



NetArrays Project Program Development Example

## **Setup Examples**

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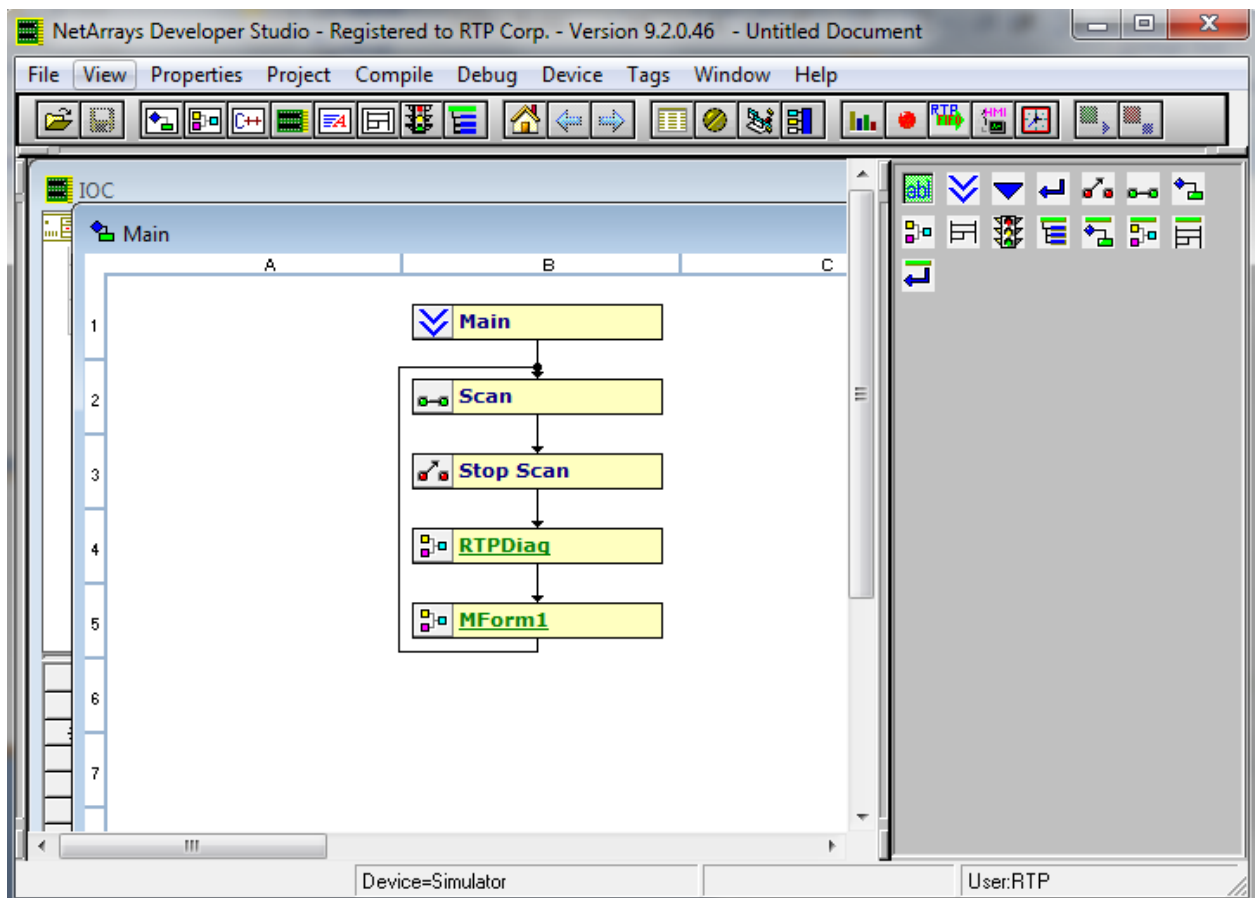
**File Name: NetArrays Example 3200T.pdf**  
**Last Updated: 10/20/20**

## NetArrays Project Program Development

This document will demonstrate the use of the PID object and Signal Validation. This example consists on voting multiple redundant input signals by selecting one of signal validation algorithm and configuring the PID Object's parameters under two 14-slot chassis in a dual redundant centralized configuration.

The only equipment required is a PC or laptop with NetSuite installed. To verify, the project program will be run on the NetArrays build-in simulator.

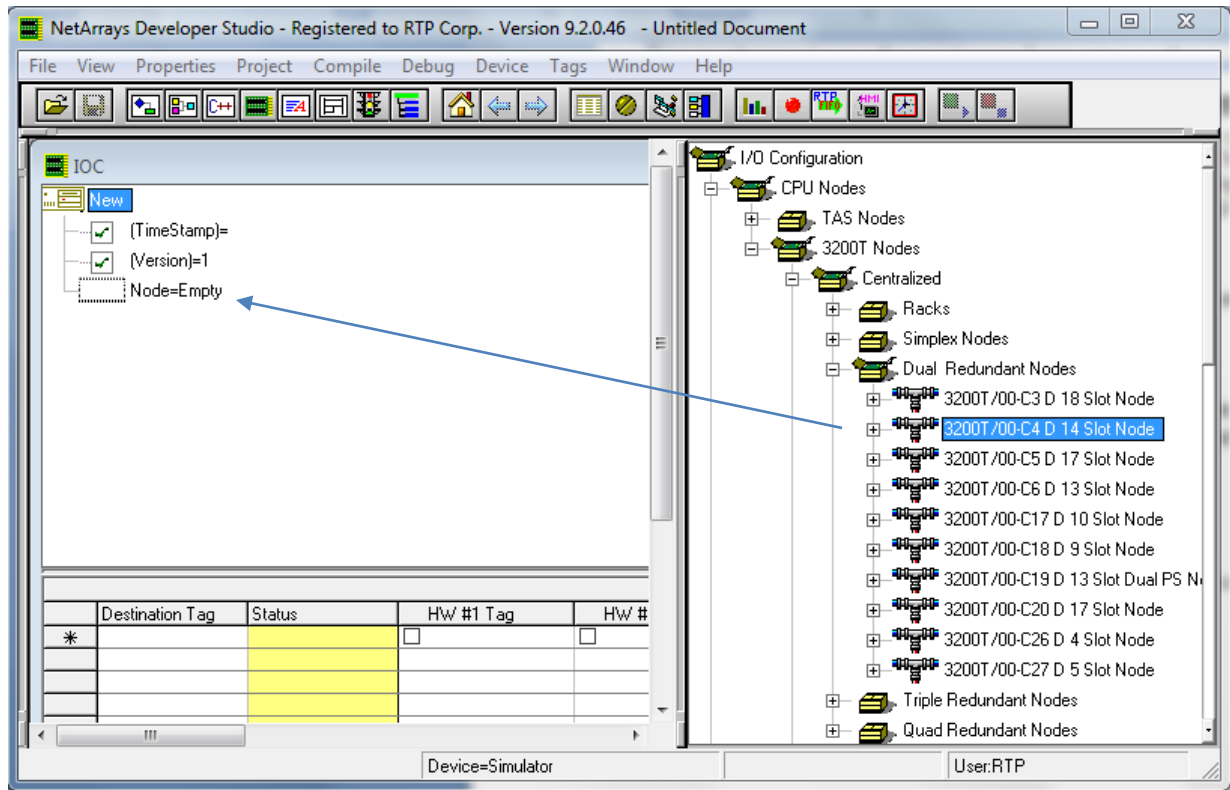
- Open NetArrays and log in. If you have not created a user account please refers to the file ug-netsuite.pdf found in the directory C:\RTP NetSuite\Manuals. After logging in, you are going to see the figure below



### Choosing the Hardware configuration:

We are going to use a dual redundant centralized configuration in two chassis. Therefore, go to the I/O configuration display and grab the system configuration 3200T/00-C4 D 14 Slot Node and drop it on the Node = Empty on the system configuration window.

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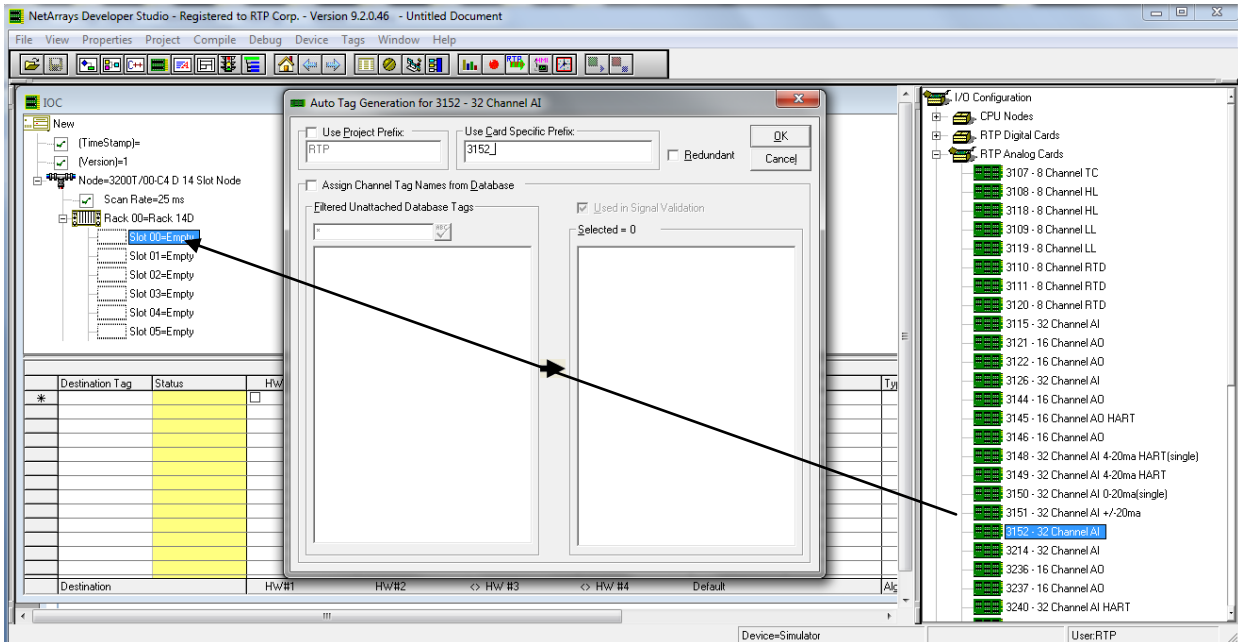


### Adding the Analog Redundant Cards:

The system will consist of a set of 2 **Redundant 3152 Analog Input Cards**.

