Foxboro®

by Schneider Electric

Foxboro Evo™
Process Automation System

DCS Fieldbus Modules for Westinghouse WDPF® Systems User's Guide

B0400BA

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Preface

This document describes all aspects of the DCS Fieldbus Modules for Westinghouse WDPF® Systems migration kits, including:

- Configuration
- Installation
- Maintenance.

Audience

This guide is intended for process control engineers and operators, and other qualified and authorized personnel involved in converting a Westinghouse WDPF system to the Foxboro Evo™ and I/A Series® system.

This document is organized in a way that reflects a typical sequence of actions in setting up a system. Appendix A “Hardware Specifications” consolidates equipment specifications, and Appendix B “Edge Connector Wiring Diagrams” illustrates edge connector wiring for the DCS Fieldbus Modules.

What You Should Know

Prior to using this document, you should be familiar with the Foxboro Evo and I/A Series system. Detailed information for the software and the hardware is found in the full documentation set for Foxboro Evo and I/A Series systems. See “Workstation Types” on page xiv.

Revision Information

For this revision of the document (B0400BA-H), the following changes were made:

Global

- Updated the document to implement new corporate and product branding.

Safety Considerations

Safe use of this product depends largely upon proper installation, use, and maintenance. This manual provides the information needed to properly install, use, and maintain the DCS Fieldbus Modules subsystem.

Workstation Types

You should be aware of the various types of workstations and their definitions as indicated below.

Term	Definition
Foxboro Evo workstation	Any workstation installed with a Foxboro Evo software component, including Control Core Services, Control Software, Wonderware Historian, I/A Series software, FCS or any combination of thereof.
Control Core Services workstation	Any Foxboro Evo workstation installed with Control Core Services or I/A Series software. This workstation is connected to the Mesh network.
non-Control Core Services workstation	Any Foxboro Evo workstation that does not have Control Core Services or I/A Series software installed. This type of workstation is not connected to the Mesh network, but can have Control Software installed on it.
Control Software workstation	Any Foxboro Evo workstation installed with Control Software components, including Control Editors, Control HMI, Wonderware Historian, or other components installed as part of Control Software. This workstation may or may not also be a Control Core Services workstation.

Reference Documents

In addition to various Westinghouse process control documents associated with the WDPF system, you should be familiar with the following Foxboro Evo and I/A Series documents:

- *Field Control Processor 280 (FCP280) User's Guide* (B0700FW)
- *Field Control Processor 280 (FCP280) Upgrade Guide* (B0700GC)
- *Field Control Processor 280 (FCP280) Sizing Guidelines and Excel® Workbook* (B0700FY)
- *Field Control Processor 270 (FCP270) User's Guide* (B0700AR)
- *Field Control Processor 270 (FCP270) Sizing Guidelines and Excel Workbook* (B0700AV)
- *Z-Module Control Processor 270 (ZCP270) User's Guide* (B0700AN)
- *Z-Module Control Processor 270 (ZCP270) Sizing Guidelines and Excel Workbook* (B0700AW)
- *Control Processor 60 and Control Processor 60S Installation and Maintenance (DM)* (B0400FB)
- *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA)
- *Letterbug Configurator User's Guide* (B0700AY)
- *The MESH Control Network Architecture Guide* (B0700AZ)
- *System Definition: A Step-by-Step Procedure* (B0193WQ)

- *Control Processor 270 (CP270) and Field Control Processor 280 (CP280) Integrated Control Software Concepts* (B0700AG)
- *Integrated Control Software Concepts* (B0193AW) - For CP60 or earlier control processors
- *Integrated Control Block Descriptions* (B0193AX)
- *System Manager* (B0750AP)
- *I/A Series Configuration Component (IACC) User's Guide* (B0700FE)
- *Integrated Control Configurator* (B0193AV)
- *Process Operations and Displays* (B0700BN)
- *System Management Displays* (B0193JC)

Most of these documents are available on the Foxboro Evo Electronic Documentation media (K0173WT). The latest revisions of each document are also available through our Global Customer Support at *https://support.ips.invensys.com.*

Conventions

The following conventions are used in this document:

- In numbered instructions, **`this type`** is used to show menu items, options, and buttons that are to be selected on the screen
- Verbatim data entries are shown in `this type`
- Variable data entries are shown in *italic type*.

Instructions for making selections from the application menu bar and associated pull-down menus use the following format:

1. Choose **`File > New`**.

- The example is shorthand for “Pull down the **`File`** menu from the application menu bar and select the **`New`** option from the menu.”

1. Introduction

This chapter provides an overview of the DCS Fieldbus Module subsystem.

The DCS Fieldbus Modules for Westinghouse Process Control WPDF systems enable you to migrate the control of loops from the WPDF equipment to a Foxboro Evo system, while preserving existing process I/O terminations and wiring, cabineting and power supplies. The DCS Fieldbus Module subsystem, which are installed in the Distributed Processing Unit (DPU) cabinet, interchanges process measurement and output signals and digital input/output signals directly with the Foxboro Evo control system.

NOTE

The DCS Fieldbus Modules for Westinghouse Process Control WPDF systems are considered the equivalent of 200 Series Fieldbus modules by the Foxboro Evo Control Core Services software.

All process signals are fully integrated into the Foxboro Evo system, allowing direct Foxboro Evo system monitoring and control of the process. Operating in conjunction with the Foxboro Evo control and management software, the DCS Fieldbus Module subsystem provides advanced plant-wide control, display, history, alarming, and information management capabilities.

The WPDF system migration consists of DCS Fieldbus Modules connected to one of the following control processors:

- Field Control Processor 280 (FCP280)
- Field Control Processor 270 (FCP270)
- Z-Module Control Processor 270 (ZCP270)
- Control Processor 60 (CP60).

The CP60 mounts in a 19-inch rack. The CP60 connects to a 10Base2 (10 Mbps) Ethernet trunk Fieldbus, or fiber optic cabling, or a combination of 10Base2 cable and fiber optic cabling. The trunk Fieldbus can be implemented in either a single or redundant configuration. WDPF conversions employ either the Westinghouse Field Communication Module (WFCM10E), which connects to a 10Base2 network, or the WFCM10Ef, which connects to the Fieldbus via fiber optic cabling. WFCM10Es or WFCM10Efs mount on a 200 Series baseplate located in the DPU cabinet. The DCS Fieldbus Module subsystem can exist as a single entity on a trunk Fieldbus, or can be combined with other Fieldbus-based process interface subsystems.

The FCP280 and FCP270 mount on standard and compact 200 Series Modular Baseplates located in the DPU cabinet. Each Modular Baseplate supports either a single FCP280/FCP270 module or a pair of fault-tolerant FCP280/FCP270 modules. The FCP280 and FCP270 provide the control algorithms and the interface between the FBMs and the Foxboro Evo Control Network (hereinafter referred to as the control network) (100 Mbps Ethernet). This allows migration to Foxboro Evo control, display and application products, while retaining the original process termination and field I/O wiring.

The ZCP270 mounts in a 19-inch rack. In this case, optionally redundant Fieldbus Communication Modules (FCM100Ets or FCM100Es) are installed in a Modular Baseplate. FCM100Et and FCM100E modules provide the interface between the DCS Fieldbus Modules (via a 2Mbps fieldbus HDLC Fieldbus) and the ZCP270 (via the 100Mbps Ethernet Fieldbus). FCM100Et and FCM100E modules mount on a 200 Series baseplate located in the DPU cabinet. This allows migration to Foxboro Evo control, display and application products, while retaining the original process termination and field I/O wiring

The subsystem itself is a local Fieldbus that provides I/O to the process using the original field terminations. Major components of the DCS Fieldbus Module subsystem that can mount in the DPU cabinet are:

FCP280	The FCP280 is a distributed, field-mounted controller module that supports up to 128 DCS Fieldbus Modules, when the FCP280 is used exclusively with these DCS Fieldbus Modules or other 200 Series FBMs. The FCP280 connects to the control network via standard fiber optic 100 Mbps Ethernet.
FCP280 Baseplate	The FCP280 plugs into a 2-position Modular Baseplate, which is installed in the 19-inch rack above the Q-Crates replacing the DPU, as described in *Field Control Processor 280 (FCP280) User's Guide* (B0700FW). The Modular Baseplate requires connection to 24 V dc power supplies and the local Fieldbus cables.
FCP270	The FCP270 is a distributed, field-mounted controller module that supports up to 32 DCS Fieldbus Modules (or up to 36 Westinghouse DCS FBMs). The FCP270 connects to the control network via standard fiber optic 100 Mbps Ethernet.
FCP270 Baseplate	The FCP270 plugs into a Modular Baseplate, which is installed in the 19-inch rack above the Q-Crates replacing the DPU. The Modular Baseplate requires connection to 24 V dc power supplies and the local Fieldbus cables.
FCM100Et/ FCM100E	Fieldbus Communication Modules (FCM100Ets or FCM100Es), which can be installed in redundant pairs or as single-channel devices, provide the interface between the ZCP270 and up to 36 DCS Fieldbus Modules.
FCM100Et/ FCM100E Baseplate	FCM100Et and FCM100E modules plug into a Modular Baseplate, which can be installed in the 19-inch rack above the Q-Crates. The Modular Baseplate requires connection to 24 V dc power supplies and the local Fieldbus cables.
Westinghouse Fieldbus Communications Module (WFCM10E or WFCM10Ef)	The optionally redundant WFCMs connect the CP60 control processor to the Ethernet trunk Fieldbus and up to 36 DCS Fieldbus Modules.

WFCM10E or WFCM10Ef Baseplate
: The WFCM plugs into a molded plastic baseplate, which can be installed in the 19-inch rack above the Q-Crates. The baseplate requires connection to the +13 V power supplies and the local Fieldbus cables.

WFBE Fieldbus Extender
: A WFBE card is installed in each Q-Crate in the paddle-card slot. The WFBE provides cable connections to the WFCMs, FCP280s, FCM100Ets, FCP270s, and to WFBE cards in other Q-Crates. The WFBE communicates with the DCS Fieldbus Modules using the Q-Crate backplane.

DCS Fieldbus Modules
: These process interface cards are installed in the Q-Crate as direct replacements for the WDPF Q-Cards. The original field terminations are connected to the DCS Fieldbus Modules in the same way that the terminations were connected to the Q-Cards.

In addition to these major components, various supporting hardware items, such as local Fieldbus cables and equipment labels, are included in the DCS Fieldbus Module subsystem.

Subsystem Implementation

WDPF equipment is replaced on a DPU-by-DPU basis. Each DCS Fieldbus Module migration parts/kit provides all the components necessary to convert a single DPU, based on your specification of single or redundant Fieldbus and I/O terminations.

The I/O modules (and any redundancy cable) are removed from the module racks and replaced one-for-one by the equivalent DCS Fieldbus Module (FBMs). The FBMs plug directly into the backplane and communicates with the FCP280, FCP270, FCM100Et, or WFCM via the WFBE over the existing bus. The FBMs also plug directly into the existing field terminations cables, and are pin-for-pin compatible with the existing modules.

A single 2-position FCP280 baseplate can hold two single-channel or one fault-tolerant pair. A single FCP270, FCM100Et, or WFCM baseplate can hold two single-channel or two redundant pairs. Each WFCM/FCP270 single module or pair can support 36 DCS Fieldbus Modules configured in three Q-Crates. Each FCM100Et single module or pair can support 36 DCS Fieldbus Modules configured in three Q-Crates. Thus, with a single baseplate you can upgrade a double-sided WDPF cabinet or two adjacent single cabinets.

Chapter 2 “Product Application” describes the selection of optional components for the WPDF system migration. After identifying the components, implementation of the DCS Fieldbus Module subsystem includes:

- Integrated Control Configuration, as described in Chapter 3 “Configuration”
- Subsystem Installation, as described in Chapter 4 “Installation”.

Terminology

This document uses certain terms specific to the DCS Fieldbus Module subsystem and the Foxboro Evo system. Understanding these terms is essential to understanding this document.

FCP270	The Field Control Processor 270 (FCP270) is a distributed, field-mounted controller module that supports up to 36 DCS Fieldbus Modules (FBMs). The FCP270 connects to the control network via standard fiber optic 100 Mbps Ethernet. The FCP270 is an optionally fault-tolerant station that performs regulatory, logic, timing, and sequential control together with connected FBMs. It also performs data acquisition, and alarm detection and notification. The fault-tolerant version of the FCP270 consists of two processor modules. These modules install in adjacent FCP270 slots in a Modular Baseplate for high-speed communication between the modules. In a Westinghouse migration using FCP270s, an FCP270 or a redundant FCP270 pair is installed in a separate standard and compact 200 Series Modular Baseplate. The FCP270s are powered by 24 V dc power supplies, and connect to the control network via standard fiber optic 100 Mbps Ethernet cables.
FCP280	The Field Control Processor 280 (FCP280) is a distributed, field-mounted controller module that supports up to 128 DCS Fieldbus Modules (FBMs) or other 200 Series FBMs when the FCP280 is used exclusively with these DCS FBMs and 200 Series FBMs. The FCP280 connects to the control network via standard fiber optic 100 Mbps Ethernet. The FCP280 is an optionally fault-tolerant station that performs regulatory, logic, timing, and sequential control together with connected FBMs. It also performs data acquisition, and alarm detection and notification. The fault-tolerant version of the FCP280 consists of two processor modules. These modules install in adjacent FCP280 slots in a FCP280 Modular Baseplate for high-speed communication between the modules. The baseplate is powered by 24 V dc power supplies, and connects to the control network via standard fiber optic 100 Mbps Ethernet cables.
ZCP270	The Z-Module Control Processor 270 (ZCP270) is a Z-form factor controller that supports up to a maximum of 30 Fieldbus Communication Modules (FCM100Ets) and 120 DCS Fieldbus Modules (FBMs). The ZCP270 connects to the control network and FCM100Ets via standard fiber optic 100 Mbps Ethernet cable. The ZCP270 is an optionally fault-tolerant station that performs regulatory, logic, timing, and sequential control together with connected FCM100Ets and FBMs. It also performs data acquisition, and alarm detection and notification. The fault-tolerant version of the ZCP270 consists of two single-width processor modules. These modules install in adjacent ZCP270 slots in a 1x8 or 2x8 mounting structure and connect to a fault-tolerant connector to allow for high-speed communication between the modules.

FCM100Et

Fieldbus Communication Module 100Et (FCM100Ets), which can be installed in redundant pairs or as single-channel devices, provide the interface between the ZCP270 and a maximum of 36 DCS Fieldbus Modules (FBMs). The FCM100Et is not used when the control processor is an FCP280, FCP270, or CP60.

In a Westinghouse migration using ZCP270s, an FCM100Et or a redundant FCM100Et pair is installed in a separate standard and compact 200 Series Modular Baseplate. The FCM100Et is powered by 24V dc power supplies, and connects to the host ZCP270 via standard fiber optic 100 Mbps Ethernet.

Baseplate or Modular Baseplate

The baseplate or Modular Baseplate replaces the DPU assembly, including card cage and +5 V/±12 V power supplies (removed from cabinet). The baseplate for WFCMs uses the 13 V dc power supplies in the CPU cabinet and the Modular Baseplates for FCP280s, FCP270s, or FCM100Ets require the installation of 24 V dc power supplies.

FBM

A Fieldbus Module (FBM) provides the interface between the process sensors and actuators and the Fieldbus in a standard Foxboro Evo system. Each FBM is represented in the Foxboro Evo control database by an equipment control block (ECB). The DCS Fieldbus Modules consist of advanced 200 Series FBMs in a Q-Card form factor. The Series 200 FBM technology provides remote intelligence, a rich array of network management features, and use of proven software resources. The DCS Fieldbus Modules provide one-for-one replacements of the Q-Card form factor I/O modules.

Letterbug

In the Foxboro Evo system, a letterbug is a six-character module identifier. The term refers to a set of six interlocking plugs that are installed on some Foxboro Evo equipment, including the DCS Fieldbus Modules and the WFCM. Letters printed on the front of the plugs are read visually by the user. Pin connectors at the back are read electronically by the module. FCP280 letterbugs are soft letterbugs assigned either through the host station or set using the buttons on the module's faceplate. FCP270, ZCP270 and FCM100Et letterbugs are soft letterbugs assigned through either through the host station or the modules infrared communications port.

In the Westinghouse migration, the FCP280/FCP270 and its associated DCS Fieldbus Modules (or the FCM100Et and its associated DCS Fieldbus Modules) use a set of letterbugs in which the first four characters are identical. (The fifth and sixth characters of the FCM100Et letterbug are 00.) The last two characters of the DCS Fieldbus Module letterbugs must be unique within the subsystem.

The Foxboro Evo Control Network

The control network is a switched Fast Ethernet network based on IEEE 802.3u (Fast Ethernet) and IEEE 802.3z (gigabit Ethernet) standards. The control network consists of a number of Ethernet switches connected to the control network configuration.

The control network configuration allows high availability by providing redundant data paths and eliminating single points of failure. The flexibility of the architecture enables design of a network configuration that fits the needs of the control system. Configurations can be as simple as a host workstation connected directly to one controller, or as complex as a multi-switch, fully meshed control network, communicating at speeds of up to 1 gigabit per second.

CP60 — The Control Processor 60 (CP60) is an optionally fault-tolerant control station that performs regulatory, logic, timing, and sequential control together with the connected DCS Fieldbus Module subsystem and other I/O subsystems. The station controls process variables using algorithms contained in functional control blocks configured by on-site process engineers to implement the desired control strategies.

WFCM — Fieldbus Communications Modules (WFCMs), which can be installed in redundant pairs or as single-channel devices, provide the interface between the trunk Fieldbus and a group of FBMs. WDPF conversions employ either the WFCM10E, which connects to a 10Base2 network, or the WFCM10Ef, which connects to the Fieldbus via fiber optic cabling. Both WFCMs are designed to operate on the +13 V power supplied by the original Q-Crate supplies.

CP60 Fieldbus — This is an optionally redundant serial bus conforming to the EIA standards' general requirements for RS-485. The Fieldbus carries data communications on twin axial cable between the input/output modules on the Fieldbus (FBMs and DCS Fieldbus Modules, for example), and their associated control stations. There are two Fieldbuses used in the WDPF upgrade: the Ethernet trunk Fieldbus, operating at 10 Mbps, which connects the CP60 to the subsystem and other Fieldbus devices, and the DCS Fieldbus subsystem, which is a 2 Mbps local Fieldbus.

Planning Ahead

Individuals who should be involved with the planning process include sales support personnel, system engineers, software engineers, and process control engineers. For throughput and sizing information tailored to your system, consult your Foxboro® engineering or sales support representative. There are three major areas of concern when planning a system:

- System Definition

  During system definition you select and configure the hardware and software for the system. The end product of this configuration is a disk that defines the network equipment packaging, documents the configuration, provides a list of material for the quotation system, and enables software installation. Prior to undertaking this configuration, you should determine:

  - Number and type of loops and blocks in the process control scheme
  - Memory and throughput requirements based on block definition, scan rates, and other block-related functions that can affect the number and selection of hardware items.

