Honeywell

Experion PKS
SIM-C200E Implementation Guide

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Contents

1 About This Document

Provides information about simulating your C200/C200E Controller control strategy with or without Honeywell's Shadow Plant simulator application.

Revision history

Revision	Date	Description
A	February 2015	Initial release of document.

2 Introduction

Related topics

“Overview” on page 8
“Getting Started” on page 12
“Conventions” on page 13
“Functional Overview” on page 14

2.1 Overview

The SIM-C200E controller is used with SIMIOLIM to simulate C200E and IOLIM, while the Shadow Plant application interfaces to the Experion Server. The SIM-C200E provides the ability to simulate configured control strategies for training and testing purposes using the Shadow Plant simulator.

The SIM-C200E also supports the ability to run its own simulation to checkout your existing system without using the Shadow Plant application.

Note: The C200E Controller is an enhanced C200 Controller with additional user memory and an enhanced function block set. The C200E Controller provides increased user memory from 4 MB to 16 MB.

Attention

The Experion R200 release SIM-C200 consists of the SCE (Simulation Control Environment) block and its associated CEESCE (Control Execution Environment) block.

In later Experion releases, the SIM-C200 blocks have been renamed as follows:

- **SCE** is now named **SIM_C200**
- **CEESCE** is now named **CEESIMC200FB**

Be aware that this document still uses the legacy name references **SCE** and **CEESCE**, respectively. While the names have changed, the functionality is the same.

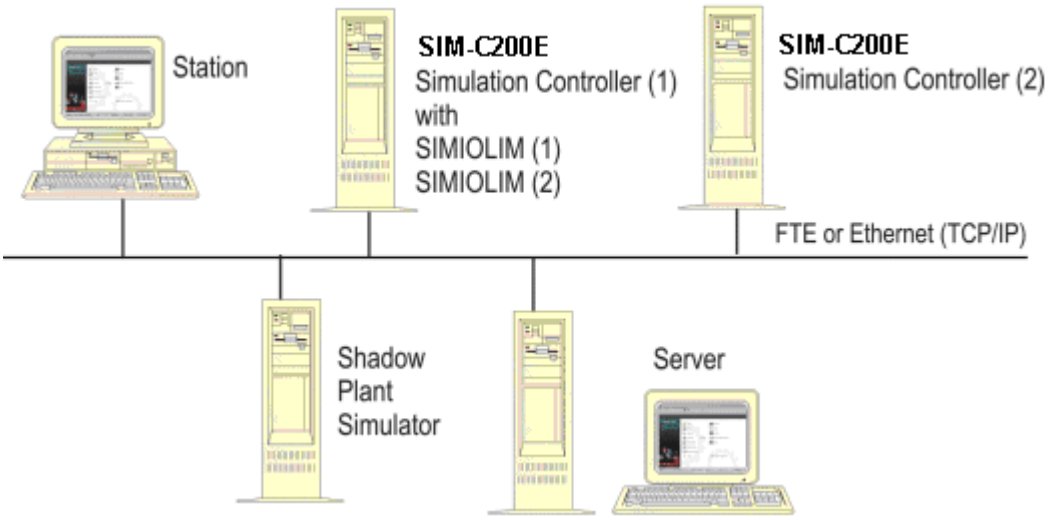
2.1.1 System Architecture

Shadow Plant simulation

The following figure shows how SIM-C200E and Shadow Plant applications typically integrate to provide standalone simulation architecture. The SIM-C200E is designed to emulate the same Control Execution Environment (CEE) functions found in the Control Processor Module (CPM) of the Hybrid Controller to provide high fidelity simulation of control strategies. It requires the same system Server and operator Station support as the other system controllers. The components are connected through the Fault Tolerant Ethernet (FTE) or Ethernet network.

Attention

- You can connect the SIM-C200E to the ControlNet, but the infrastructure prevents on-process nodes from using data from it. SIM-C200E can use data from on-process or other simulation nodes.
- The SIM-C200E does not support controller redundancy for operator training purposes.
- The SIM-C200E can be used with redundant servers.

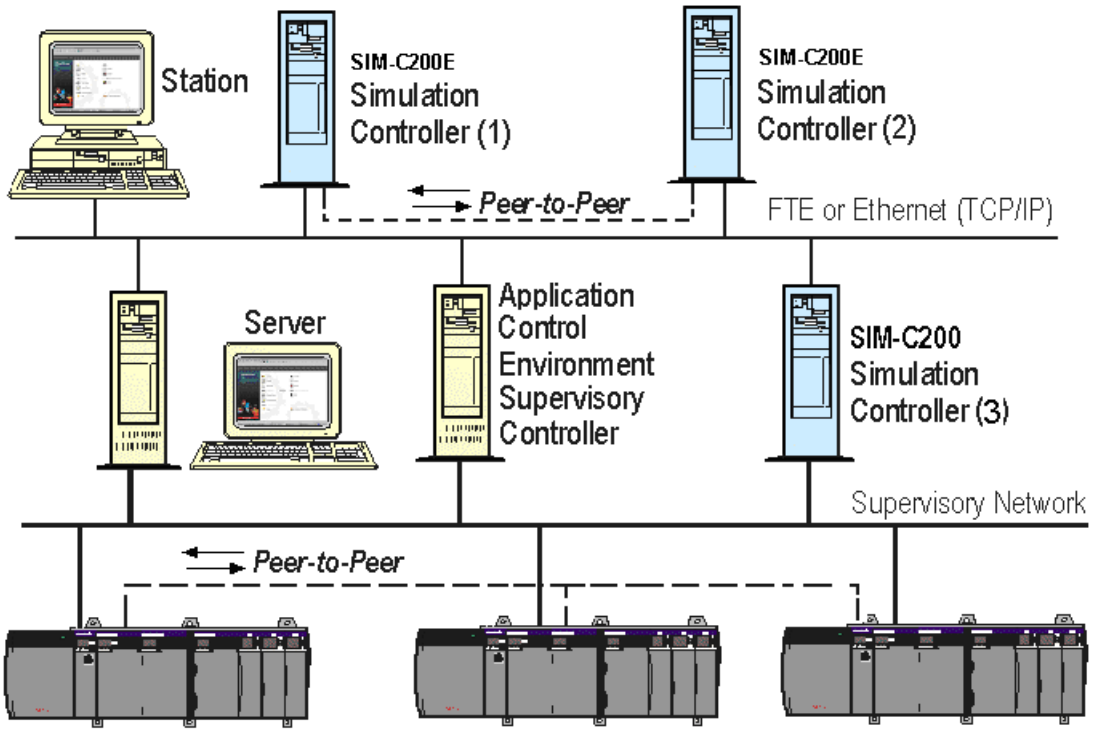


SIM-C200E controller simulation

The following figure shows how the SIM-C200E can interact with an Experion system to provide a quick checkout or low fidelity simulation architecture. The SIM-C200E is designed to emulate the same Control Execution Environment (CEE) functions found in the Control Processor Module (CPM) of the Hybrid Controller so it can provide simulation of an existing system without loading it to an on-process controller. It requires the same system Server and operator Station support as the other system controllers. The components are connected through the Fault Tolerant Ethernet (FTE) or Ethernet network.

Attention

Peer-to-peer communications are allowed between the SIM-C200E controller and other on-process control hardware such as C200 CPM, Fieldbus Interface Module (FIM), I/O Link Interface Module, and Application Control Environment (ACE) supervisory controller. But on-process modules will get failsafe data from the SIM-C200E.



2.1.2 Shadow Plant integration basics

The following characteristics define the basis for the SIM-C200E to Shadow Plant integration.

- The Shadow Plant simulator is a Control Data Access (CDA) client that uses parameter reads and writes through the CDA server to communicate with the Simulation Control Environment.
- The Shadow Plant simulator does not command a conventional 'snapshot '. It commands a dynamic state save/restore that gives the ability to save and restore an exact state of the C200/C200E at any given point of time.
- The Shadow Plant simulator is a client of the system Server to gather data related to operator actions, alarms, and events.

2.1.3 SIM-C200E controller simulation basics

The following characteristics define the basis for the SIM-C200E controller simulation as a standalone environment.

- SIM-C200E controller Redundancy is not supported for operator training purposes.
- Non-Simulation environments never consume data from the Simulation environments.
- The SIMSTATE parameter on all tagged blocks including CEE, indicates whether the block is executing in a simulation environment or not. If not in simulation, its value will be SIMNONE.
- SIM-C200E can now be used 'standalone ', independent of Shadow Plant, for strategy checkout, simulation and testing.

2.1.4 Difference between C200/C200E and SIM-C200E

The following is a list of functionality that differs between the C200/C200E Controller and the SIM-C200E.

- SIM-C200E cannot generate any of the soft failures.

- The values of the parameters such as MAXSTACK and CPUFREE cannot be computed on the SIM-C200E. These values always remain at default, typically 0.
- Statistics, failure indications, and other viewable parameters on IO modules/channels loaded to SIM-C200E cannot be computed. These values always remain at default.

2.1.5 About Input/Output Simulation

For Shadow Plant simulation

The Shadow Plant simulator can read and write output and input data associated with configured Chassis Series A type I/O modules, Rail Series A type I/O modules, Rail Series H type I/O modules, and PM I/O Input/Output Processors (IOPs).

You configure Chassis Series A, Rail Series A, and Rail Series H type I/O modules as you normally would for any control strategy in Control Builder. The Shadow Plant simulator only writes process values to the input channel blocks and reads values from the output channel blocks. It has no interest in how the I/O channels interact with I/O modules or how the I/O modules interact with the I/O Manager.

To simulate PM I/O, a new Simulation I/O Link Interface Module (SIMIOLIM) block including an associated Simulation I/O Link block is included in the Control Builder library. You configure I/O Processors as you normally would but you assign them to the SIMIOLIM/SIMIOLINK instead of an IOLIM/IOLINK block. In this case, there is no communication over the actual I/O Link, since it does not exist.

While full simulation of Chassis Series A HART I/O module types is not supported, you can use analog values to check out a strategy within the following guidelines.

- You **cannot** load the HART IOM.
- You can use SIMVALUE and SIMMODE/FETCHHMODE parameters to simulate analog values sufficient for strategy checkout.
- You **cannot** simulate the digital component for HART communications, since it is not supported.

While full simulation of HART PM I/O Processor types is not supported, you can use analog values to check out a strategy within the following guidelines.

- You **cannot** load the HART PM IOP
- You can use SIMVALUE and SIMMODE parameters to simulate analog values sufficient for strategy check out. The FETCHMODE parameter is not supported.
- You **cannot** simulate the digital component for HART communications, since it is not supported.

FETCHMODE on non-IOP input channels needs to be set to 1 so that Shadow Plant can write PV's.

For SIM-C200E controller simulation

When the SIM-C200E is not interfaced to a Shadow Plant simulator, the FETCHMODE should be set to enable writing values to output channels. The following configuration setting is required: FETCHMODE = 1 and is used to disable initialization. This is needed when SIM-C200E is to be used as a C200/C200E emulator for simple strategy checkout. FETCHMODE is not used on output channels.

2.2 Getting Started

Related topics

“Has system software been installed?” on page 12
“Has system hardware components been installed?” on page 12
“Has system communication network media been installed?” on page 12
“Have you used Control Builder to build control strategies before?” on page 12

2.2.1 Has system software been installed?

- If the answer to this question is **Yes**, go to the next question.
- If the answer to this question is **No**, please refer to the *Experion Software Installation and Upgrade Guide* to install the system software and upgrade component firmware, as required. Refer to the applicable Shadow Plant documentation to install the application and any other vendor documentation for applicable third party components.

2.2.2 Have system hardware components been installed?

If the answer to this question is **Yes**, go to the next question?

If the answer to this question is **No**, refer to the *Planning Guide* and appropriate installation guide to assist in the planning and installing of system components as well as any third-party vendor documentation.

2.2.3 Has system communication network media been installed?

If the answer to this question is **Yes**, go to the next question?

If the answer to this question is **No**, refer to the *Planning Guide* and appropriate installation guide to assist in the planning and installing of the system communication networks.

2.2.4 Have you used Control Builder to build control strategies before?

If the answer to this question is **Yes**, proceed to the next section in this guide to continue with implementing a Simulation Control Environment.

If the answer to this question is **No**, refer to the *Control Building Guide* for an introduction on how to use the Control Builder application.

2.3 Conventions

Related topics

“Terms and type representations” on page 13

2.3.1 Terms and type representations

The following table summarizes the terms and type representation conventions used in this guide.

Term/Type Representation	Meaning	Example
Click	Click left mouse button once. (Assumes cursor is positioned on object or selection.)	Click the Browse button.
Double-click	Click left mouse button twice in quick succession. (Assumes cursor is positioned on object or selection.)	Double click the Station icon.
Drag	Press and hold left mouse button while dragging cursor to new screen location and then release the button. (Assumes cursor is positioned on object or selection to be moved.)	Drag the PID function block onto the Control Drawing.
Right-click	Click right mouse button once. (Assumes cursor is positioned on object or selection.)	Right-click the AND function block.
<F1>	Keys to be pressed are shown in angle brackets.	Press <F1> to view the online Help.
<Ctrl>+<C>	Keys to be pressed together are shown with a plus sign.	Press <Ctrl>+<C> to close the window.
File->New	Shows menu selection as menu name followed by menu selection	Click File->New to start new drawing.
>D:\setup.exe<	Data to be keyed in at prompt or in an entry field.	Key in this path location >D:\setup.exe<.

2.4 Functional Overview

Related topics

2.4.1 Simulation environments

The SIM-C200E and its associated Simulation Control Environment (SCE) and Simulation Control Execution environment (CEESCE) support the following two possible simulation environments.

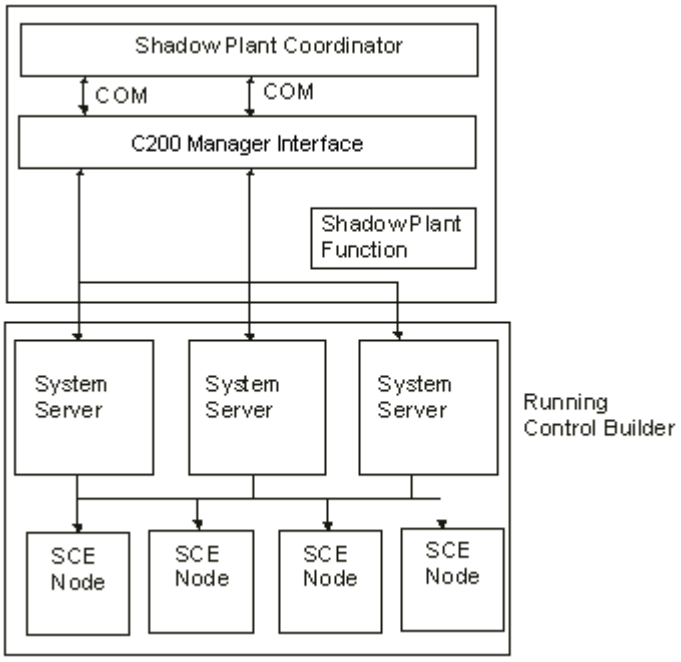
- An advanced simulation environment to integrate with Honeywell's Shadow Plant simulator.
- A Hybrid Controller emulation environment to support a standalone engineering environment and a control strategy check out function.

2.4.2 Shadow Plant interface

The Simulation Control Environment supports the following high-level functions for interface with a Shadow Plant simulator.

- Control Execution Environment (CEE) functionality on Windows 2000 system for simulation purposes.
- Control Data Access (CDA) peer-to-peer communications with other Simulation Control Environments.
- Ability to substitute the I/O Channel values with values from process simulator models.
- Initiate simulation Freeze/Unfreeze command to Simulation Control Execution Environment (SIM-C200E) through Shadow Plant simulator. This lets operators look at the state of the control algorithms at the end of a particular cycle or process engineers can check out the logic of the strategy before controlling the real process.
- Initiate Step/Multi-Step execution commands. This lets operators view the effects of running Control Modules (CMs) and/or Sequential Control Modules (SCMs) for one cycle or multiple cycles and determine the effects of the given action.
- Can not initiate Save/Restore static state snapshot through Shadow Plant.
- Initiate Save/Restore of dynamic state data snapshot through Shadow Plant. The dynamic data snapshot coupled with Shadow Plant functionality allows users to load a particular non-structural snapshot when the SIM-C200E is in the SIMFREEZE state. This lets operators replay their actions to see how the process evolved in response to given actions. This also provides the ability to Save/Restore emergency scenarios for training purposes.
- Control Builder application is common configuration tool for all Control Execution Environments and their control strategies.

The following figure is a simplified functional block diagram of the Shadow Plant simulation environment.



2.4.3 SIM-C200E controller simulation functions

Available functions are determined by, which block type and configuration form tab are open. These functions allow users with appropriate access level to view current state and initiate commands. Refer to “SCE block” on page 62 and “CEESCE block” on page 63 and “SIM-C200E block” on page 64 and “CEESIM-C200E block” on page 65 in this document.

2.4.4 Function Block support

The SIM-C200E supports the function blocks that are included in the Control Builder libraries listed in the following table, as identified in the Library tree view.

If Control Builder Library is . . .	Then, SIM-C200E Supports Included Blocks . . .
SYSTEM	**Yes**
AUXILIARY	**Yes**
DEVCTL	**Yes**
DATAACQ	**Yes**
IOMODULE	**Yes**
IOCHANNEL	**Yes**
PMIO	**Yes**
LOGIC	**Yes**
REGCTL	**Yes**
SCM	**Yes**
UCNIF	No
UTILITY	**Yes**

If Control Builder Library is . . .	Then, SIM-C200E Supports Included Blocks . . .
RAIL_IO_HAZ	**Yes**
HARTIO	No[1]
DNETIF	No
PBUSIF	No
RAIL_IO	**Yes**
FBUSIF	No
EXCHANGE	**Yes**
PULSEINPUT	No
AGA	**Yes**
ABDRIVE	No
PMIO HART	No[1]
FIELDBUS	No
[1] You can do a partial simulation using analog values only, see the previous “For Shadow Plant simulation” section for more information.	

