



## **Setup Examples**

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# **TMR System Setup**

## TMR System Setup Example

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## TMR System Setup

This document describes the setup of a simple 3000-T Triple Modular Redundant (TMR) System consisting of three 3000 Chassis with three 3000 Node Processors, three Chassis Processors, plus four Ethernet switches, and a PC or a laptop running the NetSuite applications. A 3000-T TMR system may also be packaged as three 3000 Node Processors installed in a single chassis. The setup for both systems is similar; any differences are noted in the instructions. Although individual installations will differ, if you carefully consider each of the following examples your system setup should proceed smoothly.

### NetSuite Installation

If NetSuite is not installed on your PC or laptop computer connected to the host network, place the RTP NetSuite distribution CD into the CD drive and follow the instructions.



**Note:** When the installer prompts you for a destination path for the installation, make sure that the intended users have read and write privileges to that directory.



**Note:** If you are updating to a newer version of NetSuite, you **must** first uninstall the older version before you perform the installation.

### IP Address Planning


In this example TMR System, the “Host Network” is a private network that is **not** connected to the Internet. This simplifies the communications setup considerably. It allows you to access the 3000-T target node at its shipped IP address (89.89.xxx.xxx) for the initial configuration, and allows you to use any address 89.xxx.xxx.xxx for your PCs and the target node, without having to change the subnet mask from its default value (255.0.0.0).

The TMR System requires a block of four consecutive IP addresses that are **not** assigned to any other devices. Select a suitable IP address (i.e., one with three unassigned IP addresses immediately following it). The first address will be the IP address that you will assign during the node configuration; the other three are used (or reserved) as secondary IP addresses by the TMR system.

The IP address of your PC or laptop must be within the same subnet as the IP address assigned to the TMR System (89.xxx.xxx.xxx). If not, change the IP address on your computer. Of course, if you configure the TMR System for a different subnet, you will have to change the IP address of your PC or laptop back to that subnet.

#### Changing the PC’s IP Address

Note that this procedure may differ slightly, depending on your operating system.

- Open Network Connections (On Microsoft Windows XP click  **Start**, click **Control Panel**, click **Network and Internet Connections**, and then click **Network Connections**).
- In the Network Connections window, select the Local Area Connection that your Ethernet cable is plugged in to. Right-click that entry and select **Properties** from the menu.
- In the Local Area Connection Properties dialog, on the **General Tab**, double click on the **Internet Protocol (TCP/IP)** from the list of components. (**Note:** Write down and save the current IP address and subnet mask so you can return to the original

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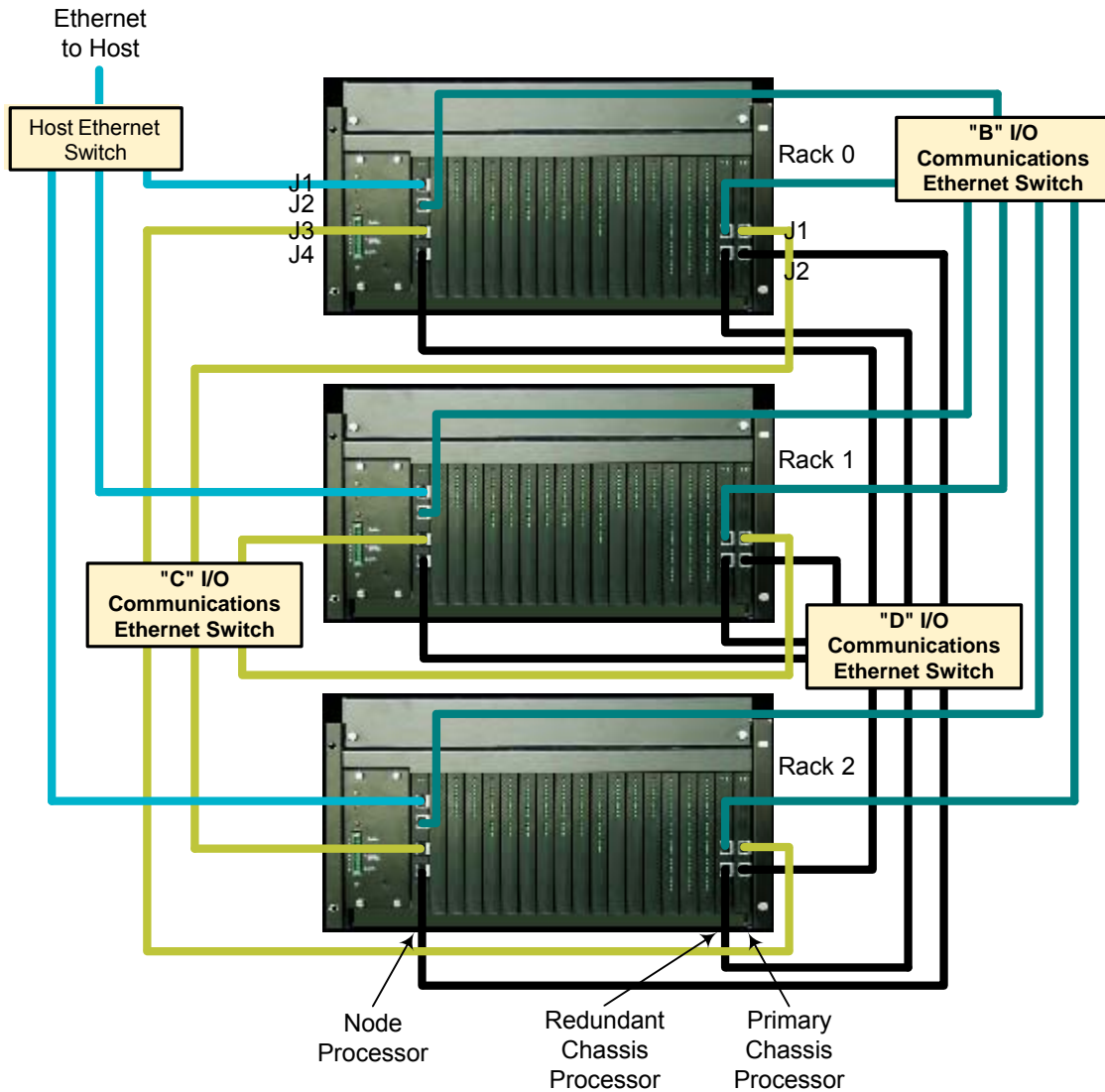
configuration if required.) In the Internet Protocol (TCP/IP) Properties dialog type in a new IP address.

