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Honeywell

EXPERION LX

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C300 Controller User's Guide

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CHAPTER

1

ABOUT THIS DOCUMENT

This guide provides information that will assist you in planning and designing activities, as well as the installation, operation, and troubleshooting of C300 Process Controllers in a PlantCruise system.

Starting with R501, C300 controllers (Hardware model — CC-PCNT02) provide an expanded functionality of large memory capacity, primarily to support the Profit Controller. CC-PCNT02, with the in-built firmware, is interoperable with CC-PCNT01 and enables easy synchronization,

1.1 Revision History

Revision	Date	Description
A	August 2019	Initial release of the document.

CHAPTER

2

C300 CONTROLLER PURPOSE

This section provides a quick comparison of C200 and C300 Controller features and reference to topics in this book for a given task related to using the C300 Controller with the Experion system.

> **ATTENTION**
>
> The C300 Controller can be used with the Universal Input/Output (UIO) module for replacing the TPS components such as Basic Controller (CB) and Extended Controller (EC). For more information about the usage of the C300 Controller with the Universal Input/Output (UIO) module, see *Series 8 I/O User's Guide*.

- C300 Controller and C200 Controller comparison
- Getting started

2.1 C300 Controller and C200 Controller comparison

The C300 Controller provides design improvements and greater operational capabilities for process control over the chassis-based C200 controller. The following table is a listing that compares design features and operational improvements of the C300 Controller with the C200 controller.

> **ATTENTION**
>
> The C300 - 20mS CEE Controller has all the features as the C300 - 50ms Controller with exceptions related to the faster execution speed (20ms). The C300 - 20mS CEE controller supports only the Series 8 I/O modules. Two new Series C I/O Modules (Speed Protection Module (SPM) and Servo Valve Positioner Module (SVPM)) are only supported by the C300 - 20mS CEE Controller.
>
> The C300 - 20mS CEE controller is only intended for Honeywell Turbine Control Solutions.

Controller Feature	Comparison
Form Factor	**C200** - Chassis-based controller with plug-in modules for Control Processor, I/O Link Interface, Redundancy, FTE interface, Fieldbus, other I/O and control modules. **C300** - A single control module that plugs into an Input Output Terminal Assembly (IOTA). Control module functions include a Control processor, two I/O Link interfaces,

Controller Feature	Comparison
	Redundancy functions, and FTE interfaces.
Memory (RAM)	**C200** - 4MB User Memory **C300** - 16MB User Memory
Redundancy	**C200** -Two identically-equipped controller chassis that contain two Redundancy Modules (RM) provide controller redundancy. **C300** - Controller redundancy function is built in. A second C300 Controller and redundancy cable is all that is required for redundant controller operation. (No RMs)
I/O Link Interface	**C200** - An I/O Link Interface plug-in Module (IOLINK) installed in the controller chassis is required to connect PMIO I/O to the controller CPM. **C300** - Two I/O Link interfaces are built in to the controller. Each I/O Link can connect with either PMIO I/O or Series 8 I/O modules. **Note**: C300 - 20mS CEE Controller supports only Series 8 I/O modules.
Communications Interface to supervisory network	**C200** - Ethernet or Fault Tolerant Ethernet plug-in modules are needed to connect to respective Ethernet and FTE communication networks. ControlNet Interface plug-in module is needed to connect with other ControlNet nodes. **C300** - Ethernet interface is built into the controller and supports both Ethernet and redundant FTE communications. No ControlNet interface.
Peer-to-Peer Connections	**C200** - Ethernet or Fault Tolerant Ethernet Bridge plug-in modules are needed to connect to respective Ethernet and FTE networks. ControlNet Interface plug-in module is needed to connect with other ControlNet nodes. **C300** - Ethernet interface is built into the controller to support both Ethernet and redundant FTE communications. C300 connection to C200 controller is made through an FTE Bridge module installed in the C200 chassis. No ControlNet interface. **Note**: C300 - 20mS CEE Controller does not support peer-to-peer connection with C200E.
Function Blocks	**C200 and C300** - Both Controllers use the same standard Experion function block types for control strategy execution. There are some exceptions.

Controller Feature	Comparison
	Note: C300 - 20mS CEE Controller supports only limited function blocks. For more information refer to Series 8 control hardware.
Engineering Tools	**C200 and C300** - Both controllers use the same engineering tools utilities and applications for maintenance tasks (except NTools). The CTools engineering utility is used to upgrade C300 firmware and extract files containing diagnostic data when troubleshooting problems.

2.2 Getting started

The following table lists some of the tasks covered in this document that are related to implementing a C300 Controller in your Experion R300 system or later. If you are viewing this document online, just click the reference to jump to the topic in this document.

- What task do you want to perform?

2.2.1 What task do you want to perform?

If you want to ...	Then, see this topic ...
Plan and design a C300 Controller installation	C300 Controller planning and design
Know more about C300 hardware	Series 8 control hardware Identify C300 Controller components
Know more about C300 Controller performance	C300 Controller performance data
Install and wire C300 Controller hardware	C300 Controller installation
Upgrade Controller firmware	Upgrading C300 Controller firmware
Create C300 Controller and CEE function blocks	C300 Controller configuration
Configure CEE function blocks	Configure CEEC300 block
Configure IOLINK function blocks	Configure IOLINK function blocks
Configure a Secondary C300 Controller	Configure a Secondary C300 Controller block
Convert a Non-redundant C300 Controller to a redundant controller	Convert a non-redundant C300 Controller to a redundant controller

If you want to ...	Then, see this topic ...
Convert a redundant C300 Controller to a Non-redundant controller	Convert a redundant C300 Controller to a non-redundant controller
Reset Controller Device Index	Reset Device Index and IP address of a controller
View configuration parameter descriptions	C300 configuration form reference
Load function blocks to C300 components	Load C300 Controller Configuration
Reload components from Project	Reloading components from project
Review C300 Controller start up routines	C300 Controller start up
Review C300 Controller operating indications	C300 faceplate indicators/displays
Shutdown a C300 Controller	Initiating C300 Controller shutdown
Activate the Controller's CEE	Activate C300 Controller's CEE
View Controller operations	Viewing controller operation and status in Control Builder Using Station displays
Review C300 controller operating behaviors Time management, Watchdog Timer	C300 operating behaviors
Controller processing overload behavior and recovery	C300 Controller processing overload behavior
Review C300 Controller redundancy functionality	C300 redundancy operation
Review C300 Controller maintenance and replacement procedures	C300 Controller maintenance
Investigate a cause of a problem	C300 Controller troubleshooting
Install and wire C300 Controller hardware	C300 Controller installation
Review C300 Controller redundancy functionality	C300 redundancy operation

CHAPTER

3

C300 CONTROLLER PLANNING AND DESIGN

This section includes information about system planning and design of the C300 Controller. The following topics are presented here.

- Review Experion system capabilities
- Control Hardware Planning Guide
- Series 8 control hardware
- Identify C300 Controller components
- C300 Controller performance data

3.1 Review PlantCruise. system capabilities

Read the *Overview* document so that you understand the basic concepts and terminology, and appreciate the capabilities of PlantCruise.

Complement the information in this document with the data in the *Server and Client Planning Guide* to cover all aspects of PlantCruise installation.

For planning and design topics for Engineering Station and clients as well as information about adding third-party controllers, see the *Server and Client Planning Guide*.

- Planning for system security

3.1.1 Planning for system security

System security must be achieved at all levels in the Experion system to manage security threats.

For details on security related planning, refer to the *Network and Security Planning Guide*.

For controller hardware specific security planning, refer to the chapter *Securing controller hardware* of the *Network and Security Planning Guide*.

3.2 Control Hardware Planning Guide

Refer to the *Control Hardware Planning Guide* for a general discussion of planning activities for Experion Control hardware that covers:

- Initial planning and design
- Control network considerations
- Control hardware configuration
- Site selection and planning
- Control processing considerations
- Application licensing considerations

3.3 Series 8 control hardware

Series 8 control hardware consists of the following system components:

- **C300 Controller** is a distributed process controller and I/O gateway for the Experion system.
- **Series 8 Input/Output Modules** that feature HART-capable AI and AO modules, and a low level Mux AI module. Digital input modules that support high voltage AC and 24V DC inputs.

- Series 8 form factor
- C300 Controller
- C300 controller model CC-PCNT02 – Enhanced Functionality
- C300 Controller execution environments

3.3.1 Series 8 form factor

All Series 8 control hardware is constructed using the same form factor; that is, the C300 Controller modules, Series 8 I/O modules, and Series 8 FIMs all mount on their associated Input Output Termination Assemblies (IOTAs), which are installed on channel hardware specifically designed to support Series 8 hardware installation. The module's circuit board assemblies are housed in a plastic case with a round faceplate that identifies the module type and model number along with status LEDs and a four-character alphanumeric display. The IOTA contains connectors that accept the associated control module and the various I/O connectors for cables that connect to other Series 8 control hardware. Below figure shows an example of the design.

Figure 3.1 Series 8 form factor example



For more details about Series 8 I/O, Level1 Switch and FIM modules refer to the following documents:

- *Series 8 I/O User's Guide*
- *Series C Mark II I/O User's Guide*
- *Series 8 Fieldbus Interface Module User's Guide*.

3.3.2 C300 Controller

The C300 Controller is constructed using the Series 8 form factor that employs an Input Output Termination Assembly (IOTA) and an electronics module which mounts and connects to the IOTA. This smaller controller footprint and ease of installation provides greater value for PlantCruise users.

The C300 Controller fully supports configuration, load and execution of the standard function blocks. Note that there are a few exceptions defined below.

Exceptions

The following function blocks are *not* supported by the C300 Controller:

- The LIOM function block set.
- CAB related function blocks other than the Custom Data Block (CDB)

3.3.3 C300 - 20mS CEE Controller

The C300 - 20mS CEE Controller uses the same Controller Module and IOTA as the C300 - 50ms controller. It uses a different firmware image that supports faster control execution. The C300 - 20 mS CEE supports Speed Protection Module (SPM) that monitors turbine speed inputs, analog inputs, and digital status inputs, and controls digital outputs and a single analog output. Servo Valve Positioner (SVP) Module monitors valve position either with LVDT/RVDT interface or analog input and two digital inputs, and controls the valve movement either with servo coil current or analog output.

The C300 - 20mS CEE Controller fully supports configuration, load and execution of the standard function blocks supported in the C300 - 50ms Controller. Note that there are a few exceptions defined below.

Exceptions

The C300 - 20 controller does not support the following function blocks.

- LIOM function block set
- Custom Data Block (CDB)
- Profibus Gateway Module (PGM2) function blocks
- SIM C300 20ms function block
- FIM4 function block
- Wireless Device Manager (WDM) function blocks
- Sequential Control Module (SCM) function block
- Recipe Control Module (RCM) function block
- Unit Control Module (UCM) function block
- Phase Block
- Series A - Serial Interface Module (SIM) (for third party integration)
- Series H module
- Profibus I/O Module
- PMIO function blocks
- Exchange blocks
- Change Execute (CHGEXEC) Block
- Fieldbus blocks
- DeviceNet blocks
- Profibus blocks
- American Gas Association (AGA) blocks
- A-B Drive Interface Library
    - Legacy SCANport Drives
    - PowerFlex Drives

- JAGXTREME block library
    - JAGXCHAN
    - JAGXTERM
- QIMPACT Library block
    - QIPACCHAN
    - QIPACTERM

ATTENTION

C300-20ms controller does not support peer-to-peer communication with the following:

- FIM4
- Profibus Gateway Module (PGM2)
- C200E
- Wireless Device Manager (WDM)

C300 Controller redundancy

The C300 Controller may operate in both non-redundant and redundant configurations. Redundant operation requires a second identical controller and connecting cables, which is the typical configuration. The switchover time from the active primary controller to the backup controller of a redundant pair is less than 500 milliseconds.

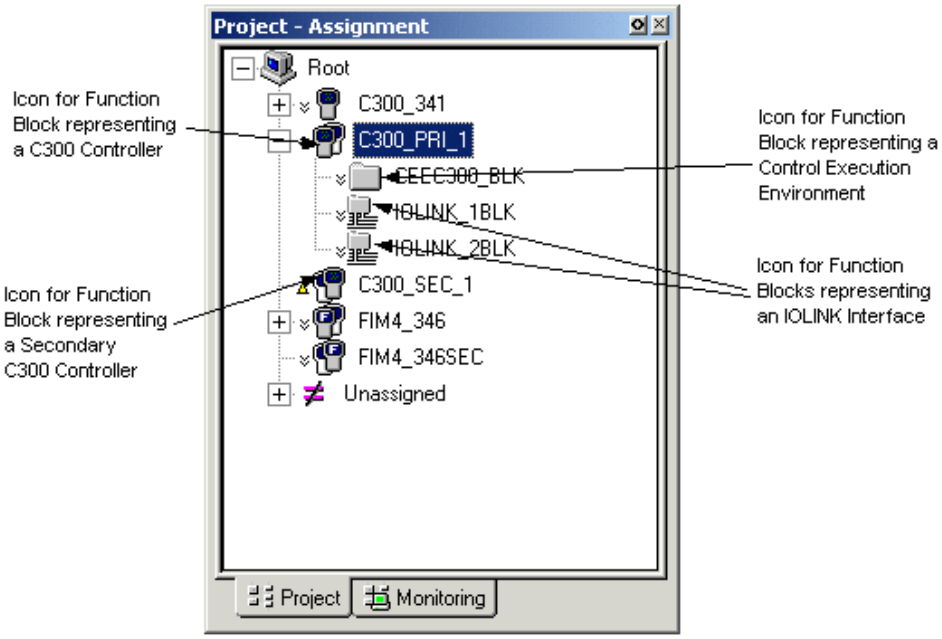
ATTENTION

The switchover time from the active primary C300-20ms controller to the backup C300-20ms controller of a redundant C300-20ms controller pair is less than 200 milliseconds.

C300 Controller block

When a C300 Controller block is added to the Project tree in Control Builder, a graphic representation of a controller module and its resident function blocks appears as shown in Figure 2. The function blocks that are contained in the controller support multiple execution environments. A Control Execution Environment block (CEEC300) and two IOLINK blocks are contained in the controller and appear under the controller. When the controller block is configured as redundant, the secondary controller block is added in the Project tree.

Figure 3.2 Redundant C300 Controller block in the Project tree



3.3.4 C300 controller model CC-PCNT02 – Enhanced Functionality

Beginning with R501, a new C300 controller model with enhanced functionality: the CC-PCNT02, has been introduced to meet the demand for expanded memory and to address the ASIC hardware (Spartan-IIE FPGA) obsolescence.

While the initial release of C300 (CC-PCNT01) contained a Processor board with 32 MB of main Memory and Application board that used the Spartan-IIE FPGA family, the new release of C300 (CC-PCNT02) gets 64 MB of main Memory and an Application board that uses the Spartan-3A FPGA family ASIC.

The enhanced memory enables the CC-PCNT02 to provide extended functionalities such as support for Profit Controller and Ethernet Interface Module (IEC & EIP) blocks. Besides this, there is no significant change in the functionality offered by the CC-PCNT02 model compared to CC-PCNT01.

The CC-PCNT02 may be used as a compatible field replacement for CC-PCNT01 by installing the current-release firmware image with Ctools. The following table summarizes the supported releases and the firmware required to enable CC-PCNT02 to either work with enhanced functionality or only replace CC-PCNT01.

In the Release	CC-PCNT02 behavior will be	When flashed with the firmware
R501	Exactly as CC-PCNT01	C300.lcf
As CC-PCNT02 (that is, with extended functionality)	PCNT02.lcf	boot2x; app2
R310.3 to R432	Exactly as CC-PCNT01 (that is, as a replacement for an existing CC-PCNT01 only)	

> **NOTE**
>
> See the appropriate release SCN for details of applicable firmware and required upgrade procedures.

What this essentially means is, in R501, the CC-PCNT02 can run compatible firmware that includes application image types: 20 ms, 50 ms, or 50ms_EHB, and be the exact equivalent of a CC-PCNT01.

In R501, when the CC-PCNT02 is running compatible firmware with the application image type 50ms_Extended, it acquires extended functionality to support Profit Control and EIP blocks.

See the BeAware ADVISORY BW2016-19_introducing_c300_cc-pcnt02 for a description of conditions under which the CC-PCNT02 C300 can be used to replace a CC-PCNT01 C300, and restrictions on migration.

For more information about migration and interoperability considerations between CC-PCNT02 and CC-PCNT01, see the *C300 and Series C IO Modules On-Process Migration Guide* and *C300 and Series C IO Modules Off-Process Migration Guide*.

Identifying the CC-PCNT02

You can identify a CC-PCNT02 by using one or a combination of these three methods:

1. 1. On the front display of the module – Marked as CC-PCNT02
2. Check the module in FTE Status Display and in Ctools. You will see:
   - C300V2, if it is PCNT01
   - C300V3, it is PCNT02 with PCNT01 compatible firmware
   - C300V3E, if it has extended functionality firmware

   > **NOTE**
   >
   > In releases prior to R501, this information is not shown in FTE Status Display and in Ctools but as shown for any PCNT01 model.

3. In Control Builder, on the Hardware Information tab of the C300 Module Property block, Hardware version is displayed as
   - Version 3 for PCNT02
   - Version 2 for PCNT01

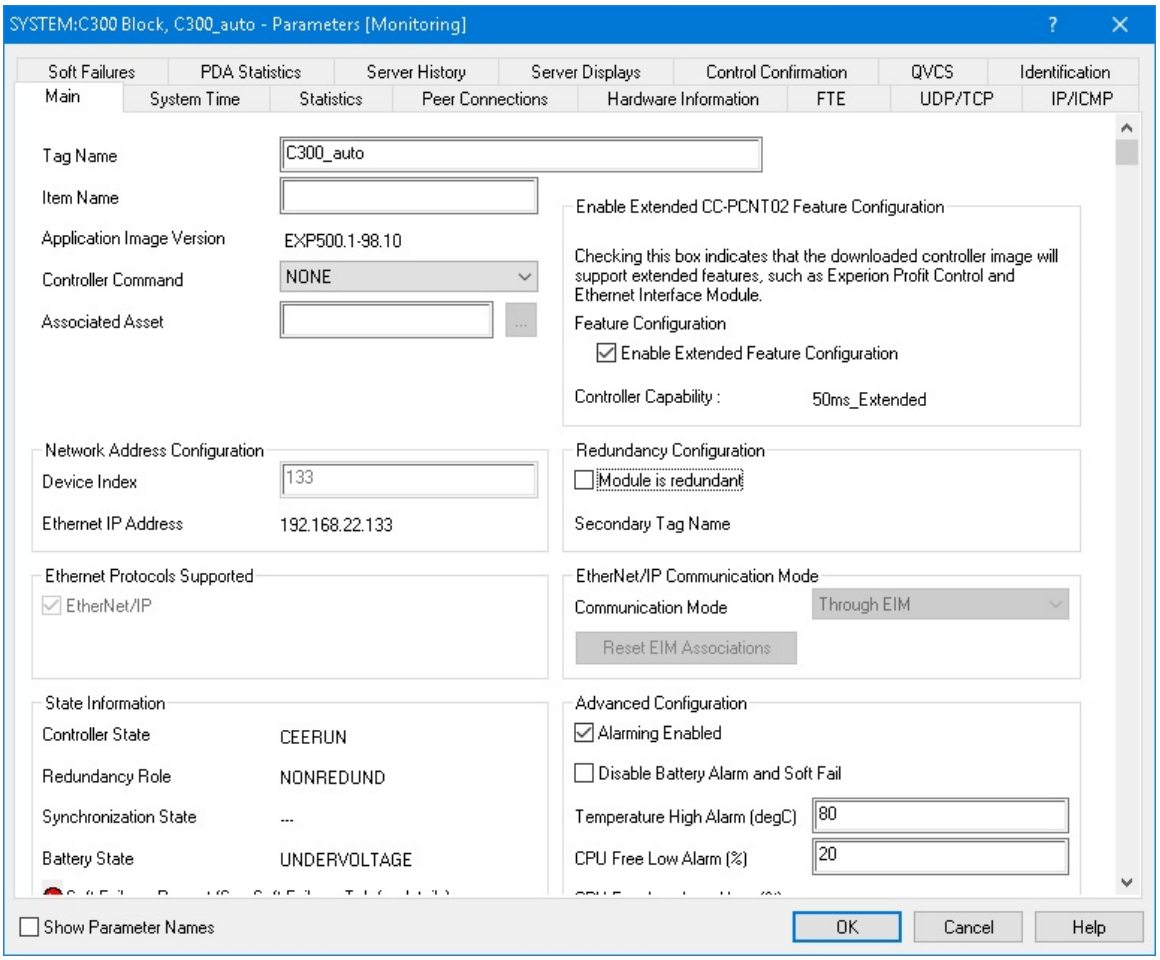
In R501, after installing the new controller and flashing the current-release firmware image, on the controller's **Main** tab, under **Controller Capability Configuration**, ensure that the **Extended Functionality** checkbox (CAPABILITY parameter) is selected.

This checkbox is already checked if you have migrated to the CC-PCNT02 from the CC-PCNT01 and you have flashed it with the PCNT02.lcf firmware.

Also, under **Controller Capability** (CTRLCAPABILITY parameter), the actual capability of the controller is shown. This is a read-only parameter and could have one of the following values:

- 50ms – Indicates CC-PCNT02 is running as CC-PCNT01
- 20ms – Indicates CC-PCNT02 is running as CC-PCNT01
- 50ms_EHB – Indicates CC-PCNT02 is running as CC-PCNT01
- 50ms_Extended – Indicates the CC-PCNT02 is running as CC-PCNT02.

> **NOTE**
> The 50ms_Extended firmware includes the 50ms_EHB firmware.



3.3.5 C300 Controller execution environments

The C300 Controller supports three Execution Environment (EE) function blocks. One is the Control EE block (CEEC300) The IOLINK blocks in the C300 support connection and communications with all I/O modules.

CEE function block

The Control Execution Environment (CEEC300) block is a function block which uses the same library of block types. The CEEC300 block provides an execution and scheduling environment in which Control Modules (CMs) and Sequential Control Modules (SCMs) execute user-configured control strategies. Existing control strategies can be ported to a C300 controller, although manual editing of these strategies is required to support the C300 controller configuration. The CEEC300 block contains a peer-to-peer communications layer which is used to communicate between other controllers.

3.3.6 I/O modules supported by the C300 Controller

The C300 Controller supports all Series A chassis-based I/O modules, all Series 8 I/O modules and all PMIO I/O modules that are qualified for use in Experion. Series A I/O modules are connected to the C300 through a Fault Tolerant Ethernet Bridge (FTEB) module which is installed in a C200 controller or remote I/O chassis. See FTE Bridge (FTEB) Topologies in the *Control*

Hardware Planning Guide for an example of this connection. Some Series A modules are implemented in a Control Component Library (CCL).

Series 8 I/O and PMIO modules are connected to the C300 by a pair of I/O Link Interfaces. Two IO Link interfaces, which are redundant, provide connection between the C300 controller and associated I/O modules. Each IO links can be configured to support Series 8 I/O modules or PMIO I/O modules.

See the following resources for listings of the supported I/O modules:

- **PMIO Modules** - Planning Your Input/Output Processor (IOP) Cards in the control Hardware Planning Guide.
- **Series C I/O Modules** - Available Series 8 I/O modules in the Series 8 IO User's Guide.

3.3.7 I/O Modules supported by the C300 - 20mS CEE Controller

The C300 - 20mS CEE Controller supports all Series C I/O modules that are supported by C300 - 50ms controller. In addition, the C300 - 20mS CEE controller supports two new Series C I/O modules - Speed Protection Module (SPM) and Servo Valve Positioner Module (SVPM). See Series C I/O Topologies in the *Control Hardware Planning Guide* for an example of this connection.

The C300 Controller is connected to the associated I/O hardware modules by a pair of I/O Link Interface cables. Each IO link can be configured to support Series C I/O modules.

For a list of supported I/O modules, see in the *Series C I/O User's Guide*.

3.4 Identify C300 Controller components

> **ATTENTION**
>
> The C300 - 20mS CEE controller components are same as the C300 - 50ms controller. The C300 - 20mS CEE controller is intended for Honeywell Turbine Control Solutions.

The following table identifies the C300 Controller components and its associated components. The C300 Controller supports non-redundant and fully redundant operation. Redundancy is built in to the controller, so that just adding another controller and a redundancy cable; a redundant controller pair is achieved. Note that the 'CC' designation on the model number indicates the printed wiring boards are conformally coated for additional protection from the environment, (CU = uncoated).

Table 3.1 Series 8 Hardware components

Series 8 Component	Description	Model Number
C300 Controller Module	A distributed process controller and I/O gateway for the PlantCruise system. Module contains printed circuit assemblies, status indicators and a display, inside in a plastic housing. Module mounts to its Input Output Termination Assembly (IOTA). The CC-PCNT02 hardware supports enhanced functionality with expanded memory. It is interoperable with CC-	CC-PCNT01 CC-PCNT02 CU-PCNT01

Series 8 Component	Description	Model Number
	PCNT01.If you replace an existing CC-PCNT01 with CC-PCNT02, the firmware provides an easy synchronization of both the controllers. This hardware is required for the enhanced R501 features of Profit Controller.	
C300 Controller Input Output Termination Assembly (IOTA)	Provides the connection point for the C300 Controller module and all cable terminations to the controller, (FTE, IOLink, Redundancy, Battery, and Time Source cable terminations). Provides 24 Vdc power distribution to the controller module. Note: The C300 Controller IOTA supports only one controller module.	CC-TCNT01 CU-TCNT01
9 Port FTE Control Firewall Module	Provides FTE distribution to the cabinet network nodes, (other C300 Controllers and Series 8 FIMs)	CC-PCF901 CU-PCF901
9 Port Control Firewall IOTA	Provides connection for the eight FTE cables from in-cabinet controllers and Series 8 FIMs. The 9th port provides an uplink to the FTE supervisory network. Provides 24 Vdc power distribution to the CF9 module.	CC-TCF901 CU-TCF901
FTE Cable	STP CAT5 Cable with RJ 45 connectors for FTE connections.	
2 m (6.5 ft) (Y) = Yellow coded boots (G) = Green coded boots	51305482-102 (Y) 513054820202 (G)	
5 m (16 ft)	51305482-105 (Y) 513054820205 (G)	
10 m (33 ft)	51305482-110 (Y) 513054820210 (G)	
20 m (65.5 ft)	51305482-120 (Y)	

Series 8 Component	Description	Model Number
	51305482-220 (G)	51305482-xxx
Redundancy Cable	STP CAT5 Cable with RJ 45 connectors joining primary and secondary controllers.	
IOLink Cable	Multidrop cable assemblies to connect the I/O modules of a controller IOLink.	xxxxxxxx-xxx
Battery Cable	Multidrop twisted pair cable to connect battery power to controllers.	xxxxxxxx-xxx
IOTA Channel Supports	Aluminum channels that provide a mounting medium for the IOTA Channel.	CC-MCHN01
IOTA Channel	Assembly for mounting the Series 8 hardware IOTAs. Channels contain power and grounding busbars are mounted onto IOTA channel supports.	CC-MCAR01
Power Supply, Non-redundant no Battery Back Up	24 Vdc, 20 A power supply. Provides non-redundant power to Channel busbars and Series 8 IOTAs.	CC-PWRN01
Power Supply Redundant, no Battery Back Up	24 Vdc, 20 A fully redundant power supply. Provides redundant power to Channel busbars and Series 8 IOTAs.	CC-PWRR01
Power Supply, Redundant with Battery Back Up	24 Vdc, 20 A fully redundant power supply with battery back up. Provides redundant power to Channel busbars and Series 8 IOTAs.	CC-PWRB01
COTS Power Supply (Meanwell) Redundant, no Battery Back Up	24 Vdc, 20 A COTS power supply. Provides redundant power to channel busbars and Series 8 IOTAs.	CU-PWMR20
COTS Power Supply (Meanwell) Non-redundant, no Battery Back Up	24 Vdc, 20 A COTS power supply. Provides non-redundant power to channel busbars and Series 8 IOTAs.	CU-PWMN20
COTS Power Supply (Phoenix Contact) Redundant, no Battery Back Up	24 Vdc, 20 A COTS power supply. Provides redundant power to channel busbars and Series 8 IOTAs.	CU-PWPR20
COTS Power Supply (Phoenix Contact) Non-redundant, no Battery	24 Vdc, 20 A COTS power supply. Provides non-redundant power to channel busbars and Series 8 IOTAs.	CU-PWPN20

Series 8 Component	Description	Model Number
Back Up		
Specially Series C Mark II Parts		
C300 Controller Input Output Termination Assembly (IOTA) for Series C Mark II	Provides the connection point for the C300 Controller module and all cable terminations to the controller, (FTE, IOLink, Redundancy, Battery, and Time Source cable terminations). Provides 24 Vdc power distribution to the controller module. **TIP** The C300 Controller IOTA supports only one controller module.	DC-TCNT01
9 Port Control Firewall IOTA for Series C Mark II	Provides connection for the eight FTE cables from in-cabinet controllers and Series 8 FIMs. The 9th port provides an uplink to the FTE supervisory network. Provides 24 Vdc power distribution to the CF9 module.	DC-TCF901
COTS Power Supply (Meanwell) Redundant, no Battery Back Up 24 Vdc, 20 Amp. COTS power supply. Provides redundant power to Channel busbars and Series C IOTAs CU-PWMR20	24 Vdc, 20 Amp. COTS power supply. Provides redundant power to header board and Series C Mark II IOTAs	DU-PWMR20
COTS Power Supply (Phoenix Contact) Redundant, no Battery Back Up 24 Vdc, 20 Amp. COTS power supply. Provides redundant power to Channel busbars and Series C IOTAs CU-PWPR20	24 Vdc, 20 Amp. COTS power supply. Provides redundant power to header board and Series C Mark II IOTAs	DU-PWPR20

3.5 C300 Controller performance data

The following table lists some C300 Controller performance related data for quick reference. *Note that this information is subject to change without notice.*

Performance	Capacity
Block Performance	5500 Execution Units (XU) per second with full cycle average CPU loading (CPUCYCLEAVG) of no more than 60.
Memory	16 MB user memory
Tagged Objects	4095 Total CMs, SCMs, UCMs, RCMs, IOMs, and other named objects.
Alarms and Events	10 events per second.
Total I/O Budget	64 I/O units. Total for I/O types. See Note 1 for example.
Number of I/O Links	2
Data Access Performance	2000 points per second.
Data Access Connections	12. Up to two servers and 20 direct Stations.
Peer to Peer Connections	30 Peer Connection Units.
Note 1: The C300 Controller supports up to a total of 64 I/O Units which can be calculated in the following manner: **PMIO I/O Units + Series C I/O Units + Series A I/O Units + Fieldbus IO Units = 64** Where ... • One non-redundant or redundant PMIO IOM = 1 I/O Unit • One non-redundant or redundant Series 8 = 1 I/O Unit • The number of I/O Units assigned to any given Series A I/O device is specified for that device. • One non-redundant or redundant Series 8 Fieldbus Interface Module = 4 I/O Units	

3.6 Control network considerations

In PlantCruise system, the C300 controller exists as a single node on an FTE network. The C300 controller connects to the network and communicates with other FTE nodes through a Series 8Level1 Switch installed in the same control cabinet. Standard Ethernet communications also are supported by the C300 Controller, although FTE should be considered the recommended communications protocol.

The C300 controller does not contain a ControlNet interface and therefore cannot reside on a ControlNet supervisory network.

C300 controllers and C200 controllers can exist on the same server only when FTE is used as the supervisory network protocol.

- C300 controller communication with C200 controllers and ControlNet using FTEB
- C300 controller peer communication with Experion nodes
- C300 - 20mS CEE peer communication with Experion nodes
- C300 connections with Rockwell PLC devices
- C300 connections to the Control Firewall

3.6.1 C300 controller communication with C200 controllers and ControlNet using FTEB

The C300 controller communicates with C200 controllers, FIMs, and associated Series A I/O modules using a Fault Tolerant Ethernet network in which a Fault Tolerant Ethernet Bridge (FTEB) module is installed in the associated C200 controller chassis, a FIM chassis or a non-redundant I/O chassis. See the Supervisory Network considerations in the *Control Hardware Planning Guide* for supervisory network topologies.

3.6.2 C300 controller peer communication with Experion nodes

The C300 controller supports peer communication with the following nodes in Experion Release 300 and later:

- C300 controllers
- C200 controllers - via Fault Tolerant Ethernet Bridge module
- ACE nodes
- Series 8 FIM nodes
- EHPM nodes

Note that when configuring a peer connection, the C200 controller can be made the initiator of the connection only when the node is loaded with R3xx.x firmware. Additionally, C200 controllers and ACE nodes must have R3xx.x firmware installed and be running Experion R3xx.x software to ensure a reliable peer-to-peer connection.

Although the system topology in Experion Release 3xx.x provides for peer communications between C300 and C200 controllers, (via FTEB module); both controllers must reside on an FTE supervisory network. That is, a C300 controller cannot be added to a server where C200 controllers are resident on a ControlNet supervisory network.

Currently, C300 controller does not support connection with the following Experion nodes: Series A (Chassis) FIM, Chassis IOLIM, and OPC servers.

Starting with Experion R430, peer-to-peer communication between C300 Controller and EHPM Controller is supported.

For information on EHPM integration with Experion, refer to the *Integrated Experion-TPS User's Guide*.

To establish peer-to-peer communication between C300 Controller and EHPM Controller, refer to the *Control Building User's Guide*.

3.6.3 C300 - 20mS CEE peer communication with Experion nodes

ATTENTION

The C300 - 20mS CEE supports peer-to-peer communications with the following nodes:

- C300 (50ms and 20ms) controllers
- C200 (50ms and 5ms) controllers - through Fault Tolerant Ethernet Bridge module
- ACE nodes

The C300 - 20mS CEE controller is intended for Honeywell Turbine Control Solutions.

3.6.4 C300 connections with Rockwell PLC devices

You can configure peer connections for the C300 controller to communicate with Rockwell PLC devices using the same interfaces as is currently supported for C200 controllers. These interfaces include Exchange function blocks, CIP protocol, and Programmable Controller Communications Commands (PCCC). See C300 interoperability with PLC topologies in the *Control Hardware Planning Guide* for additional information.

The C300 controller *does* require the use of an approved Ethernet interface device to access the ControlNet network on which the PLC devices reside.One of the following Ethernet interface modules can be used to connect with the Rockwell PLCs:

- FTEB Module (TC/TK-FTEB01)
- Ethernet Interface Module (TC-CEN021)

3.6.5 C300 connections to the Control Firewall

The C300 controller connects to the control and supervisory communication networks through the 9-Port Control Firewall. The Control Firewall Module provides connection to other field Level 1 nodes on the FTE network and an uplink to the supervisory level FTE network. The module provides message management and protects the Level 1 network from message storms by allowing only messages intended for Level 1 nodes, and rejecting other unneeded messages.

3.6.6 C300-PLC Integration

CDA is used for communciation between the controller and C300. The controller acts as a CDA responder. It must be selected for either Ethernet port 1 or port 2 to communciate with C300.

If you want to publish the configuration to the Experion Server for CDA communication, the following configuration should be done:

- ControlEdge integration service is installed and running in the Experion Server. See "Installing ControlEdge integration service" in the ControlEdge Builder Software Installation Users Guide for more information.
- CDA must be selected on the Ethernet port(s) connected to the same network as the Experion Server. See "Configuring ETH1 and ETH2" on page 31 for more information.
- CDA must be selected for the global variables or local variables you want to publish to Experion. See the following table for the data type matching between the ControlEdge PLC points and Experion Server points.

Data Type in ControlEdge PLC	Data Type in Experion
IEC_BOOL	BOOLEAN
IEC_SINT	INT8
IEC_INT	INT16
IEC_DINT	INT32
IEC_LINT	INT64
IEC_USINT	UINIT8
IEC_UINT	UINT16
IEC_UDINT	UINT32
IEC_TIME	TIME
IEC_ULINT	UINT64
IEC_LWORD	UINT64
IEC_STRING	STRING
IEC_ARRAY	ARRAY
IEC_STRUCT	Not Applicable
IEC_CLASS	Not Applicable
IEC_CSTRING	Not Applicable
IEC_ENUM	ENUM

a. Click IEC Programming Workspace from the toolbar.

b. Double click Global Variables, select CDA for the target variables. You can also select CDA when you create a new variable, or edit the variable properties.

c. Double click the Variables grid worksheet containing the local variables of the target POU, select CDA for the target variables. You can also select CDA when you create a new variable, or edit the variable properties.

Download the Configuration to the Controller

If you want to communicate with C300 through CDA, you should install the ControlEdge integration service in the Experion Server. This service should be in running.

To install the ControlEdge integration service:

1. Insert the ControlEdge Builder Media Kit into the DVD-ROM drive.
2. Browse to the folder ControlEdgeIntegrationService, and double click the file ControlEdgeIntegrationService.exe.
3. The ControlEdgeIntegrationService - InstallShied Wizard dialog appears. Click Next.

4. In the License Agreement page, click I accept the terms in the license agreement and click Next.
5. In the Customer Information page, enter your information if required. Click Next.
6. In the Setup Type page, choose the setup type that best suits your needs. Click Next.
7. In the Ready to Install the Program page, click Install to begin the installation..
8. The installation is in progress, and then the Set Service Login dialog appears.
9. Enter the Username, Password and Confirm password. Click OK.The Services dialog appears.

> **ATTENTION**
>
> The user name must be started with .\

10. The InstallShield Wizard Completed dialog appears, click Finish.

To check the status of the ControlEdge integration service:

1. Click Start button of PC, and enter services.msc in the search bar. The Services dialog appears.
2. Find Honeywell ControlEdge Integration Service, check the status is Running.
3. If the status is not running, right-click the service and click Start.

CHAPTER

4

C300 CONTROLLER INSTALLATION AND UPGRADES

This section includes information about installing various Series 8 components. Physical descriptions of the components as well as procedures for installing these components are provided. The following topics are presented here.

- Pre-installation considerations
- Series 8 power system
- Series C Mark II power system
- C300 Controller installation
- C300 Controller installation for Series C Mark II
- Series 8 I/O modules installation
- Series 8 FIM installation
- Upgrading C300 Controller firmware

4.1 Pre-installation considerations

- Installation declarations
- Series 8 control hardware installation requirements

4.1.1 Installation declarations

ATTENTION

The C300 - 20mS CEE controller is only intended for Honeywell Turbine Control Solutions. The C300-20mS CEE requires a different firmware image. For more information about the firmware image, refer to the “Loading C300-20 Controller firmware” topic in the *Turbine Control User's Guide*.

ATTENTION

This equipment shall be installed in accordance with the requirements of the National Electrical Code (NEC), ANSI/NFPA 70, or the Canadian Electrical Code (CEC), C22.1. It is intended to be mounted within an enclosure or suitable environment acceptable to the local “authority having jurisdiction,” as defined in the NEC, or “authorized person” as defined in the CEC.



Electrostatic discharge can damage integrated circuits or semiconductors if you touch connector pins or tracks on a printed wiring board. Follow these guidelines when you handle any electronic component:

- Touch a grounded object to discharge static potential,
- Wear an approved wrist-strap grounding device,
- Do not touch the wire connector or connector pins,
- Do not touch circuit components inside a component,
- If available, use a static safe workstation,
- When not in use, keep the component in its static shield box or bag.

WARNING

Unless the location is known to be non-hazardous, do **not** connect or disconnect cables while the control system is powered.

4.1.2 Series 8 control hardware installation requirements

See Planning Your Series 8 Control System in the *Control Hardware Planning Guide* for details.

4.2 Series 8 power system

Power Systems for Series 8 control hardware provides the following:

- Optional redundant power supplies with separate mains power feeds
- 20A and 40A redundant versions available
- Optional system battery backup is also available with 20A version. However, battery backup is not available with 40A version
- Memory RAM battery is provided to supply memory retention power for C300 controller

The capabilities and options available with the Series-C power system are identical to those available with the Process Manager Power System.

The Power Supply for the Series 8 control hardware is mounted on the left hand side of the enclosure and includes battery backup and battery charger if required. Connection from the power supply to a power system rail in the IOTA Channels is made at the top of the enclosure. Connections from the Power System rail to the IOTA is made with screws that connect to the rails running down the spine (back of) of the IOTA Channel. See Selecting Series 8 Power System in the *Control Hardware Planning Guide* for power system options.

With R410, the Commercial Off-the-Shelf (COTS) power system is available which, is a low cost power system used to power Series 8 system. The power system provides 24 volts DC with maximum output of 20 A. The COTS power system is available in the following two configurations.

- The COTS power redundant system, which consists of the following:
    - Two power supply modules
    - Redundancy module
    - Terminal block
    - Mechanical hardware
    - Cable kit
- The COTS power non-redundant system, which consists of the following:

- Power supply module
- Terminal block
- Mechanical hardware
- Cable kit

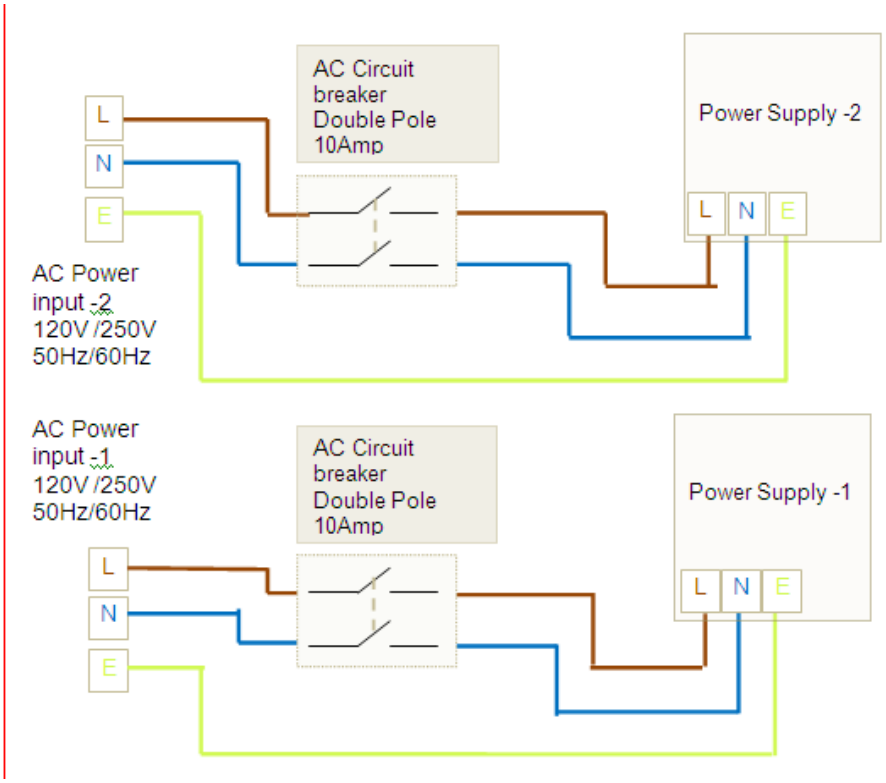
Following are the two types of the COTS power system that are available.

- COTS Power- Meanwell redundant (20A) and Meanwell non-redundant (20A)
- COTS Power-Phoenix redundant (20A) and Phoenix non-redundant (20A)

Phoenix or Meanwell power contact supply does not have an on/off switch. The AC input power to the power supplies is via double pole circuit breaker.

For more details, see the following image.

Figure 4.1 AC power input connections



ATTENTION

- There is no battery backup arrangement for the COTS power system.
- You cannot combine different types of power supplies and redundant modules.
- In a redundant configuration, the Phoenix contact power supply system cannot be replaced with the Meanwell power supply system and vice versa.
- If you have a pre-installed breaker box, then the arrangement as shown in the above figure is not required.

For more information on the power system, see Control Hardware Planning Guide.

- Controller memory backup

4.2.1 Controller memory backup

C300 Controller memory backup provides memory retention power for the C300 should power be lost to the Series 8 cabinet. Memory power is rated for 50 hours for a pair of redundant C300 controllers. See C300 Controller Memory Backup in the *Control Hardware Planning Guide* for hardware details.

4.3 Series C Mark II power system

Power systems for Series C Mark II control hardware provides the following:

- Redundant power supplies with separate mains power feeds.
- 20A redundant versions available.
- Optional system battery backup is also available with 20A version.
- Memory RAM battery is provided to supply memory retention power for C300 controller.

The capabilities and options available with the Series C Mark II power system are identical to those available with the Process Manager Power System.

The power supply for the Series C Mark II control hardware is mounted on the left hand side of the enclosure and includes battery backup and battery charger if required. IOTAs are connected by combo cables. The other end of combo cable is connected with header board which is powered from the power supply.

With Series C Mark II, the Commercial Off-the-Shelf (COTS) power system is available which, is a low cost power system used to power Series C Mark II system. The power system provides 24 volts DC with maximum output of 20 A. The COTS power system is available in the following two configurations.

- The COTS power redundant system, which consists of the following:
    - Two power supply modules
    - Two power supply back panels
    - Two cable-AC power inputs, alternate Fan (Length -3000 millimeter)
    - Alarm Cable - Redundant option, COTS Power supply

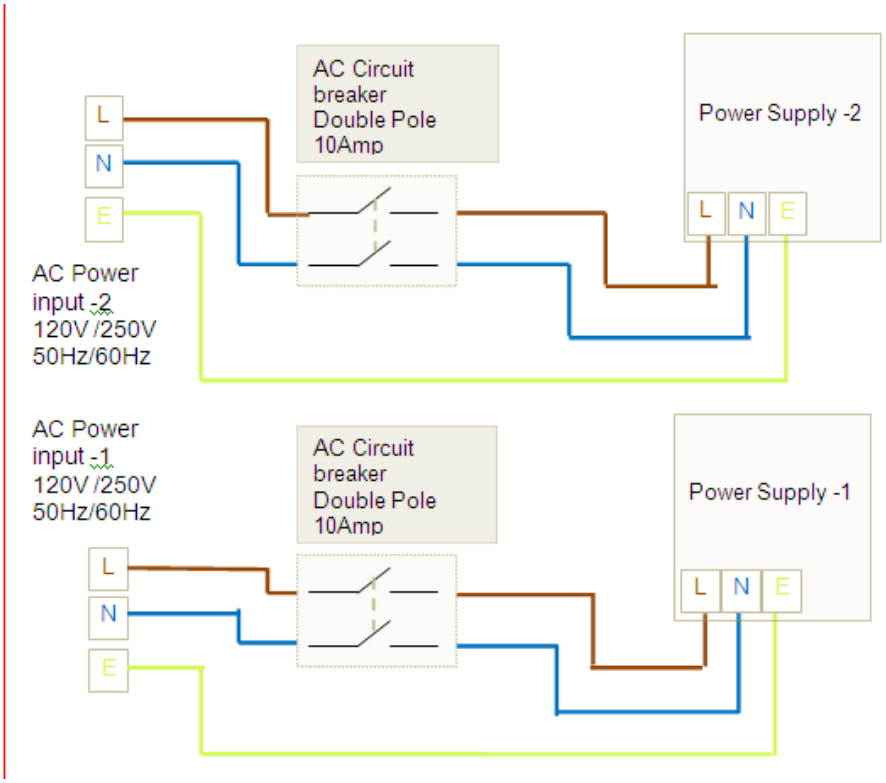
Following are the two types of the COTS power system that are available.

- COTS Power- Meanwell redundant (20A)
- COTS Power-Phoenix redundant (20A)

Phoenix or Meanwell power contact supply does not have an on/off switch. The AC input power to the power supplies is via double pole circuit breaker.

For more details, see the following image.

Figure 4.2 AC power input connections



ATTENTION

- There is no battery backup arrangement for the COTS power system.
- You cannot combine different types of power supplies and redundant modules.
- In a redundant configuration, the Phoenix contact power supply system cannot be replaced with the Meanwell power supply system and vice versa.
- If you have a pre-installed breaker box, then the arrangement as shown in the above figure is not required.

For more information on the power system, see *Control Hardware Planning Guide for Series C Mark II*.

- Controller memory backup for Series C Mark II

4.3.1 Controller memory backup for Series C Mark II

C300 Controller memory backup provides memory retention power for the C300 should power be lost to the Series C cabinet. Memory power is rated for 50 hours for a pair of redundant C300 controllers. See C300 Controller memory backup for Series C Mark II in the *Control Hardware Planning Guide for Series C Mark II* for hardware details.

4.4 C300 Controller installation

- C300 Controller assembly
- C300 Secondary Controller Installation

4.4.1 C300 Controller assembly

The C300 Controller consists of an Input/Output Terminal Assembly (IOTA) board and the controller module which is housed within a plastic cover and is mounted onto the IOTA board. The Controller assembly is installed in a control cabinet on vertically-mounted channels specifically for Series 8 control hardware. The following figure shows the features of the C300 Controller IOTA board.

Figure 4.3 C300 Controller IOTA Board Features

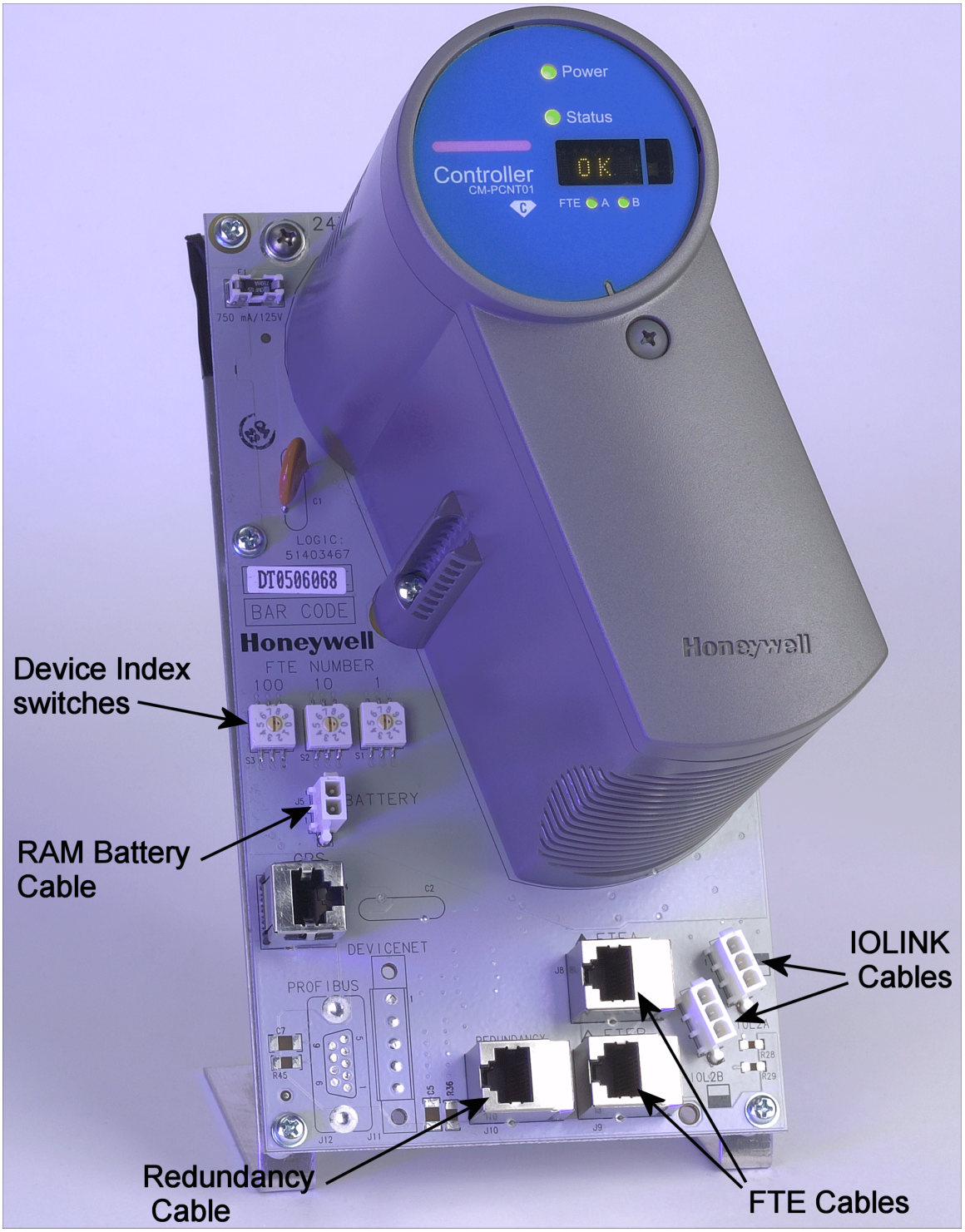


Table 4.1 C300 Controller IOTA Board Connector Summary

C300 IOTA Board	Description
F1	Fuse
IOL1A, IOL1B (Gray cable) IOL2A, IOL2B (Violet cable)	Redundant IOLINK connectors for IOLINK 1 and IOLINK 2 IOLink A cable connectors are Yellow. IOLink B cable connectors are Green.
FTEA, FTEB	Fault Tolerant Ethernet (FTE) network connectors FTE A network cable connectors are Yellow. FTE B network cable connectors are Green.
REDUNDANCY	Redundant private path cable connector. Redundancy cable connector is Orange
MEMORY HOLD-UP	Battery Backup cable connector Battery cable is a twisted pair.
GPS (Currently not used)	GPS cable connector
FTE DEVICE INDEX 99, 10, 1	Three rotary decimal switches used to set the FTE network address (Device Index) of the controller. See the To install a C300 Controller for setting the address.

Prerequisites

When installing a redundant controller pair consisting of a primary and a partner secondary controller:

- The secondary controller should be installed in the same cabinet as the primary controller.
- The secondary controller may be installed on a separate channel from the primary controller.
- Both the primary and partner secondary controllers must be connected to the same pair of Control Firewall (CF9) assemblies.

Before you install the C300 Controller you should have:

- A control cabinet installed with appropriate channel hardware for mounting Series 8 control hardware.
- A Series 8 power supply and optional battery backup hardware installed in the cabinet.
- Installed pair of Control Firewall (CF9) assemblies.
- The necessary parts for installing C300 Controller to the control system. See Series 8 System Cabling in the *Control Hardware Planning Guide* for cable hardware details.

  Parts include:

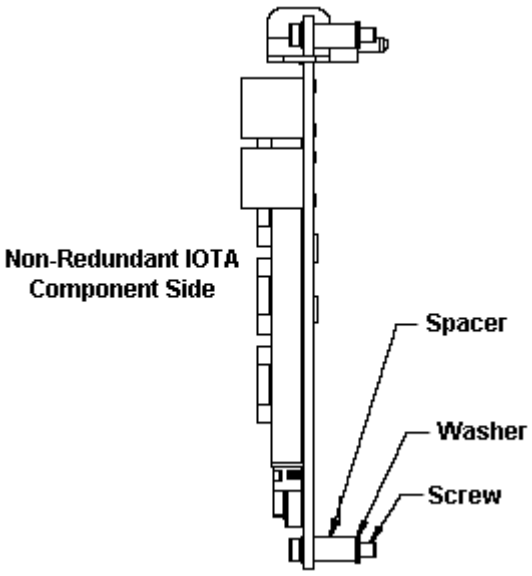
- the C300 Controller assembly (control module with IOTA board and mounting hardware)
- 2 STP Cat5 Ethernet cables (one Yellow cable, one Green cable)
- 2 or 4 IOLink cable assemblies for connecting on-board IO Link interface if the controller is supporting Series 8 I/O or Process Manager IO modules.

- Ensure the cabinet enclosure is connected to a protective earth ground using #8 AWG solid copper wire. There should be metal to metal contact between the grounding bus bar and the enclosure as well as the channel.

To install a C300 Controller

1. Refer to appropriate site location drawings for the specified controller installation location, controller Device Index (FTE address) and wiring diagrams.
2. Identify the mounting location on channel and align mounting holes in IOTA with screw hole locations on the channel.
3. Ensure that the component side of IOTA is facing up. Refer to the figure below.

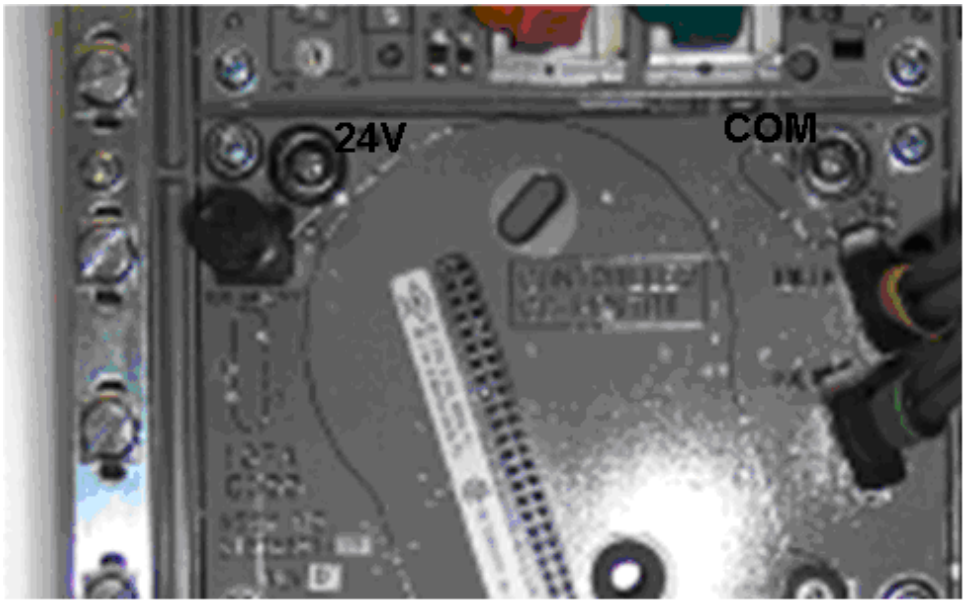
   Assemble the mounting screws, washers, and spacers. Insert spacers and washers between the backside of IOTA and front of the channel.



