
Honeywell

PlantScape Controller Implementation

Lesson 3

Configuring Digital and Analog IOMs

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Notes

Introduction

The purpose of this Lesson is to familiarize you with the different IOMs that are available. You will learn how to configure Analog and Digital IOMs. After completing this Lesson you will be able to Configure IOMs in Control Builder.

Objectives

- ❶ Understand I/O naming and configuration
- ❷ Understand IOM location configuration: IOM Slot Number, Uplink CNI MAC Address, and Downlink CNI Slot Number.
- ❸ Configure 2 Digital and 2 Analog IOMs in Control Builder
- ❹ Configure any additional IOMs as required

NOTE: The hardware configuration labs must be done as a team since there is one controller per student team. From this point onward the # sign is to be replaced with the student team number.



-
- The screenshot shows the 'Control Builder - Library' window. The 'I/O Modules' list is expanded, showing a hierarchy of modules. The 'RAIL_IO_HAZ' module is selected, and its sub-modules are listed: TC-PIA081, TC-PIB161, TC-PIL081, TC-POA081, and TC-POB041. The 'PULSEINPUT' module is also visible, with sub-modules: PICFASCTOUFF, PICHANNEL, PITOTALIZER, and TC-MDP081. The 'TC-PIA081' module is highlighted in blue.
- | Module Name | Description |
|--------------|--|
| TC-PIA081 | 1757-CN2FF - FieldBus Linking Device |
| TC-PIB161 | TC-IAH161 - Analog Input, 16 ch, 10V / 4-20 mA |
| TC-PIL081 | TC-IAH061 - Analog Input, 6 ch, 10V / 4-20 mA, Isolated |
| TC-POA081 | TC-IR061 - Analog Input, 6 ch, RTD |
| TC-POB041 | TC-IL061 - Analog Input, 6 ch, Thermocouple (TC/mV) |
| PULSEINPUT | TC-OAV061 - Analog Output, 6 ch, 10V, Isolated |
| PICFASCTOUFF | TC-OAH061 - Analog Output, 6 ch, 4-20 mA, Isolated |
| PICHANNEL | TC-OAV081 - Analog Output, 8 ch, 10V / 4-20 mA |
| PITOTALIZER | TC-IDA161 - Digital Input, 16 ch, 120V AC |
| TC-MDP081 | TC-IDK161 - Digital Input, 16 ch, 120V AC, Isolated |
| | TC-IDW161 - Digital Input, 16 ch, 15V-265V AC, Isolated |
| | TC-IDX161 - Digital Input, 16 ch, 24V DC, Diagnostic |
| | TC-IDJ161 - Digital Input, 16 ch, 24V DC, Isolated |
| | TC-IDD321 - Digital Input, 32 ch, 24V DC |
| | TC-IDX081 - Digital Input, 8 ch, 120V AC, Diagnostic |
| | TC-ODA161 - Digital Output, 16 ch, 120/220V AC |
| | TC-ODK161 - Digital Output, 16 ch, 120/220V AC, Isolated |
| | TC-ODX161 - Digital Output, 16 ch, 24V DC, Diagnostic |
| | TC-ODJ161 - Digital Output, 16 ch, 24V DC, Isolated |
| | TC-ODD321 - Digital Output, 32 ch, 24V DC |
| | TC-ODX081 - Digital Output, 8 ch, 120V AC, Diagnostic |
| | TC-MUX021 - Serial Interface, 32 ch |
| | TC-MDP081 - Pulse Input, 8 Channel in, 2 out |
| | TC-PIA081 - Analog Input, 8 ch, Haz 1, Classic |
| | TC-POA081 - Analog Output, 8 ch, Haz 1, Classic |
| | TC-PIB161 - Digital Input, 16 ch, Haz 1, Classic |
| | TC-POB041 - Digital Output, 4 ch, Haz 1, Classic |
| | TC-PIL081 - Temperature Input, 8 ch, Haz 1, Classic |

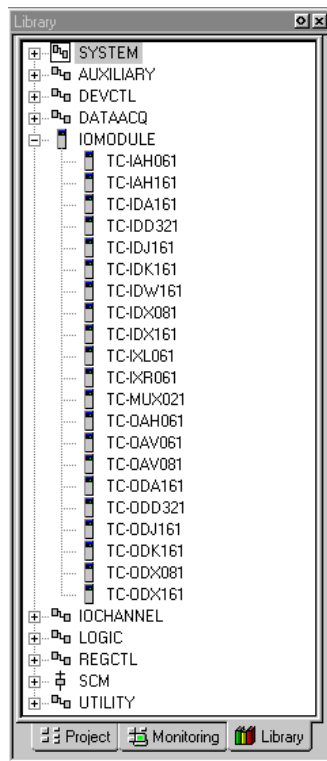
Notes

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Methods of Selecting the Proper IOM ... Continued

