



# Redundant MODBUS Serial Communications Card Configuration Example

# **Redundant MODBUS Serial Communications Card Configuration Example**

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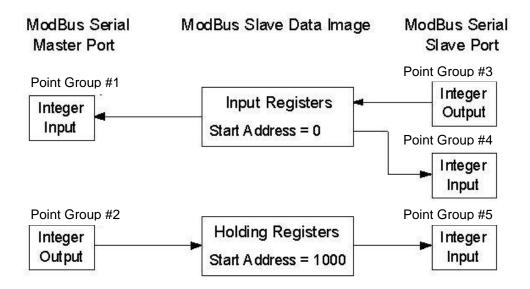
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#### **MODBUS Serial Communications Card Configuration Overview**

This document provides an example of how to configure the 3019 MODBUS Serial Communications Card. In the first section of this example, a single MODBUS Serial Communications Card will be used; one of its ports will be configured as Master and the second port will be configured as Slave. The MODBUS Serial Communications Card is installed in a 3200T Rack. The Point Groups for this example will create as shown in the figure below where integer variables are going to be exchanged via MODBUS Serial Communication protocol between the two ports.



The 5 Point Groups will be configured as follows. Each point group on the MODBUS Master Port will be identified as (PG1\_ and PG2\_). The rest of point groups are on the MODBUS Slave Port and will be identified as.(PG3\_, PG4\_ and PG5).

- Integer Output Point Group #3 writes data into the Input Registers starting at address 0. Integer Input Point Group #4 reads back this data for verification. Integer Input Point Group #1, in the MODBUS Master Port, then reads this data from the Input Registers.
- Integer Output Point Group #2, in the MODBUS Master Port, writes data into the Holding Registers starting at address 1000. Integer Input Point Group #5 then reads this data from the Holding Registers.

The second section of this example consist on showing the configuration of a second MODBUS Serial communication card as redundant.

## **MODBUS Serial Communications Card Installation**

The MODBUS Serial Communications Card system will be configured with Port 1 (J1) designated as the Master Port, and Port 2 (J2) as the Slave Port. The other two ports, J3 and J4, will not be used.

The DIP switches on the MODBUS Serial Communications Termination Module are user configured to connect the RS-232/485 electronic data signals on the Serial DB-9 connectors to the corresponding transmitters and receivers on the MODBUS Serial Communications Card Ports.

This example will provide information for configuring the MODBUS Serial Communications Card Termination Module to utilize either a straight pin-to-pin or crossover RS-232 signal cable.

- Install the MODBUS Serial Communications Card in the slot in the RTP I/O Chassis that matches your system configuration. The card does not require any physical settings by the user as all options are programmable. (DIP Switch SW1 should have all 8 positions set to OFF (left), the factory default settings. See picture below.
- Set the DIP switches for Serial Port 1 (J1) and Serial Port 2 (J2) on the 3099/25-100 Termination Module to be compatible with the RS-232 Serial Cable that will be supplied.
- Connect a DB-9 RS-232 Serial Cable (Straight Pin-to-Pin or Crossover) between Port 1 (J1) and Port 2 (J2) on the Termination Module.
- Connect the MODBUS Serial Communications Card to the Termination Module with a 3056/00 Digital Cable.

Two RS-232 Cable and Termination Module Port Configurations are shown in the Tables below. It is critical that the interconnecting cable and the DIP Switch settings exactly match. For full details on DB-9 Cable Connectors or Port DIP Switch Configurations, refer to the "3019 MODBUS Serial" card manual. A reference picture of the Termination Module is shown below.

	Termination Module	Termination Module
RS-232 Cable Type	Port 1 Configuration	Port 2 Configuration
Straight Pin-to-Pin Cable	RS-232 Normal	RS-232 Null-Modem
J1 Pin 3 Tx to J2 Pin 3 Rx		
J1 Pin 2 Rx to J2 Pin 2 Tx		
J1 Pin 5 to J2 Pin 5 (Ground)		
Crossover Cable	RS-232 Normal	RS-232 Normal
J1 Pin 3 Tx to J2 Pin 2 Rx		
J1 Pin 2 Rx to J2 Pin 3 Tx		
J1 Pin 5 to J2 Pin 5 (Ground)		

Cable and Termination Module Configuration Combinations

Note: Tx = Transmit, Rx = Receive.

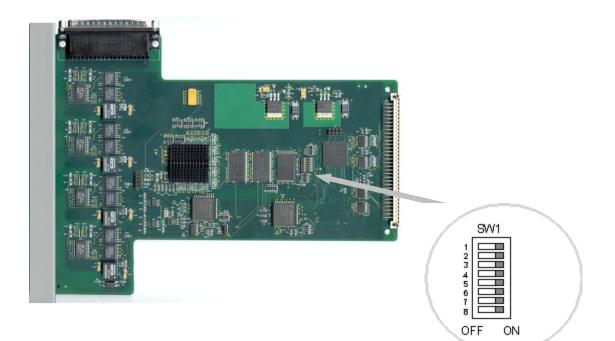
Port	Configuration	Switch Setting
J1	Normal	SW1, Switch 2 ON
		SW2, Switch 6 ON
		SW3, Switch 3 ON
		SW4, Switch 5 ON
		SW4, Switch 8 ON
J2	Normal	SW5, Switch 2 ON
		SW6, Switch 6 ON
		SW7, Switch 3 ON
		SW8, Switch 5 ON
		SW8, Switch 8 ON
J2	Null-Modem	SW5, Switch 3 ON
		SW6, Switch 5 ON
		SW7, Switch 2 ON
		SW8, Switch 6 ON
		SW8, Switch 8 ON

3099/25-100 MODBUS Serial Communications Termination Module Port DIP Switch Settings

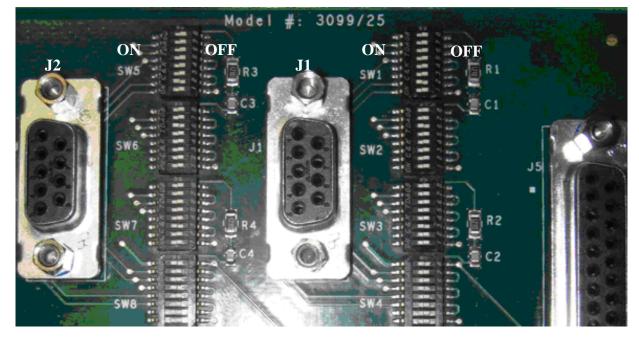
All other switches on SW1 – SW8 **must** be in the **OFF** position.

Note: On SW1 – SW8, Switch 1 is on the **bottom**, and Switch 8 on the **top**.

3019/00 MODBUS Serial Communications Card



3099/25-100 MODBUS Serial Communications Termination Module (J1 and J2 Ports shown)



# **MODBUS Master Serial Port Configuration**

• 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

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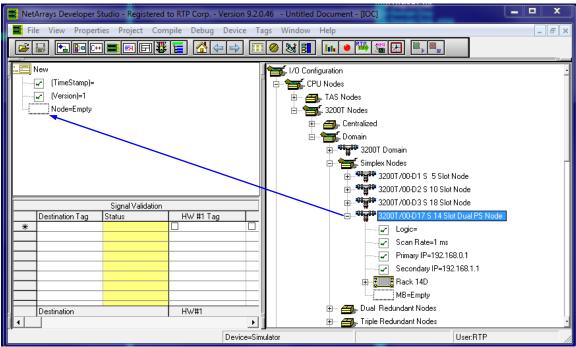
Click on the I/O Configuration Studio button in the NetArrays main toolbar

Maximize the I/O Configuration form using the Maximize Icon.