2.4.5 Function block scheduling requirements

The SIM-C200E CEE supports the following periods for block execution and peer subscriptions.

- Base Execution Period: 50 milliseconds (fixed)
- Execution Periods for Control Modules and Sequential Control Modules:

50 milliseconds	500 milliseconds
100 milliseconds	1 second (default value)
200 milliseconds	2 seconds

- Peer Subscription Periods:

100 milliseconds	500 milliseconds (default value)
200 milliseconds	1 second

The SIM-C200E/CEE uses the same scheduling scheme as the Control Processor Module (CPM) /CEE with 40 possible phases or cycles. Each phase/cycle is a time slot of 50 milliseconds. The ORDERINCEE parameter determines when a scheduled block runs in a phase. The I/O module function blocks will execute in every cycle, since they run at 50 milliseconds.

2.4.6 SIM-C200E peer-to-peer communication guidelines

As shown in the following figure, Simulation Control Environment nodes can communicate with other SIM-C200E nodes as long as they belong to the same system Server. Observe the following guidelines when configuring multiple SIM-C200Es that use peer-to-peer communications.

Note: SIM-C200E is used for illustration purposes.

- All SIM-C200Es must belong to the same system Server or be part of the same Engineering Repository Database (ERDB) to support peer-to-peer communications between them.

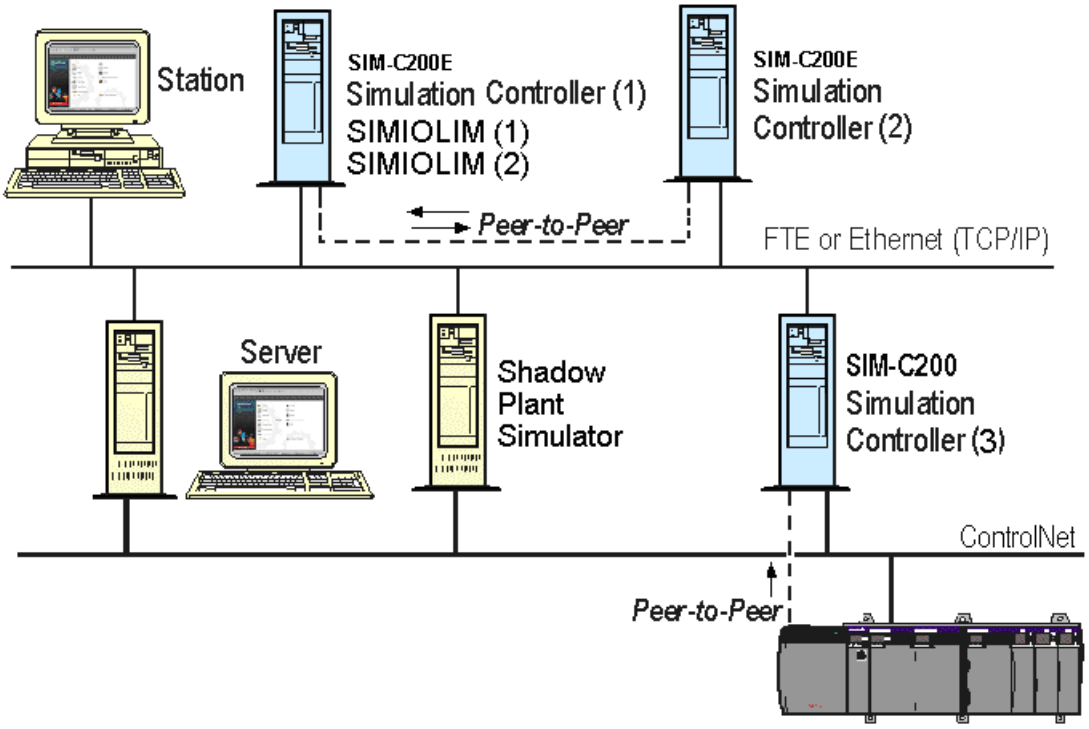
Tip
If you must communicate with a SIM-C200E associated with a different Server, you can use Distributed Server Architecture to establish communications using the server application to obtain data from one SIM-C200E node and provide it to a SIM-C200E node associated with another Server.

SIM-C200Es and SIMIOLIMs on the same node or different nodes must belong to the same system Server or be part of the same ERDB to support peer-to-peer communications between them.

- SIM-C200Es and SIMIOLIMs on the same node must be associated with the same ERDB. For example, if a given node has a SIM-C200E named SCE01 that is associated with ERDB_1, then any other SIM-C200E on this node must also be associated with ERDB_1.
- We recommend limiting the number of SIM-C200Es that are loaded on a given dual-processor node to four (or two per processor) with no more than two SIMIOLIMS per SIM-C200E. Performance may be adversely affected, if these limits are exceeded.

On-process systems can request data from SIM-C200Es, but this data is in a FAILSAFE state.

SIM-C200Es can receive data from an on-process system.



Tip
You make peer-to-peer connections the same way you would for CPM/CEE by specifying the full tag names for parameters in parameter connectors, calculation expressions, and input and output condition expressions for TRANSITIONs and STEPs in SCMs. On-Process nodes use fail-safe data, instead of what is produced by the SCE/SIMIOLIM. Refer to the functionality@kb@Implications *Peer-to-Peer Functionality* section in the Control Builder Component Theory document for more information.

2.4.7 Cycle overruns

Like the CPM and ACE, Cycle overruns occur in the SIM-C200E when the scheduled processing for a cycle does not finish by the start of the next cycle.

The CEE issues a diagnostic alarm for cycle overruns that occur on a regular basis. The conditions for reporting and clearing this alarm are summarized below based on the controller running the CEE for comparison purposes.

If Controller is . . .	CEE clears alarm if . . .	CEE reports alarm if . . .
CPM (50 ms BASEPERIOD)	two consecutive intervals of 2000 milliseconds have at least one cycle overrun.	four consecutive intervals of 2000 milliseconds have no cycle overruns.
ACE (500 ms BASEPERIOD)	two consecutive intervals of 20 seconds have at least one cycle overrun.	four consecutive intervals of 20 seconds have no cycle overruns.
SIM-C200E (50 ms BASEPERIOD)	two consecutive intervals of 2000 milliseconds have at least one cycle overrun.	four consecutive intervals of 2000 milliseconds have no cycle overruns.

Obviously, you must change a CEE configuration that causes regular overruns by reducing the total load or improving the balance of the load across the timing cycles.

2.4.8 SIM-C200E communication performance

The following table compares the performance requirements for a SIM-C200E with those for a CPM running a 5 ms or 50 ms CEE. 50ms CEESIM-C200E/SIM-C200E - connection is allowed to on-process nodes. The SIM-C200E connections count towards total allowable connections for those on-process nodes.

Attention
The CEE of the C200E Controller supports only 50 ms base execution period. Refer to the applicable CPM/CEE Specifications for the latest information.

Some of the ratings are specified in terms of the average Parameters Per Second (PPS)

Overall Communications Performance per CEE	5 ms CEE/CPM	50 ms CEE/CPM	50 ms CEESIM-C200E/SIM-C200E
Maximum Total Parameter Access Response Rate from Shadow Plant Simulator	N/A	N/A	1000 PPS
Maximum Total Parameter Access Response Rate *(Includes Shadow Plant Simulator, display, Fast/Slow History, Excel I/ODBC Exchange, and peer communications*.)	2000 PPS	2000 PPS	2000 PPS

CEE to CEE - Peer-to-Peer Communications Performance per CEE	5 ms CEE/CPM	50 ms CEE/CCPM	50 ms CEESIM-C200E/SIM-C200E
Maximum number of peer-to-peer connections to other CEE type environments (CPM, ACE, FIM)	5 to CPMs 21 to FIMs	5 to CPMs 21 to FIMs	5 from this SIM-C200E to other SIM-C200E s (Connections to CPM, ACE, and FIM are **not** allowed.)

CEE to CEE - Peer-to-Peer Communications Performance per CEE	5 ms CEE/CPM	50 ms CEE/CCPM	50 ms CEESIM-C200E/SIM-C200E
Maximum number of peer-to-peer connections as target initiated by other CEE type environments (CPM, ACE, FIM)	5 from CPMs 21 from FIMs	5 from CPMs 21 from FIMs	5 from other SIM-C200E s to this SIM-C200E (Connections to CPM, ACE, and FIM are **not** allowed.)
Maximum Initiator Node Pull/Get Request Rate - To all target nodes. *(Based on the number of requests for peer data and the peer update rate.)*	500 PPS **Or** 5 @ 10 ms 10 @ 20 ms 25 @ 50 ms 50 @ 100 ms 100 @ 200 ms 250 @ 500 ms 500 @ 1 sec	500 PPS **Or** 50 @ 100 ms 100 @ 200 ms 250 @ 500 ms 500 @ 1 sec	500 PPS **Or** 50 @ 100 ms 100 @ 200 ms 250 @ 500 ms 500 @ 1 sec
Maximum Target Node Response Rate to Pull/Get Requests - From all initiator nodes.	500 PPS	500 PPS	500 PPS
Maximum Initiator Node Push/Store Request Rate - To all target nodes. (The SCM STEP and PUSH function blocks are the only blocks that can currently initiate peer push/store requests for CEE-to-CEE peer communications.)	50 PPS	50 PPS	50 PPS
Maximum Target Node Response Rate to Push/Store Requests - From all initiator nodes.	50 PPS	50 PPS	50 PPS
CEE to PLC - Peer-to-Peer Communications Capacity per CEE	**5 ms CEE/CPM**	**50 ms CEE/CPM**	**50 ms CEESIM-C200E/SIM-C200E**
Maximum Number of REQUEST blocks per CEE/CPM	32	32	32
Maximum Number of RESPONSE blocks per CEE/CPM	32	32	32
Maximum Number of 'active' Target Devices (connections available) for REQUEST blocks per CEE/CPM.	8	8	N/A

2.4.9 CEE configuration comparisons

The following table compares the configuration options for a CEESIM-C200E in a SIM-C200E with those for a CEE in a CPM. Please note that the performance specifications for the CPM/CEE are also included in the Control Builder Component Theory document and they are only repeated here for comparison purposes.

Attention
The CEE of the C200E Controller supports only 50 ms base execution period.

Function	5 ms CEE/CPM	50 ms CEE/CPM	50 ms CEESCE/SCE
CM/SCM Execution Periods - Configurable	5, 10, 20, 50, 100 and 200 ms (Default is 200 ms)	50, 100, 200, 500, 1000, and 2000 ms (Default is 1000 ms)	50, 100, 200, 500, 1000, and 2000 ms (Default is 1000 ms)
Peer-to-Peer Update Rates (Periods) - Configurable *(Defines the period at which data is updated for all 'pull/get ' requests for peer data required by all blocks within a CEE.)*	10, 20, 50, 100, 200, 500, and 1000 ms (Default is 100 ms)	100, 200, 500 and 1000 ms (Default is 500 ms)	Values will be 100, 200, 500, 1000 ms (Default is 500 ms)
Controller Redundancy compatible	No	Yes	No
Remote I/O Supported	No	Yes	N/A
I/O Module (IOM) Execution Period	5 ms	50 ms	50 ms
Publication rate for local Digital IOMs in Controller chassis	1 ms	25 ms	N/A
Maximum number of IOMs per CEE/CPM *(Chassis plus Rail IOMs in any combination - see exceptions noted in following entries.)*	12 (In Controller chassis only. Rail I/O is not supported)	64	64
Maximum number of FIMs per CEE/CPM *(Each FIM counts as 3 IOMs in the 64 Max calculation above.)*	N/A	21	N/A
Maximum Number of Analog IOMs per CEE/CPM - including Pulse Input Modules (PIM)	12	32	32 (Excluding Pulse Input Module)
Maximum Number of Serial Interface Modules (SIM) per CEE/CPM	1	3	N/A
Maximum Number of Field Termination Assemblies (FTAs) per SIM *(Each FTA connected counts as 4 IOMs in the 64 Max calculation above and the 24 IOMs/CNI calculation below.)*	2	2	N/A
Maximum Number of remote I/O Chassis plus Rail Gateways (combined) per CEE/CPM	0 (Local I/O Only)	8	8
Maximum Number of IOMs per Downlink CNI - Rack plus Rail Modules in any combination, Except SIM and PIM as noted *(Each PIM counts as 1.5 IOMs in the 24 IOM/CNI calculation.)*	0 (Local I/O Only)	24	N/A
PM I/O Supported	No	Yes	Yes
Maximum Number of IOLIMs per CPM	N/A	2	2
Maximum Number of SCEs per Node in dual-processor pc	N/A	N/A	4
Maximum Number of Simulation IOLIMs per Node	N/A	N/A	8
Maximum Number of Downlink CNIs per Controller Chassis	0 (Local I/O Only)	4	N/A

3 Configuration

Related topics

“Simulation Blocks Creation” on page 22
“Configuring a SIM-C200E” on page 30
“Load Configured Components” on page 39
“Simulation Operations” on page 40

3.1 Simulation Blocks Creation

Related topics

“Creating a SCE and CEESCE” on page 22

3.1.1 Creating a SCE and CEESCE

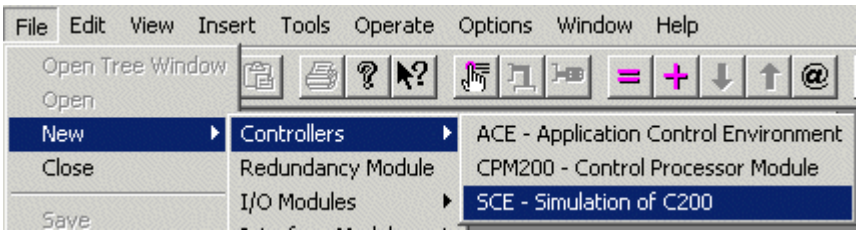
Use the following procedure to create a SIM-C200E and associated Simulation Control Environment (SCE) and Control Execution Environment (CEESCE) blocks in the Project Tree that will represent an installed SIM-C200E controller. The CEESCE supports execution of a set of Function Blocks for simulating control applications. It runs in the SIM-C200E controller as a software layer built on top of the control software infrastructure.

The following procedure assumes that Control Builder is running and two tree windows are open. All illustrations used in the procedure are for example purposes only.

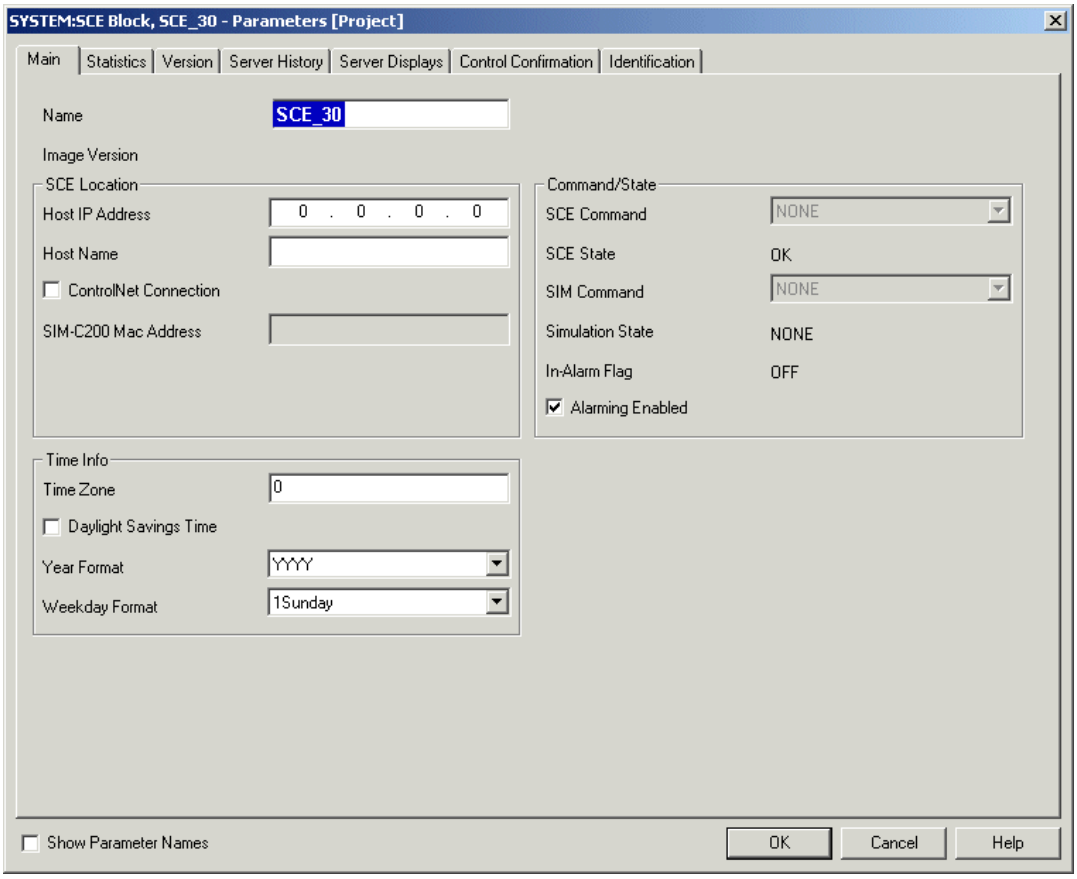
Attention

The Experion R200 release SIM-C200 consists of the SCE (Simulation Control Environment) block and its associated CEESCE (Control Execution Environment) block.

1 Click **File -** > **New -** > **Controllers -** > **SCE - Simulation of C200**.



Calls up the SCE Block configuration form with Name field highlighted.



Tip

Host name and Host IP Address are interactive entries. We recommend that you key in the Host IP Address first and let the system determine the Host Name automatically. This is especially true if you are configuring the SCE block with the SIM-C200E node offline. In this case, entering the Host IP address first generates a Warning message, but entering the Host Name first generates an error message.

When keying in an IP address, use the mouse or the left and right arrow keys to move the cursor to locations within the field. Do not press the <Tab> key until the complete address is keyed in.

2 Key in desired name of up to 16 characters or accept the default. Press <Tab>.
Moves cursor to Host IP Address field.

3 Key in the host pc IP address for the SIM-C200E node. Press <Tab>.
Or, press <Tab> to skip this field and enter Host Name instead. Acknowledge any error message prompts.

