Experion PKS®

CEE-based Controller

Specifications and Technical Data

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Version 1.0

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Experion PKS® CEE-based Controller Specifications and Technical Data

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Revision Status

Revision	Date	Description
Ver 0.1	October 2003	Preliminary Release for R200
Ver 0.2	November 2003	Updated On-Process Migration section
Ver 1.0	December 2003	Updated for final version

Revision Description

Section	Change	Description
Throughout	M	Minor edits
ACE Node	A	Information on AFDSIO

Legend for Change column:
A -- Added
D -- Deleted
M -- Modified

Introduction

Experion PKS
The Next Generation Process Knowledge System

Experion PKS® embeds three decades of Honeywell process control, asset management, and domain expertise, combined with Six Sigma methodologies, into a unified Process Knowledge System architecture. Experion PKS optimizes work processes, improves routine maintenance efficiencies, and releases personnel from manual processes. Capturing and managing untapped process knowledge in a single Process Knowledge Solution™, Experion PKS delivers process and control data using innovative technologies that are only offered by Honeywell. These technologies fully integrate with existing Honeywell systems, including TPS, TDC2000®, TDC3000®, **TotalPlant®** Alcont, FSC, and the PlantScape® system.

Process Knowledge – Beyond Distributed Control

Experion PKS Process Knowledge capabilities expand the role of distributed control, addressing all of manufacturing's critical business objectives to facilitate knowledge sharing and workflow management. The result is improved operating profit, capital cost and cash flow. Delivering a robust, scalable, plant-wide system, Experion PKS connects your operations staff with the latest automation technology as well as with each other. Built on a rock-solid foundation of process control and safety system know-how, this next-generation system provides unprecedented connectivity through all levels of process and business operations. This is a truly collaborative production and safety management solution.

In addition to embedding Distributed Control System (DCS) technologies, Experion PKS integrates powerful knowledge-driven decision support and diagnostic tools, providing information where and when it is needed. This revolutionary system approach unifies business, process, safety, and asset management to:

- Facilitate knowledge capture
- Promote knowledge sharing
- Optimize work processes
- Accelerate improvement and innovation

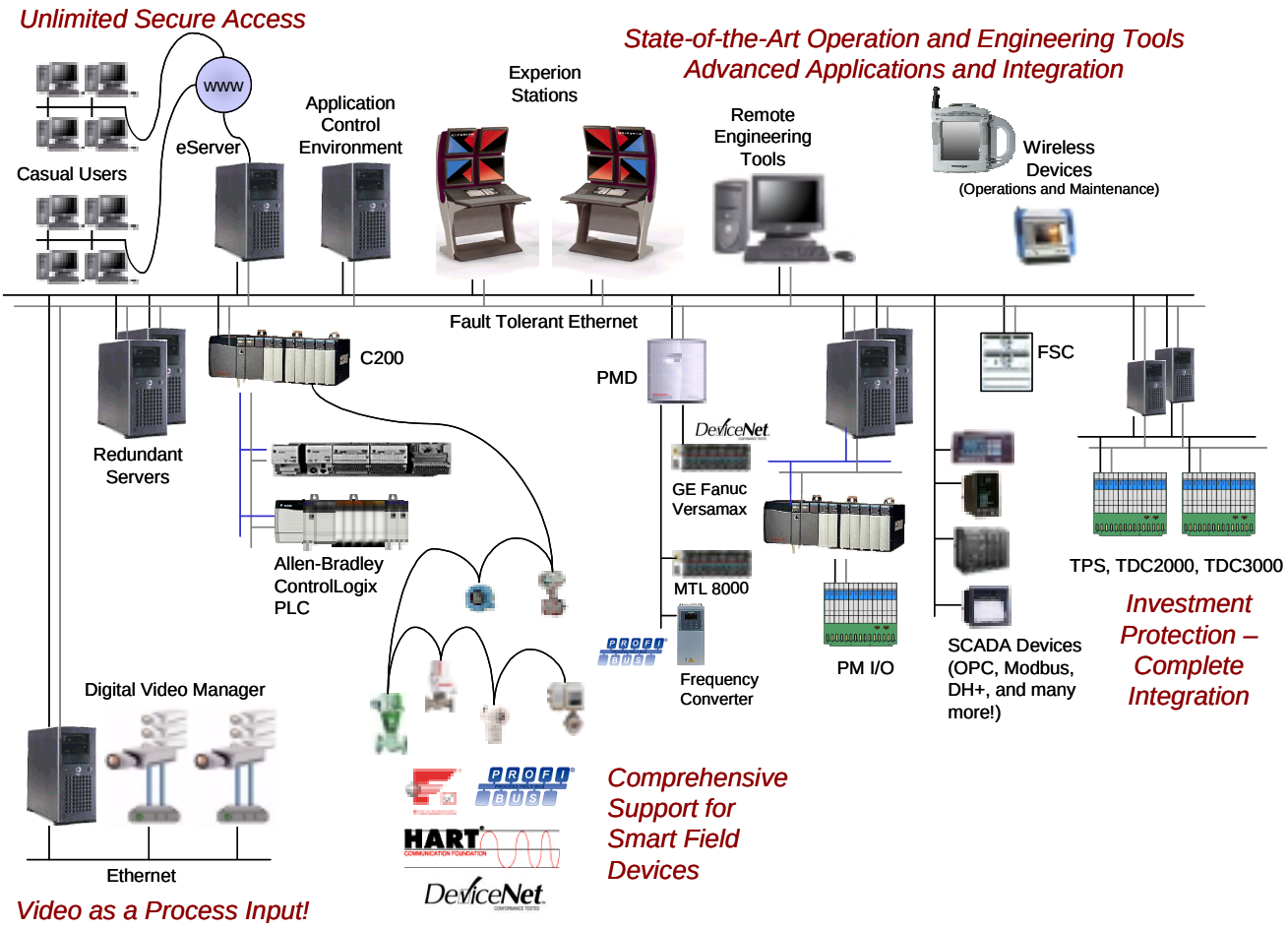
Unified, Collaborative Architecture

Experion PKS is a unified, collaborative architecture with state-of-the-art DCS capabilities that encompass Abnormal Situation Management® (ASM®), Safety Management, and Information Management technologies. Experion PKS interfaces with FOUNDATION* Fieldbus, Profibus, DeviceNet, LON, ControlNet and Interbus. Robustness, security, compliance, control, safety, and reliability are plant-wide, penetrating all layers of the architecture to provide the only available high-performance, plant-wide infrastructure. Experion PKS' distributed control features include a complete continuous, logic, sequential, and drive object-oriented control environment hosted on fully redundant controllers.

By unifying the plant-wide architecture, Experion PKS allows you to make the right product at the right time, optimize and automate, increase workforce effectiveness, and increase availability of resources while reducing incidents. Rather than taking the narrow instrument-centric approach that informs you only when there is a need to replace a valve or perform maintenance, Experion PKS establishes a broad, process-centric view of your plant operations by focusing on the impact to operational objectives, not only the replacement of devices. This is the key to optimizing performance. Combining DCS functionality and a plant-wide infrastructure, the Experion PKS unified architecture provides collaborative production management solutions for Knowledge Management, Asset and Abnormal Situation Management, Business Process Integration, and Optimization and Automation.

Architecture Overview

Experion PKS comprises many different integrated hardware and software solutions depending upon the needs of the installation. Figure 1 is a representation of many of the possible nodes that can be utilized in an Experion PKS architecture. The Experion PKS architecture is highly scalable and not all nodes are necessary or required.



This document contains **specifications** and **model numbers** for the Experion PKS Controller. For more information about Experion PKS, please refer to:

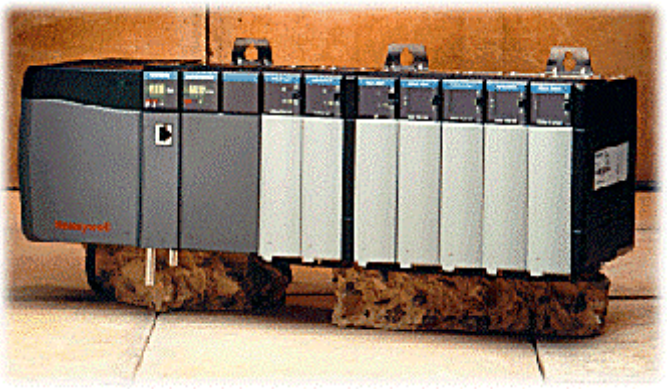
EP03-100-200	Experion PKS Process System Overview
EP03-200-200	Experion PKS Server Specification and Technical Data
EP03-210-200	Experion PKS Station Specification and Technical Data
EP03-400-200	Experion PKS Chassis I/O Modules - Series A Specification and Technical Data
EP03-410-200	Experion PKS Rail I/O Modules - Series A Specification and Technical Data
EP03-420-200	Experion PKS Galvanically Isolated/Intrinsically Safe Rail I/O Modules - Series H Specification and Technical Data
EP03-430-200	Experion PKS PM I/O Specifications and Technical Data
EP03-440-200	Experion PKS DeviceNet Specification and Technical Data
EP03-450-200	Experion PKS PROFIBUS DP Specification and Technical Data

Experion PKS CEE-based Controller Overview

The Experion PKS CEE-based Controller comprises 30 years of controller development and technology. The solution combines robustness, flexibility and uniformity in a Control Execution Environment (CEE) that is hosted on different platforms. Its open architecture allows integration with existing Honeywell controllers, third party control systems and devices. This document describes in detail the configuration, design and architecture of the different controllers.

The CEE is the foundation of the controller and provides a configured control execution environment. It makes this control application execution deterministic, consistent and reliable. A single builder tool, **Control Builder**, allows integrated application configuration. The Control Execution Environment offers dedicated function blocks to cover all control requirements for continuous processes, batch processes, discrete operations, and machine control applications. Experion PKS currently features two CEE-based controllers, the C200 **Process Controller** and the **Application Control Environment (ACE)**. The system also supports a simulation environment, the **C200 Simulation Environment (SIM-C200),** which provides complete system simulation on PCs without requiring dedicated controller hardware or process connections.

The **C200 Controller** consists of a chassis, ControlNet communication module or the new FTE Bridge module, the Control Processor module (CPM) and, optionally, the Redundancy Module. The **ACE node** is hosted on a server-grade PC platform. The C200 controller is a compact and cost-effective solution located close to the process with direct IO connections. It is ideal for integrated regulatory, fast logic, sequential, and batch control applications. The ACE node is ideally suited for supervisory control solutions and integration with third party control systems.



An Experion PKS C200 Process Controller

With Experion PKS, the user configures the system instead of building it from the ground up. Most industrial process control applications require a number of common elements, such as communications protocols and control algorithms. Experion PKS includes such elements in its standard operating framework, allowing the user to concentrate on the application, not the system. Control functions are provided through a library of block types called **Function Blocks** (FBs). Strategies are easily built and configured using a single state-of-the-art graphical engineering tool called **Control Builder**. Once built, control strategies can be loaded and monitored using Control Builder.

The wide range of Experion PKS controller features include:

- **Process Controller for integrated process and discrete control**
  - ***Powerful Control Processor Module***
  - ***Redundant or Non-redundant configuration options***
  - ***50 msec or 5 msec base Control Execution Environments***
  - ***Flexible, compact chassis-based I/O family with optional Remote Termination Panels***
  - ***Honeywell Process Manager™ I/O Integration***
  - ***Galvanically Isolated/Intrinsically Safe I/O family for hazardous area requirements***
  - ***Cost-effective rail-based I/O family***
  - ***Allen-Bradley PLC5 and Logix 5550 Programmable Logic Controller Integration***
  - ***FOUNDATION Fieldbus, HART and Profibus device integration***

- **PC based Supervisory Control**
  - ***Powerful Windows 2000 Server- based Application Control Environment (ACE)***
  - ***500 msec base Control Execution Environment***
  - ***Uses the same Function Block libraries as the Process Controller***
  - ***Integrates OPC data access directly into the control environment***
- **Process Simulation System**
  - ***Full simulation of the Experion PKS System***
  - ***PC based C200 Simulation Environment (SIM-C200) with no controller hardware required***
  - ***Support for advanced Honeywell ShadowPlant features***
- **Experion PKS Software**
  - ***Supervisory software with features such as dynamic data caching, alarm/event management, reporting, and much more!***
  - ***Control Builder with Comprehensive Control Libraries for process point building***
  - ***HMIWeb Builder for powerful html-based operator graphic creation***
  - ***Knowledge Builder On-Line HTML-Based Documentation***
  - ***System Configuration and Diagnostic Utilities***
- **Process Control Networks**
  - ***FTE – supporting the Fault Tolerant Ethernet network for the highest level of availability***
  - ***ControlNet -- supporting redundant media for high system robustness***
  - ***Ethernet – (single ethernet) for flexibility based on open technology (only for existing ethernet customers)***

The Experion PKS supervisory system is highly integrated with the CEE-based controller architecture. These integrated features include:

- ***Integrated Database*** -- Control Builder configuration includes information for both the Control environments and Experion PKS Server. Information is entered once, not repeated in several databases.
- ***Integrated Alarms and Events*** – Alarms are configured by Control Builder, generated by the Controller, recorded into the event system, and acknowledged by operators on the Experion PKS Operator Station alarm summary display. Users do not have to separately configure process alarms in both the controller and the supervisory system.

Communication Infrastructure

Experion PKS supports three different communication networks to connect the system's supervisory layer (or human-machine-interface layer) with the control layer, to meet the customer's specifications. The network types are:

- Fault Tolerant Ethernet (FTE),
- ControlNet, and
- Single Ethernet.

The system only supports one type of Supervisory Control Network per Experion PKS Server.

Fault Tolerant Ethernet Overview

Fault Tolerant Ethernet: High Availability Ethernet for Industrial Applications
The evolution of open Ethernet technology has introduced high-performance, low-cost networking to industrial plants. Until now, providing the robustness of industrial control networks with commercial-off-the-shelf (COTS) Ethernet equipment remained a major hurdle. Honeywell unites the benefits of Ethernet technology with their expertise in designing robust networks to deliver the patented Fault Tolerant Ethernet (FTE) solution. For more detailed information see the Fault Tolerant Ethernet (FTE) Specification and Technical Data, EP03-500-200.

The controller or Fieldbus-only chassis is connected with the FTE network through a newly designed FTE Bridge module that is placed in the controller/FIM chassis. The FTE Bridge module supports redundancy so can be used in a redundant Controller and Fieldbus chassis as well. See the Models-at-a-Glance Examples sections for a topology and more detailed information.

As stated above, the Experion PKS server only supports one Supervisory Control Network type. However, the Experion PKS server does support the ControlNet interface card in conjunction with the FTE Supervisory Control Network for SCADA connections to ControlNet resident Allen-Bradley devices. This also requires RSLinx software installation on the server. A SCADA solution is also supported through a single Ethernet connection. Allen-Bradley devices can be connected via single Ethernet with an FTE switch. With a separate Ethernet module, a remote or non-redundant controller chassis can be connected with the same FTE switch as an Allen Bradley PLC.