NOTE

During System Definition you configure the letterbugs for the host FCP280, FCP270, ZCP270, CP60s, FCM100Ets, the WFCMs, and other Fieldbus subsystems, but not for DCS Fieldbus Subsystem for WDPF systems. These letterbugs should be assigned during Process Control Configuration.

- Process Control Configuration

  Compounds, continuous and sequential control blocks, and ladder logic are defined with the Foxboro Evo Control Editors (hereinafter referred to as Control Editors), I/A Series Configuration Component, or the Integrated Control Configurator. You lay out the schemes for your compounds and blocks prior to actually performing a configuration on the system. You also configure the FCMs and DCS Fieldbus Modules, assigning letterbugs and defining an Equipment Control Block (ECB) for each DCS Fieldbus Module. You then use the resulting information, in conjunction with information on the System Definition worksheets, to arrive at a final plan for hardware and software, and a final process control strategy.

- Equipment Installation

  Equipment installation does not require special tools beyond those required for the standard Foxboro Evo system. However, it does require a basic knowledge of Foxboro Evo system hardware concepts. This knowledge can be attained by reviewing the documents listed in the “Preface” on page xiii. You should also be familiar with the WDPF technology and the specific DPU to be upgraded.

2. Product Application

This chapter describes how the DCS Fieldbus Module subsystem is used to replace the WDPF System units.

The Foxboro Evo migration strategy replaces the WDPF Distributed Process Unit (DPU) with a high-speed Ethernet connection to an control processor (CP60 or later), provides a card-for-card replacement of I/O modules, but leaves the original process interface wiring and cabinets in place.

Control Processor and System Software Compatability

For migration support, the DCS Fieldbus Module subsystem requires the following:

- Foxboro Evo Control Core Services (hereinafter referred to as Control Core Services) software v9.0 (or higher) is required for FCP280.
- I/A Series software v8.1.1 (or higher) is required for FCP270 and ZCP270.
- I/A Series software v6.3.2 and v6.5 (or higher) are required for CP60. (I/A Series software v6.4 does not include this support for the CP60. However, I/A Series software v6.4 supports all other competitive migration products.)

I/O from the subsystem is connected to the control strategy using standard I/O type blocks described in *Integrated Control Block Descriptions* (B0193AX).

WDPF DPU Configuration

The WDPF DPU "A" Cabinet diagram in Figure 2-1 defines the WDPF terminology and original system components used in this document. The standard 19-inch DPU cabinet includes the following equipment:

Power Supplies	The WDPF I/O cards are powered by one or two +13 V dc power supplies at the top of the cabinet. The power supplies remain in the cabinet and provide power for the DCS Fieldbus Modules using the same wiring and backplane connections used to supply the Q-Cards. In addition, the +13 V dc power supplies are used for the WFCMs only.
DPU	The optionally redundant DPU provides control strategy via I/O modules in the cabinet, and connection to Wesnet Data Highway™ or other networks. The entire DPU assembly, including card cage and +5 V/±12 V dc power supplies, is removed from cabinet.
Q-Crates	A Q-Crate is a 13-slot card nest that includes a local backplane. Up to 12 I/O modules, or Q-Cards, can be installed in the Q-Crate. The 13th slot is used for the paddle card, which provides connections between the CPU and the Q-Crate backplane. Three Q-Crates are configured in a standard "A" Cabinet when the DPU uses card-edge field terminations in the cabi-

net. Four Q-Crates can be installed in the “A” Cabinet when field terminations are made in a Remote Q-Line I/O™ subsystem or in an adjacent “B” Cabinet. Depending on the field termination options used, three or four additional Q-Crates can be configured in an adjacent Expansion cabinet. The Q-Crates are used in the DCS Fieldbus Module subsystem. The original wiring between the 13 V dc power supplies and the Q-Crates is maintained.

Q-Cards

Q-Cards are the WDPF I/O modules. They are installed in the Q-Crates and communicate with the DPU via the local backplane, paddle cards, and cables. Field termination assemblies attach directly to the front edge connectors on the Q-Cards. Optionally, the edge connectors can be used for cables to the field terminations in a Remote Q-Line I/O subsystem or in an adjacent “B” Cabinet.

The Q-cards are replaced card-for-card by the DCS Fieldbus Modules. The Foxboro Evo modules are configured in the same form factor as the Q-Cards. They are plugged into the local backplane and connect to the field termination assemblies or the cables from the termination assemblies in a separate cabinet.

Paddle Card

A paddle card in the Q-Crate 13th slot provides for cable connections between the local backplane and the DPUs. The paddle card is replaced by the WFBE Fieldbus Extender card.

Edge Connector for Field Terminations

In “A” Cabinets and Expansion Cabinets, field terminations can be at the front edge of the Q-Cards using the edge connector shown in Figure 2-1. Optionally, the field terminations are installed in a Remote Q-Line I/O subsystem or in an adjacent “B” Cabinet, and connected to the Q-cards via a cable connection to the Q-Card front edge.

Whichever of the two field termination options is used in the original WDPF system, they are re-used without change in the DCS Fieldbus Module subsystem.

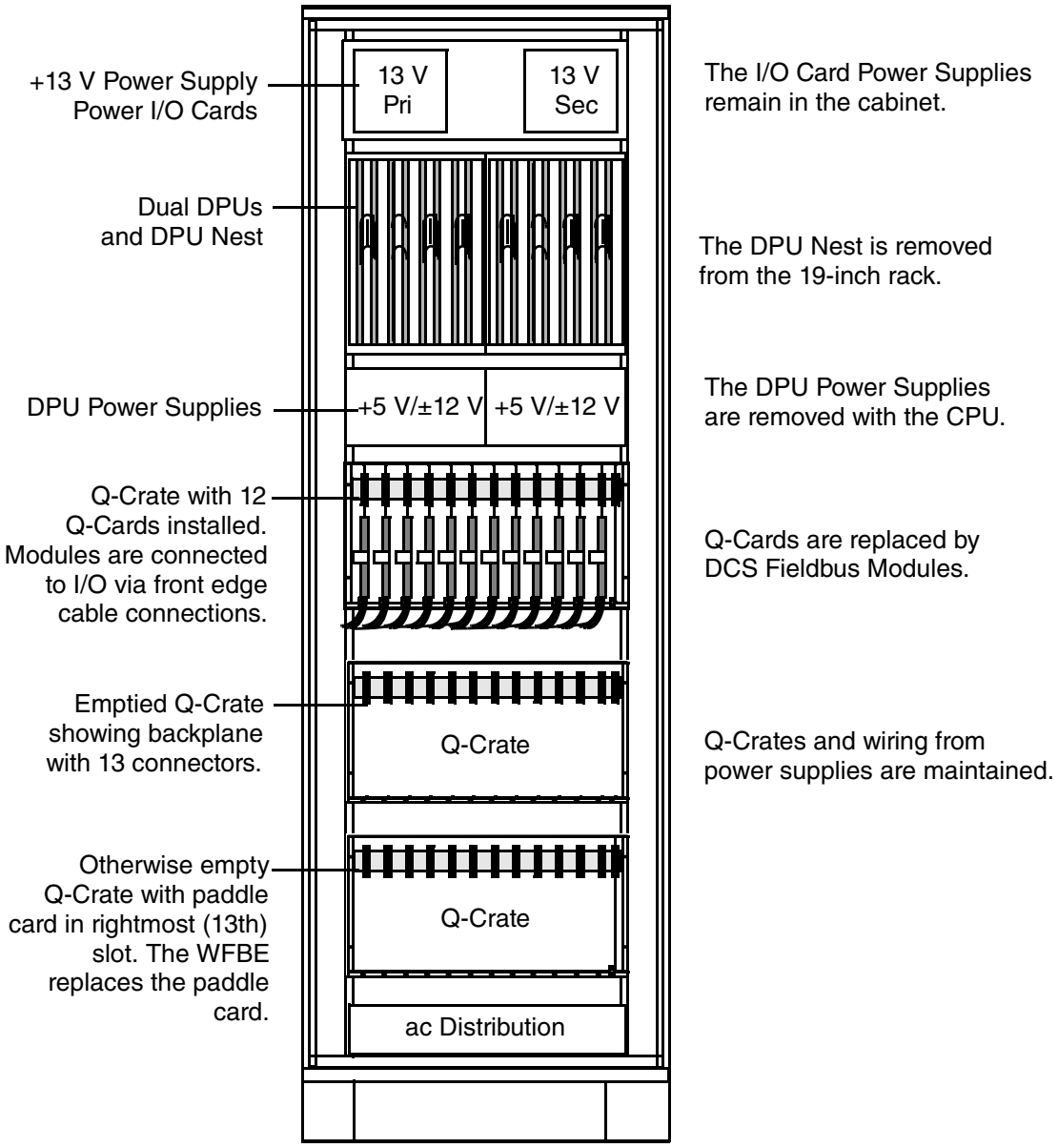

Figure 2-1. WDPF "A" Cabinet

DCS Fieldbus Module Subsystem Implementation

This section describes three configurations involving upgrades of WDPF systems.

- Single “A” Cabinet with card edge field terminations
- Single Enhanced Cabinet with field terminations in an adjacent “B” Cabinet
- Side-by-side “A” Cabinet and Expansion Cabinet using card edge field terminations.

Additional configurations are variations on these basic setups.

In each case, a DCS Fieldbus Module baseplate physically replaces the single or dual CPU assembly.

The baseplate for WFCMs, used with a CP60, can hold two single or two redundant pairs of WFCMs. Whether a single module or a redundant pair, each WFCM can support up to 36 DCS Fieldbus Modules, each of which is a direct replacement for a Q-Card. Thus, from a single baseplate, you can replace up to 72 Q-Cards. For WDPF systems that support from 73 to 96 Q-Cards, a second baseplate can be installed in the Expansion Cabinet.

An FCP280 Modular Baseplate[1] or a Modular Baseplate which supports FCP270s can hold a single or a redundant pair of FCP280s or FCP270s. These FCP280s or FCP270s support multiple DCS Fieldbus Modules, each of which is a direct replacement for a Q-Card.

A single or fault-tolerant FCP280 can support up to 128 DCS Fieldbus Modules, or other 200 Series FBMs, when used exclusively with these DCS FBMs and 200 Series FBMs. For the module quantity and combinations which can be used with the FCP280, refer to *Field Control Processor 280 (FCP280) User's Guide* (B0700FW).

When a single or fault-tolerant FCP270 is used with FEM100 modules, it can support up to 128 DCS Fieldbus Modules. When used without FEM100 modules, a single or fault-tolerant FCP270 can support up to 36 DCS Fieldbus Modules. For example, a single Modular Baseplate with a one (single or fault-tolerant) FCP270 can replace up to 36 Q-Cards without FEM100s, or 128 Q-Cards with FEM100s. With two single FCP270s or two fault-tolerant pairs of FCP270s located in the same Modular Baseplate, you can replace up to 72 Q-Cards (without FEM100s). For WDPF systems that support from 73 to 96 Q-Cards, a second Modular Baseplate can be installed in the Expansion Cabinet with additional FCP270s if you do not use FEM100s with the FCPs.

Each single FCM100Et or FCM100E (or each redundant pair) can support up to 36 DCS Fieldbus Modules, each of which is a direct replacement for a Q-Card. A Modular Baseplate, can hold a single or a redundant pair of FCM100Ets or FCM100Es. Thus, from a single Modular Baseplate with a one (single or redundant) FCM100Et or FCM100E, you can replace up to 36 Q-Cards. With two FCM100Ets/FCM100Es located in the same Modular Baseplate, you can replace up to 72 Q-Cards. With three FCM100Ets/FCM100Es located in the same Modular Baseplate, you can replace up to 108 Q-Cards. For WDPF systems that support from 108 to 120 Q-Cards, a second Modular Baseplate can be installed in the Expansion Cabinet.

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1. The FCP280 can only be mounted in a dedicated 2-position FCP280 baseplate.

Single "A" Cabinet

The single "A" Cabinet configuration, shown in Figure 2-2, originally included dual power supplies, redundant DPUs and three Q-Crates with 12 Q-Cards each. The field termination connectors were detached from the front edge of the Q-Cards and saved for re-use with the DCS Fieldbus Modules. The DPU assembly, DPU power supplies, Q-Cards, paddle cards, and associated cables were removed. The +13 V dc power supplies were maintained, as were the emptied Q-Crates.

To complete this upgrade:

- For FCP280s and FCP270s
  - Mount the FCP280 or FCP270 Modular Baseplate in the rack on the rear DIN rails where the DPU assembly had been installed, as described on page 78.
  - Install single or redundant 24 V dc power supplies for the Modular Baseplate, as described on page 79.
  - Connect the Modular Baseplate to the 24 V dc power supplies, as described on page 79.
  - Install the host FCP280(s) or FCP270(s) in the Modular Baseplate and connect them to the control network, as described on page 80.
- For FCM100Ets or FCM100Es
  - Mount the FCM100Et/FCM100E Modular Baseplate in the rack on the rear DIN rails where the DPU assembly had been installed, as described on page 78.
  - Install single or redundant 24 V dc power supplies for the Modular Baseplate, as described on page 79
  - Connect the Modular Baseplate to the 24 V dc power supplies, as described on page 79
  - Installing the host FCM100Et/FCM100E(s) and connect them to the control network, as described on page 79
- For CP60s
  - Mount the DCS Fieldbus Module baseplate in the rack where the DPU assembly had been installed, as described on page 71
  - Plug the redundant pair of WFCM10E or WFCM10Ef modules in the first two baseplate sockets on the left and connect the WFCMs to the Ethernet trunk Fieldbus. See page 74
- Install a WFBE in the right-most slot of each Q-Crate. Ensure that the jumpers are installed on the WFBE placed in the last Q-Crate on the local Fieldbus. Remove the jumpers from the other WFBE modules. See page 81 for specific instructions.
- Use local Fieldbus cables to connect the baseplate to the first Q-Crate and to add the other two Q-Crates to the local Fieldbus. See "Cable Connections" on page 82.
- Insert the appropriate DCS Fieldbus Modules in the Q-Crates and reattach the field termination edge connectors to the DCS Fieldbus Modules, as described on page 85.

The newly installed modules form a single subsystem, which the Foxboro Evo system addresses with a series of letterbugs, in which the first four characters are identical.

Figure 2-2 shows the upgraded "A" Cabinet before installation of the DCS Fieldbus Modules and reattachment of the field termination edge connectors.

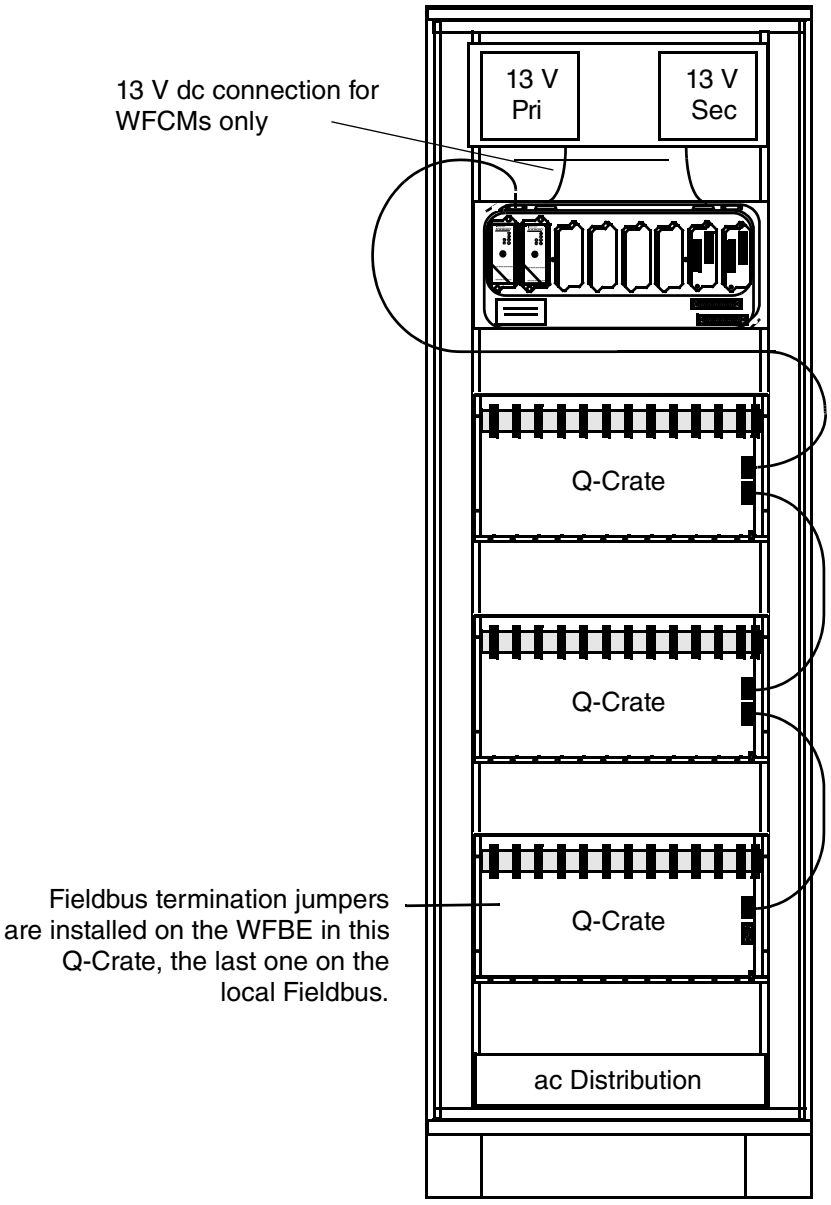


Figure 2-2. Upgraded "A" Cabinet Before Installation of DCS Fieldbus Modules

Enhanced Cabinet

The Enhanced Cabinet configuration, shown in Figure 2-3, originally included dual power supplies, redundant DPUs and four Q-Crates with 12 Q-Cards each. The cables to the field termination cabinet were disconnected from the front edge of the Q-Cards and saved for re-use with the DCS Fieldbus Modules. The DPU assembly, DPU power supplies, Q-Cards, paddle cards, and associated cables were removed. The +13 V power supplies were maintained, as were the emptied Q-Crates.

