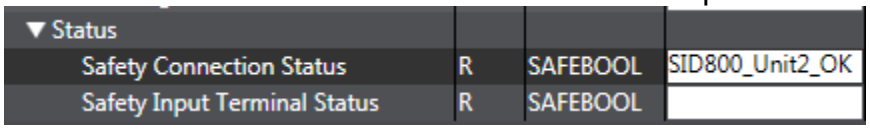
59.) If you only have 2 safety I/O modules, drag and drop AND(2) to the center of the screen until a green box that says “Start Here” appears. Drop it on the green box. If you have more than 2 I/O modules, select AND(3).

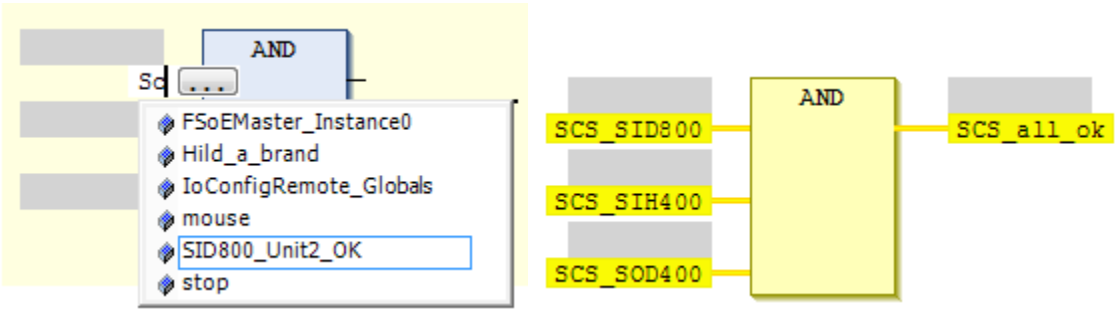


60.) The AND function block can have up to 8 inputs. To add more inputs, right click on the function block and select “Add Input”.



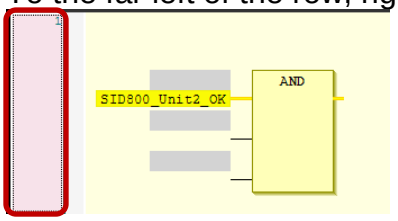
61.) Just left of the dash mark on the input side (left), left click. Start to type the name of the variable. A list of the variable will appear that you can choose from. Add all of the “Safety Connection Status” variables added in the I/O map earlier.





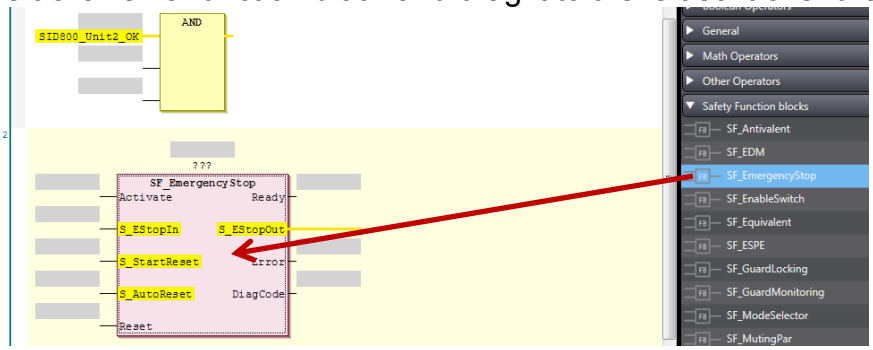
Note: Example on the right is from another program.

62.) To the far left of the row, right click and select “Insert Network Below” to add another row.



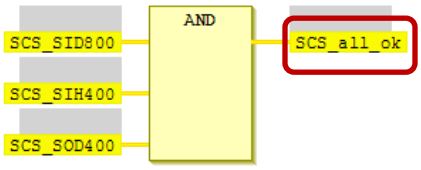
63.) In the toolbar (on the right side), open up the “Safety Function blocks” section by clicking on the arrow. This is a list of the function blocks needed for the safety devices.

64.) Left click on a function block and drag it to the left so it over the “Start here” green box.

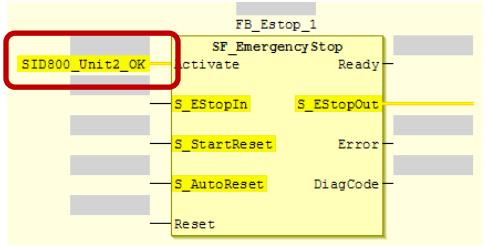


65.) Enter a name for the safety function block. (Left click and type when ??? turn into blanks and the … button, then enter.)

66.) The activate inputs verifies the module is active. If multiple I/O modules were used, this would use the same variable defines as the output of the AND function block.

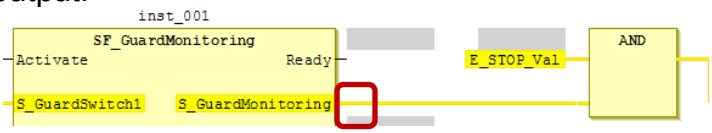


In this example “SID800_Unit2_OK” could be used. If the Safety Connection status variable was not defined in the I/O map, “true” would be used.



67.) Enter the inputs variables on the left side of the function block, and the output variable on the right side. In this example, more logic will be added to the output variable. If the logic string was long or needed in multiple places, a variable could be defined. See the manual or quick start guides for more programming details.

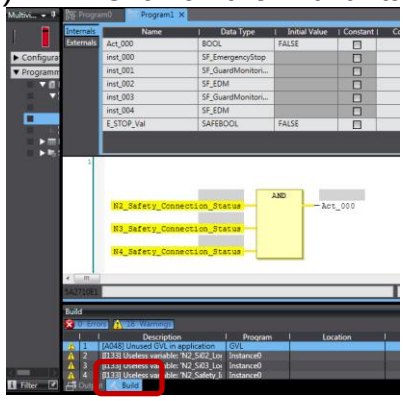
68.) To add another function block, drag it until the green diamond appears on the S_EStopOut output.

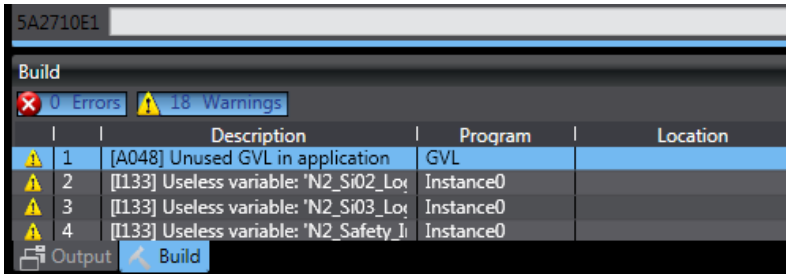


Build (Video)

69.) Project -> Build controller (or F8).

70.) Click on the “Build” tab to see the errors and warnings.



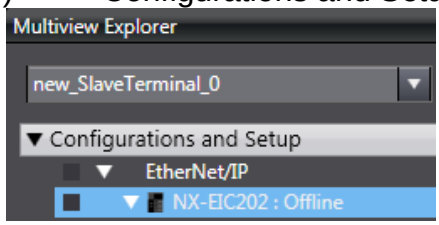


Download (Video Coupler) (Video Safety)

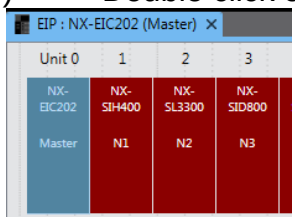
71.) Go Online. 