- Library Method



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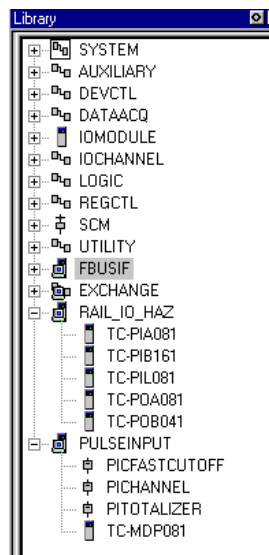
Notes

IOM Function Block	Channels	Type	Rating	Isolated
TC-IXL061	6	Thermocouple In	Low Level mV	No
TC-ODX081	8	Diagnostic Output	120 Vac	Yes
TC-ODA161	16	Digital Output	120/220 Vac	No
TC-ODK161	16	Digital Output	120/220 Vac	Yes
TC-ODX161	16	Diagnostic Output	24 Vdc	Yes
TC-ODD321	32	Digital Output	24 Vdc	No
TC-ODJ161	16	Digital Output	24 Vdc	Yes
TC-OAH061	6	Analog Output	4 to 20 mA	Yes
TC-OAV061	6	Analog Output	10 V	Yes
TC-OAV081	8	Analog Output	10 V and 4 to 20 mA	No
TC-MUX021	32	Serial Interface Module		

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Methods of Selecting the Proper IOM ... *Continued*

- Library Method, continued



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Notes

IOM Function Block	Channels	Type	Rating	Isolated
TC-MDP081	8	Pulse Input	5 to 24 V	Yes
TC-PIA081	8	Analog Input	Haz. 1	Yes*
TC-POA081	8	Analog Output	Haz. 1	Yes*
TC-PIB161	16	Digital Input	Haz. 1	Yes*
TC-POB041	4	Digital Output	Haz. 1	Yes*
TC-PIL081	8	Temp. Input	Haz. 1	Yes*

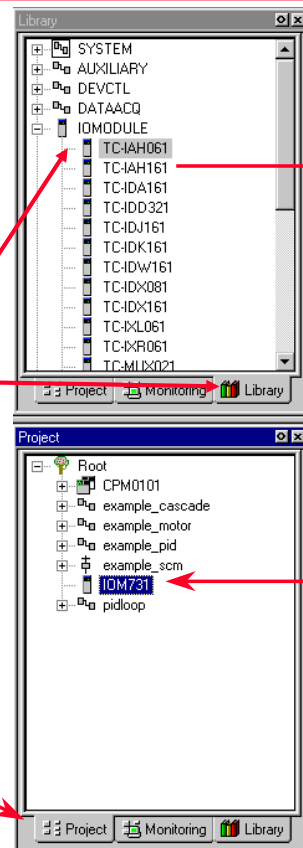
* Galvanic isolation (per DIN EN 50 020) for input / backplane bus and input / power supply.
 There is no galvanic isolation for the inputs relative to each other.

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Creating I/O Modules

➤ Creating an analog input module

- Set up Control Builder so that two Tree Views are visible
- Click the **Library** tab in the upper tree view of Control Builder and expand the **IOMODULE** Library
- Drag and Drop the I/O Module **TC-IAH061** from the IOMODULE Library to the project in the **Project** View



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Notes

Overview

When you build your control strategy later in this training, you will need to configure the four simulator Input/Output Modules (IOMs), two input's (1 Digital, 1 Analog) and two outputs (1 Digital, 1 Analog).

- Analog Input: TC-IAH061 Digital Input: TC-IDJ161
- Analog Output: TC-OAH061 Digital Output: TC-ODJ161



The number that appears after any object in Control Builder is only a reference created by the Control Library to ensure name uniqueness and has no other significance. In the example above an I/O module was created resulting in a device named IOM731. The number 731 has no significance other than a reference for Control Builder.



For more information on how to create an IOM, refer to *Control Building Guide, Hardware Module Creation, Creating an Instance of Input/Output Modules*.