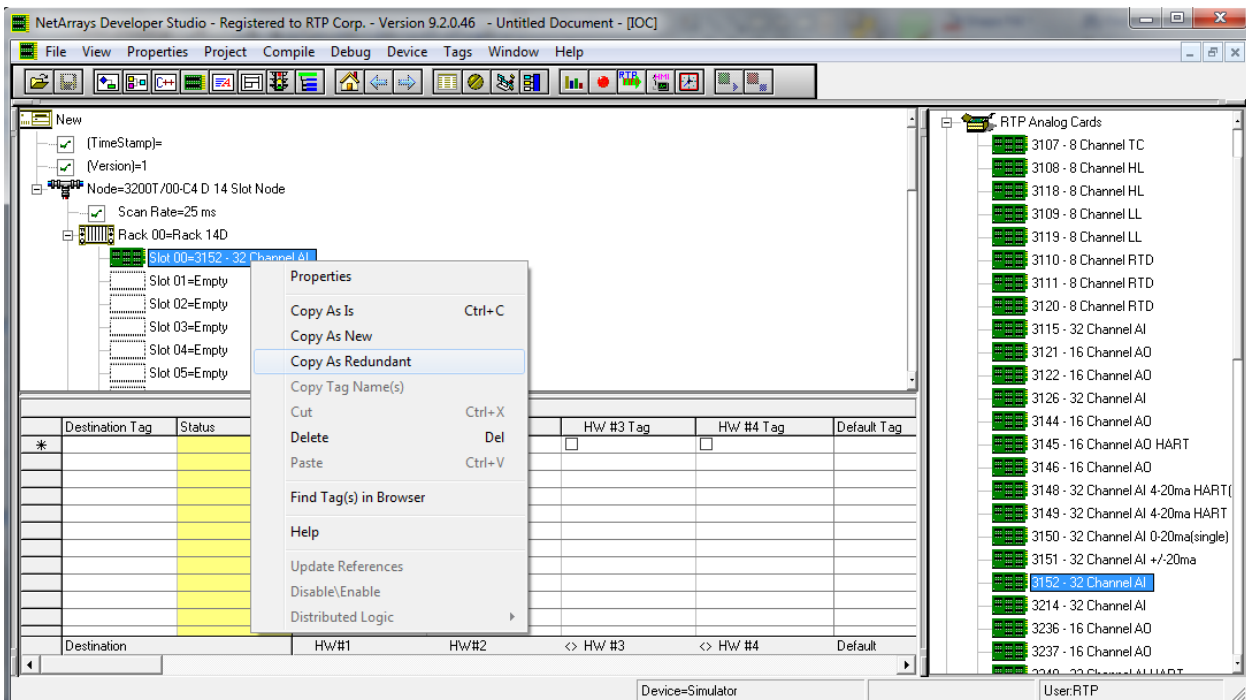
To add a card to the system, go to the I/O configuration and expand the folder for the RTP Analog Cards. Then, grab the 3152 card and drop it into the rack-00 /slot 00. As you drop the card, an Auto Tag Generation window will prompt. In the Use Card Specific Prefix cell, type "3152\_" and check the redundant option. Then Click OK.

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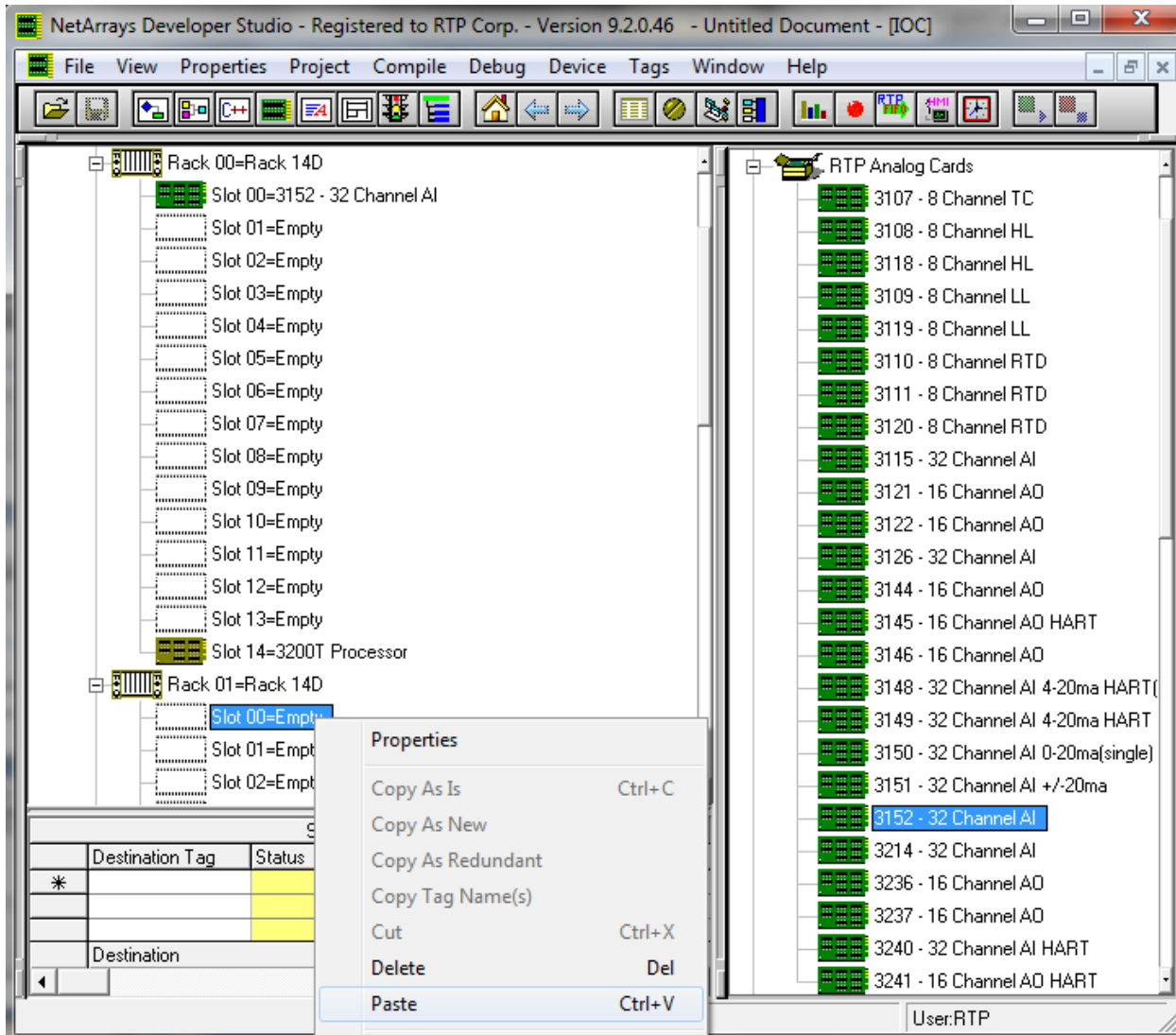


### Copying Redundant Card:

Right click on the 3152 card in **Slot 00** of the I/O configuration and then, select **Copy As Redundant** from the pop-up menu.