> **CAUTION**
>
> Do **not** fully tighten the IOTA mounting screws before installing and tightening the power and ground screws (**24V** and **COM** terminals), which can bend during installation or removal. Follow instructions carefully.

4. Position the assembled IOTA board at the proper mounting location.
5. Thread the four mounting screws only **half-way** to attach the IOTA board to the channel.

6. With a #2 Phillips Screwdriver, by hand, turn each screw (after it is engaged with the thread) for three complete clockwise turns in cross-pattern sequence.

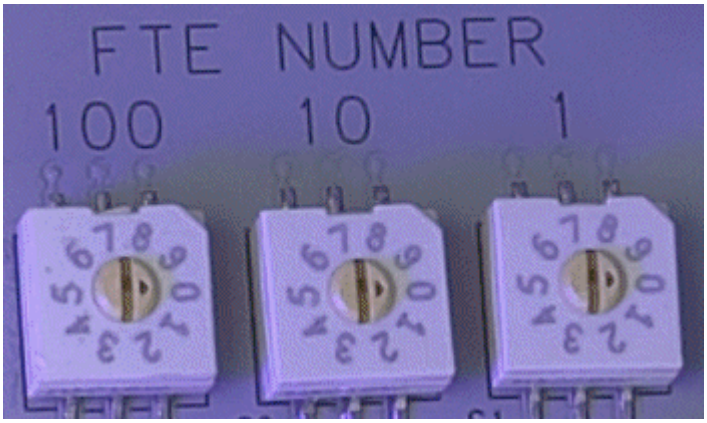


7. Refer to the preceding figure.
   - Start installation of the 24-volt connections by turning the screw three (3) complete turns clockwise with a Phillips Screwdriver and by hand. Do not tighten fully!
   - Next, install the COM screw by turning the screw three (3) complete turns clockwise with a Phillips Screwdriver and by hand. Do not tighten fully!
   - Tighten the earlier installed screw to the 24-volt connections and the bus completely. Torque the screw to 12.8 in-lbs (1.45Nm).
   - Tighten the earlier installed COM screw completely. Torque the screw to 12.8 in-lbs (1.45Nm).
8. To secure IOTA board to the channel, tighten each mounting screw in cross-pattern sequence, as used to start the screw installation (refer to Step 6). Torque the screws between 7 in-lbs to 9 in-lbs (0.79 Nm to 1.02 Nm).
9. Connect FTE-A and FTE-B Ethernet link cables to the RJ-45 connectors on C300 IOTA board.
   - The **Yellow** Cat5 cable connects to the "**FTEA**" connector on the IOTA.
   - The **Green** Cat5 cable connects to the "**FTEB**" connector on the IOTA.
10. Route the FTE cables to the appropriate Control Firewall module location.
    - The **Yellow** FTE cable is routed to the Control Firewall that supports FTE-A.
    - The **Green** FTE cable is routed to the Control Firewall that supports FTE-B.
11. If using the IOLINK interface in the controller, connect IOLink cable pairs to IOTA board.

    Four connectors on the IOTA provide redundant support for two IOLink interfaces IOLINK 1 (Gray) and IOLINK 2 (Violet). IOLink cable pairs include multidrop connectors to connect other I/O components to the IOLink.
    - Connect IOLINK cable pair to **IOL1A** and **IOL1B** for **IOLINK 1** interface of the controller.
    - Connect a second IOLINK cable pair to **IOL2A** and **IOL2B** for **IOLINK 2** interface of the controller.

Note that when connecting Redundant C300 Controller pairs, connect the primary controller IOLINK and the redundant partner IOLINK to the same IOLink cable pair.

12. Install the two-wire twisted pair battery cable onto the **MEMORY HOLD-UP** connector on the left side of the IOTA board.
13. Set the Device Index (**FTE DEVICE INDEX**) of the controller according to the site documentation by turning the three rotary decimal switches located on the IOTA board. Set the switches to the three digit address ranging from 001 to 509. The leftmost switch (100) is used to set the hundreds digit. The middle switch (10) is used to set the tens digit and the rightmost switch (1) sets the ones digit.



The Device Index of all non-redundant and primary C300 Controllers must be set to an odd number address.

Note: The FTE DEVICE INDEX setting on the switches should match the C300 Controller Device Index number entered in the Main tab of the Controller block's configuration form.

14. Secure the controller module to the IOTA board with two screws located on each side of the plastic cover.The screws must be tightened to 1.3 Newton-meters.
15. Using a #2 Phillips screwdriver, hand-tighten the plastic screw on the front of the module cover. Ensure that you do not strip the plastic screw head.
16. If the controller is to be redundant -

    In Control Builder, select the **Main** tab of the primary controller's configuration form and be sure to check the **Controller is Redundant** check box.

4.4.2 C300 Secondary Controller Installation

Creating a C300 Controller redundant pair is as simple as installing a second controller in the control hardware cabinet. See C300 Controller assembly to review the location of the cable connections.

- The secondary controller should be installed in the same cabinet as the primary controller.
- The secondary controller may be installed on a separate channel from the primary controller.
- Both the primary and partner secondary controllers must be connected to the same pair of FTE Level1 Switch assemblies.

Prerequisites

Before you install the C300 Controller you should have:

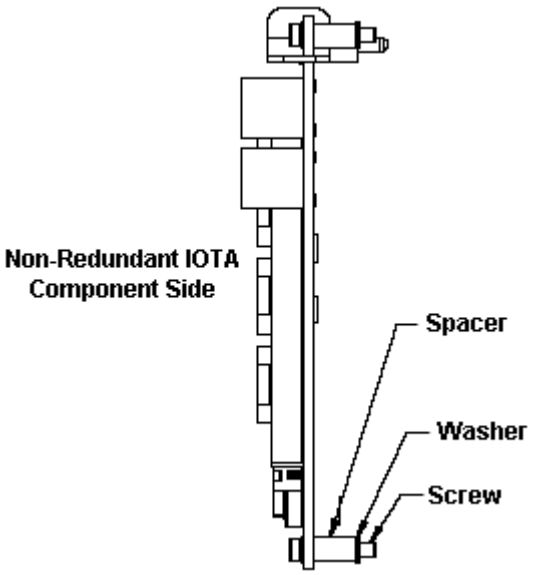
- A control cabinet installed with appropriate channel hardware for mounting Series 8 control hardware.
- A Series 8 power supply and optional battery backup hardware installed in the cabinet.
- An installed pair of Level1 Switch assemblies.
- The necessary parts for installing C300 Controller to the control system. See Series 8 System Cabling in the *Control Hardware Planning Guide* for hardware details.

  Parts include:
  - a C300 Controller assembly (controller module with IOTA board and mounting hardware)
  - STP Cat5 Redundancy Cable (Orange cable)
  - 2 STP Cat5 Ethernet cables (one Yellow cable, one Green cable)
  - 2 or 4 IOLink cable assemblies for connecting on-board IO Link interface if the controller is supporting Series 8 I/O or Process Manager IO modules.
- Ensure the cabinet enclosure is connected to a protective earth ground using #8 AWG solid copper wire. There should be metal to metal contact between the grounding bus bar and the enclosure as well as the channel.

To install a partner secondary C300 Controller

1. If the primary C300 FB already exists in Control Builder and it is currently configured as a redundant controller, select the Redundancy tab and click the **Disable Synchronization** button to set the Auto-Synchronization State parameter to “DISABLED.”
2. Refer to appropriate site location drawings for the specified controller installation location, controller Device Index (FTE address) and wiring diagrams.
3. Identify the mounting location on channel and align mounting holes in IOTA with screw hole locations on the channel.
4. Be sure component side of IOTA is facing up. Refer to the figure below.

   Assemble mounting screws, washers and spacers provided. Insert spacers and washers between backside of IOTA and front of channel.



> **CAUTION**
>
> Do **not** fully tighten the IOTA mounting screws before installing and tightening the power and ground screws (**24V** and **COM** terminals) which can bind during installation or removal. Follow instructions carefully.

5. Position the assembled IOTA board at the proper mounting location.
6. Thread the four mounting screws only **half-way** to attach the IOTA board to the channel. Do **not** tighten.



7. Refer to the figure above.
   - Insert and tighten the screw to the left side of the IOTA board that connects to the **24 Vdc** bus bar.
   - Insert and tighten the screw to the right side of the IOTA board that connects to the **COM** bus bar.
8. Tighten the mounting screws securing the IOTA board to the channel.
9. Connect FTE-A and FTE-B Ethernet link cables to the RJ-45 connectors on C300 IOTA board.
   - The **Yellow** Cat5 cable connects to the "**FTEA**" connector on the IOTA.
   - The **Green** Cat5 cable connects to the "**FTEB**" connector on the IOTA.
10. Route the FTE cables to the appropriate Control Firewall module location.
    - The **Yellow** FTE cable is routed to the Control Firewall that supports FTE-A.
    - The **Green** FTE cable is routed to the Control Firewall that supports FTE-B.
11. Connect the Orange Redundancy cable to the **REDUNDANCY** connector on the secondary controller IOTA.

    Route the cable to the primary controller location and connect it to the REDUNDANCY connector on the primary controller IOTA.

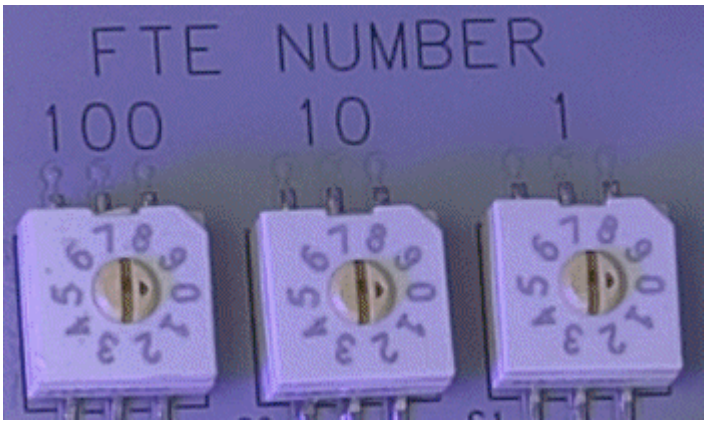
12. If using the IOLINK interface in the controller, connect IOLink cable pairs to IOTA board.

    Four connectors on the IOTA provide redundant support for two IOLink interfaces IOLINK 1 (Gray) and IOLINK 2 (Violet). IOLink cable pairs include multidrop connectors to connect other I/O components to the IOLink.

    - Connect IOLINK cable pair to **IOL1A** and **IOL1B** for **IOLINK 1** interface of the controller.
    - Connect a second IOLINK cable pair to **IOL2A** and **IOL2B** for **IOLINK 2** interface of the controller.

    Note that when connecting Redundant C300 Controller pairs, connect the primary controller IOLINK and the redundant partner IOLINK to the same IOLink cable pair.

13. Install the two-wire twisted pair Battery cable onto the **MEMORY HOLD-UP** connector on the left side of the IOTA board.
14. Set the FTE Device Index (**FTE DEVICE INDEX**) of the controller by turning the three rotary decimal switches located on the IOTA board. Set the switches to a three digit address ranging from 002 to 510. The leftmost switch (100) is used to set the hundreds digit. The middle switch (10) is used to set the tens digit and the rightmost switch (1) sets the ones digit.



    The Device Index of the secondary controller must be set to the primary controller's Device Index plus 1. For example, if the primary controller's Device Index is 3 (all primary controller Device Indexes are set to an odd number address), then set the Device Index of the secondary controller to 4.

    Note: The FTE Number setting on the switches should match the C300 Controller Device Index number shown on the Controller block's configuration form Main tab.

15. Insert the controller module onto IOTA board making sure that the controller circuit board mates properly with the IOTA board connector.

    Secure the controller module to the IOTA board with two screws located at each side of the plastic cover.

16. Using a #2 Phillips screwdriver, hand tighten the plastic screw on the front of the module cover. Be careful not to strip the plastic screw head.
17. Load firmware that is identical to the firmware version currently running on the primary controller (if not loaded already).
18. Load the Secondary C300 FB and initiate an Enable Synchronization command.

    Result: The new secondary should synchronize with primary controller and display the sync status.

4.5 C300 Controller installation for Series C Mark II

- C300 Controller assembly for Series C Mark II
- C300 Secondary Controller Installation for Series C Mark II

4.5.1 C300 Controller assembly for Series C Mark II

The C300 Controller consists of an Input/Output Terminal Assembly (IOTA) board and the controller module which is housed within a plastic cover and is mounted onto the IOTA board. The Controller assembly is installed in a control cabinet with backplane specifically for Series C Mark II control hardware. The following figure shows the features of the C300 Controller IOTA for Series C Mark II board.

Figure 4.4 C300 Controller IOTA Board Features



Table 4.2 C300 Controller IOTA Board Connector Summary

C300 IOTA Board	Description
F1	Fuse
IOL1A, IOL1B (Gray cable) IOL2A, IOL2B (Violet cable)	Redundant IOLINK connectors for IOLINK 1 and IOLINK 2 IOLink A cable connectors are Yellow. IOLink B cable connectors are Green.
FTEA, FTEB	Fault Tolerant Ethernet (FTE) network connectors FTE A network cable connectors are Yellow. FTE B network cable connectors are Green.
REDUNDANCY	Redundant private path cable connector. Redundancy cable connector is Orange
MEMORY HOLD-UP	Battery Backup cable connector Battery cable is a twisted pair.
GPS (Currently not used)	GPS cable connector
FTE DEVICE INDEX 99, 10, 1	Three rotary decimal switches used to set the FTE network address (Device Index) of the controller. See the To install a C300 Controller for setting the address.

Prerequisites

When installing a redundant controller pair consisting of a primary and a partner secondary controller:

- The secondary controller should be installed in the same cabinet as the primary controller.
- The secondary controller may be installed on a separate column from the primary controller.
- Both the primary and partner secondary controllers must be connected to the same pair of Control Firewall (CF9) assemblies.

Before you install the C300 Controller you should have:

- A control cabinet installed with backplane for mounting Series C control hardware.
- A Series C power supply and optional battery backup hardware installed in the cabinet.
- Installed pair of Control Firewall (CF9) assemblies.
- The necessary parts for installing C300 Controller to the control system. See Series C Mark II System Cabling in the *Control Hardware Planning Guide* for cable hardware details.

  Parts include:

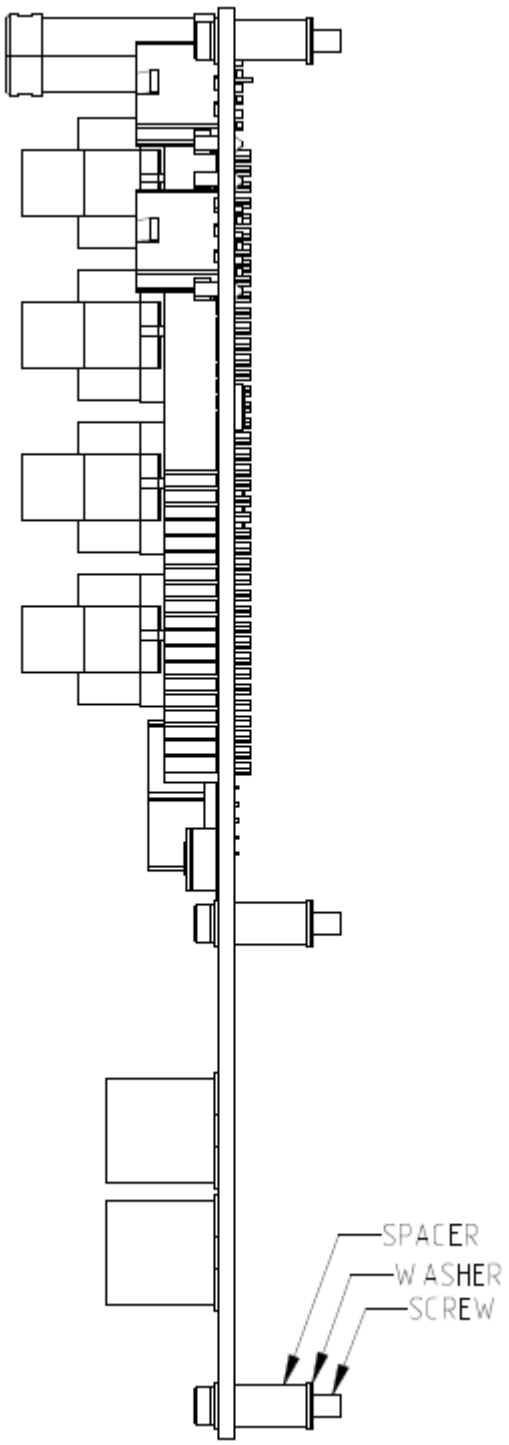
    - the C300 Controller assembly (control module with IOTA board and mounting hardware)
    - 2 STP Cat5 Ethernet cables (one Yellow cable, one Green cable)
    - 2 or 4 combo cable assemblies for connecting on-board combo cable connector if the controller is supporting Series C Mark II I/O.

- Ensure the cabinet enclosure is connected to a protective earth ground using #8 AWG solid copper wire. There should be metal to metal contact between the grounding bus bar and the enclosure as well as the channel.

To install a C300 Controller

1. Refer to appropriate site location drawings for the specified controller installation location, controller Device Index (FTE address) and wiring diagrams.
2. Identify the mounting location on the backplane and align mounting holes in IOTA with screw hole locations on the backplane.
3. Ensure that the component side of IOTA is facing up. Refer to the figure below.

   Assemble the mounting screws, washers, and spacers. Insert spacers and washers between the backside of IOTA and front of the backplane.

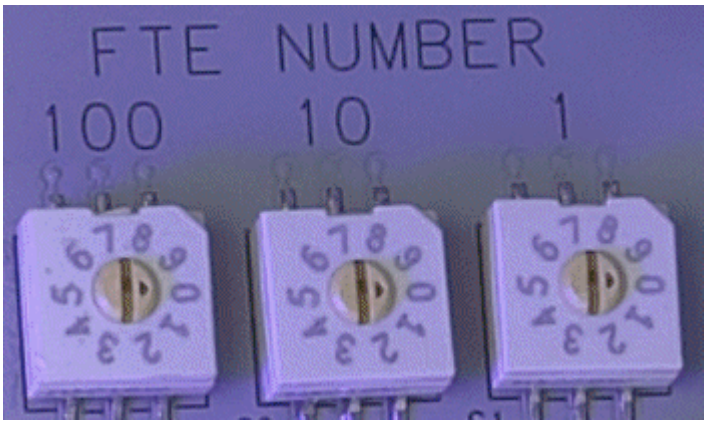


4. Position the assembled IOTA board at the proper mounting location.
5. Thread the four mounting screws to attach the IOTA board to the backplane and tighten the screws securing the IOTA board.
6. Connect FTE-A and FTE-B Ethernet link cables to the RJ-45 connectors on C300 IOTA board.
   - The **Yellow** Cat5 cable connects to the "**FTEA**" connector on the IOTA.
   - The **Green** Cat5 cable connects to the "**FTEB**" connector on the IOTA.

7. Route the FTE cables to the appropriate Control Firewall module location.
   - The **Yellow** FTE cable is routed to the Control Firewall that supports FTE-A.
   - The **Green** FTE cable is routed to the Control Firewall that supports FTE-B.
8. Connect combo cable pairs to IOTA board using combo cable connectors in the controller..

   Four connectors on the IOTA provide redundant support for two combo cable connectors IOLINK 1 (Gray) and IOLINK 2 (Violet). Combo cable pairs include multidrop connectors to connect other I/O components to the IOLink.
   - Connect combo cable pair to **IOL1A** and **IOL1B** for combo cable connector of the controller.
   - Connect a second combo cable pair to **IOL2A** and **IOL2B** for combo cable connector of the controller.

   Note that when connecting Redundant C300 Controller pairs, connect the primary controller IOLINK and the redundant partner IOLINK to the same combo cable pair.
9. Install the two-wire twisted pair battery cable onto the **MEMORY HOLD-UP** connector on the left side of the IOTA board.
10. Set the Device Index (**FTE DEVICE INDEX**) of the controller according to the site documentation by turning the three rotary decimal switches located on the IOTA board. Set the switches to the three digit address ranging from 001 to 509. The leftmost switch (100) is used to set the hundreds digit. The middle switch (10) is used to set the tens digit and the rightmost switch (1) sets the ones digit.



    The Device Index of all non-redundant and primary C300 Controllers must be set to an odd number address.

    Note: The FTE DEVICE INDEX setting on the switches should match the C300 Controller Device Index number entered in the Main tab of the Controller block's configuration form.
11. Secure the controller module to the IOTA board with two screws located on each side of the plastic cover.The screws must be tightened to 1.3 Newton-meters.
12. Using a #2 Phillips screwdriver, hand-tighten the plastic screw on the front of the module cover. Ensure that you do not strip the plastic screw head.
13. If the controller is to be redundant -

    In Control Builder, select the **Main** tab of the primary controller's configuration form and be sure to check the **Controller is Redundant** check box.

4.5.2 C300 Secondary Controller Installation for Series C Mark II

Creating a C300 Controller redundant pair is as simple as installing a second controller in the control hardware cabinet. See C300 Controller assembly for Series C Mark II to review the location of the cable connections.

- The secondary controller should be installed in the same cabinet as the primary controller.
- The secondary controller may be installed on a separate column from the primary controller.
- Both the primary and partner secondary controllers must be connected to the same pair of FTE Level1 Switch assemblies.

Prerequisites

Before you install the C300 Controller you should have:

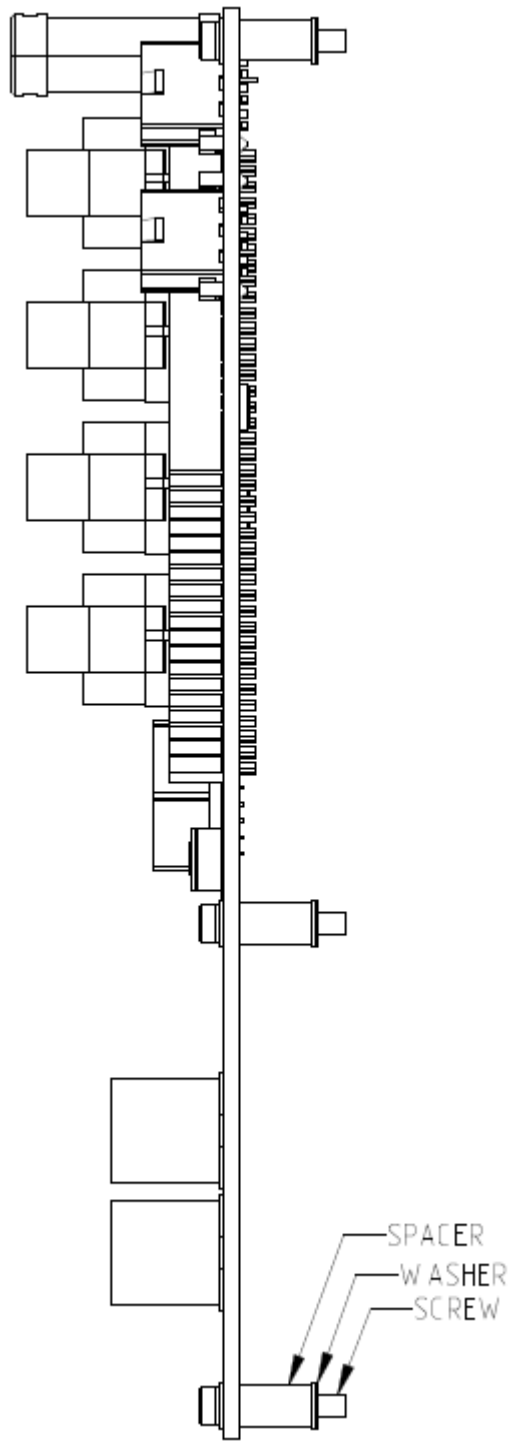
- A control cabinet installed with backplane for mounting Series 8 control hardware.
- A Series 8 power supply and optional battery backup hardware installed in the cabinet.
- An installed pair of Level1 Switch assemblies.
- The necessary parts for installing C300 Controller to the control system. See Series C Mark II System Cabling in the *Control Hardware Planning Guide* for hardware details.

  Parts include:
  - the C300 Controller assembly (control module with IOTA board and mounting hardware)
  - 2 STP Cat5 Ethernet cables (one Yellow cable, one Green cable)
  - 2 or 4 combo cable assemblies for connecting on-board combo cable connector if the controller is supporting Series C Mark II I/O.
- Ensure the cabinet enclosure is connected to a protective earth ground using #8 AWG solid copper wire. There should be metal to metal contact between the grounding bus bar and the enclosure as well as the channel.

To install a partner secondary C300 Controller

1. If the primary C300 FB already exists in Control Builder and it is currently configured as a redundant controller, select the Redundancy tab and click the **Disable Synchronization** button to set the Auto-Synchronization State parameter to “DISABLED.”
2. Refer to appropriate site location drawings for the specified controller installation location, controller Device Index (FTE address) and wiring diagrams.
3. Identify the mounting location on channel and align mounting holes in IOTA with screw hole locations on the column.
4. Be sure component side of IOTA is facing up. Refer to the figure below.

   Assemble mounting screws, washers and spacers provided. Insert spacers and washers between backside of IOTA and front of column.



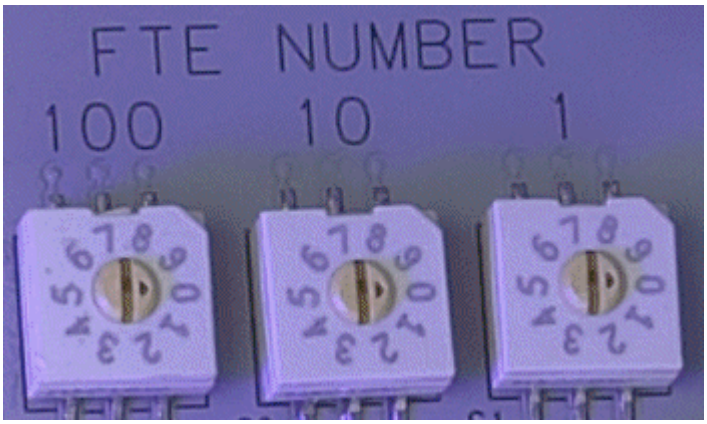
5. Position the assembled IOTA board at the proper mounting location.
6. Thread the four mounting screws to attach the IOTA board to the backplane and tighten the screws securing the IOTA board.
7. Connect FTE-A and FTE-B Ethernet link cables to the RJ-45 connectors on C300 IOTA board.
   - The **Yellow** Cat5 cable connects to the "**FTEA**" connector on the IOTA.
   - The **Green** Cat5 cable connects to the "**FTEB**" connector on the IOTA.

8. Route the FTE cables to the appropriate Control Firewall module location.
   - The **Yellow** FTE cable is routed to the Level1 Switch that supports FTE-A.
   - The **Green** FTE cable is routed to the Control Firewall that supports FTE-B.
9. Connect the Orange Redundancy cable to the **REDUNDANCY** connector on the secondary controller IOTA.

   Route the cable to the primary controller location and connect it to the REDUNDANCY connector on the primary controller IOTA.
10. Connect combo cable pairs to IOTA board using combo cable connectors in the controller..

    Four connectors on the IOTA provide redundant support for two combo cable connectors IOLINK 1 (Gray) and IOLINK 2 (Violet). Combo cable pairs include multidrop connectors to connect other I/O components to the IOLink.
    - Connect combo cable pair to **IOL1A** and **IOL1B** for combo cable connector of the controller.
    - Connect a second combo cable pair to **IOL2A** and **IOL2B** for combo cable connector of the controller.

    Note that when connecting Redundant C300 Controller pairs, connect the primary controller IOLINK and the redundant partner IOLINK to the same combo cable pair.
11. Install the two-wire twisted pair Battery cable onto the **MEMORY HOLD-UP** connector on the left side of the IOTA board.
12. Set the FTE Device Index (**FTE DEVICE INDEX**) of the controller by turning the three rotary decimal switches located on the IOTA board. Set the switches to a three digit address ranging from 002 to 510. The leftmost switch (100) is used to set the hundreds digit. The middle switch (10) is used to set the tens digit and the rightmost switch (1) sets the ones digit.



The Device Index of the secondary controller must be set to the primary controller's Device Index plus 1. For example, if the primary controller's Device Index is 3 (all primary controller Device Indexes are set to an odd number address), then set the Device Index of the secondary controller to 4.

Note: The FTE Number setting on the switches should match the C300 Controller Device Index number shown on the Controller block's configuration form Main tab.

13. Insert the controller module onto IOTA board making sure that the controller circuit board mates properly with the IOTA board connector.

    Secure the controller module to the IOTA board with two screws located at each side of the plastic cover.
14. Using a #2 Phillips screwdriver, hand tighten the plastic screw on the front of the module cover. Be careful not to strip the plastic screw head.

15. Load firmware that is identical to the firmware version currently running on the primary controller (if not loaded already).
16. Load the Secondary C300 FB and initiate an Enable Synchronization command.

    Result: The new secondary should synchronize with primary controller and display the sync status.

4.6 CF9 9-Port Control Firewall

In the control cabinet, Control Firewall assemblies (CF9) provide connection of control hardware (C300 Controllers, Series C FIMs, and FTEB modules) to the FTE network. STP CAT5 cables connect the FTE-capable control hardware to the Control Firewall IOTA. Two Control Firewall assemblies are required to provide network redundancy, (one CF9 supports the FTE “A” segment and the second supports FTE “B” segment). Eight ports on each control firewall provide connection for up to eight FTE nodes. A 9^{th} port provides an uplink to the supervisory FTE network and level 2 control.

See the *Control Firewall User's Guide* for details about the Control Firewall installation.

4.7 Series 8 I/O modules installation

See the Series 8 *I/O User's Guide* for details about the various Series 8 I/O modules and their installation.

4.8 Series 8 FIM installation

See the *Series 8 Fieldbus Interface Module User's Guide* for details about the Series 8 FIM modules and its installation.

4.9 Upgrading C300 Controller firmware

The Series 8 Firmware Load Tool (CTool) utility is used to efficiently upgrade firmware in Series 8 control hardware components.

Refer to Upgrading Firmware in Series 8 Components in the *Control Hardware and I/O Modules Firmware Upgrade Guide* for details about using CTool to upgrade firmware in Series 8 components. For more information about the CTool utility, refer to the Series 8 Firmware Load Tool (CTool) for Series 8 Components section in the *C300 Hardware Troubleshooting and Maintenance Guide*.

- Using the Controller Migration Wizard
- C300 Controller behavior during firmware upgrade and timeout

4.9.1 Using the Controller Migration Wizard

If you have Series C Controllers which are configured and loaded, you can use the Controller Migration Wizard to update you control component's firmware in an On-Process or Off-Process fashion to the latest release version or to a service pack or point release. Note that you must have Control Builder to use this application. See the *Experion Migration User's Guide* as well as the Control Builder on-line help for more information in using the Controller Migration Wizard.

4.9.2 C300 Controller behavior during firmware upgrade and timeout

The following indications are shown on the faceplate display of the C300 Controller during the firmware upgrade operation.

- The display shows LOAD while the firmware image is being loaded to the controller
- The display shows PROG while the firmware image is being programmed into the controller's flash memory
- The STATUS LED is red and blinks on and off during the upgrade operation.

The controller is set to timeout in 4.5 minutes if the firmware upgrade operation is not completed. When the timeout occurs, the controller aborts the upgrade operation and returns to the operating state (ALIV or RDY) prior to the start of the firmware upgrade.

CHAPTER

5

C300 CONTROLLER CONFIGURATION

This section includes information about creating and configuring the various function blocks using Control Builder. Also included are procedures to create Control Modules in which control strategies are built. The control modules then can be assigned to a CEE block. The following topics are presented here.

- Configuration overview
- Create C300 Controller and CEE function blocks
- Configure CEEC300 block
- Configure a Secondary C300 Controller block
- Convert a non-redundant C300 Controller to a redundant controller
- Convert a redundant C300 Controller to a non-redundant controller
- Configure IOLINK function blocks
- Import/export C300 Controller configuration
- Reset Device Index and IP address of a controller
- Create a Control Module
- Assign Control Modules and IOMs to a CEEC300 block
- Copy Control Modules
- Assign I/O Modules to C300 IOLINK blocks
- Add an I/O Channel to a Control Module

5.1 Configuration overview

Control Builder is the application used to create and configure Series 8 hardware modules and function blocks so you can build process control strategies for your system. Control Builder is accessed through Configuration Explorer.

- If you are familiar with using Control Builder, then most of the same rules apply for configuring, loading and monitoring when implementing Series 8 control hardware.
- If you are new to Control Builder, you should first refer to the *Control Building Guide* to familiarize yourself with the application and its capabilities.

ATTENTION

The information and procedures presented in this section apply to using Control Builder for configuring the C300 Controller. Some procedures cover the creation and configuration of the Control Execution Environment block (CEEC300) where you create your control strategies. This section does not attempt to provide all details for using Control Builder in configuring the numerous components that are associated with the Experion system.

Please refer to the *Control Building Guide* for additional information and procedures.

- Configuration Studio
- Define and add assets in your enterprise model
- FTE system configuration
- Specifying a Time Server
- C300 Controller Device Index

5.1.1 Configuration Studio

Configuration Studio is the central location from which you can access engineering tools and applications to configure your PlantCruise system. When you choose Control Strategy in the Configuration Explorer tree and then choose the task Configure a Control Strategy, Control Builder is launched so you can configure Series 8 hardware modules and build the process control strategies for your system.

5.1.2 Define and add assets in your enterprise model

If you are using Enterprise Model Builder (EMB) application to create an asset model of your system, assets that represent C300 Controllers can be created and added to your model following the same procedures for creating assets and alarm groups.See *the Enterprise Model Builder User's Guide* for details.

5.1.3 FTE system configuration

Planning and configuration of your FTE network should be performed prior to C300 configuration. Follow best practices for constructing your level 1 LAN groupings in your FTE network. See *Fault Tolerant Ethernet Network Overview and Implementation Guide* for details.

5.1.4 Specifying a Time Server

The C300 Controller requires a reference source for time in order to power up and normally operate, but limited controller operation can be achieved in cases where system time is not available. Although the controller can use a number of time sources of varying quality, the preferred time source is a Simple Network Time Protocol (SNTP) operating on another node (as a time server) on the local subnet. Connection to the time source is made at controller start up. The controller receives updates from the time source at one minute intervals to keep its clock synchronized. See Time management in the C300 Controller for more information.

The time source is given an IP address so that controllers and other nodes can access time. See the Setting system preferences in the *Control Building User's Guide* for more information about setting IP addresses.

5.1.5 C300 Controller Device Index

The primary C300 Controller of a redundant controller pair and non-redundant C300 Controllers must be configured with an odd numbered Device Index. Control Builder will enforce this restriction. The secondary C300 Controller of a redundant controller pair is assigned an even Device Index (primary controller Device Index plus 1) upon the configuration of the primary controller.

The Device Index switches on the primary and secondary controller IOTAs must be set according to their configured Device Indexes. If the Device Index switches on a primary or non-redundant C300 IOTA are set to an even number address or do not match the configured Device Index, then an error is generated when loading the controller and the load operation is aborted.

See Create C300 Controller and CEE function blocks for details on controller configuration.

5.2 Create C300 Controller and CEE function blocks

ATTENTION

You shall follow the same procedure to create a new C300 - 20mS CEE controller and CEE function blocks.

You create function blocks that represent a C300 Controller and its associated Control Execution Environment (CEE). Once created, the function blocks appear in the Project tab view of Control Builder. The CEEC300 block supports execution of a set of function blocks for solving control applications which run in the C300 as a software layer built on top of the control software infrastructure.

Two additional EE blocks are also created when a C300 Controller block is created. These blocks, IOLINK1 and IOLINK 2, provide the controller interface for associated Series 8 and Process Manager I/O Module blocks.

TIP

You can configure a C300 Controller block in the Control Builder Project tab without the controller hardware being installed.

All illustrations used in the procedure are for example purposes only.

5.2.1 Prerequisites

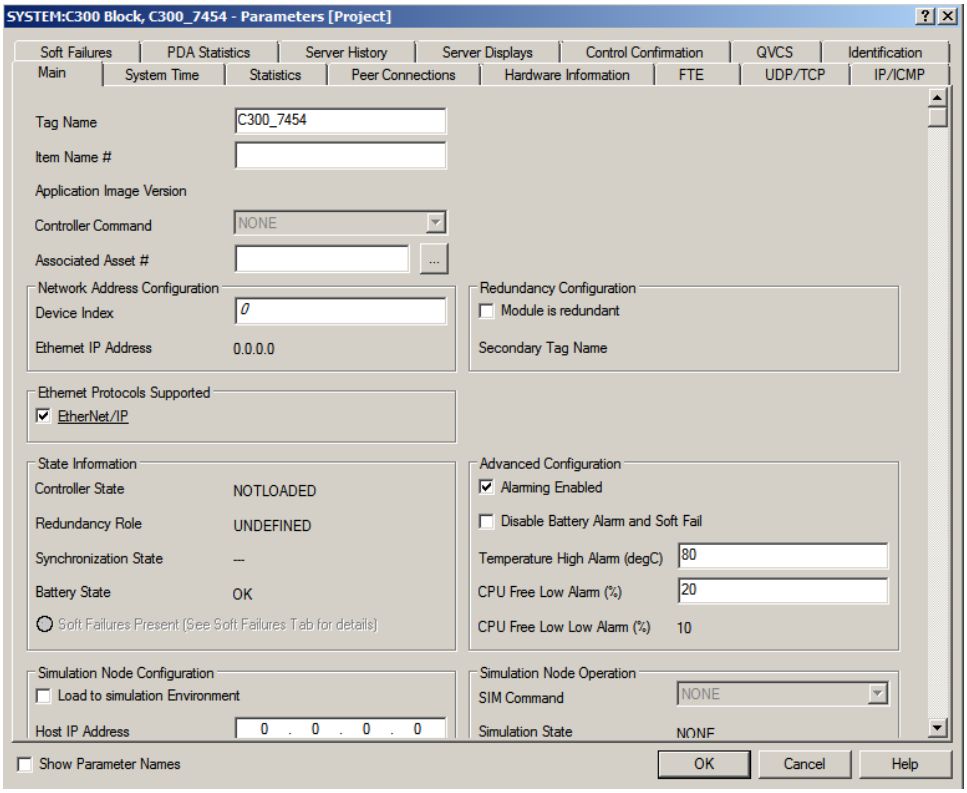
- You have started Configuration Studio and launched the Control Builder application.
- You have logged on with sufficient privileges to create control strategies using Control Builder.
- You have configured the applicable IP addresses when you set up your FTE network.
- You have configured applicable Base IP address and IP addresses for network time protocol (NTP) servers through the System Preferences dialog in Control Builder. See the Setting system preferences in the *Control Building User's Guide* for more information about setting IP addresses.

ATTENTION

The same procedure can be followed to create a new C300 - 20mS CEE Controller.

5.2.2 To configure a C300 Controller block

1. Click **File** > **New** > **Controllers** > **C300 Controller (2 I/O Links).**
   Calls up the C300 Block configuration form with a default Tag Name field highlighted.



2. Key in desired name of up to 40 characters or accept the default. Press <Tab>.
   Note Tag Name is limited to 40 characters and when creating redundant controllers, the last four characters of the secondary controller tagname will be _SEC. Therefore, you should create a tagname no longer than twelve characters to allow for the suffix of the secondary controller tag name.
   Moves cursor to the Item Name field.
3. Enter Item Name. Press <Tab>.
   Moves cursor to Associated Asset field.
4. Click the  button to the right of the **Associated Asset** box.
   The **Point Selection** dialog box appears.

5. Select an asset from those configured in the Enterprise Model Database to set the Scope of Responsibility (SOR) for the point.

   Note: No validation is done at the configuration time. If you enter an asset that does not exist in the points database, the associated asset for the point reverts to the server point. If the asset does exist but is not an area-enabled asset, then the first area-enabled asset up the tree is used for the SOR of that device. A subsequent upload of that device point to Control Builder returns the area-enabled asset and not the original non-assignable asset entered.

   Moves cursor to Device Index field.



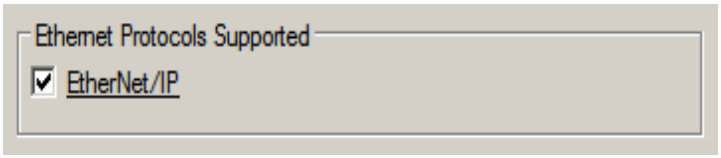
6. Click on the value and enter a valid Device Index number. Use odd numbers for primary controllers. Press <Tab>.

   Moves cursor to Module is redundant check box.

7. Check the box if the controller will be one of a redundant pair. If you check the box, the Secondary Tag Name will appear in the Redundancy Configuration box.

   C300 Controller is configured as either non-redundant or redundant with a Secondary C300 Controller block added when the Primary controller FB configuration form is closed.

8. If you want to enable EtherNet/IP supportability, select EtherNet/IP. This is a licensed feature.



9. The Alarming Enabled check box contains a check (default). Press <Tab>.

   To disable alarming for the parameters in the Advanced Configuration box, clear the Alarming Enabled check box.

   Moves cursor to the Disable Battery Alarm and Soft Fail field.

10. If you have the C300 battery backup, clear the box to allow the battery-related soft failures and events to be reported.

    If you do not have the C300 battery backup, check the box to suppress battery-related soft failures and events.

    Note: Prior to R400, users did not have the option of enabling or disabling battery-related soft failures and events.

    Moves cursor to the Temperature High Alarm (deg. C) field.

11. Click on the Temperature High Alarm (deg. C) field.

    Accept the default or enter a value at which an alarm is generated for controller hardware high temperature. Press <Tab>.

    Note setting this value at 0 disables the temperature high alarm.

    Moves cursor to the CPU Free Low Alarm (%) field.

12. Accept the default or key in desired value. Press <Tab>.

    Note: Do not set lower than the default value of 20%.

    Moves cursor to Simulation Node Configuration.

13. If this block is to be loaded to a simulation environment, check this box. Press <Tab>.

    Moves cursor to Host IP Address field

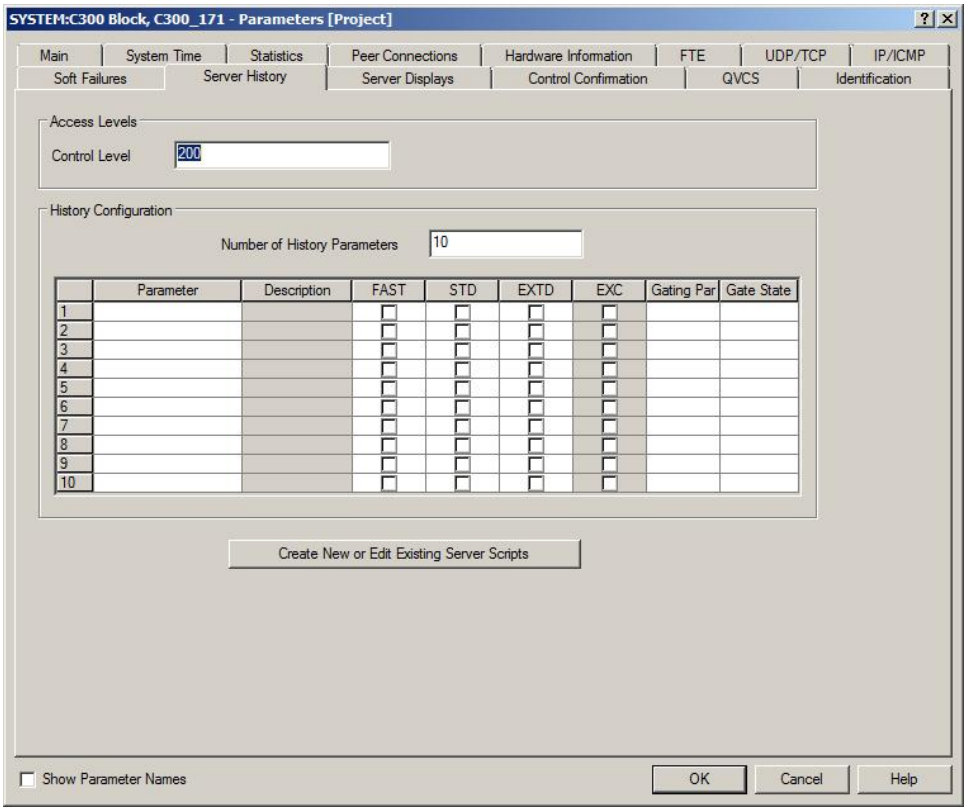
14. If the controller is to be a SIMC300 controller you must enter the IP Address of the SIMC300 controller.

    Cursor moves to the Host Name field.

15. Enter the host name of the SIMC300 controller if it does not appear in the field.

16. Click Server History tab.

    Calls up the Server History configuration form.



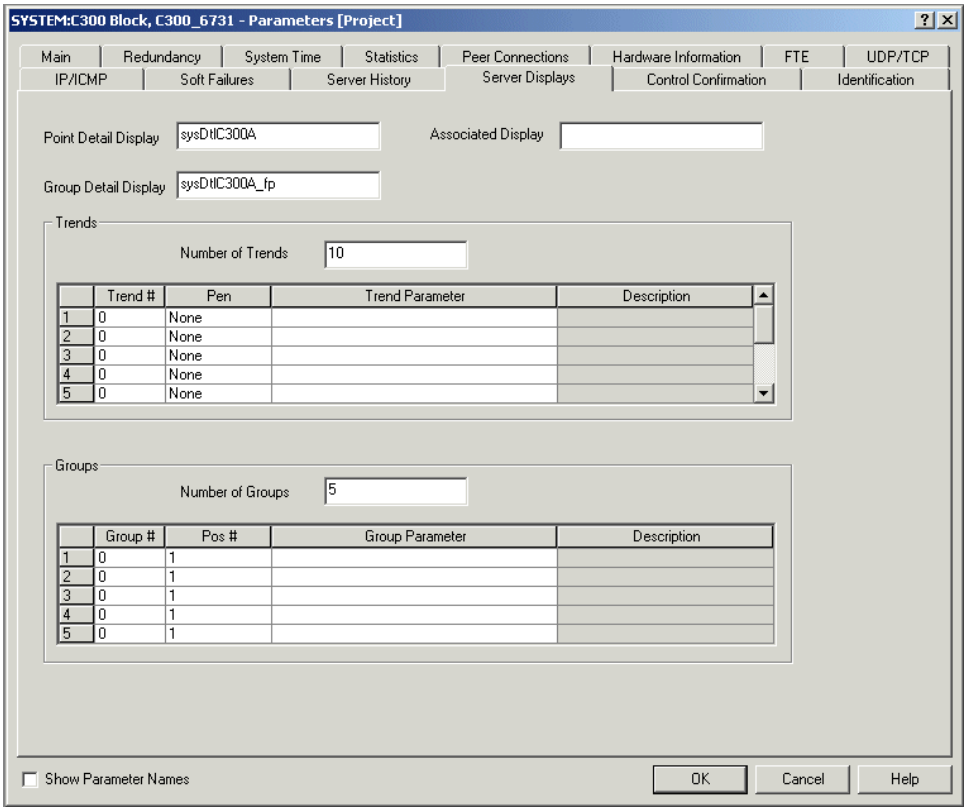
TIP

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 area is not enabled through the Station application.

17. Use the on-line help as a guide to complete the configuration entries on this tab.

    Click the Server Displays tab.

    Calls up the Server Displays configuration form.

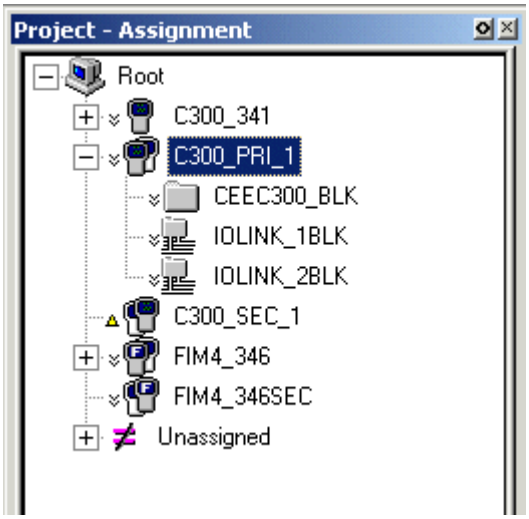


18. Use the on-line help as a guide to complete the configuration entries on this tab. Click the OK button.

    Closes the form.

    The following block icons now appear in the Project window:

    - C300 Controller block, and
    - its associated CEEC300 block
    - 2 IOLINK blocks and
    - a C300 Secondary Controller block (if redundant).



5.3 Configure CEEC300 block

A CEE block is created automatically when a C300 Controller function block is added to the Project

tab.

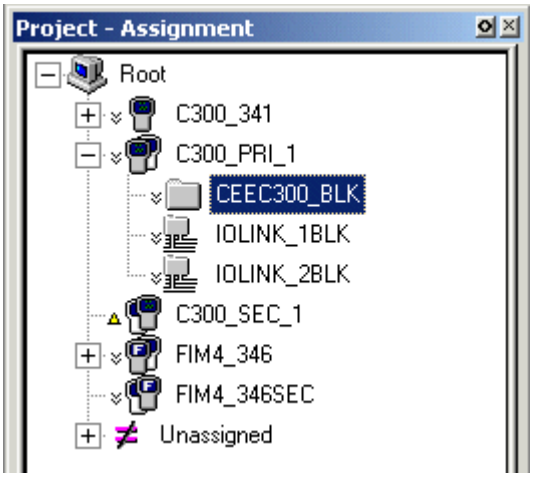
All illustrations used in the procedure are for example purposes only.

5.3.1 Prerequisites

- Control Builder is running
- Tree windows are open

5.3.2 To configure a CEEC300 function block

1. In the Project window, right-click on the CEEC300_BLK block icon.



Calls up shortcut menu.



2. Click Module Properties...

   Calls up CEEC300 Block configuration form. The Tag name field is highlighted.

3. Key in desired name of up to 40 characters or accept the default. Press <Tab>.

   Moves cursor to Item Name field

4. Enter Item Name. Press <Tab>.

   Moves cursor to Base Execution Period field.

5. Select the Base Execution Period from the drop down list. Press <Tab>.

   Note: Prior to selecting the IOLINK configuration for the controller, the base execution period must be selected. Otherwise, an error message appears as follows: “CEE BASEPERIOD can not be changed because IOLINK TYPE of at least one IOLINK of this C300 has been configured.”

   For Honeywell Turbine Control Solutions, select the Base Execution Period as 20 ms.

   Moves cursor to User Lock for CEE Run field.

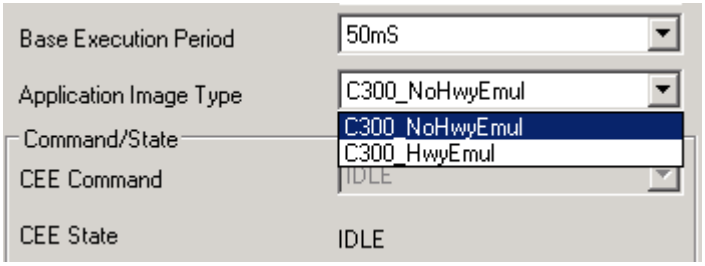
   Note that CEE Command field is available only in Monitor mode.

ATTENTION

Once the Base Execution Period is selected, and configuration is configured and loaded to the C300 - 20, the Base Execution Period cannot be modified. To modify it, refer to *Control Hardware and I/O Modules Planning Guide*.

6. Select the Application Image Type from the drop-down list. Press <Tab>.

   The Application Image Type distinguishes the type of application image running in the C300 and indicates whether the image supports C300 functions with EHB emulation enablers (C300_HwyEmul) or C300 functions without EHB emulation enablers (C300_NoHwyEmul).



7. Accept the default or click down-arrow button and select desired user. Press <Tab>.

   Moves cursor to User Lock for CEE Idle field.

8. Accept the default or click down-arrow button and select desired user. Press <Tab>.

   Moves cursor to Program Access may command CEE from Idle to Run check box.

9. Add a check to the box if you want to enable access. Press <Tab>.

   Moves cursor to Program Access may command CEE from Run to Idle check box.

10. Add a check to the box if you want to enable access. Press <Tab>.

    Moves cursor to the Alarming Enabled check box.

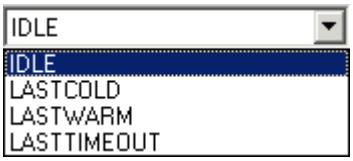
11. Accept the default (Alarming Enabled), or uncheck the box to disable alarming function. Press <Tab>.

    Moves cursor to the Enable Memory Limit Exceeded Alarm check box.

12. Accept the default (Memory Limit Exceeded Alarm enabled), or uncheck the box to disable alarming function. Press <Tab>.

    Moves cursor to the Powerup Restart Settings for CEE State.

13. Accept the default or click down-arrow button and select desired state.



    Note that if you select LASTTIMEOUT state, then the Warm Timeout field is active.

14. If the Warm Timeout field is active, accept the default or key in desired timeout value. Press <Tab>.

    Moves cursor to the Time Zone field.

15. Enter the appropriate value for the time zone of the controller location. Press <Tab>.

    Moves cursor to the Daylight Savings Time check box.

16. Add a check to the box if Daylight Savings Time is in effect for this location. Press <Tab>.

    Note: The **Daylight Savings Time** check box is selected/cleared by default at the start/end of DST respectively if you have enabled the **Automatically apply DST** option.

    Moves cursor to the Year Format field.

17. Accept the default or click down-arrow button and select desired format. Press <Tab>.

    Moves cursor to the Weekday Format.

18. Accept the default or click down-arrow button and select desired format.

    Click on the Peer Configuration tab.

    The Store Expiration Time Field is highlighted in the Peer Defaults box.

19. Accept the default or key in desired value. Press <Tab>.

    Moves cursor to Subscription Period field.

20. Accept the default or click down-arrow button and select desired period. Press <Tab>.

    Moves cursor to Number of Peer Environments field.

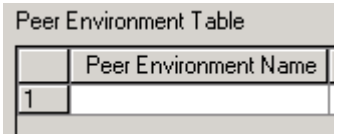
> **TIP**
>
> The Number of Peer Environments and Peer Environment Table are interactive. The value entered for the Number of Peer Environments determines how many rows appear in the Peer Environment Table.

21. Key in number of peer environments for this controller. Press <Tab>.

    Or, skip this field, if no peer environments will be used. Click Server History tab and go to Step 25.

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

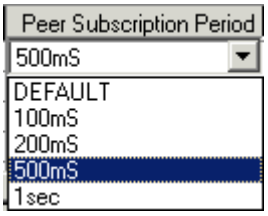
22. Key in valid name for existing peer environment.



    Press <Tab>.

    Moves cursor to Peer Subscription Period column.

23. Accept default or click down-arrow button to select another value specific to the given environment.



Press <Tab>.

Moves cursor to Store Expiration Time column.

24. Accept the default or key in desired value. Click Batch tab.

    Moves cursor to Batch Events Memory field.

25. Accept the default or click  down-arrow button and select desired state. Click Server History tab.

    Calls up the Server History configuration form.

26. Use the on-line help as a guide to complete the configuration entries on this tab. Click on the Server Displays tab.

    Calls up the Server Displays configuration form.

27. Use the on-line help as a guide to complete the configuration entries on this tab. Click the OK button.

    Closes the form.

    This completes the configuration procedure for CEEC300 block.

> **TIP**
>
> See the Experion Control Builder Components Reference, Component Categories and Types and the *Experion Planning Guide*.

5.4 Configure a Secondary C300 Controller block

When a C300 Controller is configured as Redundant, the Secondary C300 Controller block is added to the Project tab automatically.

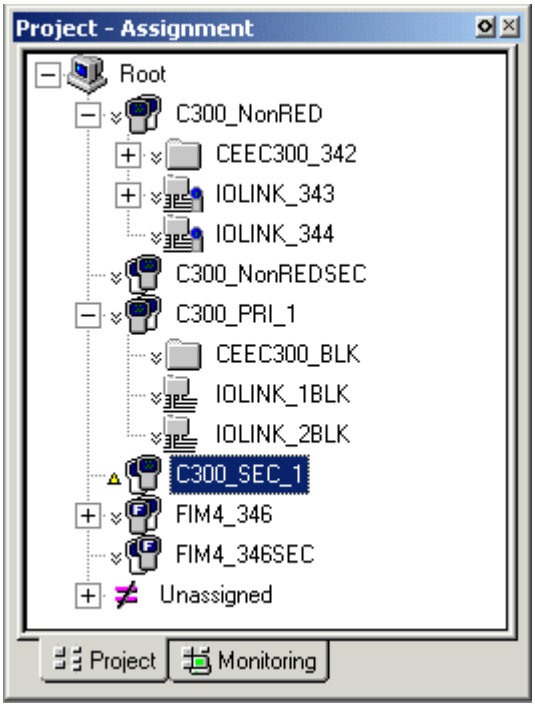
All illustrations used in the procedure are for example purposes only.