FTE is the only network that supports the new Experion Station - Console.

ControlNet Overview

ControlNet: Based on the ControlNet International Standard
ControlNet is an open network specification specifically designed for industrial control applications. It can be deployed in a single or redundant fashion to provide higher availability of the network. ControlNet can be deployed as Supervisory Control Network to connect the control layer with the supervisory layer of the system. It is also the only supported network to connect additional IO chassis to a controller.

The controller or Fieldbus-only chassis is connected with the ControlNet network through a ControlNet Interface Module (CNI) with single or redundant media connections. The CNI module supports redundancy so can be used in a redundant Controller and Fieldbus chassis as well. See the Models-at-a-Glance Examples sections for a topology and more detailed information.

Ethernet Overview

Ethernet: Open Network Technology
Ethernet is an open network technology that is used to communicate the Ethernet/IP protocol through the single media Ethernet module. It can only be deployed in a single fashion; therefore it has the lowest availability of the three supported network types. Ethernet can be deployed as Supervisory Control Network to connect the control layer with the supervisory layer of the system

The controller chassis is connected with the Ethernet network through an Ethernet Module with a single media connection. The Ethernet module does not support controller redundancy or the Fieldbus Interface Module. Refer to the Models-at-a-Glance Example section for more detailed topology information.

The Ethernet module is supported for existing Ethernet users only, new installations should make use of the FTE solution listed above.

Functional Description

Control Execution Environment

The Control Execution Environment (CEE) is the common core software used in the various controllers supported by Experion PKS. This includes the C200 controller, the Application Control Environment (ACE) and the C200 Simulation Environment (SIM-C200). The CEE provides an execution and scheduling environment in which the user-configured Control Modules and Sequential Control Modules execute. It also provides for a peer-to-peer communication layer used to seamlessly communicate between controllers. Implementation is transparent so that peer-to-peer connections are configured in the same way as intra-controller connections.

The CEE is specialized for each platform to provide optimal execution on that specific hardware and operating system. Specific functions are also added specifically for that platform. The platform specific versions include: the Control Solver for the C200, the ACE base software for the ACE node, and the SIM-C200 base software for the SIM-C200 node.

The CEE supports a large number of Function Blocks, which are detailed in table 11. Since the CEE is common to all platforms, applications using these Function Blocks can be moved easily between the different platforms. This allows the user the make optimal use of control resources without the need for re-implementation.

The **Control Solver** is the specialized control execution environment for the C200 Control Processor module. It is available in two base execution rates, 50 msec (normal) and 5 msec (fast). It features:

- Individual **per-module selectable execution rates** of 50, 100, 200, 500, 1000 and 2000 msec for the 50 msec CEE and 5, 10, 20, 50, 100 and 200 ms for the 5 msec CEE. All Control Modules and Sequential Control Modules, regardless of Function Block content, can, in each case, execute at any of these 6 rates. All Function Blocks within a CM or SCM execute at the same rate.
- **Configurable phase assignment** of any module executing slower than the base rate. This provides the flexibility to “load balance” a Controller.

Control Strategy Building

Experion PKS control strategies are built using **Control Builder,** a graphical, object-oriented tool that supports the Control Execution Environments of the Experion PKS Control Processor, Application Control Environment and Simulation Control Environment. It allows system design, documentation, and monitoring. It provides comprehensive handling of various I/O points, including Fieldbus, Profibus, and DeviceNet. In addition, it covers continuous, logic, motor, sequential, batch and advanced control functions through a library of **Function Blocks (FBs)**. Function Blocks are basic block types provided by Honeywell to perform different control functions. Each block supports parameters that provide an external view of what the block is doing. FBs easily interconnect via "soft wires" to construct control applications or strategies.

Function Blocks are grouped together and contained in **Control Modules (CMs)** and, in the case of sequential FBs, **Sequential Control Modules (SCMs)**. SCMs greatly simplify batch logic implementation by sequencing a group of process equipment through a series of distinct steps to accomplish one or more process tasks. **CMs** and **SCMs** act as **"containers"** for Function Blocks. This is a very powerful tool for creating, organizing, and checking out control strategies. Figure 3 illustrates a simple Control Module -- in this case a PID loop -- consisting of basic FBs. In this example, several FBs are "contained" within the CM named FIC101, and the AI and AO FBs are executing in FOUNDATION Fieldbus devices. Each Control Module may be scheduled at its own execution rate from 5 msec to 20 sec (depending on the controller), and the user can schedule Function Blocks and Control Modules to execute in any desired order.

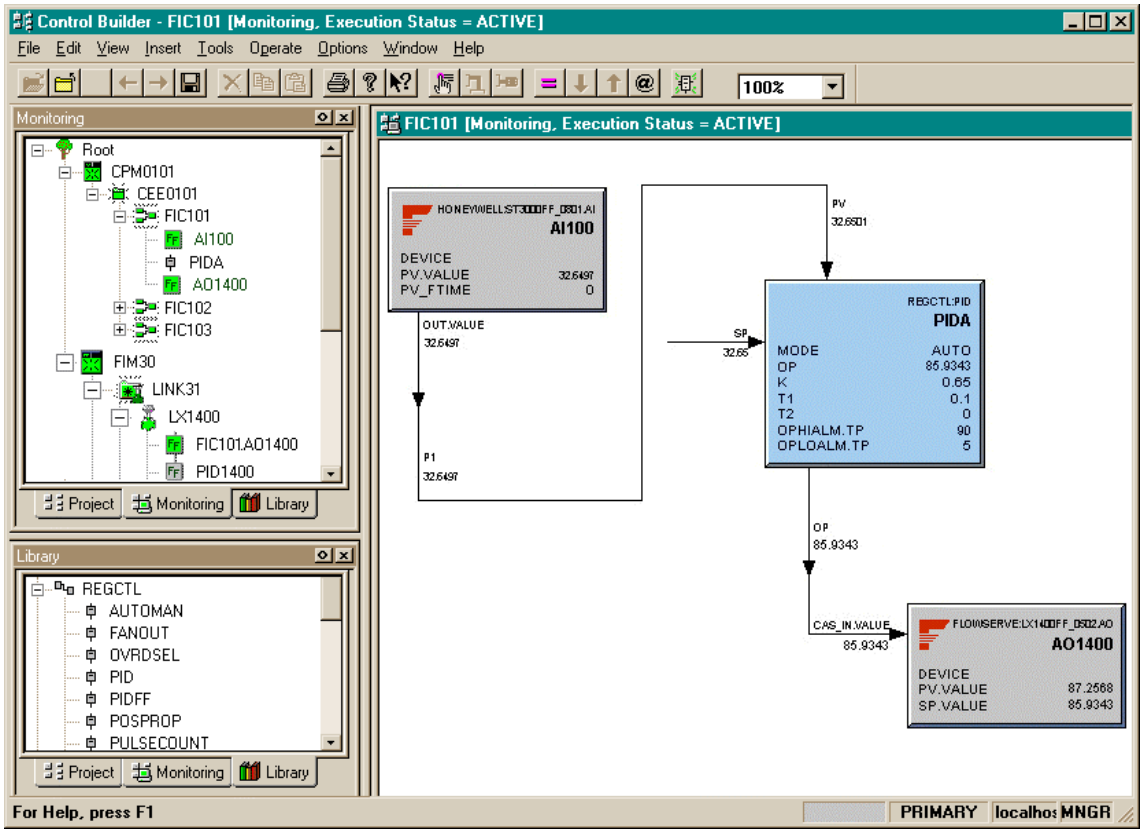


Figure 2. Control Builder Supports a Powerful Set of Algorithm Libraries for Implementing Process Control Strategies

Control Builder uses icons to represent control blocks, which can be "wired" together using simple point and click techniques. Control drawings can be used on-line to monitor control execution and make changes to control parameters, thereby significantly simplifying control strategy checkout. Control drawings are also accessible to the operator via detail displays.

Control Builder also supports **Hierarchical Building** that enables nesting of Control Modules regardless of their controller assignment and the creation of projected parameters. These are FB parameters, which are now promoted to the boundary of the control module with a user-defined name. These parameters are used to make wired connections between Control Modules and/or FBs. It also provides the configuration engineer with the ability to organize the control configuration in a more process-oriented way. For example, a user may create one Control Module named "Reactor" and embed the individual temperature, pressure and agitator Control Modules and the fill sequence. Any interconnection can be "soft- wired" between user-defined parameters. The user can switch the Control Builder view between the traditional assignment view (controller oriented view) and the new containment view.

Projected parameters can be defined without immediately resolving the source parameter. This supports a "top-down" implementation. In a top down design, the overall control strategy is defined on a high level with minor detail. Once the overall strategy is defined, more detail is added to the underlying Control Modules.

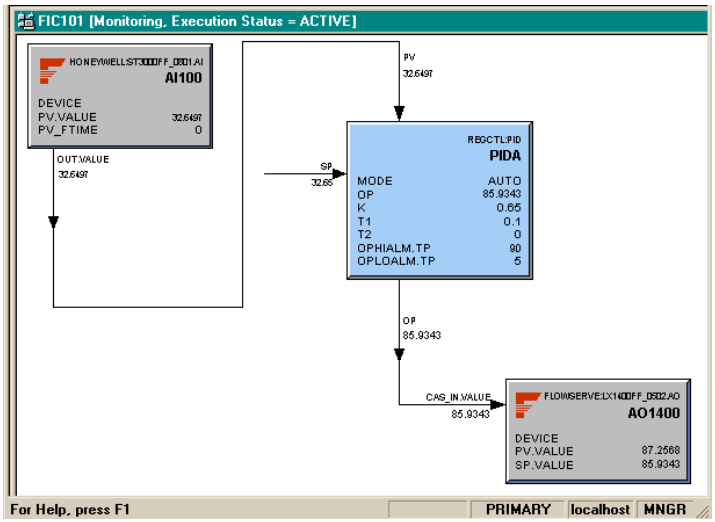


Figure 3. Simple Control Module Example

The Control Builder enables the creation of reusable control strategies, which can be duplicated, with minimal effort through a simple copy and paste action. To further increase the engineering productivity of Control Builder, it optionally supports **User Templates**. With this licensed option, the user can create block templates and/or Control Module templates. These templates appear under the user library on the library tab. These user templates can be instantiated and loaded to a control environment. Whenever a change is made in the template, it will automatically propagate the change through all instances. Propagation of template defining parameters is unconditional. Non-template defining parameter propagation is conditional, where the change is propagated if the value of the parameter in the instance is equal to the old template parameter value.

Control Builder also supports a **multi-user** control strategy development and debugging environment. The function provides **remote access** to engineering databases across any media capable of TCP/IP and UDP/IP communication. For maximum security, access is **password protected**. Several users can create, configure and load control strategies at the same time from different workstations. Multiple users can have the **same chart open**, with **full write access** to the **first user** who opens a chart. When multiple users open a chart for monitoring, all users can change controller values based on their security level.

The **Fieldbus Configuration Tools** integrates the Controller with Fieldbus devices. Key features include:

- Communication through the ControlNet path from the Experion PKS Server
- Block and Device tag and address setting
- An easy-to-use graphical environment for creating linkages, loops and a schedule based upon Fieldbus concepts.
- Configuration of hardware information, ControlNet network addressing, Linking Device paths, Device descriptions, and the base directory to store Device Description information.

Control Functions

Control functions currently supported in the Experion PKS Control Builder libraries are listed in the **Specifications** section. Standard available function blocks include Process Variable, Regulatory Control, Fieldbus (Device and Control blocks), Motor Control, Discrete Logic and Sequential Control, as well as general-purpose blocks like Flags, Numerics, Timers and Arrays.

Regulatory Control

The regulatory control library includes many standard function blocks, such as PID, PID Feed Forward, Ratio/Bias, etc. Experion PKS R200 introduces the Profit Loop PKS™ block (PID-PL). Profit Loop PKS utilizes a Honeywell patented algorithm that represents a single input/single output (SISO) model predictive controller specifically designed with the operating simplicity and computational efficiency of a standard PID controller. This allows it to be executed in either the C200 controller or ACE node. Profit Loop PKS also provides an integrated set of tools (Profit Loop Assistant and Control Builder Enhancements) that allow easy configuration and model identification.

The Profit Loop function block (PID-PL) is a hybrid of a PID and model based controller; it contains both PID and Profit Loop capabilities to enable the easy replacement and on-line conversion from an existing PID to a PID-PL block. Users can take a well-tuned PID controller and directly translate it into a Profit Loop controller and immediately benefit from improved control delivered by Profit Loop technology. The PID-PL function block uses a simple process model to predict the effect of past, present, and future control moves on the process variable. It can be used in place of PID, Smith Predictors, gap controllers, and optimizers since Profit Loop can anticipate future process behavior. This allows the controller to know exactly how much to move the process to meet the desired control objectives. The Profit Loop solution can be used to control temperatures, pressures, flows, discrete analyzers, tank levels, and it is ideal for control processes with process delay, inverse response, non-linear effects, and noisy process signals.

The level of effort to configure a PID-PL block is similar to that of the PID, but due to its model-based formulation, this algorithm outperforms PID while being easier to tune and maintain than conventional controllers. After its initial model is implemented, Profit Loop controllers are easily adjusted using a single tuning parameter to obtain the desired control performance. The Profit Loop Assistant and Control Builder enhancements deliver a variety of tools that greatly simplify the initial determination of the process model and assist in diagnosing control loop problems:

- Direct conversion of existing PID tuning to a Profit Loop model
- Profit Stepper - an automated on-line identification tool that steps the process and calculates the process model for the user.
- Basic Model creation based on Loop Type
- Valve Doctor - diagnoses valve hardware problems prior to controller implementation.

In addition to standard control features, Profit Loop also offers a wide range of expanded capabilities that extend beyond existing regulatory control algorithms:

- Anti-windup handling (including handling windup on secondary loops)
- Range control
- Target optimization
- Predictive alarming on controller predictions
- Asynchronous inputs for direct analyzer control

Profit Loop model implementation results in significantly reduced valve travel that directly translates into decreased valve maintenance and extended valve life.

Sequential Control

Due to its rich set of standard features, SCMs greatly simplify **batch** logic implementation. The SCM implementation follows the S88.01 standard. Standard features include **abnormal handling,** providing an alternative sequence execution for user specified abnormal conditions. Abnormal handlers support restart capabilities, re-starting the sequence from the position it was left or any other Step the process requires to continue. Standard Abnormal handlers include: Checking, Interrupt, Restart, Hold, Stop and Abort. Each sequence supports up to 50 recipe parameters. These include a range, material code and scale option. In addition, it has 50 history parameters for reporting the amount of actual dosed material and/or reached process conditions. The **mode track** option allows for different operating philosophies. Devices, such as motors, pumps, and controllers, will follow SCM mode changes allowing either operator or sequence device control. The devices can also be pre-configured with the action required after an SCM start, abnormal situation or restart. This reduces the SCM step configuration.

