

# Planning and Designing Your DeltaV™ Digital Automation Systems and DeltaV™ SIS Process Safety Systems





Printed in the Republic of Singapore.

© Emerson Process Management 1996 - 2015. All rights reserved. For Emerson Process Management trademarks and service marks, go to [Emerson Process Management Trademarks and Service Marks](#). All other marks are property of their respective owners. The contents of this publication are presented for informational purposes only, and while every effort has been made to ensure their accuracy, they are not to be construed as warranties or guarantees, expressed or implied, regarding the products or services described herein or their use or applicability. All sales are governed by our terms and conditions, which are available on request. We reserve the right to modify or improve the design or specification of such products at any time without notice.

Emerson Process Management Distribution Ltd. Process Systems and Solutions  
Meridian East  
Meridian Business Park  
Leicester, LE19 1uX, UK

Emerson a.s.  
European System and Assembly  
Piešťanská 1202/44  
Nové Mesto nad Váhom 91528  
Slovakia

Fisher-Rosemount Systems, Inc. – an Emerson Process Management company  
1100 W. Louis Henna Blvd.  
Round Rock, TX 78681

# Contents

	<b>Preface .....</b>	<b>vii</b>
<b>Chapter 1</b>	<b>System Sizing Overview .....</b>	<b>1</b>
	Minimum system size .....	1
	Sizing considerations .....	1
	Maximum system size .....	2
<b>Chapter 2</b>	<b>Control Network .....</b>	<b>3</b>
	Control network introduction .....	3
	Designing a control network .....	3
	DeltaV Smart Switches and media modules .....	4
	MD Smart Switches and media modules .....	4
	RM100 Smart Switches and expansion modules .....	6
	FP20 8-port Smart Switch .....	9
	Terminal access cable .....	9
	DeltaV SIS Smart Switches .....	10
	DeltaV LSN20 SIS Smart Switches .....	10
	DeltaV SRM100 SIS Smart Switch .....	10
	Network switches .....	11
	10/100 unmanaged switches .....	11
	10/100 managed switches .....	11
	10/100/1000 (Gigabit) managed switches .....	12
	Selecting 10 Mbps or 100 Mbps .....	12
	Network considerations .....	13
	Network topology .....	13
	Remote network .....	14
	Determining port and switch count .....	14
	Small non-production systems .....	14
	Connecting printers .....	15
<b>Chapter 3</b>	<b>Controllers .....</b>	<b>17</b>
	Controllers introduction .....	17
	Simplex controllers .....	17
	Redundant controllers .....	17
	System compatibility .....	18
	Selecting controllers .....	18
	Controller carriers .....	18
	M-series carriers .....	19
	S-series carriers .....	19
	Determining the quantity of controllers .....	19
	Controller function licensing .....	20
	Conventional, CHARM and WirelessHART I/O license demand guidelines .....	20
	Serial Card I/O license demand guidelines .....	22
	AS-i Bus I/O license demand guidelines .....	23
	DeviceNet I/O license demand guidelines .....	23
	Profibus I/O license demand guidelines .....	25
	Ethernet I/O Card license demand guidelines .....	26
	Foundation Fieldbus I/O license demand guidelines .....	27

	I/O signal-bearing parameters in modules assigned to workstations .....	28
	OPC client license guidelines .....	29
	Advanced unit management licensing .....	29
<b>Chapter 4</b>	<b>M-series and S-series Traditional I/O .....</b>	<b>31</b>
	Traditional I/O introduction .....	31
	Available M-series I/O cards .....	32
	Available S-series I/O cards .....	33
	Counting DSTs in a redundant I/O subsystem .....	34
	Traditional I/O redundancy .....	34
	CHARMs redundancy .....	35
	Zone 1 remote I/O cards .....	35
	Zone 2 remote I/O cards .....	35
	Fiber optic switches for remote I/O .....	37
	Determining the quantity of conventional I/O and HART interfaces .....	37
	Determining the quantity of serial interfaces .....	38
	Determining the quantity of DeltaV controller interface for PROVOX I/O .....	38
	Determining the quantity of DeltaV controller interface for RS3 I/O .....	39
	Determining the quantity of multifunction/pulse input interfaces .....	39
	Determining the quantity of SOE interfaces .....	39
	Determining the quantity of AS-i bus segments .....	40
	Determining the quantity of DeviceNet segments .....	42
	Determining the quantity of FOUNDATION fieldbus segments .....	44
	Determining the quantity of Profibus segments .....	46
	Intrinsically safe I/O subsystem .....	47
	I/O subsystem carriers .....	48
	fieldbus H1 carrier .....	49
	DeltaV controller interface for PROVOX I/O carrier .....	49
	DeltaV controller interface for RS3 I/O carrier .....	50
	DeltaV FlexConnect solutions .....	50
<b>Chapter 5</b>	<b>CHARMs I/O and other I/O .....</b>	<b>51</b>
	Overview to this chapter .....	51
	CHARMs I/O .....	51
	CHARM classes .....	52
	Required controllers for CHARM I/O .....	53
	Application guidelines for CHARM I/O .....	54
	Available control room cabinets for CHARM I/O .....	54
	Available field enclosures for CHARM I/O .....	55
	Ethernet I/O Card .....	55
	Required controllers for the EIOC .....	56
	Applications guidelines for the EIOC .....	56
	Function blocks supported by the EIOC .....	56
	Polling times for the EIOC by communication protocol .....	57
	Switchover times for the EIOC by communication protocol .....	60
	How distribution of signals affects EIOC performance .....	62
<b>Chapter 6</b>	<b>Wireless Networks .....</b>	<b>65</b>
	Wireless network types .....	65
	WirelessHART I/O card field network .....	65
	WirelessHART I/O card installation dimensions .....	66
	General recommendations for wireless I/O cards .....	68
	Basic WirelessHART I/O card network design .....	69

Smart Wireless Gateway field network .....	70
Smart Wireless Gateway communication protocols .....	71
Modbus serial protocol .....	71
Modbus TCP/IP protocol .....	71
OPC DA .....	72
Smart Wireless Gateway installation dimensions .....	72
Basic Smart Wireless Gateway network design .....	74
Using AMS Device Manager with wireless networks .....	75
Version 11.3 .....	75
Version 10.3 .....	75
Version 9.3 and earlier .....	75
AMS Wireless SNAP-ON .....	76
Ordering equipment .....	76
<b>Chapter 7 Safety Instrumented Systems .....</b>	<b>79</b>
DeltaV SIS Process Safety Systems overview .....	79
SLS 1508 Logic Solver Systems .....	79
Smart Logic Solvers .....	80
SISNet Repeaters .....	80
Workstation communication .....	82
SISNet distance extenders .....	82
Using horizontal I/O carriers .....	82
Using vertical I/O carriers .....	82
Optional devices .....	83
Licensing for SLS 1508 systems .....	85
CHARMs Smart Logic Solver (CSLS) systems .....	85
CHARMs Smart Logic Solvers .....	86
SZ Controllers .....	86
Local Safety Network Bridges .....	87
Ethernet Isolation Ports .....	87
CHARMs Smart Logic Solver Carriers .....	87
Dual Universal Safety Carriers .....	87
Baseplates .....	87
Logic Solver (LS) CHARMs .....	88
Terminators and extender cables .....	88
Licensing for CHARMs Smart Logic Solver systems .....	89
<b>Chapter 8 Power Supplies .....</b>	<b>91</b>
Power supply types .....	91
S-series system power supplies .....	91
SE5009 DC/DC dual system power supplies .....	91
Using multiple system power supplies .....	92
M-series system power supplies .....	92
VE5001 AC to DC system power supply .....	93
VE5009DC/DC dual system power supplies .....	94
Using multiple system power supplies .....	95
Bulk power supplies .....	96
DeltaV Bulk Power Supplies .....	96
Legacy bulk power supplies .....	97
Intrinsically safe system power supply .....	100
Selecting uninterruptible power supplies .....	100
<b>Chapter 9 Workstations .....</b>	<b>101</b>

Workstation software licenses .....	101
DeltaV Four-monitor Workstation license .....	103
DeltaV Operator keyboard license .....	104
Batch licenses .....	104
Remote access services (RAS) .....	105
Remote client (Remote Desktop Services) .....	105
DeltaV Connect License .....	105
Continuous history data .....	106
DeltaV Analyze license .....	106
DeltaV InSight Basic and DeltaV InSight .....	107
Alarm Help .....	107
Alarm Mosaic .....	108
AMS Device Manager .....	108
DeltaV Executive Portal .....	109
DeltaV Logbooks .....	109
Third-party software compatibility .....	109
Workstation application summary .....	110
ProfessionalPLUS Station software suite .....	114
Professional Station software suite .....	115
Engineering Seat software suite .....	117
Operator Station software suite .....	119
Base Station software suite .....	121
Application Station software suite .....	123
Maintenance Station software suite .....	126
PlantWeb Experience .....	128
Workstation application prerequisites .....	128
Connecting to a plant LAN .....	130
DeltaV Zones .....	130
<b>Chapter 10 Computer Selection and Security .....</b>	<b>133</b>
Hardware classes .....	133
PC selection .....	133
Operating system compatibility .....	134
Upgrading from an earlier DeltaV version .....	134
Windows domain security and login accounts .....	134
Cyber security for Dell PCs in DeltaV systems .....	135
<b>Chapter 11 Hardware Planning .....</b>	<b>137</b>
OEM items .....	137
Site preparation .....	138
AC power calculation .....	138
DC power calculation .....	139
M-series Pre-Series 2 and Series 2 I/O cards and S-series conventional I/O cards. ....	140
S-series CHARMs I/O devices .....	142
24 VDC-powered DeltaV Smart Switches .....	142
Enclosures .....	144
Mounting M-series DeltaV systems in enclosures .....	144
Mounting S-series DeltaV systems in enclosures .....	148
Power dissipation considerations .....	151
Enclosure selection procedure .....	158
Example enclosure selection calculation .....	158
Physical dimension considerations .....	159

Migration Panels .....	164
Carriers .....	166
Horizontal carrier considerations .....	167
S-series horizontal carrier .....	170
VerticalPLUS I/O carrier considerations .....	171
Connecting S-series I/O carrier to VerticalPLUS carrier .....	172
Legacy vertical I/O carrier considerations .....	173

## Appendices and reference

<b>Appendix A System Capacities .....</b>	<b>177</b>
System capacities and requirements summary .....	177
System capacities .....	178
Batch capacity .....	179
System configuration .....	180
Capacity for all workstations .....	180
ProfessionalPLUS workstation capacity .....	181
Operator workstation capacity .....	181
Application workstation capacity .....	182
Professional, Maintenance, and Base workstation capacity .....	183
Function blocks allowed in ProfessionalPLUS and Application stations .....	183
M-series and S-series controller with M-series I/O and S-series conventional I/O .....	186
S-series controller and S-series CHARMs I/O .....	188
I/O bus system (M-series and S-series Conventional) .....	188
Smart Wireless Gateway .....	189
SLS 1508 Logic Solver system .....	189
CHARMs Smart Logic Solver (CSLS) system .....	191
SIS controller capacity .....	191
<b>Appendix B Product Specifications .....</b>	<b>193</b>
Product data sheets .....	193
European standards .....	193
CSA certification .....	193
Environmental specifications .....	193
<b>Index .....</b>	<b>199</b>



# Preface

## About the System Planning Guide

The DeltaV System Planning Guide contains information to help you build a correct bill of materials for a DeltaV system. This manual includes product explanations, specifications, licensing requirements, appropriate planning and design information, and other things you need to consider.

While this manual contains information you need to make informed decisions for a bill of materials, it does not include information on all available DeltaV products or their specifications. Refer to the product data sheets for additional information.

### Intended Audience

This manual is intended for project, sales, and service personnel at Emerson Process Management Local Business Partners and Field Sales Offices (LBP/FSO), and for company personnel of Emerson Process Management. Outside requests for a copy of the System Planning Guide must come through an Emerson or Sales Office person, and this person will make the decision if it is appropriate to send a copy to the requester.

### DeltaV version this manual supports

This manual provides planning information for DeltaV version 13. This version contains enhancements not available in earlier versions. When adding functionality to an existing DeltaV system, keep in mind the functionality which the existing system can handle.

### Operating system compatibility

DeltaV version 13 is compatible with Microsoft Windows 7 Professional 64 bit and Server 2008 Standard Edition 64 bit, Service Pack 1. For operating system compatibility of other DeltaV versions, see [Table 10-1](#).

### Warning, Caution, Important, and Note

A Warning, Caution, Important, or Note identifies helpful or critical information. The type of information included in each is:

#### **WARNING!**

**Warnings are installation, operation, or maintenance procedures, practices, conditions, statements, and so forth, which if not strictly observed, may result in personal injury or loss of life.**

**⚠ CAUTION!**

**Cautions are installation, operation, or maintenance procedures, practices, conditions, statements, and so forth, which if not strictly observed, may result in damage to, or destruction of, equipment or may cause long term health hazards.**

---

**Note**

Notes contain installation, operation, or maintenance procedures, practices, conditions, statements, and so forth, which alert you to important information which may make your task easier or increase your understanding.

---

# 1 System Sizing Overview

## Topics covered in this chapter:

- *Minimum system size*
- *Sizing considerations*
- *Maximum system size*

## Minimum system size

DeltaV systems can be efficiently scaled over a wide range of process control system sizes. A minimum set of components for a DeltaV system consists of one workstation, one controller, and associated equipment.

---

### Note

Many of the figures in this book are conceptual and the hardware depicted in them may not look like the hardware you have. Other figures show the actual hardware being discussed.

---

A DeltaV system includes, at least:

- A control network that provides communication between workstations and controllers (simplex or redundant).
- A ProfessionalPLUS workstation that provides a graphical user interface to the process and system configuration functions.
- A controller that performs control and manages communications between the I/O subsystem and the control network.
- An I/O subsystem that processes information to and from field devices.
- A system power supply for powering controllers and I/O cards
- A bulk power supply (or 24 VDC plant power) for powering field devices connected to the DeltaV system.
- DIN-rail mounted carriers that connect power and network communications to controllers and I/O subsystem.

## Sizing considerations

To determine the required size of a DeltaV system, the following items must be considered:

- Total Device Signal Tag (DST) count (conventional I/O devices)
- Total SCADA tag usage

The total count for SCADA tags is unlimited. However, when using thousands of them in workstations already heavily loaded with other data items, workstation performance may be slower than acceptable. See Appendix C for the definition of SCADA tags as they are used for DeltaV systems.

- Total FOUNDATION fieldbus or other I/O bus system device tag count
- Total number of workstations required

This number is typically driven by the number of workstations (Professional Stations, Operator Stations, Application Stations, and Maintenance Stations) desired at the facility.

- The geographical nature of the system

The geographical layout of the system can influence the number of controllers needed.

- The percentage of spare capacity desired in controllers from an I/O perspective
- Whether or not DeltaV batch will be used and if used, whether or not redundant batch will be enabled

## Maximum system size

A DeltaV system can be scaled to include many nodes: workstations, controllers and associated power supplies, and I/O subsystems. There are two types of nodes:

- Primary-workstations and controllers: A DeltaV system can have a total of 120 primary nodes consisting of some combination of as many as 65 workstations and 100 controllers.
- I/O subsystems: A DeltaV system can have a combined total of as many 300 CHARMs I/O nodes, WirelessHART I/O Card nodes, and Remote I/O nodes. In addition, a DeltaV system can have as many as 120 Smart Wireless Gateway nodes.

---

### Note

Each system must include one and only one ProfessionalPLUS workstation.

---

See Appendix A for a complete list of capacities. See Appendix C for definitions of DST, Data Values, and other terms as they are used for DeltaV systems.

---

### Note

A system can contain up to 65 workstation nodes and up to 100 controller nodes, but not more than a total of 120 primary nodes.

---

### Note

In addition to the 65 workstations a DeltaV system can contain an Inter-Zone Server that does not count against the workstation count.

---

## 2 Control Network

### Topics covered in this chapter:

- [Control network introduction](#)
- [Designing a control network](#)
- [DeltaV Smart Switches and media modules](#)
- [DeltaV SIS Smart Switches](#)
- [Network switches](#)
- [Selecting 10 Mbps or 100 Mbps](#)
- [Network considerations](#)
- [Network topology](#)
- [Remote network](#)
- [Determining port and switch count](#)
- [Small non-production systems](#)
- [Connecting printers](#)

### Control network introduction

The DeltaV Control Network is an IEEE 802.3 Ethernet local area network (LAN) dedicated to the DeltaV system. The network provides communication between controllers, workstations, and I/O nodes. The network consists of switches, cables, and auxiliary items orderable with a DeltaV system.

The network switches available are DeltaV Smart Switches as well as factory-tested third-party switches available from our pricebook. Only switches ordered from the DeltaV pricebook are supported for use in a DeltaV network. If other switches are used we will not guarantee the robustness and reliability of the network. Network considerations and topology and determining port and switch count are the same for both types of switches.

### Designing a control network

This chapter provides information for DeltaV control network planning. Before you design a control network, read the Control Network Specifications section and study the control network examples in the DeltaV hardware reference manuals.

---

#### Note

If, after reviewing specifications and examples, the terminology is not familiar or if the network is particularly large or complex, it is recommended that you contact an expert consultant for network design.

---

## DeltaV Smart Switches and media modules

There are three families of DeltaV Smart Switches:

- DeltaV MD Smart Switches and Media Modules
- DeltaV RM100 Smart Switches and Media Modules
- DeltaV FP20 8-Port Smart Switches

---

### Note

MD20 switches do not support stacking. If you need more than 24 ports, use MD30 switches or RM100 switches, interconnecting them through the gigabit ports.

---

## MD Smart Switches and media modules

DeltaV MD Smart Switches consist of MD20 and MD30 switches with backplanes which mount vertically on horizontal DIN-Rail.

- The MD20 switch has 8, 16, or 24, 10/100Mbit ports.
- The MD30 switch has 8, 16, or 24, 10/100Mbit ports plus a gigabit slot.

MD switches are powered by nominal 24 VDC. Standard DeltaV DIN-rail or panel-mounted 24 VDC power supplies can be used to power the switches. A variety of media modules plug into the base switches to provide interface to the DeltaV Control Network.

[Table 2-1](#) lists available MD20 switches and [Table 2-2](#) lists available MD30 switches.

See the product data sheet for DeltaV Smart Switches for illustrations. Switches and backplanes are not available separately. A base switch functions as the power supply and the backplane contains the switching circuits.

Media Modules listed in [Table 2-3](#) can be used on both MD20 and MD30 switches. ES switch versions have an extended temperature range and conformal coating. Refer to Appendix B for temperature ranges. Conformal coating allows switches to be used in G3 environments, but the switches are not tested and certified to G3. You may use ES switches and modules in G2 environments, but never use non-ES switches in G3 environments. You may use ES modules with non-ES switches as long as the environment is G2 or better.

[Table 2-4](#) lists gigabit uplink modules available for MD30 switches. These modules allow interconnection between MD30 switches. [Table 2-8](#) lists 1 Gbit transceivers which can be used in the gigabit uplink modules. Only the 1 Gbit transceivers can be used. The 100 Mbit transceivers cannot be used with the gigabit uplink modules for MD30 switches.

A backplane extension is available for the MD20 and MD30 16- and 24-port switches to add up to two more media modules. The extension cannot be used with 8-port switches.

**Table 2-1: MD20 switches**

Switch	Module Capacity	Ports
MD20-8 MD20-8-ES	Two Media Modules	Up to eight 10/100Mbit ethernet ports when appropriate media modules are added

**Table 2-1: MD20 switches (continued)**

Switch	Module Capacity	Ports
MD20-16 MD20-16-ES	Four Media Modules	Up to sixteen 10/100Mbit ethernet ports when appropriate media modules are added
MD20-24 MD20-24-ES	Six Media Modules	Up to twenty-four 10/100Mbit ethernet ports when appropriate media modules are added

**Table 2-2: MD30 switches**

Switch	Module Capacity	Ports
MD30-8 MD30-8-ES	Two Media Modules One Uplink Module	Up to eight 10/100Mbit ethernet ports when appropriate media modules are added Two gigabit ports
MD30-16 MD30-16-ES	Four Media Modules One Uplink Module	Up to sixteen 10/100Mbit ethernet ports when appropriate media modules are added Two gigabit ports
MD30-24 MD30-24-ES	Six media Modules One Uplink Module	Up to twenty-four 10/100Mbit ethernet ports when appropriate media modules are added Two gigabit ports

**Table 2-3: Media modules for MD20 and MD30 switches**

Media Module	Ports
MD2-2FXM2 MD2-2FXM2-ES	Two 100BASE-FX fiber optic multimode SC ports
MD2-2FXS2 MD2-2FXS2-ES	Two 100BASE-FX fiber optic single mode SC ports
MD2-4TX1 MD2-4TX1-ES	Four 10BASE-T/100BASE-TX copper RJ45 ports
MD2-4TX1-POE MD2-4TX1-POE-ES	Four 10/100BASE-TX copper RJ45 ports with Power over Ethernet (PoE) <sup>(1)</sup>
MD3-2FXM2/2TX1 MD3-2FXM2/2TX1-ES	Two 10/100BASE-TX copper RJ45 ports Two 100BASE-FX fiber optic multimode SC ports
MD3-2FXS2/2TX1 MD3-2FXS2/2TX1-ES	Two 10/100BASE-TX copper RJ45 ports Two 100BASE-FX fiber optic single mode SC ports
MD3-4FXM2 MD3-4FXM2-ES	Four 100BASE-FX fiber optic multimode SC ports
MD3-4FXM4 MD3-4FXM4-ES	Four 100BASE-FX fiber optic multimode ST ports
MD3-4FXS2 MD3-4FXS2-ES	Four 100BASE-FX fiber optic single mode SC ports

**Table 2-3: Media modules for MD20 and MD30 switches (continued)**

Media Module	Ports
MD3-2FXM4/2TX1	Two 10BASE-T/100BASE-TX copper RJ45 ports
MD3-2FXM4/2TX1-ES	Two 100BASE-FX fiber optic multimode ST ports
MD3-1FXS2/3TX1	Three 10BASE-T/100BASE-TX copper RJ45 ports
MD3-1FXS2/3TX1-ES	One 100BASE-FX fiber optic single mode SC port

(1) Power over Ethernet through MD2-4TX1-PoE and MD2-4TX1-PoE-ES requires separate 48 VDC power supply. Order separately from vendor of your choice.

**Table 2-4: Gigabit uplink modules for MD30 switches**

Uplink Module	Ports
MD4-2TX/SFP	Two gigabit copper RJ45 ports
MD4-2TX/SFP-ES	Two gigabit fiber optic multimode SFP slots
	<p><b>Note</b></p> <p>Use either the RJ45 ports or the SFP slots. Both cannot be used at the same time.</p>
	<p><b>Note</b></p> <p>See <a href="#">Table 2-8</a> for 1 Gbit transceivers that can be used in these uplink modules. 100 Mbit transceivers cannot be used.</p>

## RM100 Smart Switches and expansion modules

DeltaV RM100 Smart Switches consist of four types with up to two pluggable expansion modules. RM100 Smart Switches can be mounted on a 19 inch rack or wall-mounted. RM100 switches are powered by 120 or 240 VAC. See the product data sheet for DeltaV Smart Switches for illustrations.

[Table 2-5](#) lists the four types. As noted in the table, all four types contain eight 10/100BASE-TX copper RJ45 ports, two RJ45 uplink ports, and two slots for transceivers.

The RM100 Network Switch and the RM100 Network Switch-RP, are modular. Both types accept expansion modules. The difference between these two types is that one contains a simplex power supply and the other a redundant power supply.

The other two types are not modular — no expansion bays can be added to them. The RM100 Network Switch-8TX includes 8 ports. The RM100 Network Switch-24TX includes an additional sixteen 10/100BASE -TX ports for a total of 24.

For all four types, different power cords are used for different world areas. Be sure to order the RM100 switch with the correct power cord. See the selection listed in the product data sheet.

[Table 2-6](#) lists the number of slots and connectable network segments for RM100 network switches. [Table 2-8](#) lists available expansion modules for RM100 switches. [Table 2-9](#) lists 100 Mbit and 1 Gbit transceivers available for transceiver slots (SFP ports). Choose the transceiver which provides the needed link span. Be sure to review transceiver specifications in the product data sheet.

**Table 2-5: Four types of RM100 network switches**

Type	Ports
RM100 Base Up to two expansion modules can be added Simplex power supply	Eight 10/100BASE-TX copper RJ45 ports Two 10/100/1000 Mbit copper RJ45 uplink ports Two transceiver slots (SFP ports) Add an additional 8 or 16 ports or slots with expansion bays
RM100 Base-RP Up to two expansion modules can be added Redundant power supply	Eight 10/100BASE-TX copper RJ45 ports Two 10/100/1000 Mbit copper RJ45 uplink ports Two transceiver slots (SFP ports) Add an additional 8 or 16 ports or slots with expansion bays
RM100-8TX No expansion modules can be added Simplex power supply	Eight 10/100BASE-TX copper RJ45 ports Two 10/100/1000 Mbit copper RJ45 uplink ports Two transceiver slots (SFP ports)
	<hr/> <p><b>Note</b></p> <p>Either the 10/100/1000Mbit copper RJ45 uplink ports or the transceiver slots can be used. Both port types cannot be used at the same time.</p> <hr/>
RM100-24TX No expansion modules can be added Simplex power supply	Twenty-four 10/100BASE-TX copper RJ45 ports Two 10/100/1000 Mbit copper RJ45 uplink ports Two transceiver slots (SFP ports)
	<hr/> <p><b>Note</b></p> <p>Either the 10/100/1000Mbit copper RJ45 uplink ports or the transceiver slots can be used. Both port types cannot be used at the same time.</p> <hr/>

**Table 2-6: Number of slots and connectable network segments for RM100 network switches**

Item	RM100 Base and RM100 Base-RP	RM100-8T X	RM100-24T X
Number of Slots for 10/100Mbit Switch Modules <sup>(1)</sup>	2	0	2
Number of Ports for Gigabit Connections	2	2	2
Maximum Number of Connectable 10/100 Mbit Network Segments	24	8	24
Maximum Number of Connectable Gigabit Network Segments	2	2	2

(1) Up to two expansion modules can be installed in any combination of fiber and twisted-pair for the RM100 Base and the RM100 Base-RP.

**Table 2-7: Expansion modules for modular RM100 Base and RM100 Base RP network switches**

Model	Ports
RM100-EM8TX	Eight fast Ethernet twisted-pair ports with RJ45 connectors
RM100-EM8MMFX	Eight fast Ethernet multimode fiber ports with DSC connectors
RM100-EM8SMFX	Eight fast Ethernet single mode fiber ports with DSC connectors
RM100-EM8SFP	Eight fast Ethernet SFP ports

**Table 2-8: Available 100 Mbit and 1 Gbit transceivers**

Transceiver	Maximum Link Span
100 Mbit SFP-MM/LC	Up to 5 km, multimode
100 Mbit SFP-SM/LC	Up to 25 km, single mode
100 Mbit SFP-SM+/LC	Up to 65 km, single mode
100 Mbit SFP-LH/LC	Up to 100 km, single mode
1 Gbit SFP SX/LC	Up to 550 m, multimode
1 Gbit SFP LX/LC	Up to 20 km, single mode
1 Gbit SFP LH/LC	up to 80 km, single mode
1 Gbit SFP LH+/LC	Up to 120 km, single mode <sup>(1)</sup>

(1) This transceiver is not compatible with Extended Specs (ES) gigabit uplink modules for MD30 switches.

**Note**

Actual link span depends on the fiber optic cable type and other installed components such as splices and patch panel connections

## FP20 8-port Smart Switch

DeltaV FP20 8-Port Smart Switches are all 8-port devices. The eight ports are made up of six 10/100Mbit twisted pair ports and two ports which can be: two fiber uplink ports, or two twisted pair uplink ports, or one twisted pair uplink port and one fiber uplink port. FP20 network switches mount on DIN rails. FP20 switches are powered by nominal 24 VDC. Standard DeltaV DIN-rail or panel-mounted 24 VDC power supplies may be used to power the switches.

See the product data sheet for DeltaV Smart Switches for illustrations.

[Table 2-9](#) lists available FP20 network switches and their ports. The ES versions of the switches have an extended temperature range and conformal coating. Refer to [Environmental specifications](#) for temperature ranges.

**Table 2-9: FP20 Smart Switches**

Model	Ports
FP20-6TX2TX FP20-6TX2TX-ES1	Eight 10/100Mbit RJ45 twisted pair ports
FP20-6TX1MM1TX FP20-6TX1MM1TX-ES	Six 10/100Mbit RJ45 twisted pair ports, and One 100Mbit (DSC) multimode fiber uplink port One 10/100Mbit RJ45 twisted pair uplink port
FP20-6TX1SM1TX FP20-6TX1SM1TX-ES	Six 10/100Mbit RJ45 twisted pair ports One 100Mbit (DSC) single mode fiber uplink port One 10/100Mbit RJ45 twisted pair uplink port
FP20-6TX1SMLH1TX FP20-6TX1SMLH1TX-ES	Six 10/100Mbit RJ45 twisted pair ports One 100Mbit (DSC) single mode fiber uplink port One 10/100Mbit RJ45 twisted pair uplink port
FP20-6TX2MM FP20-6TX2MM-ES	Six 10/100Mbit RJ45 twisted pair ports Two 100Mbit (DSC) multimode fiber uplink ports
FP20-6TX2SM FP20-6TX2SM-ES	Six 10/100Mbit RJ45 twisted pair ports Two 100Mbit (DSC) single mode fiber uplink ports
FP20-6TX2SMLH FP20-6TX2SMLH-ES	Six 10/100Mbit RJ45 twisted pair ports Two 100Mbit (DSC) single mode fiber uplink ports

## Terminal access cable

Some switch configuration can be performed only from a Maintenance Station or terminal connected to the switch with a Terminal Access Cable.

The cable can be purchased from Emerson Process Management or it can be handmade. Two or three cables are recommended for each network. A cable for each switch is not required.

## DeltaV SIS Smart Switches

DeltaV SIS Smart Switches are intended for use on the DeltaV SIS Local Safety Network only and connect only to SZ Controllers and CHARMS Smart Logic Solvers (CSLS). There are two DeltaV SIS Smart Switches:

- DeltaV LSN20 SIS Smart Switches
- DeltaV SRM100 SIS Smart Switch

### DeltaV LSN20 SIS Smart Switches

The LSN20 SIS Smart Switches are used exclusively on the Local Safety Network (LSN). DeltaV LSN20 Safety Switches have eight ports. Two ports on each switch are fiber uplink, twisted pair uplink, or a combination of fiber and twisted pair uplink ports. The remaining 6 ports are 10/100mb/s twisted pair.

**Table 2-10: Port information for DeltaV LSN20 SIS Smart Switches**

Model	Number and types of ports
<ul style="list-style-type: none"> <li>• LSN20-6TX2TX</li> <li>• LSN20-6TX2TX-ES <sup>(1)</sup></li> </ul>	8, 10/100mb/s RJ45 twisted pair ports
<ul style="list-style-type: none"> <li>• LSN20-6TX2MM</li> <li>• LSN20-6TX2MM-ES <sup>(1)</sup></li> </ul>	<ul style="list-style-type: none"> <li>• 6, 10/100mb/s RJ45 twisted pair ports</li> <li>• 2, 100mb/s multimode fiber uplink ports (SC connectors); full duplex</li> </ul>
<ul style="list-style-type: none"> <li>• LSN20-6TX2SM</li> <li>• LSN20-6TX2SM-ES<sup>(1)</sup></li> </ul>	<ul style="list-style-type: none"> <li>• 6, 10/100mb/s RJ45 twisted pair ports</li> <li>• 2, 100mb/s single mode fiber uplink ports (SC connectors); full duplex</li> </ul>

(1) The ES version of the switches have an extended temperature range and conformal coating.

### DeltaV SRM100 SIS Smart Switch

The SRM100 SIS Smart Switch is used exclusively on the Local Safety Network (LSN). It can be mounted on a 19 inch rack or on a wall. If the switch is mounted on a 19 inch rack, be sure to install sliding mounting rails to properly hold the switch.

The SRM100 SIS Smart Switch consists of a base switch and sockets for two media modules that plug into the switch and provide an additional 8 or 16 ports.

The SRM100 Safety Switch supports redundant input power. The standard power supply alone supplies power to the SRM100 Safety Switch. The redundant power supply automatically becomes active if the standard supply fails.

**Table 2-11: Port information for the DeltaV SRM100 SIS Smart Switch**

Model	Number and types of ports
SRM100	<ul style="list-style-type: none"> <li>• 2, gigabit Ethernet combo ports</li> <li>• 8, fast Ethernet ports</li> <li>• 2, 100/1000mb/s SFP-based ports</li> <li>• 2 sockets for media modules for an additional 8 or 16 ports</li> </ul>

## Network switches

Switches, screened twisted-pair (ScTP) cable, shielded and non-shielded RJ45 connectors that meet Category 5E specifications or better are required to build a DeltaV control network. The following items are currently available from Emerson Process Management.

### 10/100 unmanaged switches

- VE6019 Ethernet Switch with one 100Base-FX port (MT-RJ Connector) and four 10/100Base-TX ports (RJ45 Connector) - This switch is primarily used for a fiber port connection to Remote Zone 1 components.
- VE6020 Ethernet Switch with four 100Base-FX port (MT-RJ Connector) and one 10/100Base-TX ports (RJ45 Connector) - This switch is primarily used for a fiber port connection to Remote Zone 1 components.
- VE6017FO Allied Telesyn AT-FS708 8-Port 10/100Base-TX Ethernet Switch
- VE6017FO Allied Telesyn AT-FS709FC 8-Port 10/100Base-TX Ethernet Switch with one 100Base-FX port supporting up to 2 km of fiber

### 10/100 managed switches

- Cisco Catalyst 2960-48TC-L 48-Port 10/100Base-TX Fast Ethernet Switch with two SFP Slots
- Cisco Catalyst 2960-24TC-L 24-Port 10/100Base-TX Fast Ethernet Switch with two SFP Slots
- Cisco Catalyst 2960-8TC-L 8-Port 10/100Base-TX Fast Ethernet Switch with one SFP Slot
- Cisco Catalyst 2960-24 TT-L 24-Port 10/100Base-TX Fast Ethernet Switch with two 10/100/1000 Ports
- Cisco Catalyst 2960-48TT-L 48-Port 10/100Base-FX Fast Ethernet Switch with two 10/100/1000 Ports

## 10/100/1000 (Gigabit) managed switches

The following Cisco switches are no longer supported for new systems. They are only available for use to support current systems as spares or small expansions. For new system the DeltaV Smart Switch should be used if the system requires managed switches.

---

### Note

1000 Mbps (1 Gigabit) communication noted in the selections below is only used between switches. Communication between nodes (controller, workstation) and switches is either 10 Mbps or 100 Mbps.

---

- Cisco Catalyst 3750-24FS 24-Port 100Base-FX Fiber Optic Switch with two 1-Gigabit Ethernet Interface Converter Ports
- Cisco 3750-24-TS-S 24-Port 10/100Base-TX Fast Ethernet Switch with two slots for Gigabit Transceivers
- Cisco 3750G12S-S 12 Slot Gigabit Switch (uses any combination of transceivers listed).

## 10/100/1000 (Gigabit) transceivers

The following transceivers can be used with 10/100/1000 (Gigabit) managed switches:

- Cisco GLC-SX-MM Gigabit Transceiver Module (Up to 550 m of fiber optic cable)
- Cisco GLC-LH-SM Gigabit Transceiver Module (Up to 10 Km of fiber optic cable)
- Cisco GLC-T Gigabit Transceiver Module (Up to 100 m of copper cable)

---

### Note

DeltaV systems are supported only on specific versions of vendor switch software and special switch configurations. The use of other versions of switch software or incorrect switch configurations can cause serious degradation in DeltaV system operation.

---

Switches ordered from Emerson Process Management are shipped with the supported software version and pre-configured switch configurations. To ensure that switches contain correct software and proper configuration, purchase switches through normal factory channels. Switches obtained directly from non-DeltaV sources may not contain DeltaV supported switch software and may be impossible to re-program for suitable operation with a DeltaV system.

## Selecting 10 Mbps or 100 Mbps

Early DeltaV controllers through the M5 Plus controller are half-duplex devices which communicate over a DeltaV Control Network at 10 Mbps. When DeltaV workstations are connected to 10 Mbps switches, the workstations communicate at 10 Mbps. The early DeltaV controllers can be connected to dual speed 10/100 Mbps switches, but communicate at 10 Mbps.

Controllers and DeltaV workstations communicate at half-duplex or full-duplex (auto-negotiating) and at 10 Mbps or 100 Mbps (auto-sensing), depending on the system sensed. When two or more controllers are used in conjunction with Sequence of Events (SOE) cards, 100 Mbps switches are required.

---

**Note**

M-series Remote Interface Units support 10/100 Mbps on the primary port but only 10 Mbps on the secondary port.

---

## Network considerations

The following network considerations are applicable when using either third-party switches or DeltaV Smart Switches.

The simplest DeltaV system consisting of one workstation and controller can use a single connecting cable. Most small DeltaV systems are somewhat larger than the simplest one and use at least one switch with interconnecting cables.

Larger DeltaV systems normally use multiple switches with a variety of cables. The DeltaV hardware reference manuals show many examples of copper cable and fiber optic networks using several types of switches.

When you design a control network, consider:

- Node types are workstations (ProfessionalPLUS, Operator, Application, Inter-Zone Server, and so on), controllers, and I/O nodes. When nodes are redundant, each pair is counted as one node. Therefore, there can be more switch ports than nodes. For example, a redundant controller requires two switch ports per network (primary and secondary), but is counted as one node.
- To ensure DeltaV system reliability and performance, non-DeltaV devices (devices not approved for use on a DeltaV network) and other networks must not be directly connected to a DeltaV control network. Non-DeltaV devices and other networks must be integrated into a DeltaV control network only through a DeltaV Application Workstation.
- All DeltaV workstations, controllers, and I/O nodes have redundant control network ports as a standard feature. When installed in a simplex control network, the redundant port of each device is not used.

## Network topology

The following network topology information is applicable when using either third-party switches or DeltaV network switches.

The DeltaV control network conforms to IEEE 802.3 Local and Metropolitan Area Network standards. The network can be configured in a daisy-chained (cascaded) technology, a star topology, or a combination of the two. The number of nodes in a combination daisy-chain and star configuration is limited by the maximum node count in a DeltaV system.

Hops let you extend a control network. A hop is a data link between two switches or between a switch and a controller or workstation. Across an entire system, switches can be daisy-chained up to a maximum of 12 (twelve) hops.

Maximum copper cable distances between any two devices (switches, controller, workstation) is 100 m (328 ft). Maximum fiber optic cable distances between any two devices is based on manufacturers specifications for transceivers.

## Remote network

A DeltaV Remote Network is an Ethernet 10/100BaseT local area network (LAN) which provides communications between remote workstations and a DeltaV system. The network can be a dedicated LAN that contains only DeltaV remote workstations, or it can be a plant-wide LAN that contains other computers or Ethernet devices, such as printers. See the manual *DeltaV™ M-series Hardware Installation and Reference* for further information.

## Determining port and switch count

The port and switch count required for a system depends on the quantity of workstations and controllers in the system. To determine the count, first determine the port count required for a simplex control network. Then, taking the total quantity of nodes into consideration, convert the port count into a switch count. For redundant control networks, double the count.

Calculate the required port count as follows:

*Total quantity of workstations + total quantity of simplex controllers + 2 X (quantity of redundant controllers) = required port count.*

Calculate the quantity of nodes required as follows:

*Total quantity of workstations + total quantity of simplex controllers + total quantity of redundant controllers = total quantity of nodes.*

Consider equipment locations to determine where switches will be located. Then calculate the number of switches in each area. For minimum bids, maximize port usage to reduce the number of switches required.

## Small non-production systems

Small non-production systems such as demonstration or training systems with eight or less Ethernet nodes should use the VE6017 8-port switch.

## Connecting printers

Microsoft Windows operating systems contain many built-in printer drivers. Printers that can be run with these drivers normally operate correctly with DeltaV systems, other than possible effects on workstation loading. Printers can be connected to the same plant LAN as a workstation or directly to the workstation. Sometimes, printers connected directly to a LAN require an interface device.

When a printer is connected to a workstation that is connected to a LAN, other workstations on the LAN can print to the printer. Be aware that printing activity will significantly increase CPU loading on the workstation with the connected printer that may cause slow operating-data updates on that workstation. Print resources should never be shared across a DeltaV control network.



# 3 Controllers

## Topics covered in this chapter:

- [Controllers introduction](#)
- [Simplex controllers](#)
- [Redundant controllers](#)
- [System compatibility](#)
- [Selecting controllers](#)
- [Controller carriers](#)
- [Determining the quantity of controllers](#)
- [Controller function licensing](#)
- [Advanced unit management licensing](#)

## Controllers introduction

In DeltaV v13.3, M-series controllers and S-series controllers are available.

M-series controllers operate with M-series I/O. This I/O consists of Pre-Series 2 and Series 2 I/O.

S-series controllers operate with S-series I/O. This I/O consists of two I/O types: Conventional I/O (with a new look) and CHARMs I/O.

## Simplex controllers

A simplex controller consists of a controller card and system-wide I/O based DST licenses. The controller can be configured to perform the function you need, such as data acquisition, calculation control, sequence control, regulatory control, or batch control. Specific functionality depends on the controller license installed. See [Controller function licensing](#) for selection guidelines.

The controller card installs on a 2-wide power/controller carrier with a system power supply.

## Redundant controllers

A redundant controller consists of two controller cards, the same system-wide controller licenses as used for simplex controllers, and a controller redundancy license.

## System compatibility

MD Plus, MX, SD Plus, and SX controllers are available for DeltaV version 13. MD controllers are no longer a standard controller offering for DeltaV systems, but they continue to operate in a v13 system.

---

### Note

An MD Plus controller only runs on DeltaV v8.3 and later systems. An MX controller only runs on DeltaV v10.3 and later systems. SD Plus and SX controllers only run on DeltaV v11.3 and later systems. MQ and SQ controllers only run on v12 and later systems. None are backward compatible to earlier systems.

---

## Selecting controllers

Controllers are selected based on the chosen I/O subsystem:

- For traditional DeltaV I/O, now known as M-series I/O, select MD Plus, MX, or MQ controllers. The controllers are also known as M-series.
- Select SD Plus, SX, and SQ controllers for the following I/O subsystems:
  - S-series Conventional I/O. This I/O subsystem is a re-packaged version of the traditional DeltaV I/O subsystem. The re-packaged I/O operates the same as traditional I/O.
  - S-series CHARMs I/O. This I/O subsystem is a new system conceptually different from the traditional I/O system. See the product data sheet for a description of S-series CHARMs I/O.

The controllers used with these two I/O subsystems are known as S-series controllers. The controllers are ordered according to the chosen S-series I/O system. The controllers contain different software to make them compatible with the chosen system.

MX and SX controllers have more memory and higher performance than MD Plus and SD Plus controllers. Use the Controller Loading Estimator on the DeltaV installation media in the directory \\_Support\Tools\LoadEstimator to obtain an indication of which controller is recommended and the required quantity of controllers.

## Controller carriers

Controllers mount on either 2-wide or 4-wide power/controller carriers. Carriers for M-series controllers are slightly different than those for S-series controllers. The carriers are not interchangeable.

## M-series carriers

M-series controllers mount on two-wide carriers when I/O cards are mounted on a horizontal carrier, and 4-wide carriers when I/O cards are mounted on vertical carriers. For horizontally mounted I/O cards, order one 2-wide carrier for each simplex controller or two 2-wide carriers for each redundant controller. For vertically mounted I/O cards, order one 4-wide carrier for either simplex or redundant controllers. Further information about carriers is given in product data sheets.

## S-series carriers

Controller carrier selection depends on the chosen S-series I/O system:

- S-series Conventional I/O - For this I/O, S-series controllers mount on two-wide carriers when I/O cards are mounted on a horizontal carrier. For horizontally mounted I/O cards, order one 2-wide carrier for each simplex controller or two 2-wide carriers for each redundant controller. Further information about carriers is in carrier product data sheets.
- S-series CHARMs I/O - For this I/O, S-series controllers mount on two-wide carriers. Order one 2-wide carrier for each simplex controller or two 2-wide carriers for each redundant controller.

## Determining the quantity of controllers

The control network design and loading determine the quantity of controllers your control strategy requires: that is, you may need to divide the total application into multiple controllers. To determine the required quantity of simplex or redundant controllers, consider the following:

- Some systems require a widely dispersed system with field-mounted controllers connected to small pockets of I/O. In these applications, geographical considerations along with CPU capacity determine the controller count. Alternatively, consider CHARMS I/O to reduce controller count.
- Some systems use a central I/O room. In these applications, I/O capacity and CPU capacity determine the controller count.
- If a system requires more DST capacity than a single controller (either simplex or redundant) can handle, add additional controllers. See [M-series and S-series controller with M-series I/O and S-series conventional I/O](#) and [S-series controller and S-series CHARMs I/O](#) for controller capacities. CHARMS I/O offers greater flexibility to add control capacity without rewiring I/O.

## Controller function licensing

Controller software is licensed through four I/O-based, system-wide licenses. For batch control, a fifth system-wide license is added; it is the Advanced Unit Management license. The system-wide licenses are assigned to the ProfessionalPLUS workstation and determine both the functionality available in every controller in the system and the potential size of the system. System size is expressed in Device Signal Tags (DSTs).

Class-based units used with Advanced Unit Management and Batch functionality are licensed by additional system-wide licenses sized by the number of class-based units configured in the system. These licenses are discussed in [Advanced unit management licensing](#).

**Table 3-1: Controller function license types**

License type	Model number	License size (DST)
Discrete Monitor Input	VE3111Sxxxxx	xxxxx = 00025 to 30000
Discrete Control Output	VE3112Sxxxxx	xxxxx = 00025 to 30000
Analog Monitor Input	VE3113Sxxxxx	xxxxx = 00025 to 30000
Analog Control Output	VE3114Sxxxxx	xxxxx = 00025 to 30000
ProfessionalPLUS Station, for v11.3 and earlier systems	VE2101Sxxxxx	xxxxx = 00025 to 30000
ProfessionalPLUS Station, for v12.3 and later systems	VE2101Sxxxxx-1	xxxxx = 00025 to 30000

Using certain I/O parameters in control modules can require an I/O software license. The system determines license demand based on the I/O type. The following sections can help you to determine license demand for your control strategy.

## Conventional, CHARM and WirelessHART I/O license demand guidelines

References by DeltaV modules to certain conventional, CHARM and WirelessHART I/O parameters (referred to as signal-bearing parameters) can require an I/O software license.

An I/O channel can cause a demand for only one I/O license. This means that multiple references (by one or more modules) to the same signal-bearing parameter result in the demand for only one license.

If modules are using multiple signal-bearing parameters that are part of a single channel, (for example, certain Pulse Count Input channels or HART-enabled AI or AO channels), the system only requires one license. The system consumes a single license of the most expensive type used. The license costs are (from highest to lowest): AO, AI, DO and DI.

The tables show the signal-bearing parameters that can trigger license demand for discrete and analog I/O.

**Table 3-2: Discrete I/O signal-bearing parameters and license demand requirements**

Parameter name	I/O license type used
COUNTER_IN	AI
FIELD_VAL_D	DI
FREQUENCY	AI
ON_TIME	AO
OUT_D	DO
RATE_COUNT	AI

**Table 3-3: Analog I/O signal-bearing parameters and license demand requirements**

Parameter name	
DURATION	AI
FIELD_VAL	AI
FIELD_VAL_PCT	AI
FREQUENCY	AI
GROSS_WEIGHT	AI
HART_DV_SLOT0	AI <sup>(1)</sup>
HART_DV_SLOT1	AI <sup>(1)</sup>
HART_DV_SLOT2	AI <sup>(1)</sup>
HART_DV_SLOT3	AI <sup>(1)</sup>
HART_FIELD_VAL	AI
HART_PV	AI <sup>(1)</sup>
HART_SV	AI <sup>(1)</sup>
HART_TV	AI <sup>(1)</sup>
HART_FV	AI <sup>(1)</sup>
HART_VAL0	AI
HART_VAL1	AI
HART_VAL2	AI
HART_VAL3	AI
HART_VAR5	AI
HART_VAR6	AI
HART_VAR7	AI
HART_VAR8	AI
HART_VAR9	AI
HART_VAR10	AI
HART_VAR11	AI
HART_VAR12	AI

**Table 3-3: Analog I/O signal-bearing parameters and license demand requirements (continued)**

Parameter name	
HART_VAR13	AI
HART_VAR14	AI
HART_VAR15	AI
HART_VAR16	AI
NET_WEIGHT	AI
OUT	AO <sup>(1)</sup>
TARE_WEIGHT	AI

(1) Module references to these parameters in a SIS Logic Solver HART Two-state Output Channel are counted as discrete outputs (DO) for IO license demand.

## Serial Card I/O license demand guidelines

References from DeltaV control modules to serial I/O datasets require an I/O license. References to multiple registers in the same datasets require only one I/O license. Multiple modules can reference the same dataset without requiring additional licenses.

The table shows the I/O license type required for each dataset direction and type.

**Table 3-4: Controller and Serial card I/O register license demand requirements**

Dataset data direction	DeltaV data type	I/O license type used
Input	8 bit int w/status	AI
Input	8 bit uint w/status	AI
Input	16 bit int w/status	AI
Input	16 bit uint w/Status	AI
Input	32 bit int w/status	AI
Input	32 bit uint w/Status	AI
Input	Floating point with status	AI
Input	String w/Status	AI
Output	8 bit int w/status	AO
Output	8 bit uint w/status	AO
Output	16 bit int w/status	AO
Output	16 bit uint w/Status	AO
Output	32 bit int w/status	AO
Output	32 bit uint w/Status	AO
Output	Floating point with status	AO
Output	String w/Status	AO

**Table 3-4: Controller and Serial card I/O register license demand requirements (continued)**

Dataset data direction	DeltaV data type	I/O license type used
Input	Boolean with status	DI
Input	Discrete with status	DI
Output	Boolean with status	DO
Output	Discrete with status	DO

## AS-i Bus I/O license demand guidelines

References by DeltaV control modules to certain AS-i Bus parameters (referred to as signal-bearing parameters) can require an I/O software license. An AS-i Bus device can cause a demand for at most one I/O license regardless of how it is referenced by DeltaV control modules.

The table shows the signal-bearing parameters that can trigger license demand for an AS-i Bus device.

The system consumes a single license of the most expensive type used. The license costs are (from highest to lowest): DO and DI.

**Table 3-5: AS-i Bus signal-bearing parameters and license demand requirements**

Parameter name	I/O license type used
FIELD_VAL_D	DI
OUT_D	DO

## DeviceNet I/O license demand guidelines

The system requires only one I/O license for references to as many as 16 I/O signal-bearing parameters per device. The system consumes a single license of the most expensive type used. The license costs are (from highest to lowest): AO, AI, DO and DI.

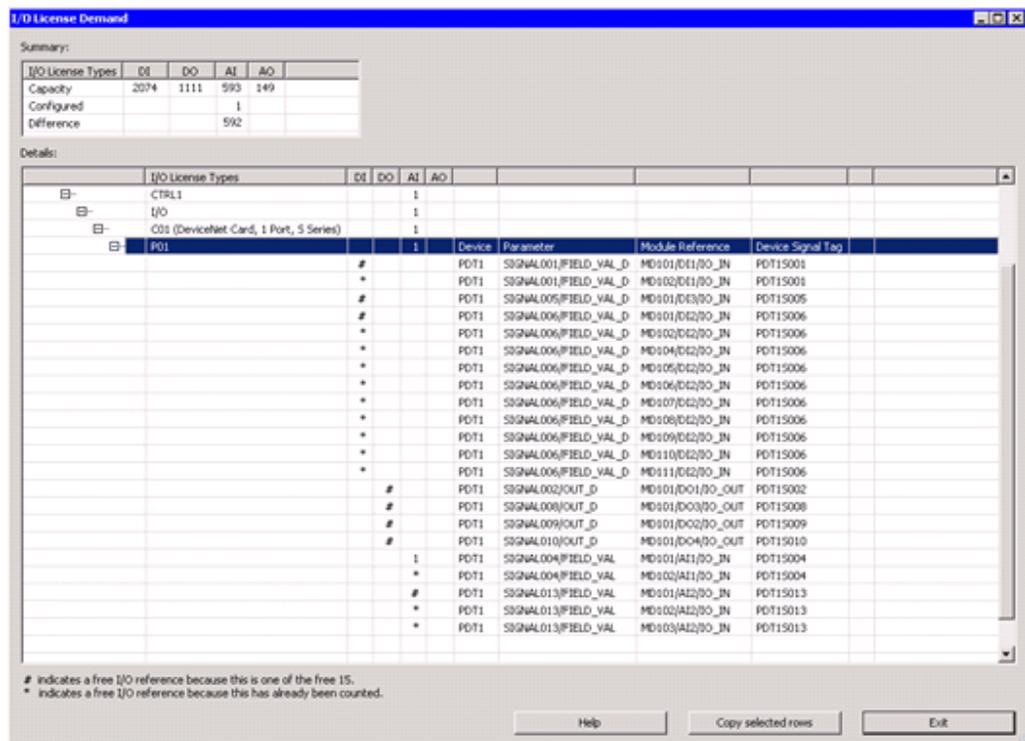
**Table 3-6: DeviceNet signal-bearing parameters and license demand requirements**

Parameter name	I/O license type used
FIELD_VAL	AI
FIELD_VAL_D	DI
OUT	AO
OUT_D	DO

Multiple module references to the same parameter do not affect the count. For DeviceNet devices with more than 16 signal parameters referenced by modules, the 15 least expensive I/O parameters do not require a license. The remaining parameters each cause an I/O license demand.