5.4.1 Prerequisites

- Control Builder is running
- Tree windows are open

5.4.2 To configure a Secondary C300 Controller block

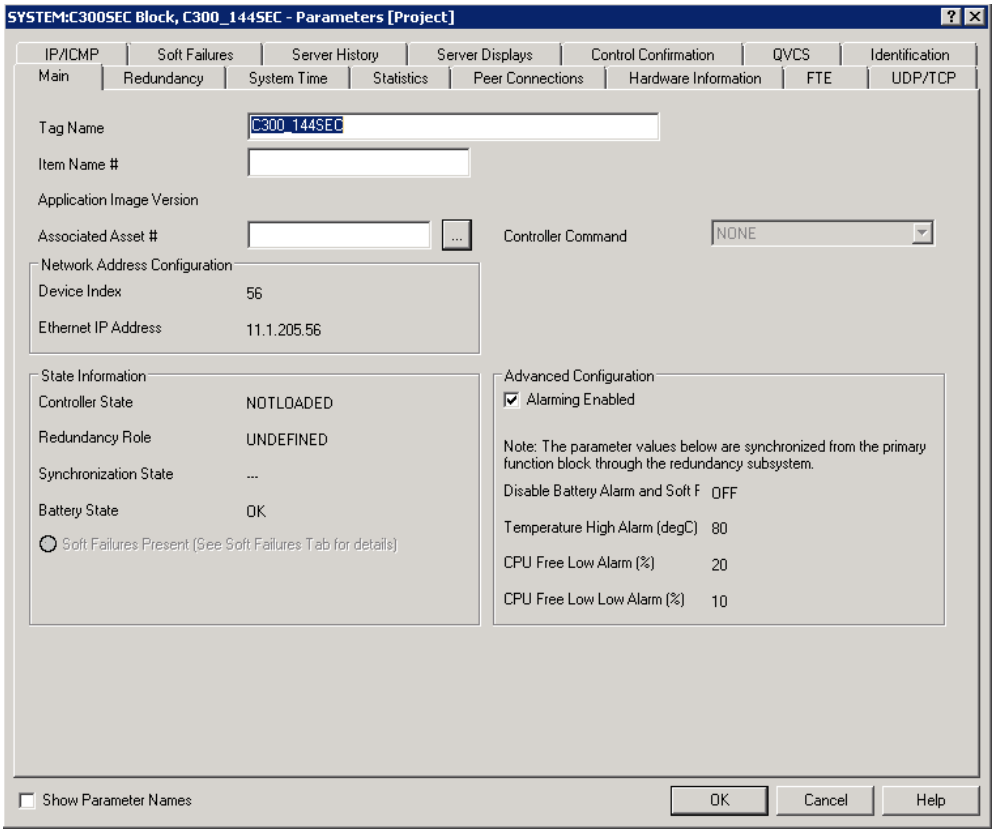
1. In the Project window, right-click on the C300_SEC_1 block icon.



Calls up shortcut menu.



2. Click Module Properties...
   Calls up the Secondary C300 Block configuration form.



3. Key in desired name of up to 40 characters or accept the default. Press <Tab>.

   Moves cursor to Item Name field

4. Enter Item Name. Press <Tab>

   Moves cursor to Associated Asset field.

5. Click the  button to the right of the **Associated Asset** box.

   The **Point Selection** dialog box appears.

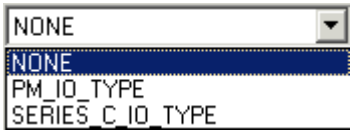
6. Select an asset from those configured in the Enterprise Model Database to set the Scope of Responsibility (SOR) for the point.

   Note: No validation is done at the configuration time. If you enter an asset that does not exist in the points database, the associated asset for the point reverts to the server point. If the asset does exist but is not an area-enabled asset, then the first area-enabled asset up the tree is used for the SOR of that device. A subsequent upload of that device point to Control Builder returns the area-enabled asset and not the original non-assignable asset entered.

7. Enter descriptive text of up to 132 characters. Press <Tab>.

   Moves cursor to I/O Family field.

8. Accept the default or click down-arrow button and select I/O type.



   Click the OK.

Closes the IOLINK block configuration form since no other data on this form is available in the Project view.

9. Repeat this procedure from step 1 to configure other IOLINK blocks.

5.5 Convert a non-redundant C300 Controller to a redundant controller

You can convert a single non-redundant C300 Controller to a redundant controller simply by configuring the controller as redundant. The controller icon which represents the secondary controller is then added to the Project tab.

- Do *not* connect the Redundancy cable between the two controllers until instructed to do so.
- This procedure can be performed on-process.

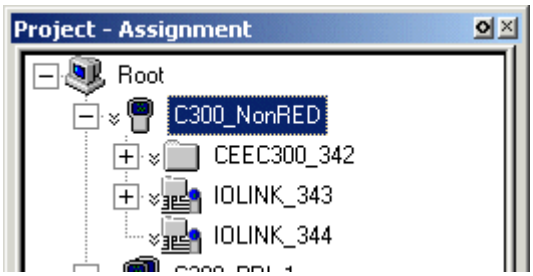
All illustrations used in the procedure are for example purposes only.

5.5.1 Prerequisites

- Control Builder is running
- Tree windows are open
- Ensure that a C300 Controller is properly installed in the same control cabinet as the C300 Controller designated to become the redundant partner.
- The C300 Controller hardware and firmware must be identical for both controllers in a redundant pair

5.5.2 To convert a non-redundant C300 Controller to a Redundant controller

1. In the Project window, right-click on the C300_NonRED Controller block icon.



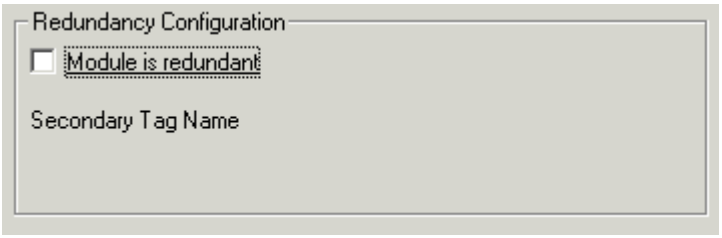
Calls up shortcut menu.



2. Click Module Properties...

Calls up the C300 Block configuration form.

3. Add a check to the Module is redundant check box.



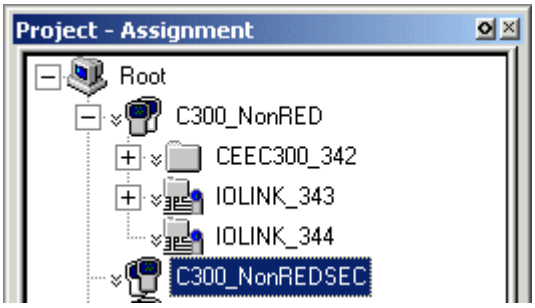
A default tag name of the secondary C300 Controller block appears in the Secondary Tag Name field. Usually it is the primary controller block's name with SEC appended to it.

4. Click the OK button.

   The C300 Controller configuration form closes.

   In the Project window:

   - The C300 Controller icon indicates that it is configured as redundant, (showing a double controller icon). A double 'V' sign is shown next to the primary icon.
   - An additional C300 Controller icon is created representing the secondary controller.



5. Load the primary C300 block to the controller.

   The double 'V' disappears from the primary C300 icon in the Project view. The C300 block in the Monitor view changes from a non-redundant icon to a redundant icon.

6. Connect the Redundancy cable between the redundant controller pairs.

   A 'Not Synchronized' alarm may be generated.

7. Perform the procedure To configure a Secondary C300 Controller block.

8. Select the Secondary C300 Controller icon. Perform a Load to the controller.

   The double 'V' sign next to the Secondary C300 icon disappears in the Project view.

9. Verify the redundant controller pair achieves a synchronized state.

5.6 Convert a redundant C300 Controller to a non-redundant controller

This procedure can be performed on-process. All illustrations used in the procedure are for example purposes only.

5.6.1 Prerequisites

- Control Builder is running
- Tree windows are open
- Make sure that the current primary C300 Controller is physically configured with the odd Device Index. If not, enable synchronization, wait for initial-sync to complete, and manually

command switchover.

5.6.2 To convert a redundant C300 Controller to a non-redundant controller

1. In the Monitor view, open the configuration form for the secondary C300 Controller block.

   Secondary C300 Block configuration form is visible.

2. Select the Redundancy tab, and click on the Disable Synchronization button. Allow command to complete.

   Synchronization between primary and secondary C300 controllers terminates.

   A 'Not Synchronized' diagnostic alarm will be generated by both the primary & secondary controllers

3. Delete the C300 secondary function block from the Monitor view.

   C300 secondary function block is deleted from Monitor view.

4. Disconnect the redundancy cable from the primary C300 Controller.

   Alarms are generated.

5. Remove the secondary controller hardware by removing the controller module and its IOTA.

   Refer to the procedure To replace a non-redundant controller IOTA board and follow the steps only to remove the controller hardware.

   If reusing the controller elsewhere in the system, see the procedure To install a C300 Controller.

   Controller hardware is removed from system.

6. In the Project view, right click on the primary C300 Controller icon and choose Module Properties.

   Calls up the primary C300 Controller configuration form.

7. Uncheck the Module is redundant check box. Click the OK button.

   The secondary C300 Controller icon is deleted from the project view, the primary C300 Controller icon changes from a redundant to a non-redundant icon, and the non-redundant C300 icon shows a delta

8. Click non-redundant C300 block icon in Project view. Perform a Load to the controller.

   The delta sign should disappear from the C300 Controller icon in the Project view. The C300 Controller icon in the Monitor view should indicate the controller is now non-redundant.

5.7 Configure IOLINK function blocks

Two IOLINK blocks are created automatically when a C300 Controller function block is added to the Project tab. These blocks provide the interface to the controller for associated I/O Module blocks

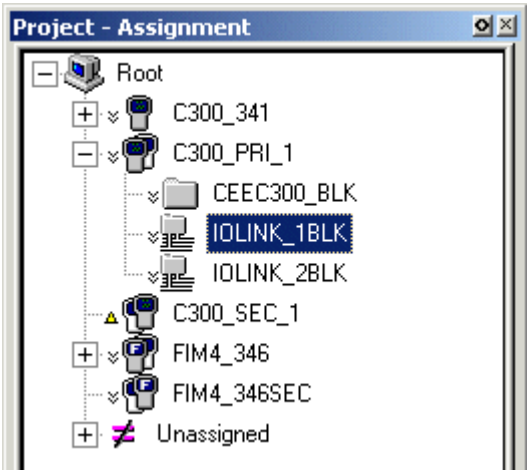
All illustrations used in the procedure are for example purposes only.

5.7.1 Prerequisites

- Control Builder is running
- Tree windows are open

5.7.2 To configure IOLINK blocks

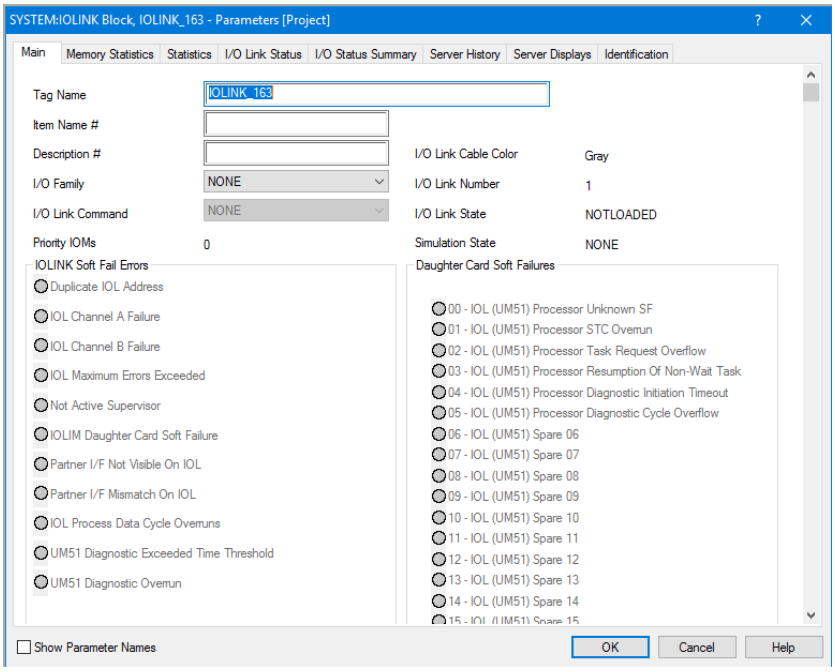
1. In the Project window, right-click on the IOLINK_1BLK block icon.



Calls up shortcut menu.



2. Click Module Properties...
   Calls up IOLINK Block configuration form.



3. Key in desired name of up to 40 characters or accept the default. Press <Tab>.
   Moves cursor to Item Name field

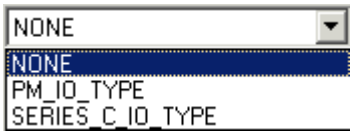
4. Enter Item Name. Press <Tab>.

   Moves cursor to Description field.

5. Enter descriptive text of up to 132 characters. Press <Tab>.

   Moves cursor to I/O Family field.

6. Accept the default or click  down-arrow button and select I/O type.



   Click the OK button.

   Closes the IOLINK block configuration form since no other data on this form is available in the Project mode.

7. Repeat this procedure from step 1 to configure other IOLINK blocks.

5.8 Import/export C300 Controller configuration

You can copy a C300 Controller configuration from another system database using the Export and Import function in Control Builder.

> **ATTENTION**
>
> It is recommended that you use the ERDB Database Migration tool rather than Import/Export for moving hardware definitions like C300, and Series 8 FIM.

Use “Export/Import” only to move or copy control strategies (CMs & SCMs) from one system to another.

When using the export function the Device Index information for the C300 is exported, but not the controller's IP Address. This enables import of the C300's configuration into a different server cluster, and allows the C300 to use a different IP Address based upon that server cluster's base IP Address.

5.9 Reset Device Index and IP address of a controller

Once set, a C300 Controller retains the Device Index (determined by the FTE NUMBER rotary switches on the IOTA) and its assigned IP Address in the controller's non-volatile memory.

You can change the Device Index and obtain another IP Address for the controller upon startup. For instance, when a duplicate Device Index is discovered on the same FTE network, or when moving a controller to a different node, another FTE network, another server domain or another system.

> **WARNING**
>
> Be sure that the controller is in its IDLE or safe state before initiating a shutdown.

Use this procedure to assign a new Device Index and IP Address to a controller installed in the system.

1. If you are only assigning another Device Index to a controller - Go to Step 5.

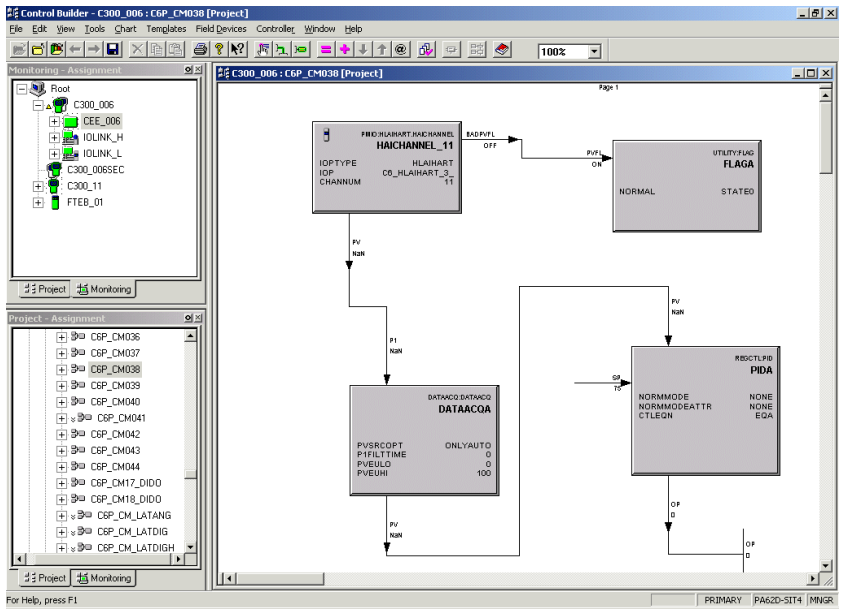
If moving the controller to a different location or FTE network - Go to Step 2.

2. Shutdown the controller using Control Builder. See Initiating C300 Controller shutdown for the procedure.
3. Uninstall the controller module and IOTA.

   Refer to the procedure To replace a non-redundant controller IOTA board and follow the steps only to remove the controller and IOTA.
4. Refer to the procedure To install a C300 Controller to install the controller in its new location. Go to step 7.
5. Shutdown the controller using Control Builder. See Initiating C300 Controller shutdown for the procedure.
6. Set the FTE DEVICE INDEX rotary switches on the controller IOTA to the new Device Index.
7. Using ESD precautions, short the two RESET pads on the right side of the IOTA, (labeled RP) to restart the controller.
8. Upon restart, the controller will:
   - Clear its user memory database and transition to the NODB state.
   - Clear the old Device Index retained in memory
   - Assume the new Device Index set in the FTE DEVICE INDEX and request an IP Address based on this new Device Index.
9. In Control Builder, configure as a new controller. See Create C300 Controller and CEE function blocks for the procedure.

5.10 Create a Control Module

To build a Control Strategy, a Control Module (CM) must be created where function blocks are inserted and connected with other function blocks. The following graphic shows Control Builder with a Control Module chart shown in the control drawing area.



All illustrations used in the procedure are for example purposes only.

WARNING

All edits done on project-related objects must be reloaded to the controller before those edits can be seen in the controller. See *Control Strategy Loadin*g for information on how to load control strategy objects.

5.10.1 Prerequisites

- Control Builder is running
- Tree windows are open

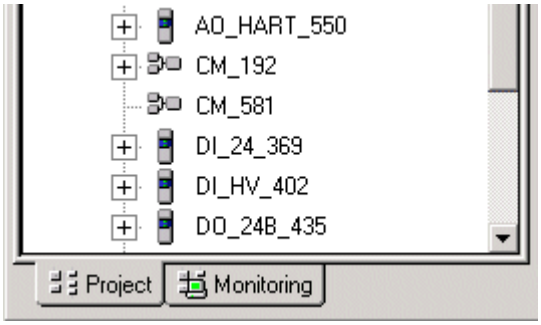
5.10.2 To create and save a Control Module

1. Click**File** > **New** > **Control Module**

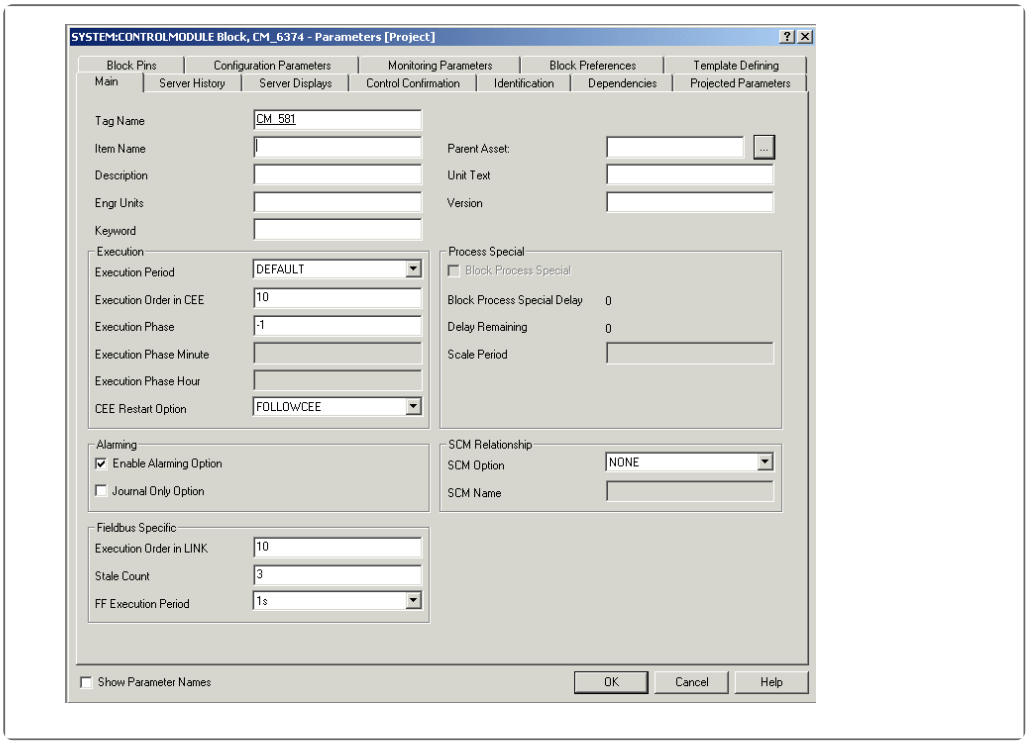
   A blank Control Module is opened up in the Control Drawing area, (shown in the figure above).

   The new Control Module appears under the Unassigned Project Tree. Control Module names are sequentially numbered (for example, CM_30, CM_31, etc.).

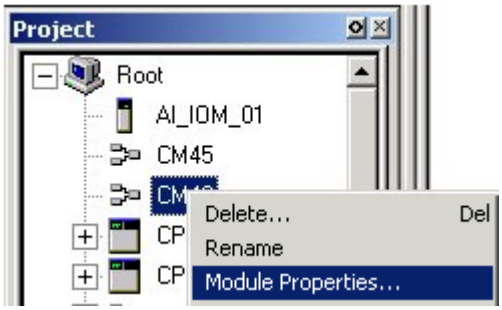
   The new Control Module is automatically saved to your hard drive.



2. Select Edit -> **Module Properties...** or double-click with the mouse cursor located anywhere inside the chart to open the Control Module parameter configuration form for input.



Note: If the Control Module's chart is NOT open in the control drawing area, right-click on the new Control Module in the Project Tree to display the selection options and click on **Module Properties...** to open the Control Module parameter configuration form for input.



3. Enter a new Control Module name in the Name field along with a description in the Description field.
4. Using the F1 key to access context-sensitive Help, fill in the remaining fields as required.
5. Click **OK**.

   Configuration form closes.
6. If necessary, double-click on the newly-named Control Module in the Project Tree to open it. The new name appears at the top of the Control Module drawing when the control drawing opens.
7. **Click File -** > **Save** to save any additional changes you make to the Control Module before closing.
8. **Click File -** > **Close** to close the chart.

5.11 Assign Control Modules and IOMs to a CEEC300 block

Once a Control Module (CM) or Sequential Control Module (SCM) is created, you can assign it to a

CEEC300 block of a C300 Controller. Use the following procedure as a general guide to assign configured CMs and I/O Modules (IOMs) to the CEEC300 block.

Note that in the C300 controller environment, Chassis IOMs and Rail IO modules can be assigned only to the CEEC300 block.

All illustrations used in the procedure are for example purposes only.

For additional information on CM assignment, see the *Control Building Guide*; or for SCM assignment, the *Sequential Control User's Guide*.

ATTENTION

- Before Control Builder allows you to associate an IOM to an IOCHANNEL block, it checks to make sure that the CM and IOM are assigned to the same CEE
- All edit windows (such as CM charts) must be closed before proceeding with this procedure or a lock contention may occur. To resolve these types of lock contentions, close the open CM chart and attempt to open the CM chart again.

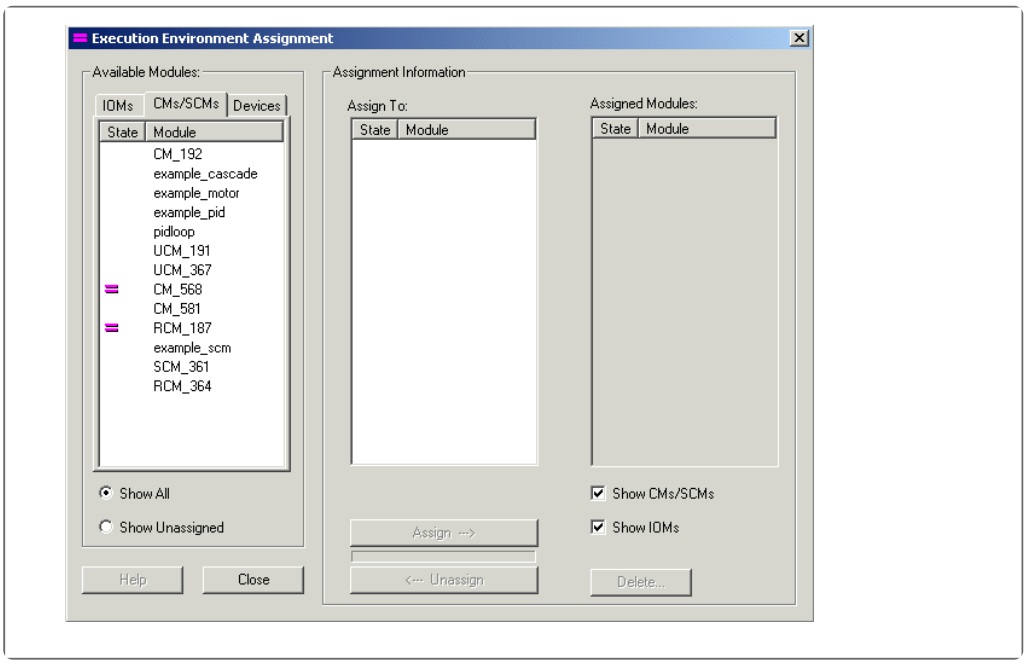
5.11.1 Prerequisites

- Control Builder is running
- Tree windows are open

5.11.2 To assign Control Modules and IOMs to a CEE

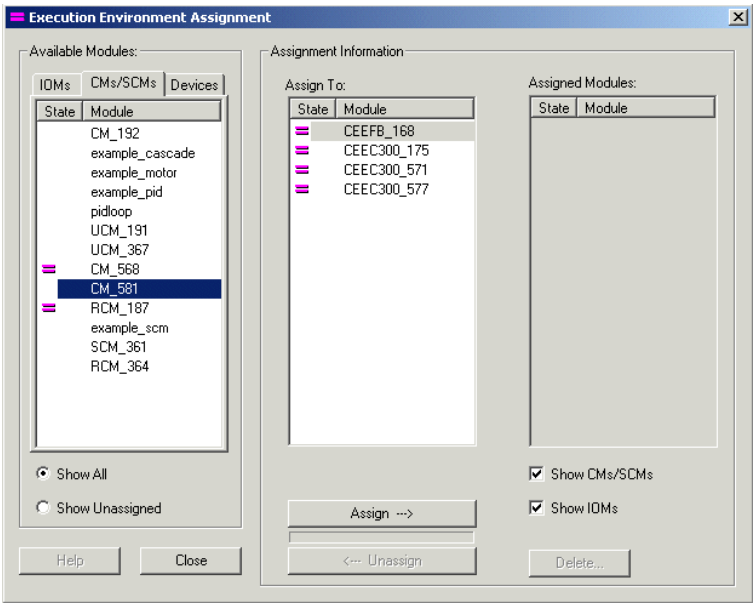
1. **Click Edit-** > **Execution Environment Assignment**. Or, click  assignment button in the toolbar.

   Calls up Execution Environment Assignment dialog box. (There is no set default state for the dialog, so it may come up with different active fields than shown below.)



> **TIP**
>
> You can use common <Shift> plus click and <Control> plus click actions to select multiple items in Available Modules and Assigned Modules lists.

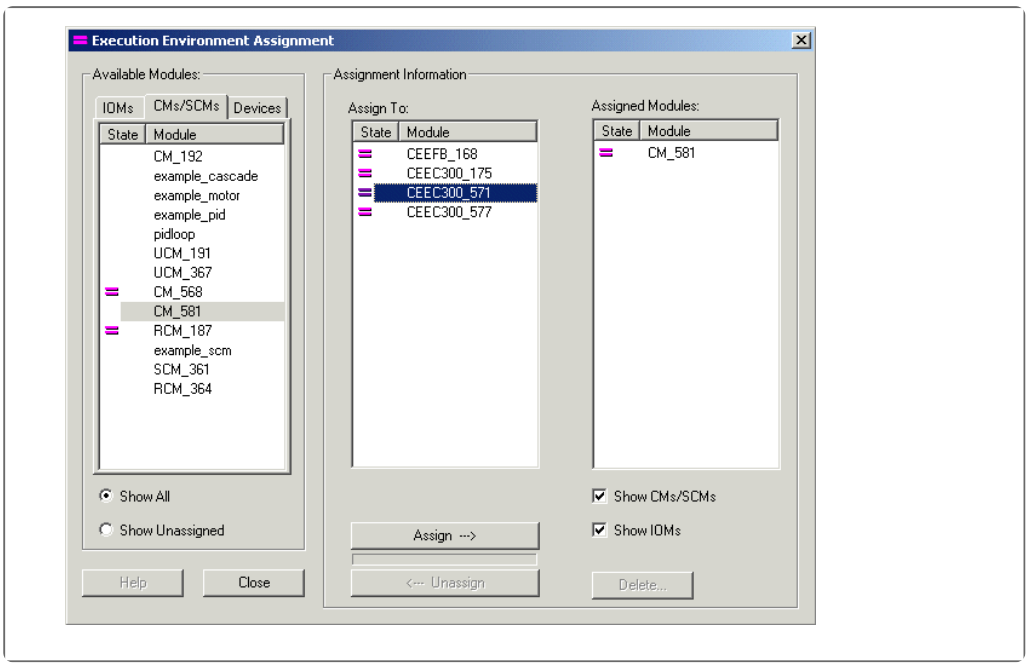
2. With CMs/SCMs tab selected, click listed CM to be assigned to a CEE.
   Highlights selection and configured CEEs appear in the Assign To list.



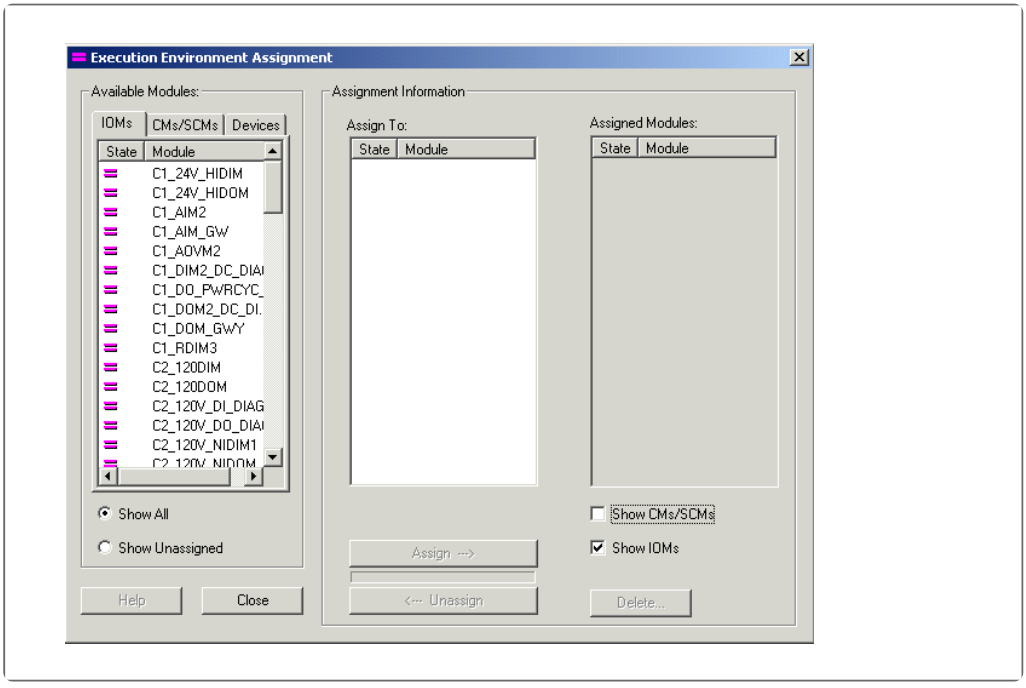
3. Accept default CEE selection or click desired CEE in list.
   Be sure correct CEE is selected in list.
4. Click the

   assign button.
   Selected CM is assigned to the selected CEE and appears in the Assigned Modules list.



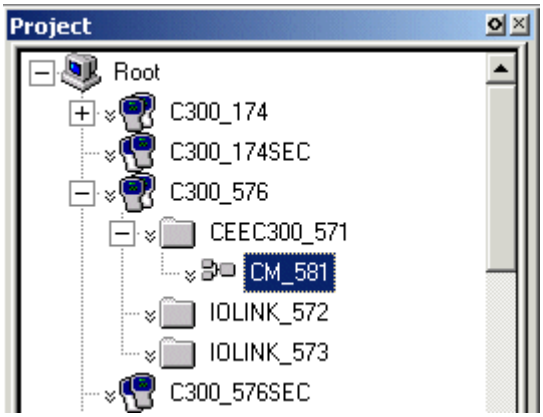
5. Click IOMs tab in Available Modules section.
   Configured IOMs/IOPs appear in list.



6. Click listed IOM to be assigned.
   Highlights selection and applicable CEEs appear in Assign To list.
7. Accept default CEE selection or click desired CEE in list.
   Be sure correct CEE is selected in list.
8. Click the 

assign button.
   Selected IOM is assigned to the selected CEE and appears in the Assigned Modules list.

9. Repeat Steps 2 to 4 to assign other CMs/SCMs. Or, repeat Steps 5 to 8 to assign other IOMs.
   Complete CM, SCM, and IOM assignments.
10. Click the Close button.
    Closes dialog box and assigned components now appear in CEE folder in Project tab.



5.12 Copy Control Modules

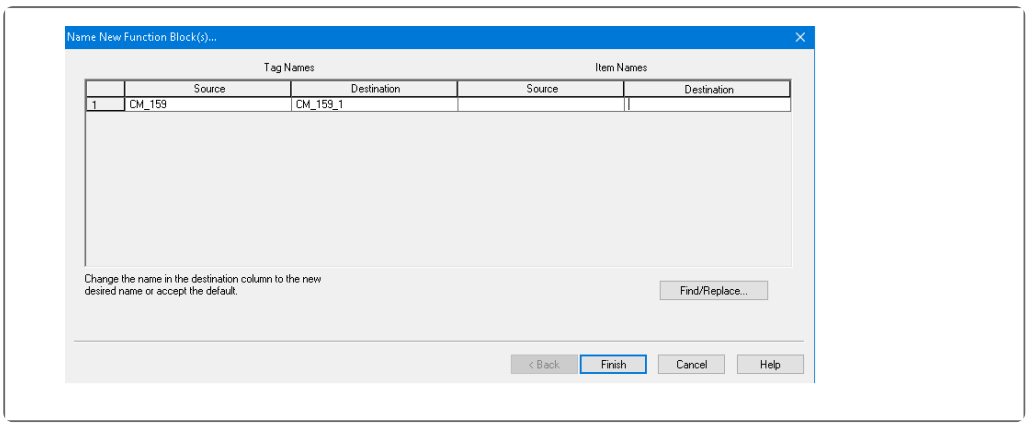
All illustrations used in the procedure are for example purposes only.

5.12.1 Prerequisites

- Control Builder is running
- Tree windows are open

5.12.2 To copy an existing Control Module

1. From the Project Tree, select the desired Control Module block to be copied.
   Selected Control Module block is highlighted on the Project Tree.
2. Click**Edit** > **Copy**.
   Alternate method:
   Click <Ctrl>-C.
   Selected Control Module block is saved to Control Builder clipboard and Name New Function Block(s)... dialog appears.



3. Change the Control Module block's Tagname in the Destination column of the Name New Function Block(s) dialog to a desired name or accept the default name.

   The copied Control Module block is assigned a new name.

   Note: You may opt to keep the default name which is simply the original name with a number appended to it.

4. Click **Next** to proceed to the next dialog page (if appropriate) and enter new names as prompted to resolve any existing connections and/or associations.

   If the CM contains connections to outside blocks, an additional dialog page appears which is used to resolve any existing connections and/or associations.

5. Click **Finish**

   Copied Control Module block with newly-designated name is pasted onto the Project Tree.

5.13 Assign I/O Modules to C300 IOLINK blocks

In the C300 Controller environment, only Series 8 IO modules can be assigned to IOLINK blocks.

ATTENTION

I/O assigned to the I/O Link of a C300 may only be associated with and directly controlled by the CEE executing on the same C300 Controller. In other words, I/O devices operating on a C300 Controller's I/O Link may not be directly associated with control strategies running on the CEE of another controller.

Users should be aware and must calculate the I/O Link bandwidth consumed by the planned I/O configuration for a given I/O Link. Use the **I/O Link Unit spreadsheet** to calculate IOM loading for I/O Links. See also Priority IOMs in the Series 8 *I/O User's Guide* for more information.

All illustrations used in the procedure are for example purposes only.

ATTENTION

You must assign Input/Output Processor Modules (IOM) to an IOLINK before you can assign Input/Output Channels (IOC) to a given IOM.

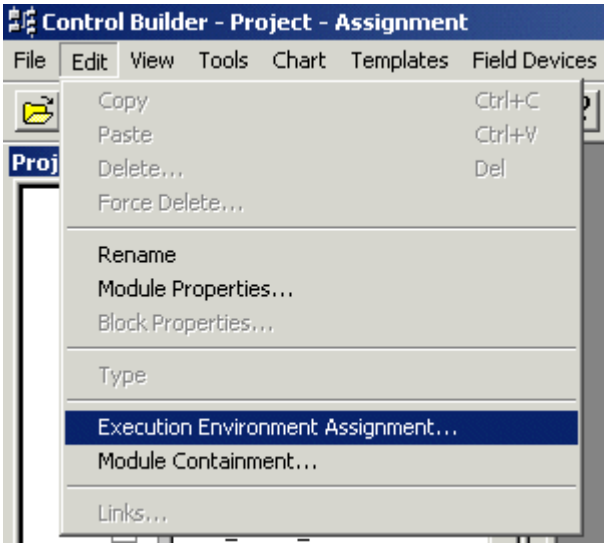
> **TIP**
>
> Configure the IOM first to avoid duplicate IOM number error message when attempting to assign an IOM to an IOLINK. The system checks for unique IOM identification before assigning it to the IOLINK.

5.13.1 Prerequisites

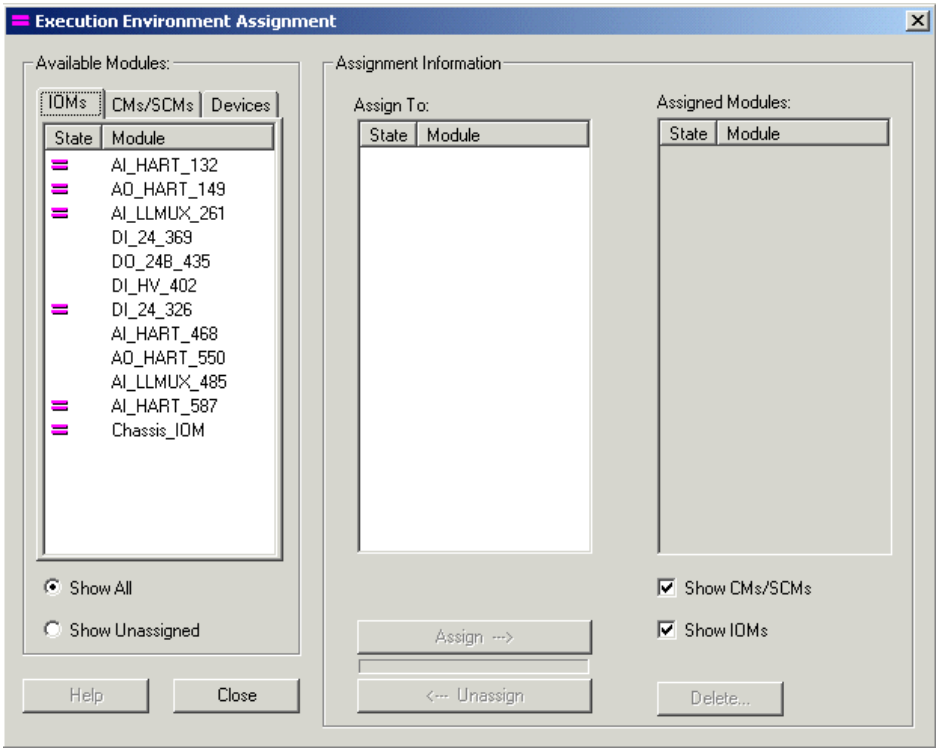
- Control Builder is running
- Tree windows are open

5.13.2 To assign Series 8 IO Modules and Process Manager IOMs to IOLINK blocks

1. Click Edit->**Execution Environment Assignment**. Or, click  assignment button in the toolbar.



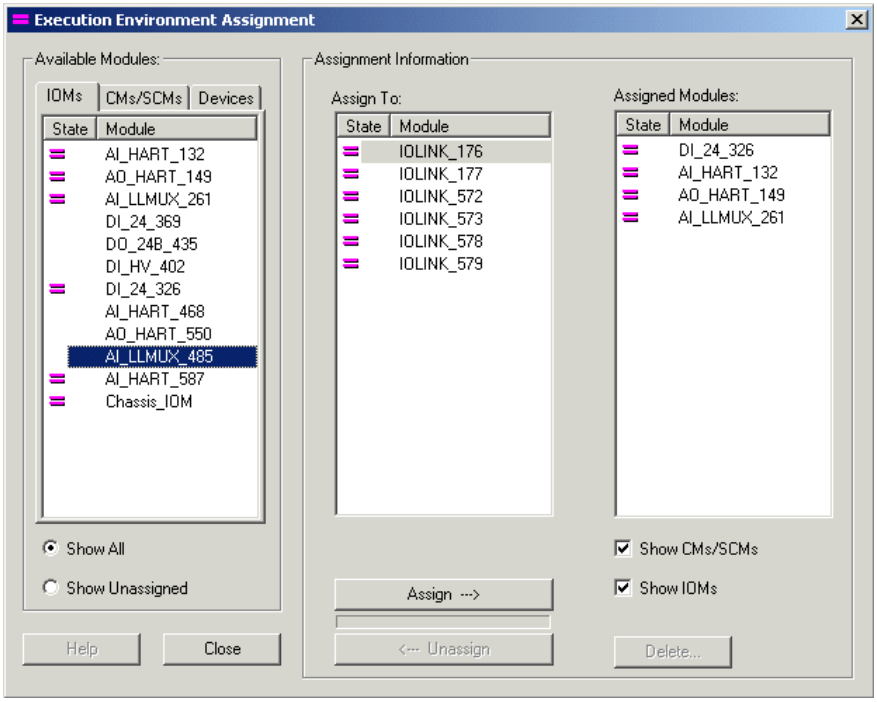
Calls up Execution Environment Assignment dialog box. (There is no set default state for the dialog, so it may come up with different active fields than shown below.)



TIP

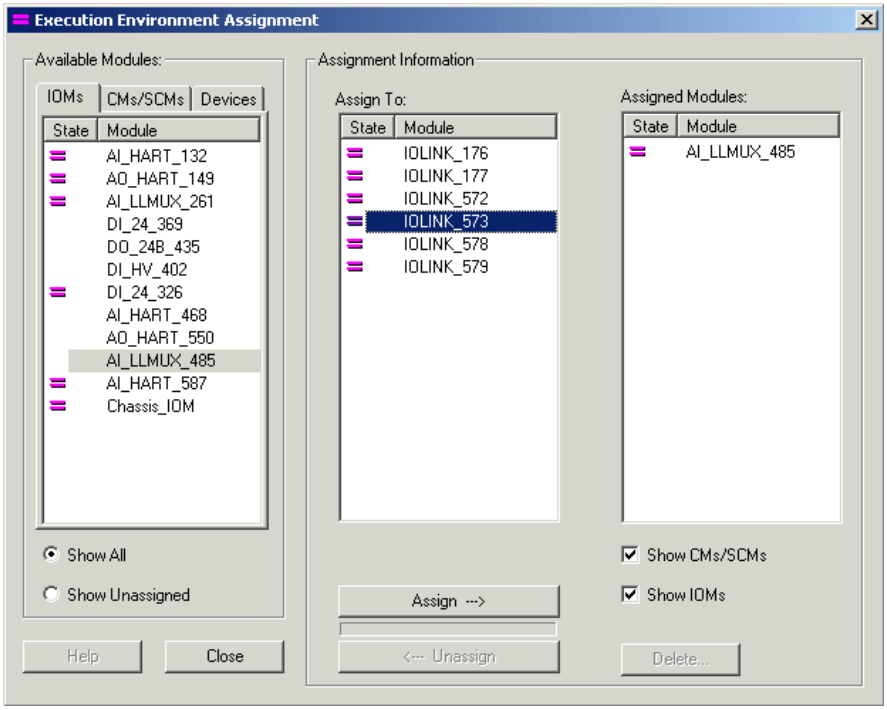
You can use common <Shift> plus click and <Control> plus click actions to select multiple items in Available Modules and Assigned Modules lists.

2. With IOMs tab selected, click desired IOM to be assigned to given IOLINK.
   Highlights selection and configured IOLINKs appear in the Assign To list.

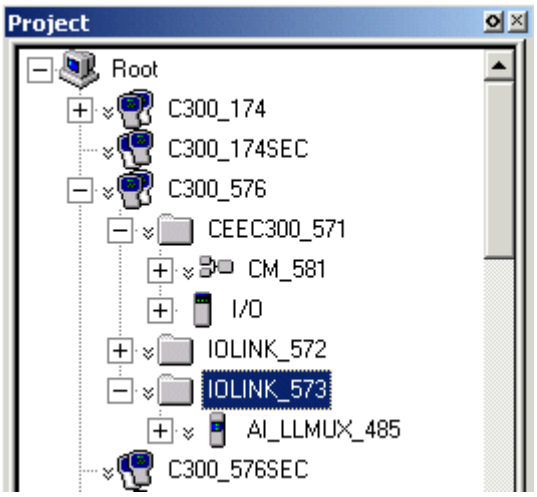


3. Accept default IOLINK selection or click desired IOLINK in list.
   Be sure correct IOLINK is selected in list.

4. Click the  assign button.
   Selected IOM is assigned to the selected IOLINK and appears in the Assigned Modules list.
   Note: You may need to select the IOLINK in the list to view the IOM just assigned to it.



5. Repeat Steps 2 to 4 to assign other IOMs.
   Complete IOM assignments.
6. Click the Close button.
   Closes dialog box and assigned components now appear in IOLINK folder in Project tab.



5.14 Add an I/O Channel to a Control Module

An IO Channel block represents a channel in one of the various IO modules (IOMs). The IO Channel blocks can be added to a control module in the Project tab to build a process control strategy.

The procedure is a drag and drop operation and is the same for any type IO Channel, whether it is an AI channel in a Series 8 IO module or an DO channel in a Series A IO module.

- All illustrations used in the procedure are for example purposes only.
- Blocks appear as Block Symbols on the Control Module chart.

5.14.1 Prerequisites

- Control Builder is running
- Tree windows are open

5.14.2 To add IO Channel blocks to a Control Module chart

1. Make sure a Control Module (CM) chart is open.

   Double-click the CM in the Project Tree to open your CM chart so function blocks may be added.

   See To create and save a Control Module.

   The Control Module (CM) chart is open so that function blocks may be added.
2. From the appropriate Library Tree group, drag and drop the desired block (or blocks) to the Control Module Control Drawing (such as an AICHANNEL block from the IOCHANNEL group).

   Desired block is shown in reverse video on the tree.

   The new function block appears on the Control Module chart.

   TIP

   You can drag and drop Series 8or PMIO Input/Output Channel (IOC) blocks directly from IO Ms added to the Project tab to the Control Module.

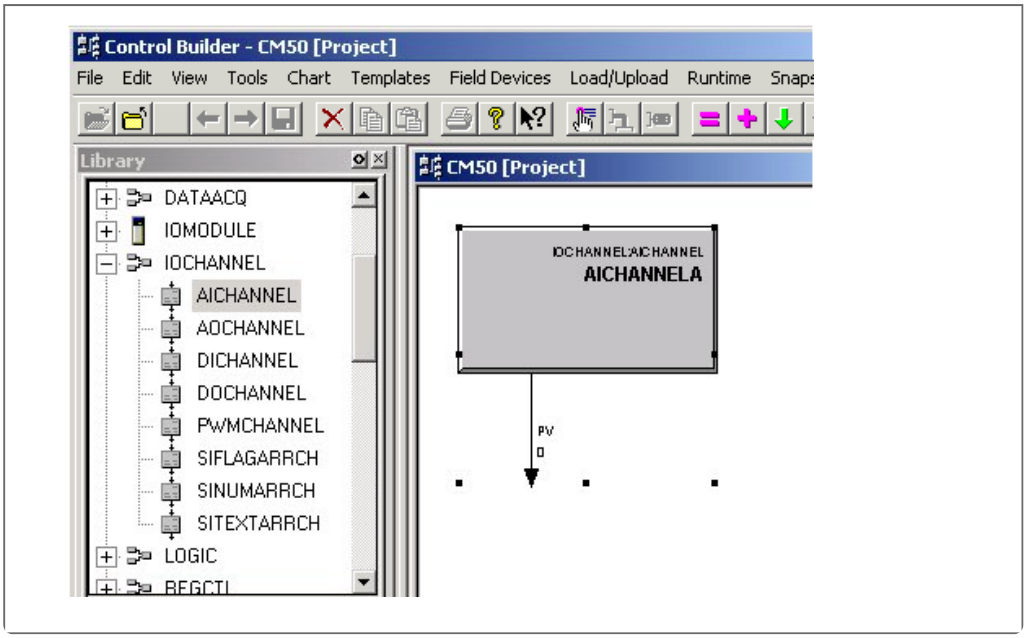
   You can not add IOC blocks to Control Modules already assigned to a Fieldbus Interface Module (FIM).
3. Repeat Step 2 as many times as necessary to create the desired blocks for your control strategy.
4. Create your control strategy by connecting the function blocks using the Insert wire option.

   TIP

   For details to connect function blocks, see Connecting and disconnecting blocks in the *Control Building Guide*.

   If you are building a control strategy to include insertion points, refer to Creating a strategy to use insertion points in the *Control Building Guide*.

Table 5.1 Control Module chart with an AICHANNEL block



CHAPTER

6

C300 CONFIGURATION FORM REFERENCE

This section provides a summary all of the user visible parameters for a C300 Controller and its associated blocks, (Secondary C300, CEEC300, and IOLINK blocks). The parameters are grouped according to the tab where they reside on the configuration form. For more details on these parameters see the *Control Builder Parameter Reference*. Click on the topic in the table to view the parameters listed in that block's configuration form.

- C300 Controller Block
- Secondary C300 Block
- CEEC300 Function Block
- IOLINK Block

6.1 C300 Controller Block

> **ATTENTION**
>
> If you are configuring the C300 controller block for Turbine control solution, select the BASEPERIOD as 20 ms.

- Main tab - C300 Controller Block
- Redundancy tab - C300 Controller Block
- System Time tab - C300 Controller Block
- Statistics tab - C300 Controller Block
- Peer Connections tab - C300 Controller Block
- Hardware Information tab - C300 Controller Block
- FTE tab - C300 Controller Block
- UTP/TCP tab - C300 Controller Block
- IP/ICMP tab - C300 Controller Block
- Soft Failures tab - C300 Controller Block
- PDA Statistics tab - C300 Controller Block
- QVCS tab - C300 Controller Block
- Server History tab - C300 Controller Block
- Server Displays tab - C300 Controller Block
- Control Confirmation tab - C300 Controller Block
- Identification tab - C300 Controller Block

6.1.1 Main tab - C300 Controller Block

The Main Tab is used to configure (and display configuration of) the C300 Controller. See To

configure a C300 Controller block for the steps to configure a C300 Controller block. The Main tab contains most of the parameters that **must** be configured when setting up a C300 Controller. It also displays the important states of the C300 Controller and supports the key commands associated with C300 Controller operation. Location and Redundancy configuration can be entered only in the Project Tree. The following table summarizes the parameter data you can monitor and/or configure on the **Main** tab of the configuration form for the selected C300 block.

Plain Text	Parameter Name	User Configurable	Notes
Tag Name	Tag Name	**Project** Only	System assigned or user configured unique name. Consisting of up to 40 characters and at least one character must be a letter (A-Z).
Item Name	Item Name	**Project** Only	A non-unique name by which an entity is known within the context of the enterprise model.
Application Image Version	IMAGEVER	No	Identifies current version of application firmware installed in module.
Controller Command	C300COMMAND	**Monitoring** Only	Allows user to initiate commands to a C300 Controller.
Associated Asset	ASSOCASSET	**Yes**	Allows user to select an asset from those configured in the Enterprise Model Database to set the Scope of Responsibility (SOR) for the point.
Network Address Configuration			
Device Index	DEVICEIDX	**Project** Only - Matches	Unique FTE Device Index of the C300

Plain Text	Parameter Name	User Configurable	Notes
		Hardware Setting	Controller. Set on the C300 IOTA switches.
Ethernet IP Address	IPADDRESS	No	IP address of the C300 Controller, derived as the Embedded FTE Base Ethernet IP Address plus configured Device Index.
State Information			
Controller State	C300STATE	No	Shows C300 Controller's current module state.
Redundancy Role	RDNROLESTATE	No	Shows C300 Controller's current redundancy role.
Synchronization State	C300 redundancy-related notifications	No	Shows C300 Controller's current synchronization state.
Battery State	BATTERYNOTOK	No	Indicates if battery voltage is within 'good' range. The values displayed by the BATTERYNOTOK parameter depends on the following: • Power supply • Battery backup • Disable Battery Alarm and Soft Fails field in the Main tab. See Battery State Values for more information.

Plain Text	Parameter Name	User Configurable	Notes
Soft Failures Present (See Soft Failures tab - C300 Controller Block for details)	SOFTFAIL	No	Indicates if Soft Failures are currently active.
Redundancy Configuration			
Module is redundant	MODISREDUN	**Project** only	Controller is part of redundant pair
Secondary Tag Name	SECMODNAME	**Project** only	System assigned name based on tag name with sec suffix for secondary block.
Advanced Configuration			
Alarming Enabled	ALMENBSTATE	Yes	Allows user to set the alarm reporting function used when an alarm condition is detected by the function block.
Disable Battery Alarm and Soft Fail	DISABLEBATTERYALARM	**Project** only	Allows you to enable or disable the battery-related soft failures and events to be reported. When this parameter is checked, battery-related soft failures and events are not reported when a battery is not connected. When this parameter is unchecked, battery-related soft

Plain Text	Parameter Name	User Configurable	Notes
			failures and events are reported.
GPS Time Source Enabled	GPSENABLE (Currently not used)	Yes	Allows you to select GPS as TIMESOURCE for time synchronization.
Temperature High Alarm (degC)	OVERTEMPTHLD	Yes	Set threshold value for module's temperature high alarm.
CPU Free Low Alarm	CPULOLM	Yes	Allows user to set CPU Free Low Capacity alarm limit in percent.
CPU Free Low Low Alarm	CPULOLOLM	No	Fixed CPU Free Low Low Capacity alarm limit in percent
Simulation Node Configuration			
Load to simulation Environment	SIMTARGET	Yes	Enables load to simulation environment.
Host IP Address	HOSTIPPRI	No	Indicates the IP address for the node hosting the simulation program.
Host Name	HOSTNAMEPRI	No	Specifies the network name for the node hosting the simulation program.
Simulation Node Operation			
SIM Command	SIMCOMMAND	No	Initiates Simulation Command from Shadow Plant.

Plain Text	Parameter Name	User Configurable	Notes
Simulation State	SIMSTATE	No	Specifies the current state of the simulation.
WIN32 Process Identifier	PROCESS_ID	No	Identifies associated process

Battery State Values

The following table provides information on the values that appear in the Battery State field based on the battery backup and Disable Battery Alarm and Soft Fails field in the Main tab.

Battery Backup	Disable Battery Alarm and Soft Fails field	Battery State
Yes	Unchecked (Reports battery-related alarms and soft failures)	OK
Yes	Checked (Does not report battery-related soft failures. However, an unknown battery error is reported)	UNKNOWN
No	Unchecked (Reports battery-related alarms and soft failures)	UNDERVOLTAGE
No	Checked (Does not report battery-related alarms and soft failures)	OK

6.1.2 Redundancy tab - C300 Controller Block

The Redundancy Tab displays redundancy-related information and allows redundancy commands to be issued when the C300 FB is opened on the Monitor Tree in Control Builder. The following table summarizes the parameter data you can monitor and/or configure on the **Redundancy** tab of the configuration form for the selected C300 block. See Redundancy parameters also for further descriptions of these parameters.

Note that the Redundancy tab is exposed only when the Controller is configured as redundant. The Module is redundant check box (MODISREDUN parameter) is checked on the Main tab - C300 Controller Block of the C300 block.

Plain Text	Parameter Name	User Configurable	Notes
Disable Synchronization	Disable Synchronization - DSBLSYNCCMD	**Monitoring** only	Triggers a synchronizing/ synchronized/standby redundant controller pair to abort synchronization.