One feature of particular importance is the **Common SCM** function. A Common SCM is one that can control several equipment units, one at a time, depending upon the unit selected. It saves implementation, test and maintenance time required to support the application. The selected unit may be determined at configuration time or changed dynamically during run time. An example application might be header dosing in a batch plant. SCMs, including this Common SCM function, are fully integrated into Honeywell's **TotalPlant** Batch package for flexible batch operation.

Control Libraries

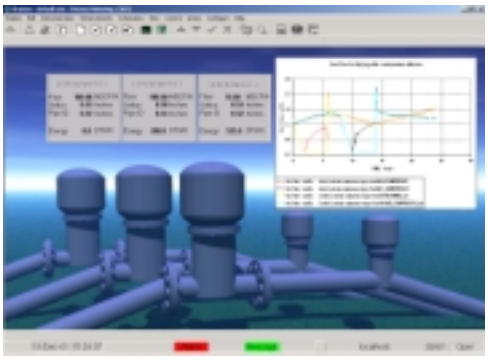
In addition to the standard Control Builder libraries, Experion PKS also supports special function block libraries that are licensed separately, such as the Profibus, Fieldbus, American Gas Association (AGA) Flow Rate Calculation, and Allen Bradley Drive Interface Libraries.

Libraries are licensed per control system. All function block libraries appear in the library tab of the Control Builder. This enables the user to see, use and learn all available function blocks on the project side of the Configurator. Only the standard and licensed function blocks can be loaded to a controller.

The AGA Flow Rate Calculation Library provides the ability to normalize gas flow based on ambient temperature, pressure and composition of a gas. Calculations are based upon reference C code (Version 1.3, July 1997) provided by AGA (copyright © 1992-1995 Starling Associates, Inc.):

- AGA3OM_92: AGA Report 3 – 1992 (part III and IV) Orifice Metering of Natural Gas
- AGA7TM_96: AGA Report 7 – 1996 Measurement of Gas by Turbine Meters
- AGA8DL_94 and AGA8GS_94: AGA Report 8 – 1994 Compressibility Factors of Natural Gas and Other Related Hydrocarbon Gases
- AGA9UM_96: AGA Report 9 – 1998 Measurement of Gas by Multi-path Ultrasonic Meters
- AGA3OM_98, AGA7TM_96 and AGA9UM_98 also include AGA Report 5 – 1996 Fuel Gas Energy Metering calculations

Once the library license is enabled on the system, the meter run can be configured and loaded using these special function blocks. Advantages of running the AGA flow rate calculations in the controller include:



- Native support of controller redundancy
- All parameters are available at the controller level, allowing, for example, on-line analyzers to provide gas composition data directly to the algorithm.

Gas composition information can be entered directly into the algorithms when an off-line analyses is used. Data is protected from changes by the normal access control features of Experion PKS. All information can be historized and used in trends for analysis or reporting purposes.

The operator has easy access to all information related to the calculations. Orifice and gas composition information is presented through an extensive set of detail displays provided with this option. Detailed information related to AGA calculation error conditions is presented in the detail displays. The error is also written to the system event log.

Allen-Bradley Drive Interface Library provides the ability to interface directly with Allen-Bradley variable speed drives making a PLC as an intermediate device unnecessary.

Two specific drives are supported – the 1305 AC Drive and the 1336 Plus II drive. The drives are connected to a special Allen-Bradley ControlNet communication module (1203-CN1) to communicate with the drive interface library. A generic interface function block is provided for other drives that can connect to the scan port module 1203-CN1. The I/O data transfer of the generic drive has to be similar to the 1305 and 1336-PLUS-II drive.

The function blocks provide access to all drive status and command information without the need for additional configuration. The information is available for the operator through a detail display and as parameters in the controller for control purposes. In addition to the standard status and command data, additional drive parameters can be accessed through four Datalinks, which have to be configured on the drive and in the function blocks.

Standard initialization processing is supported on the frequency output to the drive, making bumpless transition possible on communication recovery.

21 CFR Part 11

The Experion PKS system provides enhanced capabilities to support the regulated industry and their unique requirements related to FDA regulations, particularly compliance with 21 CFR Part 11. The Control Builder related features are discussed in this section. The Server-related features are described in EP03-200-200, *Experion PKS Server Specifications and Technical Data.* For more detail on validating an Experion PKS System, consult 'System validation with Experion PKS' White Paper.

The Control Builder supports three levels of version control:

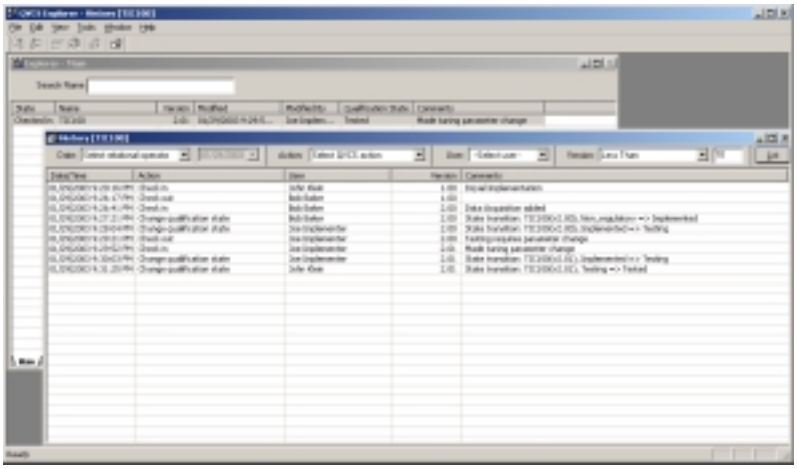
- Manual Version Control,
- Basic Version Control, and
- Qualification and Version Control System (QVCS).

These three options are discussed below. The last option, QVCS, specifically supports the regulated industries and makes system validation easy and efficient.

Manual Version Control is the system default. It allows a user to enter version specific information in a version parameter available on each configurable Control Builder object. The user is responsible for updating and controlling the version information. Four additional parameters are maintained by the system: date created, created by, date modified and modified by.

Basic Version Control is standard available and is enabled through the system preferences menu. It differs from the functionality mentioned above by automatically assigning a version number and incrementing it on-change. The version number increment is based on a minor or major change. The system defines a major change as the addition of a FB or the creation of a parameter connection. A minor change is, for example, a parameter change or a graphical change. In addition, the version number is shown on the Control Builder tree view and in the chart title.

Qualification and Version Control System (QVCS) is a licensable option. QVCS is more than a version control system because it simplifies system qualification by defining and enforcing a user defined development lifecycle. The user also defines, as part of the lifecycle, what configuration may be loaded to a controller. The enforced lifecycle guarantees an implementation procedure and reduces the number of Standard Operating Procedures while eliminating manual signatures and paper trails.



QVCS provides the user with the ability to define the development lifecycle and the electronic signatures required to qualify a configuration object. The system is flexible and allows for single or multiple electronic signatures.

Objects can only be modified once they are checked out of the QVCS system. Only the user who checked the object out can modify the object. The full user name is stored in the QVCS log for each user interaction with the system.

For each configuration object, the system maintains an individual audit trail and stores each individual version in a version repository. The user is able to retrieve specific versions into the project side of the Control Builder. The QVCS also allows a specific version of an object to be compared with the checked out version, the version currently on the monitoring side of Control Builder, the previous version or a specific version selected in the QVCS. The difference report will indicate in detail, which changes, additions and deletions have occurred between the two versions.

To make configuration management easier, the user can apply revert labels to specific versions of one or more objects. The user can now easily retrieve them by using the revert label. Revert labels can be assigned in bulk or individually.

The QVCS does not interfere directly with the configuration currently loaded in the controller. The user performs a separate action to load a new version to a controller.

Experion PKS Process Simulation

Experion PKS supports two levels of simulation:

- Strategy check-out (on an Experion PKS server R200 and above), and
- High fidelity simulation (on a dedicated Experion PKS Simulation system).

An Experion PKS server (R200 and above) can be expanded with one or more C200 simulation environments (SIM-C200), formerly known as the Simulation Control Environment, for a quick and simple strategy checkout. The SIM-C200 environment counts as a controller in the maximum number of controllers per server sizing rule.

The SIM-C200 supports restricted peer-to-peer communication with other controller environments such as C200 and ACE nodes. This prevents upsets in a process due to simulation activities. The SIM-C200 reads from on-process environments, but is safely restricted from writing back to those environments. In the case of a store command, the SIM-C200 will indicate a successful store although the value never reaches the on-process environment. Similarly, the on-process environment is not allowed to read from the SIM-C200 but they can store values. The SIM-C200 supports full peer-to-peer with other SIM-C200 environments. The SIM-C200 supports high fidelity features when deployed with a Honeywell ShadowPlant license.

For operator training and high fidelity process simulation, a very attractive Experion PKS Process Simulation system offering is available. This offering includes a full server license and a number of simulation environments for a fraction of the cost. It allows full Experion PKS system simulation without the need for dedicated controller hardware. The simulation license is used in combination with the Honeywell ShadowPlant process simulation system (see dedicated ShadowPlant product information).

The simulation system includes a system license that enables many standard server options and the new C200 Simulation Environment (SIM-C200). A simulation system consists of an Experion PKS Server, one or more operator stations, one or more SIM-C200 environments and a ShadowPlant server (requires separate hardware and software purchase). The SIM-C200 supports advanced simulation features such as control freeze, unfreeze, store current dynamic state of the process, and initialize controllers to a particular process state, and others in combination with the ShadowPlant simulation server.

On-Process Migration

Experion PKS supports on-process migration. The server-related functionality is described in the Server Specifications and Technical Data EP03-200-200 document. This document specifically describes the controller-related functionality. Server migration is performed before controller migration.

Controller on-process migration is supported on all redundant components, redundant controllers with or without FIM modules, and IO Link modules. The FTE Bridge and ControlNet Interface (with single or redundant media) communication modules are both supported. In addition, the redundant FIM-only chassis is supported.

An on-process migration is performed through a migration wizard, which will perform the following high-level actions:

1. The migration wizard first focuses on the secondary chassis.
2. The secondary chassis is interrogated to determine the module types and versions. All modules that require firmware updates will be updated automatically during the migration process.
3. The static database is loaded after the new controller firmware is loaded.
4. Next, the dynamic information is synchronized between the primary (executing the old software) and the secondary (executing the new software). During this limited period, the control is frozen (several seconds). When the transfer of all dynamic data is complete, a failover occurs (identical to a normal failover between redundant controllers) and the secondary chassis using the new software will assume the role of primary controller.
5. Finally, the 'old' primary chassis is migrated and will then synchronize with the primary controller after which a normal redundant controller pair exists.

In addition, the Experion PKS system supports release interoperability, which provides the flexibility to leave controllers on an older release while they remain interoperable with the new server and controllers in the system. Each Software Change Notice describes in detail which releases are interoperable.

Specifications and Sizing

Controller Environmental and Compliance Certifications

The Experion PKS C200 Controller and I/O Modules meet the following certifications:

Table 1. C200 Controller & I/O General Environmental and Agency Certifications

Parameter	Specification	
Environmental Conditions Operating Temperature Storage Temperature Relative Humidity[2] Temp. Rate of Change	 0 to 60 °C (32 to 140°F) -40 to 85°C (-40 to 185°F) 5 to 95% non-condensing ≤ 1°C/min. (≤ 5°C/min. storage)	
Uncoated Models (TC-xxxxxx) Coated Models (TK-xxxxxx)[3]	Mild (G1) Moderate (G2) or Harsh (G3)	
	Operative and Storage Limits	**Transportation Band**
Vibration (3 axes) Frequency Acceleration Displacement	 10 to 60 Hz 0.5 g max. 0.1 inches	 10 to 60 Hz 1 g max. 0.1 inches
Mechanical Shock Acceleration Duration	 5 g max. 30 ms max.	 20 g max. 30 ms max.
Barometric Pressure **Altitude**	 -300 to +3000 m	 Any
Agency Certification **(when product is marked)**	UL LISTED	**UL 508 Industrial Control Equipment**
	CSA FM APPROVED	**Class I, Div 2, Groups A, B, C & D Hazardous and Ordinary locations** **(Maintenance may require a hot work permit)**
	CE	89/336/EEC, EMC Directive EN 50081-2, Emissions, Industrial EN 50082-2, Immunity, Industrial
	(C-Tick)	Meets requirements of the Australian Radiocommunications Act of 1992, Section 182, relating to electromagnetic compatibility.
Removal/Insertion Under Power (RIUP)	**PERMITTED** when equipment is installed in ordinary, non-hazardous, locations (I/O modules reload automatically). Not permitted when equipment is installed in a Class I, Division 2, Hazardous (Classified) Location.	

[1] The above environmental and agency specifications apply to all Experion PKS Chassis Series A models, including Controllers, Power Supplies and I/O, except where noted.

[2] The maximum relative humidity specification applies up to 40°C. Above 40°C the RH specification is de-rated to 55% to maintain constant moisture content.

[3] With an enclosure.

Compliance to European Union Directives. This product has the CE mark and is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives:

- **EMC Directive.** This apparatus is tested to meet Council Directive 89/ 336/ EEC Electromagnetic Compatibility (EMC) using a technical construction file and the following standards, in whole or in part:
  - EN 50081- 2 EMC – Generic Emission Standard, Part 2 – Industrial Environment
  - EN 50082- 2 EMC – Generic Immunity Standard, Part 2 – Industrial Environment

  The product described in this document is intended for use in an industrial environment.
- **Low Voltage Directive**. This product is also designed to meet Council Directive 73/ 23/ EEC Low Voltage, by applying the safety requirements of EN 61131– 2 Programmable Controllers, Part 2 – Equipment Requirements and Tests.

Table 2. Agency Standards Compliance

Agency	Standard	Description
CE Mark	Standard Compliance	Electrical Emissions and Susceptibility
CSA	C22.2 No. 142-M1983	Process Control Equipment
	C22.2 No. 0-M1982	General Requirements Canadian Electrical Code, Part II
	C22.2 No. 4-M1982	Bonding and Grounding of Electrical Equipment
FM	ISA S12.12	Non-incendive Electrical Equipment for Use in Class I & II, Div. 2 and Class III, Div 1 & 2 Hazardous (Classified) Locations
UL	508	Industrial Control Equipment
C-Tick	Australian Radiocommunications Act of 1992	Electromagnetic Compatibility

Control Processor Module Hardware Specifications

The Experion PKS C200 Control processor module meets the following specifications:

Table 3. TC-PRS021, TK-PRS021 Specifications

Parameter	Operative and Storage Limits	Transportation Band
Module Power Requirements	+5 VDC +/- 5% @ 1.5 A +3.3 VDC +/- 5% @ 1.0 A	
Module Battery Backup Time[1] Lithium Battery (standard, built in) Battery Extension Module (BEM)	 144 hours (non-rechargeable, replaceable) - 6 days 120 hours (rechargeable) - 5 days	 Lithium battery is disconnected during shipment.[2]

1 CPM backup is provided via the Lithium Battery or the Battery Extension Module (BEM), but not by both. The Lithium battery must be removed from the Control Processor if a BEM is used in the rack. A label inside the CP front door provides that warning.