72.) Select “new_SlaveTerminal_0” (or the name it was changed to for the coupler) from the device pulldown menu.

73.) Configurations and Setup -> EtherNet/IP -> NX-EIC202



74.) Double click on NX-EIC202



75.) Right click on “EIC202” -> Coupler Connection (USB) -> Transfer to Coupler

76.) Select “new_SafetyCPU0” (or the name it was changed to for the Safety CPU)from the device pulldown menu.

77.) Controller -> Mode -> Program

78.) Controller -> Mode -> Debug

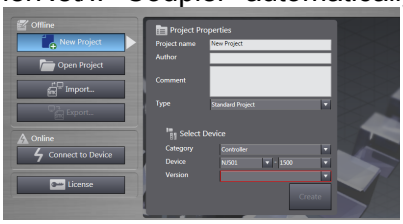
79.) Controller -> Safety Validation

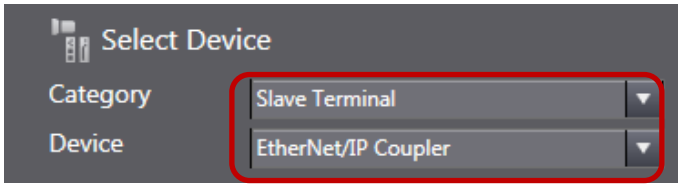
80.) Controller -> Mode -> Run

Differences Between NJ/NX and NX Standalone

Creating a New Project

When creating a new project, under “Select Device” section, for category select “Slave Terminal”. Verify “EtherNet/IP Coupler” automatically appears for “Device”.





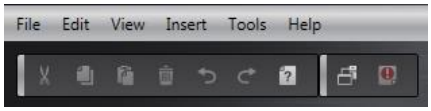
Online

Difference #1 No choice with communication type (Ethernet or USB) when going online.

Difference #2 No way to go online from menu bar of the coupler.

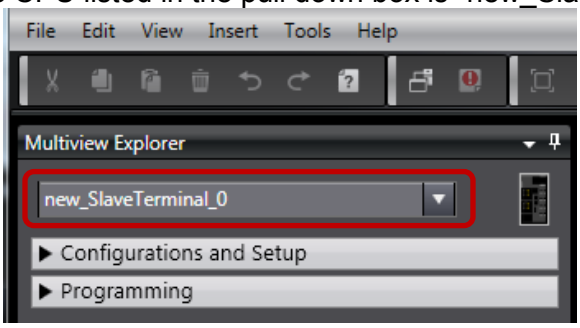
(However, really easy to log on from the menu bar of the Safety CPU.)

Only able to go online with the USB cable.



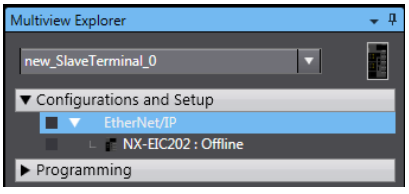
CPU Pulldown List

The CPU listed in the pull down box is “new_SlaveTerminal_0.”

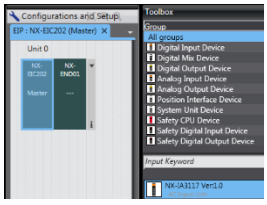


Hardware Configuration

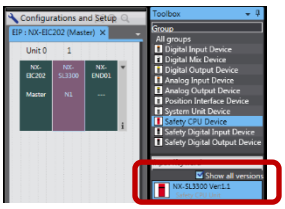
New naming is EtherNet/IP and it automatically has the coupler.



The toolbox does not list couplers.



It only shows the NX-SL3300 V1.1.
(No NX-SL3500)

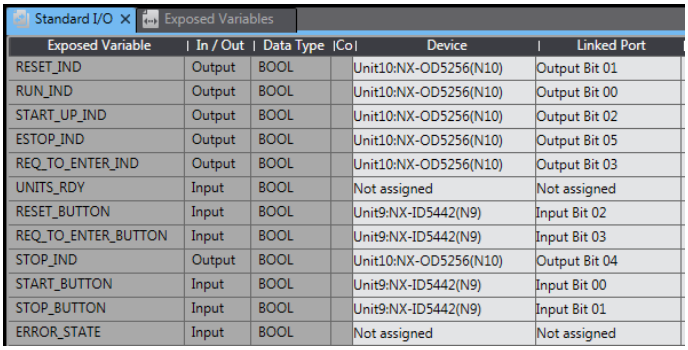


It will automatically select the SIH400 V1.1 module.

Assign Variables Location on Standard Side

1.) Multiview Explorer -> Configurations and Setup -> Communications -> Standard -> Standard I/O

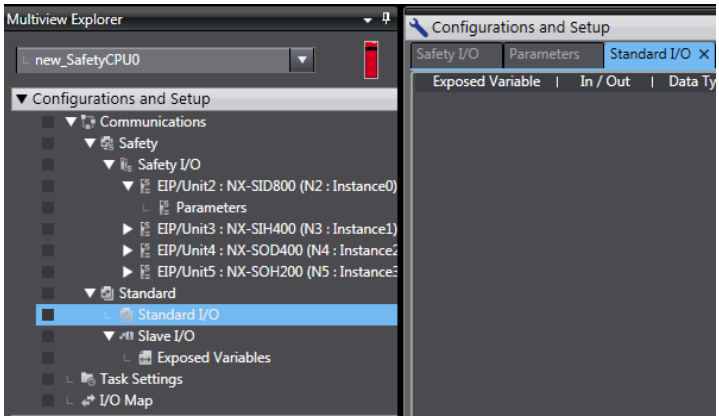
2.) Manually assign the device and linked port. (Hint: If you have multiple screens with a copy of the original and new programs open, look at the I/O map of the original program. NJ controller -> Configurations and Setup -> I/O Map)



Exposed Variable	In / Out	Data Type	Co	Device	Linked Port
RESET_IND	Output	BOOL		Unit10:NX-OD5256(N10)	Output Bit 01
RUN_IND	Output	BOOL		Unit10:NX-OD5256(N10)	Output Bit 00
START_UP_IND	Output	BOOL		Unit10:NX-OD5256(N10)	Output Bit 02
ESTOP_IND	Output	BOOL		Unit10:NX-OD5256(N10)	Output Bit 05
REQ_TO_ENTER_IND	Output	BOOL		Unit10:NX-OD5256(N10)	Output Bit 03
UNITS_RDY	Input	BOOL		Not assigned	Not assigned
RESET_BUTTON	Input	BOOL		Unit9:NX-ID5442(N9)	Input Bit 02
REQ_TO_ENTER_BUTTON	Input	BOOL		Unit9:NX-ID5442(N9)	Input Bit 03
STOP_IND	Output	BOOL		Unit10:NX-OD5256(N10)	Output Bit 04
START_BUTTON	Input	BOOL		Unit9:NX-ID5442(N9)	Input Bit 00
STOP_BUTTON	Input	BOOL		Unit9:NX-ID5442(N9)	Input Bit 01
ERROR_STATE	Input	BOOL		Not assigned	Not assigned

Standard I/O Map

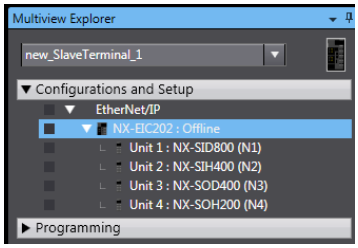
It is located under the safety CPU.



