

Hirschmann Networking
Interoperability in an
EMERSON Process
Management Environment

White Paper

Hirschmann Interoperability
White Paper

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HIRSCHMANN NETWORKING INTEROPERABILITY IN AN EMERSON PROCESS MANAGEMENT ENVIRONMENT

Introduction

DeltaV was developed in 1997 by Emerson Process Management to be an automation solution based on digital communication protocols used over their PlantWeb architecture to enable plant-wide information flow. At the device level, Emerson equipment supports HART, FOUNDATION Fieldbus, AS-i bus, Profibus DP, and DeviceNet protocols.

The DeltaV Control Network is an Ethernet network that connects DeltaV workstations and controllers. The control network employs FOUNDATION Fieldbus High Speed Ethernet (HSE), which encapsulates legacy FOUNDATION Fieldbus H1 protocols. Meanwhile, lower-level devices are being developed that will also directly support HSE.

Typical network components in a DeltaV control network can include either 10BASE-T hubs or 10/100BASE-TX switches such as RS2-5TX/FX or RS2-FX/FX. Switches supporting FX ports can be employed to use fiber optic cable for long-distance communication.

Controller in a redundant DeltaV topology will typically include two communication modules, each of which has two network interfaces. One interface connects with the primary network carrying process control data, the other is connected to a secondary network handling batch information.

The Emerson Alliance program is a product-referencing initiative to verify equipment that complements Emerson's control solutions. Hirschmann is member of the Alliance program as a global partner supporting Ethernet on the control level and in the field.

This section is divided into two parts:

The first part covers interoperability considerations noted by Emerson Process Management and Hirschmann's responses.

The second part describes interoperability testing conducted by Hirschmann using DeltaV equipment at the Emerson process lab in Austin, Texas.

1. Vendor interoperability considerations

1.1 Switches vs. Hubs

Emerson Process Management recognizes that dual-speed hubs can improve performance by allowing physical segmentation between 10-Mbps controller traffic and 100-Mbps workstation traffic—but also recognizes that “dual-speed switches improve performance even further” by enabling separate collision domains per port for controllers and workstations.

Hub and switch components linked to DeltaV workstations and devices are connected to two interfaces, serving a primary and secondary network that both operate simultaneously (Figure 1).

Hirschmann concurs with Emerson Process Managements recommendations regarding the advantages of switch over hubs.

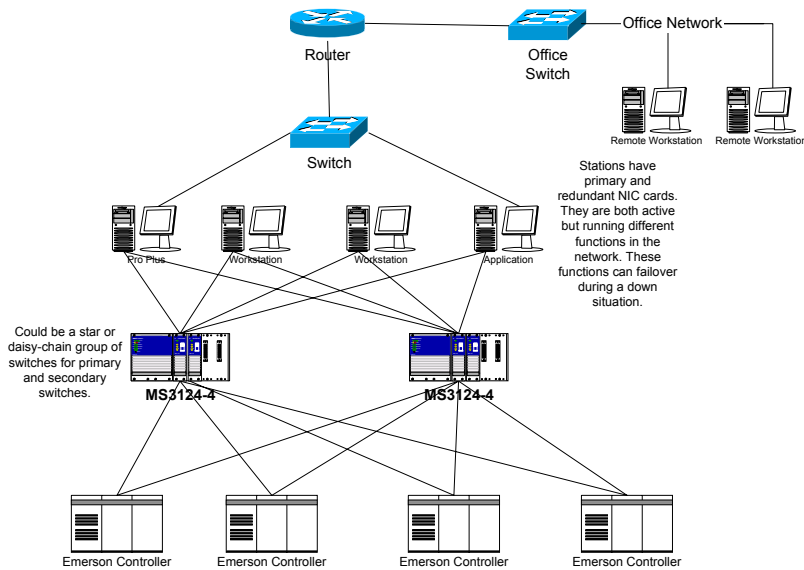


Figure EPM-1: DeltaV primary and secondary switched networks with remote LAN connection

1.2 Switching performance

Emerson Process Management does not make an issue of using non-blocking, wire-speed switches.

To minimize latency, Hirschmann supports switches using a non-blocking, wire-speed switch fabric.

1.3 Autonegotiation

Emerson Process Management plans to recommend manually port speed and duplex settings. Hirschmann managed switches support manual speed and duplex settings as well as autonegotiation.

Segments supporting the controller network can be connected at 10 or 100Mb/s, half duplex mode. But in such cases, collision timing may affect network extension and latency. Manual configuration is possible on all DeltaV devices.

1.4 Multicast filtering

Multicasting is not supported by DeltaV equipment; therefore multicast filtering methods such as IGMP and GMRP are not necessary.

The default setting for IGMP and GMRP on Hirschmann switches is Off. Hirschmann recommends not to enable this protocols on switches in a DeltaV control network.



1.5 VLAN implementation

Emerson Process Management does not require the use of VLANs within a DeltaV control network. Hirschmann RS2, MICE, MACH and GES switches support 802.1q VLANs, which are disabled by default.

1.6 Port mirroring

Emerson Process Management and Hirschmann recommends the use of port mirroring as a means of connecting a traffic analyzer to a switch based network. This permits system diagnosis without affecting the dataflow in the run-time system.

1.7 Network management

Emerson Process Management supports OPC and does not require the use of SNMP to exchange data with their SCADA system. Hirschmann recommends the use of switches supporting SNMP. The use of SNMP and HiOPC allows network based information to be viewed by SCADA devices.

1.8 Redundancy

DeltaV redundancy is based on a primary and secondary network. Both networks are active at the same time. The primary network carries process control traffic, while the secondary network transfers batch information. If one network fails, the other one transfers both types of messages. For this reason, a DeltaV controller typically employs two Ethernet interfaces—each connected to the respective primary or secondary network.

