



Setup Examples

Thermocouple Card Configuration

Thermocouple Card Configuration Examples

© 2005, 2008, 2009 RTP Corporation

Not for reproduction in any printed or electronic media without express written consent from RTP Corp.

All information, data, graphics and statements in this document are proprietary intellectual property of RTP Corp. unless otherwise indicated and are to be considered RTP Corp. confidential. This intellectual property is made available solely for the direct use of potential or licensed RTP Corp. customers in their application of RTP Corp. products, and any other use or distribution is expressly prohibited. If you have received this publication in error, immediately delete, discard or return all copies to RTP Corp.

RTP Corporation
1834 SW 2nd Street
Pompano Beach, FL 33069
Phone: (954) 974-5500
Fax: (954) 975-9815
Internet: <http://www.rtpcorp.com>

File Name: Thermocouple Examples.pdf
Last Updated: 1/20/09

Thermocouple Card Configuration

This document provides two examples to help you understand the configuration of thermocouple inputs. The hardware required to complete these examples include a 3007/00 8-Channel Scanning Thermocouple Card, a 3058/00 Thermocouple Analog Cable, a 3099/03 Thermocouple Triple Termination Module, and two thermocouples. (Note: other Thermocouple types than those listed in the example can be substituted.) If thermocouples are not available, you may substitute four short lengths of wire for the verification test.

Hardware Setup

- Remove the protective cover from the 3099/03 Thermocouple Triple Termination Module. Connect the leads of an “S” thermocouple to the Channel 0 inputs on the termination module’s brass terminals; connect the leads of a “K” thermocouple to the Channel 1 inputs of the termination module’s brass terminals. Replace the protective cover on the 3099/03 Thermocouple Triple Termination Module.

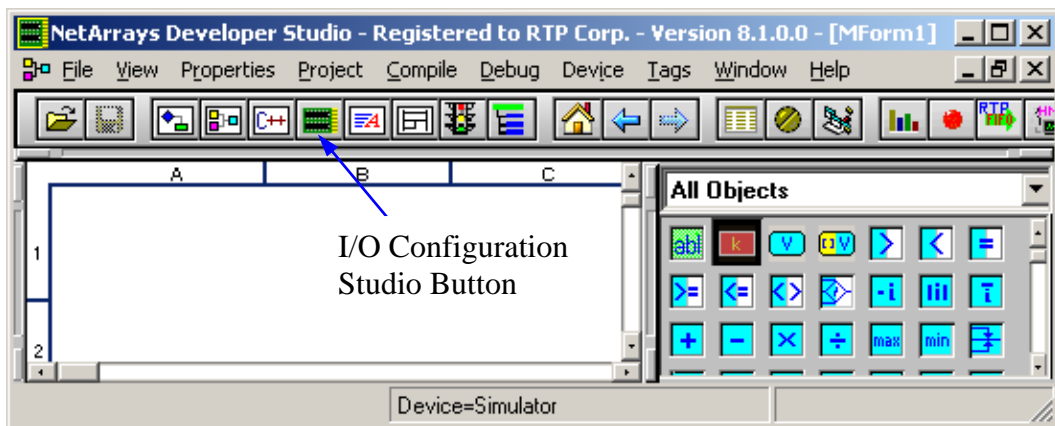
If you are not using thermocouples, connect one jumper wire between the Shield and High terminals of Channel 0, and another jumper wire between the High and Low terminals of Channel 0. Likewise, connect the Channel 1’s Shield, High, and Low input terminals together with two wires.


- Disconnect power from the Rack power supply. Insert the Thermocouple card into Slot 3.
- Connect the 3058/00 Thermocouple Analog Cable from the 3007/00 8-Channel Thermocouple card to the 3099/03 Thermocouple Triple Termination Module.

Example 1

The physical I/O configuration of this example consists of one 8-Channel Scanning Thermocouple card (model number 3007/00) installed in Slot 03 of a 3000D Rack in a 3000T/00-9T Node. One S-Type thermocouple is connected to channel 0 of the card. We want to take advantage of the card’s Open Transducer Detection (OTD) feature and perform these tests at regular intervals.