System automatically determines the Host Name, when SIM-C200E node is online, and moves cursor to Host Name field.

(Valid IP address entry results in system automatically determining the Host Name, when SIM-C200E node is online.)

4 If Host Name has been automatically determined, press <Tab>.
Or, Key in name assigned to the host pc for the SIM-C200E node. There is a 255-character limit on this field. Press <Tab>.

(Valid Host Name entry results in system automatically determining the Host IP Address, when SIM-C200E node is online.)

Moves cursor to ControlNet Connection field.

5 Leave check box checked to enable the ControlNet Connection function or click check box to clear it and disable the ControlNet Connection function.
NOTE: Box should be checked if the SIM-C200E PC has a PCIC card.

Press <Tab>.

Moves cursor to Alarming Enabled field.

6 Leave check box checked to enable the alarm function or click check box to clear it and disable the alarm function.
NOTE: Box should be checked if the SIM-C200E PC has a PCIC card.

Press <Tab>.

Moves cursor to the Time Zone field.

Tip

The time zone represents the offset value from the Greenwich Mean Time (GMT) based on your geographical location. For example, the time zone value for a CPM located in the Eastern time zone of the United States that is currently not observing daylight savings time would be -05.0 or -5. Always use the offset value that is not adjusted for daylight savings time as the entry for the Time Zone field. For example, the adjusted offset value for the Eastern time zone of the United States is -04.0, but use the unadjusted value of -5 instead.

You may want to visit the website, if you have a question about the appropriate offset value for your given location.

7 Key in the appropriate time zone offset value for the location where the SIM-C200E is installed. Press <Tab>.
Moves cursor to Daylight Savings Time check box.

8 Leave box unchecked, if Daylight Savings Time is not currently being observed at your location. Or, Check the box, if Daylight Savings time is currently being observed at your location. Press <Tab>.
Moves cursor to Year Format field.

9 Accept default or click down-arrow button and select desired format from the list. Press <Tab>.
Moves cursor to Weekday Format field.

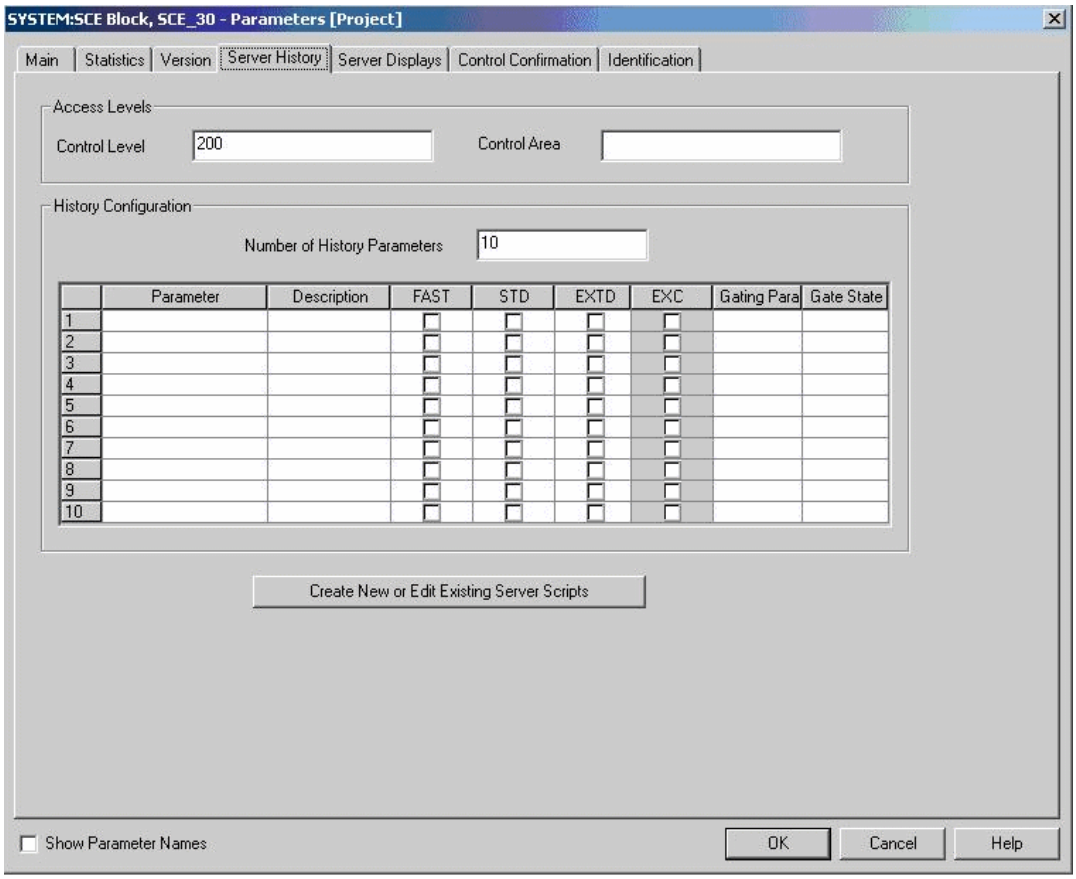
Attention

The other fields on the Main tab and those on the Statistics tab are not accessible in the Project mode.

The Version tab is only applicable, if you are using the licensed Version Control System function.

10 Accept default or click down-arrow button and select desired format from the list. Click the Server History tab.

Calls up the Server History configuration form.

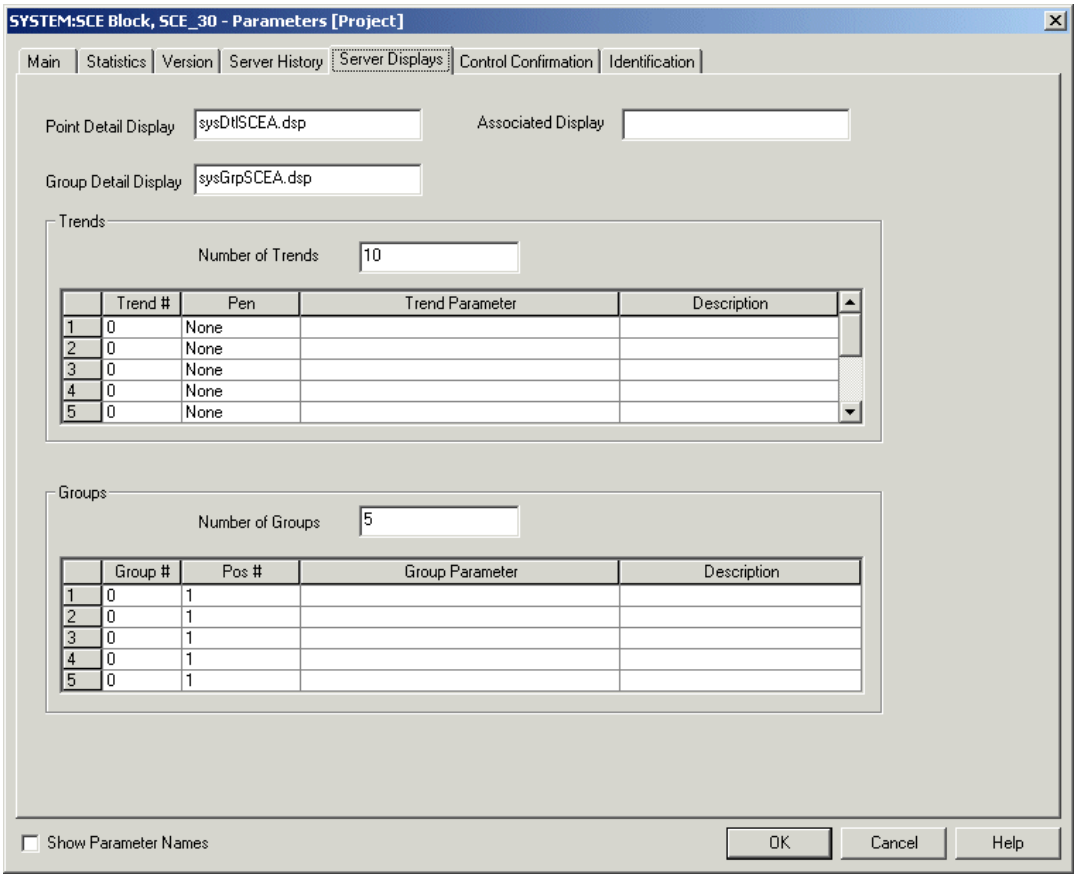


Tip

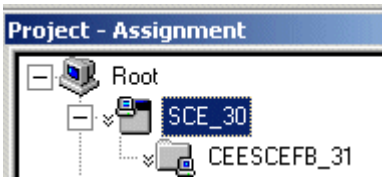
If you have a Distributed Server Architecture (DSA), you must enter the Control Area assignment for this Server. (Note that area code assignments are made through the Station application.) If you do not have a DSA, you can skip this field if areas are not enabled through the Station application.

11 Use the online help as a guide to complete the configuration entries on this tab. Click the Server Displays tab.

Calls up the Server Displays configuration form.

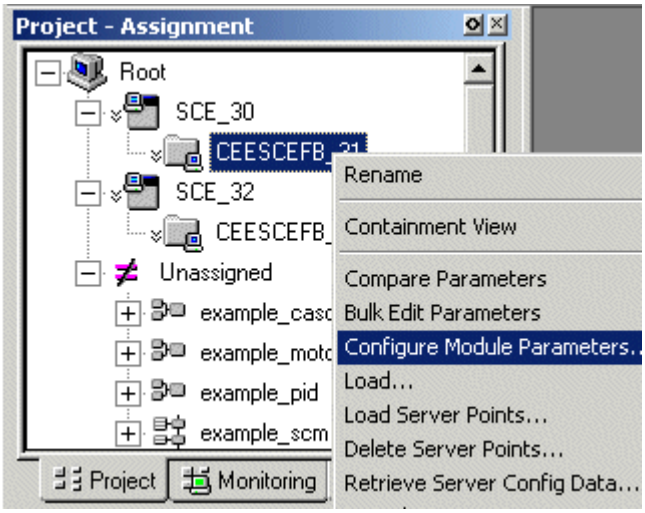


12 Use the online help as a guide to complete the configuration entries on this tab. Click the OK button.
Closes the form and creates SCE/CEESCEFB block icons in Project tab.

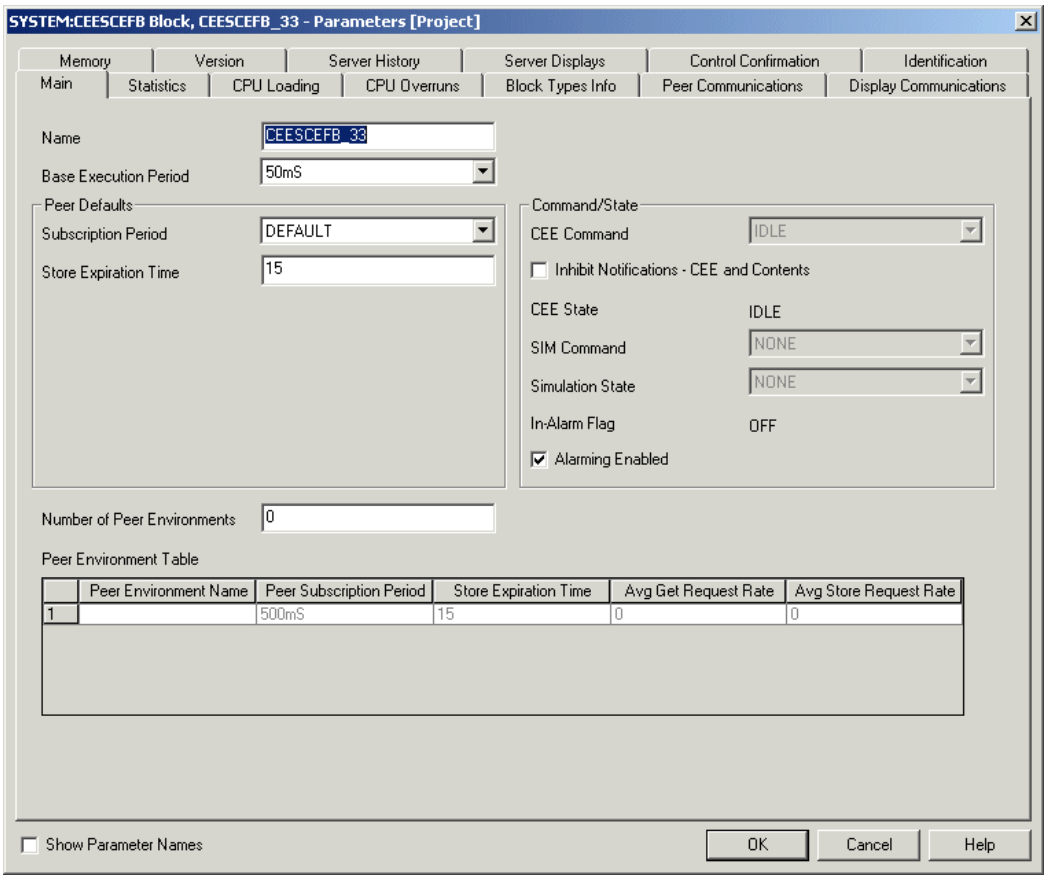


Attention
The Identification tab is only applicable, if you are using the licensed Template function. See the online help for configuration data, if required.

13 Right-click CEESCEFB block icon.
Calls up shortcut menu.



14 Click Configure Module Parameters.
Calls up CEESCEFB Block configuration form.



15 Key in desired name of up to 16 characters or accept the default. Press <Tab>.
Moves cursor to Base Execution Period field.

16 Accept the default, since the period is fixed at 50 milliseconds. Press <Tab>.
Moves cursor to Subscription Period field.

17 Accept the default or click down-arrow button and select desired period. Press <Tab>.
Moves cursor to Store Expiration Time field.

18 Accept the default or key in desired value. Press <Tab>.
Moves cursor to Inhibit Notifications - CEE and Contents.

19 Leave check box checked to Inhibit Notifications - CEE and Contents function or click check box to clear it and disable the Inhibit Notifications - CEE and Contents function. Press <Tab>.
NOTE: 'Inhibit Notifications ' when checked, prevents any alarms from the SIM-C200E from being reported. This is useful when the SIM-C200E is part of an on-process system and you want to prevent SIM-C200E notifications to be reported to the operators.

Moves cursor to Alarming Enabled field.

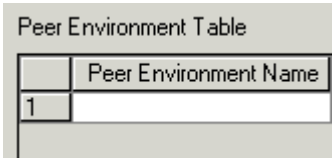
20 Leave check box checked to enable the alarm function or click check box to clear it and disable the alarm function. Press <Tab>.
NOTE: "Alarming Enabled" only affects the CEESCEFB.

Moves cursor to Number of Peer Environments field.

Tip
The Number of Peer Environments and Peer Environment Table are interactive. The value entered for the Number of Peer Environments determines how many rows appear in the Peer Environment Table.

21 Key in number of peer environments for this SIM-C200E. Press <Tab>.
Or, skip this field, if no peer environments will be used. Click Server History tab.

If peer environments will be used, cursor moves to the Peer Environment Name column in the Peer Environment Table.



22 Key in valid name for existing peer environment. Press <Tab>.
Moves cursor to Peer Subscription Period column.

23 Accept default or key in another value specific to the given environment. Press <Tab>.
Moves cursor to Store Expiration Time column.

24 Accept default or key in another value specific to the given environment. Click Server History tab.
Calls up the Server History configuration form.

25 Repeat Steps 11 and 12.
Completes CEESCE configuration and closes the form.

26 This completes the SCE/CEESCE creation procedure.

3.2 Configuring a SIM-C200E

Use the following procedure to create a SIM-C200E and Control Execution Environment (CEE) blocks in the Project Tree that will represent an installed SIM-C200E Controller. The CEE support execution of a set of Function Blocks for simulating control applications. It runs in the SIM-C200E Controller as a software layer built on top of the control software infrastructure.

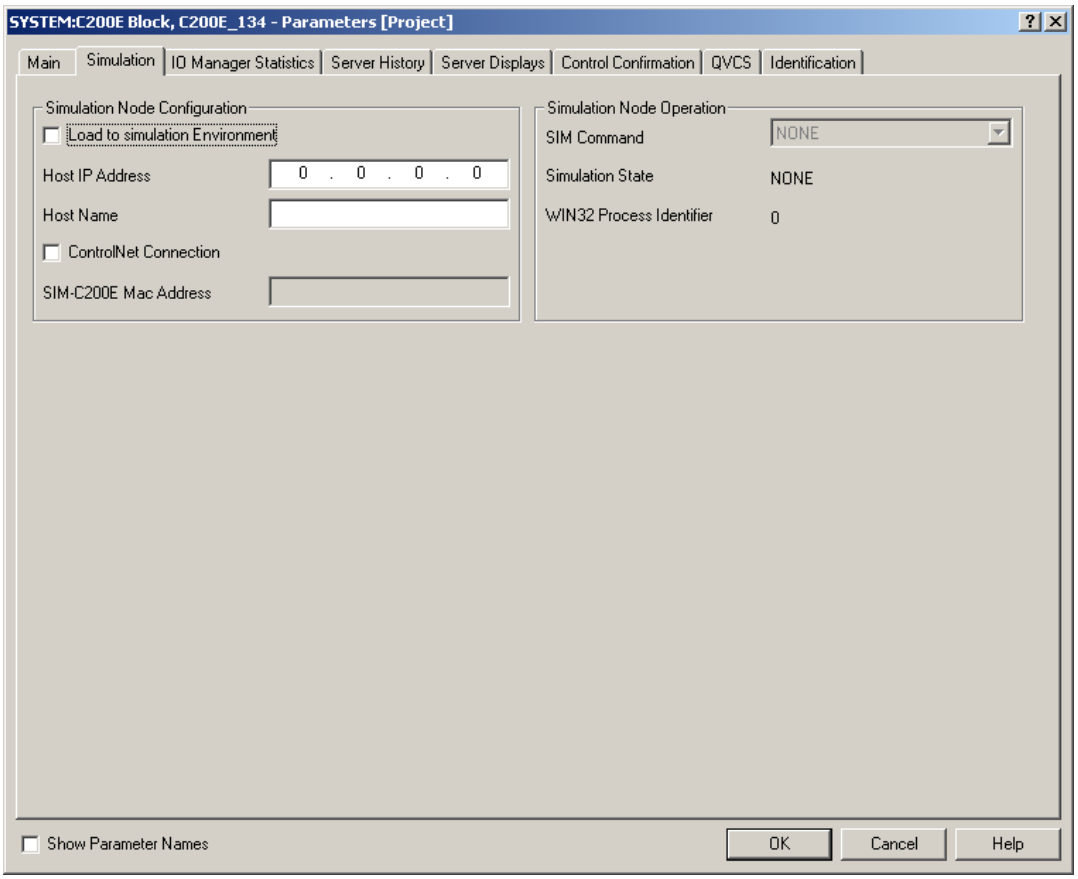
The following procedure assumes that Control Builder is running and two tree windows are open. All illustrations used in the procedure are for example purposes only.