The figures provide example license requirements using the I/O License Demand dialog. The following figure shows 22 module references to nine different parameters in a single device. This results in a demand for a single AI license because the number of unique references is within the 16 parameter guideline per device. The AI license is the most expensive license used.

**Figure 3-1: DeviceNet license example: one license required**



The following figure shows 26 module references to 18 different parameters in a single device. This results in a demand for three licenses. The first, most expensive license (AO), meets the demand for 16 parameter references. Two additional licenses (one AI and one DO) are required for the unique parameters over 16.

**Figure 3-2: DeviceNet license example: multiple licenses required**

The screenshot shows the 'I/O License Demand' window. It contains a 'Summary' table and a 'Details' table.

**Summary:**

I/O License Types	DI	DO	AI	AO
Capacity	2074	1111	593	149
Configured		1	1	1
Difference		1110	592	148

**Details:**

I/O License Types	DI	DO	AI	AO	Device	Parameter	Module Reference	Device Signal Tag
P01	#	1	1	1	P0T2	SIGNAL001/FIELD_VAL_D	MD001,DO4/DO_IN	PD125001
	*				P0T2	SIGNAL001/FIELD_VAL_D	MD002,DO4/DO_IN	PD125001
	#				P0T2	SIGNAL002/FIELD_VAL_D	MD001,DO1/DO_IN	PD125002
	#				P0T2	SIGNAL005/FIELD_VAL_D	MD001,DO3/DO_IN	PD125005
	#				P0T2	SIGNAL006/FIELD_VAL_D	MD001,DO2/DO_IN	PD125006
	*				P0T2	SIGNAL006/FIELD_VAL_D	MD002,DO2/DO_IN	PD125006
	*				P0T2	SIGNAL006/FIELD_VAL_D	MD003,DO2/DO_IN	PD125006
	#				P0T2	SIGNAL007/FIELD_VAL_D	MD001,DO7/DO_IN	PD125007
	#				P0T2	SIGNAL008/FIELD_VAL_D	MD001,DO6/DO_IN	PD125008
	#				P0T2	SIGNAL009/FIELD_VAL_D	MD001,DO5/DO_IN	PD125009
	#				P0T2	SIGNAL010/FIELD_VAL_D	MD001,DO10/DO_IN	PD125010
	*				P0T2	SIGNAL010/FIELD_VAL_D	MD003,DO10/DO_IN	PD125010
	#				P0T2	SIGNAL011/FIELD_VAL_D	MD001,DO8/DO_IN	PD125011
	#				P0T2	SIGNAL014/FIELD_VAL_D	MD001,DO9/DO_IN	PD125014
	1				P0T2	SIGNAL003/OUT_D	MD001,DO3/DO_OUT	PD125003
	#				P0T2	SIGNAL004/OUT_D	MD001,DO2/DO_OUT	PD125004
	*				P0T2	SIGNAL004/OUT_D	MD002,DO2/DO_OUT	PD125004
	#				P0T2	SIGNAL012/OUT_D	MD001,DO4/DO_OUT	PD125012
	#				P0T2	SIGNAL013/OUT_D	MD001,DO1/DO_OUT	PD125013
	#				P0T2	SIGNAL017/OUT_D	MD001,DO6/DO_OUT	PD125017
	#				P0T2	SIGNAL018/OUT_D	MD001,DO5/DO_OUT	PD125018
	1				P0T2	SIGNAL016/FIELD_VAL	MD001,AI1/DO_IN	PD125016
	*				P0T2	SIGNAL016/FIELD_VAL	MD002,AI1/DO_IN	PD125016
	*				P0T2	SIGNAL016/FIELD_VAL	MD002,AI2/DO_IN	PD125016
	1				P0T2	SIGNAL015/OUT	MD001,AO1/DO_OUT	PD125015
	*				P0T2	SIGNAL015/OUT	MD002,AO1/DO_OUT	PD125015

# indicates a free I/O reference because this is one of the free 15.  
\* indicates a free I/O reference because this has already been counted.

## Profibus I/O license demand guidelines

The system requires only one I/O license for references to as many as 16 I/O signal-bearing parameters per device. The system consumes a single license of the most expensive type used. The license costs are (from highest to lowest): AO, AI, DO and DI. For Profibus devices with more than 16 signal parameters referenced by modules, the 15 least expensive I/O parameters do not require a license. The remaining parameters each cause an I/O license demand.

The table shows the signal-bearing parameters that can trigger license demand for a Profibus device.

**Table 3-7: Profibus signal-bearing parameters and license demand requirements**

Parameter name	I/O license type used
FIELD_VAL	AI
FIELD_VAL_D	DI
OUT	AO
OUT_D	DO

The following table provides an example of 18 DSTs in a Profibus device that consume 3 DST licenses. Note that an AI DST is the most expensive of the least expensive 16 and therefore consumes a license. Additional DSTs (in this case AOs) each consume a license.

**Table 3-8: Profibus license example**

DST type	Uses DST license
Discrete Input	No
Discrete Input	No
Discrete Input	No
Discrete Output	No
Analog Input	Yes
Analog Output	Yes
Analog Output	Yes

## Ethernet I/O Card license demand guidelines

Two license types are associated with the Ethernet I/O Card (EIOC): an interface license and one or more DST licenses.

### Interface license

The Interface license is available for each of the three protocols supported by the EIOC: Modbus TCP, Ethernet/IP, and IEC 61850. Only one interface license can be assigned to an EIOC.

### DST licenses

A DST license is counted at the logical device level (LDT). One hundred (100) signals can be configured within the logical device. A maximum of one DST is counted per logical device and the DST license type is based on the most expensive type of signal configured for the logical device. The license costs are (from highest to lowest): AO, AI, DO, and DI. For example, if a logical device has both AO and DO signals configured, one AO DST is counted

for the logical device. The DST license demand from the logical devices configured for an EIOC are counted against the system-wide AO DST, AI DST, DO DST, and DI DST license capacities assigned to the system.

## Foundation Fieldbus I/O license demand guidelines

The system determines license demand for Foundation Fieldbus devices based on modules being configured with fieldbus extended blocks. An extended function block is a block that you create in a module and assign to a fieldbus device. The resulting extended block resides in the controller and communicates with the function block running in a fieldbus device.

The table shows the number of signal-bearing parameters for certain extended blocks when configured in modules.

**Table 3-9: Signal-bearing parameters for extended blocks**

Extended block name	DI	AI	DO	AO
FFAI		1		
FFAI_RMT		1		
FFAO				1
FFAO_RMT				1
FFDI	1			
FFDO			1	
FFMAI		8		
FFMAI_RMT		8		
FFMAO				8
FFMDI	8			
FFMDI_STD	8			
FFMDO			8	
FFMDO_STD			8	

All signal-bearing parameters in these extended blocks are available to the module and can contribute to the I/O license demand, even if there are no module references to the signal-bearing parameters configured.

The system requires only one I/O license for references to as many as 16 I/O signal-bearing parameters per device. The system consumes a single license of the most expensive type used. The license costs are (from highest to lowest): AO, AI, DO and DI. For Foundation Fieldbus devices with more than 16 signal parameters referenced by modules, the 15 least expensive I/O parameters do not require a license. The remaining parameters each cause an I/O license demand.

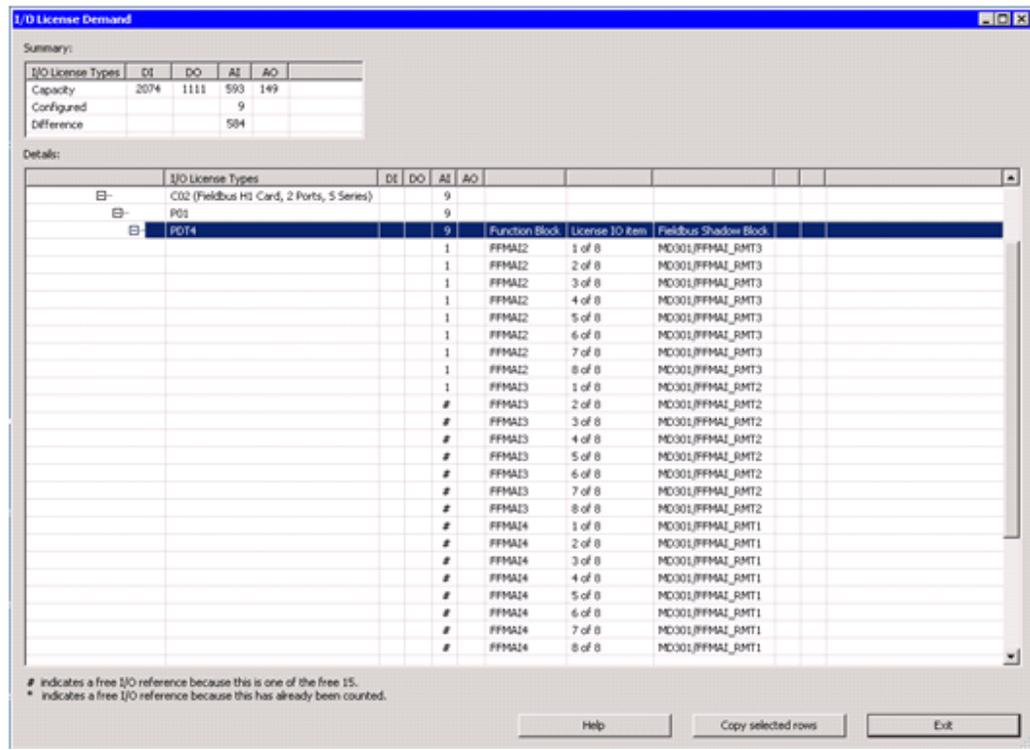
For example, creating an extended block in a module for an FFAI function block in a device costs one AI license regardless of the parameters in the function block that are referenced by this or other modules. (OUT, OUT\_D, and FIELD\_VAL can all be referenced, but the IO license demand is never be more than one AI.)

In the following example, the user creates a module with extended blocks for the following function blocks in the device:

- FFMAI2
- FFMAI3
- FFMAI4

The figure shows the I/O parameters used and the resulting license requirements. Each extended block used has 8 I/O signal-bearing parameters. This results in 24 license-related items. One I/O license is required for 16 of the items. The remaining 8 items each require a license. This results in a total license demand of 9 AI.

**Figure 3-3: Fieldbus license example: multiple licenses required**



## I/O signal-bearing parameters in modules assigned to workstations

Using any function block (allowed to execute) in a module assigned to a workstation does not, by itself, trigger I/O license demand. However, the rules regarding I/O signal-bearing parameters and how they cause I/O license demand apply when the associated module is assigned to a workstation.

## OPC client license guidelines

All parameters read or written through OPC DA clients or OPC .NET clients may be referenced by modules without causing I/O license demand.

## Advanced unit management licensing

The Advanced Unit Management license ( is a system-wide controller license that enables you to build class-based units and phase logic to create unit-relative equipment control strategies. The license (VE3122Syyyyy) is available in several sizes. The string yyyy represents the total number of class-based Unit Modules configured in the system. The following sizes are available:

- 2 Units
- 5 Units
- 10 Units
- 20 Units
- 30 Units
- 50 Units
- 75 Units
- 100 Units
- 150 Units
- 300 Units
- >300 Units



# 4 M-series and S-series Traditional I/O

## Topics covered in this chapter:

- *Traditional I/O introduction*
- *Available M-series I/O cards*
- *Available S-series I/O cards*
- *Counting DSTs in a redundant I/O subsystem*
- *Zone 1 remote I/O cards*
- *Zone 2 remote I/O cards*
- *Fiber optic switches for remote I/O*
- *Determining the quantity of conventional I/O and HART interfaces*
- *Determining the quantity of serial interfaces*
- *Determining the quantity of DeltaV controller interface for PROVOX I/O*
- *Determining the quantity of DeltaV controller interface for RS3 I/O*
- *Determining the quantity of multifunction/pulse input interfaces*
- *Determining the quantity of SOE interfaces*
- *Determining the quantity of AS-i bus segments*
- *Determining the quantity of DeviceNet segments*
- *Determining the quantity of FOUNDATION fieldbus segments*
- *Determining the quantity of Profibus segments*
- *Intrinsically safe I/O subsystem*
- *I/O subsystem carriers*
- *fieldbus H1 carrier*
- *DeltaV controller interface for PROVOX I/O carrier*
- *DeltaV controller interface for RS3 I/O carrier*
- *DeltaV FlexConnect solutions*

## Traditional I/O introduction

M-series I/O subsystems include traditional DeltaV form and function in both Pre-Series 2 and Series 2 cards. S-series I/O subsystems include a complete set of traditional DeltaV functions in a new form. M-series I/O operates with M-series controllers and S-series Conventional I/O operates with S-series controllers.

## Available M-series I/O cards

M-series I/O cards include a complete range of simplex I/O cards for all DeltaV versions, and a wide range of redundant I/O cards for DeltaV versions 6.x and later. Available cards are listed in [Table 4-1](#). Each card includes a terminal block for field-wiring. For I/O subsystem capacity information, see [Table A-12](#).

### Note

For migration systems check release notes and the compatibility charts to verify compatibility of existing hardware (particularly for Series 1 cards).

**Table 4-1: Available M-series I/O cards**

Card Type	Series 2 Features for DeltaV Versions 6.x and Later	
	Simplex	Redundant
AI, 4-channel, Isolated, mV, V, RTD, Ohms, TC	X	
AI, 8-channel, 4-20 mA with HART, 2-wire or 4-wire connection in groups of 4 signals	X	X
AI, 8-channel, 1-5 VDC		
AI, 8-channel, mV	X	
AI, 8-channel, TC	X	
AI, 8-channel, RTD	X	
AI, 16-channel, 4-20 mA with HART	X	
AO, 8-channel, 4-20 mA with HART	X	X
DI, 8-channel, 24 VDC, Isolated	X	
DI, 8-channel, 24 VDC, Dry Contact	X	X
DI, 8-channel, 120 VAC, Isolated	X	
DI, 8-channel, 120 VAC, Dry Contact	X	
DI, 8-channel, 230 VAC, Isolated		
DI, 8-channel, 230 VAC, Dry Contact		
DI, 16-channel, Sequence of Events (SOE)	X	
DI, 32-channel, 24 VDC, Dry Contact	X	
DO, 8-channel, 24 VDC, Isolated	X	
DO, 8-channel, 24 VDC, High-side (uses bussed field power)	X	X
DO, 8-channel, 115/230 VAC, Isolated	X	
DO, 8-channel, 115/230 VAC, High-side	X	
DO, 32-channel, 24 VDC, High Side	X	
AS-i Interface	X	
DeviceNet	X	
Fieldbus H1	X	X

**Table 4-1: Available M-series I/O cards (continued)**

Card Type	Series 2 Features for DeltaV Versions 6.x and Later	
	Simplex	Redundant
Multifunction/Pulse	X	
Profibus DP	X	X
Serial Interface with 2 Ports	X	X
Thermocouple, mV	X	
VIM 2	X	X

## Available S-series I/O cards

S-series I/O cards include the cards listed in [Table 4-2](#). Each card includes a terminal block for field-wiring. For capacity information, see [Table A-12](#).

**Table 4-2: Available S-series I/O cards**

Card Type	DeltaV Versions 11.3 and Later	
	Simplex	Redundant
AI 16-channel 4-20 mA HART	X	
Isolated Input	X	
AI 8-channel 4-20 mA HART	X	X
RTD / Resistance	X	
Thermocouple / mV Input	X	
AO 8-channel 4-20 mA HART	X	X
Sequence of Events (SOE)	X	
DI, 8-channel, 120 VAC, Dry Contact	X	
DI, 8-channel, 120 VAC, Isolated	X	
DI, 8-channel, NAMUR	X	X
DI, 8-channel, 24 VDC, Isolated	X	
Pulse Count Input	X	
DI, 32-channel, 24 VDC, Dry Contact	X	
DI, 32-channel, 24 VDC, Dry Contact Plus	X	X
DO, 8-channel, 120/230 VAC, High-side	X	
DO, 8-channel, 120/230 VAC, Isolated	X	
DO, 8-channel, 24 VDC, High-side (uses bussed field power)	X	X
DO, 8-channel, 24 VDC, Isolated	X	

**Table 4-2: Available S-series I/O cards (continued)**

Card Type	DeltaV Versions 11.3 and Later	
	Simplex	Redundant
DO, 32-channel, 24 VDC, High Side	X	
DO, 32-channel, 24 VDC, High Side Plus	X	X
AS-i Interface	X	
DeviceNet	X	
Fieldbus H1	X	X
Fieldbus H1 4-Port Plus	X	X
Fieldbus H1 with integrated power	X	X
Profibus DP	X	X
Serial Interface with 2 Ports	X	X
VIM	X	X
VIM 2	X	X

## Counting DSTs in a redundant I/O subsystem

Redundant M-series I/O requires MD Plus or MX controllers and M-series Series 2 I/O cards. A redundant pair of I/O cards installs on a redundant terminal block, which is two cards wide and specifically designed for redundancy. The terminal block has connections for 8 field signals. A redundant card pair acts as a single card for DST count against the controller DST limits. Thus a redundant 8-channel card pair provides eight pairs of redundant channels and is counted as eight DSTs.

## Traditional I/O redundancy

Each redundant card pair occupies 2 interface slots per controller against the I/O interface limit. The maximum number of I/O slots is 64, which limits the number of redundant I/O cards to 32. Each controller therefore is limited to 32 interfaces installed on the LocalBus for a maximum of 256 redundant channels.

For traditional I/O, first determine how many of each type of card are needed to cover the I/O count. Then allocate these I/O cards to controller nodes. For 1000 I/O, this is a minimum of 125 redundant I/O cards of 8 channels each. Dividing this number by 32 results in the minimum number of controllers required, which would be 4 (round up:  $125/32 = 4$ ). For simplex I/O, the number of interfaces per controller is 64, allowing all 1000 I/O to be assigned to 2 controllers. For redundant I/O subsystems, MD Plus or SD Plus controllers provide sufficient control capacity while the simplex I/O with similar control could be assigned to MX or SX controllers. Other factors might dictate additional controllers to achieve desired independence of hardware.

## CHARMs redundancy

The CHARM I/O Card is inherently redundant with each CIOC Carrier supporting one simplex or one redundant pair of CIOCs. The I/O density does not change when using simplex or redundant CIOCs. Each CIOC can have up to 96 I/O channels of any type, including RTDs, Thermocouples and AC powered discrete I/O.

When using CHARM I/O, the I/O design is done independently of the controller design, and is the same whether using simplex or redundant CIOCs. Determine the needed I/O count and assign closely related I/O to the same CIOC. These CIOC channels are later assigned to the same controller. For 1000 DSTs, I/O can be assigned to any of up to four controllers without any additional design considerations. Add the appropriate number of controllers based on the control strategy needs.

## Zone 1 remote I/O cards

The DeltaV Zone 1 Remote Interface Unit has been withdrawn from sale. For Zone 1 mounted remote I/O needs refer to the Alliance Partner products to select an appropriate solution.

## Zone 2 remote I/O cards

DeltaV remote I/O subsystems for both M-series and S-series Conventional I/O are installed in remote Zone 2 areas to incorporate I/O signals in these areas into a DeltaV system. Remote I/O uses traditional cards and are connected to DeltaV controllers through the DeltaV control network. Remote I/O cards are added to the I/O subsystem under Remote I/O Nodes and the cards are assigned to a DeltaV controller. It is possible to assign all cards under a Remote I/O Node to a single controller or assign individual cards under one Remote I/O Node to multiple controllers (up to four controllers).

A Remote I/O Node installed in Zone 2 supports the following types of I/O cards:

- Analog Input Cards
  - AI, 8-channel, 1-5 VDC (M-series Series 1)
  - AI, 8-channel, 4-20 mA
  - AI, 8-channel, 4-20 mA HART and Series 2
  - AI, 16-channel, 4-20 mA HART
  - Millivolt, 8-channel
  - RTD, 8-channel
  - Thermocouple, 8-channel
- Analog Output Cards
  - AO, 8-channel, 4-20 mA

- AO, 8-channel, 4-20 mA HART (Series 1 and 2)
- Discrete Input Cards
  - DI, 32-channel, High Density
  - DI, 8-channel, 120 VAC, Dry Contact
  - DI, 8-channel, 120 VAC, Isolated
  - DI, 8-channel, 230 VAC, Dry Contact
  - DI, 8-channel, 230 VAC, Isolated
  - DI, 8-channel, 24 VDC, Dry Contact (Series 1 and 2)
  - DI, 8-channel, 24 VDC, Isolated
- Discrete Output Cards
  - DO, 32-channel, High Density
  - DO, 8-channel, 120/230 VAC, High Side
  - DO, 8-channel, 120/230 VAC Isolated
  - DO, 8-channel, 24 VDC High Side (Series 1 and 2)
  - DO, 8-channel, 24 VDC, Isolated

For card specifications, refer to the I/O Cards topic in the *DeltaV™ M-series Hardware Installation and Reference* manual.

Standard M-series or S-series 8-wide horizontal I/O carriers hold the I/O cards. A 24 VDC bulk power supply provides power to the system power supply and field circuits in the system. A scanner provides communications interface to the DeltaV system. The power supply and the scanner plug into a 2-wide power/controller carrier. This carrier plugs into the left side of the horizontal I/O carrier .

M-series Remote Interface Units can also be mounted on a VerticalPLUS 4-wide carrier with the single 8-wide I/O carrier.

Use the following guidelines when developing a bill of materials for a Zone 2 Remote I/O system:

- Each remote I/O node is defined as a scanner and a power supply on a power/controller carrier connected to one 8-wide carrier with up to 8 I/O cards.
- All existing intrinsically safe I/O, bus I/O, serial I/O, Multifunction I/O, and discrete-in with SOE *cannot* be used for remote I/O.
- Except as noted above, all other existing 4-, 8-, 16- and 32-channel simplex I/O cards can be used for remote I/O.
- Redundant I/O cards *cannot* be used for remote I/O.
- Remote I/O nodes and all associated MD, MD Plus. or MX controllers should be connected to control network switches, not hubs.

- One controller can support up to 16 remote I/O nodes; therefore, one controller can talk to 128 remote I/O cards plus its normal 64 local I/O cards, as long as the controller DST limit is not exceeded.
- One I/O card on a remote I/O node can be associated with one, and only one, controller
- Any I/O card/controller association is possible as long as:
  - One I/O card talks to only one controller
  - Each controller talks to no more than 16 remote I/O nodes.
  - Each remote I/O node talks to no more than four controllers.
- One remote I/O node can support up to four controllers. For example, from one remote I/O node, I/O card #1 can talk to controller #1, I/O card #2 can talk to controller #2, I/O card #3 can talk to controller #3, and I/O cards 4 thru 8 can talk to controller #4.
- Each scanner supports redundant ethernets; however, there is no such thing as redundant scanners. M-series scanners support only 10 Mbps on the secondary network connection.
- In a DeltaV system, there can be up to 300 Zone 1, Zone 2, CHARM I/O cards (CIOCs), and Wireless I/O cards (WIOCs) in any combination.
- A DeltaV system can have as many as 120 Wireless Gateways.

## Fiber optic switches for remote I/O

Two DeltaV Fiber Switches are available for fiber optic communication to Remote I/O areas. The Single Port Fiber Switch is an Ethernet switch with one 100BaseFx port and four 10/100BaseTx ports. The Four Port Fiber Switch is an Ethernet switch with four 100BaseFx ports and one 10/100BaseTx port.

The switches can be mounted on a DIN rail. They provide comprehensive LED diagnostics. Primarily, the switches are used for the fiber port connection to Zone 1 components over the certified energy-limited fiber port. The switches can be installed in Zone 2 and they can be used for DeltaV control network applications.

## Determining the quantity of conventional I/O and HART interfaces

A DeltaV system can use standard 4-20 mA and 1-5 VDC analog input and output signals; millivolt, RTD, Ohms, and thermocouple input signals; and a wide-range of discrete input and output signals in both classic and HART I/O interfaces. Refer to the Classic I/O and HART I/O product data sheets for determining the quantity of interfaces.

## Determining the quantity of serial interfaces

Each serial interface card includes two serial communications ports that support RS232, RS422/485 half duplex, or RS422/485 full duplex signals. Each port can support 16 datasets - all input, all output, or a combination of input and output. The ports support multi-dropping of devices if RS485 is used. A dataset can be a set of contiguous registers/coil values from a programmable logic controller (PLC). The 16 datasets may be spread over 1 to 16 devices, depending on the amount and organization of the data. Each dataset can hold up to 100 16-bit data values or 50 32-bit data values. You cannot mix inputs and outputs in the same dataset.

In most cases, the controller DST capacity dictates the size limit. If you have 100 data values in a dataset configured to one module, the dataset counts as one DST. If you have the same 100 values in a dataset configured to six modules, the dataset counts as six DSTs. In both cases, you can alarm and control any of the 100 values, but the DST count remains as configured.

If more than 100 data values are needed, spread them over multiple datasets. For example, reading 140 16-bit values from a PLC uses two datasets and writing back 110 16-bit values uses two datasets. So four datasets on one port are required to support the PLC. Twelve datasets remain for use. However, if dataset values are used in control strategies, the values count as DSTs (as opposed to SCADA tags), and the normal controller DST limit determines the number of datasets you can use on the port.

## Determining the quantity of DeltaV controller interface for PROVOX I/O

An MD, MD Plus, or MX controller is used for the M-series DeltaV Controller Interface to PROVOX I/O solution. An SD Plus or SX controller is used for the S-series DeltaV Controller Interface to PROVOX I/O solution. The quantity of DeltaV Controller Interface for PROVOX I/O solutions is governed by the DST capability of the associated controller. One PROVOX I/O channel is equal to one DST. This solution is compatible with most MUX and Control I/O products. This solution is not compatible with the regulatory controller (IACs, Computing, and/or Configurable Controllers) products. Refer to the DeltaV Controller Interface for PROVOX I/O product data sheet for a list of supported PROVOX I/O types.

If the PROVOX I/O system is redundant, a redundant interface is required. That is, the interface requires two DeltaV system power supplies, two controllers, and two I/O interface cards. Redundant PROVOX I/O interfaces require twice as many controllers as an equivalent simplex system.

Certain PROVOX I/O products (EIC and the IDI) used as a serial interface in a PROVOX system must be replaced with a DeltaV Serial Interface Card for use in a DeltaV system. Refer to the DeltaV Controller Interface for PROVOX I/O product data sheet for additional details.

## Determining the quantity of DeltaV controller interface for RS3 I/O

An MD, MD Plus, or MX controller is used for the M-series DeltaV Controller Interface to RS3 I/O solution. The quantity of DeltaV Controller Interface for RS3 I/O solutions is governed by the DST capability of the associated controller. One RS3 I/O channel is equal to one DST. This solution is compatible with the later FIC and FIM I/O products. This solution is not compatible with the Multi-Loop Controller (MLC), Single Strategy, and DORIC MUX I/O products. Refer to the DeltaV Controller Interface for RS3 I/O product data sheet for a list of supported RS3 I/O types.

If the RS3 I/O system is redundant, a redundant interface is required. That is, the interface requires two DeltaV system power supplies, two controllers, and two I/O interface cards. Redundant RS3 I/O interfaces require twice as many controllers as an equivalent simplex system.

The RS3 serial interface FlexTerm in a RS3 system must be replaced with a DeltaV Serial Interface card for use in a DeltaV system. Refer to the DeltaV Controller Interface for RS3 I/O product data sheet for additional details.

## Determining the quantity of multifunction/pulse input interfaces

The Multifunction/Pulse Input card is both a discrete input card and a pulse train input card. It installs like any other I/O card. It does not provide field power, thus field devices requiring external power must have separate power supplies. There are no special requirements for installing or using the Multifunction/Pulse Input card, other than the need to provide external power for field devices. See the product data sheet for specifications.

If the I/O channel is referenced for its pulse count value, an AI DST is used. If configured only as a DI channel, a DI DST is used.

## Determining the quantity of SOE interfaces

On a Sequence of Events (SOE) card, any of the inputs can be used for sequence of events inputs or for standard discrete inputs. An SOE card installs on standard carriers. A Network Time Protocol server is required to obtain tight synchronization of SOE cards installed on different controllers for an accurate time stamp of the events. This server replaces the synchronization signal from a DeltaV workstation. See the SOE interface product data sheet for specifications.

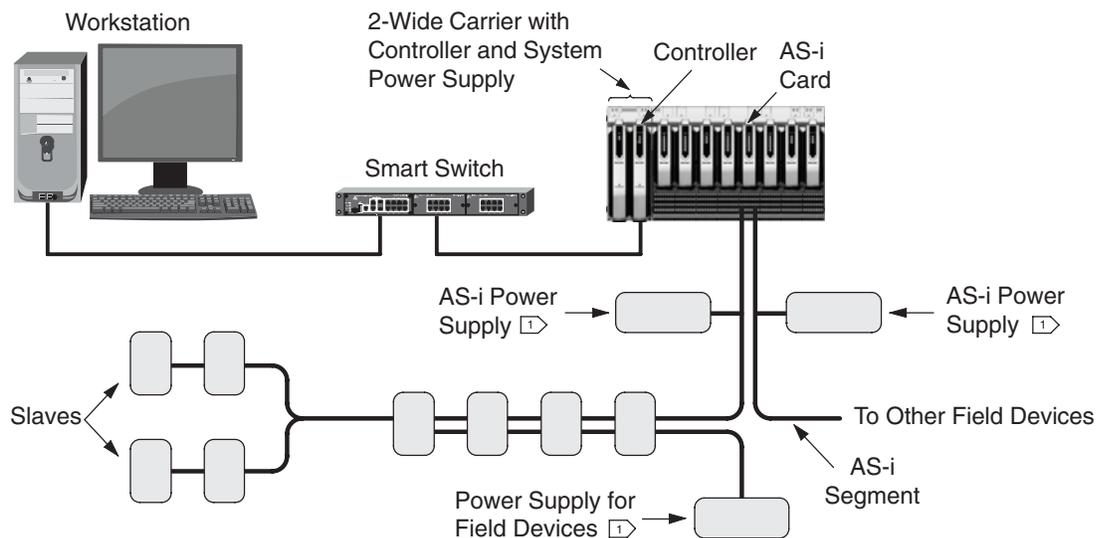
## Determining the quantity of AS-i bus segments

The Actuator/Sensor interface (AS-i) is an I/O network or bus system that connects binary on-off field devices to controllers over a single pair of wires, thus replacing many multiple pairs. The AS-i system is a master/slave system in which a master device controls the transmission of information to and from slaves. Slaves connect to field devices.

The master is an AS-i card located on a standard DeltaV I/O carrier. The card operates and appears as another I/O card in the DeltaV I/O Subsystem. [Figure 4-1](#) illustrates a typical AS-i system. Many I/O network configurations can be used, as shown by examples in [Figure 4-2](#).

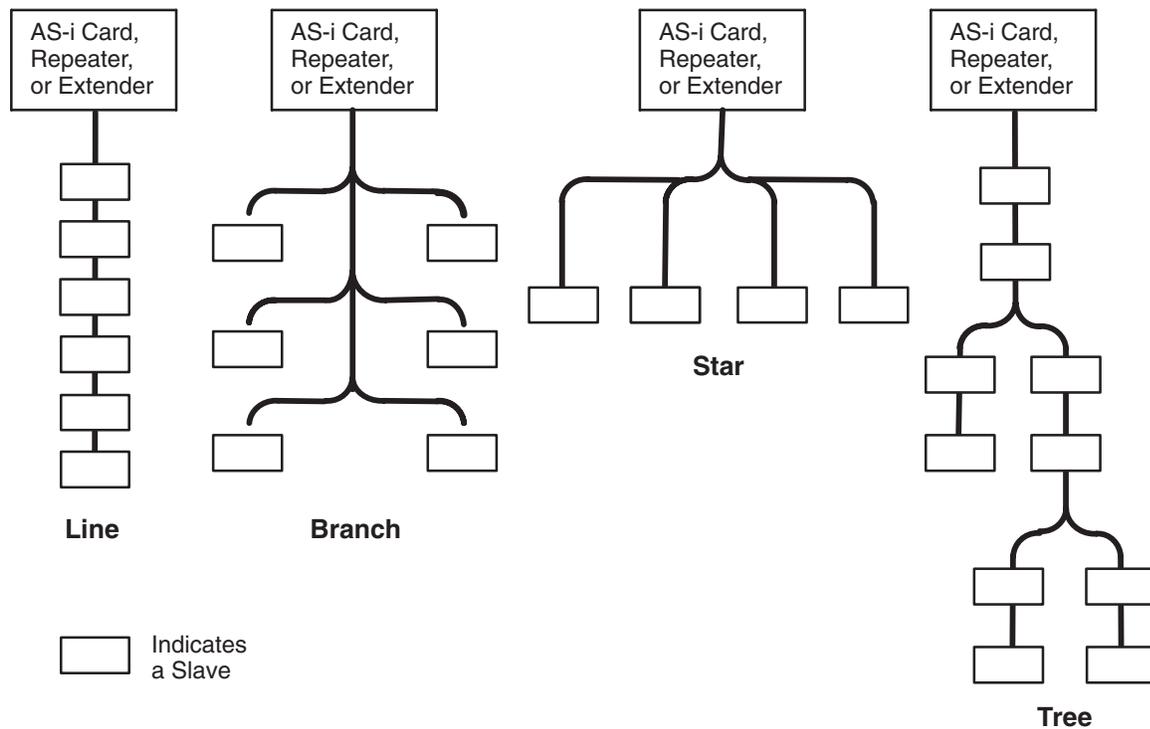
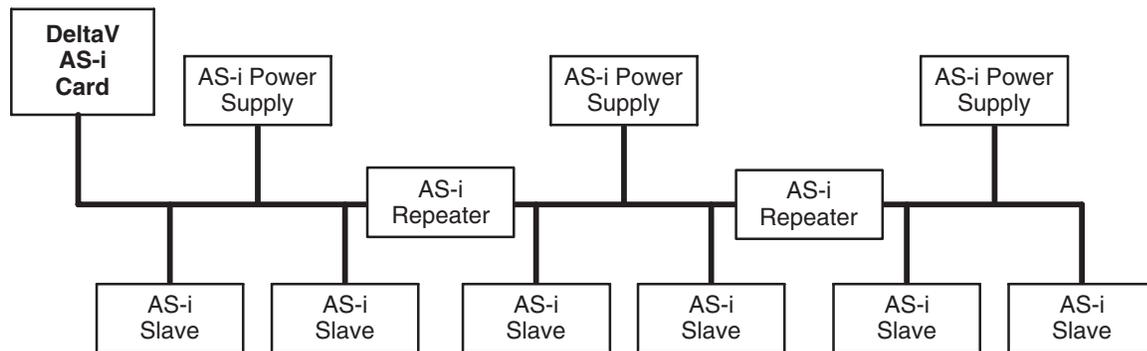
Each grouping of AS-i products connected to a port on a DeltaV AS-i card is a network. If there are no repeaters, the network consists of one segment. When repeaters are used, up to three segments can make up a network. See [Figure 4-3](#).

**Figure 4-1: AS-i I/O network in a DeltaV system**



**Note:**

Each AS-i Segment requires a power supply to power the slaves connected to the segment. In addition, field devices producing output signals require a separate power supply. See guidelines below.

**Figure 4-2: Typical AS-i segment configurations****Figure 4-3: Example network consisting of multiple repeaters and segments**

Use the following guidelines to determine the type and quality of AS-i hardware needed for your DeltaV system. If you have special needs, such as extended AS-i cable distances, contact the factory.

- Each AS-i card supports up to two AS-i networks.
- Each AS-i network can have up to 31 slaves.
- Each slave is capable of reading or writing to a maximum of four sensors/actuators.
- Select the slave address for each segment. You can choose any address between 1 and 31 based on the best logical approach for your application.

- Each signal brought into a controller via AS-i counts as a DST, and is handled in exactly the same manner as directly connected I/O in the control strategies. The number of DSTs per connected device can vary from 1 to 8 (4 in and 4 out), with a typical device using 3.
- The sum of the length of all cables used in any one segment must not exceed 100 meters (328 ft). Fabricate the AS-i segment cables using the standard AS-i flat-type, two-pair cable.

If longer distances are required, repeaters or an extender can be used. There can be two repeaters (three segments) in a network. An extender can be used to increase the distance by 100 meters between a segment and an AS-i card. See installation instructions shipped with extenders. An extender does not use slave devices or power supplies on the AS-i card side of the extension.

- An AS-i power supply is required for each segment to provide power for the slaves and the loads connected to the segment.

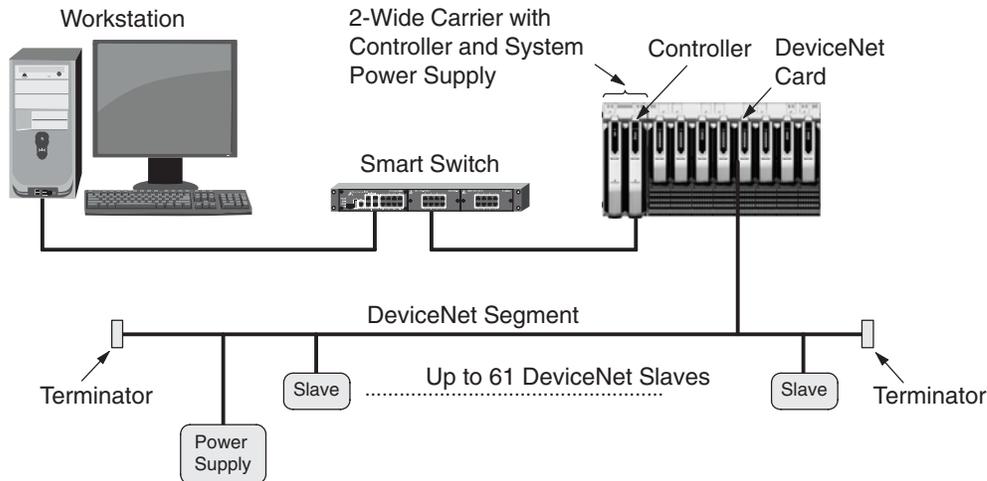
Repeaters divide network segments. A power supply is required on each side of a repeater. The current capacity needed from the power supply depends on the loads of all the slaves connected to the segment. To calculate the required current, add the current draw from each I/O slave plus the current of any active sensors connected to that I/O slave. I/O devices with output signals require an additional power supply. Do not use the AS-i power supply for output signals because changing loads can cause communication errors.

For complete AS-i Bus specifications, refer to European Standard EN50295E. For more information on the AS-Interface, refer to the AS-Interface web site at <http://www.as-interface.com>.

## Determining the quantity of DeviceNet segments

DeviceNet provides single-cable connection of field devices, such as limit switches, photoelectric cells, valve manifolds, motor starters, drives, and operator displays, to a DeltaV controller. Controller interface is through the DeltaV I/O system.

It is very important that you understand DeviceNet specifications before planning a DeviceNet network. The specifications, along with general user guidelines, are available through the DeviceNet internet site: [www.odva.org](http://www.odva.org). [Figure 4-4](#) shows a typical DeviceNet segment.

**Figure 4-4: DeviceNet segments in a DeltaV system**

Use the following guidelines to determine the type and quantity of DeviceNet hardware needed for your DeltaV system. If you have special needs such as extended DeviceNet cable distances, contact the factory.

- Each DeviceNet card supports one DeviceNet segment.
- Each DeviceNet segment can have up to 61 slave devices plus the DeltaV DeviceNet card. In a DeltaV system, device numbers 62 and 63 are reserved for diagnostic tools and new devices, respectively.
- A DeviceNet power supply is required for each segment to provide power for the slaves and the loads connected to the segment.

The current capacity needed from the power supply depends on the loads of all the slaves connected to the segment. To calculate the required current, add the current draw from each I/O slave plus the current of any active sensors connected to that I/O slave.

I/O devices with output signals require an additional power supply. Do not use the DeviceNet power supply for output signals because changing output loads can cause communication errors.

- DeviceNet uses twisted shielded wire as the transmission medium. Line parameters are defined in the DeviceNet specifications. Standard cables are available from Belden.
- Determine the best path to run DeviceNet cable. The maximum length of the cable depends on the selected communication speed. For more information about maximum length, refer to the cable description in the DeviceNet specifications.
- Each DeviceNet segment must have appropriate terminators at both ends.
- Select the slave address for the segment. You can choose any address between 1 and 61 based on the best logical approach for your application.

## Determining the quantity of FOUNDATION fieldbus segments

FOUNDATION fieldbus H1 Cards install on standard DeltaV 8-wide horizontal and vertical I/O carriers. Each card has connections for two fieldbus segments. Each segment supports a maximum of 16 fieldbus devices. [Figure 4-5](#) shows a possible fieldbus segment.

Use the following guidelines to determine the types and quantities of hardware needed for your fieldbus segment:

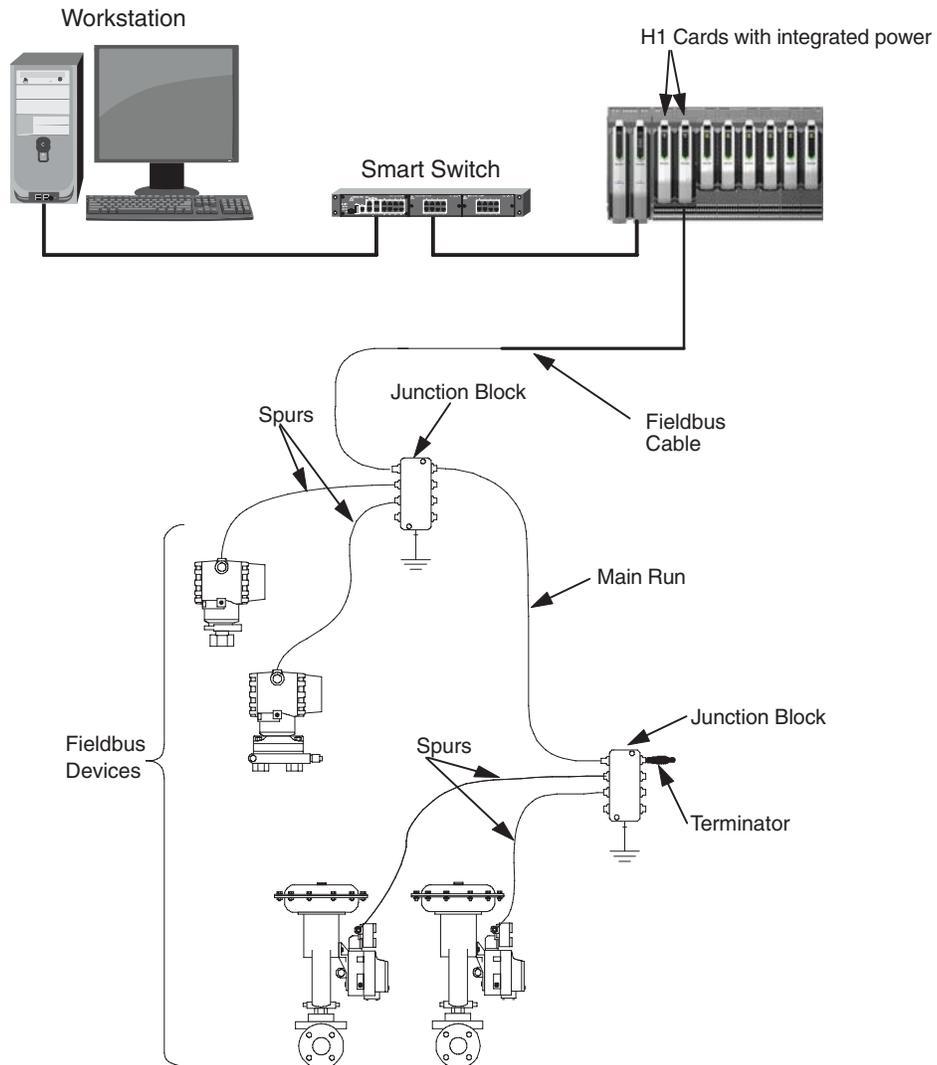
- Up to two fieldbus segments can be connected to a DeltaV H1 Fieldbus card. (Only one segment is shown in [Figure 4-6](#)).

For example, if you have 13 fieldbus transmitters and four fieldbus control valves, you could put two valves and six transmitters on one segment, and two valves and seven transmitters on a second segment. You only need one Fieldbus H1 card.

- A fieldbus segment can have up to 16 fieldbus transmitters and fieldbus control valves connected to it; however, the factory recommends that you limit the number of valves per segment to four.
- If a backup linkmaster device is installed on an H1 segment, it can be commissioned only at device address 20, so care must be taken not to use this location for other devices. The Rosemount 3051 Rev 4 Pressure Transmitter and the Rosemount 3244 Rev 3 Temperature Transmitter are examples of backup linkmaster devices. If control in the field is not implemented, a backup linkmaster is not required.
- Unless you are using an S-series H1 I/O Card with Integrated Power, one fieldbus power supply is required for each segment to provide power for devices connected to the segment. The power supply receives 24 VDC, typically from a 24 VDC bulk supply, and isolates it. The same bulk power supply may be used as the one supplying power for classic I/O field devices.
- The sum of the lengths of all cables used in the segment must not exceed 1.9 kilometers.
- The maximum length of the cable drops between a fieldbus device and a junction block is 120 meters.
- Each end of the trunk cable must be terminated with a fieldbus terminator. The terminator internal to the fieldbus power supply terminates the left end of the trunk cable.
- Fabricate the main run and spur cables using standard fieldbus Type A cable (Belden 3076F) and associated connectors.
- All unused connectors on the junction block(s) must be protected with closure caps.
- If you are using gland adapters, you may purchase them installed or separate. The adapter screws into the device's ½-inch NPT conduit fitting and adapts the devices' signal screw terminals to a male connector that matches with a female connector on the fieldbus cable.
- H1 cards can be installed as redundant pairs. The standby card provides backup to the active link in the Scheduler, as well as any assigned function blocks.

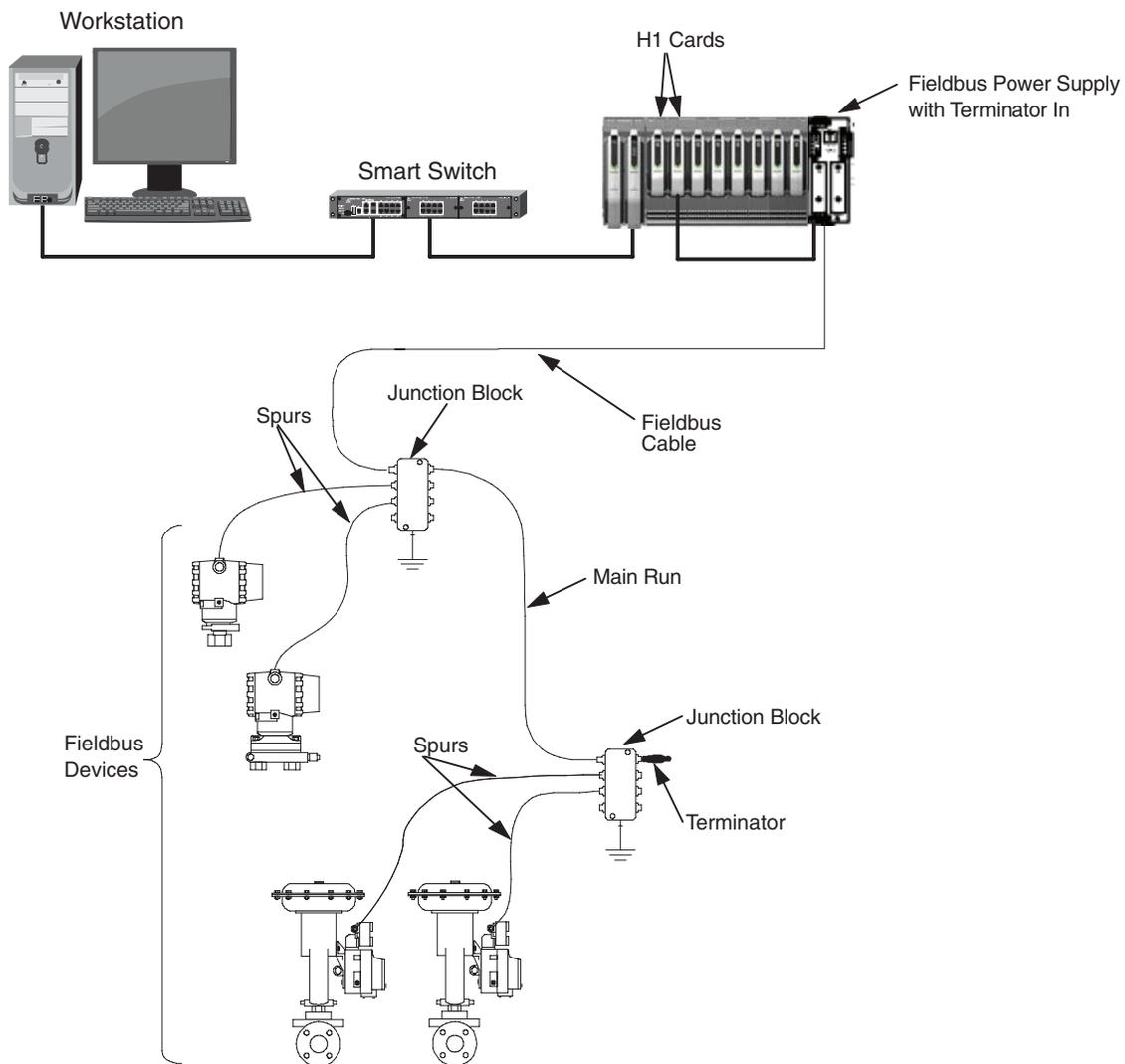
- H1 cards with integrated power provide all of these capabilities and replace the segment power conditioners. Wire bulk 24 VDC power to S-series I/O carriers and wire segments to cards.

**Figure 4-5: S-series FOUNDATION fieldbus segment in a DeltaV system (using integrally powered cards)**



**Note**

H1 cards with integrated power are available in S-series only.

**Figure 4-6: S-series FOUNDATION fieldbus segment in a DeltaV system**

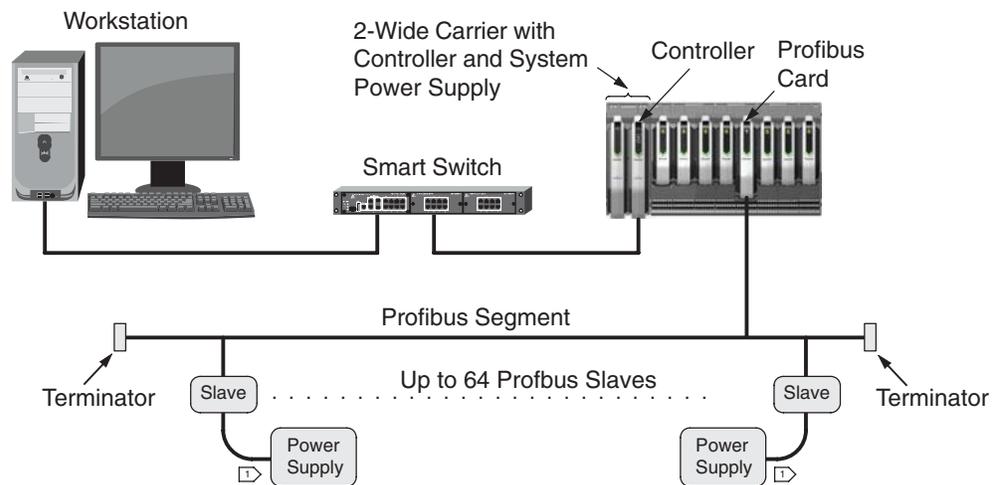
## Determining the quantity of Profibus segments

Use the following guidelines to determine the type and quantity of Profibus hardware needed for your DeltaV system. If you have special needs such as extended Profibus cable distances, contact the factory. [Figure 4-7](#) shows a typical Profibus segment.

- Each Profibus DP card supports one Profibus segment.
- Each Profibus segment can have up to 64 slave devices plus the DeltaV master.
- Profibus is not a self-powered bus. Each slave must be supplied with the appropriate power for the connected device.
- Profibus uses twisted shielded wire as the transmission medium. Line parameters are defined in EN50170. Standard cables are available from Belden.

- Determine the best path to run Profibus cable. The maximum length of a Profibus segment depends on the selected communication speed. For more information about maximum length, refer to the cable description in the Profibus specification EN50170.
- Each Profibus segment must have appropriate terminators at both ends. The DeltaV Profibus terminal block contains a selectable Profibus terminator. It is common for a Profibus connector to contain one selectable Profibus terminator. Consult the connector documentation to determine if a connector contains a Profibus terminator.
- Profibus cards can be redundant. The standby is always address 0. Any other class 1 masters cannot be set to address 0 with redundant pairs of Profibus cards.
- For a description of the Profibus interface, refer to the Profibus specification EN50170. For more information on the Profibus interface, refer to the Profibus web site at [www.profibus.com](http://www.profibus.com).

