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# **PlantScape**

## **Controller Implementation**

### **Book 3 : Discussion Session Notes and Unit Exam**

### **Answers**

**Release 400**  
**11/01**

Note: These lectures are used to supplement the course material. They are Power Point slides printed in slide format. The lectures are presented at appropriate times during the class

## **Release 400**

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## 428 Process Description

The process we will automate uses a steam jacketed reactor fed by two ingredient tanks. (See the diagram on the following page.) Ingredient A is always used in the process in varying amounts. Ingredient B is optional depending on the final product. The reactor has a two-speed agitator which runs on low as the ingredients are charging. It switches to high during the reaction, which takes place when the charging is complete.

The reaction phase of the process consists of a temperature ramp to a specified set point and a ramp down immediately after. The reactor agitator is set to high speed during the ramp up and down.

When the temperature cools to a specified level, the agitator switches to low and reactor draining begins. Draining continues until the reactor is empty. The agitator is switched off as the reactor nears empty to prevent the motor from burning out.

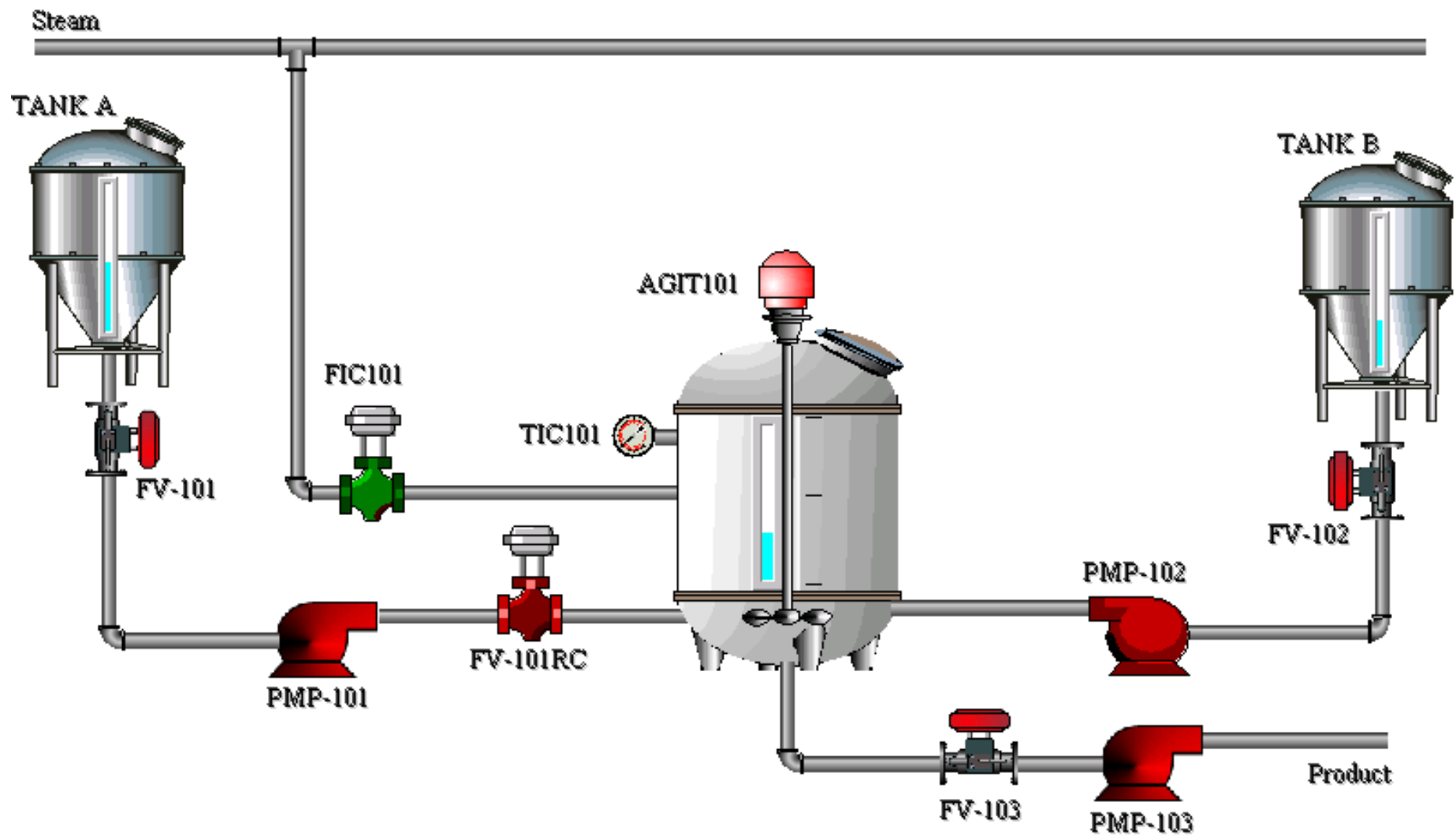
Both ingredient tanks as well as the reactor have two-state bottom valves and two-state pumps in-line. In addition, the A fill line has a regulatory control valve since flow rate of ingredient A into the reactor is process critical. Totals of ingredients A and B, and product, are monitored and recorded after each batch.

Process and safety interlocks are incorporated to: 1) prevent reactor over flow; 2) prevent fill valves opening during draining; 3) prevent the pumps being turned on when their corresponding bottom valves are closed; 4) prevent the agitator being turned on when the reactor is empty; and 5) prevent the drain valve opening during ingredient charging.

The process can be run manually and we will also set it up to run automatically.

## 428 Process Diagram

Honeywell



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# PlantScape System Overview

## 431 Introduction

## 431 Introduction Topics

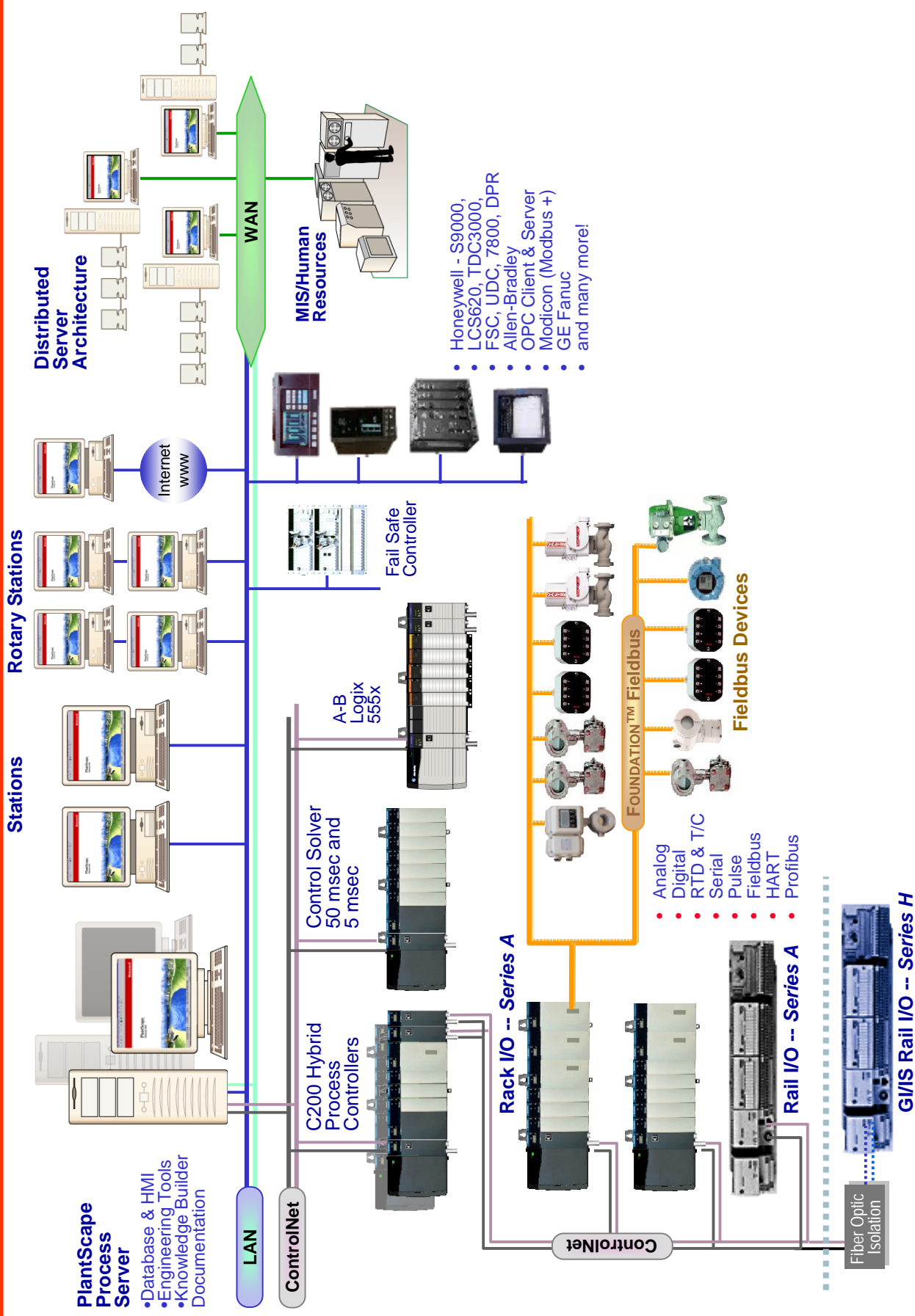
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### PlantScape Hybrid Control System

- Overview of PlantScape system
- C200 Controller description
- I/O Options & Field Networks
- Server Functionality
- Human Interface
- PlantScape Options
- Release 400 Enhancements



# PlantScape: The Big Picture

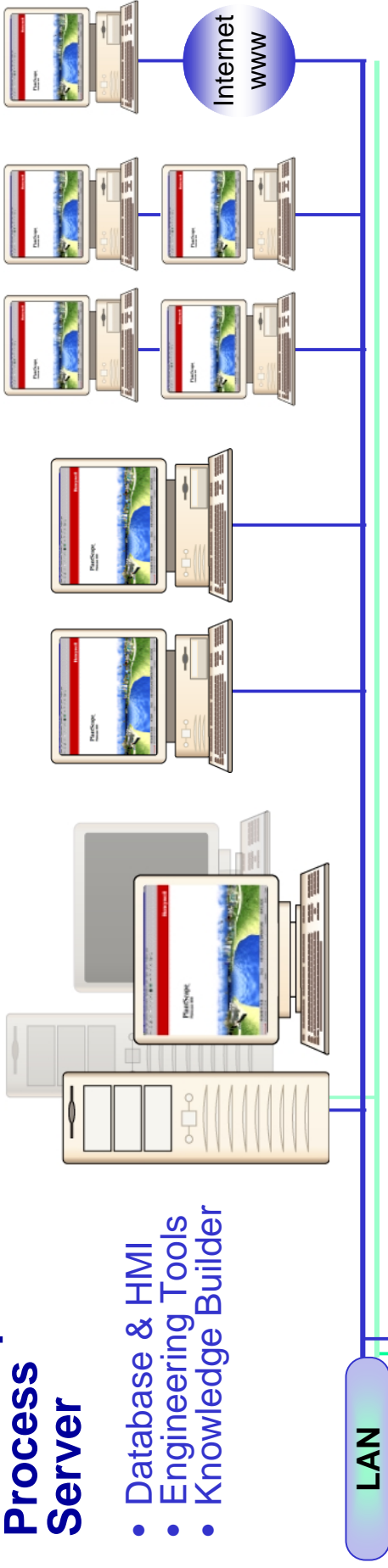


# PlantScape: HMI & 3rd Party Control

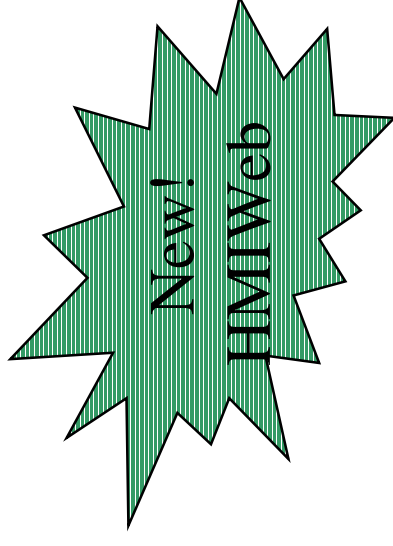
## PlantScape Process Server

- Database & HMI
- Engineering Tools
- Knowledge Builder

## Stations Rotary Stations



- Honeywell - S9000,
- LCS620, TDC3000,
- UDC, 7800, DPR
- Allen-Bradley
- OPC Client & Server
- Modicon ASCII, RTU, +, TCP/IP)
- GE Fanuc
- Moore APACS
- **Fail Safe Controller**
- and many more!



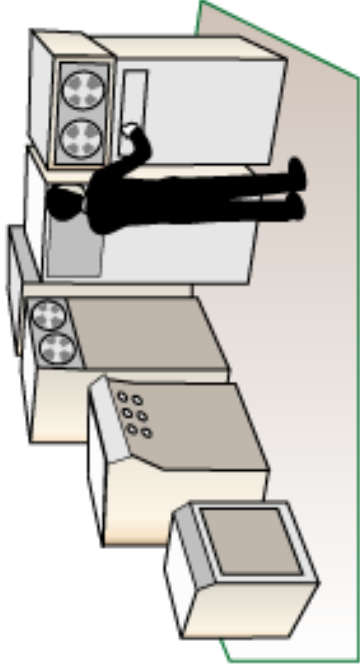
# Knowledge Builder

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- HTML-Based Documentation
  - Uses standard & familiar Internet Explorer interface
  - World-Wide Web look & feel
- Built-in Search Tools
- Can add site documentation to system (Site Docs)
- Easily updated for new features & releases
- Can view from within operator interface, or from any PC with web browser

# PlantScape: High-Level Interface

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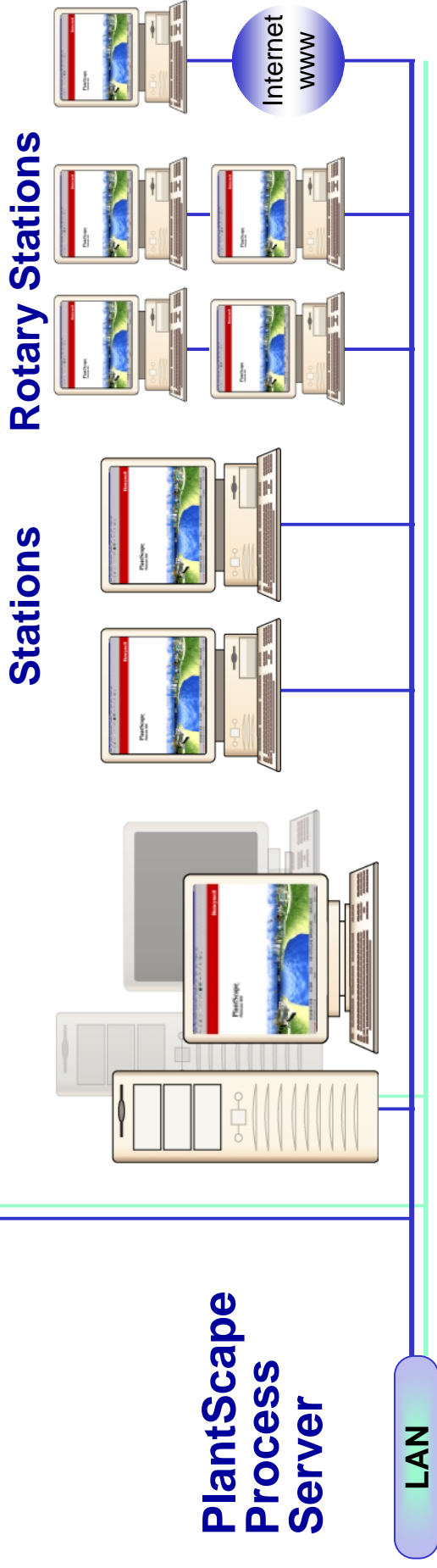


## High-Level Interfaces

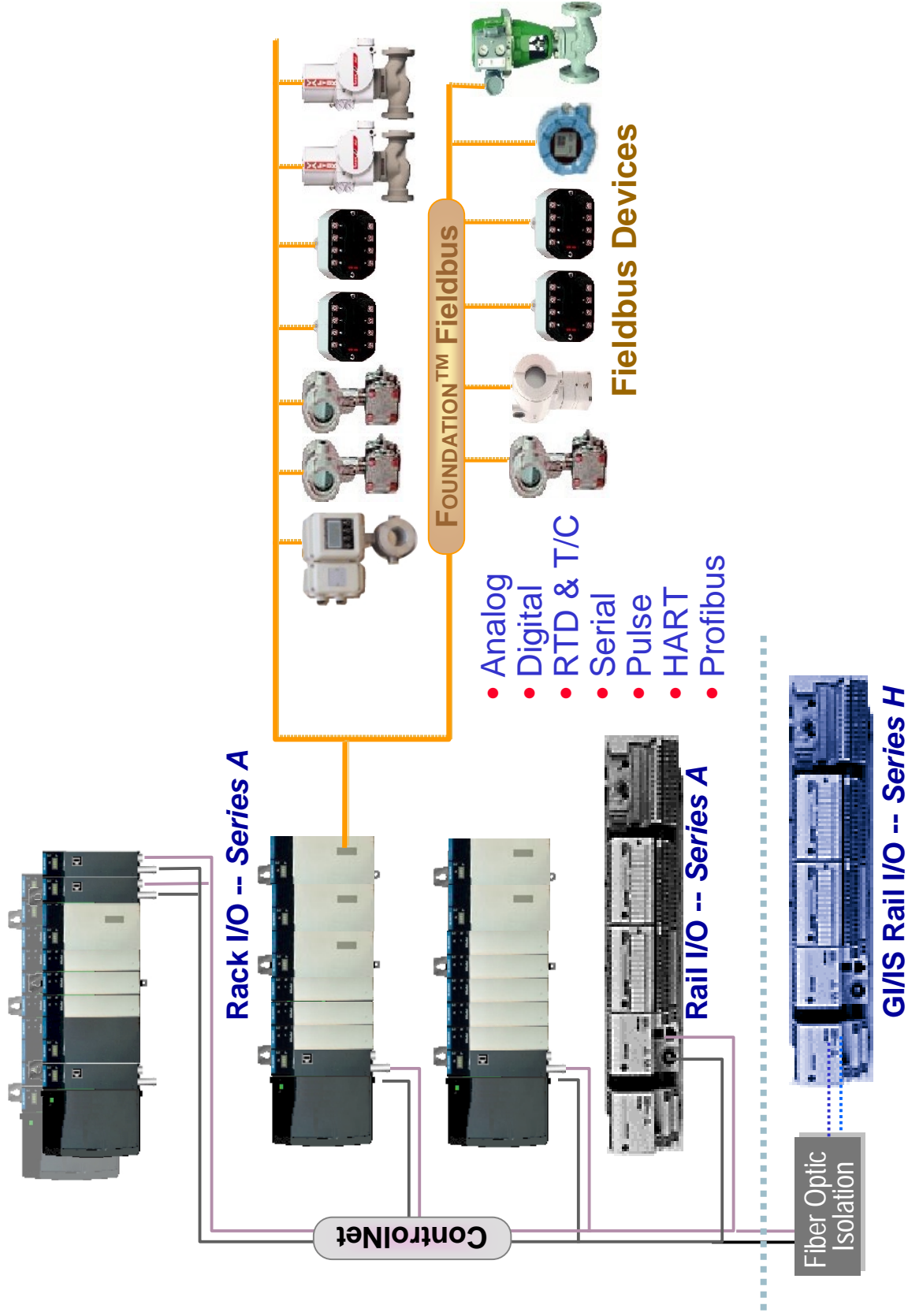
- Total Plant Batch
- Uniformance Historian
- MIS/Human Resources

## Via Many Open Interfaces

- OPC Client & Server
- ODBC
- SQL
- DDE
- Microsoft Excel Data Exchange
- And Many Others!



# PlantScape C200 and I/O



# C200 Hybrid Controller

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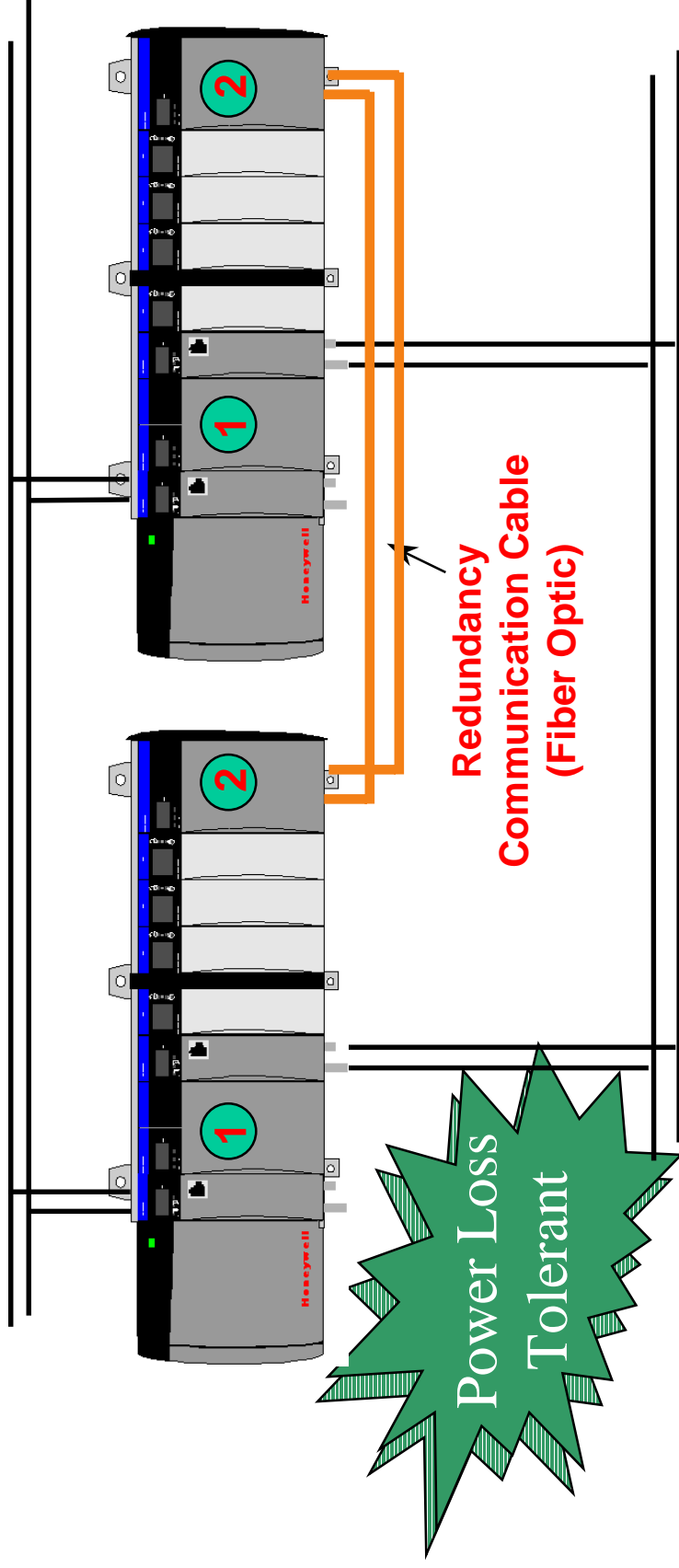
- Loop, Logic, and Sequence Control as fast as 5 mS
  - Deterministic execution rate for each control module
  - One engineering tool
- Fully Redundant with separate back-plane for each controller
  - Instant, seamless failover with Honeywell's Redundancy Module
  - Redundant Power Supplies for Controller and I/O (2001)
  - Redundant network for peer-to-peer, Server, and I/O Communications
- On-line modification to control strategy
- Peer-to-Peer with other C200 Controllers, Allen-Bradley PLC5 and CL5550 controllers
- One database for controller, HMI, alarms, and events
- Snapshot save / restore services
- Variety of Local & Remote I/O



# Full Controller Redundancy

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*Redundant Communication to Peer Controllers and  
PlantScape Server*

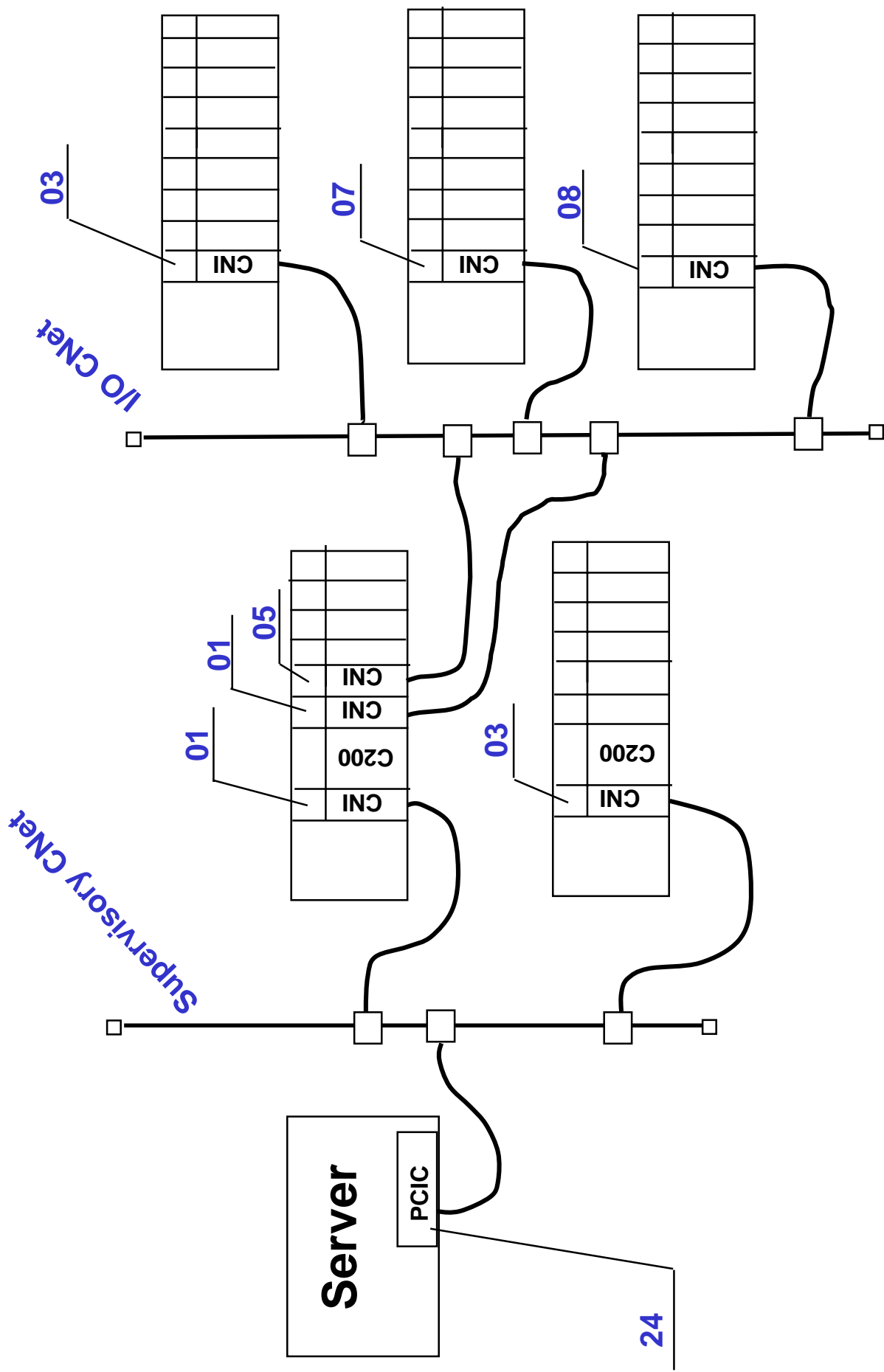


1 Controller

2 Redundancy  
Modules

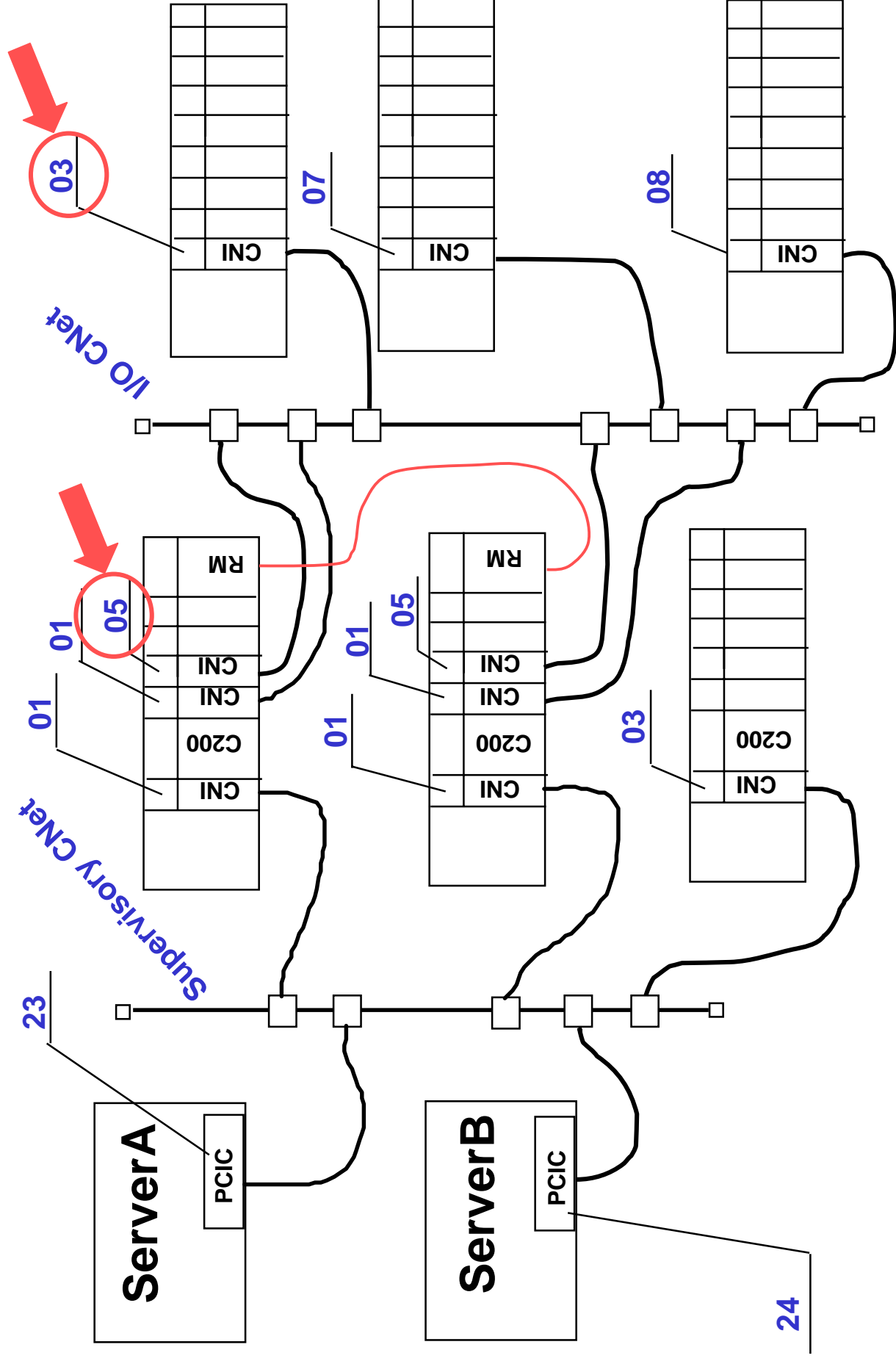
*Redundant Communication to I/O  
Chassis*

# Address Settings





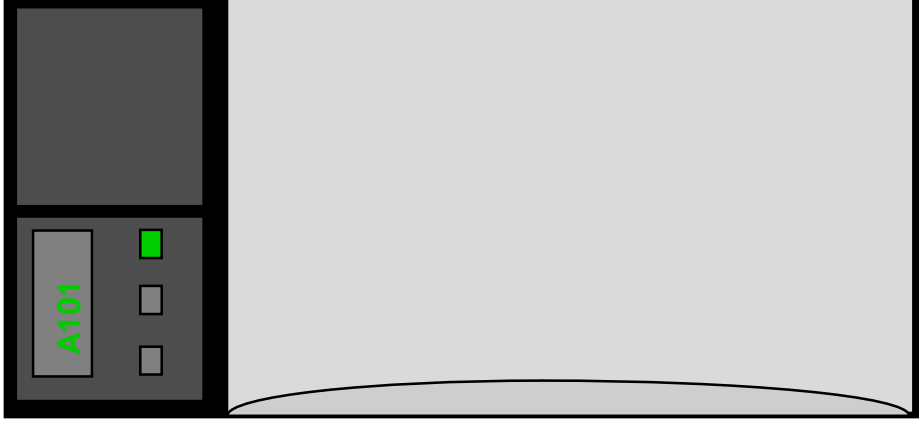
# Address Settings



# Control Processor Module

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- 2 board, double-wide module
- 100 MHz PowerPC microprocessor
- Memory
  - 8 Mbyte RAM with EDAC
  - 4 Mbyte Flash ROM with EDAC (upgrades w/o a new chip)
  -
- Built in lithium battery; Optional rechargeable Battery Extension Module
- Supports up to 64 I/O modules



# C200 Processing Power

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- Capacities
  - 10 redundant or non-redundant controllers per server
  - 64 I/O modules per controller
  - 8 Remote I/O sites per controller
- Racks
  - Multiple sizes (4, 7, 10, 13 and 17 slots)
- Redundant power supplies available for processor & I/O racks
- Networks
  - Redundant, deterministic, and redundant ControlNet -- Up to 10 km with Fiber Optic support
  - Popular and inexpensive Ethernet Supervisory network option



# C200 Control Environment

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Every Controller is licensed for:

- Continuous Functions
  - Regulatory, computation, compensation functions
  - Full-featured algorithm set
  - User-written expression for PV
- Device Control Functions
  - Multiple Inputs and Outputs
  - 2 or 3 States
  - Full interlock Capability
- Logic Functions
  - Boolean, selection, comparison functions
  - Broad range of logic functions
- Sequence Control Modules (SCMs)
  - Sequential condition/action handling
  - Powerful abnormal/failure handling and recovery
  - Common SCMs for unit functions

# Control Processor Module: LED Indicators

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## States:

- RUN - loaded and operating
- BKUP - redundant backup controller
- IDLE - loaded and not processing
- NODB - personality loaded, no configuration
- RDY - inactive and ready to be loaded
- ALIV - alive; base software not loaded
- FAIL - hardware/software failure

## BATtery and OK indicator LEDs

BAT and OK LEDs are green when OK; red if status is failed.