2 The 1/2AA Lithium Battery has a non-restricted classification due to its size. It can be shipped without any special documentation or note on the shipping list. The battery is specified for operation from -55 °C to +85 °C.

See Table 1 (previous page) for all general environmental specifications and agency certifications.

ControlNet Specifications

Table 4. 9904-KTCX15, TC-PCIC01, TC-CCN013, TC-CCR013, TK-CCR013		
Parameter	**Specification**	
Data rate	5 Mbit/sec	
Redundancy	Single cable or redundant operation supported	
ControlNet Components	End devices (workstations and controllers), taps, trunk cable, cable connectors, terminators, segments, repeaters, and bridges.	
Cable Type and Topology	RG-6 Quad Shield cable, BNC connectors, trunk & drop, bus topology. See next page for recommended cable types.	
Cable Type by Application • Light industrial applications • Heavy industrial applications • High and low temperature applications, as well as corrosive (harsh) areas • Moisture Resistant (direct burial, flooding, etc.)	 • Standard PVC CM-CL2 • Lay-on Armored and Interlocking Armor • Plenum FEP CMP-CL2P • Flood burial	
Maximum Distance and Total number of Repeaters Between any two (2) Nodes	• Maximum Coax plus Fiber length of 10 km • Maximum of 5 Repeaters (6 Segments)	
• Maximum Coax Segment Length • Maximum Fiber Segment Length	• 1000 m (3280 ft.) - 16.3 m (53.4 ft.) x [number of Taps - 2] • See Repeater Specifications below	
Maximum Total Length Differential Between A and B Trunk	• 800 m (2624 ft.) (total link)	
Fiber Optic Repeater Specifications – TC-RPA002, TC-RPRS01, TC-RPFM01		
Mounting	DIN rail mountable (35 mm wide rail)	
Maximum number of Fiber Modules per TC-RPA002 ControlNet Module Adapter	Four (2 ports/module)	
Power Requirements (TC-RPA002)	24 VDC, 700 mA maximum	
Fiber Optic Repeater Model	TC-RPFS01 (300 M)	TC-RPFM01 (3000 M)
Optical power budget	4.2 dB	9.3 dB
Cable wavelength specification	650 ηm (red)	1300 ηm
Fiber Type	200 µm glass (HCM)	62.5 µm
Fiber Termination Type	Versalink	ST Termination
Maximum fiber optic segment distance is dependentupon the quality of the fiber, number of splices, and connectors. For more ControlNet topology information, refer to the Planning Guide in Knowledge Builder or to EP-DCXX21.		

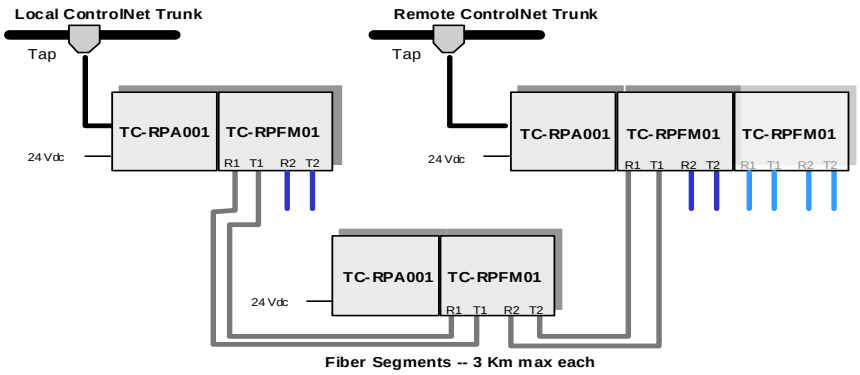


Figure 3. ControlNet Fiber Optic Example -- Use of 2 Fiber Segments to Interconnect 2 Non-Redundant-Media ControlNet Trunk Segments

Control Net Cable

Table 5. Honeywell-Recommended ControlNet Coaxial Trunk Cable Types

Honeywell Part Number	Supplier and Part Number	Field Usage	NEC / CEC Rating (15)	Jacket color	Jacket material	Dielectric Type	Electrical Properties	Compatible Connector	Comments
51192416	Belden 3092A(4)	riser-rated	CMR	Black	PVC (10)	Foam PE	ControlNet network-tested by Honeywell	51192417-100 (7)	Standard Honeywell ControlNet raw trunk cable (sold as TC-KCC900).
(2)	CommScope 5060R	riser-rated	CMR	Black	PVC (10)	Foam PE	(5)	(8)	CommScope version of Belden 3092A cable above.
	CommScope 5060	general purpose	CMG	Black (3)	PVC (10)	Foam PE	(5)	(8)	
	CommScope 5061	plenum-rated	CMP	Natural	Kynar	Foam FEP	(6)	(9)	
	Belden 3093A	plenum-rated	CMP	Gray	fluoro-copolymer	Foam FEP	(6)	(9)	Belden states this cable is suitable for Outdoor and Direct Burial applications.
	CommScope 5060B	direct-burial		Black	PE	Foam PE	(5)	(8)	Not armored
	Belden 123092A	interlocked aluminum armor		Black	PVC	Foam PE	(5)	(8)	See note 13
	Belden 133092A	interlocked steel armor		Black	PVC	Foam PE	(5)	(8)	See note 13
	Belden 543092A	corrugated aluminum armor		Black	PE	Foam PE	(5)	(8)	See note 14
	Belden 553092A	corrugated steel armor		Black	PE	Foam PE	(5)	(8)	See note 14
	CommScope 5060A	corrugated aluminum armor		Black	PVC (10) (11)(16)	Foam PE	(5)	(8)	Armor layer plus outer PVC jacket. Jacket also available in PE.
	CommScope 5060C	continuous cast armor		Black	PVC (10) (11)	Foam PE	(5)	(8)	Jacket also available in PE.
	Belden 1191A	messenger		Black	PVC (10)	Foam PE	(6)	(8)	Separate messenger wire.
	CommScope 5060M	messenger		Black	PVC (10) (11)	Foam PE	(5)	(8)	Separate messenger wire. Jacket also available in PE.
	Belden YR-28890	hi-flex	CM	Black	PVC (10)	Foam PE	(6)	(8)	More flexible center conductor and shields.
	CommScope 5060F	hi-flex	CMG	Black (3)	PVC (10)	Foam PE	(6)	(8)	More flexible center conductor and shields.

See Notes next page…

Table 5. Honeywell-Recommended ControlNet Coaxial Trunk Cable Types (cont'd)

Notes:

1. ControlNet is a registered trademark of ControlNet International, Ltd.
2. Meets electrical/mechanical requirements of standard trunk cable 51192416
3. Other jacket colors (white, red, blue, green, orange, brown, yellow, violet, or gray) available if specially ordered
4. Standard raw trunk cable used in Honeywell-supplied, pre-assembled trunk cable assemblies TC-KCCX01 through TC-KCC500
5. Electrical characteristics are the same as standard ControlNet trunk cable 51192416
6. Electrical characteristics are the same as standard ControlNet trunk cable 51192416 except greater attenuation results in less distance capability than 51192416 cable
7. Standard ControlNet trunk cable connector 51192417-100 is Amphenol part # 31-71000-RFX used in Honeywell-supplied pre-assembled trunk cable assemblies TC-KCCX01 through TC-KCC500
8. Connector specified in note 7 above should be usable because cable diameter and jacket thickness dimensions are the same as (or very close to) standard 51192416 cable
9. Connector specified in note 7 above may not be usable because cable diameter and jacket thickness dimensions are smaller than standard 51192416 cable
10. Cables with PE (polyethylene) jacket last longer outdoors than cables with PVC jacket. Protect PVC cables outdoors by placing them in conduit away from moisture.
11. This cable is also available with PE jacket
12. All cables in the table above are 75-ohm, RG6/U-style, quad-shield (foil/braid/foil/braid) cables with suitable electrical characteristics for ControlNet networks
13. Belden states this armored cable can be used outdoors (without conduit protection) but not for direct burial. Basically it is Belden 3092A cable with armoring and outer PVC jacket.
14. Belden states this armored cable can be used outdoors (without conduit protection) and also for direct burial (due to moisture immunity of jacket and underlying tape). Basically it is Belden 3092A cable with armoring, flooding, and outer PE jacket.
15. Refer to supplier's datasheet for approval information printed on cable jacket, especially for approvals needed for Canadian applications
16. CommScope states that the armor is also available in interlocked aluminum or steel

Function Block Types

Table 6. Function Block (FB) Types for CEE-based controllers.

- **General Purpose**
  - Flag
  - Type Convert Block
  - Push
  - Numeric
  - General Purpose Array (Numeric, Flag, Text)
  - Timer
  - Message block support for Operator messages
- **PV Algorithms**
  - Data Acquisition
  - General Linearization
  - Totalizer
  - Dead Time
  - PV Calculator
  - Lead / Lag
- **Regulatory Control Algorithms**
  - Profit Loop PKS™
  - Proportional, Integral, Derivative (PID)
  - PID with Feedforward
  - Override Selector (4 inputs)
  - Remote Cascade
  - Auto Manual
  - Switch (8 input single pole)
  - Fanout Block (1 input/up to 8 outputs)
  - Regulatory Calculator
  - Ratio Bias
  - Ramp / Soak
  - Positional Proportional
  - Pulse Length
  - Pulse Count
- **Device Control (Motor Control)**
- **Discrete Logic (per IEC 1131 standard)**
  - 2oo3 (2-out-of-3 Voting)
  - AND
  - CHECKBAD
  - DELAY
  - EQ (Compare Equal)
  - FTRIG (Falling-Edged Trigger)
  - GE (Compare Greater Than or Equal)
  - GT (Compare Greater Than)
  - LE (Less Than or Equal)
  - LIMIT
  - LT (Compare Less Than)
  - MAX (Maximum)
  - MAXPULSE (Maximum Time Limit Pulse)
  - MIN (Minimum)
  - MINPULSE (Minimum Time Limit Pulse)
  - MUX (8-Input Multiplexer)
  - MUXREAL (8-Input Multiplexer, Real Number)
  - MVOTE (Majority Vote)
  - NAND
  - NE (Compare Not Equal)
  - nOON (n-out-of-N Voting)
  - NOR
  - NOT
  - OFFDELAY
  - ONDELAY
  - OR
  - PULSE (Fixed Pulse Output)
  - QOR (Qualified OR)
  - ROL (Rotate Left)
  - ROR (Rotate Right)
  - RS (Reset-Dominant Flip-Flop)
  - RTRIG (Rising-Edged Trigger)
  - SEL (Selector Function)
  - SELREAL (Selector Function, Real Number)
  - SHL (Shift Left)
  - SHR (Shift Right)
  - SR (Set-Dominant Flip-Flop)
  - TRIG (Change Detect Trigger)
  - WATCHDOG
  - XOR (Exclusive OR)
- **Sequential Control Functions** (follows S88.01)
  - Step FB
  - Transition FB
  - Handlers: Main, Interrupt, Check, Restart, Hold, Stop, Abort
- **FOUNDATION Fieldbus**
  - All blocks & parameters defined by manufacturer supplied DD/Capability files

Additional Function Blocks (FB) for the C200 Process controller.	
• **Data Exchange**	
➢ Request (Numeric, Flag, Text)	➢ Response (Numeric, Flag, Text)
• **I/O Channel Blocks**	
➢ Analog Input (AI)	➢ Digital Input (DI)
➢ Analog Output (AO)	➢ Digital Output (DO)
➢ Pulse Width Modulation (PWM)	➢ Serial Interface Array (Numeric, Flag, Text)
➢ Rail I/O Series A (Input & Output)	
➢ PM IO channels (AO16, DI24V, DISOE, DO32, HLAI, LLMUX, STIMV)	➢ Rail I/O Series H (Input & Output)
	➢ Fieldbus Analog & Digital (Input & Output)
	➢ Pulse module (Fast cut off, Input, totalizer)
• **AGA flow rate calculation library (Optional)**	
➢ AGA3OM_92	➢ AGA7TM_96
➢ AGA8DL_94	➢ AGA8GS_94
➢ AGA9UM_98	
• **AB drive interface library (Optional)**	
➢ 1305	➢ 1336-PLUS-II
➢ Generic_Drive	➢ Drive_Input
➢ Drive_Output	
• **Profibus DP (Optional)**	
➢ PTO Encoder (Input & Output)	➢ Generic (Input & Output)
➢ Generic PTO Drive (Input & Output)	➢ Siemens Simatic (Input & Output)
➢ Siemens Simocode (Input & Output)	
Additional Function Blocks (FB) for the ACE environment	
• **OPC Extension library (Optional)**	
➢ OPC Server	
• **UCN Interface library (Optional)**	
➢ UCN output	

Control Builder Specifications

Table 7. Multi-User Control Builder Operational Limits	
Maximum concurrent Control Builder Clients connected to single Server	4
Minimum continuously available Network Bandwidth required for each multi-user CB Client.	128 KB
Maximum Fieldbus Library Manager Clients connected to single Server	1

Network Specifications

Table 8.a. Node Network Residency Table

Node	Network				
	Supervisory ControlNet	***Supervisory Ethernet***	***I/O Net***	***Auxillary exchange peer to peer network***	***Con-joined Net***
ACE Node	Yes (optional)	No	No	No	N/A
Non-Redundant Controller Chassis	Yes	Yes	No[1]	Yes [2]	N/A
Redundant Chassis Pair	Yes	No	No[1]	Yes [2]	Yes (1 pair)
Remote I/O Chassis	No	No	Yes	Yes [3]	Yes
Rail I/O Adapters	No	No	Yes	No	Yes
FIM-Only Chassis	Yes	No	Yes	No	Yes
Redundant FIM Chassis Pair (RFP)	Yes	No	Yes	No	Yes
Remote FIM/IO Mixed Chassis	No	No	Yes	Yes [3]	Yes
Linking Device (LD) Node	No	No	Yes [4]	No	No
Supported AB Drive Controllers	No	No	Yes [4]	No	No
PLCs, etc.	Yes	Yes	No	Yes	No

[1] Supported as a master of the network

[2] A connection to the auxiliary peer-to-peer communication network is supported in addition to the existing supervisory network connection to the server. No network hops exist in the supervisory network connection.

[3] A connection to the auxiliary peer-to-peer communication network is supported in addition to the existing Uplink ControlNet IO network. The auxiliary communication network does not support I/O communications.