**Figure 4-7: Profibus segment in a DeltaV system**



## Intrinsically safe I/O subsystem

The DeltaV intrinsically safe I/O subsystem is isolated from the controller and the regular system power supply by a Localbus isolator. [Figure 4-8](#) shows a typical installation using intrinsically safe I/O. One intrinsically safe power supply is required for each carrier.

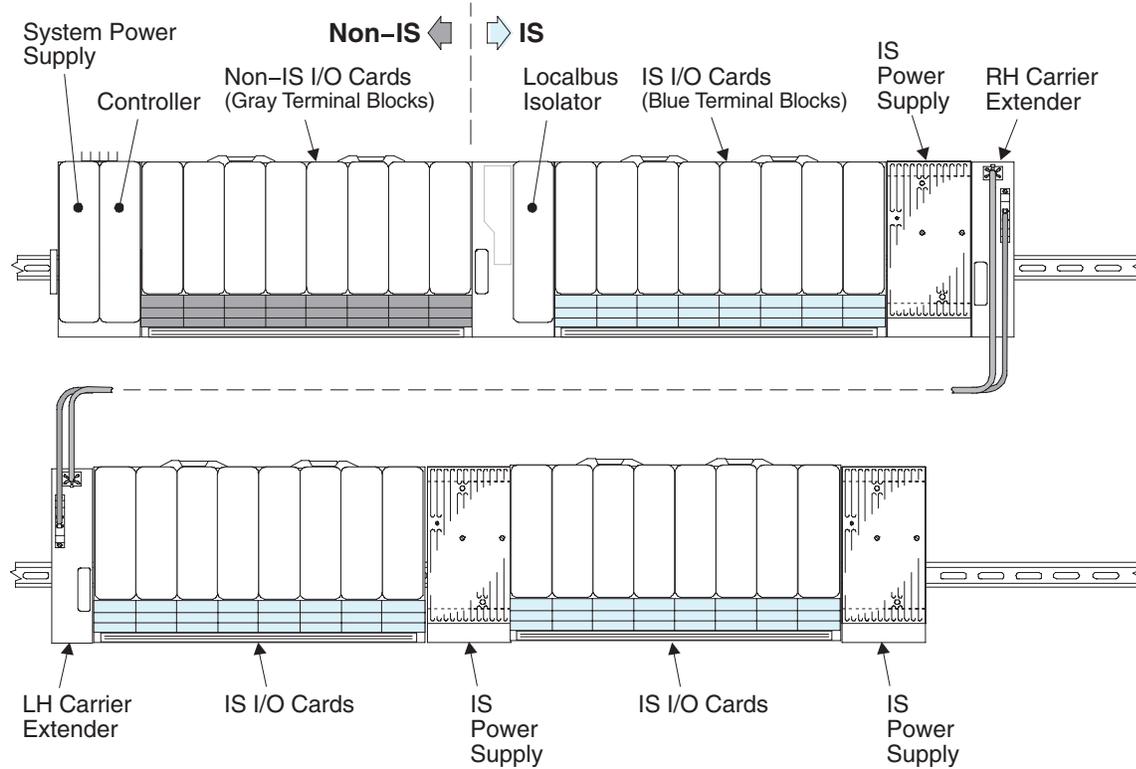
Intrinsically Safe I/O subsystem is available only in M-series. For S-series systems the Intrinsically Safe CHARMS provide this functionality.

DeltaV I/O cards available for an intrinsically safe I/O subsystem include:

- AI, 8-channel, 4-20 mA with HART
- AO, 8-channel 4-20 mA

- AO, 8-channel, 4-20 mA with HART
- DI, 16-channel
- DO, 4-channel

**Figure 4-8: Intrinsically safe I/O overview**



For further information about intrinsically safe I/O subsystems, see the following manuals (located on the DeltaV Documentation Library DVD):

- DeltaV™ Scalable Process System, Class I Division 2 Installation Instructions (Part Number - 12P1293)
- DeltaV™ Scalable Process System, Class I Div. 2 with Class I, II, III Div. 1 Field Circuits Installation Instructions (Part Number - 12P1892)
- DeltaV™ Scalable Process System with Zone 0 Field Circuits Installation Instructions (Part Number - 12P1990)
- DeltaV™ Scalable Process System, Zone 2 Installation Instructions (Part Number - 12P2046)

## I/O subsystem carriers

M-series has 8-wide Horizontal and VerticalPLUS carriers. S-series has 8-wide Horizontal and CHARM I/O carriers.

Both horizontal and vertical I/O carriers are available for mounting I/O carriers. Carriers for M-series controllers are slightly different than those for S-series controllers. The carriers are not interchangeable. Vertical carriers are often used to fit M-series DeltaV I/O into vertical system enclosures. Horizontal carriers usually provide denser I/O mounting than vertical carriers. Up to eight I/O cards mount on an 8-wide horizontal carrier or on a vertical carrier. The S-series vertical solution is CHARMs.

The minimum required number of carriers is calculated by dividing the quantity of I/O interfaces by eight and rounding up. Redundant I/O interfaces double the requirement. I/O interfaces can be spread over more than just the calculated minimum quantity of I/O carriers.

---

**Note**

You can use both horizontal and vertical carriers in a DeltaV system, but horizontal and vertical carriers cannot be connected. There is no means of doing so.

---

See the I/O subsystem carriers product data sheet for further information.

## fieldbus H1 carrier

A Fieldbus H1 Carrier is an M-series I/O carrier that holds one 8-Channel DI card and one 8-Channel DO card to connect discrete I/O field devices to fieldbus segments and can be used with S-series H1 cards. You may install one or both cards. The DST count per card is always eight, whether you use one or all eight channels. Twenty-four VDC power for the carrier and cards must be supplied separately from 24 VDC power for field devices. The carrier mounts on T-type DIN rail, wall, or panel. See the *M-series Fieldbus H1 Carrier* product data sheet for further information.

## DeltaV controller interface for PROVOX I/O carrier

The DeltaV Controller Interface for PROVOX I/O Carrier provides a means of connecting PROVOX I/O to DeltaV MD, MD Plus, or MX Controllers. The S-series DeltaV Controller Interface for PROVOX® I/O solution provides a means of connecting PROVOX I/O to SD Plus or SX controllers. The redundant PROVOX I/O serial Bus connects to two BNC connectors on the carrier. Each carrier holds one each of a DeltaV system power supply, a controller, and an I/O interface module for a simplex system, and two each of DeltaV system power supplies, controllers, and I/O interface modules for a redundant system. AC or DC system power supplies may be used. The carrier mounts on a standard 19-inch EIA rail.

## DeltaV controller interface for RS3 I/O carrier

A DeltaV Controller Interface for RS3 I/O Carrier provides a means of connecting RS3 I/O to DeltaV MD, MD Plus, or MX Controllers. RS3 I/O cabling connects to RS3-type I/O connectors on the carrier. Each carrier holds one each of a DeltaV system power supply, a controller, and an I/O interface module for a simplex system, and two each of DeltaV system power supplies, controllers, and I/O interface modules for a redundant system. AC or DC system power supplies may be used. The carrier mounts on a standard 19-inch EIA rail.

## DeltaV FlexConnect solutions

DeltaV FlexConnect lets users of competitive control systems connect their I/O systems to a DeltaV system. FlexConnect is a method of connecting multi-conductor cables from competitive I/O subsystems to DeltaV termination panels, and auto-marshalling the signals to DeltaV I/O. For further information about DeltaV FlexConnect products, see corresponding product data sheets.

DeltaV FlexConnect Solutions lets users of Emerson PROVOX, RS3, RMV9000 and Competitive Distributed Control Systems (DCS) connect their I/O subsystems to a DeltaV system. FlexConnect Solutions is a method of connecting multi-conductor cables with or without pass-through cards from legacy I/O subsystem termination or marshalling panels and auto-marshalling the signals to DeltaV I/O. For further information about DeltaV FlexConnect Solutions products, see corresponding product data sheets.

# 5 CHARMs I/O and other I/O

## Topics covered in this chapter:

- *Overview to this chapter*
- *CHARMs I/O*
- *CHARM classes*
- *Required controllers for CHARM I/O*
- *Application guidelines for CHARM I/O*
- *Available control room cabinets for CHARM I/O*
- *Available field enclosures for CHARM I/O*
- *Ethernet I/O Card*
- *Required controllers for the EIOC*
- *Applications guidelines for the EIOC*
- *Function blocks supported by the EIOC*
- *Polling times for the EIOC by communication protocol*
- *Switchover times for the EIOC by communication protocol*
- *How distribution of signals affects EIOC performance*

## Overview to this chapter

This chapter discusses CHARMs I/O and the Ethernet I/O card. The CHARM I/O Card (CIOC) and the Ethernet I/O Card (EIOC) are configured in the I/O Network in DeltaV Explorer.

## CHARMs I/O

*Characterizing Modules (CHARMs)* is an I/O family based on a distributed module methodology. This I/O family is called CHARMs I/O.

CHARMs I/O connects only to S-series controllers through a CHARMs I/O Card (CIOC) which is a resident device on the DeltaV control network. The CIOC is configured under the I/O Network in DeltaV Explorer.

The CHARMs family consists of devices and their functions as described in [Table 5-1](#).

**Table 5-1: Functions of CHARMs family of devices**

Device	Function
CHARM I/O Card (CIOC)	A simplex or redundant card that processes I/O signals between a CHARM and the connected controller. The card connects to the area control network through an I/O port on the carrier.
CHARM I/O Carrier	DIN-rail mounted carrier that holds up to two CHARMs I/O Cards (CIOC) and houses the I/O port.
CHARM	Characterizing module that plugs into a CHARM terminal block. The CHARM determines the I/O type, such as AI, AO, DI, DO, and so forth.
CHARM Terminal block	Field wiring terminal that plugs onto the CHARM Baseplate, and holds a CHARM.
CHARM Injected Power Terminal block	Field wire terminal providing internally supplied bussed power to field circuits.
CHARM Baseplate	DIN-rail mounted hardware for holding up to 12 CHARM terminals (and thus 12 CHARMs) plus an Address Plug terminal and Address Plug. Eight baseplates for up to 96 CHARMs can be connected to a CHARM I/O Card.
I/O Port	Area Control Network communication module on the CHARM I/O Carrier.
CHARM Address Terminal	Address Plug terminal that plugs onto a CHARM baseplate to hold an Address Plug. The connection point for injected power used by Injected Power Terminal Block.
Address Plug	Defines the address for each CHARM on the baseplate. Once the address is given to a CHARM, the CHARM gives its address to the controller.

## CHARM classes

*Table 5-2* lists available CHARM classes and types.

**Table 5-2: CHARM classes and available types**

Class	Available Type
AI	AI 4-20 mA HART I.S. AI 4-20 mA HART
AO	AO 4-20 mA HART I.S. AO 4-20 mA HART

**Table 5-2: CHARM classes and available types (continued)**

Class	Available Type
DI	DI 24 VDC Low Side DI 24 VDC Isolated Isolated DI 120 VAC DI 120 VAC Isolated Plus Isolated DI 230 VAC DI Namur I.S. DI Namur
DO	DO 24 VDC High Side Isolated DO 24 VDC DO 100 mA Energy Limited DO VAC Isolated I.S. DO 45 mA
Power Output	24 VDC Power
RTD	RTD I.S. RTD  <b>Note</b> Both are configurable as PT100, PT200, Ni120, Cu10, Resistance user defined Pt, PT500, PT1000, NI100, NI200, NI500, NI1000.
Thermocouple, mV	T/C I.S. T/C  <b>Note</b> Both are configurable as B, E, J, K, N, R, S, T, 100 mV
Voltage	AI 0-10 VDC Isolated  <b>Note</b> Configurable as 100 mV, 1V, 5V, 10V, 0-5V, 0-10V, and custom configurable as 0-10V to match legacy.

## Required controllers for CHARM I/O

S-series CHARMs I/O cards require either an SD Plus or SX controller. M-series controllers cannot communicate with S-series I/O cards or CHARMs.

## Application guidelines for CHARM I/O

The CHARM I/O Card (CIOC) is a node under the I/O Network. The following application guidelines apply:

- A single CHARM can be assigned to only one controller, but different CHARMs from one CIOC can be assigned to four controllers.
- A controller can support up to 16 remote I/O nodes of any type. That is, the maximum number of CIOCs a controller can support is 16 (assuming no other remote I/O nodes).
- The maximum number of CIOC, Zone 1, Zone 2, WIOC, and EIOC nodes in a DeltaV v13 system is 300. The maximum number of CIOCs is 300 (assuming no other remote I/O nodes).
- CHARMs and their I/O values are only accessible through a controller. They are not available as a direct path to an operator interface. CIOC diagnostics and similar applications are directly accessible to an operator interface.
- The default update rate from a CIOC is 50 msec, selected to be compatible with the fastest module execution of 100 msec. I/O terminal to terminal performance is 300 msec, assuming a 100 msec module execution.
- A CHARM can be assigned to only one controller. Once a CHARM is assigned it appears under the remote I/O subsystem of the controller, other controllers, workstations, and so forth can access the CHARM through the assigned controller.

## Available control room cabinets for CHARM I/O

Standard CHARMs I/O control room cabinet configurations are available to simplify ordering. All CHARMs control room cabinets include:

- An internal mounting plate
- Grounding bars
- Interior lighting
- Front and rear left-hinged single doors
- Top and bottom cable entry
- IP54 (NEMA 12) Protection

Cabinets are available in two configurations, as follows:

- CHARM-288IO cabinet - Cabinet for up to 288 I/O channels mounted in the rear. The front of the cabinet has five horizontal DIN-rails ready for mounting additional hardware. 24 VDC can be provided with simplex or redundant VE5011 bulk power supplies mounted on one of the DIN-rails.
- CHARM-576IO cabinet - Cabinet for up to 576 I/O channels mounted as 288 channels in the rear and 288 channels in the front. 24 VDC can be provided with simplex or redundant VE5011 bulk power supplies mounted in a nearby cabinet. See the *Quick Start Guide for DeltaV Power, Grounding, and Surge Suppression* for maximum distances.

**Note**

CIOCs and CHARMs are not included in the control room cabinets so that they can be selected per user requirements.

---

The cabinets can be shipped directly to a customer site assembled with components noted above. Cabinets can also be shipped to an integration site where the following additional hardware can be added.

- Side panels to close off the ends of the first and last cabinets of a cabinet row
- Nameplate with custom cabinet identification
- Redundant 8-port network switches for the I/O segment of a control network
- Control network wiring of CIOCs to the controllers
- 24 VDC power distribution for isolated Discrete Outputs requiring more than 100 mA
- For the CHARM-288IO cabinet, 120/240 VAC power distribution hardware
- For the CHARM-288IO cabinet, integration of internal-cabinet power, ground, and alarm wiring with redundant VE5011 24 VDC bulk power supplies, redundant controllers, 8-wide carriers for Series 1 and Series 2 I/O, and other customer requested equipment.

CHARM-288IO cabinets include five horizontal DIN-rails. Generally, the power supplies and controllers occupy all or parts of two DIN-rails, leaving three DIN-rails for mounting other equipment.

## Available field enclosures for CHARM I/O

Standard CHARM I/O field enclosure configurations are available to simplify ordering. These cabinets substitute for traditional junction boxes and provide electronic marshalling in the field. Refer to the product data sheet for more information.

Refer to product data sheets for information on Factory Tested Enclosures (FTE).

**Note**

CIOCs and CHARMs are not included in the field cabinets and must be ordered separately per user requirements.

---

## Ethernet I/O Card

The Ethernet I/O Card (EIOC) provides an interface to Ethernet device networks and to intelligent devices that use the Modbus TCP/IP protocol, Ethernet/Industrial Protocol (Ethernet/IP), or IEC 61850 Manufacturing Message Specification (MMS) protocol. The EIOC accesses intelligent device data for history collection, alarming, and limited control. Control modules running in the EIOC make the device data available to the DeltaV system.

## Required controllers for the EIOC

The EIOC communicates with M and S-series controllers using the standard inter-controller communications.

## Applications guidelines for the EIOC

The Ethernet I/O Card (EIOC) is a node under the I/O Network. EIOCs:

- Are not assigned to controllers like the other nodes within the I/O Network
- Support a subset of function blocks that are used for motor control and supervisory control
- Reference device data only; the EIOC does not reference other I/O such as CHARMs I/O
- Reference data from devices on the network to which it is connected and external module data. It does not support externally referenced device data directly.

## Function blocks supported by the EIOC

The EIOC supports the following function blocks:

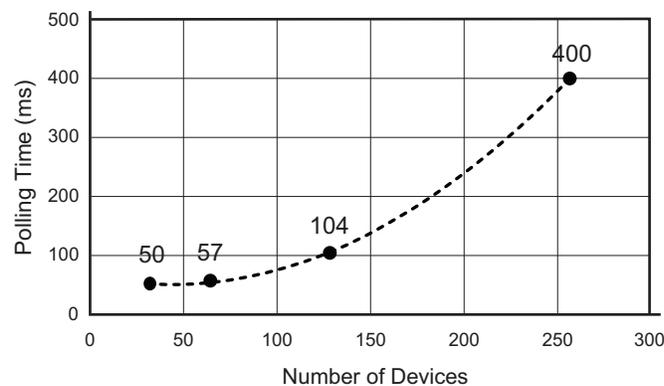
- Advanced Functions
  - State Transition - 4 maximum per EIOC
  - Step Sequence - 4 maximum per EIOC
- Analog Control
  - Analog Tracking
  - Bias/Gain
  - Calc/Logic
  - Filter
  - Input Selector
  - Limit
  - Manual Loader
  - PID - 26 maximum per EIOC
  - Ramp
  - Ramp Limit
  - Scaler
  - Signal Characterizer
  - Signal Generator
  - Signal Selector
  - Splitter

- I/O
  - Alarm Detection
  - AI
  - AO
  - DI
  - DO
- Logical: all Logical function blocks except for the Device Control function block.
  - DCC - 256 maximum per EIOC
  - EDC - 256 maximum per EIOC
- Math: all
- Special items: all
- Timer Counters: all

## Polling times for the EIOC by communication protocol

*Polling time* is the time it takes the EIOC to get responses from all connected devices. Polling time depends on the communication protocol, the number of connected devices (PDTs in the DeltaV hierarchy), and the number of LDTs configured for the connected devices. The following graphs and tables show polling times for the four communication protocols that the EIOC supports.

**Figure 5-1: Modbus polling times**

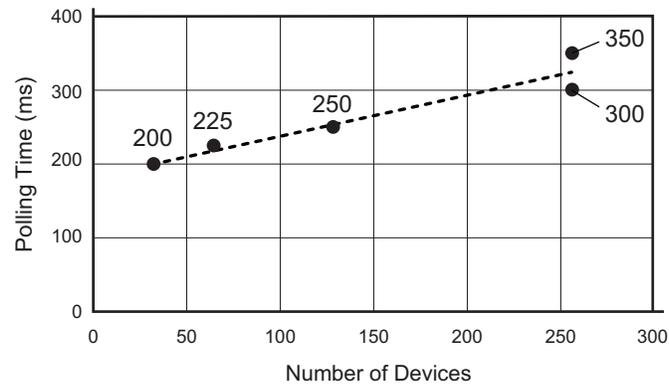


**Table 5-3: Modbus polling times**

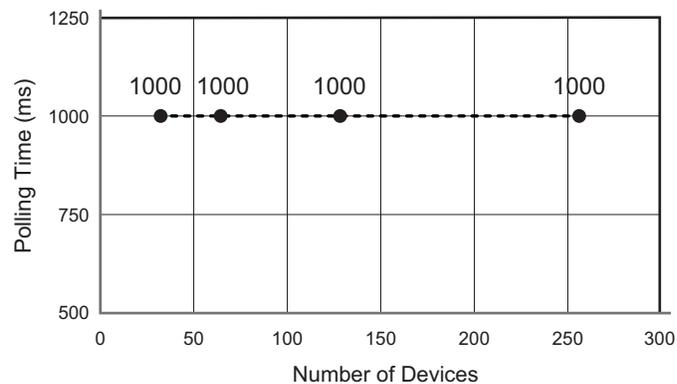
Number of Devices	Number of Signals	Polling Time (ms)
32	4,000	50
64	8,122	57
128	10,707	104

**Table 5-3: Modbus polling times (continued)**

Number of Devices	Number of Signals	Polling Time (ms)
256	20,402	400
256	32,000	400

**Figure 5-2: EtherNet/IP Class 1 polling times****Table 5-4: EtherNet/IP Class 1 polling times**

Number of Devices	Number of Signals	Polling Time (ms)
32	3,107	200
64	6,307	225
128	12,707	250
256	20,943	300
256	32,000	350

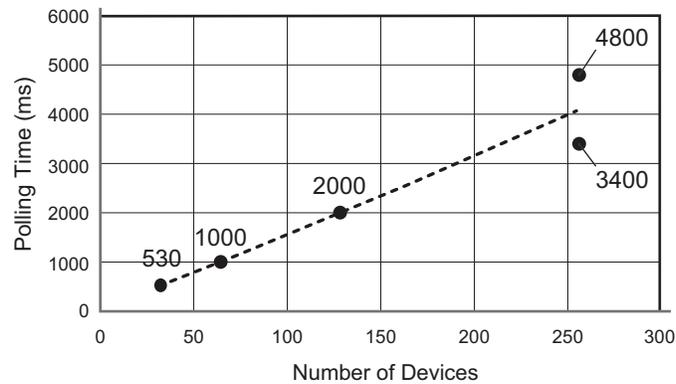
**Figure 5-3: EtherNet/IP Class 3 polling times**

**Table 5-5: EtherNet/IP Class 3 polling times**

Number of Devices	Number of Signals	Polling Time (ms)
32	4,000	1,000
64	8,122	1,000
128	10,707	1,000
256	20,000	1,000
256	32,000	1,000

**Note**

If the EIOC is using Class 3 Explicit Messaging for control, Emerson recommends the default value of 1 s for the Requested Packet Interval (RPI). Using an RPI value of less than 1 s will result in RPI faults, and in severe cases, outputs can freeze until delayed packets are delivered.

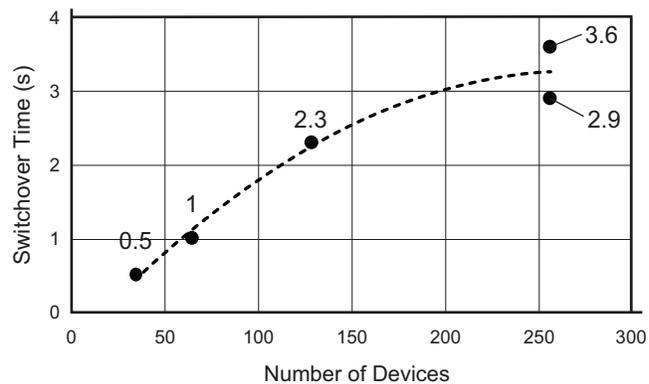
**Figure 5-4: IEC 61850 MMS polling times****Table 5-6: IEC 61850 MMS polling times**

Number of Devices	Number of Signals	Polling Time (ms)
32	4,000	530
64	8,122	1,000
128	10,707	2,000
256	20,402	3,400
256	32,000	4,800

## Switchover times for the EIOC by communication protocol

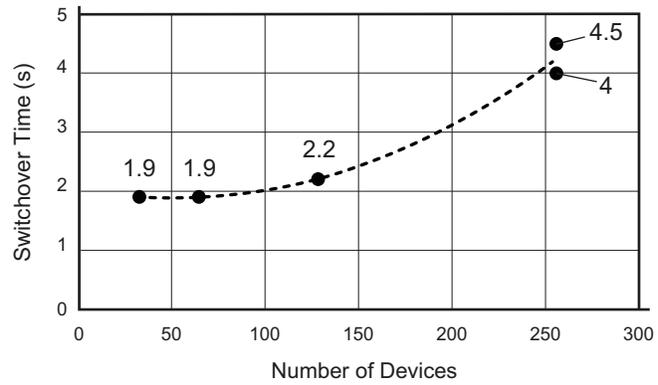
*Switchover time* is the time it takes for control of devices to pass from one EIOC to the other in a redundant pair. Switchover time depends on the communication protocol, the number of connected devices (PDTs in the DeltaV hierarchy), and the number of LDTs configured for the connected devices. The following graphs and tables show switchover times for the four communication protocols that the EIOC supports.

**Figure 5-5: Modbus switchover times**

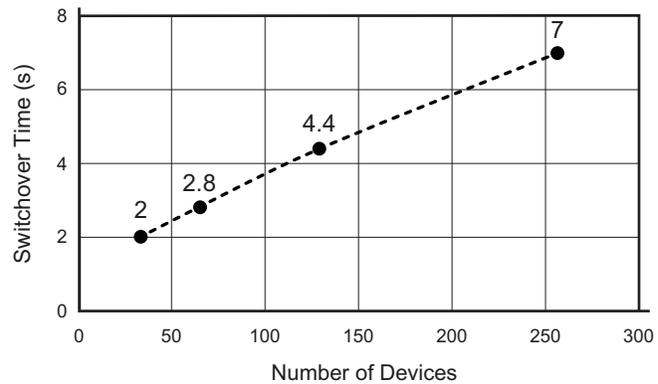


**Table 5-7: Modbus switchover times**

Number of Devices	Number of Signals	Switchover Time (s)
32	4,130	0.5
64	8,122	1
128	10,707	2.3
256	20,400	2.9
256	32,768	3.6

**Figure 5-6: EtherNet/IP Class 1 switchover times****Table 5-8: EtherNet/IP Class 1 switchover times**

Number of Devices	Number of Signals	Switchover Time (s)
32	3,107	1.9
64	6,307	1.9
128	12,707	2.2
256	20,943	4.5
256	5,186	4

**Figure 5-7: EtherNet/IP Class 3 switchover times****Table 5-9: EtherNet/IP Class 3 switchover times**

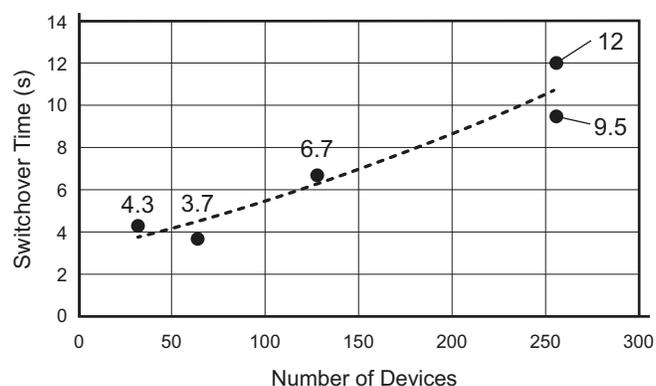
Number of Devices	Number of Signals	Switchover Time (s)
32	3,107	2
64	6,307	2.8
128	12,707	4.4

**Table 5-9: EtherNet/IP Class 3 switchover times (continued)**

Number of Devices	Number of Signals	Switchover Time (s)
256	20,943	7

**Note**

If the EIOC is using either of the supported EtherNet/IP protocols for control, devices *must* be configured to delay going into fail-safe state after detecting a communication loss. The delay time must be greater than the switchover time for the EIOC. Otherwise, devices will go into the fail-safe state whenever control passes from one EIOC to the other in the redundant pair.

**Figure 5-8: IEC 61850 MMS switchover times****Table 5-10: IEC 61850 MMS switchover times**

Number of Devices	Number of Signals	Switchover Time (s)
32	4,000	4.3
64	8,122	3.7
128	10,707	6.7
256	20,402	9.5
256	32,000	12

## How distribution of signals affects EIOC performance

The number of LDTs per device has a greater effect on polling and switchover time than the number of connected devices. Configuring more devices with one LDT per device will result in faster polling and switchover times than configuring fewer devices with more LDTs per device.

---

**Note**

Each LDT can contain 100 signals.

---

---

**Note**

For Modbus, each LDT can contain only one datatype.

---



# 6 Wireless Networks

## Topics covered in this chapter:

- *Wireless network types*
- *WirelessHART I/O card field network*
- *Smart Wireless Gateway field network*
- *Using AMS Device Manager with wireless networks*
- *Ordering equipment*

## Wireless network types

DeltaV software supports two types of wireless networks that communicate with WirelessHART devices: WirelessHART I/O Card (WIOC) nodes and Smart Wireless Gateway nodes.

## WirelessHART I/O card field network

The WirelessHART I/O Card provides an easy to use, high-availability redundant WirelessHART interface to a DeltaV system. You can easily integrate wireless field instruments into your control system with the DeltaV WirelessHART I/O Card (WIOC). Control engineers and maintenance technicians work with WirelessHART devices as easily as with wired devices.

The WIOC resides as a native DeltaV node on the DeltaV control network under the Wireless I/O Network and is auto-sensed by DeltaV software. Each WIOC supports up to 100 WirelessHART transmitters. The card installs into its own DeltaV I/O carrier and is connected to one Smart Wireless Field Link located in the field. This connection provides power to the Field Link as well as wired communication between the Field Link and the WIOC.

No site survey is required to determine equipment locations. The self-organizing network automatically determines the optimum communication paths for each device to navigate around structures.

The WIOC is similar to the CHARM I/O card. The following rules and limits apply:

- The total number of WIOC, CIOC, Zone 1, and Zone 2 remote I/O nodes in a DeltaV system is limited by the remote I/O node limit (300 maximum). Wireless Gateway nodes are counted separately.
- Each device in the WIOC wireless network can be assigned to one controller. The signal data can only be accessed via the assigned controller. There is no direct path to the data by workstations or other controllers.
- For a particular WIOC, the maximum number of controllers to which devices can be assigned is 4.

- A controller can communicate with a total of 16 WIOC, CIOC, Zone 1, and Zone 2 remote I/O nodes.

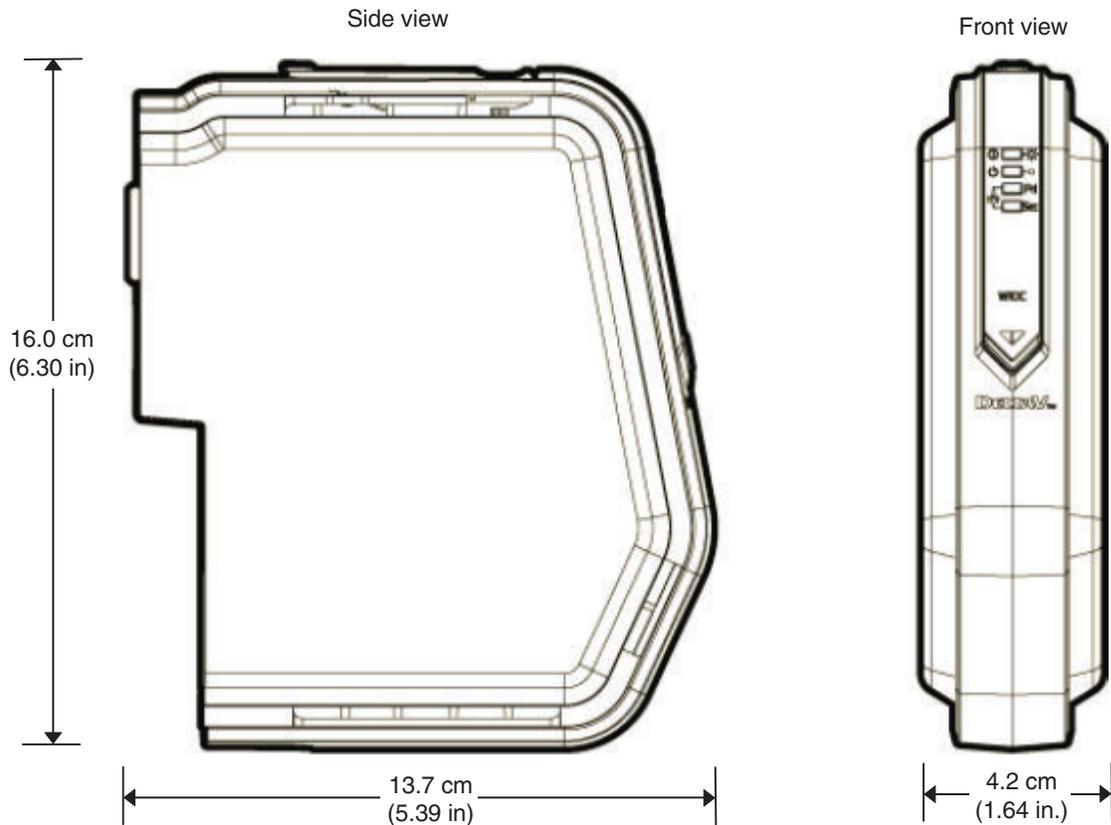
**Note**

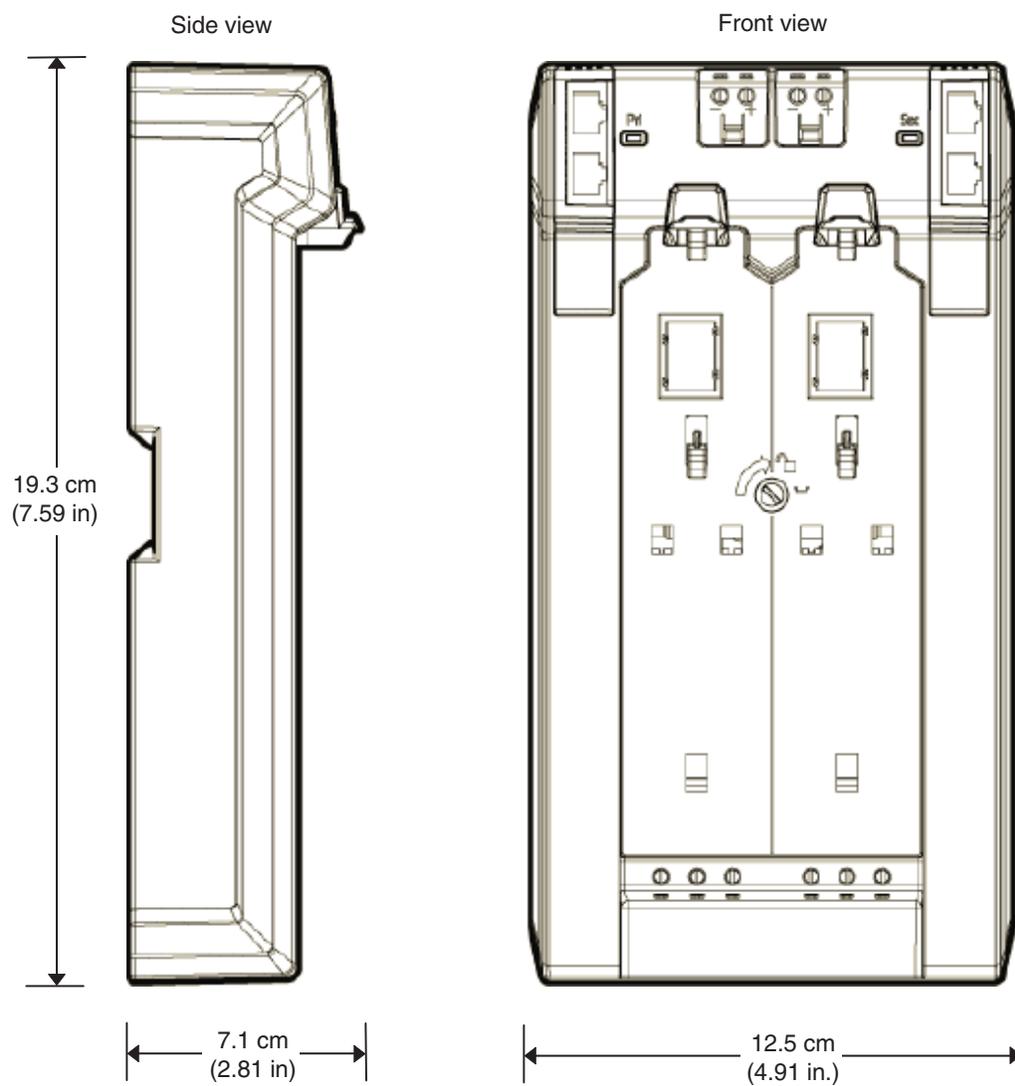
A WIOC communicates with a maximum of four controllers. A controller communicates with a maximum of 16 WIOC, CIOC, Zone 1, and Zone 2 I/O nodes.

## WirelessHART I/O card installation dimensions

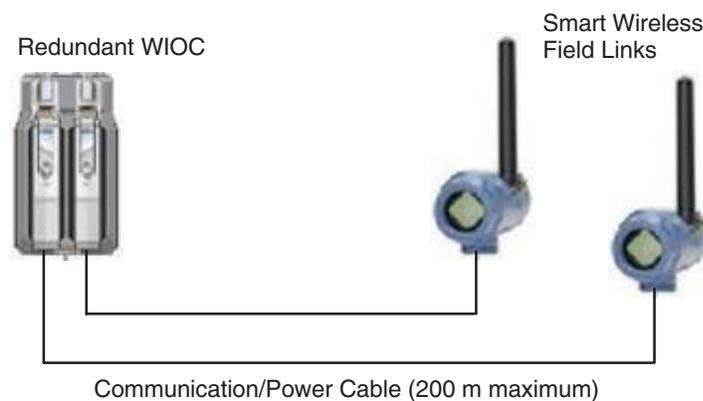
Figure 6-1 and Figure 6-2 show dimensions necessary for planning the installation of Wireless I/O cards.

**Figure 6-1: WirelessHART I/O card dimensions**



**Figure 6-2: WirelessHART I/O carrier****Note**

Connect to DC common ground, to DeltaV reference ground, and then to protective earth. Refer to *Quick Start Guide for DeltaV Power, Grounding, and Surge Suppression* for more information on grounding control systems.

**Figure 6-3: WIOC/Smart Wireless field link wiring**

## General recommendations for wireless I/O cards

There are three main features of the WIOC that differentiate it from the Smart Wireless Gateway (Rosemount 1420):

- The WIOC can have a redundant interface to the wireless network eliminating a single point of failure
- The WIOC has a remotely mounted antenna for flexible installation and easier maintenance
- Wireless devices can be assigned to any one of 4 controllers

WirelessHART devices connected to a WIOC are treated in the same manner as wired HART devices, with the exception of the scaled 4-20 mA HART Field Value. Each device is assigned to a controller and can be referenced by control modules or directly by Operator Stations as a SCADA tag.

### Note

There are several WirelessHART discrete devices currently available. They use the standard HART variables to report the field contact status (1.0 - Closed/ 0.0 - Open). DeltaV treats these values as Analog signals, not as Discrete signals.

The WIOC is defined with a unique Network ID and Join Key, assigned by DeltaV that defines a single mesh network. Devices are assigned to a network by configuring them with the appropriate Network ID and Join Key. To assign this information to a device, the user must connect to it with either to a 375/475 Field Communicator, or via the AMS Device Manager Server Plus Station using a HART Modem.

### Note

It is recommended that the HART modem be included to enable the AMS Suite configuration tools. A field communicator is a minimum requirement to support field devices and should always be available.

HART variables are always in engineering units and are suitable for display directly on a process display or for recording in the Continuous Historian database. Referencing these signals as SCADA tags allows additional data to be displayed to the operator without adding DST licensing cost. If one of the HART variables is referenced in a control module, the other variables can also be brought into the same module to give them context and add alarming or secondary processing without any additional licensing cost.

WirelessHART devices can expand the amount of process data with minimal installation costs. The wiring infrastructure is eliminated, allowing installation in process locations that would be costly, or difficult to wire. Wireless devices can sit alongside wired devices, providing supplemental data for more informed operator decisions or for regulatory compliance. Consider using SCADA functionality to minimize DST licensing costs. Remember that SCADA tags are not available for simulation in the virtual controller, since they are not part of control modules.

When commissioning a wireless node, DeltaV provides tools to reconcile the database configuration to the actual devices installed in the field. The device long tag is read and compared to existing device placeholders, along with the device types to auto commission devices. By limiting the device long tag to 16 characters, the DeltaV Device Tag and the device long tag can match. DeltaV can reconcile device tags and also allows the user to write the DeltaV tag to the device. It is recommended that the device long tag and DeltaV device tag be the same, or follow a consistent tagging convention to avoid confusion. The device long tag is supported for HART 6 and HART 7 devices.

## Basic WirelessHART I/O card network design

Two or more wireless field networks can physically overlap. The direct sequence spread spectrum, channel hopping, temporal and spatial diversity virtually assure coexistence between multiple networks in close proximity to one another.

When planning the wireless network, you need to determine the update rate requirements for the devices and determine how many WirelessHART IO cards to purchase. The standard device update (burst) rates are 4, 8, 16, 32 and 60 seconds. A quick calculation can be made based on these rates, but final performance is dependent on the physical installation.

For each wireless device in the network, divide by its configured burst rate to determine the packet count per second for that device. The total of all the devices on the network should be no greater than 12.5 packets per second.

$$\sum \text{Device/Update\_rate} = \text{Packets per Second}$$

This provides sufficient margin for the Network Management software to adjust individual device update rates as needed to ensure reliable communication through the available communication paths of the network. There are additional installation considerations such as distance between devices and distribution of devices, but keeping the packet rate below 12.5 during early design will greatly help in avoiding installation issues.

The following table shows the maximum number of devices allowed for different wireless update rates. Device update rates should be set as slow as possible to meet the process requirements while maximizing battery life.

**Table 6-1: Maximum number of devices on a wireless network**

Average Wireless Update Rate	WIOC Network
4 seconds	50
8 seconds or longer	100

Most devices do not allow their update rate to be faster than once every 4 seconds. A few devices can be special ordered for 1 second updates. In these special applications, extra care should be given to ensure the network is properly distributed. Consult the factory for assistance in these applications.

The WirelessHART Snap-on in AMS Device Manager helps in the design of a mesh network to avoid these conditions and also helps analyze the performance of the network during commissioning. There is a finite bandwidth in the network shared among the devices. A "Pinch Point", or bottleneck, can occur when many devices must use the same path to reach the Smart Wireless Field Link. A typical network has multiple transmitters that have direct line of site to the field link. These "inner" devices provide multiple paths to other devices further out in the network. The network management software will determine optimum paths for primary and alternative paths for each device so that any device failure does not affect the availability of data from any other device. Pinch Points should be avoided in order to have a robust, highly available network. Although the WirelessHART Snap on is not required to install a WirelessHART network, it can be a valuable tool to make the installation go smoothly.

You should also consider spare capacity in the network for project scope increase and desired spare capacity for future use. It is recommended to size the networks for no more than 80 devices during the project. Also consider the physical topology, understanding that devices must be within proximity of adjacent devices in the network. During installation, it may be necessary to add some devices to improve overall communications to eliminate pinch points.

Equipment autonomy may also play a role in determining what devices are suitable to share the same WIOC. The WIOC provides more flexibility by allowing devices to be assigned to any one of four controllers. This can help maximize the throughput capacity of a WIOC, but you must consider the mesh topology and process boundaries that may require separate WIOCs to meet the customers design requirements and maintenance practices.

## Smart Wireless Gateway field network

The Smart Wireless Gateway is another field access point through which WirelessHART field devices communicate their sensor values to a DeltaV system. The gateway manages the device network, securing the communication and enabling the host system to configure connected field devices. It can be extended by a smart wireless plant network and directly connected to a wireless DeltaV control network segment.

The smart wireless field network consists of WirelessHART devices communicating in a self-organizing mesh network to a Smart Wireless Gateway. Connection between the gateway and the main process can be made through wire or, if more convenient, through a wireless plant network. No RF survey is required for the WirelessHART devices, but the guidelines for WirelessHART device installation must be followed.

## Smart Wireless Gateway communication protocols

The communications protocols required depend on the version of DeltaV software being used:

- Version 10.3 and later - the gateway is a native DeltaV I/O node on the DeltaV control network and is assigned to a controller. It can be auto-sensed and auto-configured in the DeltaV Explorer.
- Versions 9.3 and earlier - the gateway can be set up to communicate through Modbus Serial I/O, Modbus TCP/IP I/O, or the gateway's OPC Server. In the case of OPC, the OPC Mirror can also be used to map device data from the Smart Wireless Gateway to the DeltaV OPC Server control modules.

The Smart Wireless Gateway comes configured with the DeltaV Commissioner and HART Port protocols enabled. This configuration is done for you when you order model VE4041Exxx series.

For installation of a Smart Wireless Field Network to any legacy control system, the gateway is also able to communicate through Modbus Serial I/O, Modbus TCP/IP I/O, or the gateway's OPC Server.

## Modbus serial protocol

The Smart Wireless Gateway includes an RS485 port which can be connected to a DeltaV system using a serial card. The card contains two ports which can be configured as RS485, allowing up to 16 gateways connected in multidrop fashion. The serial card is configured as the master with gateways as slaves.

The serial card is limited to 16 datasets per port and each dataset can have up to 100 Modbus registers. This limits the number of devices or variables which can be connected through a single port. For example, if multiple gateways are connected in multidrop to a port and if each transmitter has multiple registers associated with it, there is a significant risk of running out of registers when simply transferring information of only a couple of gateways since each gateway can have up to 100 transmitters.

## Modbus TCP/IP protocol

To use Modbus TCP/IP Protocol, a Mynah Virtual I/O Module (VIM) card is necessary. The card is connected to any Modbus TCP/IP device in a DeltaV system. To setup parameters in the VIM card, VIMNet software is required. This software can be purchased from Mynah Technologies. See [www.mynah.com](http://www.mynah.com) for information about Mynah products.

The VIM card allows for the connection of several Modbus TCP/IP devices into a DeltaV system in multidrop fashion. Since a DeltaV controller treats the VIM card as a DeltaV serial card, the same limitations apply as noted for Modbus Serial Protocol concerning the amount of registers allowed by a DeltaV controller.

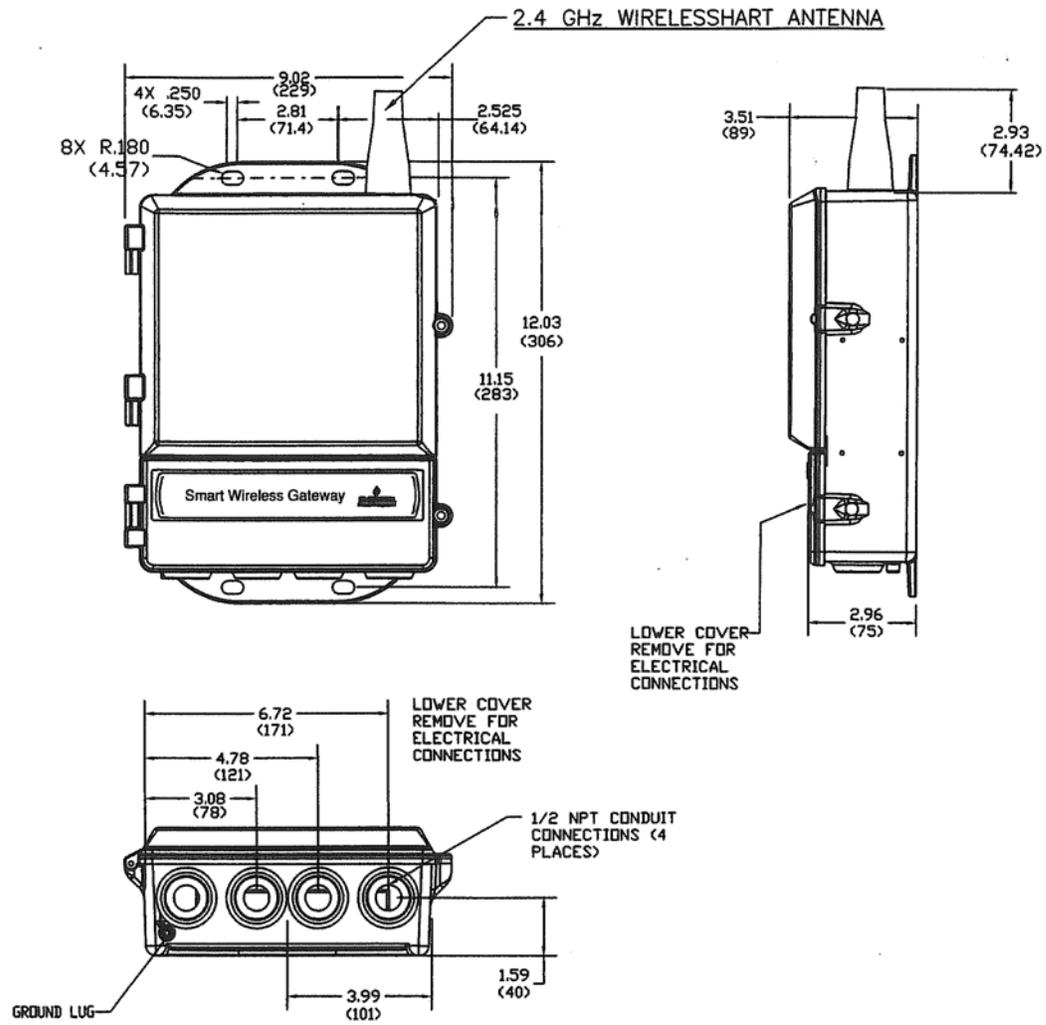
## OPC DA

For OPC DA, a separate network must be set up to connect a gateway to an OPC DA server. The server resides on an DeltaV Application or ProfessionalPLUS workstation. In addition, an OPC DA server (available on the installation disk included with the gateway) must be installed in the gateway.

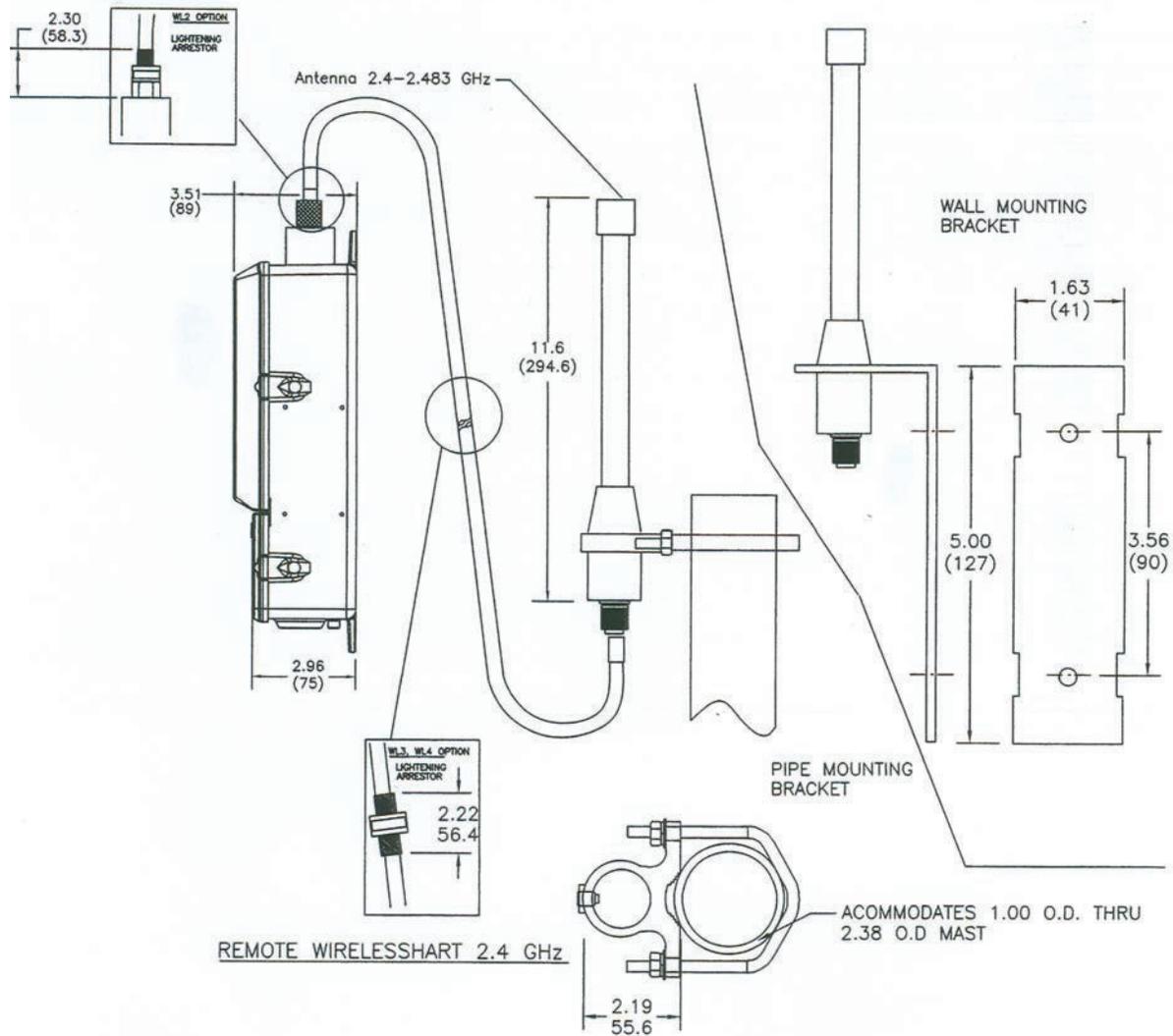
## Smart Wireless Gateway installation dimensions

*Figure 6-4* and *Figure 6-5* show dimensions necessary for planning both the gateway mounting and its antenna mounting.

Figure 6-4: Outline dimensions for Smart Wireless Gateway mounting



**Figure 6-5: Outline dimensions for Smart Wireless Gateway antenna mounting**



## Basic Smart Wireless Gateway network design

Two or more wireless field networks can overlap. The direct sequence spread spectrum, channel hopping, temporal and spatial diversity virtually assure coexistence between multiple networks in close proximity to one another.