Insert Additional Coupler

Menu bar -> Insert -> Slave Terminal -> Ethernet/IP coupler

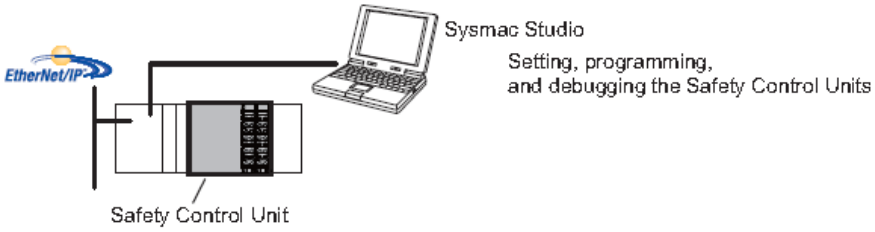
Additional couplers can be added, but they will not have everything needed to map I/O, label variable or do programming unless an NX CPU is added.



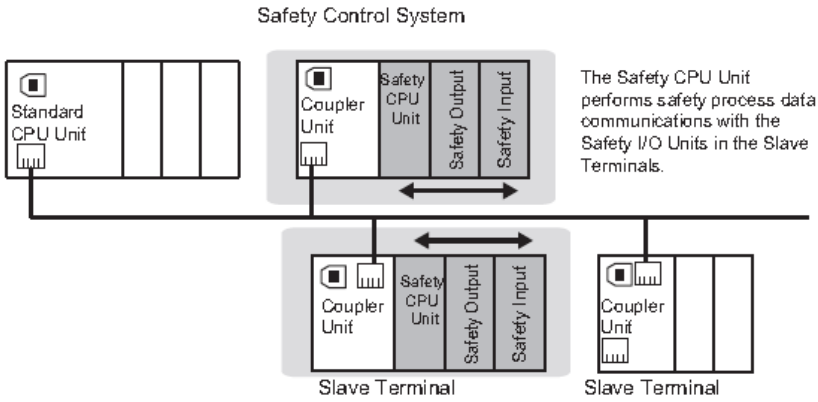
Can I expand I/O on the network with additional couplers?

No. (Page 41 NX-series Safety Control Unit User's Manual Z930)

Coupler unit is limited to the EtherNET/IP Slave Terminal at the connection.

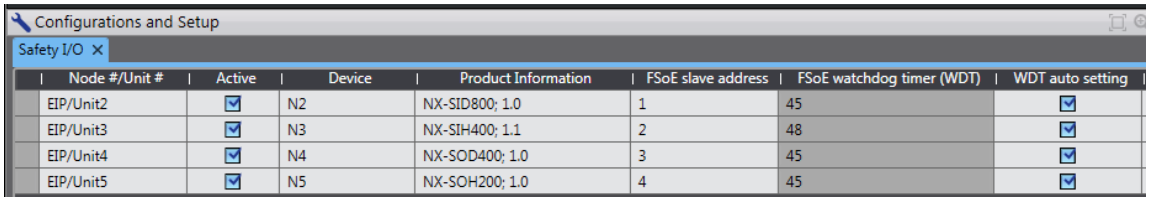


You can add Safety CPU to each coupler with safety. (page 45)



Safety I/O

Node is listed as EIP instead of a node setting

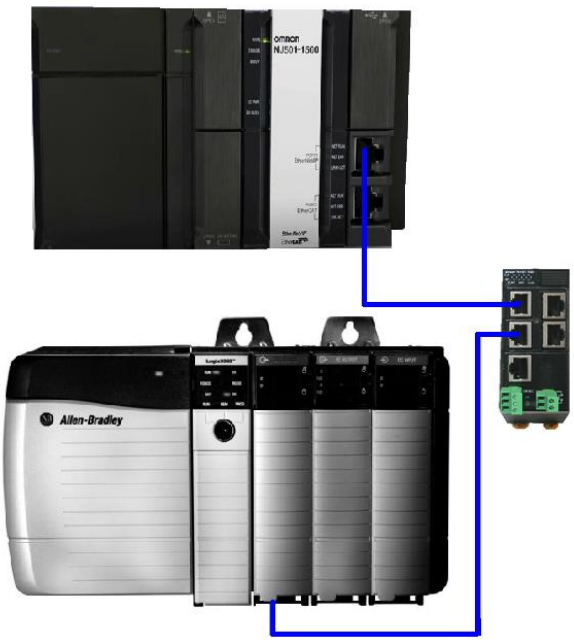


Node #/Unit #	Active	Device	Product Information	FSoE slave address	FSoE watchdog timer (WDT)	WDT auto setting
EIP/Unit2	☑	N2	NX-SID800; 1.0	1	45	☑
EIP/Unit3	☑	N3	NX-SIH400; 1.1	2	48	☑
EIP/Unit4	☑	N4	NX-SOD400; 1.0	3	45	☑
EIP/Unit5	☑	N5	NX-SOH200; 1.0	4	45	☑

Omron NJ to Rockwell CompactLogic or ControlLogix EtherNet/IP Implicit Messaging

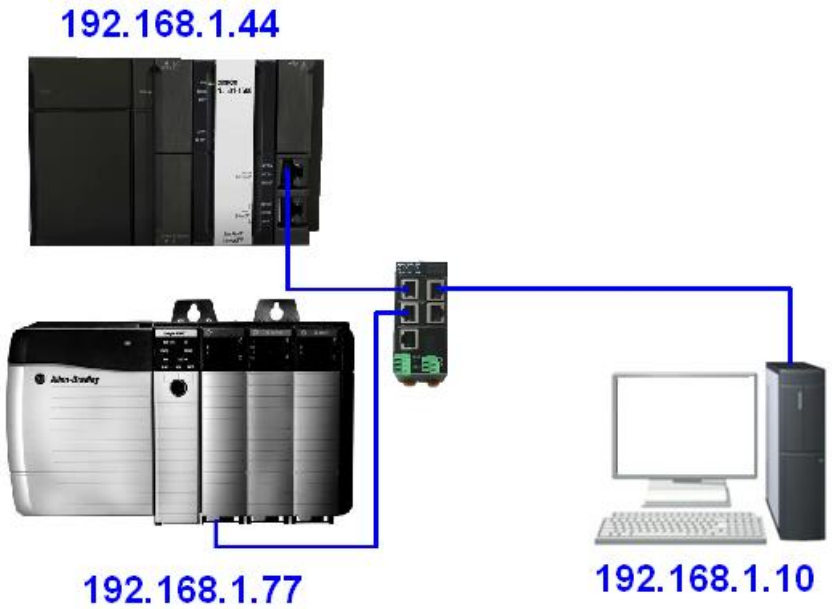
Overview

This section is to setup an EtherNet/IP Tag Datalink (Implicit Messaging) connection between an Omron NJ or NX Stand-alone Machine Automation Controller (MAC) and a Rockwell ControlLogix or CompactLogix controller. This Tag Datalink will share an array of 100 Integer values (200 Bytes) from the Omron NJ MAC to a Rockwell CompactLogix and an array of 100 Integer values (200 Bytes) from the CompactLogix to the NJ MAC. A ControlLogix would be similar to the steps shown in this document.