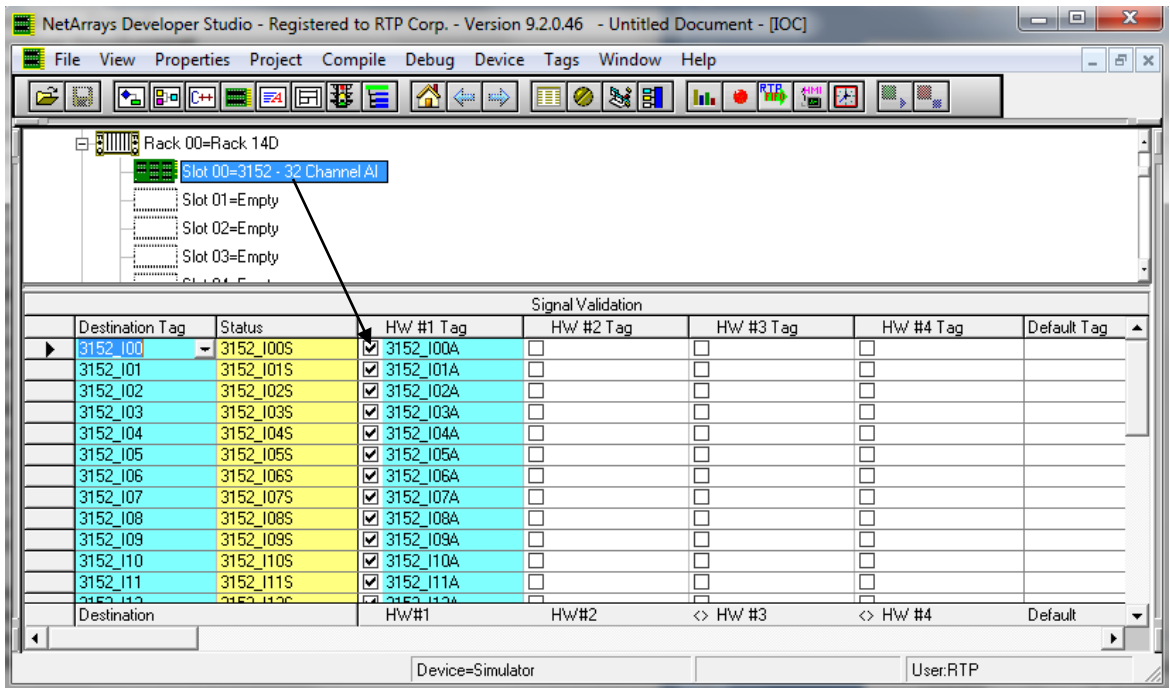
- Right Click on Rack 01 / Slot01=Empty position and paste the redundant card.



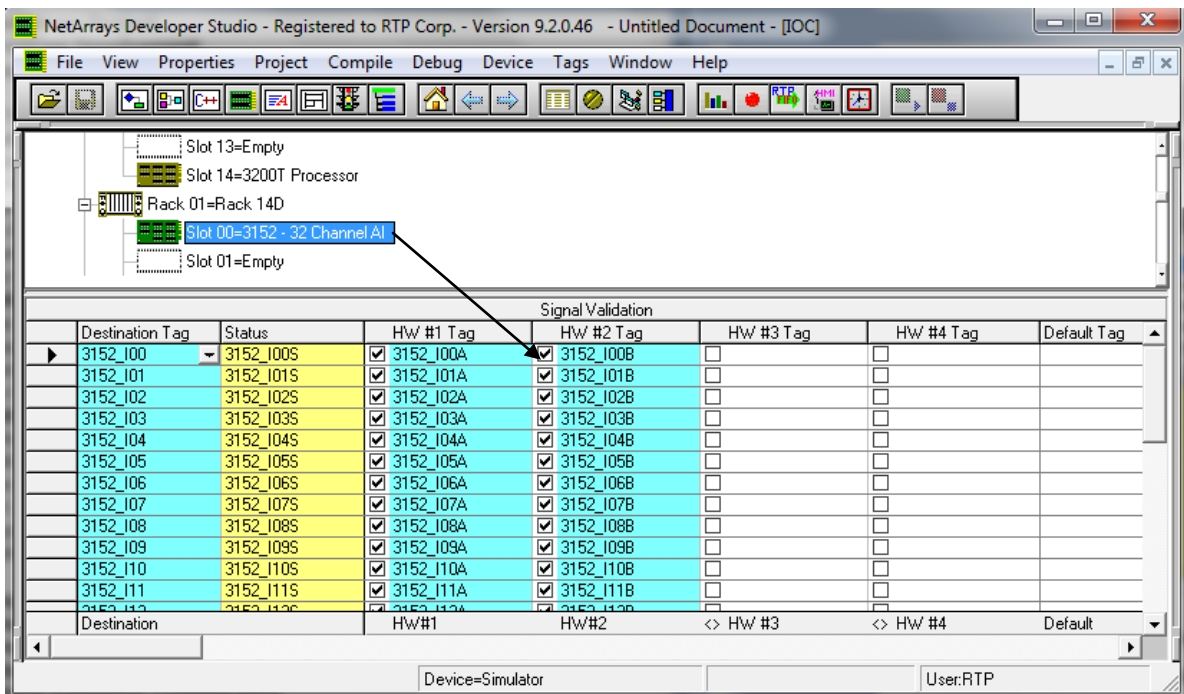
## Signal Validation Configuration

- Click the first 3152 Analog Input Card's icon in **Slot 00** and drag it to the first cell of the HW#1 Tag column of the Signal Validation display. Carefully position the cursor over the first Tag field and release the left mouse button.
- After releasing the mouse button, NetArrays will fill in the Signal Validation display in HW#1 Tag with the card's configured parameter as show below.

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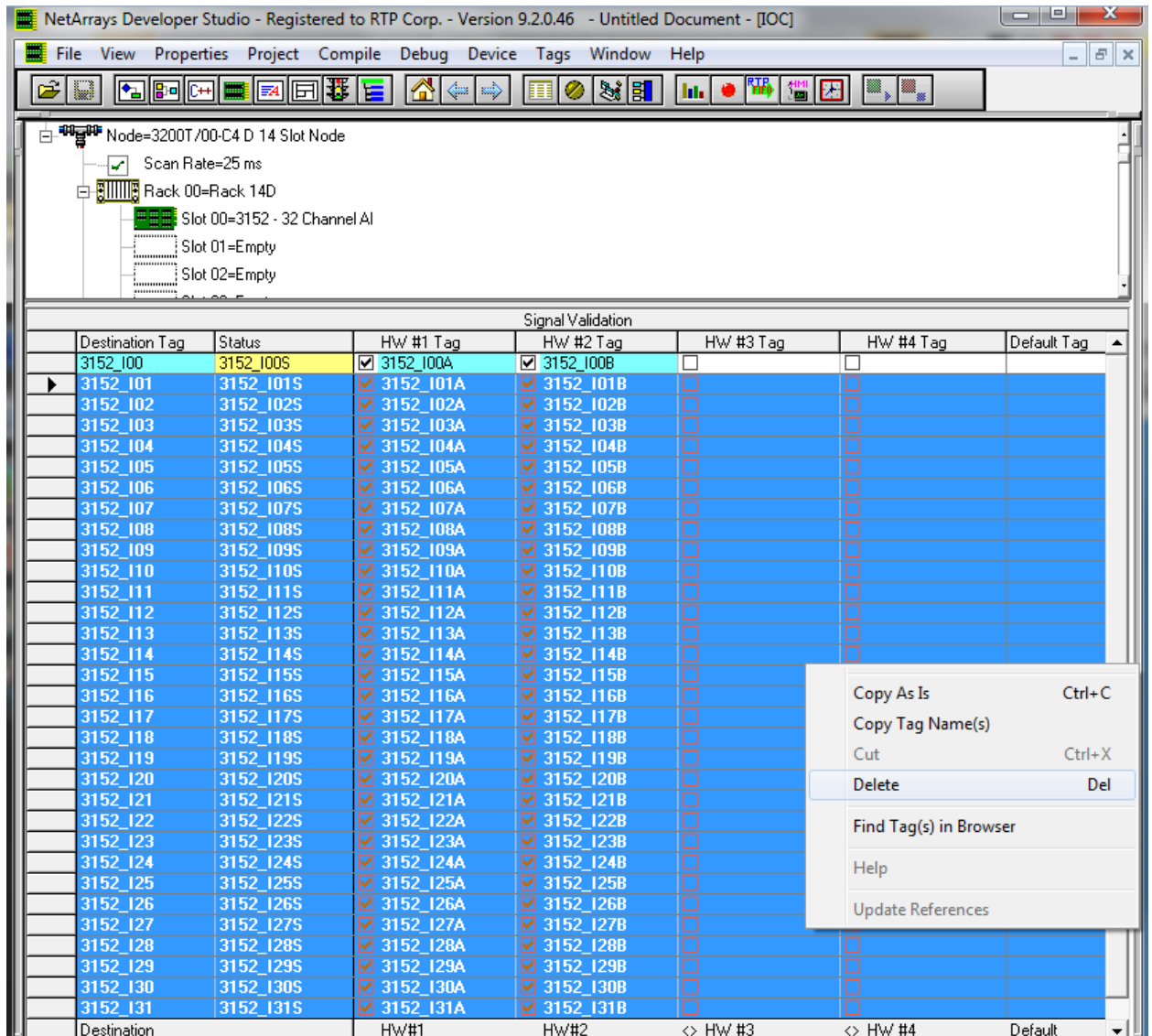


- The Signal Validation Destination Variable fields are automatically populated. Destination Tag is without the suffix, and Status is with a suffix of S.
- Drag and drop the second redundant 3152 analog card from rack 01 / slot 00 into the first cell of the HW # 2 Tag column.