It is important to avoid overloading wireless networks. The following table shows the maximum number of devices allowed on the two network types for different wireless update rates.

**Table 6-2: Maximum number of devices on a wireless network**

Average Wireless Update Rate	Smart Wireless Gateway Network
4 seconds	25
8 seconds	50
32 seconds	100

## Using AMS Device Manager with wireless networks

The AMS Device Manager device dashboard and configuration dialogs can be accessed from DeltaV once the device is communicating in the mesh network.

If AMS Device Manager is licensed, AMS Device Manager applications, including the hierarchical view, are available. Licensing is required to assign the Network ID and Join Key through the AMS Device Manager HART modem connection. AMS Device Manager is not a mandatory software requirement for using wireless devices with the DeltaV system, but is recommended to realize the full asset management capabilities.

How AMS Device Manager is used with wireless networks depends on the version of DeltaV software being used.

### Version 11.3

With DeltaV v11.3 systems HART alerts from WirelessHART devices on both WIOC and Wireless Gateway networks (with the DeltaV interface) are passed directly to an AMS Device Manager, eliminating the need for a separate Ethernet network or other connection. AMS Device Manager version 11.0 (or later version 11 release) is required.

### Version 10.3

With DeltaV v10.3 systems HART alerts from WirelessHART devices on Smart Wireless Gateway networks (with the DeltaV interface) are passed directly to an AMS Device Manager, eliminating the need for a separate Ethernet network or other connection. AMS Device Manager version 10.5 or 11.0 (or later version 11 release) is required.

### Version 9.3 and earlier

When connecting DeltaV v10.3 systems with a gateway using Modbus Serial Protocol or Modbus TCP/IP Protocol, a separate connection is required to connect the gateway to AMS Device Manager server. When using Modbus 485 (with serial protocol) to connect to a DeltaV v9.3 or earlier system, any of the gateway ports can be used. When using TCP/IP protocol, one port is used for the gateway and the other port is used to communicate to the AMS Device Manager server. AMS Device Manager version 9.0, version 10.5, or version 11.0 (or later version 11 release) is required for use with DeltaV v9.3.

For OPC DA, the connection is already made to the Application or ProfessionalPLUS workstation containing the AMS Device Manager server. If the AMS Device Manager server is not located in the same workstation as OPC DA, the connection must be extended to the machine which has the OPC DA server.

With these connections, AMS Device Manager contains two networks: The DeltaV network with HART and field devices and the gateway network to display wireless devices. It is important to remember that the Alert Monitor from Device Manager will consolidate the alarms of both networks.

## AMS Wireless SNAP-ON

The AMS Wireless SNAP-ON can be added to AMS Device Manager and used for offline design checking prior to installation of a wireless project. A bitmap image representing the location plan of the area where the network is to be installed can be imported into the SNAP-ON and scaled. This can be an engineering drawing or even an aerial or satellite photo. The locations of wireless devices used in the process are almost always fixed by the mechanical design of the plant with little or no discretion given to the wireless network designer. This information be entered into the AMS Wireless SNAP-ON, resulting in icons paired with device tag names. These need to be the same tag names used in the network (to work correctly in live mode).

The AMS Wireless SNAP-ON lets the designer set a number of design rules and parameters. It will then test the network topology against these rules and make suggestions for fortifying the network. Different gateway locations can be experimented with as well.

Thus the offline design can be determined. The resulting configuration can be saved and taken to the plant for live monitoring and graphic display using the same drawings and data entered during the offline engineering phase of the project. This display can be used for identifying problem areas during start-up so minor corrections (e.g. WirelessHART field devices to fortify the network) can be made if necessary.

The DeltaV alarms and alerts can detect loss of communication from a device if it occurs. The Wireless SNAP-ON can help troubleshoot the source of any loss of communication should it occur.

## Ordering equipment

For ordering information on WIOCs and Smart Wireless Gateway components, refer to their product data sheets.

The quantities of parts to order should follow standard rules for calculating spares. Factor in that the shelf life of the batteries is about 10 years. Spares can be shared across multiple units in the plant, or in multiple plants if operated in fleets.

Be sure that once the maximum number of devices has been determined for a particular wireless network that spares are factored in. 20-25% is a typical range for percent spares.

For information on the WirelessHART field devices available refer to the DeltaV website.

Field tools needed by the plant technical services department include a 375 Field Communicator or a 475 Field Communicator. Be sure to have it upgraded to include the Device Descriptions for wireless devices. The communicator is required to assign the Network ID and Join Key to devices.

If field devices are to be configured in the instrument shop, it is helpful to have a HART modem to use along with AMS Device Manager.

It could be helpful to have access to a laptop computer with an Ethernet crossover cable and browser software that is JavaScript enabled.



# 7 Safety Instrumented Systems

## Topics covered in this chapter:

- [DeltaV SIS Process Safety Systems overview](#)
- [SLS 1508 Logic Solver Systems](#)
- [CHARMs Smart Logic Solver \(CSLS\) systems](#)

## DeltaV SIS Process Safety Systems overview

DeltaV SIS hardware and software is used to install, configure, and operate a system to implement a safety instrumented system in conjunction with sensors and final elements to take a process to a configured safe state when hazardous conditions occur. There are two types of DeltaV safety instrumented systems:

- SLS 1508 Logic Solver systems
- CHARMs Smart Logic Solver (CSLS) systems

The two hardware types are different, and their physical installation and configuration in DeltaV Explorer is different, but both provide similar functionality to implement safety instrumented systems.

## SLS 1508 Logic Solver Systems

A DeltaV SLS 1508 Logic Solver System consists of:

- Smart Logic Solvers (SLS) with I/O termination blocks
- SISNet Repeaters
- SISNet Repeater Carrier for use with VerticalPLUS I/O Interface Carriers
- SISNet Distance Extenders
- Local Peer bus extender cables
- Right one-wide carriers for use with Horizontal I/O Interface Carriers
- Terminators
- Optional Devices

SISNet Domains allow the creation of large DeltaV SIS networks containing multiple fiber optic rings. Each ring can contain multiple domains. For more information on SISNet Domains refer to *DeltaV Books Online*.

*Figure 7-1* illustrates an example SLS 1508 System integrated with a DeltaV distributed control system. As shown in the figure, the safety instrumented system can include SLS 1508 equipment in remote locations.

The figure also shows DeltaV SLS 1508 equipment mounted on Horizontal I/O Interface Carriers. DeltaV SIS equipment can also be mounted on VerticalPLUS I/O Interface Carriers. See [Using vertical I/O carriers](#) in this chapter for information on using DeltaV SIS components on VerticalPLUS carriers.

## Smart Logic Solvers

Smart Logic Solvers (SLS) contain the logic solving capability of the SLS 1508 system and provide an I/O interface for up to any 16-channel combination of Analog Input (HART), Discrete Input, and Discrete Output. SLSs and termination blocks mount on 8-wide horizontal I/O carriers or VerticalPLUS I/O carriers. SLSs mount in odd numbered slots (1,3,5,7). Simplex SLSs take two slots and redundant SLSs take four slots.

Analog Input (HART) and Discrete Input are standard DeltaV I/O specification. Discrete Output can be voltage (0 and 24 VDC) or current (4 and 20 mA) for full valve stroke. The current output may also be configured for 0 mA. The current output includes built-in HART capability for partial stroke testing. Hart is not used otherwise.

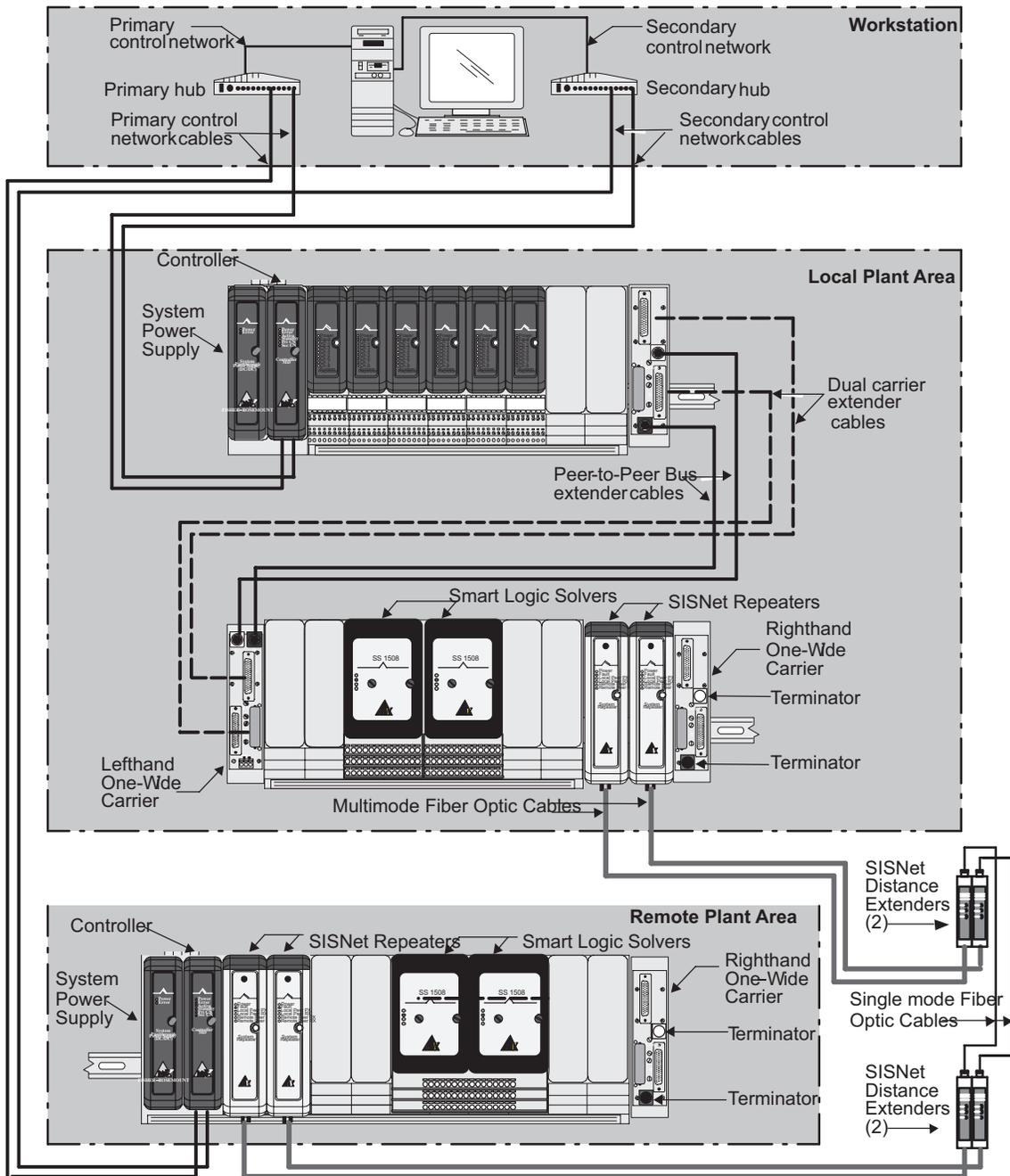
SLSs communicate with each other over a two-channel, peer-to-peer bus. The bus uses the railbus on the I/O carrier backplane and can be extended to SLSs on other carriers by peer-to-peer extender cables.

## SISNet Repeaters

When one controller (or set of redundant controllers) is used for the local and remote SLSs, SISNet Repeaters and fiber-optic cable provide ring-type, global-broadcast communication between local SLSs and SLSs scattered across two or more I/O subsystems. There is one SISNet Repeater pair for each I/O subsystem carrier. Up to 32 simplex SLSs or 16 redundant SLSs can be connected on the fiber-optic ring.

SISNet Repeaters mount in pairs (for redundancy) on 2-wide repeater carriers [9.5 cm (3.8 in) wide]. Although this carrier is the same width as a power/controller carrier, it is *not* interchangeable with the power/controller carrier. For further information, including allowable fiber-optic cable length, see the manual *Installing Your DeltaV SIS Process Safety System Hardware*.

Figure 7-1: Safety Instrumented System integrated into a DeltaV system



## Workstation communication

An certain hardware revisions of the MD controller, an MD Plus controller, or an MX controller provides the communications link to the workstation via a DeltaV control network. Local SLSs are connected to the local controller and remote SLSs are connected to remote controllers, as shown in the figure. It is highly recommended that fiber-optic cable be used in the control network between the remote controller and the workstation.

## SISNet distance extenders

SISNet Distance Extenders allow fiber optic extensions between SISNet Repeaters of up to 20 km (nominal) beyond the limitations of multimode fiber optic cable. The extenders mount directly on DIN-rail wherever it can be conveniently located (within environmental specifications) and are powered from field 24 VDC.

Single mode fiber optic cable connects local and remote extenders. Two extenders are used for each cable; one at each end. Redundant extensions use four extenders as shown in [Figure 7-1](#).

## Using horizontal I/O carriers

Left-hand and right-hand one-wide cable carriers provide connectors for the redundant peer-to-peer bus extender cables. The cables require proper electrical impedance termination which is accomplished with two terminators at the right-hand one-wide carrier on the farthest I/O horizontal carrier. Horizontal cable carriers are each 42 mm (1.6 in) wide.

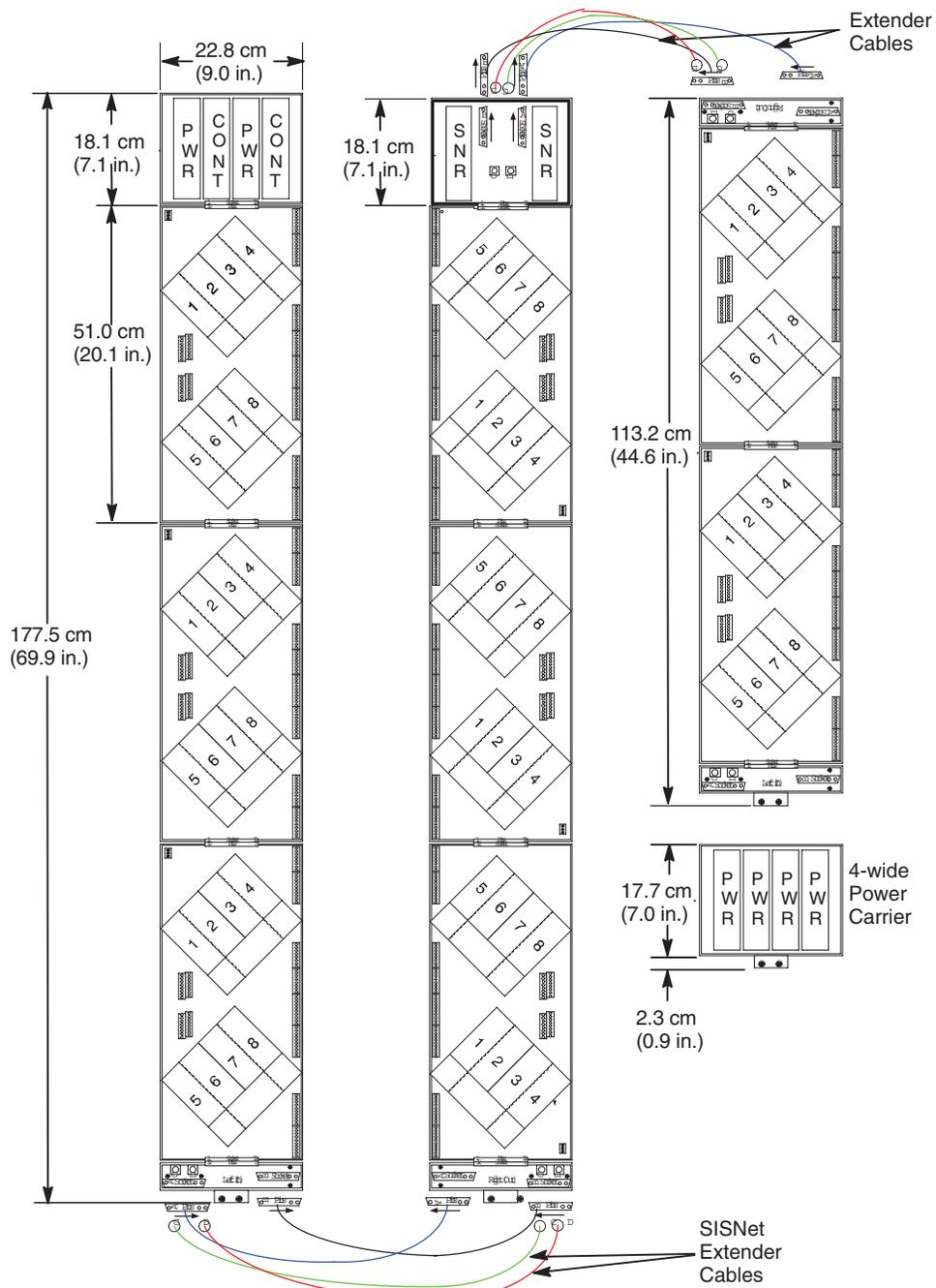
Dual carrier extender cables connect railbus power and signals between carriers. The cables connect to the same left-hand and right-hand one-wide cable carriers as the peer-to-peer bus extender cables. SLSs are powered by a 24VDC power supply that is separate from the DeltaV controller and I/O power supply.

## Using vertical I/O carriers

SLS 1508 equipment can be mounted on VerticalPLUS I/O carriers; not Legacy Vertical carriers. With VerticalPLUS I/O carriers, you can connect DeltaV SIS systems, such as local and remote, by SISNet Repeaters mounted on 4-Wide VerticalPLUS SISNet Repeater Carriers as shown in [Figure 7-2](#). SISNet repeaters are not needed unless you need to connect to another DeltaV SIS system.

In the figure, note the extender cable connections. In SLS 1508 systems, carrier extender cables and SISNet Repeater extender cables are required between the left and right carriers. You may use only one carrier extender cable, but you must use both SISNet Repeater extender cables for redundancy. The repeater carrier is always mounted above the cable extender card (left-hand card) used with a right-hand vertical carrier. SISNet extender cables are one meter long.

**Figure 7-2: Dimensions and extender cables with SISNet repeaters on VerticalPLUS I/O carriers**



## Optional devices

The following items can be added to a DeltaV SIS system.

## End-of-Line resistor module for discrete in

End-of-Line Resistor Modules for Discrete In are used for Line Fault Detection. Line Fault Detection must be turned on during system configuration and must include one End-of-Line Resistor Module in each line pair between an SLS and the discrete input field device where line fault detection is desired.

## RC compensator for discrete out

An RC Compensator is used for large inductive loads on SLS Discrete Outs when Line Fault Detection is turned on. It is not required otherwise. In addition, even when Line Fault Detection is turned on, it is only used if the inductive load is greater than 0.8H simplex or 0.3H redundant. A compensator does not assist in driving inductive loads; it only compensates for line fault detection distortion caused by large inductive loads. Install the RC Compensator at the field device.

## Dual channel voltage monitor

The Dual Channel Voltage Monitor can be used to drive a Logic Solver's discrete input channel based on the output of the Safety Relay Module. Each monitor can handle two DI channels.

## Current limiter

The Current Limiter limits the current from SLS discrete output channels to levels below the ignition curves for Class 1, Div 2 and Zone 2 installations. Each limiter can handle four DO channels.

## Relay DTA module and relay diode module

Often used for fire and gas applications, but also usable elsewhere, the Relay De-energize-to-Activate (DTA) Module is an inverting unit which energizes a field device when a Logic Solver output to the DTA module is turned OFF. The power supplied to the module for the field device is 24 VDC. Two 24 VDC inputs are included for redundant power. The DTA module is single channel.

The Relay Diode Module is paired with the Relay DTA Module to perform required functions, such as monitoring field wiring when not actuated. The diode module contains a switch to change between energize-to-activate (ETA) and De-energize-to-Activate (DTA).

## Safety relay module

For safety applications, the Safety Relay Module lets a DeltaV SIS discrete output signal switch (open or close) the connection between either one AC source and its AC field device or two DC sources and their DC field devices. Relay current rating is 2.5 A at 250 VAC. The safety relay module is single channel.

## Licensing for SLS 1508 systems

Implementing a SLS 1508 system requires an activation license. If DeltaV SIS and DeltaV BPCS run on the same ProfessionalPLUS Station, use license model number VS1508. If DeltaV SIS runs on its own ProfessionalPLUS Station, use license model number VS1509.

## CHARMs Smart Logic Solver (CSLS) systems

A CHARMs Smart Logic Solver System consists of:

- CHARMs Smart Logic Solvers
- CHARMs Smart Logic Solver Carriers
- CHARMs Smart Logic Solver Power Modules
- Local Safety Network Bridges
- SZ Controllers
- SZ Controller Carriers
- Ethernet Isolation Ports
- Baseplates
- LS CHARMs
- LS CHARM Column Terminators
- LS CHARM Column Extenders and cable

In a CSLS SIS system, communication occurs over the DeltaV Area Control Network and a Local Safety Network. The DeltaV Area Control Network is an Ethernet network that enables communication between the nodes in a DeltaV network. SZ Controllers connect to the Area Control Network (as well as to the Local Safety Network) and isolate the CHARMs Smart Logic Solvers (CSLS) from the rest of the DeltaV system.

The Local Safety Network is a Ethernet network that enables communication between CSLSs and a single SZ Controller. The CSLSs communicate secure parameter and input data to other CSLSs over the Local Safety Network. The SZ Controller communicates configuration, parameter changes, and module data over the Local Safety Network to the CSLSs. SZ Controllers provide the DeltaV interface to multiple CSLSs on the same Local Safety Network. All CSLSs under one SZ Controller share the same Local Safety Network. When it is necessary for a CSLS in one Local Safety Network to communicate secure data to a CSLS in another Local Safety Network, two or more Local Safety Networks can be connected with Local Safety Network Bridges to form a Global Safety Network.

---

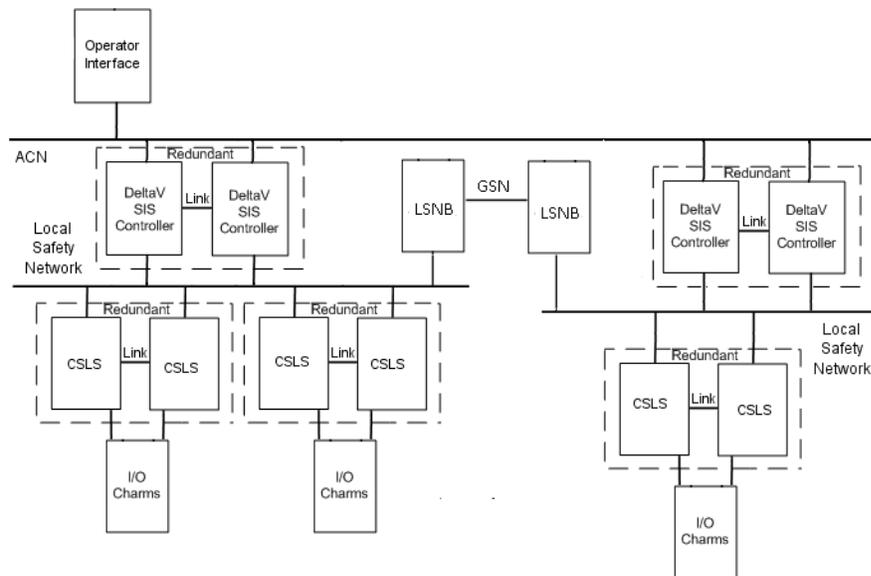
### Note

The Local Safety Network must be treated as a dedicated standalone Local Area Network (LAN) and must not be connected to any other network including other DeltaV Local Safety Networks. Other than switches and DeltaV nodes, no other network devices should be connected to the Local Safety Network.

---

The following figure shows an example CSLS system implementation. The schematic shows two redundant SIS Controllers, each with its Local Safety Network. One of the networks has two redundant CSLSs and the other has one redundant CSLS. The two Local Safety Networks are connected by Local Safety Network Bridges to form a Global Safety Network.

**Figure 7-3: CSLS SIS network example**



## CHARMs Smart Logic Solvers

CSLS process LS CHARM signals and run the SIS modules that contain the safety system logic. Redundant CSLS can support up to 96 LS CHARMs. CSLS mount on CHARMs Smart Logic Solver Carriers and connect to the Local Safety Network through connectors on the carriers. The CSLS receives redundant 24 VDC input power from the CHARMs Smart Logic Solver Carrier. A physical keylock switch on the CHARMs Smart Logic Solver Carrier along with an unlock software function restricts how and when the CSLS can be unlocked for downloads and upgrades.

## SZ Controllers

SZ Controllers (SIS controllers) mount on the SZ Controller Carrier and connect to the Area Control Network and the Local Safety Network through ports on the carrier. SZ Controllers isolate CSLS from the rest of the system. SZ controllers receive redundant 24 VDC input through the carrier. An optional Modbus TCP port on the carrier enables an SZ controller to support standalone SIS installations. By default, SZ Controllers communicate to the DeltaV system over the redundant Area Control Network (ACN).

## Local Safety Network Bridges

Local Safety Network Bridges (LSNB) connect Local Safety Networks under different SZ Controllers so that secure parameters can be passed between CHARMs Smart Logic Solvers on different Local Safety Networks. Local Safety Network Bridges mount on Dual Universal Safety Carriers that house redundant connections to the Local Safety Network and to the Global Safety Network.

## Ethernet Isolation Ports

The SZ Controller Carrier houses a primary and secondary Ethernet Isolation Port (EIP). Each EIP consists of an Area Control Network port for connections to the DeltaV Area Control Network and a Safety Network port for connections to the Local Safety Network. The secondary Area Control Network port also functions as a Modbus TCP port. The EIPs are removable.

## CHARMs Smart Logic Solver Carriers

CSLS Carriers are DIN rail-mounted carriers that hold redundant CSLS and Power Modules and connect to the baseplates holding Logic Solver (LS) CHARMs. The CSLS Carrier provides 24 VDC input to the CSLS and to the Power Modules. The Power Modules provide 6.3 VDC to the LS CHARMs. The CSLS Carrier houses primary and secondary Safety Network Ports for connections to the Local Safety Network and a keylock switch that restricts how and when the CSLS can be unlocked for downloads and upgrades.

## Dual Universal Safety Carriers

Dual Universal Safety Carriers are horizontal DIN rail-mounted carriers that hold redundant Local Safety Network Bridges or SZ Controllers. The Dual Universal Safety Carrier houses primary and secondary Ethernet Isolation Ports for connections to the Global Safety Network and Local Safety Network when used with Local Safety Network Bridges and connections to the DeltaV Area Control Network and the Local Safety Network when used with SZ Controllers.

## Baseplates

CHARM Baseplates hold Logic Solver CHARMs (LS CHARMs) and I.S. Baseplates hold LS Intrinsically Safe CHARMs. The baseplates connect to the CSLS Carrier and to other baseplates through connectors on the baseplates. The baseplates hold the terminal blocks for the LS CHARMs and an Address Plug that determines the address of the baseplate and the LS CHARMs installed on the baseplate. The baseplates can hold a maximum of 12 LS CHARMs in simplex and redundant terminal blocks.

## Logic Solver (LS) CHARMS

LS CHARMS are single I/O channels that plug into the LS CHARM Terminal Blocks on the CHARM Baseplate. The DeltaV system supports analog input, AC or DC discrete input, discrete output (including LS DO redundant DTA and LS DO redundant ETA CHARMS), LS DVC HART simplex and redundant DTA, power output, thermocouple and RTD input, and voltage LS CHARMS as well as LS Intrinsically Safe analog input and discrete input CHARMS.

### Logic Solver (LS) CHARM classes

The following table lists the available LS CHARM classes and types.

**Table 7-1: LS CHARM classes and available types**

Class	Available type
AI	LS AI 0-10 VDC isolated LS AI 4-20 mA HART LS AI 4-20 mA HART (I.S.)
DI	LS DI 24 VDC isolated LS DI 120 VAC isolated LS DI 230 VAC isolated LS DI 24 VDC low-side (dry contact) LS DI NAMUR CHARM LS DI NAMUR (I.S.)
DO	LS DO 24 VDC DTA LS DO 24 VDC (Redundant DTA) LS DO 24 VDC ETA CHARM LS DO 24 VDC (Redundant ETA)
DVC	LS DVC HART DTA LS DVC HART (Redundant DTA)
Power	LS 24 VDC Power CHARM
RTD	LS RTD / Resistance input LS RTD / Resistance input (I.S.)
Thermocouple / mV input	LS Thermocouple / mV input LS Thermocouple / mV input (I. S.)

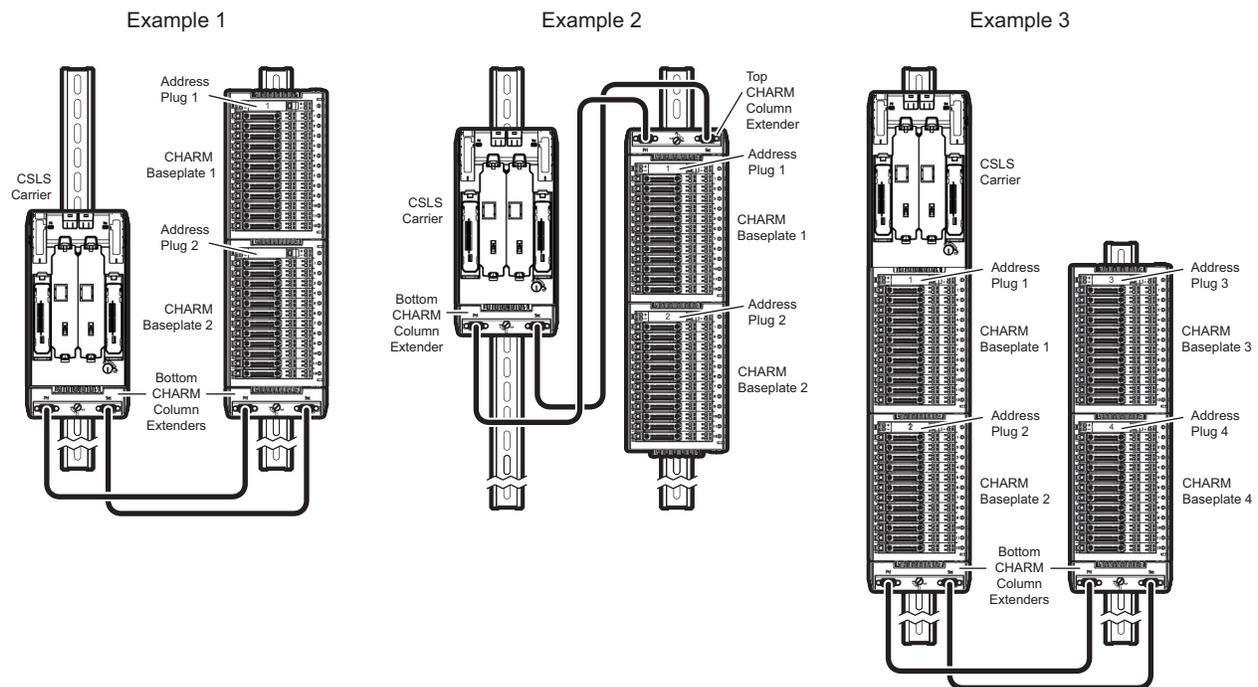
### Terminators and extender cables

The CHARM Column Terminator terminates the redundant bus and provides terminals for connecting the baseplates to shield ground. It installs after the last CHARM Baseplate on the DIN rail.

The CHARM Column Extenders are used to extend the power and communications buses when CHARM Baseplates in a 96 CHARM system are installed on multiple DIN rails. The bottom column extender can be connected to a CHARMs Smart Logic Solver (CSLS) Carrier or to a baseplate depending upon the physical location of the carrier and the baseplate. The top column extender can be connected to baseplates only.

Three cable lengths are available for use with the extenders: 0.5 meters, 1.0 meters and 2.0 meters. A maximum of four extender pairs can be used and only one extender pair can exceed 0.5 meters.

**Figure 7-4: Example installation using column extenders**



## Licensing for CHARMs Smart Logic Solver systems

Implementing a CHARMs Smart Logic Solver (CSLS) system requires an activation license. If DeltaV SIS and DeltaV BPCS run on the same ProfessionalPLUS Station, use license model number VS1508. If DeltaV SIS runs on its own ProfessionalPLUS Station, use license model number VS1509.



# 8 Power Supplies

## Topics covered in this chapter:

- *Power supply types*
- *S-series system power supplies*
- *M-series system power supplies*
- *Bulk power supplies*
- *Intrinsically safe system power supply*
- *Selecting uninterruptible power supplies*

## Power supply types

DeltaV systems use two types of power supplies:

- system power supplies mount directly on DeltaV Power/Controller 2-wide carriers to power DeltaV controllers and I/O subsystems
- bulk power supplies that supply power to system power supplies and/or field devices.

## S-series system power supplies

S-series hardware has been designed to be powered by 24 VDC bulk power. The SE5009 DC/DC system power supply accepts bulk 24 VDC power and generates 5 VDC for an adjacent controller and 12 VDC for powering IO Cards.

### SE5009 DC/DC dual system power supplies

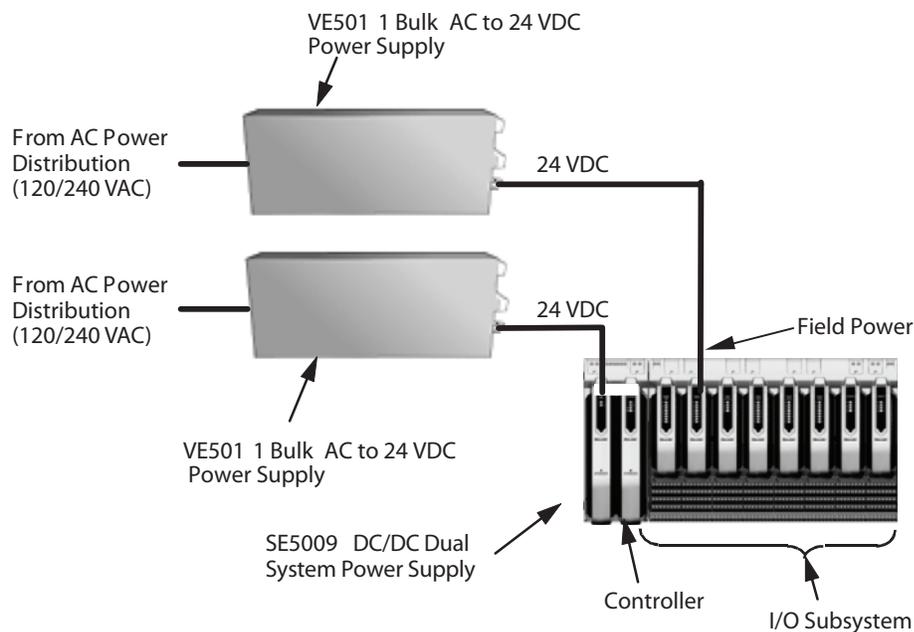
The SE5009 DC/DC System Power Supply is typically used in DeltaV systems with controllers and their associated I/O subsystems.

The SE5009 accepts 24 VDC input and provides power to the controller and its associated I/O subsystem. The power supply is mounted directly to the left of the controller on a 2-wide power/controller carrier. When the supply is operated on 24 VDC, it is rated at 8 Amps up to 60°C (linearly derated to 6 Amps at 70°C) LocalBus current. [Figure 8-1](#) illustrates a possible setup.

A system may require more than one SE5009. Three factors determine how many are needed: 1) the use of simplex or redundant controllers, 2) the type and quantity of I/O cards used with the controller, and 3) redundant power requirements for the I/O cards. Additional SE5009 power supplies are mounted to the left of the controller on additional carriers.

Limits exist to the amount of current a carrier can handle. The limit for S-series Horizontal and M-series vertical I/O carrier is specified at 15 Amps. The number and type of I/O cards installed under a controller determines the total LocalBus power required. Most controllers with 64 I/O cards will draw less than 15 Amps and system power supplies can be installed along side the controller 2-wide carriers. The PCI card and TC/mV cards, along with the Bus type cards draw more power and could exceed the 15 Amp limit. When this happens, additional system power supplies can be installed in line with 8-wide I/O carriers to provide supplemental power for the balance of the cards. See the manual *DeltaV™ M-series Hardware Installation and Reference*, for further details about M-series horizontal and vertical carrier capabilities and the *DeltaV S-series and CHARMS Hardware Reference* manual for S-series carrier capabilities.

**Figure 8-1: S-series SE5009 DC/DC system power supply**



## Using multiple system power supplies

There are several ways to add multiple S-series system power supplies for providing adequate power to many I/O cards in a large DeltaV system. These ways are described in the *DeltaV S-series and CHARMS Hardware Reference* manual.

## M-series system power supplies

Two system power supplies are available: VE5001 AC to DC System Power Supply which operates from 120 or 240 VAC and VE5009 DC/DC Dual System Power Supply which operates from 12 or 24 VDC.

## VE5001 AC to DC system power supply

The VE5001 AC to DC System Power Supply, illustrated in [Figure 8-2](#), is typically used in small DeltaV systems where a single-controller with a limited number of I/O is required. This supply is available in M-series only.

---

### Note

This supply is available for M-series controllers only; not for S-series controllers.

---

The supply provides up to 2.1 A LocalBus current, enough to power, for example:

- 8 Discrete I/O cards, or
- 8 Analog I/O cards, or
- 4 Serial I/O cards, or
- 4 Series 2 H1 cards

The VE5001 accepts 120 or 240 VAC and provides power to a controller and its associated I/O subsystem. The power supply is mounted directly to the left of the controller on a 2-wide power/controller carrier.

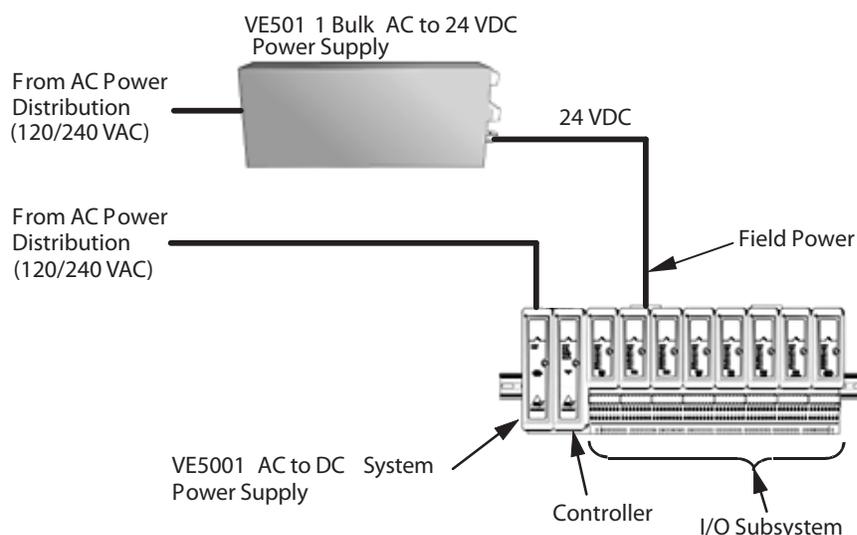
A system may require more than one VE5001. Three factors determine how many are needed:

- the use of simplex or redundant controllers,
- the type and quantity of I/O cards used with the controller, and
- redundant power requirements for the I/O cards

Additional VE5001 power supplies are mounted to the left of the controller on additional carriers. See the power supply product data sheet for output power capacity.

---

**Figure 8-2: VE5001 AC to DC system power supply**



Limits exist to the amount of current an I/O carrier can handle. The horizontal I/O carrier limit is specified at 8 Amps; the limit for either vertical I/O carrier is specified at 15 Amps. However, the VE5001 AC to DC system power supply should not be used if the power required for the I/O subsystem approaches these limits. Consider the VE5009 DC/DC Dual System power supply if more than 4 Amps of I/O subsystem power is required. See the manual *DeltaV™ M-series Hardware Installation and Reference*, for further details about horizontal and vertical carrier capabilities.

---

**Note**

Keep in mind any future expansions. If for example your system is sized using a VE5001 system power supply, and you are using two H1 cards in your present configuration, you have six empty I/O slots on the 8-wide carrier. If you are planning future expansions by adding more cards to that carrier, one VE5001 system power supply will not be sufficient. You can install additional VE5001 system power supplies; however, you may want to consider using a VE5009 power supply and a VE5011 or VE5012 bulk power supply to accommodate future expansions.

---

## VE5009DC/DC dual system power supplies

The VE5009 DC/DC Dual System Power Supply is typically used in DeltaV systems where several controllers and their associated I/O subsystems are installed.

The VE5009 accepts either 12 VDC or 24 VDC and provides power to the controller and its associated I/O subsystem. The power supply is mounted directly to the left of the controller on a 2-wide power/controller carrier. When a VE5009 is operated on 12 VDC, it is rated at 13 Amps at 60°C (linearly derated to 10 Amps at 70°C) LocalBus current. When the supply is operated on 24 VDC, it is rated at 8 Amps at 60°C (linearly derated to 6 Amps at 70°C) LocalBus current.

A system may require more than one VE5009. Three factors determine how many are needed:

- the use of simplex or redundant controllers,
- the type and quantity of I/O cards used with the controller, and
- redundant power requirements for the I/O cards.

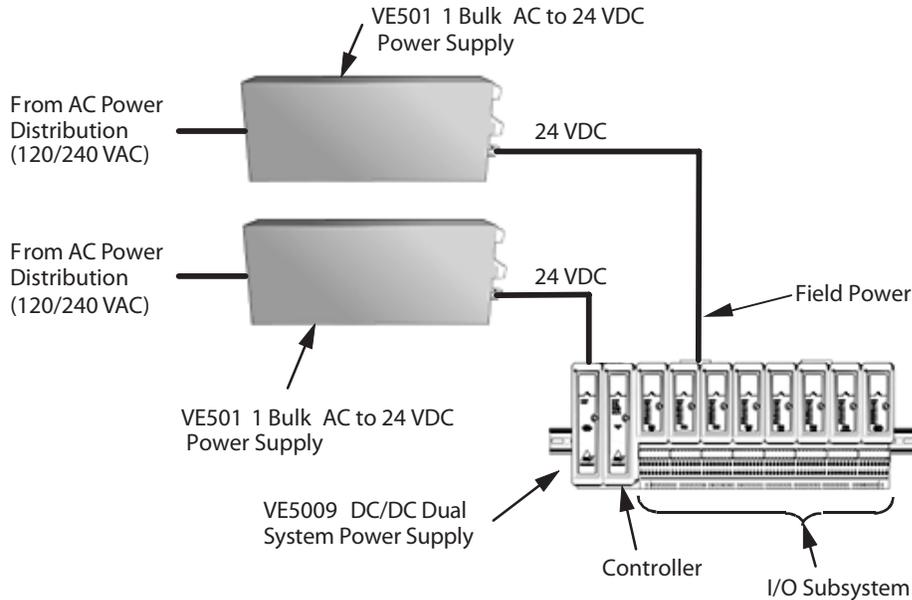
Additional VE5009 power supplies are mounted to the left of the controller on additional carriers.

Limits exist to the amount of current a carrier can handle. The M-series horizontal I/O carrier limit is specified at 8 Amps. The limit for M-series vertical I/O carrier is specified at 15 Amps. This limit can be quickly reached when many I/O cards are used, requiring carriers to be connected by extender cables. If the limit is reached, DC/DC Dual System power supplies can be mounted on power carriers to provide 12 VDC power to the power injection terminals of 1-wide extenders or vertical I/O carriers. See the manual *DeltaV™ M-series Hardware Installation and Reference* for further details about horizontal and vertical carrier capabilities.

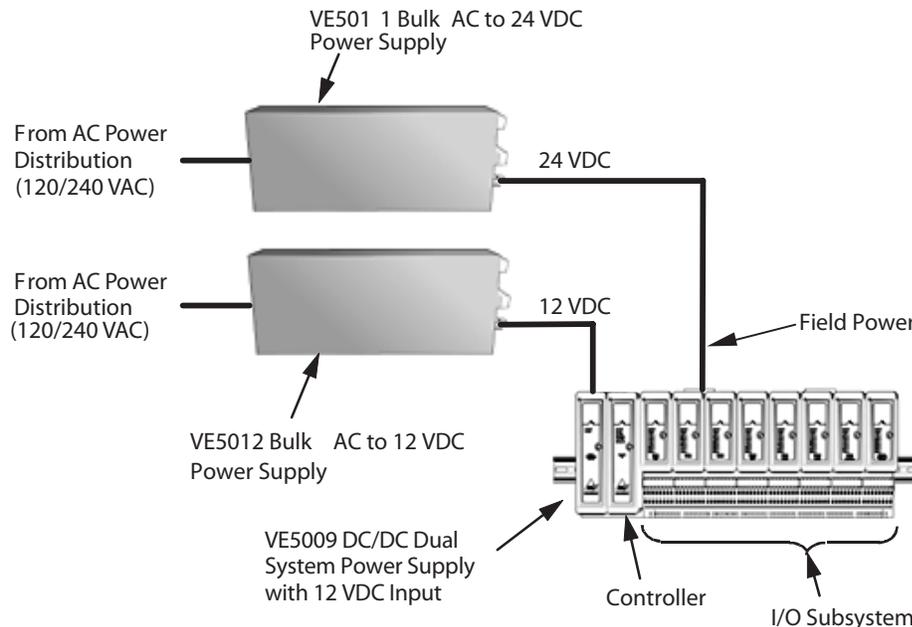
## Using multiple system power supplies

There are several ways to add multiple system power supplies for providing adequate power to many I/O cards in a large DeltaV system. These ways are described in System Power Guidelines appendix in the manual *DeltaV™ M-series Hardware Installation and Reference*.

**Figure 8-3: VE5009 DC/DC dual system power supply with 24 VDC input**



**Figure 8-4: VE5009 DC/DC dual system power supply with 12 VDC input**



## Bulk power supplies

DeltaV Bulk Power supplies and Redundancy Modules and legacy bulk power supplies are available for DeltaV systems. The following sections describe DeltaV Bulk Power supplies and legacy bulk power supplies.

### DeltaV Bulk Power Supplies

The DeltaV DIN-rail mounted bulk power supplies take 100-240 VAC and supply 12 or 24 VDC at 15, 5, 10, 20, or 40 amps to field devices and system power supplies. The following types of DeltaV Bulk Power Supplies are available:

- 100-240 VAC to 12 VDC 15 A
- 100-240 VAC to 24 VDC 5 A
- 100-240 VAC to 24 VDC 10 A
- 100-240 VAC to 24 VDC 20 A
- 100-240 VAC to 24 VDC 40 A

Refer to Books Online for specifications for DeltaV Bulk Power Supplies.

### Redundancy considerations for DeltaV Bulk Power Supplies

DeltaV Bulk Power Supplies and Redundancy Modules can be used in applications that require load sharing and redundancy. The following types of DeltaV Redundancy Modules are available:

- 12-48 VDC 20 A
- 12-24 VDC 40 A
- 12-24 VDC 80 A

Redundancy can be achieved by:

- Using an n+ power scheme where n+ refers to using one more power supply than is required for continual steady state operation. N+ redundancy schemes are typically used for high integrity field power applications.
- Powering one system power supply from one bulk power supply and the redundant system power supply from another bulk power supply.
- Combining two bulk power supplies through a redundancy module for one system power supply and a second pair of redundant bulk power supplies with a redundancy module to power a redundant system power supply. This is the highest integrity power scheme.

External diodes or other switching arrangements are required to isolate the redundant power supply outputs from each other. Refer to Books Online for more information on using DeltaV Bulk Power Supplies for load sharing and redundancy.

## Using DeltaV Bulk Power Supplies for field power

The DeltaV Bulk Power Supplies accept 100-240 VAC and supply 12 or 24 VDC with a capacity of 15, 5, 10, 20, and 40 Amps for field devices connected to the I/O subsystem. Power to field devices is isolated from power to a DeltaV I/O subsystem.

In general, AI, AO, and Dry-Contact DI cards use small amounts of current. The DeltaV Bulk Power Supplies provide enough power for approximately 40 of these types of cards. If you are supplying power to DO cards with high-side switches, you must evaluate the power requirements carefully.

Each I/O card connected to bulk field power will consume some power in its internal field circuitry in addition to the field signal power itself. Refer to the product documentation to ensure proper sizing of the bulk field power supplies. Do not simply rely on the individual field circuit requirements. For DO cards, the actual field device will determine the actual current draw under operating conditions. The maximum current capacity of the channel can be used to ensure the bulk power supplies are always adequate.

Fieldbus usage must also be considered when calculating available current for field devices. Fieldbus segments powered by a fieldbus power supply typically receive primary power from the bulk supply.

## Using DeltaV Bulk Power Supplies with the System Power Supply (24 VDC)

Use the DeltaV Bulk Power Supplies to convert 100 to 240 VAC to 12 VDC to power the System Power Supply (24 VDC). One bulk power supply can supply several system power supplies. However keep in mind the consequences of single points of failure if one bulk power supply fails.

## Legacy bulk power supplies

There are two legacy bulk power supplies available for DeltaV systems:

- The legacy VE5011 DIN-rail mounted supply takes 120 or 240 VAC and supplies 24 VDC to field devices through the DeltaV I/O subsystem.
- The legacy VE5012 DIN-rail mounted supply takes 120 or 240 VAC and supplies 12 VDC to VE5009 DC/DC Dual System Power Supplies.

## Redundancy considerations for the legacy VE5011 and VE5012

Redundancy for the legacy VE5011 and VE5012 power supplies is one-for-one; that is, one legacy VE5011 is primary and another legacy VE5011 is backup. The same is true for the legacy VE5012 supplies. The legacy VE5011 and VE5012 supplies include integrated "OR'ing" diodes, so external diodes are not required.

## Using the legacy VE5011 for field power

The legacy VE5011 bulk power supply accepts 120 or 240 VAC and supplies 24 VDC with a capacity of 12 Amps for field devices connected to the I/O subsystem (*Figure 8-2*). Power to field devices is isolated from power to a DeltaV I/O subsystem.

In general, AI, AO, and Dry-Contact DI cards use small amounts of current. The legacy VE5011 provides enough power for approximately 40 of these types of cards. If you are supplying power to DO cards with high-side switches, you must evaluate the power requirements carefully.

Each I/O card connected to the 24 VDC bulk field power will consume some power in its internal field circuitry in addition to the field signal power itself. Refer to the product documentation to ensure proper sizing of the bulk field power supplies. Do not simply rely on the individual field circuit requirements. For DO cards, the actual field device will determine the actual current draw under operating conditions. The maximum current capacity of the channel can be used to ensure the Bulk Supplies are always adequate. Fieldbus usage must also be considered when calculating available current for field devices. Fieldbus segments powered by a fieldbus power supply typically receive primary power from the VE5011 bulk supply.

To help you calculate the required system current draw, see the Power Supply Calculation Worksheets in the manual *DeltaV™ M-series Hardware Installation and Reference*.

## Using the legacy VE5012 with VE5009

Use a legacy VE5012 bulk power supply (available on M-series only) to convert 120 or 240 VAC to 12 VDC to power a legacy VE5009 DC/DC Dual System Power Supply. One legacy VE5012 can supply several legacy VE5009 supplies up to the limit of the legacy VE5012. However, keep in mind the consequences of single points of failure if one bulk supply fails.

---

### Note

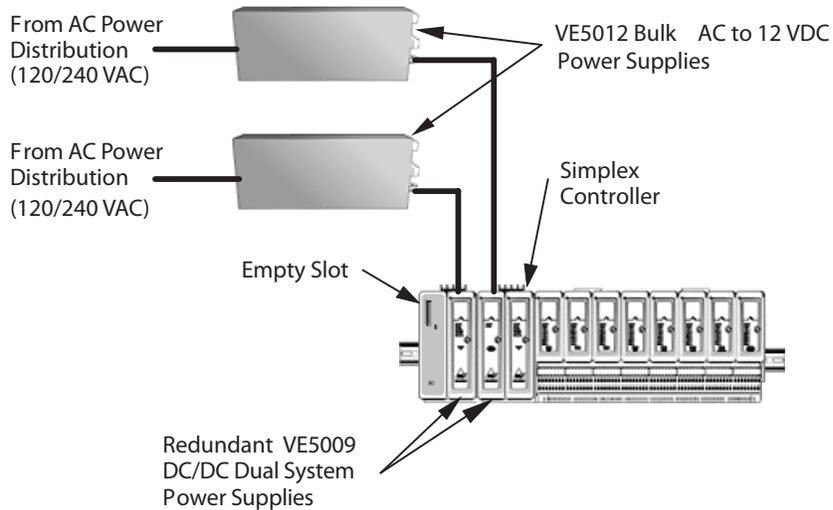
It is possible to use the legacy VE5011 with a legacy VE5009, but because the legacy VE5009 has a higher current output with 12 VDC input than with 24 VDC input, the legacy VE3012 power supply is recommended.