# Control Builder

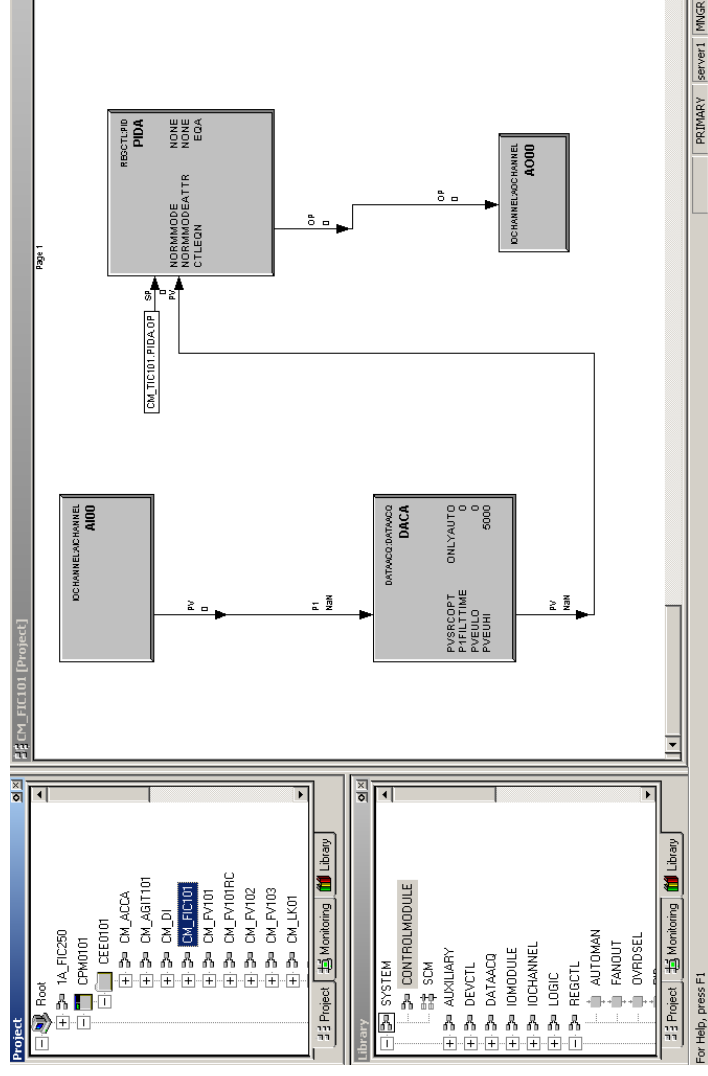
- Provides “single point of build” for PlantScape Process global database

## –One database for

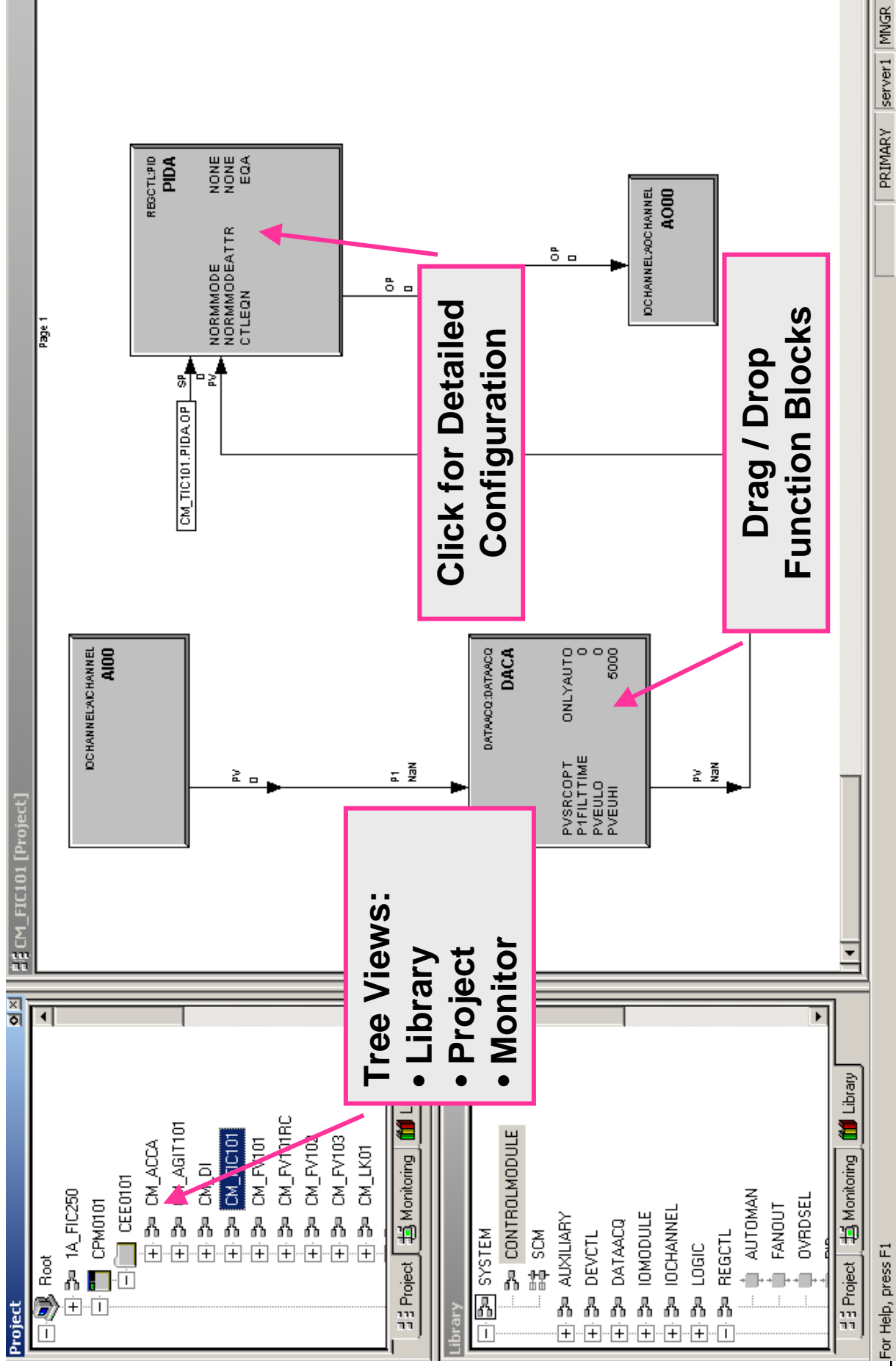
all server nodes

–One database for controller & HMI

- Tagged entity is the:
  - Control Module
  - Sequential Control Module
- Flexible scheduling:
  - 5 mS to 2000 mS



# Control Module Example



For Help, press F1

PlantScape R400 02/2002

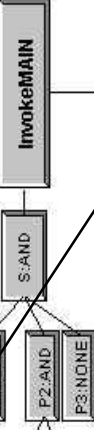
UI-L1-17

[HelpLink](#)

## Embedded Operator Instructions

Transition Conditions	
#	
1	EXAMPLE_SCM.command=3
2	EXAMPLE_PID.pida.pv>50.
3	EXAMPLE_MOTOR.DEVCTLA.gpv=4
Down Up Del Add	

The **invoke transition** can be used to automatically start the SCM handler if the condition s specified within are met. If the operator command the SCM to start, the Invoke transition is bypassed.



## Link to KnowledgeBuilder

### Step Blocks

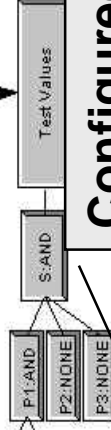
Step Outputs	
#	
1	EXAMPLE_PID.pida.modeattr=2
2	EXAMPLE_PID.pida.sp=75.
3	EXAMPLE_PID.pida.sp=EXAMPLE_SCM.rectarget[1]
4	EXAMPLE_SCM.histvalue[1]=EXAMPLE_PID.pida.pv
Down Up Del Add	

**STEP blocks** are used to issue commands via output expressions to other devices (control modules) in the system. Among other things, this step is changing the setpoint of a PID block in the example\_pid control module. Step blocks can have up to 16 different output expressions, and must connect to transition blocks.

## Transition Blocks

Transition Condition Descriptions	
#	
1	Test PID pv value
2	Test SCM Command
Down Up Del Add	

**Standard transition blocks** can contain up to 10 condition expressions. These expressions are used to test database points against constant values or other database points. More powerful expressions can be created using a complete transition is testing to see that the previous step were carried out



## Configured Handlers





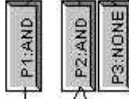
SCM FB.htm url

[HelpLink](#)

## Colors indicate the current status of the active output steps

The **invoke transition** can be used to automatically start the SCM handler if the condition s specified within are met. If the operator command the SCM to start, the Invoke transition is bypassed.

Transition Conditions	
#	
1	EXAMPLE_SCM.command=3
2	EXAMPLE_PID.PIDA.pv>60.
3	EXAMPLE_MOTOR.DEVCTLA.gpv=4



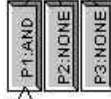
## Indication of active step

**STEP blocks** are used to issue commands via output expressions to other devices (control modules) in the system. Among other things, this step is changing the setpoint of a PID block in the example\_pid control module. Step blocks can have up to 16 different output expression blocks.

Step Outputs	
#	
1	EXAMPLE_PID.PIDA.modeattr=2
2	EXAMPLE_PID.PIDA.sp=75.
3	EXAMPLE_PID.PIDA.sp=EXAMPLE_SCM.redrange(t)
4	EXAMPLE_SCM.hstvalue(t)=EXAMPLE_PID.PIDA.pv

## And transition conditions

Transition Condition Descriptions	
#	
1	Test PID.pv value
2	Test SCM Command



Test Values
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**Standard transition blocks** can contain up to 10 condition expressions. These expressions are used to test database points against constant values or other database points. More powerful expressions can be created using a complete operator set. This transition is testing to see that the commands issued in the previous step were carried out successfully.

# C200 Embedded Batch Features

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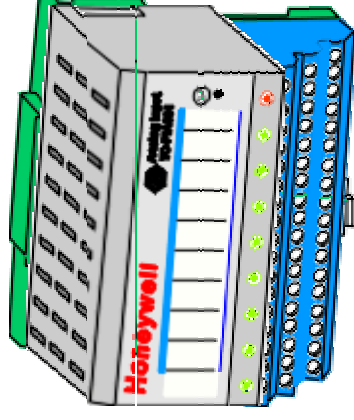
## Batch Features in every PlantScape system:

- C200 Sequence Control Modules (SCMs)
  - Sequence flow chart condition/action handling, designed for batch
  - Fully integrated with TotalPlant Batch, consistent with S88.01
  - Built-in recipe handling for unit communications
  - Built-in history parameters
  - Powerful abnormal/failure handling and recovery
  - Configurable Device / Sequence relationships
  - Common SCMs for unit functions
- PlantScape Server
  - Built-in messaging and batch-related alarming
  - See running SCM from PlantScape HMI (Detail Display)
  - Optional Lot-tracking and reporting
  - Powerful options for data export through OPC Server, SQL, ODBC, Excel, and more.

# C200 I/O Functions

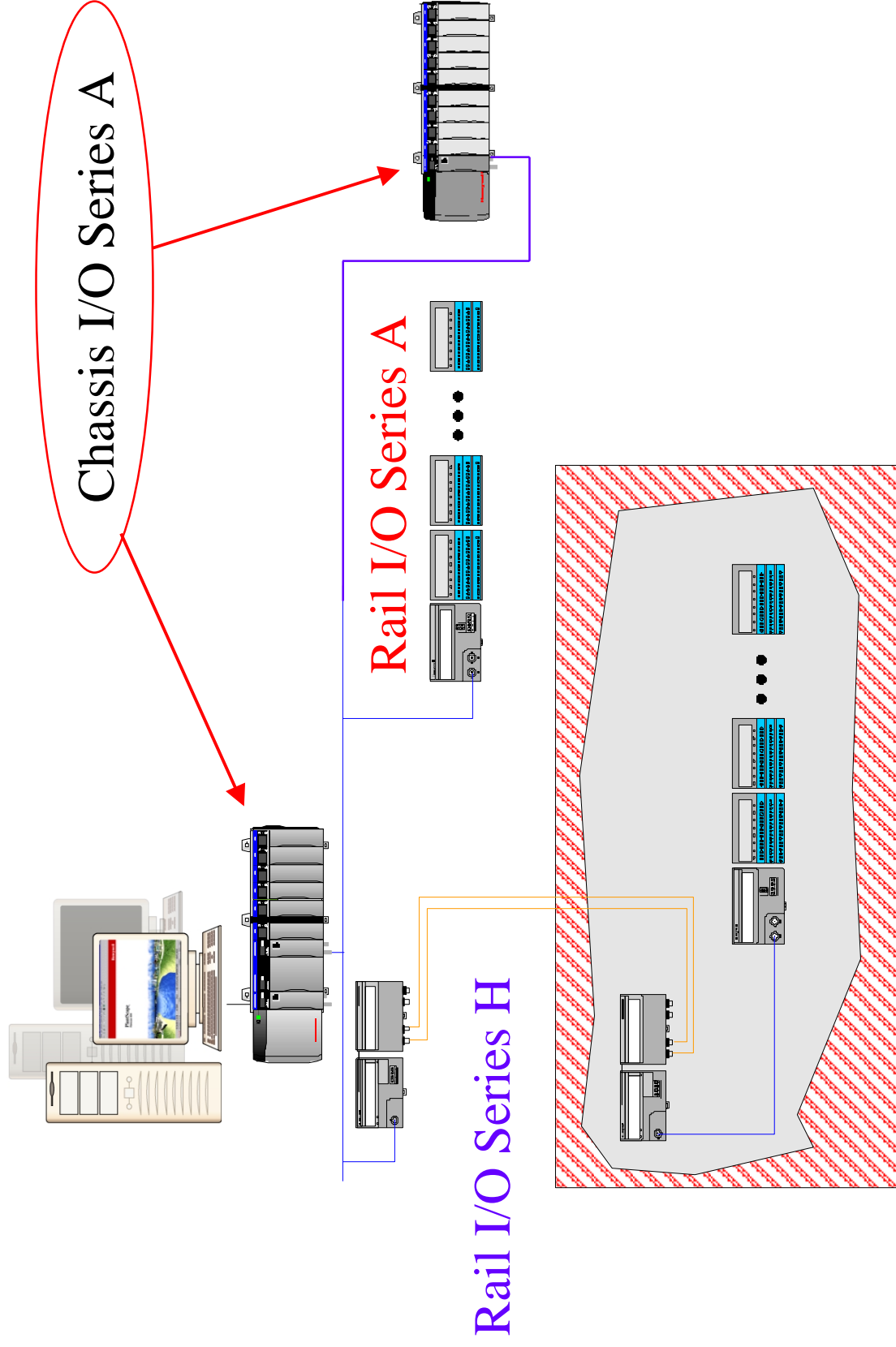
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- Local to Controller or remote -- Up to 10 kM from controller
- Three families of dedicated I/O
  - Chassis-based, using the same racks as C200 Processors
  - Rail-based, for normal environments
  - Rail-based for hazardous environment
  - Any mix of chassis or rail in one controller system
- Remove and replace I/O while under power--without reconfiguring
- Variety of field networks
  - Foundation Fieldbus
  - Profibus DP
- Special Function I/O
  - Serial Interface
  - Pulse Input / Output
- Available in conformal-coated versions



# PlantScape I/O Options

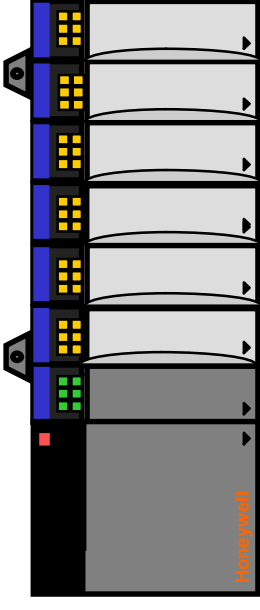
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# PlantScape Chassis I/O

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- I/O modules are configured via ControlBuilder
- Removable Wiring Hood
  - Includes a wire tie slot
  - Protects wiring while removed from module
  - Removable hood to gain termination access
- Choice of Removable Terminal Block (RTB) style
  - 20 position RTB (8 point or less I/O modules)
  - 36 position RTB (16 point I/O modules)
- Termination Connector
  - Supports “Removal & Insertion under Power” for field termination *and* backplane connectors
  - Door opens to provide a handle for connector removal



# Chassis I/O LED Indicators

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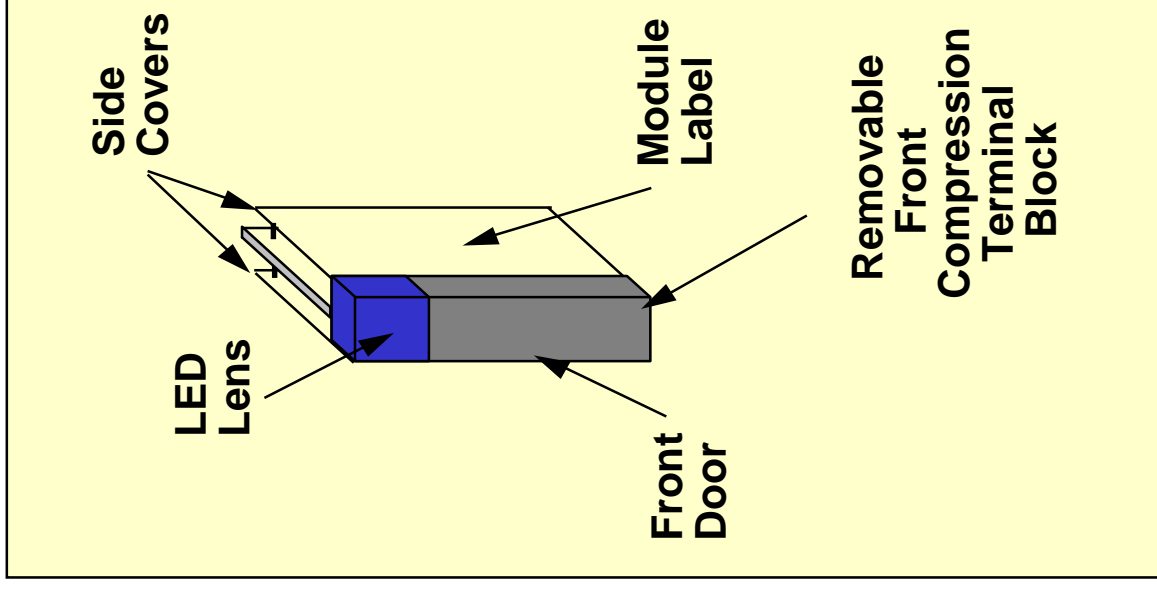
<u>LED</u>	<u>Display</u>	<u>Definition</u>
OK	steady green	normal operations
OK	flashing green	passed internal diagnostics, but not operational
OK	flashing red	communications time-out
OK	steady red	replace module
I/O State	yellow	active I/O (point active)
I/O Fault	red	point failed
Cal	flashing green	calibration mode

# PlantScape Chassis I/O

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- Analog
- Isolated discrete relay
- AC Digital I/O modules
- DC Digital I/O modules
- Serial Interface module

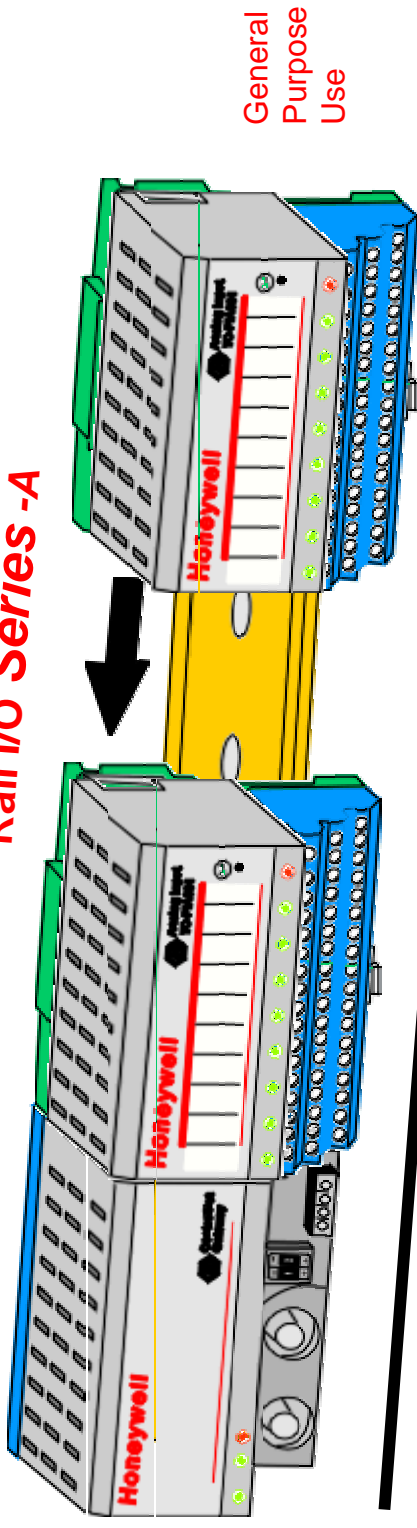
See *Quick Navigation* for Detailed information on available I/O modules



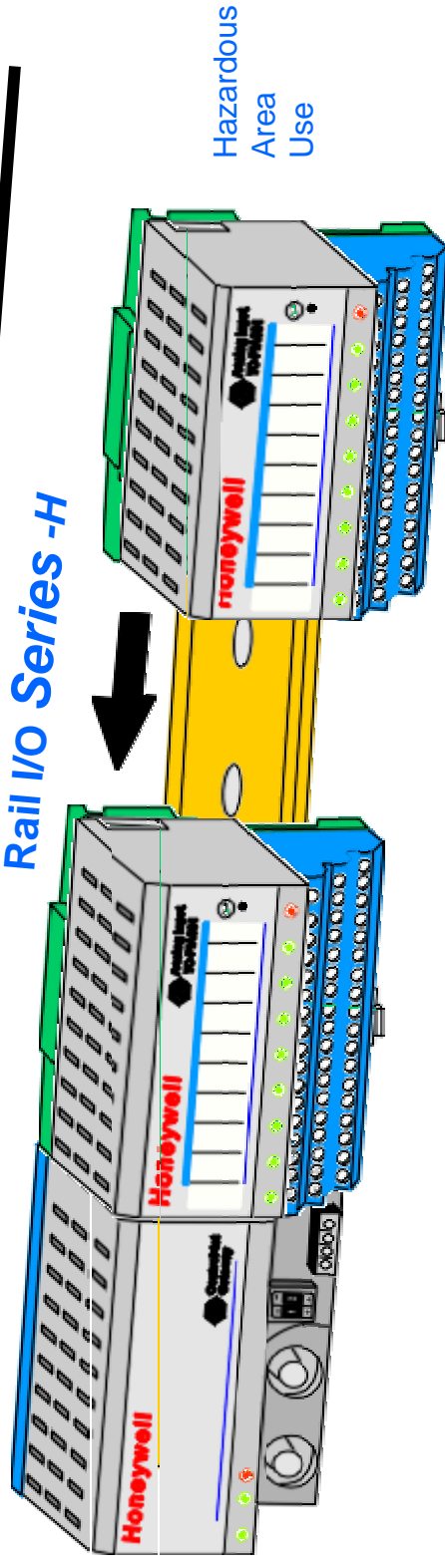
# Rail-Based I/O Options

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**Rail I/O Series -A**



**Rail I/O Series -H**





# R400 Fieldbus Integration

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## Major Features

- **Robust Chassis-Based Interface Module**  
(Honeywell Design)
- **Common, Integrated Database**
- **Single, Easy-to-Use Integrated Builder**  
(Control Builder)
- **Interconnectable FF and PSc  
Function Blocks (Mix & Match) on Same  
Drawing**
- **High-Performance Design**
- **High Capacity Limit**
- **Fieldbus Library Manager for  
Interoperability**

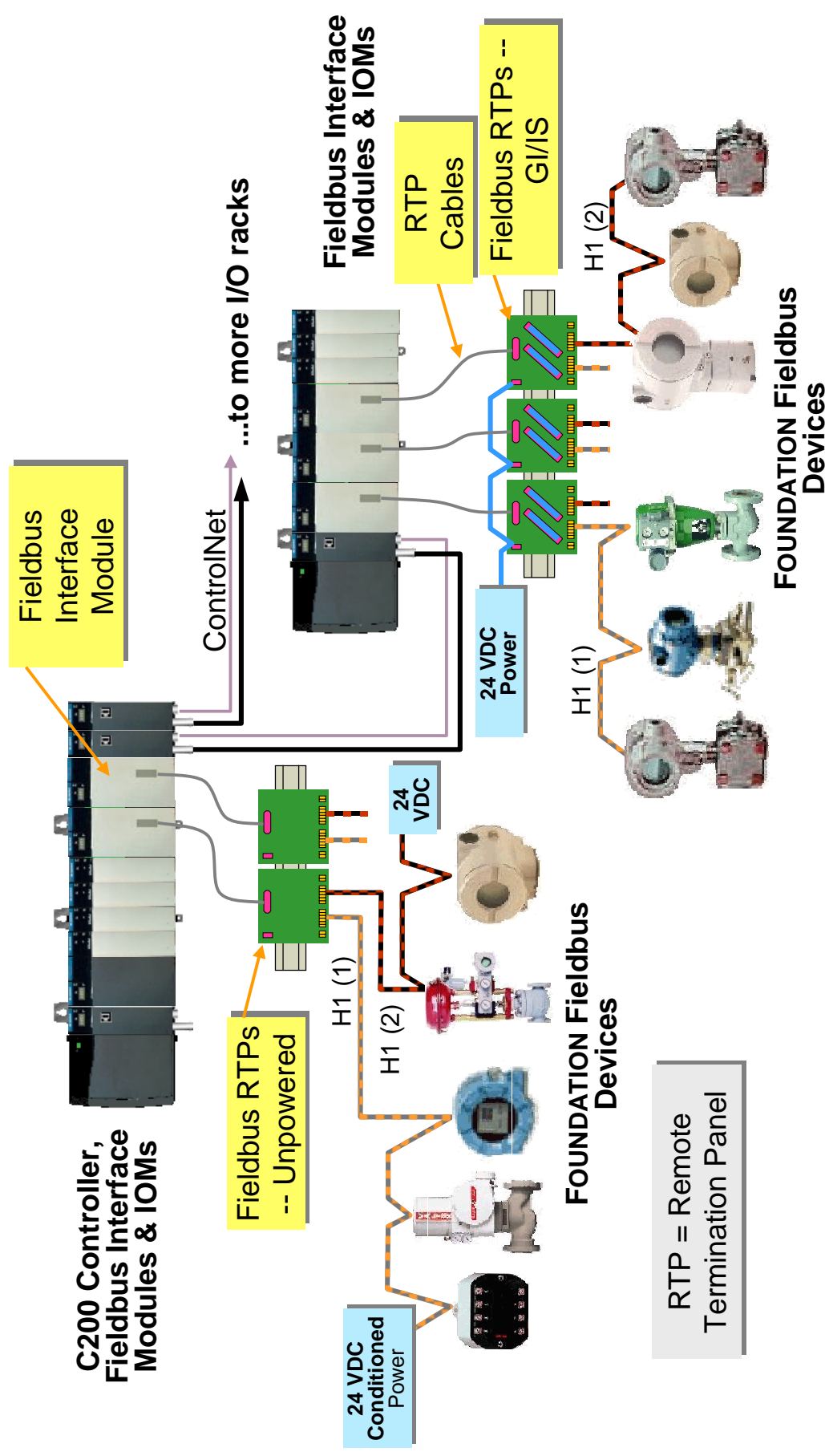
# R400 Fieldbus Integration

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## Major Benefits

- **Easy Engineering** with a unified database and transparent, integrated builder
- **Easy Configuration** using Control Builder, allowing mixing of FBs
- **Easy** and cost effective **Installation**
- **Easy Maintenance** and integration with Alert Manager
- **Flexibility** and **Robustness** through support for LAS and Backup LAS
- **Full Support** of Device Replacement, Performance Statistics, and Diagnostics
- Fieldbus Library Manager, allowing users to **Integrate Devices**
- **Efficient Caching** and **Data Access**, allowing quick call-up and efficient use of fieldbus bandwidth

# R400 Fieldbus -- What's New

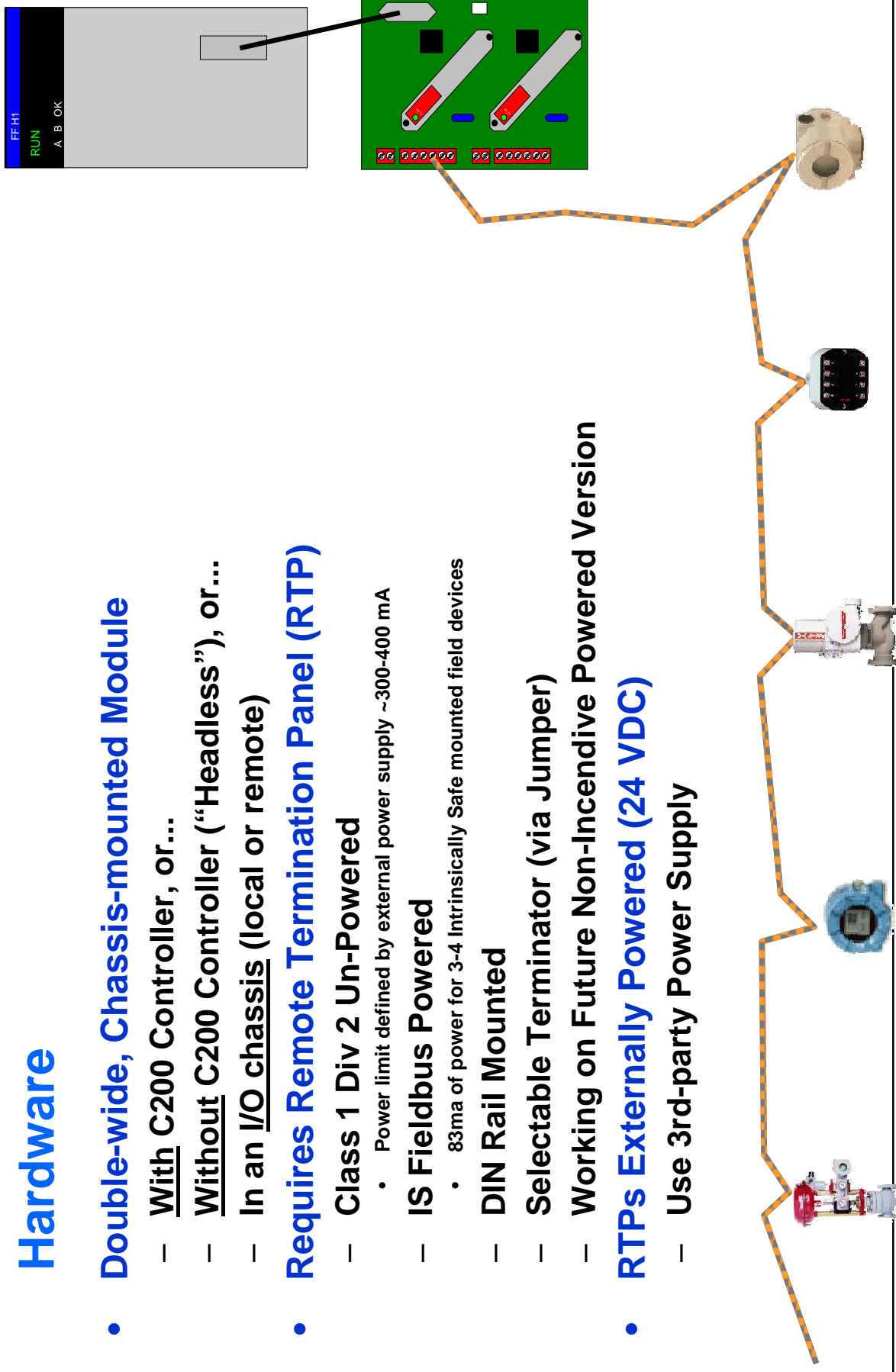


# R400 FIM Design Features

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## Hardware

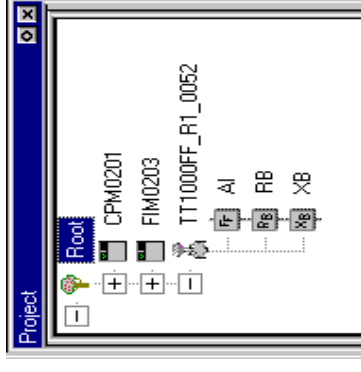
- **Double-wide, Chassis-mounted Module**
  - With C200 Controller, or...
  - Without C200 Controller (“Headless”), or...
  - In an I/O chassis (local or remote)
- **Requires Remote Termination Panel (RTP)**
  - Class 1 Div 2 Un-Powered
    - Power limit defined by external power supply ~300-400 mA
  - IS Fieldbus Powered
    - 83ma of power for 3-4 Intrinsically Safe mounted field devices
  - DIN Rail Mounted
  - Selectable Terminator (via Jumper)
  - Working on Future Non-Incendive Powered Version
- **RTPs Externally Powered (24 VDC)**
  - Use 3rd-party Power Supply



# R400 Fieldbus System Capacity

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- 16 Devices per Link
- 2 Networks per FIM
  - 32 Devices per FIM
- 21 FIMs per C200 Controller
  - Each FIM counts as 3 IOMs against 64 IOM limit
  - 42 Networks per Controller
  - Over 600 Devices possible per C200 Controller
- 100 FIMs per Server
  - 200 Networks per Server max
  - Each FIM counts as 3 IOMs against 300 IOM limit
- 1,600 Devices per Server max



\*Practical maximums are highly application and device specific!!