[4] Linking Devices and AB Drives reside on an isolated I/O network; no other chassis or rail I/O connect to the same network.

Table 8.b. Supervisory Process Control Network

	FTE (Using FTE Bridge Module TC-FTEB01)	**ControlNet**	**Ethernet** (Non-redundant 10Mb Ethernet using TC-CEN021)
Supervisory Networks per Server *(Mixed Supervisory FTE, ControlNet, & Ethernet on the same Server is not supported.)*	1 high availability network serviced by 1 redundant or non-redundant Server	1 redundant or non-redundant network serviced by 1 redundant or non-redundant Server (1 ControlNet card per PC)	1 non-redundant network serviced by 1 redundant or non-redundant Server (FTE-based Servers will not support Ethernet Supervisory Control Network)
Total ControlNet Connection Limit per PC ControlNet Interface Card (PCIC) *(Each node (C200 Controller, Server, FIM-only Chassis, and ACE) uses 1 PCIC connection regardless of where they reside in the system.)*	N/A	127	N/A
Maximum Number of Nodes allowed, including Controllers, Servers, FIM-only Chassis, and ACEs	200 (includes all FTE nodes within a FTE community)	32	12 [1]
Maximum Allowable Combinations of Controllers per Server [2,3]	10 (whether redundant or non-redundant)	10 (whether redundant or non-redundant)	10 (non-redundant)
Maximum Number of ACEs supported per Server (The ACE application requires a separate server)	2	2	Not supported
Network Topology	Dual Switch tree	Shared medium bus	Switched
Data Rate	10 Mbits/sec	5 Mbits/sec	10 Mbits/sec
Media Redundancy	Redundant media operation	Single media or redundant media operation supported.	Non-redundant only

[1] Qualified for Redundant Server + 10 non-Redundant controllers; Fieldbus (FIMs) is not supported on an Experion PKS system that uses Ethernet as the supervisory process control network; ACEs do not exist on a Supervisory Ethernet Configuration

[2] Controller Definitions including PLCs which make use of the same network and utilize Server SCADA connections:

To ensure no single point-of-failure exists, multiple Controllers per chassis are not supported. The ACE is not included in this limit.

One controller in a Non-Redundant configuration equals:
1 C200
1 CL5550[3]
1 PLC5/C or E [3]
1 SLC (Ethernet only)
1 SIM-C200

One controller in a Redundant configuration equals:
2 C200s in a Chassis Pair with 2 Redundancy Modules
2 CL5555s in a Chassis Pair with 2 Redundancy Modules

[3] A Logix5550 or PLC5/C counts as a Controller only if a SCADA connection is formed to it. Use of the EXCHANGE FB does not constitute a SCADA connection.

Control Execution Environment Specifications

Table 9. Control Execution Environment (CEE) General Configuration Options			
	C200 Controller		ACE
Base Execution Period	**50 ms CEE**	**5 ms CEE**	**500 ms CEE**
Controller Redundancy Supported	Yes	No	No
Remote I/O Supported	Yes	No	N/A
I/O Module Function Block Execution Period	50 ms	5 ms	N/A
Available CM/SCM Execution Periods	50, 100, 200, 500, 1000, 2000 ms	5, 10, 20, 50, 100, 200 ms	500 ms and 1, 2, 5, 10, 20 sec
Configurable Peer-to-Peer Update Rates (Period) (Rate at which a CEE can subscribe to data from other CEEs through peer-to-peer communications; Supervisory Ethernet LAN systems have a guaranteed pull/get request rate of 500 ms or greater)	100, 200, 500, 1000 ms	10, 20, 50, 100, 200, 500, 1000 ms	500 ms and 1, 2, 5, 10 sec

Controller Communications Performance

Peer-to-peer communication between **Controllers** allows data to be transparently shared among separate **Control Execution Environments (CEE)**, irrespective of controller location within a Server domain (i.e., within a Supervisory Process Control Network). If a parameter connection can legitimately be formed between two function blocks within a single controller, then that same parameter connection is permitted between two function blocks located in separate controllers. All data connections are done via data "**pulls**." The *only* data "**push**" in Experion PKS is the output expression of a Sequential Control Module Step function block and the output of the PUSH FB. Experion PKS provides end point **fail-safe data protection** and **handling**. Connections are protected against failures and abnormal conditions by always receiving either live-process data or fail-safe data.

Table 10. Controller Communications Performance	*PPS = Average Parameters per Second*		
	C200/CPM, FIM, IOL		ACE 500ms CEE
Overall Communications Performance per Experion PKS Server			
Maximum Total Parameter Access Response Rate to the Server from all Controllers combined. *(Includes Display updates, Fast/Slow History, Excel I/ODBC Exchange, and CB Monitoring)*	4000 PPS		2000 PPS
	C200 50 ms CEE	C200 5 ms CEE	ACE 500ms CEE
Overall Communications Performance per C200/CPM, FIM, ACE			
Maximum Total Parameter Access Response Rate *(Includes all Server Data Requests and peer communications)*	2000 PPS	2000 PPS	2000 PPS
C200 Controller and ACE Notifications Performance			
Maximum Number of Events *(burst condition, where event bursts will be throttled to one burst per minute to allow the Server to process the previous burst. The "sustained rate" may continue between bursts)*	50 events		
Maximum Number of Events/Second (sustained)	2/second		

Controller Communications Performance, continued

Table 10. Controller Communications Performance, cont	*PPS = Average Parameters per Second*		
	C200 50 ms CEE	**C200 5 ms CEE**	**ACE 500ms CEE**
CEE to CEE Peer-to-Peer Communications Performance per C200/CPM, FIM, ACE			
Maximum Initiator Node Pull/Get Request Rate (to all target nodes). FIM-from-C200 is "pull" and is fixed at 200 ms. C200-from-FIM is "pull" and is published on receipt by FIM from FF *(Limits based on the number of requests for peer data and the peer update rate.)*	500 PPS	500 PPS	500 PPS
	ControlNet		
	50 @ 100 ms 100 @ 200 ms 250 @ 500 ms 500 @ 1 sec	5 @ 10 ms 10 @ 20 ms 25 @ 50 ms 50 @ 100 ms 100 @ 200 ms 250 @ 500 ms 500 @ 1 sec	250 @ 500 ms 500 @ 1 sec 1000 @ 2 sec 2500 @ 5 sec 5000 @ 10 sec
	Supervisory Ethernet		
	250 @ 500 ms 500 @ 1 sec	250 @ 500 ms 500 @ 1 sec	Not Supported
Maximum Target Node Response Rate to Pull/Get Requests (from all initiator nodes).	500 PPS	500 PPS	500 PPS
Maximum Initiator Node Push/Store Request Rate (to all target nodes)[1]	50 PPS	50 PPS	50 PPS
Maximum Target Node Response Rate to Push/Store Requests (from all initiator nodes).	50 PPS	50 PPS	50 PPS
Maximum Initiator OPC Pull/Get Request Rate (to all target OPC Servers. There are no limits imposed on the number of different OPC Servers that can be accessed by the ACE)	N/A	N/A	1000 PPS
Maximum Initiator OPC Push/Store Request Rate (to all target OPC Servers. There are no limits imposed on the number of different OPC Servers that can be accessed by the ACE)	N/A	N/A	100 PPS
Maximum Initiator Node Pull/Get Request Rate from other ACE(s) *(Based on the number of requests for ACE peer data and the peer update rate.)*	N/A	N/A	**500 PPS** (using one of the following): 250 @ 500 ms 500 @ 1 sec 1000 @ 2 sec 2500 @ 5 sec 5000 @ 10 sec
To maximize the number of subscription items and allow for some spares, it is recommended to use the slowest subscription rate needed for a given controller's application.			
CEE to CEE Peer-to-Peer Communications per C200/CPM and ACE node			
Number of Remote CEEs that a CEE can initiate a peer connection with	5	5	**30** (includes C200s and FIMs)
Number of Remote CEEs that a CEE can receive a peer connection from	5	5	**30** (includes C200s and FIMs)

Controller Communications Performance, continued

Table 10. Controller Communications Performance, continued *(Not supported on the ACE Node)*		
C200 to PLC Peer-to-Peer		
Supported Protocols and Commands		
PCCC (Programmable Controller Communications Commands):	Typed Read and Typed Write through logical ASCII addressing	
CIP (Control and Information Protocol):	Data Table Read and Data Table Write	
Supported Datatypes		
B (Binary), F (Floating Point), N (Integer), I (Input), O (Output), S (Status), D (Binary Coded Decimal), A (ASCII), ST (String)		
Communications Capacity per C200/CPM	**50 ms CEE**	**5 ms CEE**
Maximum Number of REQUEST blocks per C200/CPM	32	32
Maximum Number of RESPONSE blocks per C200/CPM	32	32
Maximum Number of Target Devices per C200/CPM for REQUEST blocks (*DHRIO Module counts as 1 Target Device even when communicating with multiple PLCs on either DH+ network* [2])	8	8
Maximum Number of request per C200/CPM Devices for RESPONSE blocks	8	8
Maximum Number of DHRIO Modules per C200/CPM	2	2 (local chassis)
Target communication performance	500PPS [2]	500PPS [2]

[1] The SCM Step and push FB are the only block types that can initiate peer push/store requests for CEE to CEE peer communications. The number of parameters communicated per second depends upon target device configuration and use of requested Function Block

[2] The communication performance depends upon the response from the target device, the number of Exchange FBs communication through the same path and the application implementation in the target device.

Peer-to-peer communication between a **Controller** and **PLC's** or other **devices** is also supported. The **Exchange FBs** support both the PCCC (Programmable Controller Communications Commands) and CIP (Control and Information Protocol). The data is stored in the exchange FBs and can be used in any control strategy. Exchange FBs can also be used to exchange data between two Control Processors in different Server domains, because these protocols support direct ControlNet addressing. Both controllers would be interconnected through a separate ControlNet or Ethernet network, referred to as Auxiliary peer-to-peer communication network (FTE does not support bridging).
In addition the Data Highway plus network of Allen Bradley is supported for communication between a C200 controller and an AB PLC through the AB DHRIO module (purchased separately).

Controller Redundancy Specifications

Table 11. Controller Redundancy	*(50 ms CEE only)*
Control Processor Module (CPM) models supported	C200
Redundancy Compliant Devices	ControlNet Interface, FTE Bridge, C200 CPM, FIM, Redundancy Module, Battery Extension Module, I/O Link Module
Control Processing Switchover Interruption Time	500 ms
Redundancy Module Cable Medium	Fiber Optic Cable
Redundancy Module Cable Lengths	1, 3, 10 meters
Redundancy Module Slot Width	2 slots
Initial Synchronization Time (from Sync Start to Completion)	90 sec
Maximum Elapsed Time Between Commanded Switchover and Completion of Initial Synchronization	150 sec
Maximum Elapsed Time Between Switchover Due to Power Cycle of the Primary and Completion of Initial Synchronization	200 sec

I/O Module and Fieldbus Capacity

Table 12a. I/O Unit definition table

IO Device or Module	I/O UNITs
1 Chassis-mounted "Series A" I/O Module (except where noted elsewhere)	1
1 Rail-mounted "Series A or H" I/O Module	1
1 Serial Interface Module (SIM) FTA	4
1 Pulse Input Module (PIM)	1 (for 64 Unit/CPM limit) 1.5 (for 24 Unit/CNI limit)
1 FF Linking Device (FF LD)	1
1 non-redundant Fieldbus Interface Module (FIM)	2 (for 64 Unit/CPM limit) 3 (for 24 Unit/CNI limit)
1 Redundant Fieldbus Interface Module Pair (Red-FIM)	2 (for 64 Unit/CPM limit) 4 (for 24 Unit/CNI limit)
1 non-redundant or redundant PM IOP Module	1
1 DHRIO Module	1
1 1203-CN1 SCANport module for AB Drive Controller	1 (for 64 Unit/CPM Limit) 1.2 (for 24 Unit/CNI Limit)
1 SST-PFB-CLX Profibus Module	2 (for 64 Unit/CPM Limit) 6 (for 24 Unit/CNI Limit)
1 DeviceNet Bridge Module (DNB)	2 (for 64 Unit/CPM Limit) 2 (for 24 Unit/CNI Limit)
1 Source or Destination partner on Auxiliary Exchange peer to peer Ethernet network	1 (for 24 Unit/CNI Limit)

Table 12b. I/O Module and Fieldbus Capacity

I/O module Capacity per C200/CPM	**50 ms CEE**	**5 ms CEE**
Maximum number of I/O ControlNet CNI's per Controller Chassis ("Downlink CNI")	4	0
Maximum number of I/O Units per C200/CPM (See above for I/O Unit definition)	64 I/O Units	12 I/O Units *(Rail I/O not supported)*
Maximum number of I/O Units per downlink ControlNet CNI (See above for I/O Unit definition)	24 I/O Units	0 I/O Units *(local I/O)*
Maximum number of Serial Interface Modules per C200/CPM	3	1
Maximum number of FTA assemblies per Serial Interface Module *Each SIM FTA is the equivalent of 4 IO UNITS in the 64 IO per CPM calculation and the 24 IO per CNI calculation. See the IO UNIT Definition Table for details.*	2	2
Maximum number of Remote I/O Racks + FIM-only Chassis + Remote Mixed FIM/IO Chassis + Rail Adapters (combined) per C200/CPM.	8	0 *(local I/O)*
Maximum number of FF non-redundant Fieldbus Interface Modules (FIMs) per C200/CPM [1,2,3] *Each FIM counts as 2 IO UNITS in the 64 IO/CPM calculations above. See the IO UNIT Definition Table for details.*	21	Not supported[1]
Maximum number of FF redundant Fieldbus Interface Modules (FIMs) per C200/CPM [1,2,3] *Each Primary FIM counts as 2 IO UNITS in the 64 IO/CPM calculations above. Each FIM pair counts as 4 IO Units in the 24 IO Units per downlink CNI calculation. See the IO UNIT Definition Table for details.*	12	Not supported[1]
Maximum number of Profibus Modules per C200/CPM	10	2
Maximum number of Profibus Modules per downlink CNI	4 @ 25 ms 2 @ 12.5 ms	Not supported
DEVICENET BRIDGE-RELATED:	***50 ms CEE***	***5 ms CEE***
Maximum number of DNBs (DeviceNet Bridge Modules) per CPM	32	6
Maximum number of DNB Modules per downlink CNI	12	Not Supported

[1] Qualified for use with 50 ms CEE and ControlNet or FTE Supervisory Process Control Network. Fieldbus (FIMs) is not supported on an Experion PKS system that uses Ethernet as the Supervisory Process Control Network .
[2] Series D CNI modules are used with the FIM.
[3] See EP3-400-200 for more detailed Fieldbus Interface Module specifications.