➤ **Naming an analog input module**

- Double-click the newly created IOM in the **Project** tab to display its Parameters configuration form
- Enter the following information in the appropriate fields on the **Main** tab:
 - Module Name **AI_IOM_01**
 - Module Description **Test Strategy AI Module**

IOMODULE: TC-IAH061 Block, AI_IOM_01 - Parameters [Project]

Main | Module Configuration | Channel Configuration | Server Parameters

Module Name: AI_IOM_01

Module Description: Test Strategy AI Module

☐ I/O Module Information

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Notes

Naming an analog input module

The module name should reflect the type of module you are using and its location. This will make tracking easier in the future when you add more modules to your system. We have chosen **AI_IOM_01**. This stands for Analog Input _ Input Output Module _ Module Number 1.



Your form should look like the form in this slide, except that your I/O Rack Address section may be different.

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➤ Configuring I/O addresses ...continued

- I/O modules may reside in either controller or remote (I/O) chassis
- Three (3) addresses (fields on the modules Parameters Window) may be associated with each I/O module:
 - IOM Slot Number
 - Remote IO Chassis MAC Address
 - CNI Slot Number (connected to chassis)
- I/O modules in a controller chassis need only the IOM Slot Number field completed

- In the **IOM Slot Number** field, enter the physical slot number of the I/O module being configured

- Enter 0 for the **Remote IO Chassis MAC Address** and the **CNI Slot Number**

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Notes

Configuring I/O rack addresses

The I/O Rack Address is made up of three numbers that are described in the table below.

I/O Rack Addresses	Description
IOM Slot Number	Number of the slot where the IOM resides in whatever rack it is in.
Remote IO Chassis MAC Address	MAC address of the CNI card in the remote rack where the IOM resides. This is zero for local IOMs.
CNI Slot Number (connected to IO chassis)	Slot location of the CNI card in the control rack that the IO module communicates with. This is zero for local IOMs.

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➤ Configuring I/O addresses ...continued

- I/O modules in a remote chassis need all three fields completed.

- In the **IOM Slot Number** field, enter the physical slot number of the I/O module being configured.
- In the **Remote IO Chassis MAC Address** field, enter the MAC address of the Uplink CNI which resides in the chassis being configured.
- In the **CNI Slot Number** field, enter the Physical slot number of the downlink CNI which resides in controller chassis and communicates with the I/O module.

IO Rack Addresses

IOM Slot Number
8

Remote IO Chassis MAC Address
5

CNI Slot Number
(connected to IO Chassis)
3

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Notes



For more information on how to configure an IOM, refer to *Control Building Guide, Hardware Module Creation, Configuring the I/O Module*.



In this course the modules are in the primary chassis therefore we will not need to specify numbers for “**Remote IO MAC Address**” and “**CNI Slot Number**”. Putting a 0 in the fields lets the system know we are only using this chassis.



➤ **Configuring analog input module channels**

- Click the **Channel Configuration** tab of the IOM Parameters configuration form
- Enter the following data on the Channel Configuration page for Channel Zero
 - Input Range **4mA to 20mA**
 - Notch Filter **60Hz**
 - Calibration Bias **0.0**
 - High Engineering **5000.0**
 - Low Engineering **0.0**
 - Digital Filter **0**

	Input Range	Notch Filter	Calibration Bias	Digital Filter (Low Engineering	High Engineering (I)
0	4MA_TO_20MA	60HZ	0	0	0	5000
1						
2						
3						
4						
5						

Digital Filter: Valid values are 0 (disabled) or a value greater than (2 x Sample Rate).

☐ Show Parameter Names

OK Cancel Help

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Notes

Configuring analog input module channels



Engineering units can be established in one of two ways: 1) in the IOM configuration; and 2) in the Data Acquisition Block of the Control Module (CM) using the input.

If you configure the low and high range in the IOM, as we do here, you will enter ranges in your (CM) that correspond to the IOM settings.

If you configure the range in the CM, you leave the IOM settings 0 and 100. You use the Characterization function in the Data Acquisition block to establish engineering units.

When configuring channels as described above, you are actually configuring only Channel 0, the first input on your AI IOM. For the other channels:

- each channel may be configured individually
- the settings for one channel may be copied to all others

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➤ Configuring analog input module channels ...continued

- Copy Channel Data to the remaining Channels. Click on the 0, located on the left column of the form. When the selection is highlighted, copy the selection using the **CTRL - C** on your keyboard.