---

## Redundancy considerations for the legacy VE5012 and VE5009

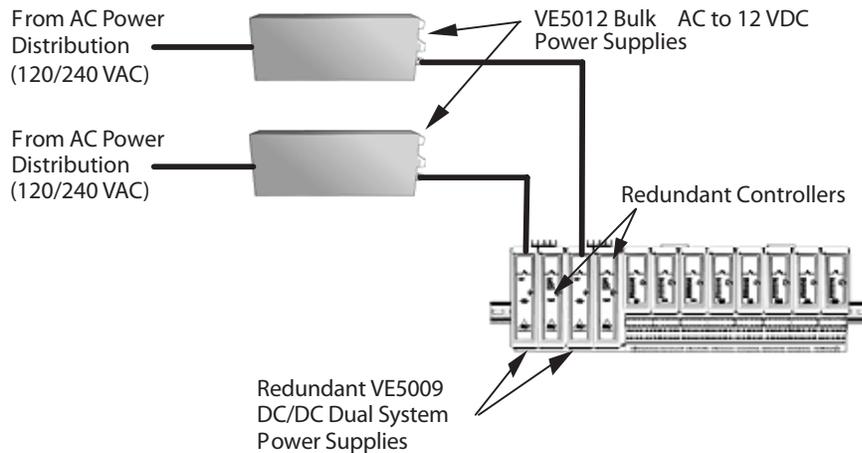
You can add a second combination of legacy VE5012 and VE5009 power supplies as illustrated in *Figure 8-5* to provide system power redundancy for systems using simplex controllers. You need an extra 2-wide power/controller carrier to add the second legacy VE5009.

**Figure 8-5: Redundant combination of legacy VE5009 and VE5012 for simplex controllers**



If your system uses redundant controllers, you must use a second combination of legacy VE5012 and VE5009 power supplies as illustrated in [Figure 8-6](#) to maintain the controller redundancy. For redundancy, each controller requires its own legacy VE5009 supply. A second 2-wide carrier provides mounting for the second controller of the redundant pair.

**Figure 8-6: Redundant combination of legacy VE5009 and VE5012 for redundant controllers**



Do not use bridging diodes for 12 VDC power to controllers as the 12 VDC over voltage constraint is much less when operating with 12 VDC bulk feed compared to 24 VDC bulk feed.

Only 24 VDC supports +20% operation up to 28.8 VDC.

## Intrinsically safe system power supply

To power intrinsically safe I/O cards, an intrinsically safe system power supply is used. The supply accepts nominal 24 VDC input voltage and provides 12 VDC output at up to 5 Amps. Depending on the type and mix of I.S. cards, the supply can power eight to fifteen cards. You can have up to ten I.S. power supplies plus an additional power supply for redundancy. The total quantity of I.S. power supplies for a redundant system is eleven. Use the I.S. power supply worksheet in the manual *DeltaV™ M-series Hardware Installation and Reference* to determine the quantity of power supplies needed for your system.

## Selecting uninterruptible power supplies

The primary AC power source for DeltaV systems must be free of power interruptions greater than 20 milliseconds. An interruption greater than this amount can cause loss of control, system configuration, and process data. Uninterruptible power supplies (UPS) should be ordered with a DeltaV system if existing plant power does not meet the 20 millisecond requirement.

A VE5006 uninterruptible power supply (UPS) is available from Emerson Process Management. Use the following guidelines to determine the quantity of each UPS model to order:

- Order one VE5006 UPS for each workstation and server.
- Order VE5006 UPSs for DeltaV controllers as follows:
  - If VE5001 system power supplies are used, order one VE5006 UPS for each controller.
  - Order one VE5006 UPS for each VE5012 Bulk AC to 12 VDC power supply
  - Order one VE5006 UPS for each VE5011 Bulk AC to 24 VDC power supply.

# 9 Workstations

## Topics covered in this chapter:

- *Workstation software licenses*
- *DeltaV Four-monitor Workstation license*
- *DeltaV Operator keyboard license*
- *Batch licenses*
- *Remote access services (RAS)*
- *Remote client (Remote Desktop Services)*
- *DeltaV Connect License*
- *Continuous history data*
- *DeltaV Analyze license*
- *DeltaV InSight Basic and DeltaV InSight*
- *Alarm Help*
- *Alarm Mosaic*
- *AMS Device Manager*
- *DeltaV Executive Portal*
- *DeltaV Logbooks*
- *Third-party software compatibility*
- *Workstation application summary*
- *ProfessionalPLUS Station software suite*
- *Professional Station software suite*
- *Engineering Seat software suite*
- *Operator Station software suite*
- *Base Station software suite*
- *Application Station software suite*
- *Maintenance Station software suite*
- *PlantWeb Experience*
- *Workstation application prerequisites*
- *Connecting to a plant LAN*
- *DeltaV Zones*

## Workstation software licenses

You determine the functionality and size of each workstation with software licenses. Workstation licenses enable the use of specific functions and applications as defined in the product data sheets. The following briefly describes the workstation licenses.

### **The PlantWeb Experience license**

The PlantWeb Experience license includes a broad set of operating, diagnostic and engineering tools. The license is available in two sizes and enables you to configure, download, and control either 100 DSTs or 250 DSTs, depending on the license size purchased. These DSTs can include any combination of the following types: AI, AO, DI, DO, Serial, PROFIBUS-DP, DeviceNet, HART, FOUNDATION fieldbus (provided that AMS Device Manager is installed).

Software Add-on licenses and system hardware can be added to a PlantWeb Experience system, but the DST capacity cannot be scaled larger than 100 DST or 250 DST (depending on the license size initially purchased) without re-licensing the ProfessionalPLUS and I/O DST licenses.

### **ProfessionalPLUS Workstation**

The ProfessionalPLUS workstation license suite supports the global database for a DeltaV system. You need one ProfessionalPLUS workstation per system. A ProfessionalPLUS workstation has a complete set of operating, diagnostic and engineering tools. PCs defined as ProfessionalPLUS workstation nodes during workstation configuration can accept the ProfessionalPLUS license suite.

### **Professional Station**

The Professional Station license suite provides engineering workstation capabilities to Operator Station nodes. This suite is for systems that require more than one engineering seat. It has a complete set of operating, diagnostic and engineering tools without the global database. PCs defined as Operator Station nodes during workstation configuration can accept the Professional license suite.

### **Engineering Seat**

The Engineering Seat license is a license type that enables access to the DeltaV engineering tools (applications) from other DeltaV workstation types (for example, stations already licensed with station licenses, such as Operator, Maintenance, and Base station licenses, including local workstation nodes and remote client sessions). These licenses can be fixed (assigned) to a particular workstation, or they can float throughout the system (license pool allocation is managed by the ProfessionalPLUS station). In addition, these licenses can be issued as valid for a limited duration (60, 90, or 180 days).

The Engineering Seat license is compatible only with DeltaV v12.3 and newer software. A new system license dongle (shipped with all new v12.3 and newer systems, and available to existing customers upgrading to v12.3 and newer versions) that includes a real-time clock is necessary to use the temporary versions of the Engineering Seat license.

### **Operator Station**

The Operator Station license suite provides the licensing typically required for operators. The suite contains DeltaV Operate support as well as support for viewing historical data. PCs defined as Operator Station nodes during workstation configuration can accept the Operator license suite.

### Base Station

The Base Station license suite provides fundamental software support. The Base Station is best suited to situations where you want to define the functionality of the workstation using Add-on licenses. PCs defined as Operator Station nodes during workstation configuration can accept the Base license suite.

### Application Station

The Application Station license suite provides a foundation for integrating the DeltaV system with other networks and 3rd-party applications. PCs defined as Application Station nodes during workstation configuration can accept the Application license suite.

### Maintenance Station

The Maintenance Station license suite provides software licenses tailored to maintenance personnel. This includes diagnostics and the Inspect with InSight feature in DeltaV InSight. It also includes a maintenance version of Configuration Studio which enables users to commission, decommission and calibrate devices and view their configurations (calibration requires an appropriate AMS Device Manager license). It does not allow configuration. Download of fieldbus devices is allowed when the user has the Replace Device security function.

PCs defined as Operator Station nodes during workstation configuration can accept the Maintenance license suite.

### View-only Operator Station

The View-only Operator Station license suite enables users to view DeltaV Operate pictures. The View-only license:

- Prevents users from changing setpoints and other values that affect the process.
- Prevents users from acknowledging alarms.
- Prevents viewing alarms in alarm summaries and lists and in the alarm banner.

### Add-on and Scale-up licenses

After you assign a license suite, you can assign Add-on and Scale-up licenses. Add-on licenses add new licensed features and functionality to the initial license suite and Scale-up licenses increase the capacity of an existing license feature.

To expand the DST capacity of a workstation that has the DeltaV Experience license assigned, you must first assign a base ProfessionalPLUS license suite. Assigning a base license suite uninstalls the DeltaV Experience license and enables you to assign I/O base and Scale-up licenses. Refer to product data sheets and *DeltaV System Planning Guide* for detailed information about workstation Add-on and Scale-up licenses.

## DeltaV Four-monitor Workstation license

Except for the Application Station software suite, each of the workstation software suites can be viewed on one of the four-monitor workstations. Refer to the DeltaV product data sheets for specific hardware and license information required.

## DeltaV Operator keyboard license

Operator keyboard lets you use one of the monitors in a four-monitor workstation as a touchscreen monitor, displaying a standard-look keyboard. For the keyboard monitor select the Touchscreen monitor. Refer to the DeltaV product data sheets for specific hardware and license information required.

## Batch licenses

Batch licenses are system-wide and available as Basic Batch, Advanced Batch, and Professional Batch tiers. You can choose only one batch license tier per system. In DeltaV v12.3 and later, the sizing for batch licenses is unit-based (for example, Advanced Batch, 5 Units). More specifically, sizing is based on the total number of class-based unit module instances configured under process cells in the system.

Applications which are enabled in system-wide batch licenses are Batch Executive, Batch Historian, Soft Phase Server, and Campaign Manager. Each system-wide batch license enables the applications as shown in [Table 9-1](#).

**Table 9-1: System-wide batch licenses and available applications**

Batch License	Batch Executive	Batch Historian	Soft Phase Server	Campaign Manager	Recipe Exchange	Batch Analytics
Basic Batch	X					
Advanced Batch	X	X	X			
Professional Batch	X	X	X	X	X	X
Batch Redundancy	X			X		

### Note

The Batch Redundancy license is required, in conjunction with at least one other Batch license, for Redundant Batch Executives or Redundant Campaign Managers.

A batch license is assigned to the ProfessionalPLUS workstation. After you choose the license, choose its size. The enabled applications can run on either the ProfessionalPLUS workstation or an Application workstation.

When you use the Advanced Unit Management license, its size must be equal to or greater than the size of the system-wide batch license.

For most DeltaV systems, it is recommended to run Batch Executive and Batch Historian on separate Application Stations. When these applications are run on Application Stations, no non-batch applications should run on them.

## Remote access services (RAS)

DeltaV Remote Access Services (RAS) let you use Remote DeltaV Nodes to perform operator or engineering functions from a non-DeltaV network or a remote network up-link, such as a microwave or satellite link. The remote DeltaV nodes connect and communicate through DeltaV RAS to perform operator functions through standard DeltaV applications. Either a ProfessionalPLUS Station or an Application Station can run DeltaV RAS.

A ProfessionalPLUS running DeltaV RAS can serve operating data to two remote nodes. An Application Station running DeltaV RAS can serve up to 10 remote nodes. These nodes can run Continuous Historian (250 Parameters), Control Studio On-Line, Diagnostics, Event Chronicle, Process History View Suite, and operating data to DeltaV Operate. For more details, see the DeltaV Remote Access Services product data sheet and the Remote DeltaV sales information sheet.

With up to seven Application Stations running DeltaV RAS, the system supports up to 72 remote stations.

## Remote client (Remote Desktop Services)

DeltaV Remote Client lets you locate full-function DeltaV operator and engineering workstations remotely to a DeltaV control network. Remote client consists of a server, clients, and appropriate DeltaV licenses. It uses standard computer hardware and Microsoft applications: Remote Desktop Connection and Remote Desktop Services. The computer hardware and Microsoft applications are ordered separately. See the product data sheet on DeltaV Remote Client for details.

Either a ProfessionalPLUS Station or a Base Station can be set up to function as a remote client server (host machine). See the product data sheet on DeltaV Remote Client for details.

## DeltaV Connect License

DeltaV Connect products let users of competitive process control systems migrate to DeltaV workstations. Current DeltaV Connect products include interfaces to Bailey INFI 90 and NET 90 systems, Siemens-Moore APACS and QUADLOG systems, and Honeywell TotalPlant Solutions Systems. As a minimum, an Application station, running the appropriate DeltaV Connect software, and a ProfessionalPLUS station are required. For further information about DeltaV Connect products, see corresponding product data sheets.

## Continuous history data

Continuous history data in DeltaV Systems is retrievable from the DeltaV Continuous Historian for non-DeltaV plant information systems, using the DeltaV OPC Historical Data Access Server. The OPC History Server is available on the ProfessionalPLUS and Application Stations. One concurrent OPC Historical Data Access client connection is provided with each OPC History Server. For more than one concurrent client connection, the OPC History Server license is required. The OPC History Server license allows up to 25 concurrent client connections per server.

It is recommended that the OPC History Server be used only for periodic historical data transfer. Real-time data requests from the OPC History Server are not recommended because real-time data requests may cause excessive load on the DeltaV Continuous Historian, resulting in higher workstation CPU utilization and potential loss of historical data. The DeltaV workstation CPU utilization should always be considered when determining the optimum historical data transfer rate from the OPC History Server. It is recommended that the CPU load on the DeltaV workstation not exceed 75% for an extended period of time, regardless of what applications are running on the workstation.

For real-time data retrieval from the DeltaV system, the DeltaV OPC Data Access Server should be considered. All of the DeltaV parameters available for collection in the DeltaV Continuous Historian are available in the OPC Data Access Server. The OPC Data Access Server is much more efficient than the OPC History Server at retrieving real-time data from the DeltaV system and it does not require use of the DeltaV Continuous Historian.

## DeltaV Analyze license

DeltaV Analyze v3.0 lets you perform alarm analysis for selected plant areas based on historical data in either Event Chronicle or Plantwide Event Historian. DeltaV Analyze is ordered separately and is licensed.

DeltaV Analyze can run on a ProfessionalPLUS or Application Station where Event Chronicle is enabled. Since DeltaV Analyze requires enabled IIS, you must decide on which station you wish to run it. It can also run on a computer running Plantwide Event Historian, whether a DeltaV machine or non-DeltaV machine.

When used with Event Chronicle or Plantwide Event Historian, DeltaV Analyze can be licensed for single client mode, up to 7 clients, 8 to 15 clients, or 16 to 50 clients. Refer to the DeltaV product data sheet for detailed licensing information.

Prerequisites for running DeltaV Analyze v3.0 are:

- Standard DeltaV workstation hardware specifications suitable for DeltaV Analyze.
- A DeltaV Application Station with Event Chronicle enabled, or a workstation with Plantwide Event Historian installed. Each workstation with an event database to be analyzed must have a DeltaV Analyze license.
- Windows Server 2008 R2 operating system.
- DeltaV Analyze on Windows 7 is only offered with the single concurrent user.

- Clients may be any workstation with Windows Internet Explorer version 9. Recommended client memory is 500 Mbytes. Concurrent user timeout is 20 minutes.

For more information about DeltaV Analyze v3.0 compatibility, refer to the *DeltaV Analyze Release Notes* and to Knowledgebase Article NK-1400-0043, *Addendum to DeltaV Analyze v3.0 Release Notes*.

Compatibility of previous DeltaV Analyze releases, DeltaV system versions, and Windows versions:

- DeltaV Analyze v1.2 is compatible with DeltaV v7.3 through v9 and Windows XP / Server 2003.
- DeltaV Analyze v1.3 is compatible with DeltaV v10 and Windows XP / Server 2003.
- DeltaV Analyze v2.0 is compatible with DeltaV v11 through v12.3.1 and Windows 7 / Server 2008.

## DeltaV InSight Basic and DeltaV InSight

For DeltaV version 9.3 and later, DeltaV InSight Basic replaces DeltaV Tune and DeltaV Inspect. DeltaV InSight Basic is a single-client licensed application which can be added to all workstations except the Application workstation. It provides all of the functionality of DeltaV Tune with some improvements in the user interface, history, and system loading.

The broader functionality of DeltaV InSight, contains advanced features, including model-based metrics (tuning Index), loop diagnostics, and adaptive tuning recommendations. DeltaV InSight provides system-wide unlimited client connections based on total system DST count (for example, AO+AI+DO+DI). DST capacities available are 750, 2000, 5000, and 30,000 DSTs for pre-v12.3 systems. For v12.3 and newer systems, DeltaV InSight sizing is based on the total number of AO DSTs in the system. AO DST license capacities available range from 100 AO DSTs to 30000 AO DSTs. Scale up licenses are also available when systems are expanded. See the DeltaV InSight product data sheet for details.

## Alarm Help

Alarm Help lets you present background and guidance information about an alarm to operators, such as probable cause of the alarm, recommended action to remedy the alarm, consequence of inaction and time to respond.

The alarm help information is stored in the system configuration database along with all of the other parameters that define the alarm such as priority, type and limit. Because the information is simply more information in the system configuration database, the "Alarm Help" license is not required to import, bulk edit, or interactively view or change it using DeltaV Explorer, Control Studio, or the System Alarm Management (SAM) application on any DeltaV workstation. Configuring Alarm Guidance in these applications falls under the existing license enforcement rules for the "Configuration Studio" license feature. Alarm help information is included in the coverage of DeltaV Configuration Audit Trail.

Presentation of alarm help information to operators (users without access to the configuration applications mentioned above) requires a DeltaV Alarm Help license for each Operator Station Node Type or Remote Client Session.

The Alarm Help license is not necessary, or allowed, on the ProfessionalPLUS Station because the user interface designed for presenting alarm help information to operators is always allowed to run on the ProfessionalPLUS. This is for the convenience of configuration personnel who want to cross-check what the operators will view. Also note that alarm information can be entered into the configuration database from this operator user interface subject to the security privileges assigned to the user.

The Alarm Help license is automatically present on all workstations with any base "DeltaV Simulate xxx Station, Networked" (aka Simulate Multinode workstation) license.

## Alarm Mosaic

Alarm Mosaic provides dynamic visualization of current active alarms for a highly comprehensible view of alarm floods. Operator actions are integrated into Alarm Mosaic views for efficient operator evaluation of actions that may have contributed to the alarms. A history view in Alarm Mosaic enables comprehensive shift transition discussions of alarms and actions occurring in previous shifts.

Alarm Mosaic can be licensed per Operator Station or systemwide.

See the Alarm Mosaic product data sheet for more information.

## AMS Device Manager

AMS Device Manager extends DeltaV software's ability to work with FOUNDATION fieldbus, HART, and PROFIBUS-DP devices. The AMS Device Manager software is packaged with the DeltaV software on separate installation disks. After the DeltaV installation process has run Workstation Configuration, the system prompts you to install the AMS Device Manager software. You have two options:

- **Install AMS Device Manager software** - this option installs an unlicensed version of AMS Device Manager software. The unlicensed version enables you to configure and set up devices, view and compare device configurations, access device diagnostics, and access device methods from DeltaV ProfessionalPLUS and Professional workstations. Refer to *DeltaV Books Online* for more information on AMS Device Manager licensed and unlicensed functionality.
- **Install AMS Device Manager software and install an AMS Device Manager license** - this option installs the full AMS Device Manager application. Run the AMS Licensing Wizard any time after installing AMS Device Manager. This provides you with fully functional AMS Device Manager software.

If you do not install AMS Device Manager software your ability to work with fieldbus devices is limited. You can work extensively with HART, and PROFIBUS DP devices if AMS Device Manager is not installed. However, you cannot view device EDD screens.

## DeltaV Executive Portal

DeltaV Executive Portal enables you to view DeltaV displays remotely from a Web browser. You can easily define your own dashboards, selecting and arranging the information you need. You can also combine related real-time and historical information from multiple DeltaV systems, other control systems and historians. DeltaV Executive Portal provides one place to view all of your process information. DeltaV Executive Portal replaces DeltaV Web Server.

Refer to the DeltaV Executive Portal product data sheet for more information.

## DeltaV Logbooks

DeltaV Logbooks is a browser-based application used to capture electronic records of operator activity as well as plan and track operator tasks during a shift. With Logbooks, operators can record information about daily operations, view a prioritized task list, and access a shift change dashboard that includes shift status and summary reports.

Logbooks can be installed on an existing Application Station and leverage past investments in DeltaV networking and servers. As the system grows, it may be beneficial to dedicate a server to the task.

Licenses are available for various numbers of users. An optional Event Monitor license component enables automatic creation of log entries based on OPC values or DeltaV Events. These auto-generated entries can trigger tasks in the system that need to be completed and flag them to raise attention to issues that may need to be remediated.

See the DeltaV Logbooks product data sheet for more information.

## Third-party software compatibility

Certain third-party software products are compatible with DeltaV systems and may be incorporated into a system. A list of compatible software can be found on the Compatibility Chart in the Release Notes Knowledge Base Article (KBA). It is highly recommended to run third-party software *only* on an Application Station. As with any third-party software, caution should be used when loading and running it.

### **⚠ CAUTION!**

**Do not risk the possible consequences of installing and using third-party software not listed on the compatibility chart. Installing and using such software on a DeltaV workstations that is used as a primary operator interface may cause loss of operator visibility to the process, unexpected system actions, and other unpredictable results. Emerson Process Management cannot support proper operation of your system should you take this risk.**

**Note**

For computer virus protection, we strongly recommend that you purchase approved DeltaV anti-virus software and install it on all of your workstations. Be sure to stay current with subsequent software releases to protect your system from newly discovered viruses.

## Workstation application summary

[Table 9-2](#) lists applications that are included, and applications that can and cannot be added in workstation software suites. This table summarizes applications listed in [Table 9-3](#) through [Table 9-9](#).

**Note**

The tables indicate the applications that can be installed and run on the station types, **not** the licenses that can be applied to the station types.

In [Table 9-2](#), the contents of the cells mean:

- INC: Application included.
- LIC: Application included with appropriate system licenses.
- A: Application can be added with an Add-on license.
- A<sup>P</sup>: Application can be added with an Add-on license. A prerequisite application may be required as defined in [Table 9-11](#).
- NA: Application cannot be added.

**Table 9-2: Application availability in workstation software suites**

Application	Professional-PLUS Station Suite	Professional Station Suite	Engineering Seat Software Suite	Operator Station Suite	Base Station Suite	Application Station Suite	Maintenance Station Suite	PlantWeb Experience
Advanced Batch	A	NA	NA	NA	NA	A	NA	A
Advanced Continuous Historian	NA	NA	NA	NA	NA	A	NA	NA
Alarm Help	INC	A	A	A	A	NA	A	INC
Alarm Mosaic	INC	A	A	A	A	NA	A	INC
AMS Device Manager Client SC	A	A	A	A	A	A	A	A
AMS Device Manager Client SC for device status	LIC	LIC	LIC	LIC	LIC	LIC	LIC	LIC

**Table 9-2: Application availability in workstation software suites (continued)**

<b>Application</b>	<b>Professional-PLUS Station Suite</b>	<b>Professional Station Suite</b>	<b>Engineering Seat Software Suite</b>	<b>Operator Station Suite</b>	<b>Base Station Suite</b>	<b>Application Station Suite</b>	<b>Maintenance Station Suite</b>	<b>PlantWeb Experience</b>
AMS Device Manager Server Plus	A	NA	NA	A	NA	A	A	INC
AMS SNAP-ON Product Options	A	NA	NA	NA	NA	A	NA	A
AMS ValveLink SNAP-ON	A	A	A	A	A	A	A	A
AMS Wireless Snap-ON	A	A	A	A	A	A	A	A
Backup and Recovery	NA	NA	NA	NA	NA	A	NA	NA
Basic Batch	A	NA	NA	NA	NA	A	NA	A
Campaign Manager Operator Interface	LIC	LIC	NA	LIC	NA	NA	LIC	LIC
Configuration Audit Trail	A	NA	NA	NA	NA	NA	NA	A
Configuration Database	INC	NA	NA	NA	NA	NA	NA	INC
Configuration Software Suite	INC	INC	INC	A	A	NA	A	INC
Configuration Software Suite for Maintenance	NA	NA	NA	NA	NA	NA	INC	NA
DeltaV Continuous Historian > 250 Parameters	NA	NA	NA	NA	NA	A <sup>P</sup>	NA	NA
DeltaV Continuous Historian, 250 Parameters or less	INC	INC	NA	INC	INC	INC	INC	INC
Control Studio On-Line	INC	INC	INC	A <sup>P</sup>	A <sup>P</sup>	A	A <sup>P</sup>	INC
DeltaV Analyze	A	NA	NA	NA	NA	A	NA	A

**Table 9-2: Application availability in workstation software suites (continued)**

<b>Application</b>	<b>Professional-PLUS Station Suite</b>	<b>Professional Station Suite</b>	<b>Engineering Seat Software Suite</b>	<b>Operator Station Suite</b>	<b>Base Station Suite</b>	<b>Application Station Suite</b>	<b>Maintenance Station Suite</b>	<b>PlantWeb Experience</b>
DeltaV Campaign Manager Web Service	NA	NA	NA	NA	NA	LIC	NA	NA
DeltaV Connect	A <sup>P</sup>	NA	NA	NA	NA	A <sup>P</sup>	NA	A <sup>P</sup>
DeltaV Event Chronicle	INC	INC	NA	A	A	A	INC	INC
DeltaV Excel Add-in	A	A	A	A	NA	INC	A	A
DeltaV Executive Portal	NA	NA	NA	NA	NA	A	NA	NA
DeltaV Four-Monitor Workstation	A	A	NA	A	NA	NA	A	A
DeltaV History Analysis	NA	NA	NA	NA	NA	A	NA	NA
DeltaV History Web Service	NA	NA	NA	NA	NA	INC	NA	NA
DeltaV InSight	A	LIC	LIC	LIC	LIC	NA	LIC	A
DeltaV InSight Basic	A	A	A	A	A	NA	A	A
DeltaV Logbooks	A	A	A	A	A	A	A	A
DeltaV Neural	LIC	INC	INC	NA	NA	NA	NA	LIC
DeltaV Operate	INC	INC	INC	INC	A	NA	A	INC
DeltaV Operate for Batch	LIC	LIC	NA	LIC	NA	NA	LIC	LIC
DeltaV Operate for Maintenance	NA	NA	NA	NA	NA	NA	INC	NA
DeltaV Operator Keyboard	A	NA	NA	A	NA	NA	NA	A
DeltaV RAS for Application Station	NA	NA	NA	NA	NA	A	NA	NA
DeltaV RAS for Professional-PLUS Station	A	NA	NA	NA	NA	NA	NA	A

**Table 9-2: Application availability in workstation software suites (continued)**

Application	Professional-PLUS Station Suite	Professional Station Suite	Engineering Seat Software Suite	Operator Station Suite	Base Station Suite	Application Station Suite	Maintenance Station Suite	PlantWeb Experience
DeltaV Reporter	INC	INC	NA	INC	INC	INC	INC	INC
DeltaV Web Server	NA	NA	NA	NA	NA	A <sup>P</sup>	NA	NA
Diagnostics	INC	INC	INC	INC	A	A	INC	INC
Dual Monitor	INC	INC	NA	INC	LIC	NA	INC	INC
Flexlock	INC	INC	INC	INC	INC	INC	INC	INC
History View Suite	INC	INC	NA	INC	A	A	INC	INC
OPC .NET Server	NA	NA	NA	NA	NA	INC	NA	NA
OPC Events Server	A	NA	NA	NA	NA	A	NA	A
OPC Excel Add-in	A <sup>(1)</sup>	A	A	A	A	INC	A	A <sup>(1)</sup>
OPC History Server	A	NA	NA	NA	NA	A	NA	A
OPC Mirror	A	NA	NA	NA	NA	A	NA	A
OPC Pager	A	NA	NA	NA	NA	A	NA	A
OPC Server > 250 Data Values	NA	NA	NA	NA	NA	INC	NA	NA
OPC Server, 250 Data Values	A	NA	NA	NA	NA	NA	NA	A
OSIsoft PI Server	NA	NA	NA	NA	NA	A	NA	NA
Plantwide Event Historian	NA	NA	NA	NA	NA	A	NA	NA
Predict and PredictPRO <sup>(2)</sup>	LIC	LIC	LIC	LIC	LIC	NA	LIC	LIC
Professional Batch	A	NA	NA	NA	NA	A	NA	A
Recipe Exchange	LIC	LIC		NA	NA	NA	NA	LIC

**Table 9-2: Application availability in workstation software suites (continued)**

Application	Professional-PLUS Station Suite	Professional Station Suite	Engineering Seat Software Suite	Operator Station Suite	Base Station Suite	Application Station Suite	Maintenance Station Suite	PlantWeb Experience
Recipe Exchange Web Service	NA	NA	NA	NA	NA	A	NA	NA
Recipe Studio	LIC	LIC	LIC	A <sup>P</sup>	A <sup>P</sup>	NA	A <sup>P</sup>	LIC
Redundant OPC Mirror	NA	NA	NA	NA	NA	A	NA	NA

(1) OPC Excel Add-in or OPC Events Server, but not both simultaneously

(2) One MPC output is standard (unlimited usage)

## ProfessionalPLUS Station software suite

A ProfessionalPLUS Station is the primary engineering and configuration interface for a DeltaV System. The station provides the global configuration and contains the configuration database for the system. Each DeltaV system must have one, and only one, ProfessionalPLUS Station. For small DeltaV systems, a ProfessionalPLUS Station also serves as the operator and diagnostics interface for the system.

**Table 9-3: ProfessionalPLUS Station software suite**

Applications Included	Applications Can Be Added	Applications Cannot Be Added
Alarm Help	Advanced Batch	Advanced Continuous Historian
Alarm Mosaic	AMS Device Manager Client SC	Backup and Recovery
AMS Device Manager Client SC for device status <sup>(1)</sup>	AMS Device Manager Server Plus	DeltaV Continuous Historian > 250 parameters
Campaign Manager Operator Interface <sup>(1)</sup>	AMS SNAP-ON Product Options	Configuration Software Suite for Maintenance
Configuration Database	AMS ValveLink SNAP-ON	DeltaV Campaign Manager Web Service
Configuration Software Suite	AMS Wireless SNAP-ON	DeltaV Connect
DeltaV Continuous Historian, 250 parameters or less	Basic Batch	DeltaV Executive Portal
Control Studio On-Line	Configuration Audit Trail	DeltaV History Web Service
Diagnostics	DeltaV Analyze	DeltaV History Analysis
DeltaV Event Chronicle	DeltaV Connect	DeltaV Operate for Maintenance
DeltaV Neural <sup>(1)</sup>	DeltaV Four-Monitor Workstation	DeltaV RAS for Application Station
DeltaV Operate	DeltaV InSight	DeltaV Web Server
DeltaV Reporter	DeltaV InSight Basic	OPC Server > 250 data values
Dual Monitor <sup>(1)</sup>	DeltaV Logbooks (access)	OPC .NET Server
Flexlock	DeltaV Operator Keyboard	OSIsoft PI Server
History View Suite	DeltaV RAS for Professional-PLUS	Plantwide Event Historian
Predict and PredictPRO <sup>(1)</sup>	OPC Events Server	Recipe Exchange Web Service
Recipe Exchange <sup>(1)</sup>	OPC Excel Add-in	Redundant OPC Mirror
Recipe Studio <sup>(1)</sup>	OPC History Server	
	OPC Mirror,	
	OPC Pager	
	OPC Server, 250 Data Values	
	Professional Batch	

(1) With appropriate system license.

## Professional Station software suite

When you require additional DeltaV engineering workstations to that of the ProfessionalPLUS station, use the Professional Station Software Suite. This suite provides both an engineering and configuration interface and an operator interface to a DeltaV System. The system database still resides on the ProfessionalPLUS Station. [Table 9-4](#) describes the Professional Station Software Suite.

### Note

The software suite is available in various sizes. See the product data sheet for details.

**Table 9-4: Professional Station software suite**

Applications Included	Applications Can Be Added	Applications Cannot Be Added
AMS Device Manager Client SC for device status <sup>(1)</sup> Campaign Manager Operator Interface <sup>(1)</sup> Configuration Software Suite DeltaV Continuous Historian, 250 Parameters or less Control Studio On-Line Diagnostics DeltaV InSight <sup>(1)</sup> DeltaV Neural <sup>(1)</sup> DeltaV Operate DeltaV Reporter Dual Monitor Event Chronicle Flexlock History View Suite Predict and PredictPRO <sup>(1)</sup> Recipe Exchange <sup>(1)</sup> Recipe Studio <sup>(1)</sup>	Alarm Help Alarm Mosaic AMS Device Manager Client SC AMS ValveLink SNAP-ON AMS Wireless SNAP-ON DeltaV Excel Add-in DeltaV Four-Monitor Workstation DeltaV InSight Basic DeltaV Logbooks (access) OPC Excel Add-in	Advanced Batch Advanced Continuous Historian AMS Device Manager Server Plus AMS SNAP-ON Product Options Backup and Recovery Basic Batch Configuration Audit Trail Configuration Database Configuration Software Suite for Maintenance DeltaV Continuous Historian > 250 parameters DeltaV Analyze DeltaV Campaign Manager Web Service DeltaV Connect DeltaV Event Chronicle DeltaV Executive Portal DeltaV History Analysis DeltaV History Web Service DeltaV Operate for Maintenance DeltaV Operator Keyboard DeltaV RAS for Application Station DeltaV RAS for the ProfessionalPLUS Station DeltaV Web Server History View Suite OPC Events Server OPC History Server OPC Mirror OPC Pager OPC Server, 250 data values OPC Server > 250 data values OPC .NET Server OSIsoft PI Server Plantwide Event Historian Professional Batch Recipe Exchange Web Service

**Table 9-4: Professional Station software suite**

Applications Included	Applications Can Be Added	Applications Cannot Be Added
		Redundant OPC Mirror

(1) *With appropriate system license.*

## Engineering Seat software suite

The DeltaV Engineering Seat delivers engineering capabilities that can be accessed on demand from DeltaV workstations such as Operator Stations, Maintenance Stations, and Base Stations. Temporary use licenses enable you to purchase the number of DeltaV Engineering Seats you need for the duration of time needed.

[Table 9-4](#) describes the Engineering Seat software suite.

---

### Note

The software suite is available in permanent and temporary versions. See the product data sheet for details.

---

**Table 9-5: Engineering Seat software suite**

Applications Included	Applications Can Be Added	Applications Cannot Be Added
Configuration Software Suite Control Studio On-Line DeltaV InSight <sup>(1)</sup> DeltaV Neural Flexlock Predict and PredictPRO <sup>(1)</sup> Recipe Studio <sup>(1)</sup>	Alarm Help Alarm Mosaic AMS Device Manager Client SC AMS ValveLink SNAP-ON AMS Wireless SNAP-ON DeltaV Excel Add-in DeltaV InSight Basic DeltaV Logbooks (access) OPC Excel Add-in	Advanced Batch Advanced Continuous Historian AMS Device Manager Client SC for device status <sup>(1)</sup> AMS Device Manager Server Plus AMS SNAP-ON Product Options Backup and Recovery Basic Batch Campaign Manager Operator Interface Configuration Audit Trail Configuration Database Configuration Software Suite for Maintenance DeltaV Continuous Historian, 250 parameters or less DeltaV Continuous Historian > 250 parameters DeltaV Analyze DeltaV Campaign Manager Web Service DeltaV Connect DeltaV Event Chronicle DeltaV Executive Portal DeltaV Four-Monitor Workstation DeltaV History Analysis DeltaV History Web Service DeltaV Operate DeltaV Operate for Batch DeltaV Operate for Maintenance DeltaV Operator Keyboard DeltaV RAS for Application Station DeltaV RAS for the ProfessionalPLUS Station DeltaV Reporter DeltaV Web Server Diagnostics

**Table 9-5: Engineering Seat software suite**

Applications Included	Applications Can Be Added	Applications Cannot Be Added
		Dual Monitor History View Suite OPC Events Server OPC History Server OPC Mirror OPC Pager OPC Server, 250 data values OPC Server > 250 data values OPC .NET Server OSIsoft PI Server Plantwide Event Historian Professional Batch Recipe Exchange Recipe Exchange Web Service Redundant OPC Mirror

(1) *With appropriate system license.*

## Operator Station software suite

Operator Workstations are used to operate a process.

The Operator Station software suite is available with three license options (Full Span of Control, Zero Span of Control, and View-Only) to accommodate different needs for controlling the process. [Table 9-6](#) describes the Operator Station Software Suite.

To operate and view continuous history only, select the Operator Station Software Suite. Applications typically added to this suite are Event Chronicle, Diagnostics, and Control Studio On-Line.

---

### Note

The software suite is available in various sizes. See the product data sheet for details.

---

**Table 9-6: Operator Station software suite**

Applications Included	Applications Can Be Added	Applications Cannot Be Added
AMS Device Manager Client SC for device status <sup>(1)</sup> Campaign Manager Operator Interface <sup>(1)</sup> DeltaV Continuous Historian, 250 Parameters or less DeltaV Operate DeltaV Reporter Diagnostics Dual Monitor Flexlock History View Suite MPC Operate and MPC OperatePRO Predict and PredictPRO	Alarm Help Alarm Mosaic AMS Device Manager Client SC AMS ValveLink SNAP-ON AMS Wireless SNAP-ON Configuration Studio Suite Control Studio On-Line DeltaV Excel Add-in DeltaV Four-Monitor Workstation DeltaV InSight Basic DeltaV Logbooks (access) DeltaV Operator Keyboard Event Chronicle OPC Excel Add-in Recipe Studio	Advanced Batch Advanced Continuous Historian AMS Device Manager Server Plus AMS SNAP-ON Product Options Backup and Recovery Basic Batch Batch Redundancy Configuration Audit Trail Configuration Database Configuration Studio Suite for Maintenance DeltaV Continuous Historian > 250 Parameters DeltaV Analyze DeltaV Campaign Manager Web Service DeltaV Connect DeltaV Executive Portal DeltaV History Analysis DeltaV History Web Service DeltaV Neural DeltaV Operate for Maintenance DeltaV RAS for Application Station DeltaV RAS for Professional-PLUS Station DeltaV Web Server OPC Events Server OPC Mirror OPC Pager OPC History Server OPC Server, 250 data values OPC Server > 250 data values OPC .NET Server OSIsoft PI Server Plantwide Event Historian Predict and PredictPRO Professional Batch Recipe Exchange

**Table 9-6: Operator Station software suite**

Applications Included	Applications Can Be Added	Applications Cannot Be Added
		Recipe Exchange Web Service Redundant OPC Mirror

(1) *With appropriate system license*

## Base Station software suite

When additional workstations are required to address a single task, such as configuration only or diagnostics only, the Base Station is a very cost-effective solution.

The Base Station is sized according to the software application licenses added to it. You may upgrade a Base Station to an Operator Station. If you do, the station follows the sizing instructions for the Operator Station. Check the product data sheet of each added software application to understand whether there is a size dimension that will be attached to the station. [Table 9-7](#) describes the Base Station Software Suite.

**Table 9-7: Base Station software suite**

Applications Included	Applications Can Be Added	Applications Cannot Be Added
AMS Device Manager Client SC for device status <sup>(1)</sup> DeltaV Continuous Historian, 250 Parameters or less DeltaV Operate DeltaV Reporter Dual Monitor <sup>(1)</sup> Flexlock MPC Operate and MPC OperatePRO Predict and PredictPRO	Alarm Help Alarm Mosaic AMS Device Manager Client SC AMS ValveLink SNAP-ON AMS Wireless SNAP-ON Configuration Studio Suite Control Studio On-Line DeltaV InSight Basic DeltaV Logbooks (access) Event Chronicle OPC Excel Add-in Recipe Studio	Advanced Batch Advanced Continuous Historian AMS Device Manager Server Plus AMS SNAP-ON Product Options Backup and Recovery Basic Batch Batch Redundancy Campaign Manager Operator Interface Configuration Audit Trail Configuration Database Configuration Studio Suite for Maintenance DeltaV Continuous Historian > 250 Parameters DeltaV Analyze DeltaV Campaign Manager Web Service DeltaV Connect DeltaV Excel Add-in DeltaV Executive Portal DeltaV Four-Monitor Workstation DeltaV History Analysis DeltaV History Web Service DeltaV Neural DeltaV Operate DeltaV Operate for Maintenance DeltaV Operator Keyboard DeltaV RAS for Application Station DeltaV RAS for Professional-PLUS Station DeltaV Web Server Diagnostics History View Suite OPC Events Server OPC Mirror OPC Pager

**Table 9-7: Base Station software suite**

Applications Included	Applications Can Be Added	Applications Cannot Be Added
		OPC History Server OPC Server, 250 data values OPC Server > 250 data values OPC .NET Server OSIsoft PI Server Plantwide Event Historian Predict and PredictPRO Professional Batch Recipe Exchange Recipe Exchange Web Service Redundant OPC Mirror

(1) With appropriate system license

## Application Station software suite

The Application Station integrates your DeltaV system and the rest of your day-to-day operations, using OLE for Process Control (OPC). With the Application Station, you can also extend your DeltaV system with DeltaV applications and other third-party applications tailored for your particular process.

Generally, the integration needs and add-on application software determine the number of Application Stations required. Decisions as to the number of Application Stations are also based on the isolation of key add-on applications. If you are running batch applications in your system, see the Batch Application Licensing section for Application Station requirements.

Application Station license size is based upon the number of data values that are communicated through the OPC Server on the Application Station. Each value (for example, a flow, a setpoint, a register) communicated through the OPC Server is counted as a data value.

The sizing equation is:

*Application Station size = Quantity of Data Values being read out of the Application Station + Quantity of Data Values being written into the Application Station*

Once you have determined the approximate number of data values, you need to consider how this data is being used within the system.

- For data values being read out of a DeltaV system, no further work is needed.
- For data values being written into a DeltaV system, the data values must be hosted in modules somewhere within the DeltaV system. Each data value will also be counted as either a DST or as a SCADA tag.

- For less than 50 data values being written into a DeltaV system, the data values can be hosted in a DeltaV controller.
- For more than 50 data values being written into a DeltaV system, the data values should be hosted directly in the Application Station.

If you need to integrate data in the Application Station with data from other OPC Servers, the OPC Mirror application may also be added onto the Application Station.

[Table 9-8](#) describes the Application Station Software Suite.

---

**Note**

The software suite is available in various sizes. See the product data sheet for details.

---

**Table 9-8: Application Station software suite**

Applications Included	Applications Can Be Added	Applications Cannot Be Added
AMS Device Manager Client SC for device status <sup>(1)</sup> DeltaV Continuous Historian, 250 Parameters or less DeltaV Campaign Manager Web Service DeltaV Excel Add-in DeltaV History Web Service <sup>(1)</sup> DeltaV Reporter Flexlock OPC Excel Add-in OPC Server > 250 data values OPC .NET Server	Advanced Batch Advanced Continuous Historian AMS Device Manager Client SC AMS Device Manager Server Plus AMS SNAP-ON Product Options AMS ValveLink SNAP-ON AMS Wireless SNAP-ON Backup and Recovery Basic Batch Batch Redundancy DeltaV Continuous Historian > 250 parameters Control Studio On-Line DeltaV Analyze DeltaV Connect DeltaV Executive Portal DeltaV Logbooks DeltaV RAS for Application Station DeltaV Web Server Diagnostics Event Chronicle History Analysis History View Suite OPC Events Server OPC History Server OPC Mirror OPC Pager OSIsoft PI Server Plantwide Event Historian Professional Batch Recipe Exchange Web Service Redundant DeltaV Connect Redundant OPC Mirror Redundant OPC Server	Alarm Help Alarm Mosaic Campaign Manager Operator Interface Configuration Audit Trail Configuration Database Configuration Software Suite Configuration Software Suite for Maintenance Control Studio On-Line DeltaV Four-Monitor Workstation DeltaV InSight DeltaV InSight Basic DeltaV Neural DeltaV Operate DeltaV Operate for Maintenance DeltaV Operator Keyboard DeltaV RAS for Professional-PLUS Station Dual Monitor OPC Server, 250 data values Predict and PredictPRO Recipe Exchange Recipe Studio

(1) With appropriate system license.

## Maintenance Station software suite

The Maintenance Station provides maintenance personnel with a view of a DeltaV system for maintenance purposes. It is sized according to the software application licenses added to it.

You may upgrade a Maintenance Station to an Operator Station. If you do, the station follows the sizing instructions for the Operator station. Check the product data sheet of each software application added to understand whether there is a size dimension that will be attached to the station. [Table 9-9](#) describes the Maintenance Station Software Suite.

**Table 9-9: Maintenance Station software suite**

Applications Included	Applications Can Be Added	Applications Cannot Be Added
AMS Device Manager Client SC for device status <sup>(1)</sup> Campaign Manager Operator Interface <sup>(1)</sup> Configuration Software Suite for Maintenance DeltaV Continuous Historian, 250 Parameters or less Diagnostics DeltaV InSight <sup>(1)</sup> DeltaV Operate for Maintenance Dual Monitor DeltaV Reporter Event Chronicle Flexlock History View Suite Predict and PredictPRO <sup>(1)</sup>	Alarm Help Alarm Mosaic AMS Device Manager Client SC AMS Device Manager Server Plus AMS ValveLink SNAP-ON AMS Wireless SNAP-ON Configuration Software Suite Control Studio On-Line DeltaV Excel Add-in DeltaV Four-Monitor Workstation DeltaV InSight Basic DeltaV Logbooks (access) DeltaV Operate OPC Excel Add-in Recipe Studio	Advanced Batch Advanced Continuous Historian AMS SNAP-ON Product Options Backup and Recovery Basic Batch Configuration Audit Trail Configuration Database DeltaV Continuous Historian > 250 parameters DeltaV Analyze DeltaV Campaign Manager Web Service DeltaV Connect DeltaV History Analysis DeltaV History Web Service DeltaV Neural DeltaV Operator Keyboard DeltaV RAS for Application Station DeltaV RAS for the ProfessionalPLUS Station DeltaV Executive Portal DeltaV Web Server History View Suite OPC Events Server OPC History Server OPC Mirror OPC Pager OPC Server, 250 data values OPC Server > 250 data values OPC .NET Server OSIsoft PI Server Plantwide Event Historian Predict and PredictPRO Professional Batch Recipe Exchange Recipe Exchange Web Service Redundant OPC Mirror

(1) With appropriate system license.

## PlantWeb Experience

The PlantWeb Experience is the basis for a small simplified DeltaV system of up to 100 DSTs or 250 DSTs with and AMS Suite. Refer to the product data sheet for product variations.

**Table 9-10: PlantWeb Experience**

Applications Included	Applications Can Be Added	Applications Cannot Be Added
Alarm Help	Advanced Batch	Advanced Continuous Historian
Alarm Mosaic	AMS Device Manager Client SC	AMS Device Manager Server Plus
AMS Device Manager Client SC for device status <sup>(1)</sup>	AMS SNAP-ON Product Options	Backup and Recovery
Campaign Manager Operator Interface <sup>(1)</sup>	AMS ValveLink SNAP-ON	DeltaV Continuous Historian > 250 parameters
Configuration Database	AMS Wireless SNAP-ON	Configuration Software Suite for Maintenance
Configuration Software Suite	Basic Batch	DeltaV Campaign Manager Web Service
DeltaV Continuous Historian, 250 parameters or less	Configuration Audit Trail	DeltaV Connect
Control Studio On-Line	DeltaV Analyze	DeltaV Executive Portal
Diagnostics	DeltaV Connect	DeltaV History Web Service
DeltaV Event Chronicle	DeltaV Four-Monitor Workstation	DeltaV History Analysis
DeltaV Neural <sup>(1)</sup>	DeltaV InSight	DeltaV Operate for Maintenance
DeltaV Operate	DeltaV InSight Basic	DeltaV RAS for Application Station
DeltaV Reporter	DeltaV Operator Keyboard	DeltaV Web Server
Dual Monitor	DeltaV RAS for Professional-PLUS	OPC Server > 250 data values
Flexlock	OPC Events Server	OPC .NET Server
History View Suite	OPC Excel Add-in	OSIsoft PI Server
Predict and PredictPRO <sup>(1)</sup>	OPC History Server	Plantwide Event Historian
Recipe Exchange <sup>(1)</sup>	OPC Mirror,	Recipe Exchange Web Service
Recipe Studio <sup>(1)</sup>	OPC Pager	Redundant OPC Mirror
	OPC Server, 250 Data Values	
	Professional Batch	

(1) With appropriate system license.

## Workstation application prerequisites

To be functional, some workstation applications require a prerequisite application not included in the suite. For example, Advance Unit Management is a prerequisite Basic Batch, Advanced Batch, and Professional Batch. Even when one of these batch programs is a standard application in an Application Station, it is not operational until Advance Unit

Management is added. [Table 9-11](#) lists workstation applications which require prerequisites (some prerequisites are licensed). If a workstation application is not listed, it does not require a prerequisite.

**Table 9-11: Workstation applications and their prerequisite applications**

<b>Workstation Application</b>	<b>Prerequisite Application</b>
Continuous Historian > 250 parameters	Application Station, 250 data values or larger
Control Studio On-Line	Operator Interface [Must reside in same station(s) in which Control Studio On-Line resides]. Operation software for Base or Maintenance Station (VE2126Sxxxx) is also required if you wish to run Control Studio On-line on a Base or Maintenance Station.
DeltaV Connect	Application Station, 250 data values or larger
DeltaV Web Server	Application Station, 250 data values or larger
Excel add-in	Excel spreadsheet (Purchase separately)
Process History View Suite	To view process history on stations where Process History View Suite resides, a DeltaV Continuous Historian must be enabled and configured on or more stations. To view events on stations where Process History View Suite resides, an Event Chronicle must be enabled and configured on one or more stations. To view batch history on stations where Process History View Suite resides, either Advance Batch or Professional Batch must reside in the system and the Batch Historian must be enabled and configured.
Recipe Studio	A Basic Batch, Advanced Batch, or Professional Batch is required. Any of these licenses allow four Batch Executives per system, which can reside in any of the system workstations; however, an Application Station is preferred. To edit and save recipes using Recipe Studio, Configuration Studio Suite is required. Without this suite, Recipe Studio is view only.
OPC Events Server	Event Chronicle on the same workstation enabled, configured and downloaded.
OPC History Server	DeltaV Continuous Historian on the same workstation enabled, configured and downloaded.
History Analysis	To view process history, event history or batch history in History Analysis, a DeltaV Continuous Historian, Event Chronicle and/or a Batch Historian must be enabled and configured on or more stations.
DeltaV OPC .NET Server	DeltaV OPC Data Access Server, OPC Events Server and/or OPC History Server on the same workstation.

## Connecting to a plant LAN

In most cases, Application Stations can be used as a gateway between other networks and the DeltaV Control Network. The DeltaV system provides industry standard interfaces which may be used to transfer data between a DeltaV system and other systems or applications residing on workstations connected to the LAN. DeltaV OPC servers provide access to DeltaV real-time and historical data and may be licensed for use on an Application Station. DeltaV Web Services provide access to DeltaV batch and continuous data and are available for use on an Application Station.

If a server with sufficient space to install them is used (space varies with the model of server used) each Application Station (when installed on specific server class computers) can support as many as five Ethernet cards, one of which can be used as a Plant LAN card, as follows:

- One Primary card
- One Secondary card
- One RAS Primary card (not common)
- One RAS Secondary card (not common)
- One Plant LAN, or one gateway card, or one Redundant Batch Direct Link card

Please refer to the DeltaV product data sheets for information on the number of network cards provided with each type of workstation.

---

### Important

To protect the engineering database from unauthorized external access and to further secure the system from possible malware intrusions, Emerson strongly suggests that the ProfessionalPLUS workstation is not used to provide a DeltaV gateway to the external LAN.

---

You cannot move a card from an original workstation to another workstation, even if it appears that the connection is not being used. The DeltaV system expects that network interface connection to be there and the system will not function properly without it.

## DeltaV Zones

DeltaV Zones is a combination of hardware and software for connecting two or more DeltaV systems through an Inter-Zone Network. DeltaV Zones let you control or monitor a DeltaV system in one zone with workstations of a DeltaV system in another zone.