- On your PC, press  **Start** and select **Programs** ▶ **RTP NetSuite** ▶ **NetArrays**.
- Click on the I/O Configuration Studio button in the NetArrays main toolbar . Maximize NetArrays and the I/O Configuration form.

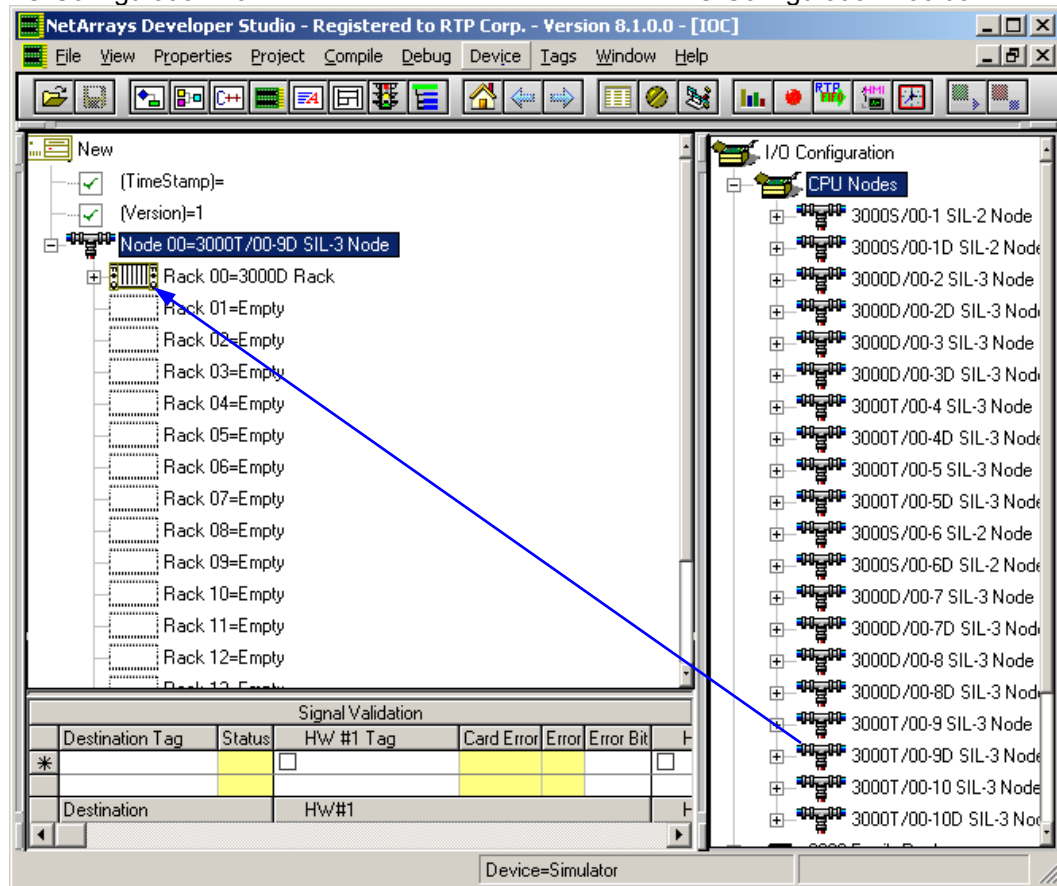


- Drag the **3000T/00-9D** Node icon from the I/O Configuration Toolbox to the **Node 00=Empty** position on the I/O Configuration Form, then expand the **Rack 00=3000D Rack** on the tree-branch by clicking on the .