For the simulation configuration, perform the following procedure.

1 Click **File** > **New** > **Controllers** > **C200E Control Processor Module (16M).**
The C200E Block configuration form is displayed.

2 Use the online help as a guide to complete the configuration entries on the Main tab.

3 Click the **Simulation** tab.
The Simulation configuration form is displayed.



4 Click the **Load to simulation Environment** check box to configure a C200E as a SIM-C200E. Press **<Tab>**.
Moves cursor to Host IP Address field.

5 Enter a valid IP address (or hostname) for the PC to which the SIM-C200E is loaded.

6 Use the online help as a guide to complete the configuration entries on all tabs.
Refer to the *Control Building User's Guide* for the following:

- Creating a C200E.
- C200E Controller related parameters.

3.2.1 Converting a SIM-C200E to a ControlNet Interface C200E

Perform the following steps to convert a SIM-C200E to a ControlNet interface C200E.

1. Shutdown the SIM-C200E Controller. Refer to “Initiating SIM-C200E Shutdown” on page 58.
2. On the Monitoring view, select SIM-C200E and click the delete button in the tool bar.
   Repeat step 2 to delete all other blocks assigned to the SIM-C200E from the Monitoring view.
3. On Project view, double-click the C200E Controller icon. The C200E Block configuration form is displayed.
4. Click the **Simulation** tab.
   The Simulation configuration form is displayed.
5. Clear the Load to simulation environment check box.
   The SIM-C200E reverts to C200E.
6. Configure a ControlNet Interface C200E by performing the following steps.
   a. Click the **Main** tab.
   b. Select **ControlNet** from the **Network Type** list.
   c. Select the installed driver from the **Network Driver Name** list.
   d. Select the **Controller Slot Number** where the controller is installed in the chassis from the list.
   e. Select the address of the CNI (ControlNet Interface) card in the chassis that is connected to the communications adapter card in the server from the **Supervisory MAC Address** list.
   f. Select the **CNI Slot Number** from the list.
   g. Use the online help as a guide to complete the configuration entries on this tab.

   Note: The C200E Module function block remains under the 'Root ' in the Control Builder Project view.
7. Load the C200E.
   When you load the C200E Function Block, the CEEC200FB is also loaded.

   For more information, refer to the Loading a Control Strategy section of the *Control Building User's Guide*.
8. Load the strategy.
   For more information, refer to the Loading a Control Strategy section of the *Control Building User's Guide*.

   For more information about converting a ControlNet Interface C200E to a SIM-C200E, refer to the *Control Building User's Guide.*

3.2.2 Converting a SIM-C200E to an Ethernet Interface C200E

Perform the following steps to convert a SIM-C200E to an Ethernet interface C200E.

1. Shutdown the SIM-C200E Controller. Refer to “Initiating SIM-C200E Shutdown” on page 58.
2. On Monitoring view, select SIM-C200E and click the delete button in the tool bar.
   Repeat step 2 to delete all other blocks assigned to the SIM-C200E from the Monitoring view.
3. On the Project view, double-click the C200E Controller icon.
   The C200E block configuration form is displayed.
4. Click the **Simulation** tab.
   The Simulation configuration form is displayed.
5. Clear the Load to simulation environment check box.
   The SIM-C200E reverts to C200E.
6. Configure an EtherNet Interface C200E by performing the following steps.
   a. Click the **Main** tab.
   b. Select **Ethernet** from the **Network Type** list.

c Select the FTEB that you created from the **Network Driver Name** list.

d Select the **Controller Slot Number** where the controller is installed in the chassis from the list.

e Use the online help as a guide to complete the configuration entries on this tab.

Note:

- If the assigned FTEB is redundant, a secondary C200E Controller FB is created in the Control Builder Project view underneath the secondary FTEB.
- The C200E Module function block is moved to the assigned FTEB in the Control Builder Project view.

7 Load the C200E.

For more information, refer to the Loading a Control Strategy section of the *Control Building User's Guide*.

When you load the C200E Function Block, the CEEC200FB is also loaded.

8 Load the strategy.

For more information, refer to the Loading a Control Strategy section of the *Control Building User's Guide*.

For more information about converting an Ethernet Interface C200E to a SIM-C200E, refer to the *Control Building User's Guide*.

3.2.3 Description of SIM-C200E parameters

Parameter Name	Description
STEP	Step execution based on number of cycles. This parameter is applicable if the controller has a SIMSTATE of SIMFREEZE. • 0 - Controller runs continuously (default value). • X -Controller runs for ‘x’ cycles and then freezes execution.
STEPTOPHASE	Command the SIM-C200E CEE to execute until the specified PHASE is reached.
STEPTIME	Step execution in milliseconds. This parameter is applicable if the controller has a SIMSTATE of SIMFREEZE. • 0 - Controller runs continuously. • X - Controller runs for ‘x’ milliseconds and then freezes execution.
SPDFACTOR	UniSim commands SIM-C200E to run slower or faster by setting the value of SPDFACTOR parameter. For example, if the SPDFACTOR is 2.0 (shown as 2X in UniSim), a 500ms period CM executes in 250ms. A SPDFACTOR of 0.5 in the same scenario results in the CM executing in 1s. • If the value is out of range, the request is rejected with an error. Since SPDFACTOR is a float value, the value requested may not be valid. Therefore, the value of parameter SPDFACTOR must be adjusted to the nearest supported value. • If the value of SPDFACTOR that UniSim commands is within the supported range (0.01 to 5), the value is reset.

3.2.4 Creating a SIMIOLIM and SIMIOLINK

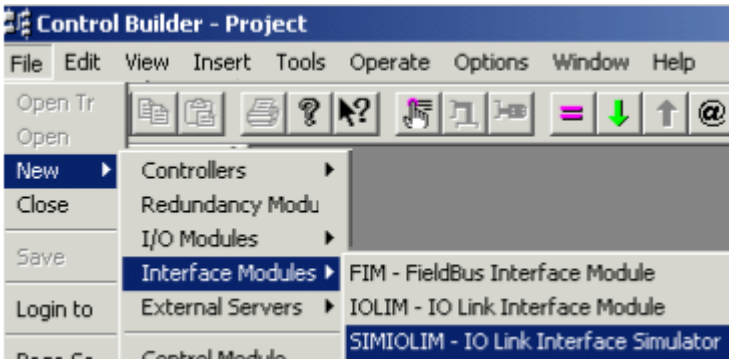
Use the following procedure to create a Simulation I/O Link Interface Module (SIMIOLIM) and associated Simulation I/O Link (SIMIOLINK) blocks in the Project Tree that will represent an installed SIMIOLIM on a SIM-C200E node. The SIMIOLIM provides interface to Process Manager I/O for the Simulation Control Environment controller.

Tip

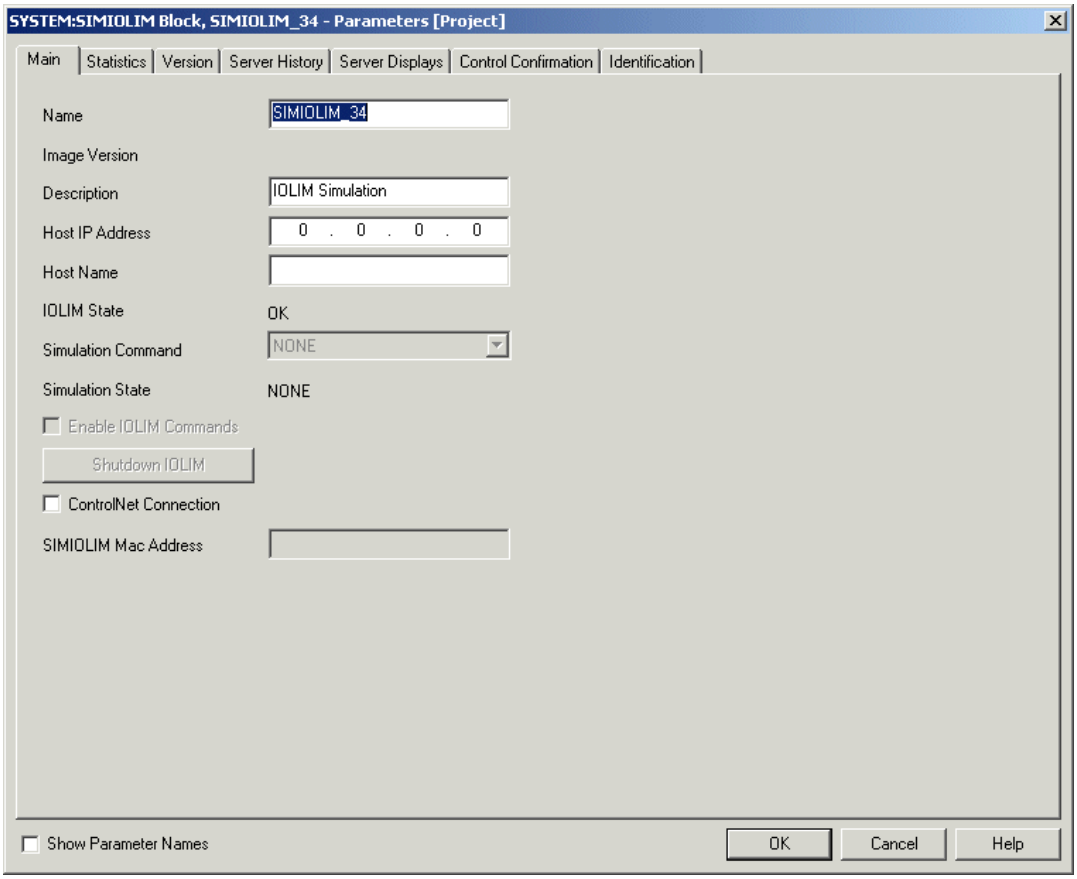
You can configure an SIMIOLIM block in the Control Builder Project tab without the SIM-C200E software being installed. However, it is good idea to have the communications network that is going to be used for the system installed, configured, and running. The SIMIOLIM needs the IP address and name of the resident SIM-C200E node specified on its configuration form to complete its configuration data. The SIMIOLIM represents a functional module and the block configuration specifies the communication path to the function.

The following procedure assumes that Control Builder is running and two tree windows are open. All illustrations used in the procedure are for example purposes only.

1 Click **File-** > **New-** > **Interface Modules-** > **SIMIOLIM - IO Link Interface Simulator.**



Calls up the SIMIOLIM Block configuration form with Name field highlighted.



2 Key in desired name of up to 16 characters or accept the default. Press <Tab>.
Moves cursor to Description field.

3 Accept default or key in desired description of up to 64 characters. Press <Tab>.

Moves cursor to Host IP Address field.

Tip

Host Name and Host IP Address are interactive entries. We recommend that you key in the Host IP Address first and let the system determine the Host Name automatically. This is especially true if you are configuring the SIMIOLIM block with the SIM-C200E node offline. In this case, entering the Host IP address first generates a Warning message, but entering the Host Name first generates an error message.

When keying in an IP address, use the mouse or the left and right arrow keys to move the cursor to locations within the field. Do not press the <Tab> key until the complete address is keyed in.

4 Key in the host pc IP address for the SIM-C200E node. Press <Tab>.

Or, press <Tab> to skip this field and enter Host Name instead. Acknowledge any error message prompts.

System automatically determines the Host Name, when SIM-C200E node is online, and moves cursor to Host Name field.

5 If Host Name has been automatically determined, click Server History tab.

Or, Key in name assigned to the host pc for the SIM-C200E node. There is a 255-character limit on this field. Press <Tab>

(Valid Host Name entry results in system automatically determining the Host IP Address, when SIM-C200E node is online.)

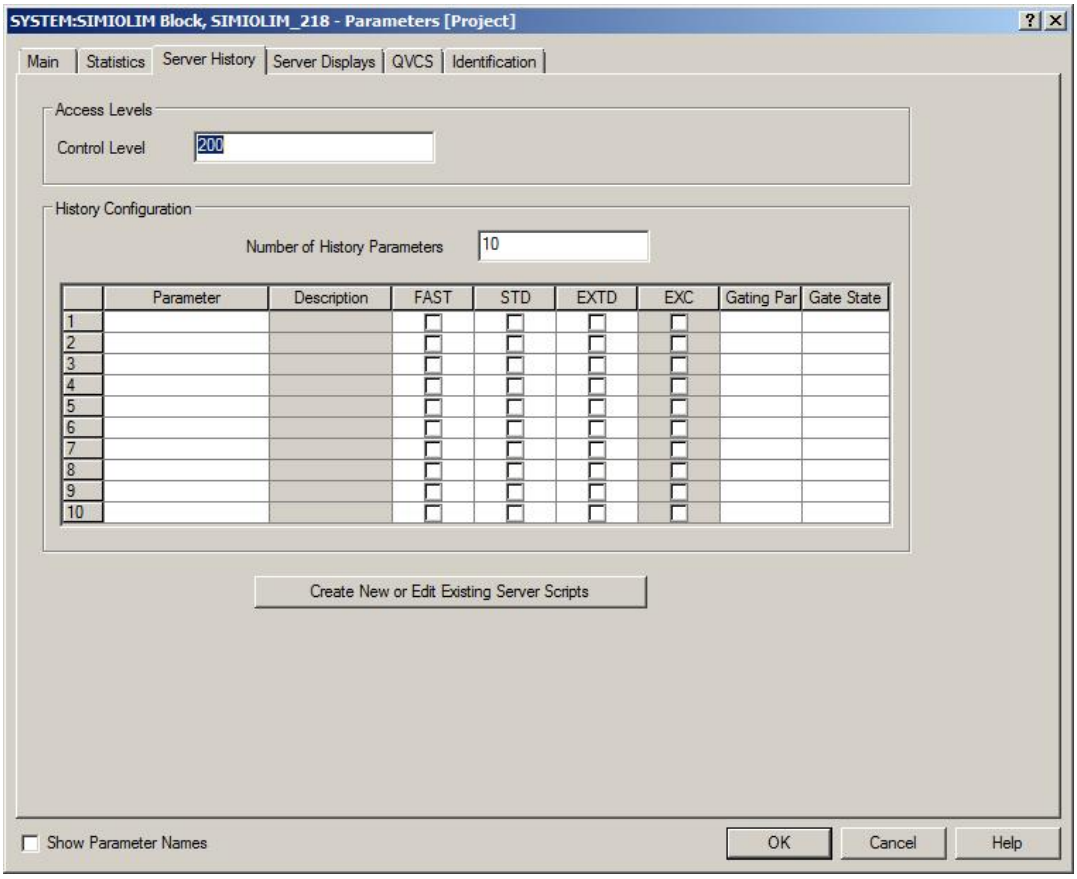
Moves cursor to ControlNet Connection field.

6 Leave check box checked to enable the ControlNet Connection function or click check box to clear it and disable the ControlNet Connection function.

NOTE: Box should be checked if the SIM-C200E PC has a PCIC card.

Click the Server History tab.

Calls up the Server History configuration form, since no other fields on this form are accessible in the Project mode.

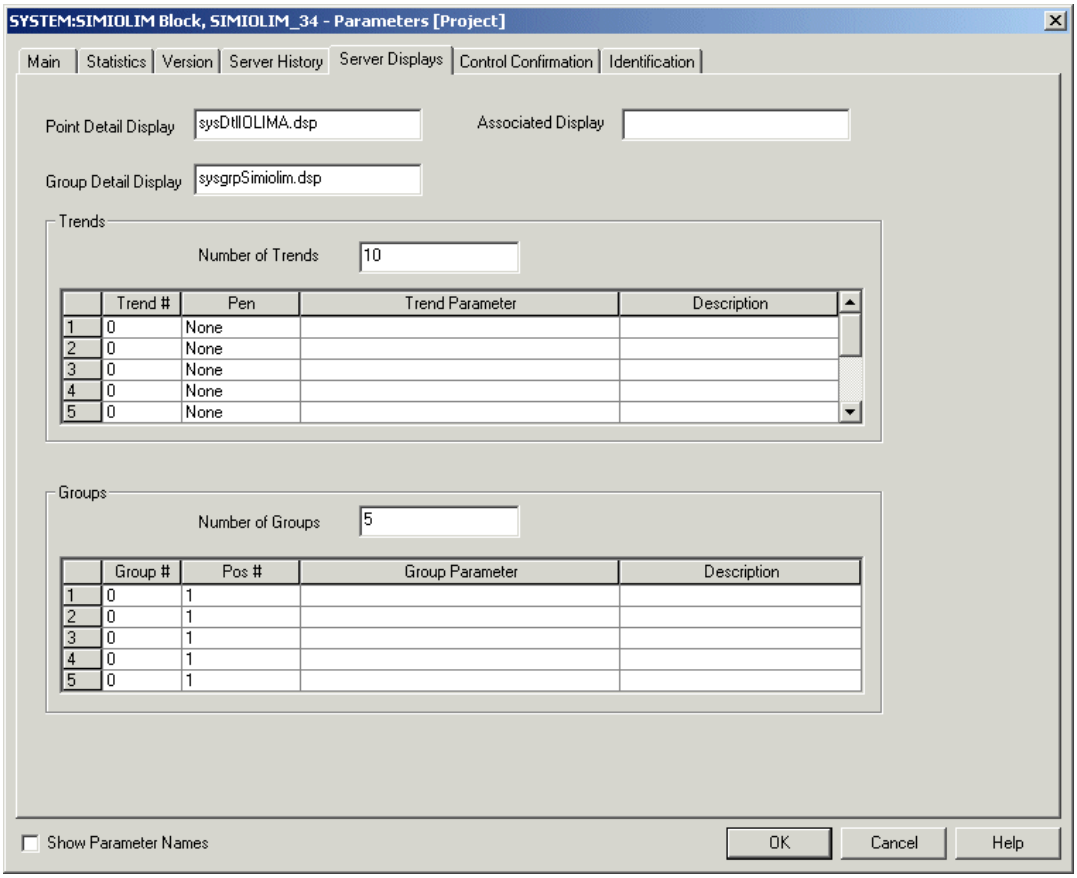


Tip

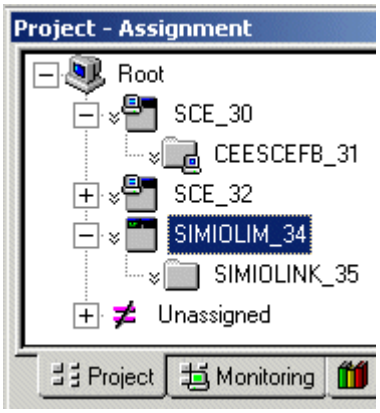
If you have a Distributed Server Architecture (DSA), you must enter the Control Area assignment for this Server. (Note that area code assignments are made through the Station application.) If you do not have a DSA, you can skip this field if Areas is not enabled through the Station application.