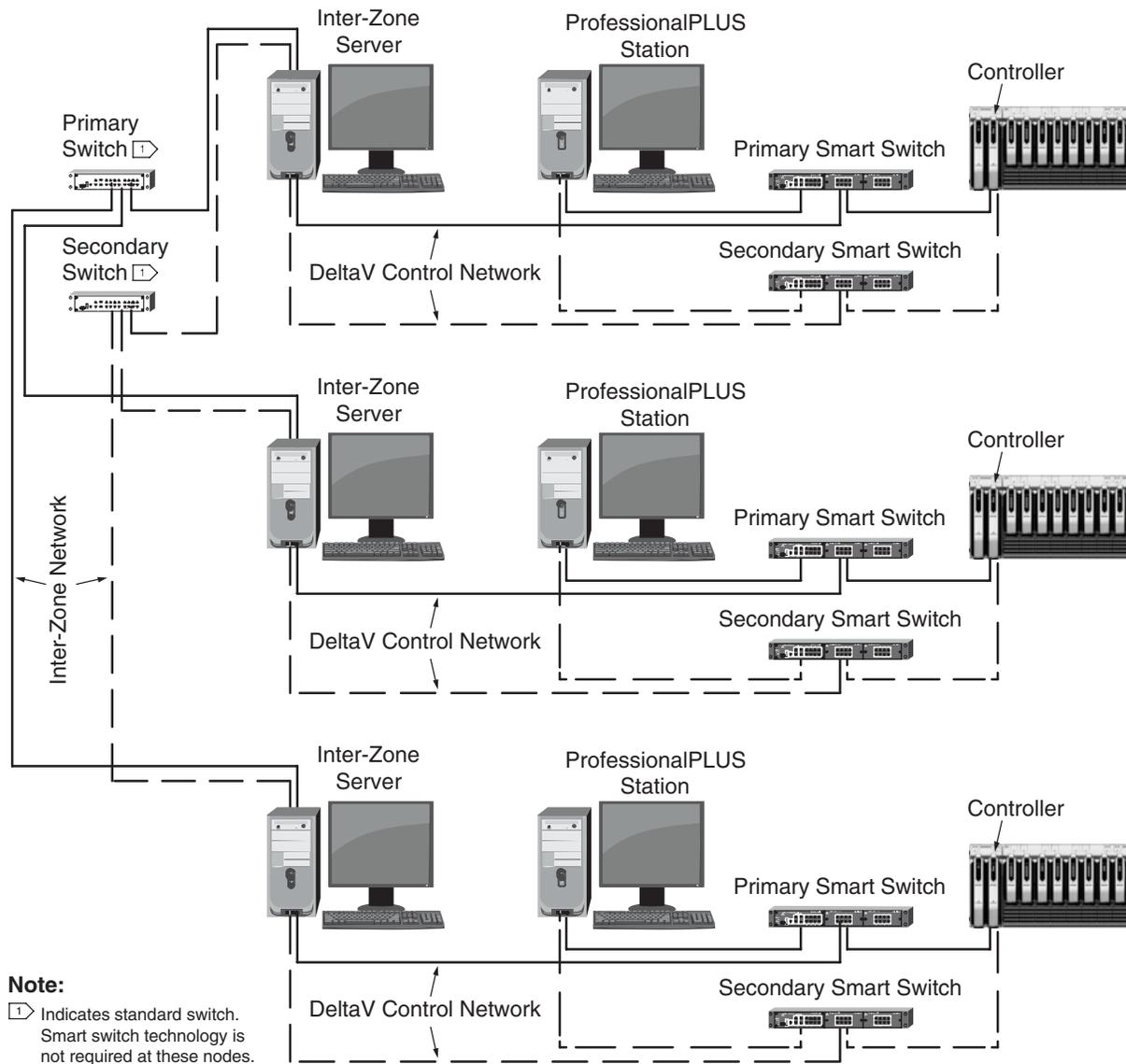
An Inter-Zone Server (IZS) must be installed in each DeltaV system to implement zones. Inter-Zone Servers are connected by an Inter-Zone Control Network (IZCN). An IZCN may be simplex or redundant. A simplex network requires one network switch; a redundant network requires two network switches. An IZCN follows the same rules as a standard DeltaV Control Network.

The only function of the Inter-Zone Servers and the Inter-Zone Network is to communicate inter-zone operating data between systems. Refer to the System Administration and Maintenance manual in DeltaV Books Online for complete information on implementing zones, zone-to-zone data communication, and security considerations.

Each zone requires a license. Licenses are purchased based on the quantity of workstations in one zone which will be used to access systems in other zones. Refer to the product data sheet for licensing information.

When scaling up an installed DeltaV system, scale-up licenses are available to increase the number of workstations available for access to other zones. [Figure 9-1](#) shows three DeltaV systems connected to Inter-Zone Servers through an Inter-Zone Network. Although the figure shows simplex Inter-Zone Servers, you can have redundant ones. For redundancy, a redundant license is required. Refer to the product data sheet for licensing information.

**Figure 9-1: Simple Inter-Zone control network**





# 10 Computer Selection and Security

## Topics covered in this chapter:

- *Hardware classes*
- *PC selection*
- *Operating system compatibility*
- *Upgrading from an earlier DeltaV version*
- *Windows domain security and login accounts*
- *Cyber security for Dell PCs in DeltaV systems*

## Hardware classes

Computers used in DeltaV systems can be divided into two main classes: server class and workstation class. The Microsoft Windows software required for DeltaV systems has changed. Refer to [Table 10-1](#) for information on Windows versions required for DeltaV versions.

For a small system, all DeltaV PC nodes can run on workstation class machines (unless Version Control Audit Trail is also being used). However, larger systems may require a server class machine. The determining factors are the overall PC node count of the system, the node's specific role in the system, and the desired security and login account scheme.

Servers offer more CPU, more storage capacity, and increased reliability over PCs. The server operating system is optimized and licensed to serve a large number of client connections, and is only certified to run on server class machines.

If the ProfessionalPLUS is a server class machine it is also the first domain controller if you use Windows domains. Windows domains provide centralized security and login account management.

If the overall PC node count is over 11, your ProfessionalPLUS workstation must be licensed as a server class machine. An Application workstation serving a primary role in a large batch system, OPC data transfer, or historical collection may also require a server class machine.

## PC selection

A DeltaV system is specifically qualified to run on certain models of Dell PC hardware. This hardware is extensively tested to ensure optimum performance and stability for your DeltaV system. Refer to the appropriate version 13 release notes for workstations and servers supported by DeltaV version 13 software.

## Operating system compatibility

*Table 10-1* lists compatibility between DeltaV versions and Microsoft operating systems..

**Table 10-1: Compatibility of DeltaV versions with Microsoft operating systems**

DeltaV Version	Computer Operating System	Server Operating System
v10.3	Windows XP, SP2	Server 2003, SP2
v10.3.1 (XP version)	Windows XP, SP3	Server 2003, SP2
v10.3.1 (Vista version)	Windows Vista, SP1	Server 2008, SP1
v11.3	Windows 7	Server 2008, SP2
v12.3 (32-bit)	Windows 7 Professional	Server 2008, SP2 (32-bit Standard Edition) Server 2008, SP2 (32-bit Enterprise Edition)
v12.3 (64-bit)	Windows 7 Professional SP1	Server 2008 R2, SP1 (64-bit Standard Edition) Server 2008 R2, SP1 (64-bit Enterprise Edition)
v13.3 (64-bit only)	Windows 7 Professional SP1	Server 2008 R2, SP1 (64-bit Standard Edition)

## Upgrading from an earlier DeltaV version

Refer to the DeltaV release notes and the DVUpgrade.chm file for information on upgrading from a previous version of DeltaV software.

Note that upgrading computers will require purchasing new Microsoft operating system licenses from Emerson to upgrade existing computers to Windows 7 or Server 2008.

## Windows domain security and login accounts

Large DeltaV systems should be setup in a Windows Active Directory. Microsoft recommends using a domain if there are five or more computers on the network. The benefit is centralized user account information which reduces the administration tasks of the system. For this setup, a ProfessionalPLUS station must be a domain controller for the Active Directory.

Centralized user accounts let each PC validate and authenticate each login with the centralized database on the domain controller. The accounts also eliminate the need to update a user account on each machine every time an account needs to be added, changed, deleted, or a password needs to be changed or reset. The DeltaV User Manager is

automatically integrated with the centralized account database for the domain. When a user needs a new account or password reset, an administrator simply logs into a DeltaV PC node, invokes the DeltaV User Manager, and performs the necessary function, once.

However, with a centralized security system, there may be a concern if the central point fails. The structure of a Windows domain uses two methods that eliminate this concern: cached accounts and peer domain controllers.

A cached account is a process where each workstation caches the security information of each user at login. If the domain controller in the ProfessionalPLUS workstation is not operating or is unreachable, the cached information allows a user to login and operate. By default, up to 10 accounts are cached.

A second, or peer, domain controller is a separate computer, running the server operating system and specifically configured as a domain controller in that domain. Once configured, the peer domain controller receives replication updates of the security information for the domain. If the ProfessionalPLUS domain controller is not operating, the peer domain controller functions as the domain controller.

A DeltaV system requires the ProfessionalPLUS workstation to be a domain controller at the time of installation, upgrade, or reinstallation (anytime the Workstation Configuration Utility is initiated). The peer domain controller must be a server class machine installed as a domain controller for that domain. This machine can be a DeltaV Application workstation.

## Cyber security for Dell PCs in DeltaV systems

Prior to delivery to an end user, Dell PCs must be set up to provide the most cyber secure DeltaV system possible. In addition, certain pre-cautions must be taken to minimize any data corruption after delivery. Procedures described below are part of the requirements for integrator certification for a DeltaV system.

The intention of these procedures is to ensure that the customer receives the most cyber protected, cyber secure system possible. Integrators must be able to verify to the customer that the system has been in a secure environment at all times.

When a PC is received from Dell and prior to any network connections being made, the following must be done:

- The latest supported security patches from Microsoft must be installed.
- The latest supported Symantec anti-virus program and the latest anti-virus signature files must be installed.

Beyond these actions, a DeltaV PC must never be attached to any network with direct access to the internet. Direct access means that a user can open the Internet Explorer and immediately connect to an internet site. E-mail programs must never be run on a DeltaV workstation at any time.

The DeltaV system should never be connected to any network (including the time the system is being engineered and implemented at the integration site) unless it is properly protected with a correctly configured firewall. The firewall should specifically block all port

80 (internet) traffic and any port that can be used for e-mail traffic. All ports should be blocked in both directions except for those needed for applications on the DeltaV Control Network.

Upon installation, all default user passwords should be changed to prevent unauthorized users from accessing the system. Each user at the integrator site should have a unique account and any account not required for startup must be deleted before the system is shipped to the customer. After startup is complete, all non-customer accounts should be deleted.

To ensure that only authorized customer accounts remain on the system after implementation, the customer administrator should change the administrator password and delete any vendor accounts. If a vendor account is required, the user may set up the account, but it is strongly suggested that the account be given limited capabilities, only enabled for the time required for the vendor to provide the necessary service, and then disabled again.

Because an anti-virus program may not completely clean a computer, or if there is any suspicion that other undetectable malicious programs may have been installed, it is best practice to have its hard-drive reformatted and the system completely reinstalled. This ensures that no traces of the infection remains and that no undetected malicious programs remain.

# 11 Hardware Planning

## Topics covered in this chapter:

- *OEM items*
- *Site preparation*
- *AC power calculation*
- *DC power calculation*
- *Enclosures*
- *Migration Panels*
- *Carriers*

## OEM items

You may need to purchase additional items from suppliers other than Emerson Process Management to complete your DeltaV system. Items can include:

- Field wiring, marshalling and cable-management hardware (such as panduit, cable ties, etc.) installed between DeltaV I/O terminations and field devices.
- Mating connectors and associated cabling for multi-pin connectors on the 10-pin, 16-pin and 24-pin mass I/O termination blocks, such as those used in programmable logic controllers (PLC) and marshalling panel applications.

Mating connectors and associated cabling are available from suppliers such as Weidmuller, Phoenix Contact, and Tyco Electronics. Tyco Electronics carries products formerly available through AMP. [Table 11-1](#) provides examples of specific mating connectors and ribbon cables from Tyco Electronics.

**Table 11-1: Tyco Electronics wire, cable, and cable accessories**

Mass I/O Terminal Block	Part Number For Mating Connector	Part Number For Ribbon Cable	Part Number For Strain Relief
10-pin	1658622-1	10WEY00004	499252-5
16-pin	1658622-3	57034-6	499252-8
24-pin	1658622-5	57034-8	1-499252-0

- DIN rail to mount controllers and I/O carriers.
- Enclosures to house controllers and I/O. Enclosures can be ordered from Emerson Process Management with an Integrated System Request (ISR).
- Furniture for workstations. Furniture can be ordered from Emerson Process Management with an Integrated System Request (ISR).
- AC wiring between AC power distribution panels and a VE5001 AC to DC System Power Supply, VE5011 Bulk AC to 24 VDC Power Supply, and VE5012 AC to 12 VDC bulk power supply.

- 12 VDC wiring between the VE5012 AC to 12 VDC bulk power supply and a VE5009 DC/DC Dual System Power Supply.
- 24 VDC wiring between the VE5011 Bulk AC to 24 VDC Power Supply and bussed power connectors on I/O carriers.
- Terminal Blocks for power distribution.
- Copper or fiber optic cable to link control network switches and transceivers.
- Additional Ethernet interface cards (three are shipped with each DeltaV system).
- Bus I/O system cables and termination equipment for As-i Bus, DeviceNet, FOUNDATION fieldbus, and Profibus systems.
- Microsoft Excel spreadsheets used with the Excel add-in option available in the various types of workstation software.

## Site preparation

Proper power, grounding, and signal wiring is extremely important for optimum DeltaV system operation. Even the best control system can only be as good as the electrical foundation on which it is built. Clean input power, single-point grounding, and adequate shielding from outside interference are a must. For a DeltaV system to meet customer's expectations, power, grounding and signal wiring must be correctly designed and installed before the system is delivered.

For details of proper site preparation, see the manual *Quick Start Guide for DeltaV Power, Grounding, and Surge Suppression*. It is included on the DeltaV Documentation Library disk and on the Foundation Support website. It can also be ordered separately as a printed manual.

## AC power calculation

You need to estimate AC power required by a DeltaV system so that an adequate AC power distribution system can be designed. [Table 11-2](#) provides normal AC current draw for DeltaV Control Network products and power supplies.

Use the entries in this table to make estimates. For more exact figures, see DeltaV product data sheets or manufacturer's manuals. For power consumption of workstations, servers, and monitors, see the Dell Computer website.

**Table 11-2: AC current draw for control network products and power supplies**

Product	Amps at 115 VAC	Amps at 230 VAC
Allied Telesyn AT-FS708 8-Port 10/100Base-TX Ethernet Switch	0.4	0.2
Allied Telesyn AT-FS709FC 8-Port 10/100Base-TX Ethernet Switch (with one 100Base-FX port supporting up to 2 Km of fiber)	0.8	0.4

**Table 11-2: AC current draw for control network products and power supplies**  
(continued)

Product	Amps at 115 VAC	Amps at 230 VAC
Cisco Catalyst 2960-8TC-L 8-Port 10/100Base-TX Fast Ethernet Switch with one SFP Slot	0.5	0.25
Cisco Catalyst 2960-24TC-L 24-Port 10/100Base-TX Fast Ethernet Switch with two SFP Slots	3.0	1.5
Cisco Catalyst 2960-48TC-L 48-Port 10/100Base-TX Fast Ethernet Switch with two SFP Slots	3.0	1.5
Cisco Catalyst 2960-24 TT-L 24-Port 10/100Base-TX Fast Ethernet Switch with two 10/100/1000 Ports	1.3	0.8
Cisco Catalyst 2960-48TT-L 48-Port 10/100Base-FX Fast Ethernet Switch with two 10/100/1000 Ports	1.3	0.8
Cisco Catalyst 3750-24FS 24-Port 100Base-FX Fiber Optic Switch with two 1 Gigabit Converter Interface Ports	1.5	0.9
Cisco Catalyst 3750-24TS-S 24-Port 10/100Base-TX Fast Ethernet Switch with two slots for Gigabit Transceivers	1.2	0.6
Cisco 3750G12S-S 12 Slot Gigabit Switch	1.2	0.6
RM100 Smart Switches	0.4	0.2
VE5001 AC to DC System Power Supply	0.34	0.17
VE5012 Bulk AC to 12 VDC Power Supply	4.2	4.2
VE5011 Bulk AC to 24 VDC Power Supply	4.2	4.2

## DC power calculation

DC power calculation must take into account the current draw on 12 VDC and 24 VDC power supplies for controllers, I/O subsystems, and DC-powered DeltaV Smart Switches.

The amount of current draw required for a controller and I/O subsystem varies with the type and quantity of I/O cards plugged into the I/O subsystem. If you use redundant controllers, you need at least two system power supplies—one for each controller, regardless of the type and quantity of I/O cards.

Each VE5001 AC to DC System Power Supply can deliver a maximum of 25 watts (2.1A). Each VE5009 DC/DC Dual System Power Supply can deliver a maximum of 96 watts (8.0A).

---

### Note

When determining the number of VE5001 or VE5009 supplies required for a controller and its associated I/O, only I/O needs to be considered.

---

See the tables below to determine I/O card current draw. Then, add the currents for each card to calculate total current draw. Complete I/O card specifications are listed in the manual *DeltaV™ M-series Hardware Installation and Reference*. Be sure to use the manual published for DeltaV version 13.3.

- [Table 11-6](#) lists current draw for M-series Pre-Series 2 and Series 2 I/O Cards and S-series Conventional I/O Cards.
- [Table 11-4](#) lists current draw for S-series CHARMs I/O Devices.
- [Table 11-5](#) lists current draw for 24 VDC-powered DeltaV Smart Switches.

## M-series Pre-Series 2 and Series 2 I/O cards and S-series conventional I/O cards.

**Table 11-3: DC current draw for M-series Pre-Series 2 and Series 2 I/O cards and S-series conventional I/O cards**

Product	Current Required for Each Product (Amperes)	
	12 VDC Local Bus Power	24 VDC Bussed Field Power
<b>M-series Pre-Series 2 I/O Cards</b>		
AI, 8-channel, 4-20 mA	0.150	0.300
AI, 8-channel, 4-20 mA with HART	0.150	0.300
AI, 8-channel, 1-5 VDC	0.150	0.100
AI, 8-channel, Thermocouple, mV	0.350	N/A
AI, 8-channel, RTD	0.160	N/A
AO, 8-channel, 4-20 mA	0.150	0.300
AO, 8-channel, 4-20 mA with HART	0.150	0.300
DI, 8-channel, 24 VDC, Isolated	0.100	N/A
DI, 8-channel, 24 VDC, Dry Contact	0.100	0.040
DI, 8-channel, 120 VAC, Isolated	0.100	N/A
DI, 8-channel, 120 VAC, Dry Contact	0.100	N/A
DI, 8-channel, 230 VAC, Isolated	0.100	N/A
DI, 8-channel, 230 VAC, Dry Contact	0.100	N/A
DI, 16-channel, Sequence of Events (SOE)	0.075	0.075
DI, 32-channel, 24 VDC Dry Contact	0.075	0.150
DO, 8-channel, 24 VDC, Isolated	0.150	N/A
DO, 8-channel, 24 VDC, High Side	0.150	depends on field devices; 3.0 maximum each card
DO, 8-channel, 120/230 VAC, Isolated	0.150	N/A
DO, 8-channel, 120/230 VAC, High Side	0.150	N/A
DO, 32-channel, 24 VDC, High Side	0.150	depends on field devices; 3.2 maximum each card

**Table 11-3: DC current draw for M-series Pre-Series 2 and Series 2 I/O cards and S-series conventional I/O cards (continued)**

Product	Current Required for Each Product (Amperes)	
	12 VDC Local Bus Power	24 VDC Bussed Field Power
I.S. AI, 8-channel, 4-20 mA with HART	0.600	N/A
I.S. AO, 8-channel, 4-20 mA	0.630	N/A
I.S. AO, 8-channel, 4-20 mA with HART	0.630	N/A
I.S. DI, 16-channel	0.350	N/A
I.S. DO, 4-channel	0.560	N/A
I.S. LocalBus Isolator	0.060	N/A
AS-i Interface	0.300	0.040
DeviceNet	0.600	N/A
Fieldbus H1Card	0.600	N/A
Fieldbus H1 Carrier, Input power	N/A	0.020 (carrier only); 0.5 maximum with cards)
Multifunction/Pulse	0.250	N/A
Profibus DP	0.600	N/A
Serial Interface with 2 Ports RS232/RS485	0.300	N/A
<b>M-series Series 2 I/O Cards and S-series Conventional I/O Cards</b>		
AI 16-channel 4-20 mA HART	0.150	0.600
Isolated input	0.350	N/A
AI 8-channel 4-20 mA HART (Simplex)	0.150	0.300
AI 8-channel 4-20 mA HART (Redundant)	0.250 per card	0.200 per card
RTD / Resistance input	0.160	N/A
Thermocouple / mV input	0.210	N/A
AO 8-channel 4-20 mA HART (Simplex)	0.150	0.200
AO 8-channel 4-20 mA HART (Redundant)	0.250 per card	0.300
Sequence of Events	0.075	0.075
DI 8-channel 120 VAC Low Side Detection	0.100	N/A
DI 8-channel 120 VAC isolated	0.100	N/A
DI 8-channel NAMUR Simplex (S-series only)	0.150	0.100
DI 8-channel NAMUR Redundant (S-series only)	0.150 per card	0.100
DI, 8-channel, 24 VDC, Dry Contact, Redundant (M-series only)	0.150	0.040
DI, 8-channel, 24 VDC, Dry Contact, Simplex (M-series only)	0.150 per card	0.020 per card
DI 8-channel 24 VDC isolated	0.100	N/A

**Table 11-3: DC current draw for M-series Pre-Series 2 and Series 2 I/O cards and S-series conventional I/O cards (continued)**

Product	Current Required for Each Product (Amperes)	
	12 VDC Local Bus Power	24 VDC Bussed Field Power
Pulse count input (S-series only)	0.250	N/A
Multifunction (M-series only)	0.250	N/A
DI 32-channel 24 VDC High Density	0.075	0.100
DO 8-channel 120/230 VAC high-side	0.150	N/A
DO 8-channel 120/230 VAC isolated	0.150	N/A
DO 8-channel 24 VDC high-side (Simplex)	0.150	3.05
DO 8-channel 24 VDC high-side (Redundant)	0.150	3.05
DO 8-channel 24 VDC Isolated	0.150	N/A
DO 32-channel 24 VDC High Density	0.150	3.272
AS-interface	0.300	0.112
DeviceNet	0.600	0.053
Fieldbus H1 (Simplex)	0.300	N/A
Fieldbus H1 (Redundant)	0.300	N/A
H1 card with integrated power	0.300	1.6
Profibus DP (Simplex)	0.600	N/A
Profibus DP (Redundant)	0.600	N/A
Serial (Simplex)	0.300	N/A
Serial (Redundant)	0.300	N/A

## S-series CHARMs I/O devices

**Table 11-4: DC current draw for S-series CHARMs I/O devices**

Refer to the CHARMs product data sheet. For CHARMs, the 24 VDC current draw covers both internal and field signal requirements.

## 24 VDC-powered DeltaV Smart Switches

**Table 11-5: DC current draw for 24 VDC-powered DeltaV Smart Switches**

Product	Current Required for Each Product (Amperes) at 24 VDC
<b>MD20 and MD30 Switches, and Media Modules</b>	
MD20-8 and MD20-8-ES	0.208

**Table 11-5: DC current draw for 24 VDC-powered DeltaV Smart Switches (continued)**

<b>Product</b>	<b>Current Required for Each Product (Amperes) at 24 VDC</b>
MD20-16 and MD20-16-ES	0.500
MD20-24 and MD20-24-ES	0.500
MD30-8 and MD30-8-ES (includes MD4-2TX/SFP or MD4-2TX/SFP-ES gigabit uplink module)	0.233
MD30-16 and MD30-16-ES (includes MD4-2TX/SFP or MD4-2TX/SFP-ES gigabit uplink module)	0.525
MD30-24 and MD30-24-ES (includes MD4-2TX/SFP or MD4-2TX/SFP-ES gigabit uplink module)	0.525
MD2-2FXM2 and MD2-2FXM2-ES	0.142
MD2-2FXS2 and MD2-2FXS2-ES	0.142
MD2-4TX1 and MD2-4TX1-ES	0.333
MD2-4TX1-PoE and MD2-4TX1-PoE-ES	0.333 <sup>(1)</sup>
MD3-2FXM2/2TX1 and MD3-2FXM2/2TX1-ES	0.142
MD3-2FXS2/2TX1 and MD3-2FXS2/2TX1-ES	0.142
MD3-4FXM2 and MD3-4FXM2-ES	0.292
MD3-4FXM4 and MD3-4FXM4-ES	0.292
MD3-4FXS2 and MD3-4FXS2-ES	0.292
MD3-2FXM4/2TX and MD3-2FXM4/2TX1-ES	0.142
MD3-1FXS2/3TX1 and MD3-1FXS2/3TX1-ES	0.142
<b>FP20 Switches</b>	
FP20-6TX2TX and FP20-6TX2TX-ES1	0.221
FP20-6TX1MM1TX and FP20-6TX1MM1TX-ES	0.271
FP20-6TX1SM1TX and FP20-6TX1SM1TX-ES	0.271
FP20-6TX1SMLH1TX and FP20-6TX1SMLH1TX-ES	0.271
FP20-6TX2MM and FP20-6TX2MM-ES	0.321
FP20-6TX2SM and FP20-6TX2SM-ES	0.321
FP20-6TX2SMLH and FP20-6TX2SMLH-ES	0.321

(1) Power over Ethernet through MD2-4TX1-PoE and MD2-4TX1-PoE-ES modules is up to 1.2 amperes (depending on the distant load) at 48 VDC from separate 48 VDC power supply

## Enclosures

---

### Note

All enclosures must conform to applicable federal, state, and local codes and regulations. In addition, when designing enclosures for the European Union you must ensure that the appropriate EU Directives have been considered as required (for example, 73/23/EEC Low Voltage Directive and 89/336/EEC Electromagnetic Compatibility, with amendments).

---

To choose an enclosure for your DeltaV system, consider the following items:

- System environment
- Wire management
- Heat dissipation

You can choose from a wide variety of suitable enclosures to protect your system from adverse environmental conditions. The enclosures range from simple sheet metal boxes to NEMA 4X-rated enclosures. Select the appropriate type for your specific application.

Enclosures are designed to properly dissipate heat generated within the enclosure, maintain an ambient temperature in the enclosure which is within the range of installed devices, and filter potentially damaging air-borne contaminants. You must take into account the space needed in and around an enclosure to service, remove, or replace components.

---

### Note

To ensure adequate airflow through I/O cards, horizontal I/O carriers must be mounted horizontally and vertical I/O carriers must be mounted vertically.

---

To determine the optimal enclosure for temperature control, consider the following:

- Maximum external ambient temperature
- Power dissipation of each installed device
- Internal temperature of the enclosure (cannot exceed the ambient rated temperature for lowest temperature rating of any device located in the enclosure)
- Physical dimensions of the DeltaV components to be enclosed
- Adequate access space around installed components

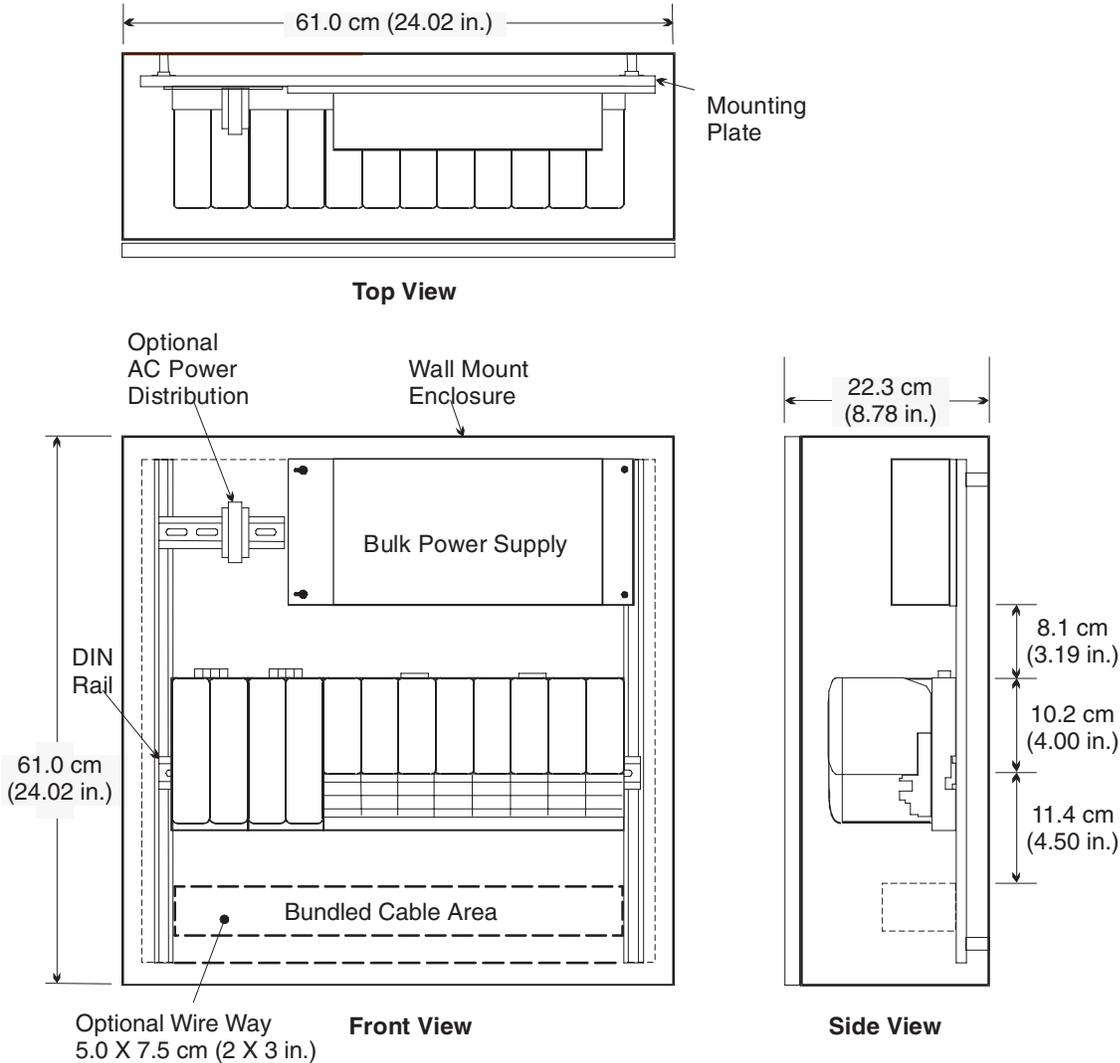
Selecting enclosures for control of air-borne contaminants should be done with the help of experts in this field.

## Mounting M-series DeltaV systems in enclosures

*Figure 11-1* and *Figure 11-2* show example arrangements for horizontally mounting a DeltaV system in an enclosure, including areas available for wire management. *Figure 11-3* shows the spacing when mounting multiple DIN rails in an enclosure. *Figure 11-4* shows an arrangement for vertically mounting a DeltaV system in an enclosure. Wiring can be fed into an enclosure through gland plates or through conduit entries. The cabinet supplier can help you select the proper arrangement for the application.

These figures are applicable for mounting DeltaV systems using M-series I/O and S-series Conventional I/O. If you select pre-configured enclosures for S-series CHARMs I/O, equipment mounting and internal wire management is completed at the factory. Power and field wiring can be fed through top or bottom entry ways.

Figure 11-1: Enclosure example for controller and 8 I/O interfaces



**Figure 11-2: Enclosure example for controller and 24 I/O interfaces**

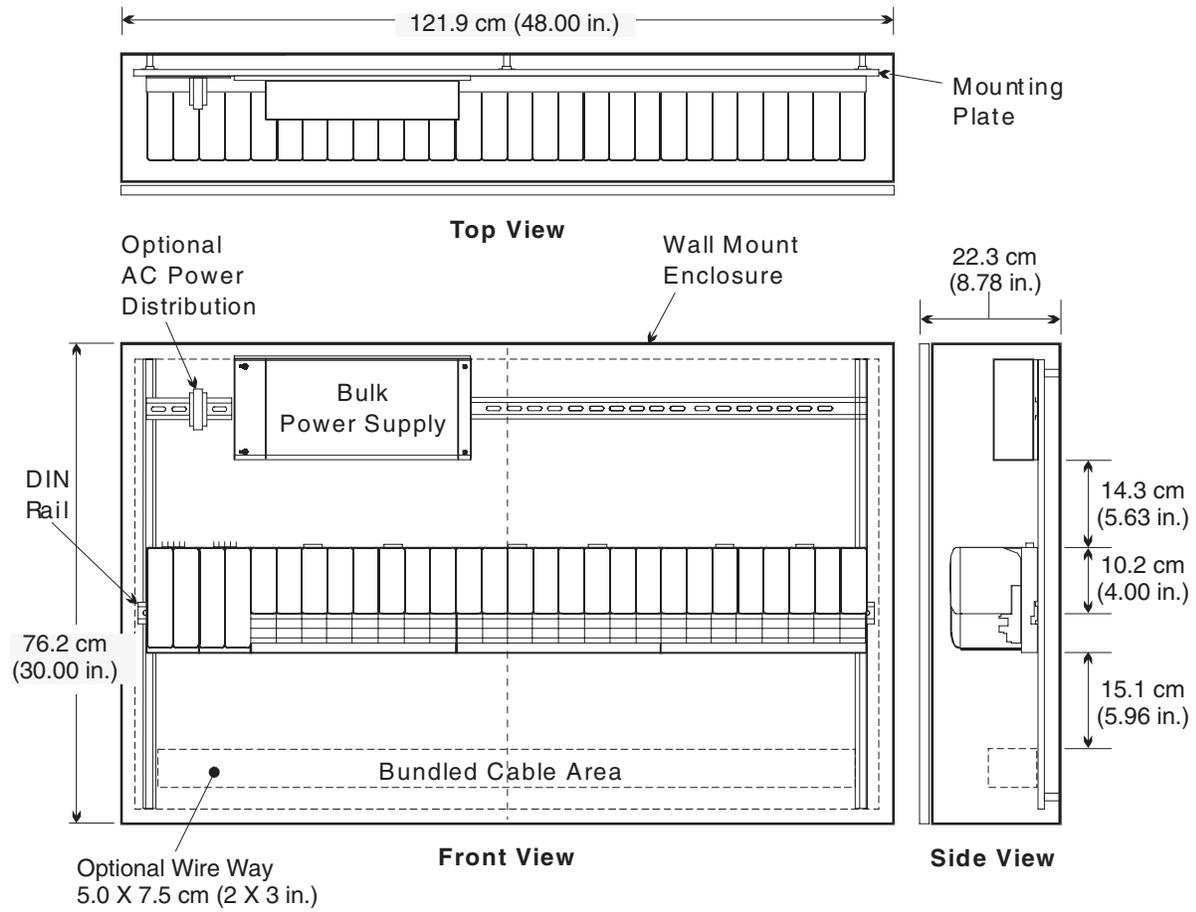
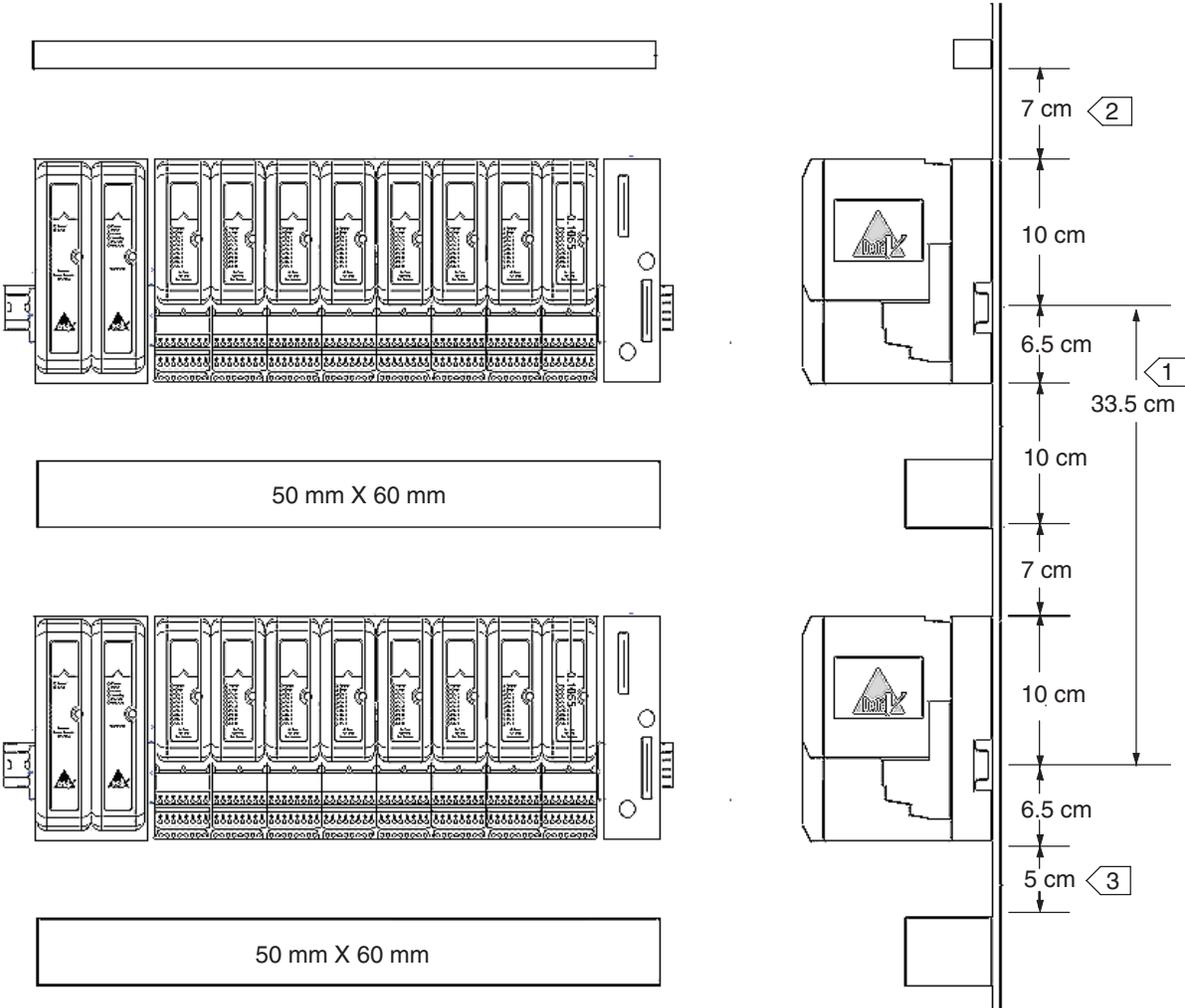
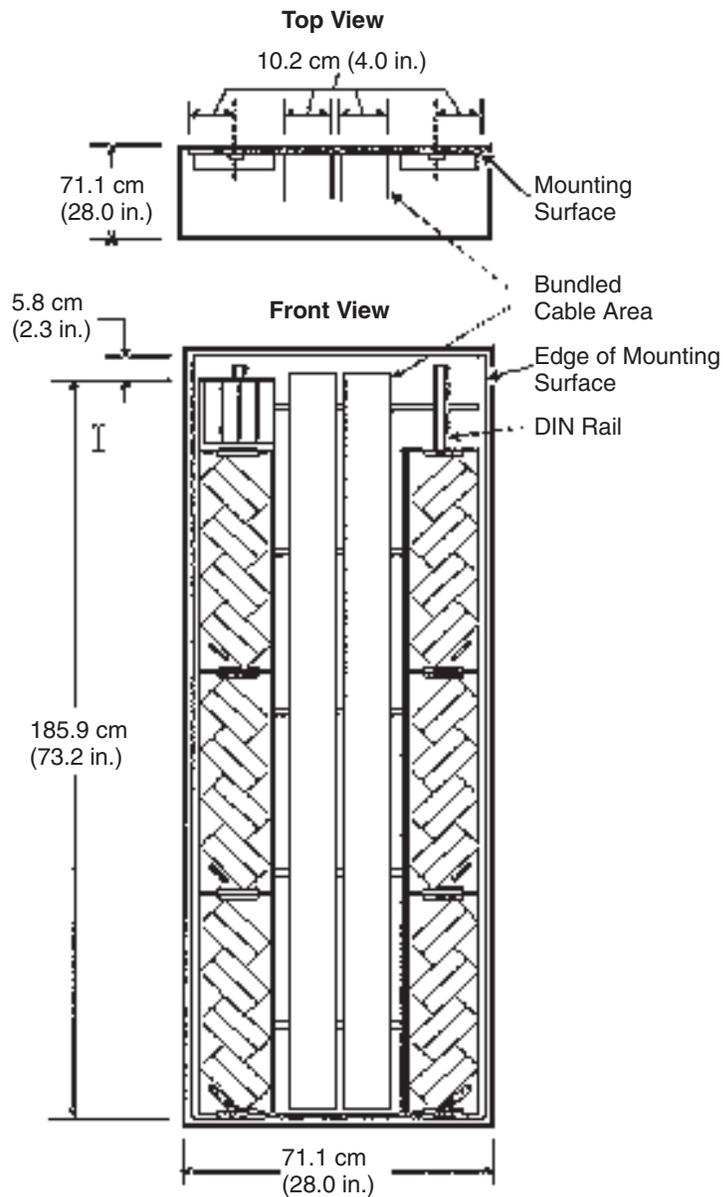


Figure 11-3: Mounting multiple DIN rails (M-series)



- 1 Recommended distance between Carrier DIN rails
- 2 Recommended clearance between carrier and adjacent equipment
- 3 Recommended clearance between carrier and wire way

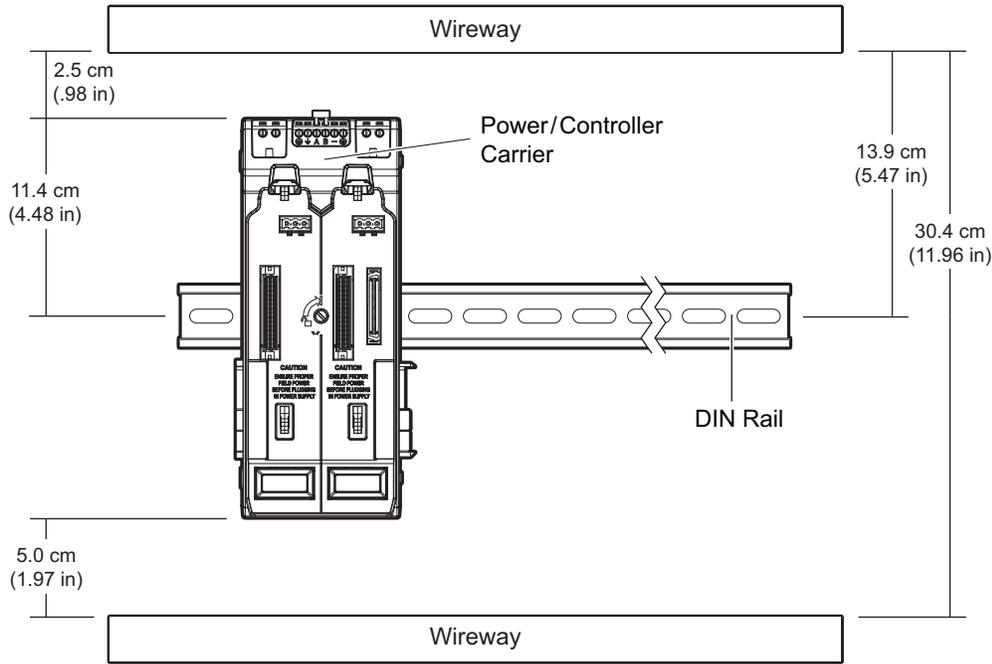
**Figure 11-4: Enclosure example for vertically mounted I/O carriers**

## Mounting S-series DeltaV systems in enclosures

DeltaV S-series horizontal carriers and hardware are designed for installation in an enclosure suitable for the location in which the equipment is installed. Use standard, 3.5 cm (1.38 inch) T-type DIN rails to hold the equipment.

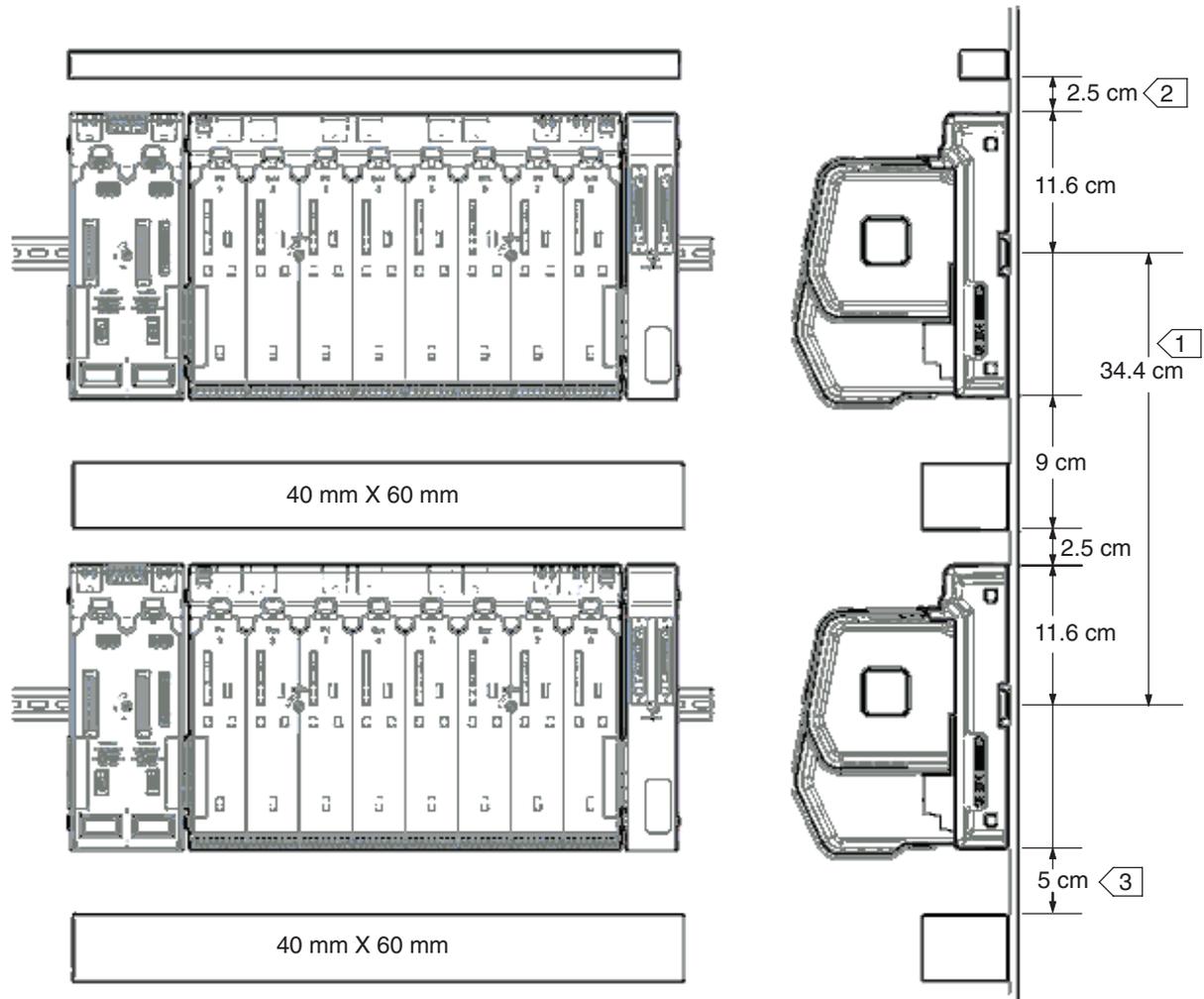
Mounting requirements for S-series hardware is similar to that for M-series hardware. Because S-series hardware dimensions are slightly different than M-series, the clearances required are different as shown in [Figure 11-5](#).

Figure 11-5: S-series hardware mounting clearances



**Note**  
S-series DIN rails must be T-type.

**Figure 11-6: Mounting multiple rows of S-series hardware in an enclosure**



- 1 Recommended distance between Carrier DIN rails
- 2 Recommended clearance between carrier and adjacent equipment
- 3 Recommended clearance between carrier and wire way

**Suggested spacing for DIN rail installation**

- Maintain 2.5 cm (.98 inch) from the top of the carrier to the bottom of the wireway mounted above or to the top edge of the enclosure's mounting surface.
- Maintain 5.0 cm (1.97 inch) from the bottom of the carrier to the top of the wireway mounted below or from the bottom edge of the enclosure's mounting surface.
- Maintain 30.4 cm (11.96 inches) from the bottom of the wireway mounted above or to the top edge of the enclosure's mounting surface to the top of the wireway mounted below or from the bottom edge of the enclosure's mounting surface.

- Maintain 11.4 cm (4.48 inches) from the center of the DIN rail to the top of the carriers.

## Power dissipation considerations

The power dissipated within an enclosure generates heat. An enclosure vendor uses power dissipation figures to determine airflow requirements needed to maintain heat within allowable limits. When there is no internal heat control, a change in internal heat requires an equal and opposite change in external ambient temperature.

The power dissipation in an enclosure is relational to the power requirements of the enclosed equipment, including the power required to operate the equipment and the field power dissipation within the enclosure.

- [Table 11-6](#) lists maximum power dissipation of M-series controllers and M-series Pre-Series 2 and Series 2 I/O cards.
- [Table 11-7](#) lists maximum power dissipation of S-series controllers and S-series Conventional I/O Cards.
- [Table 11-8](#) list maximum power dissipation of CHARMs I/O.
- [Table 11-9](#) lists maximum power dissipation of DeltaV Smart Switches.
- [Table 11-10](#) lists maximum power dissipation of DeltaV power supplies, DeltaV SIS components, and other components.

To determine the total power dissipation, sum the power dissipated by each component.

## M-series controllers and M-series Pre-Series 2 and Series 2 I/O cards

### Note

The power dissipation for each DC-powered discrete and analog card includes the loss of a power supply which is 75% efficient. If the power supply is not included in the enclosure or a supply with a different efficiency is used, adjust the dissipation accordingly.

**Table 11-6: Maximum power dissipation of M-series controllers and pre-Series 2 and Series 2 I/O cards**

Product	Power Dissipation (includes power supplies)
<b>M-series Controller Equipment</b>	
MD Plus and MX Controller	14.0 W
Zone 2 Remote Interface Unit	6.0 W
<b>M-series (Pre-Series 2) I/O Cards</b>	
AI, 8-channel, 4-20 mA	10.1 W
AI, 8-channel, 4-20 mA, HART	10.1 W
AI, 8-channel, 1-5 VDC	10.1 W
AI, 8-channel, Thermocouple, mV	5.9 W

**Table 11-6: Maximum power dissipation of M-series controllers and pre-Series 2 and Series 2 I/O cards (continued)**

Product	Power Dissipation (includes power supplies)
AI, 8-channel, RTD	2.7 W
AO, 8-channel, 4-20 mA	11.9 W
AO, 8-channel, 4-20 mA with HART	11.9 W
DI, 8-channel, 24 VDC, Isolated	3.6 W
DI, 8-channel, 24 VDC, Dry Contact	2.9 W
DI, 8-channel, 120 VAC, Isolated	3.4 W
DI, 8-channel, 120 VAC, Dry Contact	3.4 W
DI, 8-channel, 230 VAC, Isolated	3.6 W
DI, 8-channel, 230 VAC, Dry Contact	3.6 W
DI, 16-channel, SOE	3.5 W
DI, 32-channel, 24 VDC, Dry Contact	5.7 W
DO, 8-channel, 24 VDC, Isolated	4.9 W
DO, 8-channel, 24 VDC, High Side	3.7 W + load dependent power dissipation (maximum of 25 W at 24 VDC <sup>(1)</sup> )
DO, 8-channel, 115/230 VAC, Isolated	6.1 W
DO, 8-channel, 115/230 VAC, High Side	6.1 W
DO, 32-channel, 24 VDC, High Side	3.0 W + load dependent power dissipation (maximum of 27 W at 24 VDC <sup>(2)</sup> )
AS-I Interface	9.6 W
DeviceNet	11.4 W
Fieldbus H1 card	10.2 W
Multifunction/Pulse	8.2 W
Profibus DP	10.1 W
Serial Interface with 2 Ports	5.1 W
PROVOX® I/O Interface Module	3.6 W typical, 6.0 W maximum
RS3™ I/O Interface Module	13.2 W typical, 17.0 W maximum
<b>M-series Series 2 I/O Cards</b>	
AI, 4-channel, Isolated mV, V, RTD, Ohms, TC, Simplex	5.9 W
AI, 8-channel, 4-20 mA with HART, Simplex	8.4 W
AI, 8-channel, 4-20 mA with HART, Redundant	9.1 W per card
AI, 16-channel, 4-20 mA with HART, Simplex	12.7 W
AO, 8-channel, 4-20 mA with HART, Simplex	10.2 W
AO, 8-channel, 4-20 mA with HART, Redundant	10.2 W per card
DI, 8-channel, 24 VDC Dry Contact, Simplex and Redundant	3.7 W per card

**Table 11-6: Maximum power dissipation of M-series controllers and pre-Series 2 and Series 2 I/O cards (continued)**

Product	Power Dissipation (includes power supplies)
DI, 32-channel, 24 VDC Dry Contact, Simplex	5.7 W per card
DO, 8-channel, 24 VDC High-Side, Simplex and Redundant	3.7 W per card
DO, 32-channel, 24 VDC High-Side, Simplex	3.0 W + load dependent power dissipation (27 W maximum at 24 VDC) <sup>(2)</sup>
DeviceNet, Simplex	11.4 W
Fieldbus H1, Simplex and Redundant	6.1 W per card
Isolated Input (supports mV, V, RTD, Ohms, TC), Simplex	5.9 W
Profibus, Simplex	10.1 W
Serial Interface with 2 Ports, Simplex and Redundant	5.1 W per card
Fieldbus H1 carrier	5.2 W <sup>(3)</sup>
<b>Intrinsically Safe I/O Cards</b>	
I.S. AI, 8-channel, 4-20 mA with HART	9.8 W
I.S. AO, 8-channel, 4-20 mA with HART	11.3 W
I.S. DI, 16-channel	7.6 W
I.S. DO, 4-channel	8.5 W

- (1) Power dissipation in this card is based on a full load of 3 A at 24 V. Actual dissipation is determined by the following equation:  
 $Supply\ Voltage \times Actual\ Load\ Current\ (8\ channels) \times [(1 \div power\ supply\ efficiency) - 1]$
- (2) Power dissipation in this card is based on a full load of 3.2 A at 24 V. Actual dissipation is determined by the following equation:  $Supply\ Voltage \times Actual\ Load\ Current\ (32\ channels) \times [(1 \div power\ supply\ efficiency) - 1]$
- (3) Does not include I/O card dissipation or 2.2 W power supply dissipation. (Assumes power supply is not in the same enclosure as the H1 carrier).