A GOOD RULE of THUMB is 6-8 devices per link.

# PlantScape Server Functions

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- Provides global database
- Supports PlantScape Station Human Interface
- Manages and presents global Alarms, Events, and Messages
- Integrates 3rd-party devices through wide variety of interfaces
  - Fail-Safe Controller
  - PLCs
  - Loop-controllers and other devices
  - Any device using OPC Client, Modbus, or many other protocols
- Presents PlantScape data to high-level applications & systems
  - OPC Server
  - ODBC
  - DDE
  - SQL
  - Application Programming Interfaces (APIs)
  - Microsoft Excel Data Exchange

# PlantScape Server Database

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## A True Single Database

- The process database is created once and only once--When the C200 controller is configured
- There is a single database that serves all users:
  - Controllers
  - Operator Stations--No need to replicate databases
  - Applications
  - History
- C200 alarms, events, and messages are configured in the controller itself and reported as soon as they occur
- Data is published only if used and on an exception-basis. Result--low controller, network, and Server loading.

# PlantScape Server Features

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- Redundancy using standard & open hardware
- Built-In History engine provides global access to history data
- Over 300 Pre-Built System Displays
  - Configure Group and Trend Displays in seconds
  - Intuitive access to system status information
- Pre-Built Detail Displays
  - Provides instant access to all point data (composite point structure)
  - Designed for Operator use
- Advanced alarm management
- Supports R400 Server and Display Scripting via VBScript
- Seamless integration of multiple PlantScape servers via Honeywell's patented Distributed Server Architecture (DSA)





Steam Flow Cntr



IO CHANNEL ADDRESS	AI00	PV	1493.82
--------------------	------	----	---------

Faceplate selected	NONE AUTO 1493.82 NORMAL
	HIALM.TYPE PVSOURCE PV PVSTS

RESCTLPID	PIDA	NONE	CAS
		OPERATOR	OFF
		NORMAL	NORMAL
		NOTCON	NOTCON
		29.8789	

IO CHANNEL: AO CHANNEL  
AO00

SP	1496.21
PV	1493.82
OP	29.88
MD	CAS
MD APP	OPERATOR

Active Handler

CHECK

Handler Type	Handler	Handler Type	Handler
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
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89	89	89	89
90	90	90	90
91	91	91	91
92	92	92	92
93	93	93	93
94	94	94	94
95	95	95	95
96	96	96	96
97	97	97	97
98	98	98	98
99	99	99	99
100	100	100	100

Active Step

0

Time in Step (cyc)

15

IDE

EXEC

OK

CM

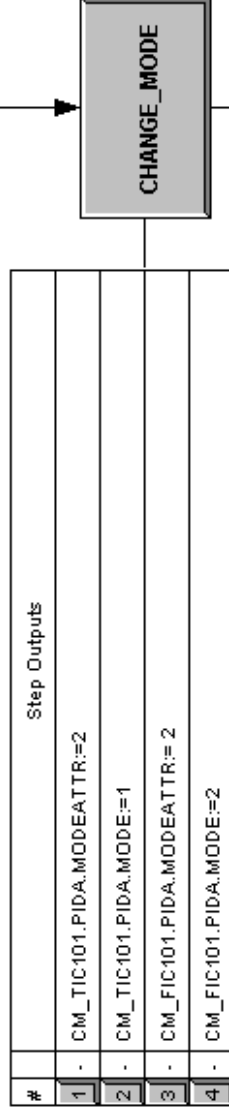
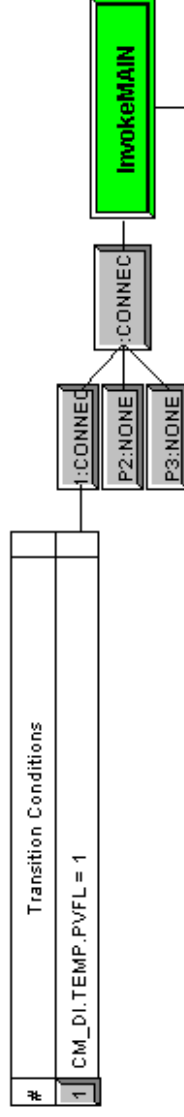
NON

2

511

MD  
ATR

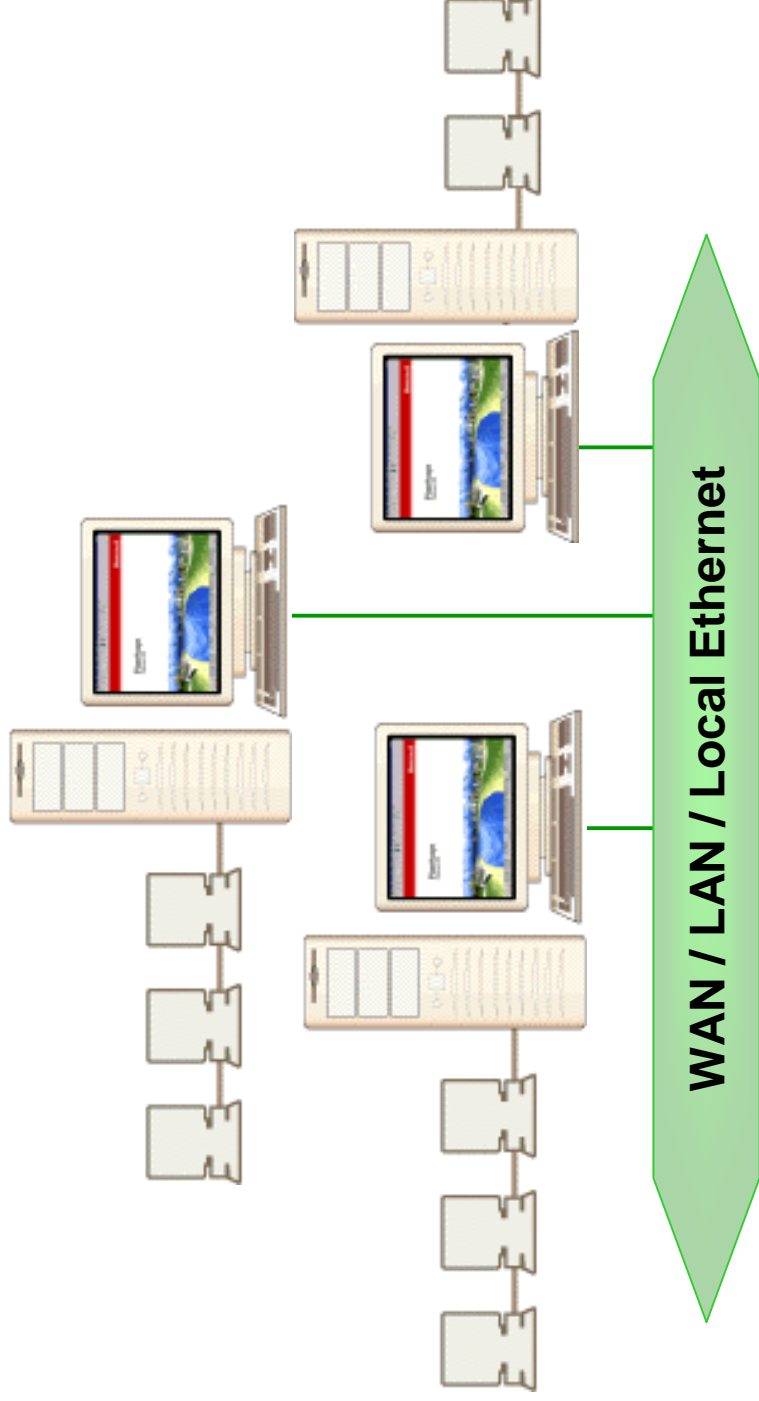
OPERATOR



# Distributed Server Architecture

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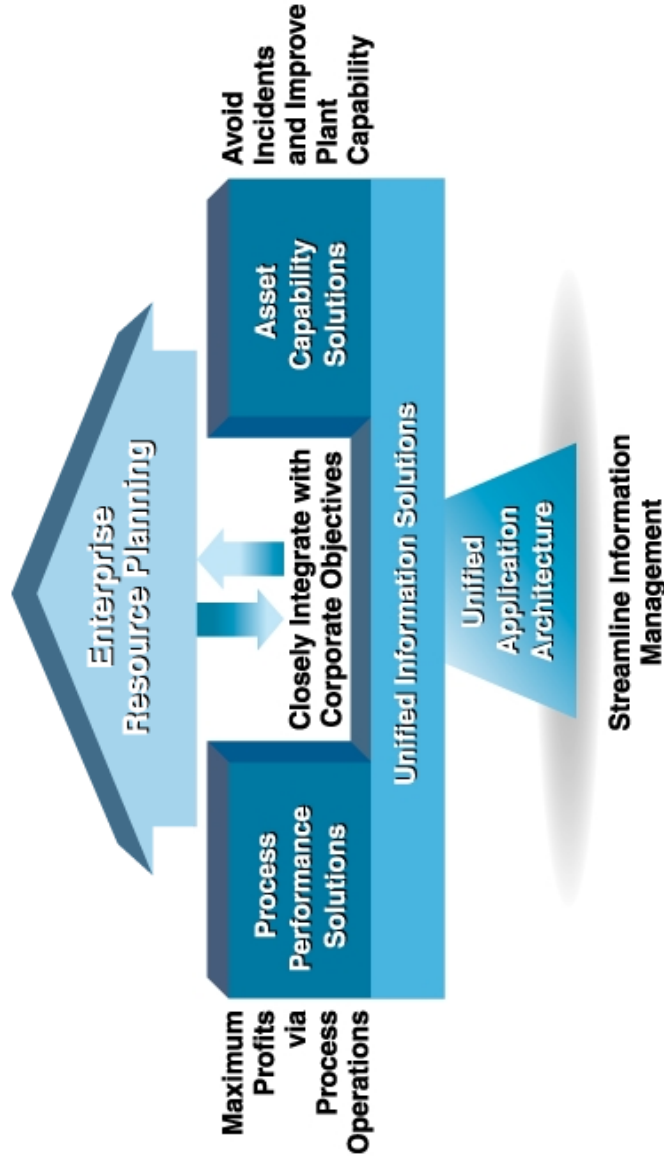
- Creates a single virtual server
- Integrates data, alarms, history, and events
- Extends TRUE single database--NO duplication of data and NO Maintenance
- Configured using existing displays in minutes!



# Applications & Options

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- TotalPlant Batch
- @sset.MAX
- Uniformance
- Recipe Manager
- Alarm Pager
- SPQC
- Downtime Analysis
- Digital Video Manager
- Integrated Maintenance Manager
- HVAC / Security Integration



## **UNIT 2: Hardware Definition**

---

- **Lesson 1: Control Builder Navigation**
- **Lesson 2: Controller Configuration**
- **Lesson 3: I/O Module Configuration**
- **Lesson 4: NTools**

# Control Builder Tabs

---

- **Library Tab** - lists all available components and function blocks
- **Project Tab** - used to configure a project
- **Monitoring Tab** - used to monitor a project

## **Project Tab Functionality**

---

- **create new CMs and SCMs**
- **define parameter configurations for CMs and SCMs**
- **wire components of CMs and SCMs together**
- **configure CM and SCM alarms**
- **assign CMs and SCMs to CEE**
- **open and edit existing CMs and SCMs**
- **save changes ( resulting triangle in tree view indicates a difference between the Project and Monitor databases)**
- **load CMs and SCMs to the CPM**

# Monitoring Tab Functionality

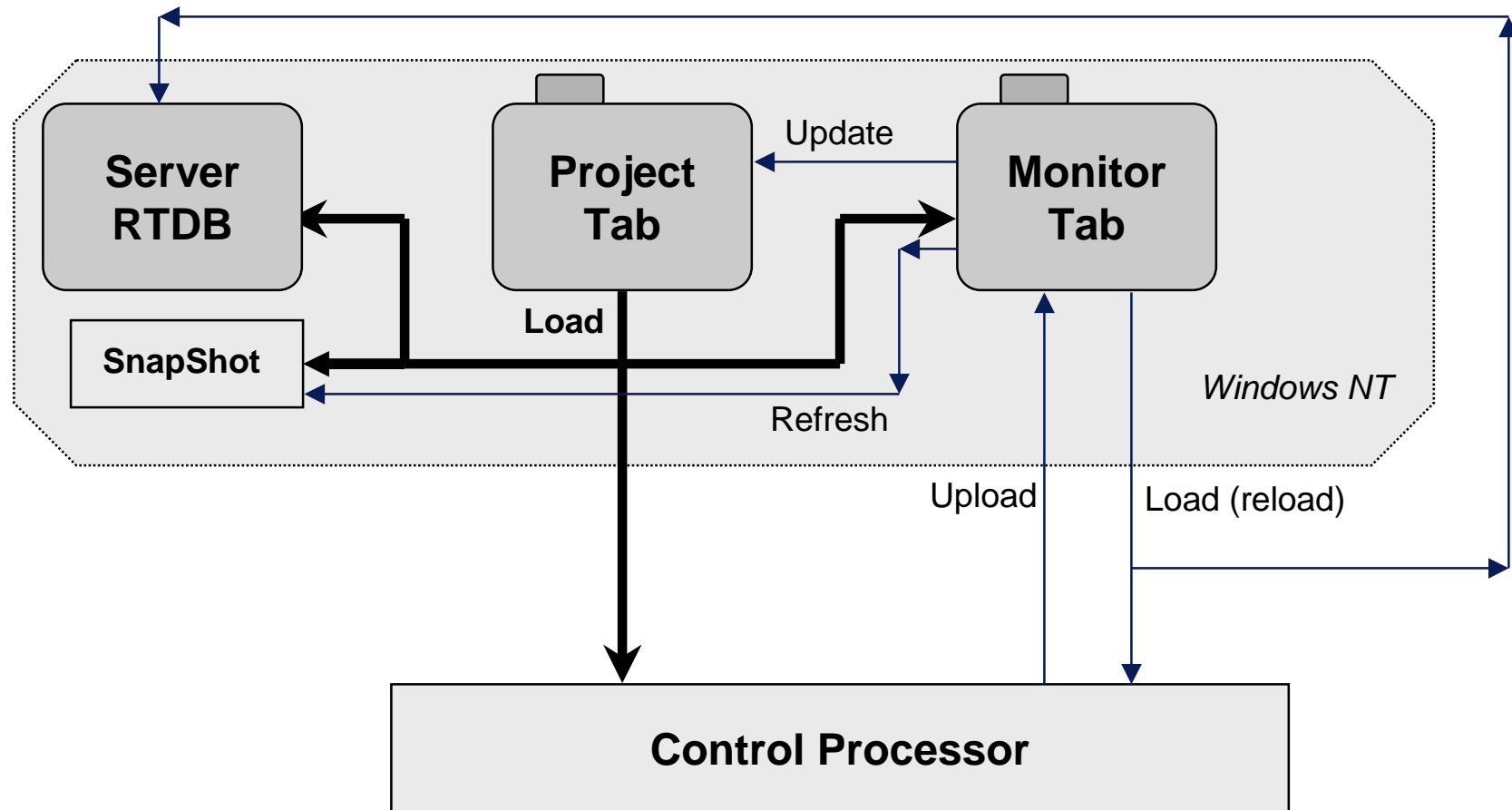
---

- open CMs and SCMs for online monitoring/control
- activate / deactivate CMs and SCMs
- change on-line execution parameters
- upload on-line changes to the Monitor DB  
(resulting triangle in tree view indicates a difference between the Monitor and Project databases)
- update changes to the Project database
- refresh changes to the controller Snapshot



# Project / Monitor Tabs

---



# Tools Menu: Load, Upload, Update, and Refresh

---

## Load Command (from Project Tab)

- loads control strategy from Project tab to Control Processor
- copies the control strategy to the Monitoring tab
- automatically creates PlantScape Server points
- automatically creates controller Snapshot

## Load Command (from Monitoring Tab)

- reloads the object/control strategy to the Control Processor and updates points in the PlantScape Server real time database

## Upload Command

- copies parameters from the Control Processor to the Monitoring tab

## Update to Project Command

- copies changes from the Monitoring tab to the Project tab

## Refresh from Monitoring Tab

- updates Snapshot file for selected items

# Disable Chart Monitoring

---

- **breaks data link between the Monitoring tab and the Control Processor**
- **allows user to view the contents of the Monitoring data base, not the reflection of what is contained in the Control Processor**
- **access from Operate menu while chart is open and being monitored**



## Lesson 2. Controller Configuration

---

### Objectives:

- create a new controller and its associated Control Execution Environment (CEE)

# Creating a Controller

---

**Step 1. Click *File* → *New* → *Controllers* → *CPM200 - Control Processor Module***

**Step 2. Enter CPM Name, Network Type, Driver Name, Supervisory MAC Address, CPM Slot Number, and Supervisory Slot Number.**

SYSTEM:CPM200 Block, CPM417 - Parameters [Project]

CPM/CEE Operations | Server Parameters

CPM

Name: 1A\_CPM0101

Network Type: CONTROLNET

Driver Name: AB\_PCIC-1

Supervisory MAC Address: 01

Supervisory Slot Number: 00

CPM Slot Number: 01

Command: NONE

Status: OK

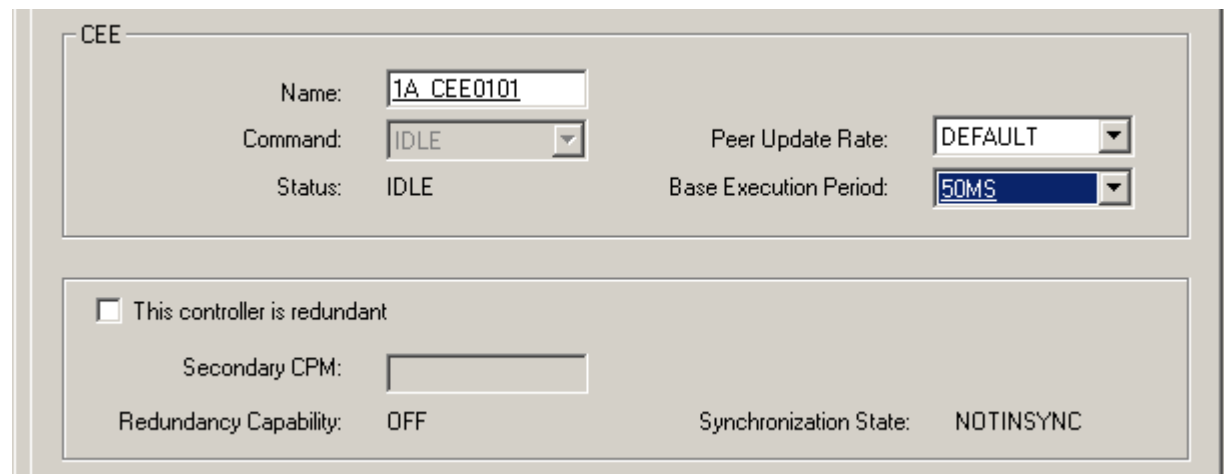
# Creating a Controller

---

**Step 3. Select the Peer Update Rate and Base Execution Period**

**Step 4. If controller is redundant select redundancy option, Name the Secondary CPM, and add Redundancy Modules**

**Step 5. Click *OK***



The screenshot shows a configuration window for a CEE controller. The window has a title bar with the text 'CEE'. Inside, there are two main sections. The top section contains fields for 'Name' (1A\_CEE0101), 'Command' (IDLE), 'Status' (IDLE), 'Peer Update Rate' (DEFAULT), and 'Base Execution Period' (50MS). The bottom section contains a checkbox labeled 'This controller is redundant' which is currently unchecked. Below this checkbox are fields for 'Secondary CPM' (empty), 'Redundancy Capability' (OFF), and 'Synchronization State' (NOTINSYNC).

Name:	1A_CEE0101	Peer Update Rate:	DEFAULT
Command:	IDLE	Base Execution Period:	50MS
Status:	IDLE		
<input type="checkbox"/> This controller is redundant			
Secondary CPM:		Redundancy Capability:	OFF
		Synchronization State:	NOTINSYNC





## Lesson 3. I/O Modules (IOM)

---

### Objectives:

- create new IOMs
- configure the IOMs

# Creating an IOM

---

**Step 1** Set up *Control Builder* with 2 Tree Views and expand the *IOM directory* under the *Library Tree*.

**Step 2** Drag and drop an *IOM* from the Library to the Project Tab or Select *File-- New-- IO Modules* and select from the menu.

Note that Control Builder automatically names the IOM.

You can change the IOM name with *Configure Module Parameters...*

# Configuring an IOM

---

**Step 1** Double click on the *IOM* under the *Project Tab* to bring up the configuration dialog box.

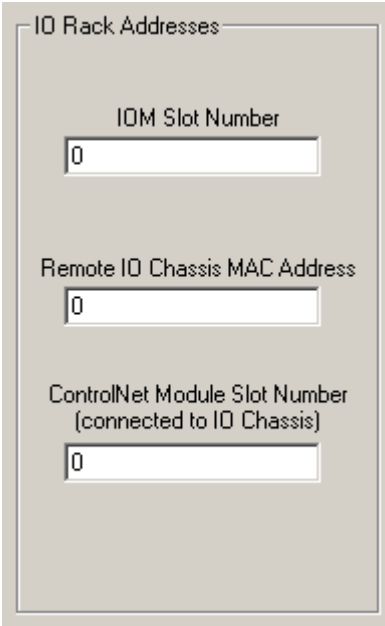
**Step 2** Fill out the properties of the various tabs of the dialog box.

- Main
- Module Configuration
- Channel Configuration
- Server Parameters

# I/O Parameters Configuration -- Main Tab

---

- Enter a module name.
- Enter I/O module location and communication link
  - IOM Slot Number
  - Remote I/O Chassis MAC Address
  - CNI Slot Number



The screenshot shows a configuration window titled "IO Rack Addresses". It contains three input fields, each with the number "0" entered. The first field is labeled "IOM Slot Number". The second field is labeled "Remote IO Chassis MAC Address". The third field is labeled "ControlNet Module Slot Number (connected to IO Chassis)".

## I/O Parameters Configuration -- Channel Configuration Tab

---

- Enter appropriate data for the type of I/O Module configuring.
- Use *Copy* and *Paste* to speed input for similar channels.

## **I/O Parameters Configuration -- Server Parameters Tab**

---

- **Default Detail Display and Group Display references are supplied and generally used as is**
- **Since I/O modules (as well as CPM and CEE modules) will be viewed as points in the server, an Area Database assignment may be necessary**

# Assigning and Loading IOMs

---

- After configuration completed, IOMs must be assigned to a CEE and loaded to the CEE
- To Assign:
  - Select the assign icon =
  - In the assignment display, select the IOM tab
  - Select the IOMs to assign, select the CEE to assign to
  - Press the *Assign* button

# Assigning and Loading IOMs

---

- **Loading: From Project Tree View**
  - Select individual IOM(s) and select the down arrow
  - *or* Select the CEE and select **Tools** ➡ **Load With Contents** to load all assigned IOMs
  - *or* Select the CEE, right click, and select **Load With Contents** to load all assigned IOMs



## Lesson 4. NTools

---

### Objectives:

- Open Ntools with options
- Under Ntools Screens and functions

# Command Line Options

---

NetworkTools has seven command-line options: -c, -e, -pg, -pit, -l , -nl and -u.

Start NetworkTools at the command prompt with the line:

**ntools -c** to start it in “ControlNet” mode. In this mode Network Tools scans the supervisory segments for MAC Ids from 1 to 99.

**ntools -e** to start it in “EtherNet” mode. In this mode Network Tools gets a list of all installed EtherNet drivers and scans them periodically.

**ntools -pg** to enable updating of ControlNet parameters.

**ntools -pit** to allow setting ANY value of Network Update Time (NUT), when used with the -pg option. Using this option without using ‘-pg’ option does not permit updating of ControlNet parameters.

## Command Line Options *continued*

---

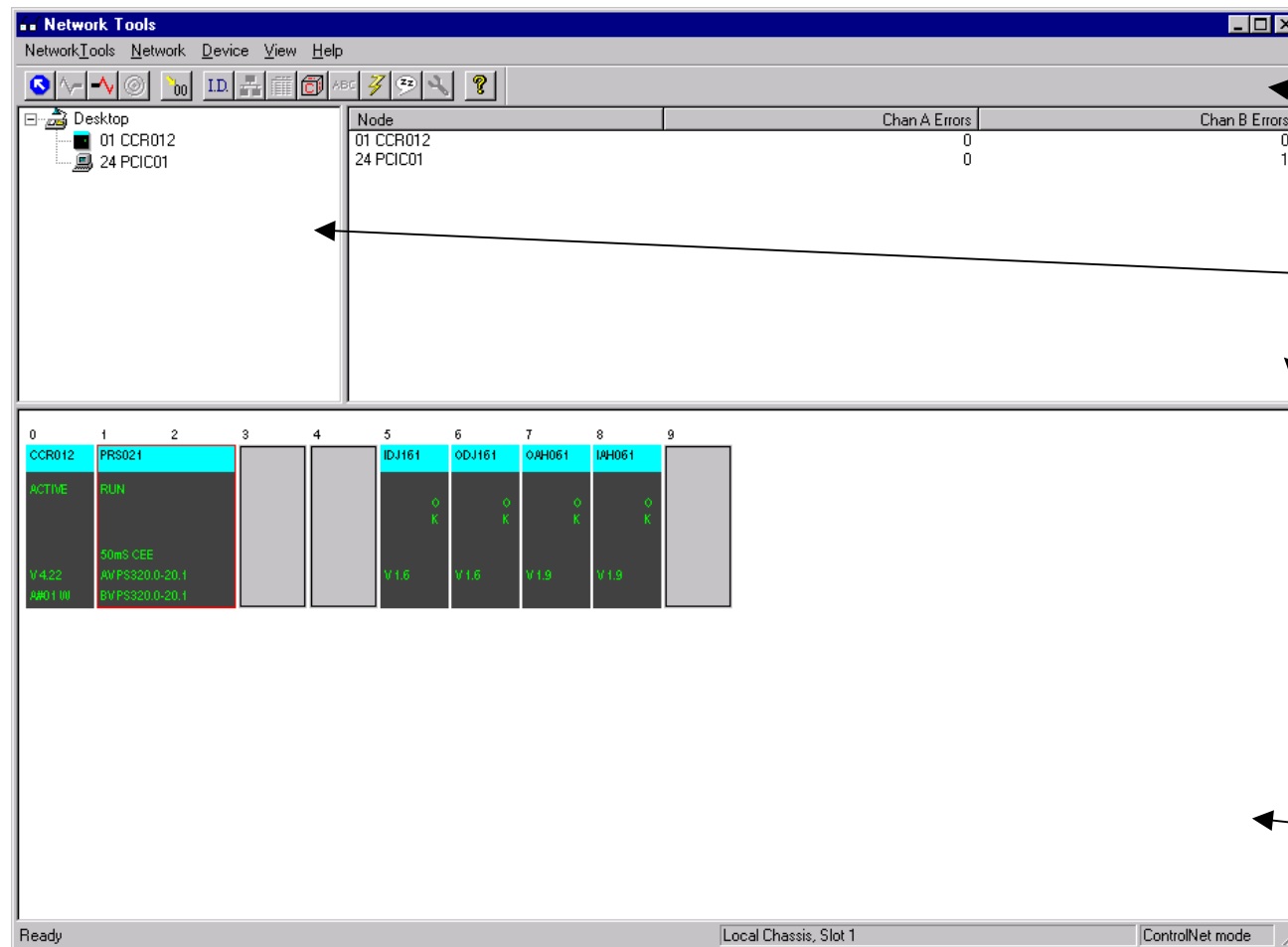
**ntools -l** to have it run in "Log" mode. This mode creates an ASCII text file called log.txt in the same directory in which NetworkTools lives. This contains a textual record of what modules were found on the last scan. The log.txt file also contains a "path string" (per module) that can be cut and pasted into the RSI ControlFlash tool. It will save you a few minutes when upgrading module firmware. Look for the word "ControlFlash" in the log.txt file.

**Note:** this option causes the log.txt file to be written every scan - this may be more hard drive activity than some users want. Suggestion: only use this when running NetworkTools in "ping" mode.