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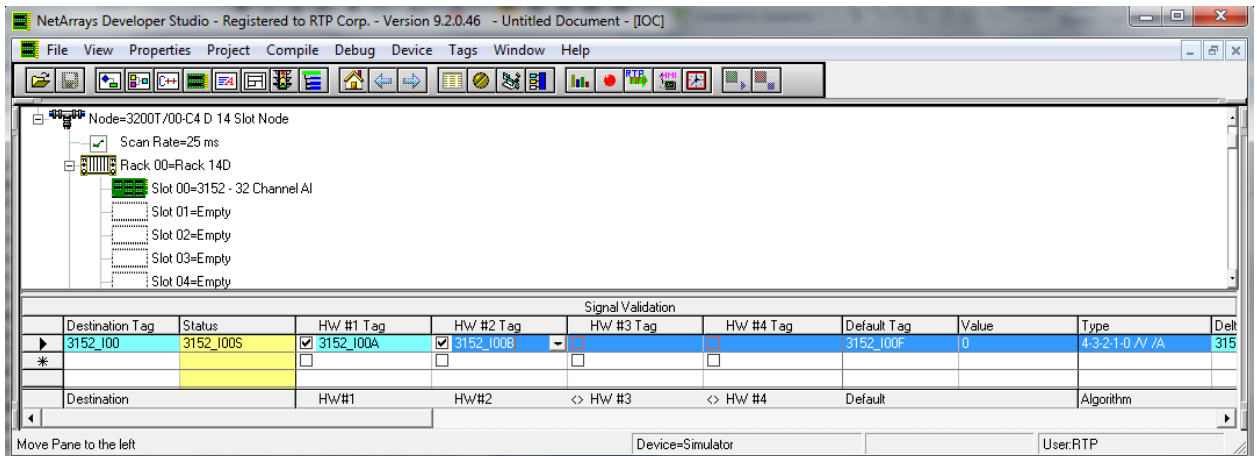
- In this example, the channel 0 will be the only channel use. Therefore, the rest of the inputs should be removed from the signal validation.
- Select the channels from 0-31 on the Signal Validation display window, and then right click on the window. In the pop-up menu, select delete.



- Go to the Column type of the Signal Validation display and select the option 4-3-2-1-0/V/A. This signal validation algorithm will vote the 2 input signals and output the mean of the valid inputs. In the case that none of the inputs is valid, it will output the value of the Tag located in the column "Default Tag".

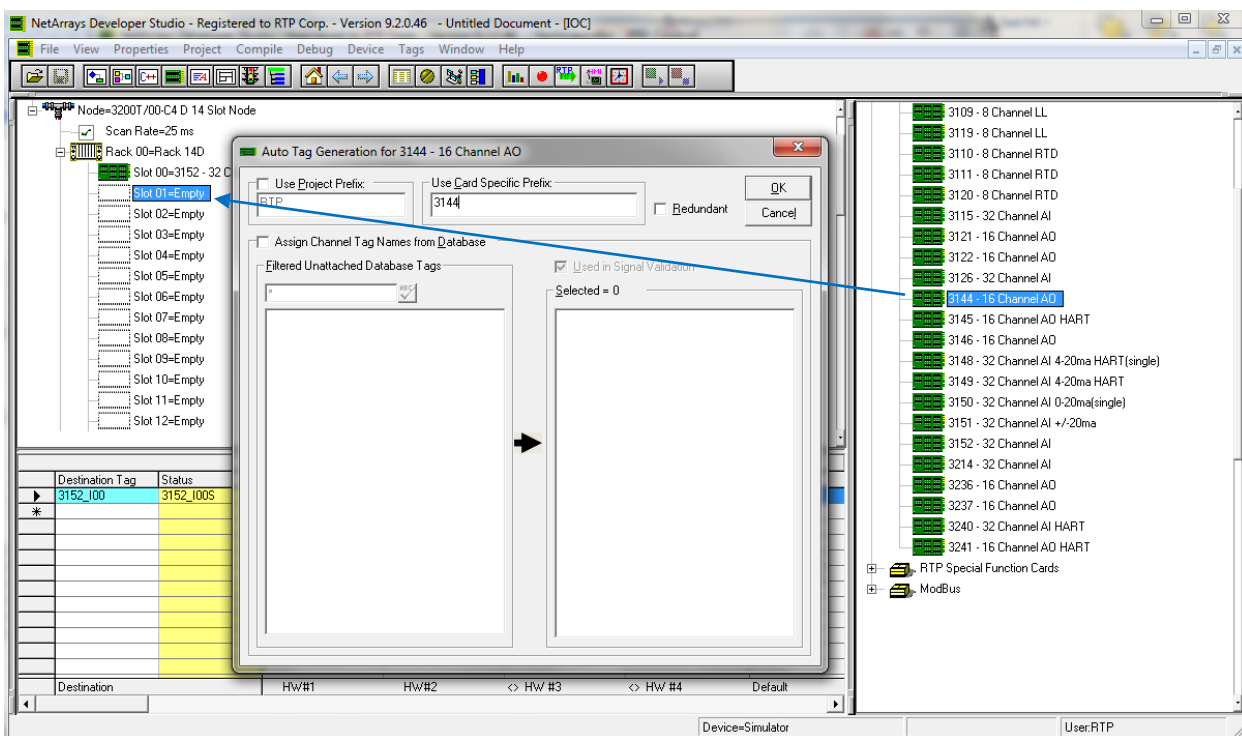


## NetArrays Project Program Development Example




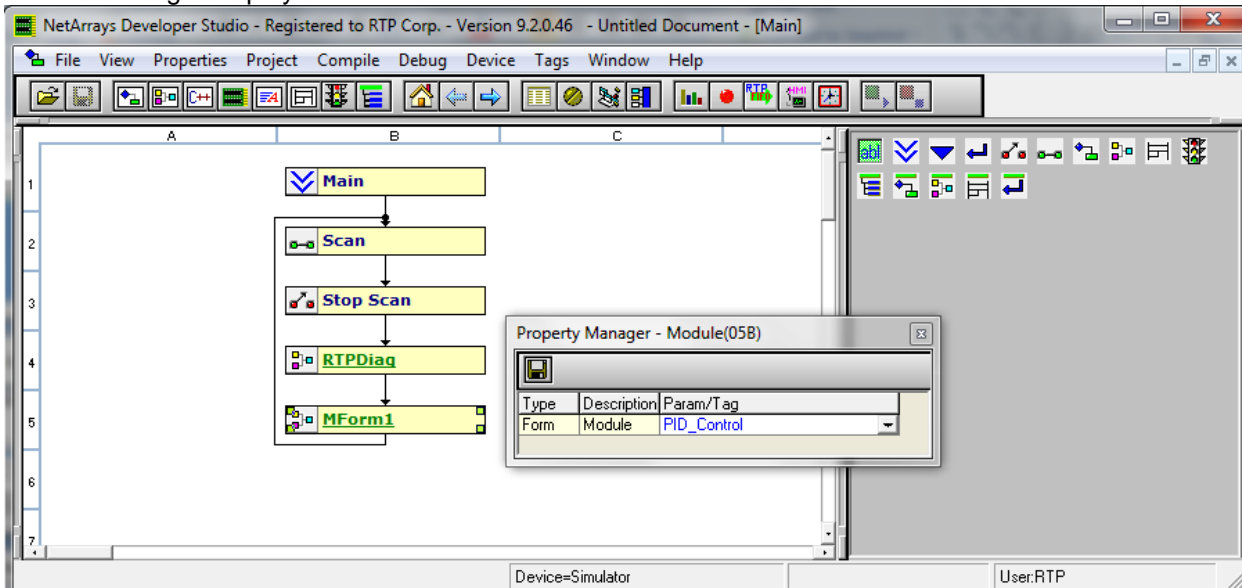
### Adding an output Analog Card:

- Drag a 3144- 16 Channel AO Output card from the I/O configuration window and drop it in the Rack 00/ Slot 01. The Auto Tag Generation dialogue box will appear. Type in "3144" and click okay.

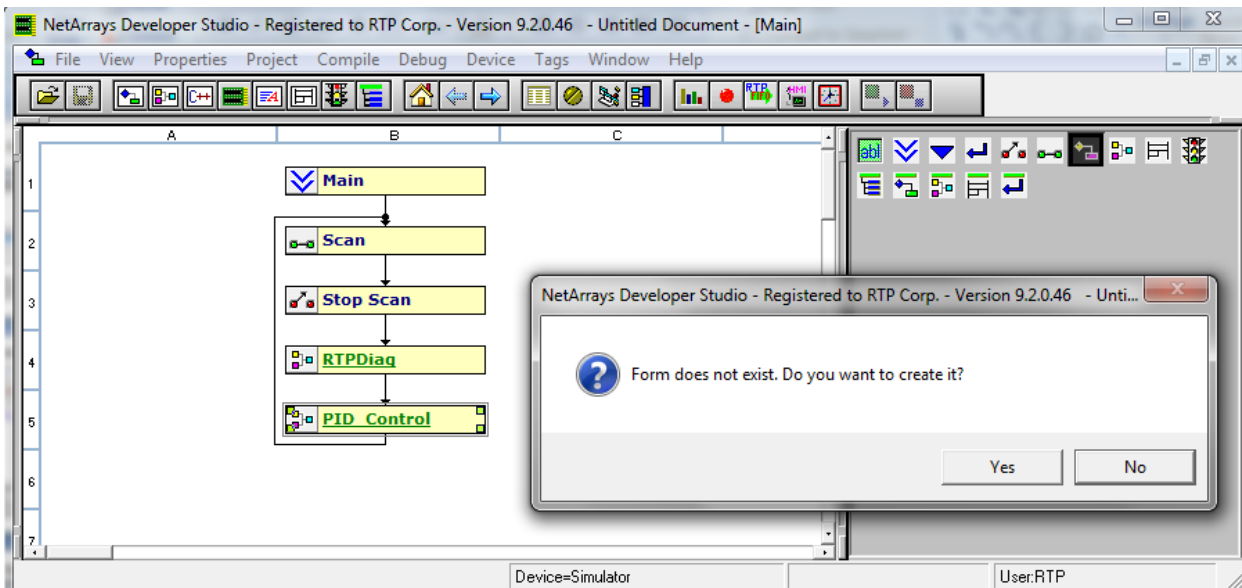


## Creating NetArrays Project Program

- Go to the main form by clicking on icon  in the main Toolbar.
- Right Click on the MForm1 and select Properties from the pop-up menu. In the Property Manager display, type in the Tag name "PID\_Control" and press Enter. Close the Property Manager display.