7 Use the online help as a guide to complete the configuration entries on this tab. Click the Server Displays tab.

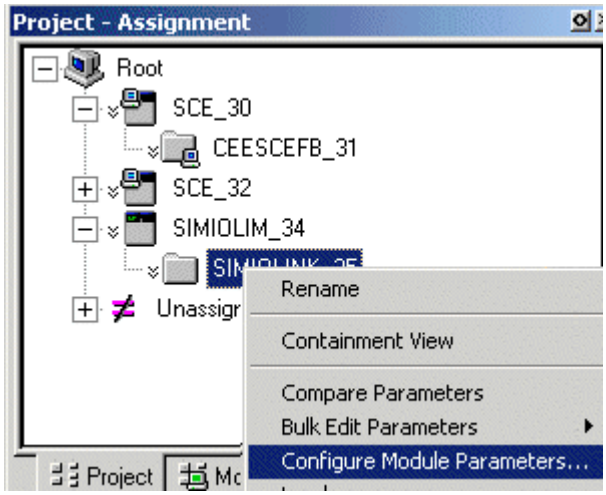
Calls up the Server Displays configuration form.



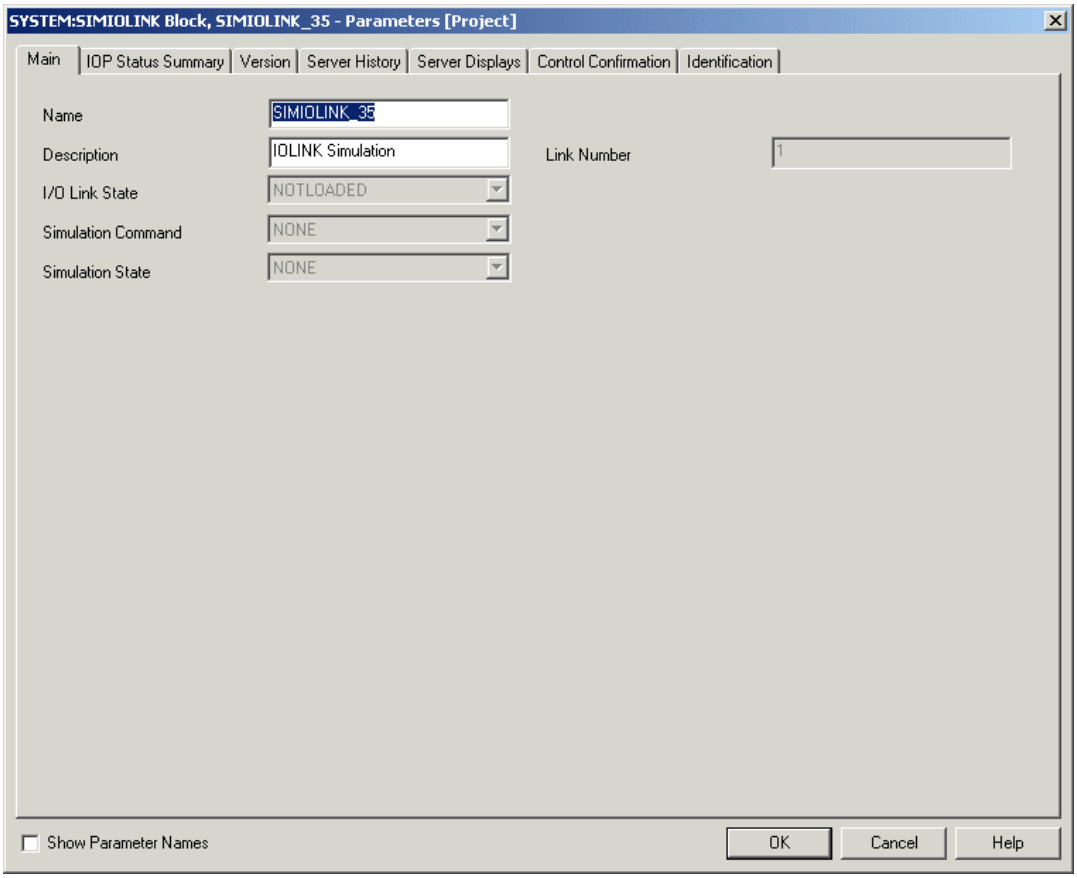
8 Use the online help as a guide to complete the configuration entries on this tab. Click the OK button.
Closes the form and creates SIMIOLIM/SIMIOLINK block icons in Project tab.



9 Right-click SIMIOLINK block icon.
Calls up shortcut menu.



10 Click Configure Module Parameters.
Calls up SIMIOLINK Block configuration form with Name field highlighted.



11 Key in desired name of up to 16 characters or accept the default. Press <Tab>
Moves cursor to Description field.

12 Accept default or key in desired descriptive text of up to 64 characters. Click Server History tab.
Calls up the Server History configuration form, since no other fields on this form are accessible in the Project mode.

13 Repeat Steps 7 and 8.
Completes SIMIOLINK configuration and closes the form.

3.3 Load Configured Components

Please refer to the *Control Building Guide* for more information about the load operations.

3.4 Simulation Operations

Related topics

“Start Simulation Operation” on page 40
“Stop Simulation Operation” on page 40

3.4.1 Start Simulation Operation

The Start Simulation operation can be performed on a C200/C200E/SIM-C200E Controller that has been configured earlier. The start simulation function loads the C200/C200E/SIM-C200E Controller and its associated contents to the Monitoring view of the Control Builder. The start simulation operation automatically converts a C200/C200E Controller to a SIM-C200E Controller.

To initiate the Start Simulation operation,

- Ensure that the controller is not loaded
- The controller is non-redundant

Attention
To convert a C200/C200E Controller to a SIM-C200E Controller and vice-versa, ensure that the C200/C200E/SIM-C200E Controller is not loaded and that it is non-redundant.

Perform the following procedure to start a simulation.

1 Right-click the C200/C200E/SIM-C200E icon on the **Project - Assignment** view.
2 Click **Start Simulation…**.
The simulation progress dialog box is displayed.
3 The C200E/SIM-C200E is loaded with the contents and appears in the **Monitoring- Assignment** view.

3.4.2 Stop Simulation Operation

The stop simulation operation can be used to stop the simulation of a SIM-C200E controller that has been loaded to the simulation environment. This operation deletes a SIM-C200E Controller and its contents from the Monitoring view.

Attention
To stop the simulation of a SIM-C200E Controller, alternatively you can delete the C200/C200E Controller and its contents. Stop-simulation option is available only if the C200/C200E Controller is loaded to the simulation environment.

To initiate a stop simulation operation,

- Ensure that the SIM-C200E is loaded to the simulation environment.

Perform the following procedure to stop a simulation.

1 Right-click the SIM-C200E icon on the **Monitoring- Assignment** view.
2 Click **Stop Simulation…**.
The simulation progress dialog box is displayed.
3 The SIM-C200E with its contents are deleted from the **Monitoring- Assignment** view.

Attention

- Deleting SIM-C200E with its contents from simulation environment, converts the SIM-C200E into a C200/C200E Controller which can be loaded to a real controller if proper FTEB or ControlNet configuration is provided before loading to the simulation environment.
- The Start-Stop simulation operation gives a warning message and becomes invalid, if the C200/C200E Controller is in QVCS check-in state.

4 Operation

Related topics

“Control Builder Interface” on page 44
“Operational Considerations and Routines” on page 48

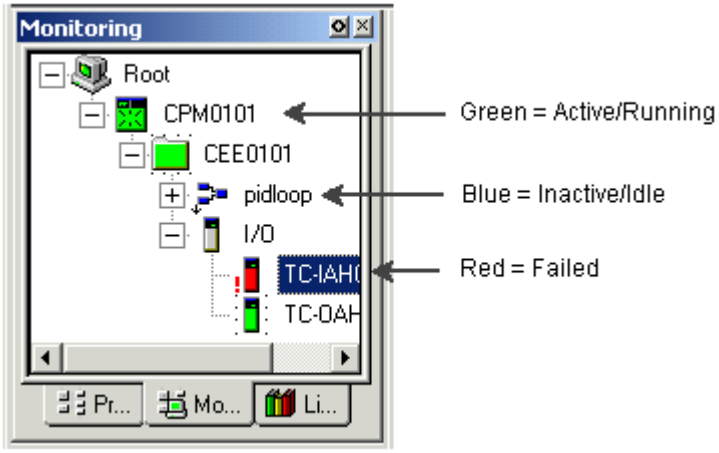
4.1 Control Builder Interface

Related topics

“About Monitor mode” on page 44
“Simulation monitoring functions” on page 44
“About Simulation Command functions” on page 45
“CEESCE state versus simulation state” on page 46

4.1.1 About Monitor mode

Once a control strategy is loaded to a controller, you can interact with online data through the Monitor tree in Control Builder. You simply click the Monitoring tab to invoke the Monitor mode and open the tree view as shown below.



As shown in the figure above, Control Builder uses color-coding to visually represent the current status of a given component. The tasks you can perform in the Monitoring mode depend on the access level you used to sign-on to this session of Control Builder.

Attention
The Experion R200 release SIM-C200E consists of the SCE (Simulation Control Environment) block and its associated CEESCE (Control Execution Environment) block.

Please refer to the *Control Building Guide* for more information about using Control Builder for online monitoring and other functions.

4.1.2 Simulation monitoring functions

The following table summarizes the functions that users with the appropriate access level can access through the given simulation related function block in the Monitoring mode of Control Builder.

If Block Type is . . .	And, Open Configuration Form Tab is . . .	Then, You Can Access These Functions . . .	Description
SCE	Main	SCE Command	Lets user with appropriate access level, initiate a shutdown command to the SCE application. The CEESCE block must be in its **Idle** state.

If Block Type is . . .	And, Open Configuration Form Tab is . . .	Then, You Can Access These Functions . . .	Description
		SCE State	Shows the current state of the SCE block.
		SIM Command	Lets user with Engineer access level, initiate SIMDISABLE command. Only Shadow Plant can issue commands other than SIMDISABLE.
		Simulation State	Shows the current state of the simulation. If Shadow plant is not controlling the CEESCE, the SIMSTATE always equals SIMRUN.
	Statistics	All Fields	Lets user view read-only performance parameters.
CEESCE	Main	CEE Command	Lets user with appropriate access level, initiate an Idle or Run command to the CEESCE block.
		CEE State	Shows current state of CEESCE block.
		SIM Command	Same as above for SCE block.
		Simulation State	Same as above for SCE block.
	Statistics	All Fields	Lets user view read-only performance parameters.
	CPU Loading	All Fields	Lets user view read-only performance parameters for given phase.
	CPU Overruns	All Fields	Lets user view read-only performance parameters for given phase.
SIMIOLIM	Main	IOLIM State	Lets user view current state of I/O Link Interface Module.
		Simulation Command	Same as above for SCE block (SIM Command).
		Simulation State	Same as above for SCE block.
		Enable IOLIM Commands	Lets user enable Shutdown IOLIM function.
		Shutdown IOLIM	Lets user initiate shutdown to SIMIOLIM, when enabled.
	Statistics	All Fields	Lets user view read-only performance parameters including current time.
SIMIOLINK	Main	I/O Link State	Lets user view current state for I/O Link.
		Simulation Command	Same as above for SCE block (SIM Command).
		Simulation State	Same as above for SCE block.
	IOP Status Summary	All Fields	Lets user view read-only performance parameters for given IOP.

4.1.3 About Simulation Command functions

The Simulation Command (SIMCOMMAND) parameter defines the simulation commands that Shadow Plant can issue. This parameter features a special access lock, so only the Shadow Plant simulator can issue SIMCOMMANDs and SIMFREEZE/SIMRUN. The following table lists the possible command settings along with a brief description for each.

Tip
Shadow Plant initiated commands are issued to all CEESCEs in its simulation environment to assure the coordination of simulation functions.

If SIMCOMMAND is Set to . . .	Then, resulting simulation action is . . .
SIMFREEZE	Freezes CEESCE operation and stops simulation. The following is a summary of system operation in this state. • Stops execution of all the blocks including SCE, SIMCEE, IOMs, CMs and SCMs. This means the EXECSTATES remain as they were before the SIMFREEZE command was issued. • The wall clock time continues incriminating. However, the Free Running Counter (FRC) is stopped. The FRC is set to a value corresponding to the beginning of the next PHASE to be executed. • The next PHASE to be executed is not updated. • Neither memory compaction nor CEESCE statistics calculations are performed. • The parameter request processing continues. This means the operator can change parameter values from the station, and an engineer can change values from the Control Builder. The peer-to-peer cyclic gets are also processed when the SIMSTATE equals SIMFREEZE. • Stops the peer-to-peer acyclic store processing. If a SCM step has made a store to a peer SIM-C200E and is waiting for a response, it will not get it and the peer connection will not time out either.
SIMRUN	Tells CEESCE to start running the simulation or stepping through different execution cycles. The following is a summary of system operation in this state. • Starts execution of SCE, CEESCE and IOM function blocks. Depending upon the CEESTATE of CEESCE, CMs and SCMs will run. The blocks start executing in the same PHASE in which they were stopped. • The wall clock time continues incriminating and the Free Running Counter (FRC) also increments. • The current PHASE is now updated. • Both memory compaction and CEESCE statistics calculations are performed. • The parameter request processing continues. This means the operator can change parameter values from the station, engineer can change values from the control builder and they can load new blocks etc. The peer-to-peer cyclic gets are also processed. • The peer-to-peer acyclic store processing is done. If a SCM step has made a store to a peer SIM-C200E and is waiting for a response, it will either get it or the peer connection will time out.
SIMDISABLE	Disables the simulation because Shadow Plant has exited or the engineer has issued a SIMDISABLE command. This will always change SIMSTATE to SIMRUN.
NONE	No command has been issued or the issued command has been processed.

4.1.4 CEESCE state versus simulation state

The behavior of the CEESCE state (CEESTATE) transitions from IDLE to RUN or RUN to IDLE will differ depending upon the current simulation state (SIMSTATE).

When simulation state equals SIMRUN, the CEESCE state controls the execution of the all tagged blocks the same as CEEs in C200 or ACE.

When simulation state equals SIMFREEZE, the simulation scheduler is not executing the SCE and CEESCE blocks. In this case, even though the CEE state is RUN and its execution state is ACTIVE, an operator will not see any data changes due to algorithm execution.

The following table summarizes the interaction between Shadow Plant issued simulation commands (SIMCOMMAND) and the simulation state (SIMSTATE) for reference.

If Issued SIMCOMMAND is . . .	And, SIMSTATE is . . .	Then, Result is . . .
SIMFREEZE	X	• SIMSTATE equals SIMFREEZE. • All blocks including SCE and CEESCE, and IOMs are stopped from executing their algorithms. • The parameter request continues to be processed.
SIMRUN	SIMFREEZE	• SIMSTATE equals SIMRUN. • All the blocks start executing their algorithms based on the CEESTATE. • The parameter requests continue to be processed.
SIMRUN	SIMRUN	• Nothing happens, since the SIMSTATE equals SIMRUN already. • The execution of SCE, CEESCE and IOMs will continue and execution of other tagged blocks will be controlled by the CEESTATE.
SIMDISABLE	X	• SIMSTATE equals SIMRUN. • This means Shadow Plant or a user with Engineer access level has disabled simulation. The execution of blocks will be controlled by the CEESTATE

4.2 Operational Considerations and Routines

Related topics

“Station displays” on page 48
“Single-step and multiple-step execution” on page 48
“Snapshot save and restore” on page 49
“Notification Recovery” on page 50
“Deleting SCE/CEESCE block” on page 50
“Issuing a Shutdown Command and using snapshot to restore SCE” on page 54
“Initiating SIM-C200E Shutdown” on page 58
“Recovering from power failure” on page 58

4.2.1 Station displays

The following Detail and Group Display templates are located in the *c:\Program Files\Honeywell\Experion \client\system\r100* directory. These displays can be used as templates for creating your own displays or they can be used as is, provided that your function block names match the names built into the pre-built detail displays. They provide access to most of the same data found on the configuration form for a given block in Control Builder.

If Function Block is . . .	Then, Use This Detail (Dtl) or Group (Grp) Template . . .
CEESCE	sysDtlceescea.dsp sysGrpceescea.dsp
SCE	sysDtlscea.dsp sysGrpscea.dsp
SIMIOLIM	sysDtliolima.dsp sysGrpSimiolim.dsp
SIMIOLINK	sysDtlSimiolink.dsp sysGrpSimolink.dsp

4.2.2 Single-step and multiple-step execution

The Shadow Plant simulator can initiate either a single-step or multiple-step execution command to all the SIM-C200s in the simulation environment. The following table describes the actions associated with a given execution command for general reference.