Drag an icon RTP3200T Node from the I/O Configuration Toolbox CPU Nodes->3200T Nodes->Domain->Simplex Nodes folder to the "Node=Empty" position on the I/O Configuration Form. For this example, the RTP3200T/00-D17 S 14 Slot Dual PS Node was chosen. Select an RTP3200T Node that matches your configuration. (This example shows a domain configuration).

# I/O Configuration Form

I/O Configuration Toolbox



Add a MODBUS Serial Communications Card, Master Port, Node, and Point Groups to the I/O Configuration

## Add a MODBUS Serial Communications Card

 In the I/O Configuration Form, expand the "Rack 00=Rack 14D" (left-click on the 
→). In the I/O Configuration toolbox expand the "MODBUS" branch (left-click on the 
→). Drag the "3019 MB Serial" icon to the "Slot 00=Empty". (Place the MODBUS Serial Communications Card in the proper chassis and slot to match your configuration.) The Auto Tag Generation dialogue box will appear. Type in "Serial\_" and click OK. The Prefix of the Tag names for the MODBUS Serial Communications Card will be set to "Serial\_". This does not affect the tag prefixes for the point groups.

# I/O Configuration Form

I/O Configuration Toolbox

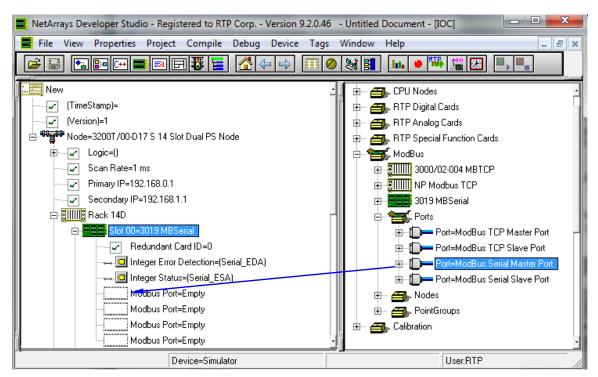
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	Device=Simulator	User:RTP

# Add a MODBUS Master Port

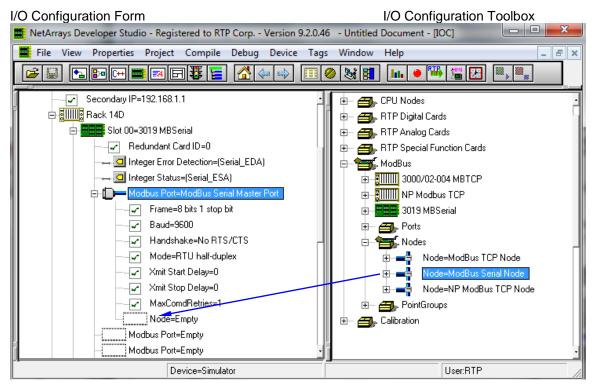
• Expand the "Slot 00=3019 MB Serial" branch on the I/O Configuration Form by clicking on the 
. Expand the "MODBUS" "Ports" branch on the I/O Configuration Toolbox by clicking on the 
. Drag the "Port = MODBUS Serial Master Port" from the I/O Configuration Toolbox to the Port 1 (top) "MODBUS Port =Empty" Slot in the I/O Configuration Form.

I/O Configuration Form

I/O Configuration Toolbox



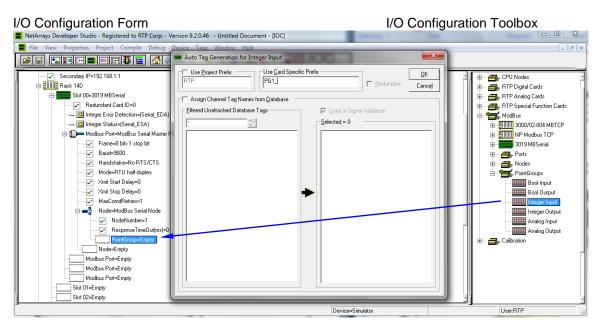
#### Add MODBUS Master Node

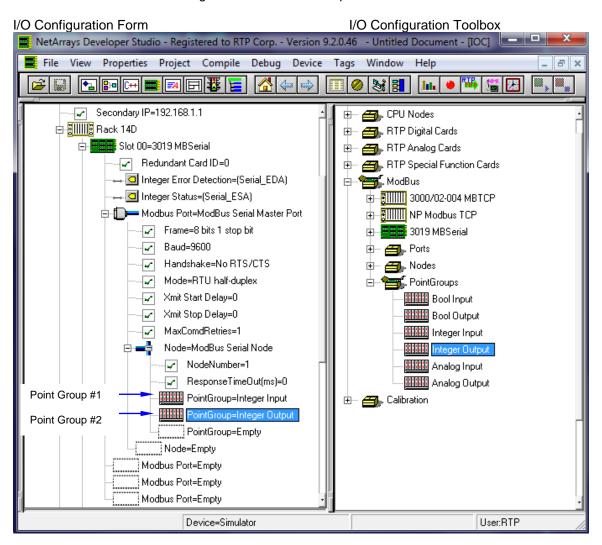


# Add 2 MODBUS Master Point Groups

Move the mouse pointer to the "Node=MODBUS Serial Node" icon on the I/O Configuration Form and expand it by clicking on the 
 Expand the "MODBUS"
 "Point Groups" on the I/O Configuration Toolbox by clicking on the 
 Select the Integer Input Point Group icon in the I/O Configuration toolbox and drag it to the "PointGroup=Empty" placeholder under the Node in the I/O Configuration form. The Auto Tag Generation dialogue box will appear. In response to the request for a Prefix, enter PG1\_ and click OK. Repeat the process for the Integer Output Group with a prefix of PG2\_. The Prefix of the Tag names for the MODBUS Master Point Groups will be set to the Tag used.

Point Group #1	Integer Input (PG1_)
Point Group #2	Integer Output (PG2_)





The MODBUS Master I/O Configuration should look as pictured below.

On the following pages you will configure the MODBUS Master Port and Point Group properties. Note that when you enter text or a number into the **Property Manager**, it **<u>must</u>** be followed by **Enter**.

• When the configuration is complete, collapse the MODBUS Port=MODBUS Serial Master Port by clicking on the ⊡.

# **Configuring the MODBUS Communications Serial Master Port**

Right click on the **MODBUS Port=MODBUS Serial Communications Master Port**, and select **Properties**. Change **Baud** to 115200. Select RTU full-duplex for the **Mode** property. Make the **NodeNumber** 10. Leave the other properties at their default settings. Note that Xmit Start Delay and Xmit Stop Delay are specifically for RT-485 multi-drop applications.

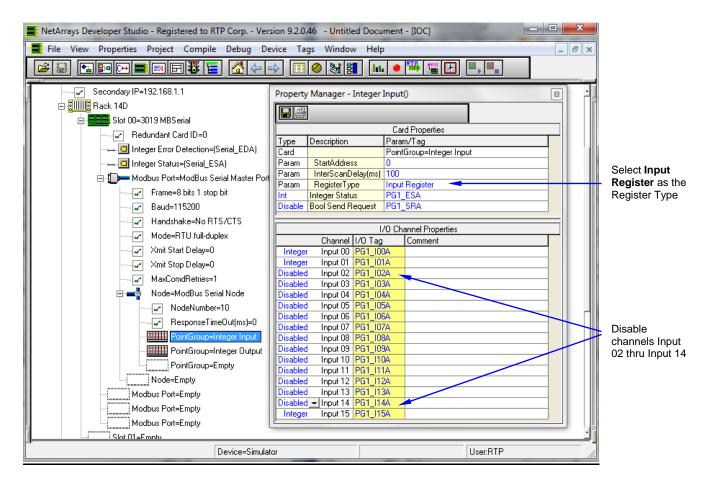
The Property Manager window is shown below.