Thermocouple Card Configuration Examples

I/O Configuration Form

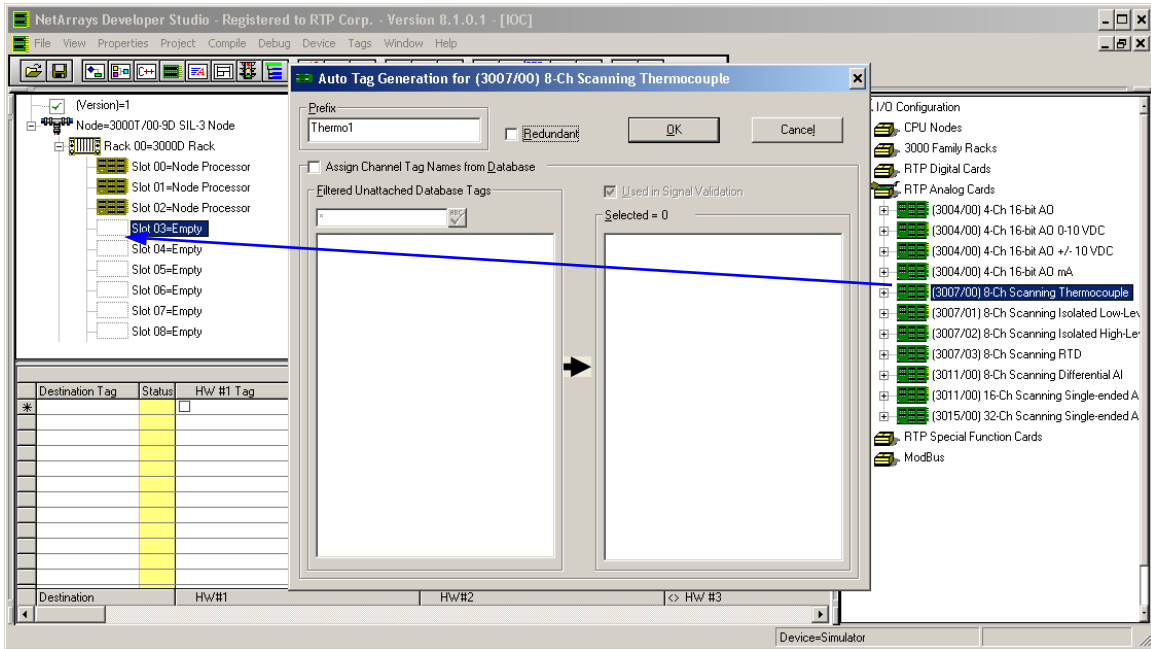
I/O Configuration Toolbox



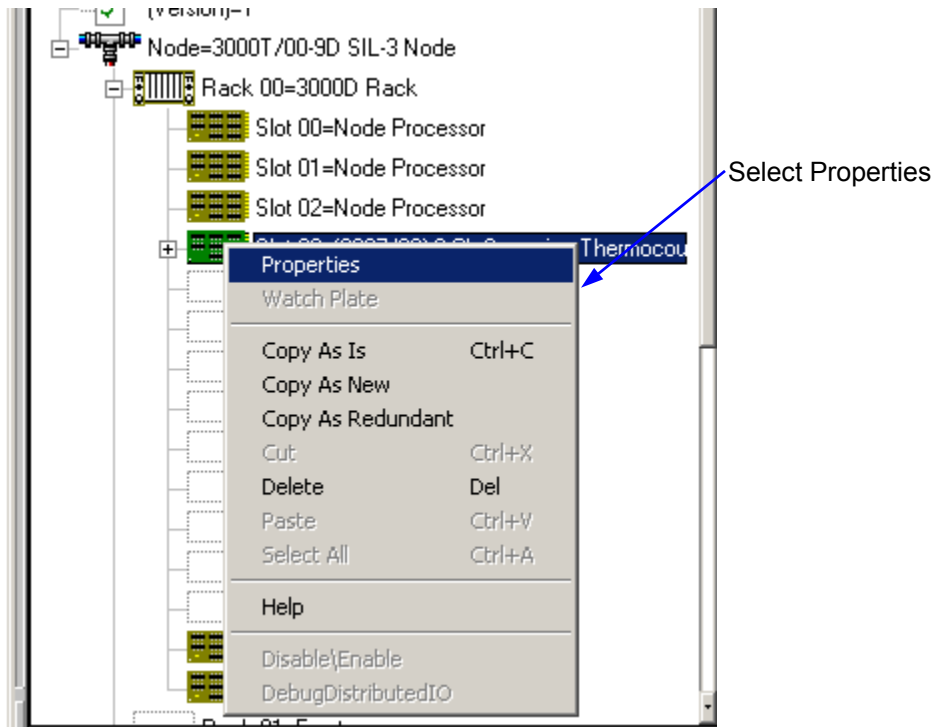
Note that the I/O Configuration form **must** match the physical I/O rack installation. If your installation differs from this example, adjust the icons on the I/O Configuration form accordingly.