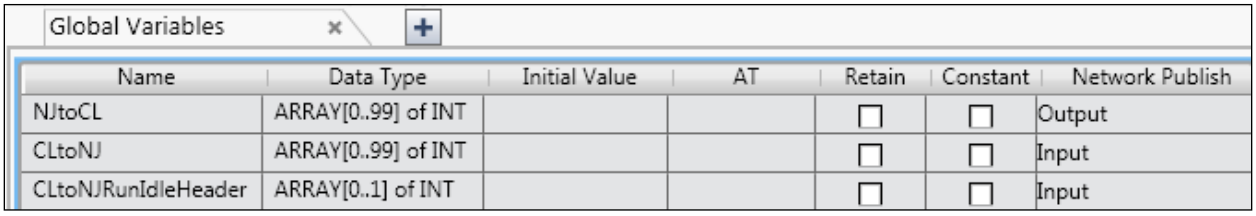
There is a second tag used in the NJ, which maps the 32 bit Run / Idle header in the connection from the CompactLogix to the NJ, which is necessary, but does not contain meaningful data. This is the tag called CLtoNJRunIdleHeader.

Example Configuration



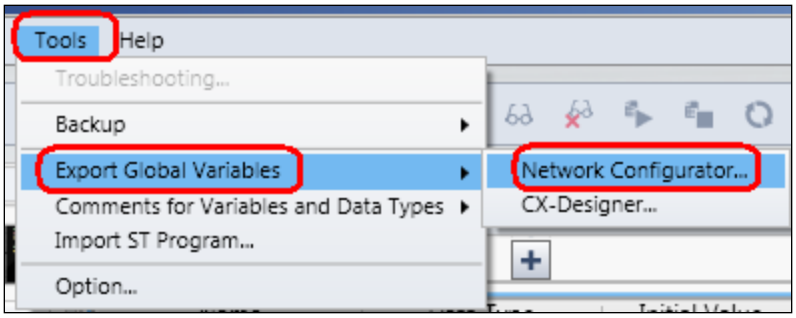
NJ Configuration

1. In Sysmac Studio, configure the Sysmac NJ tags as shown in the Global Variables.



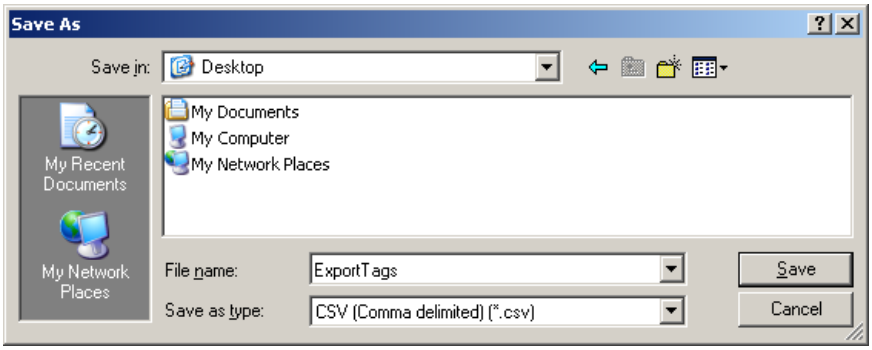
Name	Data Type	Initial Value	AT	Retain	Constant	Network Publish
NJtoCL	ARRAY[0..99] of INT			☐	☐	Output
CLtoNJ	ARRAY[0..99] of INT			☐	☐	Input
CLtoNJRunIdleHeader	ARRAY[0..1] of INT			☐	☐	Input

2. Synchronize the project with the NJ controller to transfer the Tags to the NJ.

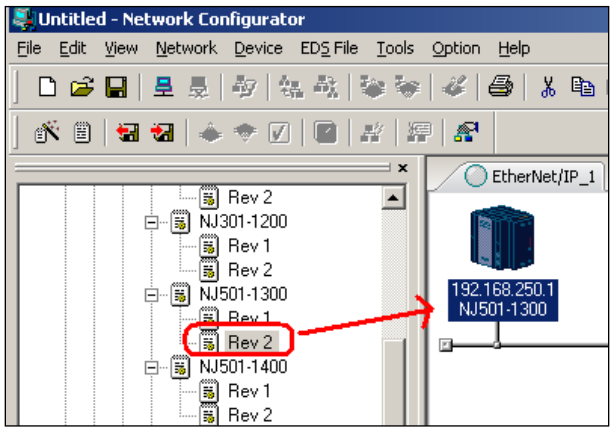


3. In Sysmac Studio, export the Tags to the Network Configurator for EtherNet/IP.

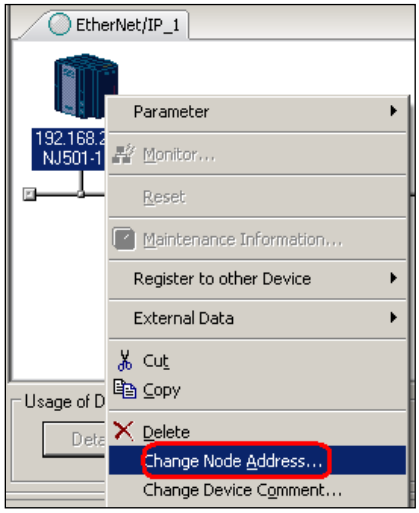
4. Save the .csv file that contains the tags. This will be imported in a later step.

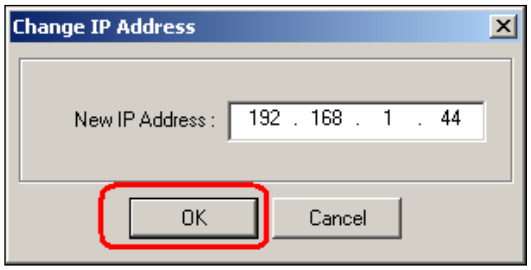


5. In the Network Configurator for EtherNet/IP, add an NJ to the network diagram. Select the correct model and Revision. Rev 1 = NJ firmware 1.00, 1.01, or 1.02. Rev 2 = NJ firmware 1.03 or higher.



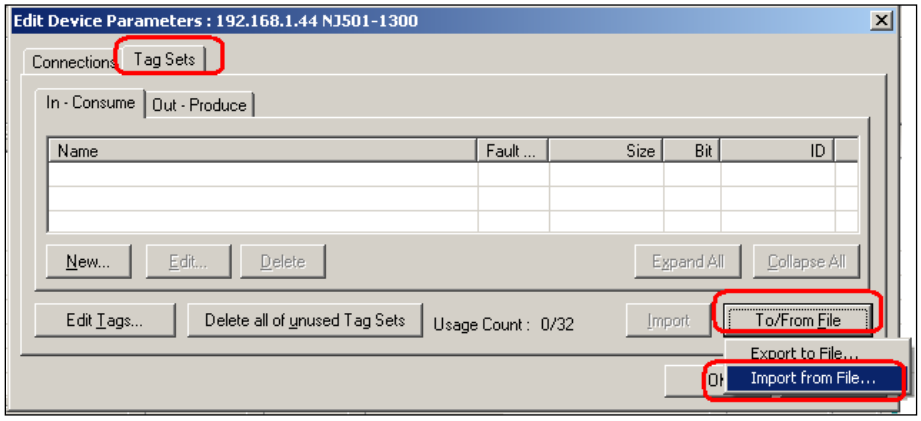
6. Right click on the NJ in the network diagram, and select '**Change Node Address'**. Enter the IP Address of the NJ, and click '**OK**'.