I/O Module and Fieldbus Capacity, continued

Table 13. I/O Link Interface Module (IOLIM) Communications Performance	
Maximum Total Parameter Access Response Rate (Includes all Server Data Requests and peer communications to other C200/CPMs)	6000 PPS
Maximum IOLIM to CEE Parameter Access Response Rate (PEERRATEAVG and PEERRATEMAX)	5120 PPS *(Max 1280 channels @ 250 ms publish rate)*
Maximum Display Parameters per IOLIM (DISPRATEAVG and DISPRATEMAX)	1000 PPS
Maximum Initiator Node Pull/Get Request Rate (PEERINITAVG and PEERINITMAX) (IOLIM from CEE is fixed at 100 ms)	1000 PPS *(Restricted by Link Unit limit of 1000, assuming 1 Link Unit = 1 parameter/sec.)*
Maximum Target Node Response Rate to Push/Store Requests (Currently the SCM Step Output and the Push FB are the only blocks that can initiate push/store requests from CEE to IOLIM.)	50 PPS

Table 14a. I/O Module Publication Period Specifications	
Input Module type	**Publication Period**
Typical InputI/O Modules (Includes Series A (Chassis) and Series A and H (Rail) I/O Modules, and FF Linking Devices with exceptions noted below)	25 ms
High Density/Non-Isolated Analog Input Module	250 ms
RTD Module (CIOM-Series A)	50 ms
Thermocouple Module (CIOM-Series A)	50 ms
Serial Interface Module (CIOM-Series A)	250 ms
Digital Input Module used by 5 ms CEE (local only)	1 ms
For CMs that contain associated input channels, it is recommended that the CM execution period should be set to at least double the input module sampling period.	
Output Module Type	**Publication Period**
Typical Output Module *Includes Series A (Chassis) and Series A & H (Rail) Output Modules*	50 ms & on change
Mixed Module Type (input & output)	**Publication Period**
PFB Module (SST-PFB-CLX) *Update rate is configurable on the PBIM block.*	Default = 25 ms Minimum = 12.5 ms (remote chassis) or 5 ms (local chassis) Maximum = 50 ms
DeviceNet Bridge Module (1756-DNB)	50 ms

C200 Control Processor Processing and Memory Resources

The **C200 Control Processor** provides a flexible execution environment for performing a variety of control tasks at different execution speeds. To determine how much control a Processor can perform, **Processor Usage** and **Memory Usage** must be considered. Available CPU and memory resources determine the number of modules or blocks a C200 Control Processor can execute. Other constraints, such as total number of CMs and SCMs, must also be taken into account.

These specifications should be reviewed to ensure that Experion PKS meets the application requirements. The table below represents an example of non-redundant Control processor configuration (not necessarily typical).

C200 Control Processor (Non-Redundant, 50 msec CEE) Capacity, Sample Configuration

Module Type	No. of Modules	Period, sec	Module PU	Module MU	Total PUs*	Total MUs
I/O Module (64 max)	*40*	*0.05*	0.3	0.6	240	24
Analog Data Acquisition CM	*20*	*1*	2.9	7.4	58	148
Small Analog Data Acq. CM	*10*	*2*	0.47	1.0	2.35	10
Regulatory Control CM	*100*	*0.5*	2.8	3.9	560	390
Auxiliary Function CM	*10*	*0.5*	4.2	13.1	84	131
Digital Data Acquisition CM	*20*	*0.1*	1.2	3.1	240	62
Small Digital Data Acq. CM	*10*	*0.1*	0.22	0.6	22	6
Device Control CM	*140*	*0.1*	1.3	3.1	1820	434
Logic Control CM	*10*	*0.1*	1.0	3.5	100	35
Sequential Control Module (SCM)	*50*	*1*	2.0	55	100	2750
				Total	**3226**	**3990**
				Max	**3600/1600****	**4000**

PU = Processing Unit per Control Cycle; MU = Memory Unit, Kbytes
PUs for any given CM = (PU per Cycle) / (Cycle Time, sec.)

*Total PUs = (No. of Modules) x (Module PU) / (Period, sec.) for each CM type.
Available Period for all CM and SCM types are 0.05, 0.1, 0.2, 0.5, 1.0 and 2.0 sec. I/O Modules fixed at 0.05 sec.
**Total PUs for Non-Redundant/Redundant C200 Control Processors (Module PUs provided above apply to a non-redundant controller, see table 17 for Module PU values for redundant controllers).

Table 15. CEE/CPM and CEE/ACE Processing Resources		
Minimum Reserved overall CPU to be Maintained During Runtime (CPUFREEAVG) [1]	**20% - CPM 40% - ACE**	
CEE type	**PU Maximum [2]**	**Maximum Loading Cycle [3]**
500 ms CEE - ACE	15000 PU/sec	60%
50 ms CEE – Non Redundant C200 Configuration	3600 PU/sec	60%
50 ms CEE – Redundant Configuration	1600 PU/sec	60%
5 ms CEE – Non Redundant Configuration	2400 PU/sec	40%

[1] CPUFREEAVG is not supported on ACE; CPU Usage from Windows Task Manager provides the CPU Resources used.

[2] Available Processing Units at indicated maximum loading cycle percentage. For example, for a 50 ms non-redundant CEE, users may configure it to use all of the 3600 PU. They must balance the CPU load across all cycles. Once they have done so, no single cycle should exceed 60% in its CPUCYCLEAVG value.

[3] Maximum Cycle Loading: Over cycles 0-39, the Average CPU Usage (CPUCYCLAVG) statistic is not to exceed the stated maximums.

Table 16. CEE Memory Resources and Block Configuration *MU = Memory Unit = 1 Kbyte = 1024 bytes*	C200/CPM	ACE
Maximum available memory resources	4000 MU	32000 MU
Maximum total number of CMs, SCMs and IOMs configurable per CEE	1000	4000 (IOMs not supported)
Maximum number of component blocks per CM This maximum number is achievable under nominal operating and monitoring conditions. The following items may lower the maximum number of FB's that can be placed in or monitored from a single CM: • Monitoring frequently changing values • Operating in a redundant system • Operating with high quantities of configured peer-to-peer	40	40
Maximum number of Steps & Transitions (divided over all handlers) per SCM	160 (80 Step/Transition pairs)	160 (80 Step/Transition pairs)

Table 17. Typical IOM/CM/SCM Processing and Memory Resource Requirements

Typical Module Types (FB Content in Parentheses) *Total Processing Consumption (PU/sec) per module type = Processing Resource Consumption (PU/module execution) / Execution Period (sec/module execution) * number of Modules*	Processing Resource Consumption		Memory Resource Consumption
	50/5 ms CEE Non-Redundant (PU/Module Execution)	50 ms CEE Redundant (PU/Module Execution)	500 ms ACE 50/5 ms CPM CEE (Mu/Mod)
Typical I/O Module (Average consumption of available IOM's)	0.3	0.19	0.6
Analog Data Acquisition CM (10 AI, 10 DataAcq FB's)	2.9	3.8	7.4
Small Analog Data Acquisition CM (1 AI, 1 DataAcq FB's)	0.47	0.43	1.0
Regulatory Control CM (1 AI, 1 DataAcq, 1 PID, 1 AO, 6 Logic FB's)	2.8	2.8	3.9
PID-PL Regulatory Control CM[1] (1 AI, 1 DataAcq, 1 PID-PL, 1 AO, 6 Logic FB's)	4.2[2]	4.2[2]	5.1[2]
Auxiliary Function CM (10 Aux. FB's, such as AuxCalc, Totalizer)	4.2	5.1	13.1
Digital Data Acquisition CM (10 DI, 10 Flag FB's)	1.2	1.2	3.1
Small Digital Data Acquisition CM (1 DI, 1 Flag FB's)	0.22	0.14	0.6
Device Control CM (2 DI, 2 DO, 1 DevCtl, 5 Logic FB's)	1.3	1.3	3.1
Logic Control CM (20 Logic FB's)	1.0	1.0	3.5
Sequence Control Module (SCM) A (Includes: 1 handler of each: Main, Hold, Stop and Abort; a total of 10 Steps with 8 Outputs and a total of 10 Transitions with 5 Conditions spread over all handles; 10 Recipe items, 5 History items) Total of 10 Steps and 10 Transitions spread over the 4 Handlers	2.0	3.0	28.9
Sequence Control Module (SCM) B (Includes: 1 Main Handler, no other Handlers, 20 Steps with 4 Outputs each, 20 Transitions with 3 Conditions each, 10 Recipe items, 5 History Items) Total of 20 Steps and 20 Transitions	2.0	3.0	35.7
Sequence Control Module with an alias table of size 45 rows by 100 columns (Includes: 1 handler of each: Main, Hold, Stop and Abort; a total of 10 Steps with 8 Outputs and a total of 10 Transitions with 5 Conditions spread over all handlers, 10 Recipe items, 5 History items) Total of 10 Steps and 10 Transitions spread over the 4 Handlers	2.0	3.0	128.5
Sequence Control Module with an alias table of size 500 rows by 9 columns (Includes: 1 handler of each: Main, Hold, Stop and Abort, a total of 10 Steps with 8 Outputs and a total of 10 Transitions with 5 Conditions spread over all handlers, 10 Recipe items, 5 History items) Total of 10 Steps and 10 Transitions spread over the 4 Handlers	2.0	3.0	124.5
The following Function Block libraries consume the following extra memory when the first block is loaded to the C200 Controller:	▪ Allen-Bradley Drive – 90 Mus ▪ AGA Calculation – 172 Mus ▪ DeviceNet Interface – 106 MUs ▪ Exchange (PLC5 & Logix5550) – 89 MUs ▪ Pulse Input IOM – 90 MUs ▪ FBUSIF (Linking Device) – 82 Mus ▪ HART I/O – 105 Mus ▪ Profibus Interface – 244 Mus ▪ Rail (RIOM- H) I/O – 107 MUs ▪ Rail (RIOM- A) I/O – 120 MUs		

[1] The PID-PL block supports execution rates as fast as 50ms for ACE and C200. A CM with the PID-PL block consumes approximately 50 percent more PUs as compared to a CM with the standard PID block. A CM with the PID-PL block utilizes circa 30 percent more MUs as compared to a CM with the standard PID block. [2] Estimated value

C200 Simulation Environment Specifications

The C200 Simulation Environment (SIM-C200) is an environment that simulates the C200 control processor execution. It can be used for strategy check-out, factory acceptance tests, and strategy development. It supports the same execution rate as the C200 50 msec Control Execution Environment. It also supports IO modules, IO channel templates and standard function block libraries. It does not currently support FOUNDATION Fieldbus, Pulse Input, Profibus, and special-use CCL library simulation.

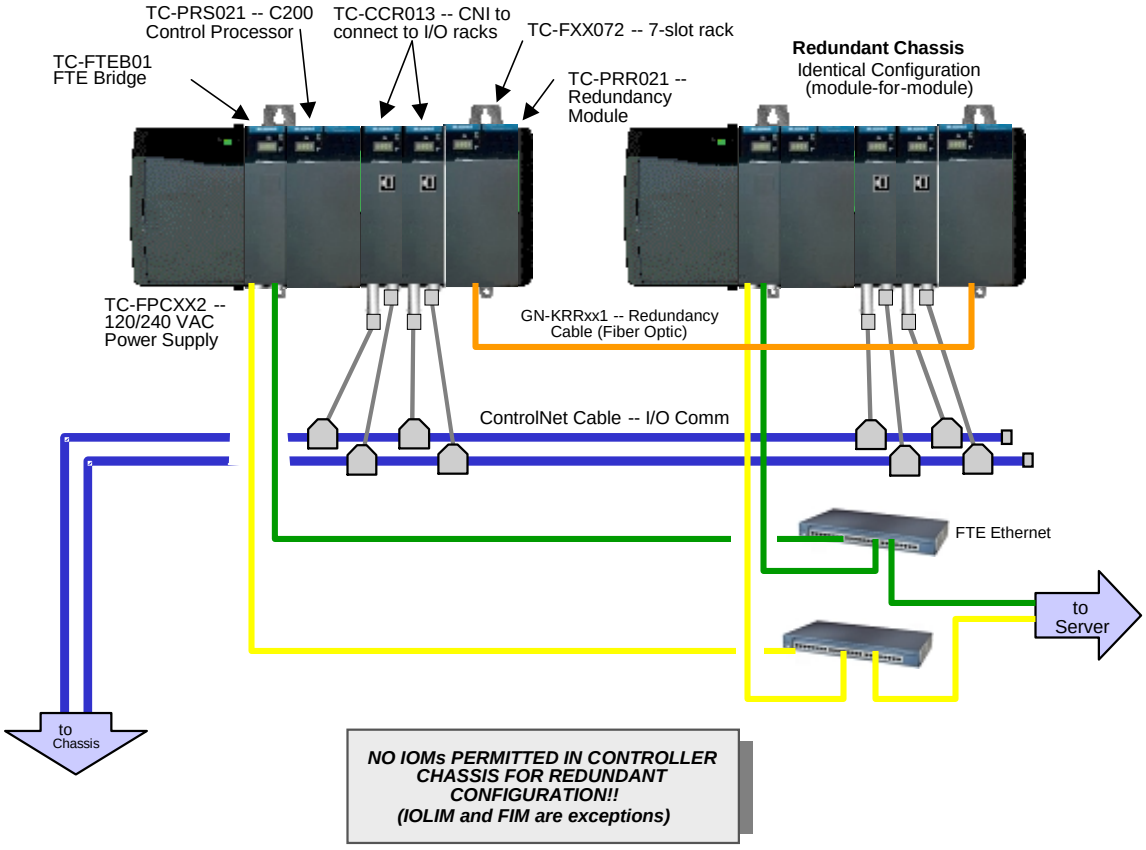
Application configuration can be moved between the simulation environment and the controller through the export and import function or by reassignment when both reside on the same Experion PKS server. Changes made on the simulation system can be restored on the real controller through the same procedure.

The SIM-C200 environment is equivalent to the Control Processor's Control Execution Environment. It is installed on a PC platform with up to four SIM-C200 environments loaded to that PC. The SIM-C200 environment requires the Windows 2000 Server operating system. A dual processor server is required when four environments are executed on the same node to guarantee the 50 msec base cycle.