	Input Range	Notch Filter	Calibration Bias	Digital Filter	Low Engineering	High Engineering (I)
0	4MA_TO_20MA	60HZ	0	0	0	5000
2						
3						
4						
5						

- Select the 1 on the left column of the form.

	Input Range	Notch Filter	Calibration Bias	Digital Filter	Low Engineering	High Engineering (I)
0	4MA_TO_20MA	60HZ	0	0	0	5000
1						
2						
3						
4						
5						

- Paste the copied selection by selecting **CTRL - V** on your keyboard. Repeat this for the remaining Channels.

	Input Range	Notch Filter	Calibration Bias	Digital Filter	Low Engineering	High Engineering (I)
0	4MA_TO_20MA	60HZ	0	0	0	5000
1	4MA_TO_20MA	60HZ	0	0	0	5000
2						
3						
4						
5						

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Notes



It is possible to configure a different set of ranges, etc., for each channel on your AI module. However, for this tutorial, we elected to just copy the configuration of the first channel to the others.

After completing Step 4, your IOM now appears in the **Project** tab by name (AI_IOM_01). It is not associated with the CEE, but will be after you assign it later in this lesson.



➤ **Creating an analog output module**

- Set up Control Builder so that two Tree Views are visible
- Click the **Library** tab in the upper tree view of Control Builder and expand the IOM Library
- Click the **Project** tab in the lower tree view of Control Builder
- Drag and Drop the I/O Module **TC-OAH061** from the IOM Library to the project in the Project View

➤ **Naming an analog output module**

- Double-click the newly created IOM in the **Project** tab
- Enter the following information in the Main Tab of the Parameters Window:
 - Module Name **AO_IOM_01**
 - Module Description **Test Strategy AO Module**

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Notes

Creating analog output modules



The procedures and displays for creating an analog output module are very similar to those of the analog input module. Therefore, some of the details have been left out of these activities.



Refer to the preceding Naming, Configuring Addresses, and Configuring Channels topics for analog input modules if you need to review these details.



➤ **Configuring I/O addresses**

- Enter the I/O rack address information for the analog output module, including (as necessary):
 - IOM Slot Number
 - Remote IO Chassis MAC Address
 - CNI Slot Number

➤ **Configuring analog output module channels**

- Click the **Channel Configuration** tab
- Enter the following data on the Channel Configuration page, for Channel 0.
 - Calibration Bias **0**
- Click **OK**

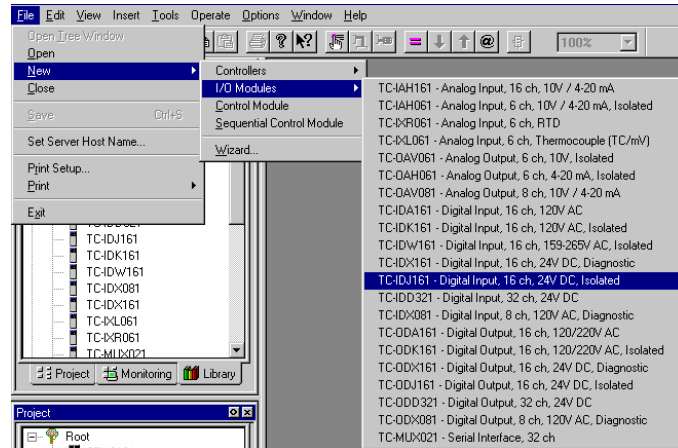
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Notes



➤ Creating a digital input module

- Click
 - **File**
 - **New**
 - **I / O Modules**
- Select the I/O Module **TC-IDJ161** from the IOM list



➤ Naming a digital input module

- Having used the **File > New** method to create your new I/O Module it should be open to the Main Tab
- Enter the following information:
 - Module Name **DI_IOM_01**
 - Module Description **Test Strategy DI Module**

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Notes

Creating digital input modules



The procedures and displays for creating a digital input module are similar to those of the analog input module. Therefore, some of the details have been eliminated from these activities.



For more information on how to configure a digital input module, refer to *Control Building Guide, Hardware Module Creation, Configuring the Digital I/O Module*.