The property settings selected **must** be set the same when configuring the Slave Port.

#### Point Group #1 Properties – Integer Input Point Group

This Point Group will be reading three Integer inputs from the Input Registers starting at address 0.

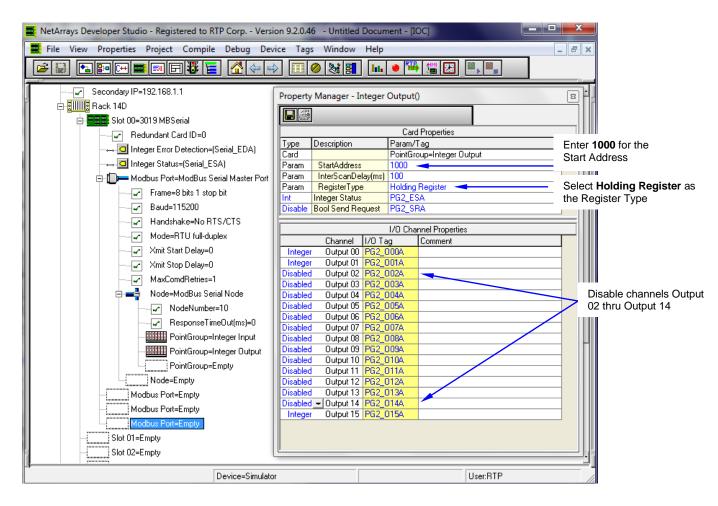
- Select Point Group #1 and right click to display its **Property Manager**. Select **Properties**.
- A **StartAddress** of 0 is specified for the starting point for this Point Group's data in the MODBUS Slave Data Image. This is the default value.
- An InterScan Delay of 100 milliseconds is specified. This is the default value.
- The **Register Type** of this point group is "Input Register". We will be reading input data from the MODBUS slave.
- The Tag assigned to the Integer Status is "PG1\_ESA".
- The I/O Tags assigned are "PG1\_I00A", "PG1\_I01A", and "PG1\_I15A".
- Channel Input 02 through Input 14 are disabled by selecting "Disabled".
- Close the Property Manager display.



# Point Group #2 Properties – Integer Output Point Group

This Point Group will be writing three Integer outputs into the Holding Registers starting at address 1000.

- Select Point Group #2 and right click to display its **Property Manager**. Select **Properties**.
- A **StartAddress** of 1000 is entered for the starting point for this Point Group's data in the MODBUS Slave Data Image.
- An InterScan Delay of 100 milliseconds is specified. This is the default value.
- Select Holding Register as **Register Type**. We will be writing to the Holding Register of the MODBUS slave.
- The Tag assigned to the Integer Status is "PG2\_ESA".
- The I/O Tags assigned are "PG2\_000A", "PG2\_001A", and "PG2\_015A".
- Channel Output 02 through Output 14 are disabled by selecting "Disabled".
- Close the Property Manager display.

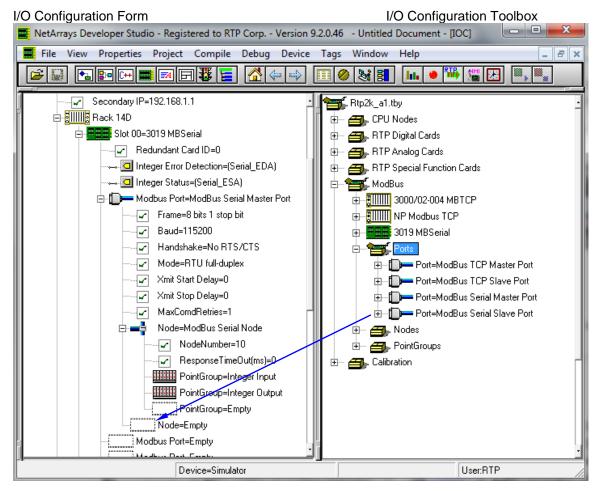


# **MODBUS Slave Port Configuration**

#### Add a MODBUS Slave Port, Node, and Point Groups to the I/O Configuration

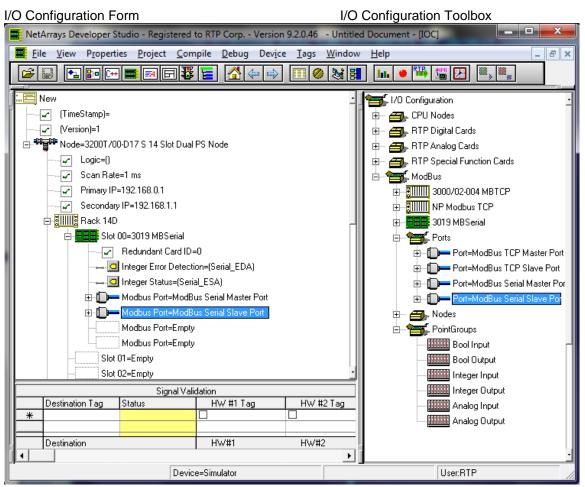
#### Add MODBUS Slave Port

- Since the same MODBUS Serial Communications Card will be utilized for both Master and Slave Ports, a second card will not be added.
- If required, expand the "Slot 00=3019 MB Serial Card's" branch on the I/O Configuration Form by clicking on the 
   Expand the "MODBUS" "Ports" branch on the I/O Configuration Toolbox by clicking on the 
   Drag a "Port = MODBUS Serial Slave Port" from the I/O Configuration Toolbox to the second "MODBUS Port =Empty" Slot in the I/O Configuration Form. This corresponds to the J2 port on the 3099/25-100 MODBUS Serial Termination Module.



#### MODBUS Slave Node

 When the MODBUS Slave Port is added, the MODBUS Slave Node is automatically added. Note: A MODBUS Slave Port can only have 1 MODBUS Slave Node. After adding the MODBUS Slave Port, the I/O Configuration Form will look like the one below.



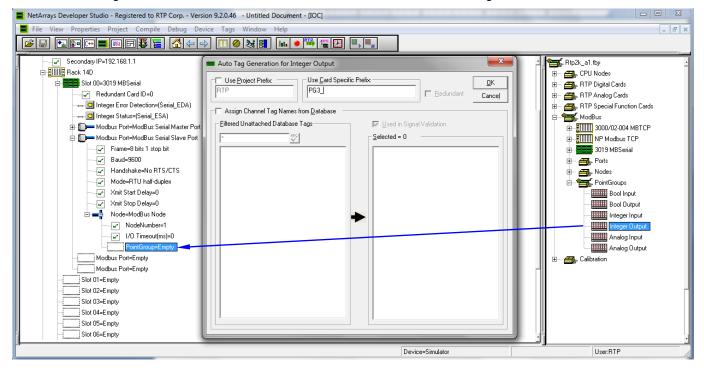
# Add 3 MODBUS Slave Point Groups

Expand the "MODBUS Port=MODBUS Serial Slave Port" clicking on the ⊞. Expand the "Node=ModBus Node" by clicking on the ⊞. Expand the "MODBUS" "Point Groups" on the I/O Configuration Toolbox by clicking on the ⊞. Select the Integer Output Point Group icon in the I/O Configuration Toolbox and drag it to the "PointGroup=Empty" placeholder under the Port in the I/O Configuration form. The Auto Tag Generation dialogue box will appear. In response to the request for a **Prefix**, enter**PG3\_** and click **OK**. In a similar fashion add the two Integer Input point groups. The Prefix of the Tag names for the MODBUS Master Point Groups will be set to the Tag used.