To complete this upgrade:

- For FCP280s, FCP270s, and FCM100Ets/FCM100Es:
  - Follow all the FCP280, FCP270, FCM100Et or FCM100E steps outlined on page 13 for the single “A” Cabinet.
  - Install a second Modular Baseplate for the FCP280s, FCP270s, FCM100Ets or FCM100Es into the “A” cabinet rack
  - Connect the single or redundant 24 V dc power supplies to the Modular Baseplate
  - Install single or redundant pair of FCP280s, FCP270s, FCM100Ets or FCM100Es in the Modular Baseplate and connect the FCP280s, FCP270s, FCM100Ets or FCM100Es to the control network.
  - Make sure unique sets of letterbug identifiers are used for each subsystem.
- For CP60s:
  - Follow all the CP60 steps outlined on page 13 for the single “A” Cabinet.
  - Install a second redundant pair of WFCMs in the two baseplate sockets on the right and connect the WFCMs to the Ethernet trunk Fieldbus.
  - Make sure unique sets of letterbug identifiers are used for each subsystem.
- Install the Fieldbus termination jumpers on a WFBE and insert the module in the rightmost slot of the last Q-Crate on the second local Fieldbus (the fourth Q-Crate in Figure 2-3).
- Plug one end of a local Fieldbus cable to the connector on the top right of the baseplate and the other end into the upper connector on the WFBE in the fourth Q-Crate.
- Insert the appropriate DCS Fieldbus Modules in the Q-Crate and connect field termination cables to the DCS Fieldbus Modules.

For FCP280 or FCP270 installations, the newly installed modules form two subsystems, one accessed through a separate FCP280/FCP270 (includes the DCS Fieldbus Modules in the first two Q-Crates), the second accessed through a separate FCP280/FCP270 (includes the DCS Fieldbus Modules in the third and fourth Q-Crate).

For FCM100Et or FCM100E installations, the newly installed modules form two subsystems, one accessed through a separate FCM100Et or FCM100E (includes the DCS Fieldbus Modules in the first two Q-Crates), the second accessed through a separate FCM100Et or FCM100E (includes the DCS Fieldbus Modules in the third and fourth Q-Crate). However, both subsystems can be hosted by the same ZCP270.

For CP60 installations, the newly installed modules form two subsystems, the first accessed through the WFCMs on the left and including the modules in the first three Q-Crates, the second accessed via the WFCMs on the right and including the DCS Fieldbus Modules in the fourth Q-Crate. However, both subsystems are hosted by the same CP60.

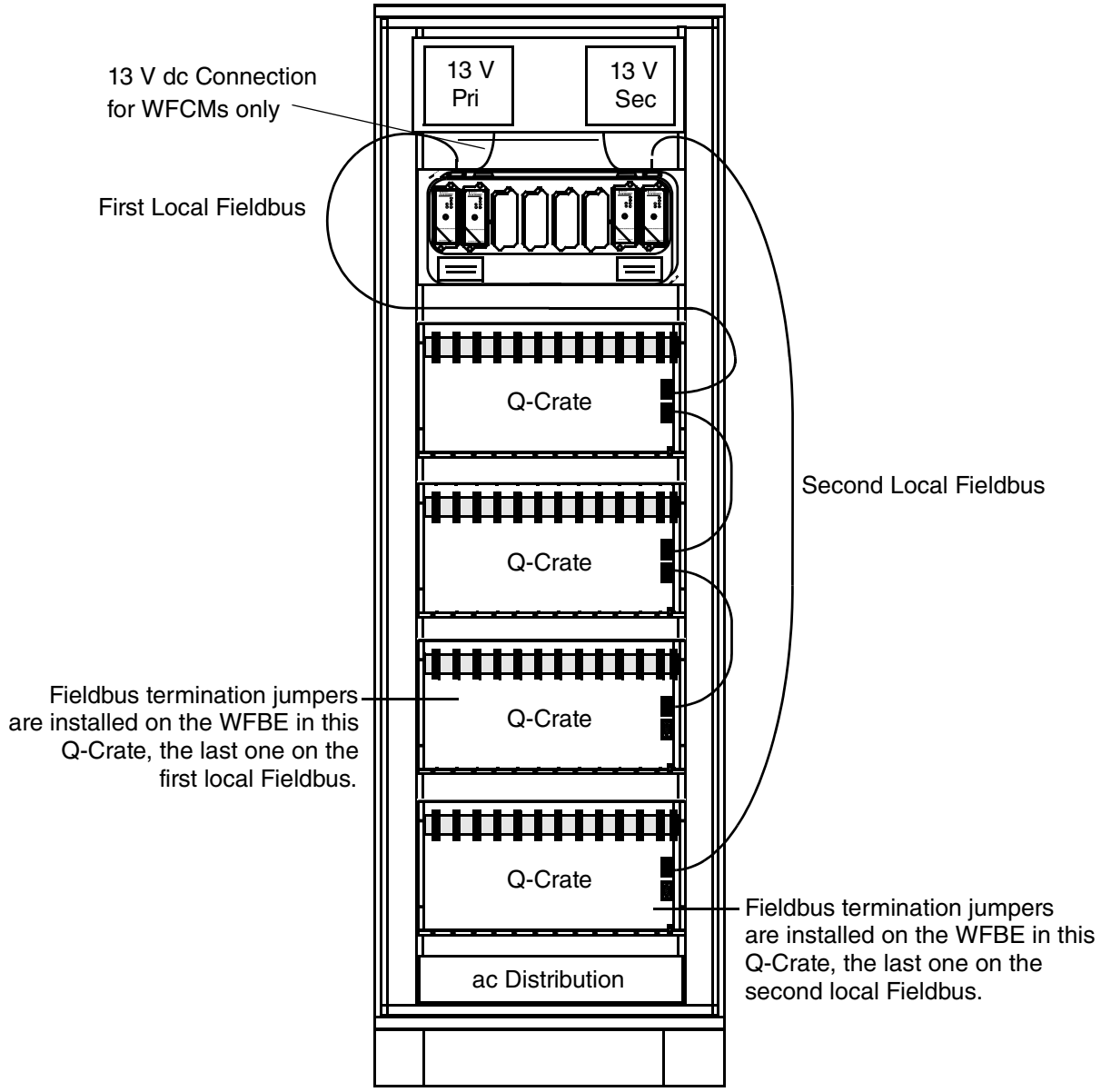


Figure 2-3. Upgraded Enhanced Cabinet

"A" Cabinet with Expansion Cabinet

The "A" Cabinet and Expansion Cabinet configuration shown in Figure 2-4 originally included dual power supplies, redundant DPUs and three Q-Crates with 12 Q-Cards each in an "A" Cabinet and another three Q-Crates in the Expansion Cabinet. The field termination connectors were detached from the front edge of the Q-Cards and saved for re-use with the DCS Fieldbus Modules. The DPU assembly, DPU power supplies, Q-Cards, paddle cards, and associated cables were removed. The +13 V dc power supplies in both cabinets were maintained, as were the emptied Q-Crates.

To complete this upgrade:

- For FCP280s or FCP270s
  - Follow all the FCP280 or FCP270 steps outlined on page 13 for the single "A" Cabinet.
  - Install a second Modular Baseplate for the FCP280s/FCP270s in the single "A" Cabinet.
  - Install single or fault-tolerant pair of FCP280s/FCP270s in the Modular Baseplate and connect the FCP280s/FCP270s to the control network.
  - Install single or redundant 24 V dc power supplies in the "Expansion" cabinet.
  - Mount an FCP280/FCP270 Modular Baseplate in the rack on the rear DIN rails in the "Expansion" cabinet, as described on page 78.
  - Install a second Modular Baseplate for the FCP280s/FCP270s in the "Expansion" cabinet.
  - Install a single or fault-tolerant pair of FCP280s/FCP270s in the Modular Baseplate and connect the FCP280s/FCP270s to the control network.
  - Connect the single or redundant 24 V dc power supplies to the Modular Baseplate in the "Expansion" cabinet.
  - Make sure unique sets of letterbug identifiers are used for each subsystem.

  For FCP280 or FCP270 installations, the newly installed modules in "A" cabinet form two subsystems, one accessed through a separate FCP280/FCP270 (includes the DCS Fieldbus Modules in the first two Q-Crates), the second accessed through a separate FCP280/FCP270 (includes the DCS Fieldbus Modules in the third Q-Crate).

  For FCP280 or FCP270 installations, the newly installed modules in the "Expansion" cabinet form two subsystems, one accessed through a separate FCP280/FCP270 (includes the DCS Fieldbus Modules in the first two Q-Crates), the second accessed through a separate FCP280/FCP270 (includes the DCS Fieldbus Modules in the third Q-Crate).
- For FCM100Ets or FCM100Es
  - Follow all the FCM100Et or FCM100E steps outlined on page 13 for the single "A" Cabinet.
  - Install a second Modular Baseplate for the FCM100Ets or FCM100Es in the single "A" Cabinet
  - Install single or redundant pair of FCM100Ets or FCM100Es in the Modular Baseplate and connect the FCM100Ets or FCM100Es to the control network.
  - Make sure unique sets of letterbug identifiers are used for each subsystem.

For FCM100Et or FCM100E installations, the newly installed modules form two subsystems, one accessed through a separate FCM100Et or FCM100E (includes the DCS Fieldbus Modules in the “A” cabinet), the second accessed through a separate FCM100Et or FCM100E (includes the DCS Fieldbus Modules in the “Expansion” cabinet). However, both subsystems can be hosted by the same ZCP270.

- For CP60s
  - Follow all the CP60 steps outlined on page 13 for the single “A” Cabinet for each cabinet.
  - Make sure unique sets of letterbug identifiers are used for each subsystem.
  - Connect the two WFCM pairs to the Ethernet trunk Fieldbus.

    The newly installed subsystems installed in each cabinet are connected to the same CP60 via the Ethernet trunk Fieldbus. The control program operating in the CP60 has high-speed access to the I/O modules through their respective WFCMs.

    If the Q-Cards in the Expansion Cabinet are powered from the +13 V dc supplies in the “A” Cabinet, plug the WFCMs for the Expansion Cabinet modules in the right side (slots 7 and 8) of the baseplate in the “A” Cabinet. The WFCMs should be on the same 13 V dc power supplies as the DCS Fieldbus Modules they connect to the Foxboro Evo system.

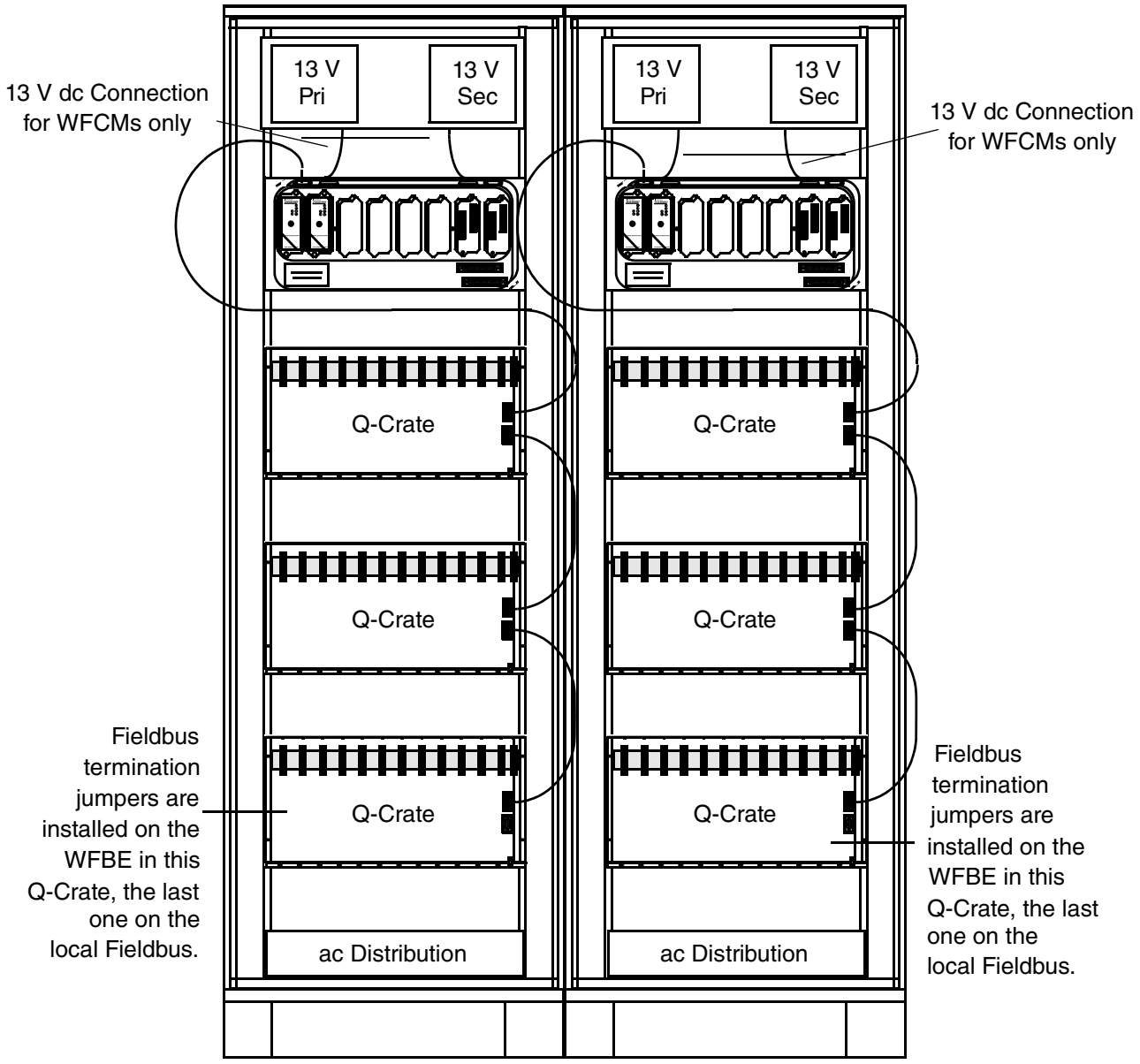


Figure 2-4. Upgraded "A" Cabinet and Expansion Cabinet

CP60 Ethernet Trunk Fieldbus

Refer to the document *Control Processor 60 and Control Processor 60S Installation and Maintenance* (B0400FB) for:

- Connecting the 10Base2 Ethernet trunk Fieldbus to the WFCM10Es
- Connecting an optional fiber optic Ethernet trunk Fieldbus extension to the WFCM10Efs.

Control Processor Connections to The Foxboro Evo Control Network

Refer to the following documents for instructions on connecting the control processors (or the ZCP270's FCM100Et or FCM100E) to the control network:

- *Field Control Processor 280 (FCP280) User's Guide* (B0700FW)
- *Field Control Processor (FCP270) User's Guide* (B0700AR)
- *Z-Module Control Processor (ZCP270) User's Guide* (B0700AN).

DCS Fieldbus Modules

The DCS Fieldbus Modules provide advanced 200 Series FBM technology on a Q-Card form factor. Each module plugs into the slot used by the replaced Q-Card and provides a front edge connector for the field termination connector or the cable connection to the field terminations in a separate cabinet. The modules have the following features in common:

- Light-emitting diodes (LEDs) mounted in the front of the module provide visual status indications of Fieldbus Module functions.
- The module can be removed or replaced without removing power or communications cabling.
- Each module is addressed by a unique six-character letterbug. The first four characters are determined by the host WFCMs/FCM100Ets/FCM100Es. The fifth and sixth characters are determined by letterbugs plugged into sockets on the card.

Analog Input

WAH01 Series

The WAH01 Series includes four high level analog input modules that replace QAH Series modules. The modules provide eight two-wire group-isolated input channels. Table 2-1 lists the modules in the series, their signal ranges, and the Q-Cards they replace.

Table 2-1. WAH01 Series Analog Input Modules

Module	Signal Range	Q-Cards
WAH01A	–10.24 to +10.24 V dc	QAH-G01
WAH01B	–5.12 to +5.12 V dc	QAH-G02
WAH01C	0 to +10.24 V dc	QAH-G03
WAH01D	0 to +5.12 V dc	QAH-G04

Each module performs the signal conversion required to interface the electrical input signals from the field sensors to the optionally redundant Fieldbus. The modules execute an Analog Input application program, which provides the configurable options for Conversion Time and Rate of Change Limits.

For high accuracy, the WAH01 Series incorporates a multiplexed Sigma-Delta data conversion on a per channel basis, which can provide new analog input readings every 25 ms, and a configurable moving average filter to remove any process noise and power line frequencies.

WAI01 Series

The WAI01 Series includes four low-level analog input modules that replace the QAI Series modules. Each module provides four two-wire, individually isolated input channels.

Table 2-2 lists the modules in the series, their signal ranges, and the Q-Cards they replace.

Table 2-2. WAI01 Series Analog Input Modules

Module	Signal Range	Q-Cards
WAI01A	–512 to +512 mV dc	QAI-G01
WAI01B	–1.02 to +1.02 V dc	QAI-G02
WAI01C	–10.24 to +10.24 V dc	QAI-G03
WAI01D	0 to 20.48 mA	QAI-G04

Each module performs the signal conversion required to interface the electrical input signals from the field sensors to the optionally redundant Fieldbus. The modules execute an Analog Input application program, which provides the configurable options for Conversion Time and Rate of Change Limits.

For high accuracy, the WAI01 Series incorporates Sigma-Delta data conversion on a per channel basis, which can provide new analog input readings every 25 ms, and a configurable moving average filter to remove any process noise and power line frequencies.

WAI02A

The WAI02A is a channel-isolated thermocouple/mV input interface module that replaces QAI Series modules G01, G02, G03 and G08.

The WAI02A contains four isolated thermocouple input channels. Each channel accepts standard thermocouples for various temperature ranges and provides thermocouple burnout detection (up-scale).

Each channel can also be software-configured to read a –100 mV to +100 mV range. See “Thermocouple Signal Range” on page 47 for information on configuring the WAI02A using the FoxCAE™ application or the Integrated Control Configurator.

Each module performs the signal conversion required to interface the electrical input signals from the field sensors to the optionally redundant Fieldbus. The modules execute an Analog Input application program, which provides the configurable options for Conversion Time and Rate of Change Limits.

For high accuracy, the WAI02A incorporates Sigma-Delta data conversion on a per channel basis, which can provide new analog input readings every 25 ms, and a configurable moving average filter to remove any process noise and power line frequencies.

External temperature compensation is provided by RTDs that are mounted in a “B” Cabinet. The RTDs are wired to WRT03 Series cards, which in turn are referenced by the AIN blocks connected to the thermocouples, as shown in B in Figure 3-7. See “Configuring TC Temperature Compensation RTDs” on page 55.

WAV02A

The WAV02A is a channel-isolated thermocouple/mV input interface module that replaces QAV Series modules G01 through G09.

The WAV02A contains six isolated thermocouple input channels with on-card temperature compensation. Each channel accepts standard thermocouples for various temperature ranges, and each provides thermocouple burnout detection (up-scale).