- In the I/O Configuration Toolbox, expand **RTP Analog Cards** on the tree-branch by clicking on the \oplus .
- Drag and drop a **3007/00 8-Ch Scanning Thermocouple** card icon from the I/O Configuration Toolbox into the rack and slot occupied by the Thermocouple card in the I/O Configuration Form. (For this example we used Rack **00** Slot **03**.) The Auto Tag Generation dialogue box will automatically appear. Type in "Thermo1" and click **OK**. This will automatically create a series of Tag Names beginning with the prefix specified. You can either retain these Tag Names or edit them.

Thermocouple Card Configuration Examples



- Right-click on the Thermocouple Card's icon to display the menu and select **Properties** to open the card's Property Manager window.



The upper portion of the Property Manager contains the Card Properties and the lower portion contains the individual I/O Channel Properties. We will configure the Card Properties first.

Card Properties

- This card is not part of a parallel redundant input configuration, the **Redundant Card ID** parameter must stay at the default value of **0**.
- The **Dash Number** parameter adjusts the scan rate to match the input filters installed on the card. Select **001** or **003** to match the dash number of the card's part number, which appears on the card.
- **OTD Method** determines if OTD tests are performed at regular intervals or only when commanded by the project program. Select **Fixed Interval - Sequential** to initiate tests at the rate specified in the channel's **OTD Interval** column.
- Because we will be using the card's CJC Sensor as the CJC temperature source, the **CJC Constant (Card)** parameter will not be used. Skip to the next parameter.
- Because we will be using the card's CJC Sensor as the CJC temperature source, the **Float CJC Variable** variable will not be used. Disable it by selecting **False** for the **Enabled** parameter.
- Because we will be using the Fixed Interval OTD, the **Integer Demand OTD Trigger** variable will not be used. Disable it by selecting **False** for the **Enabled** parameter.
- Leave all other card properties at their default values. If desired, you can change any of the tag names.

Property Manager - (3007/00) 8-Ch Scanning Thermocouple()

Card Properties	
Card	Slot 03=(3007/00) 8-Ch Scanning Thermocouple
Redundant Card ID	0
Dash Number	003
OTD Method	Fixed Interval - Sequential
CJC Constant (Card)	0.0
Float CJC Variable	(Thermo1FCJC_A)
Enabled	False
(Tag)	0
Float Sensor Input	(Thermo1FSEN_A)
Enabled	True
(Tag)	Thermo1FSEN_A
Float Cal High Input	(Thermo1FCHI_A)
(Tag)	Thermo1FCHI_A
Float Cal Low Input	(Thermo1FCLOW_A)
(Tag)	Thermo1FCLOW_A
Integer Error Detection	(Thermo1IE_A)
(Tag)	Thermo1IE_A
Integer Demand OTD Trigger	(Thermo1IOTDT_A)
Enabled	False
(Tag)	0
Integer OTD Status	(Thermo1IOTD_A)
Enabled	True
(Tag)	Thermo1IOTD_A

Annotations:

- Select **Dash Number** (points to 003)
- Select an **OTD Method** (points to Fixed Interval - Sequential)
- Disable **Float CJC Variable** (points to False)
- Disable the **Integer Demand OTD Trigger** (points to False)

Thermocouple Card Configuration Examples

That completes the Card Properties configuration. Now we will configure the I/O Channel Properties.