- Click the **OK** button to save the IP address and close the Internet Protocol (TCP/IP) Properties dialog. Click on the **OK** button to close the Local Area Connection Properties dialog. Close the Network Connections window.

If the installation involves connecting the 3000-T TMR System to an existing private network, consult the MIS professional responsible for maintaining the network for assistance on assigning IP addresses, subnet masks, and IP routes.

## Ethernet Cabling

The following figure depicts the Ethernet cabling for a TMR System consisting of three chassis with dual Chassis Processor cards. Most likely, your installation will differ. However, the instructions below are valid for any TMR System, regardless of how many chassis are involved.



### Host Network Connections

- Connect an Ethernet cable from your PC or laptop computer to the Host Ethernet Switch.
- Connect an Ethernet cable from J1 on each of the three 3000 Node Processors to the Host Ethernet Switch.

### “B” I/O Communications Connections

- Connect an Ethernet cable from J2 on each of the three 3000 Node Processors to the “B” I/O Communications Ethernet Switch.
- Connect an Ethernet cable from J1 on each Redundant Chassis Processor to the “B” I/O Ethernet Switch.

### “C” I/O Communications Connections

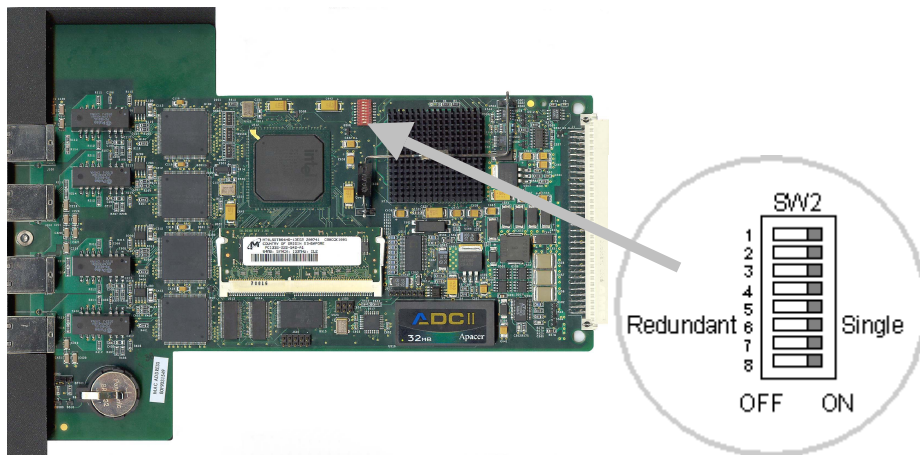
- Connect an Ethernet cable from J3 on each of the three 3000 Node Processors to the “C” I/O Ethernet Switch.
- Connect an Ethernet cable from J1 on each Primary Chassis Processor to the “C” I/O Ethernet Switch.

### “D” I/O Communications Connections

- Connect an Ethernet cable from J4 on each of the three 3000 Node Processors to the “D” I/O Ethernet Switch.
- Connect an Ethernet cable from J2 on each Primary Chassis Processor to the “D” I/O Ethernet Switch.
- Connect an Ethernet cable from J2 on each Redundant Chassis Processor to the “D” I/O Ethernet Switch.

## Node Processor Configuration

To match your system environment, you must specify the 3000/02 Node Processor card configuration option. Set SW2 Segment 6 to the Off position to select Redundant Node Processors. All other segments must be set to the On position.



## Chassis Processor Addresses

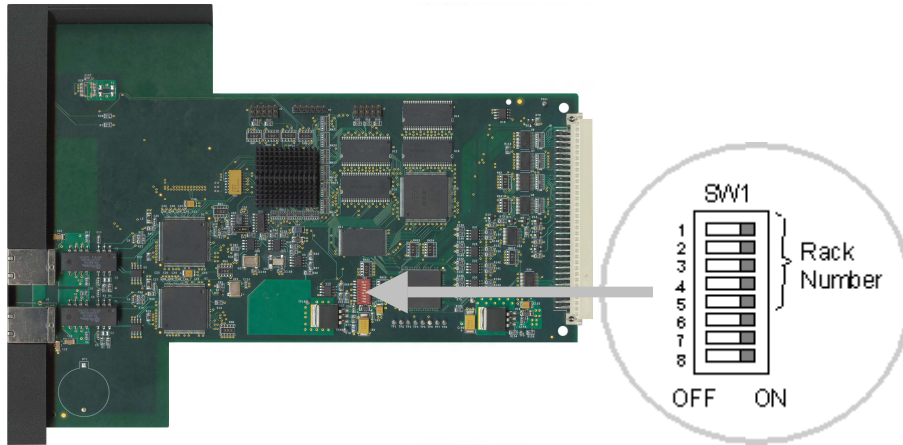
Every Chassis Processor in the 3000-T TMR System must be assigned a unique identification number. These numbers can range from 0 to 32 (Chassis 0 to 15 and Primary or Redundant). The Chassis number will be used in the NetArrays I/O Configuration. Chassis Processor identifiers are assigned by switch settings on the Chassis Processors. The location of these switches (on DIP switch SW1) is shown in the

## TMR System Setup Example

following figure. All you have to do is remove the Chassis Processor from the chassis, set the switches as indicated, and return the card to the chassis.

For this example we will assign the rack numbers 0, 1, and 2 to the 3000 primary chassis processor. (For the Single-Chassis TMR System, the single rack number will be 0.) The table indicates the switch settings for the three Chassis Processors. Note that there is no requirement to assign rack numbers 0, 1, and 2 to these chassis; they can be any rack numbers from 0 to 15.

### Chassis Processor Number Selection Switches



### Primary Chassis Processor Number Selection Switch Positions

Rack Number	SW1-5	SW1-4	SW1-3	SW1-2	SW1-1
0	ON	ON	ON	ON	ON
1	ON	ON	ON	ON	OFF
2	ON	ON	ON	OFF	ON

The previous table shows the switch positions for rack numbers 0, 1 and 2 used in this example. The rightmost four switch positions represent a straight binary coding of the rack number where SW1-4 is the most-significant bit and SW1-1 is the least-significant bit, and the ON position equals a binary 0 and the OFF position equals a binary 1. Switch SW1-5 selects Primary or Redundant Chassis Processor The ON position represents Primary and the OFF position represents Redundant. If all five switches were placed in the OFF position, the Chassis Processor identification would equal Rack 15 Redundant. If all five switches were placed in the ON position, the Chassis Processor identification would equal Rack 0 Primary. (The 3000 Family Hardware Installation and Setup manual contains a table listing the switch position for all 32 possible Chassis Processor identifications.) The other three switches should be in the ON (default) position.