**ntools -nl** if you do not want to get warning messages (dialog boxed) for Lonely CNIs'. This is discouraged in normal practice but this warning may become a nuisance in certain commissioning situations.

**ntools -u** to enable you to Update the device firmware. See the Update Firmware from File topic for more information.

# Ntools Main Window



Tool Bar

Tree pane

List pane

Detail pane

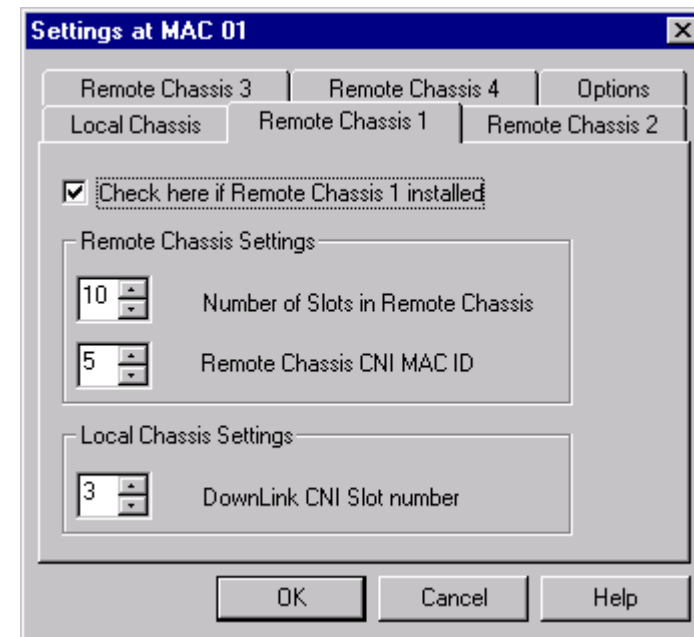
# Tool Bar Icons

---



## Settings

This menu pick launches the dialog that permits you to configure the Ntools display.



The Remote Chassis can be used to configure the detail panel to display up to five racks

# Tool Bar Icons *continued*

Settings for redundant controller to show Primary, Secondary, and I/O racks

The screenshot shows the 'Network Tools' application window. The top menu bar includes 'NetworkTools', 'Network', 'Device', 'View', and 'Help'. Below the menu is a toolbar with various icons. The main window is divided into two panes. The left pane shows a 'Desktop' view with a tree structure containing '01 CCR012', '02 CCR012', and '24 PCIC01'. The right pane displays a table with columns for 'Node', 'Chan A Errors', and 'Chan B Errors'.




Node	Chan A Errors	Chan B Errors
01 CCR012	0	7
02 CCR012	0	4
24 PCIC01	0	7

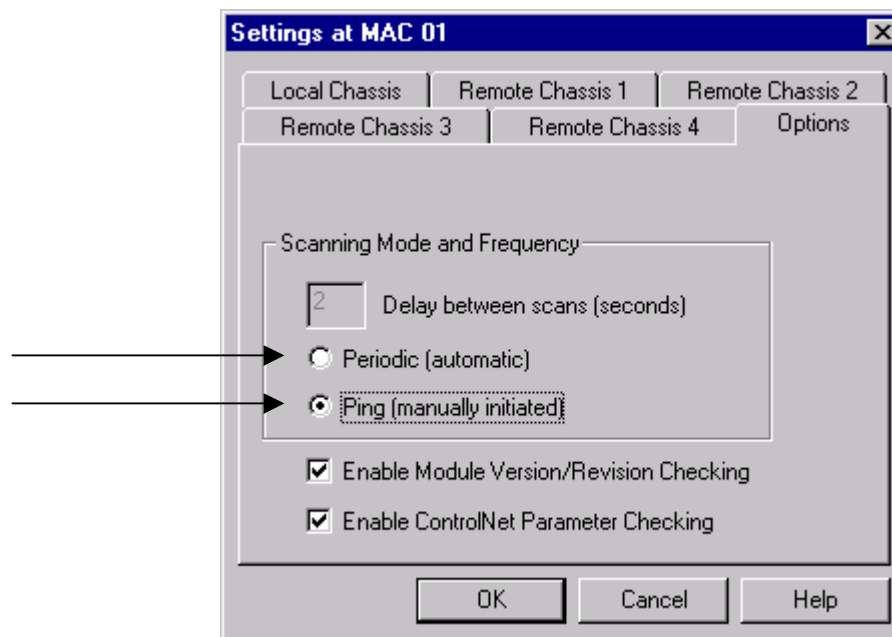
Below the table is a rack diagram showing three racks. The first rack has slots 0, 1, and 2. Slot 0 contains 'CCR012' (ACTIVE), 'V4.22', and 'AW01 IN'. Slot 1 contains 'PRR021' (RUN), '50ms CEE', 'AVPS320.0-20.1', and 'BVP320.0-20.1'. Slot 2 contains 'CCR012' (ACTIVE), 'V4.22', and 'AW01 IN'. The second rack has slots 5 and 6. Slot 5 contains 'PRR021' (ACTIVE), 'V4.22', and 'BW1.11'. Slot 6 contains 'PRR021' (ACTIVE), 'V4.22', and 'BW1.11'. The third rack has slots 5, 6, 7, and 8. Slot 5 contains 'IDJ161' (OK), 'V1.6', and 'V1.6'. Slot 6 contains 'ODJ161' (OK), 'V1.6', and 'V1.6'. Slot 7 contains 'OAH061' (OK), 'V1.9', and 'V1.9'. Slot 8 contains 'OAH061' (OK), 'V1.9', and 'V1.9'.

At the bottom of the window, there is a status bar with the text 'Ready', 'Scanning Complete (in Ping Mode)', and 'ControlNet mode'.

## Tool Bar Icons *continued*

---

-  **Pause** - While the automatic scanning is taking place, selecting this icon the Pause will stop all scanning
-  **Resume** - While the automatic scanning is "Paused", selecting this icon will cause scanning to resume.
-  **Ping** - If the scanning mode selected in the Options page of the Settings dialog is "Ping (manual)" then this menu pick will be enabled. (This menu pick will be disabled if the "Periodic (automatic)" mode was chosen.) Selecting this choice will cause exactly one scan.

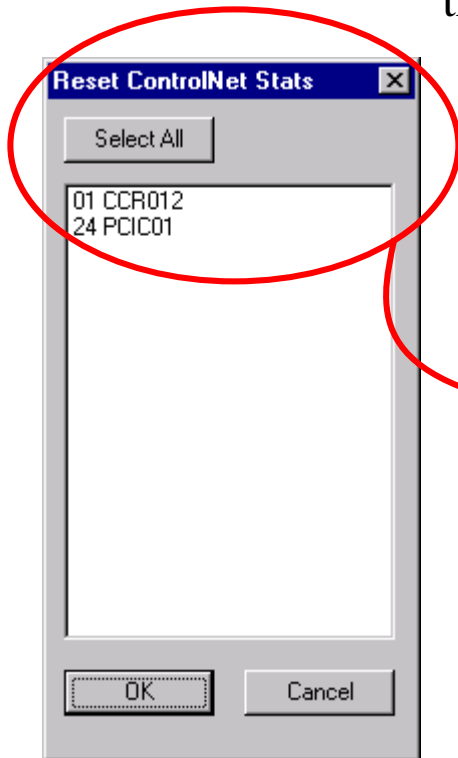


## Tool Bar Icons *continued*



**Reset errors** - This menu pick launches a dialog with a multiple-selection list box so you can choose which node's error counters (in NetworkTools) are reset.

These counters are shown in the “List” pane (upper right portion of the main window).




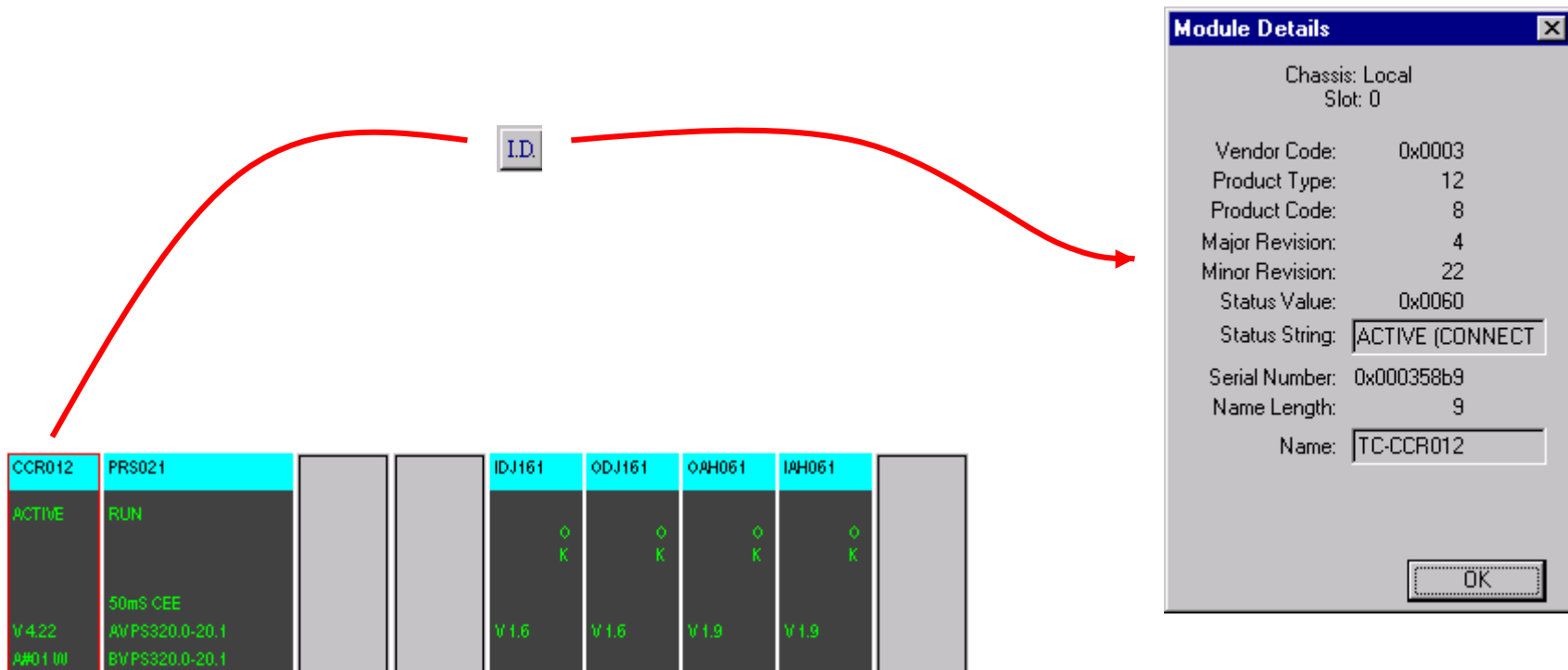
Main window - List pane

Node	Chan A Errors	Chan B Errors
01 CCR012	0	1
24 PCIC01	0	1



## Tool Bar Icons *continued*

-  **Details** - This menu pick launches a dialog to show the actual Device Identity Object contents for the selected module (the one with the red framing rectangle).



The diagram illustrates the workflow for viewing module details. A red arrow points from the 'ID.' icon in the toolbar to the 'CCR012' module in a rack. Another red arrow points from the 'ID.' icon to the 'Module Details' dialog box.

**Module Details**

Chassis: Local  
Slot: 0

Vendor Code: 0x0003  
Product Type: 12  
Product Code: 8  
Major Revision: 4  
Minor Revision: 22  
Status Value: 0x0060  
Status String: ACTIVE (CONNECT)  
Serial Number: 0x000358b9  
Name Length: 9  
Name: TC-CCR012

OK

CCR012	PRS021			IDJ161	ODJ161	0AH061	IAH061	
ACTIVE	RUN							
V 4.22	50ms CEE			V 1.6	V 1.6	V 1.9	V 1.9	
A#01 W	AVPS320.0-20.1							
	BVPS320.0-20.1							

## Tool Bar Icons *continued*



**ContrlNet Stats** - This menu choice launches a dialog to display three pages of ControlNet statistics as maintained by a particular CNI.

Note: The presently selected module (the one with the red framing rectangle) must be a CNI.

The diagram illustrates the process of viewing ControlNet statistics for a specific module. It shows a module selection interface with several modules listed. The 'CCR012' module is highlighted with a red border. A red arrow points from this module to the 'ContrlNet Stats' icon in the toolbar. Another red arrow points from the toolbar icon to the 'ControlNet Stats for CCR012 at MAC ID 01' dialog box.

CCR012	PRS021			IDJ161	ODJ161	0AH061	IAH061	
ACTIVE	RUN							
V 4.22	50mS CEE			K	K	K	K	
A#01 W	AVPS320.0-20.1			V 1.6	V 1.6	V 1.9	V 1.9	
	BVPS320.0-20.1							

**ControlNet Stats for CCR012 at MAC ID 01**

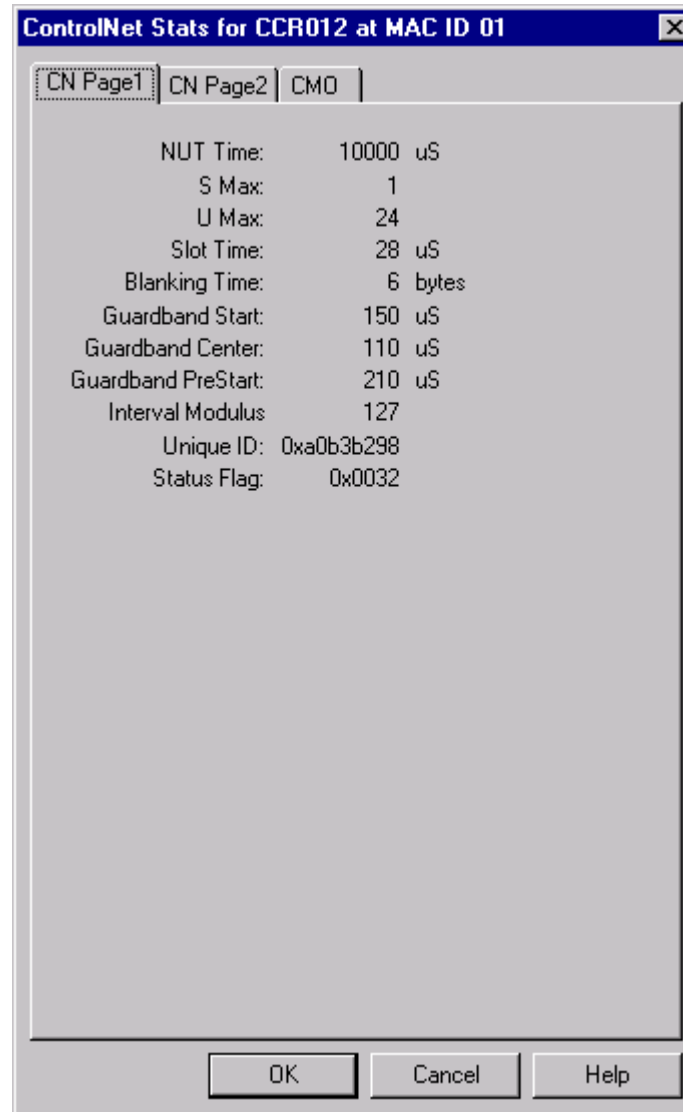
CN Page1 | CN Page2 | CMO

NUT Time: 10000 uS  
S Max: 1  
U Max: 24  
Slot Time: 28 uS  
Blanking Time: 6 bytes  
Guardband Start: 150 uS  
Guardband Center: 110 uS  
Guardband PreStart: 210 uS  
Interval Modulus: 127  
Unique ID: 0xa0b3b298  
Status Flag: 0x0032

OK Cancel Help

# ControlNet Stats Page 1

---



# ControlNet Stats Page 1

---

- **The NUT Time** is the period at which the basic transfer of information on ControlNet occurs.
- **S Max and U Max** are the highest numbered node (ControlNet device) to participate in the Scheduled and Unscheduled portions, respectively, of the Net Time.
- **The Slot Time** is a specific network parameter relating to the time a node waits to hear activity.
- **The Blank Time** is a specific network parameter.
- **GB** stands for guardband and three times are defined: Start, Center and PreStart.
- **The Interval Modulus** is related to bandwidth loading across NUT Time periods.

# ControlNet Stats Page 1 *continued*

---

- **The Unique ID** is a unique identifier. This helps resolve identity of nodes.
- **The Status Flag** is a bit field per the following: (see Knowledge Builder - Troubleshooting and Maintenance Guide - Network Tools)
- **TUI** is Table Unique Identifier and is a 32 bit CRC of important network parameters. It is calculated by the Keeper node and distributed to all other nodes as a security protocol.
- **The Keeper** (ControlNet Configuration Manager) is the object that is in the CNI that holds the operational network parameters.

# ControlNet Stats Page 2

ControlNet Stats for CCR012 at MAC ID 01

CN Page1 CN Page2 CMO

	CNI	NTools
Buffer Errors:	0	
Error Log:	n/a	
Good Frames Transmitted:	9998490	
Good Frames Received:	8154207	
Selected Channel Frame Errors	0	
Channel A Frame Errors:	0	0
Channel B Frame Errors:	95	0
Aborted Frames Transmitted:	0	
Highwaters	0	
NUT Overloads	0	
Slot Overloads	0	
Blockages:	0	
Non-Concurrences:	0	
Aborted Frames Received:	0	
Lonely Counter:	0	
Duplicate Node:	0	
Noise Hits:	0	
Collisions:	0	
Moderator MAC ID:	1	
Non-Lowman Moderators:	0	
Mismatch:	0	
Unheard Moderator:	0	
SM Commands:	0	
Pre-Reset Fault:	0	
Post-Reset Fault:	0	

Reset

OK Cancel Help

## ControlNet Stats Page 2 *continued*

---

- **Buffer Errors** - Buffer Errors is the buffer event counter.
- **Error Log** - is the bad MAC Frame log.
- **Good Frames Transmitted** - is the number of good frames.
- **Good Frames Received** - is the number of good frames.
- **Selected Channel Frame Errors** - is the number of framing errors in the active receive channel.
- **Channel A Frame Errors** - is the number of framing errors on A.
- **Channel B Frame Errors** - is the number of framing errors on B.

## ControlNet Stats Page 2 *continued*

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- **Aborted Frames Transmitted** - is the number of aborted transmissions (due to underflows).
- **Highwaters** - is the maximum of: transmit/receive FIFO under/overflows and out-of-step events.
- **NUT Overloads** - is the number of occurrences when there was no unscheduled time in the NUT.
- **Slot Overloads** - is the number of occurrences of more scheduled data queued for one NUT than allowed by the sched\_max\_frame parameter.
- **Blockages** - Blockages is the number of Lpackets which exceed the sched\_max\_frame parameter.



## ControlNet Stats Page 2 *continued*

---

- **Non- Concurrences** - Non-Concurrences is the count of cases where two or more nodes can't agree on whose turn it is to transmit.
- **Aborted Frames Received** - Aborted Frames Received is the count of incomplete can't agree on whose turn it is to transmit.
- **Lonely Counter** - Lonely Counter is the number of times nothing heard for eight or more NUTs.
- **Duplicate Node** - Duplicate Node is the count of frames received with this node's MAC ID.
- **Noise Hits** - Noise Hits is the count of noise hits which briefly synched the modem receive PLL (but were not associate with the reception of a frame).
- **Collisions** - Collisions is the count of cases where receive data was heard just when this node was to transmit.

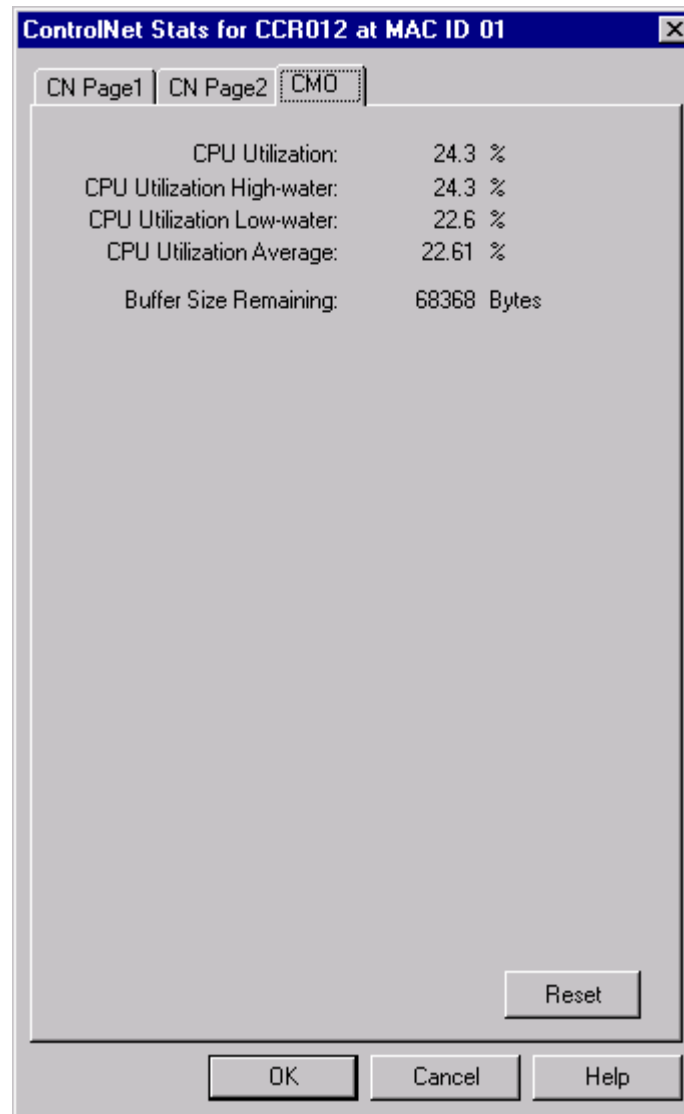
## ControlNet Stats Page 2 *continued*

---

- **Moderator MAC ID** - Moderator MAC ID is just that.
- **Non-Lowman Moderators** - is the count of moderator packets heard from non-lowman nodes.
- **Mismatch** - is the count of cases where the moderator frame received does not match the link configuration information in this node.
- **Unheard Moderator** - is the count of cases where normal packets are being heard but not moderator packets.
- **SM Commands** - is the number of Station Management commands heard on the network.
- **Pre-Reset Fault** - is a fault condition detected prior to reset.
- **Post-Reset Fault** - Post-Reset Fault is a fault condition retained after reset.

# ControlNet Stats Page 3

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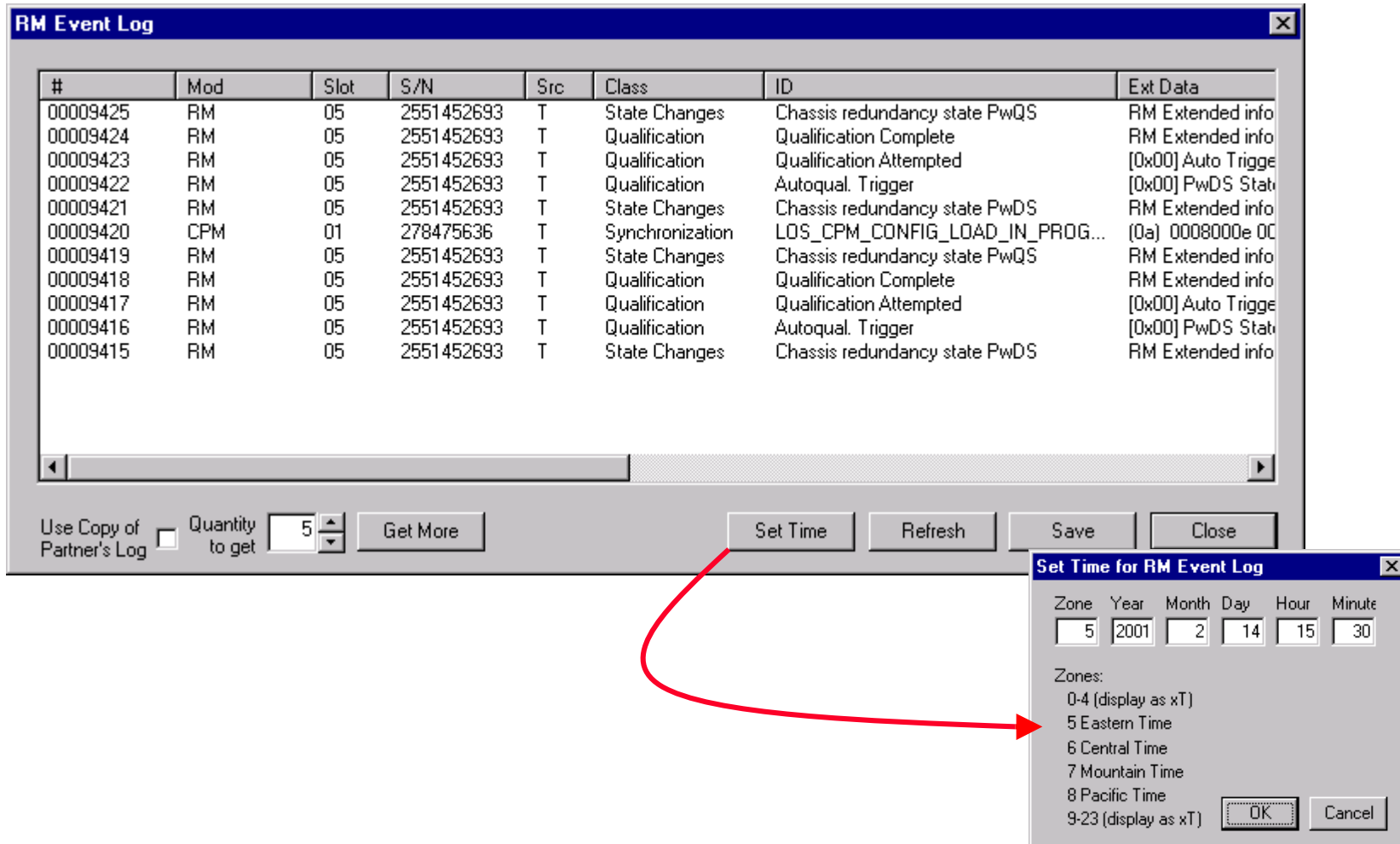
## ControlNet Stats Page 3 *continued*

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- **CPU Utilization** - is a number between 0 and 100.
- **PU Utilization Highwater** - is the highest value of CPU Utilization while this dialog page has been displayed.
- **CPU Utilization Lowwater** - is the lowest value of CPU Utilization while this dialog page has been displayed.
- **CPU Utilization Average** - A 2 minute first-order lag average of the CPU Utilization.
- **Buffer Size Remaining** - Buffer Size Remaining is just that.
- **The Reset Button** causes a reset to the logic involved in the calculation of CPU Utilization Highwater, CPU Utilization Lowwater and CPU Utilization Average . This has the same effect as tabbing to another page and then tabbing back to the Connection Manager Stats page.

## Tool Bar Icons *continued*

-  **History** - History of the RM (events) and history of the CPM (bread crumbs) can be shown. (Only available to redundant controller systems)



The **RM Event Log** window displays a table of events. The table has the following columns: #, Mod, Slot, S/N, Src, Class, ID, and Ext Data. The events listed are:

#	Mod	Slot	S/N	Src	Class	ID	Ext Data
00009425	RM	05	2551452693	T	State Changes	Chassis redundancy state PwQS	RM Extended info
00009424	RM	05	2551452693	T	Qualification	Qualification Complete	RM Extended info
00009423	RM	05	2551452693	T	Qualification	Qualification Attempted	[0x00] Auto Trigge
00009422	RM	05	2551452693	T	Qualification	Autoqual. Trigger	[0x00] PwDS Stat
00009421	RM	05	2551452693	T	State Changes	Chassis redundancy state PwDS	RM Extended info
00009420	CPM	01	278475636	T	Synchronization	LOS_CPM_CONFIG_LOAD_IN_PROG...	(0a) 0008000e 0C
00009419	RM	05	2551452693	T	State Changes	Chassis redundancy state PwQS	RM Extended info
00009418	RM	05	2551452693	T	Qualification	Qualification Complete	RM Extended info
00009417	RM	05	2551452693	T	Qualification	Qualification Attempted	[0x00] Auto Trigge
00009416	RM	05	2551452693	T	Qualification	Autoqual. Trigger	[0x00] PwDS Stat
00009415	RM	05	2551452693	T	State Changes	Chassis redundancy state PwDS	RM Extended info

At the bottom of the window, there is a section with the following controls:

- Use Copy of Partner's Log: ☐
- Quantity to get: 5 (with up/down arrows)
- Get More button
- Set Time button
- Refresh button
- Save button
- Close button

The **Set Time for RM Event Log** dialog box is open, showing the following fields:

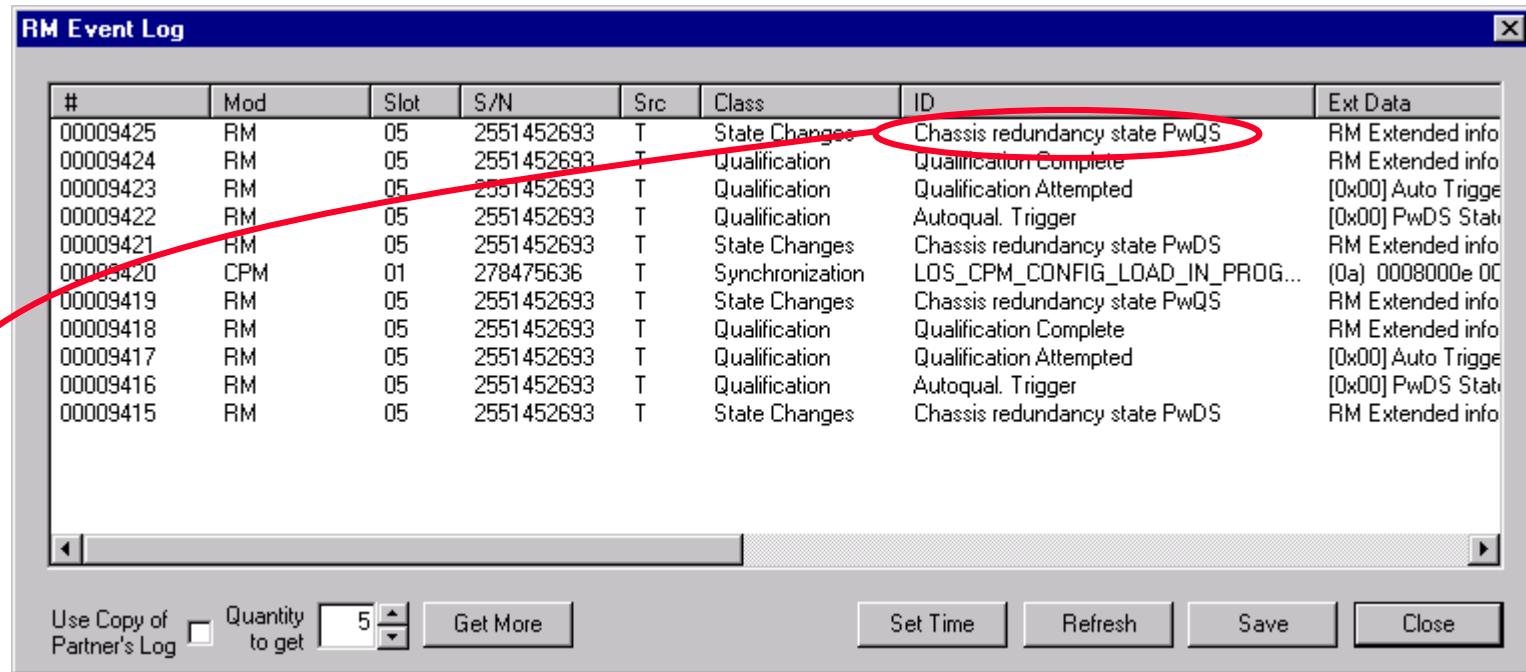
Zone	Year	Month	Day	Hour	Minute
5	2001	2	14	15	30

Below the fields, there is a list of zones:

- 0-4 (display as xT)
- 5 Eastern Time
- 6 Central Time
- 7 Mountain Time
- 8 Pacific Time
- 9-23 (display as xT)

At the bottom of the dialog box, there are **OK** and **Cancel** buttons. A red arrow points from the **Set Time** button in the main window to the **Set Time for RM Event Log** dialog box.