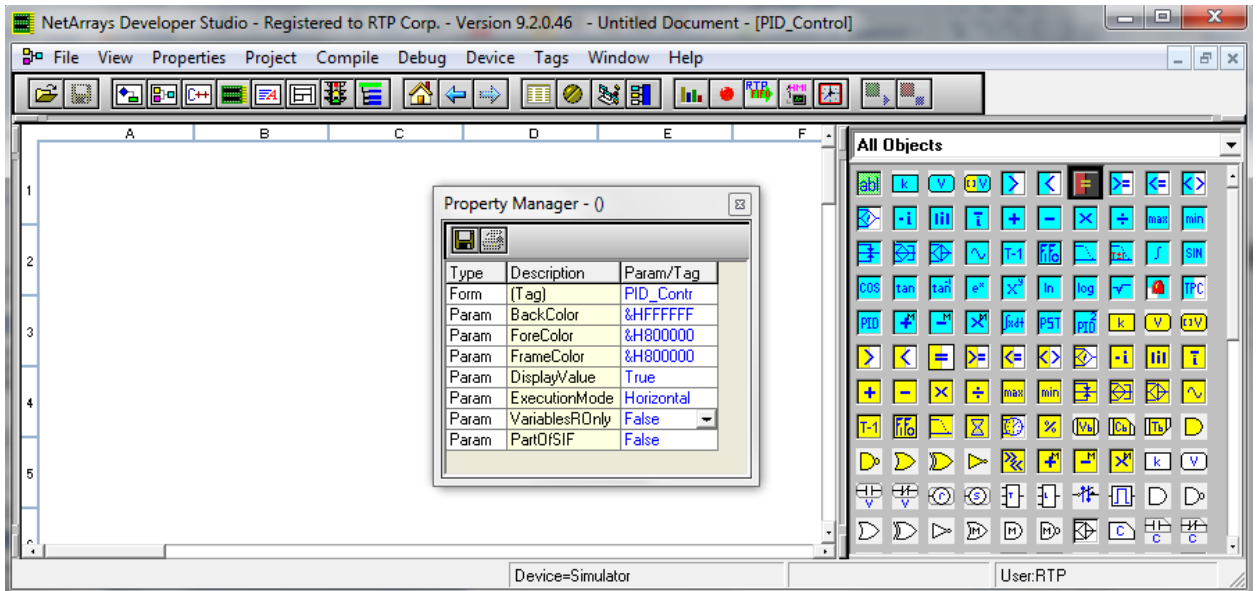
- Double Click on the PID\_Control Form. Then, click yes in the pop-up window to create this form.



- Right click in any blank area of the form and select **Properties** in the pop-up window.
- Set "**PartOfSIF**" and "**VariablesOnly**" **False**. This action will permit us to change variables using RTPView/HMI.

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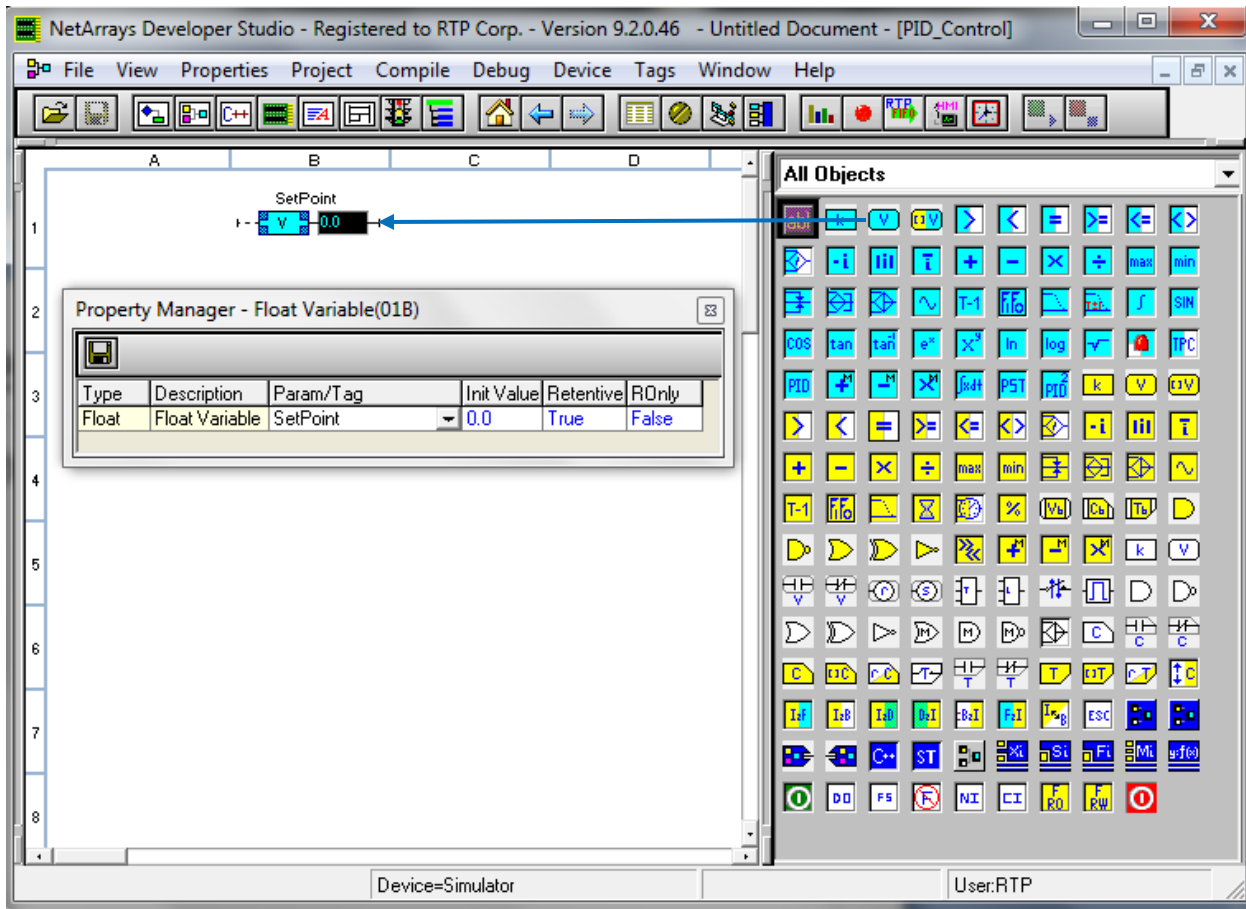
- Close the **Property Manager** Window.



Follow the steps below to add a Float Variable object in the Form.

- In the Object Module, grab the Float Variable Object and drop it in the cell B1.
- Right Click on the object and click on properties option from the pop-up menu.
- In the column Param/Tag, rename the tag with the name "SetPoint". Then, press enter.
- Set the Init Value to 0.0.