Channel	I/O Tag	Filter	Type	OTD Tag	OTD Interval	CJC	C
Float	Input 00	100	S	<input checked="" type="checkbox"/> Thermo1BE00_A	2	Sensor	
Float	Input 01	None	E	<input checked="" type="checkbox"/> Thermo1BE01_A	1	Sensor	
Float	Input 02	None	E	<input checked="" type="checkbox"/> Thermo1BE02_A	1	Sensor	
Float	Input 03	None	E	<input checked="" type="checkbox"/> Thermo1BE03_A	1	Sensor	
Float	Input 04	None	E	<input checked="" type="checkbox"/> Thermo1BE04_A	1	Sensor	
Float	Input 05	None	E	<input checked="" type="checkbox"/> Thermo1BE05_A	1	Sensor	

I/O Channel 0 Properties

- In this example, **Channel** Input 0 is connected to a thermocouple. Leave Input 0 at the default setting of “Float”.
- To enable the **Filter**, enter a recursive filter weight. A moderate filter was created by entering a value of **100**.
- The selection in the **Type** column must match the type of thermocouple connected to the input channel. In this example, an **S**-Type thermocouple is employed.
- The checkbox in the **OTD Tag** column must be checked to allow OTD test for the channel. (When the variable is **Checked** OTD tests are enabled; when **Unchecked** they are disabled.) The auto tag generator assigns an OTD tag to each input channel.
- Because fixed interval OTD testing will be used; an **OTD Interval** for this channel must be entered in this column. An interval of **2** minutes is specified.
- The **CJC** column selects the temperature source for the cold junction compensation. Because the card’s CJC sensor will be used as the source of the CJC temperature, you must select either **Sensor** or **Sensor Filtered**. We chose not to add filtering to the CJC Sensor input.
- Leave all other configuration parameters as is until after Channel 1 is configured.

This completes the configuration of Channel 0 of the Thermocouple card.

Example 2

In this example, a K-Type thermocouple is connected to channel 1 of the card. OTD testing will also be enabled for this channel. The Card Properties have already been configured, we will move right to the I/O Channel Properties.

I/O Channel Properties								
Channel	I/O Tag	Filter	Type	OTD Tag	OTD Interval	CJC	CJC Point Constant	
Float	Input 00	Thermo1I00_A	100	S	<input checked="" type="checkbox"/> Thermo1BE00_A	2	Sensor	
Float	Input 01	Thermo1FI01_A	250	K	<input checked="" type="checkbox"/> Thermo1BE01_A	3	Sensor	
Disabled	Input 02				<input type="checkbox"/>			
Disabled	Input 03				<input type="checkbox"/>			
Disabled	Input 04				<input type="checkbox"/>			
Disabled	Input 05				<input type="checkbox"/>			
Disabled	Input 06				<input type="checkbox"/>			
Disabled	Input 07				<input type="checkbox"/>			