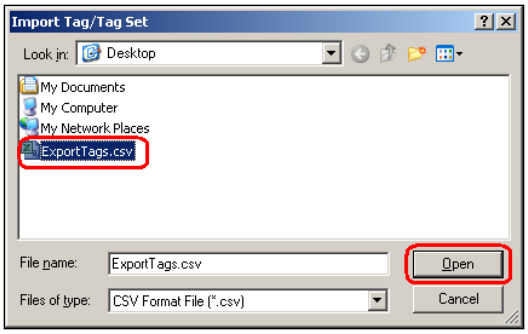


7. Double click on the NJ CPU in the network diagram.

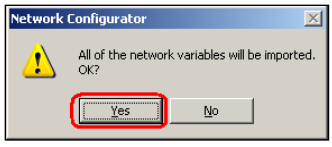
8. Click on the '**Tag Sets'** tab, and click '**To / From File'**, and select '**Import from File**'.



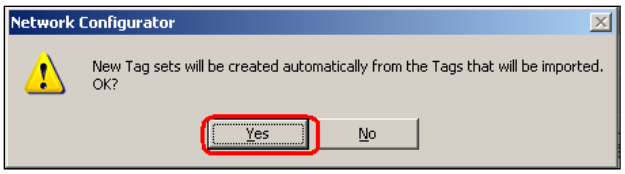
9. Browse for the .csv file created earlier**,** select it, and click **'Open'.**



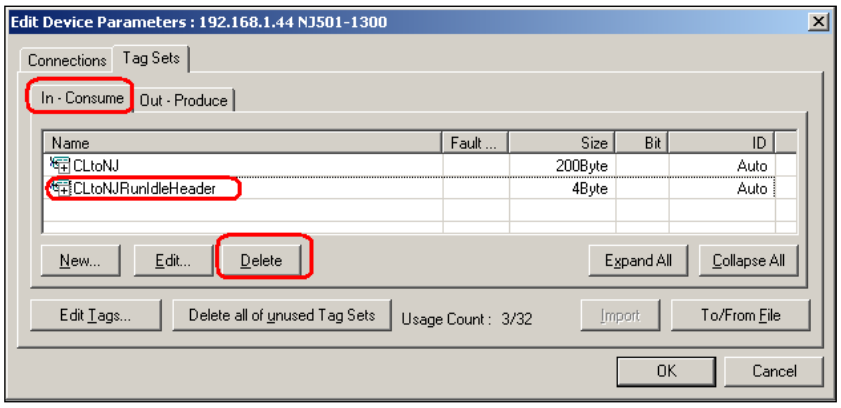
10. When "All of the network variables will be imported" dialog box appears, click **'Yes'.**



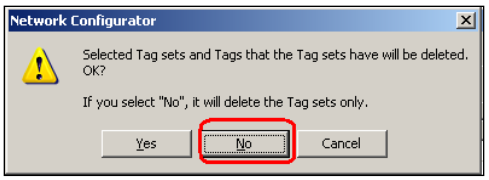
11. When “New Tag sets will be created automatically from the Tags that will be imported” click **‘Yes’.**



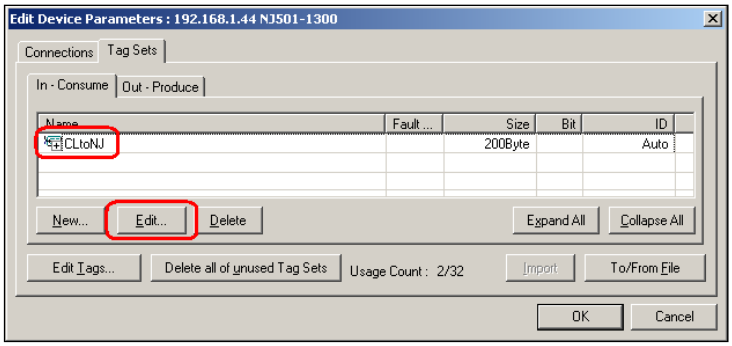
12. On the ‘**In- Consume**‘ tab, select the Tag Set named ‘**CLtoNJRunIdleHeader**’, and click ‘**Delete**’.



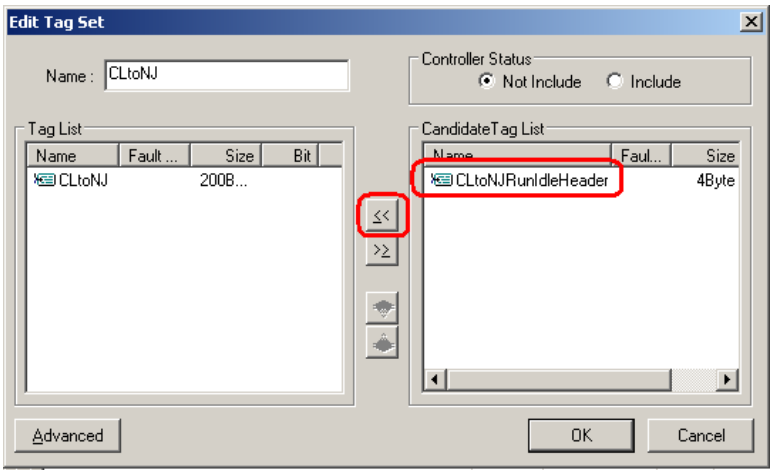
13. When the “Selected Tags set and Tags that the Tag sets have all been deleted” dialog box appears, click **‘No’.**



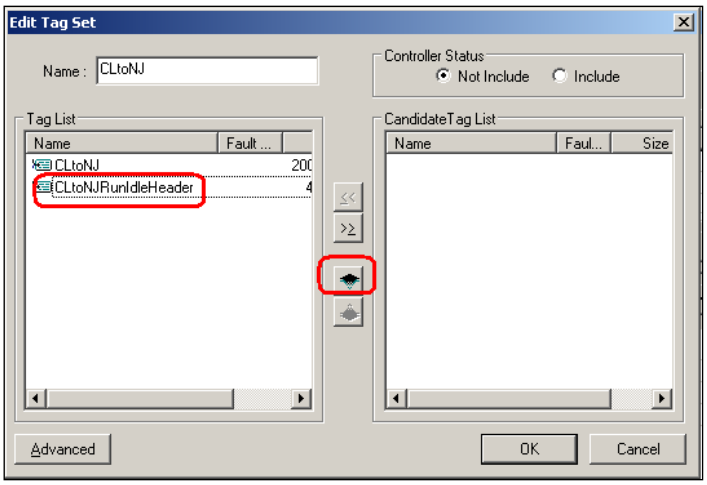
14. On the ‘**In- Consume**‘ tab, select the Tag Set named ‘**CLtoNJ**’, and click ‘**Edit**’.