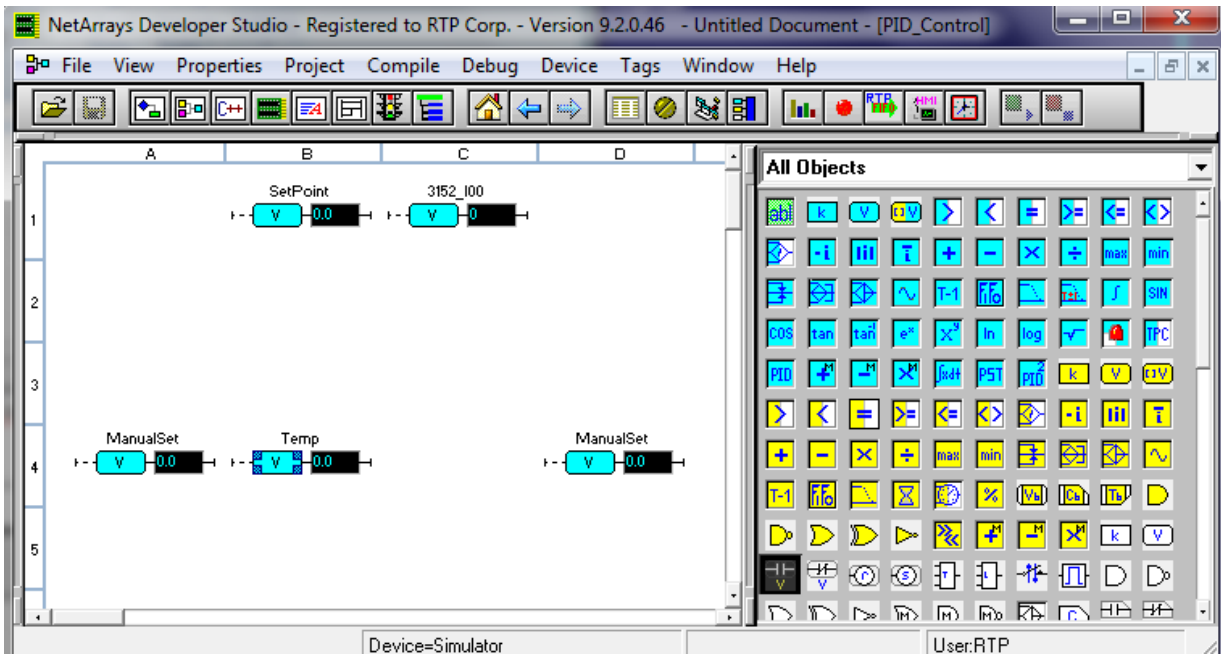
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- Add more float Variable objects in the “IP\_Control” by repeating the above steps using the information of the table below.

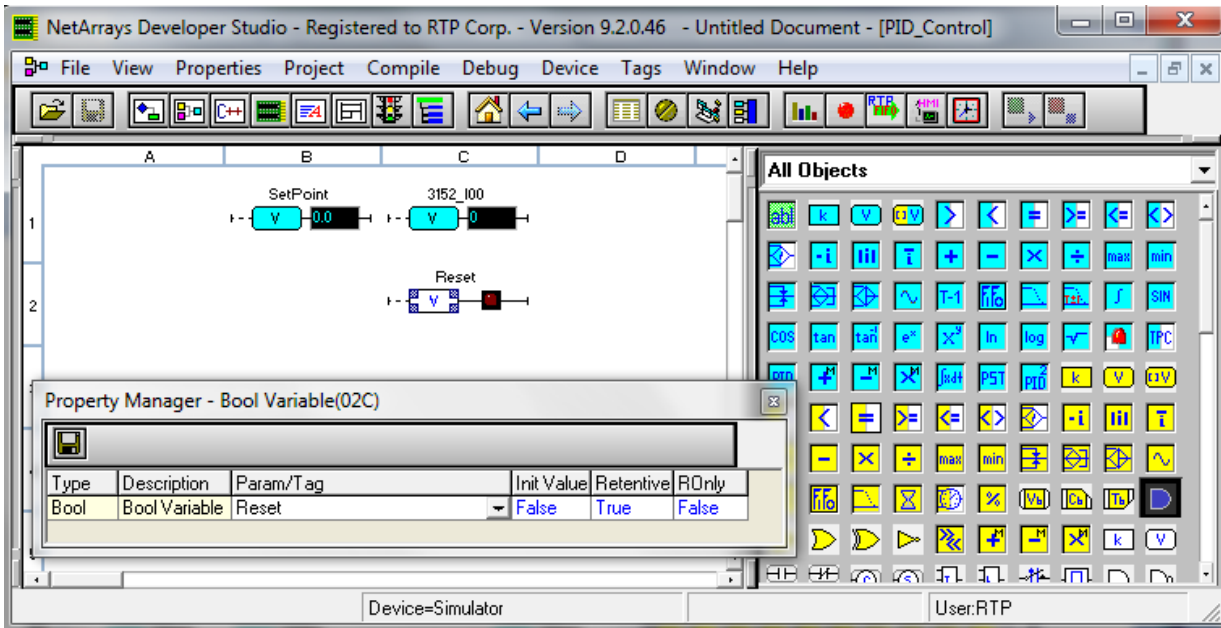
Cell	Object	Properties
C1	Float Variable	(Tag) = 3152_I00 Init Val = 0.0
A4	Float Variable	(Tag) = ManualSet Init Val = 0.0
B4	Float Variable	(Tag) = Temp
D4	Float Variable	(Tag) = ManualSet Init Val = 0.0

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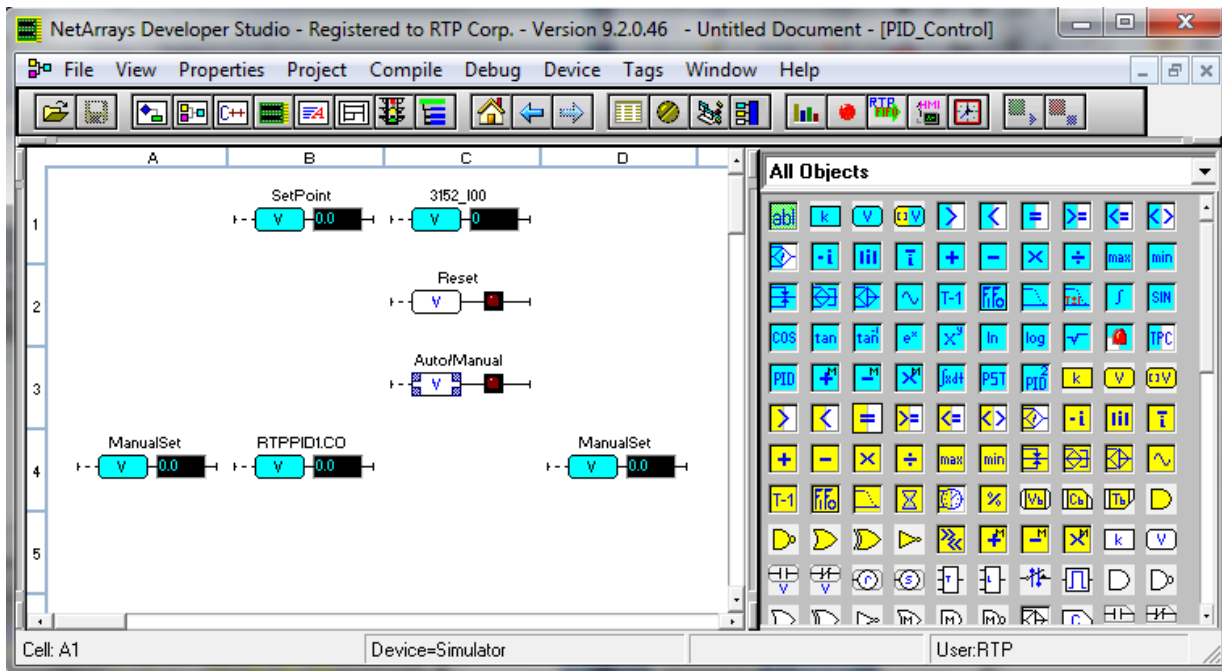
Follow the steps below to add a Bool Variable object in the Form.

- In the Object Module, grab a Bool Variable Object and drop it in the cell C2.
- Right Click on the object and click on properties option from the pop-up menu.
- In the column Param/Tag, rename the tag with the name "Reset". Then, press enter.
- Set the Init Value to False.

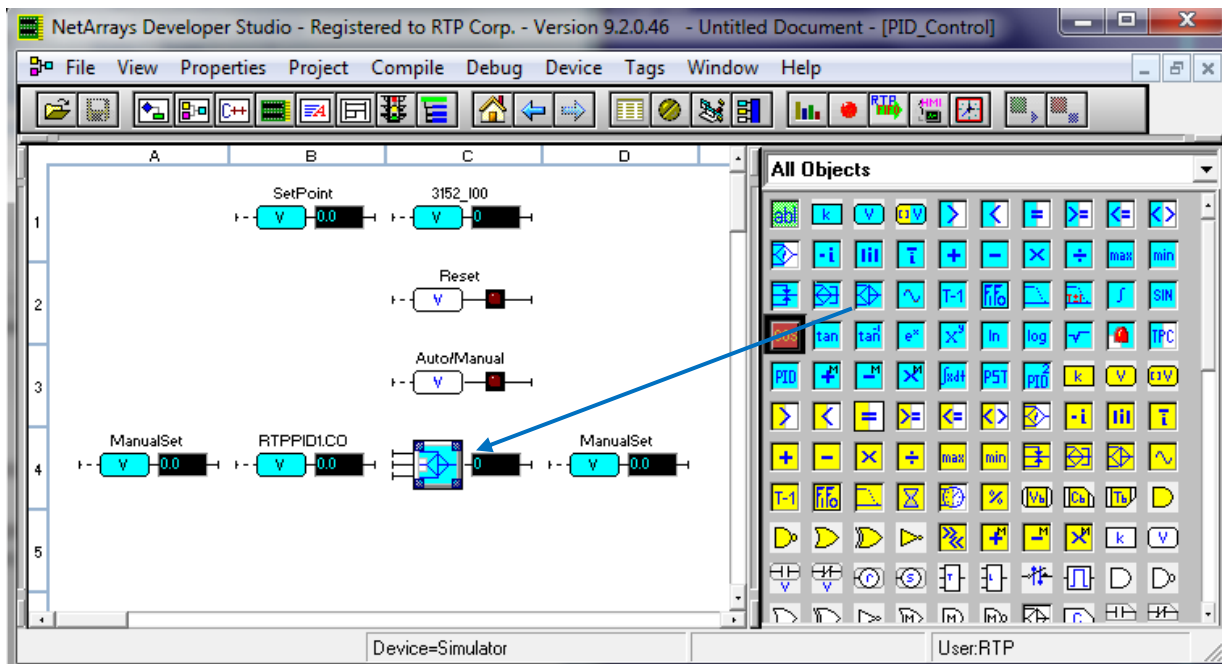


### NetArrays Project Program Development Example

- On cell C3 in the "IP\_Control" Form, add one more Bool Variable object by repeating the above steps. Rename this new Bool Variable to Auto/Manual and set the Init Value to False.