Plain Text	Parameter Name	User Configurable	Notes
Become Primary	Become Primary command - BECMPRICMD	**Monitoring** only	Triggers an unsynchronized secondary controller to transition into the primary role in the absence of a partner controller.
Enable Synchronization	Enable Synchronization - ENBLSYNCCMD	**Monitoring** only	Triggers an unsynchronized redundant controller pair to attempt initial-synchronization.
Initiate Switchover	Initiate Switchover - SWITCHCMD	**Monitoring** only	Triggers a redundancy role change where the original primary controller reboots into the secondary role and the Synchronized or Standby secondary controller assumes the primary role to continue control operations.
Redundancy Status			
Auto Synchronization State	Auto-Synchronization State - RDNAUTOSYNC	No	Shows current auto synchronization state. If enabled, not synchronized controllers will attempt to synchronize automatically when conditions permit.
Redundancy Compatibility	Redundancy compatibility parameter - RDNCMPT	No	Shows redundant partner compatibility.
Inhibit Sync Reason	Inhibit Sync Reason - RDNINHIBITSYNC	No	Shows the reasons for inhibiting initial-sync.
Initial Sync Progress (%)	Initial Sync Progress - RDNSYNCPROG	No	Shows current synchronization progress in percent.
Last Synchronization Time	Last Synchronization Time -	No	Shows system time when initial synchronization was completed.

Plain Text	Parameter Name	User Configurable	Notes
	SYNCTIMEBEG		
Last Loss of Sync Time	Last Lost of Sync Time - SYNCTIMEEND	No	Shows system time when last synchronization was lost.
Redundancy Controllability	RDNCTLABILITY	No	Shows whether the current controller is better, equal, or worse to be the primary controller (as compared to the partner controller).
Device Index	RDNDEVICEIDX	No	Shows the Device Index of the redundant secondary controller.
Redundancy Statistics			
Traffic Redundancy (bytes/sec)	RDNXFERAVG	No	Current amount of redundancy data traffic across the redundancy private path, in bytes per second.
Max Redundancy Traffic (bytes/sec)	RDNXFERMAX	No	Maximum amount of redundancy data traffic across the redundancy private path throughput since power up or last statistics reset.
Redundancy Delay (%)	RDNDELAYAVG	No	The average of redundancy delay CPU in percent.
Max Redundancy Delay (%)	RDNDELAYMAX	No	Historical maximum redundancy delay CPU value observed since power up or last statistics reset.
Max Initial Sync Time (sec)	Maximum Initial Synchronization Time - RDNISTIMEMAX	No	Maximum initial synchronization time, in seconds.
Max Switchover Time (mSec)	Max Switchover Time - RDNSOTIMEMAX	No	Maximum switchover time, in milliseconds.

Plain Text	Parameter Name	User Configurable	Notes
OPM Freeze Ctrl Time (msec)	RDNOPMFRZTIME	No	Maximum control freeze time during an On-Process Migration session.
Redundancy History			
Time	RDNHISTTIME Refer to Redundancy history.	No	Show time of related state.
Event	RDNHISTSTATE Refer to Redundancy history.	No	Lists the last 16 redundancy related activities.
Reason	RDNHISTREASON Refer to Redundancy history.	No	Identifies reason for redundant history state
Redundancy Link Failed	RDNLINKFAILED	No	Indicates if Redundancy link communications are interrupted.
OPM Status	OPM Status - RDNOPMSTATUS	No	Status parameter indicating the notifications generated by the primary controller during an On-Process Migration session.

6.1.3 System Time tab - C300 Controller Block

The System Time tab contains information about the C300 Controller's time source and synchronization with that time source. The “System Time” and “System Time Synchronization Status” subgroups on this tab provide current controller system time and indicate the time source with which it is synchronized and status of synchronization with that source. “SNTP Status” and “GPS Status” subgroups provide meaningful statistics related to time synchronization with SNTP servers and GPS sources, along with their status. The following table summarizes the parameter data you can monitor on the **System Time** tab of the configuration form for the selected C300 block.

Plain Text	Parameter Name	User Configurable	Notes
System Time			

Plain Text	Parameter Name	User Configurable	Notes
Current System Time	CURTIME	No	Shows current system time.
Current System Time Source	TIMESOURCE	No	Shows source of system time. Default is Simple Network Time Protocol (SNTP).
System Time Synchronization Status			
Time Synchronization Status	TIMESYNCSTAT	No	Shows time sync status.
Time of Last Time Sync	TIMELASTSYNC	No	Displays the time controller time last synced with time source.
Skew at Last Time Sync (msec)	TIMELASTSKEW	No	Displays the new difference between controller time and new time.
SNTP Status			
SNTP Server Address	SNTPADDRESS	No	Displays the IP address of SNTP server (it may not be an FTE device).
SNTP Status	SNTPSTAT	No	Shows status for SNTP time source.
SNTP Skew Limit (msec)	SNTPSKEWTHLD	No	Shows the limit set for the skew between the controller time and the SNTP time source
SNTP Skew Limit Exceeded	NUMSNTPSKEWEX	No	Shows number times SNTP skew threshold was exceeded.
Max. SNTP Skew (msec)	MAXSNTPSKEW	No	Shows maximum SNTP skew recorded.
Precision Time Protocol			
Enable	PTPENABLE	Yes	Indicates that the PTP

Plain Text	Parameter Name	User Configurable	Notes
Precision Time Protocol			client should attempt to synchronize its local clock with a PTP GrandMaster.
PTP Status	PTPSTAT	No	Displays the current status of the PTP time synchronization.
Max PTP Positive Skew (msec)	MAXPTPSLOWSKEW	No	Displays the maximum skew (in milliseconds) of the local clock for which the local clock was slower than the master clock.
Max PTP Negative Skew (msec)	MAXPTPFASTSKEW	No	Displays the maximum skew (in milliseconds) of the local clock for which the local clock was faster than the master clock.
PTP Skew Limit Exceeded	NUMPTPSKEWEX	No	Displays the number of times PTP skew threshold has been exceeded.
PTP Skew Limit (msec)	PTPSKEWTHLD	No	Displays the maximum skew between the local clock and PTP GrandMaster clock, under which gradual correction of the local clock will be allowed.

6.1.4 Statistics tab - C300 Controller Block

The Statistics tab contains various statistical parameters used for maintaining and monitoring C300 Controller performance. Such information includes CPU utilization, hardware temperature and communications sub-system (CDA) statistics. The following table summarizes the parameter data you can monitor on the **Statistics** tab of the configuration form for the selected C300 block.

Plain Text	Parameter Name	User Configurable	Notes
Reset All Statistics	STATSRESET	No	Button to initiate reset of statistics in **Monitoring** mode.
CPU Statistics			

Plain Text	Parameter Name	User Configurable	Notes
CPU Free	CPUFREEAVG	No	Current CPU Free value, in percent.
Minimum CPU Free	CPUFREEMIN	No	Minimum CPU Free value, in percent. Value represents minimum recorded since module power up or last statistics reset.
Time Since Powerup	UPTIME	No	Indicates time that has elapsed since the last powerup of the controller CPU.
Hardware Temperature			
Current Temperature (degC)	CTEMP	No	Current operating temperature, in degrees C.
Maximum Temperature (degC)	CMAXTEMP	No	Maximum recorded operating temperature, in degrees C.
Minimum Temperature (degC)	CMINTEMP	No	Minimum recorded operating temperature, in degrees C.
Notification and Network Message Statistics			
Notifications Rate	TNUMNTFRQUAVG	No	Shows the total number of notification requests per second average.
Maximum Notifications Rate	TNUMNTFRQUMAX	No	Shows the total number of notification requests per second maximum.
Initiator Input	TINUMINMSGAVGPS	No	

Plain Text	Parameter Name	User Configurable	Notes
Rate			
Max Initiator Input Rate	TINUMINMSGMAXPS	No	
Initiator Output Rate	TINUMOUTMSGAVGPS	No	
Max Initiator Output Rate	TINUMOUTMSGMAXPS	No	
Responder Input Rate	TRNUMINMSGAVGPS	No	
Max Responder Input Rate	TRNUMINMSGMAXPS	No	
Responder Output Rate	TRNUMOUTMSGAVGPS	No	
Max Responder Output Rate	TRNUMOUTMSGMAXPS	No	
PCDI Network Message Statistics			
Transmit Messages/sec	TMBTCPAVGXMITMSGPS	No	Shows the number of Transmit Modbus TCP Messages per Second average.
Max Transmit Messages/sec	TMBTCPMAXXMITMSGPS	No	Shows the maximum number of Modbus TCP Transmit Messages per Second.
Receive Messages/sec	TMBTCPAVGRCVMSGPS	No	Shows the number of Receive Modbus TCP Messages per Second average.
Max Receive Messages/sec	TMBTCPMAXRCVMSGPS	No	Shows the maximum number of Maximum Modbus TCP Receive Messages per Second.

6.1.5 Peer Connections tab - C300 Controller Block

The Peer Connections tab contains data indicating the number of peer connections for both

initiator and responder types between this C300 Controller and other peer-capable nodes, (such as FIMs). The following table summarizes the parameter data you can monitor on the **Peer Connections** tab of the configuration form for the selected C300 block.

Plain Text	Parameter Name	User Configurable	Notes
Peer Initiator Connections			
Initiating to ACEs	TNUMACEINCON	No	Number of peer connections initiating to ACE nodes.
Initiating to C300s	TNUMC3INCON	No	Number of peer connections initiating to C300 nodes.
Initiating to C200s	TNUMCPMINCON	No	Number of peer connections initiating to C200 nodes.
Initiating to FIM4s	TNUMSCFIMINCON	No	Number of peer connections initiating to Series 8 FIM nodes.
Initiating to SIM-C200s	TNUMSCEINCON	No	Number of peer connections initiating to SCE nodes.
Initiating to LIOIMs	TNUMLIOMINCON	No	Number of peer connections initiating to LIOIM nodes.
Initiating to PMDs	TNUMPMDINCON	No	Number of peer connections initiating to PMDs.
Initiating to QCSs	TNUMQCSINCON	No	Number of peer connections initiating to QCSs.
Initiating to SMs	TNUMSMINCON	No	Number of peer connections initiating to SMs.
Initiating to SCADAs	TNUMSCADAINCON	No	Number of peer connections initiating to SCADAs.
Initiating to EHPMs	TNUMEHPMINCON	No	Number of peer connections initiating to EHPMs.

Plain Text	Parameter Name	User Configurable	Notes
Peer Responding Connections			
Responding to ACEs	TNUMACEOUTCON	No	Shows the number of originator Application Control Environments (ACEs).
Responding to C300s	TNUMC3OUTCON	No	Shows the number of originator C300 Controllers.
Responding to C200s	TNUMCPMOUTCON	No	Shows the number of originator CPMs (C200 controllers).
Responding to FIM4s	TNUMSCFIMOUTCON	No	Shows the number of originator Series 8 FIMs.
Responding to SIM-C200s	TNUMSCEOUTCON	No	Shows the number of originator SCEs.
Responding to LIOIMs	TNUMLIOMOUTCON	No	Shows the number of originator LIOIMs.
Responding to QCSs	TNUMQCSOUTCON	No	Displays the number of originator QCSs.
Responding to PMDs	TNUMPMDOUTCON	No	Displays the number of originator PMDs.

6.1.6 Hardware Information tab - C300 Controller Block

The Hardware Information tab contains data describing the C300 Controller module device including firmware and hardware revision and version information. The parameters provided here are used for maintenance, troubleshooting and problem description purposes. The following table summarizes the parameter data you can view on the **Hardware Information** tab of the configuration form for the selected C300 block.

Plain Text	Parameter Name	User Configurable	Notes
Firmware Version			
Boot Image Version	BOOTIMAGEVER	No	Shows the current version of boot firmware installed in the module.

Plain Text	Parameter Name	User Configurable	Notes
Application Image Version See Note 1	IMAGEVER_D	No	Shows the current version of application firmware installed in the module.
Hardware Factory Information			
Module Type	MODTYPE	No	Identifies the model number and identification string of the module.
Serial Number	SERIALNUM	No	Identifies the serial number of the module.
Programmable Logic Version	PLREVISION	No	Identifies the version of the programmable logic set of the module.
Hardware Version	HWREVMAJ	No	Identifies the major hardware revision number of the module.
Hardware Revision	HWREVMIN	No	Identifies the minor hardware revision number of the module.
Network Interface Address Information			
FTE Interface A MAC Address	MACADDRA	No	Identifies Ethernet MAC Address of FTE Interface A (Yellow Tree Port)
FTE Interface B MAC Address	MACADDRB	No	Identifies

Plain Text	Parameter Name	User Configurable	Notes
			Ethernet MAC Address of FTE Interface B (Green Tree Port)
Redun. Interface MAC Address	MACADDRR	No	Identifies Ethernet MAC Address of Redundancy Interface.
Note 1: IMAGEVER is also provided on the Main Tab; it is provided here with other version information related to the C300.			

6.1.7 FTE tab - C300 Controller Block

The FTE tab contains statistics related to Fault Tolerant Ethernet (FTE) communications and performance. The FTE tab features parameters associated with the MAC Address Resolution Table (MART), which deals with on-line media access control (MAC) address mapping. Two separate MARTs are maintained - one for FTE nodes and one for non-FTE nodes.

> **ATTENTION**
>
> For non-FTE nodes only — On connecting or reconnecting, the updated count in the Non-FTE MART Statistics section is displayed immediately. However, when disconnected, the updated count (decremented value) is not displayed until the non-FTE node remains in a disconnected state for 10 minutes.

The following table summarizes the parameter data you can monitor on the **FTE** tab of the configuration form for the selected C300 block.

Plain Text	Parameter Name	User Configurable	Notes
FTE Mart Statistics			
Address Count	FTEMARTADDRCOUNT	No	Shows number of IP addresses contained in FTE MART.
Max Depth	FTEMARTMAXDEPTH	No	Shows maximum depth that the FTE MART has reached (largest

Plain Text	Parameter Name	User Configurable	Notes
			number of entries in table).
Average Depth	FTEMARTAVGDEPTH	No	Shows average depth of FTE MART (average number of entries in table).
Address Collisions	FTEMARTCOLLCOUNT	No	Shows number of collisions that have occurred when hashing the FTE MART.
Non-FTE MART Statistics			
Address Count	NONFTEMARTADDRCOUNT	No	Shows number of IP addresses contained in the non-FTE MART
Max Depth	NONFTEMARTMAXDEPTH	No	Shows maximum depth of the non-FTE MART has reached (the largest number of entries in the table).
Average Depth	NONFTEMARTAVGDEPTH	No	Shows average depth of the non-FTE MART (the average number of entries in the table).
Address Collisions	NONFTEMARTCOLLCOUNT	No	Shows number of collisions that have occurred when hashing the non-FTE MART
Current FTE Traffic			
LAN_A Tx Rate (kBit/sec)	LANATXRATE	No	Indicates communication transmission rate in kilobits per second (kbps) for port A (Yellow Tree Port) on the FTE Bridge.

Plain Text	Parameter Name	User Configurable	Notes
LAN_B Tx Rate (kBit/sec)	LANBTXRATE	No	Indicates communication transmission rate in kilobits per second (kbps) for port B (Green Tree Port) on the FTE Bridge.
LAN_A Rx Rate (kBit/sec)	LANARXRATE	No	Indicates communication receive rate in kilobits per second (kbps) for port A (Yellow Tree Port) on the FTE Bridge.
LAN_B Rx Rate (kBit/sec)	LANBRXRATE	No	Indicates communication receive rate in kilobits per second (kbps) for port B (Green Tree Port) on the FTE Bridge.
Peak FTE Traffic			
LAN_A Tx Rate Max (kBit/sec)	LANATXRATEMAX	No	Indicates maximum communication transmission rate in kilobits per second (kbps) for port A (Yellow Tree Port) on the FTE Bridge.
LAN_B Tx Rate Max (kBit/sec)	LANBTXRATEMAX	No	Indicates maximum communication transmission rate in kilobits per second (kbps) for port B (Green Tree Port) on the FTE Bridge.
LAN_A Rx Rate Max (kBit/sec)	LANARXRATEMAX	No	Indicates maximum communication receive rate in kilobits per second (kbps) for port A (Yellow Tree Port) on the FTE Bridge.

Plain Text	Parameter Name	User Configurable	Notes
LAN_B Rx Rate Max (kBit/sec)	LANBRXRATEMAX	No	Indicates maximum communication receive rate in kilobits per second (kbps) for port B (Green Tree Port) on the FTE Bridge.
FTM Statistics			
Number of FTE Nodes	NUMFTENODES	No	Current number of FTE nodes within FTE community.
Max Number of FTE Nodes	MAXFTENODES	No	Maximum number of FTE nodes that have been detected within FTE community.
Max Device Index	MAXNODEID	No	Highest Device Index supported within FTE community.
IP Checksum Errors	BADIPCSUM	No	Number of FTE IP messages which were received but determined as having bad IP checksums.
UDP Checksum Errors	BADUDPCSUM	No	Number of FTE UDP messages which were received but determined as having bad UDP checksums.
LAN_A (Yellow) Failed	LANAFAILED	No	Status indicator for port A (Yellow Tree Port) on the FTE Bridge. If this LED is lit, it is an indication that communications have failed on Port A.
LAN_B (Green) Failed	LANBFAILED	No	Status indicator for port B (Green Tree Port) on the FTE Bridge. If this LED is lit, it is an indication that

Plain Text	Parameter Name	User Configurable	Notes
			communications have failed on Port B.
InterLAN Comm Failed	INTERLANFAILED	No	Status indicator for Inter-LAN communications - indicates that inter-LAN communications have failed.
Crossover Cable Failed	XOVERFAILED	No	Status indicator for Crossover cable - indicates that the top-level FTE switch crossover cable (Inter-LAN link) has failed.

6.1.8 UTP/TCP tab - C300 Controller Block

The UDP/TCP tab displays statistics related to open UDP and TCP connections associated with this C300 Controller. These parameters provided here are used for maintenance and performance monitoring purposes. The following table summarizes the parameter data you can monitor on the **UDP/TCP** tab of the configuration form for the selected C300 block.

Plain Text	Parameter Name	User Configurable	Notes
UDP/TCP			
Local UDP Listeners	UDPLISTENERS	No	Shows path information for all open ports on the FTE Bridge module.
Current TCP Connections	TCPCONNTABLE	No	Shows path information for all currently connected clients of the FTE Bridge module.
UDP Statistics- (Provides unreliable connectionless packet delivery service between clients.)			
Datagrams	UDPINDGRAMS	No	Total number of User

Plain Text	Parameter Name	User Configurable	Notes
Delivered			Datagram Protocol (UDP) datagrams delivered to destination protocol ports.
Datagrams for Unknown Ports	UDPNOPORTS	No	Total number of received UDP datagrams for which there was no application at the destination port.
Datagrams Dropped for Errors	UDPINERRORS	No	Number of received UDP datagrams that could not be delivered.
Datagrams Sent to Applications	UDPOUTDGRAMS	No	Total number of UDP datagrams sent from this entity.
TCP Statistics - (Provides reliable stream delivery service between clients.)			
Active Opens	TCPACTIVEOPENS	No	Number of times TCP connections have made a direct transition to the SYN-SENT state from the CLOSED state.
Passive Opens	TCPPASSIVEOPENS	No	Number of times TCP connections have made a direct transition to the SYN-RCVD state from the LISTEN state.
Failed Connection Attempts	TCPATTEMPTFAILS	No	Number of times TCP connections have made a direct transition to CLOSED state from either SYN-SENT state or SYN-RCVD state, plus number of times TCP connections have made a direct transition to LISTEN state from SYN-RCVD state.

Plain Text	Parameter Name	User Configurable	Notes
Connection Resets	TCPESTABRESETS	No	Number of times TCP connections have made a direct transition to CLOSED state from either ESTABLISHED state or CLOSE-WAIT state.
Current Connections	TCPCURRESTAB	No	Number of TCP connections for which current state is either ESTABLISHED or CLOSE-WAIT.
Segments Received	TCPINSEGS	No	Total number of segments received, including those received in error.
Segments Sent	TCPOUTSEGS	No	Total number of segments sent, including those on current connections but excluding those containing only retransmitted octets.
Segments Retransmitted	TCPRETRANSSEGS	No	Total number of segments retransmitted - that is, number of TCP segments transmitted containing one or more previously transmitted octets.
Segments Discarded for Errors	TCPINERRS	No	Total number of segments received in error (for example, bad TCP checksums).
Reset Segments Sent	TCPOUTRESETS	No	Number of TCP segments sent containing the RST flag.

6.1.9 IP/ICMP tab - C300 Controller Block

The IP/ICMP tab displays statistics related to IP and ICMP protocol messages associated with (i.e. originating in or received by) this C300 Controller. These types of messages are generally associated with maintenance and status operations on the network. The following table summarizes the parameter data you can monitor on the **IP/ICMP** tab of the configuration form for the selected C300 block.

Plain Text	Parameter Name	User Configurable	Notes
IP Statistics - (Provides packet delivery services between nodes.)			
Datagrams Received from Below	IPINRECEIVES	No	Total number of input datagrams received from connected nodes, including those received in error.
Datagrams Format Errors Drops	IPINHDRERRORS	No	Number of input datagrams discarded due to errors in their Internet Protocol (IP) headers, including bad checksums, version number mismatch, other format errors, time-to-live exceeded, errors discovered in processing their IP options, etc.
Datagrams Misdelivery Drops	IPINADDRERRORS	No	Number of input datagrams discarded because the IP address in their IP header's destination field was not a valid address to be received at this entity.
Unknown Protocol Datagrams	IPINUNKNOWNPORTS	No	Number of locally-addressed datagrams received successfully but discarded because

Plain Text	Parameter Name	User Configurable	Notes
			of an unknown or unsupported protocol.
Datagrams Discarded for Resrcs	IPINDISCARDS	No	Number of input IP datagrams for which no problems were encountered to prevent their continued processing, but which were discarded; for example, for lack of buffer space.
Datagrams Delivered Above	IPINDELIVERS	No	Total number of input datagrams successfully delivered to IP user-protocols, including Internet Control Message Protocol (ICMP).
Datagrams Sent Out	IPOUTREQUESTS	No	Total number of IP datagrams which local IP user-protocols (including ICMP) supplied to IP in requests for transmission.
Out Datagrams Discarded	IPOUTDISCARDS	No	Number of output IP datagrams for which no problem was encountered to prevent their transmission to their destination, but which were discarded; for example, for lack of buffer space.
Datagrams	IPOUTNOROUTES	No	Number of IP

Plain Text	Parameter Name	User Configurable	Notes
Drops for No Routes			datagrams discarded because no route could be found to transmit them to their destination.
Fragments Needing Reassembly	IPREASSEMREQS	No	Number of IP fragments received which needed to be reassembled at this entity.
Fragments Reassembled	IPREASSEMOKS	No	Number of IP datagrams successfully reassembled.
Fragments Reassembly Fails	IPREASSMFAILS	No	Number of failures detected by the IP reassembly algorithm, for whatever reason: timed out, errors, etc.
Datagrams Fragmented	IPFRAGOKS	No	Number of IP datagrams that have been successfully fragmented at this entity.
Datagram Fragmentation Fails	IPFRAGFAILS	No	Number of IP datagrams that have been discarded because they needed to be fragmented at this entity but could not be. For example, because their do not Fragment flag was set.
Fragments Created	IPFRAGCREATES	No	Number of IP datagram

Plain Text	Parameter Name	User Configurable	Notes
			fragments that have been generated as a result of fragmentation at this entity.
Routing Entries Discarded	IPROUTINGDISCARDS	No	Number of routing entries which were chosen to be discarded even though they are valid.
ICMP Statistics - (Controls transmission of error and control messages between hosts and gateways.)			
Messages Received	ICMPINMSGS	No	Total number of ICMP messages which the entity received.
Messages With Format Errors	ICMPINERRORS	No	Number of ICMP messages which entity received but determined as having ICMP-specific errors such as bad ICMP checksums and bad length.
Dest. Unreachable Msgs Recvd	ICMPINDESTUNREACHS	No	Number of ICMP Destination Unreachable messages received.
Echo Messages Recvd	ICMPINECHOS	No	Number of ICMP Echo (request) messages received.

Plain Text	Parameter Name	User Configurable	Notes
Echo Reply Messages Recvd	ICMPINECHOREPS	No	Number of ICMP Echo Reply messages received.
Messages Sent	ICMPOUTMSGS	No	Total number of ICMP messages which this entity attempted to send.
Out Error Messages	ICMPOUTERRORS	No	Number of ICMP messages which this entity did not send due to problems discovered within ICMP such as a lack of buffers.
Dest. Unreachable Msgs Sent	ICMPOUTDESTUNREACHS	No	Number of ICMP Destination Unreachable messages sent.
Echo Messages Sent	ICMPOUTECHOS	No	Number of ICMP Echo (request) messages sent.
Echo Reply Messages Sent	ICMPOUTECHOREPS	No	Number of ICMP Echo Reply messages sent.

6.1.10 Soft Failures tab - C300 Controller Block

The Soft Failures tab provides indications of various soft failure conditions for the C300 Controller hardware. See C300 Controller soft failures table in the Troubleshooting section for more detailed information and corrective actions in clearing these faults.

Plain Text	Parameter Name	User Configurable	Notes
Soft Failure Conditions			
Battery State Warning	BATTERYNOTOKSFTAB	No	Indicates the status of CPM battery. Status is also shown on Main tab of C300 block.

Plain Text	Parameter Name	User Configurable	Notes
			The Battery State Warning soft failure condition is indicated when the C300 does not have a battery backup and the “Disable Battery Alarm and Soft Fail” field in the Main tab is not checked.
Device Index Switches Changed	BCDSWSTS	No	Online diagnostic warning: Switches broken or deliberately changed.
Factory Data Error	FACTDATAERR	No	Online diagnostic error reading factory data.
ROM Application Image Checksum Failure	ROMAPPIMGCHKSMFAIL	No	Online diagnostic error: ROM application image may be corrupted.
ROM Boot Image Checksum Failure	ROMBOOTIMGCHKSMFAIL	No	Online diagnostic error: ROM boot image may be corrupted.
WDT Hardware Error	WDTHWFAIL	No	Online diagnostic error: Fault detected in the Watchdog Timer hardware circuit.
WDT Refresh Warning	WDTSWFAIL	No	Online diagnostic warning: Watchdog Timer is being refreshed late and close to the timeout limit.
Critical Task Watchdog	TASKHLTHMON	No	A key task within the controller is

Plain Text	Parameter Name	User Configurable	Notes
Warning			executing less frequently than normal.
Uncorrectable Internal RAM Sweep Error	RAMSWEEPERR	No	Uncorrectable single-bit errors in Main RAM.
Corrected Internal RAM Sweep Error	RAMSCRUBERRS	No	Corrected single-bit errors in Main RAM.
Uncorrectable User RAM Sweep Error	BACKUPRAMSWEEPERR	No	Uncorrectable single-bit errors in Application RAM.
Corrected User RAM Sweep Error	BACKUPRAMSCRUBERRS	No	Corrected single-bit errors in Application RAM.
IOLink (1) Soft Fail Error	IOL1SOFTFAIL	No	Soft fail condition detected on IOLink 1 interface. See Main Tab - IOLINK Block.
IOLink (2) Soft Fail Error	IOL2SOFTFAIL	No	Soft fail condition detected on IOLink 2 interface. See Main Tab - IOLINK Block
Debug Flag Enabled	DEBUGFLAGSET	No	Warning: Engineering internal debug flag is set.
Minimum HW Revision	MINHWREVSF	No	
Partner Not Visible On FTE	PARTNERNOTVISFTE	No	Indicates redundant module partner is not visible on FTE.

6.1.11 PDA Statistics tab - C300 Controller Block

The **PDA Statistics** tab contains various PDA statistical parameters used for monitoring the communication between the PGM and the C300. The following table summarizes the parameter data you can monitor on the **PDA Statistics** tab of the configuration form for the selected C300 block.

ATTENTION

One C300 block can have 4 PDA connection.

Table 6.1 PDA Statistics tab

Plain Text	Parameter Name	User Configurable	Notes
Packets Sent Avg	PKTSTXAVG	No	Displays the average number of packets sent to PGM.
Packets Received Avg	PKTSRXAVG	No	Displays the average number of packets received to PGM.
PDC Messages Avg	PDCMSAVG	No	Displays the average PDC messages sent in a packet.
Connection Statistics			
IP Address	IPADDR [0..4]	No	Indicates the IP address of the PGM through which the C300 communication occurs.
Connection Status	CONNSTATUS [0..4]	No	Indicates the connection status between the PGM and the C300.

6.1.12 QVCS tab - C300 Controller Block

The **QVCS** tab is common to all configuration forms for tagged blocks in Control Builder. If you have a Qualification and Version Control System (QVCS) license, this tab shows current QVCS information for the selected C300 block. Please refer to the online help and the *Qualification and Version Control System User's Guide* for more information about the data on this tab.

6.1.13 Server History tab - C300 Controller Block

The **Server History** tab is common to all configuration forms for tagged blocks in Control Builder. The following table summarizes the parameter data you can monitor and configure on this tab of the configuration form for the selected C300 block.

ATTENTION

The configuration settings you make for Server Load Options on the **System Preferences** dialog determines whether or not the data entered on the **Server History** tab is loaded to the Engineering Station. See the *Control Building Guide* for information about setting system preferences.

Plain Text	Parameter Name	User Configurable	Notes
Access Levels			
Control Level	SCANCTRLLVL	Yes	Indicates Server control level to be associated with this function.
History Configuration			
Number of History Parameters	HIST.NUMPARAMS	Yes	Defines number of history parameters to be included in History Configuration table.
Parameter	HIST.PARAM	Yes	Valid parameter name for a parameter associated with the given point that is to be collected and stored as historical data at predetermined intervals.
Description		No	Provides a brief description of the entered parameter.
FAST	HIST.FAST	Yes	Select the Fast type of history collection.
STD	HIST.STD	Yes	Select the Standard type of history collection.
EXTD	HIST.EXTD	Yes	Select the Extended type of history collection.
EXC	HIST.EXC	Yes (**Station** only)	Select the Exception type of history collection.
Gating Parameter	HIST.GATEPARAM	Yes	Optional gating parameter to define conditions under which data for this parameter should be collected.

Plain Text	Parameter Name	User Configurable	Notes
Gate State	HIST.GATEVALUE	Yes	Defines gate state for configured gating parameter.
Create New or Edit Existing Server Scripts (Button)		N/A	Launches the Server scripting configuration utility.
Parameter History Options			
History type	HIST.FAST HIST.STD HIST.EXTD HIST.EXC	No	For the selected parameter, lists the available history types. • Fast • Standard • Extended • Exception
Collection Rate	HIST.FASTCOLLRATE HIST.STDCOLLRATE HIST.EXCCOLLRATE	Yes	For the selected parameter, defines the collection rate for each history type.
Offset	HIST.EXCOFFSET HIST.STDOFFSET	Yes	(Optional) Applicable only to Standard history and Exception history. For the selected parameter, defines the offset value, which enables the data collection to be staggered.
PHD Collection	HIST.FASTPHDCOLLRATE HIST.STDPHDCOLLRATE HIST.EXTDPHDCOLLRATE HIST.EXCPHDCOLLRATE	Yes	For the selected parameter, defines the PHD Collection strategy. • Default • Override • Disable

6.1.14 Server Displays tab - C300 Controller Block

The **Server Displays** tab is common to all configuration forms for tagged blocks in Control Builder. The following table summarizes the parameter data you can monitor and configure on this tab of the configuration form for the selected C300 block.

> **ATTENTION**
>
> The configuration settings you make for Server Load Options on the **System Preferences** dialog determines whether or not the data entered on the **Server Displays** tab is loaded to the Engineering Station. See the *Control Building Guide* for information about setting system preferences.

Plain Text	Parameter Name	User Configurable	Notes
Point Detail Display	SCANPNTDTL	Yes	By default, a Display template is already entered into Point Detail Display box (for example, sysDtlFTEB.dsp). This template can be used for creating your own display or it can be used as is, provided that your function block name matches name built into detail display that is supplied as a template.
Group Detail Display	SCANGRPDTL	Yes	By default, a Display template is already entered into the Group Detail Display box (for example, sysGrpFTEB.dsp). This template can be used for creating your own display or it can be used as is, provided that your function block name matches name built into detail display that is supplied as a template
Associated Display	SCANASSOCDSP	Yes	Name of the Server display to be associated with this function block.
Trends			
Number of Trends	TREND.NUMPARAMS	Yes	Defines the number of trend parameters to be included in

Plain Text	Parameter Name	User Configurable	Notes
			the Trends Configuration table.
Trend #	TREND.NUMBER	Yes	Defines Trend number to be associated with this trend parameter
Trend Position	TREND.POSITION	Yes	Defines color of pen that will be used to trace assigned parameter on Station Trend display.
Trend Parameter	TREND.PARAM	Yes	Valid parameter name for a parameter associated with given point that is configured for trend collection.
Description		No	Provides a brief description of the entered parameter.
Groups			
Number of Groups	GROUP.NUMPARAMS	Yes	Defines the number of group parameters to be included in Groups Configuration table.
Group #	GROUP.NUMBER	Yes	Defines Group number to be associated with this group parameter.
Pos #	GROUP.POSITION	Yes	Defines number of position configured parameter will occupy in the Station Group display.
Group Parameter	GROUP.PARAM	Yes	Valid parameter name for a parameter associated with the given point that is configured in the system.
Description		No	Provides a brief description of the entered parameter.

6.1.15 Control Confirmation tab - C300 Controller Block

The **Control Confirmation** tab is common to all configuration forms for tagged blocks in Control Builder. If you have an optional Electronic Signature license, you can configure electronic signature information for the tagged block through this tab on the block's configuration form in Control Builder. Please refer to the online help and the *Server and Client Configuration Guide* for

information about the data on this tab.

The Electronic Signature function aligns with the identical Electronic Signatures function that is initiated through Quick Builder and Station for Server points. When this block is loaded to a controller, its control confirmation configuration (electronic signatures) is also loaded to the Server. This means you can view the control confirmation configuration for this tagged object in Station and also make changes to it. If you make changes through Station, you must initiate an **Upload** or **Upload with Contents** function through the **Controller** menu in Control Builder for the object in the **Monitoring** tab to synchronize changes in the Engineering Repository Database (ERDB).

6.1.16 Identification tab - C300 Controller Block

The **Identification** tab is common to all configuration forms for tagged blocks in Control Builder. The following table summarizes the parameter data you can monitor and configure on this tab of the configuration form for the selected C300 block.

Plain Text	Parameter Name	User Configurable	Notes
Name	Name	Yes	Unique block name consisting of up to 40 characters to identify the block. At least one character in the name must be a letter (A-Z).
Description	DESC	Yes	Descriptive text that appears on detail and group displays to uniquely describe this particular function block
Block Comment 1	BLCKCOMMENT1	Yes	Comment to be associated with this block consisting of up to 40 characters.
Block Comment 2	BLCKCOMMENT2	Yes	Comment to be associated with this block consisting of up to 40 characters.
Block Comment 3	BLCKCOMMENT3	Yes	Comment to be associated with this block consisting of up to 40 characters.
Block Comment 4	BLCKCOMMENT4	Yes	Comment to be associated with this block consisting of up to 40 characters.
Library	n/a	No	Identifies Control Builder Library that is source of template.
System Template		No	Identifies System Template that is source for this block.
Base Template		No	Identifies Base Template that is used for this block.

Plain Text	Parameter Name	User Configurable	Notes
Created By	CREATEDBY	No	Identifies user who created block, if operator security is implemented. Otherwise, may just show Default login.
Date Created	DATECREATED	No	Shows date and time template was created. If this block is in Version Control System, shows date and time initial version of template was created.
Last Modified By	MODIFIEDBY	No	Identifies user who made last modifications to block, if operator security is implemented. Otherwise, may just show default login. If this block is in Version Control System, modifications apply to last version of block.
Date Last Modified	VERSIONDATE	No	Shows date and time last modification was made to block's configuration. If this block is in Version Control System, modification date and time applies to last version of block.

6.2 Secondary C300 Block

The Secondary C300 Controller block is available when the 'Module is redundant' (MODISREDUN) check box is checked on the Primary C300 configuration form Main tab. The Secondary C300 configuration form contains the same tabs and parameters as the primary with the exception of a few parameters on the Main and Redundancy tabs. The differences are described in the following paragraphs.

- Main Tab - Secondary C300 Block
- Redundancy Tab - Secondary C300 Block

6.2.1 Main Tab - Secondary C300 Block

The Main Tab of the Secondary C300 Controller's configuration form does not contain the 'Module is redundant' or 'Secondary Tag Name' fields. Additionally, the SIM node parameters are not shown on the secondary controller forms because simulation is not supported in redundant nodes. All other parameters contained on the Primary's main tab are present on the secondary's main tab. Parameters in the Advanced Configuration subgroup are copied from the primary block to the secondary block and are view only on the secondary's form.

6.2.2 Redundancy Tab - Secondary C300 Block

The Redundancy Tab of the Secondary C300 block contains the parameter 'Last Block Migrated'

(LASTOPMNAME) which is not applicable on the Primary C300 block.

6.3 CEEC300 Function Block

The CEEC300 function block is created when a new C300 Controller block is created and configured in the Project tree in Control Builder. The following sections identify and describe all user-visible parameters associated on the CEEC300 configuration form. For more details about these parameters see the *Control Builder Parameter Reference*.

- Main Tab - CEEC300 Function Block
- Peer Configuration tab - CEEC300 Function Block
- Statistics tab - CEEC300 Function Block
- CPU Loading Tab - CEEC300 Function Block
- CPU Overruns tab – CEEC300 Function Block
- Memory tab - CEEC300 Function Block
- Peer Communications tab - CEEC300 Function Block
- Exchange Communications tab - CEEC300 Function Block
- Display Communications tab - CEEC300 Function Block
- Block Types Info tab - CEEC300 Function Block
- CAB Types Info tab - CEEC300 Function Block
- Custom Types Info tab - CEEC300 Function Block
- QVCS tab - CEEC300 Function Block
- Server History tab - CEEC300 Function Block
- Server Displays tab - CEEC300 Function Block
- Control Confirmation tab - CEEC300 Function Block
- Identification tab - CEEC300 Function Block

6.3.1 Main Tab - CEEC300 Function Block

The Main tab is used for the configuration of the CEEC300 block. See To configure a CEEC300 function block for the steps to configure a CEEC300 block. This tab also displays important state information and supports generation of commands to the CEEC300 via parameters. The following table summarizes the parameter data you can monitor and/or configure on the **Main** tab of the configuration form for the selected CEEC300 block.

Plain Text	Parameter Name	User Configurable	Notes
Main			
Tag Name	Tag Name	**Project** Only	System assigned or user configured unique name. Consisting of up to 40 characters and at least one character must be a letter (A-Z).
Item Name	Item Name	**Project** Only	A non-unique name by which an entity is known within the context of the

Plain Text	Parameter Name	User Configurable	Notes
			enterprise model.
Base Execution Period	BASEPERIOD	Yes	Indicates the base execution period for the CEE block.
Application Image Type	APPIMAGETYPE	Yes	Indicates the type of application image running in C300.
Command/State			
Control Execution Environment (CEE) Command	CEECOMMAND	Yes	Indicates the command to change the CEESTATE parameter.
Control Execution Environment (CEE) State	CEESTATE	No	The current state of CEE.
User Lock for CEE Run	USERLCKTORUN	Yes	Indicates the user level required to perform a ColdStart and WarmStart.
User Lock for CEE Idle	USERLCKTOIDLE	Yes	Indicates the user level required to command CEEIDLE.
Program Access may command CEE from Idle to Run	PROGLCKTORUN	Yes	Determines whether program access is allowed to command CEE from Idle to Run.
Program Access may command CEE Run to Idle	PROGLCKTOIDLE	Yes	Determines whether program access is allowed to command CEE from Run to Idle.
Alarm Info			
In-Alarm Flag	INALM	No	Indicates if an alarm has been detected with this function block.
Alarming Enabled	ALMENBSTATE	Yes	Allows user to set the alarm reporting function used when an alarm condition is detected by the function

Plain Text	Parameter Name	User Configurable	Notes
			block.
Enable Memory Limit Exceeded Alarm	ENBMEMALMFL	Yes	Allows user to enable the alarm reporting function for Memory Limit Exceeded alarm.
Powerup/Restart Settings			
CEE State	RRRCEESTATE	Yes	Shows the CEE state after a RAM retention restart.
Warm Timeout	WARMTIMEOUT	Yes	Shows the power down timeout that indicates whether the CEE block executes a warm or cold restart upon power up.
Batch Events Settings			
Batch Events Memory	BATCHEVTMRY	Yes	Indicates the buffer size allocated for batch events.
Time Info			
Time Zone	TIMEZONE	Yes	Shows the time zone offset value for the controller location
Daylight Savings Time	DAYLIGHTTIME	Yes	Determines if the location observes Daylight Savings Time.
Year Format	YEARFMT	Yes	Shows the selected day and year format.
Weekday Format	WEEKDAYFMT	Yes	Shows the selected day of the week format.
Simulation Info			
Simulation State	SIMSTATE	No	Specifies the current state of the simulation.
Inhibit Notifications - CEE and Contents	NOTIFINHIBIT	No	Indicates if the display of notifications associated with the CEESIMC300 and its contents is inhibited on the Station's Alarm Summary.

6.3.2 Peer Configuration tab - CEEC300 Function Block

The Peer Configuration tab contains information about user-defined peer connections for the CEE block. It allows the user to define operating parameters for the peer environments. The following table summarizes the parameter data you can configure and monitor on the **Peer Configuration** tab of the configuration form for the selected CEEC300 block.

Plain Text	Parameter Name	User Configurable	Notes
Peer Defaults			
Store Expiration Time	STRRESP	Yes	The default expiration time used in waiting for Store responses for all CEE peers in seconds.
Subscription Period	SUBSCPERIOD	Yes	The update period used for cyclic get requests for specific CEE peers (such as C300) and non-CEE data servers (such as OPC Servers).
Number of Peer Environments	NUMPEERENV	Yes	Indicates the number of peer environments (such as C300) configured for the CEE block.
Peer Environment Table			
Peer Environment Name	PEERENV[ ]	Yes	Shows the name of the peer environment.
Peer Subscription Period	PEERSUBSCPER	Yes	Shows the update period of the peer environment in seconds.
Store Expiration Time	PEERSTRRESP [ ]	Yes	Shows the expiration time used in waiting for Store responses for specific CEE peers (such as C300s) and non-CEE data servers (such as OPC Servers).
Average Get Requests Rate	PEERGETAVG [ ]	No	Shows the running average of get responses per second to this CEE received from the peer environment.
Average Store Requests Rate	PEERSTRAVG [ ]	No	Shows the running average of acyclic stores added per second from this CEE sent to the peer environment.

6.3.3 Statistics tab - CEEC300 Function Block

The Statistics tab contains CDA and Common Component Library (CCL) statistics used for maintenance and performance monitoring of the CEE. The following table summarizes the parameter data you can monitor and/or configure on the **Statistics** tab of the configuration form for the selected CEEC300 block.

Plain Text	Parameter Name	User Configurable	Notes
Statistics			
Reset All Statistics	STATSRESET	No	Button to initiate reset in **Monitoring** mode.
Notification Statistics			
Notifications Rate	NUMNTFRQUAVG	No	The number of Notification Requests per second average.
Maximum Notifications Rate	NUMNTFRQUMAX	No	The number of Notification Requests per second maximum.
Whole Array Transfer Statistics			
Whole Array (WA) Peer Responder Rate	CPEERWAAVGPPS	No	Indicates the average peer responder rate.
Whole Array (WA) Max Peer Responder Rate	CPEERWAMAXPPS	No	Indicates the maximum peer responder rate.
Responder Statistics			
Total Responder Rate	NUMPARRSPAVG	No	The average number of parameter get/store

Plain Text	Parameter Name	User Configurable	Notes
			responses per second.
Maximum Total Responder Rate	NUMPARRSPMAX	No	The maximum number of parameter get/store responses per second.
Peer Responder Rate	CPEERAVGPPS [ ]	No	The average number of peer parameters per second processed by the CEE.
Maximum Peer Responder Rate	CPEERMAXPPS [ ]	No	The maximum number of peer parameters per second processed by the CEE.
Display Responder Rate	CDISPAVGPPS [ ]	No	The average number of display peer parameters per second processed by the CEE.
Maximum Display Responder Rate	CDISPMAXPPS [ ]	No	The maximum number of display peer parameters per second processed by the CEE.
Exchange Statistics			
Exchange Request Rate	NUMEXCRQUAVG	No	The average exchange request throughput.

Plain Text	Parameter Name	User Configurable	Notes
Maximum Exchange Request Rate	NUMEXCRQUMAX	No	The maximum exchange request throughput.
Exchange Response Rate	NUMEXCRSPAVG	No	The average exchange response throughput
Maximum Exchange Response Rate	NUMEXCRSPMAX	No	The maximum exchange response throughput
Initiator Statistics			
Total Initiator Pull Requests	NUMCCLRQU	No	The number of cyclic parameter requests for peer data per second.
Push/Store Response Rate	NUMACCRQUAVG	No	The average number of acyclic peer communication parameter requests per second.
Average Initiator Pull Requests	NUMCCLRQUAVG	No	The rolling average of initiator pull requests in the last second.
Maximum Push/Store Rate	NUMACCRQUMAX	No	The maximum number of acyclic peer communication parameter requests per second.
Maximum	NUMCCLRQUMAX	No	The maximum

Plain Text	Parameter Name	User Configurable	Notes
Initiator Pull Requests			initiator pull requests since last Statistics reset.
OPC Statistics			
OPC Pull/Get Rate	EXTGETRQUAVG	No	The average number of completed Get requests to all external servers, such as an OPC server, from this CEE per second.
Maximum OPC Pull/Get Rate	EXTGETRQUMAX	No	The maximum number of completed Get requests to all external servers, such as an OPC server, from this CEE per second.
OPC Push/Store Rate	EXTSTRRQUAVG	No	The average number of completed Store requests to all external servers, such as an OPC server, from this CEE per second.
Maximum OPC Store Rate	EXTSTRRQUMAX	No	The maximum number of completed Store requests to all external servers, such as an OPC server, from this CEE per second.

Plain Text	Parameter Name	User Configurable	Notes
CCL Info			
Number of Loaded Libraries	CCLCNT	No	The number of loaded Control Component Libraries (CCLs) in the controller.
Library Load Status	CCLLOADSTAT	No	The load status of the CCL last loaded to the controller.
Batch Events Statistics			
Batch Events Rate	NUMBEVENTSAVG	No	
Maximum Batch Events Rate	NUMBEVENTSMAX	No	
PCDI Transmit Statistics			
Transmit Messages/sec	NUMMBTCPXMITMSGAVG	No	The number of Modbus TCP transmit messages on average per second.
Maximum Transmit Messages/sec	NUMMBTCPXMITMSGMAX	No	The maximum number of Modbus TCP transmit messages on average per second.
Transmit Bytes/sec	NUMMBTCPXMITBYTEAVG	No	The number of Modbus TCP transmit bytes on average per second.

Plain Text	Parameter Name	User Configurable	Notes
Maximum Transmit Bytes/sec	NUMMBTCPXMITBYTEMAX	No	The maximum number of Modbus TCP transmit bytes per second.
PCDI Receive Statistics			
Receive Messages/sec	NUMMBTCPRCVMSGAVG	No	The number of Modbus TCP receive messages on average per second.
Maximum Receive Messages/sec	NUMMBTCPRCVMSGMAX	No	The maximum number of Modbus TCP receive messages per second.
Receive Bytes/sec	NUMMBTCPRCVBYTEAVG	No	The number of Modbus TCP receive bytes on average per second.
Maximum Receive Bytes/sec	NUMMBTCPRCVBYTEMAX	No	The maximum number of Modbus TCP receive bytes per second.
Invalid Receive Message Count	MBTCPINVALIDRCVMSGCOUNT	No	The Modbus TCP invalid receive message count.

6.3.4 CPU Loading Tab - CEEC300 Function Block

The CPU Loading tab is one of two tabs containing CPU statistics used for maintenance and performance monitoring of the CEE. The following table summarizes the parameter data you can monitor on the **CPU Loading** tab of the configuration form for the selected CEEC300 block.

Plain Text	Parameter Name	User Configurable	Notes
CPU Loading Table			
Average CPU Used per Cycle	CPUCYCLEAVG [0...39]	No	Average percentage of Central Processing Unit (CPU) processing power used per cycle. Note: There are 40 phases in a CEE macro-cycle. Each element of CPUCYCLEAVG[0..39] contains the CPU overrun value for the corresponding phase. For example: CPUCYCLEAVG[0] is for Phase 1; CPUCYCLEAVG[1] is for Phase 2; and so on. CPUCYCLEAVG [40] contains the average value across all 40 phases.
Maximum CPU Used per Cycle	CPUCYCLEMAX [0...39]	No	Shows the historical maximum of Central Processor Unit (CPU) processing power used per cycle. Note: There are 40 phases in a CEE macro-cycle. Each element of CPUCYCLEMAX[0..39] contains the CPU overrun value for the corresponding phase. For example: CPUCYCLEMAX[0] is for Phase 1; CPUCYCLEMAX[1] is for Phase 2; and so on CPUCYCLEMAX [40] contains the maximum value across all 40 phases.

6.3.5 CPU Overruns tab – CEEC300 Function Block

The CPU Overruns tab contains additional CPU statistics used for maintenance and performance monitoring of the CEE. The following table summarizes the parameter data you can monitor on the **CPU Overruns** tab of the configuration form for the selected CEEC300 block.

Plain Text	Parameter Name	User Configurable	Notes
CPU Overruns Table (%)			

Plain Text	Parameter Name	User Configurable	Notes
Current Hour Cycle Overruns	CRCYCLEOVRN [0...40]	No	A count of cycle overruns that have occurred during the current hour.
Previous Hour Cycle Overruns	LSCYCLEOVRN [0...40]	No	A count of cycle overruns that have occurred during the previous hour.

6.3.6 Memory tab - CEEC300 Function Block

The Memory tab contains data on general memory usage in the C300. It also shows memory usage parameters in terms of internal memory units: descriptors and blocks. The following table summarizes the parameter data you can monitor on the **Memory** tab of the configuration form for the selected CEEC300 block.

Plain Text	Parameter Name	User Configurable	Notes
Memory Usage in KBytes			
Total User Memory(kb)	TOTALMEMINK	No	Shows the total size of CEE user memory pool, in kilobytes.
Currently Used Memory(kb)	USEDMEMINK	No	The total amount of used memory in CEE user memory pool, in kilobytes.
Currently Free Memory(kb)	FREEMEMINK	No	Amount of free memory in CEE user memory pool, in kilobytes.
Largest Free Memory Block Size(kb)	MAXFREEINK	No	The size of largest contiguous memory block in CEE user memory pool, in kilobytes.
Memory Usage in Bytes			
Total User Memory(b)	TOTALMEM	No	Total size of CEE user memory pool, in bytes.
Currently Used Memory(b)	USEDMEM	No	Total amount of used memory in CEE user memory pool, in bytes.
Currently Free Memory(b)	FREEMEM	No	Current amount of free memory in CEE user

Plain Text	Parameter Name	User Configurable	Notes
			memory pool, in bytes.
Largest Free Memory Block Size(b)	MAXFREEBLKSZ	No	Shows size of largest contiguous memory block in CEE user memory pool, in bytes.
Memory Descriptors			
Total Memory Descriptors	NTOTMEMDESC	No	Total number of memory descriptors available.
Free Memory Descriptors	NUMFREEDESC	No	Number of free (available) memory descriptors.
Registered Memory Descriptors	NUMREGDESC	No	Number of registered memory descriptors.
Used Memory Descriptors	NUMUSEDDESC	No	Number of used memory descriptors.
Memory Blocks			
Used Memory Blocks	NUMUSEDBLKS	No	Number of used memory blocks.
Free Memory Blocks	NUMFREEBLKS	No	Number of free (available) memory blocks.
External Memory Blocks	NUMEXTBLKS	No	Number of external memory blocks.
Stack Usage			
Maximum CEEB Stack	MAXSTACK	No	Maximum CEE budgeted stack in percent.

6.3.7 Peer Communications tab - CEEC300 Function Block

The Peer Communications tab contains information about peer connections. It gives statistics for connections initiated by the CEEC300 block and connections on which the CEEC300 responds. The following table summarizes the parameter data you can monitor on the **Peer Communications** tab of the configuration form for the selected CEEC300 block.

Plain Text	Parameter Name	User Configurable	Notes
Initiator Connections			

Plain Text	Parameter Name	User Configurable	Notes
Target Name	IPEERNAME [ ]	No	Shows the name of the peer initiator.
Target Path	IPEERPATH [ ]	No	The peer initiator's Automation System Architecture (ASA) path.
Connection Status	IPEERCONNSTS [ ]	No	The peer initiator connection status.
Connection Error Code	IPEERCONNERRCODE [ ]	No	The ICP/ASA error returned on an open connection attempt.
Extended Error Info	IPEERCONNERRINFO [ ]	No	The ICP/ASA extended error information returned on an open connection attempt.
Responder Connections			
Originator Name	RPEERNAME [ ]	No	Name of the FIM, or IOLINK peer originator block.
Average Get Rate	CPEERAVGPPSCONN [ ]	No	The average number of peer parameters/sec processed by the CEE.
Maximum Get Rate	CPEERMAXPPSCONN [ ]	No	The maximum number of peer parameters/sec processed by the CEE.
Average Store Rate	CPEERAVGSPSCONN [ ]	No	The average number of peer acyclic stores/sec processed by the CEE.
Maximum Store Rate	CPEERMAXSPSCONN [ ]	No	The maximum number of peer acyclic stores/sec processed by the CEE.
Degraded Messages	RPEERDEGIMRCONN[ ]	No	The count of peer IMRs (Interprocess Message Structure) that have degraded to Request-Response on each connection.

Plain Text	Parameter Name	User Configurable	Notes
Whole Array (WA) Average Get Rate	CPEERWAAVGPPSCONN [ ]	No	The Whole Array average Get rate
Whole Array (WA) Maximum Get Rate	CPEERWAMAXPPSCONN [ ]	No	The Whole Array maximum Get rate

6.3.8 Exchange Communications tab - CEEC300 Function Block

The Exchange Communications tab contains information about exchange connections between the C300 controller and a target controller or programmable logic controller. It gives statistics for connections initiated by the CEEC300 block. The following table summarizes the parameter data you can monitor on the **Exchange Communications** tab of the configuration form for the selected CEEC300 block.

Plain Text	Parameter Name	User Configurable	Notes
Exchange Initiator Connections			
Exchange Target Path	EIPATH	No	The exchange initiator's Automation System Architecture (ASA) path.
Exchange Connection Status	EICONNSTS	No	The status of the connection between the initiating controller and the target controller or programmable logic controller (PLC).
Exchange Connection Error Code	EICONNERRCODE	No	Shows the error code of the connection between the controller and the target controller or PLC.
Exchange Connection Error Description	EICONNERRINFO	No	Shows the extended error information of the connection between the controller and the target controller or PLC.

6.3.9 Display Communications tab - CEEC300 Function Block

The Display Communications tab contains information about display connections to the C300 (i.e. Control Builder, Station, etc.). The following table summarizes the parameter data you can monitor on the **Display Communications** tab of the configuration form for the selected CEEC300 block.

Plain Text	Parameter Name	User Configurable	Notes
Responder Connections			
Average Get Rate	CDISPAVGPPSCONN [ ]	No	Shows the average number of display peer parameters/sec processed by the CEE.
Maximum Get Rate	CDISPMAXPPSCONN [ ]	No	Shows the maximum number of display peer parameters/sec processed by the CEE.
Average Store Rate	CDISPAVGSPSCONN [ ]	No	Shows the average number of display acyclic stores/sec processed by the CEE.
Maximum Store Rate	CDISPMAXSPSCONN [ ]	No	Shows the maximum number of display acyclic stores/sec processed by the CEE.
Degraded Messages	RDISPDEGIMRCONN [ ]	No	Shows the count of display IMRs (Interprocess Message Structure) that have degraded to Request-Response on each connection.

6.3.10 Block Types Info tab - CEEC300 Function Block

The Block Type Info tab contains information about the function blocks loaded in the CEE. The following table summarizes the parameter data you can monitor on the **Block Types Info** tab of the configuration form for the selected CEEC300 block.

Plain Text	Parameter Name	User Configurable	Notes
Block Types Info			
Number of Block Types Defined	NUMBLKTYPES	No	Shows the number of block types defined in the CEE.
Maximum Number of Block Types	MAXBLKTYPES	No	Shows the maximum number of block types that can be supported in the CEE.
Block Type	BLKTYPDESC	No	Shows the description string

Plain Text	Parameter Name	User Configurable	Notes
Name			used for the block type name.
CCL Library	BLKTYPLIB	No	Shows the name of the CCL containing the block type.
Block Size (bytes)	BLKTYPSIZE	No	Shows the size of the block type footprint.
Instance Count	BLKTYPCOUNT	No	Shows the number of instances currently loaded to the controller.

6.3.11 CAB Types Info tab - CEEC300 Function Block

The CAB Types Info tab contains information about the CAB types loaded in the CEE. The following table summarizes the parameter data you can monitor on the **CAB Types Info** tab of the configuration form for the selected CEEC300 block.