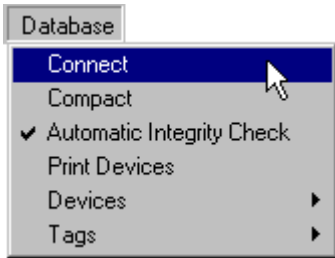
## Device Configuration

A device corresponding to the TMR System must be configured in the Project Tag Database Manager (PTDBM) utility so that we can communicate with the target node. First create a new Project Tag Database and then configure the device.

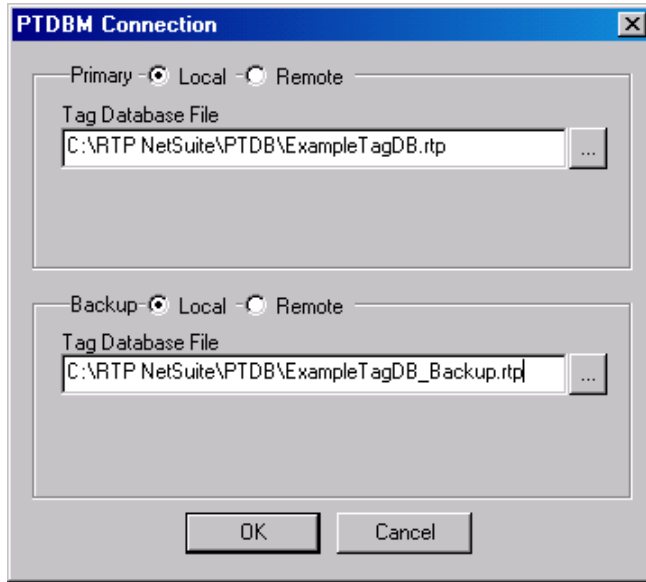
- Press  **Start** and select **Programs ▶ RTP NetSuite ▶ PTDBM**.

### Create a New Project Tag Database

- In the PTDBM window, select **Connect** from the **Database** menu.



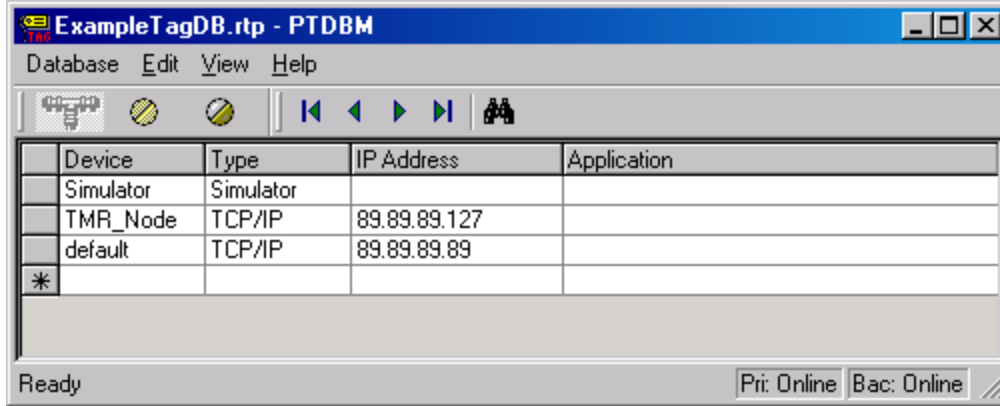
(Note that the default tag database names “TagDB.rtp” and “TagDB\_Backup.rtp” may appear in the PTDBM Connection dialog.)



- Type in new names for the Primary and Backup Tag Databases as shown above. (Both are located on the Local PC.) In this example we used the names **ExampleTagDB** and **ExampleTagDB\_Backup**. Click on the **OK** button.

### Configure a Device

- In the PTDBM Device window, type in a *name* for the node **Device**, select **TCP/IP** for the **Type**, and enter the **IP address** assigned to the TMR target node. (This will be the first of four reserved IP addresses for the TMR.) For this example, we chose **TMR\_Node** as the device name and **89.89.89.127** as the **IP Address**. This device name and IP address will be used throughout NetSuite to access the TMR System target node. For your installation, the device name can be any name of your choice, and the IP Address can be any address within the same subnet as your PC.
- In the next row create another device named **default** with an IP address such as **89.89.xxx.xxx**. When the 3000 system is shipped, it has a label identifying the assigned IP Address. For this example, we have chosen **89.89.89.89** as an example assigned IP Address.
- Click on the next row (\*). The PTDB devices configured should look similar to below.



Close the PTDBM window.


## Node Processor Configuration



**Note:** If your installation is a Single-Chassis TMR System, differences will be noted in parenthesis with *Italic font*.

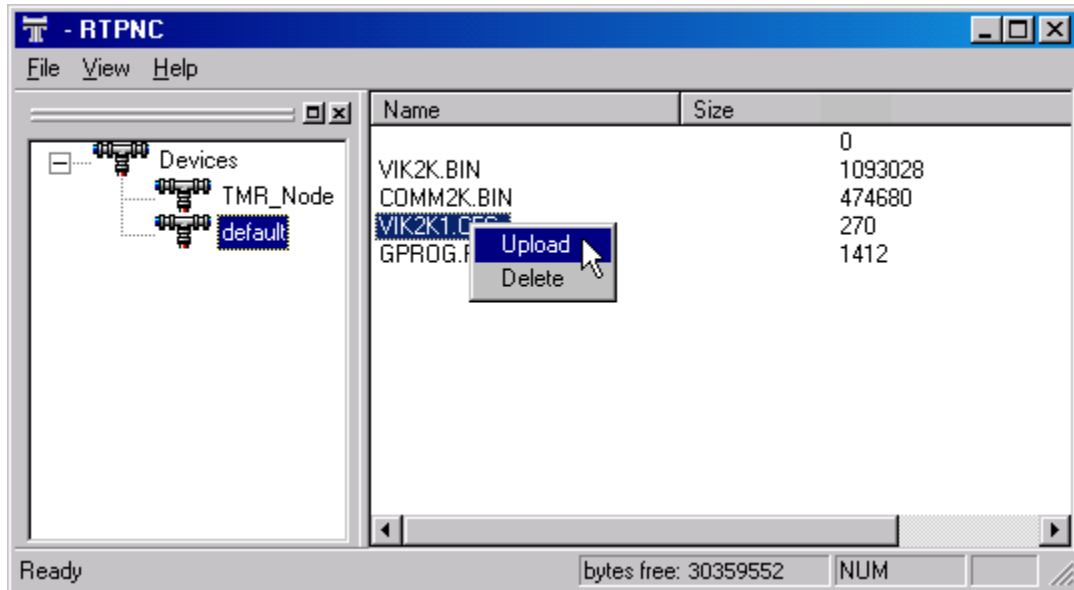
Configuration files within the three Node Processors of the TMR System must be edited before you can use the system. These files are accessed and edited with the RTP Node Configuration (RTPNC) utility. For this example, we arbitrarily chose the node processor installed in Rack 0 as Node Processor “A”, the node processor installed in Rack 1 as Node Processor “B”, and the node processor installed in Rack 2 as Node Processor “C”. Please note that there is no correlation between the rack number and the Node Processor’s designation. (*For a Single-Chassis TMR System, select one of the Node Processors to be “A”, another Node Processor to be “B”, and the third Node Processor to be “C”.*) Processor designations (A, B and C) are automatically assigned based on the processors MAC address. The powered-up processor with the lowest MAC address is assigned as Node Processor “A” and the powered-up processor with the highest MAC address is assigned as Node Processor “C”.