➤ **Configuring I/O addresses**

- Enter the I/O rack address information for the digital input module, including (as necessary):
 - IOM Slot Number
 - Remote IO Chassis MAC Address
 - CNI Slot Number

➤ **Configuring Digital input module channels**

- Click the **Module Configuration** tab
- On this screen you will have 4 drop down selection tabs
 - **1 ms Filtering Delay** should be selected for all 4 drop down menus
- Click **OK**

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Notes



➤ **Creating an digital output module**

- Click
 - **File**
 - **New**
 - **I / O Modules**
- Select the I/O Module **TC-ODJ161** from the IOM list

TC-ODX161 - Digital Output, 16 ch, 24V DC, Diagnostic
TC-ODJ161 - Digital Output, 16 ch, 24V DC, Isolated
TC-ODD321 - Digital Output, 32 ch, 24V DC

➤ **Naming an digital input module**

- Having used the **File > New** method to create your new I/O Module it should be open to the Main Tab
- Enter the following information:
 - Module Name **DO_IOM_01**
 - Module Description **Test Strategy DO Module**

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Notes

Creating digital output modules



The procedures and displays for creating a digital output module are similar to those of the analog output module. Therefore, some of the details have been eliminated from these activities.



For more information on how to configure a digital output module, refer to *Control Building Guide, Hardware Module Creation, Configuring the Digital I/O Module*.



➤ **Configuring I/O addresses**

- Enter the I/O rack address information for a digital output module, including (as necessary):
 - IOM Slot Number
 - Remote IO Chassis MAC Address
 - CNI Slot Number

- Click **OK**

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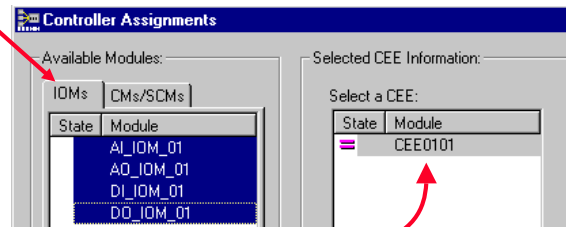
Notes



➤ Assigning IOMs to the CEE

- From the Control Builder Tools menu, click **Assign** to display the Controller Assignments screen
- Locate the Available Modules section on the left side of the window and Click the tab labeled IOMs
- Locate the destination CEE

– CEE0101



If...

your system has multiple
controllers...

you only have one IOM ...

Then...

click the destination CEE from the window
section labeled **Select CEE**.

it will be selected by default.

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Notes

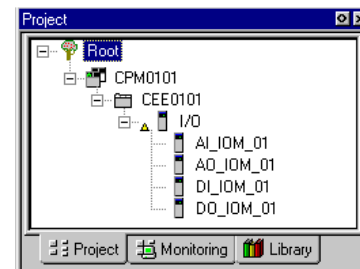
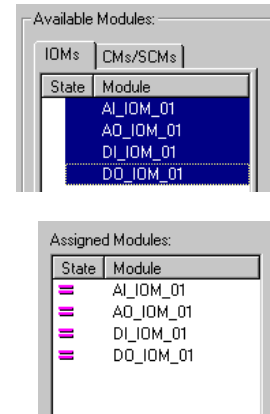
Assigning IOMs and CMs to the CEE

Before you can load your IOMs to the CEE they must be Assigned.

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➤ Assigning IOMs to the CEE

- In the **IOMs** tab:
- Hold down the <CTRL> key and click on
AI_IOM_01
AO_IOM_01
DI_IOM_01
DO_IOM_01
- Select the destination CEE
- Click **Assign** in the center of the window and after a few seconds, your IOMs will appear in the section of the window labeled **Assign Modules**
- Click **Close** and observe that your IOMs appear in the **Project** tab under and connected to your CEE



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Notes

Please note the following with regards to **Assigning**:

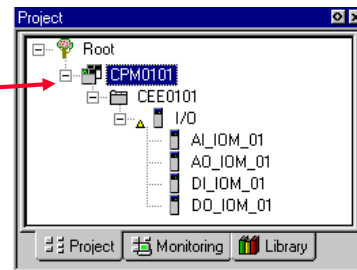
- On the toolbar you will find a purple “=” sign. This button can be used to call up the assignment menu.
- If the object you wish to assign is open for editing, the Assign function will return an error. Close the open CM drawing and repeat the Assign.