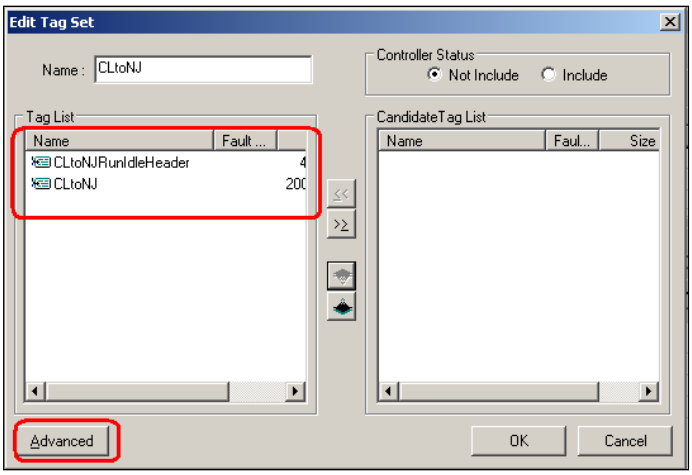
15. Select the Tag named ‘**CLtoNJRunIdleHeader**’ on the right, and click the 2 left pointing arrows to add this tag to the Tag Set on the left.



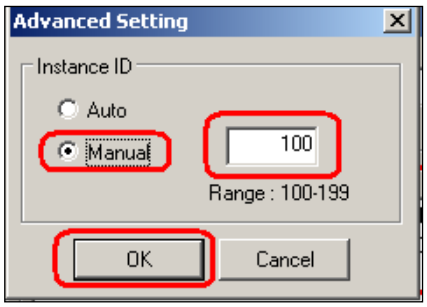
16. In the Tag Set on the left, select the Tag named '**CLtoNJRunIdleHeader**', and click the **Up Arrow** to move the tag to the top of the list.



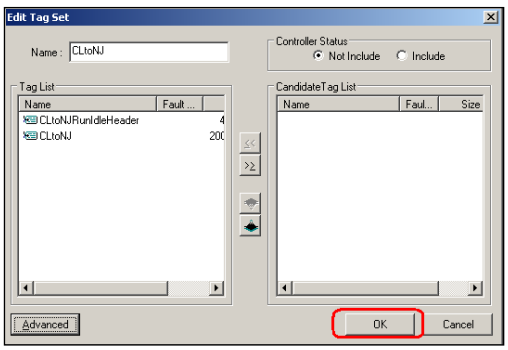
17. Verify that the CLtoNJRunIDleHeader is now at the top of the list, then click '**Advanced**'.



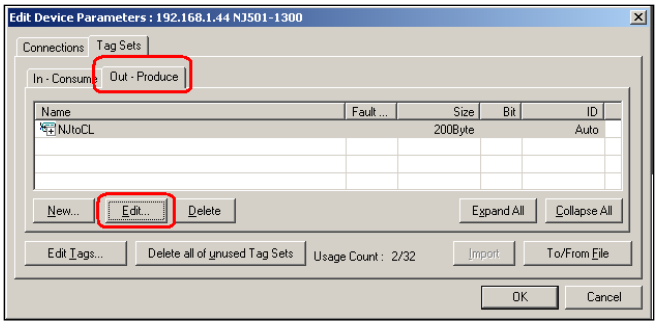
18. Select the '**Manual**' radio button, and enter a value of **100** for the Assembly Number. Click '**OK**'.



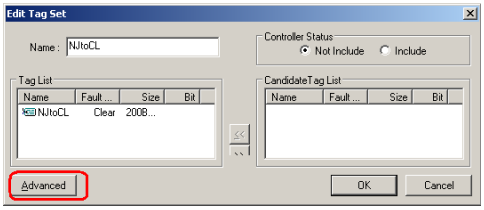
19. Click '**OK**' to complete the edit of the Tag Set.



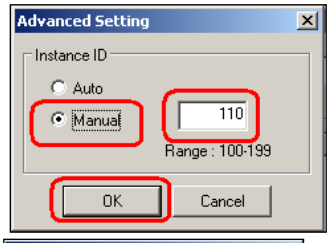
20. Click on the '**Out – Produce**' tab, and select '**Edit**'.



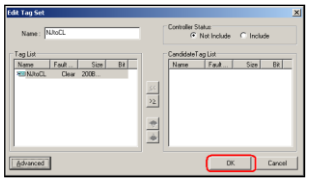
21. Click **'Advanced'**.



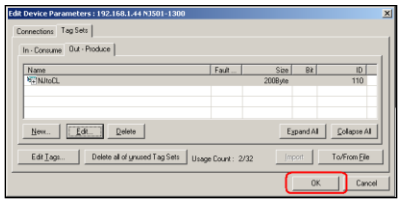
22. Select the '**Manual**' radio button, and enter a value of **110** for the Assembly Number. Click '**OK**'.



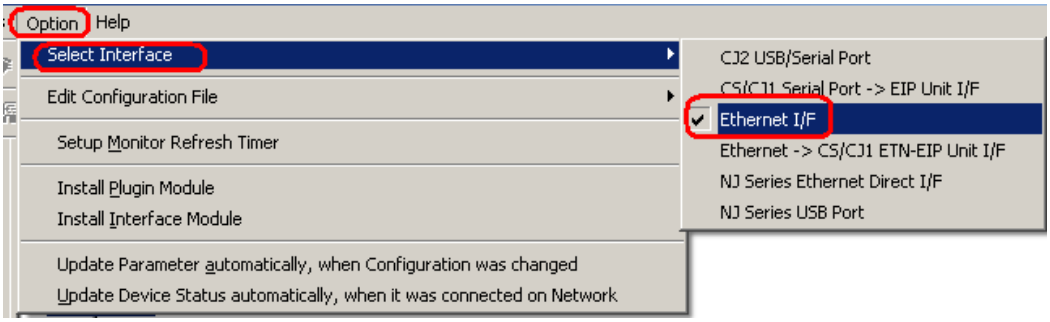
23. Click '**OK**' to complete the edit of the Tag Set.



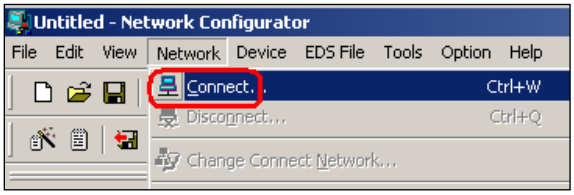
24. Click '**OK**' to complete the network configuration of the NJ.



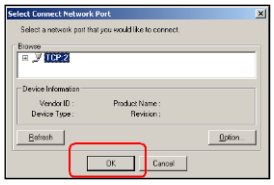
25. The network configuration has been setup, but still need to be downloaded to the NJ. To connect to the network, click '**Options' / 'Select Interface'** menus. Choose '**Ethernet I/F'**.



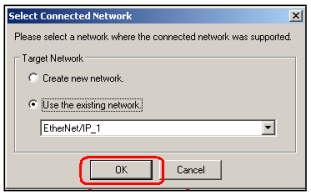
26. Click on the '**Network' / 'Connect'** menus to connect to the network.