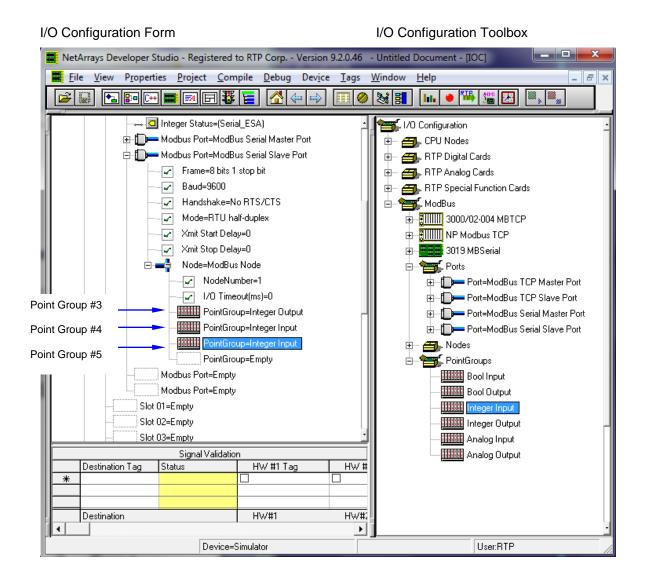
Point Group #3	Integer Output (PG3_)
Point Group #4	Integer Input ( <b>PG4_</b> )
Point Group #5	Integer Input (PG5_)

I/O Configuration Form

I/O Configuration Toolbox



Once completed, the MODBUS Slave I/O Configuration should look as pictured below.



On the following pages you will be configuring the MODBUS Slave Port and Point Group properties. Note that when you enter text or a number into the **Property Manager**, it **<u>must</u>** be followed by **Enter**.

# Configuring the MODBUS Serial Communications Slave Port

Right click on the **MODBUS Port=MODBUS Serial Slave Port**, and select **Properties**. Change **Baud** to 115200. Select RTU full-duplex for the **Mode** property. Make the **NodeNumber** 10. Leave the other properties at their default settings. Note that Xmit Start Delay and Xmit Stop Delay are specifically for RT-485 multi-drop applications.

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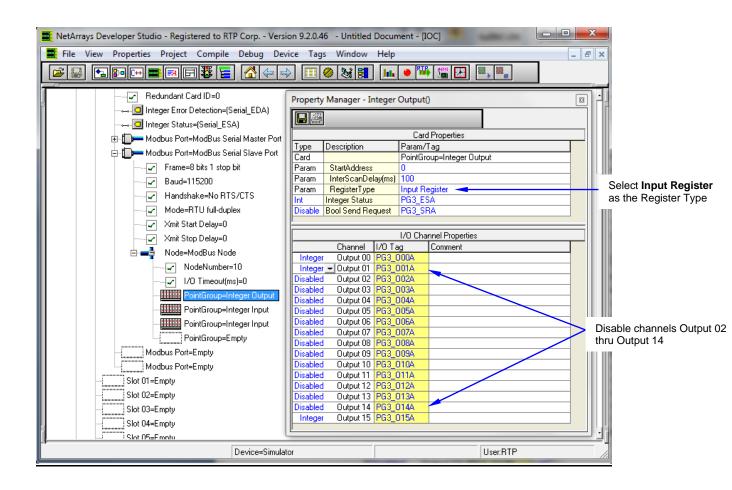
The **Property Manager** window is shown below.

All property settings **must** match the Master Port.

# Point Group #3 Properties – Integer Output Point Group

This Point Group will be writing three Integer outputs into the Input Registers starting at address 0.

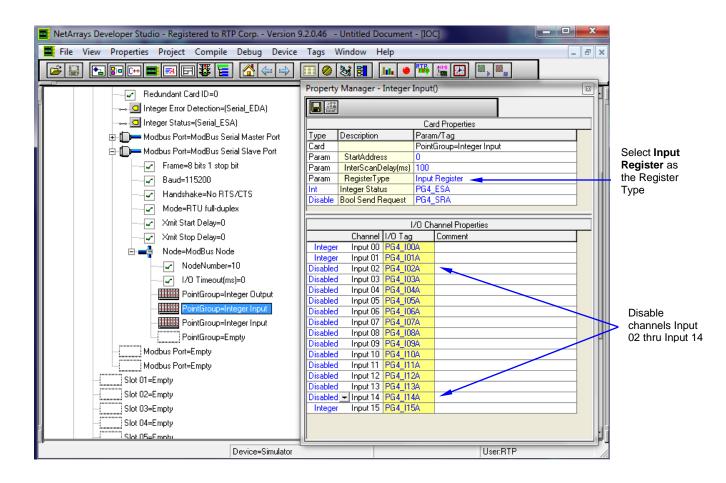
- Select Point Group #3 and right click to display its **Property Manager**. Select **Properties**.
- A **StartAddress** of 0 is specified for the starting point for this Point Group's data in the MODBUS Slave Data Image.
- An InterScan Delay of 100 milliseconds is specified. This is the default value.
- The **Register Type** of this point group is "Input Register". We will be writing data to the Input Registers.
- The Tag assigned to the Integer Status is "PG3\_ESA".
- The I/O Tags assigned are "PG3\_000A", "PG3\_001A", and "PG3\_015A".
- Channel Output 02 through Output 14 are disabled by selecting "Disabled".
- Close the Property Manager display.



#### Point Group #4 Properties – Integer Input Point Group

This Point Group will be reading three Integer inputs from the Input Registers starting at address 0.

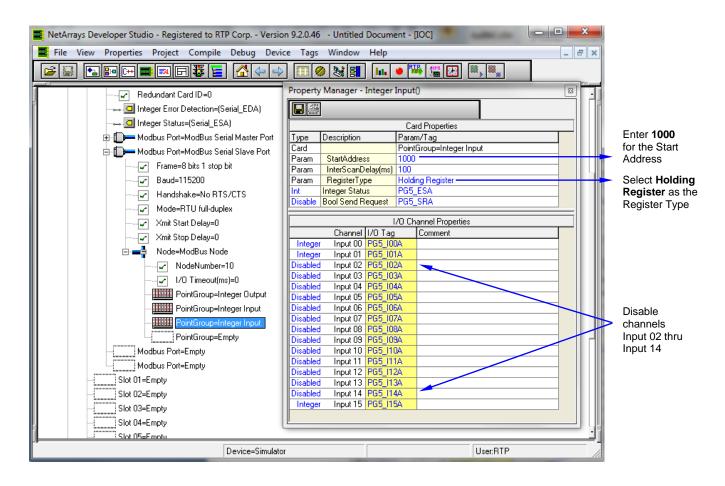
- Select Point Group #4 and right click to display its **Property Manager**. Select **Properties**.
- A **StartAddress** of 0 is specified for the starting point for this Point Group's data in the MODBUS Slave Data Image.
- An InterScan Delay of 100 milliseconds is specified. This is the default value.
- The **Register Type** of this point group is "Input Register". We will be reading back data from the Input Registers.
- The Tag assigned to the Integer Status is PG4\_ESA".
- The I/O Tags assigned are "PG4\_I00A", "PG4\_I01A", and "PG4\_I15A".
- Channel Input 02 through Input 14 are disabled by selecting "Disabled".
- Close the Property Manager display.