## S-series controllers, S-series I/O, and CHARMs I/O

### Note

The values in the following table are based on 75% efficiency for the System Power Supply (24 VDC) and 91% efficiency for the Bulk Power Supply.

**Table 11-7: Power dissipation for S-series I/O and controllers**

Product	Power dissipation per unit (Watts)	System power dissipation (Watts)
	Use these values if external power is used.	Use these values to calculate the heat generated from the S-series cards, system power supplies, and bulk power supplies.
Controllers (SD Plus, SX, SQ)	4.7	8.4
AI 8-channel, 4-20 mA, HART	Simplex: 5.4 Redundant: 6.1	Simplex: 6.8 Redundant: 8.5
AI 16-channel, 4-20 mA, HART	7.7	9.1
AO 8-channel 4-20 mA HART	Simplex: 7.1 Redundant: 7.2	Simplex: 8.6 Redundant: 9.6
AS-Interface	7.0	9.8
DeviceNet	8.2	13.9
DI 8-channel NAMUR (simplex or redundant)	3.0	4.5
DI 8-channel 24 VDC isolated	3.1	4.1
DI 8-channel 120 VAC dry contact	2.9	3.9
DI 8-channel 120 VAC isolated	2.9	3.9
DI 32-channel 24 VDC dry contact	4.2	4.9
DO 8-channel 24 VDC high-side (simplex or redundant)	3.9	5.3
DO 8-channel 24 VDC isolated	4.2	5.6
DO 8-channel 120/230 VAC high-side	5.4	6.8
DO 8-channel 120/230 VAC isolated	5.4	6.8
DO 32-channel 24 VDC high-side	4.0	5.4
Fieldbus H1 (simplex or redundant)	4.4	7.3
H1 card with integrated power	3.7	8.0
Isolated input	4.2	7.6

**Table 11-7: Power dissipation for S-series I/O and controllers (continued)**

Product	Power dissipation per unit (Watts)	System power dissipation (Watts)
	Use these values if external power is used.	Use these values to calculate the heat generated from the S-series cards, system power supplies, and bulk power supplies.
Pulse count input	5.9	8.3
Profibus DP (simplex or redundant)	7.2	13
RTD / Resistance input	1.9	3.5
Sequence of Events	2.5	3.3
Serial card (simplex or redundant)	3.6	6.5
Thermocouple / mV input	4.2	7.6

**Table 11-8: Power dissipation for CHARMs I/O**

Product	Power dissipation (Watts)
CHARM I/O card	8.0 maximum per redundant CIOC node: <ul style="list-style-type: none"> <li>• 2 W per CIOC</li> <li>• 2 W per fiber-optic I/O port or 1.3 W per copper I/O port</li> </ul>
24 VDC Power CHARM	0.32
AI 0-10 VDC CHARM	0.40
AI 4-20 mA HART CHARM	0.33
I.S. AI 4-20 mA HART CHARM	0.86 (includes terminal block)
AO 4-20 mA HART CHARM	0.48
I.S. AO 4-20 mA HART CHARM	1.1 (includes terminal block)
DI 24 VDC isolated CHARM	0.32
DI 120 VAC isolated CHARM	0.41
DI 120 VAC isolated Plus CHARM	1.3
DI 230 VAC isolated CHARM	0.40
DI 24 VDC dry contact CHARM	0.33
DI NAMUR CHARM	0.51
I.S. DI NAMUR CHARM	0.57 (includes terminal block)
DO 24 VDC high-side CHARM	0.44
DO 24 VDC isolated CHARM	0.46
I.S. DO 45 mA CHARM	1.4 (includes terminal block)
DO 100 mA energy limited CHARM	0.56

**Table 11-8: Power dissipation for CHARMs I/O (continued)**

Product	Power dissipation (Watts)
DO 120/230 VAC isolated CHARM	0.7
RTD / Resistance input CHARM	0.30
I.S. RTD / Resistance input CHARM	0.60
Thermocouple / mV input CHARM	0.30
I.S. Thermocouple / mV input CHARM	0.60

## DeltaV Smart Switches

**Table 11-9: Maximum power dissipation of DeltaV Smart Switches**

Product	Power Dissipation
<b>MD20 and MD30 Switches, and Media Modules</b>	
MD20-8 and MD20-8-ES	5.0 W
MD20-16 and MD20-16-ES	12.0 W
MD20-24 and MD20-24-ES	12.0 W
MD30-8 and MD30-8-ES	5.6 W
MD30-16 and MD30-16-ES	12.6 W
MD30-24 and MD30-24-ES	12.6 W
MD2-2FXM2 and MD2-2FXM2-ES	3.8 W
MD2-2FXS2 and MD2-2FXS2-ES	3.8 W
MD2-4TX1 and MD2-4TX1-ES	0.8 W
MD2-4TX1-POE and MD2-4TX1-POE-ES	0.8 W (1)
MD3-2FXM2/2TX1 and MD3-2FXM2/2TX1-ES	3.8 W
MD3-2FXS2/2TX1 and MD3-2FXS2/2TX1-ES	3.8 W
MD3-4FXM2 and MD3-4FXM2-ES	6.8 W
MD3-4FXM4 and MD3-4FXM4-ES	6.8 W
MD3-4FXS2 and MD3-4FXS2-ES	6.8 W
MD3-2FXM4/2TX and MD3-2FXM4/2TX1-ES	3.8 W
MD3-1FXS2/3TX1 and MD3-1FXS2/3TX1-ES	2.3 W
MD4-2TX/SFP and MD4-2TX/SFP-ES	5.8 W <sup>(1)</sup>
<b>RM100 Switches and Expansion Modules</b>	
RM100 Base	12 W
RM100 Base-RP	13 W
RM100-8TX	12 W
RM100-24TX	16 W
RM100-EM8TX	2 W

**Table 11-9: Maximum power dissipation of DeltaV Smart Switches (continued)**

Product	Power Dissipation
RM100-EM8MMFX	10 W
RM100-EM8SMFX	10 W
RM100-EM8SFP	11 W <sup>(2)</sup>
<b>FP20 Switches</b>	
FP20-6TX2TX and FP20-6TX2TX-ES1	5.3 W
FP20-6TX1MM1TX and FP20-6TX1MM1TX-ES	6.5 W
FP20-6TX1SM1TX and FP20-6TX1SM1TX-ES	6.5 W
FP20-6TX1SMLH1TX and FP20-6TX1SMLH1TX-ES	6.5 W
FP20-6TX2MM and FP20-6TX2MM-ES	7.7 W
FP20-6TX2SM and FP20-6TX2SM-ES	7.7 W
FP20-6TX2SMLH and FP20-6TX2SMLH-ES	5.3 W

(1) Does not include power dissipated by 48 VDC supply for power over internet (PoE)

(2) Add 1 Watt for each installed transceiver.

## Other DeltaV components

**Table 11-10: Maximum power dissipation of other DeltaV products**

Product	Power Dissipation
<b>Power Supplies</b>	
AC to DC System Power Supply	4.4 W
Dual DC/DC System Power Supply, 12 VDC input	11.4 W
Dual DC/DC System Power Supply, 24 VDC input	26.4 W
DIN Rail Mounted Bulk AC to 12 VDC Power Supply	12 W
DIN Rail Mounted Bulk AC to 24 VDC Power Supply	12 W
Panel-Mounted Bulk AC to 12 VDC Power Supply	22 W
Panel-Mounted Bulk AC to 24 VDC Power Supply	22 W
Bulk 24 VDC to 12 VDC Power Supply	14.5 W
<b>DeltaV SIS Components</b>	
Simplex Logic Solver	21.4 W
Redundant Logic Solver	32 W
SISNet Repeaters	9.6 W (per Repeater)

**Table 11-10: Maximum power dissipation of other DeltaV products (continued)**

Product	Power Dissipation
Auxiliary Relay Modules, Energize to Actuate and De-Energize to Actuate 24 VDC	4.65 W
Auxiliary Relay Diode Module	2.25 W
<b>Miscellaneous Components</b>	
Media converter	5.1 W
DeltaV Single Port Fiber Switch	8.2 W
DeltaV Four Port Fiber Switch	8.4 W
I.S. Local Bus Isolator	1.2 W
I.S. System Power Supply	1.5 W

## Enclosure selection procedure

To select the proper enclosure for your DeltaV system:

- Determine the allowable temperature rise by subtracting the expected ambient temperature from the lowest rated temperature of the components to be mounted in the enclosure.
- Use power dissipation tables above to determine the power dissipation for the components to be mounted in the enclosure.
- Using the temperature rise and power dissipation information, the enclosure supplier can determine the enclosure surface area and cooling options required for your application.

## Example enclosure selection calculation

Assume the system consists of the following components:

Quantity	Product	Power Dissipation
1	MX Controller	14.0 W
1	AI, 8-channel, 4-20 mA, HART	10.1 W
1	AO, 8-channel, 4-20 mA	11.9 W
1	DI, 8-channel, 24 VDC, isolated	3.6 W
1	DO, 8-channel, 24 VDC, high side (driving 8 solenoids)	3.7 W + 16.4 W
2	DO, 8-channel, 120/230 VAC, isolated	12.2 W
2	DI, 8-channel, 120 VAC, isolated	6.8 W
1	AC to DC System Power Supply	4.4 W
1	Bulk AC to 24 VDC Power Supply	22 W

Quantity	Product	Power Dissipation
	<b>Total power</b>	<b>105.1 W</b>

Assume ambient temperature is 35°C. The DeltaV components are rated for an ambient temperature of 60°C. Therefore, the enclosure design temperature rise must be less than 60 - 35 = 25°C with 105.1 W of heat dissipation within it. If the surface area of the enclosure is insufficient to dissipate the heat, you can use cooling options such as fans or blowers to improve heat dissipation.

The actual temperature rise varies with layout, enclosure location, and other factors. If the application is critical, or if the exact conditions are undetermined, follow your standard corporate/plant safety standards. Cabinet manufacturers recommend a safety margin of 25%.

## Physical dimension considerations

To ensure correct size and quantity of enclosures purchased, the size and weight of all devices to be enclosed must be totaled.

- See [Table 11-11](#) for dimensions and weights of controller and Pre-Series 2 and Series 2 I/O Cards.
- See [Table 11-12](#) for dimensions and weights of CHARMs I/O Devices.
- See [Table 11-13](#) for dimensions and weights of Allied-Telesyn and Cisco network switches.
- See [Table 1](#) for dimensions and weights of DeltaV Smart Switches.
- See [Table 11-15](#) for dimensions and weights of workstations, servers, and monitors.
- See [Table 11-16](#) for dimensions and weights of power supplies.

## Controllers and Series 1 and Series 2 I/O hardware

**Table 11-11: Dimensions and weights of controllers and Series 1 and Series 2 I/O hardware**

Product	Height cm (in.)	Width cm (in.)	Depth cm (in.)	Weight kg (lb)
All Controllers	15.9 (6.3)	4.1 (1.6)	10.7 (4.2)	0.28 (0.62)
Controller Firewall	13.1 (5.2)	4.7 (1.9)	11.1 (4.4)	0.34 (0.75)
Emerson Smart Firewall	4.3 (1.7)	47.7 (18.81)	25.0 (9.84)	3.17 (7.0)
2-wide Horizontal Power/Controller Carrier	16.5 (6.5)	9.2 (3.5)	3.1 (1.2)	0.16 (0.35)
8-wide Horizontal I/O Interface Carrier	16.5 (6.5)	34.3 (13.5)	3.1 (1.2)	0.50 (1.10)
4-Wide Legacy Vertical Power/Controller Carrier	18.0 (7.1)	18.3 (7.2)	2.8 (1.1)	0.45 (1.00)

**Table 11-11: Dimensions and weights of controllers and Series 1 and Series 2 I/O hardware (continued)**

Product	Height cm (in.)	Width cm (in.)	Depth cm (in.)	Weight kg (lb)
4-Wide VerticalPLUS Power/Controller Carrier	18.1 (7.1)	22.8 (9.0)	2.8 (1.1)	0.58 (1.30)
4-Wide VerticalPLUS SISNet Repeater Carrier	18.1 (7.1)	22.8 (9.0)	2.8 (1.1)	0.58 (1.30)
8-wide Legacy Vertical I/O Interface Carrier	55.9 (22.0)	18.3 (7.2)	2.8 (1.1)	1.36 (3.00)
8-wide VerticalPLUS I/O Interface Carrier	51.0 (20.1)	22.8 (9.0)	2.8 (1.1)	1.6 (3.60)
H1 Carrier	17.8 (7.0)	9.1 (3.6)	2.5 (1.0)	0.28 (0.62)
I.S. Power and Localbus Isolator Carriers	16.5 (6.5)	9.1 (3.6)	3.1 (1.2)	0.26 (0.56)
PROVOX I/O Interface Carrier	22.2 (8.7)	48.3 (19.0)	5.1 (2.0)	2.13 (4.70)
RS3 t I/O Interface Carrier	31.1 (12.7)	48.3 (19.0)	8.9 (3.5)	3.04 (6.70)
I/O Interface Card	10.5 (4.1)	See figures	10.7 (4.2)	0.18 (0.40)
H1 Fieldbus Card	13.2 (5.2)	See figures	10.7 (4.2)	0.28 (0.62)
I/O Interface Termination Block	N/A	N/A	N/A	0.06 (0.13)
PROVOX I/O Interface Card	15.9 (6.3)	4.2 (1.7)	10.7 (4.2)	0.28 (0.62)
RS3 I/O Interface Card	16.2 (6.4)	8.4 (3.3)	11.0 (4.3)	0.59 (1.30)
Extender Cable Connector	16.5 (6.5)	4.1 (1.6)	3.1 (1.2)	0.08 (0.18)
Remote Interface Unit (RIU)	15.9 (6.3)	4.1 (1.6)	10.7 (4.2)	0.28 (0.62)

## CHARMs I/O devices

**Table 11-12: Dimensions and weights of CHARMs I/O devices**

Product	Height cm (in.)	Width cm (in.)	Depth cm (in.)	Weight kg (lb)
CHARM I/O Card (CIOC)	13.3 (5.22)	3.5 (1.38)	13.3 (5.24)	0.262 (0.578)
CHARM I/O Carrier	19.3 (7.59)	12.5 (4.91)	7.1 (2.81)	0.542 (1.195)
CHARM I/O Carrier with two cards	19.3 (7.59)	12.5 (4.91)	15.83 (6.23)	1.066 (2.35)
CHARM (All)	1.2 (0.48)	4.8 (1.89)	7.3 (2.87)	0.024 (0.053)
CHARM Baseplate with Terminals	19.5 (7.68)	12.5 (4.91)	8.3 (3.27)	0.82 (1.81)
CHARM Column Extender	3.5 (1.39)	12.5 (4.91)	4.7 (1.86)	0.12 (0.26)
CHARM Column Terminator	3.5 (1.39)	12.5 (4.91)	4.7 (1.86)	0.11 (0.24)

**Table 11-12: Dimensions and weights of CHARMs I/O devices (continued)**

Product	Height cm (in.)	Width cm (in.)	Depth cm (in.)	Weight kg (lb)
CHARM baseplate with Terminals and CHARMs	19.5 (7.68)	12.5 (4.91)	10.44 (4.11)	1.08 (2.38)

## Allied Telesyn and Cisco network switches

**Table 11-13: Dimensions and weights of Allied Telesyn and Cisco network switches**

Product	Height cm (in.)	Width cm (in.)	Depth cm (in.)	Weight kg (lb)
Allied Telesyn AT-FS708 8-Port 10/100Base-TX Ethernet Switch	3.6 (1.4)	24.9 (9.6)	11.6 (4.6)	0.9 (2)
Allied Telesyn AT-FS709FC 8-Port 10/100Base-TX Ethernet Switch (with one 100Base-FX port supporting up to 2 Km of fiber)	4.5 (1.8)	33.0 (13.0)	20.3 (8.0)	2.0 (4.4)
Cisco Catalyst 2960-8TC-L 8-Port 10/100Base-TX Fast Ethernet Switch with one SFP Slot	4.4 (1.73)	27 (10.6)	16.3 (6.4)	1.4 (3)
Cisco Catalyst 2960-24TC-L 24-Port 10/100Base-TX Fast Ethernet Switch with two SFP Slots	4.4 (1.73)	44.5 (17.5)	23.6 (9.3)	3.6 (8)
Cisco Catalyst 2960-48TC-L 48-Port 10/100Base-TX Fast Ethernet Switch with two SFP Slots	4.4 (1.73)	44.5 (17.5)	23.6 (9.3)	3.6 (8)
Cisco Catalyst 2960-24TT-L 24-Port 10/100Base-TX Fast Ethernet Switch with two 10/100/1000 Ports	4.4 (1.73)	44.5 (17.5)	23.6 (9.3)	3.6 (8)
Cisco Catalyst 2960-48TT-L 48-Port 10/100Base-FX Fast Ethernet Switch with two 10/100/1000 Ports	4.4 (1.73)	44.5 (17.5)	23.6 (9.3)	3.6 (8)
Cisco Catalyst 3750-24FS 24-Port 100Base-FX Fiber Optic Switch with two 1 Gigabit Converter Interface Ports	4.4 (1.7)	44.5 (17.5)	30.1 (11.8)	4.1 (9.0)
Cisco Catalyst 3750-24TS-S 24-Port 10/100Base-TX Fast Ethernet Switch with two slots for Gigabit Transceivers	4.4 (1.7)	44.5 (17.5)	30.1 (11.8)	4.1 (9.0)
Cisco 3750G12S-S 12-Slot Gigabit Switch	4.4 (1.7)	44.5 (17.5)	32.6 (12.8)	4.6 (10.1)

## DeltaV Smart Switches

**Table 11-14: Dimensions and weights of DeltaV Smart Switches**

Product	Height cm (in.)	Width cm (in.)	Depth cm (in.)	Weight kg (lb)
MD20-8 and MD20-8-ES Switches	13.3 (5.2)	12.5 (4.9)	10.0 (3.9)	0.61 (1.3)
MD20-16 and MD20-16-ES Switches	13.3 (5.2)	20.2 (8.0)	10.0 (3.9)	0.88 (1.9)
MD20-24 and MD20-24-ES Switches	13.3 (5.2)	27.8 (11.0)	10.0 (3.9)	1.03 (3.0)
MD30-8 and MD30-8-ES Switches (includes gigabit uplink module)	13.3 (5.2)	16.3 (6.4)	10.0 (3.9)	0.90 (2.0)
MD30-16 and MD30-16-ES Switches (includes gigabit uplink module)	13.3 (5.2)	24.0 (9.5)	10.0 (3.9)	1.17 (2.6)
MD30-24 and MD30-24-ES Switches (includes gigabit uplink module)	13.3 (5.2)	31.6 (12.4)	10.0 (3.9)	1.32 ((2.9)
Backplane Extension for MD20 and MD30 Switches	13.4 (5.3)	7.9 (3.1)	2.2 (0.9)	0.15 (0.3)
MD2-2FXM2 and MD2-2FXM2-ES Media Modules	N/A	N/A	Add 0 <sup>(1)</sup>	0.17 (0.4)
MD2-2FXS2 and MD2-2FXS2-ES Media Modules	N/A	N/A	Add 0	0.17 (0.4)
MD2-4TX1 and MD2-4TX1-ES Media Modules	N/A	N/A	Add 0	0.17 (0.4)
MD2-4TX1-POE and MD2-4TX1-POE-ES Media Modules	N/A	N/A	Add 0	0.25 (0.6)
MD3-2FXM2/2TX1 and MD3-2FXM2/2TX1-ES Media Modules	N/A	N/A	Add 4.1 (1.6) <sup>(2)</sup>	0.18 (0.4)
MD3-2FXS2/2TX1 and MD3-2FXS2/2TX1-ES Media Modules	N/A	N/A	Add 4.1 (1.6)	0.18 (0.4)
MD3-4FXM2 and MD3-4FXM2-ES Media Modules	N/A	N/A	Add 4.1 (1.6)	0.18 (0.4)
MD3-4FXM4 and MD3-4FXM4-ES Media Modules	N/A	N/A	Add 4.1 (1.6)	0.18 (0.4)
MD3-4FXS2 and MD3-4FXS2-ES Media Modules	N/A	N/A	Add 4.1 (1.6)	0.18 (0.4)
MD3-2FXM4/2TX1 and MD3-2FXM4/2TX1-ES Media Modules	N/A	N/A	Add 4.1 (1.6)	0.18 (0.4)
MD3-1FXS2/3TX1 and MD3-1FXS2/3TX1-ES Media Modules	N/A	N/A	Add 4.1 (1.6)	0.18 (0.4)
RM100 Base Switch	4.4 (1.7)	44.8 (17.6)	31.0 (12.2)	3.60 (7.9) <sup>(3)</sup>
RM100 Base-RP Switch	4.4 (1.7)	44.8 (17.6)	31.0 (12.2)	3.60 (7.9)
RM100-8TX Switch	4.4 (1.7)	44.8 (17.6)	31.0 (12.2)	3.60 (7.9)
RM100-24TX Switch	4.4 (1.7)	44.8 (17.6)	31.0 (12.2)	4.02 (8.8)
RM100-EM8TX Expansion Module	N/A	N/A	N/A	0.21 (0.5)

**Table 11-14: Dimensions and weights of DeltaV Smart Switches (continued)**

Product	Height cm (in.)	Width cm (in.)	Depth cm (in.)	Weight kg (lb)
RM100-EM8MMFX Expansion Module	N/A	N/A	N/A	0.18 (0.4)
RM100-EM8SMFX Expansion Module	N/A	N/A	N/A	0.18 (0.4)
RM100-EM8SFP Expansion Module	N/A	N/A	N/A	0.13 (0.3)
Transceivers used in MD30 Gigabit Uplink Modules and RM100-EM8SFP Expansion Modules	N/A	N/A	N/A	0.04 (0.1) <sup>(4)</sup>
FP20-6TX2TX and FP20-6TX2TX-ES1 Switches	13.1 (5.2)	7.4 (2.9)	11.1 (4.4)	0.41 (14.4)
FP20-6TX1MM1TX and FP20-6TX1MM1TX-ES Switches	13.1 (5.2)	7.4 (2.9)	11.1 (4.4)	0.41 (14.4)
FP20-6TX1SM1TX and FP20-6TX1SM1TX-ES Switches	13.1 (5.2)	7.4 (2.9)	11.1 (4.4)	0.41 (14.4)
FP20-6TX1SMLH1TX and FP20-6TX1SMLH1TX-ES Switches	13.1 (5.2)	7.4 (2.9)	11.1 (4.4)	0.41 (14.4)
FP20-6TX2MM and FP20-6TX2MM-ES Switches	13.1 (5.2)	7.4 (2.9)	11.1 (4.4)	0.41 (14.4)
FP20-6TX2SM and FP20-6TX2SM-ES Switches	13.1 (5.2)	7.4 (2.9)	11.1 (4.4)	0.41 (14.4)
FP20-6TX2SMLH and FP20-6TX2SMLH-ES Switches	13.1 (5.2)	7.4 (2.9)	11.1 (4.4)	0.41 (14.4)
LSN20 Safety Switch	13.1 (5.2)	7.4 (2.9)	11.1 (4.4)	0.41 (14.4)
SRM100 Safety Switch <sup>(5)</sup>	4.4 (1.7)	44.8 (17.6)	31.0 (12.2)	3.60 (7.9)

- (1) Height of this module does not add to the overall height of the MD20 or MD30 switch.
- (2) Height of this module adds 4.1 cm (1.6 in.) to the overall height of the MD20 or MD30 switch.
- (3) Weights do not include expansion modules. Be sure to include these weights in overall RM100 weight.
- (4) Weights do not include transceivers. Be sure to include transceiver weights in expansion module weight.
- (5) Dimensions do not include the mounting bracket.

## Workstations, servers, and monitors

**Table 11-15: Dimensions and weights of workstations, servers, and monitors**

Product	Height cm (in.)	Width cm (in.)	Depth cm (in.)	Weight kg (lb)
Workstation	See Product Specifications Sheet			
Server	See Product Specifications Sheet			
UPS for Workstations and Servers	See Product Specifications Sheet			
Monitors	See Product Specifications Sheet			

## Power supplies

**Table 11-16: Dimensions and weights of power supplies**

Product	Height cm (in.)	Width cm (in.)	Depth cm (in.)	Weight kg (lb)
VE5001 AC to DC System Power Supply	15.9 (6.3)	See figures	10.7 (4.2)	0.35 (0.77)
VE5009 DC/DC Dual System Power Supply	15.9 (6.3)	See figures	10.7 (4.2)	0.33 (0.73)
Bulk AC to 12 VDC Power Supply (Panel Mount)	12.7 (5.0)	39.4 (15.5)	6.4 (2.5)	2.8 (6.16)
Bulk AC to 24 VDC Power Supply (Panel Mount)	12.7 (5.0)	39.4 (15.5)	6.4 (2.5)	2.8 (6.16)
Bulk AC to 12 VDC Power Supply (DIN Rail Mount)	13.5 (5.3)	24.0 (9.5)	10.6 (4.2)	11.2 (24.6)
Bulk AC to 24 VDC Power Supply (DIN Rail Mount)	13.5 (5.3)	24.0 (9.5)	10.6 (4.2)	11.2 (24.6)
Bulk 24 VDC to 12 VDC Power Supply	12.7 (5.0)	30.5 (12.0)	6.4 (2.5)	1.6 (3.52)
I.S. System Power Supply	15.9 (6.3)	8.4 (3.3)	10.9 (4.3)	0.33 (0.73)
Fieldbus Power Supply	See manufacturer's manual			

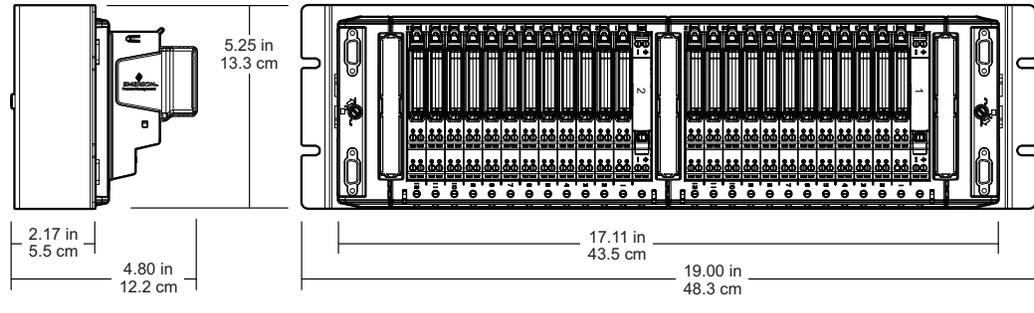
## Migration Panels

Migration Panels let you migrate legacy hardware installed in existing cabinets to CHARM I/O without adding cabinets or custom cables. There are two types of Migration Panels: CHARM I/O Card (CIOC) Migration Panels and Baseplate Migration Panels.

### Baseplate Migration Panels

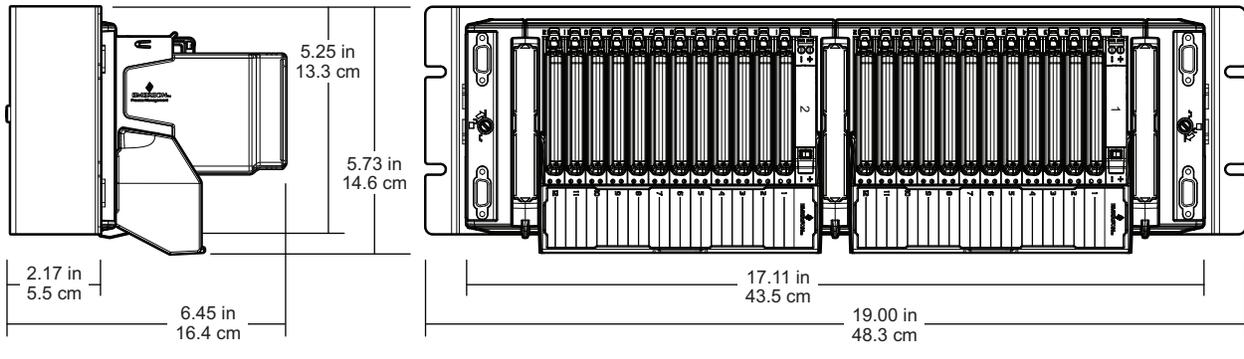
There are two types of Baseplate Migration Panels: standard CHARM Baseplate Migration Panels and I.S. CHARM Baseplate Migration Panels. Both types of Baseplate Migration panels are 3 Rack Units (U) high and install on 19 inch (48.26 cm ) EIA rails. The panels can be installed with or without the CHARM labeling component. The following figure shows the dimensions for the Standard CHARM Baseplate Migration Panels with and without labels.

**Figure 11-7: Dimensions for the standard CHARM Baseplate Migration Panel with and without labels**

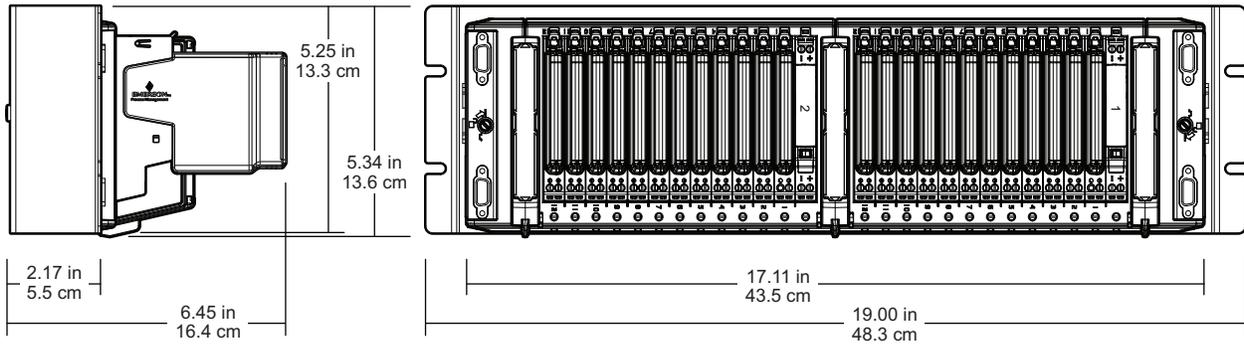


The following figures show the dimensions for the I.S. CHARM Baseplate Migration Panel with and without CHARM labels.

**Figure 11-8: Dimensions for the I.S. CHARM Baseplate Migration Panel with labels**

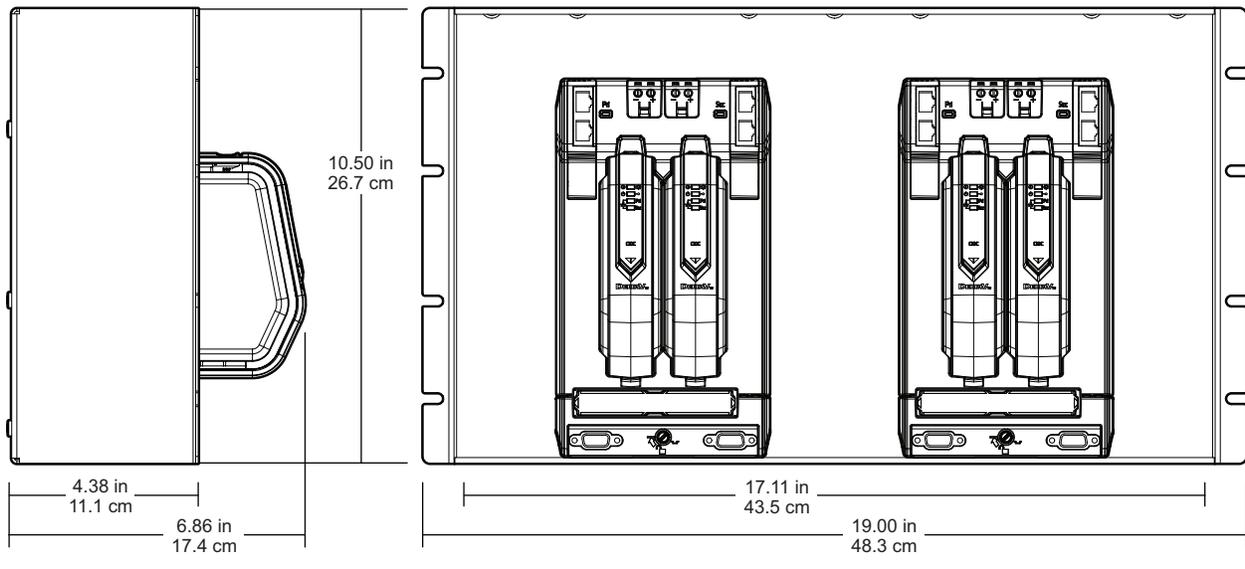


**Figure 11-9: Dimensions for the I.S. CHARM Baseplate Migration Panel without labels**



**CHARM I/O Card (CIOC) Migration Panel**

The CIOC Migration Panel is 6 Rack Units (U) high and installs on 19 inch (48.26 cm) EIA rails. The following figure shows the dimensions for the CIOC Migration Panel.

**Figure 11-10: Dimensions for the CIOC Migration Panel**

## Carriers

The DeltaV system supports horizontal carriers, vertical carriers, Intrinsically safe carriers, and the Fieldbus H1 Carrier. Carriers install on DIN-rails which can be mounted in enclosures or on racks.

There are two types of vertical carriers: Legacy and VerticalPLUS. Legacy carriers can be used for DeltaV basic process control systems. VerticalPLUS carriers can be used for both DeltaV basic process control systems and DeltaV SIS systems. DeltaV SIS hardware is not supported on Legacy carriers.

The following carriers are currently available:

- Horizontal Carriers
  - 2-Wide Horizontal Power/Controller Carrier
  - 4-Wide Horizontal I/O Carrier
  - 1-Wide Horizontal Carrier Extender (left and right versions)
- VerticalPLUS Carriers
  - 4-Wide VerticalPLUS Power/Controller Carrier
  - 4-Wide VerticalPLUS Power Carrier
  - 4-Wide VerticalPLUS SISNet Repeater Carrier
  - 4-Wide VerticalPLUS I/O Carriers
  - 4-Wide VerticalPLUS Carrier Extenders (left and right versions)
- Legacy Vertical Carriers
  - 4-Wide Legacy Vertical Power/Controller Carrier
  - 8-Wide Legacy Vertical Interface Carriers (left and right versions)

- Intrinsically Safe Carriers
  - Intrinsically Safe Power Supply Carrier
  - Intrinsically Safe 8-Wide Horizontal Carrier
  - Intrinsically Safe LocalBus Isolator Carrier
- Fieldbus H1 Carrier

## Horizontal carrier considerations

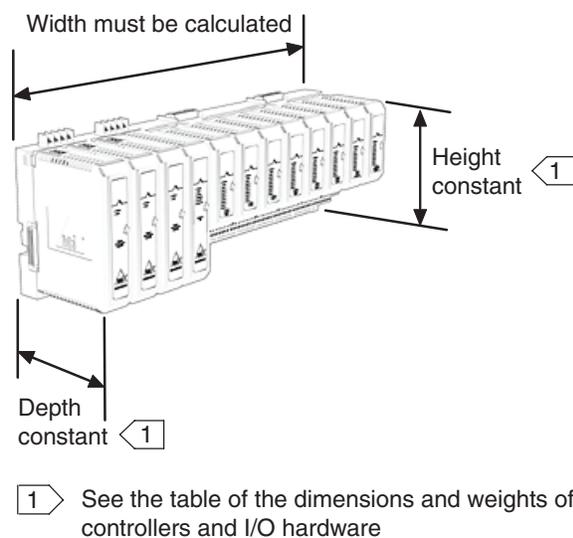
As shown in [Figure 11-11](#), the depth and height do not vary for each controller and I/O assembly. However, the width of the assembly varies depending on your controller and I/O layout. As a beginning, consider:

- 2-wide power/controller carrier: 9.2 cm (3.6 inches) for every 2-wide carrier
- 8-wide horizontal I/O carrier: 34.3 cm (13.5 inches) for every 8-wide carrier
- Extender cable connector: 4.6 cm (1.8 inches); two connectors for each extender cable

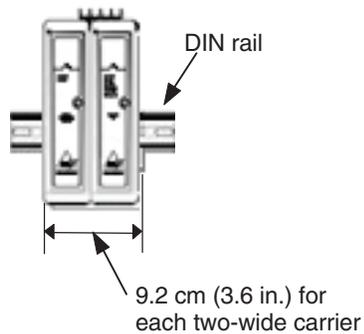
[Figure 11-12](#) through [Figure 11-17](#) illustrate how to calculate widths for several possible arrangements of 2-wide carriers, 8-wide carriers, and the combination of 2- and 8-wide carriers used with an extender cable. The maximum length of carriers connected together either side by side or with an extender cable is 6.5 meters (21.3 feet).

[Figure 11-13](#) shows the width for an 8-wide horizontal carrier. Regardless of the number of 8-wide carriers you connect directly together (no extender cable used), you need to add 34.3 cm (13.5 in.) for each carrier. [Figure 11-14](#) shows the total width when one 2-wide carrier and one 8-wide carrier are connected.

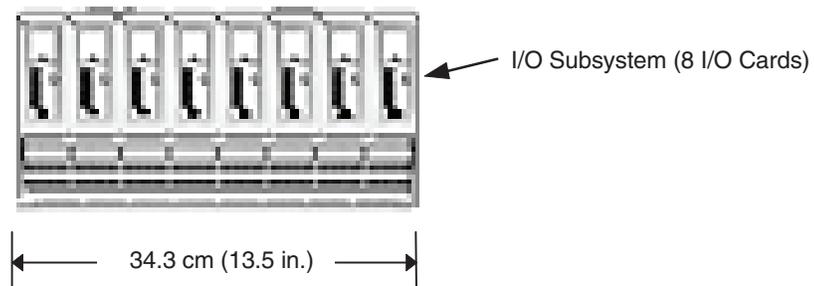
**Figure 11-11: Calculating dimensions for controller and I/O assembly**



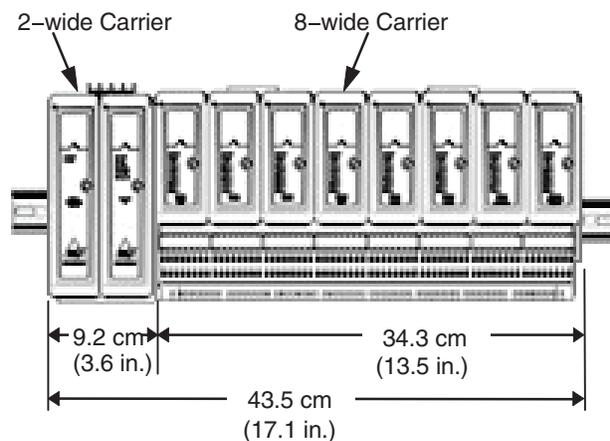
**Figure 11-12: Width of 2-wide carrier—system power supply and controller installed**



**Figure 11-13: Width of 8-wide carrier—I/O installed**



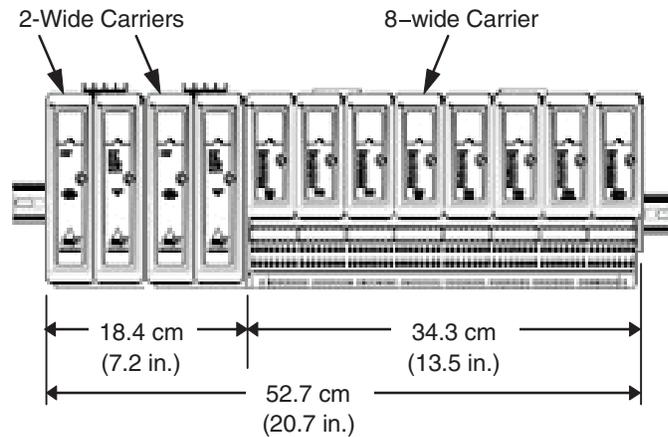
**Figure 11-14: One 2-wide carrier and one 8-wide carrier connected**



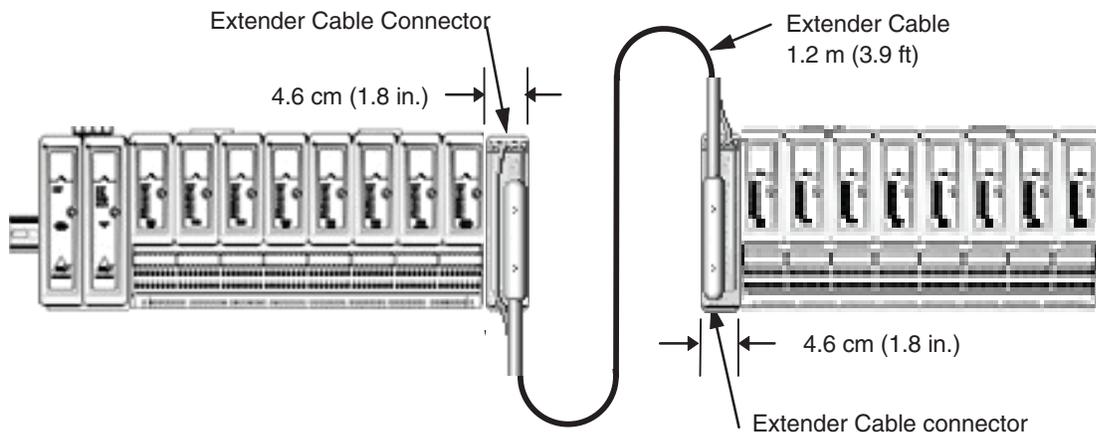
*Figure 11-15* shows the total width when a two 2-wide carrier and one 8-wide carrier are connected. *Figure 11-16* and *Figure 11-17* illustrate the additional 4.6 cm (1.8 in.) width required when an extender cable is used to connect horizontal carriers. Whether the connectors are used in extended horizontal (same level) connections or in stacked connections, 4.6 cm (1.8 in.) must be added.

As shown in Figure [Figure 11-18](#), horizontal I/O carriers can be plugged together end-to-end, or they can be connected with a carrier extender cable. The total length of the carriers plus cable is 6.5 meters (21.3 feet). Since the electrical current in a horizontal carrier is limited to 8 A, power may be inserted at the extender cable connector between carriers to maintain proper I/O card power while keeping carrier current with ratings.

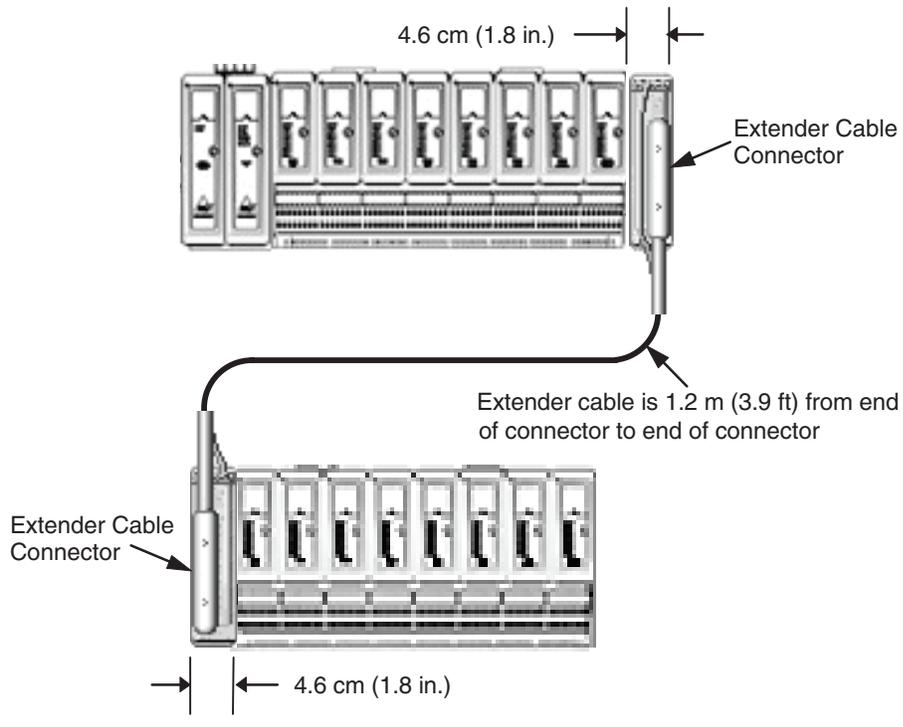
**Figure 11-15: Two 2-wide carriers and one 8-wide carrier connected**



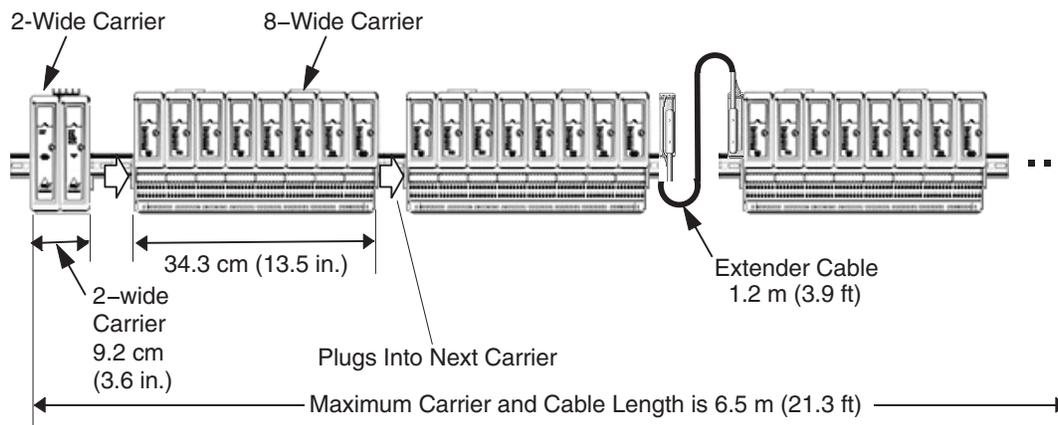
**Figure 11-16: Extender cable connecting two 8-wide carriers on same level**



**Figure 11-17: Extender cable connecting two 8-wide carriers on stacked levels**



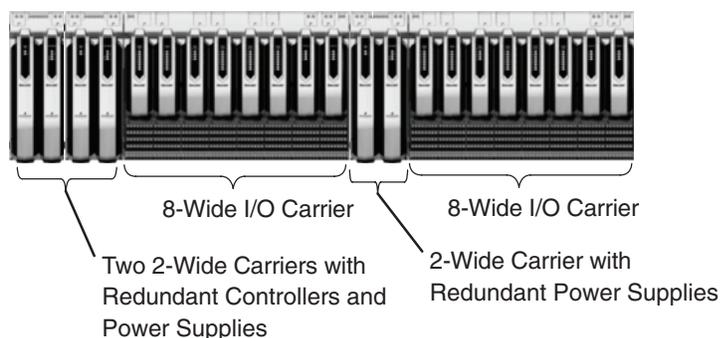
**Figure 11-18: Horizontal carriers connected together**



## S-series horizontal carrier

*Figure 11-19* shows one way to inject power to additional I/O with S-series hardware. The figure shows an 8-wide I/O carrier with redundant power supplies and controllers connected to another I/O carrier. Between them is a 2-wide carrier with redundant power supplies.

**Figure 11-19: Injecting power to additional I/O on the same DIN rail**



## VerticalPLUS I/O carrier considerations

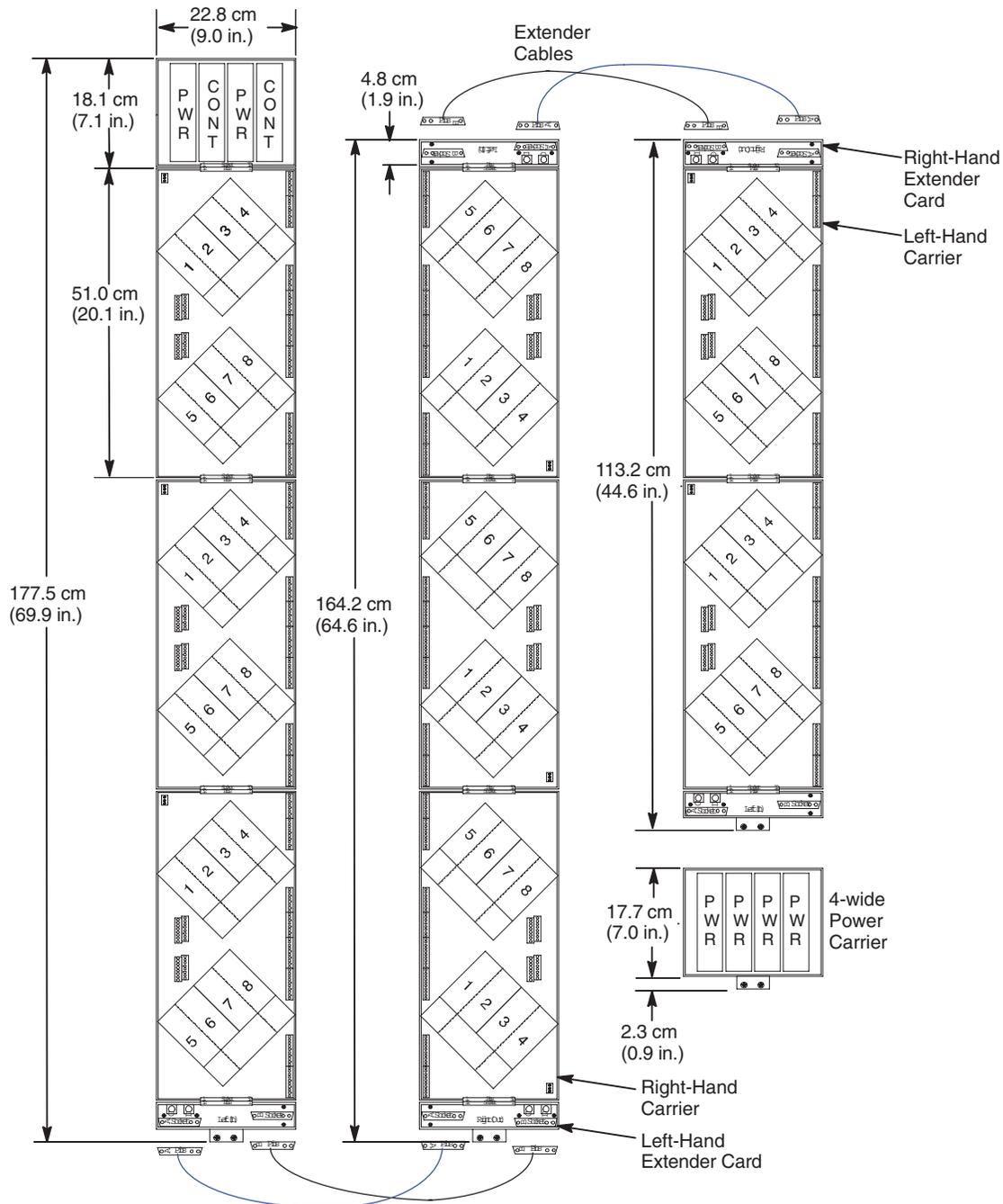
VerticalPLUS I/O carriers are available with either right-side or left-side field terminals that facilitate mounting two "columns" of carriers in a vertical enclosure with field wiring routed between the columns. In each column, carriers can be connected together end-to-end up to the vertical inner limits of the enclosure. [Figure 11-20](#) shows VerticalPLUS I/O Carrier dimensions and VerticalPLUS Power/Controller Carrier dimensions.

To make electrical connections from carriers on the left side to carriers on the right side, extender cards and extender cables are used. The top cables and the bottom cables are exactly the same. Although two extender cables are shown, they are not redundant. Some users may wish to have two cables, but they are simply parallel cables since the connectors are wired in parallel on the printed circuit board.

Extender cards are left-hand and right-hand. Order one left-hand card and one right-hand card for each extension and one or two extender cables for each extender cards pair, depending on whether you wish to connect one or two cables between the card pairs. Left and right orientation of the cards is to the cable connections, not to the carrier. Therefore, the left-hand card connects to the right-hand carrier and the right-hand card connects to the left-hand carrier. The total length of the carriers plus cable is 6.5 meters (21.3 feet). The electrical current capacity in a vertical carrier is specified as 15 A.

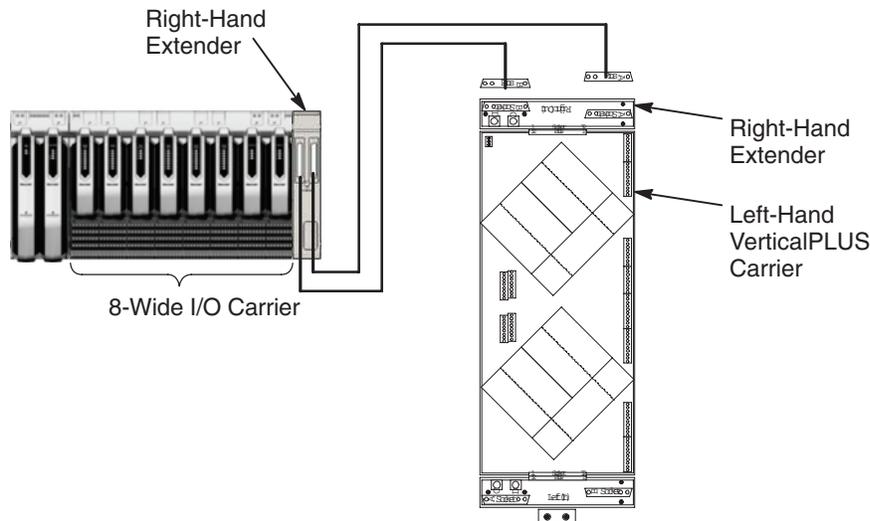
If desired, DC power may be inserted at power terminals on the carriers to provide adequate power for I/O cards, while limiting current on any one carrier to specification. The figure shows a 4-wide Power Carrier which allows users to install up to four DC/DC Dual system power supplies adjacent to the vertical carriers. These supplies can be used to insert 12 VDC power on the carriers.