Dual interconnection also makes it possible to use redundant controllers. In such cases, one controller is active, the other is a passive backup, but each has one primary and one secondary network interface, making a total of four nodes. Thus, it is possible to cascade up to four switches in a topology with two controllers. This degree of interconnection makes it possible for redundancy in smaller networks to be based on shared network resources.

Capabilities:	DeltaV device	Hirschmann RS2 and MICE	Hirschmann MACH 300	Hirschmann GES
Ethernet (10 Mb/s)	x	X	X	x
Fast Ethernet (100 Mb/s)	x	X	X	x
Gigabit Ethernet (1000 Mb/s)			X	x
Autonegotiation		X	X	x
Services:				
Port mirroring		X	X	x
VLAN		X	X	x
OPC	x	via HiOPC	via HiOPC	via HiOPC
SNMP		X	X	x
RMON		X	X	x
Security				
Strong password	x	X	X	x
Port security (ACL)		X	X	x

Figure EPM-2: Summary of features supported in DeltaV and Hirschmann products

2. Field interoperability testing

2.1 Hirschmann switches in a remote network dedicated to the DeltaV system

Testing conditions:

To validate the interoperability of Hirschmann and DeltaV equipment, extensive testing was conducted by Hirschmann using RS2, MICE, and MACH 3000 products with various DeltaV control-network topologies.

Configuration for all Hirschmann switches:

Default and manually speed and transmission mode settings.

Test objective:

Verify switch segmentation capability for primary and secondary DeltaV networks.

Conclusion:

Hirschmann switches interoperate in a DeltaV environment with default and manually settings.

Hirschmann switches enable the segmentation of primary and secondary networks for data and information traffic, respectively, and efficiently allow the allocation of less bandwidth for the 10-Mb/s control traffic on the primary network (Figure EPM-3).

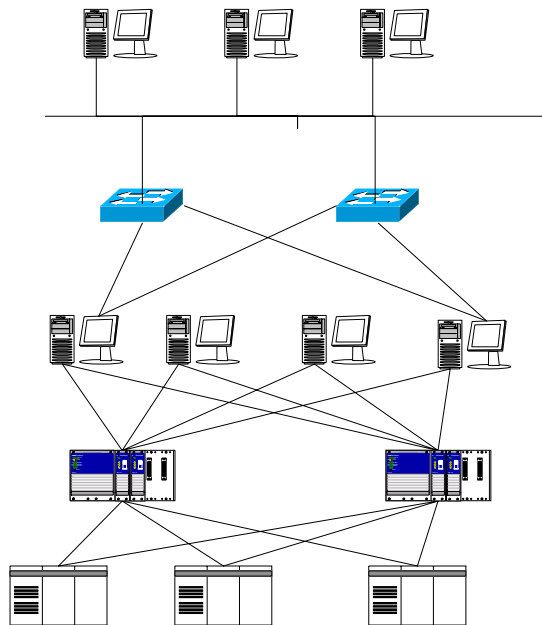


Figure EPM-3: Hirschmann switches in a remote network dedicated to the DeltaV system

2.2 Hirschmann switches in a remote plant-wide LAN connected to DeltaV system

Configuration for all Hirschmann switches in control LAN:
 Default and manually speed and transmission mode settings.

Configuration of DeltaV workstation interfaces:
 Three NIC cards are needed to support primary, secondary, and office LAN connections for ProPlus and App workstations, depending on which is used as the DeltaV redundant application server and which is the server for remote stations.

Test objective:
 Verify switch segmentation capability for primary and secondary paths in the DeltaV control network operating in conjunction with a router and a switch in the office LAN.

Conclusion:
 Hirschmann switches interoperate in a DeltaV control LAN in conjunction with a router and switch configured for an office LAN (Figure EPM-4).

Hirschmann switches enable the segmentation of primary and secondary networks for data and information traffic, respectively, while integrating with switches/routers in the office LAN/enterprise.

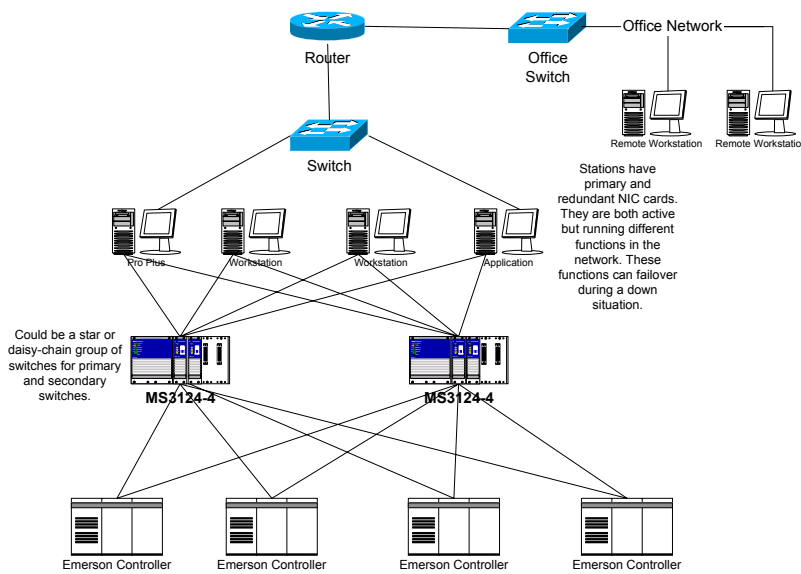


Figure EPM-4: Hirschmann switches in a remote plant-wide LAN connected to DeltaV system