Each channel can also be software-configured to read a –100 mV to +100 mV range. See “Thermocouple Signal Range” on page 47 for information on configuring the WAV02A using the FoxCAE application or the Integrated Control Configurator.

Each module performs the signal conversion required to interface the electrical input signals from the field sensors to the optionally redundant Fieldbus. The modules execute an Analog Input application program, which provides the configurable options for Conversion Time and Rate of Change Limits.

For high accuracy, the module incorporates Sigma-Delta data conversion on a per channel basis, which can provide new analog input readings every 25 ms, and a configurable moving average filter to remove any process noise and power line frequencies.

The WAV02A features an on-card RTD for thermocouple temperature compensation. The RTD is mapped into channel 9 in the ECB. On-card thermocouple temperature compensation is only used when thermocouples are directly connected to the card edge termination assembly found typically in remote Q-Line termination cabinets. When external temperature compensation is provided by an RTD mounted in a “B” Cabinet, that RTD is connected to a WRT03 Series card, which in turn is referenced by the AIN blocks connected to the thermocouples, as shown in B in Figure 3-7. See “Configuring TC Temperature Compensation RTDs” on page 55.

WAW01 Series

The WAW01 Series modules contain six individually isolated unipolar input channels, each channel accepting a 2-wire analog input. Table 2-3 lists the modules in the series, their signal ranges, and the Q-Cards they replace.

Table 2-3. WAW01 Series Analog Input Modules

Module	Signal Range	Q-Cards
WAW01A	0 to 1.02 V dc	QAW-G01
WAW01B	0 to 5.12 V dc	QAW-G02
WAW01C	0 to 10.24 V dc	QAW-G03
WAW01D	0 to 20.48 mA	QAW-G04
WAW01E	0 to 20.48 mA	QAW-G05
WAW01F	0 to 51.2 mA	QAW-G06

The WAW01E includes a jumper-selectable on-board 24 V dc power supply. See "WAW01E Options" on page 90 for information on selecting on-board or external power for the attached devices.

Each module performs the signal conversion required to interface the electrical input signals from the field sensors to the optionally redundant Fieldbus. The modules execute an Analog Input application program, which provides the configurable options for Conversion Time and Rate of Change Limits.

For high accuracy, the series incorporates Sigma-Delta conversion on a per channel basis which can provide new analog input readings every 25 ms, and a configurable moving average filter to remove any process noise and power line frequencies.

WAX01 Series

The WAX01 Series replaces the QAX Series modules. Each module contains two sets of six individually isolated unipolar voltage input channels. The input ranges are:

Table 2-4. WAX01 Series Analog Input Modules

Module	Signal Range	Q-Cards
WAX01A	0 to +1.02 V dc	QAX-G04
WAX01B	0 to +5.12 V dc	QAX-G05
WAX01C	0 to +10.24 V dc	QAX-G06

Each set of six inputs is assigned to separate communication circuits and an associated letterbug. Channel inputs are galvanically isolated from other channels and from ground. Refer to "WAX01 Series and WAX02A Letterbugs" on page 87 for letterbug information.

Each module performs the signal conversion required to interface the electrical input signals from the field sensors to the optionally redundant Fieldbus. The modules execute an Analog Input application program, which provides the configurable options for Conversion Time and Rate of Change Limits.

For high accuracy, the series incorporates Sigma-Delta conversion on a per channel basis, which can provide new analog input readings every 25 ms, and a configurable moving average filter to remove any process noise and power line frequencies.

WAX02A

The WAX02A is a channel-isolated thermocouple/mV input interface module that replaces QAX Series modules QAX-G01, G02 and G03.

The WAX02A functions as two WAV02A modules. WAX02A contains two sets of six thermocouple input channels. Each set of six inputs has separate communication circuits and a separate letterbug. Channel inputs are galvanically isolated from other channels and from ground. Refer to "WAX01 Series and WAX02A Letterbugs" on page 87 for letterbug information.

Each channel can also be software-configured to read a –100 mV to +100 mV range. See "Thermocouple Signal Range" on page 47 for information on configuring the WAX02A using FoxCAE or the Integrated Control Configurator.

When the WAX02A is used to read thermocouples, channel 12 is used to read the QAXT Terminal Block Temperature Sensor. The channel (point 6 on the second FBM) is connected as an external reference to the AIN blocks that read thermocouple inputs from the other 11 channels. A hardware jumper must be installed on the WAX02A to provide power to QAXT (see "WAX02A and QAXT Terminal Block Sensor" on page 91).

Each module performs the signal conversion required to interface the electrical input signals from the field sensors to the optionally redundant Fieldbus. The modules execute an Analog Input application program, which provides the configurable options for Conversion Time and Rate of Change Limits.

For high accuracy, the module incorporates Sigma-Delta data conversion on a per channel basis, which can provide new analog input readings every 25 ms, and a configurable moving average filter to remove any process noise and power line frequencies.

Each channel accepts standard thermocouples for various temperature ranges. Inputs are preset to read thermocouple inputs and to provide thermocouple burnout detection (up-scale).

WRF03 Series

The WRF03 Series modules are channel-isolated platinum/nickel RTD input interface cards that replace QRF Series modules:

- The WRF03A is a 200-ohm platinum input module that replaces the QRF-G01 and G03
- The WRF03B is a 100-ohm platinum input module that replaces the QRF-G02 and G04.

Each module contains six resistance temperature detector (RTD) input channels and accepts a 4-wire RTD sensor input, within a 0-640 ohm resistance range or 0-320 ohm resistance range dependent upon module type.

The module performs the signal conversion required to interface the electrical input signals from the field sensors to the optionally redundant Fieldbus. The WRF03 Series executes an Analog Input application program, which provides the configurable options for Conversion Time (on a per module basis) and Rate of Change Limits.

For high accuracy, the module incorporates Sigma-Delta data conversion on a per channel basis, which provides new analog input readings every 25 ms, and a configurable moving average filter to remove any process noise and power line frequencies.

WRT03 Series

The WRT03 Series modules are channel-isolated platinum/nickel RTD input interface cards that replace QRT Series modules:

- The WRT03A is a 0-30 ohm input module that replaces the QRT-G01.
- The WRT03B is a 0-320 ohm input module that replaces the QRT-G02.

Each module contains four resistance temperature detector (RTD) input channels and accepts a 3-wire RTD sensor input, within a 0-320 ohm resistance range or 0-30 ohm resistance range dependent upon module type.

The module performs the signal conversion required to interface the electrical input signals from the field sensors to the optionally redundant Fieldbus. The WRT03 Series executes an Analog Input application program, which provides the configurable options for Conversion Time (on a per module basis) and Rate of Change Limits.

For high accuracy, the module incorporates Sigma-Delta data conversion on a per channel basis, which provides new analog input readings every 25 ms, and a configurable moving average filter to remove any process noise and power line frequencies.

Analog Output

WAO37 Series

The channel-isolated WAO37 Series analog output interface modules contain four analog output channels, and provide direct replacements for the various QAO Series Q-Cards. Table 2-5 lists the seven modules in the series, their signal ranges, and the Q-Cards they replace.

Table 2-5. WAO37 Series Analog Output Modules

Module	Signal Range	Q-Cards
WAO37A	0 to 20.48 mA	QAO-G01
WAO37B	0 to 10.24 V dc	QAO-G02
WAO37C	–10.24 to +10.24 V dc	QAO-G03
WAO37D	0 to 5.12 V dc	QAO-G04
WAO37E	–5.12 to +5.12 V dc	QAO-G05
WAO37F	–10.24 to +10.24 V dc	QAO-G06
WAO37G	0 to 20.48 mA	QAO-G07

WAO37 Series cards execute an analog I/O application program, which provides these options:

- Conversion Time
- Fail-Safe Configuration (hold current value or assert fallback value)
- Analog Output Fail-Safe Fallback Data, on a per channel basis.

Analog Input and Output

WLJ04 Series

The WLJ04 Series includes three combination analog I/O modules, each of which features three individually isolated analog input channels, one isolated analog output channel, and an analog output readback channel to provide the user with the capability to validate the desired input. The modules provide direct replacement for QLJ Series Q-Cards.

Table 2-6 lists the modules in the series, their signal ranges and the Q-Cards they replace.

Table 2-6. WLJ04 Series Analog Input and Output Modules

Module	Input	Output Signal and Readback	Q-Card
WLJ04A	0 to 10.24 V dc	0 to 10.24 V dc	QLJ-G01
WLJ04B	0 to 5.12 V dc	0 to 10.24 V dc	QLJ-G02
WLJ04C	0 to 20.48 mA	0 to 20.48 mA	QLJ-G03

The modules perform the signal conversion required to interface the electrical input/output signals from the field sensors to the optionally redundant Fieldbus. WLJ04C executes the analog I/O application program with following configurable options:

- Conversion time
- Fail-safe configuration (hold current value or assert fallback value)
- Analog output fail-safe fallback data.

For high accuracy, the module incorporates Sigma-Delta data conversion on a per channel basis, which provides new analog input readings every 25 ms, and a configurable moving average filter to remove any process noise and power line frequencies.

Digital Input

WCI07A

The WCI07A is a 16-channel contact sensor input interface module that can be used to replace any of the following Q-Card modules: QCI-G01, QCI-G02, QSE-G01, and QSE-G02.

Each channel accepts a 2-wire input from a pair of contacts or solid state switches. The 16 single-ended contact sensor inputs share a common 48 V dc on-board power supply and a common return line.

Each discrete input is optically isolated from logic ground.

The module performs signal conversion required to interface electrical input signals from field sensors to the optionally redundant Fieldbus, and executes discrete input, ladder logic, pulse count inputs or sequence of events monitor programs, all with configurable options of input filter time and fail-safe configuration.

Two banks of eight LEDs on the front of the module provide visual indication of the discrete states of the individual input points.

WDI07 Series

The WDI07 Series modules include five 16-channel contact sensor input interface modules used to replace QDI Series modules.

The modules are listed in Table 2-7 with the model numbers of the Q-Cards they replace.

Table 2-7. WID07 Series Modules

Module	Signal Format	Q-Cards
WDI07A	5 V dc	QDI-G01
WDI07B	24 V ac/dc	QDI-G03
WDI07C	48 V ac/dc	QDI-G05
WDI07D	120 V ac/dc	QDI-G07
WDI07E	12 V dc, logic oriented	QDI-G08, QDI-G09

Each channel accepts an externally sourced 2-wire input from a pair of contacts or solid state switches. Each discrete input is optically isolated from logic ground and shares a common return line.

The module performs signal conversion required to interface electrical input signals from field sensors to the Fieldbus, and executes a discrete input or ladder logic program, with configurable options of input filter time and fail-safe configuration.

Two banks of eight LEDs on the front of the module provide visual indication of the discrete states of the individual input points.

WID07 Series

The WID07 Series includes 16 channel-isolated contact sensor input interface modules that function as 8- or 16-channel contact sensors. Each channel accepts an externally sourced 2-wire input from a pair of contacts or solid state switches. The series modules are listed in Table 2-8 with the model numbers of the Q-Cards they replace.

Table 2-8. WID07 Series Modules

Module	Channels	Signal Format	Q-Cards
WID07A	16	5 V dc	QID-G01, QBI-G01
WID07B	8	24 V ac/dc	QID-G02, QDI-G02
WID07C	16	24 V ac/dc	QID-G03, QBI-G04, QBI-G10
WID07D	8	48 V ac/dc	QID-G04, QBI-G04
WID07E	16	48 V ac/dc	QID-G05, QBI-G05, QBI-G06
WID07F	8	120 V ac/dc	QID-G06, QBI-G06
WID07G	16	120 V ac/dc	QID-G07, QBI-G07, QBI-G08
WID07H	16	12 V dc, logic oriented	QID-G08, QBI-G02
WID07I	16	12 V ac/dc	QID-G09, QBI-G03, QBI-G09
WID07J	16	48 V dc pulse	QID-G10, QDI-G10
WID07K	8	120 V ac, high threshold	QID-G11, QDI-G11

Table 2-8. WID07 Series Modules (Continued)

Module	Channels	Signal Format	Q-Cards
WID07L	16	120 V ac, high threshold	QID-G12, QBI-G11
WID07M	8	220 V ac	QID-G13
WID07N	16	220 V ac	QID-G14
WID07O	8	220 V dc	QID-G15
WID07P	16	220 V dc	QID-G16

The 16-channel module inputs are single-ended points that share a common return line. The eight-channel modules provide two-wire differential points.

Each discrete input is optically isolated from logic ground. The module performs the signal conversion required to interface electrical input signals from field sensors to the Fieldbus. It executes a discrete input or ladder logic program, with configurable options of input filter time and a fail-safe configuration.

One or two banks of eight LEDs on the front of the module provide visual indication of the discrete states of the individual input points.

WPA06A

The WPA06A is a pulse accumulator module featuring four configurable input channels. The module, which is a direct replacement for the QPA-G04, interfaces with vortex and turbine meters, solid-state and electromechanical contacts, and other sensors with similar output. The maximum pulse input rate is 25 kHz.

The module performs signal conversion required to interface electrical input signals from field sensors to the Fieldbus, and executes a pulse input application program. The module can be configured to perform pulse rate totalization and resolution on a per module basis, while meter scaling can be configured per channel.

Digital Output

WBO09 Series

The WBO09 Series includes two module types designed to replace various QBO Series Q-Cards:

- The WBO09A interface module contains 16 externally sourced discrete 60 V dc output channels. The WBO09A can be used to replace either the QBO-G01 or QBO-G02.
- The WBO09B interface module contains 16 externally sourced discrete 20 V dc output channels. The WBO09B can be used to replace the QBO-G03, QBO-G04, or QBO-G05.

Each output is fully isolated from other channels and ground. The module interfaces electrical output signals from a control processor to the field devices. It executes a digital I/O application program that provides a fail-safe configuration option.

The WBO09 Series includes an output flash option. Two banks of eight LEDs on the front of the module provide visual indication of the discrete states of the individual output points. A package of four rocker switches is used to select the rate and duty cycle at which the output and corresponding LEDs on the front of the card will flash. The switch settings are the same as the original Westinghouse QBO cards. See "WBO09 Series Options" on page 87 and Figure 4-16.

WRO09 Series

The WRO09 Series includes four channel-isolated relay output interface modules, each featuring eight externally sourced discrete output channels. The modules replace the QRO Series Q-Cards.

Table 2-9 lists the modules in the series, their operation, and the Q-Cards they replace.

Table 2-9. WRO09 Series Relay Output Modules

Module	Operation	Q-Cards
WRO09A	Switches inductive loads with mercury-wetted relay output devices.	QRO-G01 QRO-G02
WRO09B	Switches non-inductive resistive loads with mercury-wetted relay output devices.	QRO-G03 QRO-G04
WRO09C	Switches inductive loads, normally opened only, with solid-state relay output devices.	QRO-G01
WRO09D	Switches non-inductive resistive loads, normally opened only, with solid-state relay output devices.	QRO-G03

The WRO09A and WRO09B use mercury-wetted relay output devices. Output channels on these cards are jumper-selectable for normally opened or normally closed operation. See "WRO09 Series Options" on page 89.

The WRO09C and the WRO09D use solid state relay output devices. These devices are always normally opened.

WTO09

The WTO09 is a channel-isolated TRIAC output interface module that contains eight externally sourced discrete output channels. This DCS Fieldbus Module replaces QTO-G01.

Each output is fully isolated from other channels and ground. The module interfaces electrical output signals from a control processor to the field devices. It executes a digital I/O application program, which provides a fail-safe configuration option. Eight LEDs on the front of the module provide visual indication of the discrete states of the individual output points.

WDPF System Migration Kits/Components

DCS Fieldbus Modules for WDPF Migration Kit

Table 2-10 lists the DCS Fieldbus Modules for WDPF migration along with options for DCS Fieldbus Modules and Local Fieldbus cables. The WDPF cabinet, Q-Crates, field terminations, and power supplies are reused, and all I/O wiring remains connected to the field termination assemblies.

Table 2-10. DCS Fieldbus Modules and Cables for WPDF Migration

Foxboro Part Number	Description	Quantity	Physically Replaces
Optional Units			
P0918JF	WFBE Fieldbus Extender Module	1 per Q-Crate	QBE-G01 QBE-G02
P0918JP	WAH01A: Analog Input, –10.24 to +10.24 V dc	1 per Q-Card	QAH-G01
P0918JR	WAH01B: Analog Input, –5.12 to +5.12 V dc	1 per Q-Card	QAH-G02
P0918JT	WAH01C: Analog Input, 0 to 10.24 V dc	1 per Q-Card	QAH-G03
P0918JV	WAH01D: Analog Input, 0 to 5.12 V dc	1 per Q-Card	QAH-G04
P0918KE	WAI01A: Analog Input, –512 to +512 mV dc	1 per Q-Card	QAI-G04
P0918KG	WAI01B: Analog Input, –1.02 to +1.02 V dc	1 per Q-Card	QAI-G05
P0918KJ	WAI01C: Analog Input, –10.24 to +10.24 V dc	1 per Q-Card	QAI-G06
P0918KM	WAI01D: Analog Input, 0 to +20.48 mA	1 per Q-Card	QAI-G07
P0918JY	WAI02A: Analog Input, –10.5 to +71.42 mV dc	1 per Q-Card	QAI-G01 QAI-G02 QAI-G03 QAI-G08
P0918KX	WAO37A: Analog Output, 0 to +20.48 mA, Internal Power	1 per Q-Card	QAO-G01
P0918LA	WAO37B: Analog Output, 0 to +10.24 V dc	1 per Q-Card	QAO-G02
P0918LC	WAO37C: Analog Output, –10.24 to +10.24 V dc	1 per Q-Card	QAO-G03
P0918LE	WAO37D: Analog Output, 0 to +5.12 V dc	1 per Q-Card	QAO-G04
P0918LG	WAO37E: Analog Output, –5.12 to +5.12 V dc	1 per Q-Card	QAO-G05
P0918LJ	WAO37F: Analog Output, –10.24 to +10.24 V dc, External Power	1 per Q-Card	QAO-G06 QAO-G08
P0918LL	WAO37G: Analog Output, 0 to +20.48 mA	1 per Q-Card	QAO-G07
P0918LP	WAV02A: Analog Input, –10.5 to 71.42 mV	1 per Q-Card	QAV-G01 through QAV-G09
P0918LW	WAW01A: Analog Input, 0 to +1.02 V dc	1 per Q-Card	QAW-G01
P0918LY	WAW01B: Analog Input, 0 to +5.12 V dc	1 per Q-Card	QAW-G02
P0918MA	WAW01C: Analog Input, 0 to 10.24 V dc	1 per Q-Card	QAW-G03
P0918MD	WAW01D: Analog Input, 0 to +20.48 mA	1 per Q-Card	QAW-G04
P0918MF	WAW01E: Analog Input, 0 to +20.48 mA, jumper-selectable self-powered	1 per Q-Card	QAW-G05
P0918MH	WAW01F: Analog Input, 0 to +51.2 mA	1 per Q-Card	QAW-G06
P0918MT	WAX01A: Analog Input, 0 to +1.02 V dc	1 per Q-Card	QAX-G04