Plain Text	Parameter Name	User Configurable	Notes
CAB Supported Version	CC3SUPRTDV	No	Provides the version level of the CAB/C300 run-time supported by the C300. Only CAB types which require this version level or lower can be loaded to the C300.
Enable CAB Runtime	ENABLECAB	Yes	Displays whether the CAB in a C300 is enabled or disabled. For application engineers to be able to load CAB programs to a C300, this parameter must be turned “On.” This parameter is “Off” by default. You must turn this parameter “On” before the first CAB load. If you want to disable CAB in a C300 where it was previously enabled, you must first delete all CAB instances and types from the controller.
Loaded CAB Types	NUMCABTYPES	No	Displays the number of CAB types which have been loaded to and are resident in the memory of the C300.

Plain Text	Parameter Name	User Configurable	Notes
Max Loaded CAB Types	MAXCABTYPES	No	Displays the maximum number of CAB types that can be loaded to CEE. The limit is 100.
CAB Friendly Name	CABTYPNAME	No	Displays the name of each CAB type currently resident in the C300 in the format “<library name>:<type name>”.
CAB Instance Count	CABINSTCOUNT	No	Displays the number of instances of the type CABTYPNAME[I] currently resident in the C300.

6.3.12 Custom Types Info tab - CEEC300 Function Block

The Custom Types Info tab contains information about the Custom Data Blocks (CDB) loaded in the CEE. The following table summarizes the parameter data you can monitor on the **Custom Types Info** tab of the configuration form for the selected CEEC300 block.

Plain Text	Parameter Name	User Configurable	Notes
Custom Types Represented			
Custom Data Blocks (CDB) and Phase Blocks		No	
Instantiated Block Types	NUMCDDMTYPES	No	The number of custom data definition manager types.
Maximum Instantiated Block Types	MAXCDDMTYPES	No	The maximum number of instantiated block types.
Block Type Name	CDDMTYPNAME	No	Block type name.
Block Type Instance Count	CDDMTYPINSTCNT	No	Block type instance count.

6.3.13 QVCS tab - CEEC300 Function Block

The **QVCS** tab is common to all configuration forms for tagged blocks in Control Builder. If you have a Qualification and Version Control System (QVCS) license, this tab shows current QVCS information for the selected C300 block. Please refer to the online help and the *Qualification and Version Control System User's Guide* for more information about the data on this tab.

6.3.14 EHB Box Emulation tab

Starting with R430, the **EHB Box Emulation** tab is introduced in the CEEC300 function block to view the emulated Hiway boxes information and the Experion Hiway Bridge (EHB) information.

> **ATTENTION**
>
> The details on the EHB Box Emulation tab are EHB-specific.

Plain Text	Parameter Name	User Configurable	Notes
Box Number	BOXNUM	No	Displays the configured Hiway box number.
Box Type	BOXTYPE	No	Displays the box type.
Box Tag Name	BOXTAGNAME	No	Displays the name of the Hiway box.
This EHB IP Address	BOXTHISEHBIP	No	Displays IP address of the "ThisEHB."
Added EHB IP Address	BOXADDEDEHBIP	No	Displays IP address of the "AddedEHB."
Remote EHB1 IP Address	BOXREMEHBIP1	No	Displays the IP address of the remote EHB1.
Remote EHB2 IP Address	BOXREMEHBIP2	No	Displays the IP address of the remote EHB2.
Box Read Rate/sec	BOXRDAVG	No	Displays the read rate per second of the Hiway box.
Box Store Rate/sec	BOXSTAVG	No	Displays the store rate per second of the Hiway box.

6.3.15 EHB Communications tab

Starting with R430, **EHB Communications** tab is introduced in the CEEC300 function block to configure and view the communication statistics information of the EHB. In addition, this can be used to view the emulated Hiway boxes information and the Experion Hiway Bridge (EHB) information.

> **ATTENTION**
>
> Although the EHB Communications tab appears on the CEEC300 configuration form (generic CEEC300 and EHB-specific CEEC300), the details on the tab are EHB-specific and used for configuring and viewing communication statistics of EHB.

Plain Text	Parameter Name	User Configurable	Notes
Local EHB1			
Logical Hiway Number	HWYNUM1	Yes	Used to configure one of two logical Hiway numbers associated with this CEE. The value must match the HWYNUM of a "defining" EHB wihin the ESVT cluster.
Tagname	EHBLC1	No	Displays the local EHB1 name.
IP Address	EHBLC1IP1	No	Displays the IP address of the local EHB1.
Module is Redundant	EHBLC1ISRED	Yes	Used to configure the local EHB1 as a redundant module.
Local EHB2			
Logical Hiway Number	HWYNUM2	No	Displays the Hiway number of the local EHB2.
Tagname	EHBLC2	No	Displays the local EHB2 name.
IP Address	EHBLC1IP12	No	Displays the IP address of the local EHB2.
Module is Redundant	EHBLC2ISRED	Yes	Used to configure the local EHB2 as a redundant module.
Remote EHB1			
IP Address	EHBRMIP1	No	Displays the IP address of the remote EHB1.
Module is Redundant	EHBRM1ISRED	Yes	Used to configure the remote EHB1 as a redundant module.
Remote EHB2			
IP Address2	EHBRMIP2	No	Displays the IP address of the remote EHB2.
Module is Redundant	EHBRM2ISRED	Yes	Used to configure the remote EHB2 as a redundant module.
CEE-HDT			

Plain Text	Parameter Name	User Configurable	Notes
Responder Statistics			
Message Transmit Rate/sec	HDTCEETXAVG	No	Displays the rate of messages transmitted per second.
Message Receive Rate/sec	HDTCEERXAVG	No	Displays the rate of messages received per second.
Message Re-transmit Count	HDTCEERETXCNT	No	Displays the rate of messages re-transmitted per second.
CEE-HDT Read/Store Statistics			
Read Rate/sec	THDTRDAVG	No	Displays the rate of messages read per second.
Store Rate/sec	THDTSTAVG	No	Displays the rate of messages stored per second.
Total Read Errors	THDTNUMRDERR	No	Displays the total number of read errors.
Total Store Errors	THDTNUMSTERR	No	Displays the total number of store errors.
EHB-HDT Responder Statistics			
EHB Name	HDTEHBNAME	No	Displays the EHB name that is responding.
EHB IP Address	HDTEHBIPADDR	No	Displays the IP address of the responding EHB.
Message Transmit Rate/sec	HDTEHBTXAVG	No	Displays the rate of messages transmitted per second.
Message Receive Rate/sec	HDTEHBRXAVG	No	Displays the rate of messages received per second.
Message	HDTEHBRETXCNT	No	Displays the rate of messages

Plain Text	Parameter Name	User Configurable	Notes
Re-transmit Count			re-transmitted per second.
Box Emulation			
Box Number	BOXNUM	No	Displays the configured Hiway box number.
Box Type	BOXTYPE	No	Displays the box type.
Box Tag Name	BOXTAGNAME	No	Displays the name of the Hiway box.
This EHB IP Address	BOXTHISEHBIP	No	Displays IP address of the "ThisEHB."
Added EHB IP Address	BOXADDEDEHBIP	No	Displays IP address of the "AddedEHB."
Remote EHB1 IP Address	BOXREMEHBIP1	No	Displays the IP address of the remote EHB1.
Remote EHB2 IP Address	BOXREMEHBIP2	No	Displays the IP address of the remote EHB2.
Box Read Rate/sec	BOXRDAVG	No	Displays the read rate per second of the Hiway box.
Box Store Rate/sec	BOXSTAVG	No	Displays the store rate per second of the Hiway box.

6.3.16 Server History tab - CEEC300 Function Block

The **Server History** tab is common to all configuration forms for tagged blocks in Control Builder. See Server History tab - C300 Controller Block for a table that summarizes the parameter data you can monitor and configure on this tab of the configuration form for the selected CEEC300 block

6.3.17 Server Displays tab - CEEC300 Function Block

The **Server Displays** tab is common to all configuration forms for tagged blocks in Control Builder. See Server Displays tab - C300 Controller Block for a table that summarizes the parameter data you can monitor and configure on this tab of the configuration form for the selected CEEC300 block.

6.3.18 Control Confirmation tab - CEEC300 Function Block

See Control Confirmation tab - C300 Controller Block for information on this tab.

6.3.19 Identification tab - CEEC300 Function Block

The **Identification** tab is common to all configuration forms for tagged blocks in Control Builder. See Identification tab - C300 Controller Block for a table that summarizes the parameter data you can monitor and configure on this tab of the configuration form for the selected CEEC300 block.

6.4 IOLINK Block

The IOLINK function block is created when a new C300 Controller block is added to the Project tree in Control Builder. The following sections identify and describe all user-visible parameters associated on the IOLINK configuration form. For more details about these parameters see the *Control Builder Parameter Reference.*

- Main Tab - IOLINK Block
- Memory Stats tab - IOLINK Block
- Statistics tab - IOLINK Block
- I/O Link Status tab - IOLINK Block
- I/O Status Summary tab - IOLINK Block
- IOTA Summary tabs - IOLINK Block
- QVCS tab - IOLINK Block
- Server History tab - IOLINK Block
- Server Displays tab - IOLINK Block
- Control Confirmation tab - IOLINK Block
- Identification tab - IOLINK Block

6.4.1 Main Tab - IOLINK Block

The Main tab contains configuration and status information for the IOLINK block. See To configure IOLINK blocks for the steps to configure a IOLINK block. The following table summarizes the parameter data you can monitor and/or configure on the **Main** tab of the configuration form for the selected IOLINK block.

Plain Text	Parameter Name	User Configurable	Notes
Main			
Tag Name	Tag Name	**Project** Only	System assigned or user configured unique name. Consisting of up to 40 characters and at least one character must be a letter (A-Z).
Item Name	Item Name	**Project** Only	A non-unique name by which an entity is known within the context of the enterprise model

Plain Text	Parameter Name	User Configurable	Notes
Description	DESC	Yes	User-entered descriptive text for the function block.
I/O Family	IOLINKKTYPE	Yes	Allows selection of IO type to be supported by this IOLink.
I/O Link Command	COMMAND	Yes	Allows users to initiate selected commands for the associated I/O link
Priority IOMs	NUMPRIORITYIOM	No	Shows the number of IOMs configured as Priority IOMs on the IOLINK.
I/O Link Cable Color	IOLINKCOLOR	No	Shows the link cable color assigned to the IOLink number.
I/O Link Number	LINKNUM	No	Shows the link number within the I/O Link Interface.
I/O Link State	STATE	No	The current state of the IOLink, (NOTLOADED, ONLINE)
Simulation State	SIMSTATE	No	Specifies the current state of the simulation.
I/O Link Soft Fail Errors (See IOLINK block soft failures section for more information.)			
Duplicate IOL Address	DUPIOLADDR	No	Indicates if a duplicate IOLink address has been detected.

Plain Text	Parameter Name	User Configurable	Notes
IOL Channel A Failure	IOLCHNFAILA	No	Indicates if Channel A of the IOLink has failed.
IOL Channel B Failure	IOLCHNFAILB	No	Indicates if Channel B of the IOLink has failed.
IOL Maximum Errors Exceeded	IOLMAXERR	No	Shows the I/O link has exceeded the maximum error limit.
Not Active Supervisor	NOTACTSUPV	No	Indicates that the IOL interface daughter card could not transition into the active supervisor role.
IOLIM Daughter Card Soft Failure	IOLDAUGHSF	No	Shows whether or not a soft failure exists in the associated IOLINK's daughter card.
Partner I/F Not Visible On IOL	PARTNOTVIS	No	Shows the Primary IOLINK is unable to view it's redundant partner across the I/O Link
Partner I/F Mismatch On IOL	PARTMISMATCH	No	Shows the Primary IOLINK is unable to view it's redundant partner across the I/O Link
IOL Process Data Cycle Overruns	IOLOVRRUN	No	Indicates whether or not PV scanning from the IOM or IOMs completed within the IOM scan rate timeframe.
UM51 Diagnostic Exceeded Time	UM51DIAGTMO	No	Indicates that one of the online diagnostics has

Plain Text	Parameter Name	User Configurable	Notes
Threshold			exceeded its allotted time period.
UM51 Diagnostic Overrun	UM51DIAGFAILEDCOMP	No	Indicates that one of the online diagnostics did not complete within its time cycle.

6.4.2 Memory Stats tab - IOLINK Block

The Memory Stats tab contains data on the Non-Volatile Storage Memory usage for the IOLINK interface. It also buttons to initiate commands for NVS compaction. The following table summarizes the parameter data you can monitor and/or configure on the **Memory Stats** tab of the configuration form for the selected IOLINK block.

Plain Text	Parameter Name	User Configurable	Notes
Memory Stats			
Non-Volatile Storage Used	NVSUSED	No	The percentage of non-volatile storage memory used in the associated module.
Compaction In Progress	NVSCOMINPROG	No	Indicates if Non-Volatile Storage Compaction in Progress.
Non-Volatile Storage Soft Failure	NVSFAILFL	No	Indicates detection of a soft fail condition in the non-volatile storage memory.
Enable IOLINK Commands	ENCMDS	Yes	Indicates if the Enable IOLINK Commands flag is set.
Compact NVS (button)	COMPNVSCMD	Yes	Initiates the Compact Non-Volatile Storage of the IOLINK.
Total Memory Buffers	BUFXTOTAL	No	The total static allocation of memory buffers.
Memory Buffers In Use	BUFXUSED	No	The current number of memory buffers used in the Monitoring mode.
Maximum	BUFXMAX	No	The maximum number of

Plain Text	Parameter Name	User Configurable	Notes
Memory Buffers Used			memory buffers used.

6.4.3 Statistics tab - IOLINK Block

The Statistics tab contains IOLINK statistics used for maintenance and performance monitoring of the IOLINK interface. The following table summarizes the parameter data you can monitor on the **Statistics** tab of the configuration form for the selected IOLINK block.

Plain Text	Parameter Name	User Configurable	Notes
Reset Statistics	STATRESET	Yes	Button to initiate reset of statistics in **Monitoring** mode.
Primary Link Interface	PRIIFRCVCHN	No	Shows the channel that is actively listening to transmitted messages.
Active Receive Channel	PRIIFRCVCHN	No	Shows the channel that is actively listening to transmitted messages.
Channel A Errors	PRIIFCHNERRA	No	The number of I/O link channel A errors encountered locally by the primary link interface.
Channel A Silences	PRIIFCHNSILA	No	The number of I/O link silences on channel A encountered locally by the primary link interface.
Channel A- Edges	PRIIFCHNMNA	No	The number of I/O link channel A missed minus edge transitions encountered locally by the primary link interface.
Channel A+ Edges	PRIIFCHNPLA	No	The number of I/O link channel A missed plus edge transitions encountered locally by the primary link interface.
Channel B Errors	PRIIFCHNERRB	No	The number of I/O link channel B errors encountered locally by

Plain Text	Parameter Name	User Configurable	Notes
			the primary link interface.
Channel B Silences	PRIIFCHNSILB	No	The number of I/O link silences on channel B encountered locally by the primary link interface.
Channel B- Edges	PRIIFCHNMNB	No	The number of I/O link channel B missed minus edge transitions encountered locally by the primary link interface.
Channel B+ Edges	PRIIFCHNPLB	No	the number of I/O link channel B missed plus edge transitions encountered locally by the primary link interface.
Last Error	PRIIFCOMMERR	No	The last I/O link communications error experienced by the primary link interface.
Processor Status	PRIIFSTS	No	The status of the link processor for the primary link interface.
Last IOL Command	LASTIOLCMD	No	The last I/O link command requested through the COMMAND parameter or the last SELECT_CH_A / SELECT_CH_B command automatically issued when periodic channel swap is enabled.
Secondary Link Interface			
Active Receive Channel	SECIFRCVCHN	No	The channel that is actively listening to transmitted messages.
Channel A Errors	SECIFCHNERRA	No	The number of I/O Link channel A errors encountered by the

Plain Text	Parameter Name	User Configurable	Notes
			Secondary Link Interface.
Channel A Silences	SECIFCHNSILA	No	The number of I/O Link channel A silences encountered by the Secondary Link Interface.
Channel A- Edges	SECIFCHNMNA	No	The number of I/O link channel A missed minus edge transitions encountered by the secondary link interface.
Channel A+ Edges	SECIFCHNPLA	No	The number of I/O link channel A missed plus edge transitions encountered by the secondary link interface.
Channel B Errors	SECIFCHNERRB	No	The number of I/O Link channel B errors encountered by the Secondary Link Interface.
Channel B Silences	SECIFCHNSILB	No	The number of I/O Link channel B silences encountered by the Secondary Link Interface.
Channel B- Edges	SECIFCHNMNB	No	The number of I/O link channel B missed minus edge transitions encountered by the secondary link interface.
Channel B+ Edges	SECIFCHNPLB	No	The number of I/O link channel B missed plus edge transitions encountered by the secondary link interface.
Last Error	SECIFCOMMERR	No	The last I/O link communications error experienced by the secondary link interface.
Active Supervisor Information			

Plain Text	Parameter Name	User Configurable	Notes
Periodic Swap Enabled	PERSWAPENB	No	Indicates if the periodic cable swap diagnostic is enabled or disabled.
Channel A Total Errors	TOTCHNERRA	No	The total I/O Link Errors on channel A.
Channel A Total Silences	TOTCHNSILA	No	The total I/O Link silences on channel A.
Channel A- Total Edges	TOTCHNMNA	No	The total I/O Link missed minus edge transitions on channel A.
Channel A+ Total Edges	TOTCHNPLA	No	The total I/O Link missed plus edge transitions on channel A.
Channel B Total Errors	TOTCHNERRB	No	The total I/O Link errors on channel B.
Channel B Total Silences	TOTCHNSILB	No	The total I/O Link silences on channel B.
Channel B- Total Edges	TOTCHNMNB	No	The total I/O Link missed minus edge transitions on channel B.
Channel B+ Total Edges	TOTCHNPLB	No	The total I/O Link missed plus edge transitions on channel B.
Channel A Status	IOLCHNSTSA	No	The overall status of cable A based on the rate of errors detected.
Channel B Status	IOLCHNSTSB	No	The overall status of cable B based on the rate of errors detected.
Error per Minute Threshold	PERSWAPTHRES	No	Defines the acceptable rate of I/O link communication errors in errors per minute before the status of the cable transitions to ERROR.
I/O Link			

Plain Text	Parameter Name	User Configurable	Notes
Performance			
Free Bandwidth	IOLFREE	No	The percentage of I/O link bandwidth that is available.
Overruns - Current Hour	OVERRUNSCUR	No	The number of I/O link overruns that have occurred in the current hour.
Overruns - Previous Hour	OVERRUNSPREV	No	Shows the number of I/O link overruns that have occurred in the previous hour.
Token Drop Count	IOSTKNDROP	No	Indicates the number of token pass drops on the I/O link.
Token Stall Time	IOSSTALLTIME	No	Defines the period of time (currently 200us / 10ms worst case) that is allocated to handle critical activities other than I/O link traffic.
Average I/O Link Requests per Second			
Cache	CFIFORATEA	No	Shows the average number of parameters accessed through cache FIFO per second.
Process Data	PDFIFORATEA	No	Shows the average number of parameters accessed through process data FIFO per second.
Write	WRFIFORATEA	No	Shows the average number of parameters accessed through Write FIFO per second.
Supervisor	SUPVFIFORATEA	No	Indicates the average

Plain Text	Parameter Name	User Configurable	Notes
	(Currently not used)		number of parameters accessed through Supervisor FIFO per second.
Local Data Transfer	LCDXFIFORATEA	No	Indicates the average number of parameters accessed through Local Data Transfer FIFO per second.
DI Priority	DIFIFORATEA	No	
DO Priority	DOFIFORATEA	No	
Maximum I/O Link Requests Per Second			
Cache	CFIFORATEM	No	Shows the maximum number of parameters accessed through cache FIFO per second.
Process Data	PDFIFORATEM	No	Shows the maximum number of parameters accessed through process data FIFO per second.
Write	WRFIFORATEM	No	Indicates the maximum number of parameters accessed through Write FIFO per second.
Supervisor	SUPVFIFORATEM (Currently not used)	No	Indicates the maximum number of parameters accessed through Supervisor FIFO per second.
Local Data Transfer	LCDXFIFORATEM	No	Indicates the maximum number of parameters accessed through Local Data Transfer FIFO per second.
DI Priority	DIFIFORATEM	No	

Plain Text	Parameter Name	User Configurable	Notes
DO Priority	DOFIFORATEM	No	
I/O Link Statistics per Cycle			
Overruns Current Hour	OVRRUNCURHR	No	Process Data Cycle Overruns that have occurred during the Current Hour.
Overruns Previous Hour	OVRRUNPREVHR	No	Process Data Cycle Overruns that have occurred in the Previous Hour.
Average Free Bandwidth	IOLFREEBWCYCLEAVG	No	
Maximum Free Bandwidth	IOLFREEBWCYCLEMIN	No	
I/O Link Cable Error History			
Channel A	IOLCHNHISTA	No	Indicates the error history of IOLINK Cable A for the last 10 “one minute” periods.
Channel B	IOLCHNHISTB	No	Indicates the error history of IOLINK Cable B for the last 10 “one minute” periods.

6.4.4 I/O Link Status tab - IOLINK Block

The I/O Link Status tab contains statistics for the Process Manager IOMs residing on the IOLINK, which are used for maintenance and performance monitoring of the IOLINK interface. The following table summarizes the parameter data you can monitor on the **I/O Link Status** tab of the configuration form for the selected IOLINK block.

Plain Text	Parameter Name	User Configurable	Notes
Primary IOPs			

Plain Text	Parameter Name	User Configurable	Notes
IOP Block Name	PRIBLOCKNAME	No	Indicates the corresponding Primary IOP/IOM Tag.
Receive Channel	PRIRCVCHN	No	Indicates the channel that is actively listening to the transmitted messages.
Channel A Errors	PRICHNERRA	No	Shows the number of I/O link channel A errors encountered by the Primary IOP.
Channel A Silences	PRICHNSILA	No	Indicates the number of I/O link channel A silences encountered by the Primary IOP.
Channel A- Edges	PRICHNMNA	No	The number of I/O link channel A missed minus edge transitions encountered by the primary IOM.
Channel A+ Edges	PRICHNPLA	No	The number of I/O link channel A missed plus edge transitions encountered by the primary IOM.
Channel B Errors	PRICHNERRB	No	The number of I/O link channel B errors encountered by the Primary IOP.
Channel B Silences	PRICHNSILB	No	Indicates the number of I/O link channel B silences encountered by the Primary IOP.
Channel B- Edges	PRICHNMNB	No	The number of I/O link channel B missed minus edge transitions encountered by the primary IOM.
Channel B+ Edges	PRICHNPLB	No	The number of I/O link channel B missed plus edge transitions encountered by the primary IOM.
Last Error	PRICOMMERR	No	Shows the last I/O Link communication error experienced by the Primary IOP.
Secondary IOPs			
IOP Block Name	SECBLOCKNAME	No	Indicates the corresponding Secondary IOP/IOM Tag.
Receive	SECRCVCHN	No	Indicates the channel that is

Plain Text	Parameter Name	User Configurable	Notes
Channel			actively listening to the transmitted messages.
Channel A Errors	SECCHNERRA	No	Indicates the number of I/O link channel A errors encountered by the Secondary IOP.
Channel A Silences	SECCHNSILA	No	Shows the number of I/O link channel A silences encountered by the Secondary IOP.
Channel A- Edges	SECCHNMNA	No	Shows the number of I/O link channel A missed minus edge transitions encountered by the Secondary IOP/IOM.
Channel A+ Edges	SECCHNPLA	No	Shows the number of I/O link channel A missed plus edge transitions encountered by the Secondary IOP/IOM.
Channel B Errors	SECCHNERRB	No	Indicates the number of I/O link channel B errors encountered by the Secondary IOP.
Channel B Silences	SECCHNSILB	No	Shows the number of I/O link channel B silences encountered by the Secondary IOP.
Channel B- Edges	SECCHNMNB	No	Shows the number of I/O link channel B missed minus edge transitions encountered by the Secondary IOP/IOM.
Channel B+ Edges	SECCHNPLB	No	Shows the number of I/O link channel B missed plus edge transitions encountered by the Secondary IOP/IOM.
Last Error	SECCOMMERR	No	Indicates the last I/O Link communication error experienced by the Secondary IOP.

6.4.5 I/O Status Summary tab - IOLINK Block

The Status Summary tab contains additional statistics for Series 8 IOMs residing on the IOLINK, which is used for maintenance and performance monitoring of the IOLINK interface. The following table summarizes the parameter data you can monitor and/or configure on the **Status Summary** tab of the configuration form for the selected IOLINK block.

Plain Text	Parameter Name	User Configurable	Notes
IOP/IOM Number			
IOP Block Name	IOPBLOCKNAME	No	Indicates the corresponding Primary IOP/IOM Tag.
Configured IOP Type	IOMTYPE	No	Indicates the configured IOP type.
IOP Status	IOMSTSA and IOMSTSB	No	Shows the status of the specific physical I/O Module.
Database Valid	DBVALID	No	Indicates whether the user has validated the IOP database configuration.
Acting Primary Module	ACTPRIM	No	Indicates the acting primary I/O module.
Synchronization Status	SYNCHSTS	No	Indicates Primary/Secondary IOP Database Synchronization Status.
IOM Commands	IOMCOMMAND	No	Allows users to initiate selected commands for the associated redundant I/O Processor (IOP) pair or single IOP.
Physical Bias State	WITHBIASENM	No	Indicates that the preferred primary is really the acting primary.
I/O Link Scan Rate	SCANRATE	No	Shows how often periodic process data is collected from the IOPs and published to the controller.
Overruns - Current Hour	IOPORCUR	No	Indicates the number of I/O Link overruns that have occurred in the current hour.
Overruns - Previous Hour	IOPORPREV	No	Indicates the number of I/O Link overruns that have occurred in the previous hour.
Cached Parameters	NUMCACHE	No	The number of cached parameters residing in the IOLINK

6.4.6 IOTA Summary tabs - IOLINK Block

The IOTA Summary tab contains additional statistics for Series 8 IOMs residing on the IOLINK, which is used for maintenance and performance monitoring of the IOLINK interface. The following table summarizes the parameter data you can monitor and/or configure on the **IOTA Summary** tab of the configuration form for the selected IOLINK block.

Plain Text	Parameter Name	User Configurable	Notes
IOTA			
Physical Address	PHYSADDRSC(1...4)	No	Indicates the physical address for the Series 8 IOM.
Actual Module Type	PHYSMODTYPESC1	No	Indicates the physical Series 8 IOM type.
IOM Status	PHYSIOPSTSSC1	No	Shows the status of the specific physical Series 8 IOM.
IOM Commands	PHYSCOMMANDSC1	No	Shows Series 8 IOM Commands.
Firmware Revision	FNWREVSC1	No	Indicates the Series 8 IOM Firmware revision.
Boot FW Revision	BOOTREVSC1	No	Indicates the Series 8 IOM Boot Code revision.
Hardware Revision	HDWREVSC1	No	Indicates the Series 8 IOM Hardware Revision.
Active Receive Channel	PHYRCVCHNSC1	No	Indicates the actual active receive channel for the Series 8IOM.
Channel A Errors	PHYCHNERRASC1	No	Shows the I/O Link errors on Channel A for the Series 8 IOM.
Channel A Silences	PHYCHNSILASC1	No	Shows the I/O Link silences on Channel A for the Series 8 IOM.
Channel A- Edges	PHYCHNMNASC1	No	Shows the Channel A minus edges detected for the Series 8 IOM.
Channel A+ Edges	PHYCHNPLASC1	No	Shows the Channel A plus edges detected for the Series 8 IOM.

Plain Text	Parameter Name	User Configurable	Notes
Channel B Errors	PHYCHNERRBSC1	No	Shows the I/O Link errors on Channel B for the Series 8 IOM.
Channel B Silences	PHYCHNSILBSC1	No	Shows the I/O Link silences on Channel B for the Series 8 IOM.
Channel B- Edges	PHYCHNMNBSC1	No	Shows the Channel B minus edges detected for the Series 8 IOM.
Channel B+ Edges	PHYCHNPLBSC1	No	Shows the Channel B plus edges detected for the Series 8 IOM.
Last Error	PHYCOMMERRSC1	No	Shows the last I/O Link communication error experienced for the Series 8 IOM.
IOM Number	PHYSDSASC1	No	Indicates the logical address of the Series 8 IOM.

6.4.7 QVCS tab - IOLINK Block

The **QVCS** tab is common to all configuration forms for tagged blocks in Control Builder. If you have a Qualification and Version Control System (QVCS) license, this tab shows current QVCS information for the selected C300 block. Please refer to the online help and the *Qualification and Version Control System User's Guide* for more information about the data on this tab.

6.4.8 Server History tab - IOLINK Block

The **Server History** tab is common to all configuration forms for tagged blocks in Control Builder. See Server History tab - C300 Controller Block for a table that summarizes the parameter data you can monitor and configure on this tab of the configuration form for the selected CEEC300 block

6.4.9 Server Displays tab - IOLINK Block

The **Server Displays** tab is common to all configuration forms for tagged blocks in Control Builder. See Server Displays tab - C300 Controller Block for a table that summarizes the parameter data you can monitor and configure on this tab of the configuration form for the selected CEEC300 block.

6.4.10 Control Confirmation tab - IOLINK Block

See Control Confirmation tab - C300 Controller Block for information on this tab.

6.4.11 Identification tab - IOLINK Block

The **Identification** tab is common to all configuration forms for tagged blocks in Control Builder. See Identification tab - C300 Controller Block for a table that summarizes the parameter data you can monitor and configure on this tab of the configuration form for the selected CEEC300 block.

CHAPTER

7

LOAD C300 CONTROLLER CONFIGURATION

This section includes information about tasks associated with loading C300 Controller configuration using Control Builder. The following topics are presented here.

- About load operations
- Initial load order guidelines
- Load components from Project
- Load With Contents command
- Reloading components from project
- Upload to the Monitoring database

7.1 About load operations

The Experion system provides the ability to build control strategies offline, without being connected to the actual field components. The process of transferring the control strategy to the "live" working components in the field is called the load operation.

The load operation functionally copies configuration data from the control strategy that is stored in the Engineering Repository Database (ERDB) to the assigned field component in the system architecture. It indirectly assures that the planned system matches the actual one. The communication addresses and physical location assignments specified for components through Control Builder configuration must match the actual addresses and locations of components in the system.

- Loaded versus project database versions
- Load initiation and load dialog box
- Load action with compare parameters function
- Load options for server history and server displays configuration

7.1.1 Loaded versus project database versions

The master control strategy, stored in the Engineering Repository Database (ERDB), is configured and edited through the Project tree. Once the contents of the control strategy are loaded from Project to the applicable components, a loaded version of the Project or master database is created. The loaded version of the database is viewable only through the Monitoring tree and supports only minimal editing of the control strategy configuration data.

The following commands are included in the Control Builder Controller menu to synchronize data in the loaded database with the data in the Project/master database.

- Update to Project (from Monitor)
- Update with Contents (to Project)

See the on-line help for information about these commands.

There is also the Upload command which allows you upload data for selected objects from the controller to the Monitoring database. This is how the monitoring database is made to reflect the same data which is loaded in the controller. See Upload to the Monitoring database for more information.

7.1.2 Load initiation and load dialog box

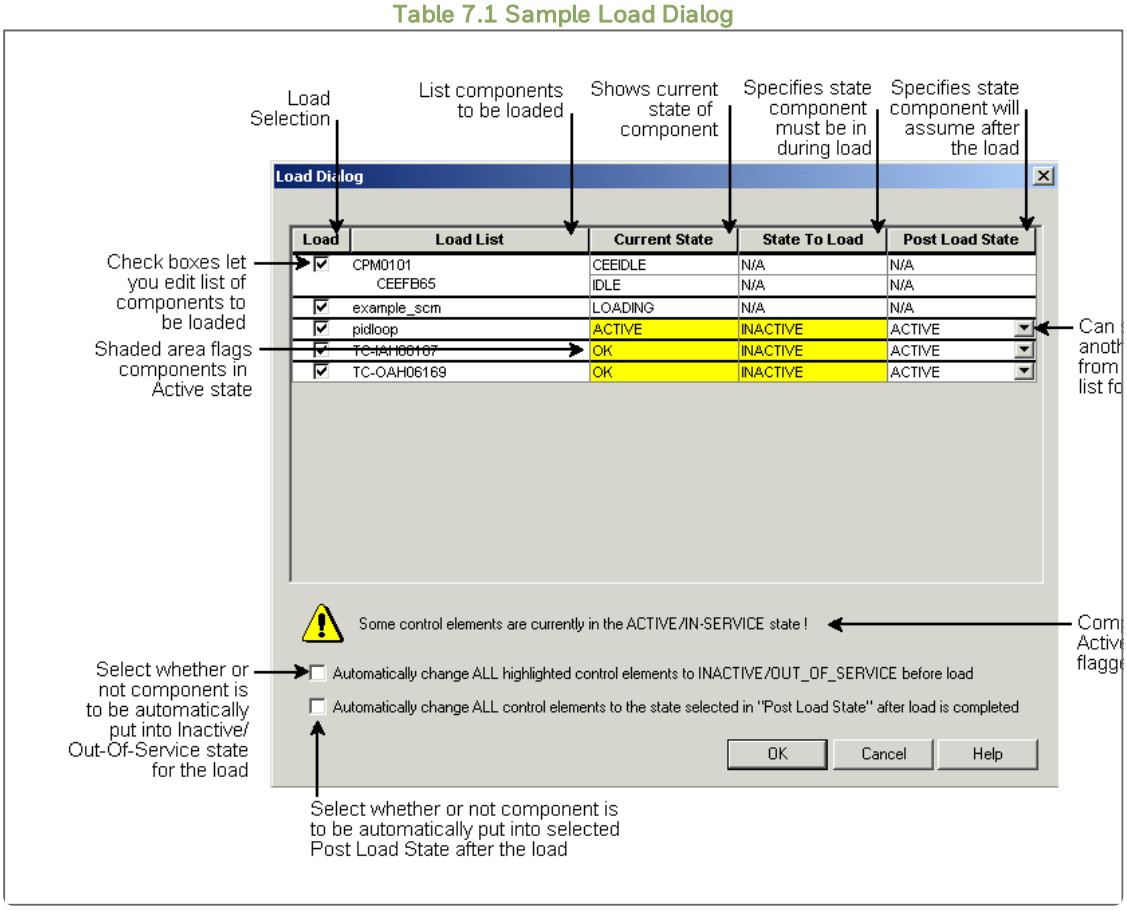
You can initiate a load operation for selected components from either the Project tree or Monitoring tree using one of the following commands in the Control Builder Controller menu.

- Load
- Load with Contents

Either command invokes the Load Dialog box. The following figure shows a sample Load Dialog box invoked for a load with contents operation for a CPM. It provides a brief description of the dialog box features for quick reference. The appearance of the dialog box will vary depending on the current load circumstances such as whether this is an initial load or a re-load operation.

> **CAUTION**
>
> The load operation is inherently an offline function. The Load Dialog box provides the ability to automatically inactivate a component during a load and then return the component to its active state. Do **not** use this automatic inactivate/activate function if your process can**not** tolerate the load disruption and consequent delay in activation. In this case, you must manually toggle the component state through the Monitoring tab in Control Builder.

Table 7.1 Sample Load Dialog



7.1.3 Load action with compare parameters function

The capability of the load action is expanded when the Use Compare Parameters function is enabled through the **System Preferences** dialog box. For more information, refer to the *Using Compare Parameters* section in the *Control Building User's Guide*.

7.1.4 Load options for server history and server displays configuration

You can enable or disable the loading of history, trend, or group configuration data for a block to Server through the **System Preferences** dialog box.

For more information, refer to the *Setting system preferences* section in the *Control Building User's Guide*.

7.2 Initial load order guidelines

Make the initial load of control strategy components from the Project tab in the following order to minimize possible load interaction generated error messages. Use the Load rather than the Load with Contents command.

Table 7.2 Initial Load Order Guidelines

Order	Component	Post Load Default State
1	A - C300 Platform B - C300 IOLINK1 C - C300 IOLINK2 D - CEEC300 D - FTEB (if C300 contains the IOMs) See Notes 1 and 2	OK OK OK IDLE
2	FTEB	
3	Process Manager IOMs*	IDLE
4	IOM* (Chassis I/O modules)	INACTIVE

Order	Component	Post Load Default State
5	CM or SCM*	INACTIVE
* Please refer to the Control Building Guide for more information about loading these components.		
Notes: Loading the C300 platform block from project without contents will load the associated CEE and IOLink blocks. All blocks must be configured before loading. Appropriate errors will be returned in case of load failures. For example, C300 not physically present at the configured address, C300 IOLINK Block state FAILED, C300 CEE Block state FAILED, IOM physically not present, configuration mismatches, etc...). 1. There are no restrictions as to when the I/O FTEB may be loaded, but to avoid I/O errors it is recommended to load I/O FTEB before the C300 block. 2. The C300 FTEB I/O Manager will attempt to connect to the FTEB I/O chassis and load the configuration data to the IOM. If the FTEB and/or IOM are not present, the C300 FTEB I/O Manager will continue to attempt to establish communications and complete the configuration.		

- Component deletion considerations

7.2.1 Component deletion considerations

- Control Strategy edits must be performed from the Project tab only.
- Deleting blocks from the Project tab eliminates them from the Project version of the database only. Only blocks that are not loaded can be deleted. Delete loaded blocks from the Monitoring tab first before deleting them from the Project tab.
- Deleting blocks from the Monitoring tab eliminates them from the controller, Server and loaded version of the database. The blocks remain in the Project version of the database.

ATTENTION

Changes to parameters in the controller can be made from the Monitoring tab. See Changing Parameters while Monitoring section in the *Control Building Guide*.

7.3 Load components from Project

- Loading C300 Controller
- Loading IOLINK
- Loading CEEC300
- Loading IOMs and CMs

7.3.1 Loading IOLINK

Use the following general procedure to load an I/O Link (IOLINK) block. The load procedure is similar for all I/O interface-related components.

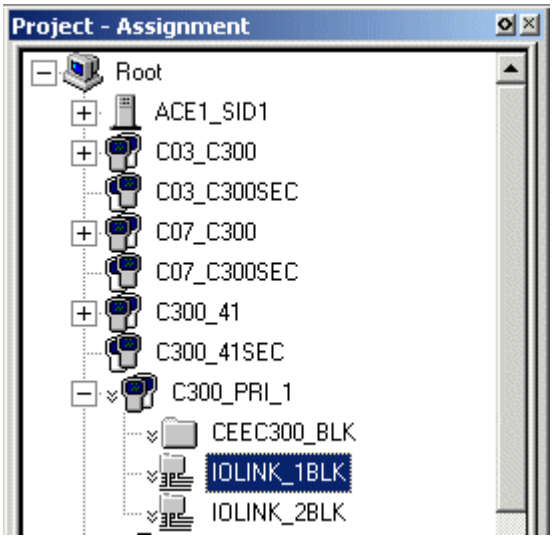
All illustrations used in the procedure are for example purposes only.

Prerequisites

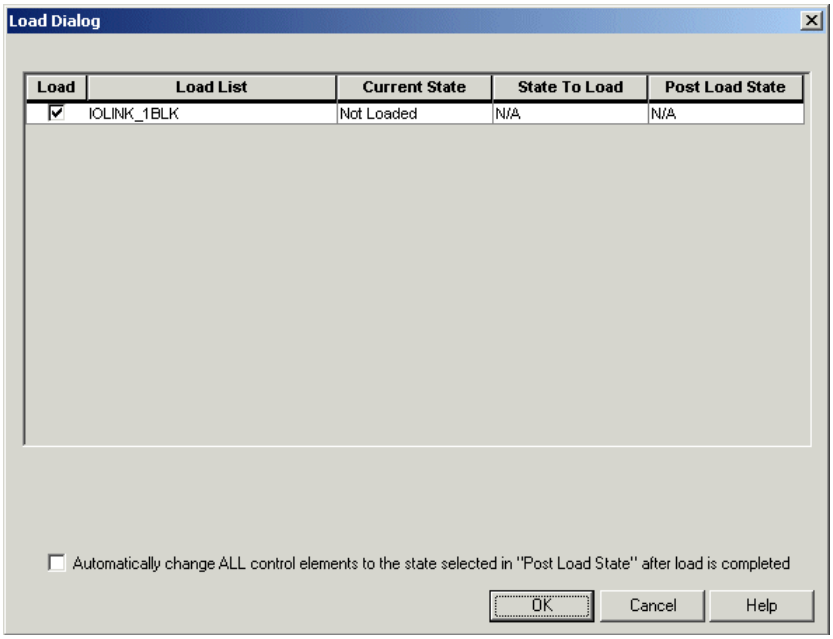
- Control Builder is running
- The C300 Controller block is loaded.
- This procedure assumes that the C300 Controller is installed and capable of communicating with the Server.

To load a IOLINK block

1. Click desired IOLINK block icon in Project tab.
   Selects and highlights the component.

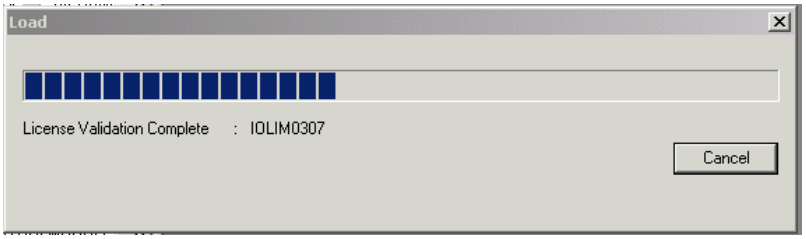


2. Click **Tools-** > **Load.**Or, click the  load button in the toolbar.
   Also, you can right click on the IOLINK block icon to select Load.
   Calls up Load Dialog box



3. With load check box checked, click the OK button.

   Initiates the load to the IOLINK and calls up the load progress dialog.



> **TIP**
>
> If errors are detected, they will be displayed in the Load progress dialog and you will be asked if you want to continue the load or cancel, depending on the nature of the error. We suggest that you cancel the load and identify and fix the errors. Each message includes an error code in parentheses. Note the last number in the string. In some cases, more information about the code number may be included in the *Control Builder Notifications Reference* document.

4. Once the load completes and the dialog box closes, click the Monitoring tab.

   IOLINK icons now appear in Monitoring tab. The default state for a loaded IOLINK is active or color code green.

5. Repeat this procedure for other I/O interface components as required.

7.3.2 Loading CEEC300

Use the following general procedure to load a Control Execution Environment (CEEC300) block to a C300 Controller. The load procedure is similar for all control environment related components.

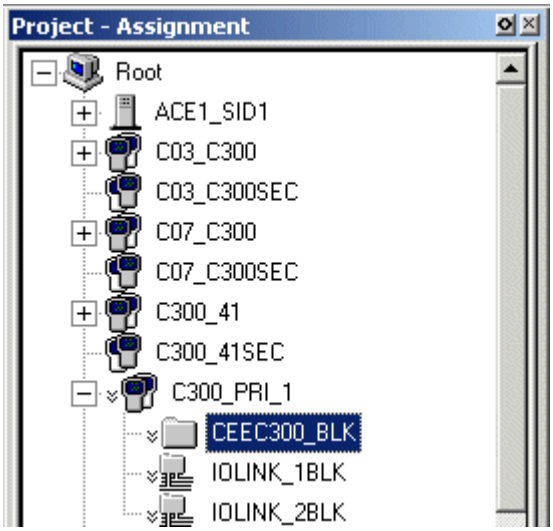
All illustrations used in the procedure are for example purposes only.

Prerequisites

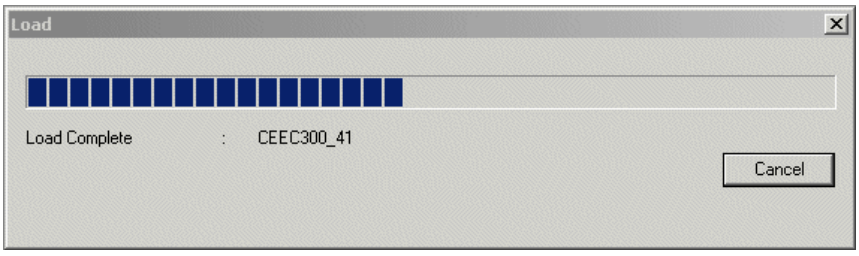
- Control Builder is running
- Make sure the C300 Controller block is loaded.
- This procedure assumes that the C300 Controller is installed and capable of communicating with the Server.

To load a CEEC300 block

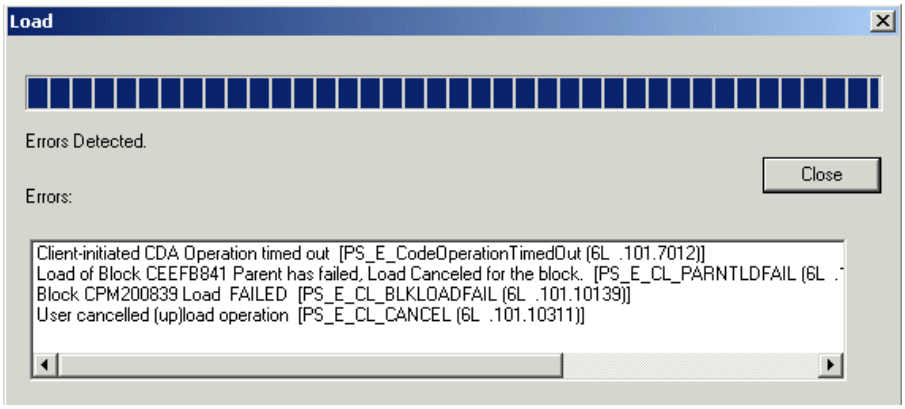
1. Click desired CEEC300 block icon in Project tab.
   Selects and highlights the component.



2. Click **Tools-** > **Load.** Or, click the
   
   load button in the toolbar.
   Calls up Load Dialog box
3. With load check box checked, click the OK button.
   Initiates the load to the CEEC300 and calls up the load progress dialog.



> **TIP**
>
> You can also check load progress through the four-character display on the faceplate of the C300 Controller module. The display changes from NODB to NOEE to IDLE upon a successful Load.
>
> If errors are detected, they will be displayed in the Load progress dialog and you will be asked if you want to continue the load or cancel, depending on the nature of the error. We suggest that you cancel the load and identify and fix the errors. The following illustration shows how error messages are typically displayed. Each message includes an error code in parentheses. Note the last number in the string. In some cases, more information about the code number may be included in the Control Builder Notifications Reference document .



4. Once the load completes and the dialog box closes, click the Monitoring tab.

   CEE icon now appears in Monitoring tab. The default state for a loaded CEE is inactive/idle or color code blue.

5. See the Activate C300 Controller's CEE section in this document to set the C300 to its Run state.

   CEE icon turns green when active.

6. Repeat this procedure for other control components as required.

7.3.3 Loading IOMs and CMs

Follow the initial load order guidelines in Initial load order guidelines to load these additional control strategy components.

- **Before you load Process Manager IOMs**, make sure that the IOLINK and IOM are installed and capable of communicating with the Server, other wise errors will result. To Load IOMs, you select the associated IOLINK block and perform a ' Load With Contents command.' You can also load PM IOMs individually using the Load command; just be sure that the associated IOLINK block is loaded first.
- **Before you load IOMs**, make sure that the I/O Modules are installed and capable of communicating with the Server, otherwise errors will result. To Load IOMs, you select the associated CEEC300 block and perform a ' Load With Contents command.' Be sure load check boxes for any CMs are not checked in the Load Dialog. You can also load IOMs individually using the Load command; just be sure that the associated IOLINK block is loaded first.
- **Load CMs and SCMs after other control strategy components are loaded**.To Load CMs and SCMs, select the associated CEEC300 block and perform a ' Load With Contents command.' Be sure only load check boxes for CMs and SCMs are checked.

See the *Control Building Guide* for more details about these procedures.

7.4 Load With Contents command

When you select “Load with Contents” from the Tools menu, The Load Dialog box shows the selected component plus any objects, (IOMs, CMs, etc.) that are contained by the selected component. For example, when a CEEC300 block is selected for loading, the Load Dialog will list all the objects assigned to (or contained by) that CEE in the dialog window. You can then select (or deselect) the objects that you want to load.

7.5 Reloading components from project

Reload of component configuration may be necessary especially when you make changes to the component or function block configuration, or after you replace a failed field device, I/O module or controller. You can use the applicable previous load procedure to re-load data to components from the Project or Monitor tab. It is good idea to invoke the following commands through the Controller menu after a reload operation.

- Upload to the Monitoring database (perform first), and then
- Update to Project

7.5.1 Restrictions and conditions for reloading operations

Re-loading parameter data to certain function blocks may incur some restrictions or conditions with other related blocks. The following table lists conditions to consider when re-loading previously loaded blocks.

Block to be Re-Loaded	Conditions or Restrictions
PMIO IOMs	• The IOM block state must be IDLE to reload a PMIO IOM block from the Monitor tab. • The IOM block loads the IOM's parameters to the IOLINK followed by all the previously loaded channels. • The IO Channel blocks assigned to CMs that have not been previously loaded, will not be loaded.
Series A IOMs	• The C300 FTEB I/O Manager retains IOM configuration so it can restore configuration if the IOM(s) are not available at load time.
Series 8 IOMs	• Channel blocks that are assigned and have not been previously loaded, will not be loaded.
CM	• The C300/CEE, IOLINK and IOMs whose channels are assigned to the CM must be previously loaded. • The CM reload operation loads the CM block and any assigned IO Channel blocks to the associated CEE and also loads the contained Channel block parameters to the IOLINK

Block to be Re-Loaded	Conditions or Restrictions

	block and its associated IOM.
	• CM reload fails if any of the following errors are encountered:
	  • The I/O Channel's associated IOM block has not been previously loaded.
	  • The CEE block is not present and loaded.
	  • The IOLINK block (if PMIO Channels are assigned to the CM) is not present and loaded.
	  • The C300 block is not present and loaded.
	  • The CM is ACTIVE
	  • Contained PMIO Channels are ACTIVE
	  • The state of any PMIO IOM whose assigned channels are contained in the CM is RUN.

IOLINK	• The C300 Block must be present and previously loaded. • The state of previously loaded IOMs must be IDLE. • IOLINK block configuration parameters are re-loaded along with configuration data for previously loaded IOM Blocks. • Re-load fails and is cancelled if the C300 is not loaded, or the state of at least one previously loaded IOM is in RUN.
CEE	• The C300 Block must be present and previously loaded. • The state of the CEE must be IDLE.

C300 with Contents	• The following blocks are re-loaded unless they are de-selected in the Load dialog.
	  • C300 Block
	  • IOLINK Block with Contents for IOLINK 1
	  • IOLINK Block with Contents for IOLINK 2

Block to be Re-Loaded	Conditions or Restrictions
	• CEE Block with Contents
NOTE: The configuration data of any previously loaded IOMs and CMs is not reloaded. You must reload any desired IOMs and CMs.	

7.6 Upload to the Monitoring database

The upload operation will upload data for the selected objects from the controller to the Monitoring Engineering Repository Database (ERDB). Upload of data for the selected objects from the server to the ERDB also can be performed.

Usually, after performing an upload to the database, you should also update the data to Project so that both the Monitoring and the Project databases agree.

See Using Upload Command in the *Control Building Guide* for procedures to upload component data.

CHAPTER

8

C300 CONTROLLER OPERATION

This section includes information about operating and monitoring the controller. The following topics are presented here.

- C300 Controller start up
- C300 faceplate indicators/displays
- C300 faceplate display indications
- Control Builder block icon descriptions>
- Activate C300 Controller's CEE
- Initiating C300 Controller shutdown
- Initiating Synchronization command
- Disable Synchronization command
- Initiating Become Primary command
- Initiating Switchover command
- Rebooting the C300 controller
- Using Station displays
- Viewing controller operation and status in Control Builder
- C300 operating behaviors
- C300 Controller processing overload behavior

8.1 C300 Controller start up

The C300 Controller module executes a series of tasks automatically when power is applied to the controller module. These tasks include:

- Power-On Self Test (POST) to verify the presence and integrity of the controller module hardware.
- Initialization of the hardware and software environment
- Determination of whether to transition to the application image, if present.

The following table summarizes the controller start up activity and execution of the POST upon power up. Figure 6 illustrates the startup routine and Boot mode controller states.

Table 8.1 C300 Controller Startup and Power On Self Test routine

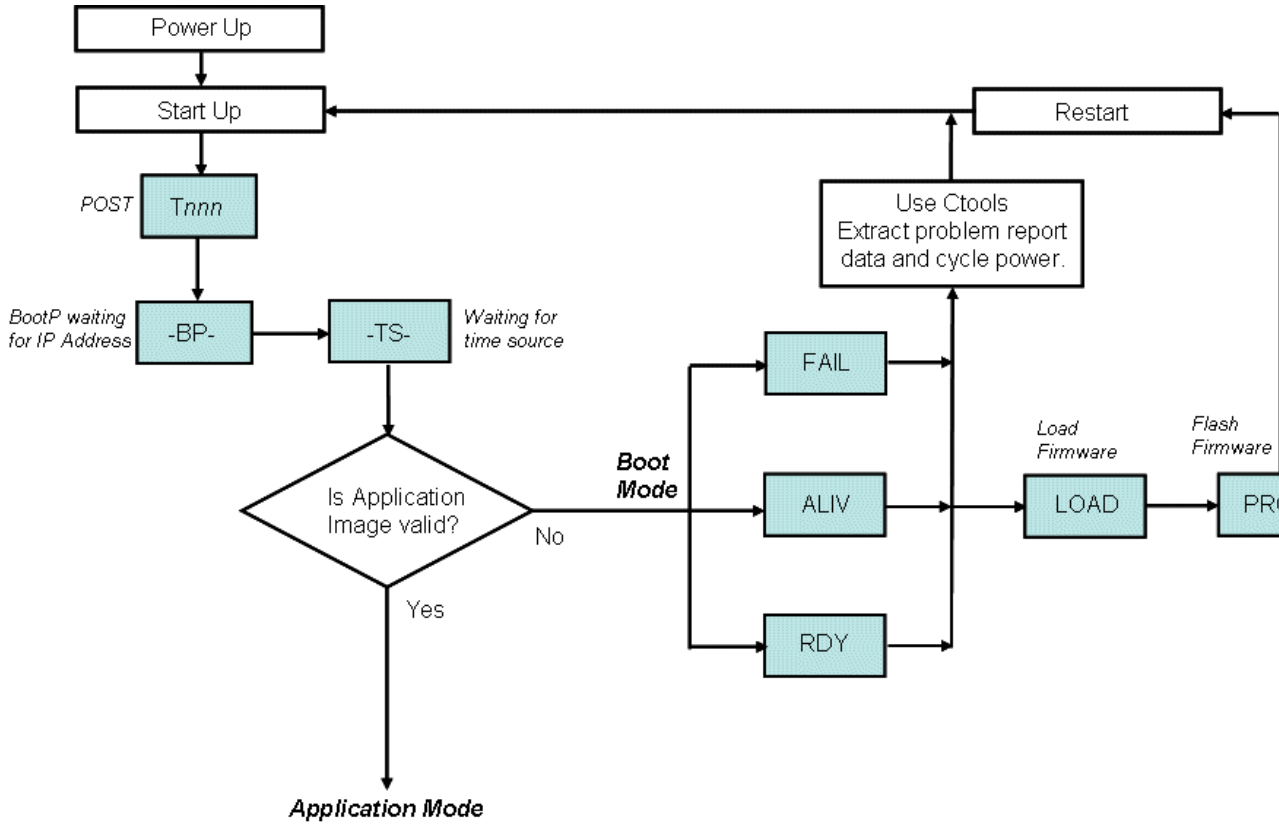
Stage	Description
1	The C300 Controller **Power** LED lights upon insertion of the module onto a powered IOTA board.
2	The C300 boots up using firmware installed in the flash memory. (Initial firmware boot image is installed in the factory.)

Stage	Description
3	A Power-On Self Test (POST) is performed as part of the C300 Controller start up. Controller display shows T*nnn*, where *nnn* indicates the number of the test currently being executed during POST.)
4	The **Status** LED briefly shows all of its colors (Red, Green, Orange), and then remains solid Red until POST completes.
5	The **four-character display** walks through a series of horizontal and vertical bars, as well as several brightness levels. Once completed successfully, the display indicates the progress of the POST. See C300 faceplate indicators/displays for a complete listing and description of the controller's status indications and displays.
6	Progress of the POST is shown on the C300's faceplate display. If a fault occurs during POST, the test halts and the display shows the test number (**T***nnn*) associated with the detected fault. **Corrective Action**: If a fault occurs and halts the POST, then reset the controller and allow the POST to execute once more. If the fault persists, then replace the failed controller module.
7	If no faults occur, POST continues to execute. Upon completion of POST, the C300 determines whether to transition to boot mode or application mode. If a valid application image is present in the C300, then it is started in application mode, unless the controller has been commanded to shutdown, or is rebooted into the FAIL state. The **Status** LED indicates the state of the controller's associated hardware.
8	The controller indicates '**-bp-**' on its display while it waits for a response from the BootP server service. The BootP server supplies the C300 its IP Address assignment and SNTP Server IP addresses. If no response is received from the BootP server in 2 minutes, the C300 will timeout. Once the C300 receives a response from the BootP server, '**-TS-**' is indicated on the display while it waits for a response from the configured time source. If the configured time source is not available, the controller will attempt to connect with an alternate time source. See Time management in the C300 Controller for more information.
9	**Action**: Verify the correct Device Index is shown on the display (**#nnn**) and that there are no address errors. Address errors - The C300 determines if any other module in the FTE network is using the same Device Index. If another module is discovered with the same Device Index, the C300 will not join the FTE network but instead will enter the "no address" state and wait for a new Device Index to be set.