**Figure 11-20: Dimensions and connected extender cables on VerticalPLUS I/O carriers**



## Connecting S-series I/O carrier to VerticalPLUS carrier

If you are using DeltaV SIS Logic Solvers with S-series cards, [Figure 11-21](#) shows one way to do so. Add a right-hand extender to the S-series carrier and connect it to a VerticalPLUS carrier as shown. Install the Logic Solver cards on the VerticalPLUS carrier.

**Figure 11-21: Connecting S-series carrier to M-series carrier****Note**

Use this setup to connect S-series controllers and I/O to M-series Logic Solver cards. You can use only SIS Logic Solver cards in this manner.

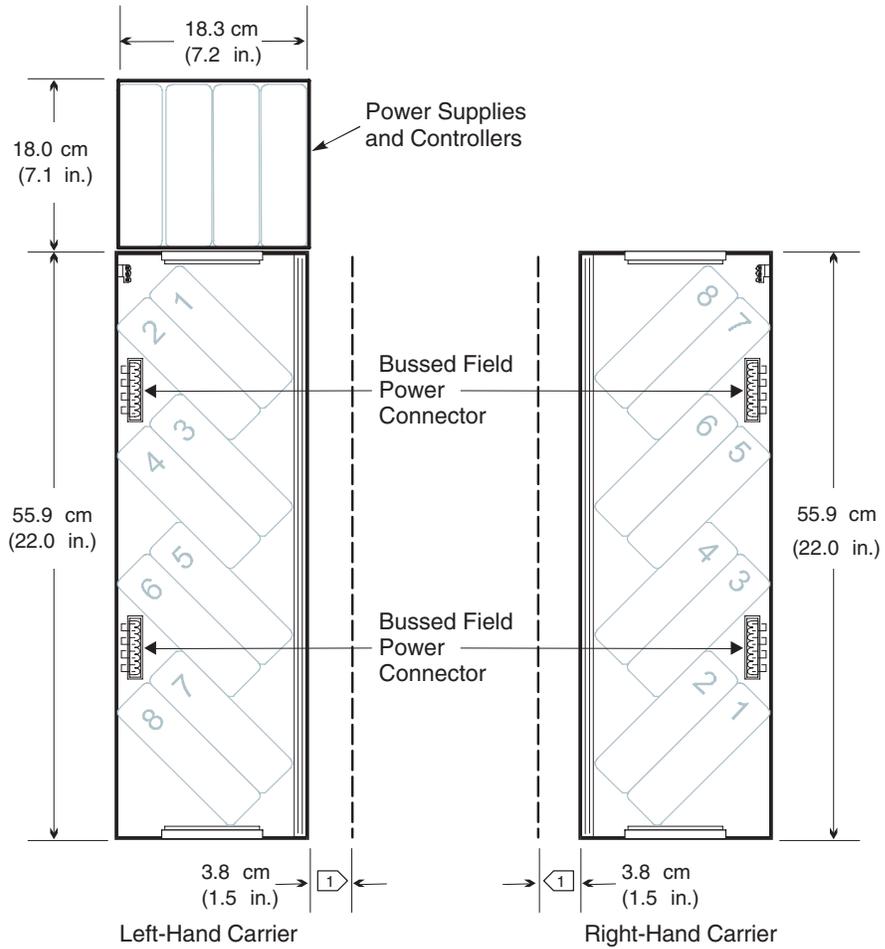
## Legacy vertical I/O carrier considerations

Legacy Vertical I/O carriers are available with either right-side or left-side field terminals that facilitate mounting two "columns" of carriers in a vertical enclosure with field wiring routed between the columns. In each column, carriers can be connected together end-to-end up to the vertical inner limits of the enclosure. To make electrical connections from carriers on the left side to carriers on the right side, extender cables are used. [Figure 11-22](#) shows Legacy Vertical I/O Carrier dimensions and Legacy Vertical power/controller carrier dimensions.

Two types of extender cables are available. A Bottom Extender Cable allows connecting bottom carriers and a Top Extender cable allows connecting top carriers. Each cable contains unique plug connections, so the cables are not interchangeable. The extender cable socket on a left-hand vertical carrier is next to I/O card position eight. The extender cable socket on a right-hand vertical carrier is next to I/O card position one. [Figure 11-23](#) illustrates connections between Legacy Vertical I/O Carriers.

The total length of the carriers plus cable is 6.5 meters (21.3 feet). The electrical current capacity in a vertical carrier is specified as 15 A. If need be, DC power may be inserted at power terminals on the carriers to provide adequate power for I/O cards, while limiting current on any one carrier to specification. For further details and illustrations, see the DeltaV Vertical Carriers section in the manual *DeltaV™ M-series Hardware Installation and Reference*.

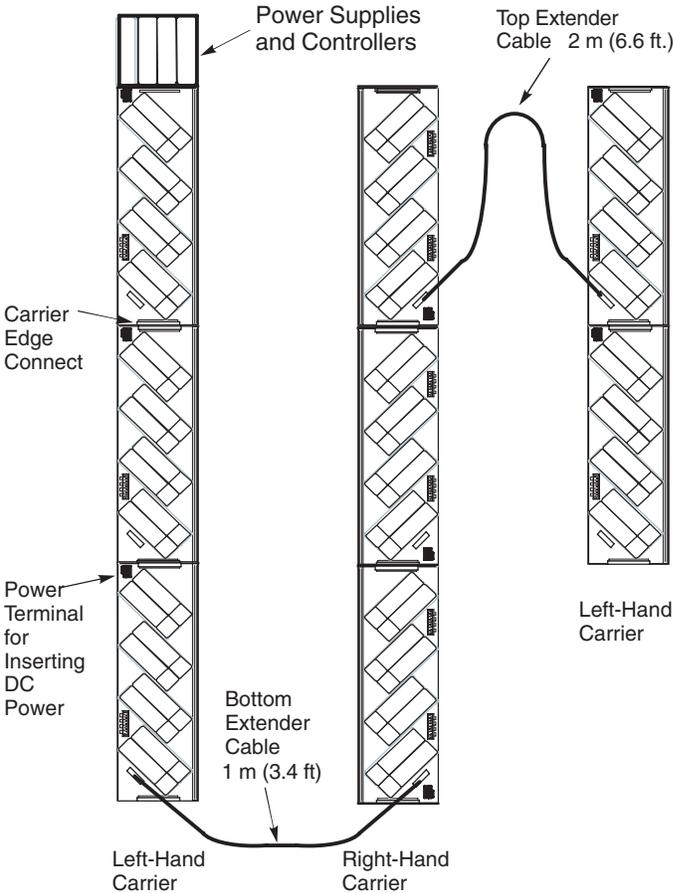
**Figure 11-22: Dimensions for legacy vertical I/O carriers**



**Note:**

① Minimum distance between carrier and panduit.

Figure 11-23: Connecting extender cables on legacy vertical I/O carriers





# Appendix A

## System Capacities

### Topics covered in this appendix:

- [System capacities and requirements summary](#)
- [M-series and S-series controller with M-series I/O and S-series conventional I/O](#)
- [S-series controller and S-series CHARMs I/O](#)
- [I/O bus system \(M-series and S-series Conventional\)](#)
- [Smart Wireless Gateway](#)
- [SLS 1508 Logic Solver system](#)
- [CHARMs Smart Logic Solver \(CSLS\) system](#)
- [SIS controller capacity](#)

## System capacities and requirements summary

---

### Note

For Zone 1 and Zone 2 remote I/O capacities see [Zone 2 remote I/O cards](#).

---

The following list summarizes capacities and requirements for DeltaV, version 12.3.

- Up to 120 nodes per Control Network. The Control Network nodes can consist of:
  - Up to 100 simplex and redundant controllers (a redundant controller is counted as one node, but uses two physical ports of a network switch)
  - Up to 65 workstations on a Control Network (non-remote), consisting of:
    - One, and only one, ProfessionalPLUS station
    - Up to 59 Application, Base, Maintenance, Operator and Professional stations. Recommended limit of 20 Application stations and 10 Professional stations
    - Plus one Inter-Zone Server
- Up to 300 I/O nodes (Zone 1, Zone 2, WIOC, CIOC, and EIOC) in any combination in a DeltaV system. Up to 16 I/O nodes per controller. One Remote I/O node can connect to up to four controllers. The I/O nodes are in addition to the system node limit (Controllers and Workstations).
- Up to 120 Wireless Gateway nodes per control network. The I/O nodes are in addition to the controller node limit.
- Up to 30,000 DSTs as AI, AO, DI, and DO distributed among controllers and application workstations: up to 1500 DSTs for MX and SX controllers and up to 750 DSTs per MD, MD Plus, MQ, SD Plus, and SQ controllers.

Use the Controller Loading Estimator on the DeltaV installation media in the directory \\_Support\Tools\LoadEstimator to obtain an indication of which controller is recommended and the required quantity of controllers.

- For M-series and S-series Conventional I/O, up to 64 I/O cards per controller, as long as total DSTs does not exceed controller capability: up to 1500 DSTs for MX and SX controllers and up to 750 DSTs per MD, MD Plus, MQ, SD Plus, and SQ controllers.

For example: 64 simplex cards X 8 I/O channels = 512 DSTs (controller DST capacity is not exceeded); 32 redundant cards X 8 channels = 256 DSTs (controller DST capacity is not exceeded); 64 cards X 32 channels = 2048 DSTs (controller DST capacity is exceeded; this combination of cards and channels is not possible).

- For S-series CHARMs I/O, quantity of CHARMs per controller is limited by controller DST capacity: up to 1500 DSTs per SX controllers and up to 750 DSTs per SD Plus and SQ controllers.
- Unlimited SCADA tags as long as their processing doesn't interfere with acceptable system performance (factory-tested to 25,000 SCADA tags).
- Up to 10,000 FOUNDATION fieldbus devices.

---

#### Note

For additional specifications and for details concerning the application of specifications shown below, see *Books Online* for version 11.3.

---

## System capacities

---

#### Note

Quantities shown in italics in the following table are recommended limits.

---

**Table A-1: System-wide capacities by DeltaV version**

Description	v10.3 v10.31	v11.3	v12.3	v13.3
Max. ProfessionalPLUS Stations	1	1	1	1
Max. Professional Stations	<i>10</i>	<i>10</i>	<i>10</i>	<i>10</i>
Max. Application Stations (including RDS)	<i>20</i>	<i>20</i>	<i>20</i>	<i>20</i>
Max. Local workstations of any kind	65	65	65	65
Max. Remote Workstations	80	80	80	80
Max. Application Workstations setup as RDS servers	7	7	7	7
Max. Number of simultaneous Asset Manager Server connections per Application Workstation	4	4	4	4

**Table A-1: System-wide capacities by DeltaV version (continued)**

Description	v10.3 v10.31	v11.3	v12.3	v13.3
Max. Number of simultaneous Asset Manager Server connections (all Application Workstations combined)	50	50	50	50
Max. Inter-Zone Servers per DeltaV system (Simplex or Redundant)	1	1	1	1
Max. DeltaV zones (including the current system)	10	15	15	15
Max. Simplex and Redundant Controllers per Control Network (each redundant pair counts as a single node)	100	100	100	100
Max. Control Network nodes	120 <sup>(1)</sup>	120 <sup>(1)</sup>	120 <sup>(1)</sup>	120 <sup>(1)</sup>
Max. Smart Wireless Gateway (SWG) nodes	120	120	120	120
Max. Mix of Zone 1, Zone 2, CIOC, and WIOC I/O nodes	—	300	300	300
Max. DSTs per system	30,000	30,000	30,000	30,000
Max. FOUNDATION fieldbus devices per system	10,000	10,000	10,000	10,000

(1) Redundant nodes count as one node in the maximum node limit.

## Batch capacity

**Table A-2: Batch capacity by DeltaV version**

Description	v10.3 v10.31	v11.3	v12.3	v13.3
Max. Batch Executives per system	4	4	4	4
Max. Campaign Managers per system	4	4	4	4
Max. Batch Historians per system	4	4	4	4

### Note

On Redundant Batch systems, a pair of Application Stations running the Batch Executive counts as one Batch Executive. Similarly, a pair of Application Stations running the Campaign Manager counts as one Campaign Manager

## System configuration

**Table A-3: System configuration capacities**

Description	v10.3 v10.31	v11.3	v12.3	v13.3
Max. Plant areas	250	250	250	250
Max. Regular Named sets <sup>(1)</sup>	1000	1000	1000	1000
Max. DeltaV SIS Named sets <sup>(1)</sup>	1000	1000	1000	1000
Max. Regular Alarm types	235	255	255	255
Max. DeltaV SIS Alarm types	255	255	255	255
Max. User accounts per system (tested limit)	200	200	200	200
Max. Control Studios per workstation	4	4	4	4
Max. Recipe Studios per workstation	4	4	4	4
Max. Explorers per workstation	1	1	1	1
Max. Recommended concurrent engineers <sup>(2)</sup>	2 to 10	2 to 10	2 to 10	2 to 10
Max. Function blocks per module	250	250	250	250
Max. Concurrent database connections	60	60	60	60
Max. Nesting levels of modules	6	6	6	6

(1) Includes system enumeration sets. The number available to users is 881.

(2) The quantity depends on server performance. Generally, the larger the server, the larger the quantity.

## Capacity for all workstations

**Table A-4: Capacity for all workstations**

Description	v10.3 v10.31	v11.3	v12.3	v13.3
Unsolicited Values reported per second	5,000	5,000	5,000	5,000
Alarms/Events Logged per second per workstation (burst condition) <sup>(1)</sup>	50	50	100	100
Max. Active History Data Sets (HDSs in Mbytes) per Event Chronicle <sup>(2)</sup>	100	100	100	100

**Table A-4: Capacity for all workstations (continued)**

Description	v10.3 v10.31	v11.3	v12.3	v13.3
Max. DeltaV Explorer applications open	1	1	1	1
Max. Control Studio applications open	4	4	4	4
Max. Recipe Studio Applications open	4	4	4	4

- (1) *Bursts of up to 100 events/sec can be handled for a few minutes (recommended limit of 10 minutes). However, continuous logging at 50 events/sec can potentially reach millions of events, quickly exceeding an Event Chronicle's size limits. When size limits are reached, logged data can be corrupted. To determine an appropriate continuous throughput, use the formula: Maximum Configured Size ÷ [(Number of days configured to be collected) + 1].*
- (2) *100 Mbytes is the recommended size. Generally, 100 Mbytes of disk space can hold between 250,000 and 500,000 event records depending on the content of each event record. 4 Gbytes is the maximum size.*

## ProfessionalPLUS workstation capacity

### Note

Quantities shown in italics in the following table are recommended limits.

**Table A-5: ProfessionalPLUS workstation capacity**

Description	v10.3 v10.31	v11.3	v12.3	v13.3
Max. Applications open	<i>10</i>	<i>10</i>	<i>10</i>	<i>10</i>
Max. Faceplates open	8	8	8	8
Max. Detail displays open	1	1	1	1
Max. Ethernet ports	5	5	5	5

### Note

See [Function blocks allowed in ProfessionalPLUS and Application stations](#) for function blocks allowed in a ProfessionalPLUS station.

## Operator workstation capacity

### Note

Quantities shown in italics in the following table are recommended limits.

**Table A-6: Operator workstation capacity**

Description	v10.3 v10.31	v11.3	v12.3	v13.3
Max. Data Values per display <sup>(1)</sup>	600	600	600	600
Max. Applications open	30	30	30	30
Max. Cached displays (pre-loaded)	25	25	25	25
Max. Cached displays (most recently used)	99	99	99	99
Max. Faceplates open	8	8	8	8
Max. Detail displays open	1	1	1	1
Max. Ethernet ports	3	3	3	3

(1) *As hundreds of links are added to the workstation, the callup rate can become slow. 300 data values per display is recommended limit when using DeltaV Operate. Quantities included in the table are also applicable when Operator Stations are used for DeltaV Operate for PROVOX Consoles and DeltaV Operate for RS3 Systems*

## Application workstation capacity

### Note

Quantities shown in italics in the following table are recommended limits.

**Table A-7: Application workstation capacity**

Description	v10.3 v10.31	v11.3	v12.3	v13.3
DSTs for Data Acquisition and Calculation Control	2,000	2,000	2,000	2,000
Max. Modules in workstation	<i>3,000</i>	<i>3,000</i>	<i>3,000</i>	<i>3,000</i>
Max. OPC writes/sec (local)	2,000	2,000	2,000	2000
Max. OPC data values received at workstation <sup>(1)</sup>	30,000	30,000	30,000	30,000
Max. OPC data values transmitted to OPC DC client installed on workstation <sup>(1)</sup>	30,000	30,000	30,000	30,000
Max. History data values (Continuous Historian)	30,250	30,250	30,250	30,250
Max. Ethernet ports	5	5	5	5

(1) *The limit, as noted, is 30,000 values. It is factory tested for 30,000 values per second. Your value may be less, depending on speed of equipment receiving data. Your actual value can be seen through diagnostics.*

## Professional, Maintenance, and Base workstation capacity

### Note

Quantities shown in italics in the following table are recommended limits.

**Table A-8: Professional, Maintenance, and Base workstation capacity**

Description	v10.3 v10.31	v11.3	v12.3	v13.3
Max. Data Values per display <sup>(1)</sup>	<i>600</i>	<i>600</i>	<i>600</i>	<i>600</i>
Max. Applications open	<i>10</i>	<i>10</i>	<i>10</i>	
Max. History values	250	250	250	250
Max. Cached displays (pre-loaded)	30	30	30	30
Max. Cached displays (most recently used)	99	99	99	99
Max. Faceplates open	8	8	8	8
Max. Detail displays open	1	1	1	1
Max. Ethernet ports	5	5	5	5

(1) As hundreds of links are added, the callup rate can become slow. 300 is recommended limit when using DeltaV Operate.

### Note

See [Function blocks allowed in ProfessionalPLUS and Application stations](#) for function blocks allowed in a Professional, Maintenance, and Base station.

## Function blocks allowed in ProfessionalPLUS and Application stations

**Table A-9: Function blocks allowed in ProfessionalPLUS and Application stations**

Function block name	Description
<b>Advanced Control palette</b>	
DIAG	Diagnostic
INSPECT	Inspect Data Block

**Table A-9: Function blocks allowed in ProfessionalPLUS and Application stations**  
(continued)

Function block name	Description
LE	Lab Entry
MPC Analyzer Template	MPC Analyzer Template
MPC_INREF	MPC Input Reference
MPC_OUTREF	MPC Output Reference
MPC-PRO	MPCPro
MPC_SIM	MPC Process Simulator
<b>Advanced Functions palette</b>	
AVTR	Analog Voter
CEM	Cause and Effect Matrix
DVTR	Discrete Voter
STD	State Transition Diagram
SEQ	Step Sequencer
<b>Analog Control palette</b>	
CALC	Calc/Logic
DT	Deadtime
FLTR	Filter
ISEL	Input Selector
LL	Lead/Lag
LIM	Limit
PID <sup>(1)</sup>	PID
RAMP	Ramp
RTLM	Rate Limit
SCLR	Scaler
SGCR	Signal Characterizer
SGGN	Signal Generator
SGSL	Signal Selector
<b>Energy metering</b>	
AGA_SI	Flow Metering in SI engineering units
AGA_US	Flow Metering in US engineering units
ISE	Isentropic Expansion
SST	Saturated Steam Properties - Given Temperature
TSS	Saturated Temperature
SDR	Steam Density Ratio
STM	Steam Properties
WTH	Water Enthalpy

**Table A-9: Function blocks allowed in ProfessionalPLUS and Application stations**  
(continued)

Function block name	Description
WTS	Water Entropy
<b>IO palette</b>	
ALM	Alarm Detection
AI	Analog Input
AO	Analog Output
DI	Discrete Input
DO	Discrete Output
PIN	Pulse Input
<b>Logical palette</b>	
ACT	Action
AND	And
BDE	Bi-Directional Edge Trigger
BFI	Boolean Fan In
BFO	Boolean Fan Out
CND	Condition
MLTX	Multiplexer
NDE	Negative Edge Trigger
NOT	Not
OR	Or
PDE	Positive Edge Trigger
RS	RS Flip-Flop
SR	SR Flip-Flop
XFR	Transfer
<b>Math palette</b>	
ABS	Absolute Value
ADD	Add
ARTHM	Arithmetic
CMP	Comparator
DIV	Divide
INT	Integrator
MLTY	Multiply
SUB	Subtract
<b>Timer Counter palette</b>	
CTR	Counter
DTE	Date Time Event

**Table A-9: Function blocks allowed in ProfessionalPLUS and Application stations  
(continued)**

Function block name	Description
OFFD	Off-Delay Timer
OND	On-Delay Timer
RET	Retentive Timer
TP	Timed Pulse

(1) *PID blocks assigned to workstations only support the IMAN mode when the system is based on a User System Identifier.*

## M-series and S-series controller with M-series I/O and S-series conventional I/O

### Note

Quantities shown in *italics* in the following table are recommended limits.

**Table A-10: M-series and S-series controller with M-series I/O and S-series conventional I/O**

Description	v10.3 v10.31	v11.3	v12.3	v13.3
Max. I/O cards per controller	64	64	64	64
Max. DSTs per MD controller	750	750	750	750
Max. DSTs per MD Plus controller	750	750	750	750
Max. DSTs per MQ controller	–	–	750	750
Max. DSTs per MX controller	1500	1500	1500	1500
Max. DSTs per SD Plus controller	–	750	750	750
Max. DSTs per SX controller	–	1500	1500	1500
Max. DSTs per SQ controller	–	–	750	750
Max. DSTs per DeltaV Interface to PRO-VOX I/O (MD/MD Plus and SD/SD Plus)	750	750	750	750
Max. DSTs per DeltaV Interface to PRO-VOX I/O (MX and SX)	1500	1500	1500	1500
Max. DSTs per DeltaV Interface to RS3 I/O (MD/MD Plus and SD/SD Plus)	750	750	750	750
Max. DSTs per DeltaV Interface to RS3 I/O (MX and SX)	1500	1500	1500	1500
Max. Modules per controller <sup>(1)</sup>	<i>750</i>	<i>750</i>	<i>750</i>	<i>750</i>
Max. Serial data sets per serial card	32	32	32	32
Max. Devices per serial port	16	16	16	16

**Table A-10: M-series and S-series controller with M-series I/O and S-series conventional I/O (continued)**

Description	v10.3 v10.31	v11.3	v12.3	v13.3
Max. Serial data sets per Ethernet IO card	—	128	128	128
Max Devices per Ethernet IO card	—	32/128 <sup>(2)</sup>	32/128 <sup>(3)</sup>	32/128 <sup>(4)</sup>
Fastest module scan rate (ms)	100	100	100	100
Max. Cable and carrier length (ft) controller to through last carrier in chain	21	21	21	21
Max. Carriers per controller	8	8	8	8
Max. Diagnostic sessions open per controller	2	2	2	2
Max. Control Studio on-line sessions per controller	4	4	4	4
Events generated per second per controller - MD and MD Plus controller	50	50	50	50
Events generated per second per controller - MX controller	100	100	100	100
Events generated per second per controller - SD Plus controller	—	50	50	50
Events generated per second per controller - SX controller	—	100	100	100
Unsolicited values per second sent - MD and MD Plus controller	2000	2000	2000	2000
Unsolicited values per second sent - MX controller	4000	4000	4000	4000
Unsolicited values per second received - MD and MD Plus controller	250	250	250	
Unsolicited values per second received - MX controller	500	500	500	
Unsolicited values per second sent - SD Plus controller	—	2000	2000	2000
Unsolicited values per second sent - SX controller	—	4000	4000	4000
Unsolicited values per second received - SD Plus controller	—	250	250	
Unsolicited values per second received - SX controller	—	500	250	
Max. Controller connections to other nodes	100	100	100	100
Minimum macro cycle (msec)	250	250	250	

(1) Actual value may be more or less depending upon the control strategy.

(2) 32 TCP/IP device addresses and 128 Modbus device addresses.

- (3) 32 TCP/IP device addresses and 128 Modbus device addresses.  
 (4) 32 TCP/IP device addresses and 128 Modbus device addresses.

## S-series controller and S-series CHARMs I/O

**Table A-11: S-series controller and S-series CHARMs I/O capacities**

Description	v11.3	v12.3	v13.3
Max. CHARMs per controller	Limit is DST limit of controller.		
Max. CHARMs per CHARMs I/O Card	96	96	96
Max. CHARMs per Baseplate	12	12	12
Max. Baseplates per CHARMs I/O Card	8	8	8
Address Plugs per Baseplate	1	1	1
Max. DSTs per SD Plus controller	750	750	750
Max. DSTs per SX controller	1500	1500	1500

## I/O bus system (M-series and S-series Conventional)

**Table A-12: I/O bus system capacities (M-series and S-series conventional)**

Description	v10.3 v10.31	v11.3	v12.3	v13.3
Max. H1 cards per controller	64	64	64	64
Max. Device function blocks per H1 card	64	64	64	64
Max. H1 function blocks per H1 card	32	32	32	32
Max. Function blocks per H1 card (Device plus H1)	96	96	96	96
Max. Ports per H1 card	2	2	2	2
Max. Publisher VCR per H1 port	35	35	35	35
Max. Subscriber VCR per H1 port	50	50	50	50
Max. Publisher and Subscriber combined per H1 port	50	50	50	50
Max. FOUNDATION fieldbus devices per segment	16	16	16	16
Min. Macrocycles (msec)	150	150	150	150
Max. Devices as Backup LAS	1	1	1	1

**Table A-12: I/O bus system capacities (M-series and S-series conventional) (continued)**

Description	v10.3 v10.31	v11.3	v12.3	v13.3
Max. Profibus segments per I/O card	1	1	1	1
Max. Slaves per Profibus segment	64	64	64	64
Max. AS-i Bus segments per I/O card	2	2	2	2
Max. Slaves per AS-i Bus segment	31	31	31	31
Max. DeviceNet segments per I/O card	1	1	1	1
Max. Slaves per DeviceNet Bus segment	61	61	61	61

## Smart Wireless Gateway

**Table A-13: Smart Wireless Gateway capacity**

Description	v10.3 v10.31	v11.3	v12.3	v13.3
Max. Number of controllers to which a Smart Gateway node can be assigned	1	1	1	1
Max. Number of Gateway nodes assigned to a controller	16	16	16	16
Max. Number of I/O devices connected to the Gateway	100	100	100	100

### Note

Other capacity specifications are the same as wired HART devices.

## SLS 1508 Logic Solver system

**Table A-14: SLS 1508 Logic Solver system capacity**

Description	v10.3 v10.31	v11.3	v12.3	v13.3
Max. Function blocks per DeltaV SIS module <sup>(1)</sup> (including blocks in composite)	250	250	250	250

**Table A-14: SLS 1508 Logic Solver system capacity (continued)**

Description	v10.3 v10.31	v11.3	v12.3	v13.3
Max. function blocks in the top level of a SIS module <sup>(1)</sup>	127	127	127	127
Max. function blocks per composite block <sup>(1)</sup>	127	127	127	127
Max. Levels of composite nesting in an SIS module	1	1	1	1
Max. SIS modules in a logic solver	4	4	4	4
Max. Secure parameters per Logic Solver	8	8	8	8
Max. Logic solvers per controller (Simplex and redundant mix)	32	32	32	32
Max. Logic solvers that can publish data globally on one controller	8	8	8	8
Max. Logic solvers per system that can publish globally	32	32	32	32
Max. Non-secure parameter references per logic solver	24	24	24	24
Max. Temporary variables defined using VAR...END_VAR per expression	32	32	32	32
Max. Simulated logic solver cards assigned to ProfessionalPLUS workstation with Windows Server 2003, Windows Server 2008, Windows XP Professional, Windows Vista	32	32	32	32
Max. Simulated logic solver cards assigned to ProfessionalPLUS workstation with Windows XP Professional	4	4	4	
Max. SISNet repeater pairs in a DeltaV system	32	32	32	
Max. SISNet repeater rings in a DeltaV system	1	1	1	
Max. Secure parameters published globally per DeltaV system	256	256	256	256
Max. Logic solvers	1024	1024	1024	

(1) The actual value may be less, depending on a number of factors, including: the complexity of SIS module configuration and the number and type of SIS function blocks used.

## CHARMs Smart Logic Solver (CSLS) system

**Table A-15: CHARMs Smart Logic Solver (CSLS) system capacity**

Description	v12.3	v13.3
Max. function blocks per SIS module <sup>(1)</sup>	500	500
Max. CHARMs Smart Logic Solvers (CSLS) per system	1600	1600
Max. CSLS per SIS controller	16	16
Max. LS CHARMs per CSLS <sup>(2)</sup>	96	96
Max. SIS modules per CSLS	16	16
Max. secure parameters per CSLS	96	96
Max. secure parameters per Local Safety Network	1536	1536
Max. user defined parameters per SIS module	230	230
Max. non secure parameters per CSLS	96	96
Max. non secure parameters per Local Safety Network (LSN)	1536	1536

- (1) The actual value may be less depending on a number of factors including: the complexity of the SIS module configuration and the number and type of SIS function blocks used.
- (2) Only 48 of the 96 LS CHARM slots can be configured as output LS CHARMs. This can be any combination of simplex and redundant as long as the slot count of output LS CHARMs does not exceed 48. This limit is not enforced during configuration, only during download. The remaining 48 slots can be configured as input LS CHARMs.

## SIS controller capacity

**Table A-16: SIS (SZ) controller capacities**

Description	v12.3	v13.3
Maximum SIS controllers (SZ) per system	100	100
Maximum CSLS per SIS controller	16	16
Maximum modules per SIS controller	256	256
Maximum CIOC per SIS controller	4	4
Maximum WIOC per SIS controller	4	4
Maximum Wireless Gateways per SIS controller	4	4
Maximum remote I/O per SIS controller	4	4

**Table A-16: SIS (SZ) controller capacities (continued)**

Description	v12.3	v13.3
Maximum Modbus coil registers per SIS controller	1000	1000
Maximum Modbus float input registers per SIS controller	3000	3000
Maximum Modbus integer input registers per SIS controller	4000	4000
Maximum Modbus float holding registers per SIS controller	3000	3000
Maximum Modbus integer holding registers per SIS controller	3999	3999
Maximum Modbus register mappings per SIS controller	15,999	15,999

# Appendix B

## Product Specifications

### Topics covered in this appendix:

- [Product data sheets](#)
- [European standards](#)
- [CSA certification](#)
- [Environmental specifications](#)

## Product data sheets

Complete product specifications are listed in product data sheets. The specifications listed below are taken from the product data sheets and provided here for your quick reference.

## European standards

All DeltaV products meet appropriate European standards for Electromagnetic Compatibility and carry the CE mark.

## CSA certification

All DeltaV products meet industry-appropriate CSA requirements and carry the CSA mark.

## Environmental specifications

[Table B-1](#) and [Table B-2](#) list environmental specifications for DeltaV products.

**Table B-1: DeltaV system temperature and humidity specifications**

Device	Operating Temperature	Storage Temperature	Relative Humidity
Workstations	10°C to 35°C (50°F to 95°F) maximum 10°C (18°F) change per hour	-20°C to 60°C (-4°F to 140°F)	20% to 80%, non-condensing
Allied Telesyn Network Switches	0°C to 40°C (32°F to 104°F)	-25°C to 70°C (-13°F to 158°F)	5% to 95%, non-condensing
Cisco Network Switches	0°C to 45°C (32°F to 113°F)	-25°C to 70°C (-13°F to 158°F)	10% to 85%, non-condensing

**Table B-1: DeltaV system temperature and humidity specifications (continued)**

Device	Operating Temperature	Storage Temperature	Relative Humidity
MD20 and MD30 Smart Switches	Standard Range: 0°C to 60°C (32°F to 140°F) Extended Specs Range: -40°C to +70°C (-40°F to +158°F)	-40°C to 70°C (-40°F to 158°F)	10% to 95%, non-condensing
RM100 Smart Switches	0°C to 50°C (32°F to 140°F)	-20°C to 85°C (-4°F to 185°F)	10% to 95%, non-condensing
FP20 Smart Switches	Standard Range: 0°C to 60°C (32°F to 140°F) Extended Specs Range: -40°C to +70°C (-40°F to +158°F)	-40°C to 70°C (-40°F to 158°F)	10% to 95%, non-condensing
MD Controller Pre-Series 2 I/O DeltaV interface for PROVOX I/O DeltaV interface for RS3 I/O	0°C to 50°C (32°F to 131°F)	-40°C to 85°C (-40°F to 185°F)	5% to 95%, non-condensing
MD Plus Controller SD Plus Controller SLS 1508 Logic Solver Devices	-40°C to 70°C (-40°F to 158°F)	-40°C to 85°C (-40°F to 185°F)	5% to 95%, non-condensing
MX Controller SX Controller	-40°C to 60°C (-40°F to 140°F)	-40°C to 85°C (-40°F to 185°F)	5% to 95%, non-condensing
SQ Controller	-40°C to 60°C (-40°F to 140°F)	-40°C to 85°C (-40°F to 185°F)	5% to 95%, non-condensing
SZ Controller	-40°C to 70°C (-40°F to 158°F)	-40°C to 85°C (-40°F to 185°F)	5 to 95% non-condensing
CHARMs Smart Logic Solver (CSLS) Devices	-40°C to 70°C (-40°F to 158°F)	-40°C to 85°C (-40°F to 185°F)	5 to 95% non-condensing
Single-port Fiber Switch Four-port Fiber Switch Remote Interface Unit (RIU)	-40°C to 70°C (-40°F to 158°F)	-40°C to 85°C (-40°F to 185°F)	5% to 95%, non-condensing
Pre-series 2 Profibus Card Pre-series 2 DeviceNet Card	0 to 55°C (32°F to 131°F)	-40°C to 85°C (-40°F to 185°F)	5% to 95%, non-condensing
Series 2 I/O, except Series 2 AS-Interface	-25°C to 70°C (-13°F to 158°F)	-40°C to 85°C (-40°F to 185°F)	5% to 95%, non-condensing
Series 2 AS-Interface	-40°C to 70°C (-40°F to 158°F)	-40°C to 85°C (-40°F to 185°F)	5% to 95%, non-condensing
AC/DC System Power Supply	0°C to 60°C (32°F to 140°F)	-40°C to 70°C (-40°F to 158°F)	5% to 95%, non-condensing

**Table B-1: DeltaV system temperature and humidity specifications (continued)**

Device	Operating Temperature	Storage Temperature	Relative Humidity
DC/DC Dual System Power Supply	-40°C to 70°C (-40°F to 158°F)	-40°C to 70°C (-40°F to 158°F)	5% to 95%, non-condensing
Legacy DIN rail-mounted Bulk Power Supply	-40°C to 70°C (-40°F to 158°F)	-40°C to 85°C (-40°F to 185°F)	5% to 95%, non-condensing
Legacy Panel-mounted Bulk Power Supply	0 to 60°C (32°F to 140°F) at 300 W and altitude <= 914 m (3000 ft)	-40°C to 85°C (-40°F to 185°F)	5% to 95%, non-condensing
DeltaV Bulk Power Supplies	-25°C to +70°C (-13°F to 158°F)	-40°C to 85°C (-40°F to 185°F)	5% to 95%, non-condensing
DeltaV Controller Fire-wall	0 to 55°C (32°F to 131°F)	-40°C to 80°C (-40°F to 176°F)	10% to 95%
Emerson Smart Fire-wall	0°C to 40°C (32°F to 104°F)	-20°C to 80°C (-4°F to 176°F)	5% to 95%, non-condensing
Fiber Optic Media Converter	0 to 60°C (32°F to 140°F)	-40°C to 70°C (-40°F to 158°F)	5% to 95%
Fieldbus H1 Carrier	-40°C to 70°C (-40°F to 158°F)	-40°C to 85°C (-40°F to 185°F)	5% to 95%, non-condensing
WirelessHART I/O Card	-40°C to 70°C (-40°F to 158°F)	-40°C to 85°C (-40°F to 185°F)	5% to 95%, non-condensing
WirelessHART I/O Carrier with copper IOP	-40°C to 70°C (-40°F to 158°F)	-40°C to 85°C (-40°F to 185°F)	5% to 95%, non-condensing
WirelessHART I/O Carrier with fiber-optic IOP	-40°C to 60°C (-40°F to 140°F)	-40°C to 85°C (-40°F to 185°F)	5% to 95%, non-condensing
CHARMs	-40°C to 70°C (-40°F to 158°F)	-40°C to 85°C (-40°F to 185°F)	5% to 95%, non-condensing
CHARM I/O Card	-40°C to 70°C (-40°F to 158°F)	-40°C to 85°C (-40°F to 185°F)	5% to 95%, non-condensing
CHARM I/O Carrier with copper IOP	-40°C to 70°C (-40°F to 158°F)	-40°C to 85°C (-40°F to 185°F)	5% to 95%, non-condensing
CHARM I/O Carrier with fiber-optic IOP	-40°C to 60°C (-40°F to 140°F)	-40°C to 85°C (-40°F to 185°F)	5% to 95%, non-condensing
Ethernet I/O Card	-40°C to 70°C (-40°F to 158°F)	-40°C to 85°C (-40°F to 185°F)	5% to 95%, non-condensing

**Table B-2: DeltaV System contaminants, vibration, and shock specifications**

Device	Airborne Contaminants	Vibration	Shock
Workstations	See Manufacturer's Manual for Specifications	See Manufacturer's Manual for Specifications	See Manufacturer's Manual for Specifications
8-Port Hub (3-COM)	See Manufacturer's Manual for Specifications	See Manufacturer's Manual for Specifications	See Manufacturer's Manual for Specifications
All Allied Telesyn and Cisco network Switches	See Manufacturer's Manual for Specifications	See Manufacturer's Manual for Specifications	See Manufacturer's Manual for Specifications
MD20, MD30, and FP20 Smart Switches	Standard Range: ISA-S71.04-1985 Airborne Contaminants Class G2 Extended Specs Range: ISA-S71.04-1985 Airborne Contaminants Class G2 plus Conformal Coating <sup>(1)</sup>	See Manufacturer's Manual for Specifications	See Manufacturer's Manual for Specifications
RM100 Smart Switches	See Manufacturer's Manual for Specifications	See Manufacturer's Manual for Specifications	See Manufacturer's Manual for Specifications
All Controllers Pre-Series 2 I/O Series 2 I/O SLS 1508 Devices DeltaV Interface for PROVOX I/O DeltaV Interface for RS3 I/O Fieldbus H1 Carrier Remote Interface Unit (RIU) Single-port Fiber Optic Switch System Power Supplies	ISA-S71.04-1985 Airborne Contaminants Class G3	1 mm peak-to-peak from 5 Hz to 16 Hz, 0.5 g from 16Hz to 150 Hz	10 g ½-sine wave for 11 ms
Ethernet I/O card	ISA-S71.04-1985 Airborne Contaminants Class G3	1 mm Peak-to-Peak from 2 Hz to 13.2 Hz; 0.7 g from 13.2 Hz to 150 Hz	10 g ½ sine wave for 11 ms
DeltaV Controller Firewall	See Manufacturer's Manual for Specifications	See Manufacturer's Manual for Specifications	See Manufacturer's Manual for Specifications

**Table B-2: DeltaV System contaminants, vibration, and shock specifications**  
(continued)

Device	Airborne Contaminants	Vibration	Shock
CHARMs and CHARM I/O card	ISA-S71.04-1985 Airborne Contaminants Class G3	1 mm Peak-to-Peak from 2 to 13.2 Hz; 0.7g from 13.2 to 150 Hz	10 g ½ sine wave for 11 ms
CHARMs Smart Logic Solver (CSLS) Devices	ISA-S71.04-1985 Airborne Contaminants Class G3	1 mm Peak-to-Peak from 2 to 13.2 Hz; 0.7g from 13.2 to 150 Hz	10g ½ sine wave for 11 ms
WirelessHART I/O card	ISA-S71.04-1985 Airborne Contaminants Class G3	1 mm Peak-to-Peak from 2 to 13.2 Hz; 0.7g from 13.2 to 150 Hz	10g ½ sine wave for 11 ms
Legacy Bulk Power Supplies	ISA-S71.04-1985 Airborne Contaminants Class G2	MIL-STD-810D Method 514.3, Category 1, Procedure I	MIL-STD-810D Method 516.3, Procedure III
DeltaV Bulk Power Supplies		5, 10, 20 A models: 1.6 mm from 2-17.8 Hz; 2 g from 17.8-500 Hz for 2 hours 40 A model: ±1.6 mm from 2-17.8 Hz; 1 g from 17.8-500 Hz for 2 hours	5, 10, 20 A models: 30 g, 6 ms duration at 3 bumps; 20 g, 11 ms duration at 3 bumps 40 A model: 15 g, 6 ms duration at 3 bumps; 10 g, 11 ms duration at 3 bumps

(1) Conformal coating allows switches to be used in G3 environment, but switches are not tested and certified to G3.



# Index

## A

- actuator/sensor interface (AS-i) 40
- advanced batch license 104
- advanced unit management license 29
- alarm analysis model number 106
- Alarm Help 107
- Alarm Mosaic 108
- Allied Telesyn switches 11
- AMP connectors and other accessories 137
- AMS inside 108
- AMS server 75
- analog I/O 37
- anti-virus program 109, 135
- application station
  - sizing 123
  - software suite 123
  - typical use 123
- Application station
  - capacity by DeltaV version 182
- applications available for RAS 105
- AS-i bus
  - extended fieldbus cable distances 40
  - extender 40
  - network 40
  - repeater 40
  - standard cables 40
- AS-i Bus segments
  - determining quantity 40
- AS-i card 40
- AS-Interface web site 40

## B

- backplane extension for MD switches 4
- backup linkmaster device 44
- Base station
  - capability by DeltaV version 183
  - sizing 121
  - software suite 121
  - typical use 121
- Base Station 101–103
- basic batch license 104
- batch
  - capacity by DeltaV version 179
- batch license distribution 104
- batch license on application stations 104
- batch licensing 104

- batch operator interface 104
- bulk power supplies
  - calculating current for field devices 98
- bundled applications 104

## C

- cabinets for protection 144
- cabling accessories 137
- cached accounts 134
- calculating current for field devices 98
- calculating events logged 180
- carrier width calculation
  - when local bus cable used 167
- carriers
  - eight-wide 48
  - H1 49
  - LegacyPLUS I/O carrier 171
  - mounting for optimal airflow 144
  - PROVOX I/O interface 49
  - RS3 I/O interface 50
  - two-wide 17
- cascaded topology 13
- centralized user accounts
  - benefits 134
- CHARMs Smart Logic Solver (CSLS) system
  - capacities by DeltaV Version 191
- CISCO switches 11
- class-based units 29
- classes
  - hardware 133
- classic I/O 37
- closure caps
  - fieldbus 44
- communication errors
  - AS-i bus 40
  - DeviceNet 42
- competitive I/O system 50
- components
  - maximum set 2
  - minimum set 1
- computer virus protection 109
- configuration
  - system capacity by DeltaV version 180
- conformal coating on switches 4, 9
- continuous history 119

- control network
  - inter-zone 130
  - nodes 13
  - wireless segment 70
- controller loading calculations 18
- controller loading estimator 177
- controllers
  - capacity by DeltaV version 186, 188
  - communication speeds 12
  - determining quantity 19
  - licensing 20
  - MD, MD Plus, SD Plus, SX 18
  - power requirements 139
  - redundant 17
  - selecting control network speed 12
  - selecting system compatibility 18
  - simplex 17
- copper cable
  - maximum distance 13
- counting network nodes 13, 14
- CSA certification 193
- cyber security 135

**D**

- data set
  - calculating 38
- data values
  - how they are used 123
- DeltaB Operate for PROVOX consoles 181
- DeltaV analyze 106
- DeltaV Connect model numbers 105
- DeltaV Executive Portal 109
- DeltaV fiber switches 37
- DeltaV InSight 107
- DeltaV inspect 107
- DeltaV Logbooks 109
- DeltaV Operate for RS3 systems 181
- DeltaV remote client 105
- DeltaV tune 107
- DeltaV user manager 134
- DeltaV zones (not remote I/O zones) 130
- demo or training system switch 14
- device audit trail 108
- DeviceNet
  - card 42
  - determining quantity 42
  - segments 42
  - website 42
- dimensions
  - system capacity by DeltaV version 178
- discrete I/O 37

- domain security 134
- dual carrier extender cables 82

## E

- eight-wide carrier
  - minimum number 48
- EIOC 57, 60
- electric current draw
  - DeltaV product 138
- EN50170
  - PROFIBUS specification 46
- EN50295E
  - AS-i bus specification 40
- enclosures
  - determining requirements 144
  - how to mount system components 144
  - selection procedure 158
- Engineering Seat software suite 117
- environmental specifications 193
- ethernet cards
  - moving between workstations 130
  - quantity supported 130
  - types in workstations 130
- ethernet network 3
- ethernet web site 3
- European standards 193
- events logged
  - calculating 180
- extended cable distances
  - AS-i bus 40
  - fieldbus 44
  - PROFIBUS 46
- extender cables
  - bottom and top 173
  - horizontal carriers 167
  - legacy vertical I/O carrier 173
  - VerticalPLUS I/O carriers 171

## F

- factors affecting power dissipation in cabinets 151
- fiber optic cable
  - maximum distance 13
- fiber switches for Zone 1 11, 37
- fiber-optic cable 80
- fiber-optic ring 80
- fieldbus
  - closure caps 44
  - device alerts 18
  - extended cable distances 44
  - gland cable adapter 44

- power supply 44
- standard type A cable 44
- terminator 44
- fieldbus device database 108
- fieldbus device manager 108
- fieldbus I/O segments 44
- FlexConnect 50
- four-monitor model number 103

## G

- gateway OPC server 71
- gateway to other networks 130
- Gigabit uplink modules 4
- gland cable adapter
  - fieldbus 44
- global messages 80

## H

- H1 Carrier 49
- H1 interface
  - determining quantity 44
- hardware classes 133
- HART interfaces 37
- HART output for partial stroke testing 80
- history data
  - retrievable 106
- horizontal carriers
  - electrical capacity 167

## I

- I/O bus systems
  - capacity by DeltaV version 188
- I/O capacities
  - by DeltaV version 186
  - DeltaV version 188
- I/O channel capability
  - SLS 80
- I/O nodes
  - remote 35
- I/O subsystem
  - power requirements 139
- IEEE 802.3 Standard 13
- integrated system request
  - obtaining OEM items 137
- inter-zone control network 130
- inter-zone server 130
- interface to OEM consoles 105
- intrinsically safe installation
  - :I/O subsystem 47
- intrinsically safe power supplies 100

## L

- licenses
  - DeltaV workstations 101–103
- licensing
  - batch 104
  - batch control 29
  - controllers 20
  - DeltaV remote client 105
- Localbus isolator
  - intrinsically safe system 47
- Logbooks 109
- logging events calculations 180
- login accounts 134

## M

- maintenance station
  - sizing 126
  - typical use 126
- Maintenance station
  - capability by DeltaV version 183
- Maintenance Station 101–103
- master/slave system 40
- maximum copper cable distance 13
- maximum fiber optic cable distance 13
- maximum hops 13
- maximum length of connected horizontal carriers 167
- maximum set of components 2
- migrate to DeltaV workstations 105
- minimum set of components 1
- Modbus serial protocol 71
- Modbus TCP/IP protocol 71
- mounting system components in enclosures 144
- moving ethernet cards between workstations 130
- Mynah virtual I/O module 71

## N

- NEMA 4X 144
- network, *See* control network
- network nodes
  - counting 13
- network time protocol server 39
- network topology 13
- node count limit on workstations 133
- node types 13
- nodes in control networks
  - counting 13

## O

- OEM items 137
- OPC mirror 71

- OPC mirror application 123
- operating and viewing continuous history 119
- operator and diagnostics interface 114, 115, 117, 128
- operator station
  - sizing 119
  - typical added applications 119
- Operator station
  - capacity by DeltaV version 181
- Operator Station 101–103
- operator station software suite 119
- optimal airflow around carriers 144

## P

- partial stroke testing 80
- peer domain controller 134
- peer-to-peer bus 80
- physical dimensions
  - calculating width on carriers 167
  - DeltaV products 159–164
- PlantWeb Experience 128
- port
  - redundant 13
- power and grounding 138
- power cords for RM100 switches 6
- power dissipation
  - DeltaV products 151
- power dissipation considerations 151
- power interruption
  - effects 100
- power requirements
  - controllers 139
  - I/O subsystem 139
- power source
  - allowable interruptions 100
- power supplies
  - 12/24 VDC input 91, 94, 97
  - 120/240 VAC input 93, 97
  - backup 97
  - bulk
    - calculating current for field devices 98
  - determining quantity 91, 93, 94
  - fieldbus 44
  - intrinsically safe 100
  - redundancy considerations 97, 98
  - special power bus link 91, 93, 94
  - system 91, 92
  - uninterruptible
    - determining quantity 100
- preparing the site 138
- primary configuration and engineering interface 114, 115, 117, 128

- primary power calculation 138
- primary power source interruptions 100
- printers
  - connecting to LANs and workstations 15
  - tested types 15
- process history view suite
  - running on an application station 104
- professional batch license 104
- Professional station
  - capability by DeltaV version 183
- Professional Station 101–103
- Professional station software suite 115
- ProfessionalPLUS station
  - capacity by DeltaV version 181
- ProfessionalPLUS Station 101–103
- ProfessionalPLUS station software suite 114
- PROFIBUS
  - DP card 46
  - extended fieldbus cable distances 46
  - standard cables 46
  - terminator 46
  - website 46
- PROFIBUS segments
  - determining quantity 46
- PROVOX I/O interface carrier 49

## Q

- quad-monitor model number, *See* four-monitor model number

## R

- RAS, *See* remote access services
- RAS available applications 105
- redundancy considerations for power supplies 97, 98
- redundant controllers 17
- redundant I/O 32
- redundant port 13
- remote access services 105
- remote I/O nodes 35
- remote network
  - definition 14
- remote network uplink
  - high-speed dialup, microwave, satellite 105
- replication updates 134
- retrievable history data 106
- RS3 I/O interface carrier 50
- RS485 capability 38

## S

- screened twisted-pair cable 11

- security request 134
- segments
  - DeviceNet 42
  - fieldbus I/O 44
- selecting correct workstation PC 133
- sequence of events card 39
- serial I/O 38
- series 2 I/O 32
- server class machine
  - determining factors 133
  - node count greater than 11 133
- signal wiring 138
- simplex controllers 17
- site preparation 138
- sizing
  - system 1
- sizing equation
  - application station 123
- SLS 1508 Logic Solver system
  - capacities by DeltaV Version 189
- SLS I/O channel capability 80
- SLS mounting on I/O carriers 80
- SLS power 82
- smart wireless field network 70
- smart wireless plant network 70
- SOE interface 39
- software
  - special for network switches 12
  - third party, *See* third-party software
- software suite
  - maintenance station 126
- software suite prerequisites 128
- special power bus link 91, 93, 94
- special software for network switches 12
- specifications
  - environmental 193
- standard cables
  - AS-i bus 40
- star topology 13
- subsystem
  - intrinsically safe installation 47
- switch count 14
- switch hops
  - maximum 13
- switch setup cable 9
- system capacities 177
- system configuration
  - by DeltaV version 180
- system database
  - sizing 114, 128

- system dimensions
  - by DeltaV version 178
- system power supplies 91, 92
- system sizing 1
- system-wide licensing 104
- SZ controller
  - capacities by DeltaV Version 191

## T

- terminator
  - fieldbus 44
  - peer-to-peer bus 80
  - PROFIBUS 46
- third-party software
  - recommended products 109
  - use on application station 109
  - using restrictions 109
- transceivers 4, 6
- two-wide carrier
  - SISNet repeater 80
- Type A cable
  - fieldbus 44

## U

- uninterruptible power supplies
  - determining quantity 100
- user account information 134
- using data values 123
- using remote access services 105

## V

- vertical I/O carriers
  - electrical capacity 173
  - legacy carrier 173
  - VerticalPLUS carrier 171
- VIMnet software 71
- virus protection 109, 135

## W

- web site
  - AS-Interface 40
  - DeltaV 3
  - DeviceNet 42
  - PROFIBUS 46
- weights
  - DeltaV products 159–164
- which workstation 119
- wireless control network segment 70
- WirelessHART devices 70

workstation  
    application comparison 110  
    selecting correct PC 133  
workstation class hardware 133  
workstation configuration utility 134  
workstation software 101–103  
workstation summary 110  
workstations  
    common capability by DeltaV version 180  
    prerequisites 128

## Z

zone 2 limitations on card types 35  
zones for DeltaV (not remote I/O zones) 130