Table 2-10. DCS Fieldbus Modules and Cables for WPDF Migration (Continued)

Foxboro Part Number	Description	Quantity	Physically Replaces
P0918MV	WAX01B: Analog Input, 0 to +5.12 V dc	1 per Q-Card	QAX-G05
P0918MX	WAX01C: Analog Input, 0 to +10.24 V dc	1 per Q-Card	QAX-G06
P0918ML	WAX02A: Analog Input, preset to read thermocouple inputs, –10.5 to 71.2 mV	1 per Q-Card	QAX-G01 QAX-G02 QAX-G03
P0918PQ	WBO09A: Digital Output, 60 V dc	1 per Q-Card	QBO-G01 QBO-G02
P0918HZ	WBO09B: Digital Output, 20 V dc	1 per Q-Card	QBO-G03 QBO-G04 QBO-G05
P0918PT	WCI07A: Contact Input, Internal 48 V dc, Short-circuit Current 2.5 mA	1 per Q-Card	QCI-G01 QCI-G02 QSE-G01 QSE-G02
P0918PZ	WDI07A: Digital Input, 5 V dc	1 per Q-Card	QDI-G01
P0918QC	WDI07B: Digital Input, 24 V ac/dc	1 per Q-Card	QDI-G03
P0918QE	WDI07C: Digital Input, 48 V ac/dc	1 per Q-Card	QDI-G05
P0918QH	WDI07D: Digital Input, 120 V ac/dc	1 per Q-Card	QDI-G07
P0918QK	WDI07E: Digital Input, 12 V dc	1 per Q-Card	QDI-G08 QDI-G09
P0918NA	WID07A: Digital Input, 5 V dc, 16 pts.	1 per Q-Card	QID-G01 QBI-G01
P0918ND	WID07B: Digital Input, 24 V ac/dc, 8 pts.	1 per Q-Card	QID-G02 QDI-G02
P0918NG	WID07C: Digital Input, 24 V ac/dc, 16 pts.	1 per Q-Card	QID-G03 QBI-G04 QBI-G10
P0918NJ	WID07D: Digital Input, 48 V ac/dc, 8 pts.	1 per Q-Card	QID-G04 QDI-G04
P0918NL	WID07E: Digital Input, 48 V ac/dc, 16 pts.	1 per Q-Card	QID-G05 QBI-G05 QBI-G06
P0918NN	WID07F: Digital Input, 120 V ac/dc, 8 pts.	1 per Q-Card	QID-G06 QDI-G06
P0918NQ	WID07G: Digital Input, 120 V ac/dc, 16 pts.	1 per Q-Card	QID-G07 QBI-G07 QBI-G08
P0918NS	WID07H: Digital Input, 12 V dc, 16 pts., logic-oriented	1 per Q-Card	QID-G08 QBI-G02

Table 2-10. DCS Fieldbus Modules and Cables for WPDF Migration (Continued)

Foxboro Part Number	Description	Quantity	Physically Replaces
P0918NU	WID07I: Digital Input 12 V dc, 16 pts.	1 per Q-Card	QID-G09 QBI-G03 QBI-G09
P0918NX	WID07J: Digital Input, 48 V dc, 16 pts., pulse inputs	1 per Q-Card	QID-G10 QDI-G10
P0918NZ	WID07K: Digital Input, 120 V ac, 8 pts., high-threshold	1 per Q-Card	QID-G11 QDI-G11
P0918PB	WID07L: Digital Input, 120 V ac, 16 pts., high-threshold	1 per Q-Card	QBI-G11 QID-G12
P0918PE	WID07M: Digital Input, 220 V ac, 8 pts.	1 per Q-Card	QID-G13
P0918PH	WID07N: Digital Input, 220 V ac, 16 pts.	1 per Q-Card	QID-G14
P0918PK	WID07O: Digital Input, 220 V dc, 8 pts.	1 per Q-Card	QID-G15
P0918PM	WID07P: Digital Input, 220 V dc, 16 pts	1 per Q-Card	QID-G16
P0918SQ	WLJ04A: Analog Input, 0 to 10.24 V dc, and Analog Output and Readback, 0 to 10.24 V dc	1 per Q-Card	QLJ-G01
P0918SS	WLJ04B: Analog Input, 0 to 5.12 V dc, and Analog Output and Readback, 0 to 10.24 V dc	1 per Q-Card	QLJ-G02
P0918SU	WLJ04C: Analog Input, 0 to 20.48 mA, and Analog Output and Readback, 0 to 20.48 mA	1 per Q-Card	QLJ-G03
P0918SX	WPA06A: Pulse Input, 48 V dc	1 per Q-Card	QPA-G04
P0918TG	WRF03A: RTD Input, 0-640 ohm	1 per Q-Card	QRF-G01 QRF-G03
P0918TK	WRF03B: RTD Input, 0-320 ohm	1 per Q-Card	QRF-G02 QRF-G04
P0918TN	WRO09A: Relay Output, 330 V dc/250 V ac, switches inductive loads	1 per Q-Card	QRO-G01 QRO-G02
P0918RK	WRO09B: Relay Output, 330 V dc/250 V ac, non-inductive resistive loads	1 per Q-Card	QRO-G03 QRO-G04
P0922BQ	WRO09C: Solid-State Switch Output, 330 V dc/250 V ac, inductive loads	1 per Q-Card	QRO-G01
P0922DR	WRO09D: Solid-State Switch Output, 330 V dc/250 V ac, non-inductive loads	1 per Q-Card	QRO-G03
P0918TR	WRT03A: RTD Input Amplifier, 0-30 ohm	1 per Q-Card	QRT-G01
P0918TT	WRT03B: RTD Input Amplifier, 0-320 ohm	1 per Q-Card	QRT-G02
P0918UH	WTO09: Voltage Switching, 115 V ac (80 to 140 V ac)	1 per Q-Card	QTO-G01
Local Fieldbus Cables			
P0916MZ	Cable, shielded twisted pair, 1 m (3.3 ft)	As required	

Table 2-10. DCS Fieldbus Modules and Cables for WPDF Migration (Continued)

Foxboro Part Number	Description	Quantity	Physically Replaces
P0916NC	Cable, shielded twisted pair, 3 m (9.9 ft)	As required	
P0916NB	Cable, shielded twisted pair, 5 m (16.5 ft)	As required	

Control Processor 60 Migration Kit

Table 2-11 lists the components comprising the CP60 WDPF Migration Kit along with options for WFCMs. The WDPF cabinet, Q-Crates, field terminations, and power supplies are reused, and all I/O wiring remains connected to the field termination assemblies.

Table 2-11. Control Processor 60 DCS Fieldbus Module Migration Kit (P0918XR)

Foxboro Part Number	Description	Quantity	Physically Replaces
P0903AN	Migration Kit Label	1	N/A
P0918XX	Mounting Bracket, 6-inch deep	1	
X0127DF	Screw, 0.190 x 0.5	4	
X0143SC	Lockwasher	4	
X0173NC	Nut clip	4	
X0143AX	Flat washer, 0.250	4	
X0143QY	Lockwasher, 0.250	4	
X0173NB	Screw, M6 x 15mm	4	
P0918QZ	DCS FCM, Baseplate	1	CPU Nest
P0918EU	General Information Label (“I/A Plugged In”)	2	
P0922AV	Power Cable, Baseplate	2	
Optional Units			
P0918JC	WFCM10E Fieldbus Communication Module	0, 1, 2, or 4	
P0918VC	WFCM10Ef Fieldbus Communication Module	0, 1, 2, or 4	
P0914ZM	Horizontal FCM Identification Assembly	1 per FCM	

Field Control Processor 280 Migration Components

Table 2-12 lists the components comprising the FCP280 WDPF Migration. The WDPF cabinet, Q-Crates, field terminations, and power supplies are reused, and all I/O wiring remains connected to the field termination assemblies.

Table 2-12. Field Control Processor 280 DCS Fieldbus Module Migration Parts

Foxboro Part Number	Description	Quantity	Physically Replaces
P0903AN	Migration Label	1	N/A
P0930AS	Horizontal Baseplate Mounting Kit (see Table 2-15 for contents)	1 or more as required	
RH924YL	Two-position horizontal-mounted Modular Baseplate for the FCP280	1 or more as required	CPU Nest
P0918EU	General Information Label (“I/A Plugged In”)	2 or more as required	
Optional Units			
P0922YU	FPS400-24 Power Supply (120/240 V ac, 125 V dc Input). For Power cables, refer to *Standard and Compact 200 Series Subsystem User’s Guide* (B0400FA)	1 or 2 per Modular Baseplate	
P0922YC	FPS400-24 Power Supply (24 V dc Input). For Power cables, refer to *Standard and Compact 200 Series Subsystem User’s Guide* (B0400FA)	1 or 2 per Modular Baseplate	

Field Control Processor 270 Migration Components

Table 2-13 lists the components comprising the FCP270 WDPF Migration. The WDPF cabinet, Q-Crates, field terminations, and power supplies are reused, and all I/O wiring remains connected to the field termination assemblies.

Table 2-13. Field Control Processor 270 DCS Fieldbus Module Migration Parts

Foxboro Part Number	Description	Quantity	Physically Replaces
P0903AN	Migration Label	1	N/A
P0930AS	Horizontal Baseplate Mounting Kit (see Table 2-15 for contents)	1 or more as required	
P0926HC	[For FCP270 used without FEM100s] Two-position horizontal-mounted Modular Baseplate for the FCP270	1 or more as required	CPU Nest
P0973CN	[For FCP270 used with FEM100s] Four-position horizontal-mounted Modular Baseplate for 2 FCP270s and 2 FEM100s	1 or more as required	CPU Nest
P0926KW	Splitter/Terminator	1 or more as required	
P0918EU	General Information Label (“I/A Plugged In”)	2 or more as required	

Table 2-13. Field Control Processor 270 DCS Fieldbus Module Migration Parts (Continued)

Foxboro Part Number	Description	Quantity	Physically Replaces
Optional Units			
P0922YU	FPS400-24 Power Supply (120/240 V ac, 125 V dc Input). For Power cables, refer to *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA)	1 or 2 per Modular Baseplate	
P0922YC	FPS400-24 Power Supply (24 V dc Input). For Power cables, refer to *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA)	1 or 2 per Modular Baseplate	

Z-Module Control Processor 270 Migration Components

Table 2-14 lists the components comprising the Z-Module Control Processor 270 Migration. The WDPF cabinet, Q-Crates, field terminations, and power supplies are reused, and all I/O wiring remains connected to the field termination assemblies.

Table 2-14. Z-Module Control Processor 270 DCS Fieldbus Module Migration Parts

Foxboro Part Number	Description	Quantity	Physically Replaces
P0903AN	Migration Kit Label	1	N/A
P0972ZA	FCM100E Redundant Fieldbus Communications Module	1 or 2 for redundancy	N/A
P0926GS	FCM100Et Redundant Fieldbus Communications Module	1 or 2 for redundancy	N/A
P0926KE	Two-position horizontal baseplate for the FCM100Et/FCM100E	1 or more as required	CPU Nest
P0918EU	General Information Label ("I/A Plugged In")	2	
P0926KW	Splitter/Terminator	1 or more as required	
P0930AS	Horizontal Baseplate Mounting Kit (see Table 2-15 for contents)	1 or more as required	
Optional Units			
P0922YU	FPS400-24 Power Supply (120/240 V ac, 125 V dc Input). For Power cables, refer to *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA)	1 or 2 per Modular Baseplate	
P0922YC	FPS400-24 Power Supply (24 V dc Input). For Power cables, refer to *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA)	1 or 2 per Modular Baseplate	

Table 2-15. P0930AS Horizontal-Mounted Baseplate Mounting Kit Contents

Part No.	Description	Qty.
P0930AY	Mounting bracket (1-inch depth)	1
X0127DF	Screw, 0.190-32 x 0.5	4
X0143SC	Lock washer, 0.190	4
X0173NC	Nut clip	4
X0143AX	Flat washer, 0.250	4
X0143QY	Lock washer, 0.250	4
X0173NB	Screw, M6 x 15 mm (for P0972XA/XB baseplates)	4
X0167VC	Screw, self threading (for P0926HC/KE/HF/HJ/HM/HT, P0973CN or RH924YF/YL Modular Baseplates)	8

Cable Lengths

Control Processor 60 Ethernet Trunk Fieldbus, 10Base2

Refer to the document *Control Processor 60 and Control Processor 60S Installation and Maintenance* (B0400FB) for:

- Ethernet trunk Fieldbus, 10Base2 coaxial cabling only
- Fiber optic extension (between BNC to fiber-ST converters).

Field Control Processor 280, Field Control Processor 270 and Z-Module Control Processor 270

For cable lengths between these control processors and the control network, refer to the following documents:

- *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA)
- *Field Control Processor 280 (FCP280) User's Guide* (B0700FW)
- *Field Control Processor 270 (FCP270) User's Guide* (B0700AR)
- *Z-Module Control Processor 270 (ZCP270) User's Guide* (B0700AN)

Module Fieldbus

- Local Fieldbus, shielded twisted-pair segment between the baseplate and a WFBE Extender module or between two WFBE modules:

  5 meters (16.4 feet) maximum
- Overall local Fieldbus length, all shielded twisted-pair segments:

  15 meters (49.2 feet) maximum

3. Configuration

This chapter provides system definition and control configuration information.

In general, configuration means specifying to the Control Core Services software the types of hardware and software modules that comprise the newly added DCS Fieldbus Module subsystem and the control blocks to be used in conjunction with it. Prior to configuring the modules, you must develop loop drawings to determine the control scheme, and a detailed equipment plan that identifies all the equipment required to control the process.

System Definition

System Configuration (or System Definition) is the process of selecting and identifying the hardware and software for a particular Foxboro Evo system. It identifies the Foxboro Evo system components, system software required by each component, the system component letterbugs, and other system characteristics for correctly loading system software and identifying the system software objects. (The letterbug is an alphanumeric string that the user defines to identify a station in a Foxboro Evo control system.) It is initially performed prior to installation of the system equipment, and it is updated with any hardware/software system changes.

- For a step-by-step procedure for defining a Foxboro Evo system configuration using the System Definition (SysDef) software, refer to *System Definition: A Step-By-Step Procedure* (B0193WQ).
- IACC allows you to import system configuration information from a Foxboro Evo system using SysDef Export media created with a previous instance of the System Definition configuration application. For importing procedures, refer to *I/A Series System Configuration Component (IACC) User's Guide* (B0700FE).
- To use the Control Editors to define the system, refer to the "System Development" and "Security" manuals listed under "Foxboro Evo Documentation" in *Foxboro Evo Control Software Deployment Guide* (B0750BA). Refer to *Foxboro Evo Process Automation System Hardware Configuration User's Guide* (B0750BB) to define the Foxboro Evo system hardware.

System Definition is initially performed prior to installation of the system equipment, and it is updated with any hardware/software system changes. Reports produced by System Definition (SysDef) software define the system network and provide information that can be used in conjunction with equipment installation.

Letterbug Assignments

In the Foxboro Evo system, a module identifier can be any combination of six alphanumeric characters. You enter these characters, or letterbugs, during the System Definition, and attach physical letterbugs to the WFCM10E or WFCM10Ef modules as part of the equipment installation process (see "Installing the Letterbugs for the DCS Fieldbus Modules" on page 85).

The FCP280 letterbug is assigned through buttons on the FCP280's faceplate as described in "Setting the Letterbug" in *Field Control Processor 280 (FCP280) User's Guide* (B0700FW).

FCP270, ZCP270, FCM100Et and FCM100E letterbugs are assigned through the module's infrared communication port using the system Letterbug Configurator. For procedures to assign letterbugs to the FCP270 and ZCP270/FCM100Et/FCM100E, see the document *Letterbug Configurator User's Guide* (B0700AY).

⚠ WARNING

Make sure you assign the FCP270/ZCP270/FCM100Et/FCM100E letterbug before connecting the Ethernet fiber optic cables to the FCP270/ZCP270/FCM100Et/FCM100E. This avoids potential process control safety issues if a letterbug has previously been assigned to the module. Label space is provided on the front of the module to record the letterbug.

NOTE

Assignment of letterbugs for the host CP60s/FCP270s/ZCP270s and FCM100Ets/FCM100Es and other subsystems are made using System Definition prior to hardware installation. However, delay installation of the letterbugs for the WFCM10E or WFCM10Ef, FCM100Et/FCM100E, ZCP270, or FCP270 and the DCS Fieldbus Modules until the subsystem is installed.

Each DCS Fieldbus Module letterbug consists of the first four characters of the host FCP270/FCM100Et/FCM100E or WFCM module identifier plus two characters that are unique among all the modules connected to the host FCP270/ZCP270/CP60. Follow these rules when assigning letterbugs:

- Determine the first four characters of the letterbug for the group. These characters must be unique to the subsystem among all devices hosted by the CP60/FCP270/ZCP270.
- Add 00 (two zeroes) after the first four characters to create the letterbug for the WFCMs or FCM100Ets/FCM100Es. If the subsystem has a redundant pair of WFCMs or FCM100Ets/FCM100Es, the letterbug applies to both modules.
- Complete the DCS Fieldbus Module letterbug by adding two characters other than 00 after the common first four characters. The resulting letterbugs must be unique within the subsystem.

When the control station is an FCP270, follow these rules for assigning letterbugs:

- Determine the module identifier of the FCP270. The first four characters of this name must be used for all modules attached to the FCP270.
- Complete each DCS Fieldbus Module letterbug by adding two characters (other than the fifth and sixth characters of the FCP270 letterbug) after the common first four characters. The resulting letterbugs must be unique within the subsystem.

When the control station is an FCP270 using FEM100 modules, follow these rules (in addition to the two above) to assign letterbugs:

- Cards connected to FEM100 expander port 1 must use only 0 - 3 and G - Z in the fifth position.
- Cards connected to FEM100 expander port 2 must use only 4 - 7 and G - Z in the fifth position.
- Cards connected to FEM100 expander port 3 must use only 8 - 9, A - B and G - Z in the fifth position.
- Cards connected to FEM100 expander port 4 must use only C - Z in the fifth position.
- Cards connected to FEM100 expander ports may use any character in the sixth position without restriction.

When the control station is a ZCP270, follow these rules for assigning letterbugs:

- Determine the first four characters of the letterbug for the group. These characters must be unique to the subsystem among all devices hosted by the ZCP270.
- Add **00** (two zeroes) after the first four characters to create the letterbug for the FCM100Et/FCM100E. If the subsystem has a redundant pair of FCMs, the letterbug applies to both modules.
- Complete each DCS Fieldbus Module letterbug by adding two characters other than 00 after the common first four characters. The resulting letterbugs must be unique within the subsystem.