Stage	Description
	If another node is discovered with the same IP Address, the controller will not join the FTE network but instead will enter the “dup address” state and wait for a new Device Index to be set. **Action**: If the Device Index is invalid, or any address error is displayed, see Reset Device Index and IP address of a controller and follow the procedure to reassign the Device Index and IP addresses. Once a valid IP Address is assigned, a redundant C300 negotiates its redundancy role (primary/secondary) with its partner module. See Stage 10.
10	The C300 alternately displays its Device Index, redundancy role and execution state on the controller's faceplate display. Redundancy role - Question marks ‘**????**’may appear on the display to indicate that the C300 's redundancy role has not been determined. For non-redundant controllers, the redundancy role is shown as ‘**nrdn**.’ Execution state - If no EE databases have been retained in a primary or non-redundant controller, the controller enters the No Database ‘**NODB**’ execution state. If the controller's database has been retained, the execution state is ‘**IDLE**.’ Secondary controller first displays ‘**????**’ until its redundancy role is determined. Once determined the secondary controller indicates it is an unsynchronized secondary or synchronized secondary. The secondary controller also shows the controller's execution state, which is ‘**BKUP**.’

Figure 6 illustrates the C300 Controller startup routine and the possible controller states when the controller is in the Boot mode.

Figure 8.1 C300 Controller Startup and Boot Mode indications



- C300 Controller states in boot mode
- C300 Controller states in application mode

8.1.1 C300 Controller states in boot mode

At the conclusion of POST, the C300 determines whether or not there is a valid Application Image present in the controller and whether it should then transition to executing this Application image (Application mode) or to continue in the Boot mode.

- If the controller remains in the Boot mode, the controller then enters one of the states listed in Controller in Boot mode table and joins the FTE network on which it resides. See Display indications when controller is in boot mode table for a description of the faceplate indications when the controller is operating in the boot mode.
- If the controller transitions to the Application mode, the controller then joins the FTE network and enters one of the operating states described in C300 Controller in Application mode table.

Table 8.2 Controller in Boot mode

Controller State	Description
ALIVE	The controller determined that no application image exists or an invalid application image is loaded. A Upgrading C300 Controller firmware can be performed from this state if desired.
READY	The controller received a command to remain in the boot mode to

Controller State	Description
	allow a Upgrading C300 Controller firmware.
FAIL	The controller detected a failure during startup. Use the CTool utility to retrieve problem report logs from the controller for failure diagnosis.

8.1.2 C300 Controller states in application mode

The following table describes the controller states of the C300 Controller after it transitions to the application mode. See Table 8.4 for a description of the faceplate indications when the controller is operating in the application mode.

Table 8.3 C300 Controller in Application mode

Controller State	Description
NODB	The C300 Controller is configured as redundant or non-redundant and has **not** retained its database from operation prior to startup. The C300 Controller/CEE moves to the **NOTLOADED** state.
IDLE	The C300 Controller is configured as non-redundant, or as redundant and has assumed the primary redundancy role. And... Has retained a valid database from operations prior to startup, And... The controller is configured to do a 'Cold Start' (RRRCEESTATE parameter). The C300 Controller/CEE moves to the **CEEIDLE** state.
OK	The C300 Controller is configured as non-redundant, or as redundant and has assumed the primary redundancy role, And... Has retained a valid database from previous operations prior to startup And... The controller is configured to do a 'Warm Start' (RRRCEESTATE parameter). The C300 Controller/CEE moves to the **CEERUN** state.
BKUP	The C300 Controller is configured as redundant and has assumed the secondary redundancy role. The C300 Controller/CEE moves to the **BACKUP** state.

See Communications and system time faults during startup for details on abnormal startup conditions in the controller due to communication and system time faults. Corrective actions are provided to clear these conditions.

8.2 C300 faceplate indicators/displays

The faceplate of the C300 Controller contains four LEDs and a four-character alphanumeric display as shown in Figure 7. The labels on the LEDs are: Power, Status, FTE A and B.

The Status LED uses a 3-color scheme of red, green and orange. Generally, green indicates OK, red indicates power up tests, a fault or failure, and orange indicates backup mode. Blinking LEDs indicate a soft or hard failure and help to point to a problem. Soft failures also are indicated in other displays throughout the system. The four-character display provides additional controller status information, see Faceplate display information. Directly below the display are two LEDs that indicate FTE activity.

Figure 8.2 C300 Controller faceplate features



- Power and Status LEDs
- Faceplate display information

- FTE activity LEDs

8.2.1 Power and Status LEDs

Table 2 C300 Controller LED indications

LED Indication	Status/Description
Power LED	
GREEN Steady	Indicates the presence of 24Vdc to the controller module.
Status LED	
GREEN Steady	Non-redundant controller OK Primary controller OK (primary and backup controllers may or may not be synchronized)
GREEN Blink off once per second (i.e. 1 sec. ON, 1 sec. OFF)	Primary OK with Soft Failure No database loaded (NODB)
ORANGE Steady	Backup OK (controllers synchronized)
ORANGE Blink off once per second	Backup OK with Soft Failure (or controllers are not synchronized)
RED steady	Selftest (POST) in progress, or Selftest has failed, Fault (hardware or software diagnostic failed), or Hardware Watchdog Timer expired
RED Blink off once per second	Operating in BOOT mode: Alive state - (ALIV on faceplate display) Operating in Boot firmware, IP address assigned, primary address in use. No application image loaded, or manually put in Alive state for loading. Ready state - (RDY on faceplate display)

LED Indication	Status/Description	
	Operating in Boot firmware, IP address assigned, primary address in use. Valid application image loaded.	
AND faceplate display is blank.	Hardware Watchdog Timer expired.	
AND faceplate display is frozen.	Indicates unrecoverable fault.	
AND display is - frozen or blank	Unknown fault.	
RED Blink off once per 1/4 second (i.e. 1/4 sec ON, 1/4 sec. OFF)	AND faceplate display shows: LOAD or PROG	Indicates: Firmware download in progress.
AND faceplate display is blank.	Indicates: Hardware Watchdog Timer expired or other major fault.	
OFF (a blank or frozen display)	AND faceplate display is frozen or blank.	Indicates: Fault (Hardware watchdog timeout or hardware failure)

8.2.2 Faceplate display information

The four-character display on the C300 faceplate shows a variety of information depending upon the controller state and status:

- During controller power-up, the display indicates the controller's Power-On Self Test execution and software version.
- The controller's operating state the display shows in a rotating display the FTE Device Index, CEE state, and soft failures (such as redundancy, communications, or diagnostic faults).
- The controller's redundancy role and synchronization status.
- Fault codes when the controller ceases normal operation due to a major fault.

The following table includes a listing and descriptions of the various indications of the C300 Controller display.

Table 8.4 C300 Controller faceplate display indications

C300 Faceplate Display	Indicates...	C300 State (PCMSTATE) shown on Station and Control Builder displays
(####) See Note 1	Communication Failure - No effect on controller state, shown on Control Builder forms and Station displays	OFFNET
Tnnn	POST test number - Transient state, No CDA.	N/A
-BP-	Controller in BOOTP mode waiting for IP address from BOOTP server - Transient state, No CDA.	BOOTING
-TS-	Controller is attempting connection to configured time source, or time server is not available - Transient state, No CDA.	BOOTING

C300 Faceplate Display	Indicates...	C300 State (PCMSTATE) shown on Station and Control Builder displays
COMM See Note 2	Controller not able to communicate with other nodes.	OFFNET
TEST	Factory Test mode - Non product state, No CDA.	TESTING
FAIL See Note 3	Failure in Module - No CDA	FAILED
ALIV	Boot mode with no valid application image - No CDA	ALIVE
RDY	Boot mode with application image - No CDA	PIREADY
LOAD	Firmware load in progress - No CDA	LOADING
PROG	Firmware flash in progress - No CDA	LOADING
NODB	Application mode with no database - CDA present	NOTLOADED
NOEE	Application node with no CEE, but C300 FB present with CDA. This is a	NOEE

C300 Faceplate Display	Indicates...	C300 State (PCMSTATE) shown on Station and Control Builder displays
	transient state during loading C300 FB or when deleting CEE FB/C300 FB	
IDLE	Application mode with database loaded, all EEs good with controller in IDLE - CDA present	CEEIDLE
OK	Application mode with database loaded, all EEs good with controller in RUN - CDA present	CEERUN
BKUP	Application mode with database loaded, all EEs good, module is secondary - CDA present	BACKUP
SF See Note 4	One or more soft fail conditions are present in the C300 Controller. This state is independent of	SOFTFAIL

C300 Faceplate Display	Indicates...	C300 State (PCMSTATE) shown on Station and Control Builder displays
	either CEE state or Redundancy role.	
Note 1: (####) - This symbol does *not* appear on the C300 Controller faceplate display. It appears on Control Builder and operator (Station) displays representing the C300 Controller to indicate that the C300 Controller is OFFNET and this data is not available at this time. Controller will continue to display the existing or changing faceplate display indication per the current controller state. As a result of communication failure, CDA will return OFFNET as C300 Module State. Note 2: The controller is 'lonely' (cables disconnected or network related problem). Startup halts until controller can obtain an IP address or validate an internally retained IP address. Note 3: When a non-redundant controller reboots into the FAIL state, it assumes the backup IP Address. Note 4: SF indicates an on-line diagnostic soft failure, such as Battery status, Hardware Watchdog timer timeout, IOLINK failure, etc.		

8.2.3 FTE activity LEDs

Each FTE port on the C300, Series 8 FIM and Ethernet Switch have one status LED. The bi-color FTE A and B LEDs indicate connectivity (link present) and communication activity (transmit and/or receive). Table 4 describes the indications of the FTE Status LEDs.

Table 8.5 FTE Activity LED Indications

FTE A and B LEDs	Indicates...
RED	Link integrity check failed - No Ethernet signal detected, or cable is not connected.

FTE A and B LEDs	Indicates...
OFF	Link integrity is OK - Ethernet signal is present, but no activity on link. Typically, every FTE node should show some activity. If the LED is observed for several seconds, some activity should be seen.
Blinking GREEN	Link integrity signal is present, with activity on link. During normal operation the FTE A and B LEDs should be blinking at a variable rate indicating normal network activity. Moderate to high network traffic conditions may cause the LEDs to appear as steady green.

8.3 C300 faceplate display indications

- Controller display during normal operation
- Controller display in BOOT mode

8.3.1 Controller display during normal operation

The C300 Controller faceplate display rotates through the following fields during normal operation, executing the loaded Application firmware:

<Device Index> -> <Controller (CEE) State>-><Redundancy Status>

For example, the display for a non-redundant or primary redundant controller shows:

#003 -> RUN -> sync

The following lists the possible display indications for controllers operating normally in application mode.

Table 8.6 Display indications when controller is in application mode

Display Indications for...	Primary Controller	Secondary Controller	Description
Device Index	#nnn	#nnn	FTE Device Index, where nnn can be 001 to 255. Does not change with redundancy role.
Controller State	NOEE / NODB / IDLE / RUN / OK	BKUP	Implies redundancy role. See Table 3.1 and Table 4.4 for a description of each controller state indication.

Display Indications for...	Primary Controller	Secondary Controller	Description
Redundancy Status	-np-	-np-	No secondary/primary partner.
!cpt	!cpt	Non-compatible partner visible	
!syn	!syn	Partner controller visible, but not synchronized and initial sync not in progress.	
xxx	xxx	Initial sync is in progress, where xxx can be 000 to 100 to indicate percentage complete.	
sync	sync	Redundant controller pair is synchronized.	
stby	stby	Backup controller in Standby Secondary state (with retained database but normal synchronization disabled).	
nrdn	(n/a)	Indication that primary controller is configured as non-redundant.	
Soft Fail State See Note 1	SF	SF	Indicates a soft failure condition.

Note 1: If a soft failure is detected, the soft failure indication alternates with the redundancy status indication.

8.3.2 Controller display in BOOT mode

The C300 Controller faceplate display rotates through the following fields when controller is executing boot firmware:

<Device Index> -> <Controller State>-><Redundancy Role>

For example: **#003 -> ALIV -> PRI**

Table 8.7 Display indications when controller is in boot mode

Display Indications for...	Primary Controller	Secondary Controller	Description
Device	#nnn	#nnn	FTE Device Index,

Display Indications for...	Primary Controller	Secondary Controller	Description
Index			where nnn can be 001 to 255. Does not change with redundancy role.
Controller State	ALIV/LOAD/RDY/FAIL	ALIV/LOAD/RDY/FAIL	Does not imply redundancy role. See Table 6.1 and Table 8.1 for a description of each controller state indication.
Fail Code	nnnn	nnnn	Indicated only when in FAIL, where nnnn = four digit failure code. Otherwise Controller State is displayed.
Redundancy Role	PRI or nrdn	SEC	Indicates redundancy role. See note.

Note: When the secondary controller is in Boot mode, the controller does not display BKUP because the controller does not support redundancy in that Controller State. Similarly, when the secondary controller is in Application mode, the controller does not display SEC because the BKUP Controller State implies a redundant secondary.

8.4 Control Builder block icon descriptions

Adding a C300 Controller block (non-redundant or redundant) to the Control Builder Project tab, results in the appearance of an icon that represents a single C300 Controller or redundant controller pair. Once the C300 Controller block has been loaded, the C300 Controller icon appears in the Monitoring tab. The appearance of the icon in the Monitoring tab is determined by the C300 ICONSTATE parameter which is derived from these C300 Controller parameters:

- Execution State parameter (C300STATE)
- Redundancy Role parameter (RDNROLESTATE)
- Redundancy Synchronization State parameter (RDNSYNCSTATE)
- Soft Failure parameter (SOFTFAIL)

When a single C300 Controller is defined, the icon appears as a single controller icon. When a redundant C300 Controller is defined, two icons appear, one representing the primary controller on the left and the icon representing the secondary controller on the right. The appearance of either icon on top in a redundant controller pair indicates the active controller.

The following table shows the various appearances that the C300 Controller block icon assumes based on the current C300 state and status.

Table 8.8 C300 Controller icon indications in Control Builder

Icon	Represents . . .	C300 Controller (C300STATE)
Project Tab		
 (gray)	C300 Controller configured for non-redundant operation.	N/A
 (gray, simulation)	C300 Controller configured for non-redundant operation. Simulation mode enabled.	N/A
 (gray & white)	C300 Primary configured for redundant operation.	N/A
 (white & gray)	C300 Secondary configured for redundant operation.	N/A
Monitor Tab		
 (red)	C300 is non-redundant and not communicating	No Communication (Offnet)
 (red, simulation)	C300 is non-redundant. Simulation mode enabled.	No Communication (Offnet)
 (red & white)	Primary C300 is not communicating.	No Communication (Offnet)
 (white & red)	Secondary C300 is not communicating.	No Communication (Offnet)
	C300 is non-redundant	No Database

Icon	Represents . . .	C300 Controller (C300STATE)
(yellow)		
 (yellow, simulation)	C300 is non-redundant. Simulation mode enabled.	No Database
 (yellow & yellow)	Primary C300 is not synchronized and partner C300 is visible	No Database
 (yellow & shadow)	Primary C300 is not synchronized and partner C300 is absent or incompatible	No Database
 (blue)	C300 is non-redundant.	Idle
 (blue, simulation)	C300 is non-redundant. Simulation mode enabled.	Idle
 (blue & white)	Primary C300 is synchronized	Idle
 (blue & white, pause)	Primary C300, standby synchronization	Idle
 (blue & yellow)	Primary C300 is not synchronized and partner C300 is visible.	Idle
 (blue & shadow)	Primary C300 is not synchronized and partner C300 is absent or incompatible.	Idle
	C300 is non-redundant	Run or OK

Icon	Represents . . .	C300 Controller (C300STATE)
(green)		
 (green, simulation)	C300 is non-redundant. Simulation mode enabled.	Run or OK
 (green & white)	Primary C300 is synchronized	Run or OK
 (green & white, pause)	Primary C300, standby synchronization	Run or OK
 (green & yellow)	Primary C300 is not synchronized and partner C300 is visible	Run or OK
 (green & shadow)	Primary C300 is not synchronized and partner C300 is absent or incompatible	Run or OK
 (white & green)	Secondary C300 is synchronized	Backup
 (white & green, pause)	Secondary C300, standby synchronization	Backup
 (yellow & yellow)	Secondary C300 is not synchronized and partner C300 is visible	Backup
 (shadow & yellow)	Secondary C300 is not synchronized and partner C300 is absent or incompatible.	Backup
	C300 is non-redundant	Idle Soft Fail

Icon	Represents . . .	C300 Controller (C300STATE)
(blue)		
 (blue, simulation)	C300 is non-redundant. Simulation mode enabled.	Idle Soft Fail
 (blue & white)	Primary C300 is synchronized	Idle Soft Fail
 (blue & white, pause)	Primary C300, standby synchronization	Idle Soft Fail
 (blue & yellow)	Primary C300 is not synchronized and partner C300 is visible	Idle Soft Fail
 (blue & shadow)	Primary C300 is not synchronized and partner C300 is absent or incompatible	Idle Soft Fail
 (green)	C300 is non-redundant	Run Soft Fail or OK Soft Fail
 (green, simulation)	C300 is non-redundant. Simulation mode enabled.	Run Soft Fail or OK Soft Fail
 (green & white)	Primary C300 is synchronized	Run Soft Fail or OK Soft Fail
 (green & white, pause)	Primary C300, standby synchronization	Run Soft Fail or OK Soft Fail
	Primary C300 is not synchronized and partner C300 is visible	Run Soft Fail or OK Soft Fail

Icon	Represents . . .	C300 Controller (C300STATE)
(green & yellow)		
 (green & shadow)	Primary C300 is not synchronized and partner C300 is absent or incompatible	Run Soft Fail or OK Soft Fail
 (white & green)	Secondary C300 is synchronized	Backup Soft Fail
 (white & green, pause)	Secondary C300, standby synchronization	Backup Soft Fail
 (yellow & yellow)	Secondary C300 is not synchronized and partner C300 is visible partner present.	Backup Soft Fail
 (shadow & yellow)	Secondary C300 is not synchronized and partner C300 is absent or incompatible	Backup Soft Fail

8.5 Activate C300 Controller's CEE

For the controller to begin executing its control strategy, you must activate the CEEC300 block.

- Initial activation order guidelines
- Activating the CEE
- Setting the CEE inactive
- CEE Icon states in the Monitoring tab

8.5.1 Initial activation order guidelines

Make the initial activation of control strategy components in Control Builder from the Monitoring tab in the following suggested order to minimize possible bad data generated alarms.

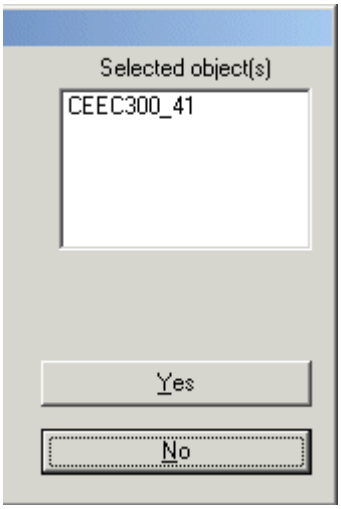
Order	Component
1	Control environment components such as: CEEC300 CEE

Order	Component
2	Process Manager IOMs
3	PMIO I/O Channels
4	Fieldbus contained function blocks
5	Fieldbus device resident blocks
6	Input/Output Modules (IOMs)
7	Control Modules (CMs) and/or Sequential Control Modules (SCMs)

8.5.2 Activating the CEE

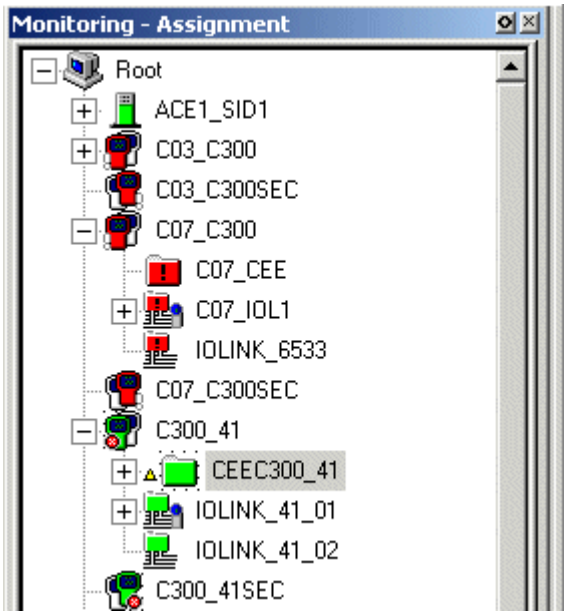
Follow the steps in the table below to activate the CEEC300 block.

1. From the Monitoring Tree, right-click the CEE.
2. Click Change State... and then the following dialog appears.
3. Click YES from the pop-up window to set the selected item active.



The CEE turns green on the Monitoring Tree.

- Remember that the CEE must be active for anything assigned to the CEE to work. Even if a CM is active, it won't do anything unless the CEE is also active.



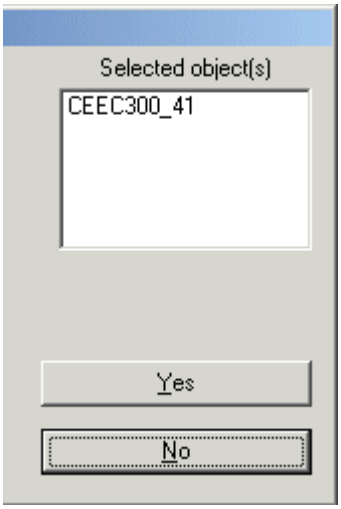
Alternate methods:

- Click the Toggle State toolbar button  to set the selected item active.
  Select Operate -> Change State...

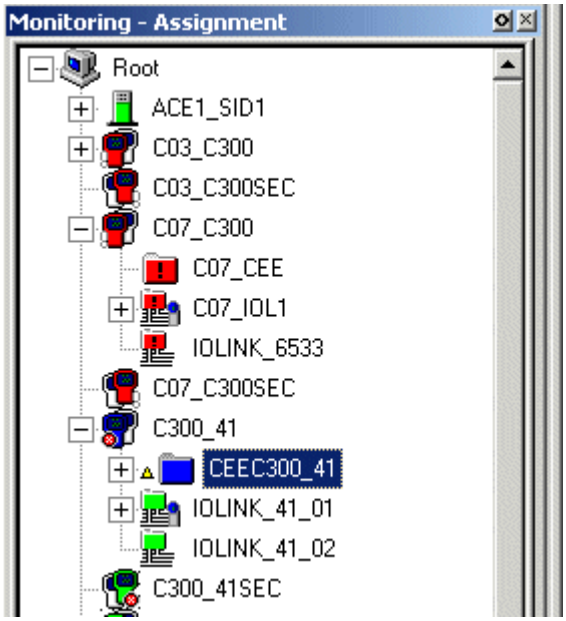
8.5.3 Setting the CEE inactive

Follow the steps in the table below to set the CEE inactive.

1. From the Monitoring Tree, right-click the CEE.
2. Click Change State... and the following dialog appears.
3. Click YES from the pop-up window to set the selected item inactive.



4. The CEE turns from green to blue on the Monitoring Tree.



Alternate methods:

Click the Toggle State

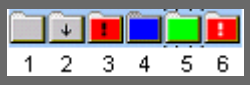


- toolbar button to set the selected item inactive.

Select Operate -> Change State

8.5.4 CEE Icon states in the Monitoring tab

The CEE status in the monitoring tab is indicated by the following versions of the CEE icon.

CEE Icon States 	Icon Color	Corresponding CEESTATE Values
1. Project Tree	Gray	N/A
2. Loaded, not monitoring	Gray	N/A
3. Communication Failure	Red	N/A
4. InActive	Blue	CEESTATE = IDLE
5. Active	Green	CEESTATE = RUN
6. Configuration Error	Red	CEESTATE = FAIL, NOT_LOADED

8.6 Initiating C300 Controller shutdown

Use the following procedure to initiate a shutdown command to the C300 Controller, which results in the C300 Controller rebooting to its RDY state or boot firmware.

> **ATTENTION**
>
> Shutting down the C300 Controller interrupts the transfer of data to the Experion system. Be sure your system can tolerate the loss of live data, while the C300 Controller is in its RDY state.

1. Using Control Builder, select the **Monitoring** tab -
   Double-click the C300 Controller icon to open the **C300 Block** configuration form.
2. On the **Main** tab, click **Controller Command** box and select **Shutdown** from the list.
3. Click the **Yes** button to confirm the action.
4. Wait for the C300 Controller to reboot to its RDY state.

8.7 Initiating Synchronization command

Use the following procedure to initiate a synchronization command manually to a redundant C300 Controller pair.

8.7.1 Prerequisites

You can view active redundant C300 Controller pair on the **Monitoring** tab in Control Builder.

8.7.2 To command synchronization

1. In the **Monitoring** tab, double-click the primary **C300** icon to call up its **Parameters** configuration form.
2. Click the **Redundancy** tab to display it.
3. Click the **Enable Synchronization** button.
4. Click the **Yes** button to confirm the action and issue the synchronize command.
5. Confirm that the **Auto Synchronization State** is, or becomes **ENABLED** and confirm that **sync** cycles in the primary C300 Controller's 4-character display.
6. Click the **OK** button to close the **Parameters** form.
7. This completes the procedure.

8.8 Disable Synchronization command

You can use the following procedure to disable synchronization manually to a redundant C300 Controller pair.

8.8.1 Prerequisites

- You can view active redundant C300 Controller pair on the **Monitoring** tab in Control Builder.
- The primary and secondary C300 Controllers are synchronizing, synchronized or in standby state.

8.8.2 To disable synchronization

1. In the **Monitoring** tab, double-click the primary **C300** icon to call up its **Parameters** configuration form.
2. Click the **Redundancy** tab to display it.
3. Click the **Disable Synchronization** button.
4. Click the **Yes** button to confirm the action and issue the Disable Synchronization command.
5. Confirm that the **Auto Synchronization State** becomes **DISABLED**.
6. Click the **OK** button to close the **Parameters** form.
7. This completes the procedure.

8.9 Initiating Become Primary command

You can use the following procedure to manually cause an unsynchronized secondary controller to transition into a primary role in the absence of a partner controller.

8.9.1 Prerequisites

- You can view active redundant C300 Controller pair on the **Monitoring** tab in Control Builder.
- The unsynchronized secondary controller has no view to a partner controller across the redundancy cable and the primary IP address is currently not occupied.

8.9.2 To command become primary

1. In the **Monitoring** tab, double-click the secondary **C300** icon to call up its **Parameters** configuration form.
2. Click the **Redundancy** tab to display it.
3. Click the **Become Primary** button.
4. Click the **Yes** button to confirm the action and issue the Become Primary command.
5. Confirm that the Secondary C300 Controller assumes the Primary role
6. Click the **OK** button to close the **Parameters** form.
7. This completes the procedure.

8.10 Initiating Switchover command

You can use the following procedure to initiate a switchover command manually to a redundant C300 Controller pair.

8.10.1 Prerequisites

- You can view active redundant C300 Controller pair on the **Monitoring** tab in Control Builder.
- The primary and secondary C300 Controllers are synchronized.

8.10.2 To command a switchover

1. In the **Monitoring** tab, double-click the primary **C300** icon to call up its **Parameters** configuration form.
2. Click the **Redundancy** tab to display it.
3. Click the **Initiate Switchover** button.
4. Click the **Yes** button to confirm the action and issue the switchover command.
5. Confirm that the Secondary C300 Controller assumes the Primary role. The old primary controller should boot up in the backup role.
6. Click the **OK** button to close the **Parameters** form.
7. This completes the procedure.

8.11 Rebooting the C300 controller

When you shut down the C300 controller as described in Initiating C300 Controller Shutdown, the C300 controller reboots to the RDY state.

The following are displayed on the Controller's LED panel

- RDY state
- A steady Green Power LED indication
- A blinking Red Status LED indication

The following procedure describes how to reboot the C300 controller from the RDY state.

8.11.1 To reboot the C300 controller

1. Power cycle the C300 controller from the fuse provided in the IOTA.

   The C300 boots to the NODB state.

   > **ATTENTION**
   > Irrespective of whether the battery is connected to the C300 controller or not, C300 boots to the NODB state.

2. Perform a checkpoint restore appropriately.

8.12 Using Station displays

Operation and status information as well as statistics for C300 Controllers can be monitored through various displays located on Engineering Station Some of these displays are briefly described below. See the *Operator's Guide.* for more information about system and detail displays in Station.

- C300 Controller Point Detail displays
- System Status Display
- Event and Alarm summary displays
- Controller Detail displays
- FTE Status display

8.12.1 C300 Controller Point Detail displays

The Engineering Station application includes pre-configured Detail displays for the C300 Controller and function blocks. These displays are the default entries for the Point Detail Display parameter on the Server Displays tab of the configuration form.

Once you establish communications with a C300 Controller you can begin monitoring the status of any component that has been loaded as part of a control strategy to a C300 Controller with points registered in the Engineering Station. The Detail displays let you quickly view the component's current state, fault status and pertinent configuration data.

8.12.2 System Status Display

The System Status Display is part of the Alarm Management Displays in Station.

The C300 Controller is represented in the System Status Display using the same icon set as is used in the Control Builder block icon descriptions.

8.12.3 Event and Alarm summary displays

Experion Station also provides Event and Alarm Summary displays that support C300 Controller notifications and events. These displays are integrated with Experion component data. Use the Event Summary to get a quick view of recent actions that have taken place within the system.

8.12.4 Controller Detail displays

The SCADA Controller display provides a status of each controller and its type. Click on the Controller name to call up the Controller's Detail display. This display shows operating values and error statistics that indicate the ‘health’ of the controller.

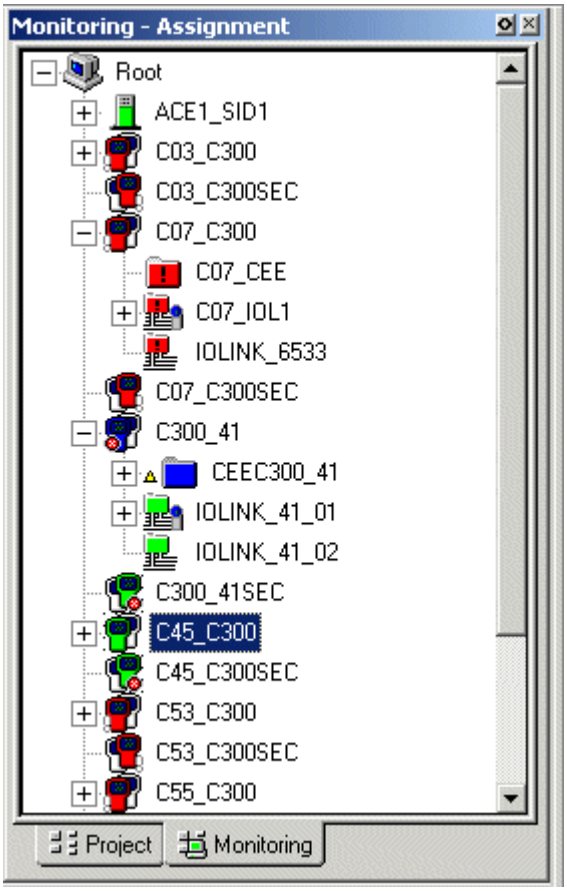
8.12.5 FTE Status display

The C300 Controller is a single node on the FTE network. As one of the System Status displays in Station, the FTE Status display provides status information for each node on the associated network.

8.13 Viewing controller operation and status in Control Builder

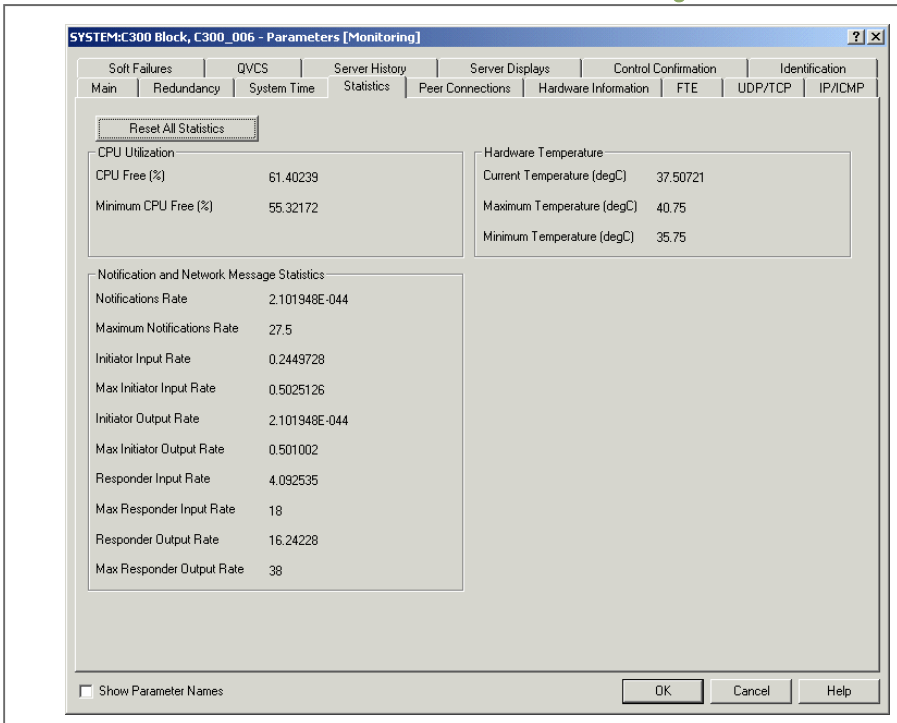
The Monitoring tab in Control Builder can be used to view the operation and status of any of the various control components represented as icons in the monitoring tree. The hierarchical tree in Figure 1 shows a number of C300 Redundant Controller Pairs and their associated CEE and IOLINK blocks. Right clicking on any of the icons and selecting Module Properties... opens the configuration form for that object.

Table 8.9 Control Builder Monitoring tab



A number of tabs on the configuration forms include parameters to indicate status and numerous operating statistics. For example, Figure shows the Statistics tab for a C300 Controller which includes CPU utilization and network messaging. Other tabs include statistics on FTE communications and Peer connections. See C300 configuration form reference for more details on the parameters available on the configuration form tabs.

Table 8.10 C300 Controller configuration form



8.14 C300 operating behaviors

This section describes some of the C300 Controller's features and operating behaviors related to event and alarm reporting.

- Time management in the C300 Controller
- Maintaining time synchronization
- Hardware Watchdog Timer
- Critical Task Monitor

8.14.1 Time management in the C300 Controller

Simple Network Time Protocol (SNTP) from a dedicated Network Time Protocol (NTP) server was the preferred time source for the controller, although the controller could operate using other time sources, such as SNTP or CDA from Engineering Station.

The C300 synchronized its local clock through NTP at startup and every minute. In the absence of SNTP, the local clock synchronized with CDA on first connection and every minute.

C300 Controller, PGM, FIM4, modules support clock synchronization using version 2 of the Precision Time Protocol (IEEE Std 1588-2008). A dedicated Precision Time Protocol (PTP) time source is the preferred time source if the module is configured to use PTP. However, if the module is not configured to use PTP, SNTP time source is preferred.

When PTP is enabled, the module listens for PTP Master Clocks on the FTE network and synchronizes to the PTP Master Clock selected using the Best Master Clock algorithm as defined by the IEEE specification.

To support clock synchronization using version 2 of the Precision Time Protocol, a new parameter **Enable Precision Time Protocol** is introduced in the **System Time** tab of the C300 Controller module properties.

Effects of enabling the Enable Precision Time Protocol option

The following list illustrates the effects of enabling the **Enable Precision Time Protocol** option.

- PTP is enabled after the module is loaded.
- The PTP Status is set to “Listening” and the PTP client listens for PTP Master Clocks on the network. The PTP Status remains in the “Listening” state for a minimum of 10 seconds after enabling PTP. After 10 seconds, if the PTP client identifies a PTP Master Clock, the PTP client synchronizes the local clock with the PTP Master Clock.
- If the PTP client does not identify a PTP Master Clock, the status remains in the “Listening” state until one of the following occurs.
    - The PTP client identifies a PTP Master Clock.
    - The PTP client determines that the PTP time source has failed (PTP Status changes to “Failed”).
- If more than one PTP Master Clock exists on the network, the PTP client uses the Best Master Clock algorithm to determine with which clock to synchronize.

For more information about Best Master Clock algorithm, refer to the IEEE Std 1588-2008 standard.

Effects of disabling the Enable Precision Time Protocol option

The following list illustrates the effects of disabling the Enable Precision Time Protocol option.

- PTP is disabled on the module when the module is loaded.
- The PTP Status is set to “NotActive,” and the PTP Master IP Address returns to the default value “0.0.0.0.”
- If a “PTP Time Source Failed” alarm condition existed when the **Enable Precision Time Protocol** option was enabled, this alarm returns to normal.
- After PTP is disabled, the Current Time Source is set to SNTP and the module attempts to synchronize to the SNTP time source.

Effects of PTP time source failure while the C300 Controller is running

The following list illustrates the effects of PTP time source failure while the C300 Controller is running.

- If the connection to the configured time source is broken during normal startup operation, the C300 Controller will continue to run. However, the loss of connection is detected when no messages from the configured system time source are received over a 60-second interval. When this happens, the PTP client declares that the PTP time source has failed. In addition, the PTP Status is set to “Failed” and a “PTP Time Source Failed” alarm is generated.

  If the C300 Controller remains connected to the FTE network beyond 90 seconds and if the SNTP is available and functioning, the C300 Controller will use the SNTP Time. In addition, the following alarms are generated.
    - Time Source Changed
    - Not Using Configured Time Source
- After the PTP Status is set to “Failed,” if more than one PTP time source is present on the network, the module synchronizes to the best available PTP time source as determined by the Best Master Clock algorithm.

See Setting up time synchronization in the *Supplementary Installation Tasks Guide* for information on setting up a system time server.

Effects of SNTP server failure on C300 Controller time source behavior

When the Windows Server cannot get the NTP time from the NTP server (for example, Domain Controller), it changes its NTP status to "Time Source Unknown." The C300 family does not accept this status as a valid time, so it switches to the CDA time.

8.14.2 Maintaining time synchronization

Adjustments to time occur in the controller to maintain synchronization with the time source. If the difference between the system time source and the controller's local clock time is less than 250 milliseconds, then time is adjusted in increments. The controller's local clock time is adjusted at a rate of change no greater than 1.0 percentage. That is, the maximum adjustment of the local clock time will be no greater than 600 milliseconds per minute of elapsed time. If the controller's local clock time differs by more than 250 milliseconds with the time source, controller time is set to match the time source with an immediate correction. In addition, an alarm “Time Jump in SOE Time Base” of priority “Journal” is generated.

Similarly, when the difference in time between the system time source and the C300 Controller local clock time is equal to or greater than 5 minutes, an alarm “Time Jump Greater Than 5 Minutes” of priority “Journal” is generated.

Note that the controller's local clock time is lost during power failure. Therefore, the local clock time in the controller cannot be used reliably for control applications until it is again synchronized.

When PTP is the current system time source, the secondary C300 Controller obtains time from the PTP Time Source directly as the primary C300 Controller. For all other time sources, time synchronization between a primary and secondary C300 Controller is maintained by the redundancy sub-system. The primary controller passes its local clock time to the secondary controller. Time adjustments are made to achieve time synchronization between the redundant controller pair.

Note that in the absence of an NTP or a PTP time source, SOE event correlation is degraded across a controller switchover. Events occurring before switchover are consistent, and events occurring after switchover are consistent, but the timestamps of the two groups of timestamps (before and after switchover) are degraded with respect to each other.

During normal operation the C300 Controller maintains a timeout on the current system time source so that the controller can detect an interruption and switch to an alternative time source. The controller will attempt periodically to re-establish a connection to a better time source when it is not currently connected to its configured time source. If the connection with the configured time source is lost, the controller will timeout after 90 seconds and will transition to use CDA - provided the controller remains connected to the FTE network. The controller generates diagnostic and state notifications announcing the change of the time source.

If the CDA time source becomes unavailable, the controller will continue to run and execute control. The controller will use its internal Wall Clock Time as it time source and will continue attempts to reconnect with its configured time source. The controller generates diagnostic and state notifications announcing the change of the time source.

8.14.3 Hardware Watchdog Timer

A Hardware Watchdog Timer is employed in conjunction with the Health Monitor and the internal Memory Management Unit to ensure that a catastrophic failure which disrupts the controller's internal instruction execution or timing results in the controller achieving a fail-safe state. The timer is refreshed periodically during normal controller operation. If a refresh does not occur within the required time interval, the controller suspends control execution and is placed into a safe state. A hardware watchdog timeout may cause the controller faceplate display to become blank and the Status LED will blink red in 1/4 second intervals. The controller will attempt to re-boot into the FAIL state.

A refresh of the watchdog timer later than expected in normal operation, but not late enough to cause a timeout produces the soft failure condition: **WDT Software Warning**.

8.14.4 Critical Task Monitor

The Critical Task Monitor detects conditions for tasks executing within the controller which are critical to proper control and view. Alarms and soft failures are generated when any of these tasks execute less frequently than expected.

Tasks critical to control

When a timeout occurs in the Critical Task Monitor for a task critical to performing control, the controller asserts a hard failure, suspends normal operation and re-boots into the **FAIL** state. If the controller is redundant and synchronized with the secondary controller prior to the failure on the primary, a switchover occurs to allow the secondary to assume control. If the controller is non-redundant or the controller is redundant but was not synchronized with its secondary, the failed controller is placed into a fail safe state. If capable, the controller will re-boot into the **FAIL** state. When a timeout of a control-critical task occurs, the controller generates the appropriate alarms (Diagnostic Alarm - Critical Task Watchdog Warning), but no other action is taken by the controller.

There is an exception to this behavior where a timeout occurs when the controller CPU is heavily loaded and the CPUFREE parameter indicates less than 5 percentage. The controller does not take any action and does not re-boot into a FAIL state.

Tasks critical to view

Tasks executing in the controller, which are critical to view, such as communication with I/O, display or peer devices, may not execute as required due to excessive loading of the CPU. The CPU overloading due to tasks other than executing control and result in a sustained level of CPU Free at 0 percentage (CPU usage is 100 percentage) may cause a loss of view of the controller.

When a timeout of a view-critical task occurs, the controller generates the appropriate alarms (Diagnostic Alarm - Critical Task Watchdog Warning), but no other action is taken by the controller.

8.15 C300 Controller processing overload behavior

The C300 Controller is able to handle controller processing overload conditions when the controller is required to perform more work than it has time for. The execution of control strategies or **control processing** usually demands the most resources in terms of processor time and is the most likely cause of an overload condition in a controller, (although other **non-control processing** causes can produce controller overloads). When the C300 controller detects an overload, it will 'borrow' time from control execution by suspending control processing in a defined and predictable manner. This allows the controller to continue operation to provide control and maintain view and communication under these conditions.

Controller operation is structured in terms of a 'base cycle'in which key processing tasks are executed. An overload condition may occur when the controller is scheduled to perform more tasks than can be completed within a base cycle. For example, a controller is scheduled to execute more control processing tasks than is recommended, which may include control, I/O and communications processing tasks. If the scheduled tasks cannot be completed by the controller within the base cycle, a control overrun occurs.

Control overruns are reported as a diagnostic event in the C300CEE block as 'cycle overruns', (CRCYCLEOVRN and LSCYCLEOVRN parameters). The controller manages cycle overruns when the scheduled processing for a cycle does not finish by 85 percentage of the 'base cycle' time in the following ways depending on the range of scheduled processing time.

- If the scheduled processing for a cycle is completed in more than 85 percentage and less than 100 percentage of the base cycle time, then cycle overrun will be logged and next cycle will be skipped.
- If the scheduled processing for a cycle is completed in more than 100 percentage and less than 150 percentage of the base cycle time, then unbudgeted tasks will be executed during the remaining 50+ percentage time. Next cycle will continue scheduled processing.
- If the scheduled processing for a cycle is completed in more than 150 percentage of base cycle time next cycle will be skipped.

Cycle overruns in the controller result in that control degrades gracefully, in terms that the latency in control loops increases. Also, a significant amount of processing time is made available to the controller so that it can handle the backlog of tasks that result from an overload.

Alarms and events are generated to alert operators to the cause of a controller overload so that appropriate actions can be taken to remedy it.

- Causes of controller overloading
- How to avoid controller overloading
- Recovery from an overload

8.15.1 Causes of controller overloading

Additional processing loads can be caused in many ways including, but not limited to:

- Activation of additional CMs/SCMs/IOMs in the controller.
- Load and activation of additional CMs/SCMs/IOMs to other controller.
- Load and activation of additional CMs/SCMs to other controllers that impose added peer-peer communication load on the controller of interest.
- Call up of displays that collect data from the controller.

8.15.2 How to avoid controller overloading

Planning your control strategies will help to avoid overloading a C300 Controller. Develop a performance model to determine whether or not a C300 Controller has the resources to execute the planned strategy. Test the strategy **before** loading it to the controller.

During operation acknowledge warning alarms associated with low values of‘CPU Free’ and overloads when control strategies are loaded incrementally to the controller. Take appropriate steps to reduce CPU usage. Overloads also may occur when a large control strategy is loaded at once, (such as a Checkpoint restore or a bulk load), rather than incrementally.

The C300 block supports the following diagnostic alarms related to CPU Free:

- CPU Free Low
    - Threshold defaults to 20 percentage and is user configurable
    - Alarm is generated when CPU Free is less than the threshold.
- CPU Free Low Low
    - Threshold is fixed at 10 percentage and is not user configurable
    - Alarm is generated when CPU Free is less than 10 percentage

Alarms and parameters that are associated with monitoring CPU use in the C300 Controller are CPUFREEAVG and CPUFREEMIN. These parameters are displayed on the C300 Detail Display in Station and on the C300 properties form, (the Statistics tab of the C300 block configuration form).

Parameters that measure the ability of the controller to execute loaded control strategies are CPUCYCLEAVG and CRCYCLEOVRN. These and other related parameters are displayed of the CPU Loading tab and the CPU Overruns tab of the CEEC300 block configuration form.

8.15.3 Recovery from an overload

Recovery from a controller overload condition depends upon whether the overload is due to a control processing (CEE Overrun - slipped cycle) or non-control processing (degraded or loss of view) overload condition.

> **ATTENTION**
>
> When attempting recovery from an overload condition, you should determine the endpoint of this recovery process. Use these following guidelines:
>
> - The controller should operate in the steady state without persistent overload alarms of any type.
> - The controller should operate in the steady state without CPULMLOLO alarms.
> - The controller should operate in the steady state with an average CPUFREEAVG of at least 20 percentage.

Control processing overloads indicated by CEE Cycle Overruns and 'control cycle slips' make enough processing time available so that adequate view of the controller is maintained. Consider the following actions to lessen control processing overloads:

- Change the execution period and/or phase of some selected Control Modules in order to more evenly distribute control processing across all control cycles in the two (2) second control macro-cycle.
- If the action above does not lessen control processing overload, then delete some of the loaded control strategy. That is, inactivate and/or delete some number of Control Modules (CMs). To perform this recovery process, first consider:
    - Which of the loaded CMs to delete from the C300 Controller in order to recover from the overloaded state.
    - Prepare for the selective loss of control that will result as individual CMs are placed in the Inactive state, and possibly deleted.

Then:

- Begin by placing the least critical CMs in the Inactive state while monitoring CPUFREE and the alarms that signaled the overload.
- When the alarms indicating overload have 'returned-to-normal'and CPUFREE has reached 5 percentage, delete the CMs selected for deletion.

If a loss of view occurs due to **non-control processing overload**, then perform the following actions:

- Close displays requesting information from lost-view controller until view is restored. If the loss of view is caused by an overload of display requests, it may be possible to recover view by reducing the display request load to the controller.
- If the C300 Controller is running as a redundant synchronized pair, Disable Synchronization by clicking the'Disable Synchronization'button on the secondary C300 block properties form (if view exists to the secondary C300), or power off the secondary controller. This will free up processor time that had been used to maintain synchronization. The additional processor time may be sufficient to support communication and view.
- Shutdown controller and incrementally reload

- Disconnect the battery from the affected C300 Controller.
- Power cycle the unit.
- Re-evaluate the size of the controller's planned configuration in light of the fact that an extreme overload previously occurred.
- Incrementally load and activate the configuration of the controller while paying attention to CPU Free data and CPU Free Low and Low Low alarms.

CHAPTER

9

C300 REDUNDANCY OPERATION

The goal of controller redundancy is to improve the availability of the controller to perform its assigned control functions. This is done by providing a pair of C300 Controllers (Primary and Backup) so a component failure in one controller switches the handling of the assigned control functions to the other controller. In this redundant arrangement, the active or primary controller is considered to have a redundant partner or backup controller which is available to take over control functions of the primary controller in the event of a switchover. This is considered a dual redundant system, which is characterized by the following two main redundancy states.

- Primary - Refers to the controller executing the assigned control functions.
- Backup or Secondary - Refers to the controller in some state of readiness to assume the responsibilities of the Primary.

- Redundancy configuration restrictions
- Partner (controller) compatibility
- Synchronization states
- Redundancy parameters
- Switchover
- Redundancy history
- C300 redundancy-related notifications
- On-process Migration of C300 Controller
- Controller redundancy specifications

9.1 Redundancy configuration restrictions

There are a number of restrictions imposed to device configuration for the purpose of providing device redundancy.

- C300 Controller Device Index
- IOLINK interface considerations
- Series 8 FIM restrictions

9.1.1 C300 Controller Device Index

The primary C300 Controller of a redundant controller pair and non-redundant C300 Controllers must be configured with an odd numbered Device Index. Control Builder will enforce this restriction. The secondary C300 Controller of a redundant controller pair is assigned an even Device Index (primary controller Device Index plus 1) upon the configuration of the primary controller.

The Device Index switches on the primary and secondary controller IOTAs must be set according to their configured Device Indexes. If the Device Index switches on a primary or non-redundant C300 IOTA are set to an even number address or do not match the configured Device Index, then an error is generated when loading the controller and the load operation is aborted.

See Create C300 Controller and CEE function blocks for details on controller configuration.

9.1.2 IOLINK interface considerations

In a C300 redundant controller pair, a C300 IOLINK function block which is configured to support a specific IO Family, (IOLTYPE parameter set to PM_IO_TYPE or SERIES_C_IO_TYPE)is verified in the secondary controller by the primary controller. After the primary controller synchronizes the configured IOTYPE, the primary uses the IOLink interface to communicate with the secondary controller to verify that the associated IOLink interface on the secondary is configured to support the same IO Family. If the IOLink cables are not connected between the primary and secondary controllers, initial-sync failures will result.

9.1.3 Series 8 FIM restrictions

The Series 8 FIM control hardware is available with a non-redundant IOTA that accepts a single Series 8 FIM module and a redundant IOTA that contains connections for accepting two Series 8 FIM modules.

Non-redundant IOTA

A non-redundant Series 8 FIM module can be configured with either an odd or even Device Index. The Device Index switches on the associated non-redundant IOTA must be set according to the module's configured Device Index. A Series 8 FIM module installed on a non-redundant IOTA cannot be configured as redundant. A status bit (RDNCAPABILITY parameter) indicates whether a Series 8 FIM module is installed in a non-redundant or redundant IOTA.

Redundant IOTA

Redundant Series 8 FIM modules are installed on a redundant Series 8 FIM IOTA. A redundant Series 8 FIM IOTA contains only one set of switches in which to set the Device Index. The Device Index switches on a redundant Series 8 FIM IOTA must be set to an odd number. This will assign the odd number Device Index to the Series 8 FIM module installed in the upper connector and an even Device Index (primary Device Index plus 1) to the secondary Series 8 FIM module. Note that Device Indexes for the Primary and secondary Series 8 FIM blocks must be configured accordingly.

A Series 8 FIM module installed in the upper connector of a redundant IOTA can be configured as non-redundant, which allows for future re-configuration to add redundancy. However, a Series 8 FIM module installed in the lower connector of a redundant IOTA cannot be configured as non-redundant.

A redundant Series 8 FIM IOTA shares a single connection to its H1 segments. It is not valid to configure two non-redundant Series 8 FIM modules on the same redundant IOTA.

See the *Series 8 Fieldbus Interface Module User's Guide* for details on Series 8 FIM configuration.

9.2 Partner (controller) compatibility

Controller redundancy is only possible when the primary controller has a compatible secondary partner. Once the redundancy private path cable is connected to a running partner, the primary controller periodically sends a partner compatibility message that contains information necessary to perform the compatibility check, and the secondary responds with its own compatibility message. Each module compares local information against the supplied remote values to determine whether the partner module is compatible or incompatible. If all of the compatibility criteria are satisfied, then the partner module is compatible. Otherwise, if any of the compatibility criteria are not met, then the partner module is incompatible and synchronization is not permitted.

The following criteria are compared:

Factory data, such as: Honeywell ID, Product Type, and Product Code must be identical to ensure same platform hardware.

Firmware Type must be identical ensure same platform firmware. Some firmware personalities that differ in functionality share a common hardware platform (for example, the 5 ms and 50 ms C200 personalities). Synchronization cannot be allowed across different personalities.

The Build ID strings are compared to detect difference in firmware versions. Some platforms that use physical memory transfer as part of their redundancy solution are sensitive to a difference in firmware versions. This includes C200, C300 and LIOM.

The partner module must have a properly configured Device Index. If this module has an odd Device Index N, the partner module has to have the even Device Index N+1. Otherwise, if this module has an even Device Index M, the partner module has to have the odd Device Index M-1.

- Redundancy compatibility parameter - RDNCMPT

9.2.1 Redundancy compatibility parameter - RDNCMPT

The RDNCMPT parameter indicates the following compatibility results.

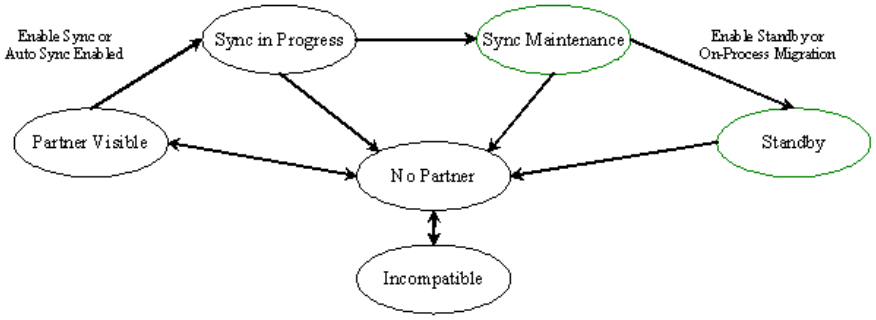
RDNCMPT Parameter	State	Description
- - -	Not Applicable	Module is configured as non-redundant.
NOPARTNER	Not Applicable	Initial/default state when no partner is responding to the partner compatibility query.
QUERYINPROG	Not Applicable	Transient state while partner compatibility check is being performed.
COMPATIBLE	Compatible	Compatible indication for those platforms not sensitive to difference in firmware versions. This includes FIM, Series 8 FIM, and IOLINK.
DIRECTCMPT	Compatible	Compatible indication for those platforms sensitive to difference in firmware versions (i.e. C300) when firmware versions are identical.
INDIRECTCMPT	Compatible	Compatible indication for those platforms sensitive to difference in firmware versions (i.e. C300) when firmware versions differ. This implies that the Controller Migration Wizard must be invoked to coordinate OPM initial synchronization and switchover to the different firmware version.
MESSAGESIZE	Incompatible	The size of the partner's compatibility message is unexpected.
VENDORID	Incompatible	The partner's Honeywell ID does not match.

RDNCMPT Parameter	State	Description
PRODUCTTYPE	Incompatible	The partner's Product Type does not match.
PRODUCTCODE	Incompatible	The partner's Product Code does not match.
MAJREVISION	Incompatible	The partner's Major revision is not supported.
MINREVISION	Incompatible	The partner's Minor revision is not supported.
PLATFORM	Incompatible	Mismatched compatibility types (i.e. different platform firmware).
OPMNOTIMPL	Incompatible	Incompatible indication for those platforms sensitive to difference in firmware versions when firmware versions differ and the platform does not support OPM (there are no known examples of this platform type).
OPMSEQUENCE	Incompatible	Attempting to migrate across more than one major release. For example, migration between R101 and R300 is not allowed.
NodeNumber	Incompatible	Device Indexes of potential redundant partner modules are not properly configured as consecutive odd/even pair.
HardwareType	Incompatible	Mismatched factory data (i.e. different platform hardware).
FirmwareType	Incompatible	Mismatched compatibility types (i.e. different platform firmware).
MessageFmt	Incompatible	The partner compatibility message format is undefined or not supported.
PartnBootFmw	Incompatible	The partner module is executing from boot firmware (e.g. partner is in the Alive, Ready, or Fail State). To be compatible, both partners must be executing from application firmware.