## Point Group #5 Properties – Integer Input Point Group

This Point Group will be reading three Integer inputs from the Holding Registers starting at address 1000.

- Select Point Group #5 and right click to display its **Property Manager**. Select **Properties**.
- A **StartAddress** of 1000 is entered for the starting point for this Point Group's data in the MODBUS Slave Data Image.
- An InterScan Delay of 100 milliseconds is specified. This is the default value.
- The **Register Type** of this point group is "Holding Register". We will be reading data from the Holding Register.
- The Tag assigned to the Integer Status is "PG5\_ESA".
- The I/O Tags assigned are "PG5\_I00A", "PG5\_I01A", and "PG5\_I15A".
- Channel Input 02 through Input 14 are disabled by selecting "Disabled".
- Close the Property Manager display.



# **NetArrays Project Program**

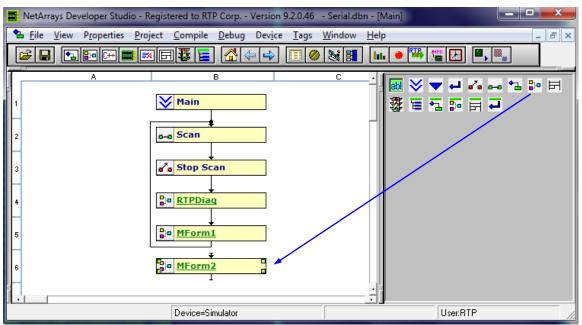
You have completed the I/O configuration of the MODBUS Serial Communications Card Master Port and the Slave Port. The next step is to add some logic to the NetArrays project program to test the card's operation.

# Save the Project

• First save the project. From the NetArrays File menu select Save New Project As... type the project name in File name: and click Save (We used "Serial".)

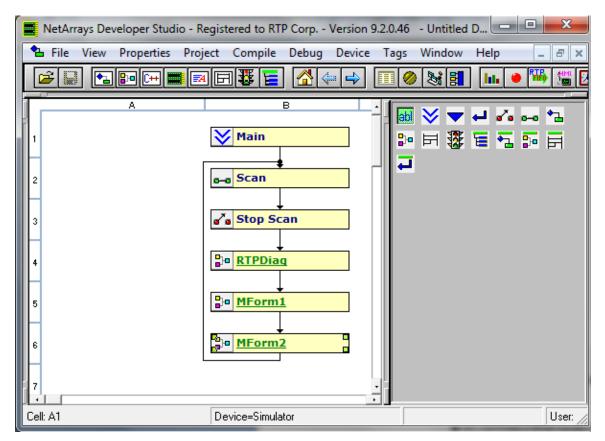
# Modify the Main Flow Chart Form

 Add one Module Form objects to the Main Form by selecting the Module icon in the Toolbox and dragging the object to the positions shown below.

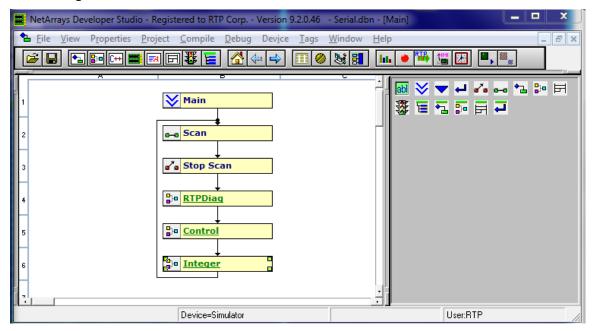


 Connect the output of the MForm1 to the input of MForm2. This automatically breaks the existing connection between MForm1 and Scan. Connect the output of MForm2 to the input of the Scan object.

#### Redundant ModBus Serial Communications Card Configuration Example



 Right click on the MForm1 and select Properties from the pop-up menu. In the Property Manager display, type in the Tag name "Control", followed by Enter. Close the Property Manager display. Repeat this for MForm2 renaming it "Integer".



# **Construct the Control Module Form**

- Double-click on the Control Module Form to display the module form.
- Select Yes to open Control.

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Right click in a blank area of the page and select Properties.

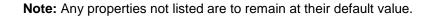
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H		Paste				Ctrl+V					
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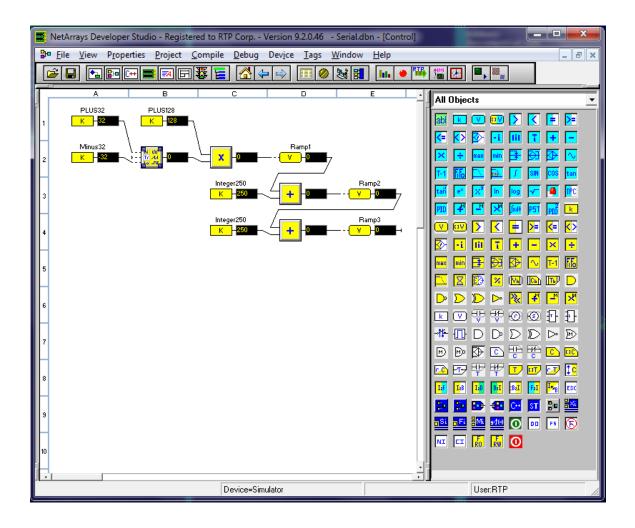
• Set "PartOfSIF" and "VariablesROnly" False. Close the Property Manager Window. This will allow placing the Non-SIL MODBUS variables on this MForm.

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	Param	BackColor	&HFFFFFF				
	Param	ForeColor	&H80000012				
3	Param	FrameColor	&H8000002				
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- Place the objects into the Module Form and connect the inputs to the outputs as shown in the following figures. Note: When entering a Tag name, you can either type the entire name or start typing the name and select the name from the available existing Tags. All of the I/O Tags will already exist as a function of the Auto Tag Generator. The Tag Prefix will be Serial\_ or PG*n*\_ where *n* is the number of the Point Group.
- The function of the Control Module Form is to generate changing Integer output data for the MODBUS Serial Communications Card.

Cell	Object	Properties
A1	Int Constant	(Tag) = PLUS32; (Initial Value) = 32
B1	Int Constant	(Tag) = PLUS128; (Initial Value) = 128
A2	Int Constant	(Tag) = Minus32; (Initial Value) = -32
B2	Int Waveform Generator	(Wave) = Ramp Up; (Period) = 2
C2	Int Multiply	
D2	Int Variable	(Tag) = Ramp1
C3	Integer Constant	(Tag) = Integer250; (Initial Value) = 250
D3	Integer Add	
E3	Int Variable	(Tag) = Ramp2
C4	Integer Constant	(Tag) = Integer250; (Initial Value) = 250 (same object as C3)
D4	Integer Add	
E4	Int Variable	(Tag) = Ramp3





# Construct the Integer Module Form

- Return to the Main Form by clicking on the 🙆 button in the Main Toolbar.
- Double-click on the **Integer** object to create a new Module Form. When prompted to create the form, answer **Yes**.