You can assign the letterbugs to the DCS Fieldbus Modules in an order that makes it easy to identify the modules by Q-Crate and slot or relate them to the cards they replace.

The WAX01 Series modules and the WAX02A have two sets of six individually isolated analog input channels. Each set is represented by a separate letterbug installed on the module and a separate ECB in the Foxboro Evo control database. Installation of letterbugs on these modules is described in “WAX01 Series and WAX02A Letterbugs” on page 87.

Integrated Control Configuration

There are three utilities for configuring control databases for the Foxboro Evo system:

- I/A Series Configuration Component (IACC) allows you to configure control databases and import system configuration information from a Foxboro Evo system using Commit media created with the System Definition configuration application. Refer to *I/A Series Configuration Component (IACC) User's Guide* (B0700FE).
- Integrated Control Configurator, a standard control configuration tool included with Control Core Services software. Refer to the *Integrated Control Configurator* (B0193AV) document.

- The Control Editors also allow you to configure control databases and import system configuration information from a Foxboro Evo system using Commit media created with SyDef, IACC or the Control Editors. Refer to the "System Development" and "Security" manuals listed under "Foxboro Evo Documentation" in *Foxboro Evo Control Software Deployment Guide* (B0750BA). Refer to *Block Configurator User's Guide* (B0750AH) and *Foxboro Evo Process Automation System Hardware Configuration User's Guide* (B0750BB) to configure the Foxboro Evo system hardware.

These utilities allow you to create and modify Foxboro Evo control schemes. IACC software can be used to configure control schemes prior to installation of the actual equipment. IACC software operates on Control Core Services workstations running Windows XP® operating system and an off-platform Windows XP workstations. Their generated database is easily loaded into the CP60/FCP270/ZCP270 once the Foxboro Evo system is installed. When IACC operates on workstations running Windows 7 or Windows Server 2008 R2 Standard operating systems, the generated database can be loaded into an FCP280 once the Foxboro Evo system is installed.

The software interface between the control logic and the process is provided by equipment control blocks (ECBs) specific to the FBMs, and control blocks used throughout the Foxboro Evo system. Actual control of the process is performed by compounds, consisting of control blocks, which you configure. The Foxboro Evo system offers a wide range of control blocks, providing solutions for a broad spectrum of process control applications. Refer to *Integrated Control Block Descriptions* (B0193AX) for details on the selection and use of control blocks.

Figure 3-1 shows a typical application of control blocks using I/O from three different DCS Fieldbus Modules. The Control Core Services software sees these devices as their equivalent FBMs:

- The WAW01E analog input DCS Fieldbus Module as an FBM201
- The WAO37A analog output module as an FBM237
- The WBO09A digital output module as an FBM242.

The control scheme receives two of the inputs from the WAW01E, a setpoint and a process measurement. These two measurements are maintained in separate Analog Input (AIN) blocks, where they are accessed by a Proportional Integral and Derivative (PID) block. The PID compares these values and determines a new valve setting, which it outputs to the process via an Analog Output (AOUT) block to the WAO37A. The PID also outputs alarm information to an ALM block. The ALM switches high and low alarm status using discrete outputs to WBO09A via two Contact Output (COUT) blocks.

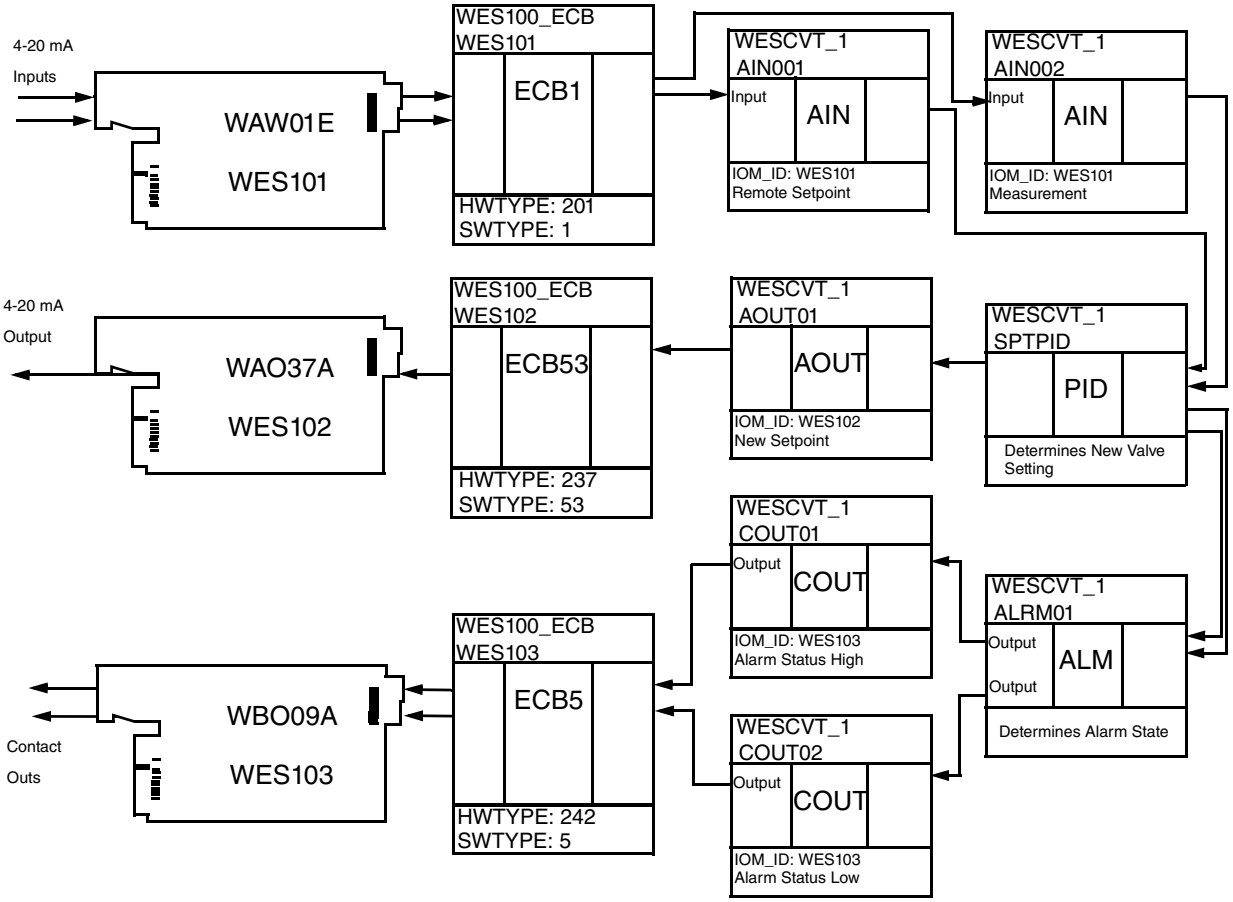


Figure 3-1. Control Scheme Using a DCS Fieldbus Module Subsystem

NOTE

Refer to *Integrated Control Configurator* (B0193AV), *Integrated Control Block Descriptions* (B0193AX) and *I/A Series Configuration Component (IACC) User's Guide* (B0700FE) for more comprehensive information regarding integrated control configuration.

The ICC, which is accessed through the process engineer's environment at a Control Core Services workstation, and the IACC allow you to configure control blocks relating to the DCS Fieldbus Module subsystem. The general procedure is to create a compound name under which the blocks are created and run, and then create and integrate the desired control blocks.

Using Control Editors, IACC, or ICC, you create an equipment control block (ECB) for each FBM in the DCS Fieldbus Module subsystem. The ECB serves as a holding place for the device's software data. You then configure the necessary control blocks and compounds for the desired control scheme.

Control Editors, ICC, and IACC let you modify configuration data for on-line stations, such as the CP60/FCP270/ZCP270/FCP280, or for off-line library volumes. A library volume is a dummy configuration that may be loaded into the CP60/FCP270/ZCP270/FCP280 when creation and editing are completed. As compound/block editors, the IACC software and the ICC provide compound or block building templates along with a full range of editing functions.

The following sections describe two approaches for configuring the DCS Fieldbus Module subsystem:

- On-line control configuration using the ICC, as described on page 45. Here the Foxboro Evo system generates ECBs using default parameters and to edit the configuration using the ICC.
- Off-line control configuration using IACC. Refer to *I/A Series Configuration Component (IACC) User's Guide* (B0700FE) to generate ECBs using default parameters and to edit the configuration using the IACC.

NOTE

For the Control Editors, refer to the "System Development" and "Security" manuals listed under "Foxboro Evo Documentation" in *Foxboro Evo Control Software Deployment Guide* (B0750BA).

Refer to Table 3-1 for the equivalent FBMs you configure to represent the DCS Fieldbus Modules. The table also includes the valid ECBs for each FBM and the corresponding software type (SWTYPE) parameters, the hardware type (HWTYPE) parameter, and the range of points used with the DCS Fieldbus Modules.

For those FBMs that have multiple valid ECBs, select the ECB based on application of the DCS Fieldbus Module:

- ECB5 for Digital Input/Output
- ECB6 for Sequence of Events
- ECB7 for Pulse Counters
- ECB8 for Ladder Logic.

Table 3-1. DCS Fieldbus Modules and Equivalent FBM200 Modules

DCS Fieldbus Module	Equivalent FBM	HWTYPE Parameter	I/O	Valid ECBs	SWTYPE Parameter	Valid Points
WAH01A through WAH01D	FBM211	211	8 Analog Inputs	ECB1	1	1 to 8
WAI01A through WAI01D	FBM201	201	4 Analog Inputs	ECB1	1	1 to 4
WAI02A	FBM202	202	4 TC Inputs	ECB1	1	1 to 4
WAO37A through WAO37G	FBM237	237	4 Analog Outputs	ECB53	53	1 to 4

Table 3-1. DCS Fieldbus Modules and Equivalent FBM200 Modules (Continued)

DCS Fieldbus Module	Equivalent FBM	HWTYPE Parameter	I/O	Valid ECBs	SWTYPE Parameter	Valid Points
WAV02A	FBM202	202	6 TC Inputs	ECB1	1	1 to 6
			On-board RTD			9
WAW01A through WAW01F	FBM201	201	6 Analog Inputs	ECB1	1	1 to 6
WAX01A through WAX01C	Two FBM201s	201	12 Analog Inputs	Two ECB1s	1	1 to 6 in each ECB
WAX02A (TC)	Two FBM202s	202	11 TC Inputs	Two ECB1s	1	1 to 6 first ECB 1 to 5 second ECB
			QAXT temperature sensor			12 in the second ECB
WAX02A (MV)	Two FBM202s	202	12 MV Inputs	Two ECB1s	1	1 to 6 in each ECB
WBO09A WBO09B	FBM242	242	16 Digital Outputs	ECB5 ECB8	5 8	1 to 16
WCI07A	FBM207c	207	16 Digital Inputs	ECB5 ECB6 ECB7 ECB8	5 6 7 8	1 to 16
WDI07A through WDI07E	FBM207	207	16 Digital Inputs	ECB5 ECB6 ECB7 ECB8	5 6 7 8	1 to 16
WID07A WID07C WID07E WID07G WID07H WID07I WID07J WID07L WID07N WID07P	FBM207	207	16 Digital Inputs	ECB5 ECB6 ECB7 ECB8	5 6 7 8	1 to 16

Table 3-1. DCS Fieldbus Modules and Equivalent FBM200 Modules (Continued)

DCS Fieldbus Module	Equivalent FBM	HWTYPE Parameter	I/O	Valid ECBs	SWTYPE Parameter	Valid Points
WID07B WID07D WID07F WID07K WID07M WID07O	FBM207	207	8 Digital Inputs	ECB5 ECB6 ECB7 ECB8	5 6 7 8	1 to 8
WLJ04A through WLJ04C	FBM204	204	3 Analog Inputs	ECB2	2	1 to 3
			Output Readback			4
			1 Analog Output			5
WPA06A	FBM206	206	4 Pulse Inputs	ECB4	4	1 to 4
WRF03A WRF03B	FBM203	203	6 Analog Inputs (4-wire RTD)	ECB1	1	1 to 6
WRO09A through WRO09D	FBM242	242	8 Digital Outputs	ECB5 ECB8	5 8	1 to 8
WRT03A WRT03B	FBM203	203	4 Analog Inputs (3-wire RTD)	ECB1	1	1 to 4
WTO09	FBM242	242	8 Digital Outputs	ECB5 ECB8	5 8	1 to 8

For a list of the control blocks may be used in conjunction with a control station, refer to:

- *Control Processor 60 and Control Processor 60S Installation and Maintenance (DM)* (B0400FB)
- *Field Control Processor 280 (FCP280) User's Guide* (B0700FW)
- *Field Control Processor (FCP270) User's Guide* (B0700AR)
- *Z-Module Control Processor (ZCP270) User's Guide* (B0700AN)

On-Line Control Configuration Using the ICC

To perform on-line integrated control configuration using the ICC, refer to *Integrated Control Configurator* (B0193AV) for details and proceed as follows:

1. Using the System Management displays at a Control Core Services workstation, boot up the CP60/FCP270/ZCP270/FCP280 to which the DCS Fieldbus Module subsystem is to be attached.

   This creates two compounds:

   - Station compound (*CPLBUG*`_STA`) containing the station block (*CPLBUG*`_STA:STATION`), where *CPLBUG* is the letterbug identifier of the CP60 automatically supplied by the station being configured.
   - ECB compound (CPLBUG`_ECB`) containing the primary ECB (*CPLBUG*`_ECB:PRIMARY_ECB`).

2. Open the ICC and access the control station in question.
3. Use the Control Configurator `Insert New Block/ECB` function to create an ECB for each WFCM or FCM100Et/FCM100E and DCS Fieldbus Module in the subsystem.
4. If required, edit the WFCM or FCM100Et/FCM100E and DCS Fieldbus Module ECBs if the default parameters provided are not satisfactory (see Figure 3-3 on page 46 for an example).

— NOTE

For ready reference, ECB parameter information appears in a “show window” along the right side of the ECB editing displays (Figure 3-2 and Figure 3-3). The show window is accessed by selecting `Show` in the menu bar, and then selecting `Legal FBM/ECB Combos`.

5. Referring to *Control Processor 270 (CP270) and Field Control Processor 280 (CP280) Integrated Control Software Concepts* (B0700AG), *Integrated Control Software Concepts* (B0193AW) (for CP60 or earlier), and *Integrated Control Block Descriptions* (B0193AX), configure the necessary compounds and blocks for the desired control scheme.

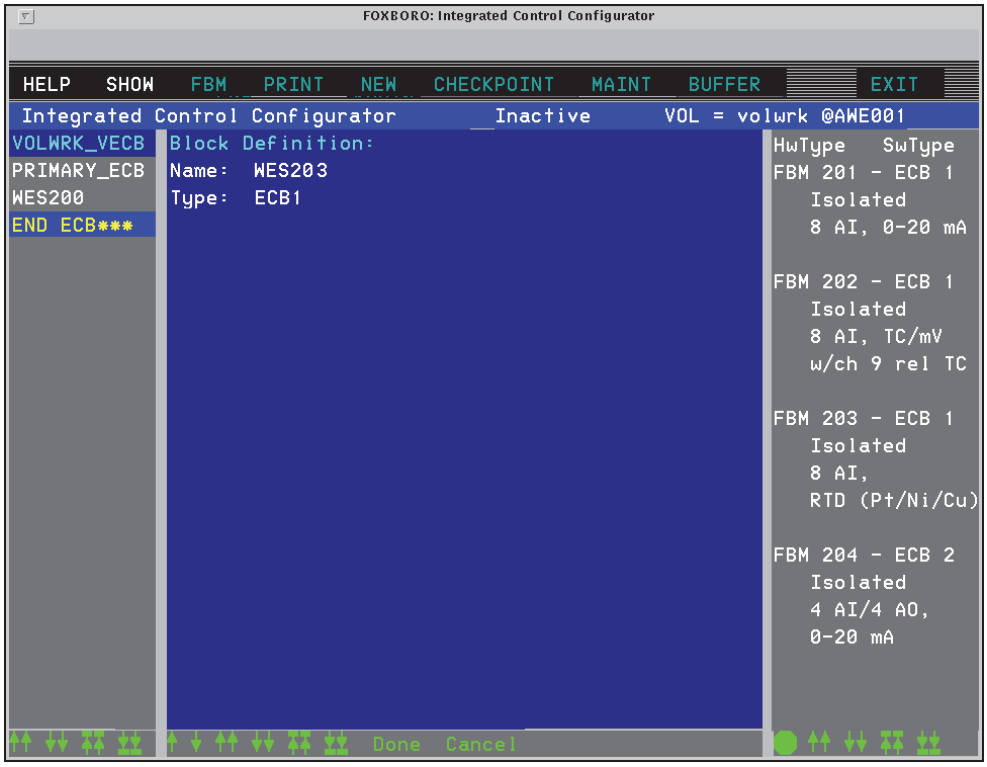


Figure 3-2. Creating an ECB1 to Support a WAW01B Analog Input Module

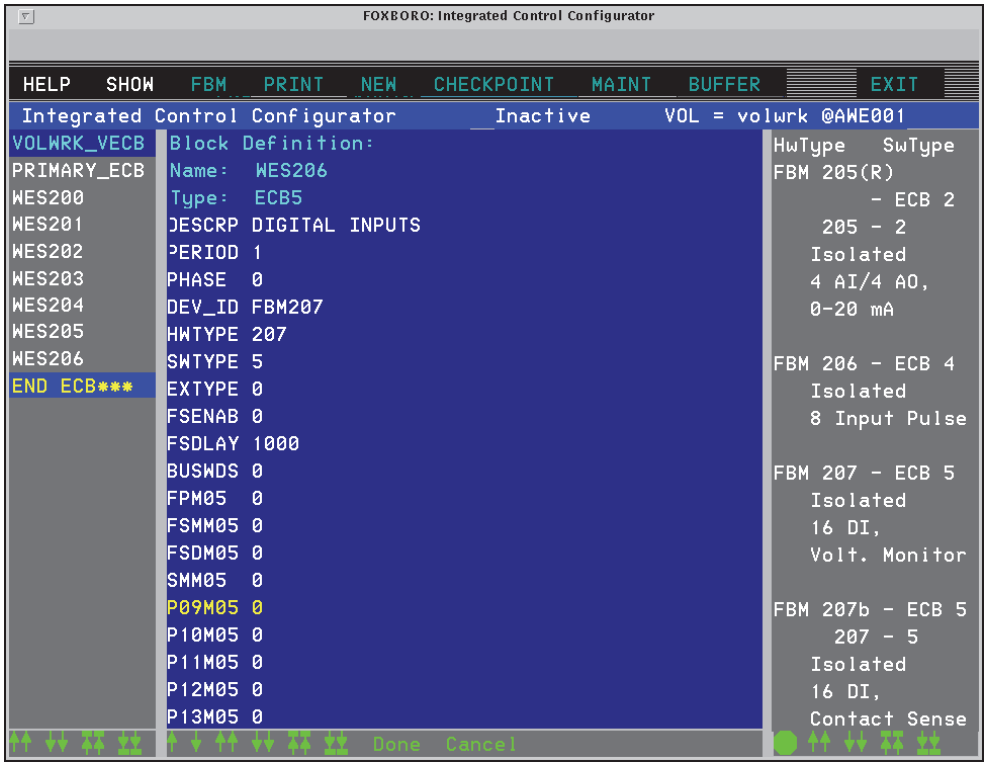


Figure 3-3. Editing an ECB5 to Support a WID07C Digital Input Module

Thermocouple Signal Range

The WAI02A, WAX02A and WAV02A DCS Fieldbus Modules provide analog input channels from a variety of thermocouple device types.