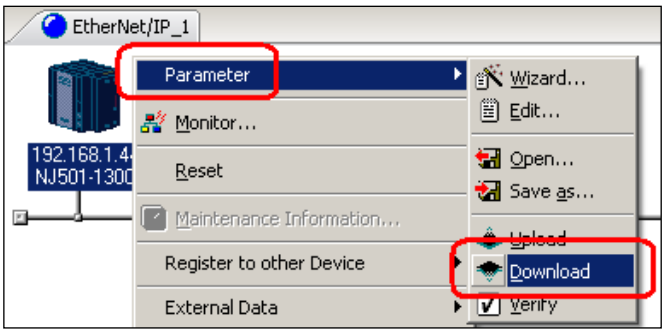
27. Click '**OK'** to connect .



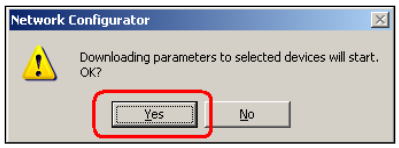
28. Click '**OK'** to select 'Use the existing network'.



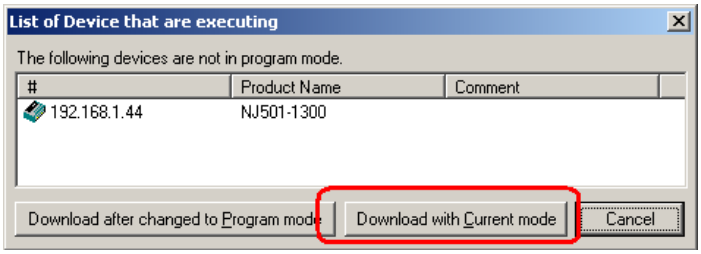
29. Download the EtherNet/IP settings to the NJ by right clicking on the NJ in the network diagram, and select '**Parameter'** / '**Download'**.



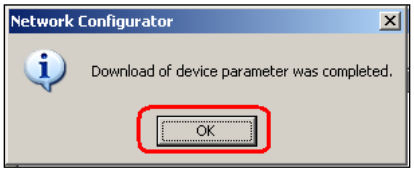
30. When "Downloading parameters to selected devices will start", dialog box appears, click **'Yes'.**



31. If the NJ is not in program mode, you will get the option to change modes, or download with the NJ in the current mode. Click '**Download with Current mode**'.

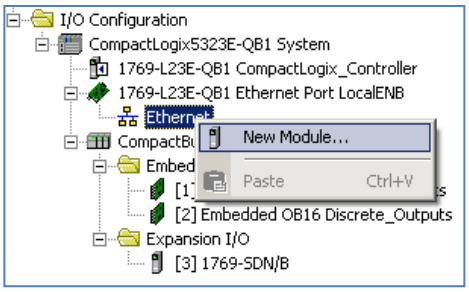


32. When "Download of device parameters was completed" dialog box appears, the NJ is ready to accept a connection from a CompactLogix. Click 'OK'.

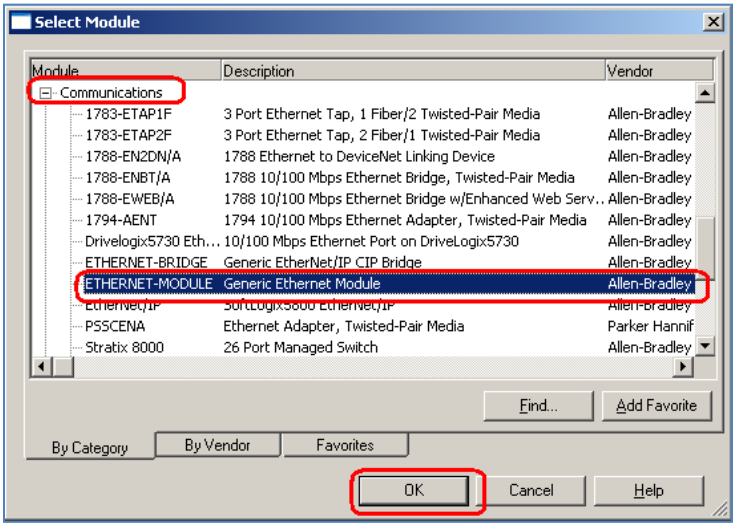


CompactLogix Configuration

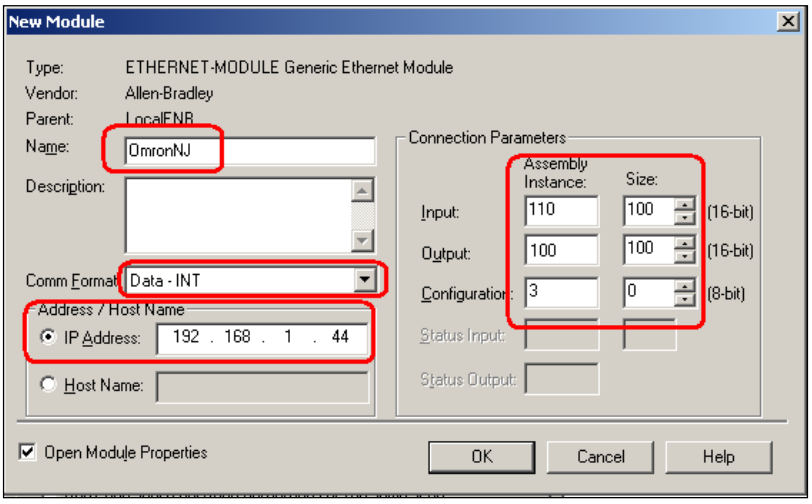
1. Open an existing project file or create a new project file for the CompactLogix in RSLogix 5000.
2. Configure the IP address of the CompactLogix as 192.168.1.77 using RSLogix 5000 (as an example IP Address).
3. In RSLogix 5000, right click on the Ethernet module in the CompactLogix, and click '**New Module'**.



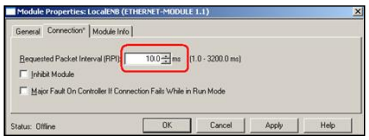
4. In the '**Communications'** group, select '**ETHERNET-MODULE Generic Ethernet Module'**, and click '**OK'**.



5. Configure the connection as shown, and click **OK.**



6. Configure the RPI for 10 ms, and click **OK**.



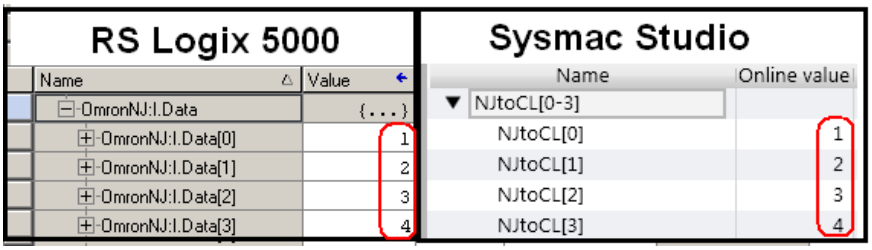
Tags will have been created automatically for the OmronNJ connection as shown below.

OmronNJ:I	{...}	{...}		AB:ETHERNET_...
OmronNJ:I.Data	{...}	{...}	Decimal	INT[100]
OmronNJ:O	{...}	{...}		AB:ETHERNET_...
OmronNJ:O.Data	{...}	{...}	Decimal	INT[100]

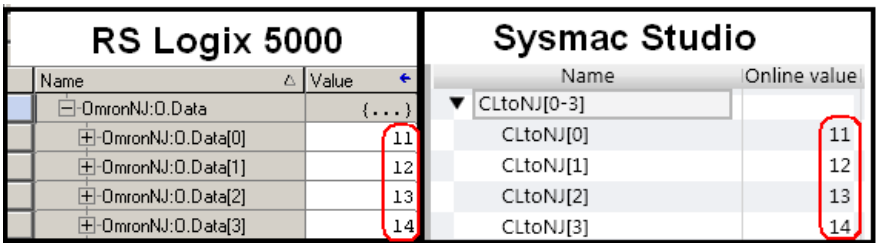
7. Download the project to the CompactLogix processor using RSLogix 5000.