# History



#	Mod	Slot	S/N	Src	Class	ID	Ext Data
00009425	RM	05	2551452693	T	State Changes	Chassis redundancy state PwQS	RM Extended info
00009424	RM	05	2551452693	T	Qualification	Qualification Complete	RM Extended info
00009423	RM	05	2551452693	T	Qualification	Qualification Attempted	[0x00] Auto Trigge
00009422	RM	05	2551452693	T	Qualification	Autoqual. Trigger	[0x00] PwDS Stat
00009421	RM	05	2551452693	T	State Changes	Chassis redundancy state PwDS	RM Extended info
00009420	CPM	01	278475636	T	Synchronization	LOS_CPM_CONFIG_LOAD_IN_PROG...	(0a) 0008000e 0C
00009419	RM	05	2551452693	T	State Changes	Chassis redundancy state PwQS	RM Extended info
00009418	RM	05	2551452693	T	Qualification	Qualification Complete	RM Extended info
00009417	RM	05	2551452693	T	Qualification	Qualification Attempted	[0x00] Auto Trigge
00009416	RM	05	2551452693	T	Qualification	Autoqual. Trigger	[0x00] PwDS Stat
00009415	RM	05	2551452693	T	State Changes	Chassis redundancy state PwDS	RM Extended info

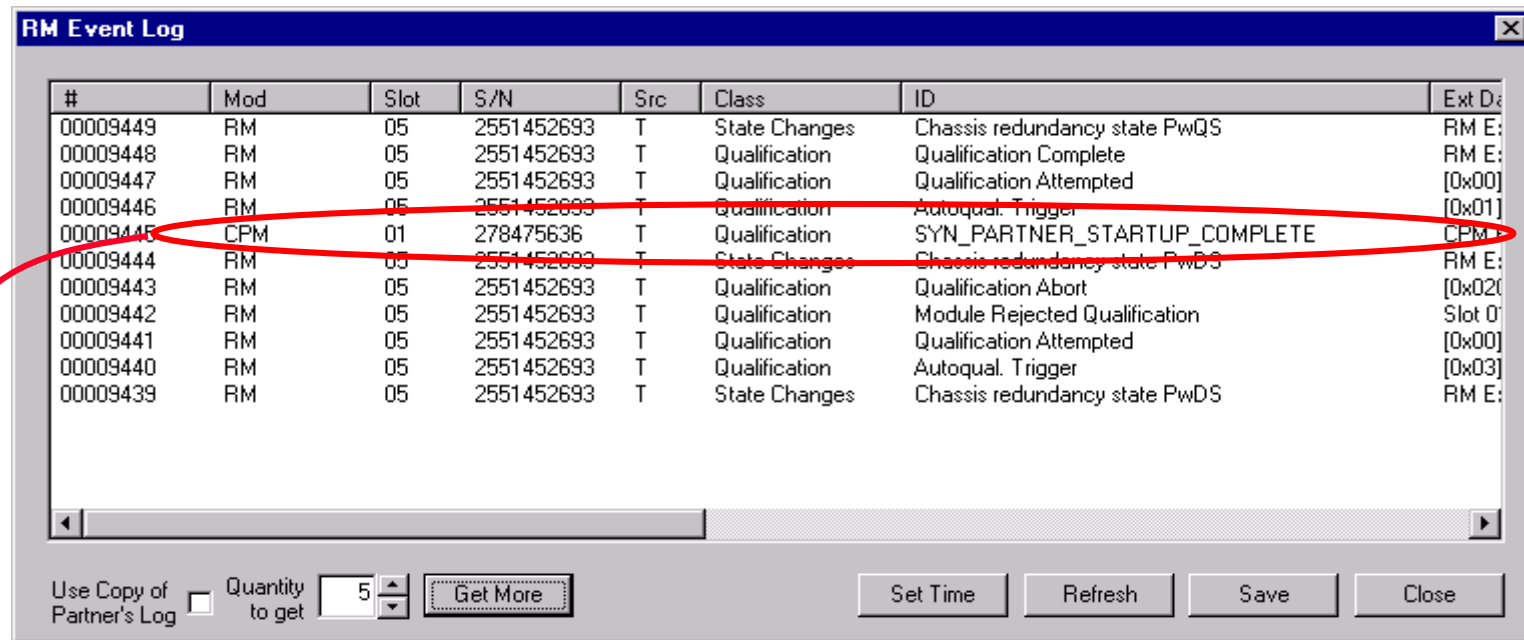
Use Copy of Partner's Log ☐ Quantity to get 5 Get More Set Time Refresh Save Close

Knowledge Builder / Troubleshooting and Maintenance Guide / RM fault codes

**Cause:** The RM either entered this state from qualification due to an autoqualification trigger or a command.

**Corrective Action:** None. Event posted for information purposes only.

# History - CPM Breadcrumbs



#	Mod	Slot	S/N	Src	Class	ID	Ext D
00009449	RM	05	2551452693	T	State Changes	Chassis redundancy state PwQS	RM E:
00009448	RM	05	2551452693	T	Qualification	Qualification Complete	RM E:
00009447	RM	05	2551452693	T	Qualification	Qualification Attempted	[0x00]
00009446	RM	05	2551452693	T	Qualification	Autoqual. Trigger	[0x01]
00009445	CPM	01	278475636	T	Qualification	SYN_PARTNER_STARTUP_COMPLETE	CPM
00009444	RM	05	2551452693	T	State Changes	Chassis redundancy state PwDS	RM E:
00009443	RM	05	2551452693	T	Qualification	Qualification Abort	[0x02]
00009442	RM	05	2551452693	T	Qualification	Module Rejected Qualification	Slot 0:
00009441	RM	05	2551452693	T	Qualification	Qualification Attempted	[0x00]
00009440	RM	05	2551452693	T	Qualification	Autoqual. Trigger	[0x03]
00009439	RM	05	2551452693	T	State Changes	Chassis redundancy state PwDS	RM E:

Use Copy of Partner's Log ☐ Quantity to get 5

Knowledge Builder / Troubleshooting and Maintenance Guide / Network Tools

**Description:** The CPM has attempted to trigger initial synchronization due to completion of the secondary CPM system startup.

**Cause:** Secondary CPM system startup completion

# History Detail

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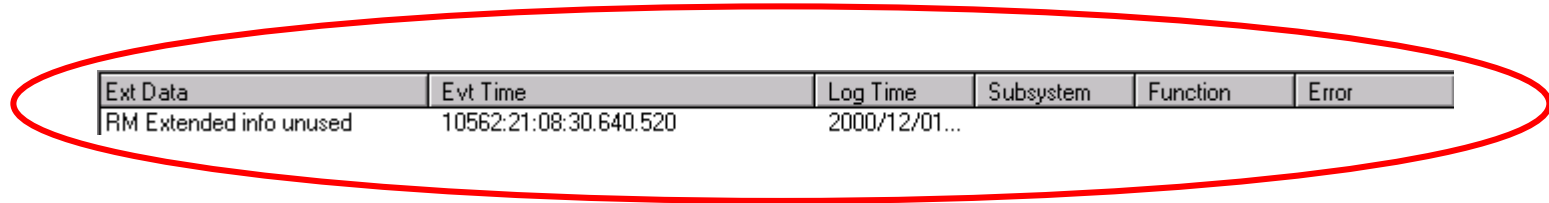
#	Mod	Slot	S/N	Src	Class	ID
00009473	RM	05	2551452693	T	State Changes	Chassis redundancy state PwQS

- **Entry Number** - Sequential number, unique to each entry.
- **Module** - Type of module that submitted the event based on its Product Type and Product Code attributes.
- **Slot Number** - Slot number of module that submitted the event.
- **Serial Number** - Serial Number of module that submitted the event.
- **Source** - In addition to viewing the RM's log the Network Tools utility allows the user to the RM's copy of its partner RMs log. To distinguish which RM log is being displayed the Network Tools utility specifies the RM log source as "T" or "O" for **T**his RM or the **O**ther RM respectively.
- **Event Class** - Represents the event classification.
- **Event ID Module** - specific event.



## History Detail *continued*

---



Ext Data	Evt Time	Log Time	Subsystem	Function	Error
RM Extended info unused	10562:21:08:30.640.520	2000/12/01...			

- **Extended Event Info.** - Module-specific extended event data.
- **Event Time-stamp** - Time that event was observed on module that submitted the event.
- **Logging Time-stamp** - RM time that event was stored into the event log.

## Tool Bar Icons *continued*

---



**Crash Block** - If a CPM, SIM or FEE is selected you can save the Crash Block (with stack info). Outputs a text file for use by TAC



**Firmware** - Updating device firmware should not be done on-process. The "Update Firmware from file" menu pick can only be used if you launched Network Tools with the -u command line option.

# Crash Block Output File

---

CPM0101:

BOOT FILENAME = cpmboot2

BOOT VERSION = PS320.0-20.1

BOOT CREATED = Tue Sep 12 10:29:40 2000

PERSONALITY = ceerex2

FILE VERSION = PS320.0-20.1

FILE CREATED = Tue Sep 12 10:50:09 2000

CR = 0x00000000 MSR = 0x00000000 HID0 = 0x00000000 XER = 0x00000000

LR = 0x00000000 CTR = 0x00000000 SRR0 = 0x00000000 SRR1 = 0x00000000

DEC = 0x00000000 IP = 0x00000000 HSR = 0x00000000

DSISR = 0x00000000 DAR = 0x00000000

R00 = 0x00000000 R01 = 0x00000000 R02 = 0x00000000 R03 = 0x00000000

R04 = 0x00000000 R05 = 0x00000000 R06 = 0x00000000 R07 = 0x00000000

R08 = 0x00000000 R09 = 0x00000000 R10 = 0x00000000 R11 = 0x00000000

R12 = 0x00000000 R13 = 0x00000000 R14 = 0x00000000 R15 = 0x00000000

R16 = 0x00000000 R17 = 0x00000000 R18 = 0x00000000 R19 = 0x00000000

R20 = 0x00000000 R21 = 0x00000000 R22 = 0x00000000 R23 = 0x00000000

R24 = 0x00000000 R25 = 0x00000000 R26 = 0x00000000 R27 = 0x00000000

R28 = 0x00000000 R29 = 0x00000000 R30 = 0x00000000 R31 = 0x00000000

Application error address - 0x0


Initialized data address 0x00000000 (size 0x0)


Uninitialized data address 0x00000000 (size 0x0)

Stack address 0x00000000 (size 0x0)

## Tool Bar Icons *continued*

---

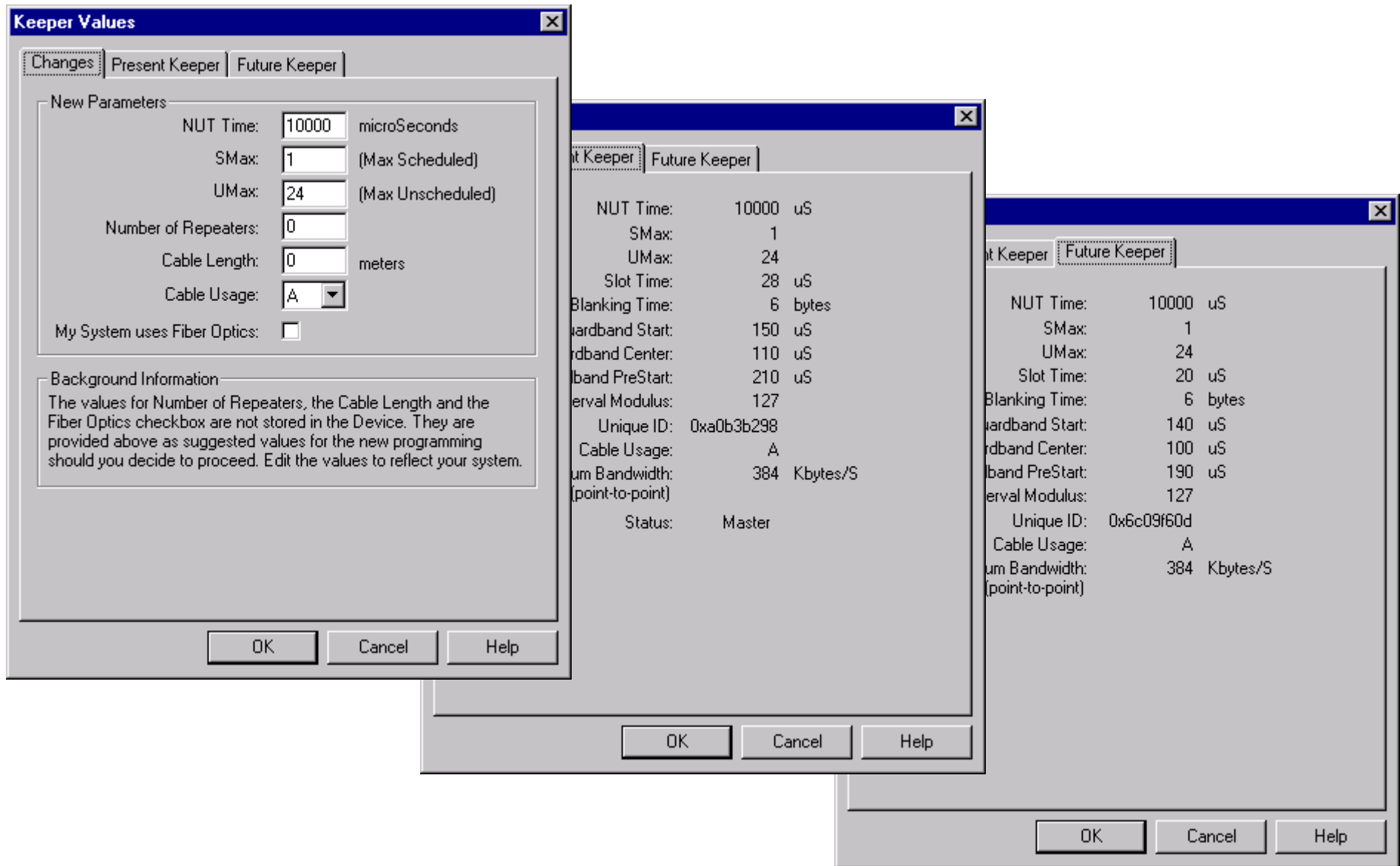
 **Sim Details** - If a Serial Interface Module (Sim) is selected you can display the strings corresponding to each FTA. See [\*Knowledge Builder/Serial Interface Implementation Guide\*](#) for more information

 **Change ControlNet** - This powerful feature should only be used by those with a thorough understanding of the operation of ControlNet. Please contact your authorized service representative.

The reason this is under the "Device" menu is that one must select a CNI with MAC ID 1 (the Keeper) for NetworkTools to effect the network changes operation.

CNIs have the Keeper Object that orchestrates the distribution of new network parameters to all segment nodes.

# Keeper Values





## **UNIT 3: Control Building CMs**

---

- **Lesson 1: Control Modules (CMs)**
- **Lesson 2: Control Strategy Execution**
- **Lesson 3: Configuring a Device Control Block**

# Lesson 1. Control Modules (CMs)

---

## Objectives:

- Build and edit CMs
  - wire and connect blocks
- Configure PID CMs
- Configure a Device Control CM
- Load, execute and monitor CMs



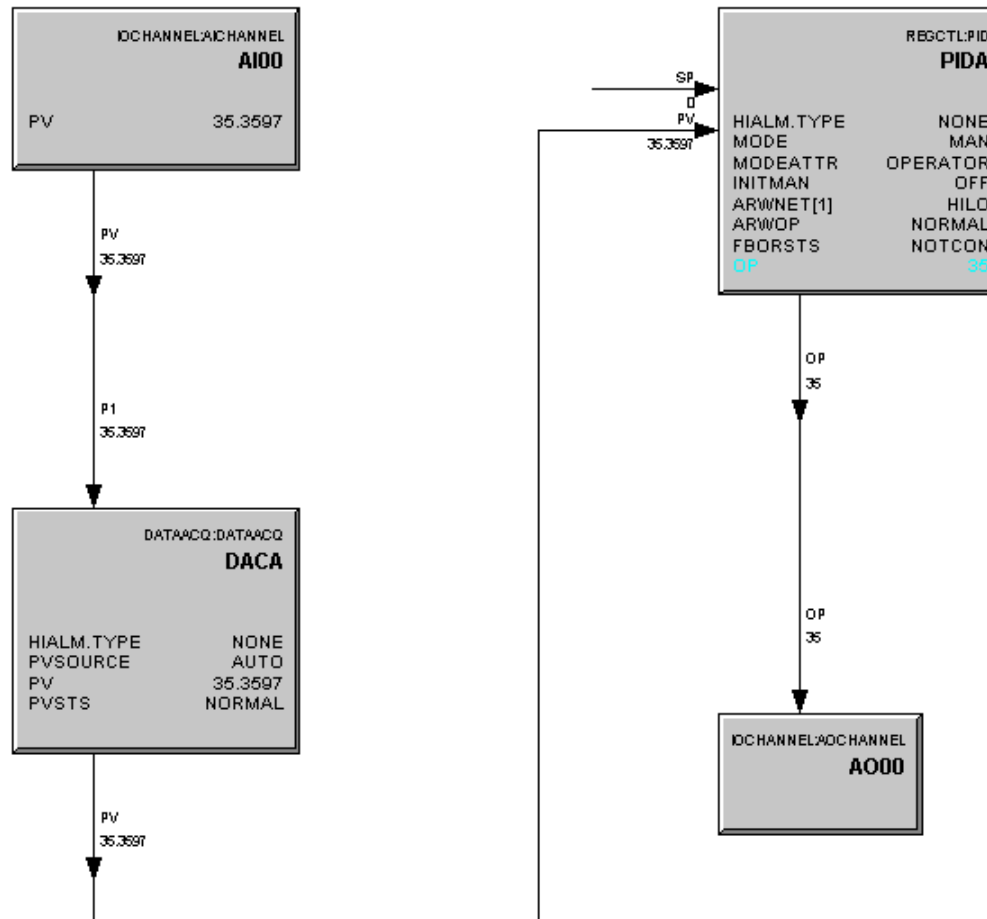
# Control Modules

---

- are used for control loops, control devices, data acquisition, and auxiliary functions
- contain Function Blocks that provide executable actions
- execution period can be set from 50 msec to 2 sec  
or  
from 5 msec to 200 msec

# Control Module Example

PIDLOOP1 [Monitoring, Execution Status = ACTIVE]



# Function Blocks

---

- **basic objects that execute different control functions**
- **contain parameters that provide an external view of what the block is doing**
  - **parameters can be viewed externally via server database or via the MONITORING tab of Control Builder**
- **interconnect to construct control applications**
  - **parameters that are wired together are passed between blocks**

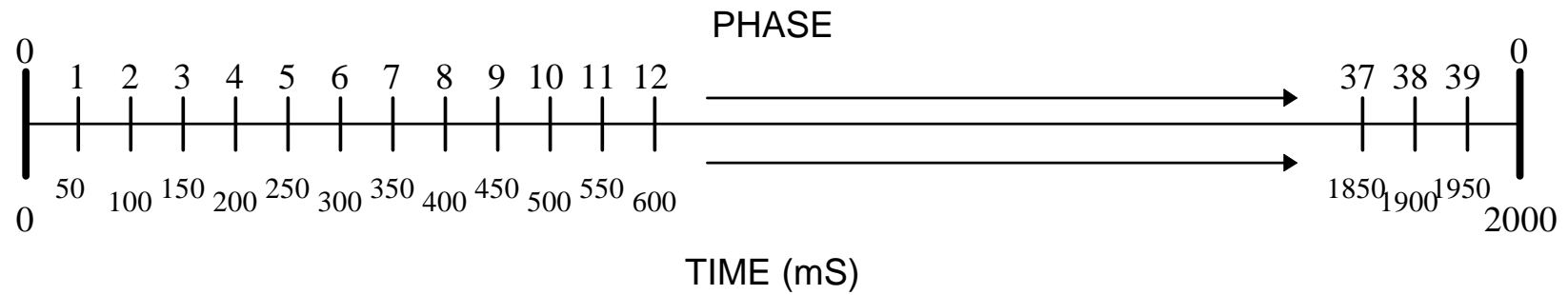
# Function Block Categories

---

- ***PlantScape Control Builder Components Reference groups by block type:***
  - System
  - IO Channel
  - Regulatory control
  - Auxiliary
  - Device control
  - Logic
  - Utility

# CM \ SCM Execution Period and Phase

---



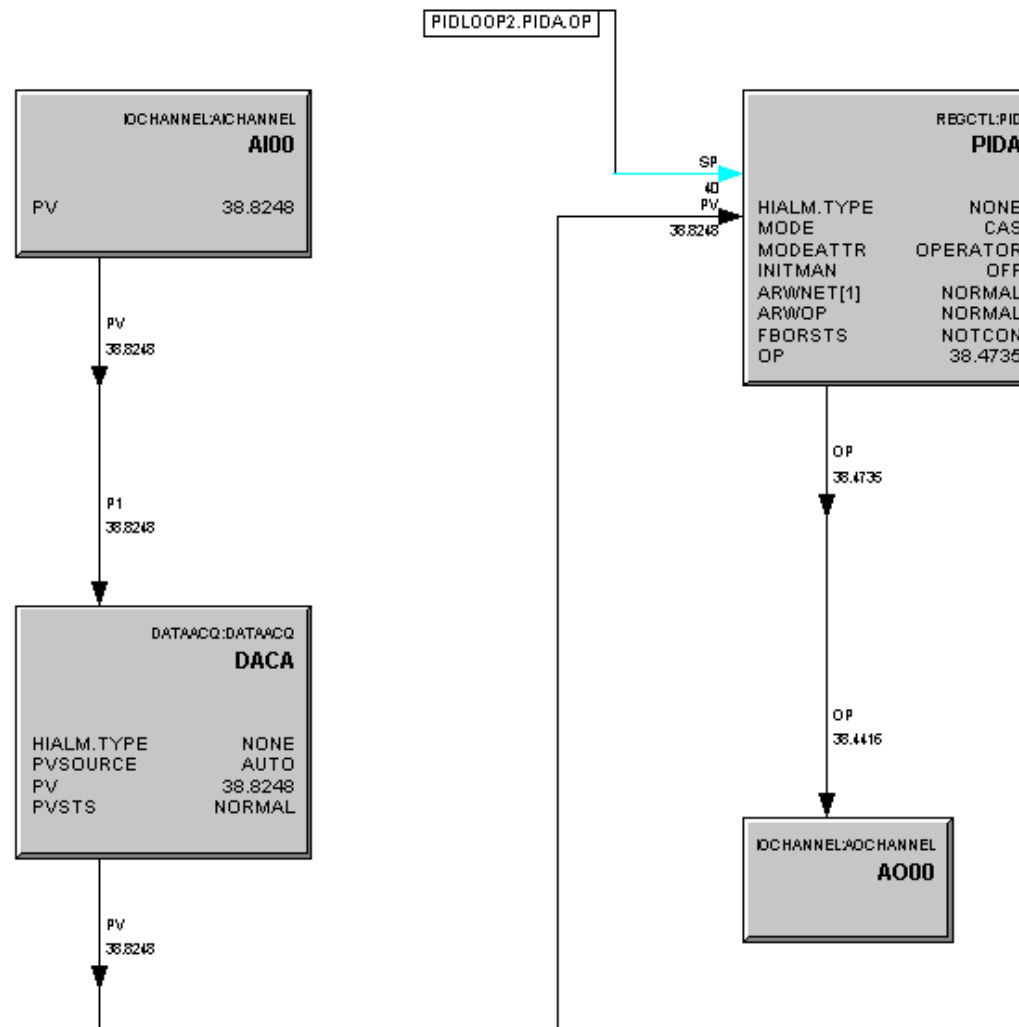
## Execution Periods / Phase Choices (50 mS Base)

---

Period (ms)	Allowable Phase Values
50	-1, 0
100	-1, 0, 1
200	-1, 0, 1, 2, 3
500	-1, 0 through 9
1000	-1, 0 through 19
2000	-1 0 through 39

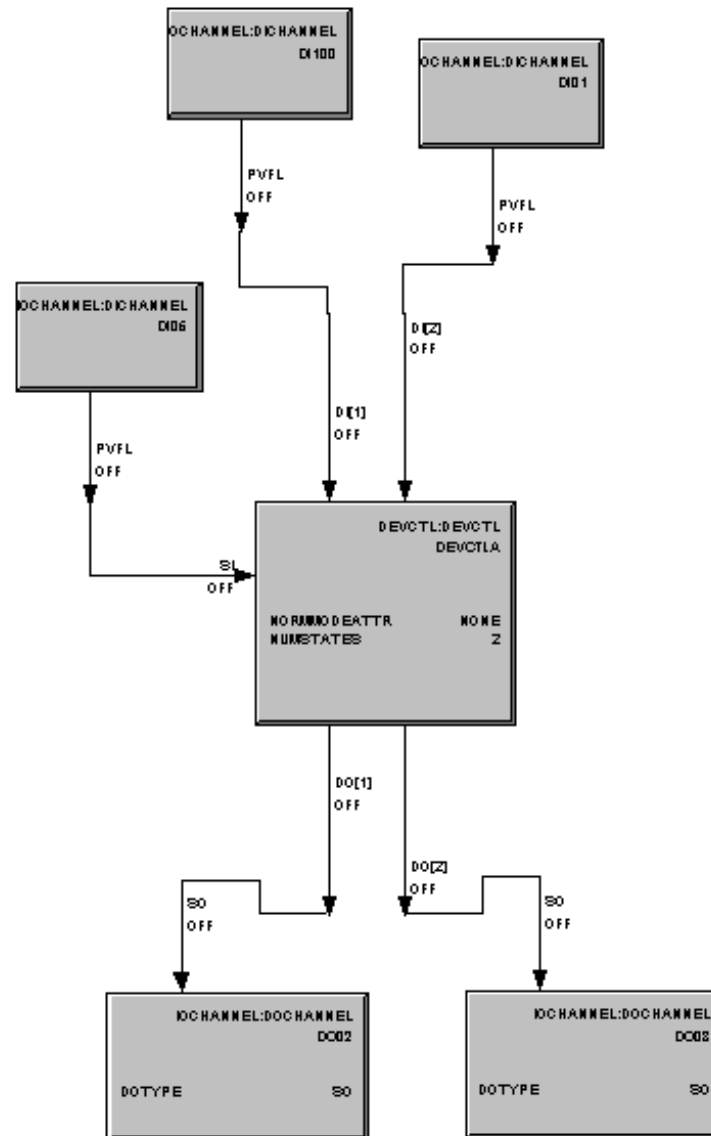
# Parameter Connections

PIDLOOP1 [Monitoring, Execution Status = ACTIVE]



# Device Control Module

---





## Lesson 2. Control Strategy Execution

---

### Objectives:

- Assign IOMs and CMs to a Control Execution Environment (CEE)
- Load and unload control strategies
- Monitor control strategies using Control Builder Monitor tab along with Station displays

# How to Assign Modules to a CEE

---

**Step 1.** Call up the assignment dialog

- ***“=” assignment icon on the toolbar***
- ***Tools -- Assign via menu items***

**Step 2.** Select appropriate CM/SCM on ***CMs/SCMs tab*** or select appropriate IOM on ***IOMs tab***

**Step 3.** Select CEE in the ***CEE Information box***

**Step 4.** Click on ***Assign button***

- verify that CM/SCM is listed in ***Assigned Module box***
- verify that IOMs are listed in ***Assigned Modules box***

# How to Load a Control Strategy

---

**Step 1. Select one or multiple items in the Project Tab.**

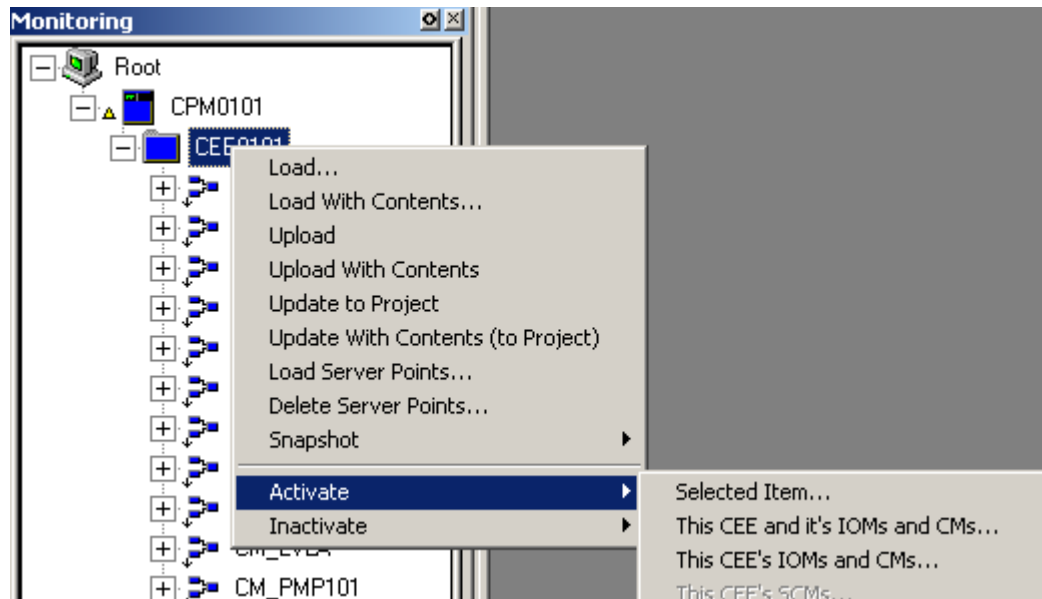
**Step 2. Click on the Down Arrow icon**

## Change CEE Status from Idle to Run

---

Right click on the CEE in the *Monitoring* tab and select *Activate* → *Selected Item...*

Result: CEE icon and CPM icon changes from blue to green to indicate status *Running*

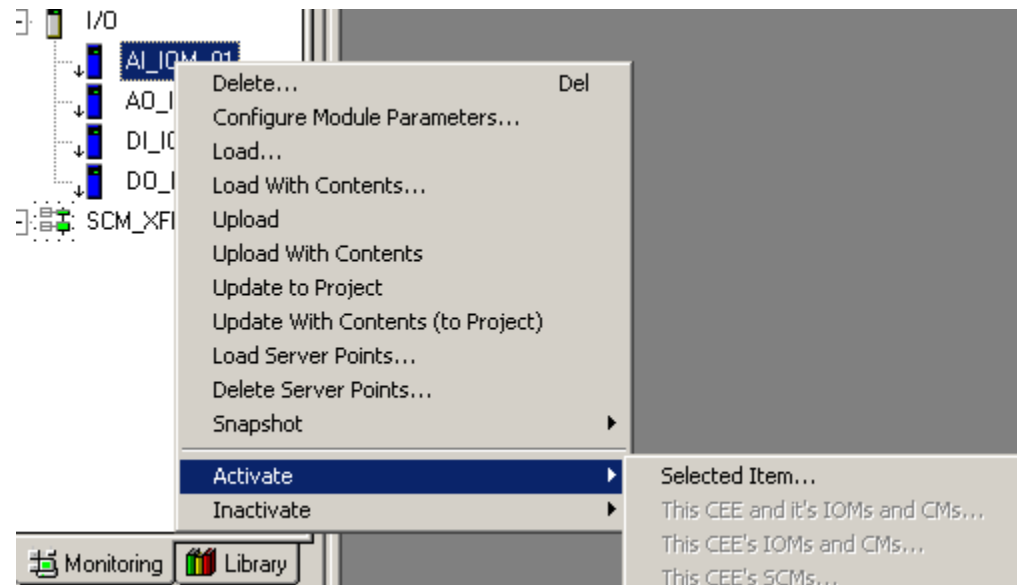


# Activate IOMs

---

Right click on the IOM in the *Monitoring* tab and select *Activate* → *Selected Item...*