- WAI02A provides four analog input channels.
- WAX02A provides twelve analog input channels.
- WAV02A provides six analog input channels.

The full thermocouple signal range of each of these modules is –10.5 to 71.42 mV dc, representing 0 to 65535 raw counts. The default signal range in the ECB01 is –10.5 to 69.5 mV dc, representing 0 to 64000 raw counts, with input above 69.5 mV read as over-range.

Each input channel can be configured in the ECB to read –100 to +100 mV dc, representing 1600 to 64000 raw counts. The full millivolt range of the cards is –105.12 to +105.12 mV dc, representing 0 to 65535 raw counts. Input outside the ±100 mV range is read as out-of-range.

The use of thermocouple or millivolt range is determined by the value in the FSENAB parameter, an 8-bit mask in which the most significant bit determines the range for channel 1, the next most significant bit sets the range for channel 2, and so on. The last two bits are not used when the module is a WAX02A or a WAV02A. The last four bits are not used when the module is a WAI02A. The default setting is 00000000, setting all channels to –10.5 to 69.5 mV dc. A value of 1 (binary) instead of a 0 changes the channel to –100 to +100 mV dc. The full parameter is entered as a hexadecimal value.

WAX02A Example

Figure 3-4 and Table 3-2 on page 48 provide an example configuration for a WAV02A.

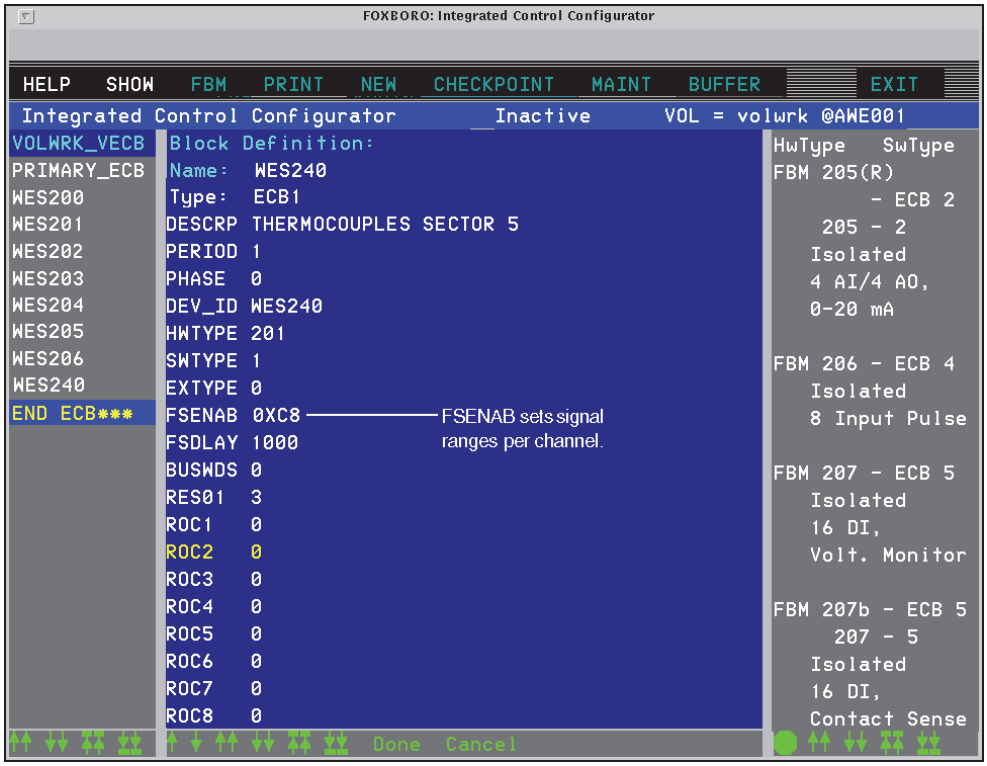


Figure 3-4. Configuring Thermocouple Signal Ranges on WAV02A

In Figure 3-4 on page 47, the FSENAB parameter has been modified so that channels 1, 2, and 5 read –100 to +100 mV dc (±100) and the other channels read the default thermocouple range (TC), as shown in Table 3-2.

Table 3-2. Example Thermocouple Range Setting

Bit	1	2	3	4	5	6	7	8
Channel	1	2	3	4	5	6	–	–
Binary	1	1	0	0	1	0	0	0
Range	±100	±100	TC	TC	±100	TC	not used	
Binary	C				8			
FSENAB	Enter: **0XC8**							

Table 3-3 shows the setting for the second ECB for a WAX02A. The 12th channel on the WAX02A is connected to a QAXT Terminal Block Sensor to provide a reference temperature for the thermocouples connected to channels 7 through 11 and for any thermocouples handled by the first ECB (connected to channels 1 through 6).

Table 3-3. Sample Configuration for the Second WAX02A ECB

Bit	1	2	3	4	5	6	7	8
Channel	7	8	9	10	11	12	–	–
Binary	0	0	0	0	0	1	0	0
Range	TC	TC	TC	TC	TC	±100	not used	
Binary	0				4			
FSENAB	Enter: **0X04**							

See “Configuring TC Temperature Compensation RTDs” on page 55 for additional information and Figure 3-8 on page 57 for additional software configuration information for the WAX02A.

Use of the QAXT Terminal Block Sensor requires a jumper change on the WAX02A module. See “WAX02A and QAXT Terminal Block Sensor” on page 91.

Fail-Safe Operation

Fail-safe parameters in the controlling ECBs specify the outputs of the associated DCS Fieldbus Module in the event of a break in communication with the CP. All fail-safe operations are initiated by the DCS Fieldbus Module.

Each time the DCS Fieldbus Module receives a write request, it resets a fail-safe timer for its ECB. The DCS Fieldbus Module asserts a fail-safe condition for the ECB if it does not receive another output command within a specified time. The fail-safe condition can be either:

- Hold current value – Holds the value sent in the most recent output command from the CP.
- Use fallback value – Uses a value specified for the output (specified in the ECB).

The ECBs for the DCS Fieldbus Modules include parameters for enabling and disabling fail-safe and for setting a fail-safe delay for the outputs. These parameters are downloaded to the DCS Fieldbus Module's database from the CP each time the subsystem is initialized or reconfigured, and each time you execute a download command from the System Management display. If fail-safe is enabled for a specific output, the DCS Fieldbus Module asserts fail-safe actions.

When normal operation resumes, the current output values are read by the CP and stored in the ECBs. These values in turn are used by the I/O blocks as the starting point for new output commands.

Fail-Safe Functionality

What the DCS Fieldbus Module does during various failed conditions is dependent upon the configuration of several fail-safe parameters, as well as the type of failure. Two basic types of DCS Fieldbus Module failures can occur:

- Conditions that cause the DCS Fieldbus Module to fail, such as OFF-LINE, DOWNLOAD, or EEPROM UPDATE
- Loss of communications (COMM FAIL).

In the description of fail-safe parameters below, *ee* is the ECB software type (4, 5, 8, or 53) and *c* is the channel number (1 through 8).

Fail-Safe for Type 1 Failures – DCS Fieldbus Module FAIL

Two parameters, fail-safe mask (FSMM*ee*) and fail-safe data (FS*c*D*ee*), determine what action the DCS Fieldbus Module takes when a Type 1 failure occurs. FSMM*ee*, configured for a particular output, determines what state is asserted at the output, Fallback Value or Hold Current Value. The default setting of the fail-safe mask parameter is zero to assert the fallback values. The mask can be set so that some outputs hold while others fall back. FS*c*D*ee*, also configured for a particular output, determines the fallback value. The default value for analog outputs is zero, and the default value for digital values is false.

— NOTE

The default for the ECB fallback value parameters (FS*c*D*ee*) is 0. For the bipolar analog outputs on the WAO37C, the 0 represents 0 volts or mid-point in the range, 32800 raw counts.

Fail-Safe for Type 2 Failures – COMM FAIL

In addition to the fail-safe mask and fail-safe data parameters, there are two other parameters, FSENAB and FSDLAY, that affect the DCS Fieldbus Module's response to communications failures. FSENAB determines whether the output simply holds (FSENAB = 0) its output value during the communications failure until the communications failure ceases, or if it delays fail-safe action (FSENAB = 1) for the time specified by FSDLAY, and then responds in the same way as Type 1 failures.

Fail-Safe Examples

These examples are fail-safe operations for an analog type I/O ECB with two outputs. The operation is performed for the first output point, which is point number 1. An AOUT block is used, and the output is driven at a value of 75% of full scale. The Fallback Value is configured to be 25% of full scale (FScDee = 16000). FSDLAY is set to 1000, which is equal to a delay time of 10 seconds.

Values shown for FSMM*ee* (0x10) are for channel 5 of a DCS Fieldbus Module equivalent to an FBM204 (software type 04). The value for a DCS Fieldbus Module equivalent to an FBM237 would be 0x01 for channel 1.

Example 1: FSENAB = 0 and FSMM*ee* = 0x00

a. Cause: Type 1 failure.
Result: Output immediately goes to 25%.

b. Cause: Type 2 failure.
Result: Output holds at 75%.

Example 2: FSENAB = 0 and FSMM*ee* = 0x10

a. Cause: Type 1 failure.
Result: Output holds at 75%.

b. Cause: Type 2 failure.
Result: Output holds at 75%.

Example 3: FSENAB = 1 and FSMM*ee* = 0x00

a. Cause: Type 1 failure.
Result: Output immediately goes to 25%.

b. Cause: Type 2 failure.
Result: Output holds at 75% for 10 seconds, then goes to 25%.

Example 4: FSENAB = 1 and FSMM*ee* = 0x10

a. Cause: Type 1 failure.
Result: Output holds at 75%.

b. Cause: Type 2 failure
Result: Output holds at 75% for 10 seconds, then continues to hold at 75%.

Configuring I/O Blocks

Process inputs from the DCS Fieldbus Modules are connected to various kinds of input blocks in the control database: Analog Input (AIN), Multiple Analog Input (MAIN), Contact Input (CIN), and Multiple Contact Input (MCIN). These blocks act as data stores and provide access to the process values for PIDs and similar control blocks in the database. New process settings determined by the control strategy are in turn routed to the DCS Fieldbus Modules via a similar set of outputs blocks: Analog Output (AOUT), Contact Output (COUT), and Multiple Contact Output (MCOUT).

The connection to the DCS Fieldbus Module is specified in the configuration of the I/O blocks by referencing the DCS Fieldbus Module letterbug, and in some instances a point number.

Figure 3-5 is an ICC editing display for an MCIN block that is connected to a WID07K (8-point digital input DCS Fieldbus Module). The module's letterbug, WES204, is specified in the IOM_ID parameter. The MCIN block provides data stores for all 8 inputs from WID07K. Other blocks in the control database can access these inputs by specifying the MCIN block name (F1M07A_MCIN) and the channel number (CIN_1 through CIN_8).

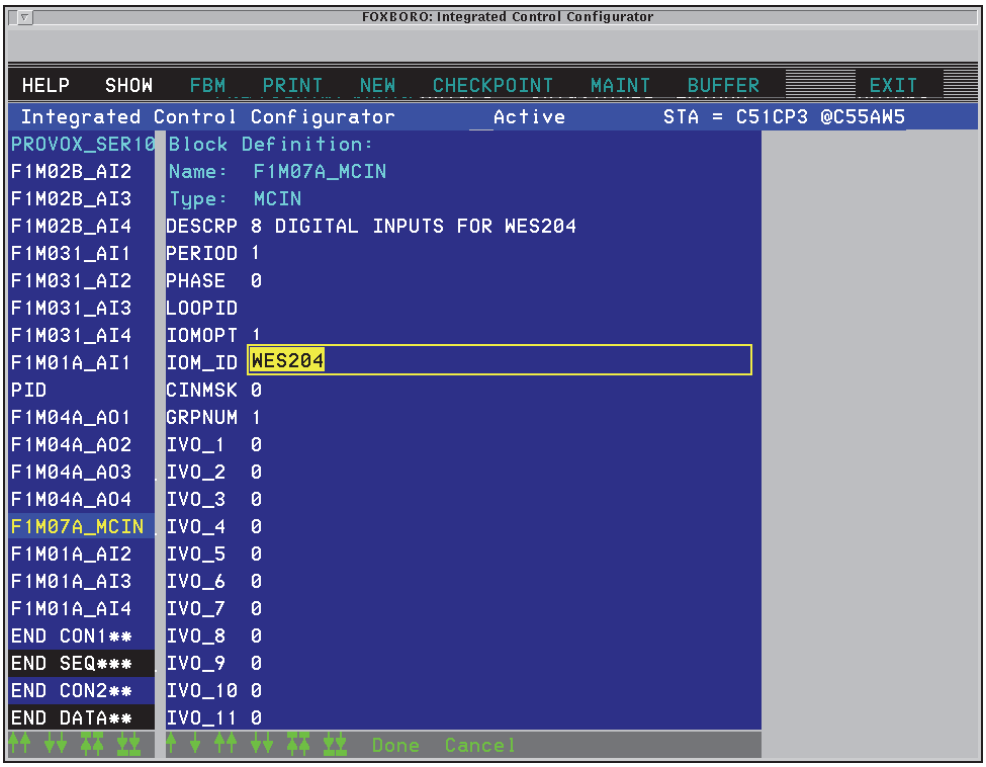


Figure 3-5. Typical Editing Display for an MCIN Block

Figure 3-6 on page 52 shows an ICC display in which an AOUT block is being connected to a WAO37A analog output DCS Fieldbus Module. The module letterbug, WES215, is specified in the IOM_ID parameter and the channel number is specified in the PNT_NO parameter.

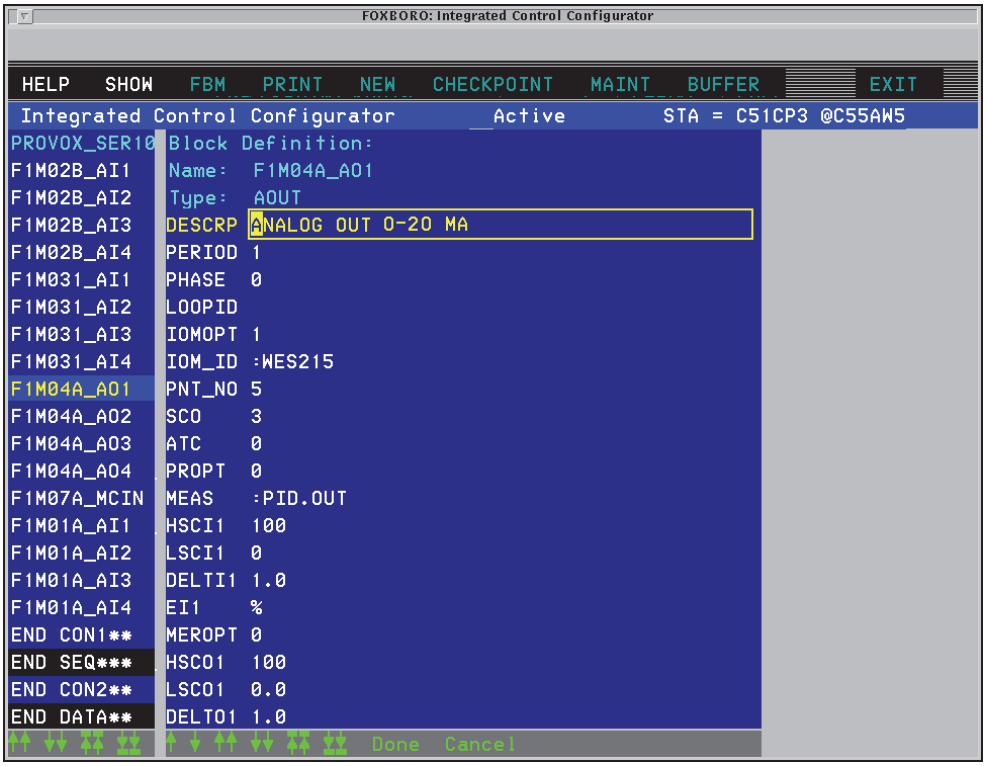


Figure 3-6. AOUT Block Configuration

"Point Numbers" on page 53 provides parameter settings for the DCS Fieldbus Modules. Refer to the following documents for additional information on the I/O blocks and configuration of the control database:

- *Integrated Control Block Descriptions* (B0193AX)
- *Control Processor 270 (CP270) and Field Control Processor 280 (CP280) Integrated Control Software Concepts* (B0700AG)
- *Integrated Control Software Concepts* (B0193AW) - For CP60 or earlier control processors
- Refer to the "System Development" and "Security" manuals listed under "Foxboro Evo Documentation" in *Foxboro Evo Control Software Deployment Guide* (B0750BA).
- *I/A Series Configuration Component (IACC) User's Guide* (B0700FE)
- *Integrated Control Configurator* (B0193AV).

Point Numbers

DCS Fieldbus Modules channels are identified by number starting with 1. The point numbers are configured in the single-channel I/O blocks in the PNT_NO parameter. For example, AIN blocks connected to a WAH01A would connect to points 1 through 8. When you connect a multi-channel I/O block such as MAIN or MCIN to a DCS Fieldbus Module, the channels are mapped to points from 1 to the total number of channels.