🧱 NetArrays Developer Studio - Registered to RTP Corp. - Version 9.2.0.46 🛛 - Untitled Document - [Main] 23 ▲ File View Properties Project Compile Debug Device Tags Wind Help 🔲 🧶 😹 🚼 🖬 🖷 🗷 😽 Main <sub>ø-ø</sub> Scan NetArrays Developer Studio - Registered to RTP Corp. - Version 9.2.0.46 - Unti... Stop Scan Form does not exist. Do you want to create it? B- RTPDiag Dia Control Yes No lo Integer Device=Simulator User:RTP

• Right click in a blank area of the page and select **Properties**.

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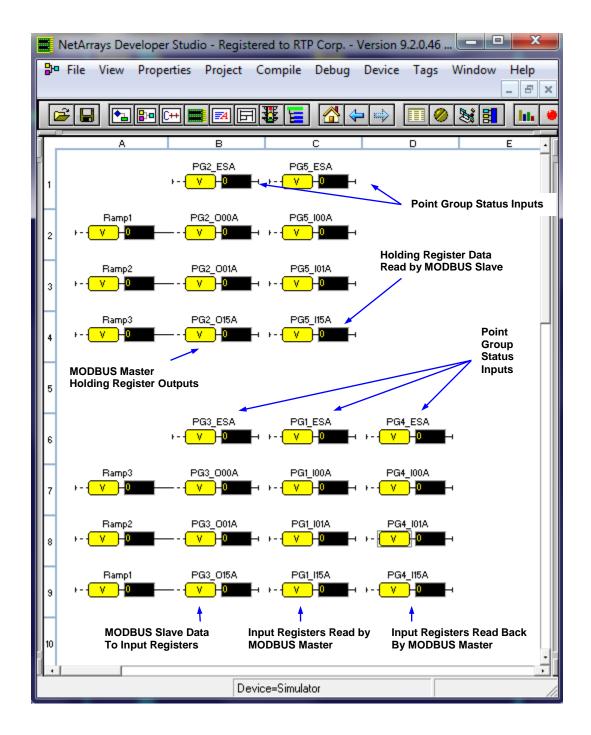
• Set "PartOfSIF" and "VariablesROnly" False. Close the Property Manager Window. This will allow placing the Non-SIL MODBUS variables on this MForm.

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- Place the objects into the Module Form and connect the inputs to the outputs as shown in the following figures.
- The function of the Integer Module Form is to display the Integer outputs and inputs to and from the MODBUS Serial Communications Card and the Point Groups Status.

Cell	Object	Properties
B1	Int Variable	(Tag) = PG2_ESA
C1	Int Variable	(Tag) = PG5_ESA
A2	Int Variable	(Tag) = Ramp1
B2	Int Variable	(Tag) = PG2_000A
C2	Int Variable	(Tag) = PG5_I00A
A3	Int Variable	(Tag) = Ramp2
B3	Int Variable	(Tag) = PG2_001A
C3	Int Variable	(Tag) = PG5_I01A
A4	Int Variable	(Tag) = Ramp3
B4	Int Variable	(Tag) = PG2_O15A
C4	Int Variable	(Tag) = PG5_I15A
B6	Int Variable	(Tag) = PG3_ESA
C6	Int Variable	(Tag) = PG1_ESA
D6	Int Variable	(Tag) = PG4_ESA
A7	Int Variable	(Tag) = Ramp3
B7	Int Variable	(Tag) = PG3_000A
C7	Int Variable	(Tag) = PG1_I00A
D7	Int Variable	(Tag) = PG4_I00A
A8	Int Variable	(Tag) = Ramp2
B8	Int Variable	(Tag) = PG3_001A
C8	Int Variable	(Tag) = PG1_I01A
D8	Int Variable	(Tag) = PG4_I01A
A9	Int Variable	(Tag) = Ramp1
B9	Int Variable	(Tag) = PG3_O15A
C9	Int Variable	(Tag) = PG1_I15A
D9	Int Variable	(Tag) = PG4_I15A

Note: Any properties not listed are to remain at their default value.



The following addresses are going to be used for the system node in this example:

Device Name	Туре	IP Address1	IP Address 2
MBSerial	Single	89.5.7.77	90.5.8.77

Enter Node IP Address and Save File for the Serial ModBus Project.

• Left Click on Node=3200T/00-D17 S 14 Slot Dual PS Node, select Properties, and enter the IP Addresses of your RTP3201T Node Processor (Primary IP 89.5.7.77 and Secondary IP 90.5.7.77 as shown in the picture below.)

NetArrays Developer Studio - Registered to RTP Corp Version 9.2.0.46 💷 💷 🗮 🎽							
File View Properties Project Compile Debug Device Tags Window Help							
New     (TimeStamp)=10/6/2020 2:23:39 PM     (Version)=7     (Version)=7     Node=3200T/00-D17 S 14 Slot Dual PS Node     Logic=()							
Scan Rate=1 ms Primary IP=89.5.7.77 Secondary IP=90.5.7.77 Rack 14D MB=Empty							
Property Manager - 3200T/00-D17 S 14 Slot Dual PS Node()							
Type     Description     Param/Tag       Param     Node     Node=3200T/00-D17 S 14 Slot Dual PS Node       Logic     Logic							
ParamScan Rate1 msParamPrimary IP89.5.7.77ParamSecondary IP90.5.7.77ParamRackRack 14DCardMB=Empty							
Device=Simulator							

• Save the project. From the NetArrays **File** menu select and **Save** this project as **Serial.dbn** (the project can be saved under a different r name).

#### Redundant ModBus Serial Communications Card Configuration Example

🗮 NetArrays Developer Studio - Registered to RTP Corp Version 9.2.0.46 - Untitled Document		
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New Project	Ctrl+N	
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Destination Tag Status	File name: Serialdbn Save as type: Project (*.dbn)		•
	Hide Folders	Save Cancel	

• Click on **Properties**, select **Project Serial.dbn** (name of the NetArrays project) **Properties**, and enter the IP Address of your RTP3201T Node Processor (**89.5.7.77** is shown as an example) in the **IPAddress** field in the **Property Manager** window.

#### Redundant ModBus Serial Communications Card Configuration Example

NetArrays Developer Studio - Registered to RTP Corp.	- Version 9.2.0.46 - Serial.dbn - [IOC]
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Node=3200T/00-D17 S 14 Slot Dual PS Node	
Logic=() Scan Rate=1 ms Primary IP=89.5.7.77 Secondary IP=90.5.7.77 Billing Rack 14D MB=Empty	Property Manager - ()       Image: Constraint of the system         Type       Description       Param/T ag         Param       Default T ag Prefix       RTP         Param       (TimeStamp)       10/6/2020 1:29:25 PM         Param       (Version)       18         Param       Lock File       No         Param       DebugDevColor       &HD5FDEDF         Param       DebugSimColor       &HD5FFDB         Param       PassWordDebug       ****         Param       IPAddress       89:5.7.77
	••••••••••••••••••••••••••••••••••••••
Device=Simulator	User:RTP

Note that **PassWordDebug** and **PassWordDownload** are set to "**rtp**" by default. If your RTP32001T Node has different passwords, change the **Properties** to match. Then use **your** passwords for the download and debug steps instead of "**rtp**".

• Save the project. From the NetArrays **File** menu select **Save Serial.dbn** (note that the name will be different if you saved the project file under another name).

# Verification

#### Downloading the Program

- Make sure that the MODBUS Serial Communications Card is installed, the MODBUS Serial Communications Card is connected to the Termination Module, the Termination Module DIP Switches are configured, and the 2 MODBUS Serial Ports (J1 and J2) are connected to each other by an RS-232 cable.
- Connect power to the chassis power supply.
- In NetArrays, select the target node containing the MODBUS Serial Communications Card from the **Device** > **Select** menu.