### Node Processor Configuration File

- Connect power to the Rack 0 chassis power supply. Make sure that the power is disconnected from the Rack 1 and Rack 2 power supplies. (*For a Single-Chassis TMR System, connect power to the single chassis. Unplug the Node Processors identified as “B” and “C.” It is not necessary to completely remove the cards from the chassis.*)
- On your PC, press  **Start** and select **Programs ▶ RTP NetSuite ▶ RTPNC**.
- In the left pane of the RTPNC window, select the **default** device. Note whether the **default** node has a program (GPROG.PGM) listed under the “Application” column. Right click on the file name **VIK2K1.CFG** and select **Upload** from the menu.



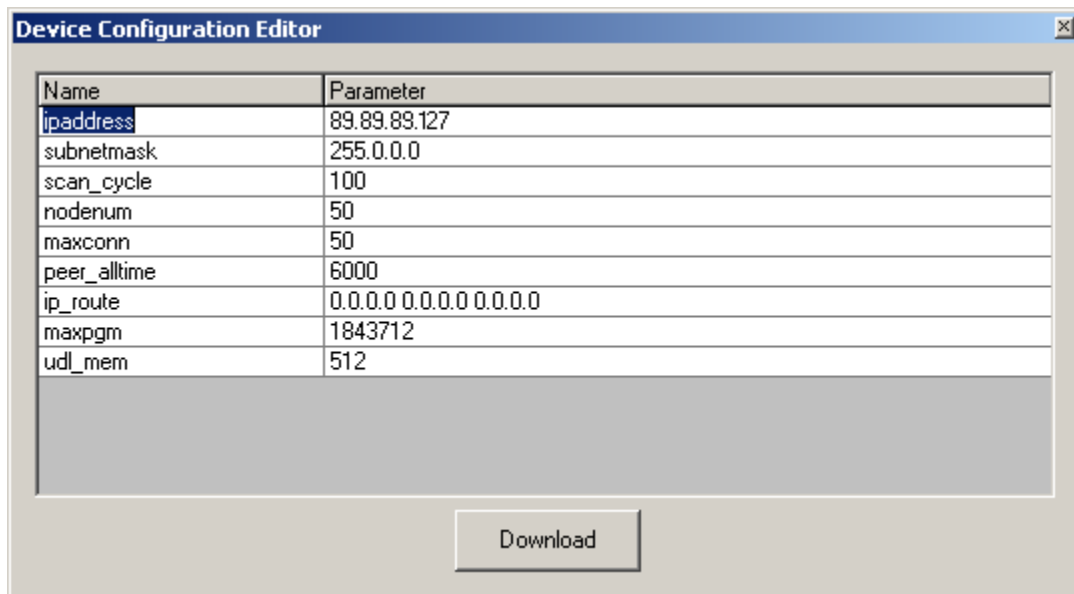
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In response to the Password prompt, enter the default password **rtp** followed by **Enter**.



**Note:** If no file names appear in the RTPNC window, your PC is unable to communicate with the target node.



- In **ipaddress**, enter the new IP address to be used for the 3000-T node. For this example, we show a typical IP address of **89.89.89.127**. If you want to assign another node IP Address, enter it here. (All other configuration parameters will remain at their default values at this time. For more information on the configuration parameters refer to the RTPNC Help file.) Click on the **Download**

button. In response to the Password prompt, enter the default password **rtp** followed by **Enter**.



- Disconnect power from the Rack 0 chassis power supply.
- Reconnect power to the Rack 0 chassis power supply. Node Processor “A” will boot up with the new configuration.



**Note:** If there was no program file in the “Application” window when you created the TMR\_Node with RTPNC, skip to the Verification section to create a program. Then return to complete this section.

- Connect power to the Rack 1 chassis power supply. *(If this is a single chassis system, plug in the Node “B” Processor card.)* Node Processor “A” will write the new configuration file to Node Processor “B”. In the NetArrays **Device** menu, select **Status**. Wait until the Secondary Processor is Online.
- Connect power to the Rack 2 chassis power supply. *(If this is a single chassis system, plug in the Node “C” Processor card.)* Node Processor “A” will write the new configuration file to Node Processor “C”. In the NetArrays **Device** menu, select **Status**. Wait until the Tertiary Processor is Online.
- The target node can now be accessed as device TMR\_Node at IP address 89.89.89.127. Observe that the Power indicators on all three Node Processors are on. The I/O Status indicators on the Node Processors and Chassis Processors will be on or repeating a two-blink sequence, to indicate primary or secondary status. (If off, the I/O Status LEDs indicate that there is no project program running in the node.)

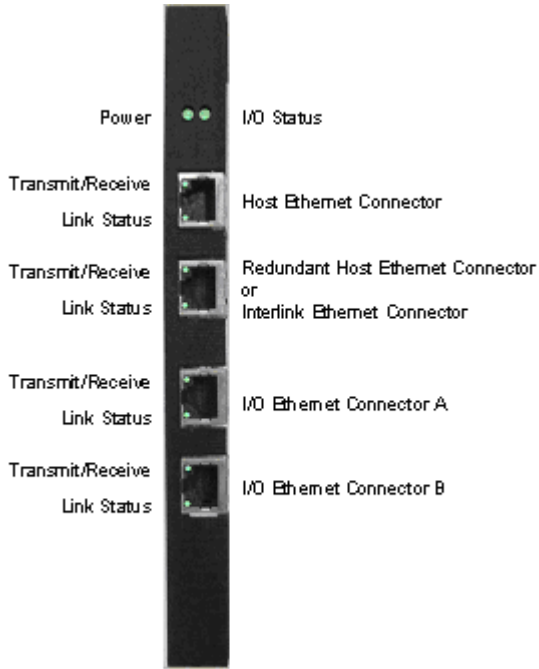
## Processor Indicators

The next figure shows the indicators during normal operation following power up and initialization with a valid project program downloaded to the node. Possible errors are shown for the Processor Cards I/O status. If the I/O in your system does not match the program in the 3000 Node, I/O errors will be indicated.