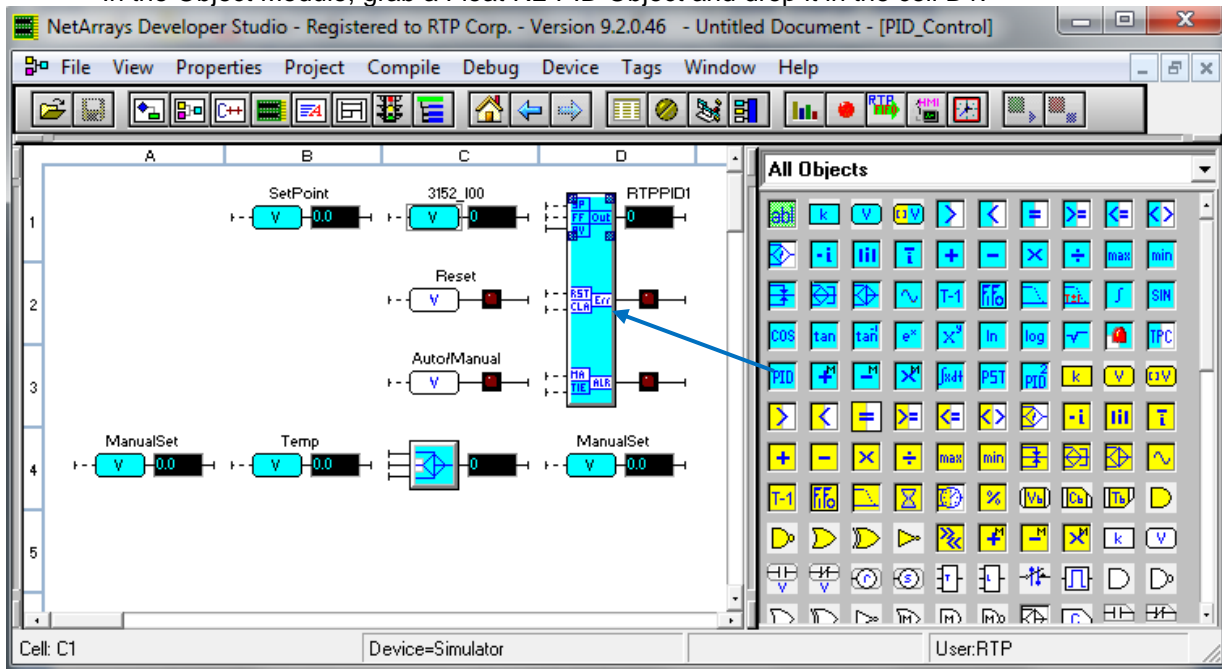


In the Object Module, grab a Float Gate Object and drop it in the cell C4.



### NetArrays Project Program Development Example

- In the Object Module, grab a Float RL-PID Object and drop it in the cell D1.



- Right Click on the PID Object and select properties in the pop-up menu. Update the PID's parameters as shown in the figure below.

### NetArrays Project Program Development Example

The screenshot displays the NetArrays Developer Studio interface. The main workspace shows a ladder logic diagram with a Float RL-PID object (RTPPID1) and its associated inputs and outputs. The inputs include SetPoint (0.0), 3152\_I00 (0), Reset, and Auto/Manual. The outputs include RT, Out, Err, and ALR. A red rectangle highlights the connection between the Reset input of the PID object and the output of the Reset Boolean Variable.

The Property Manager window for the Float RL-PID(01D) object is open, showing the following table of properties:

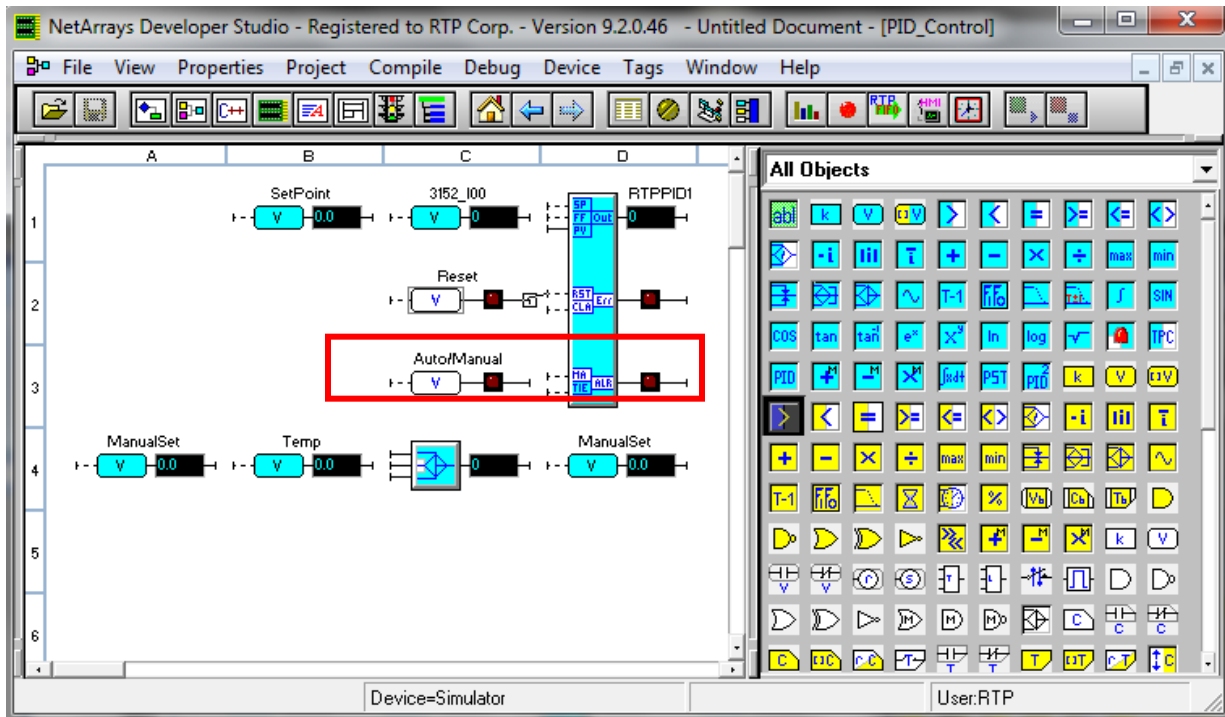
Type	Description	Param/Tag	Init Value	Retentive	ROnly
Obj	Float RL-PID				
Obj	Bool RL-PID				
Obj	Bool RL-PID				
Param	Prefix	RTPPID1			
Param	Period	0.01			
Param	CalculationMode	IG - IndependentGain			
Param	Track	OFF			
Param	UseZeroCrossing	ON			
Param	ProportionalTerm	InternalError			
Param	DerivativeTerm	ProcessVariable			
Param	InternalError	SP - PV			
Float	SP	RTPPID1.SP	0.0	True	False
Float	Kp:Kc	RTPPID1.Kp:Kc	6	True	False
Float	Ki:Ti	RTPPID1.Ki:Ti	2	True	False
Float	Kd:Td	RTPPID1.Kd:Td	0.0	True	False
Float	DB	RTPPID1.DB	0.0	True	False
Float	DrFlt	RTPPID1.DrFlt	0.0	True	False
Float	SPLo	RTPPID1.SPLo	-3.402823E+38	True	False
Float	SPHi	RTPPID1.SPHi	3.402823E+38	True	False
Float	OutLo	RTPPID1.OutLo	-100	True	False
Float	OutHi	RTPPID1.OutHi	100	True	False
Float	ROCOuA	RTPPID1.ROCOuA	100	True	False
Float	ROCOuM	RTPPID1.ROCOuM	3.402823E+38	True	False
Float	ROCSP	RTPPID1.ROCSP	25	True	False
Float	CO	RTPPID1.CO	0.0	False	False

The status bar at the bottom indicates "Device=Simulator" and "User:RTP".