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• Select Device and Download Project to download the project.

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Image: Secondary IP=30.57.77         Image: Secondary IP=30.57.77 <td< th=""><th>Select Configure Status Time Synchronize Node Information Download Project Upload Project w/Online Update Upload Project Vpdate Project</th><th></th></td<>	Select Configure Status Time Synchronize Node Information Download Project Upload Project w/Online Update Upload Project Vpdate Project	
Device=MBS	erial User:R	TP

• Enter the Download Password, we use rtp, and select OK.

🗮 NetArrays Developer Studio - Registered to RTP Corp Version 9.2.0.46 🛛 - Serial.dbn - [IOC]	
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Device=Simulator User:RTP	

• Click "Yes" to overwrite to the current Target Node.

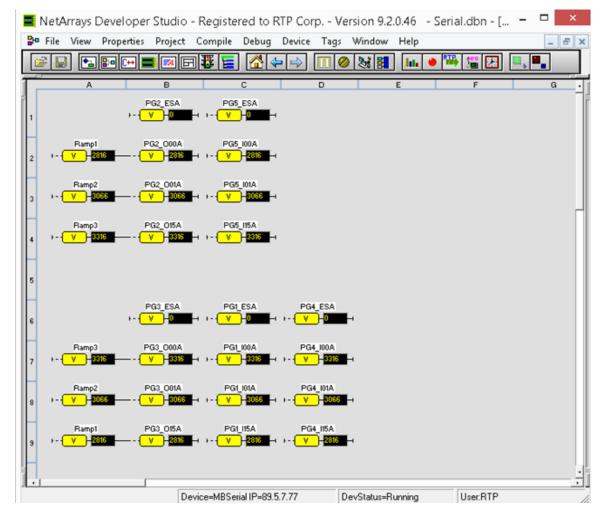
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- Run the project in Debug mode by clicking on the **Run** button in the Main Toolbar.
- Enter the Debug Password, we use **rtp**, and select **OK**.

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Device=MBSerial IP=127.0.0.1 User:RTP	

# Verify Integer Module Form

- Return to the Main Form by clicking on the 
  the button in the Main Toolbar.
- Double-click on the Integer object to open the Module Form.
- Observe that the Point Group status variables equal zero, and that the values from the Integer Input Point Groups are equal to the values of the Integer Output Point Groups. For example, the variable PG5\_I00\_A matches the variables PG2\_O00A andRamp1.



- If the inputs and outputs are not equal, carefully check the configuration of the MODBUS Serial Communications Card and the Point Groups.
- If any Master Point Group Status is not zero, carefully check the setting of the DIP Switches on the Termination Module and the RS-232 Cable.

# **Status Window**

The Status Window should show the RTP3201T Node's **Device Status:** = "**Running**". The bottom panel should be empty to indicate that there are no I/O Errors. The top panel shows historical messages.

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# **Redundant Card Configuration**

- At this point, you have successfully configured and tested the MODBUS Serial Communication Card with both a Master and a Slave Port. Now, the next step of this example is to add a redundant card to the existing Modbus serial card..
- Save the current Netarray project by clicking on File and Save Serial.dbn

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# • Go to File Save Serial.dbn As.. and save the program as SerialRedundant.dbn

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• Go to the configuration panel and expand the Rack 14D as shown in the figure below.

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Slot 02=Empty					
Slot 03=Empty					
Slot 04=Empty					
Slot 05=Empty					
Slot 06=Empty					
Slot 07=Empty					
Slot 08=Empty					
Slot 09=Empty					
Slot 10=Empty					
Slot 11=Empty					
Slot 12=Empty					
Slot 13=Empty					
Slot 14=3200T	Processor				
MB=Empty					
	Device=MBSerial				User:RTP

• Right Click on Slot 00=3019 MB Serial and select Copy As Redundant.

NetArrays Developer Studio -	Registered to RTP Cor	p Version 9.2.0.46	- SerialRedunda	ant.dbn - [IO	
File View Properties Pro	oject Compile Deb	ug Device Tags	Window Help	)	_ 8 ×
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New     (TimeStamp)=10/6/2020     (Version)=7     (Version)=7     (Version)=7     Logic=()     ✓    Logic=()     ✓    Scan Rate=1 ms     ✓    Primary IP=89.5.7.7     ✓    Secondary IP=90.5     Slot 00=200     Slot 01=E     Slot 02=E     Slot 02=E     Slot 03=E     Slot 05=E     Slot 05=E     Slot 05=E     Slot 05=E	2:23:39 PM 14 Slot Dual PS Node 77 17.77 17.77 Properties Copy As Is Copy As New Copy As Redundan Copy Tag Name(s)	Ctrl+C			
Slot 07=E	Cut	Ctrl+X			
Slot 08=E	Delete	Del			
Slot 09=E	Paste	Ctrl+V			
Slot 10=E	Find Tag(s) in Brow	/ser			
Slot 12=E	Help				
Slot 13=E	Update References				
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MB=Empty	Distributed Logic	) - F			
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	Device=MBSerial			User:RTP	

• Go to Slot 01 = Empty, Right Click on it and pasted the redundant card.

NetArrays Developer Studio - Regi	stered to RTP Corp Ver	sion 9.2.0.46	- SerialRe	dundant.dbn - [IO			
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Slot 04=Emp	Copy As New						
Slot 05=Emp	Copy As Redundant						
Slot 06=Emp	Copy Tag Name(s)						
Slot 07=Emp	Cut	Ctrl+X					
Slot 09=Emp	Delete	Del					
Slot 10=Emp	Paste	Ctrl+V					
Slot 11=Emp	F. I.T. (): D						
Slot 12=Emp	Find Tag(s) in Browser						
Slot 13=Emp	Help						
	Update References						
MB=Empty	Disable\Enable						
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The configuration will look similar as the picture below.

NetArrays Developer Studio - Registered to RTP Corp Version 9.2.0.	46 - SerialRedundant.dbn - [IO 🗖 🔳 💌
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🗊 🖶 🗮 🧱 Slot 00=3019 MBSerial	
Element      Slot 01=3019 MBSerial	
Slot 02=Empty	
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Slot 04=Empty	
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Slot 06=Empty	
Slot 07=Empty	
Slot 08=Empty	
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Slot 10=Empty Slot 11=Empty	
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Slot 13-2007 Processor	
MB=Empty	
Device=MBSerial	User:RTP

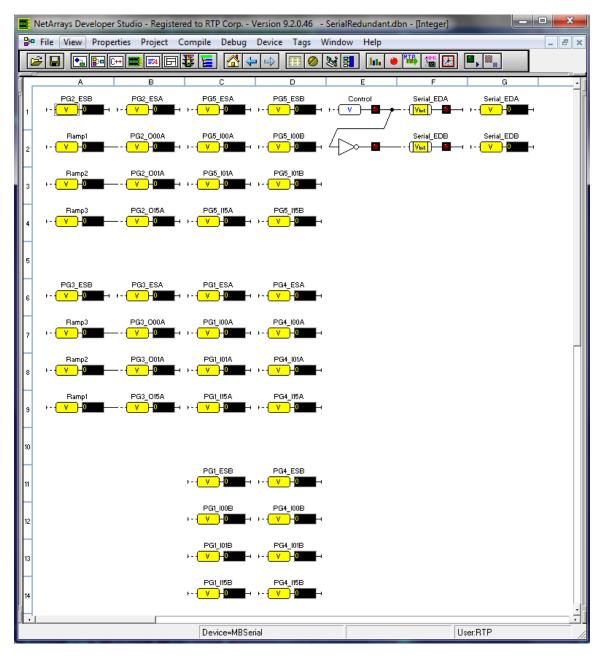
• Return to the Main Form by clicking on the 🛣 button in the Main Toolbar and double click on the Integer Module.