I/O Channel 1 Properties

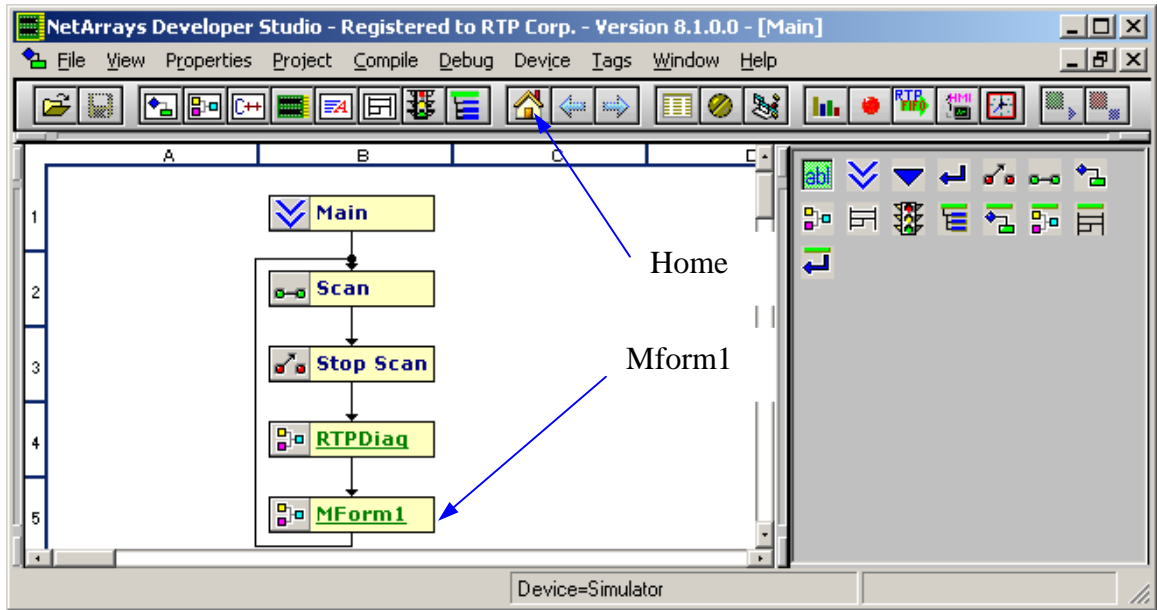
- In this example, **Channel** Input 1 is connected to a thermocouple. Leave Input 1 at the default setting of “Float”.
- To enable the **Filter**, enter a recursive filter weight. A moderate filter was created by entering a value of **250**.
- The selection in the **Type** column must match the type of thermocouple connected to the input channel. In this example, a **K**-Type thermocouple is employed.
- The checkbox in the **OTD Tag** column must be checked to allow OTD test for the channel. (When the variable is **Checked** OTD tests are enabled; when **Unchecked** they are disabled.) The auto tag generator assigns an OTD tag to each input channel.
- Because fixed interval OTD testing will be used; an **OTD Interval** for this channel must be entered in this column. An interval of **3** minutes is specified.
- The **CJC** column selects the temperature source for the cold junction compensation. Because the card’s CJC sensor will be used as the source of the CJC temperature, you must select either **Sensor** or **Sensor Filtered**. We chose not to add filtering to the CJC Sensor input.
- Since only Channel 0 and 1 are used, you can select **Disabled** for the unused channels 2-7. This step is optional.
- Save the project. From the NetArrays **File** menu select **Save New Project As...** and assign a *name* to the project.

Both Channel 0 and Channel 1 of the Thermocouple card are now configured.

Verification

Now that the I/O configuration is completed, we will now add some logic to the project program to test our configuration.

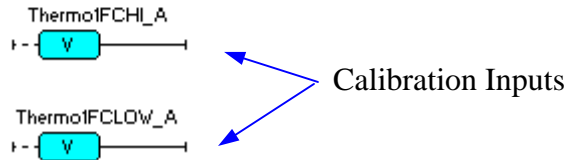
- Connect power to the Rack power supply.
- Open Module Form **MForm1** by clicking on the **Home**  icon and double clicking on the **MForm1** icon.