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Loading the Controller, CEE, and IOMs

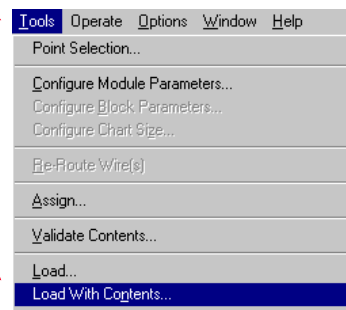
- In the **Project** tab in Control Builder:

- Left click on **CPM0101**



- Click the **Tools** Menu

- Click **Load With Contents**
 - This will load your CPM and everything in its assigned database
- Click **Continue** to load your CPM (If you get an error dialog box concerning “areas undefined” select **continue**. Select **Close** when the resulting error box appears at load conclusion.)



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Notes

Loading



There are two commands on the Tool menu that may be used to load objects to your CPM: **Load**, and **Load With Contents**. The Load command loads the selected objects to your CPM. The Load With Contents command loads all objects assigned to the CPM (that is, CEE, IOMs and CM).

Upon selecting **Load** or **Load with Contents**, a message box will appear which will tell you what objects will load as a result of the command.

Once you select “Yes,” the load begins. Time for loading is dependent on the number of objects to load.

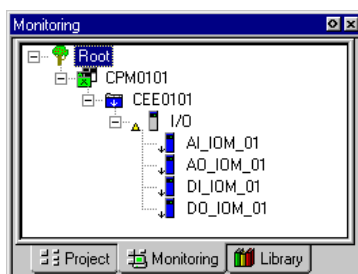
If there are any errors, a message box will appear to give you details of the problem(s). You will have a choice to continue the load, or, to abort, fix the problem, and then load.

Once the load is complete, all of the loaded objects appear in the **Monitoring** Tab.

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Loading ...continued

- Click **Monitoring** to go to the Monitoring (loaded) tab



Exercise*

Project vs. Monitoring

- 1 Toggle back and forth between Project and Monitoring views and observe their contents.
- 2 What's different about them?
- 3 What do you think that means?

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Notes

*Exercise

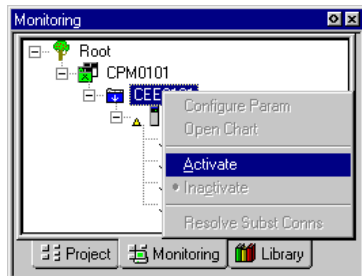
- Green** the object is running or active
- Blue** the object is not running, or inactive



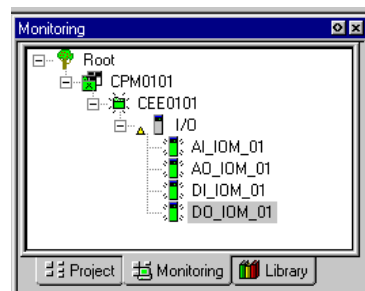
Activating a Control Strategy

- From the **Monitoring** tab of Control Builder, expand the CPM and click on **CEE0101**
 - Right-click on **CEE0101**
- Repeat Steps 1 through 4 to activate your:
- IOMs

- **AI_IOM_01**
- **AO_IOM_01**
- **DI_IOM_01**
- **DO_IOM_01**



- Click **Activate**
- Click **Yes** to activate the selected item



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Notes

Activating a Control Strategy

Once you have configured and loaded a control strategy you can activate it.

The same procedure used to activate the CEE can be used to activate IOMs and CMs. You will not normally inactivate or “shut down” your CEE.



For more information about loading and activating a control strategy refer to *Control Building Guide, Control Strategy Loading*.



Once you activate the CEE, it turns green in the **Monitoring** tab. Remember that the CEE must be active for anything assigned to the CEE to work. So, even if a CM is active, it won't do anything unless the CEE is also active.



➤ **Monitoring Hardware from Station**

- Build Group #1 to include your controller, CEE, and IOMs

Group Configuration

Group #1	Hardware
Slot 1:	CPM0101
Slot 2:	CEE0101
Slot 3:	DI_IOM_01
Slot 4:	DO_IOM_01
Slot 5:	AO_IOM_01
Slot 6:	AI_IOM_01
Slot 7:	Empty
Slot 8:	Empty

- Note that you can activate the objects from Station as well as Control Builder

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Notes



➤ **Configure Additional IOMs**

- Add all remaining IOMs, following the same naming convention. For example, a second DO module would be named DO_IOM_02.
 - See your course manager for details.

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Notes

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This completes....

PlantScape Controller Implementation

Lesson 3

Configuring Digital and Analog IOM's

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Notes