**Note:** Cables not shown for clarity.

## Node Processor Front Panel



### Power

- ON** Power on and within limits
- OFF** Power off or error

### Transmit/Receive

Indicates relative link activity

- ON** Message transmit/receive
- OFF** No link activity

### Link Status

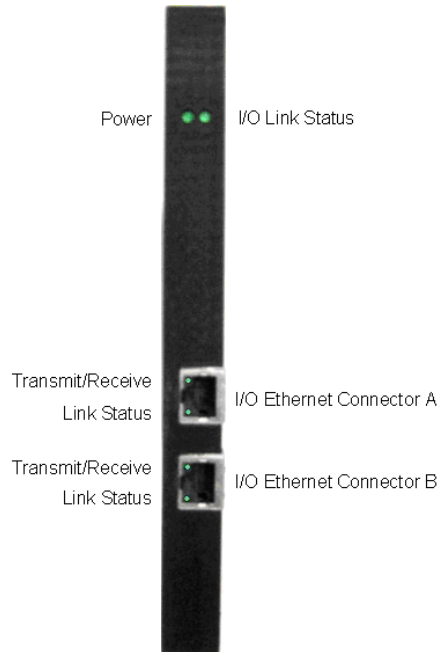
- ON** Link is functioning normally
- OFF** Link error

### I/O Status

Indicates primary or secondary mode, and rack/card errors or forced read-only variables

- ON** Primary, no errors
- 1 Blink** Primary, rack/card error or forced read-only variable
- 2 Blinks** Secondary, no errors
- 3 Blinks** Secondary, rack/card error or forced read-only variable
- 6 Blinks** Node Processor Off Line

## Chassis Processor Front Panel



### Power

- ON** Power on and within limits
- OFF** Power off or error

### Transmit/Receive

Indicates relative link activity

- ON** Message transmit/receive
- OFF** No link activity

### Link Status

- ON** Link is functioning normally
- OFF** Link error



### I/O Status

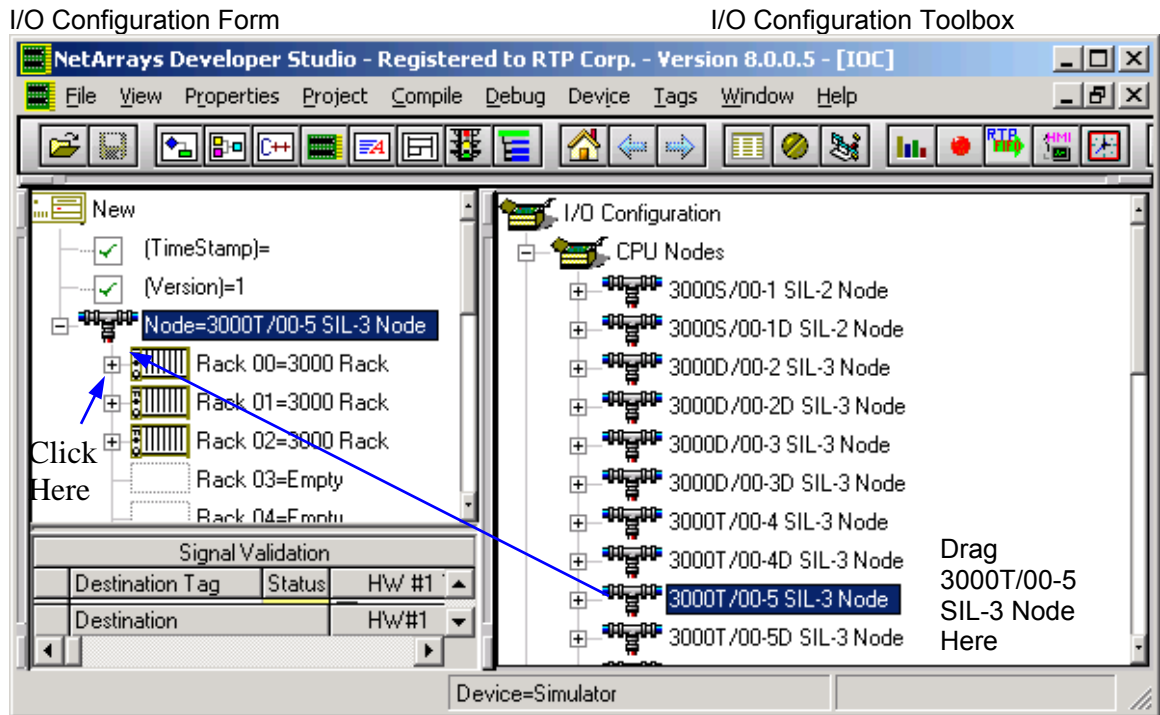
Indicates primary or secondary mode, and rack or card errors

- ON** Primary, no errors
- 1 Blink** Primary, rack/card error
- 2 Blinks** Secondary, no errors
- 3 Blinks** Secondary, rack/card error