Result: IOM icon changes to green to indicate status *Active*

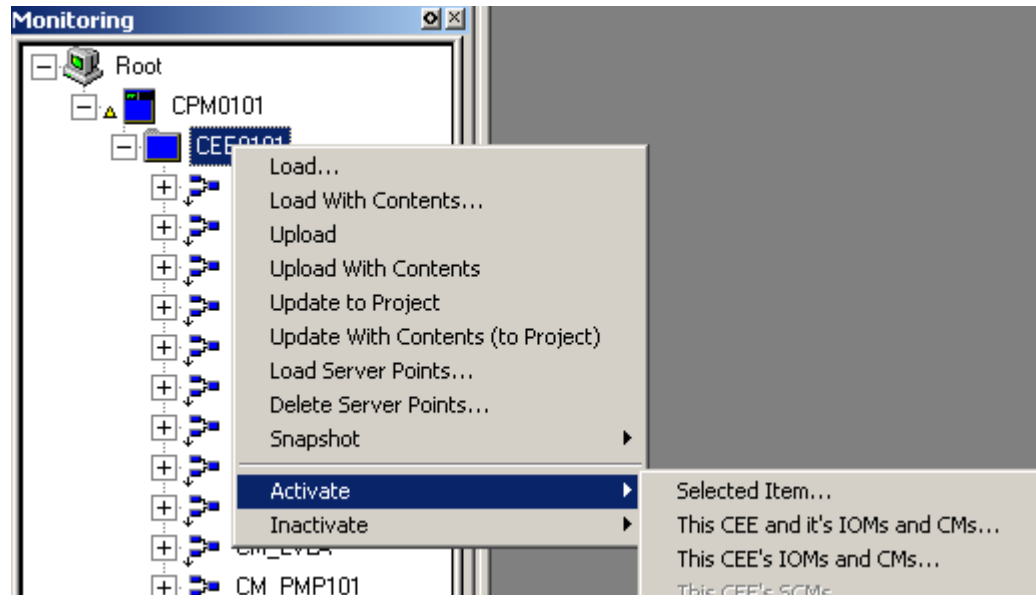


## Or --- Activate CEE and IOMs Together

---

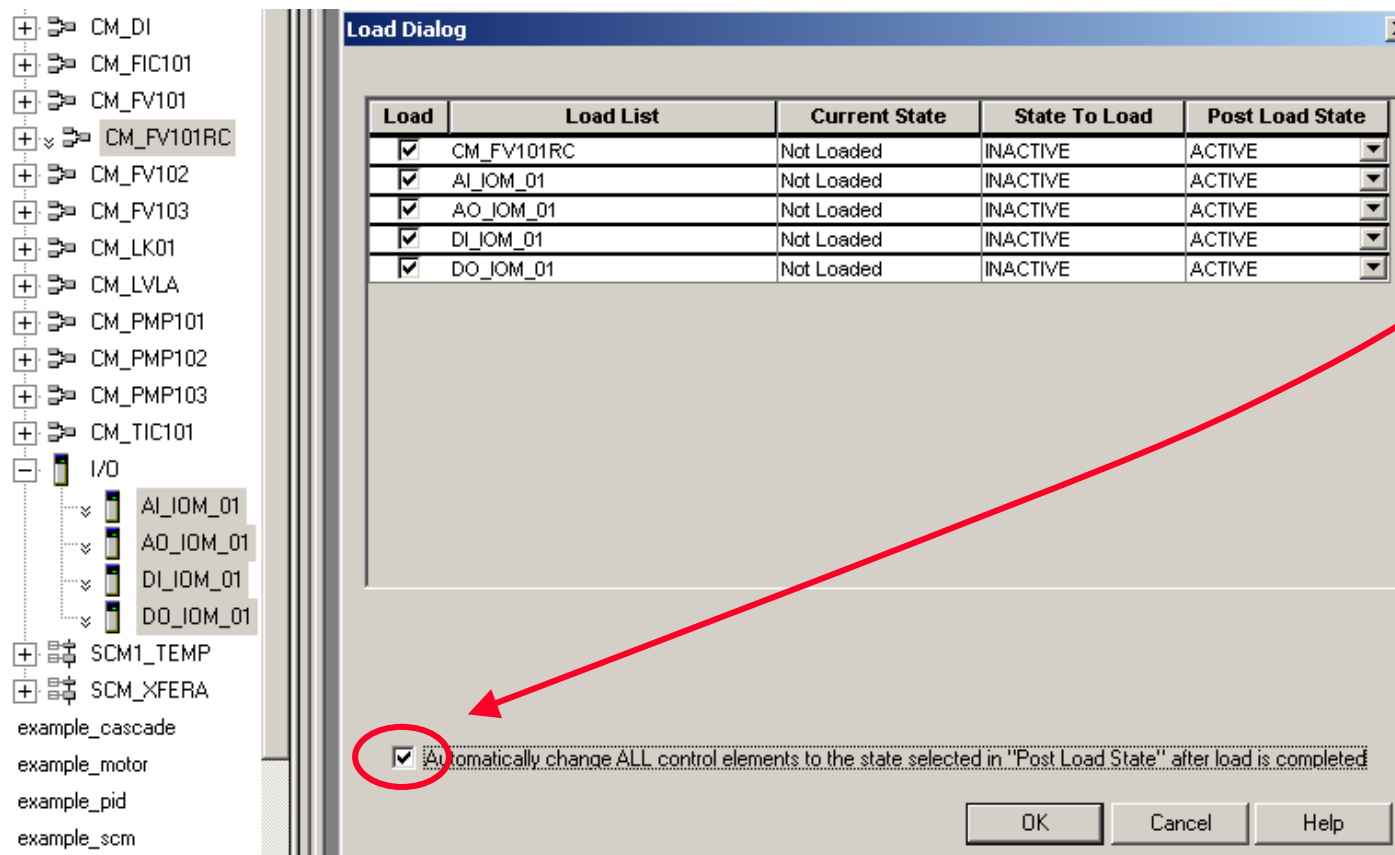
Right click on the CEE in the *Monitoring* tab and select *Activate* → *This CEE and its IOMs and CMs...*

Result: CEE icon, CPM icon, and all IOM and CM icons change from blue to green to indicate status *Running*



## Or --- Activate On Load

- Use <Ctrl> mouse to select multiple items in the Project tab to load
- Click the down arrow
- use the resulting dialog box to load and activate



## How to Monitor CM/SCM Execution

---

- Step 1. Double-click on the CM/SCM in the *Monitoring* tab.**
- Step 2. Verify that the CM/SCM status is ACTIVE in its title bar.**
- Step 3. For class tail-to-mouth wiring simulation, put CM in manual mode and enter an initial output to 'start' the CM operation**
- Step 5. Use Station displays or Monitor view to verify proper operation of CM/SCM.**



# Lesson 3. Configuring a Device Control Block

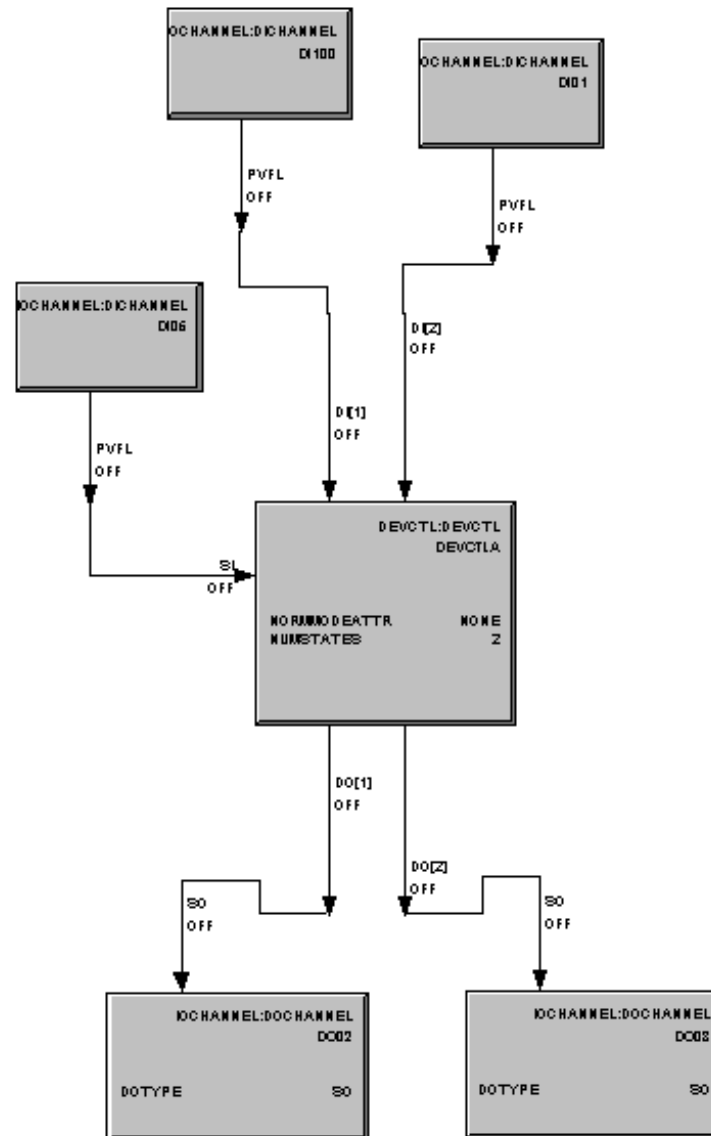
---

## Objectives:

- Understand Device Control CMs
  - Concepts
  - I/O
  - Interlocks

# Device Control Module

---



# Configuring a Device Control Block

---

**Step 1. Configure the Digital Outputs (DO).**

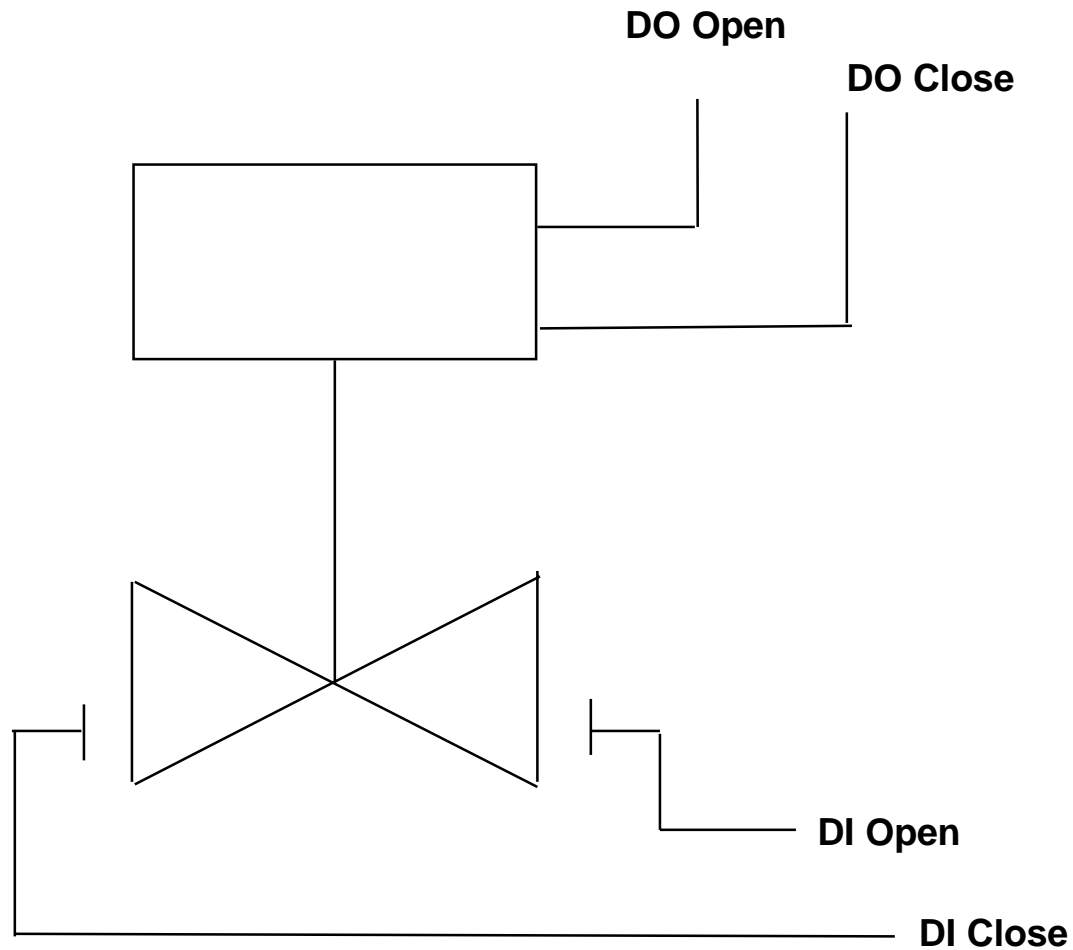
**Step 2. Configure the Digital Inputs (DI) as feedback from the DO.**

**Step 3. Configure Device Control block Parameters**

**Step 4. Configure Device Control block Interlocks**

# Valve Configuration Example

---



# Valve Configuration Example

---

- **Create a new CM**
  - **Drag from the Library the appropriate number of DI and DO blocks**
    - **Configure the blocks to map to the appropriate IOMs and Channels**
  - **Drag in a DEVCTLA block**
    - **Configure the parameters**

# Valve Example: DEVCTL Block Parameters

---

- On the DEVCTL block Main tab
  - Enter Number of Inputs and Outputs, to set up input and output pins
  - Enter Number of States
  - Enter State Names

The screenshot shows the configuration window for the DEVCTL block, specifically the 'Main' tab. It is divided into two sections: 'Block Sizing' and 'State Names'. In the 'Block Sizing' section, there are three dropdown menus: 'Number Of Inputs' set to 2, 'Number Of Outputs' set to 2, and 'Number Of States' set to 2. In the 'State Names' section, there are five text input fields: 'State 1 Name' with 'OPEN', 'State 0 Name' with 'CLOSE', 'State 2 Name' which is empty, 'In Between' with 'Inbet', and 'Null' with 'Bad'.

Block Sizing	
Number Of Inputs:	2
Number Of Outputs:	2
Number Of States:	2

State Names	
State 1 Name:	OPEN
State 0 Name:	CLOSE
State 2 Name:	
In Between:	Inbet
Null:	Bad

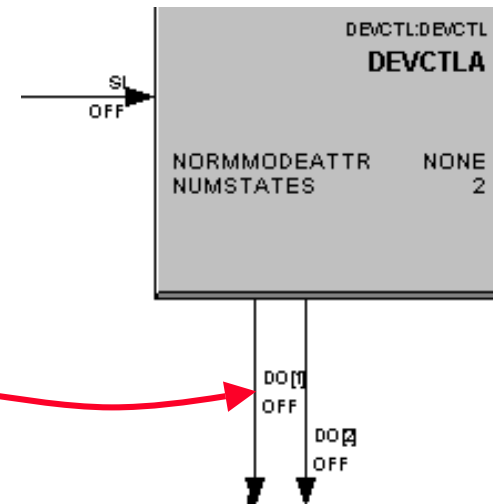
# Valve Example: DO Configuration

---

- Digital Outputs control the valve

- Soft wire the OPEN DO block to DO[1]

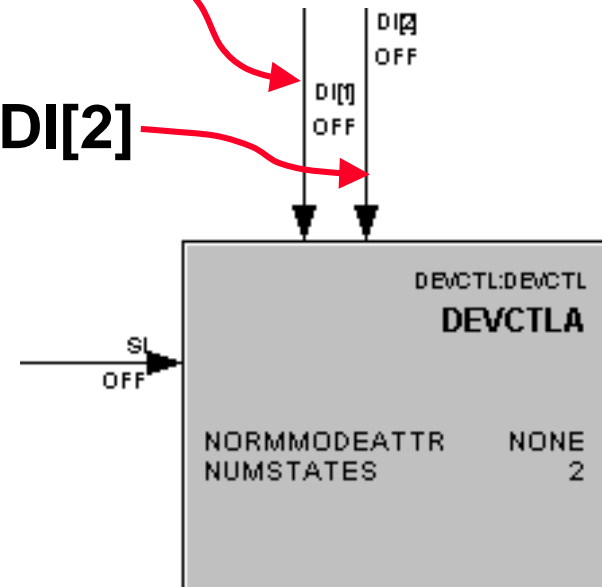
- Soft wire the CLOSE DO block to DO[2]



# Valve Example: DI Configuration

---

- Set the Digital Inputs 1 and 2 to reflect what the corresponding settings for the Digital Outputs accomplish
  - Soft wire the OPEN DI block to DI[1]
  - Soft wire the CLOSE DI block to DI[2]





# Valve Example: DEVCTL Block -- Inputs

---

- On the DEVCTL block Inputs tab
  - Select the State Descriptors that correspond to the DI configuration
    - DI[1] for OPEN
    - DI[2] for CLOSE
    - DI[1] and [2] together = bad signal
    - Neither input = in between States

The screenshot shows the 'Inputs' tab of the DEVCTL block configuration. At the top, there are four tabs: 'Main', 'Inputs', 'Output', and 'M.'. Below the tabs, the 'Number of Digital Inputs' is set to 2. A table below shows the configuration for the two inputs. The table has columns for 'Inputs' (4, 3, 2, 1) and a list of state descriptors. The state descriptors are 'Inbet', 'OPEN', 'CLOSE', and 'Bad'. The checkboxes for 'OPEN' and 'CLOSE' are checked, and the checkboxes for 'Inbet' and 'Bad' are unchecked.

Inputs	4	3	2	1	State Descriptor
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Inbet
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OPEN
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	CLOSE
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Bad

# Valve Example: DEVCTL Block -- Outputs

---

- On the DEVCTL block Outputs tab
  - Select the Outputs that correspond to the DO configuration
    - DO[1] for OPEN
    - DOI[2] for CLOSE
  - Select the Safe output

The screenshot shows the 'Output' tab of the DEVCTL block configuration. At the top, there are four tabs: 'Main', 'Inputs', 'Output' (selected), and 'Maintenance'. Below the tabs, there is a 'Number of Digital Outputs' dropdown menu set to '2'. The main area is titled 'Output States' and contains a table with columns for 'Outputs' (3, 2, 1), 'State Name', and 'Safe'.

	3	2	1	State Name	Safe
State 1	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	OPEN	<input type="radio"/>
State 0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	CLOSE	<input checked="" type="radio"/>
State 2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="radio"/>

## Valve Example: DEVCTL Block -- Outputs

---

- On the DEVCTL block Alarms tab
  - Enter times (in seconds) for Command Fail and Command Disagree alarms
    - Note that Time to CLOSE entries can be different than Time to OPEN entries

	Time to CLOSE	Time to OPEN	Time to	Priority	Severity
Command Disagree:	5	5	0	LOW	0
Command Fail:	2	2	0	LOW	0
Uncommand Change:				LOW	0
Bad PV:				LOW	0

# Interlocks

---

- **Configure Operational Interlocks**
  - **Permissives: P[0], P[1], and P[2]**
  - **Overrides: OI[0], OI[1], and OI[2]**
  - **Requires adding Block Pins**

- **Configure Safety Override: SI**



**(3-state devices)**

## Lesson 3. DBADMIN

---

### Objectives:

#### Understand DBAdmin\*

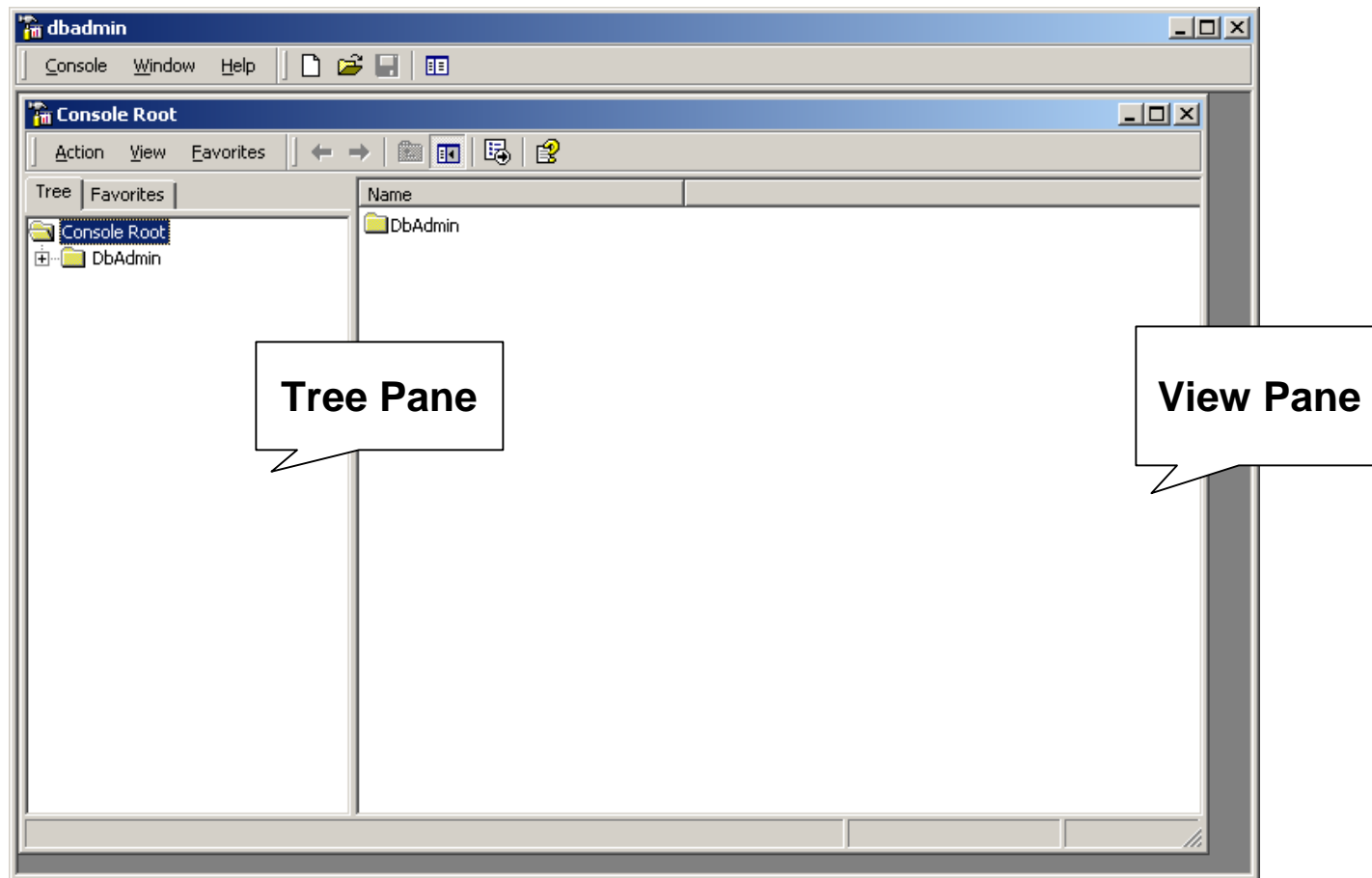
- Concepts
- Functions
- Features

\* Engineering Repository Database Administration  
tool

# Start DBAdmin

---

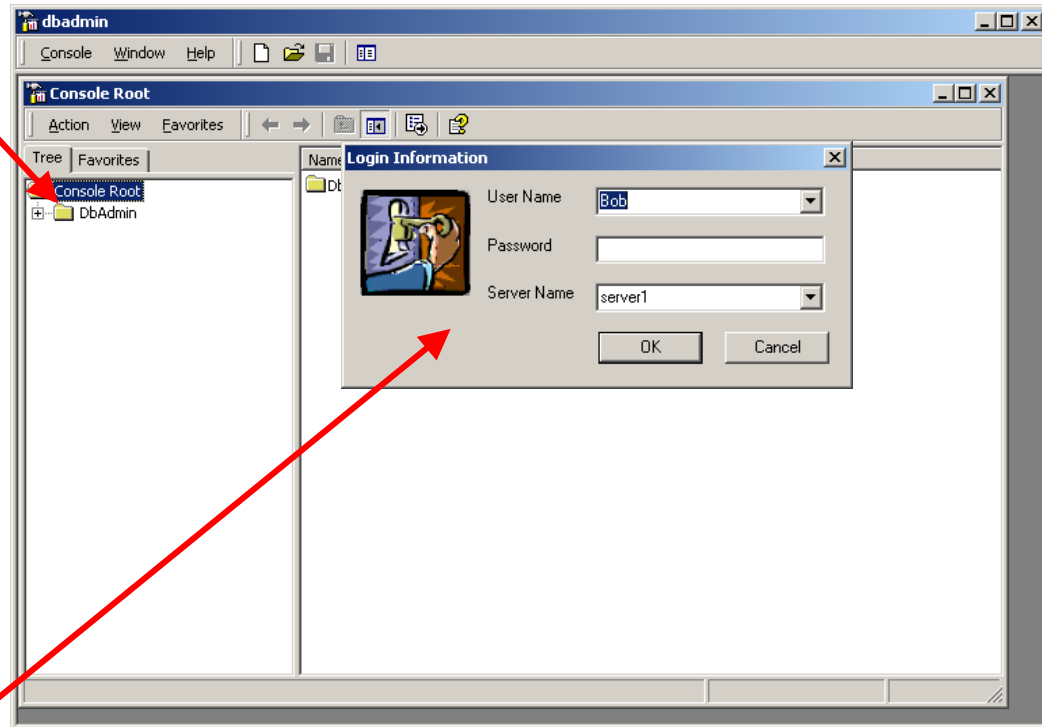
**Programs → PlantScape Engineering Tools → DBAdmin**



# Log into Server

---

- Click on the **DBAdmin** folder in the tree pane to call up the **Login Information** dialog box

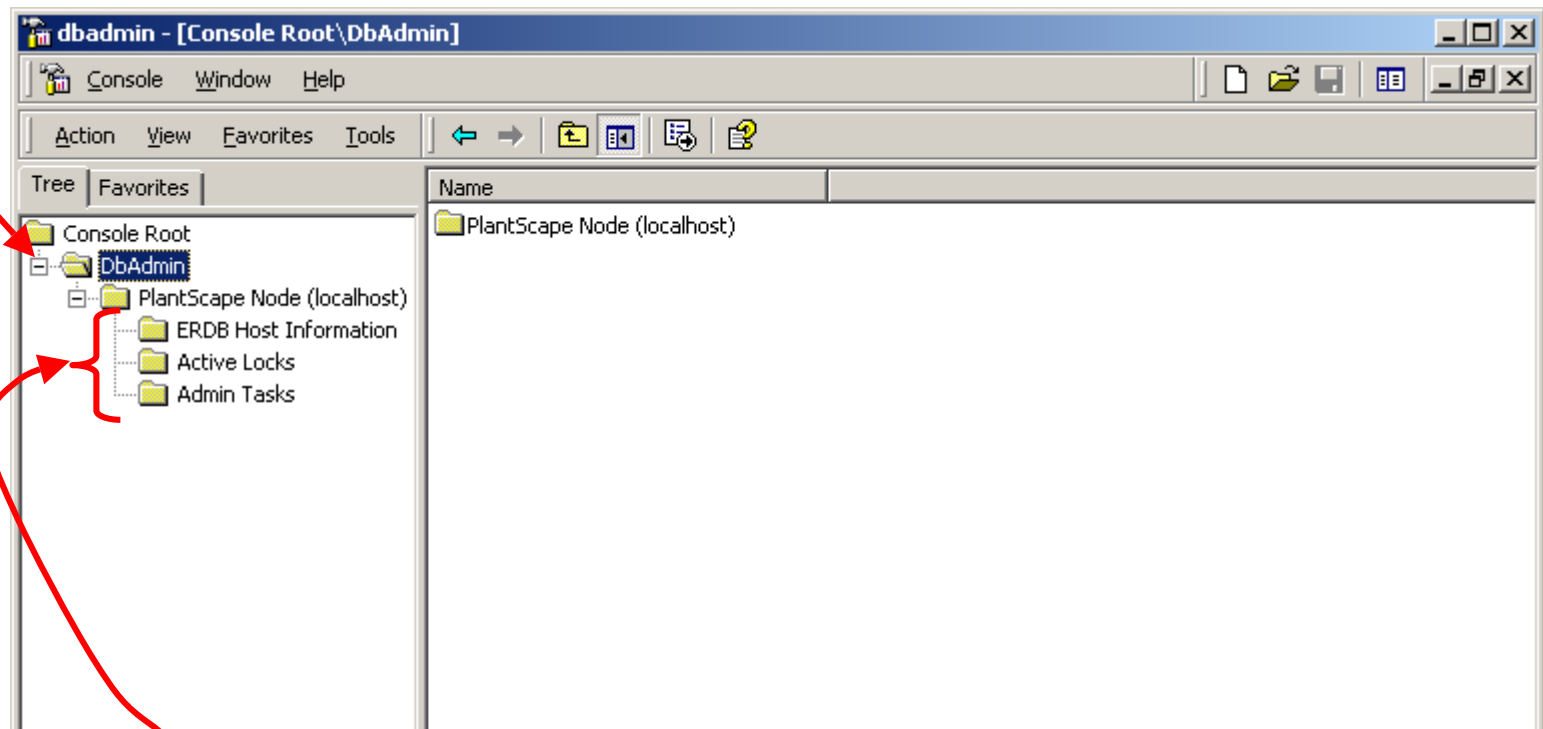


- Type in your **User Name** and **Password**. Make sure that the **Server Name** is correct.