Models Numbers

Models-at-a-Glance Examples

Redundant Controller Configuration (FTE Supervisory Network)



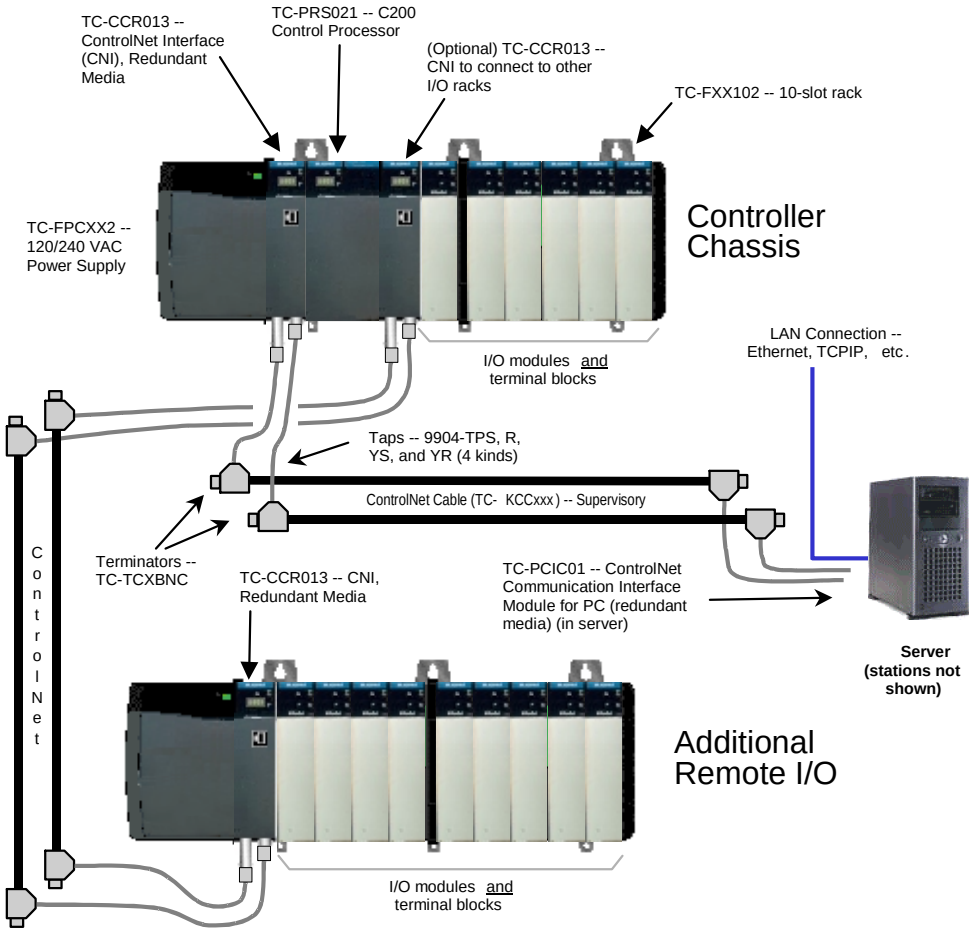
The above example is meant to illustrate **typical component model numbers** necessary for a **FTE based system** with a **redundant Controller on a FTE Supervisory Network** (see following pages for a Redundant ControlNet example and an Ethernet Supervisory Network Configuration example). A **power supply** or a redundant power supply chassis adapter always attaches to the left-end of a chassis and *does not use any chassis slots*.

The **Supervisory FTE Network** is a *physically separate* network from the **I/O ControlNet** (both shown). This Supervisory network carries supervisory messages between the Experion PKS Server and Controllers as well as peer-to-peer messages between controllers. The I/O ControlNet carries messages between controllers and IOMs. Note that a **ControlNet Tap** consists of two BNC connectors for trunk cable connection, an integral 1-meter drop cable, and a BNC connector for ControlNet Interface (CNI) connection. Several physical models are available to accommodate different mounting layouts. **FTE** is **not** supported as IO network.

The ”A” and “B” FTE network cables connect to their own Ethernet switch, which is part of the overall FTE switch tree. See the Fault Tolerant Ethernet (FTE) Specification and Technical Data, EP03-500-110 for more information.

Other Experion PKS operator stations connect to Experion PKS via the same **FTE** network.

Non-Redundant Controller Configuration (ControlNet Supervisory Network)

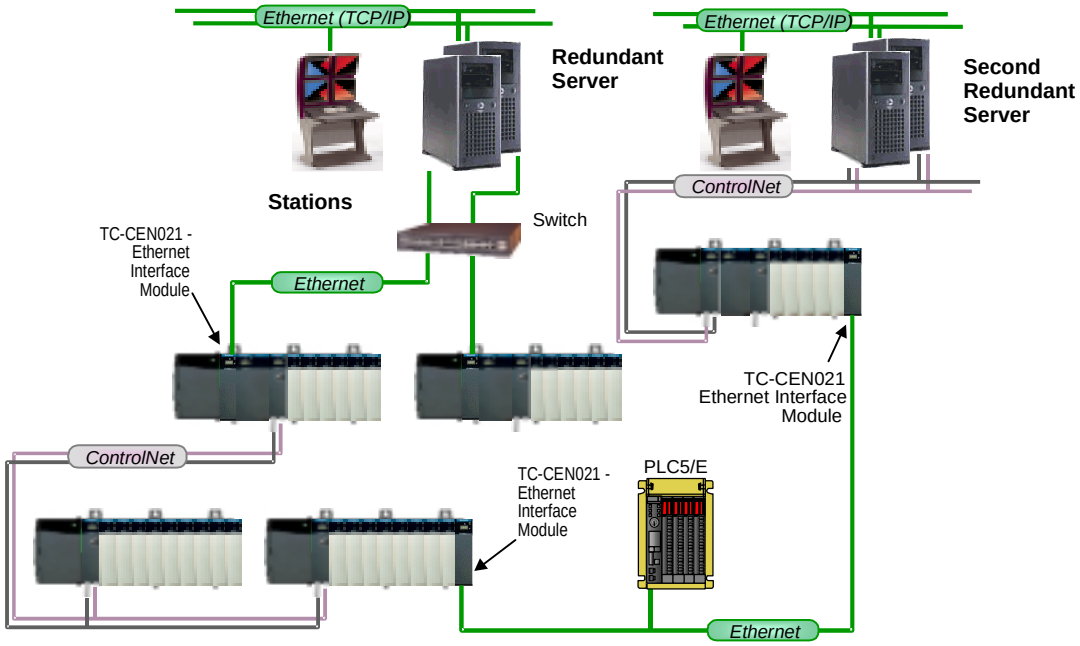


The above example is meant to illustrate **typical component model numbers** necessary for a **small system** with a **non-redundant Controller on a ControlNet Supervisory Network** (see following pages for a Redundant ControlNet example and an Ethernet Supervisory Network Configuration example). A **power supply** or a redundant power supply chassis adapter always attaches to the left-end of a chassis and *does not use any chassis slots*.

The **Supervisory ControlNet** is a *physically separate* network from the **I/O ControlNet** (both shown). This Supervisory network carries supervisory messages between the Experion PKS Server and Controllers as well as peer-to-peer messages between controllers. The I/O ControlNet carries messages between controllers and IOMs. Note that a **ControlNet Tap** consists of two BNC connectors for trunk cable connection, an integral 1-meter drop cable, and a BNC connector for ControlNet Interface (CNI) connection. Several physical models are available to accommodate different mounting layouts.

Other Experion PKS operator stations connect to Experion PKS via a **LAN** above the server, not via the Supervisory ControlNet.

Non-Redundant Controller Configuration (Ethernet Supervisory Network)

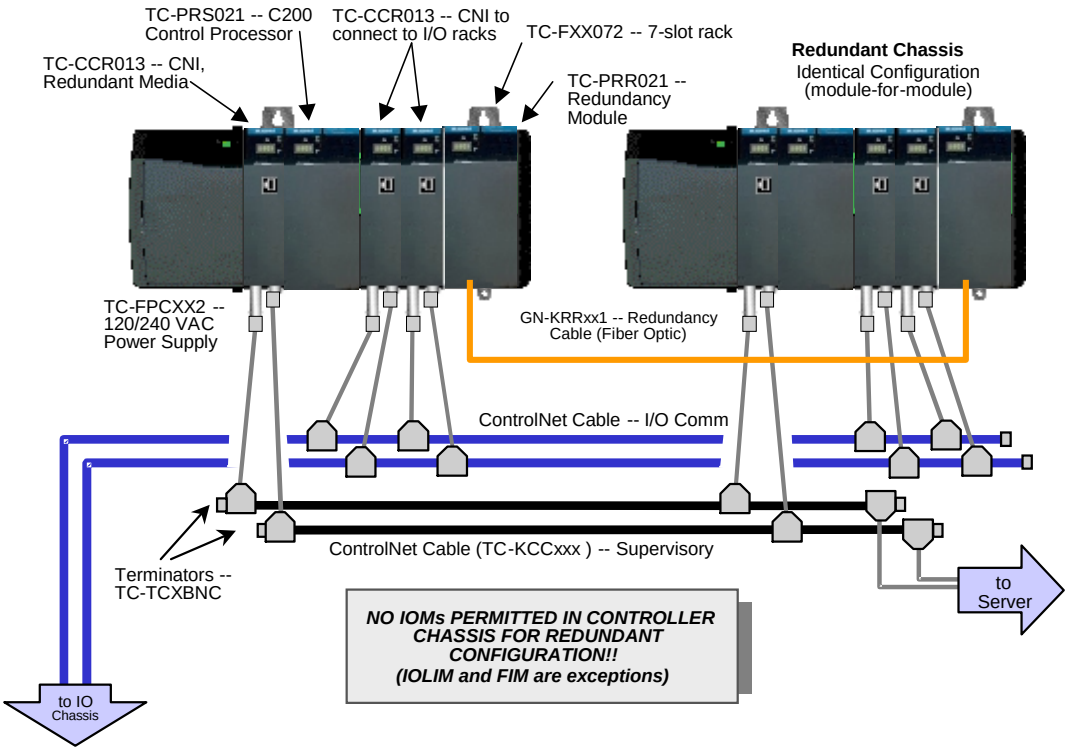


Ethernet communication exists from the server to the controller. This enhances flexibility based upon open technology. Ethernet connectivity exists on the supervisory network and as a means to connect external devices (such as PLC5s, etc.). It includes switched network topology and 10 MB TCP/IP support. The Honeywell module, **TC-CEN021**, connects via a 10BaseT Ethernet Cable connector.

The above diagram depicts a basic Ethernet topology implementation. Key Configuration Rules include:

- A Switched Ethernet Supervisory (Server to Controller) topology is supported. While this is not an Experion PKS-supplied item, the TPN Bridge switch, TP-TPNBS1 (TPN Bridge Dual Ethernet Switch) is recommended.
- Non-Redundant C200 Controllers are used with an Ethernet Supervisory Control Network, where the Ethernet module is in the Controller Rack. However, you can use the Ethernet Module with Redundant C200 Controllers for exchange peer-to-peer when it's located in the I/O Rack.
- Support for ControlNet and Ethernet to different C200 Controllers simultaneously from the same Server is not supported.
- A downlink ControlNet segment (not Ethernet) is used to support remote I/O. An Ethernet Module, located in an I/O rack, can be used to Exchange peer-to-peer with external devices.
- Experion PKS Station Nodes may reside on the same Ethernet segment as the C200 Controllers for small systems when the total number of Stations (not counting the Server) plus C200 Controllers totals four (4) or less, e.g. 1 Station + 3 C200s; or 2 Stations + 2 C200s, etc.
- The Supervisory Network segment does not support a Redundant Ethernet configuration.
- The PCIC ControlNet PC card is not needed. Instead, an Ethernet NIC card is installed in the PC. A separate PC Ethernet Interface card is required between the Server and the Stations.
- TC-CEN021 is a single wide module that, when used in the Supervisory Network, is placed in slot zero.
- RSLinx OEM version 2.4 (EP-IRSL24) is used for each Base Software License (EP-DBASE1 + EP-DPRxxx) and Redundant Server.
- Fieldbus (FIMs) are not supported on an Experion PKS system that uses Ethernet as the Supervisory Process Control Network.

Redundant Controller Configuration (ControlNet Supervisory Network)



The above example illustrates a **Redundant Controller** configuration. The redundant **Controller chassis** are **identical**, with all modules in the same slot locations and no I/O modules in the Controller chassis.

Up to **four** (4) I/O **CNIs** are present in each Controller chassis, **each** of which can **support up to 24 IOMs** (maximum of 64 IOMs per Controller). All four I/O CNIs may share a single ControlNet trunk cable, or individual cables may be used per CNI as needed. As an example, a controller with 3 I/O CNIs could use a single I/O ControlNet cable, two I/O ControlNet cables or three individual cables. All three configurations are valid.

All CNIs on the same physical **Supervisory** or **I/O ControlNet** network must be either single-cable type or redundant-cable type, but each must not contain a mixture of both. This is a requirement for proper ControlNet cable fault handling and for normal ControlNet operation with minimal communications errors. The PC ControlNet Communication Interface is only available in the redundant configuration, but works properly in either configuration.

CNI cards in a redundant chassis are either Tx-CCN012/013 (non-redundant media) or Tx-CCR012/013 (redundant media) ControlNet Interface (CNI) modules. The CNI cards in the primary rack have the same model number and revision as the CNI card in the same slot of the secondary rack.