## Verification

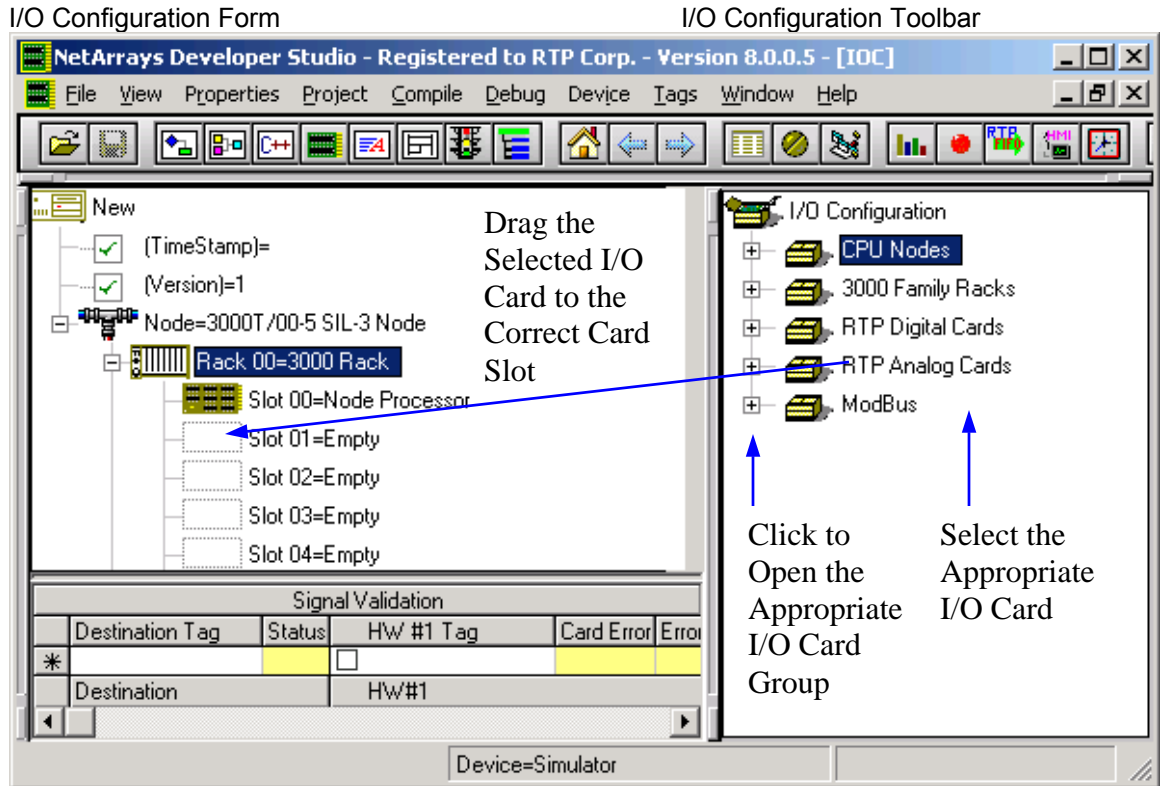
In this section, we will create a simple NetArrays program specific to your I/O configuration.

- On your PC, press  **Start** and select **Programs ▶ RTP NetSuite ▶ NetArrays**.
- First we must create a program to download to the 3000 Node.
- Click on the I/O Configuration Studio button in the NetArrays main toolbar .
- Drag the 3000T/00-5 Node icon from the I/O Configuration Toolbox CPU Nodes to the “Node=Empty” position on the I/O Configuration form. *(If your TMR system is a single chassis, use the 3000T/00-9.)*



- In the I/O Configuration form, expand the first 3000T Rack branch by clicking on the ⊕. Now add an I/O card that is in the first chassis in your configuration. Open the box of RTP appropriate card type in the I/O Configuration Toolbox by clicking on the ⊕.

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- Select the applicable card from the I/O Configuration card set and drag it into the correct card slot in the first chassis in the I/O Configuration Form.
- The Auto Tag Generation dialogue box will automatically appear. Type in a prefix to be used on all of the card's Tag Names and click **OK**. For example purposes, "TagPrefix" is shown.

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Auto Tag Generation for (3004/00) 4-Ch 16-bit AO 0-10 VDC

Prefix  
TagPrefix


Redundant

Assign Channel Tag Names from Database

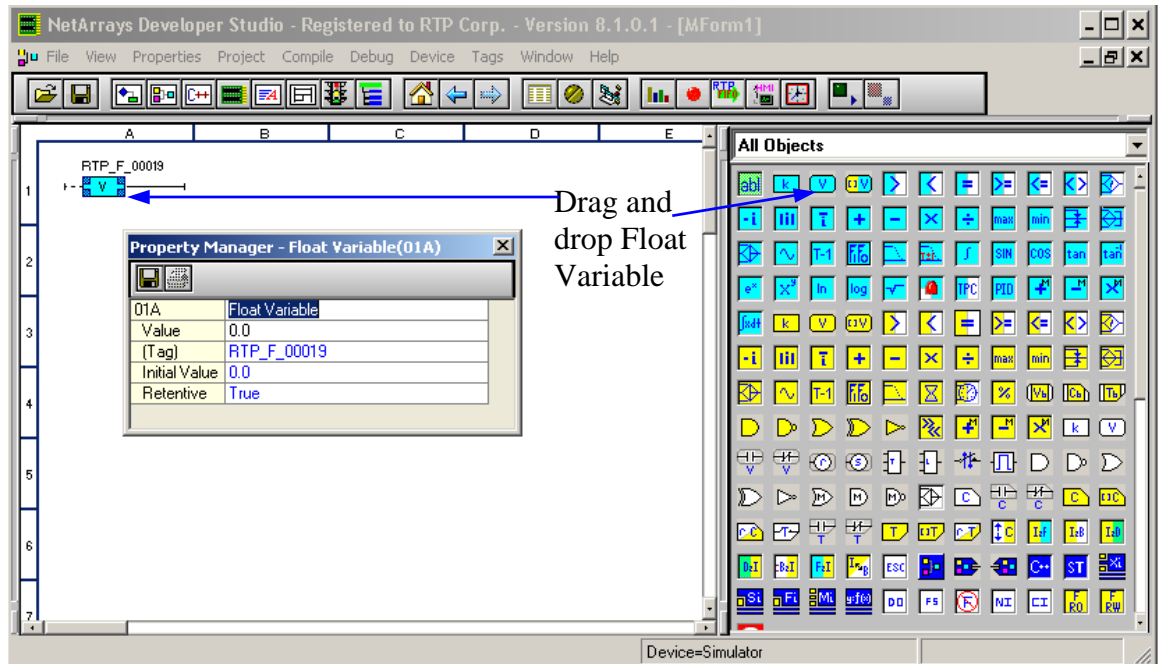
Used in Signal Validation

Filtered Unattached Database Tags

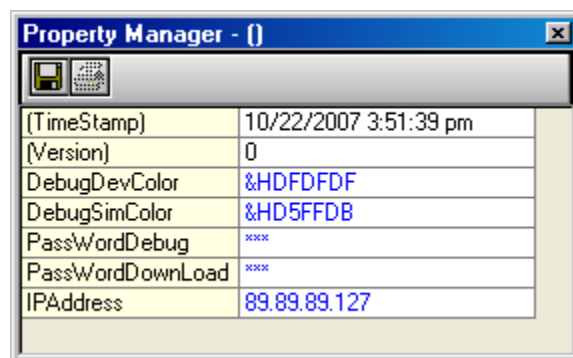
Selected = 0

- Return to the Main Form by clicking on the  button in the Main Toolbar.
- Double-click on the **MForm1** object in the Main Form to display the empty Module Form. Take a few moments to study the following figure.
- Drag any variable onto MForm1. In the example we are dragging a Float Variable to Cell A1. Even though this variable is not used, it is required to complete the program.