If Execution Command is . . .	Then, SIM-C200E Actions are . . .
Single-Step	Accepts store to STEP parameter, if current simulation state equals SIMFREEZE. The state sequence would be: • SIMFREEZE • STEP, provide a single-step parameter. SIMRUN is active until the STEP is completed. • SIMFREEZE, simulator returns to SIMFREEZE state If STEP parameter value is one, the scheduler schedules all the blocks in the current frozen PHASE/cycle to be executed when Shadow Plant issues a SIMRUN command. For example, if the STEP value equals 1 and the current frozen cycle is 23, upon receipt of a SIMRUN command, the scheduler runs all the blocks scheduled to run in cycle 23, stops the execution after all blocks are run, and returns to the SIMFREEZE state so the current PHASE (24) is frozen.
Multiple-Step	Accepts store to STEP parameter, if current simulation state equals SIMFREEZE. The state sequence would be: • SIMFREEZE • STEP, provide a multi step parameter. SIMRUN is active until the STEP is completed. • SIMFREEZE, simulator returns to SIMFREEZE state If STEP parameter value is greater than one, the scheduler schedules all the blocks from the current frozen PHASE/cycle up to the number of PHASEs defined by the value of the STEP parameter to be executed when Shadow Plant issues a SIMRUN command. For example, if the STEP value equals 5 and the current frozen cycle is 20, upon receipt of a SIMRUN command, the scheduler runs all the blocks scheduled to run in cycles 20, 21, 22, 23, and 24, stops the execution after all blocks are run, and returns to the SIMFREEZE state so the current PHASE (25) is frozen.

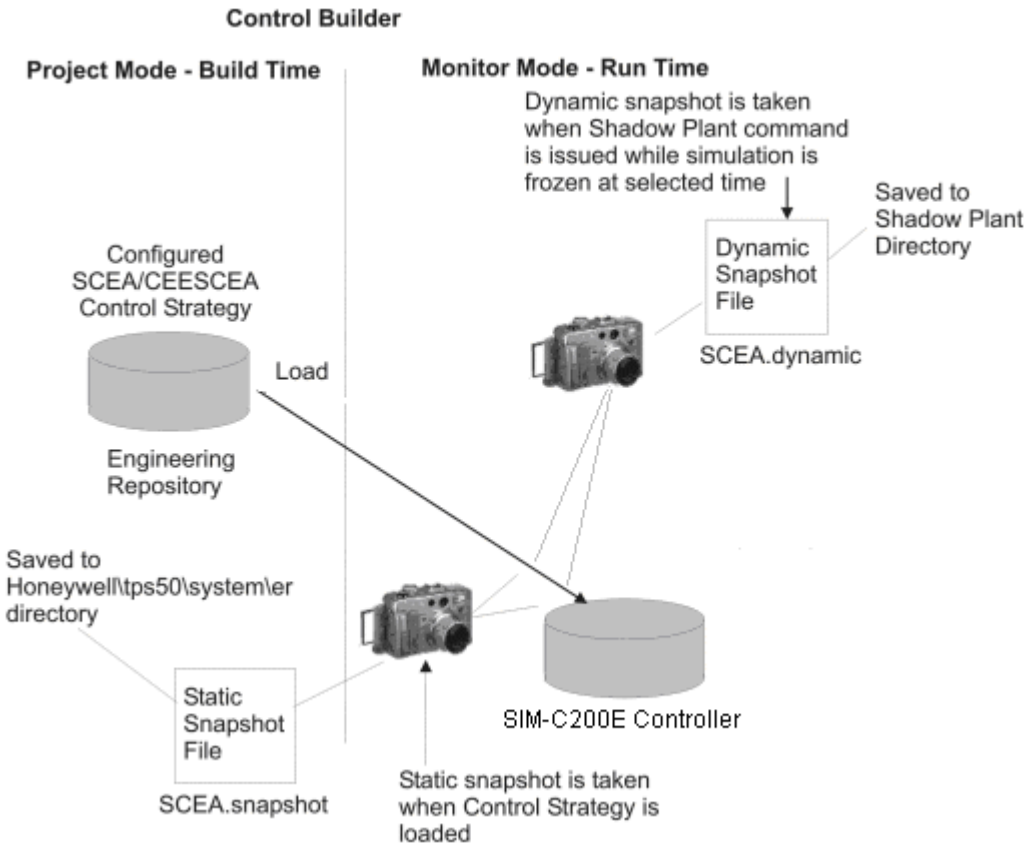
There is also a Step To Phase command that lets operators specify the STEPTOPHASE parameter number (0 to 39) of the phase the system is to step to from the current frozen phase. This command is only accepted when the current simulation state is SIMFREEZE. For example, if the value for STEPTOPHASE is 3 and the current frozen phase is 39, upon receipt of a SIMRUN command, the scheduler runs all the blocks scheduled to run in cycles 39, 0, 1, and 2, stops the execution after all blocks are run, and returns to the SIMFREEZE state so the current PHASE (3) is frozen.

4.2.3 Snapshot save and restore

The same Control Builder snapshot save and restore function used for control strategies loaded to Control Processor Modules can also be used for simulation control strategies loaded to Simulation Control Environments. For reference purposes, this is called a structural or static data snapshot.

Shadow Plant simulator has the ability to save the state of the simulation environment at a precise instance of time. That state is called a non-structural or dynamic data snapshot.

As shown in the following illustration, the static data snapshot is taken any time a control strategy is loaded to a controller while the dynamic data snapshot is taken at a selected runtime triggered by a Shadow Plant command. Since it is possible to make changes in a static snapshot that may impact a dynamic one, operators will be responsible for updating dynamic snapshots as appropriate before initiating a snapshot restore.



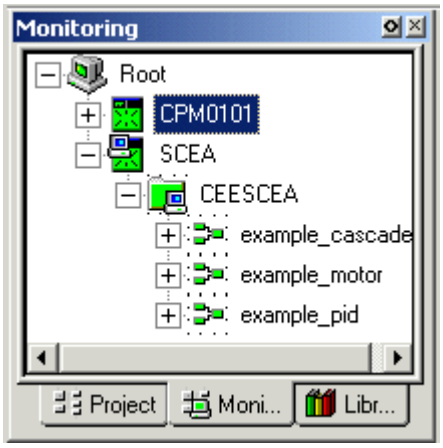
4.2.4 Notification Recovery

The SIM-C200E supports the same notification recovery routine used in the Hybrid Controller. In general, a notification recovery routine consists of the Server's Notification Manager commanding each CEE to recover all currently outstanding alarms and system diagnostics. The SIM-C200E operates the same way as the CPM. The additional functionality is to synchronize the Server's alarm summary with he new alarm states of the SCE blocks contained in the restored dynamic state. No state change events will be reported after SIMSTATE changes. While SIMSTATE is SIMFREEZE, a dynamic state snapshot restore disables all the existing alarms from the SIM-C200E on the Server, and alarms will be regenerated based on the new dynamic state data when the SIMSTATE changes to SIMRUN.

4.2.5 Deleting SCE/CEESCE block

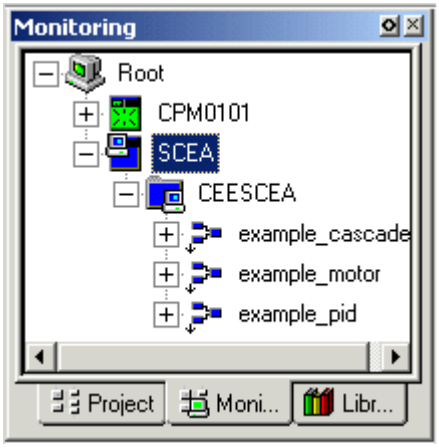
Use the following procedure as a general guide for deleting a loaded SCE/CEESCE block from the Control Strategy. This procedure assumes that Control Builder is running with tree views open. The illustrations used in this procedure are for example purposes only.

1 In Monitor Mode, open root directory for SCE/CEESCE.
Exposes contents of the CEESCE.



2 Right-click the CEESCE block and select Inactivate->Selected CEE(s), IOMs, CMs, Applicable Function Blocks from the shortcut menu.

Inactivates all components including the CEESCE. Block icons turn blue.

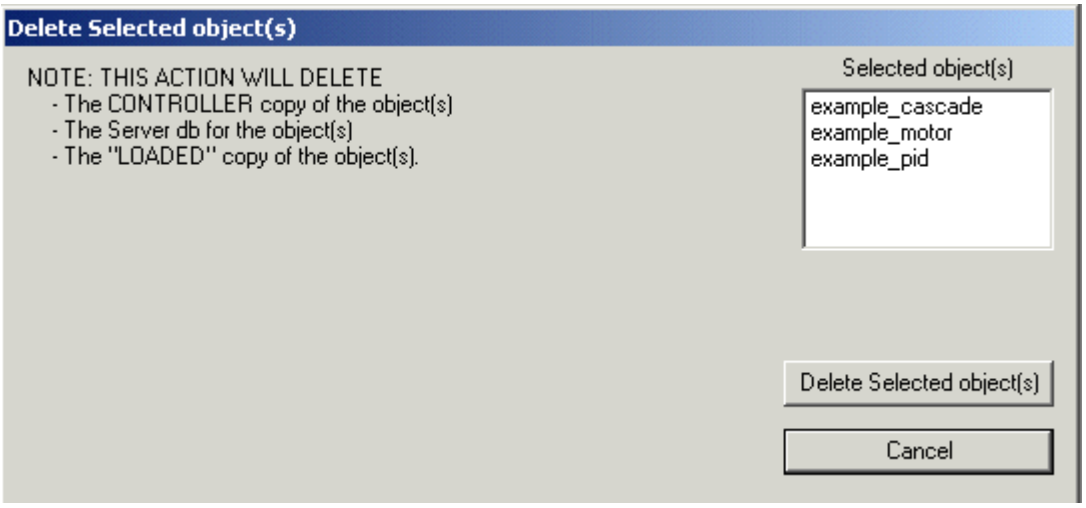


Tip

If SCE/CEESCE and its assigned components have been loaded, you must first put the CEESCE in its Idle mode and delete all of its components in the Monitor mode before you can delete them from the Project mode. The delete operation ignores the current simulation state, so the SCE/CEESCE block is deleted even if the current simulation state is SIMFREEZE or SIMRUN.

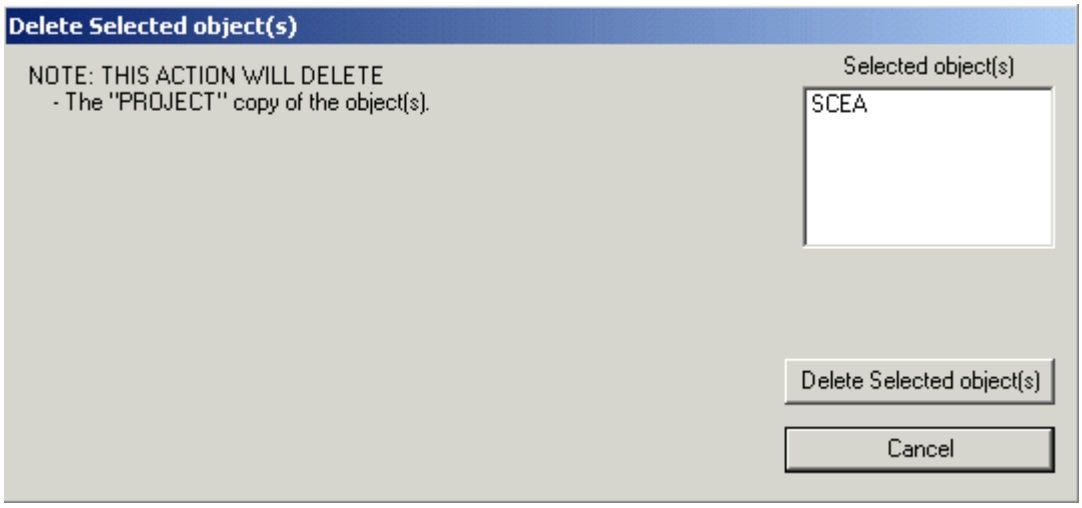
3 Select components contained in CEESCE and click delete button in the tool bar.

Calls up Delete Selected Objects dialog.



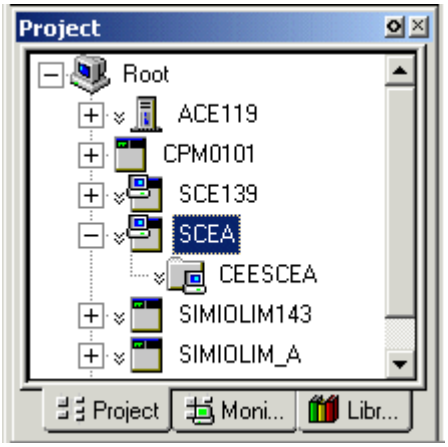
4 Click the Deleted Selected Object(s) button.
Initiates the delete function and progress dialog tracks status until complete.

5 Click the SCE block and click the delete button in the tool bar.
Calls up Delete Selected Objects dialog.

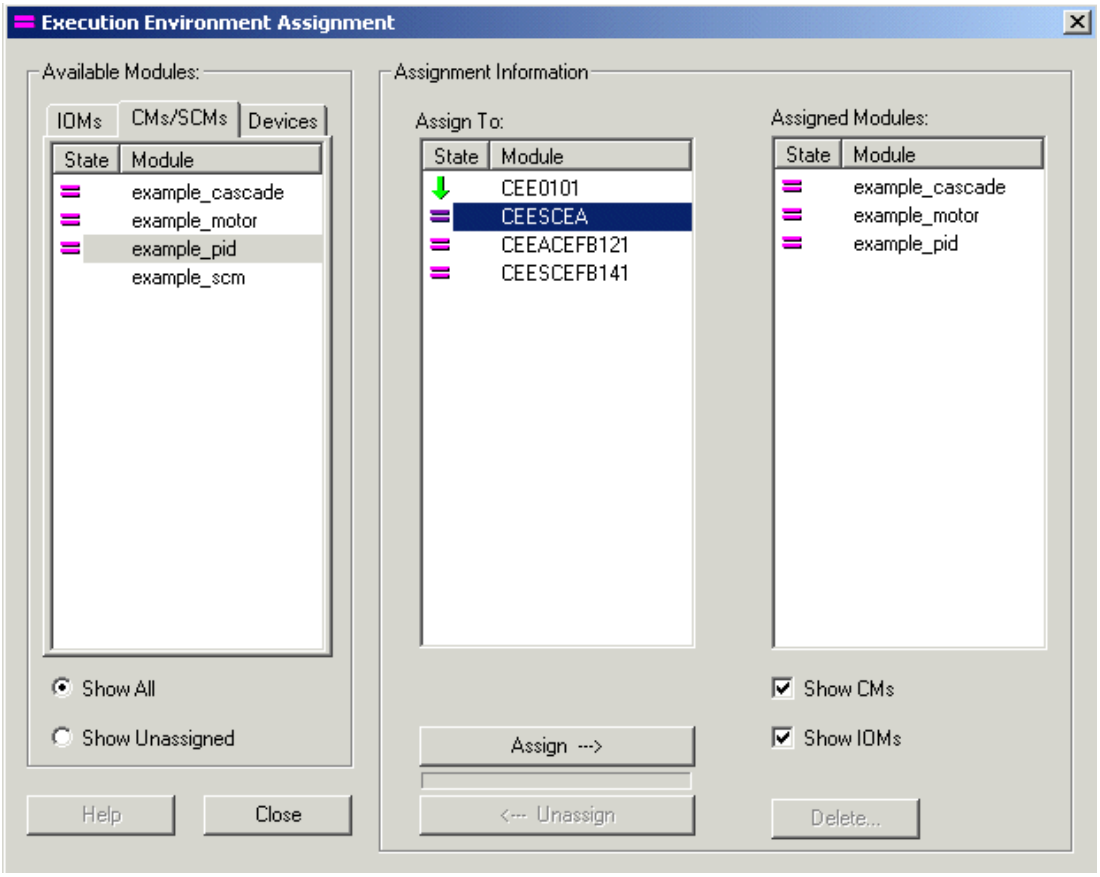


6 Click the Delete Selected object(s) button.
Initiates the delete function and progress dialog tracks status until complete.

7 Click the Project tab.
Calls up the Project view.



8 With SCE selected, click assign button in the tool bar.
Opens the Execution Environment Assignment dialog box.



9 Click module assigned to SCE in Available Modules list, select CEESCE in Assign To list, select all the modules listed in the Assigned Modules list and click the Unassign button.
Unassigns modules from CEESCE.

10 Click the Close button.
Closes dialog box and returns to Project view.

11 With SCE selected, click delete button in tool bar.
Calls up Delete Selected Objects dialog.

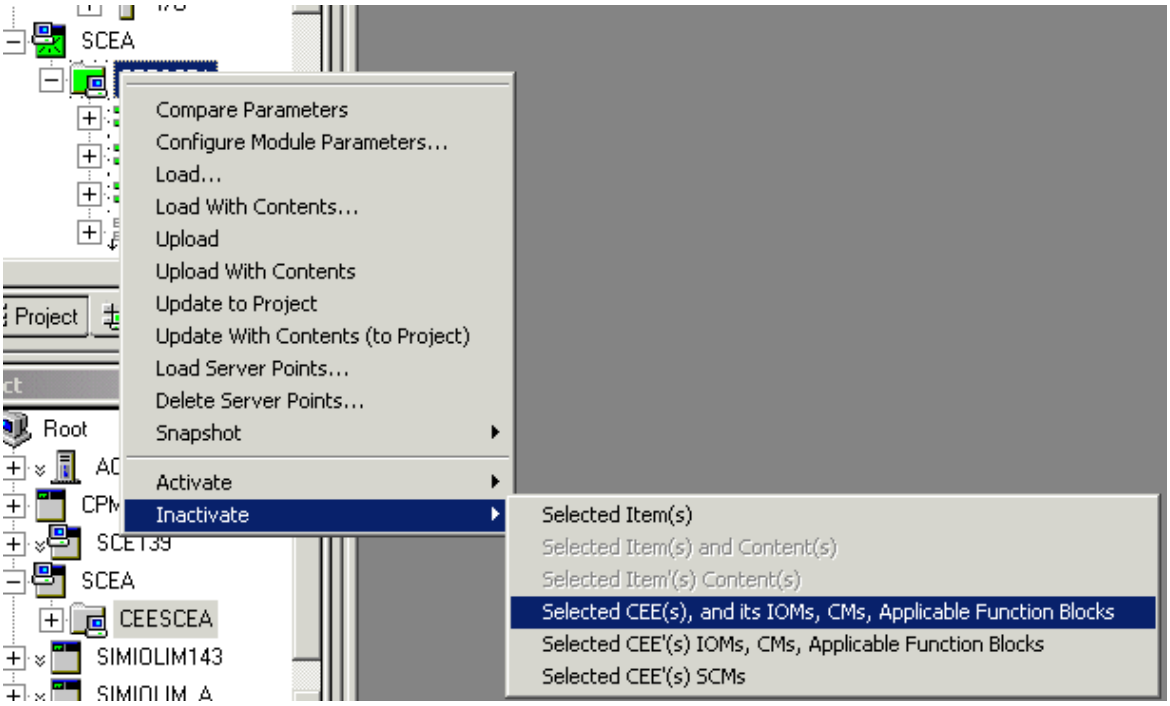
12 Click the Delete Selected object(s) button.