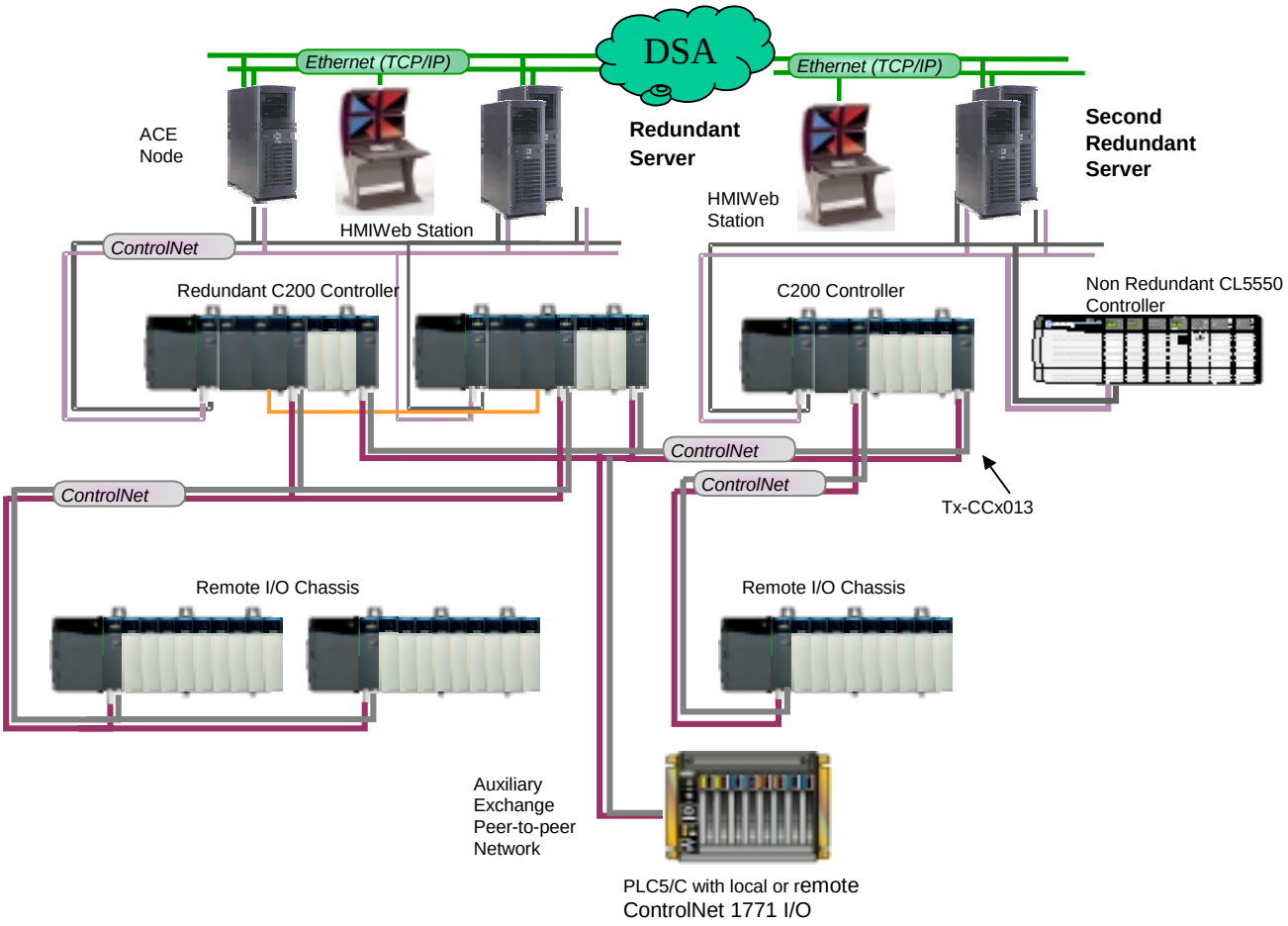
Auxillary Exchange Peer-to-Peer Topology

An Auxiliary Exchange peer-to-peer network can be created using Ethernet, ControlNet, Data Highway Plus or DeviceNet to interface with PLC devices and for example PanelView operator panels (FTE is not supported as exchange peer-to-peer network to foreign devices). When multiple Experion PKS servers are combined, the Supervisory ControlNet segments from different Experion PKS Servers are not directly connected together.

The Network between Servers can be local or Remote (WAN), and must support the necessary bandwidth described in EP03-200-200 Experion PKS Server Specification and Technical Data.

A ControlNet hosting PLC5/C with associated 1771 I/O may be interconnected to another controller chassis on another server, as shown. Both C200/CPMs may obtain PLC5/C data using exchange blocks in this case. This link is also available for a C200/CPM of one server to communicate with a C200/CPM of another server using Exchange Function Blocks.

As shown in the diagram below, an Exchange peer-to-peer is also possible between C200 controllers that reside under different Experion PKS servers. This applies to either a dedicated ControlNet network, an Ethernet network or the FTE network (same FTE community) connecting the controllers to the servers. Exchange peer-to-peer is only possible between controllers that are connected to the FTE network through the FTE Bridge. (FTE Bridge module is not supported in any foreign PLC type device).



Controllers, Racks, Power Supplies & Communications Modules

Model Description	Uncoated Model number	Coated Model number [1]
Controller		
C200 Control Processor [2]	TC-PRS021	TK-PRS021
Battery Extension Module	TC-PPD011	TK-PPD011
Redundancy		
Redundancy Module	TC-PRR021	TK-PRR021
Redundancy Cable 1 Meter	GN-KRR011	
Redundancy Cable 3 Meter	GN-KRR031	
Redundancy Cable 10 Meter	GN-KRR101	
Communication		
Fault Tolerant Ethernet Bridge	TC-FTEB01	TK-FTEB01
ControlNet Interface (single media) [3]	TC-CCN013	
ControlNet Interface (redundant media) [3]	TC-CCR013	TK-CCR013
EtherNet Interface Module [4]	TC-CEN021	
ControlNet PCI Interface 5[3]	TC-PCIC01K	

[1] **Conformal coating** optional except as noted.
[2] Each operating **Control Processor** or **Redundant Control Processor Pair** requires purchase of **one Control Solver license**, **TC-SWCS11** or **TC-SWCS21**. Note that the actual software is included with the Experion PKS Process Server Software EP-DBASE1 + EP-DPRxxx). **TC-SWCS11** and **TC-SWCS21** consist of the license to use this software.
[3] Series "D" (Tx-CCx013) ControlNet Interface Modules displaced their corresponding model numbers from Series "C" (Tx-CCx012) as of R310.
[4] The EtherNet Interface Module (TC-CEN021) is shown as a reference for existing users.
[5] TC-PCIC01K is used with both **dual** and **single** ControlNet media.

For I/O models and specifications, please refer to:

EP03-400-200 Experion PKS Chassis I/O Modules - Series A Specification and Technical Data
EP03-410-200 Experion PKS Rail I/O Modules - Series A Specification and Technical Data
EP03-420-200 Experion PKS Galvanically Isolated/Intrinsically Safe Rail I/O Modules - Series H Specification and Technical Data
EP03-430-200 Experion PKS PM I/O Specifications and Technical Data
EP03-440-200 Experion PKS DeviceNet Integration Specifications and Technical Data
EP03-450-200 Experion PKS PROFIBUS DP Specifications and Technical Data

Miscellaneous Hardware

Model Number	Description
TC-BATT01	Spare Battery -- Control Processor
TC-BATT03	Spare Battery – Battery Extension Module (BEM)

Cables and Connectors

Model Number	Description
	ControlNet connectors and terminators
TC-MC1BNC	Connector, BNC/RG-6 plug (for Trunk Cables, Pkg. of 2)
TC-MC2BNC	Connector, BNC, bullet (Jack-to-Jack, Pkg. of 2)
TC-MC3BNC	Connector, BNC, barrel (Plug-to-Plug, Pkg. of 2)
TC-MC5BNC	Connector, BNC, isolated bulkhead (Jack-to-Jack, Pkg. of 2)
TC-MC6BNC	Connector, BNC, right angle (Jack-to-Plug, Pkg. of 2)
TC-TCXBNC	ControlNet Terminator (BNC, Pkg. of 2)
9904-CTK	ControlNet Coax Network Tool Kit
1786-TCAP	Tap Dummy Load (Pkg. of 5)
	ControlNet Interface Products
9904-CP	ControlNet Network Access Cable
TC-RPFS01	ControlNet Repeater Fiber Optic (300 M)
TC-RPFM01	ControlNet Repeater Fiber Optic (3000 M)
TC-RPA002	ControlNet Modular Repeater Adapter
	ControlNet Taps *(see below)*
9904-TPS	T-Tap Straight
9904-TPR	T-Tap Right angle
9904-TPYS	Y-Tap Straight
9904-TPYR	Y-Tap Right angle
	ControlNet Trunk Cable (with connectors)
TC-KCCX01	1 meter
TC-KCCX03	3 meters
TC-KCCX10	10 meters
TC-KCCX30	30 meters
TC-KCCX50	50 meters
TC-KCC100	100 meters
TC-KCC200	200 meters
TC-KCC500	500 meters
TC-KCC900	275 meters (no connectors)
Refer to **ControlNet Cable System Planning and Installation Manual** for details	

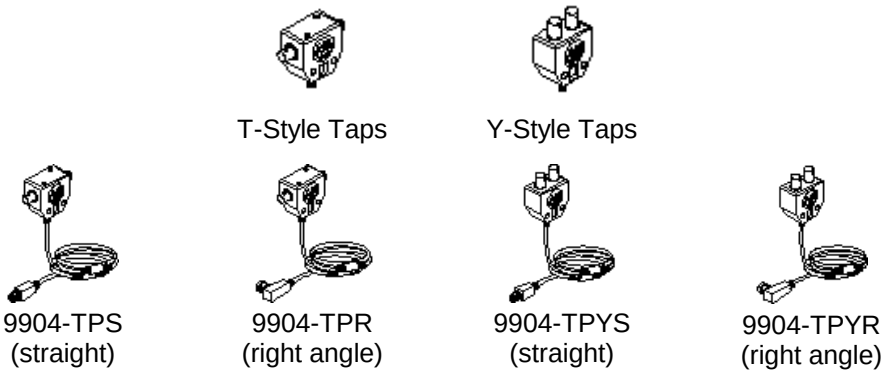


Figure 8. Illustrations of Different ControlNet Tap Styles

Controller Software

Control Builder features and Function Block Libraries can be subjected to licensing. The Control Builder complies with the licenses available on the server it is connected to. Licenses cannot be transferred between servers. There are two types of licenses, as indicated per model number:
A – a fixed number of instances can be loaded to the system, regardless of controller assignment,
B – the Function Block library or feature is enabled; the number of instances of a Function Block does not matter.

Control Execution Environment Configuration Software		
Model Number	**Model Description**	**License Type**
TC-SWCB11[1]	CB10 Control Builder	A
	- CL01 Continuous Library	
	- SL01 Sequential Library	
TC-SWCB31[2]	CB10 Control Builder Client License	A

[1] One license is included as a part of Experion PKS Base Server System Software. This model number does not support a stand-alone installation, therefore it is not orderable as a separate item.
[2] TC-SWCB31 allows Control Builder access to engineering databases via TCP/IP and UDP/IP Communications. It can be loaded on any client PC, with or without Experion PKS Station software. A login dialog box provides access restriction. Each database can be accessed simultaneously by up to four (4) clients. This means that a maximum of 3 additional TC-SWCB31 licenses can be used per Experion PKS server in addition to it's own client provided with the base system.

C200 Controller Software and Optional Control Libraries		
Model Number	**Model Description**	**License Type**
TC-SWCS11[1]	CS01 Control Solver 50 msec Control Execution Environment (license)	A
TC-SWCS21[1]	CS02 Control Solver 5 msec CEE (license)	A
TC-FFLXxx	Fieldbus Usage Licenses *see EP03-400-200 for models and requirements*	A
TC-PBLXxx	Profibus Usage Licenses *see EP03-450-200 for models and requirements*	A
TC-DNLXxx	DeviceNet Usage Licenses *See EP03-440-200 for models and requirements*	A
TC-AGAL02	AGA flow rate calculation library (R320 and later)	B
TC-ABDL02	AB drive interface library (R320 and later)	B

[1] One CS01 or one CS02 license is required to be purchased for **each** individual **C200 Control Processor** or **Redundant Control Processor pair**. This licenses the software provided with the Experion PKS Base Server System Software.

Template Support

Model Number	Model Description	License Type
TC-TMP0BS	Configuration Template Support Base SW	B
TC-TMP100	100 Point Configuration Template Support	B
TC-TMP01K	1,000 Point Configuration Template Support	B
TC-TMP02K	2,000 Point Configuration Template Support	B
TC-TMP05K	5,000 Point Configuration Template Support	B
TC-TMP10K	10,000 Point Configuration Template Support	B
The Base SW license is required for each implementation. The Point licenses augment the base and are chosen in bundles to match the system Process Point count.		

Qualification and Version Control System Support (QVCS)

Model Number	Model Description	License Type
TC-QVC0BS	Qualification and Version Control System Base SW	B
TC-QVC100	100 Point Qualification & Version Control System	B
TC-QVC01K	1,000 Point Qualification & Version Control System	B
TC-QVC02K	2,000 Point Qualification & Version Control System	B
TC-QVC05K	5,000 Point Qualification & Version Control System	B
TC-QVC10K	10,000 Point Qualification & Version Control System	B
The Base SW license is required for each implementation. The Point licenses augment the base and are chosen in bundles to match the system Process Point count.		

Application Controller Environment (ACE) Software

Application Controller Environment Software and Function Block Libraries are subjected to licensing. The license always applies to the Experion PKS Server the ACE Server is connected to. Licenses are not transferred between servers. There are two types of licenses, as indicated per model number:
A – a fixed number of instances can be loaded to the system, regardless of controller assignment,
B – the Function Block library or feature is enabled; the number of instances of a Function Block does not matter.

Application Controller Environment Software		
Model Number	**Model Description**	**License Type**
TC-SWSC01[1]	ACE Base Software License	A
[1] The ACE Base software requires a dedicated Windows 2000 Server PC.		

Application Controller Environment Control Libraries		
Model Number	**Model Description**	**License Type**
TC-OPCL01 [1]	OPC Extension Library	B
TC-UCNL01 [1]	UCN Output Extension Library	B
[1] TC-OPCL01 and TC-UNCL01 are additional libraries to the ACE Node. These require TC-SWSC01.		

Simulation System Software

SIM-C200 - Strategy Check-out Software		
Model Number	**Model Description**	**License type**
TC-SIMC21	C200 Simulation Control environment[1]	A

[1] This model number should be ordered when a SIM-C200 simulation environment should be added to an existing on-process Experion PKS server for strategy checkout purposes.

Simulation System Software	
Model Number	**Model Description**
TC-SIM001	Simulation System – 1 to 3 SIM-C200s [1]
TC-SIM002	Simulation System – 4 to 5 SIM-C200s [1]
TC-SIM003	Simulation System – 6 to 7 SIM-C200s [1]
TC-SIM004	Simulation System – 8 to 10 SIM-C200s [1]

[1] The number of SIM-C200 licenses should match the number of controllers on the on-process Experion PKS Server.

Simulation System Expansion Model Numbers	
Model Number	**Model Description**
TC-SIMEX1	Simulation System Expansion – 1 to 3 SIM-C200s to 4 to 5 SIM-C200s
TC-SIMEX2	Simulation System Expansion – 4 to 5 SIM-C200s to 6 to 7 SIM-C200s
TC-SIMEX3	Simulation System Expansion – 6 to 7 SIM-C200s to 8 to 10 SIM-C200s

The Simulation System license includes the listed functions listed below. The license cannot be expanded with other options.

Quantity	Model Number	Model Description
4	TC-SWCB31	CB10 Control Builder Client License
3	EP-STAT01	Experion PKS Station – Flex, 1 connection
1	EP-SMUWIN	Multiple Static Station Option
1	EP-DBASE1 and QTY 2 EP-DPR10K	Process Base Server 20,000 Cont Mods/Points
1	EP-RBASE1 and QTY 2 EP-RPR10K	Process Server Redund - 20,000 Point
3	EP-XRSVR1	DSA License, Per Remote Server
1	EP-AERMGR	Recipe Manager
1	EP-AEPTCT	Point Control Scheduler
1	EP-AEODEX	ODBC Data Exchange
1	EP-AEEXEA	Extended Event Archiving
1	EP-AEAPGR	Alarm Pager
1	EP-AEBRPT	Batch Reporting
1	EP-AEIMMR	Integrated Maintenance Manager
1	EP-AEEVAN	Event Analyst for Experion PKS
1	EP-EAAPTK	Application Development Toolkit
10	EP-UODA1U and EP-OPCSDA	Open Data Access -- 10 Users

Experion PKS

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