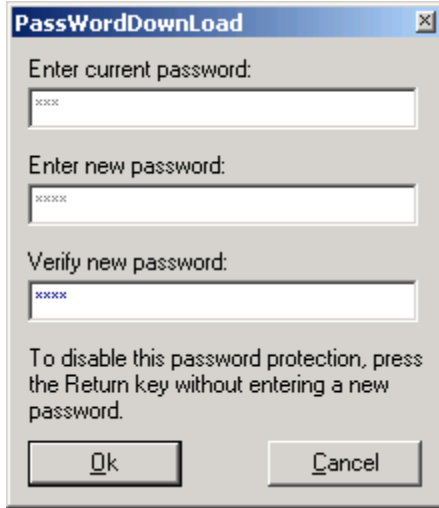
## TMR System Setup Example



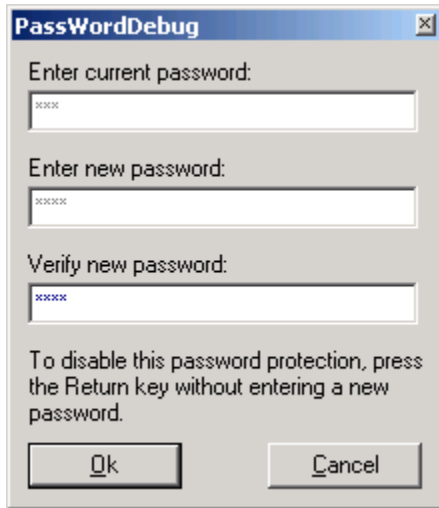
- In the NetArrays **Properties** menu, select **Select ► New Project Properties...**
- In the project **Property Manager** dialog, enter the configured IP Address, **89.89.89.127**, into the IPAddress field followed by a return.



- By default, the **PassWordDownLoad** Password should be set to the **rtp**. To change it, enter any character into the **PassWordDownLoad** field to display the **PassWordDownLoad** dialog. Enter the current password **rtp** into the **Enter current password** field followed by a return or the **OK** button. Then type the new password into the **Enter new password** and **Verify new password** fields, each time followed by a return or the **OK** button.

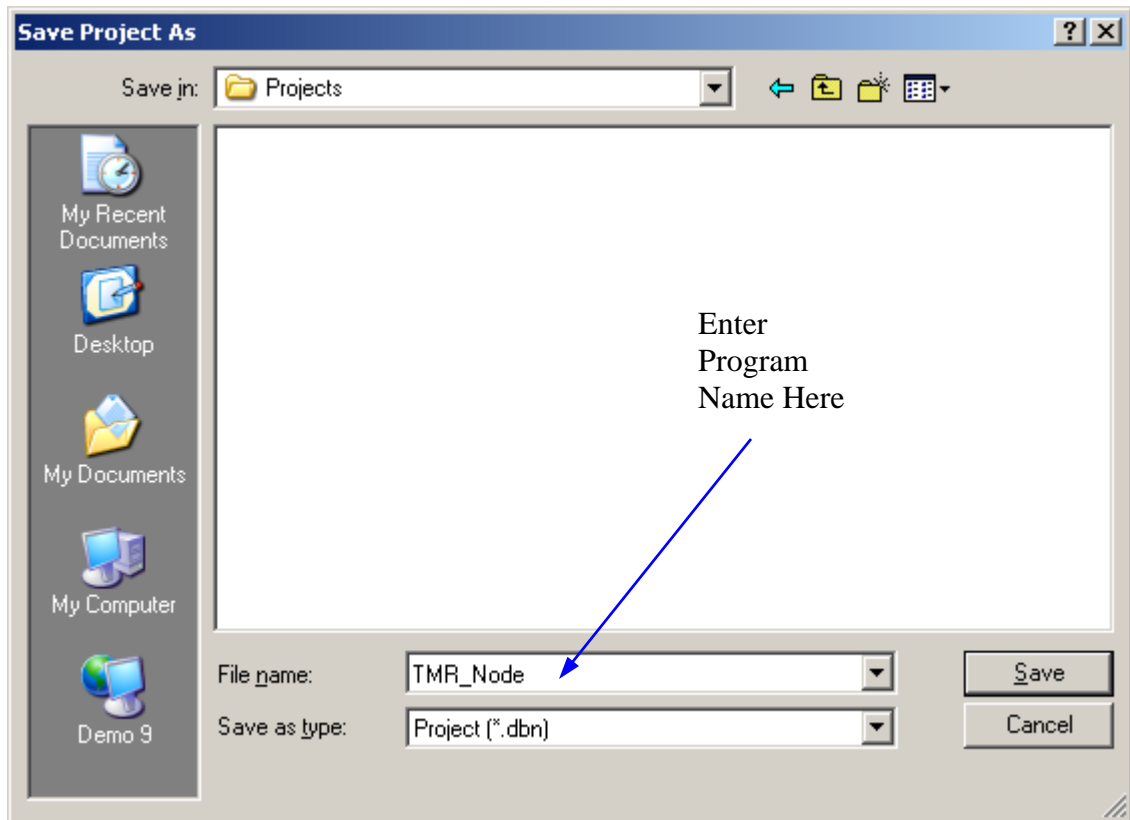


- By default, the **PassWordDebug** Password should be set to the **rtp**. To change it, enter any character into the **PassWordDebug** field to display the **PassWordDebug** dialog. Enter the current password **rtp** into the **Enter current password** field followed by a return or the **OK** button. Then type the new password into the **Enter new password** and **Verify new password** fields, each time followed by a return or the **OK** button.

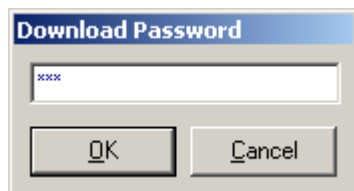


- Close the project **Property Manager** dialog.
- In the NetArrays **File** menu, select **Save New Project As...** In the Save Project As dialog, enter a file name for the project program, for example "TMR\_Node". You can enter any name you want as long as it contains eight, or fewer, characters. Click on the **Save** button.