Initiates the delete function and progress dialog tracks status until complete. This completes the deleting SCE/CEESCE procedure.

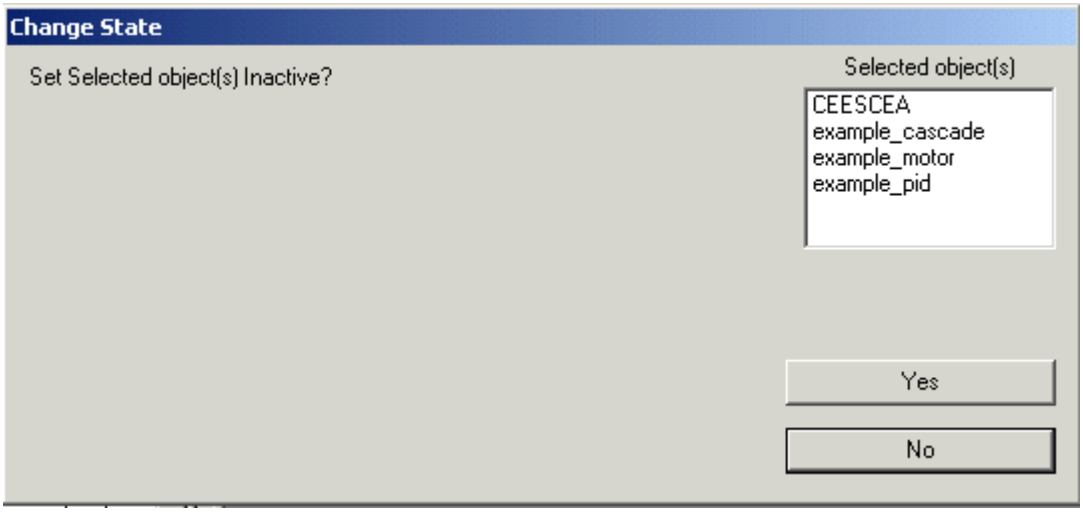
4.2.6 Issuing a Shutdown Command and using snapshot to restore SCE

Use the following procedure as a general guide for issuing a Shutdown command to a loaded SCE/CEESCE block through the Monitor mode in Control Builder. This procedure assumes that Control Builder is running with tree views open. The illustrations used in this procedure are for example purposes only.

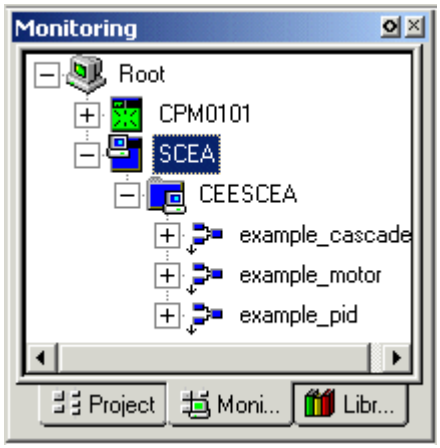
1 In Monitor mode, right-click the CEESCE block and select Inactivate->Selected CEE(s), IOMs, CMs, Applicable Function Blocks from the shortcut menu.



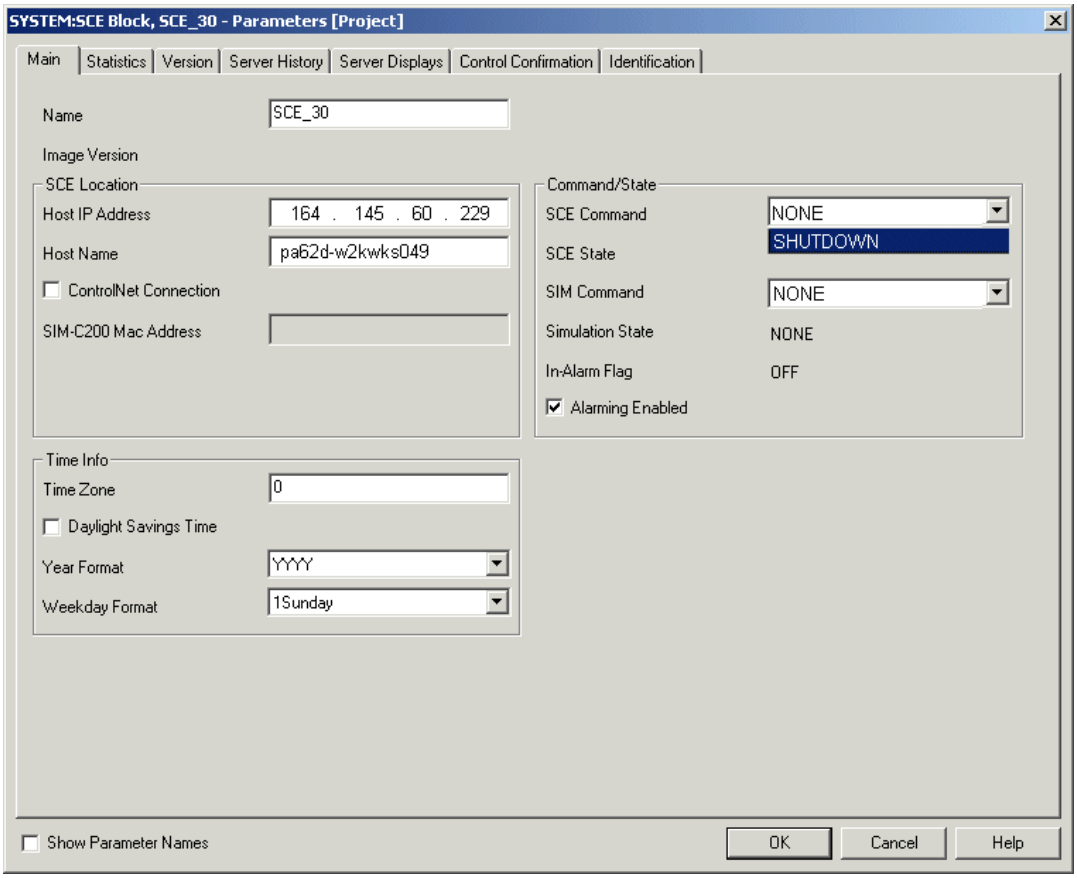
Calls up Change State dialog.



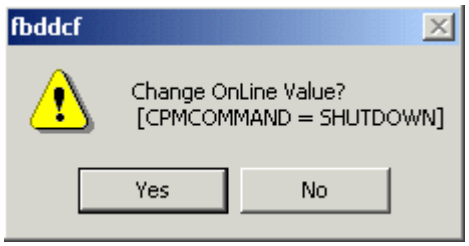
2 Click the Yes button to continue.
Inactivates all components including the CEESCE. Block icons turn blue.



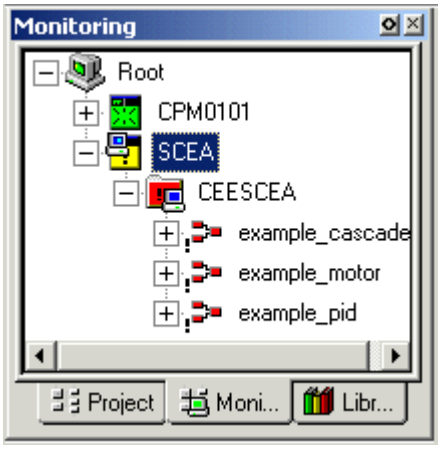
3 Right-click the SCE icon and select Configure Module Parameters.
Calls up the SCE Block configuration form.



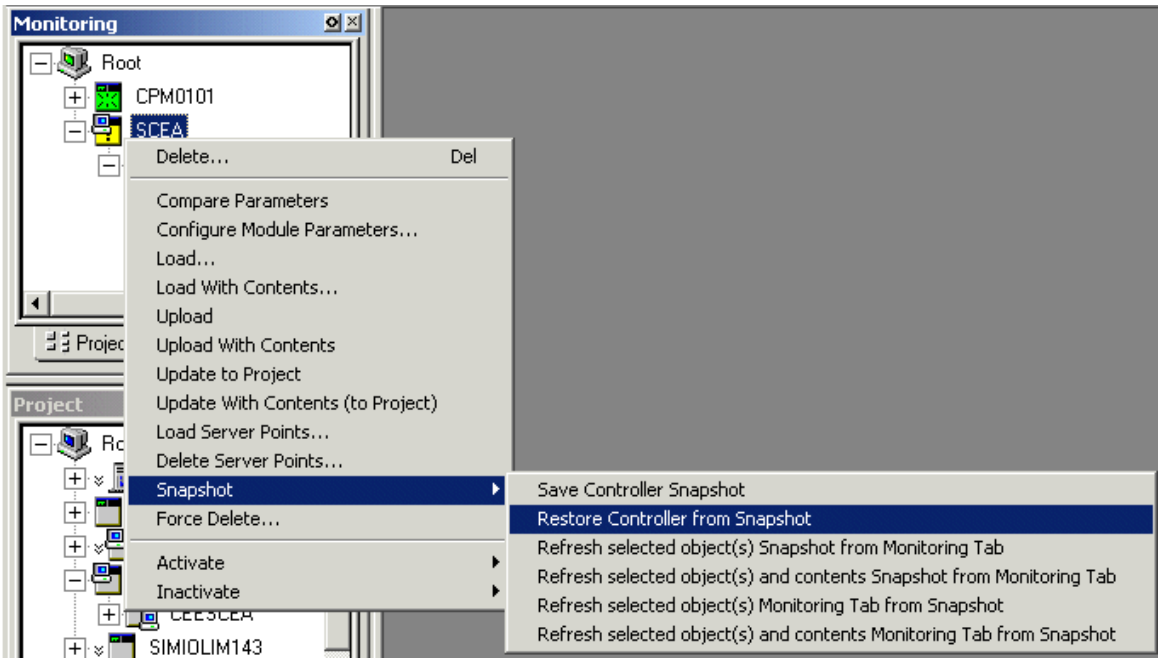
4 On Main tab, click down arrow button in SCE Command field and select shutdown.
Calls up warning prompt for confirmation of online change.



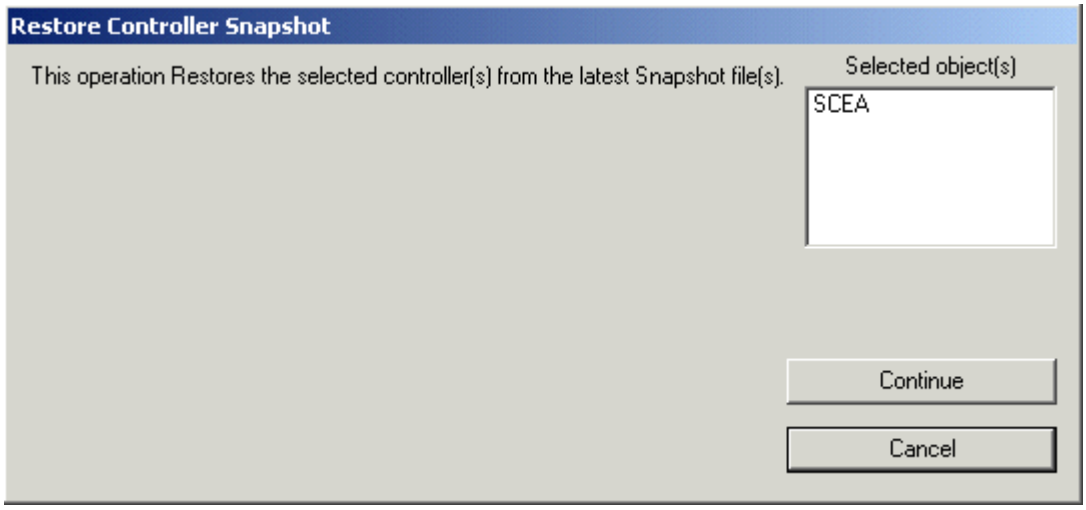
5 Click the Yes button.
Initiates shutdown of SCE, SCE turns yellow and other icons turn red.



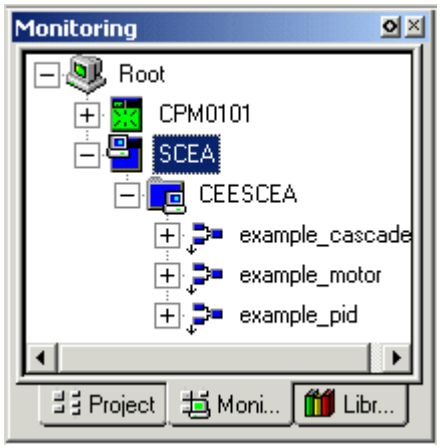
6 Right click SCE icon and select Snapshot->Restore Controller from Snapshot from shortcut menu.



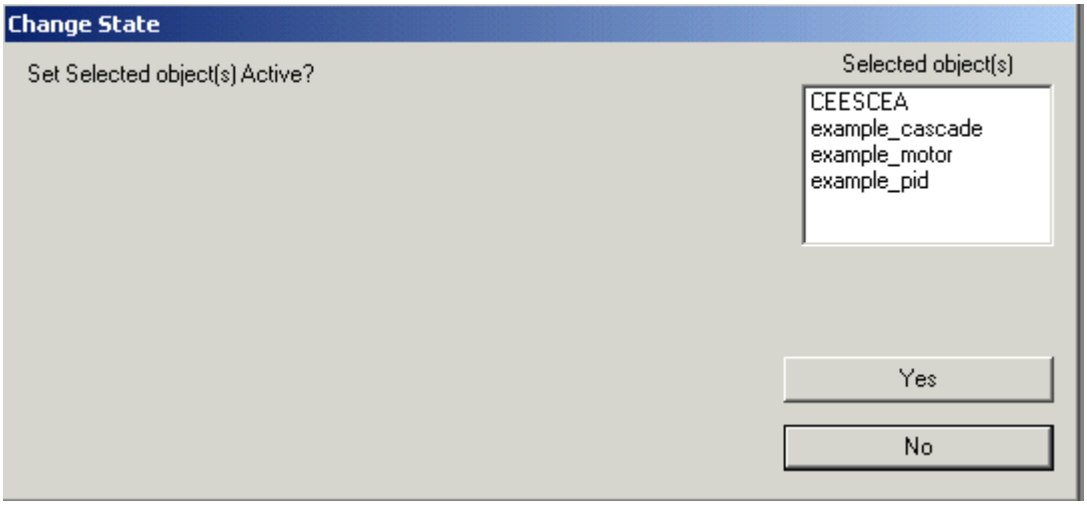
Opens Restore Controller Snapshot dialog.



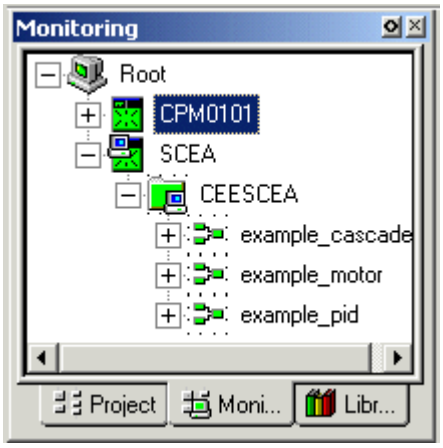
7 Click the Continue button.
Restores SCE data using the static snapshot files and icons turn blue.



8 Right-click CEESCE icon and select Activate->Selected CEE(s), and its IOMs, CMs and Applicable Function Blocks from the shortcut menu.
Calls up Change State dialog.



9 Click the Yes button to continue.
Activates components and icons turn green.



10 This completes the Shutdown Command and snapshot recovery procedure.

4.2.7 Initiating SIM-C200E Shutdown

Use the following procedure to initiate a shutdown command to the SIM-C200E Controller, which results in the SIM-C200E Controller rebooting to its RDY state or boot firmware.

Attention

Shutting down the SIM-C200E Controller interrupts the transfer of data to the Experion system. Be sure your system can tolerate the loss of live data, while the SIM-C200E Controller is in its RDY state.

1 From the Control Builder, select the **Monitoring** view.

2 Double-click the SIM-C200E Controller icon. The SIM-C200E block configuration form is displayed.

3 On the **Main** tab, click **Controller Command** box and select **Shutdown** from the list.

4 Click **Yes** to confirm the action.

5 Wait for the SIM-C200E Controller to reboot to its RDY state.

4.2.8 Recovering from power failure

Use the following procedure as a general guide for recovering SCE/CEESCE operation after a power failure. This procedure assumes that Control Builder is running with tree views open. The illustrations used in this procedure are for example purposes only.

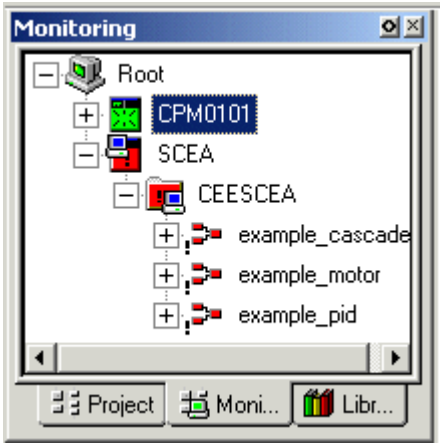
Tip

You can use this same general procedure to recover from a SCE application failure.