9.3 Synchronization states

The RDNSYNCSTATE parameter indicates the controller's synchronization state. Given a redundant controller pair, synchronization is the act of transferring configuration and execution data from the primary controller to the secondary so that the secondary has the same information as the primary when it is needed to transition into the primary role. Synchronization is only possible for a compatible redundant controller pair; when a compatible partner is found, the controller transitions from the ‘No Partner State’to the ‘Partner Visible State.’ Initial-sync is the act of performing first time transfer of synchronization data; during this time the controllers are in the ‘Sync in Progress’ State. The redundant controller pair enters the ‘Synchronization Maintenance State’ upon initial-sync completion. While in the Synchronization Maintenance State, the secondary is a viable replacement for the primary controller, and only that configuration data that is changed and the control data that changes as a consequence of primary controller execution is synchronized to the secondary controller.

Figure 9.1 C300 Controller synchronization states



- Standby state

9.3.1 Standby state

The Standby state of operation improves the software upgrade scenario, (such as On-Process migration) by providing the user with a convenient means to fallback to a previous software and database if problems are encountered during migration. Standby state is achieved either from the 'Sync Maintenance' state, via the 'Enable Standby'command, or due to On-Process Migration. For example, during a controller on-process migration the standby state allows a user to test the expected behavior of a configured control strategy using the newer or upgraded software. If controller operation is not satisfactory, then the controller could be returned to operation with the current software by invoking the Go-Back to Idle option.

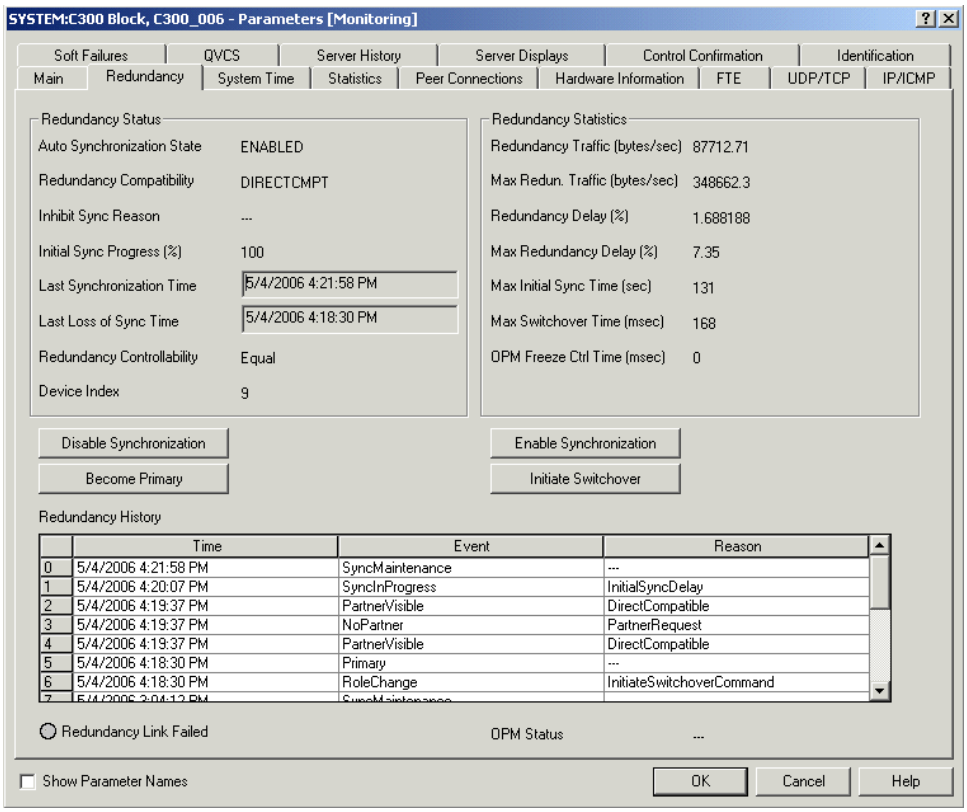
While in the Standby State, the secondary controller contains a database that was previously synchronized with the primary controller but the secondary is no longer receiving synchronization-data updates from the primary controller. Moreover, a Standby Secondary controller is able to switchover into the primary role with this stale database, but to ensure operator intervention, the C300 CEE execution state is forced to Idle. There is no time limit to the time duration of the Standby state, and as a consequence of the secondary not being synchronized, switchover to the secondary may cause a bump in outputs.

9.4 Redundancy parameters

Figure 1 shows the Redundancy tab in Control Builder for the C300 Controller block. The Redundancy tab displays redundancy-related information and allows redundancy commands to be issued when the C300 function block is opened on the Monitor Tree in Control Builder. Descriptions of these parameters follow below.

Note that the Redundancy tab is exposed only when the C300 Controller is configured as redundant. The Module is redundant check box (MODISREDUN parameter) is checked on the Main tab - C300 Controller Block of the C300 block.

Figure 9.2 C300 Controller Block Redundancy tab



- Enable Synchronization - ENBLSYNCCMD
- Disable Synchronization - DSBLSYNCCMD
- Enable Standby - ENBLSTBYCMD
- Auto-Synchronization State - RDNAUTOSYNC
- Inhibit Sync Reason - RDNINHIBITSYNC
- Initial Sync Progress - RDNSYNCPROG
- Maximum Initial Synchronization Time - RDNISTIMEMAX
- Last Synchronization Time - SYNCTIMEBEG
- Last Lost of Sync Time - SYNCTIMEEND
- Redundancy Traffic
- Redundancy Delay
- Conditions that result in loss of sync
- Conditions that do not result in loss of sync

9.4.1 Enable Synchronization - ENBLSYNCCMD

This command triggers an unsynchronized redundant module pair to attempt initial-synchronization. Additionally, the module's Auto-Synchronization State transitions to ENABLED (if previously set to DISABLED).

9.4.2 Disable Synchronization - DSBLSYNCCMD

This command triggers a synchronizing/synchronized/standby redundant module pair to abort synchronization. Also, the module's Auto-Synchronization State to DISABLED.

9.4.3 Enable Standby - ENBLSTBYCMD

This command triggers a redundant controller pair in the Synchronization Maintenance State to enter the Standby State. While in the Standby State, the secondary controller contains a database that was previously synchronized with the primary controller but the secondary is no longer receiving synchronization-data updates from the primary controller. This command is useful for testing the expected behavior of a configured control strategy if the redundant controller pair ever had to invoke the 'Go-Back to Idle' option during a controller On-Process Migration. Specifically, after entering the Standby State, issue the switchover command, and the controller with the stale database switches into the primary role with the CEE execution state set to Idle. In the case where the Standby State was achieved through the Enable Standby command, the Disable Synchronization command exits the Standby State.

9.4.4 Auto-Synchronization State - RDNAUTOSYNC

Read-only parameter that reflects the current state of Auto-Synchronization as follows:

- Enabled upon receipt of the Enable Synchronization command. When enabled, a Primary Module automatically attempts to synchronize the Secondary, upon receipt of any Auto synchronization triggers (in addition to the Enable Synchronization command).
- Disabled either upon receipt of the Disable Synchronization command or detection of a persistent synchronization fault condition (such as: end-to-end checksum failure, synchronization hardware failure, etc.). When disabled, user must explicitly issue the Enable Synchronization command to reset any persistent fault condition and (re)attempt initial-sync.

Auto synchronization triggers

When the primary controller has its Auto Synchronization State parameter set to enabled, the redundant controller pair automatically commences initial-sync without user intervention. More specifically, any action that results in the primary detecting a direct compatible partner module triggers an initial sync attempt. Such as:

- Reconnection of the redundancy cable.
- Secondary module recovery from dual-FTE-cable disconnect
- Secondary module powerup
- Secondary module reboot into Backup state following firmware update.
- Secondary module reboot into Backup state following recovery from the Fail state.

Auto synchronization retries

Once the Auto Sync State is enabled, loss of synchronization is automatically followed by an automatic attempt to re-synchronize the redundant controller pair. However, after a maximum of 3 initial-sync failures, the Auto Sync State is disabled with an inhibit sync reason of Initial Sync Fail.

9.4.5 Inhibit Sync Reason - RDNINHIBITSYNC

Whenever the C300 is not in the synchronized/standby states and initial-sync is not in progress, the RDNINHIBITSYNC parameter is set to the inhibit sync reason. Reasons for inhibiting initial-sync include the following:

Inhibit Sync Reason	Description
Startup In Progress	Initial sync is not allowed until after the C300 has completed system startup. This is a transient inhibit sync reason that is

Inhibit Sync Reason	Description
	usually not seen.
Auto Sync State	Initial sync is inhibited while the Auto Sync State is set to disabled. This is a persistent inhibit sync reason that is canceled via the Enable Sync command.
Dropping Sync	Initial-sync cannot commence until the previous abort sync operation has been completed. This is a transient inhibit sync reason that is usually not seen.
Initial Sync Delay	There is a guaranteed 20 second delay in between initial-sync attempts. More specifically, for 20 seconds after a compatible partner is identified, initial-sync is inhibited with this transient reason.
Initial Sync Fail	After 3 failed attempts to perform initial-sync, the Auto Sync State is automatically set to disabled and the inhibit sync reason is set to this persistent value. Refer to the redundancy history for the reasons why initial-sync failed, and issue the Enable Sync command to attempt initial-sync again.
Redundancy Configuration State	Initial-sync is not allowed when explicitly configured as non-redundant. This persistent inhibit sync reason can only be canceled by reconfiguring the non-redundant C300 FB as redundant.
Platform FB Load State	Initial-sync is not allowed until after the C300 FB has been loaded to the controller.
CEE Load Or Delete	Synchronization cannot be maintained during the database initialization that occurs upon CEE FB load or delete. This is a transient inhibit sync reason that is usually not seen.
Link X Load State	Initial-sync is not allowed to commence until after all link function blocks have been loaded, where X indicates the link number. This is a persistent inhibit sync reason is negated upon load of the link function block to the controller.
NVS Commands	Synchronization is aborted and/or initial-sync is inhibited during the database initialization that occurs upon I/O Link FB commanded NVS compaction.
Partner Absent	Initial-sync is not applicable without a redundant partner.
Partner Not Compatible	Initial-sync is not applicable with an incompatible redundant partner.
Partner Request	The redundant partner has requested initial-sync to be inhibited. Refer to the partner's RDNINHIBITSYNC parameter

Inhibit Sync Reason	Description
	for the actual reason.
FTE Cable Status	The secondary inhibits sync due to dual-FTE-cable disconnect. This persistent inhibit sync reason can only be canceled by restoring FTE communications with the secondary.
OPM Required	Normal C300 initial-sync is not allowed when the application firmware versions for the primary and secondary controllers are different. The Controller Migration Wizard must be used to perform On-Process Migration
Unsupported Hardware Version	Initial-sync is inhibited for controller hardware version that does not support controller redundancy.

9.4.6 Initial Sync Progress - RDNSYNCPROG

The RDNSYNCPROG parameter indicates the percentage of initial-sync completion. This is set to 0 when initial sync is not in progress and it is set to 100 when initial-sync is complete.

9.4.7 Maximum Initial Synchronization Time - RDNISTIMEMAX

The RDNISTIMEMAX parameter indicates the maximum initial synchronization time in seconds. This is a high-water mark for all the previous successfully completed initial-sync attempts. This value is reset upon issuing the C300 Platform block's Stats Reset command.

9.4.8 Last Synchronization Time - SYNCTIMEBEG

The SYNCTIMEBEG parameter indicates the wall-clock time at which the redundant controller pair last transitioned into the Synchronization Maintenance State. This time updates on every transition into the Synchronization Maintenance State.

9.4.9 Last Lost of Sync Time - SYNCTIMEEND

The SYNCTIMEEND parameter indicates the wall-clock time at which the redundant controller pair last transitioned out of the Synchronization Maintenance State. This is updated on every transition out of the Synchronization Maintenance State.

9.4.10 Redundancy Traffic

The RDNXFERAVG and RDNXFERMAX parameters indicate the average and maximum redundancy traffic in bytes per second. These values are reset upon issuing the C300 Platform block's Stats Reset command.

9.4.11 Redundancy Delay

The RDNDELAYAVG and RDNDELAYMAX parameters indicate the average and maximum redundancy delay as a percentage of control execution. This serves as a measure of the secondary-to-primary back-pressure that varies with the secondary controller's load of redundancy data to be processed. These are reset upon issuing the C300 Platform block's Stats Reset command.

9.4.12 Conditions that result in loss of sync

Assuming a synchronized or standby redundant controller pair, the following conditions result in

loss of synchronization.

- Disable Sync command (from Primary or Secondary Platform FB).
- Redundancy cable (private path) between Primary and Secondary controllers is lost.
- Both IOL channels connected to Secondary C300 I/O Link X are lost where:
    - X is the I/O Link number (i.e. equally applies to either I/O Link).
    - The IOLINK Type for this I/O Link has a value other than NONE.
- Both IOL channels connected to Primary C300 I/O Link X are lost where:
    - X is the I/O Link number (i.e. equally applies to either I/O Link).
    - The IOLINK Type for this I/O Link has a value other than NONE
    - There are no configured IOMs communicating on the I/O Link. In other words, it appears to the primary controller that it has lost communication with the Secondary I/O Link interface.
- Both IOL channels connected to Primary and/or Secondary C300 I/O Link are lost
- Loss of input power to Secondary controller
- Secondary controller failure
- Removing the powered Secondary controller module from its IOTA.

9.4.13 Conditions that do not result in loss of sync

Assuming a synchronized or standby redundant controller pair, the following conditions do not result in loss of synchronization.

- Single FTE link to Primary and/or Secondary controller is lost.
- Single IOL channel connected to Primary and/or Secondary C300 I/O Link is lost.

9.5 Switchover

A switchover describes the process where a Synchronized or Standby Secondary controller assumes the role of the Primary controller. A switchover can be triggered immediately upon the detection of a fault in the Primary or upon the receipt of an operator command. Depending on the switchover trigger, the original Primary controller attempts to reboot into the secondary role, but this controller is not immediately able to participate in another switchover operation. Specifically, after the new secondary reboots into the secondary role, it must first perform and complete initial-synchronization before another switchover is allowed.

> **ATTENTION**
>
> You must perfom freeze and switchover operation of redundant .C200, C200E, and C300 from server B only.

- Initiate Switchover - SWITCHCMD
- Max Switchover Time - RDNSOTIMEMAX
- Conditions that result in switchover
- Conditions that do not result in a switchover
- Become Primary command - BECMPRICMD

9.5.1 Initiate Switchover - SWITCHCMD

The Switchover command triggers a realistic switchover scenario. The original primary controller

reboots into the secondary role and the Synchronized or Standby Secondary controller assumes the primary role to continue control operations.

9.5.2 Max Switchover Time - RDNSOTIMEMAX

The RDNSOTIMEMAX parameter indicates the maximum switchover time in milliseconds. This is a high-water mark for all the previous switchover occurrences. This value is reset upon issuing the C300 Platform block's Stats Reset command.

9.5.3 Conditions that result in switchover

The Secondary controller must be in either the Synchronized state or Standby state for a switchover to occur. The following conditions result in a switchover:

- Execution of a Switchover command (from Primary or Secondary Platform FB).
- Loss of both FTE links to Primary controller.
- Loss of both IOL channels connected to Primary C300 I/O Link X, where:
    - X is the I/O Link number (i.e. equally applies to either I/O Link).
    - The IOLINK Type for this I/O Link has a value other than NONE
    - There is at least one configured IOM communicating on the I/O Link.

ATTENTION

- Controller redundancy protects against all single faults and some dual faults. The Primary C300 Dual IOL Cable Disconnect switchover trigger is a dual fault that cannot be detected until after some control has been back-initialized with failsafe data. Although this dual fault affects control, switchover provides automatic recovery that doesnot require the operator to diagnose how to deal with a primary that has a complete loss of IOM view.
- Do not disconnect the redundancy cable while you disconnect the FTE cables from a primary C300 as this may cause unusable dual-primary condition.
- If you remove the redundancy cable then reboot the controller after connecting the redundancy cable prior to reconnecting the network cables.

- Loss of input power to Primary controller
- Primary controller failure
- Removal of the powered Primary controller module from its IOTA
- In the case of an unsynchronized redundant controller pair with both controllers experiencing a dual-FTE cable disconnect. The FTE reconnect to the secondary controller results in initial-sync followed by immediate switchover.

9.5.4 Conditions that do not result in a switchover

These conditions do not result in a switchover:

- Loss of redundancy cable (private path) between Primary and Secondary controllers.
- Loss of one or both FTE links to Secondary controller.
- Loss of one or both IOL channels connected to Secondary C300 I/O LINK.
- Loss of input power to Secondary controller
- Secondary controller failure
- Removal of the powered Secondary controller module from its IOTA.

- Inserting any controller module into a powered Secondary IOTA.
- Loss of a single FTE link to Primary controller.
- Loss of a single IOL channel connected to Primary C300 I/O Link.
- Data communication failures with Secondary controller during synchronization.

9.5.5 Become Primary command - BECMPRICMD

The Become Primary command is used to cause an unsynchronized secondary module to transition into the primary role in the absence of a partner module. Specifically, this command applies only if the unsynchronized secondary has no view to a partner module across the redundancy cable and the primary IP address is not occupied.

9.6 Redundancy history

The C300 and Series 8 FIM support a table with 16 entries of redundancy history. There are 3 columns representing redundancy history time, state, and reason. The controller internally implements a circular list so that only the most recent 16 entries are retained once the number of redundancy history exceeds 16.

- RDNHISTTIME - Redundancy History Time. The system time captured at the time the entry was added to the table.
- RDNHISTSTATE - Redundancy History State. Indicates milestones with respect to redundancy-related activities like redundancy role states, compatibility states, synchronization states, user commands, sync abort indication, and role change indication. Set to dashes "- - -" when entry not yet initialized.
- RDNHISTREASON - Redundancy History Reason. Optionally indicates rationale for the occurrence of the associated RDNHISTSTATE entries. Includes reason for loss-of-sync, redundancy role change, commencing initial sync, and partner incompatibility. Set to dashes "- - -" when entry not applicable (or entry not yet initialized).

9.7 C300 redundancy-related notifications

This section provides listings of redundancy-related notifications implemented for the C300 Controller. The following table lists notifications along with their descriptions that may occur during controller synchronization and switchover operations.

Table 9.1 Redundancy-Related Notifications

Notification	Description	RDNSYNCSTATE
Backup State	The secondary generates the Backup State Change Event as part of event regeneration. A transition to the Backup State only occurs as part of startup or a redundancy role change. In both of these cases, any previously existing notification connection is broken, a new notification connection is reformed, and event regeneration is commanded.	
Not Synchronized	The primary and secondary are configured for redundancy but the redundant pair is not synchronized or not in standby. The primary is configured for redundancy via C300 block load of the MODISREDUN parameter. A	

Notification	Description	RDNSYNCSTATE
	secondary can only be in the secondary role if, retention startup remembered that it was previously configured redundant, and the C300 is configured with the even Device Index. The “Not Synchronized” alarm returns to normal upon configuring the primary at the odd Device Index as non-redundant or upon entering the Synchronized or Standby state.	
Redun Incompatible Partner	Both the primary and secondary controllers generate this notification upon determining that their partner module is not compatible for attempting initial-sync.	INCOMPATIBLE
Redun No Partner	Both the primary and secondary controllers generate this notification when the partner is not present. Note that the primary controller only generates this notification when it is either explicitly or implicitly configured for redundant behavior. Explicit redundancy configuration occurs when the C300 block is loaded with MODISREDUN set ON, and implicit redundancy configuration occurs in the absence of any configuration, (C300 in the NODB state).	NOPARTNER
Redun Non-Redundant	Only the controller explicitly configured non-redundant generates this notification when the partner is not present.	NOPARTNER
Redun Partner Visible on FTE	Both the primary and secondary controllers generate this notification upon detecting a compatible partner visible across FTE. Note that partner compatibility checks across FTE are triggered by the Alternate Synchronization command.	PARTNERVISBL
Redun Partner Visible on Redun Link	Both the primary and secondary controllers generate this notification upon detecting a compatible partner visible across the redundancy private-path. Note that partner compatibility checks across the redundancy private-path are periodically attempted when in the NOPARTNER sync	PARTNERVISBL

Notification	Description	RDNSYNCSTATE
	state.	
Redun Sync in Progress	Both the primary and secondary controllers generate this notification upon commencing initial-sync.	SYNCINPROG
Redun Sync Maintenance	Both the primary and secondary controllers generate this notification upon successfully completing initial-sync.	SYNCMAINT
Redun Standby	Both the primary and secondary controllers generate this notification upon entering the Standby sync state either via the Enable Standby command or due to On Process Migration.	STANDBY
Redundancy Link Active	One time information notification sent whenever the redundancy link transitions from link inactive to link active. For example, this notification will be generated when the redundancy link cable is connected.	
Redundancy Link Inactive	One time information notification sent whenever the redundancy link transitions from link active to link inactive. For example, this notification will be generated when the redundancy link cable is disconnected.	
Switchover	Both the primary and secondary controllers generate this notification following controller redundancy switchover. Specifically, switchover breaks the previously existing notification connection, a new notification connection is reformed, event regeneration is commanded, and then the controller generates this notification. This notification is generated on subsequent commanded event regenerations until initial-sync is attempted.	
Sync Checksum Fail	The primary and secondary controllers perform a continuous background checksum on redundancy tracked memory to explicitly verify that the primary and secondary are in sync. Failure of this diagnostic indicates that the secondary has encountered a condition whereby its local copy of redundancy memory does not match the primary. This fault is inserted either by {1} a software bug on	

Notification	Description	RDNSYNCSTATE
	secondary controller firmware whereby redundancy tracked memory is overwritten by code running on the secondary, or {2} marginal hardware. Given that firmware releases are formally tested with redundant controllers prior to distribution, marginal hardware is the most likely culprit. Moreover, the full redundancy communication path has to be considered: In C200 controllers: Primary CPM -> Primary backplane -> Primary RM -> Fiber Optic Cable -> Secondary RM -> Secondary backplane -> Secondary CPM. In C300 Controllers: Primary C300 -> Primary IOTA -> Private Path Cable -> Secondary IOTA -> Secondary C300. Sync Checksum Fail is detected by the secondary controller which aborts synchronization and generates this alarm notification. Detection of Sync Checksum Fail is severe in that the redundant controller pair were allegedly synchronized when redundancy tracked memory was found to be different. In other words, switchover in the presence of redundancy tracked memory differences may lead to bump in control or loss of control (where the scope of the failure varies on where and how the memory differed). Therefore, by design, a Sync Checksum Fail occurrence disables auto synchronization. Hardware replacement is recommended upon Sync Checksum Fail detection. This notification returns to normal upon issuing the Enable Sync or Alternate Sync commands.	
Sync HW Failure	Sync Hardware Failure is detected locally by the primary or secondary controller which aborts synchronization and generates this alarm notification. Detection of Sync	

Notification	Description	RDNSYNCSTATE
	Hardware Failure is severe in that the redundant controller pair could possibly repetitively synchronize and abort synchronization continuously (unless 3 consecutive initial-sync failures occur). Therefore, by design, a Sync Hardware Failure occurrence disables auto synchronization. Hardware replacement is recommended upon Sync Hardware Failure detection. This notification returns to normal upon issuing the Enable Sync or Alternate Sync commands.	
Standby	Read description of Standby state. Upon entering the Standby state, this diagnostic alarm warns users of the potential switchover to the CEE Idle state. This notification returns to normal upon exiting the Standby state either due to controller redundancy switchover or the Disable Sync command.	
Unexpected Partner on Redundancy Link	Only the controller explicitly configured non-redundant generates this alarm notification when a partner is present on the redundancy private path. The RDNSYNCSTATE parameter is set to either PARTNERVISBL or INCOMPATIBLE. This notification returns to normal if the controller is reconfigured as redundant or if the partner is removed from the redundancy link. For example, this notification is generated when the redundancy cable of a loaded, non-redundant C300 is connected to another C300. This notification is also be generated when a partner Series 8 FIM module is added to a redundant IOTA when the existing Series 8 FIM is explicitly configured as non-redundant.	PARTNERVISBL or INCOMPATIBLE

- Redundancy Link Status - RDNLINKFAILED
- OPM Status - RDNOPMSTATUS

9.7.1 Redundancy Link Status - RDNLINKFAILED

The RDNLINKFAILED parameter is set ON when the redundancy cable is disconnected and/or partner is not running. Once the redundancy cable is reconnected to a running partner, the

RDNLINKFAILED parameter is set OFF. Note that this parameter reflects the physical status of the cable (connected vs. disconnected) and in no way indicates if the redundancy cable is connected to a compatible partner. The 'Redundancy Link Inactive' and 'Redundancy Link Active' notifications are generated when the RDNLINKFAILED parameter is set ON and OFF, respectively.

9.7.2 OPM Status - RDNOPMSTATUS

The primary controller updates the On-Process Migration (OPM) Status parameter with an enumeration representing the OPMSTEP/OPMWARN/OPMFAIL notifications generated during an On-Process Migration session. The Controller Migration Wizard uses this parameter to detect controller OPM session abnormal termination. Table 1 lists the OPM-related notifications along with their descriptions and the associated text string of the OPM Status parameter.

Table 9.2 OPM-Related Notifications

Notification	Description	RDNOPMSTATUS Parameter
OPM (1) Enabled	This notification is generated by the primary controller when the Controller Migration Wizard starts a controller On-Process Migration session.	Enabled
OPM (2) Blocks Created	A secondary checkpoint restore is performed by the Controller Migration Wizard to instantiate the control strategy on the secondary controller during an OPM session. Upon completion of secondary checkpoint restore, the primary controller generates this notification.	BlocksCreated
OPM (3) Initial Sync	This notification is generated by the primary controller when the Migration Wizard commands the controller to commence initial-sync as part of an OPM session.	InitialSync
OPM (4) Open I/O Conns	The primary controller generates this notification prior to the transfer of I/O connection related data as part of initial-sync during an OPM session.	OpenIoConns
OPM (5) Match Peer Refs	This notification is generated by the primary controller prior to transferring peer cross-reference ID data as part of initial-sync during an OPM session.	MatchPeerRefs
OPM (6) Transfer Data	This notification is generated by the primary controller prior to transferring dynamic data as part of initial-sync during an OPM session. From this point forward, control is frozen on the primary controller for up to 5 seconds (depending on the size of the	TransferData

Notification	Description	RDNOPMSTATUS Parameter
	control strategy). Control is resumed following either the switchover (upon completing OPM initial-sync) or on abnormal termination of the OPM session.	
OPM Session Complete	Upon the successful completion of OPM initial-sync, a switchover follows shortly after (<100 ms). This notification is generated by the primary controller due to event regeneration following the switchover into the primary redundancy role and represents successful completion of the controller OPM session.	SessionComplete
OPM Partial Cold Init	The default behavior when one or more blocks have not yet implemented OPM support is to cold initialize the block(s). Upon the successful completion of an OPM session, the new primary controller sets the RDNOPMSTATUS parameter to PartialColdInit and generates this notification to indicate one or more blocks have been cold initialized. This notification is generated only once regardless of how many blocks were initialized. This notification represents successful completion of the controller OPM session.	PartialColdInit
OPM Commanded Abort	The primary controller generates this notification when the Controller Migration Wizard commands the controller to abort the current OPM session. This notification represents unsuccessful OPM session termination.	CommandedAbort
OPM Create Block Timeout	This notification is generated by the primary controller upon timeout of OPM secondary checkpoint restore operation. Secondary checkpoint restore timeout occurs if checkpoint data is stalled for longer than 2 minutes. This notification represents abnormal OPM session termination.	CreateBlockTimeout
OPM Initial Sync timeout	This notification is generated by the primary controller when initial sync does not commence within 2 minutes following	InitialSyncTimeout

Notification	Description	RDNOPMSTATUS Parameter
	the receipt of the Controller Migration Wizard command to commence initial-sync. This notification represents abnormal OPM session termination.	
OPM I/O Data Failure	The primary controller generates this notification that indicates a loss-of-sync occurrence while transferring I/O connection data (as part of initial-sync during an OPM session). Although any loss-of-sync triggers this behavior, the most probable loss-of-sync cause is the inability of the secondary controller to interpret the I/O connection data format. The secondary controller block's LASTOPMNAME parameter is blank in this case. This notification represents abnormal OPM session termination. Note that this applies to both C200 and C300 Controllers because they both transfer Series A I/O Connection data during OPM initial-sync.	IoDataFailure
OPM I/O Conns Timeout	Indicates a loss-of-sync occurrence while waiting for the secondary controller to form at least the same number of I/O connections as the primary controller (as part of initial-sync during an OPM session). Notification is generated by the primary controller and sets the RDNOPMSTATUS parameter to IoConnsTimeout. The secondary controller block's LASTOPMNAME parameter is blank. This notification represents abnormal OPM session termination. This only applies to C200 controllers because it forms connections directly with the Series A I/O. As with the C300, connections are formed between the FTEB and Series A I/O.	IoConnsTimeout
OPM Peer Refs Mismatch	Indicates a loss-of-sync occurrence while transferring peer cross-reference ID data (as part of initial-sync during an OPM	PeerRefsMismatch

Notification	Description	RDNOPMSTATUS Parameter
	session). The primary controller generates this notification. Although any loss-of-sync triggers this behavior, the most probable loss-of-sync cause is the presence of a ghost peer connection reference. A ghost peer connection reference exists if the primary controller has knowledge of a peer connection ID that was not instantiated in the secondary controller during OPM secondary checkpoint restore. The secondary controller block's LASTOPMNAME parameter is blank. This notification represents abnormal OPM session termination.	
OPM Peer Refs Failure	The one-time OPM initial-sync transfer of dynamic data that occurs with control frozen contains two components: peer dynamic data and block dynamic data, with the latter typically being the larger of the two. A loss-of-sync occurrence while transferring peer dynamic data causes the primary controller to generate this notification and to set the RDNOPMSTATUS parameter to PeerRefsFailure. Although any loss-of-sync triggers this behavior, the most probable loss-of-sync cause is the inability of the secondary controller to interpret the peer dynamic data format. The secondary controller block's LASTOPMNAME parameter is blank in this case. This notification represents abnormal OPM session termination.	PeerRefsFailure
OPM Block Data Failure	The one-time OPM initial-sync transfer of dynamic data that occurs with control frozen contains two components: peer dynamic data and block dynamic data, with the latter typically being the larger of the two. A loss-of-sync occurrence while transferring block dynamic data causes the primary controller to generate this notification and to set the RDNOPMSTATUS parameter to	BlockDataFailure

Notification	Description	RDNOPMSTATUS Parameter
	BlockDataFailure. This notification represents abnormal OPM session termination. Although any loss-of-sync triggers this behavior, the most probable cause for loss-of-sync is either the inability of the secondary controller to interpret the block dynamic data format or the secondary controller has no destination block to receive the dynamic data. The latter is possible in the presence of a ghost block; a ghost block exists if the primary controller has knowledge of a block that was not instantiated in the secondary controller during OPM secondary checkpoint restore. The secondary controller block's LASTOPMNAME parameter indicates the name of the last block to be (on-process) migrated. LASTOPMNAME is used to isolate the name of the first CEE subordinate block that has detected a dynamic state data error. In the special case of a ghost block, LASTOPMNAME is either blank (because the ghost block name no longer exists in the ERDB), or indicates the name of a block that is not loaded to the controller (meaning that the block only exists on the Control Builder project tree).	
OPM Session Timeout	Control is frozen upon commencing the one-time OPM initial-sync transfer of Dynamic Data. The redundancy subsystem aborts controller OPM if control is frozen longer than the maximum specified time, (i.e. 10 seconds for C200 and 20 seconds for C300). As a consequence, the redundancy subsystem generates this notification and sets the RDNOPMSTATUS parameter to SessionTimeout. This notification represents abnormal OPM session termination.	SessionTimeout

9.8 On-process Migration of C300 Controller

The Controller Migration Wizard is a software application used to migrate controllers and other

control hardware to new system firmware. See the *Experion Migration User's Guide* for more information on system migration and using the Migration wizard to migrate C300 controllers.

- 'Go-Back to Idle' option

9.8.1 'Go-Back to Idle' option

In Experion Release 300.1 the Controller Migration Wizard contains a 'Go-back to Idle' option. Go-Back to Idle allows you the option to revert to the original release firmware before completing a controller migration on redundant controllers. For example - First, the secondary controller of a redundant pair is migrated to new firmware. Once completed, a switchover occurs making the controller running the new firmware the primary controller. The operator should then conduct acceptability tests to see that the controller is operating properly. The operator then has the option to either continue with the controller migration of the redundant partner, or choose 'Go-back to Idle.' If Go-Back to Idle is selected, a switchover will occur again making the controller running on the base release firmware the primary controller. The controller on the new release firmware then will be returned to operation on the base release firmware.

ATTENTION

'Go-back to Idle' results in a bump in control because the primary C300 (running the base release firmware) reboots into the Standby Secondary role. While in the standby state, the secondary C300 retains a stale copy of the primary database (from when it was in the previous primary role) and it does not receive any synchronization updates. If 'Go-back to Idle' is selected, switchover to the stale database occurs and the new primary CEE Execution State is forced to Idle, giving you the option to manually recover from the process bump before resuming control. See Standby state for more information.

ATTENTION

Any switchover trigger that occurs while the Controller Migration Wizard presents the option for the user to 'Go-Back to Idle' or 'Continue,' will automatically initiate Go-Back to Idle without user input.

9.9 Controller redundancy specifications

ATTENTION

The Specification and Technical information is subject to change without notice and is superseded by information in applicable Experion product Specification and Technical data documents. The specification information listed in the following table is applicable until R400 release. Hence, for each Experion release, you are recommended to refer the applicable Specification and Technical data documents.

Specification	
Control processing switchover interruption time (RDNSOTIMEMAX)	500 milliseconds
Initial synchronization time (from sync start to completion) (RDNISTIMEMAX)	200 seconds

Specification	
Maximum elapsed time between commanded switchover and completion of initial synchronization	300 seconds
Maximum elapsed time between switchover due to power cycle of the primary and completion of initial synchronization	300 seconds
Maximum OPM control freeze time (RDNOPMFRZTIME)	20 seconds

CHAPTER

10 C300 CONTROLLER MAINTENANCE

This section includes information about maintaining the C300 Controller including replacement of the C300 Controller module and associated IOTA.

- Periodic checks
- Recommended spare parts
- Recommended spare parts for Series C Mark II
- Replacing a C300 Controller module and IOTA
- Replacing a C300 Controller module and IOTA for Series C Mark II
- Replacing Series C power supply module

10.1 Periodic checks

Check . . .	Possible Corrective Action . . .
That all segments of the 4-character display and the light emitting diodes (LED) on C300 Controller are working.	If segment or LED is not lit or has dimmed, you must replace the C300 Controller, since front-panel indicators and LEDs are not field replaceable.
That all connections are secure.	Secure connections, as needed.
That cable insulation is not worn or cracked.	Replace cables, as required.
That IOTA is secure.	Tighten mounting screws.

10.2 Recommended spare parts

The following table provides a list of parts that you may want to keep on hand for backup.

ATTENTION

Since aging occurs, even if the batteries have been regularly recharged throughout their lifetime, the 24 Volt Battery, Honeywell part number 51199946-100 should be replaced after every two years of operation.

Part Name	Part Number	Description	Quantity per 10/100
C300 Controller	CC- or CU-PCNT01 CC-PCNT02	C300 Controller Module	1/5
C300 IOTA	CC- or CU-TCNT01	C300 Controller Input Output Terminal Assembly	1/2
Fuse	51506348-341	800 mA, quick-acting fuse on Input Output Terminal Assembly	4/25
RAM Charger Assembly	51199932-100	Module, RAM Charger 2 Connections	2/10
RAM Charger Assembly	51199932-200*	Module, RAM Charger 4 Connections	2/10
24 Volt Battery Backup Kit	51199946-100	Battery Kit Main (3 batteries and interconnecting cables)	1/5
* Supersedes RAM Charger Assembly 51199932-100.			

10.3 Recommended spare parts for Series C Mark II

The following table provides a list of parts that you may want to keep on hand for backup.

ATTENTION

Since aging occurs, even if the batteries have been regularly recharged throughout their lifetime, the 24 Volt Battery, Honeywell part number 51199946-100 should be replaced after every two years of operation.

Part Name	Part Number	Description	Quantity per 10/100
C300 Controller	CC-PCNT01 CC-PCNT02	C300 Controller Module	1/5
C300 IOTA	DC-TCNT01	C300 Controller Input Output Terminal Assembly	1/2

Part Name	Part Number	Description	Quantity per 10/100
Fuse	51506348-341	800 mA, quick-acting fuse on Input Output Terminal Assembly	4/25
C300 Memory Backup	51454475-100	Module, RAM Charger 4 Connections	2/10
24 Volt Battery Backup Kit	51199946-100	Battery Kit Main (3 batteries and interconnecting cables)	1/5

10.4 Replacing a C300 Controller module and IOTA

For replacing a non-redundant controller module

CAUTION

This procedure can only be performed while off process.

- We recommend that you proceed with **extreme caution** whenever replacing any component in a control system. Be sure the system is offline or in a safe operating mode.
- Component replacements may also require corresponding changes in the control strategy configuration through Control Builder, as well as downloading appropriate data to the replaced component.
- Do not disconnect the redundancy cable while you disconnect the FTE cables from a primary C300 as this may cause unusable dual-primary condition.
- If you remove the redundancy cable then reboot the controller after connecting the redundancy cable prior to reconnecting the network cables.

- Loosen screws at each side of the module cover that secures the controller module to the IOTA board.
- Loosen the plastic screw on the front of the controller module cover. Be careful not to strip the plastic screw head.

For replacing a redundant or secondary controller module

CAUTION

This procedure can be performed while on-process *only* if the module to be replaced is in the secondary role.

We recommend that you proceed with **extreme caution** whenever replacing any component in a control system. Be sure the system is offline or in a safe operating mode.

Component replacements may also require corresponding changes in the control strategy configuration through Control Builder, as well as downloading appropriate data to the replaced component.

For replacing a non-redundant controller IOTA board

> **CAUTION**
>
> This procedure can only be performed while off process.
>
> We recommend that you proceed with **extreme caution** whenever replacing any component in a control system. Be sure the system is offline or in a safe operating mode.
>
> Component replacements may also require corresponding changes in the control strategy configuration through Control Builder, as well as downloading appropriate data to the replaced component.

10.4.1 To replace a non-redundant controller module

1. Carefully remove the Controller module from the IOTA board and connector.
2. Insert the new controller module onto IOTA board making sure that the controller circuit board mates properly with the IOTA board connector.

   Note that all modules are keyed.
3. Secure the controller module to the IOTA board with two screws located at each side of the plastic cover.
4. Using a #2 Phillips screwdriver, hand tighten the plastic screw on the front of the module cover. Be careful not to strip the plastic screw head.
5. The new controller will boot-up to ALIVE or NODB state.
6. Load firmware which is the same version as was running in the old controller.
7. In **Control Builder**, perform a '**Load with Contents**' to the controller.

10.4.2 To replace a redundant or secondary controller module

1. In **Control Builder**, open the primary C300 FB and select the **Redundancy tab**. Click the **Disable Synchronization** button to the auto-sync parameter to "Disabled."
2. Perform steps 1 through 5 of the procedure To replace a non-redundant controller module.
3. Load firmware which is the same version as was running in the old controller.
4. The new backup controller will boot to ALIVE or BKUP. If the application image does not match the primary controller, it will be unsynchronized.
5. From either the primary or secondary C300 FB **Redundancy tab**, click the **Enable Synchronization** button to initiate synchronization and allow auto-synchronization.
6. The controller will now display a synchronized redundancy state.

10.4.3 To replace a non-redundant controller IOTA board

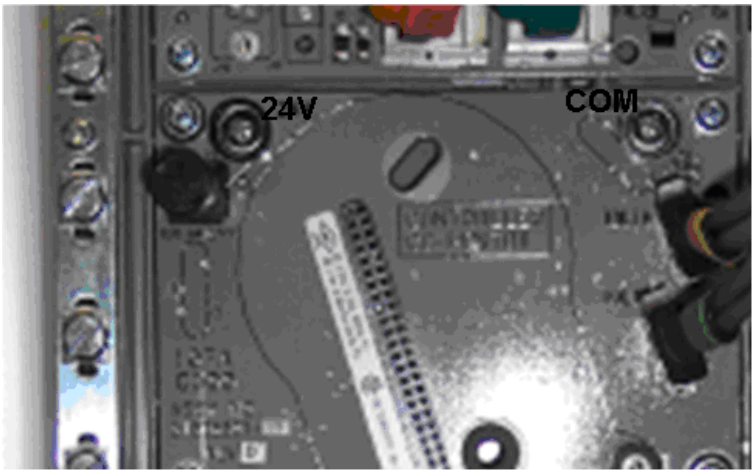
1. On the defective IOTA, loosen screws at each side of the module cover that secures the controller module to the IOTA board.

   Loosen the plastic screw on the front of the controller module cover. Be careful not to strip the plastic screw head.
2. Carefully remove the controller module from the IOTA board and connector.

3. Label and disconnect all cables from the IOTA board connectors, (yellow and green FTE cables, gray and violet IOLink cables, and Battery cable).

> **CAUTION**
>
> Do **not** fully tighten the IOTA mounting screws before installing and tightening the power and ground screws (**24V** and **COM** terminals) which can bind during installation or removal. Follow instructions carefully.

4. Loosen the four mounting screws only **half-way** that secure the IOTA board to the channel.
5. Remove 24V power to the IOTA board. See figure below.
   - Remove the screw from the left side of the IOTA board that connects to the **24 Vdc** bus bar.
   - Remove the screw from the right side of the IOTA board that connects to the **COM** bus bar.



6. Remove completely the four mounting screws securing the IOTA board to the channel and remove the IOTA.
7. Place screws, washers and spacers aside for reassembly.
8. Assemble screws, washers and spacers on the new IOTA board.

   Mount new controller IOTA board on the channel at the same position as the old IOTA board.
9. Insert and thread the four mounting screws only **half-way** to attach the IOTA board to the channel. Do **not** tighten.
10. Refer to the figure above.
11. Tighten the four mounting screws securing the IOTA board to the channel.
    - Insert and tighten the screw to the left side of the IOTA board that connects to the **24 Vdc** bus bar.
    - Insert and tighten the screw to the right side of the IOTA board that connects to the **COM** bus bar.
12. Set the Device Index address to the same address as the old IOTA using the three rotory **FTE DEVICE INDEX** switches.

13. Connect FTE-A and FTE-B Ethernet link cables to the RJ-45 connectors on C300 IOTA board.
    - The **yellow** Cat5 cable connects to the "**FTEA**" connector on the IOTA.
    - The **green** Cat5 cable connects to the "**FTEB**" connector on the IOTA.
14. Connect IOLink cables to IOTA board, if present.
    - Connect gray IOLINK cable to **IOL1A** and **IOL1B** for **IOLINK 1** interface of the controller.
    - Connect violet IOLINK cable to **IOL2A** and **IOL2B** for **IOLINK 2** interface of the controller.
15. Install the two-wire twisted pair Battery cable onto the **MEMORY HOLD-UP** connector on the left side of the IOTA board.
16. Insert the controller module onto IOTA board making sure that the controller circuit board mates properly with the IOTA board connector.

    Secure the controller module to the IOTA board with two screws located at each side of the plastic cover.
17. Using a #2 Phillips screwdriver, hand tighten the plastic screw on the front of the module cover. Be careful not to strip the plastic screw head.
18. The controller will boot-up into an ALIVE state or a NODB operating state.
19. In **Control Builder**, perform a '**Load with Contents**' to the controller.

10.4.4 To replace a redundant or secondary controller IOTA

1. In **Control Builder** open either the primary or secondary C300 FB and select the **Redundancy tab**. Click the **Disable Synchronization** button to set the Auto-Synchronization State parameter to "DISABLED."
2. Perform steps 1 through 17 of the procedure To replace a non-redundant controller IOTA board

   Note that there is additional orange REDUNDANCY cable connected to the IOTA.
3. The controller will boot-up into an unsynchronized secondary redundancy state with BKUP operating state.
4. From either the primary or secondary C300 FB form **Redundancy tab**, click the **Enable Synchronization** to initiate synchronization and allow auto-synchronization.
5. The controller will now display a synchronized redundancy state.

10.5 Replacing a C300 Controller module and IOTA for Series C Mark II

For replacing a non-redundant controller module

> CAUTION
>
> This procedure can only be performed while off process.
>
> - We recommend that you proceed with **extreme caution** whenever replacing any component in a control system. Be sure the system is offline or in a safe operating mode.
> - Component replacements may also require corresponding changes in the control strategy configuration through Control Builder, as well as downloading appropriate data to the replaced component.
> - Do not disconnect the redundancy cable while you disconnect the FTE cables from a

primary C300 as this may cause unusable dual-primary condition.

- If you remove the redundancy cable then reboot the controller after connecting the redundancy cable prior to reconnecting the network cables.

- Loosen screws at each side of the module cover that secures the controller module to the IOTA board.
- Loosen the plastic screw on the front of the controller module cover. Be careful not to strip the plastic screw head.

For replacing a redundant or secondary controller module

CAUTION

This procedure can be performed while on-process *only* if the module to be replaced is in the secondary role.

We recommend that you proceed with **extreme caution** whenever replacing any component in a control system. Be sure the system is offline or in a safe operating mode.

Component replacements may also require corresponding changes in the control strategy configuration through Control Builder, as well as downloading appropriate data to the replaced component.

For replacing a non-redundant controller IOTA board

CAUTION

This procedure can only be performed while off process.

We recommend that you proceed with **extreme caution** whenever replacing any component in a control system. Be sure the system is offline or in a safe operating mode.

Component replacements may also require corresponding changes in the control strategy configuration through Control Builder, as well as downloading appropriate data to the replaced component.

10.5.1 To replace a non-redundant controller module

1. Carefully remove the Controller module from the IOTA board and connector.
2. Insert the new controller module onto IOTA board making sure that the controller circuit board mates properly with the IOTA board connector.

   Note that all modules are keyed.
3. Secure the controller module to the IOTA board with two screws located at each side of the plastic cover.
4. Using a #2 Phillips screwdriver, hand tighten the plastic screw on the front of the module

cover. Be careful not to strip the plastic screw head.

5. The new controller will boot-up to ALIVE or NODB state.
6. Load firmware which is the same version as was running in the old controller.
7. In **Control Builder**, perform a '**Load with Contents**' to the controller.

10.5.2 To replace a redundant or secondary controller module

1. In **Control Builder**, open the primary C300 FB and select the **Redundancy tab**. Click the **Disable Synchronization** button to the auto-sync parameter to "Disabled."
2. Perform steps 1 through 5 of the procedure To replace a non-redundant controller module.
3. Load firmware which is the same version as was running in the old controller.
4. The new backup controller will boot to ALIVE or BKUP. If the application image does not match the primary controller, it will be unsynchronized.
5. From either the primary or secondary C300 FB **Redundancy tab**, click the **Enable Synchronization** button to initiate synchronization and allow auto-synchronization.
6. The controller will now display a synchronized redundancy state.

10.5.3 To replace a non-redundant controller IOTA board

1. On the defective IOTA, loosen screws at each side of the module cover that secures the controller module to the IOTA board.

   Loosen the plastic screw on the front of the controller module cover. Be careful not to strip the plastic screw head.
2. Carefully remove the controller module from the IOTA board and connector.
3. Label and disconnect all cables from the IOTA board connectors, (yellow and green FTE cables, gray and violet combo cables, and Battery cable).
4. Loosen the four mounting screws that secure the IOTA board to the backplane and remove the IOTA.
5. Place screws, washers and spacers aside for reassembly.
6. Assemble screws, washers and spacers on the new IOTA board.

   Mount new controller IOTA board on the backplane at the same position as the old IOTA board.
7. Insert and thread the four mounting screws to attach the IOTA board to the backplane and tighten the screws securing the IOTA board.
8. Set the Device Index address to the same address as the old IOTA using the three rotory **FTE DEVICE INDEX** switches.
9. Connect FTE-A and FTE-B Ethernet link cables to the RJ-45 connectors on C300 IOTA board.
   - The **yellow** Cat5 cable connects to the "**FTEA**" connector on the IOTA.
   - The **green** Cat5 cable connects to the "**FTEB**" connector on the IOTA.
10. Connect combo cables to IOTA board, if present.
    - Connect gray combo cable to **IOL1A** and **IOL1B** for **IOLINK 1** interface of the controller.
    - Connect violet combo cable to **IOL2A** and **IOL2B** for **IOLINK 2** interface of the controller.
11. Install the two-wire twisted pair Battery cable onto the **MEMORY HOLD-UP** connector on the left side of the IOTA board.

12. Insert the controller module onto IOTA board making sure that the controller circuit board mates properly with the IOTA board connector.

    Secure the controller module to the IOTA board with two screws located at each side of the plastic cover.

13. Using a #2 Phillips screwdriver, hand tighten the plastic screw on the front of the module cover. Be careful not to strip the plastic screw head.
14. The controller will boot-up into an ALIVE state or a NODB operating state.
15. In **Control Builder**, perform a '**Load with Contents**' to the controller.

10.5.4 To replace a redundant or secondary controller IOTA

1. In **Control Builder** open either the primary or secondary C300 FB and select the **Redundancy tab**. Click the **Disable Synchronization** button to set the Auto-Synchronization State parameter to "DISABLED."
2. Perform steps 1 through 15 of the procedure To replace a non-redundant controller IOTA board

   Note that there is additional orange REDUNDANCY cable connected to the IOTA.

3. The controller will boot-up into an unsynchronized secondary redundancy state with BKUP operating state.
4. From either the primary or secondary C300 FB form **Redundancy tab**, click the **Enable Synchronization** to initiate synchronization and allow auto-synchronization.
5. The controller will now display a synchronized redundancy state.

10.6 Replacing Series C power supply module

You can replace one power supply of the Series C power supply module while the other is operating (redundant).

This procedure is applicable to all redundant power systems - CC-PWRR01, CC-PWRB01, and CC-PWR401.

Before replacing the series C power supply module, ensure the following:

- You have the proper personal protection equipment (PPE) required by your site.
- You have the necessary work permits.
- Appropriate operators are aware of your work to the cabinet.
- The environment has been tested to confirm the absence of a flammable atmosphere and continuously monitored during the work process.

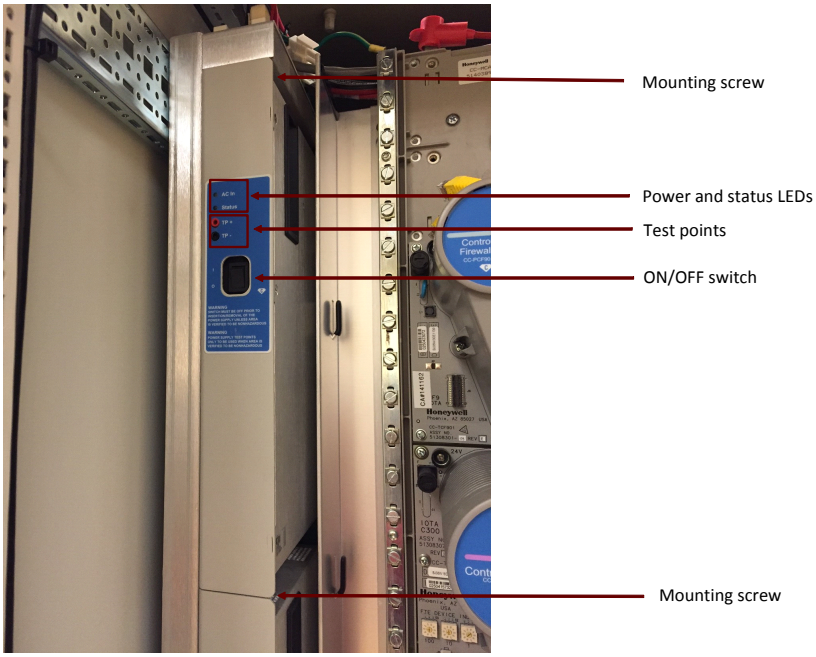
You need the following items for replacing the Series C power supply module:

- One Series C power supply module to replace the broken/defective unit.
- #2 Phillips screwdriver
- Hand-held Digital Voltmeter (DVM) set to measure DC volts.
- ESD wrist strap

10.6.1 To replace a Series C power supply module

1. Open the cabinet door.
2. Attach the ESD wrist strap on one end to the cabinet chassis ground and the other end to your wrist.
3. Confirm the following for the power supply module being replaced:
   - The AC In and status LEDs are off (not illuminated).
   - The test points in the front of the unit TP+ to TP- measure approximately 0V with the DVM.
   - The test points on the working power supply measure approximately 25V.

   The following figure displays a power supply module.



4. Turn the front power switch of the defective unit to the “O” (OFF) position.

   Do not de-energize (or disconnect) any of the power cords from the AC mains.

> **NOTE**
>
> Depending on your site-specific practices or local codes and regulations, it may be necessary to de-energize the AC mains to the defective power unit. In this case, make absolutely sure your are de-energizing the correct AC mains. De-energizing the AC mains to the operating power module will turn off the entire cabinet.

5. Loosen the two mounting screws on the module using the #2 Phillips screwdriver.
6. Pull out the module using the pull handle on the side.

   Tag this unit as defective and place it aside.
7. Get the replacement power supply module. Ensure that the switch on the front surface is in the OFF position.

8. Inspect the connector at the rear of the unit to make sure none of the contacts are bent or damaged.

> **NOTE**
>
> If for some reason they are damaged or bent, do not attempt to repair on your own. Return the unit to Honeywell for a replacement.

9. Slide the module into the chassis until it is fully seated.
10. Secure the two mounting screws with the #2 Phillips screwdriver.
11. Turn on the power switch on the new module (I position).
12. Confirm the following for the new power supply module:
    - The power supply module is ON.
    - The AC In and status LEDs are illuminated.
    - The voltage across TP+ to TP- measures approximately 25V.
13. Remove the ESD wrist strap and close the cabinet door.

CHAPTER

11

C300 CONTROLLER TROUBLESHOOTING

This section provides guidance and background information about the causes and remedies for failures which may occur in the C300 Controller. The following topics are presented here.

- What to do when faults occur
- Initial checks
- Fixing common problems
- C300 Controller soft failures
- IOLINK block soft failures
- Additional status and fault messages
- Online diagnostics
- Fault classifications
- Communications and system time faults during startup
- Gathering information for reporting problems to Honeywell
- Getting further assistance

11.1 What to do when faults occur

If a C300 Controller fails, it will not fail into a state that should cause unsafe process conditions. When a fault occurs, you should try and gather as much information as possible related to the event, such as: the status of the controller, the conditions or sequence of events that occurred before the fault. See Gathering information for reporting problems to Honeywell for a list of information. This information can be gathered from various sources in the system. See Initial checks for guidance in obtaining information from displays, diagnostic tools and log files within the Experion system. Read the topics in this section that includes troubleshooting procedures to clear faults. Refer to other troubleshooting sources . See Getting further assistance.

For more information about Secure Communications troubleshooting, see the Secure Communications User's Guide.

11.2 Initial checks

This section offers some checks that you can make to help isolate the problem. The checks are arranged in no particular order.

- Checking Control Builder error code reference
- Checking faceplate display and LEDs
- Using CTools to capture diagnostic data
- Viewing flash log
- Viewing release information log
- Checking server point build log

- Checking server point build error log
- Checking error log

11.2.1 Checking Control Builder error code reference

An indication of a problem may be in the form of an error dialog that includes an error message and possibly an error code in Control Builder.

The syntax for a typical Control Builder error message is as follows:

Connection to device is not open EPKS_E_CL_NOCONN(6L.101.3326)

In this syntax, the error code is the last four digits in the message or **3326**.

Please refer to the *Control Builder Error Codes Reference* book for applicable error code information.

11.2.2 Checking faceplate display and LEDs

Check the C300 Controller's 4-character display and C300/IOTA LED indications and compare results with data in the C300 faceplate indicators/displays section of this book. For more details on these fault classifications and possible causes of these faults see also Fault classifications in this section.

Fault Classifications	Controller display	LEDs
Hard/Severe Failures	**FAIL** alternating with a four-digit error code **03A7** = Hardware failure Any other four digit code = possible software fault A blank display indicates a Watchdog Timer timeout.	Status LED = RED
Soft Failures	**-SF-** alternating with the following controller information: <DeviceIndex> <CEE State> <Rdn State> <DeviceIndex> <CEE State> -SF -	Primary controller - Status LED = GREEN blinking off once per second Backup controller - Status LED = ORANGE blinking off once per second
Installation-Startup Failures	**Tnnn** indicating the test number that the controller was performing when a fault was detected. **-bp-** BootP service not available **-TS-** Time source not available.	Status LED = solid RED

Fault Classifications	Controller display	LEDs
Hardware Watchdog Timer Expired	**Blank**	Status LED = RED blinking off every \ second. FTE LEDs = RED
Communications Failure	**COMM** indicating no communications with other nodes.	FTE LEDs = RED

11.2.3 Using CTools to capture diagnostic data

You can use the CTool utility to capture diagnostic data used to examine the operating conditions within the controller. This data also can be analyzed to determine the cause of an error or fault. The following data can be captured using CTools:

- Trace Log
- Registers
- SSP
- Call Stack
- Instructions

See Series 8 Firmware Load Tool (CTool) for Series 8 Components in the *Control Hardware Troubleshooting and Maintenance Guide* for the procedure to capture diagnostic data.