# Expand the Tree View

---

- After successful login, click on the  next **DBAdmin** folder in the tree pane



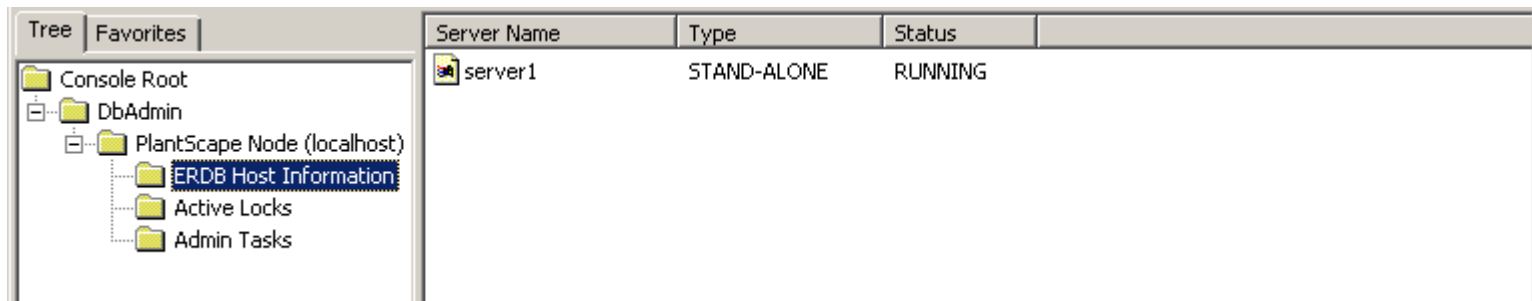
- The result is the three different view choices for the content of the View pane



# Three Different Views

---

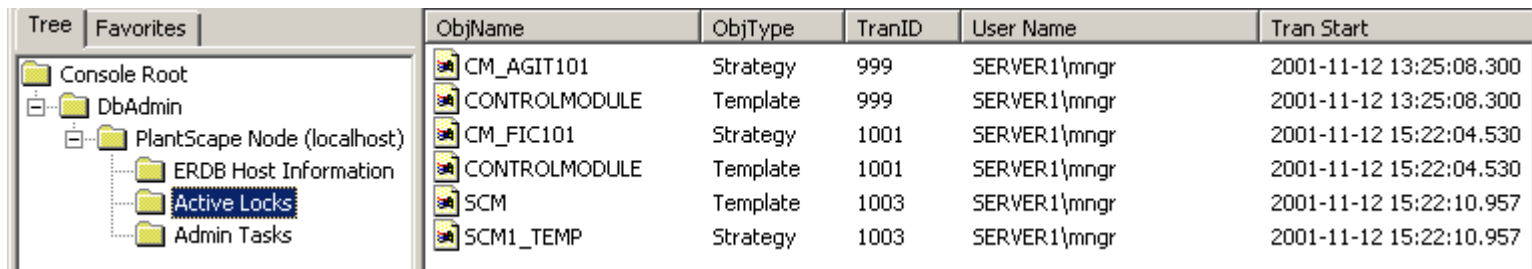
- **ERDB Host Information** - General information about the logged on Server appears in the view pane



The screenshot shows the PlantScape R400 interface. On the left, a tree view under 'Console Root' shows 'DbAdmin' expanded, with 'PlantScape Node (localhost)' selected. Under this node, 'ERDB Host Information' is highlighted. The main pane on the right displays a table with the following data:

Server Name	Type	Status
server1	STAND-ALONE	RUNNING

- **Active Locks** - Displays active lock information



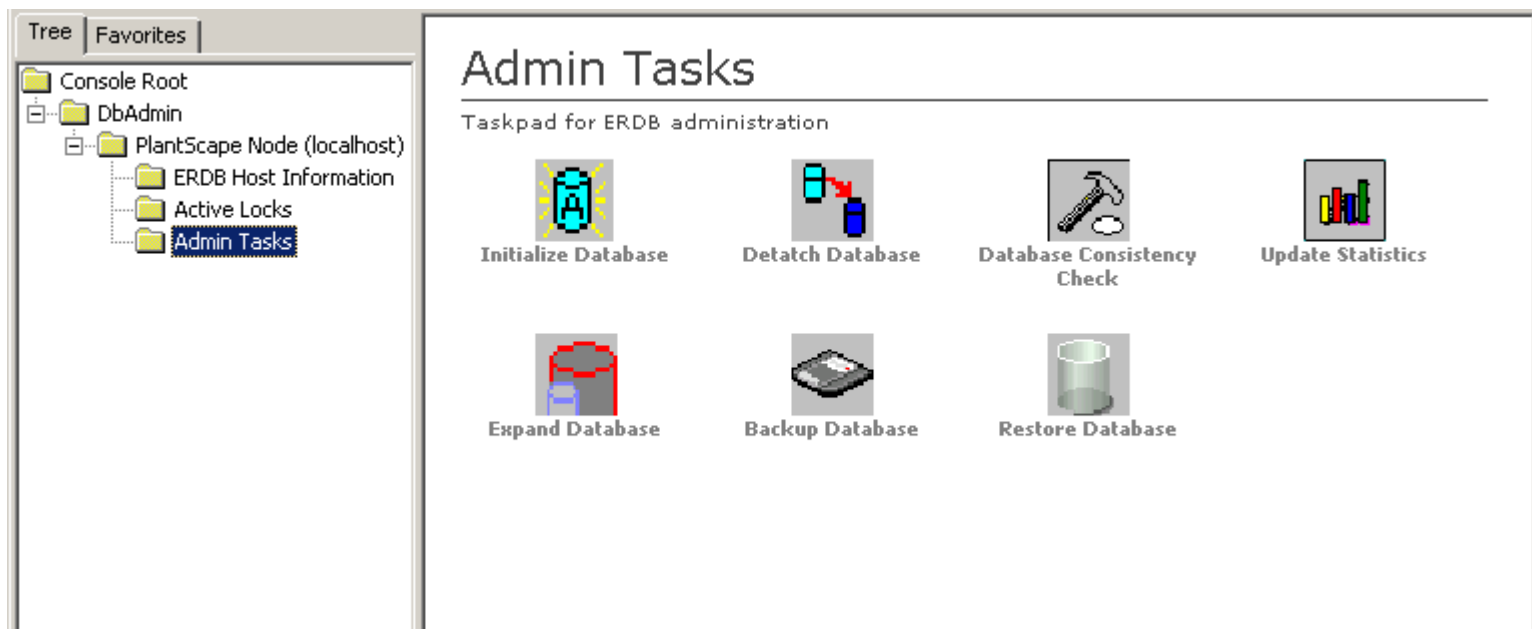
The screenshot shows the PlantScape R400 interface with the 'Active Locks' view selected in the tree. The main pane displays a table with the following data:

ObjName	ObjType	TranID	User Name	Tran Start
CM_AGIT101	Strategy	999	SERVER1\mngr	2001-11-12 13:25:08.300
CONTROLMODULE	Template	999	SERVER1\mngr	2001-11-12 13:25:08.300
CM_FIC101	Strategy	1001	SERVER1\mngr	2001-11-12 15:22:04.530
CONTROLMODULE	Template	1001	SERVER1\mngr	2001-11-12 15:22:04.530
SCM	Template	1003	SERVER1\mngr	2001-11-12 15:22:10.957
SCM1_TEMP	Strategy	1003	SERVER1\mngr	2001-11-12 15:22:10.957

# Three Different Views

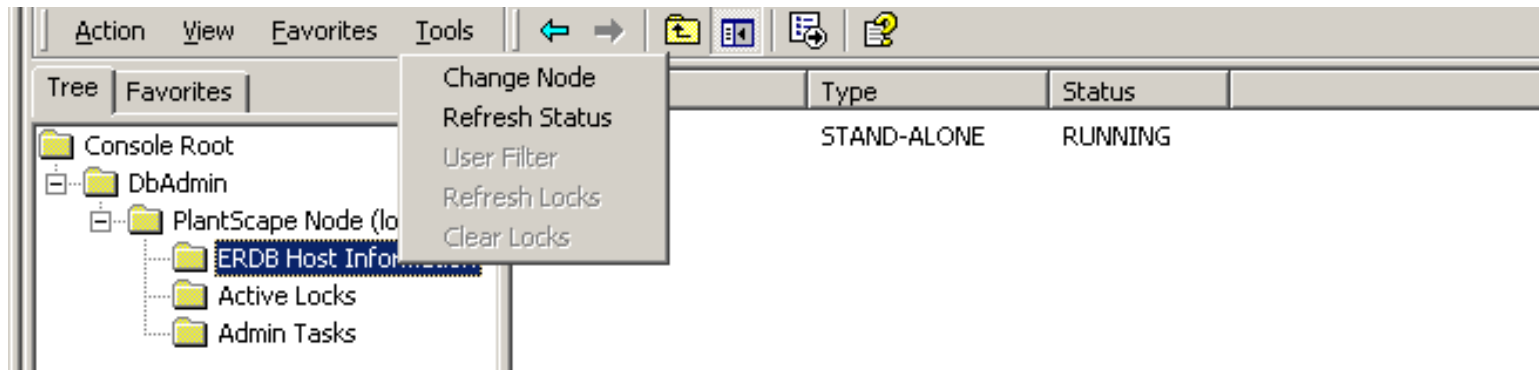
---

- **Admin Tasks** - Displays Admin Task Menu



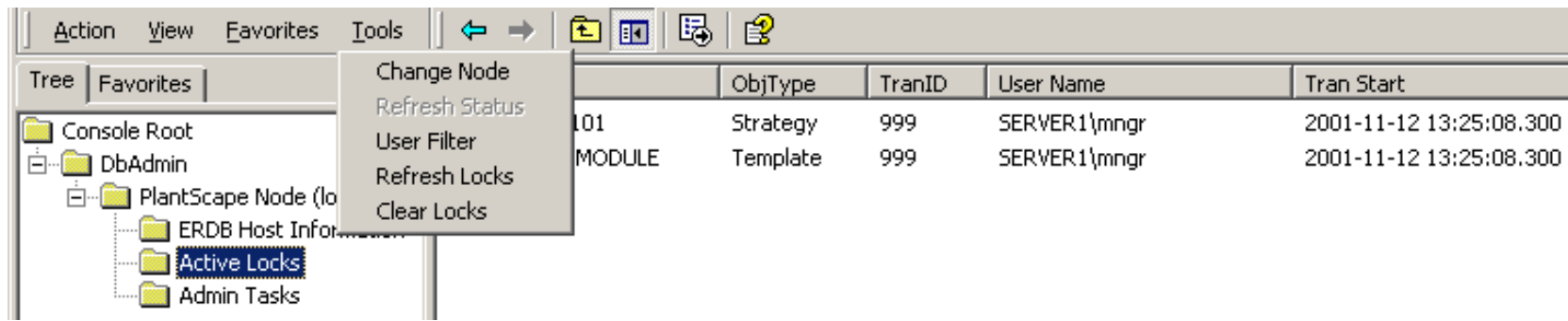
# Tools Pull-Down Menu -- ERDB Host Information

---

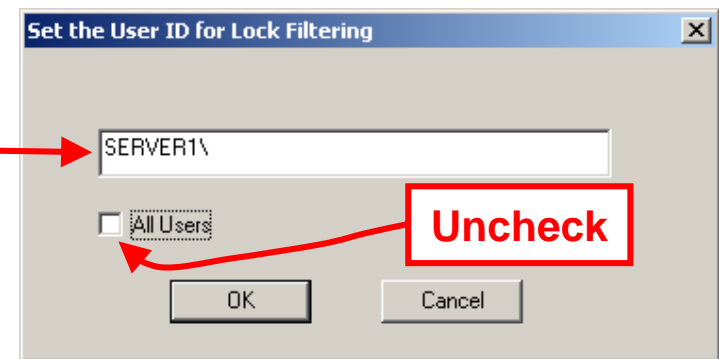


- **Change Node** - Opens the Login Information dialog box. Lets you connect to the specified system node in a multi-server environment
- **Refresh Status** - Refresh data on connected Host in View pane

# Tools Pull-Down Menu -- Active locks

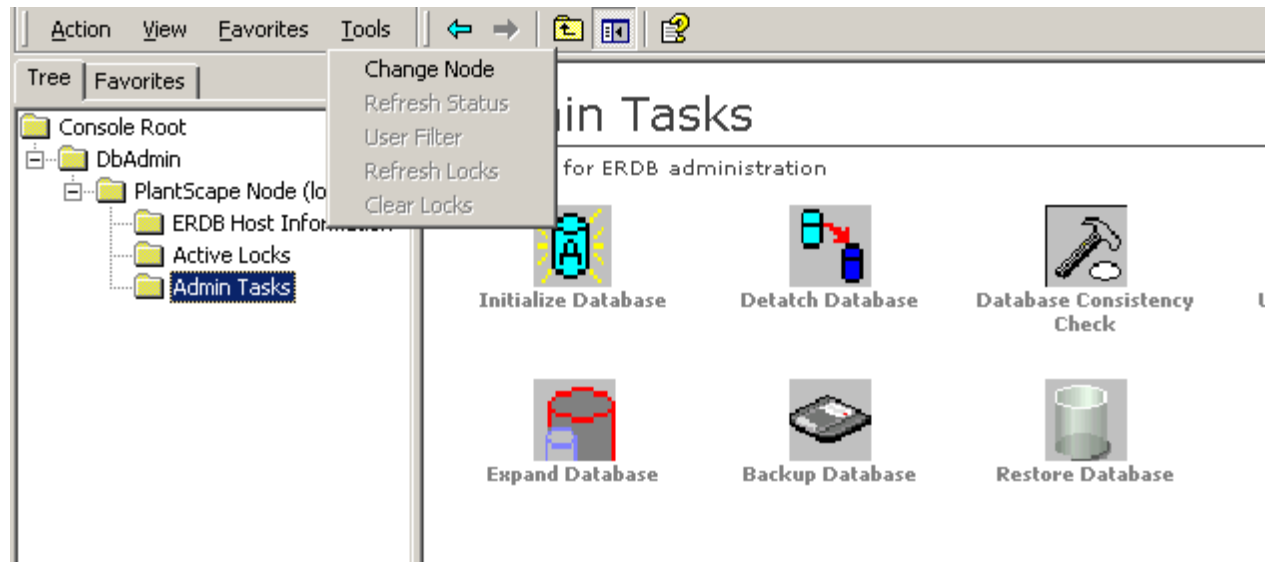


- **Change Node** - Opens the Login Information dialog box. Lets you connect to the specified system node in a multi-server environment
- **User Filter** - Calls up dialog box that permits you to restrict lock access to the specified User ID (Server Name\User ID)
- **Refresh Locks** - Refreshes the View pane to show, based on User Filter, the most current lock information in the ERDB
- **Clear Locks** - Clears all the current locks in the View pane. If the User Filter is applied, only those locks visible are cleared..



# Tools Pull-Down Menu -- Admin Tasks

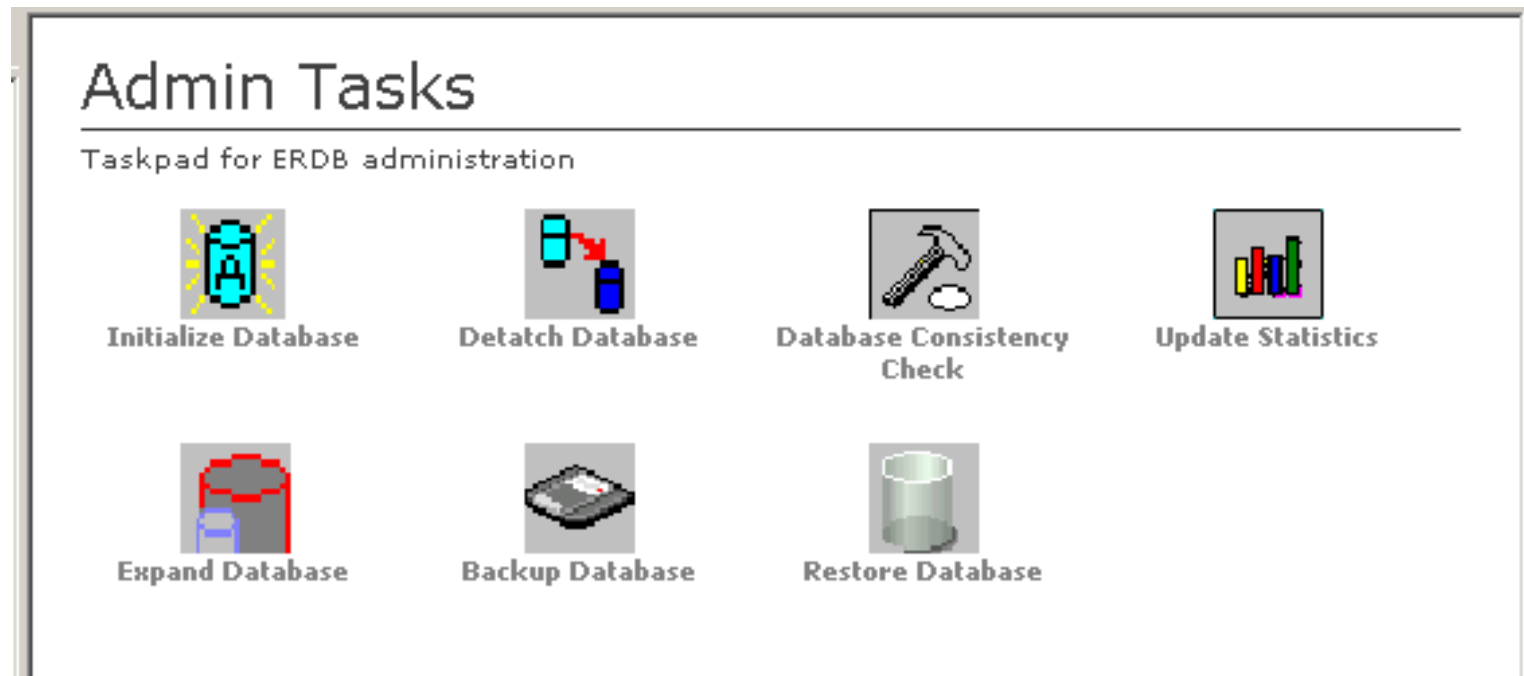
---



- **Change Node** - Opens the Login Information dialog box. Lets you connect to the specified system node in a multi-server environment

# DBAdmin Tasks

---



- **Initialize Database** - Restores the Clean database (ps\_erdb\_clean.bak) in the Primary ERDB.
- **Detach Database** - Shutdowns the database services, detaches the Primary ERDB, copies and attaches database to the c:\Temp directory location, re-attaches Primary ERDB and restarts database services.

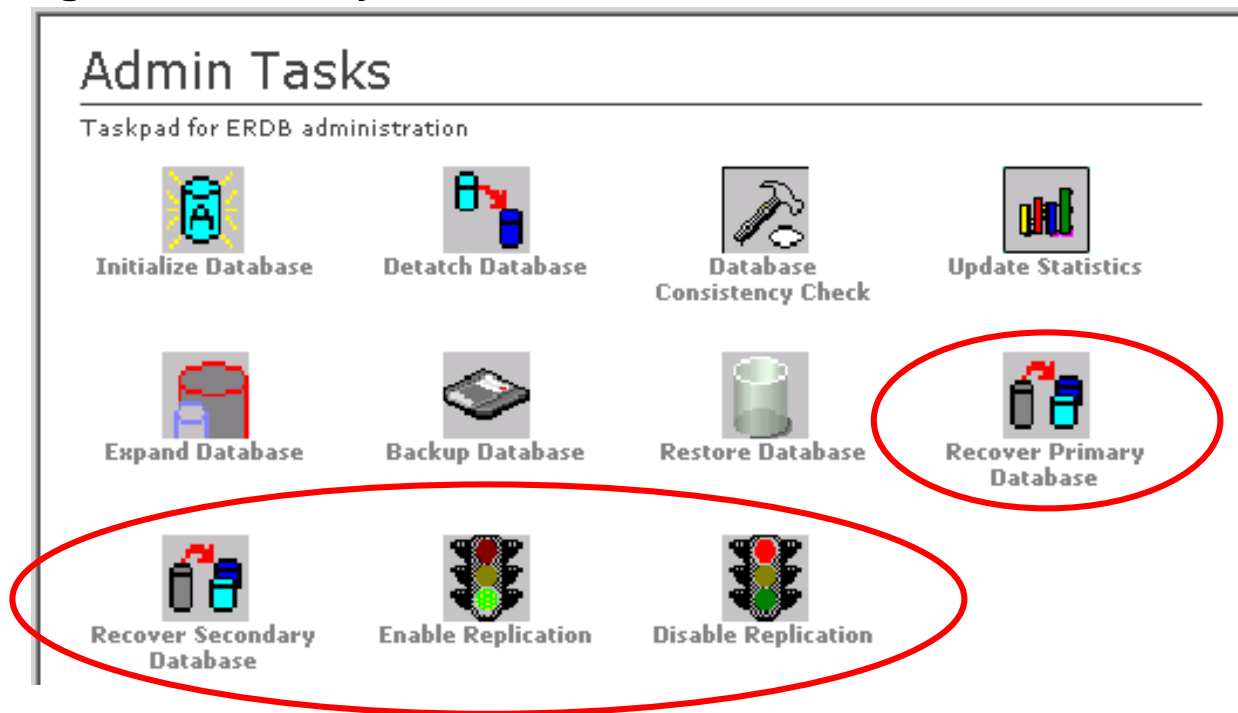
## DBAdmin Tasks (*continued*)

---

- **Database Consistency** - Checks the consistency of the database and rebuilds indexes using the SQL Server.
- **Update Statistics** - Runs DBCC REINDEX to reorganize data and index pages followed by update statistics.
- **Expand Database** - Expands the size of the database
- **Backup Database** - Creates a backup copy of the current database as a ".bak" file under the user specified name and in the user selected directory location on a local drive through the **Backup To** dialog box. A common directory location is **c:\Honeywell\tps50\system\er**.
- **Restore Database** - Restores the user selected backup database (\*.bak) in the primary ERDB through the **Restore From** dialog box. The **default** directory is **c:\Honeywell\tps50\system\er**.

# DBAdmin Tasks -- Redundant Servers

The following tasks are only available for Redundant Servers.



- **Recover Primary Database** - Recovers Primary database from secondary database. If a valid Primary (master) ERDB exists, it merely resets the mastership ID so that the primary database is the Design Master. If the master ERDB no longer exists, the utility first makes the secondary database (at SERVERA) the master temporarily. Then it replicates this database to the primary (SERVERB). Finally, it switches mastership back to the new copy at SERVERB.



# DBAdmin Tasks -- Redundant Servers

---

- **Recover Secondary Database** - Recovers Secondary database from Primary database. It creates a new replica from the Design Master, which is assumed to be located at the path set by data source `ps\_erdb'. It creates the new replica at the server node previously specified during installation as the secondary ERDB server.
- **Enable Replication** - Starts replication of the ERDB from the Primary to the Secondary. This enables replication from scratch.
- **Disable Replication** - Stops the replication function completely. This is **not** a temporary interruption of the replication function.



# Unit 7. Control Building SCMs

---

- **Lesson 1. Sequential Control Modules**
- **Lesson 2. SCM Activation**

# Lesson 1. Sequential Control Modules (SCMs)

---

## Objectives:

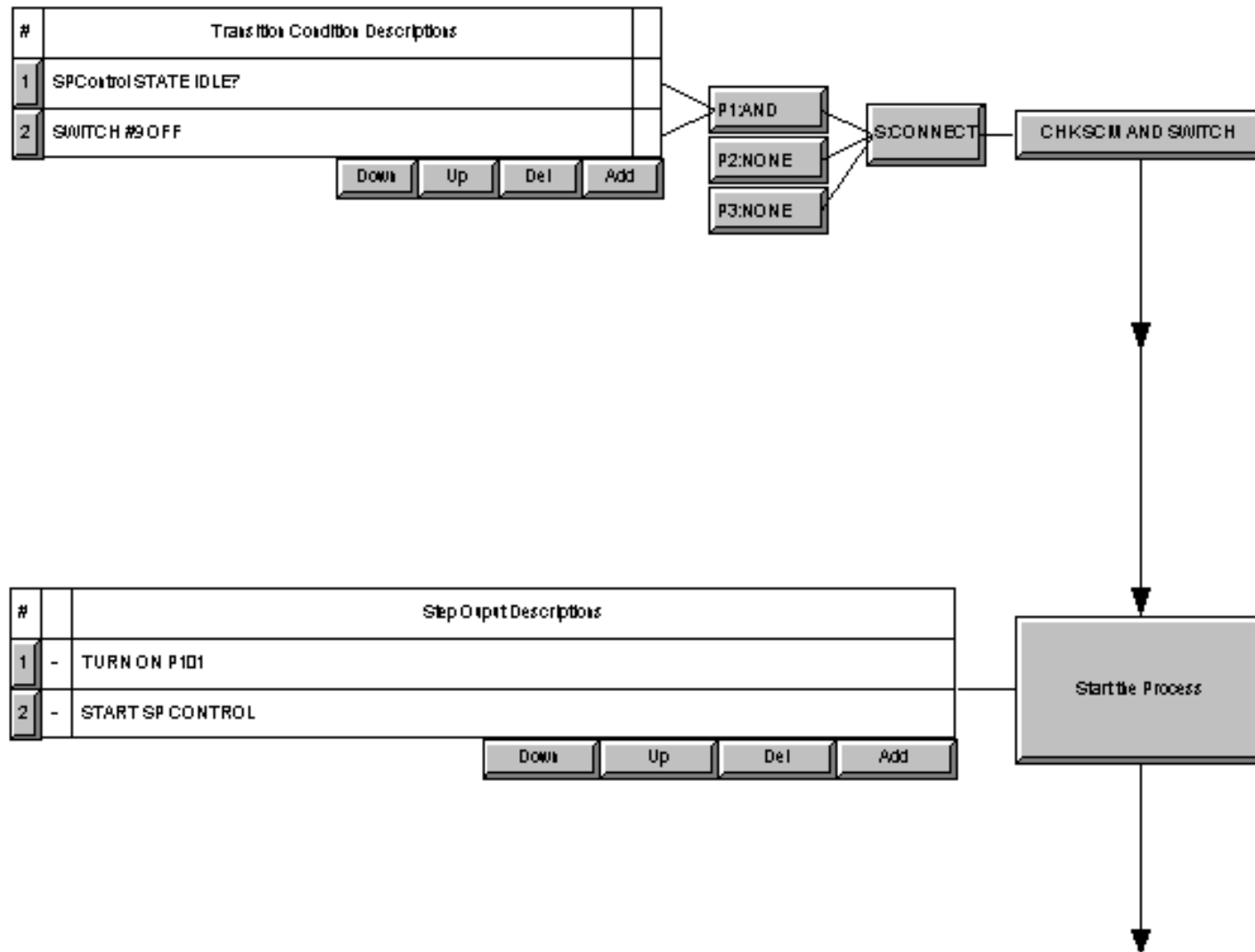
- Build and edit SCMs
- Configure step and transition function blocks
- Configure step timing
- Add looping and branching functionality
- Create exception handler

# SCMs

---

- provide phase-level batch functionality
- command regulatory and discrete function blocks contained within CMs in a defined order to accomplish higher level tasks
  - for example, boiler start up
- contain the following function blocks:
  - transitions that determine when to proceed
  - steps that take action
  - handlers for specified exceptions

# SCM Example



# SCM Transitions

---

- evaluate if the SCM is ready to advance to next step
- define up to 10 conditions
- define up to 4 logic gates
  - 3 primary
  - 1 secondary

# Transition Conditions

---

- true=on=1      false=off=0
- can be forced on or off from Monitor tab
- compound statements with OR, AND logic permitted

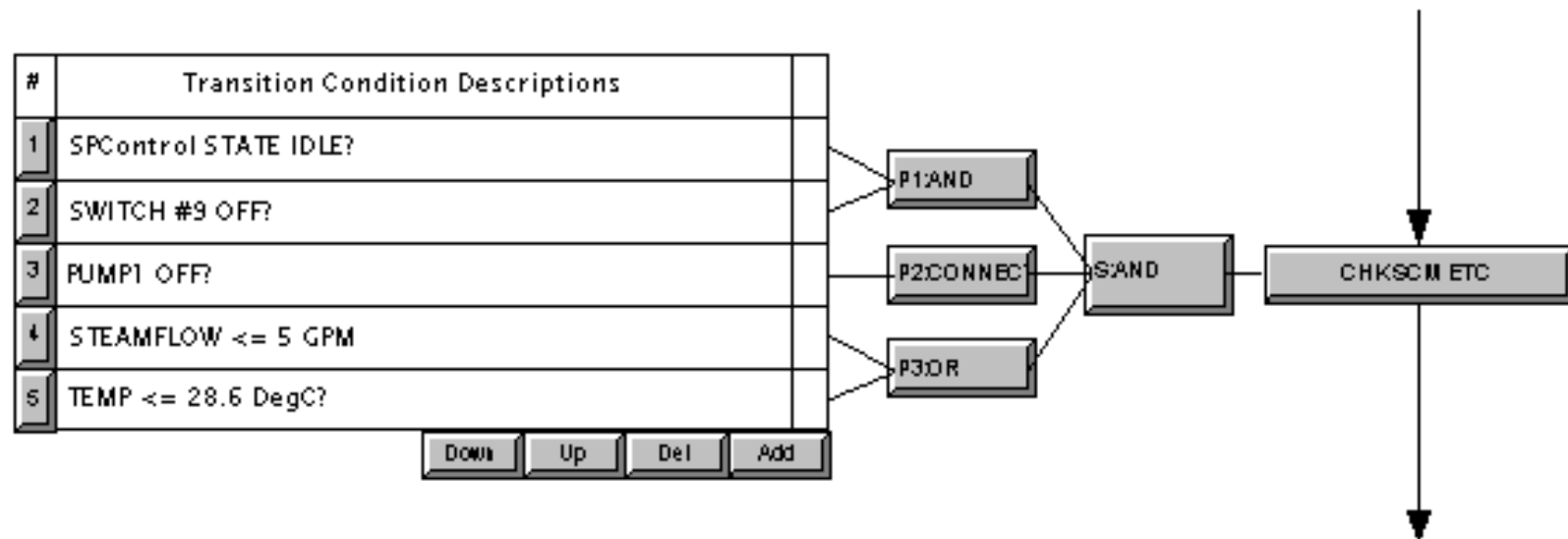
## Examples:

- PIDLOOP.PIDA.OP >= 15.
- SWITCH.DI07.PVFL = 0
- 1
- SWITCH.DI07.PVFL=0 and PIDLOOP.PIDA.SP <= 5.