You can use the same procedure to recover SIM-C200E/CEESIM-C200E operation after a power failure.

1 Power to SIM-C200E node is lost.

Generates loss of SIM-C200E communications event and SCE/CEESCE and contained component block icons turn red in Monitor Mode of Control Builder on Server.

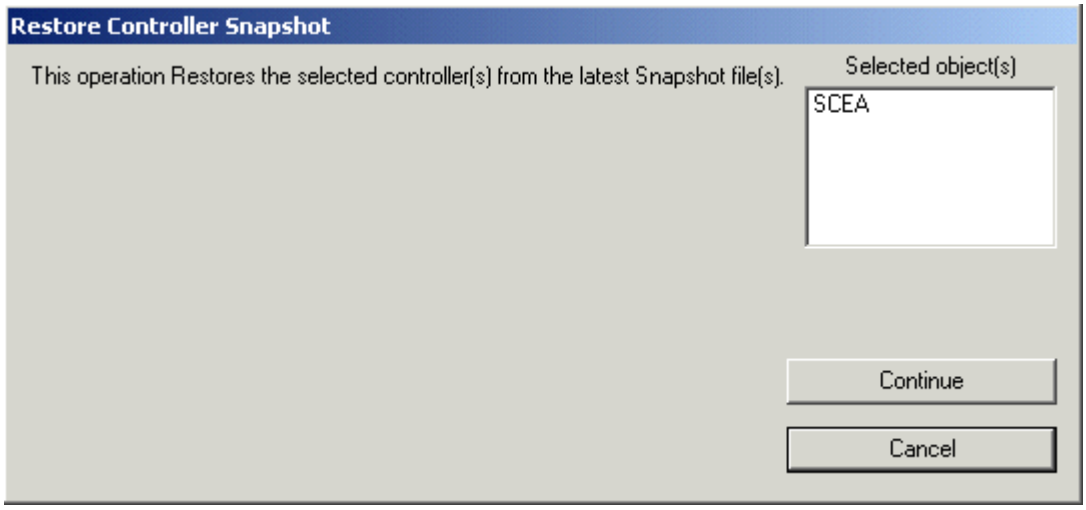


2 Restore power to SIM-C200E node.

Wait for SIM-C200E node to return to operation (Boot). The SCE block changing to yellow indicates that communication has been re-established. SIOIOLIM blocks will remain red.

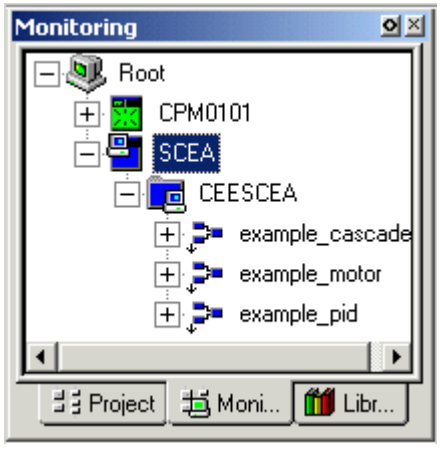
3 In Monitor mode on Control Builder, right-click the SCE block icon and select. Snapshot->Restore Controller from Snapshot from shortcut menu.

Opens Restore Controller Snapshot dialog.



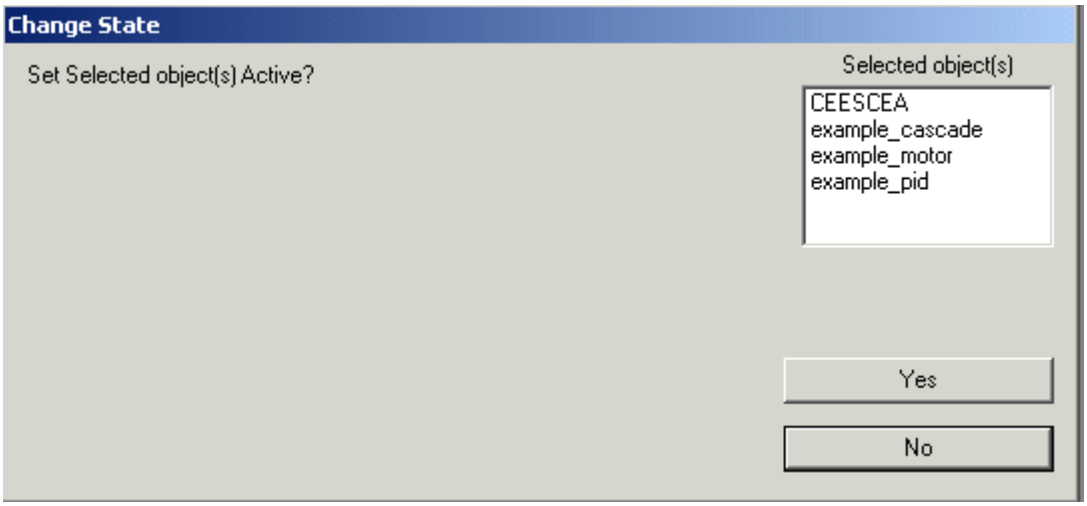
4 Click the Continue button.

Restores SCE data using the static snapshot files and icons turn blue.



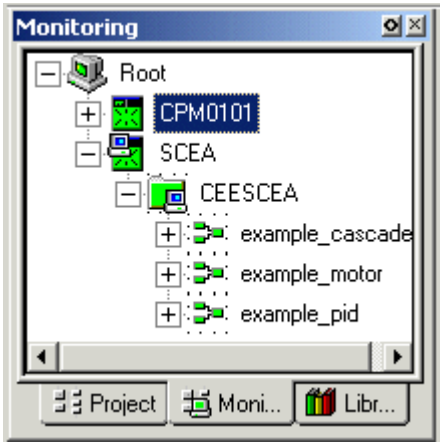
5 Right-click CEESCE icon and select Activate->Selected CEE(s), and its IOMs, CMs and Applicable Function Blocks from the shortcut menu.

Calls up Change State dialog.



6 Click the Yes button to continue.

Activates components and icons turn green.



7 This completes the power failure recovery procedure.

5 Function Block and Parameter Reference

Related topics

“SCE and CEESCE Blocks” on page 62
“SIMIOLIM and SIMIOLINK Blocks” on page 67

5.1 SCE and CEESCE Blocks

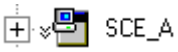
Attention

The Experion R200 release SIM-C200 consists of the SCE (Simulation Control Environment) block and its associated CEESCE (Control Execution Environment) block.

Related topics

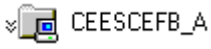
“SCE block” on page 62
“CEESCE block” on page 63
“SIM-C200E block” on page 64
“CEESIM-C200E block” on page 65

5.1.1 SCE block

Description	Identifies the SIM-C200E and associated Simulation Control Environment (SCE) and CEESCE to implement the control strategy built in the Control Builder application. It represents the entire simulation control environment. The following figure shows the graphic used to represent the block in Control Builder tree views.  This block always runs at an execution period of 2 seconds.
Function	Supports interface with Honeywell's Shadow Plant Simulator program. Publishes parameters describing the status and configuration of the SCE. Processes the computation of statistical parameters and notification reporting. Serves as a faceplate for any parameters whose scope corresponds to that of the entire SCE.
Inputs	Control protocol communications through Fault Tolerant Ethernet, Ethernet network, or Control Net C200.
Outputs	See above.

Parameters	ALMENBSTATE	MAXFREEINK
	CCLCNT	NUMCPMINCON
	CCLINFO	NUMCPMOUTCON
	CCLLOADSTAT	NUMEXTBLKS
	CCLNAME	NUMFREEBLKS
	CCLPACKET	NUMFREEDESC
	CEECOMMAND	NUMIOLMINCON
	CEESTATE	NUMIOLMOUTCN
	CPMCOMMAND[0..numChans-1]	NUMREGDESC
	CPMSTATE	NUMUSEDBLKS
	DAYLIGHTTIME	NUMUSEDDESC
	ENBMEMALMFL	NTOTMEMDESC
	FREEMEM	SCANAREA
	FREEMEMINK	SCANASSOCDSP
	HOSTIPPRI	SCANCTRLLVL
	HOSTNAMEPRI	SCANGRPDTL
	INALM	SCANPNTDTL
	MAXFREEBLKSZ	SIMENABLE
	USEDMEMINK	STATSRESET
	WEEKDAYFMT	TIMEZONE
	YEARFMT	TOTALMEM
		TOTALMEMINK
		USEDMEM
Reference	Refer to the *Experion Parameter Reference Manual* for definitions of each parameter.	

5.1.2 CEESCE block

Description	Provides simulation functionality for associated Simulation Control Environment (SCE) block. It represents the collection of control strategies that are assigned to it. The following figure shows the graphic used to represent the block in Control Builder tree views.  This block always runs at an execution period of 2 seconds.
Function	Publishes parameters describing the status and configuration of the CEESCE. Processes the computation of statistical parameters and notification reporting. Serves as a faceplate for any parameters whose scope corresponds to that of the entire system. Displayed data includes dynamic state data that is system wide, such as Free Running Counter (FRC) and PHASE or cycle of scheduler parameters. Provides control execution environment with 50ms Base Cycle for strategy checkout and simulation.
Inputs	Control protocol communications through Fault Tolerant Ethernet, Ethernet network, or Control Net C200 for peer-to-peer with C200.
Outputs	See above.

Parameters	BASPERIODAVG	NUMIOLMINCON
	BASPERIODMAX	NUMIOLMOUTCN
	BASPERIODMIN	NUMPEERENV
	BLKTYPCOUNT	NUMSCEINCON
	BLKTYPDESC	NUMSCEOUTCON
	BLKTYPHELPTXT	NUMSIOMINCN
	BLKTYPLIB	NUMSIOLMOUCN
	BLKTYPSIZE	PEERENV[ ]
	CEECOMMAND	PEERGETAVG[1..30]
	CEESTATE	PEERSTRAVG[1..30]
	FRC	PEERSUBSCPER[ ]
	FREEMEM	SCANAREA
	FREEMEMINK	SCANASSOCDSP
	INALM	SCANCTRLLVL
	MASKALLALM	SCANGRPDTL
	MAXBLKTYPES	SCANPNTDTL
	MAXFREEBLKSZ	SIMCOMMAND
	MAXFREEINK	SIMENABLE
	NEXTPHASE	SIMSTATE
	NUMACEINCON	STATSRESET
	NUMACEOUTCON	STEP
	NUMBLKTYPES	STEPTOPHASE
	NUMCPMINCON	TOTALMEM
	NUMCPMOUTCON	TOTALMEMINK
	NUMFIMINCON	USEDMEM
	NUMFIMOUTCON	USEDMEMINK
Reference	Refer to the *Experion Parameter Reference Manual* for definitions of each parameter.	

5.1.3 SIM-C200E block

Description	Identifies the SIM-C200E and CEE to implement the control strategy built in the Control Builder application. It represents the entire simulation control environment. This block always runs at an execution period of 2 seconds.
Function	Supports interface with Honeywell's Shadow Plant Simulator program. Publishes parameters describing the status and configuration of the SIM-C200E. Processes the computation of statistical parameters and notification reporting. Serves as a faceplate for any parameters whose scope corresponds to that of the entire SIM-C200E.
Inputs	Control protocol communications through redundant ControlNet, Ethernet network, or ControlNet C200/C200E.
Outputs	Refer to the description.

Parameters	ALMENBSTATE	MAXFREEINK
	CCLCNT	NUMCPMINCON
	CCLINFO	NUMCPMOUTCON
	CCLLOADSTAT	NUMEXTBLKS
	CCLNAME	NUMFREEBLKS
	CCLPACKET	NUMFREEDESC
	CEECOMMAND	NUMIOLMINCON
	CEESTATE	NUMIOLMOUTCN
	CPMCOMMAND[0..numChans-1]	NUMREGDESC
	CPMSTATE	NUMUSEDBLKS
	DAYLIGHTTIME	NUMUSEDDESC
	ENBMEMALMFL	NTOTMEMDESC
	FREEMEM	SCANAREA
	FREEMEMINK	SCANASSOCDSP
	HOSTIPPRI	SCANCTRLLVL
	HOSTNAMEPRI	SCANGRPDTL
	INALM	SCANPNTDTL
	MAXFREEBLKSZ	SIMENABLE
	USEDMEMINK	STATSRESET
	WEEKDAYFMT	TIMEZONE
	YEARFMT	TOTALMEM
		TOTALMEMINK
		USEDMEM
Reference	Refer to the *Experion Parameter Reference Manual* for definitions of each parameter.	

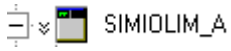
5.1.4 CEESIM-C200E block

Description	Provides simulation functionality for associated SIM-C200E block. It represents the collection of control strategies that are assigned to it. Base execution period of 50 msec is the only valid period for the CEE block.
Function	Publishes parameters describing the status and configuration of the CEE. Processes the computation of statistical parameters and notification reporting. Serves as a faceplate for any parameters whose scope corresponds to that of the entire system. Displayed data includes dynamic state data that is system wide, such as Free Running Counter (FRC) and PHASE or cycle of scheduler parameters. Provides control execution environment with 50ms Base Cycle for strategy checkout and simulation.
Inputs	Control protocol communications through Ethernet network, or ControlNet C200/ C200E for peer-to-peer with C200E.
Outputs	Refer to the description.

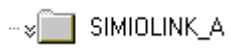
Parameters	BASPERIODAVG	NUMIOLMINCON
	BASPERIODMAX	NUMIOLMOUTCN
	BASPERIODMIN	NUMPEERENV
	BLKTYPCOUNT	NUMSCEINCON
	BLKTYPDESC	NUMSCEOUTCON
	BLKTYPHELPTXT	NUMSIOMINCN
	BLKTYPLIB	NUMSIOLMOUCN
	BLKTYPSIZE	PEERENV[ ]
	CEECOMMAND	PEERGETAVG[1..30]
	CEESTATE	PEERSTRAVG[1..30]
	FRC	PEERSUBSCPER[ ]
	FREEMEM	SCANAREA
	FREEMEMINK	SCANASSOCDSP
	INALM	SCANCTRLLVL
	MASKALLALM	SCANGRPDTL
	MAXBLKTYPES	SCANPNTDTL
	MAXFREEBLKSZ	SIMCOMMAND
	MAXFREEINK	SIMENABLE
	NEXTPHASE	SIMSTATE
	NUMACEINCON	STATSRESET
	NUMACEOUTCON	STEP
	NUMBLKTYPES	STEPTOPHASE
	NUMCPMINCON	TOTALMEM
	NUMCPMOUTCON	TOTALMEMINK
		USEDMEM
		USEDMEMINK
Reference	Refer to the *Experion Parameter Reference Manual* for definitions of each parameter.	

5.2 SIMIOLIM and SIMIOLINK Blocks

5.2.1 SIMIOLIM block

Description	Provides simulation functionality for associated Simulation I/O Link (SIMIOLINK) block. It represents the entire PM I/O environment for simulation. The following figure shows the graphic used to represent the block in Control Builder tree views.  This block runs at a fixed rate of 500 milliseconds.	
Function	Defines location of simulation I/O Link Interface Module for SCE. It does not represent the actual hardware. Defines execution state and communications path for data.	
Inputs	Simulated real-time data transmission from Shadow Plant program.	
Outputs	Simulated real-time data transmission for PM I/O Channel blocks.	
Parameters	CURTIME DESC DISPRATEAVG DISPRATEMAX ENCMDS HOSTIPPRI HOSTNAMEPRI MODSTATE MAXIMR NAME NUMIMR	NUMSCEINCON NUMSCEOUTCON NOTRATEAVG NOTRATEMAX PEERRATEAVG PEERRATEMAX SCANAREA SCANASSOCDSP SCANCTRLLVL SCANGRPDTL SCANPNTDTL SHUTDOWNCMD SIMCOMMAND SIMSTATE STATSRESET
Reference	Refer to the *Experion Parameter Reference Manual* for definitions of each parameter.	

5.2.2 SIMIOLINK block

Description	Provides simulation functionality for associated Simulation I/O Link Interface Module (IOLIM) block. It represents the collection of I/O Processors (IOPs) that are assigned to it. The following figure shows the graphic used to represent the block in Control Builder tree views. 
Function	Publishes parameters describing the status and configuration of the SIMIOLIM. Serves as repository for IOPs and IOCs associated with given I/O Link,
Inputs	Simulated real-time data transmission from Shadow Plant program.

Outputs	Simulated real-time data transmission for PM I/O Channel blocks.	
Parameters	DBVALID	SCANASSOCDSP
	DESC	SCANCTRLLVL
	IOMCOMMAND	SCANGRPDTL
	IOMSTS	SCANPNTDTL
	IOMTYPE	SIMCOMMAND
	NAME	SIMSTATE
	SCANAREA	STATE
Reference	Refer to the *Experion Parameter Reference Manual* for definitions of each parameter.	

Refer to the appropriate sections for more information about the function blocks that are common to both the control and simulation environments.

6 Notices

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You can find the most up-to-date documents on the Honeywell Process Solutions support website at:

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For the purpose of submission, a security vulnerability is defined as a software defect or weakness that can be exploited to reduce the operational or security capabilities of the software.

Honeywell investigates all reports of security vulnerabilities affecting Honeywell products and services.

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- Send an email to security@honeywell.com.

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- Contact your local Honeywell Process Solutions Customer Contact Center (CCC) or Honeywell Technical Assistance Center (TAC) listed in the “Support and other contacts” section of this document.

6.3 Support

For support, contact your local Honeywell Process Solutions Customer Contact Center (CCC). To find your local CCC visit the website, https://www.honeywellprocess.com/en-US/contact-us/customer-support-contacts/Pages/default.aspx.

6.4 Training classes

Honeywell holds technical training classes on Experion PKS. These classes are taught by experts in the field of process control systems. For more information about these classes, contact your Honeywell representative, or see http://www.automationcollege.com.