11.2.4 Viewing flash log

The Flash.txt log provides a list of firmware updates that have been initiated.

To view the log, navigate to this file location on the server:

C:\Program Files\Honeywell\Experion\Engineering Tools\system\bin\Flash.txt.

11.2.5 Viewing release information log

The ReleaseInfo.txt log provides a list of Experion software releases that have been installed on the computer.

To view the log, navigate to this file location on the server:

C:\Program Files\Honeywell\Experion\Engineering Tools\system\bin\ReleaseInfo.txt.

11.2.6 Checking server point build log

The SvrPtBld_servername.txt log provides list of process (CB) points built in the server database.

To check the log, navigate to this file location on the server: `C:\Program Files\Honeywell\Experion PKS\Engineering Tools\temp\SvrPtBld_servername.txt`.

11.2.7 Checking server point build error log

The svrptblderr_servername.txt log provides list of any errors associated with process (CB) points built in the server database

To check the log, navigate to this file location on the server: `C:\Program Files\Honeywell\Experion PKS\Engineering Tools\temp\svrptblderr_servername.txt`.

11.2.8 Checking error log

The Errlog_n.txt log provides a running list of Control Builder detected errors in chronological order. The n represents any number that is assigned to the most recent log.

To check the log, navigate to this file location on the server: `C:\ProgramData\Honeywell\Experion PKS\ErrLog_n.txt`.

Prior to R400, the Errlog_n.txt file was stored in the following location on the server: `C:\Documents and Settings\All Users\Application Data\Honeywell\Experion PKS\Errlog_n.txt`.

11.3 Fixing common problems

This section identifies some common problems and describes how you might fix them.

- Loss of power
- Power-On Self Test (POST) does not complete
- Controller display shows -bp- or -ts-
- Controller display shows -SF- alternating with OK/BKUP
- One or both FTE LEDs are RED
- FTE receive fault diagnostic
- Controller does not synchronize with backup
- Fatal ECC error
- Display shows FAIL
- Isolated (lonely) Node
- Duplicate Device Index setting
- Device Index value is zero upon power up

11.3.1 Loss of power

The power supply has failed or the main power source has been shut down or is experiencing a *brownout* or *blackout* condition.

Diagnostic Check	• The 4-character display on the C300 Controller and LEDs on the controller module and the IOTA are off. • In the **Monitoring** tab, the C300 Controller icon turns red.
Cause 1	Main power source has been disconnected or shut down either manually or temporarily by *brownout* or *blackout* condition.
Solution	Re-connect the main power source or turn it On or wait for temporary *brownout* or *blackout* condition to pass.
Cause 2	The 24 Vdc power supply failed or power cable has been disconnected or failed.
Solution	Replace the 24 Vdc power supply or re-connect/replace the power cable.

Cause 3	Power fuse opens on IOTA.
Solution	Replace power fuse.

11.3.2 Power-On Self Test (POST) does not complete

A fault is detected during the Power-On Self Test (POST).

Diagnostic Check	A self test diagnostic code remains on display and the POST does not continue. Possible indications: Display shows test pattern, or Tnnn (nnn = a test number which is executed during POST). Note that if display shows 'T499' POST has completed.
Cause	The C300 Controller POST has detected a failure that does not allow startup to continue or complete.
Solution	Short the reset pads on the IOTA to re-start the C300 Controller. If error persists, replace the controller module. See Replacing a C300 Controller module and IOTA for details.

11.3.3 Controller display shows -bp- or -ts-

After the C300 Controller completes POST, the controller was unable to contact the BootP server to obtain an IP address. Note that if BootP service is available, but no time service is available, the controller display will show -ts-.

Diagnostic Check	Display shows -bp-
Cause	BootP service is not available.
Solution	• Check FTE cable connections to FTE A and FTE B connectors on the controller IOTA. • Verify FTE network connections between the controller IOTA and the associated server. • Verify that the bootP service is running on the associated server. Restart BootP service if not running. • In Control Builder, check System Preferences for valid network IP address settings. Verify correct configuration of System Time server.

Diagnostic Check	Display shows -ts-
Cause	BootP service is available, but time source is not available. Time Server may not be configured or server may not be running the latest release time service.

Solution	Verify that the system time source is configured. Check that the Server Windows Time Service (w32time) is running on the server.

11.3.4 Controller display shows -SF- alternating with OK/BKUP

A Soft Failure condition is detected during execution of background diagnostics.

Diagnostic Check	Display shows -SF- alternating with OK/BKUP
Cause	Soft Failure condition detected by controller.
Solution	• View Soft Failures tab of C300 block configuration form to identify fault. OR • Use C300 Controller Detail Display in Station to identify fault. • See C300 Controller Soft Failures table for description and corrective actions.

11.3.5 One or both FTE LEDs are RED

Diagnostic Check	One or both FTE LEDs on the controller faceplate are RED
Cause 1	No connection
Solution	Check cable connections on controller IOTA (FTEA and FTEB connectors) and at CF9 IOTAs.
Cause 2	Cables bad
Solution	Swap known good cable with suspect cable. Replace bad cable.
Cause 3	Switch port bad
Solution	Swap cables with known good port to identify defective port. Replace assembly that contains defective port.
Cause 4	IOTA bad
Solution	Replace IOTA

11.3.6 FTE receive fault diagnostic

The C300 Controller has detected an open receive signal line between either of its two Ethernet interface devices and the processor handling incoming communication.

Diagnostic Check	• The Status LED on the front panel of the C300 Controller turns RED • The 'LAN_A' or 'LAN_B' indicator for the faulted port turns RED. The indicators are found on the FTE Tab of the C300 Block configuration form. • An alarm is generated by the C300 Controller that indicates "FTE Port A Receive Fault" or "FTE Port B Receive Fault"
Cause	The following conditions may result in a *spurious* (false) indication of an FTE Receive Diagnostic fault. These conditions are external to the C300 Controller that allow a carrier to be detected by the C300 Controller's Port A or Port B Ethernet interface but eliminate FTE traffic on that port. • Disconnecting the uplink cable of a CF9when only one C300 Controller is connected to any of the downlink ports on the CF9. *In this case, the only source of external FTE Diagnostic messages are nodes that communicate through the uplink port of the CF9. When the uplink cable is disconnected, there are no incoming FTE Diagnostic messages on the C300 Controller. Since the downlink cable from the CF9 to the C300 Controller remains attached, the C300 Controller has a 'good' Link Status on the port. The combination of a good Link Status and no incoming FTE Diagnostic messages results in the spurious indication of an FTE Receive Fault.* • Removal and re-insertion of a CF9 module or power cycling a CF9, when the associated C300 Controller is *not* power cycled. *In this case, when the CF9 is powered up, Link Status transitions to the 'good' state before the CF9 completes its power on self tests (POST) and starts passing FTE Diagnostic messages again. This interval is long enough that the C300 Controller's FTE Receive Fault Diagnostic will indicate a spurious fault.* • Throttling of Ethernet traffic during of an abnormal amount of communication traffic on one or both of the C300 Controller's Ethernet ports. *During a 'storm' on the FTE network, the C300 Controller initiates limiting of incoming Ethernet traffic on its FTE ports. As a result of this limiting, a sufficient number of FTE Diagnostic messages may be lost so that one or both ports see 'good' Link Status signals but no FTE Diagnostic messages over the sample interval of this diagnostic. In this case, the C300 Controller's FTE Receive Fault Diagnostic will indicate a spurious fault. The spurious alarm generated by the FTE*

	Receive Fault Diagnostic is a relatively minor side effect, in the case of a network storm. A network storm is signaled by other alarms in the system.
Solution	Unless you suspect that one of the causes described above exists and is resulting in a *spurious* indication, you should replace the C300 Controller Module exhibiting this diagnostic at your earliest convenience. When this fault exists, network redundancy for this node no longer is working. See Replacing a C300 Controller module and IOTA for details.

11.3.7 Controller does not synchronize with backup

Diagnostic Check	Primary controller cannot synchronize with backup. In the **Monitoring** tab, double-click the primary **C300** icon to call up its **Parameters** configuration form. Click the **Redundancy** tab to display it and check the Inhibit Sync Reason - RDNINHIBITSYNC parameter for a description for the controller not achieving synchronization. Troubleshoot to correct condition for inhibiting sync.
Cause 1	Redundancy cable bad.
Solution	Replace redundancy cable. Check to see if controllers synchronize.
Cause 2	Controller IOLINKS may be configured for PMIO or Series 8 I/O. IOL cables may be disconnected.
Solution	Reconnect cables to controller IOTA.
Cause 2	Backup controller bad.
Solution	Replace controller module. See Replacing a C300 Controller module and IOTA for details. Check to see if controllers synchronize.
Cause 3	Backup IOTA bad.
Solution	Replace the IOTA. Reinstall the original backup controller module on the new IOTA. See Replacing a C300 Controller module and IOTA for details. Check to see if controllers synchronize.
Cause 4	Primary controller module bad.
Solution	Replace primary controller module. See Replacing a C300 Controller module and IOTA for details. Check to see if controllers synchronize.

Cause 5	Primary IOTA bad.
Solution	Replace primary IOTA. Reinstall the original primary controller module on the new IOTA. See Replacing a C300 Controller module and IOTA for details. Check to see if controllers synchronize.
Cause 6	Software problem.
Solution	Contact Honeywell SSC.

11.3.8 Fatal ECC error

The C300 Controller software has detected a fatal Error Checking and Correction (ECC) condition that can be a multiple-bit error or excessive single-bit errors in the main Random Access Memory (RAM).

Diagnostic Check	• The 4-character display on the controller shows FAIL or mMBE. • In the **Monitoring** tab, the C300 Controller icon turns red.
Cause	The controller software has detected a failure that does not allow operation to continue. There can be many causes for a failure including hardware. Use the Using CTools to capture diagnostic data to capture diagnostic data for the device to determine the possible cause before proceeding. If the error occurs in the backup RAM, a fault is indicated. If the error occurs in main RAM, the module freezes with mMBE on the display.
Solution	Try shorting the reset pads on the IOTA to re-start the controller. If error persists, replace the controller. See Replacing a C300 Controller module and IOTA for details. Check the Trace log for breadcrumbs that occurred prior to the event. See Using CTools to capture diagnostic data for more information. Provide the results of the trace log to Honeywell Solutions Support Center (SSC) for analysis.

11.3.9 Display shows FAIL

The C300 Controller detects failure during system integrity checks, such as Watch Dog Timer (WDT), error detection circuits, Field Programmable Gate Array (FPGA) readback, microprocessor static configuration registers, and Read Only Memory (ROM) checksum.

Diagnostic Check	• The 4-character display on the controller displays FAIL. • In the **Monitoring** tab, the C300 Controller icon turns red.
Cause	The controller software has detected a background diagnostic

	failure that does not allow operation to continue.
Solution	Recycle power to the controller. If error persists, replace the controller. See Replacing a C300 Controller module and IOTA for details. Check the Trace log for breadcrumbs that occurred prior to the event. See Using CTools to capture diagnostic data for more information. Provide the results of the trace log to Honeywell Solutions Support Center (SSC) for analysis.

11.3.10 Isolated (lonely) Node

For a redundant C300 Controller pair, Fault Tolerant Ethernet (FTE) communications with partner and FTE network are lost.

Diagnostic Check	• The Primary controller determines whether or not to initiate a switchover. If the Secondary was known to be in better condition than the Primary at the time of fault determination, then the Primary should fail so the Secondary will switchover. But, the new Secondary (old Primary) still cannot restore FTE communications. • The Secondary controller should reboot once, in an attempt to restore communications. The Primary controller will be able to report the problem in the Secondary. If the Secondary cannot restore FTE communications, it should be able to resynchronize over the redundancy link and be a partially functional backup.
Cause 1	Secondary controller is defective.
Solution	Replace the Secondary controller that initiated switchover when fault was detected. See Replacing a C300 Controller module and IOTA for details. If Secondary controller synchronizes after replacement, the removed controller is defective. Otherwise, go to Cause 2.
Cause 2	Secondary IOTA is defective.
Solution	Replace the Secondary IOTA that initiated switchover when fault was detected. See Replacing a C300 Controller module and IOTA for details. If Secondary controller synchronizes after replacement, the removed IOTA is defective. Otherwise, go to Cause 3.
Cause 3	Primary controller is defective
Solution	Replace the Primary controller. See Replacing a C300 Controller module and IOTA for details.

	If you can command synchronization after replacement, the removed C300 Controller is defective. Otherwise, go to Cause 4.
Cause 4	Primary IOTA is defective.
Solution	Replace the primary IOTA. See Replacing a C300 Controller module and IOTA for details. If the controller pair synchronize after IOTA replacement, The removed IOTA is defective. Other wise, go to Cause 5.
Cause 5	There is a software problem.
Solution	Contact Honeywell Solution Support Center (SSC).

11.3.11 Duplicate Device Index setting

The FTE subsystem detects duplicate Device Index settings in separate nodes.

Diagnostic Check	All nodes will stop tracking cable status for the detected duplicate Device Index value. Communications will continue and will not impact system performance until there is a cable fault. This fault will also be detected by the FTE System Management Tool. A duplicate Device Index could cause a duplicate IP Address. In most cases, the duplicate IP Address would be detected first and prevent the FTE diagnostic messages from being sent.
Cause 1	Device Index switches on separate IOTA's are set to same value.
Solution	Change Device Index switches setting on one of the IOTA's to a unique value. See Reset Device Index and IP address of a controller for more information.

11.3.12 Device Index value is zero upon power up

The controller's 4-character display shows a Device Index value of zero (#000).

Diagnostic Check	Be sure Device Index switches on the IOTA were not intentionally set to zero to initiate a Device Index/IP Address reset.
Cause 1	Device Index switches set to zero.
Solution	Change Device Index switches to correct setting. See Reset Device Index and IP address of a controller for more information.
Cause 2	The controller module is defective
Solution	Replace the controller. See Replacing a C300 Controller module and IOTA for details. If Device Index switch setting matches Device Index number in 4-character display upon controller power up, the removed controller is defective. Otherwise, go to Cause 3.

Cause 3	The IOTA is defective.
Solution	Replace the IOTA. See Replacing a C300 Controller module and IOTA for details. If Device Index switch setting matches Device Index number in 4-character display upon controller power up, the removed IOTA is defective.

11.4 C300 Controller soft failures

Soft failures are indicated on the Soft Failures tab of the C300 block configuration form shown in the following figure and table which describes these soft failure conditions detected by the C300 Controller during background diagnostic checks, when indicator is lit.

Figure 11.1 Soft Failures tab in Control Builder

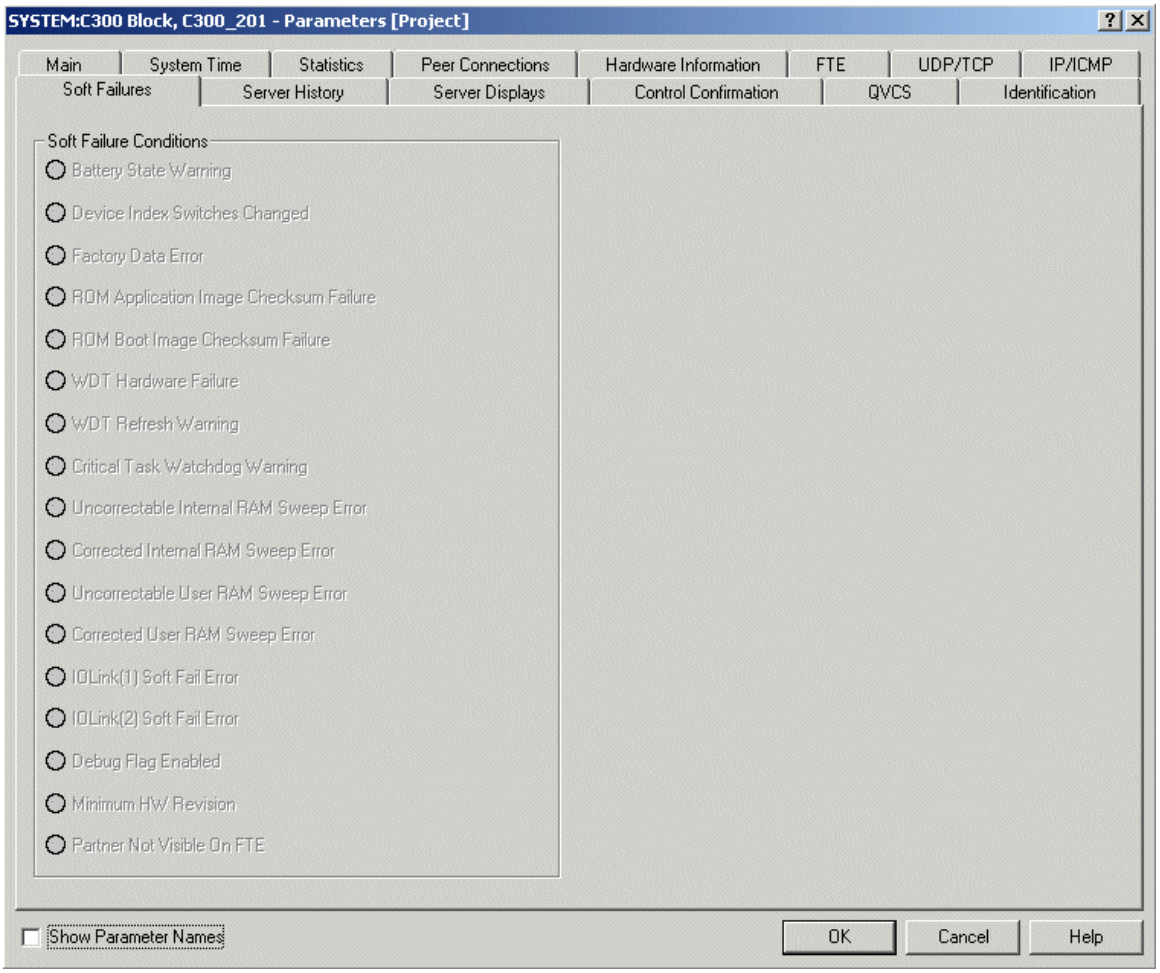


Table 11.1 C300 Controller Soft Failures

Soft Fail Message	Condition when indicator is lit	Corrective Action
Battery State Warning	Indicates that battery voltage for controller RAM retention is not	On the C300 block Main tab:

Soft Fail Message	Condition when indicator is lit	Corrective Action
Note that Battery State is also indicated on the C300 Controller block Main tab.	within specified limits. Controller state may not be maintained through a power down. This would prevent warm start and may require the user to reload control strategies when power is restored.	• If Battery Status = **UNDERVOLTAGE**, then replace battery. • If Battery Status = **OVERVOLTAGE**, make sure that the battery used is of type specified by Honeywell.
Device Index Switches Changed	The Device Index switch changed while the C300 Controller was operating. This condition would place the controller at a different and unexpected IP Address following a subsequent controller restart.	Verify if the Device Index switch setting is correct, reset if necessary. See Reset Device Index and IP address of a controller for procedure If failure still persists, the IOTA may be defective. Replace the IOTA. **CHECK** Reset/reboot will cause module to assume new/incorrect address. If visibly correct, rotate each of them 360deg. If this corrects problem, replace IOTA. Otherwise replace module then IOTA.
Factory Data Error	The Factory Data block corrupted which may cause failure of Boot Image download or Application Image download during a subsequent controller restart.	Replace the controller module and return faulty module to the factory.
ROM Application Image Checksum Failure	The controller Application Image is corrupted which may cause a failure on a subsequent controller restart.	Re-load the C300 Controller Application image. See Upgrading C300 Controller firmware for procedure. If failure still persists, replace the controller module and return faulty module to the factory.
ROM Boot	The C300 Controller Boot Image	For redundant controllers:

Soft Fail Message	Condition when indicator is lit	Corrective Action
Image Checksum Failure	is corrupted which may cause a failure on a subsequent controller restart.	• If primary, command a switchover. • If backup, reboot, reset or remove and reinsert controller module. If module does not fail POST, continue normal operation. Re-load the C300 Controller Boot image. See Upgrading C300 Controller firmware for procedure. If failure still persists, replace the controller module and return faulty module to the factory.
WDT Hardware Failure	The watchdog timer hardware circuit is faulty.	Replace the controller module and return faulty module to the factory.
WDT Refresh Warning	The watchdog timer is being refreshed at a rate which is outside acceptable limits. Or The watchdog timer is being refreshed late, but not late enough for it to expire.	Contact Honeywell SSC. You may be asked to #8230; • Further describe operating conditions • Gather controller logs • Capture and provide the control strategy running in the controller • Replace the controller
Critical Task Watchdog Warning	Indicates that one of a number of key tasks within the controller is executing less frequently than expected. See Critical Task Monitor for more information.	Contact Honeywell SSC. Note that an alarm associated with this soft failure will appear immediately after detection of a timeout on one of these internal tasks. The timeout will place the controller in a **FAIL** state with a fail code of

Soft Fail Message	Condition when indicator is lit	Corrective Action
		0123.
Uncorrectable Internal RAM Sweep Error	Test of the RAM location where the controller's Application Image executes has detected an uncorrectable bit error. Possible hardware failure which may affect controller operation.	Replace the controller module and return faulty module to the factory.
Corrected Internal RAM Sweep Error	Test of the RAM location where the controller's Application Image executes has detected (and corrected) a number of bit errors which have exceeded the acceptable threshold. Possible hardware failure which may affect controller operation.	Replace the controller module and return faulty module to the factory.
Uncorrectable User RAM Sweep Error	Test of the RAM location where the controller's control strategies and states are maintained has detected an uncorrectable bit error. Possible hardware failure which may affect controller operation.	Replace the controller module and return faulty module to the factory.
Corrected User RAM Sweep Error	Test of the RAM location where the controller's control strategies and states are maintained has detected (and corrected) a number of bit errors which have exceeded the acceptable threshold. Possible hardware failure which may affect controller operation.	Replace the controller module and return faulty module to the factory.
IOLink(1) Soft Fail Error	Indicates that the IOLINK 1 interface is in soft fail.	View the Main tab of the configuration form for the IOLINK block for soft failures specific to the IO LINK interface. See IOLINK block soft failures for description and corrective actions.
IOLink(2) Soft Fail Error	Indicates that the IOLINK 2 interface is in soft fail.	View the Main tab of the configuration form for the

Soft Fail Message	Condition when indicator is lit	Corrective Action
		IOLINK block for soft failures specific to the IO LINK interface. See IOLINK block soft failures for description and corrective actions.
Debug Flag Enabled	Indicates that engineering debug firmware is running in the controller. Non-standard behavior and/or performance may occur.	If not running a special image under the direction of HoneywellSSC, re-load the controller with the C300 Controller firmware for the Experion system release that is currently running on the system.
Minimum HW Revision	Indicates that the controller hardware is useable (POST passes) but it must be upgraded for proper operation.	Replace controller module with a module that meets current hardware specifications.
Partner Not Visible On FTE	Indicates that the Fault Tolerant Ethernet (FTE) communications with redundant controller partner and FTE network are lost.	See Isolated (lonely) Node in this section.

11.5 IOLINK block soft failures

Notifications which are generated by the controller identify Soft Failure conditions in the IOLINK interface, when indicator is lit.

Table 11.2 IOLINK Block Soft Failures

Soft Fail Message	Condition when indicator is lit	Corrective Action
Duplicate IOL Address	Indicates a duplicate IOLink address has been detected.	Check the secondary IOLINK and/or IO Modules for proper physical address. In the C300 this is derived from the Module's device Index, one partner having an odd index and the other having an even index.
IOL Channel A Failure	Indicates that Channel A of the IOLink has failed.	1. Check IOLINK cable A from end-to-end for proper connections.

Soft Fail Message	Condition when indicator is lit	Corrective Action
		2. Check the cable connectors at the IOTAs and fix as needed. 3. Refer to the IOLINK Statistics for the error counts to zero in on the suspect link (primary IOLINK, secondary IOLINK, or IOMs) and replace if necessary. 4. Once a problem has been identified and a fix is applied, verify the fix by: a. Reset the error counts through the I/O Link Command "RESET_ERRORS" from the **Main** Tab. b. Re-enable the Periodic Cable Swap diagnostic through the I/O Link Command "ENB_ PERSWAP" from the **Main** Tab c. Monitor the error counts.
IOL Channel B Failure	Indicates that Channel B of the IOLink has failed.	1. Check IOLINK cable B from end-to-end for proper connections. 2. Check the cable connectors at the IOTAs and fix as needed. 3. Refer to the IOLINK Statistics for the error counts to zero in on the culprit (Primary IOLINK, secondary IOLINK, or IOMs) and replace if necessary. 4. Once a problem has been identified and a fix is applied, verify the fix by:

Soft Fail Message	Condition when indicator is lit	Corrective Action
		a. Reset the error counts through the I/O Link Command “RESET_ERRORS” from the Main Tab. b. Re-enable the Periodic Cable Swap diagnostic through the I/O Link Command “ENB_ PERSWAP” from the Main Tab c. Monitor the error counts.
IOL Maximum Errors Exceeded	Shows the I/O link has exceeded the maximum error limit.	See “IOL Channel A Failure” and “IOL Channel B Failure” Soft fail Messages
Not Active Supervisor	Indicates that the IOL interface daughter card could not transition into the active supervisor role.	Generally this is caused by a partner IOLINK with conflicting IOLINK Address (See Duplicate IOL Address).
IOLIM Daughter Card Soft Failure	Indicates that a Daughter Card Soft Failure exists.	
Partner I/F Not Visible On IOL	Shows the Primary IOLINK is unable to view it's redundant partner across the I/O Link.	Call Honeywell SSC.
Partner I/F Mismatch On IOL	Indicates that the Secondary IOLINK Partner is incompatible with the Primary. The software versions may be different.	Applicable only to IOLIM. Check/Replace the IOLINK firmware application version. Call Honeywell SSC.
IOL PROCESSOR UNKNOWN SF	Indicates a Daughter Card soft failure.	Call Honeywell SSC.
IOL PROCESSOR, RESUMPTION OF NON-WAIT	Indicates a Daughter Card soft failure.	Call Honeywell SSC.

Soft Fail Message	Condition when indicator is lit	Corrective Action
TASK		
IOL PROCESSOR, DIAGNOSTIC INITIATION TIMEOUT	Indicates a Daughter Card soft failure.	Call Honeywell SSC.
IOL PROCESSOR, DIAGNOSTIC CYCLE OVERFLOW	Indicates a Daughter Card soft failure.	Call Honeywell SSC.
IOL PROCESSOR STACK LIMIT OVERFLOW	Indicates a Daughter Card soft failure.	Call Honeywell SSC.
IOL Process Data Cycle Overruns	Indicates that PV scanning from the IOM or IOMs was not completed within the IOM scan rate timeframe.	Reduce the IOM's scan rate or the execution period of the Control Modules containing connections to IO Channels.
UM51 Diagnostic Exceeded Time Threshold	The time allotted for the incremental internal diagnostic has been exceeded.	Call Honeywell SSC.
UM51 Diagnostic Overrun	The time allotted for the internal diagnostic to complete has been exceeded.	Call Honeywell SSC.
25 - IOL (UM51) Interrupt Circuit Failure	Interrupt diagnostic failure occurs due to a fault on the IOLINK. Therefore, the C300 redundant system experiences continuous switchovers.	1. Check the IOLINK cables A and B from end-to-end for proper connections. 2. Perform the following steps if it is a PMIO IOLINK. a. Check Surge Protection Circuit connection to the IOLINK cable and to 24V Power supply. b. Ensure that the Surge

Soft Fail Message	Condition when indicator is lit	Corrective Action
		Protection Circuit screw is properly tightened. 3. Ensure that the proper grounding is made for the IOLINK. 4. Call Honeywell SSC only when these steps have not resolved the problem.

11.6 Additional status and fault messages

- Redundancy-related notifications
- OPM-related notifications - RDNOPMSTATUS parameter

11.6.1 Redundancy-related notifications

Messages generated by the controller related to redundancy status and redundancy faults are listed in the Redundancy section in Redundancy Related Notifications table.

11.6.2 OPM-related notifications - RDNOPMSTATUS parameter

Status and Fault messages generated by the controller during the firmware migration process of the controller are listed in OPM Related Notifications table.

11.7 Online diagnostics

Hardware diagnostics are executed within the controller during normal operations. Some diagnostics execute frequently, but all diagnostics are designed to complete within eight hours (the Diagnostic Test Interval). Once the controller's Power-On Self Test and startup routines are completed successfully, these diagnostics execute to detect any of an array of faults that might cause degradation in controller operation.

When a fault is detected by the controller, it identifies and reports the fault to the system and acts to maintain control and view through a switchover, if required (in the case of synchronized redundant controller pairs). Various actions are taken by the controller depending upon the severity or type of fault (Fault classification). Even though some of these detected faults do not cause a failure or an action (such as a switchover) by the controller, the faults are reported to alert operators of a potential failure in the future if not corrected.

11.8 Fault classifications

Faults have been classified into a number of categories according to the severity of the failure. The controller behavior when a failure is detected is determined by type of fault and whether the controller is non-redundant, or is one of a redundant controller pair. The following table identifies these fault classifications and describes controller behavior in response to the fault type.

This section also includes more detailed descriptions of these fault classifications, how these faults are indicated both on the controller faceplate and through other system displays and corrective actions to clear the faults.

Table 11.3 C300 Fault Classifications and Possible Causes

Fault Classification	Description
Hard Failure	Hardware detected failure. Operation cannot continue. If software is running, the affected controller is rebooted into the FAIL State. • Hard failure on a synchronized primary controller triggers a switchover to the backup controller. • Hard failure on a backup controller causes a loss-of-synchronization (and reduced availability until fault is corrected). • Hard failure on a non-redundant controller causes a loss-of-control and loss-of-view.
Severe Failure	Software detected failure. Operation cannot continue. The affected controller is rebooted into the FAIL State. • Severe failure on a synchronized primary controller triggers a switchover to the backup controller. • Severe failure on a backup controller causes a loss-of-synchronization (and reduced availability until fault is corrected). • Severe failure on a non-redundant controller causes a loss-of-control and loss-of-view.
Partial Failure	Software detected failure. Non-redundant controller could continue to operate. • Partial failure on a non-redundant controller results in some or all loss-of-view and/or loss-of-control. However, the controller does not reboot into FAIL State but continues to provide whatever services it can.
Soft Failure	Software detected failure. Controller continues to operate with full control and full view. Soft failures are alarmed to the operator. FTE is monitored by the FTE System Management Tool. • Soft failure on the synchronized primary controller does *not* trigger a switchover to the backup controller. • Soft failure on the backup controller does *not* result in a loss-of-synchronization. • Soft failure on a non-redundant controller does *not* result in loss-of-control or loss-of-view.
Installation/Startup Failure	Software detected failure. Controller may not become operational.

Fault Classification	Description
	• Installation/Startup failure on a non-redundant controller results in the inability to commence control or view the controller on the network. • Installation/Startup failure on the backup controller results in the inability to complete initial synchronization or view the controller on the network. • Installation/Startup failure does not apply to the synchronized primary controller, because installation & startup must be successful to reach a synchronized primary state.
Communications Failure	Communication errors between peer controllers, nodes and/or I/O devices- including FTEB, do not cause any controller state change.

- Hard/Severe Failures
- Soft Failures
- Installation-Startup Failures
- Hardware Watchdog Timer Expired
- Communications Failure

11.8.1 Hard/Severe Failures

When a hard failure is detected, the following controller events occur depending on its redundancy status:

- Hard/Severe failure on a synchronized primary controller triggers a switchover to the backup controller. The I/O modules associated with the controller force their outputs to safe values. If capable, the failed controller reboots into the FAIL state and captures diagnostic data which may contain internal state events that occurred prior to a failure. The Ctools utility can be used to retrieve the diagnostic data.
- Hard/Severe failure on a backup controller causes a loss-of-synchronization. The Primary controller continues operation, but enters the 'Not synchronized' state. If the redundant controller pair was not synchronized when the fault occurred, then the failed controller reboots into the FAIL state, if capable. No further synchronization will occur and no switchover will occur.
- Hard/Severe failure on a non-redundant controller causes a loss-of-control and loss-of-view. The I/O modules associated with the controller force their outputs to safe values. If capable, the failed controller reboots into the FAIL state and captures diagnostic data which may contain internal state events that occurred prior to a failure. The CTools utility can be used to retrieve the diagnostic data.

Alarm display and function block detail display

Usually a hard or severe failure results in a communication failure. Calling up the Alarm Detail Display in Station or the Controller Block Detail Display will show this failure.

Control Builder indications and error log

Using Control Builder, you can view the current state of controllers in the system. In the Control Builder monitor tab, a hard failure in the controller is denoted by a red controller icon indicating no communication. See Control Builder block icon descriptions for a complete listing of the C300 Controller icons that may appear in Control Builder.

The Errlog_n.txt log provides a running list of Control Builder detected errors in chronological order. The n represents any number that is assigned to the most recent log.

To check the log, navigate to this file location on the server: C:\Documents and Settings\All Users\Application Data\Honeywell\Experion\Errlog_n.txt.

11.8.2 Soft Failures

Soft Failures are detected also through execution of the Controller's Online diagnostics. Soft failures do not cause change in the state of the controller's execution environments (CEEC300 or IOLINK blocks). There is no loss of control or loss of view when a controller detects a soft failure.

In a redundant controller pair, a soft failure in a synchronized primary controller does not cause a switchover to the backup controller. A soft failure in the backup controller does not result in a loss of synchronization, if the redundant controller pair is synchronized.

Alarm displays and Control Builder forms

Soft failures are reported in the Alarm Summary and the C300 Controller Function Block Detail displays in Station. In Control Builder, soft failure status is indicated on:

- The Main tab of the configuration form for the associated C300 Controller block (Soft Failures Present).
- The C300 Controller soft failures of the controller block configuration form includes a list of the possible soft failure conditions as shown in Figure 1. (A listing of the Soft Failures with descriptions and corrective action is in Table 1.) An indicator next to each condition shows when the soft failure condition is present.
- The Control Builder monitor tab, soft failure in the controller is denoted by a controller icon with a small red circle with an ‘x’ inside the circle.

Soft Failure alarm return to normal

The alarm will return to normal once the on-line diagnostics detect that the soft failure condition has been corrected. Note that on-line diagnostics run on a cycle and hence it may take a period of time for the controller to perform the subsequent diagnostic check for the condition, notice the change and then record it.

In some cases, online diagnostics may continue to assert the soft failure condition even when it appears to have been corrected. This may happen when one occurrence of the soft failure is considered sufficient to require action that requires replacement of hardware. When the controller hardware is replaced, the alarm will return to normal once the C300 Controller function block is deleted and reloaded.

11.8.3 Installation-Startup Failures

A fault that is detected during the C300 Controller's startup or Power-On Self Test (POST) may prevent the controller from entering an operational state. The C300 Controller module executes a boot program and POST automatically when power is applied to the controller module. These tests, verify the presence and integrity of the controller module hardware. See C300 Controller start up for more details on startup and POST. See also Communications and system time faults during startup for details on abnormal startup conditions and corrective actions to clear them.

If a fault is detected during POST, the controller halts and shows the number of the test that the controller was performing when it detected the fault on the faceplate display, (Tnnn). Reset the controller by shorting the two RESET contacts on the controller IOTA. If the fault persists, replace the controller module since a hardware failure is indicated. See Replacing a C300 Controller module and IOTA for details.

A redundant controller that fails during startup or POST will not begin control or join the FTE network. A backup controller that fails during startup or POST will not complete initial synchronization with its primary or join the FTE network.

11.8.4 Hardware Watchdog Timer Expired

The watchdog timer in the controller employs an independent hardware circuit to ensure that the controller and its connected I/O devices are brought to a safe state in case the controller software becomes corrupted or stops executing. If a fault arises in the hardware watchdog timer circuit, the controller would not be protected from corrupt software execution. Therefore, a run-time diagnostic check verifies the watchdog timer hardware integrity. If a fault is detected in the watchdog timer hardware circuit, a C300 Controller soft failures condition occurs. See Hardware Watchdog Timer for more information.

The failed controller module does not contain any diagnostic data, although the redundant partner module may contain some useful information.

11.8.5 Communications Failure

The System Management Display software application provides the means to configure and monitor FTE nodes in Experion. The FTE Status Server and FTE Auxiliary display includes detailed information on FTE links monitored by the FTE Provider. See the *Fault Tolerant Ethernet Status Display User's Guide* for more details.

11.9 Communications and system time faults during startup

The tables in this section help to provide guidance for determining the cause of abnormal startup conditions in the C300 Controller. These conditions may occur when the controller...

- Cannot establish normal communication on the FTE network
- Cannot obtain its network address from the system's BootP server
- Cannot obtain system time from the time source configured for the domain in which it resides,
- Finds that CDA services are not available.

Various indications on the controller's faceplate display or the state of the Control Builder icon that represents the C300 Controller (if the controller had been loaded previously) are described that point to a abnormal condition.

There are six tables that detail the abnormal conditions for both redundant and non-redundant controller configurations and whether or not the controller memory has been retained via battery backup.

Corrective actions for resolving these conditions are found below the tables, (see Secondary C300 Controller with Memory Retention).

- Non-redundant C300 Controller with no Memory Retention
- Non-redundant C300 Controller with Memory Retention
- Redundant Primary C300 Controller with no Memory Retention
- Redundant Primary C300 Controller with Memory Retention

- Secondary C300 Controller with no Memory Retention
- Secondary C300 Controller with Memory Retention

11.9.1 Non-redundant C300 Controller with no Memory Retention

Controller Faceplate		Problem	C300 Block Time Source	Station Alarm	Resolve
Status LED	Blinking Red	No communication on FTE network Controller does not complete startup.	Internal	C300 OFFNET	Secondary C300 Controller with Memory Retention
FTE LEDs	Off				
Display	COMM				
CB icon	Red				
Status LED	Blinking Red -> Blinking Green	Communication on FTE network • No Communication via CDA • Unable to establish connection to system time source	Internal	CDA comm Lost Connection	Secondary C300 Controller with Memory Retention
FTE LEDs	Blinking Green				
Display	TS for 3 min. then -> NODB				
CB icon	Grey				
Status LED	Blinking Red -> Blinking Green	Communication on FTE network • Communication via CDA • Unable to establish connection to system time	CDA	C300 Not Synchronized	Secondary C300 Controller with Memory Retention

Controller Faceplate		Problem	C300 Block Time Source	Station Alarm	Resolve
		source			
FTE LEDs	Blinking Green				
Display	TS for 1 min. then -> NODB				
CB icon	Red				
Status LED	Blinking Green	Communication on FTE network • No communication via CDA • Established connection to system time source C300 appears to startup normally but Control Builder cannot communicate with the C300 Controller ...so attempts to load or reload C300 fail. If C300 was loaded before a power cycle, its associated icons in the Monitor tab will be Red.	SNTP	CDA comm Lost Connection	Secondary C300 Controller with Memory Retention
FTE LEDs	Blinking Green				
Display	NODB				

Controller Faceplate		Problem	C300 Block Time Source	Station Alarm	Resolve
CB icon	Grey				
Status LED	Blinking Green	None. Normal operation for non-redundant controller with no battery backup following a power cycle.	SNTP	C300 Not Synchronized	None.
FTE LEDs	Blinking Green				
Display	NODB				
CB icon	Yellow				

11.9.2 Non-redundant C300 Controller with Memory Retention

Controller Faceplate		Problem	C300 Block Time Source	Station Alarm	Resolve
Status LED	Blinking Red -> Green	No communication on FTE network.	Internal	C300 OFFNET	Secondary C300 Controller with Memory Retention
FTE LEDs	Off				
Display	BP for 2 min. TS for 3 min. then IDLE				
CB icon	Red				
Status LED	Blinking Red -> Green	Communication on FTE network.	Internal	CDA Comm Lost Connection	Secondary C300 Controller

Controller Faceplate		Problem	C300 Block Time Source	Station Alarm	Resolve
		• No communication via CDA • Unable to establish connection to system time source			with Memory Retention
FTE LEDs	Blinking Green				
Display	TS for 3 min. then -> IDLE				
CB icon	Grey				
Status LED	Blinking Red -> Green	Communication on FTE network • Communication via CDA • Unable to establish connection to system time source	CDA	Not Using Configured Timesource	Secondary C300 Controller with Memory Retention
FTE LEDs	Blinking Green				
Display	TS for 1 min. then -> IDLE				
CB icon	Red -> Blue				
Status LED	Green	Communication on FTE network • No communication via CDA • Established connection to system time source	SNTP	CDA Comm Lost Connection	Secondary C300 Controller with Memory Retention

Controller Faceplate		Problem	C300 Block Time Source	Station Alarm	Resolve
FTE LEDs	Blinking Green				
Display	IDLE				
CB icon	Grey				
Status LED	Green	None. Normal operation for non-redundant controller with battery backup following a power cycle.	SNTP	None	None.
FTE LEDs	Blinking Green				
Display	IDLE				
CB icon	Blue				

11.9.3 Redundant Primary C300 Controller with no Memory Retention

Controller Faceplate		Problem	C300 Block Time Source	Station Alarm	Resolve
Status LED	Blinking Red	No communication on FTE network Controller does not complete startup.	None	• C300 OFFNET When FTE and CDA communication is established: • C300 Not Synchronized • Battery Undervoltage	Secondary C300 Controller with Memory Retention
FTE LEDs	Off				

Controller Faceplate		Problem	C300 Block Time Source	Station Alarm	Resolve
Display	COMM				
CB icon	Red				
Status LED	Blinking Red -> Blinking Green	Communication on FTE network • No Communication via CDA • Unable to establish connection to system time source	None	C300 OFFNET When FTE and CDA communication is established: • C300 Not Synchronized • Battery Undervoltage	Secondary C300 Controller with Memory Retention
FTE LEDs	Blinking Green				
Display	TS for 3 min. then -> NODB				
CB icon	Grey				
Status LED	Blinking Red -> Blinking Green	Communication on FTE network • Communication via CDA • Unable to establish connection to system time source	CDA	C300 Not Synchronized	Secondary C300 Controller with Memory Retention
FTE LEDs	Blinking Green				
Display	TS for 1 min.				

Controller Faceplate		Problem	C300 Block Time Source	Station Alarm	Resolve
	then -> NODB				
CB icon	Red				
Status LED	Blinking Green	Communication on FTE network • No communication via CDA • Established connection to system time source C300 appears to startup normally but Control Builder cannot communicate with the C300 Controller ...so attempts to load or reload C300 fail. If C300 was loaded before a power cycle, its associated icons in the Monitor tab will be Red.	SNTP	CDA comm Lost Connection C300 Not Synchronized	Secondary C300 Controller with Memory Retention
FTE LEDs	Blinking Green				
Display	NODB				
CB icon	Grey				
Status LED	Blinking Green	None. Normal operation for redundant primary controller with no battery backup following a power	SNTP	C300 Not Synchronized	None.

Controller Faceplate		Problem	C300 Block Time Source	Station Alarm	Resolve
		cycle.			
FTE LEDs	Blinking Green				
Display	NODB				
CB icon	Yellow				

11.9.4 Redundant Primary C300 Controller with Memory Retention

Controller Faceplate		Problem	C300 Block Time Source	Station Alarm	Resolve
Status LED	Blinking Red	No communication on FTE network.	None	C300 OFFNET	Secondary C300 Controller with Memory Retention
FTE LEDs	Off				
Display	BP for 2 min. COMM for 1 min. TS for 3 min. then IDLE				
CB icon	Red				
Status LED	Blinking Orange	Communication on FTE network. • No communication via CDA • Unable to establish	None	CDA Comm Lost Connection	Secondary C300 Controller with Memory Retention

Controller Faceplate		Problem	C300 Block Time Source	Station Alarm	Resolve
		connection to system time source C300 transitions to secondary redundancy role assuming its partner has CDA available.			
FTE LEDs	Blinking Green				
Display	BKUP				
CB icon	Grey				
Status LED	Blinking Red -> Green	Communication on FTE network • Communication via CDA • Unable to establish connection to system time source	CDA	Not Using Configured Timesource	Secondary C300 Controller with Memory Retention
FTE LEDs	Blinking Green				
Display	TS for 1 min. then -> IDLE				
CB icon	Red				
Status LED	Blinking Orange -> Orange	Communication on FTE network • No communication	SNTP	CDA Comm Lost Connection	Secondary C300 Controller with Memory

Controller Faceplate		Problem	C300 Block Time Source	Station Alarm	Resolve
		via CDA • Established connection to system time source C300 transitions to secondary redundancy role assuming its partner has CDA available.			Retention
FTE LEDs	Blinking Green				
Display	BKUP				
CB icon	Grey				
Status LED	Green	None. Normal operation for redundant controller with battery backup following a power cycle.	SNTP	None	None.
FTE LEDs	Blinking Green				
Display	IDLE				
CB icon	Blue				

11.9.5 Secondary C300 Controller with no Memory Retention

Controller Faceplate		Problem	C300 Block Time Source	Station Alarm	Resolve
Status LED	Blinking Red	No communication on FTE network.	None	None	Secondary C300 Controller

Controller Faceplate		Problem	C300 Block Time Source	Station Alarm	Resolve
					with Memory Retention
FTE LEDs	Off				
Display	COMM				
CB icon	Red				
Status LED	Blinking Orange	Communication on FTE network. • No communication via CDA • Unable to establish connection to system time source	None	None	Secondary C300 Controller with Memory Retention
FTE LEDs	Blinking Green				
Display	BKUP				
CB icon	Grey				
Status LED	Blinking Orange	Communication on FTE network • Communication via CDA • Unable to establish connection to system time source	CDA	C300 Not Synchronized	Secondary C300 Controller with Memory Retention
FTE LEDs	Blinking Green				

Controller Faceplate		Problem	C300 Block Time Source	Station Alarm	Resolve
Display	BKUP				
CB icon	Red -> Blue				
Status LED	Blinking Orange	Communication on FTE network • No communication via CDA • Established connection to system time source	SNTP	• CDA comm Lost Connection • C300 Not Synchronized	Secondary C300 Controller with Memory Retention
FTE LEDs	Blinking Green				
Display	BKUP				
CB icon	Grey				
Status LED	Blinking Orange	None. Normal operation for redundant secondary controller with no battery backup following a power cycle.	SNTP	C300 Not Synchronized	None.
FTE LEDs	Blinking Green				
Display	BKUP				
CB icon	Yellow				

11.9.6 Secondary C300 Controller with Memory Retention

Controller Faceplate		Problem	C300 Block Time Source	Station Alarm	Resolve
Status LED	Blinking Red	No communication on FTE network. Controller does not complete startup.	None	None	Secondary C300 Controller with Memory Retention
FTE LEDs	Off				
Display	COMM				
CB icon	Red				
Status LED	Blinking Red	Communication on FTE network. • No communication via CDA • Unable to establish connection to system time source C300 transitions to primary redundancy role on command of its partner with the possibility that it has a CDA connection.	None	None	Secondary C300 Controller with Memory Retention
FTE LEDs	Blinking Green				
Display	TS -> IDLE				
CB icon	Grey				
Status LED	Blinking Orange -> Orange	Communication on FTE network • Communication via CDA	CDA	None	Secondary C300 Controller with Memory

Controller Faceplate		Problem	C300 Block Time Source	Station Alarm	Resolve
		• Unable to establish connection to system time source C300 assumes secondary redundancy role.			Retention
FTE LEDs	Blinking Green				
Display	BKUP				
CB icon	Yellow				
Status LED	Green	Communication on FTE network • No communication via CDA • Established connection to system time source C300 transitions to primary redundancy role on command of its partner with the possibility that it has a CDA connection.	SNTP	• CDA comm Lost Connection	Secondary C300 Controller with Memory Retention
FTE LEDs	Blinking Green				
Display	IDLE				
CB icon	Grey				
Status LED	Blinking Orange -> Orange	None. Normal operation for redundant secondary controller with battery backup following a power cycle.	SNTP	None	None.

Controller Faceplate		Problem	C300 Block Time Source	Station Alarm	Resolve
		C300 assumes secondary redundancy role.			
FTE LEDs	Blinking Green				
Display	BKUP				
CB icon	Yellow				

NOTES:

Note 1: Perform the following quick checks:

Are the FTE cables properly connected to the C300 Controller's IOTA and the associated CF-9 switches?

- Are the FTE cables intact?
- Are the connected CF-9 switches powered?
- Is the CF-9 switch firmware up-to-date?
- Are the CF-9 switches properly configured?

If the problem is not identified with these checks, please consult FTE Troubleshooting information and/or contact Honeywell TAC.

Note 2: Perform the following quick checks:

- Was **-BP-** displayed for a prolonged period of time during startup?

  If so, check to make sure that ...
  - The server node on which the Honeywell BootP server is installed, is powered and running.
  - The Honeywell BootP server is running on the node on which it is installed.
- Are the server nodes turned on and properly connected to the network on which the C300 Controller resides?
- Are CDA and system services running on the designated nodes?

Note 3: Perform the following quick checks:

- Is the timeserver node powered and running?

- Is the time service running on the node on which it is installed?
- Is the “SNTP Server IP Address” properly configured?
    - Check the value configured in Control Builder **=> System Preferences => FTE**
    - Compare this to the value found on the C300 Controller FB Form à System Time Tab when opened from the Monitor Tab in Control Builder or the System Time Tab of the C300 Controller FB Detail Display.
- Re-run ntpsetup.exe to ensure that the NTP time source is properly configured.

Note 4: Perform the following quick checks:

- Is the Experion node running CDA Server powered and running?
- Is the CDA service running on the node on which it is installed

11.10 Gathering information for reporting problems to Honeywell

When a controller failure occurs, you should gather information about the controller and the conditions under which it failed. This information will be beneficial to Honeywell Solution Support Center (SSC) to help in diagnosing and correcting the fault and/or replacing the controller hardware.

Use this list to obtain information from the controller and the system so that when you contact Honeywell SSC a complete description of the problem can be made.

- Use the CTools utility to retrieve internal controller state information to aid technical personnel in diagnosing the failure. See Using CTools to capture diagnostic data for the steps to retrieve problem report data for a failed controller.
- Note the four-digit fail code shown on the controller's faceplate display.
- Remove and replace the failed controller. See Replacing a C300 Controller module and IOTA for details.
- Install the failed controller in a safe off-process location and start it up.

Obtain the following:

- Hardware revision number of the controller
- Firmware revision, both the Boot image and Application image
- The ExperionSystem Release number in which the controller was operating

Additional information regarding the operating conditions of the controller and sequence of events:

- Was the controller operating in a redundant or non-redundant hardware configuration?
- What was the redundancy state of the controller at the time of the failure, if redundant?
- How many IOLinks did the controller support: 0, 1, or 2?
- What I/O families were associated with the Series 8 controller

- If I/O was supported, were there any status indications given on the IOMs?
- Any other status or fail indications on the controller's faceplate observed at the time of the failure or following the event?
- What were the Control Builder Monitor view indications at the time of the failure or following the event?
- What did the Alarm Status summary show for the time interval around the event?
- Provide a detailed summary of the sequence of events leading up to the failure.
- What operations preceded the event, such as: load, activate, change parameter, delete, power cycle, synchronization, switchover, etc.?

11.11 Getting further assistance

- Other troubleshooting sources
- Guidelines for requesting support

11.11.1 Other troubleshooting sources

The following table lists other documents and sections that contain troubleshooting information for other Experion subsystems.

All of these documents are available in the PDF collection. Some documents are also supplied as part of Station Help. For documents that can be accessed directly from this page, click on the link, otherwise look for the document within PDF collection.

Document/Section	Comments
Experion R300 > Reference	There is a separate interface reference for each type of controller other than the Process Controller; for example, the *ASEA Interface Reference*. Most of these references contain an interface-specific troubleshooting section.
Experion R300 > Reference > TPS Integration Guide > Troubleshooting	Troubleshooting an integrated system that uses Experion “TPS Integration” option.
Experion R300 > Reference > Control Builder Error Codes Reference	Describes error codes generated from within Control Builder.
Experion R300 > Troubleshooting and Maintenance > Control Hardware Troubleshooting and Maintenance Guide	The main repository for troubleshooting, maintenance and repair of Process Controllers.
Experion R300 > Configuration > DeviceNet Interface Implementation Guide > Troubleshooting DeviceNet Status Failures	Describes error codes generated from DeviceNet Interface Board.
Experion R300 > Configuration > Fault	Troubleshooting FTE bridges.

Document/Section	Comments
Tolerant Ethernet Bridge User's Guide > Service > Troubleshooting	
Experion R300 > Installation and Upgrades > Fault Tolerant Ethernet Installation and Service Guide > Troubleshooting FTE Nodes	Troubleshooting FTE nodes.
Experion R300 > Reference > Honeywell TDC 3000 Data Hiway Interface Reference > TDC error codes and Troubleshooting	Troubleshooting TDC 3000 Hiway problems.
Experion R300 > Configuration > Qualification and Version Control System User Guide > QVCS Troubleshooting	Troubleshooting QVCS.
Experion R300 > Configuration > SafeView User's Guide > Appendix D - SafeView Error Messages	Describes the meaning of SafeView configuration errors.
Experion R300 > Reference > Server Scripting Reference > Server scripting error messages	Describes the meaning of error messages in the server log specific to server scripting.
Experion R300 > Configuration > System Management Configuration Guide > Troubleshooting System Management	Describes the meaning of System Management Configuration errors.
Experion R300 > Configuration > System Management Configuration Guide > System Event Server > Troubleshooting SES configuration	Describes the meaning of SES Configuration errors.
Experion R300 > Configuration > System Management Configuration Guide > System Performance Server > Troubleshooting SPS configuration	Describes the meaning of SPS Configuration errors.
Experion R300 > Planning and Design > Planning, Installation, and Service for WS360	Troubleshooting workstation nodes used in Experion and TPN.

11.11.2 Guidelines for requesting support

If you cannot resolve a problem by using this guide, you can request support from your Honeywell Solutions Support Center. When requesting support, please supply as many relevant details about the problem by referring to Gathering information for reporting problems to Honeywell to obtain the problem-related information.

CHAPTER

12

GLOSSARY OF ACRONYMS

This section contains a collection of special terms and acronyms used in this guide.

12.1 *AI*

Analog Input

12.2 *AI_HART*

High Level Analog Input with HART

12.3 *AO*

Analog Output

12.4 *AO_HART*

Analog Output with HART

12.5 *CB*

Control Builder

12.6 *CEE*

Control Execution Environment

12.7 *CM*

Control Module

12.8 *Control Builder*

The control building software, running on a Windows operating system, that provides an environment to build control strategies using function blocks for the Honeywell Control Processor. It includes the Function Block Builder, SCM Builder, Function Block Symbols, SCM Symbols and Configuration Forms, SCM Blocks and Configuration Forms, Function Block

Faceplate, and the Data Entry Mechanism.

12.9 *Control Execution Environment*

The Control Execution Environment supports execution of a set of function blocks for solving control applications. It runs in the hybrid controller as a software layer built on top of the control software infrastructure.

12.10 Level1 Switch

The 9-Port Switch that controls Ethernet communications and provides FTE connections to the C300 controller domain. It rejects Ethernet messages that are not needed for control.

12.11 *Control Module Function Block*

A container block within the Control Builder that serves as an encapsulation of basic function blocks.

12.12 *C300-50ms Controller*

The Series 8 form factor controller that has base period as 50ms to execute Experion control strategies. It communicates with the Input/Output (I/O) modules and peer devices through the FTE network and the connected C300 I/O link on its I/O termination assembly (IOTA).

12.13 *DCS*

Distributed Control System

12.14 *DI*

Digital Input

12.15 *DI-24V*

Low Voltage Digital Input (24 volts DC)

12.16 *DI-24B*

Bussed Low Voltage Digital Output (24 volts DC)

12.17 *DI-HV*

High Voltage Digital Input (IOM supports both 120 and 240 volts AC)

12.18 *DO*

Digital Output

12.19 *ENHGENLIN block*

Enhanced General Linearization block

12.20 *ERDB*

Engineering Repository Database

12.21 *Fault Tolerant Ethernet (FTE) Supervisory Network Support*

The default communication medium for the Series C form factor components.

12.22 *Function Block (FB)*

An executable software object that performs a specific task, such as measurement or control, with inputs and outputs that connect to other entities in a standard way. They can be connected and grouped together to construct simple or complex control strategies.

12.23 *IOTA*

Input Output Termination Assembly

12.24 *I/O or IO*

Input/Output

12.25 *IOM*

The I/O modules provide the terminals and processing power to accept input signals from transmitters, thermocouples, and so on and send output signals to valves, motors, and so on. A variety of I/O modules are available for analog inputs/outputs and digital inputs/outputs.

12.26 *IOLINK*

Input/Output Link

12.27 *LVDT*

Linear Variable Differential Transformer

12.28 *MODBUS TCP*

Modbus is a serial communications protocol.

12.29 *OP*

Output value

12.30 *OPC*

Object-Linking and Embedding (OLE) for Process Control

12.31 *OPM*

On-Process Migration

12.32 *PCDI*

Experion Peer Control Data Interface

12.33 *PID*

Proportional-integral-derivative

12.34 *PV*

Process Value

12.35 Resolver

12.36 *RTN*

Return

12.37 *RVDT*

Rotary Variable Differential Transformer

12.38 *SP*

Set Point

12.39 *TCP*

Transmission Control Protocol

12.40 *TCS*

Turbine Control Solution

12.41 Turbine flow meters

Notices

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