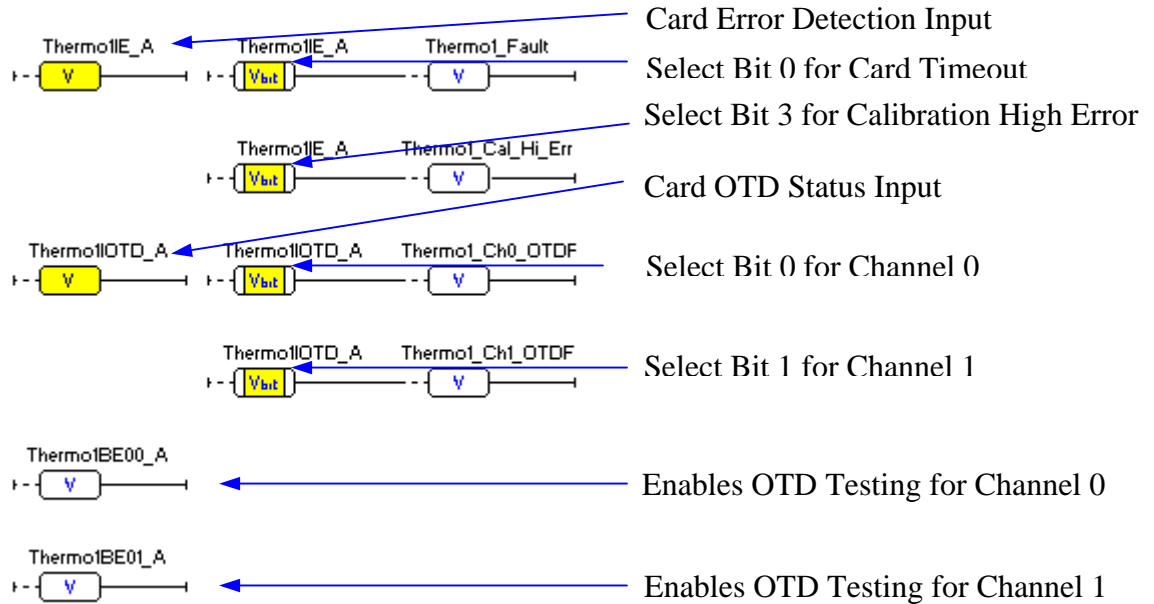
- Add the objects as indicated in the following figures. Use the tag names created by the auto tag generator where applicable.

The temperatures measured by the two channels on the Thermocouple card are accessed in NetArrays by two Float Variable objects with the Tags “Thermo1FI00_A” and “Thermo1FI01_A”. A Float Variable object with the Tag “Thermo1FSEN_A” accesses the temperature measured by the card’s CJC sensor

Thermocouple Card Configuration Examples

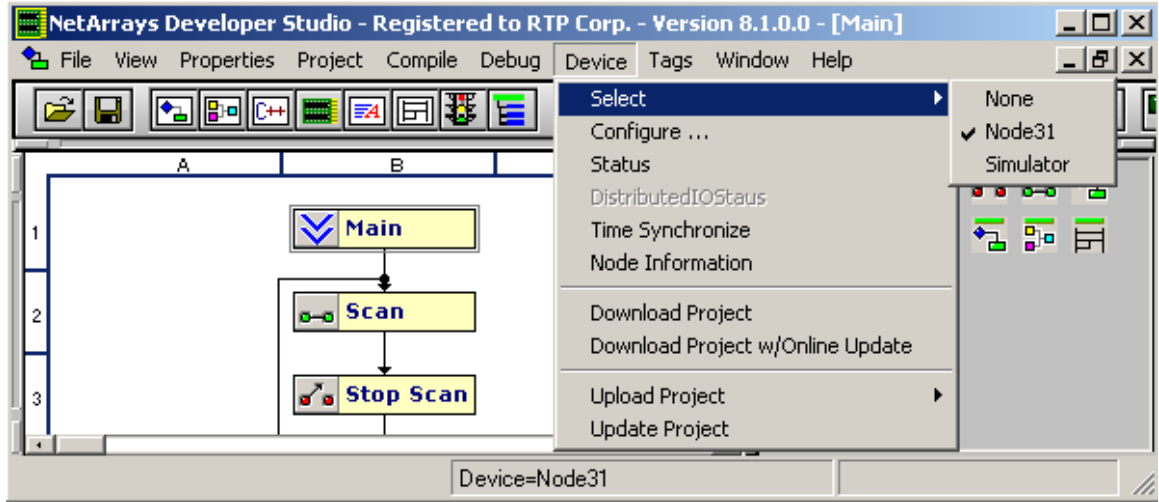



The card's Error Detection and OTD Status are accessed by Int Variable objects. The bits in these status inputs can be decoded using Bit Variable objects with the same Tags and selecting the appropriate Bit in the Property Manager to identify the specific error condition. Bit definitions can be found in the online help for the 3007/00 Thermocouple Card.