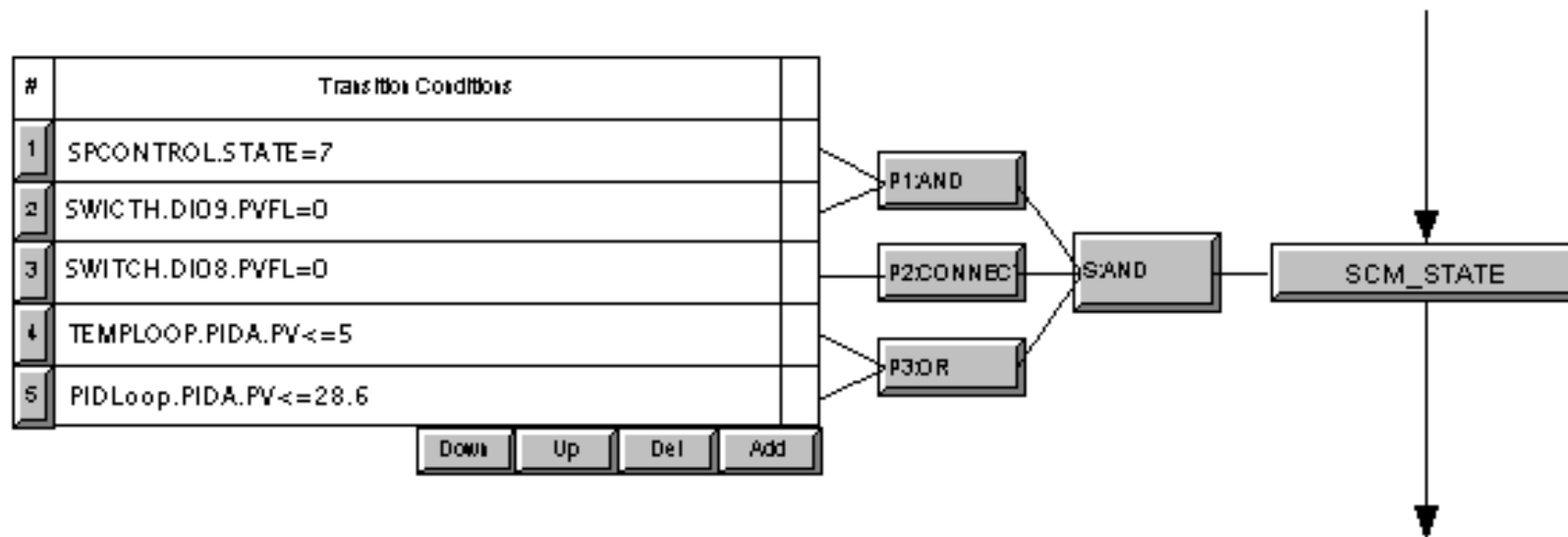
# SCM Transition Conditions -- Descriptions

---



# SCM Transition Conditions -- Code

---



# SCM Steps

---

- send output/actions to CM function blocks (CM Mode attribute must be Program)
- can define up to 16 individual outputs/actions
  - for example, PIDLOOP.PIDA.MODE:=1
    - instructs PIDA to go to AUTO mode
    - PIDA is a PID function block contained in the PIDLOOP CM
- support min and max wait times
- indicate whether the output action is allowable

# Step Outputs

---

- must have assignment
- only one assignment per output
- cannot leave blank
- assignment designator is :=

## Examples:

**PIDLOOP.PIDA.MODE := 1**

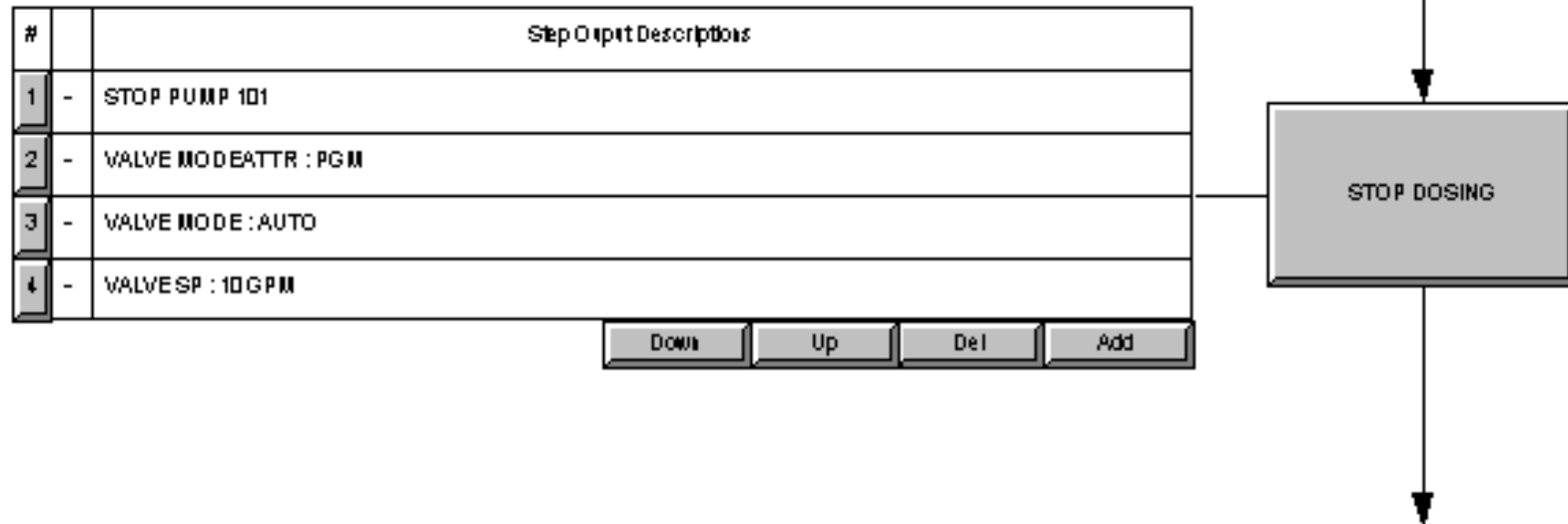
**PIDLOOP.PIDA.SP := 7.**

**SCM27.STEP8.MINTIME := 12**

**SCM27.STEP8.MAXTIME := INT (SCM27.RECTARGET[6] )**

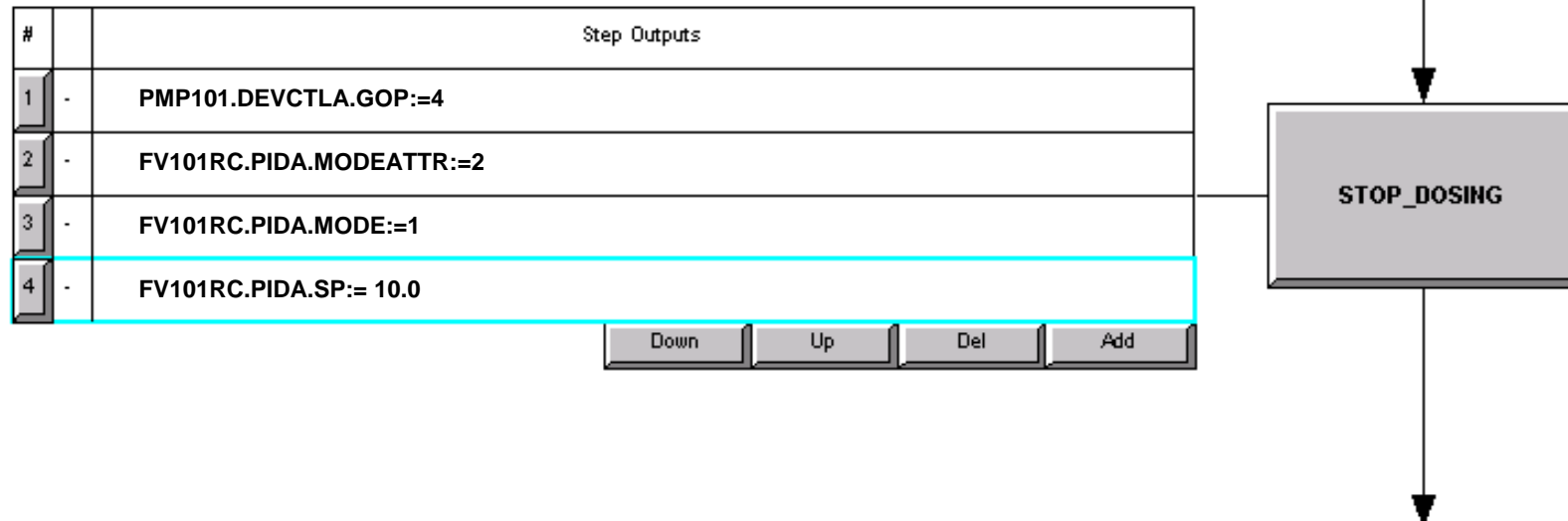
# SCM Output Descriptions

---



# SCM Output Code

---



# Rules for Defining an SCM

---

**Rule 1. Every SCM begins with an Invoke Transition.**

**Rule 2. SCMs can have multiple endings.**

**Rule 3. Steps and transitions must alternate in an SCM.**

# SCM Modes

---

- Three execution modes are available
  - Automatic, Semi-automatic, and Single step
    - Automatic : Run to Complete , no normal interruptions
    - Semi-automatic : Pause after each step, wait for Resume command
    - Single step: Pause after each step, wait for Resume command and target step (ignores transition conditions)
- Manual Mode: stops SCM execution ( normally used with TPB to link SCM execution with Recipe execution.
- Normal Mode: used with Operator or GUS keyboard to go to configured execution mode



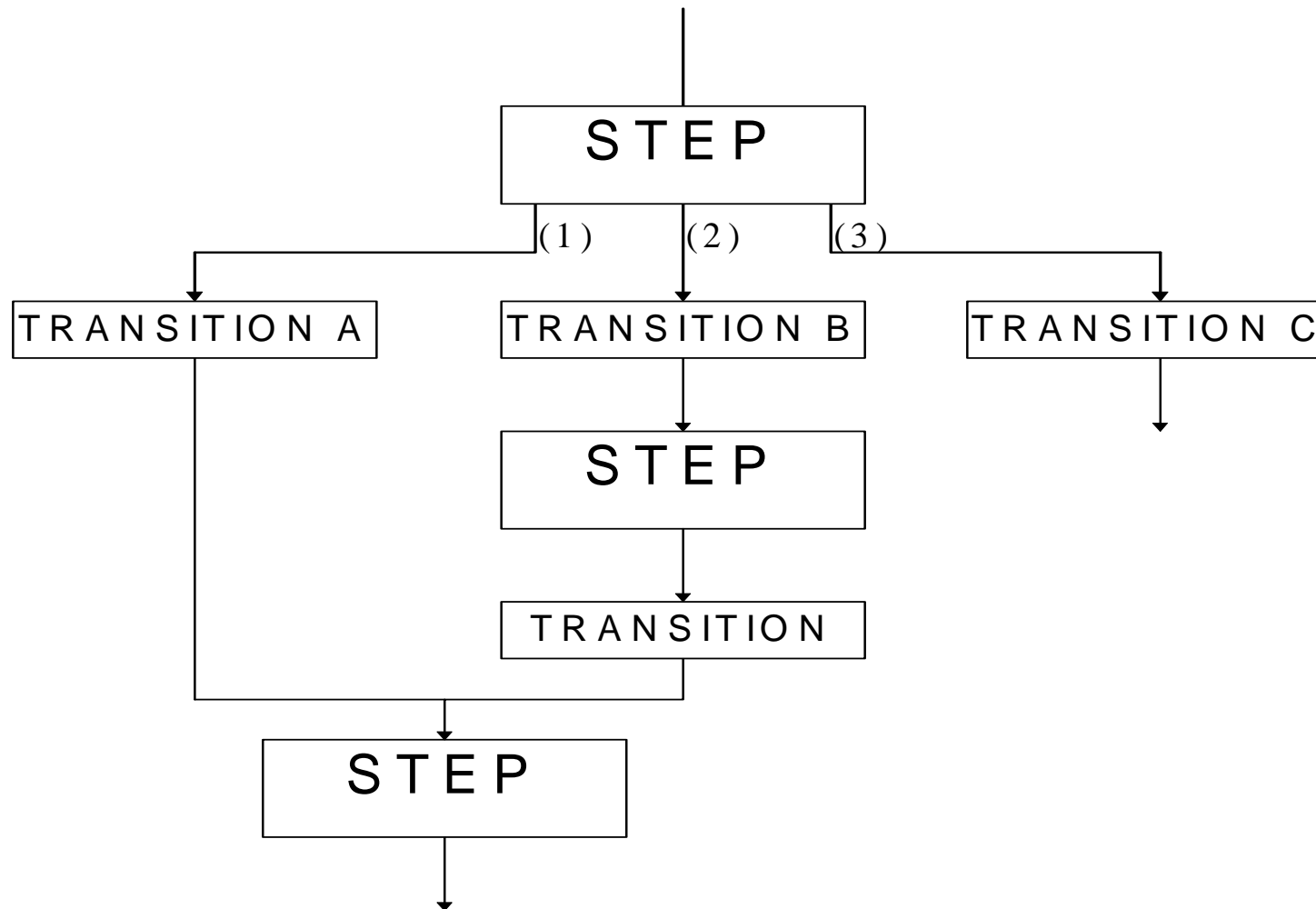
# SCM Branching

---

- Operation branches at Step, not Transition
- Up to 10 branches per step
- Outputs evaluated in order
- Execution goes to first transition that is true
- Branching, NOT parallel execution

# Example of SCM Branching

---



# Exception Handlers

---

- **transitions and steps that run only after specified conditions have been met**
  - **SCMs can have multiple handlers**
- **handler types, in priority order:**
  - **Abort**
  - **Stop**
  - **Hold**
  - **Restart**
  - **Interrupt**
  - **Check**
  - **Main**

# SCM Recipe Data

---

- maximum of 50 recipe values per SCM
- data
  - descriptors
  - SP, PV access locks
  - scaling options
  - high and low limits
  - default values
  - display and print options

## SCM History Data

---

- maximum of 50 history parameters per SCM
- store process data collected during SCM operation
- parameters
  - description
  - variable type
  - value

## Additional SCM Code Examples

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- **SCM235.HISTVALUE[1] := (CM151.PIDA.PV + CM251.PIDA.PV) / 2**
- **MESSAGES.XFERB.SENDFL[3] := 1**
- **ENBHANDLER[8] := 2**
- **CM235.PIDA.SP:=AVG (MIN(CM1.REGCALC.X[1], CM1.REGCALC.X[2], CM1.REGCALC.X[3]), MAX(CM1.REGCALC.X[1], CM1.REGCALC.X[2], CM1.REGCALC.X[3]))**
- **CM456.PIDA.SP := (CM456.SPREC1FLAG.PVFL) ? SCM457.RECTARGET[1] : SCM457.RECTARGET[2]**

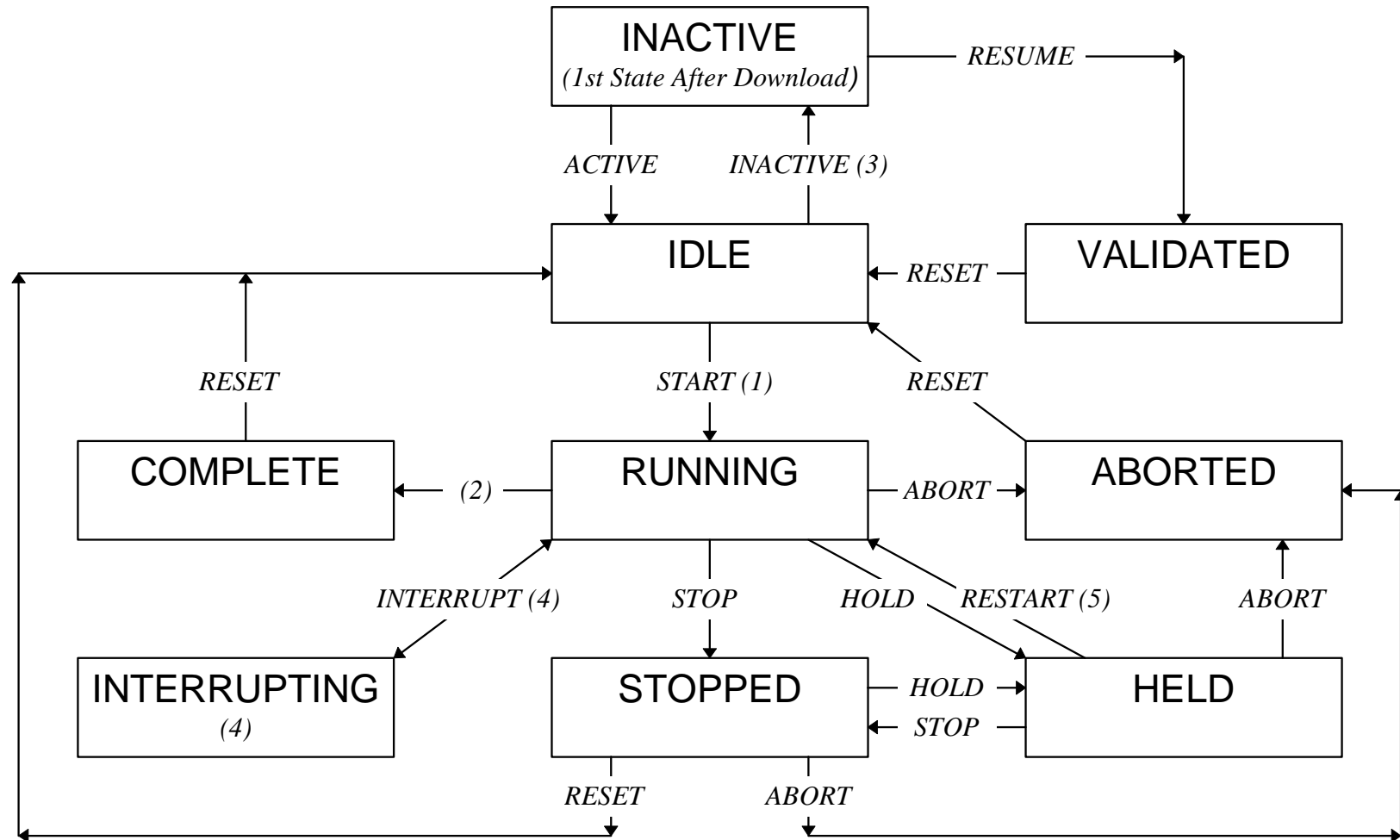
## Lesson 4. SCM Activation

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### Objectives:

- Define SCM states and commands
- Describe how SCM goes from running to completion
- Describe exception handling

# SCM State Diagram





# 431 Additional Topics

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- Spec  
and  
Tec
- 1. \honeywell\tps50\system\er
    - a) ERDB
    - b) Snapshot
  - 2. Peer-to-Peer on the Supervisory Cnet
    - a) Overview
    - b) Configuration
  - 3. 5mS Base Period Option
  - 4. CPU Loading -- PUs and MUs
  - 5. ERDB in Redundant Servers
    - a) ERDB\_a in Server B
    - b) ERDB\_b in Server A
    - c) ERDB\_b for monitoring only
  - 6. Redundant Controller Setup in Control Builder
    - a) CPMs
    - b) RMs
  - 7. OLE inserts into Control Builder Project for Documentation
  - 8. Control Builder Reports



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# **PlantScape Controller Implementation Criterion Test Answer Key**

**Release 400  
11/01**

**Release 400**

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## Unit 1 Exam

QuesNo	Question
1	Knowledge Builder can be accessed from:  <div data-bbox="371 527 727 737"><div>A Station Help.</div><div>B Control Builder Help</div><div>C Windows Desk Top.</div><div>D All of the above.</div></div>
2	Which of the following is the definition for the Knowledge Builder Guide?  <div data-bbox="371 974 1459 1220"><div>A The Knowledge Builder Guide is a collection of general purpose information.</div><div>B The Knowledge Builder Guide is a "look it up" manual, not to be read cover to cover.</div><div>C The Knowledge Builder Guide contains "how it works" information.</div><div>D The Knowledge Builder Guide is a collection of "how to" procedures.</div></div>
3	Which of the following is the definition for the Knowledge Builder Theory Manual?  <div data-bbox="371 1457 1468 1734"><div>A The Knowledge Builder Theory Manual is a collection of general purpose information.</div><div>B The Knowledge Builder Theory Manual is a "look it up" manual, not to be read cover to cover.</div><div>C The Knowledge Builder Theory Manual contains "how it works" information.</div><div>D The Knowledge Builder Theory Manual is a collection of "how to" procedures.</div></div>

- 4 Which of the following is the definition for the Knowledge Builder Reference Manual?
- A The Knowledge Builder Reference Manual is a collection of general purpose information.
  - B The Knowledge Builder Reference Manual is a "look it up" manual, not to be read cover to cover.
  - C The Knowledge Builder Reference Manual contains "how it works" information.
  - D The Knowledge Builder Reference Manual is a collection of "how to" procedures.
- 5 In Control Builder, to add a Control Module or make structural changes to an existing CM you must use the:
- A Project tab
  - B Monitoring tab
- 6 In Control Builder, to view CMs on line or to change parameters on line, you must use the:
- A Project tab
  - B Monitoring tab
- 7 To back up your controller data base, you must first ***upload*** to the Monitoring tab, then ***update*** to the Project tab.
- A True
  - B False

- 8 From the RSLinx communication software menu you can select "Configure Drivers" to display a list of the currently configured drivers. What does it mean when the driver, AB KTC-1 Cnet..., indicates Running... ?
- A You should call the Honeywell Technical Assistance Center (TAC).
  - B You need to access the device from the Windows NT Control Panel and disable the driver.
  - C You need to remove the server's ControlNet ISA Interface card and reset its jumpers according to the procedures defined in the Control Hardware Installation Guide.
  - D Your RSLinx communication software has been configured correctly on your system. Running is the expected response indicating the driver is operational.

- 9 To verify the CNet server address, from the RSLinx Communications Menu, click Configure Drivers and in the listing of Configured Drivers, double-click the line starting with "AB-KTC-1 CNet..." and observe the MAC ID.

- |   |       |
|---|-------|
| A | True  |
| B | False |





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## Unit 2 Exam

QuesNo	Question
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1	When a C200 controller is added to the Project tab, the name it is given by Control Builder is CPMxx. The xx is an index number used in controller operation and this name must not be changed.
---	---

A True

B False
---------

2	When counting slots from left to right beginning with zero, the CPM counts as 2 slot locations.
---	---

A True
--------

B False

3	The hybrid controller communicates with remote I/O racks through which of the following?
---	--

A Ethernet

B CNet using a KTC(X) card

C CNet using the supervisory CNI module

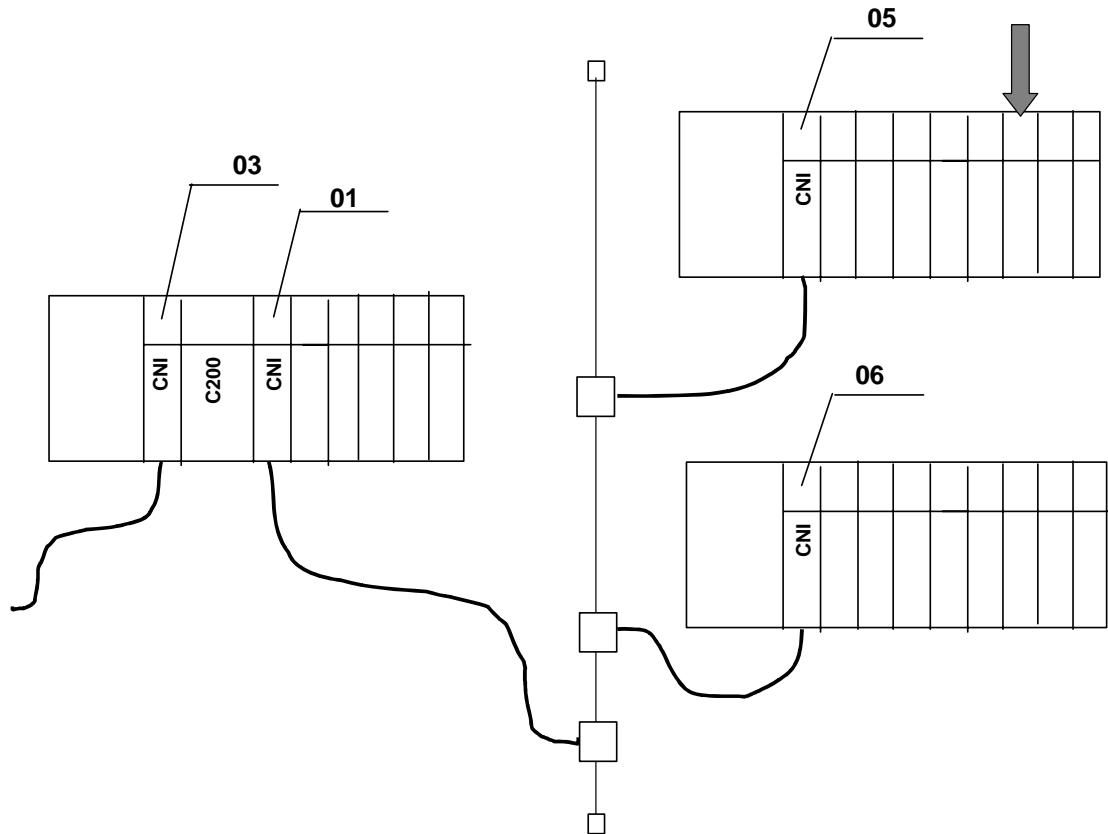
D CNet using an additional CNI(s) dedicated to remote I/O communication
---

4	When an I/O module is added to the Project tab, the name it is given by Control Builder is IOMxx. The xx is an index number used in controller operation and must not be changed.
---	---

A True

B False
---------

- 5 In the following diagram, what are the three numbers required to configure the slot location of the designated IOM.



IOM Slot Number \_\_\_\_ 06 \_\_\_\_

Remote IO Chassis MAC Address \_\_\_\_ 05 \_\_\_\_

ControlNet Module Slot Number \_\_\_\_ 03 \_\_\_\_

## Unit 3 Exam

QuesNo	Question		
1	<p>The name Control Builder gives to a CM is CMxx. The xx is an index number used by the hybrid controller and must not be changed.</p> <p>A True</p> <table border="1"><tr><td>B</td><td>False</td></tr></table>	B	False
B	False		
2	<p>CM names must be unique in the project database.</p> <table border="1"><tr><td>A</td><td>True</td></tr></table> <p>B False</p>	A	True
A	True		
3	<p>Function Block names must be unique within:</p> <p>A The project</p> <table border="1"><tr><td>B</td><td>The CM</td></tr></table> <p>C The Controller</p>	B	The CM
B	The CM		

4 Given the parameter connection reference: **TIC101.PIDA.OP**

What is TIC101? The CM name

What is PIDA? The Function Block name

What is OP? The parameter name

5 Before you can load a CM or IOM you must first assign it to a CEE.

A True

B False

6 Before you can configure the I/O channels of a CM, you must first assign the CM and the IOM the channel references, to the same CEE.

A True

B False

7 Which of the following are ways to load CMs and IOMs?

A Select the corresponding CPM in the Project tab; Select: **Tools—Load with Contents...**

B Select the CM or IOM in the Project tab and select the down arrow.

C Select the CM or IOM in the Monitoring tab and select the down arrow.

D Right click on the CPM in the Project tab and select **Load with Contents...**

E All of the above

- 8 Which of the following are ways to activate CMs and IOMs?
- A Select the corresponding CEE in the Project tab; Select: ***Operate—Activate—This CEE's IOMs and CMs...***
- B Select the corresponding CEE in the Monitoring tab; Select: ***Operate—Activate—This CEE's IOMs and CMs....***
- C Select the CM or IOM in the Project tab; right click and select ***Activate***.
- D Select the CM or IOM in the Monitoring tab; right click and select ***Activate***
- 9 In a PID loop CM, which function block provides PVHI and PVLO alarming?
- A AICHANNEL
- B DATAACQ
- C PID
- D AOCHANNEL
- 10 In a PID loop CM, you must name the DATAACQ block DACA and the PID block PIDA in order to use the supplied Station detail display.
- A True
- B False



## Unit 4 Exam

QuesNo    Question

---

- 1            The device control CM provides a user interface to the digital I/O used to control a device such as a pump, a motor, or a solenoid valve.

A	True
---	------

B      False

- 2            Device control CMs can be interlocked to prevent operation under configurable process situations.

A	True
---	------

B      False

- 3            Device control CMs can be operated from Station detail displays ( if they are not interlocked and the mode attribute is set to operator ) by manipulating which parameter(s)?

A      PV

B	OP
---	----

C	COMMAND
---	---------

D      Bad PV Alarm Priority

4 When a device control CM is copied to make a second similar CM, which item(s) are not copied to the new CM?

☒ A I/O channel configuration

☐ B Alarm configuration

☐ C State assignment names and configuration

☐ D Server parameter configuration

5 When a device control CM is copied to make a second similar CM, which item(s) are not copied to the new CM?

☐ A Function block names

☐ B Parameter connections

☒ C CM name

☐ D Engineering units

6 Device control alarms are configured to monitor operation of the device. Which of the following are device control alarms?

☒ A Command fail

☒ B Command disagree

☐ C PVHI

☐ D OPHI



## Unit 5 Exam

QuesNo	Question
1	Auxiliary function blocks are used to supplement a control scheme. Which of the following is not an auxiliary function block?  <div data-bbox="370 562 612 596">A    AUXCALC</div> <div data-bbox="370 617 609 651" style="border: 1px solid black;">B    REGCALC</div> <div data-bbox="370 672 574 705">C    GENLIN</div> <div data-bbox="370 726 630 760">D    TOTALIZER</div>
2	How many expressions can an AUXCALC function block support?.  <div data-bbox="370 1010 509 1043">A    One</div> <div data-bbox="370 1064 516 1098">B    Two</div> <div data-bbox="370 1119 519 1152">C    Four</div> <div data-bbox="370 1173 529 1207" style="border: 1px solid black;">D    Eight</div>
3	Which of the following can not be the source for the PV of an AUXCALC function block?  <div data-bbox="370 1457 911 1491">A    The result of one of the expressions</div> <div data-bbox="370 1512 821 1545">B    Any one of the P[1-6] inputs</div> <div data-bbox="370 1566 818 1600" style="border: 1px solid black;">C    The Execution Order in CM</div> <div data-bbox="370 1621 1398 1654">D    The status of any one of the expressions or of any one of the P[1-6] inputs</div>

4 In order to use a parameter from a CM in an AUXCALC expression, it must first be brought in as one of the P[1-6] inputs to the AUXCALC block.

A True

B False

5 The totalizer function block can support up to four intermediate trip points prior to reaching its target value. What is the parameter that goes true as each trip point is reached.

A PVSTS

B ACCTVFL

C STOPFL

D ACCDEV.FL[1-4]

6 The totalizer function block has a parameter that goes true when it reaches its target value. What is this parameter?

A PVSTS

B ACCTVFL

C STOPFL

D ACCDEV.FL[1-4]

## Unit 6 Exam

QuesNo    Question

---

- 1        Device control CMs can be interlocked by process conditions. Which of the following is not a device control block interlock mechanism?
- A        Safety override
- B        Process override
- C        Safety interlock option
- D        Process permissive
- 
- 2        If a device control CM is active in the one-state and its configured OI[0] parameter goes true, what will take place?
- A        The CM will go to its configured safe state and stay there until the OI[0] parameter goes false.
- B        The CM will stay in the one-state and not be allowed to go to the zero-state.
- C        The CM will go to the zero-state and stay there until the OI[0] parameter goes false.
- D        The CM will stay in the one-state, but not be allowed to return to the one-state after it goes to the zero-state until the OI[0] parameter goes false.
- 
- 3        If a device control CM is active in the one-state and its configured PI[1] parameter goes false, what will take place?
- A        The CM will go to its configured safe state and stay there until the PI[1] parameter goes true.
- B        The CM will stay in the one-state and not be allowed to go to the zero-state.
- C        The CM will go to the zero-state and stay there until the PI[1] parameter goes true.
- D        The CM will stay in the one-state, but not be allowed to return to the one-state after it goes to the zero-state until the PI[1] parameter goes true.

4 If a device control CM is active in the one-state and its configured SI parameter goes true, what will take place?

A The CM will go to its configured safe state and stay there until the SI parameter goes false.

B The CM will stay in the one-state and not be allowed to go to the zero-state.

C The CM will go to the zero-state and stay there until the SI parameter goes false.

D The CM will stay in the one-state, but not be allowed to return to the one-state after it goes to the zero-state until the SI parameter goes false.

5 One major difference between a safety override and a process override is that a process override can be by-passed while a safety override cannot.

A True

B False

6 What is the interlock mechanism for a regulatory control block?

A Safety override

B Process override

C Safety interlock option enabled with a safe OP configured

D Process permissive

## Unit 7 Exam

QuesNo    Question

---

1            What are the three Function Block types used in configuring SCMs

A      AUXCALC

B      STEP

C      FLAG

D      TRANSITION

E      HANDLER

2            What is the maximum number of outputs a Step can have?

A      8

B      10

C      12

D      16

3            What is the maximum number of conditions a Transition can have?

A      8

B      10

C      12

D      16

- 4 When a new SCM is created an Invoke Transition is always added for you. Which of the following is true?
- A Every SCM must start with a Transition named Invoke Main.
  - ☒ B Every SCM must start with a Transition, the name is configurable.
  - C The Invoke Main Transition is added to keep Control Builder from fragmenting the PC hard drive.
  - ☐ D The Invoke Transition allows automatic startup of the SCM.
  - ☐ E Invoke Transition Conditions are only active when the SCM is in the IDLE state
- 5 When operating an SCM you must issue a RESET command to go from the COMPLETE state to the IDLE state.
- ☒ A True
  - B False
- 6 SCMs may be configured and activated in Control Builder but can only be operated from Station?
- A True
  - ☒ B False
- 7 SCMs can only be started from the IDLE state.
- ☒ A True
  - B False

## Unit 8 Exam

QuesNo	Question
--------	----------

---

- |   |   |   |   |   |  |   |  |   |  |
|---|---|---|---|---|--|---|--|---|--|
| 1 | For an SCM to start automatically using start conditions, you need to add conditions to the Invoke Transition.<br><table><tr><td>A</td><td>True</td></tr><tr><td>B</td><td>False</td></tr></table>  | A | True  | B | False  |   |  |   |  |
| A | True  |   |   |   |  |   |  |   |  |
| B | False   |   |   |   |  |   |  |   |  |
| 2 | The method used to add Steps and Transition to a Handler is?<br><table><tr><td>A</td><td>Selecting File &gt; New &gt; Step (or Transition)</td></tr><tr><td>B</td><td>Right Clicking in the SCM and Selecting New &gt; Step (or Transition)</td></tr><tr><td>C</td><td>Dragging the new Step or Transition from the Library view to the Project View.</td></tr><tr><td>D</td><td>Dragging the new Step or Transition from the Library view into the open SCM in the Control drawing area.</td></tr></table> | A | Selecting File > New > Step (or Transition)           | B | Right Clicking in the SCM and Selecting New > Step (or Transition) | C | Dragging the new Step or Transition from the Library view to the Project View. | D | Dragging the new Step or Transition from the Library view into the open SCM in the Control drawing area. |
| A | Selecting File > New > Step (or Transition)   |   |   |   |  |   |  |   |  |
| B | Right Clicking in the SCM and Selecting New > Step (or Transition)  |   |   |   |  |   |  |   |  |
| C | Dragging the new Step or Transition from the Library view to the Project View.  |   |   |   |  |   |  |   |  |
| D | Dragging the new Step or Transition from the Library view into the open SCM in the Control drawing area.  |   |   |   |  |   |  |   |  |
| 3 | For an SCM to be able to record History values all you need to do is configure the History Tab in the SCM Parameter Configuration form.<br><table><tr><td>A</td><td>True</td></tr><tr><td>B</td><td>False</td></tr></table>   | A | True  | B | False  |   |  |   |  |
| A | True  |   |   |   |  |   |  |   |  |
| B | False   |   |   |   |  |   |  |   |  |
| 4 | Handlers have multiple purposes. In this course we configured a check handler. What is the purpose of a check handler?<br><table><tr><td>A</td><td>To check all the attributes of all the SCM components</td></tr><tr><td>B</td><td>Initialize process equipment and/or reset values for a new SCM run</td></tr><tr><td>C</td><td>To run the Check-Mode program for process distribution</td></tr></table>  | A | To check all the attributes of all the SCM components | B | Initialize process equipment and/or reset values for a new SCM run | C | To run the Check-Mode program for process distribution                         |   |  |
| A | To check all the attributes of all the SCM components   |   |   |   |  |   |  |   |  |
| B | Initialize process equipment and/or reset values for a new SCM run  |   |   |   |  |   |  |   |  |
| C | To run the Check-Mode program for process distribution  |   |   |   |  |   |  |   |  |