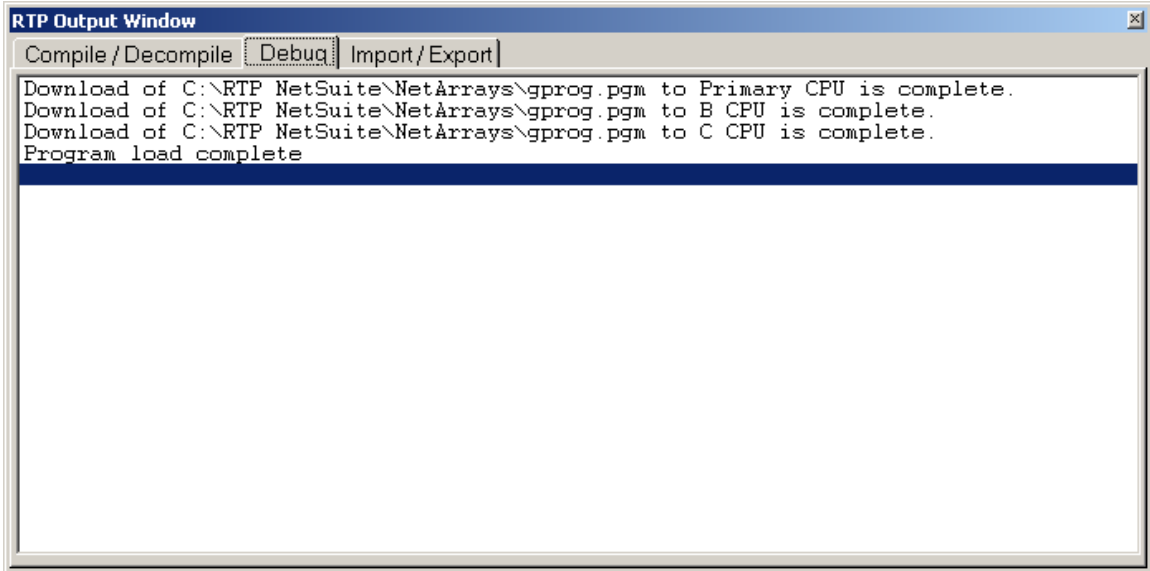


- In the NetArrays **Device** menu, select **Select ▶ TMR\_Node**.
- In the NetArrays **Device** menu, select **Download Project**. Enter **rtp** as the password. Click **OK**.



- In the NetArrays **View** menu, select **Output Window**.

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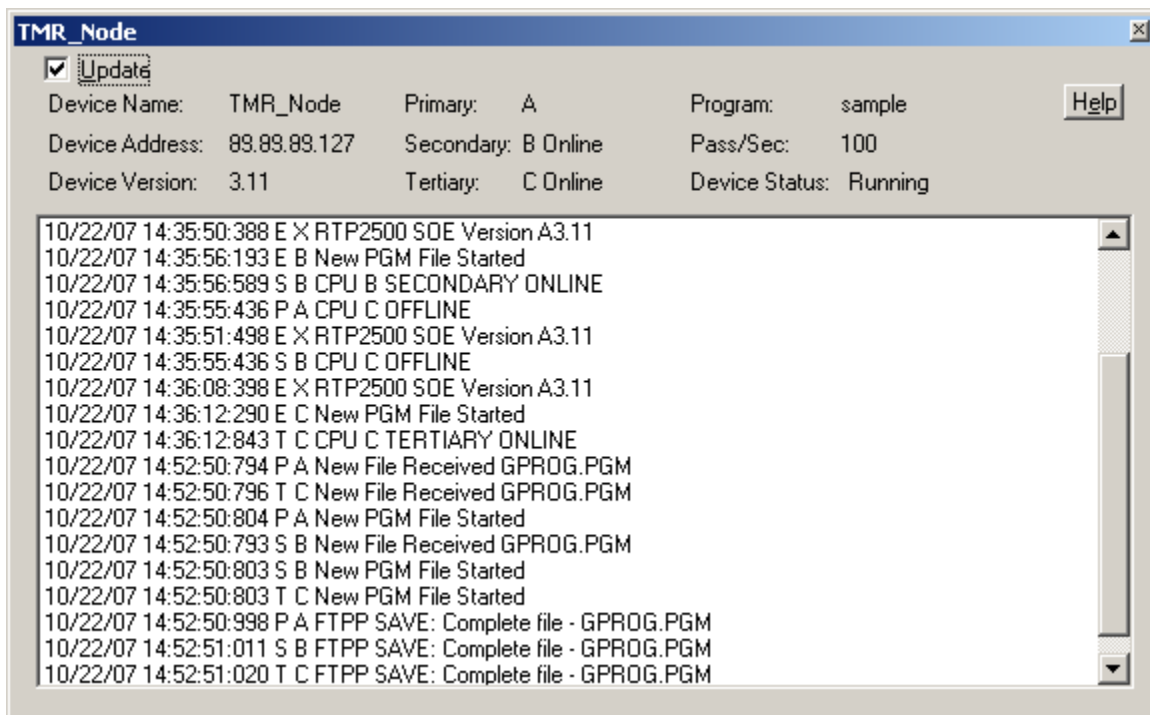


- For a triple processor system, the RTP Output Window should show three individual gprog.pgm downloads, one for each Node Processor, and a program load complete message. If not, one of the Node Processors may be incorrectly configured. When downloading to a single processor system, only the Primary CPU will receive the program. (Note that if your processor did not have a program file loaded or your are running single processor, there will only be one active Node Processor when you execute this section.)
- Examine the indicator LED on the front panels of the Node Processors and Chassis Processors. They should match the figure shown previously.
- For a triple processor system, the Power indicators on all three Node Processors should be on. The I/O Status indicator on the primary Node Processor should be on, and the I/O Status indicators of the secondary and tertiary Node Processors should be blinking twice and pausing. Any I/O Status indicator blinking once or three times indicates a Rack or I/O Card error condition.

Note that the Link Status indicators should be on and the Transmit/Receive indicators should be on or rapidly flashing. If any of these are off, an Ethernet cable may be disconnected.

- In the NetArrays **Device** menu, select **Status**. This will display the Device Status window.

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- For a triple processor system, the display in the Device Status window should indicate that all three Node Processors are online and running. Note that any of the three Node Processors (A, B, or C) may be indicated as the Primary. Likewise, either of the two remaining processors may be the Secondary or Tertiary.
- The name of the project program downloaded to the TMR System should appear in the Program field and the Target Status should be **Running**. The Pass/Sec, which is a measurement of how fast the program is executing, may be different in your display. If the Program name is incorrect or missing, or if the Target Status is anything but Running, recheck the processor configuration.

**Congratulations!** You have completed the initial configuration of the 3000-T TMR system and verified the communications with the host PC. The next step would be to develop your own project program and download it to the TMR system.