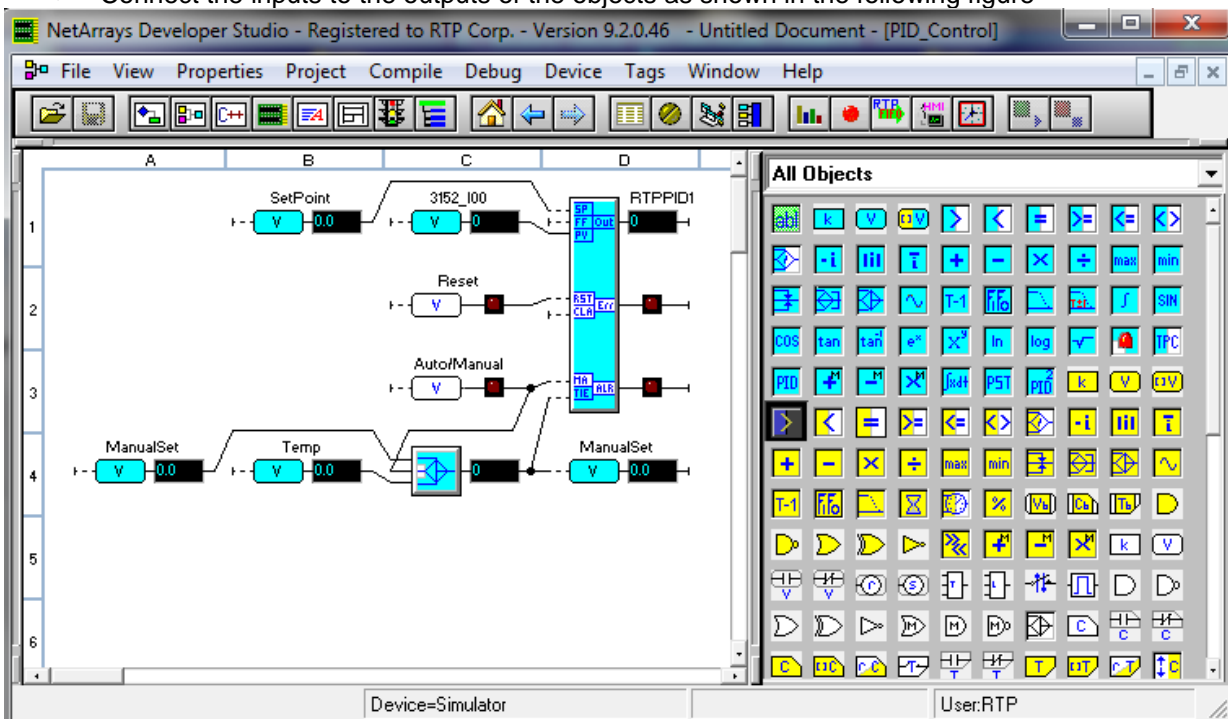
- To connect inputs to outputs, you should left click on the input of one of the objects and drag it to the output of the other. For instance, left click on the input RST of the PID object and drag to the output of the Reset Boolean Variable. This will create a line to connect the two objects as shown in the red rectangle in the figure below.



### NetArrays Project Program Development Example



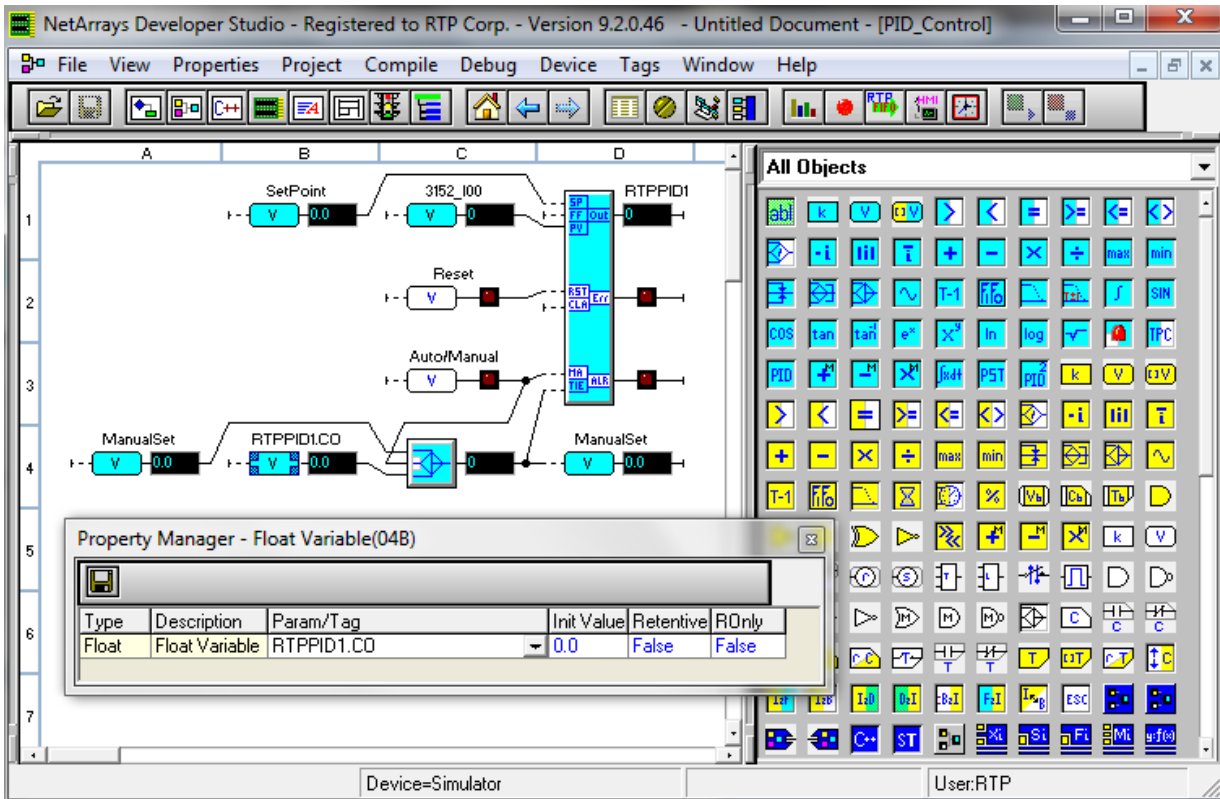
- Connect the inputs to the outputs of the objects as shown in the following figure



### NetArrays Project Program Development Example

The output of the PID object will connect to the channel 0 of the 3144 Analog Output Card and add to the logic of the PID tieback.

Right click on the Tag "Temp" in the B4 cell of the PID\_Control Form and select properties from the pop-up window. Then, rename the tag to RTPPID1.CO.



Go to the I/O configuration and right click on the card 3144 located on Rack 00/slot1. Then, select properties on the pop-up menu. In the I/O tag column of the Property Manager window, rename the tag of the channel 0 "3144O00A" with the name RTPPID1.CO. This will link the output of the PID with the 3144 card.

### NetArrays Project Program Development Example

The screenshot displays the NetArrays Developer Studio interface. On the left, a tree view shows the hardware configuration for a Node-3200T/00-C4 D 14 Slot Node, including Rack 00 and Rack 01. The main window shows the 'Property Manager - 3144 - 16 Channel AO0'. It contains two tables: 'Card Properties' and 'I/O Channel Properties'.

Card Properties		
Type	Description	Param/Tag
Card	Card	Slot 01=3144 - 16 Channel AO
Param	Redundant Card ID	0
Param	Watchdog Timer	Enabled
Bool	Bool Disable Testing	3144DTA
Int	Integer Error Detection	3144EDA
Int	Integer Channel Error Status	3144CEA
Int	Integer Card Revision	3144CRA
Int	Integer Cal Date	3144CDA
Int	Integer Cal Serial Number	3144CSNA

I/O Channel Properties					
Channel	I/O Tag	Readback Tag	Type	Comment	
Float	Output 00	RTPPID1_CO	3144S00A	current 4-20mA	
Float	Output 01	3144O01A	3144S01A	current 4-20mA	
Float	Output 02	3144O02A	3144S02A	current 4-20mA	
Float	Output 03	3144O03A	3144S03A	current 4-20mA	
Float	Output 04	3144O04A	3144S04A	current 4-20mA	
Float	Output 05	3144O05A	3144S05A	current 4-20mA	
Float	Output 06	3144O06A	3144S06A	current 4-20mA	
Float	Output 07	3144O07A	3144S07A	current 4-20mA	
Float	Output 08	3144O08A	3144S08A	current 4-20mA	
Float	Output 09	3144O09A	3144S09A	current 4-20mA	
Float	Output 10	3144O10A	3144S10A	current 4-20mA	
Float	Output 11	3144O11A	3144S11A	current 4-20mA	
Float	Output 12	3144O12A	3144S12A	current 4-20mA	
Float	Output 13	3144O13A	3144S13A	current 4-20mA	
Float	Output 14	3144O14A	3144S14A	current 4-20mA	
Float	Output 15	3144O15A	3144S15A	current 4-20mA	

It is important to mention the logic used for tieback input of the PID. This logic inside of the red triangle of the figure below is used to create bumpless transition between Auto and Manual Mode by synchronizing both the manual input and PID output.

The screenshot shows a ladder logic diagram for a PID control system. The diagram is organized into rungs (1-6) and columns (A-D). A red triangle highlights the logic for the 'ManualSet' input, which is used to create a bumpless transition between Auto and Manual Mode by synchronizing both the manual input and PID output. The diagram includes components like 'SetPoint', 'Reset', 'Auto/Manual', and 'ManualSet'.

### NetArrays Project Program Development Example

- Go to File in the main menu and select **Save New Project As**. Choose the location and name to save this file.