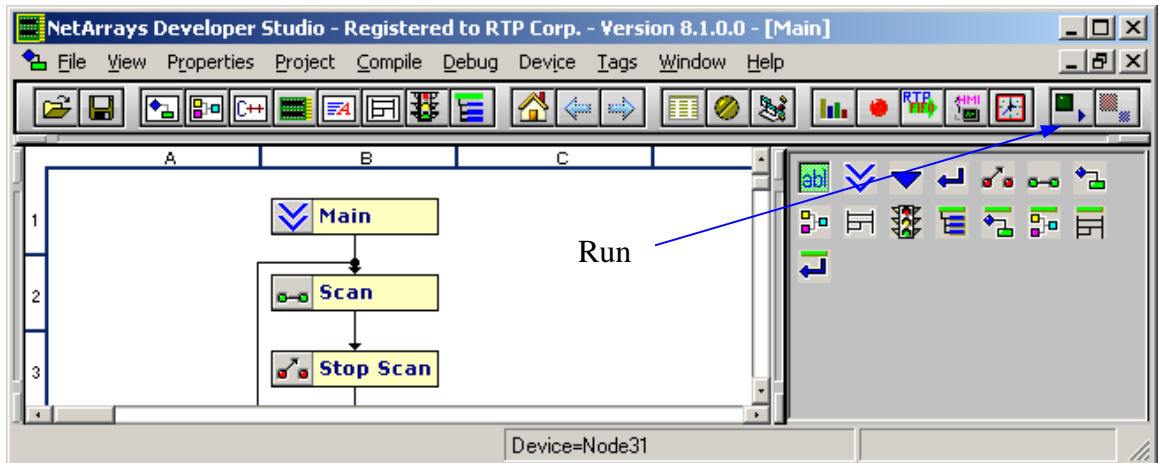


Thermocouple Card Configuration Examples

- After adding and assigning Tags to these objects, save the project program. From the NetArrays **File** menu select **Save name.dbn**. Then select the target node containing the Thermocouple card from the **Device ▶ Select** menu.



- Run the project in Debug mode by clicking on the **Run** button  in the Main Toolbar.



- Observe that the “Thermo1IE_A” error status variable equals zero.
- Observe that the calibration values reported by “Thermo1FCHI_A” and “Thermo1FCLOW_A” are approximately 9 and 0 respectively. These values indicate the Thermocouple’s Card’s calibration and performance.
- If Thermocouples are used, observe that the temperatures reported by “Thermo1F100_A” and “Thermo1F101_A” variables are approximately the same as the CJC temperature variable “Thermo1FSEN_A”. If shorts are used, observe that the temperatures reported are approximately zero.
- Force the value of “Thermo1BE00_A” and “Thermo1BE01_A” to **True** to enable OTD testing on the two channels. (Move the cursor over the object’s output indicator and click the left mouse button, select **True**, select **Yes** for “Do you want to force?”.) “The Thermo1IE_A” and “Thermo1IOTD_A” variables should remain at **0**. Observe for at least one complete OTD cycle (> 3 minutes).

Thermocouple Card Configuration Examples

- Remove the protective cover from the 3099/03 Thermocouple Triple Termination Module. Disconnect the Thermocouple (or short from the High to Low terminals) for Channel 0 from the 3099/03 Thermocouple Triple Termination Module to simulate an open thermocouple. Within 2 minutes the “Thermo1IOTD_A” integer bit variable will change to a **1** and the “Thermo1_Ch0_OTDF” variable will change to **True** when Channel 0 fails the OTD test. Do the same for the thermocouple (or short from the High to Low terminals) attached to Channel 1. Within 3 minutes the “Thermo1IOTD_A” integer bit variable will change to a **3** and the “Thermo1_Ch1_OTDF” variable will change to **True** indicating that Channel 1 failed the OTD test. Replacing the thermocouple connections (or shorts from the High to Low terminals) will clear the OTD error indications during the next test cycle (< 3 minutes).
- Replace the protective cover on the 3099/03 Thermocouple Triple Termination Module.

Congratulations! You have successfully completed the configuration of a Thermocouple card.

Additional Notes

The 3099/03 Thermocouple Triple Termination Module contains brass terminals inserted into an aluminum plate that is enclosed in an insulated aluminum cover. This provides uniform temperature reference point for the thermocouple wiring terminations.