8. Using RSLogix 5000 and Sysmac Studio to set data and monitor the data in the 2 controllers, verify the operation of the EtherNet/IP Tag Datalink.

Data from NJ to CompactLogix



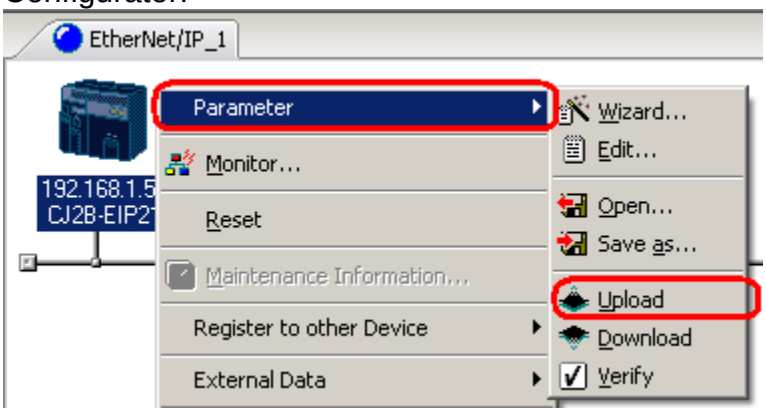
Data from CompactLogix to NJ



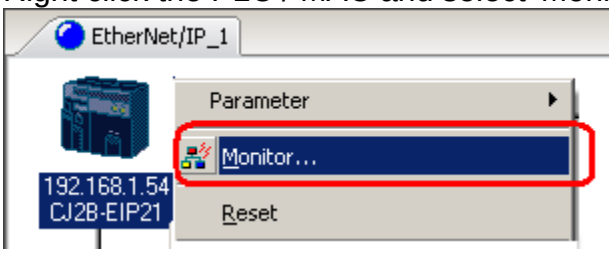
EtherNet/IP Error Code Decoder

1.) Go online with the Network Configurator.

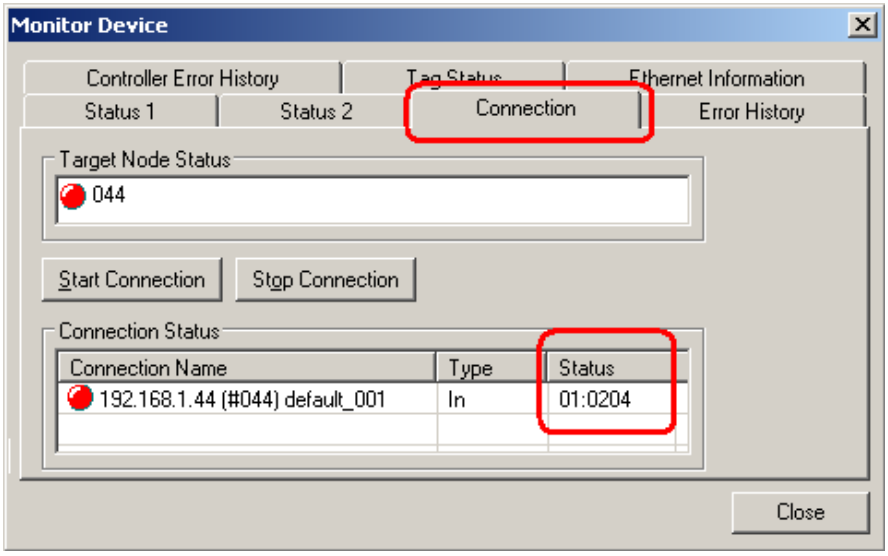
2.) Upload from the PLC / MAC if the configuration in the EIP card is different from the Network Configurator.



3.) Right click the PLC / MAC and select 'Monitor'.



4.) Go to the 'Connection' tab. The error code is shown in 'Status'.



5.) Use the list to find the status code and description of the failure.

01:0100	Connection in use or duplicate forward open
01:0103	Transport class and trigger combination not supported
01:0106	Ownership Conflict
01:0107	Target connection not found
01:0108	Invalid network connection parameter
01:0109	Invalid connection size
01:0110	Target for connection not configured
01:0111	RPI not supported
01:0113	Out of connections
01:0114	Vendor ID or Product Code mismatch
01:0115	Product Type Mismatch
01:0116	Revision Mismatch
01:0117	Invalid Produced or Consumed application path
	This could be Tag Names that do not match in the PLC
01:0118	Invalid or inconsistent configuration application path
01:0119	Non-Listen only connection not opened
01:011A	Target object out of connections
01:011B	RPI is smaller than the production inhibit time
01:011C	Transport Class Not Supported
01:011D	Production Trigger Not Supported
01:011E	Direction Not Supported
01:011F	Invalid Originator to Target Network Connection FIXVAR
01:0120	Invalid Target to Originator Network Connection FIXVAR
01:0121	Invalid Originator to Target Network Connection Priority
01:0122	Invalid Target to Originator Network Connection Priority
01:0123	Invalid Originator to Target Network Connection Type
01:0124	Invalid Target to Originator Network Connection Type
01:0125	Invalid Originator to Target Network Connection Redundant_Owner
01:0126	Invalid Configuration Size
01:0127	Invalid Originator to Target Size
01:0128	Invalid Target to Originator Size
01:0129	Invalid Configuration Application Path
01:012A	Invalid Consuming Application Path
01:012B	Invalid Producing Application Path
01:012C	Configuration Symbol Does Not Exist
01:012D	Consuming Symbol Does Not Exist
01:012E	Producing Symbol Does Not Exist
01:012F	Inconsistent Application Path Combination
01:0130	Inconsistent Consume Data Format
01:0131	Inconsistent Produce Data Format
01:0132	Null Forward Open Function Not Supported
01:0133	Connection Timeout Multiplier Not Acceptable
01:0203	Connection timed out
01:0204	Unconnected request timed out
01:0205	Parameter error in unconnected request service
01:0206	Message too large for unconnected send service

01:0207	Unconnected acknowledgement without reply
01:0301	No buffer memory available
01:0302	Network bandwidth not available for data
01:0303	No consumed connection ID filter available
01:0304	Not configured to send scheduled priority data
01:0305	Schedule signature mismatch
01:0306	Schedule signature validation not possible
01:0311	Port not available
01:0312	Link address not valid
01:0315	Invalid segment in connection path
01:0316	Error in Forward Close service connection path
01:0317	Scheduling not specified
01:0318	Link address to self invalid
01:0319	Secondary resource unavailable
01:031A	Rack connection already established
01:031B	Module connection already established
01:031C	Miscellaneous
01:031D	Redundant connection mismatch
01:031E	No more user configurable link consumer resources available in the producing module
01:031F	No more user configurable link consumer resources available in the producing module
01:0800	Network link in path to module is offline
01:0810	No target application data available
01:0811	No originator application data available

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