Cell	Object	Properties
A1	Int Variable	(Tag) = PG2_ESB
D1	Int Variable	(Tag) = PG5_ESB
E1	Bool Variable	(Tag) = Control
F1	Int BitVariable	(Tag) = Serial_EDA Bit = 14
G1	Int Variable	(Tag) = Serial_EDA
D2	Int Variable	(Tag) = PG5_I00B
E2	Bool Inverter	

Modify the original Integer Module as shown in the Table below.

F2	Int Variable	(Tag) = Serial_EDB Bit = 14
G2	Int Variable	(Tag) = Serial_EDB
D3	Int Variable	(Tag) = PG5_I01B
D4	Int Variable	(Tag) = PG5_I15B
A6	Int Variable	(Tag) = PG3_ESB
C11	Int Variable	(Tag) = PG1_ESB
D11	Int Variable	(Tag) = PG4_ESB
C12	Int Variable	(Tag) = PG1_I00B
D12	Int Variable	(Tag) = PG4_100B
C13	Int Variable	(Tag) = PG1_I01B
D13	Int Variable	(Tag) = PG4_I01B
C14	Int Variable	(Tag) = PG1_I15B
D14	Int Variable	(Tag) = PG4_I15B

The Integer Module should look like the picture below after adding the new objects.



# Verification

### **Downloading the Program**

- Make sure that the MODBUS Serial Communications Cards are installed and connected to the Termination Module. Verify that the Termination Modules' DIP Switches are configured corrected, and each card has the 2 MODBUS Serial Ports (J1 and J2) connect to each other by an RS-232 cable.
- In NetArrays, select the target node containing the MODBUS Serial Communications Card from the **Device** > **Select** menu.

NetArrays Developer Studio - Registered to RTP Corp	Version 9.2.0.46 - SerialRedundant.	dbn - [IOC]		
File View Properties Project Compile Debug	Device Tags Window Help			_ 8 ×
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	Device=MBSerial		User:RTF	

# • Select Device and Download Project to download the project.

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Image: Solution of the	Select Configure Status Time Synchronize Node Information Download Project Download Project w/Online Update Upload Project Update Project		
	Device=MBSerial	User:RTP	

• Enter the Download Password, we use **rtp**, and select **OK**.

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• Click "Yes" to overwrite to the current Target Node.

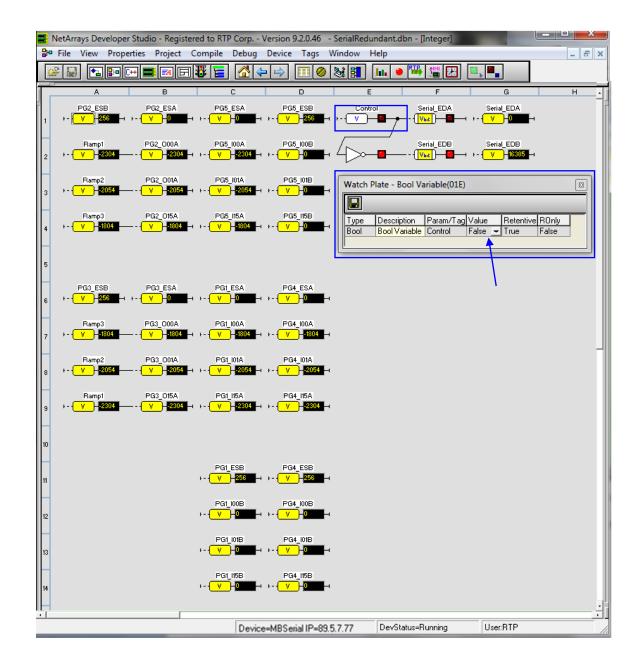
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	Device=MBSerial	User:RTP

- Run the project in Debug mode by clicking on the Run button in the Main Toolbar.
- Enter the Debug Password, we use rtp, and select OK.

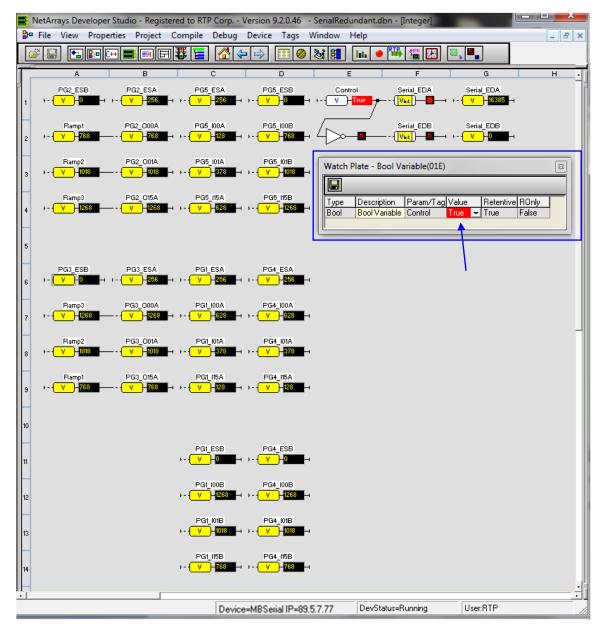
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### Verify Integer Module Form

- Return to the Main Form by clicking on the  $\Delta$  button in the Main Toolbar.
- Double-click on the Integer object to open the Module Form.
- Right click once on the light of the Boolean Control variable as shown in picture below. This will prompt Watch Plate Window that allows changing the value of the control variable.
- Observe that the Point Group status for all the tags ending with \_ESA variables are equal to zero. On the other hand, the Point Group status variables for the tags ending with \_ESB are set to 256, indicating that the point status are not active because the card associated with them is offline. Also, observe that the values from the Integer Input Point Groups are equal to the values of the Integer Output Point Groups. For example, the variable PG5\_I00\_A matches the variables PG2\_O00A and Ramp1.



- If the inputs and outputs are not equal, carefully check the configuration of the MODBUS Serial Communications Card and the Point Groups.
- If any Master Point Group Status is not zero, carefully check the setting of the DIP Switches on the Termination Module and the RS-232 Cable.
- Go to the Watch Plate for the Bool-Variable and change it to True as shown in the picture below.
- This action disables the Modbus serial card on slot 0 and enables the Modbus serial card on slot 1.



• Observe that the Point Group status variables for all the tags ending with \_ESB are equal to zero. On the other hand, the Point Group status variables for the tags ending with \_ESA are set to 256, indicating that the point status are not active because the card associated with them is offline. Also, observe that the values from the Integer Input Point Groups are equal to the values of the Integer Output Point Groups. For example, the variable PG5\_I00\_B matches the variables PG2\_000A and Ramp1. The Point Group Variables associated with the slot0 card are not changing and they conserve the last received value from the source before the card is disabled.

### **Status Window**

The Status Window should show the RTP3201T Node's **Device Status:** = "**Running**". The bottom panel should only show a message indicating that slot 1 Modbus Serial card is offline. The top panel shows historical messages.

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