Table 3-4. DCS Fieldbus Modules and Connectable Points

DCS Fieldbus Module	Equivalent FBM	Valid Points
WAH01A through WAH01D	FBM211	Points 1 through 8, analog inputs
WAI01A through WAI01D	FBM201	Points 1 through 4, analog inputs
WAI02A	FBM202	Points 1 through 4, thermocouple or millivolt inputs
WAO37A through E, WAO37G	FBM237	Points 1 through 4, analog outputs
WAO37F	FBM237	Point 1, analog output
WAV02A	FBM202	Points 1 through 6, thermocouple or millivolt inputs Point 9 for on-board RTD for thermocouple temperature compensation
WAW01A through WAW01F	FBM201	Points 1 through 6, analog inputs
WAX01A through WAX01C	Two FBM201s	Points 1 through 6 in each of two ECBs, analog inputs.
WAX02A	Two FBM202s	Points 1 through 6 in each of two ECBs, thermocouple or millivolt input. Point 6 on second ECB used for QAXT Terminal Block Temperature Sensor for thermocouple temperature compensation
WBO09A and WBO09B	FBM242	Points 1 through 16, digital outputs
WCI07A	FBM207c	Points 1 through 16, digital inputs
WDI07A through WDI07E	FBM207	Points 1 through 16, digital inputs

Table 3-4. DCS Fieldbus Modules and Connectable Points (Continued)

DCS Fieldbus Module	Equivalent FBM	Valid Points
WID07A WID07C WID07E WID07G WID07H WID07I WID07J WID07L WID07N WID07P	FBM207	Points 1 through 16, digital inputs
WID07B WID07D WID07F WID07K WID07M WID07O	FBM207	Points 1 through 8, digital inputs
WLJ04A through WLJ04C	FBM204	Points 1 through 3, analog inputs Point 4, analog output readback Point 5, analog output
WPA06A	FBM206	Points 1 through 4, pulse inputs
WRF03A WRF03B	FBM203	Points 1 through 6, inputs from 4-wire RTDs
WRO09A through WRO09D	FBM242	Points 1 through 8, relay outputs
WRT03A WRT03B	FBM203	Points 1 through 4, inputs from 3-wire RTDs
WTO09	FBM242	Points 1 through 8, digital outputs

Configuring TC Temperature Compensation RTDs

WAV02A

The WAV02A includes an on-card RTD for thermocouple temperature compensation. This RTD is used only when the thermocouples are directly connected to the card edge termination assembly typically found in a Remote Q-Line termination cabinet. The on-card RTD is mapped into channel 9 in the ECB, and can be connected to the temperature reference input in the AIN block for each of the six thermocouple inputs.

To use the on-card RTD:

- Set the AIN block's external reference option parameter (XREFOP) to **0**.

  The AIN uses input from channel 9 of the connected ECB as the temperature reference.

Diagram A in Figure 3-7 on page 56 shows two AIN blocks configured to read a thermocouple input and reference the on-card RTD.

When external temperature compensation is provided by an RTD mounted in a "B" Cabinet, that RTD is connected to a WRT03 Series card, which in turn is referenced by the AIN blocks connected to the thermocouples, as shown in B in Figure 3-7.

To use an external reference:

1. Set the AIN block's external reference option parameter (XREFOP) to **1**.
2. Connect the external reference input parameter (XREFIN) to the AIN block representing the RTD input from the WRT03 Series module.

   In Diagram B in Figure 3-7 on page 56, XREFIN = :WESRTD.PNT in both AIN blocks.

   The AIN reads the selected WRT03 channel as the temperature compensation reference.

WAI02A

The WAI02A has external thermocouple temperature compensation provided by an RTD mounted in a "B" Cabinet. The RTD is connected to a WRT03 Series card which in turn is referenced by the AIN blocks connected to the thermocouples, as shown in B in Figure 3-7.

To use an external reference:

1. Set the AIN block's external reference option parameter (XREFOP) to **1**.
2. Connect the external reference input parameter (XREFIN) to the AIN block representing the RTD input from the WRT03 Series module.

   In Diagram B in Figure 3-7 on page 56, XREFIN = :WESRTD.PNT in both AIN blocks.

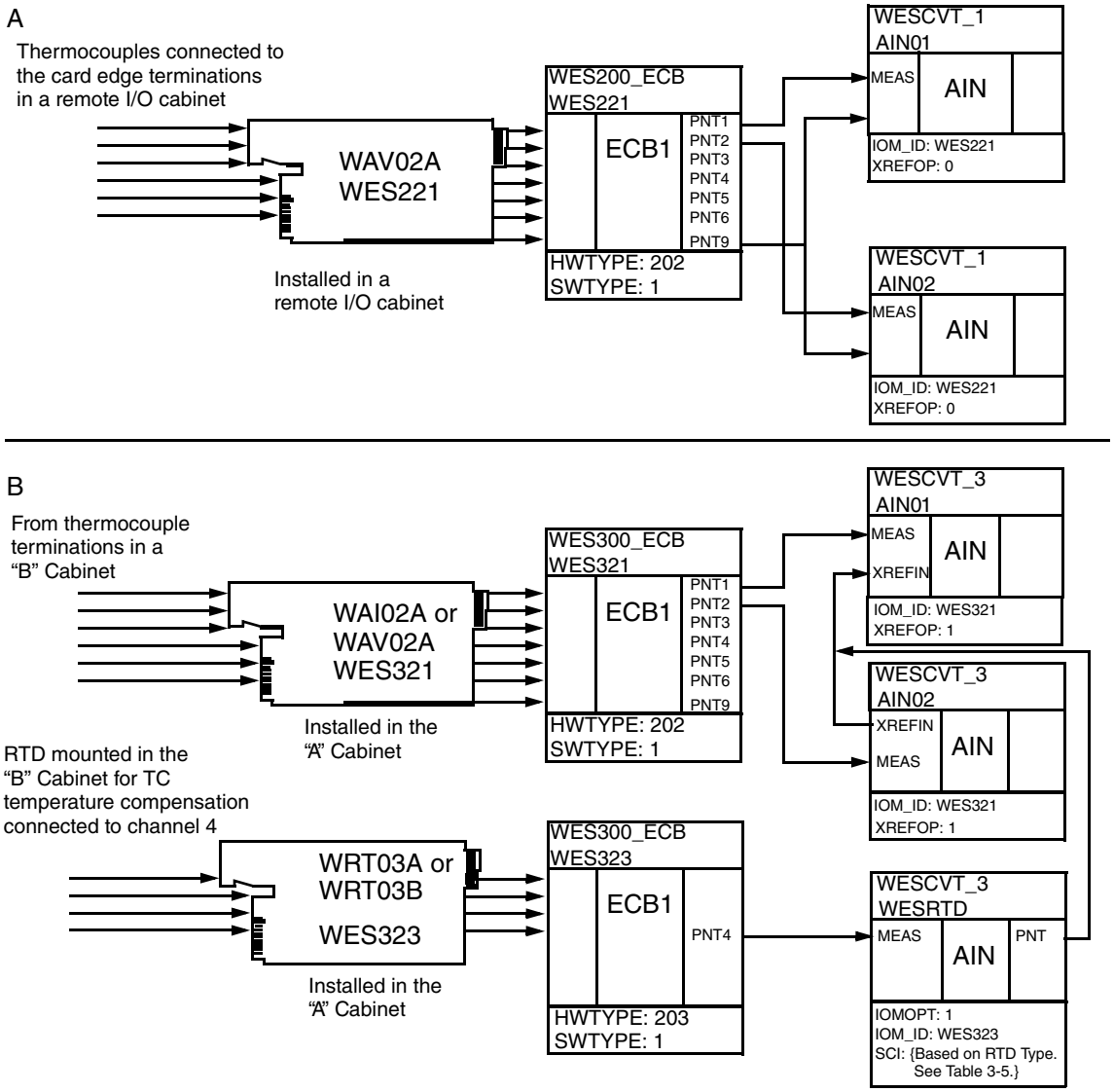


Figure 3-7. Connecting RTDs for WAV02A and WAI02A Temperature Compensation

WAX02A

The WAX02A has two sets of six isolated thermocouple input channels. Channels 1 through 6 are connected to one ECB1, and channels 7 through 12 are connected to a second ECB1. Channel 12 is wired to a QAXT Terminal Block Temperature Sensor located on point 12 on the input termination assembly. This input is connected to an AIN block that is referenced by the AIN blocks connected to the other 11 thermocouple inputs.

To use channel 12 as an external reference:

1. Connect point 6 in the second ECB (that is, channel 12 on the DCS Fieldbus Module) to the external reference AIN block (WESCVT_7:QAXT72 in Figure 3-8).
2. Set the external reference AIN block SCIX parameter to 2.

3. Configure the external reference AIN block to scale the sensor input.

   Scaling of the input from the QAXT is accomplished in the AIN block with the BSCALE and KSCALE parameters. Refer to Table 3-5 to determine the scaling parameter settings based on the type of Q-Card being replaced.

Table 3-5. AIN Block Scaling Parameters for Input from a QAXT

Q-Card Replaced	BSCALE	KSCALE	Temperature Scale	100°C at
QAX-G01	0	5	0.2 mV/°C	20 mV
QAX-G02	0	2	0.5 mV/°C	50 mV
QAX-G03	0	1	1.0 mV/°C	100 mV

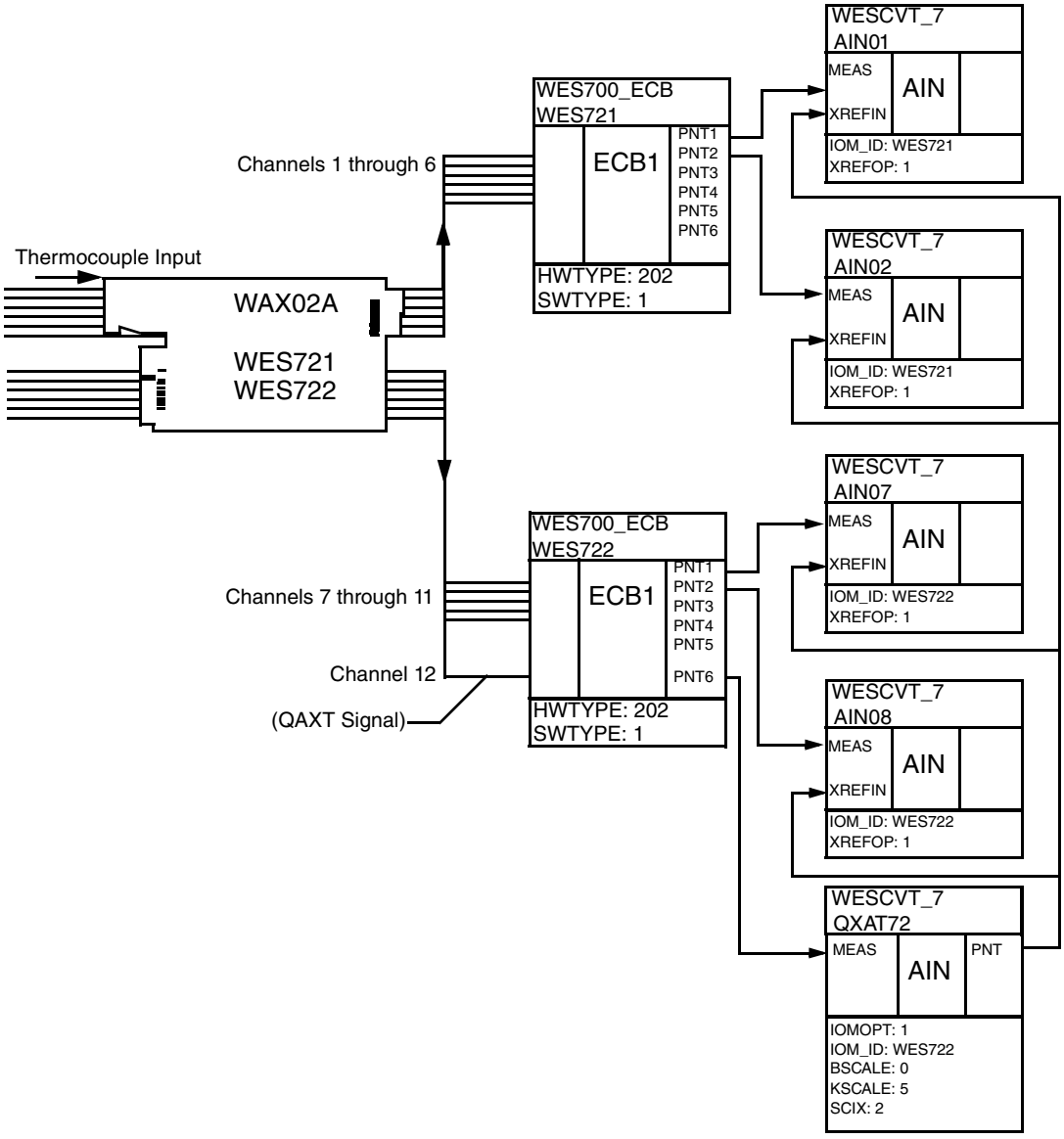


Figure 3-8. Connecting QAXT for WAX02A Temperature Compensation

Signal Conditioning

For an AIN or MAIN block to properly read signals from an analog DCS Fieldbus Module, the range must be characterized with the signal conditioning index parameter (SCI) in the AIN or MAIN block. The AOUT block uses the SCO parameter to scale signals to the DCS Fieldbus Module.

For analog type I/O blocks, configure the SCI or SCO parameter as shown in Table 3-6.

When connecting AIN blocks to a WRT03A, which interfaces with a 10 ohm copper RTD, the signal is conditioned using a characterizer (CHARC) block. See “10 Ohm Copper RTD” on page 61.

When connecting AIN blocks to a WRT03B or WRF03B, which interfaces with a 120 ohm nickel RTD, the signal is conditioned using a characterizer (CHARC) block. See “120 Ohm Nickel RTD” on page 62.

Table 3-6. Signal Conditioning Parameters

DCS Fieldbus Module	FBM Equivalent	I/O	Range/Device Type	SCI or SCO
WAH01A	FBM211	8 AI	–10 to 10 V dc	2
WAH01B	FBM211	8 AI	–5 to 5 V dc	2
WAH01C	FBM211	8 AI	0 to 10 V dc	1
WAH01D	FBM211	8 AI	0 to 5 V dc	1
WAI01A	FBM201	4 AI	–500 to 500 mV dc	2
WAI01B	FBM201	4 AI	–1 to 1 V dc	2
WAI01C	FBM201	4 AI	–10 to 10 V dc	2
WAI01D	FBM201	4 AI	0 to 20 mA	1
			4 to 20 mA	3
WAI02A	FBM202	4 AI TC/mV	TC Type B	20
			TC Type E	21
			TC Type J	23
			TC Type K	24
			TC Type N	25
			TC Type R	26
			TC Type S	27
			TC Type T	28
			±100 mV	2

Table 3-6. Signal Conditioning Parameters (Continued)

DCS Fieldbus Module	FBM Equivalent	I/O	Range/Device Type	SCI or SCO
WAV02A	FBM202	6 AI TC/mV	TC Type B	20
			TC Type E	21
			TC Type J	23
			TC Type K	24
			TC Type N	25
			TC Type R	26
			TC Type S	27
			TC Type T	28
			±100 mV	2
WAW01A	FBM201	6 AI	0 to 1 V dc	1
WAW01B	FBM201	6 AI	0 to 5 V dc	1
WAW01C	FBM201	6 AI	0 to 10 V dc	1
WAW01D	FBM201	6AI	0 to 20 mA	1
WAW01E	FBM201	6 AI	0 to 20 mA	1
			4 to 20 mA	3
WAW01F	FBM201	6AI	0 to 50 mA	1
			10 to 50 mA	3
WAX01A	FBM201	12 AI	0 to 1 V dc	1
WAX01B	FBM201	12 AI	0 to 5 V dc	1
WAX01C	FBM201	12 AI	0 to 10 V dc	1
WAX02A	FBM202	12 AI TC/mV	TC Type B	20
			TC Type E	21
			TC Type J	23
			TC Type K	24
			TC Type N	25
			TC Type R	26
			TC Type S	27
			TC Type T	28
			±100 mV	2
WRF03A	FBM203	4 AI RTD	Platinum (200 ohm DIN 43760-1980)	42
			Platinum (200 ohm IEC, DIN 43760-1980)	43
			Platinum (200 ohm SAMA)	44

Table 3-6. Signal Conditioning Parameters (Continued)

DCS Fieldbus Module	FBM Equivalent	I/O	Range/Device Type	SCI or SCO
WRF03B	FBM203	4 AI RTD	Platinum (100 ohm DIN 43760-1980)	42
			Platinum (100 ohm IEC, DIN 43760-1980)	43
			Platinum (100 ohm SAMA)	44
WRT03A	FBM203	4 AI RTD	Copper (SAMA)	*
* See "CHARC Block" on page 61				
WRT03B	FBM203	4 AI RTD	Nickel (SAMA)	41
			Platinum (100 ohm DIN 43760-1980)	42
			Platinum (100 ohm IEC, DIN 43760-1980)	43
			Platinum (100 ohm SAMA)	44
Analog Output				
WAO37A	FBM237	4 AO	0 to 20 mA	1
			4 to 20 mA	3
WAO37B	FBM237	4 AO	0 to 10 V dc	2
WAO37C	FBM237	4 AO	–10 to 10 V dc	2
WAO37D	FBM237	4 AO	0 to 5 V dc	2
WAO37E	FBM237	4 AO	–5 to 5 V dc	2
WAO37F	FBM237	1 AO	–10 to 10 V dc	2
WAO37G	FBM237	4 AO	0 to 20 mA	1
			4 to 20 mV	3
Analog Input/Output				
WLJ04A	FBM204	3 AI	0 to 10 V dc	1
		1 AI (AO Readback)	0 to 10 V dc	1
		1 AO	0 to 10 V dc	2
WLJ04B	FBM204	3 AI	0 to 5 V dc	1
		1 AI (AO Readback)	0 to 10 V dc	1
		1 AO	0 to 10 V dc	2
WLJ04C	FBM204	3 AI	0 to 20 mA	1
		1 AI (AO Readback)	0 to 20 mA	1
			4 to 20 mA	3
		1 AO	0 to 20 mA	3
			4 to 20 mA	1

CHARC Block

10 Ohm Copper RTD

A Characterizer (CHARC) block is used with the WRT03A to convert input from a 10 ohm copper RTD. The AIN blocks that read inputs from the WRT03A reference the signal conversion from the CHARC block.

To configure signal conversion for a copper RTD:

1. Using the ICC or FoxCAE software, insert a CHARC block in the appropriate compound ahead of the AIN blocks that are to refer to it.
2. Configure the CHARC parameters as follows:

NAME	10CUDEGC	Y_8	30.0
TYPE	CHARC	X_9	22577
EXTOPT	1	Y_9	40.0
HSCI1	65535	X_10	23398
LSCI1	0	Y_10	50.0
HSCO1	150	X_11	24220
LSCO1	-40	Y_11	60.0
EO1	DEG C	X_12	25041
STARTP	1	Y_12	70.0
ENDP	20	X_13	25865
X_1	15998	Y_13	80.0
Y_1	-40.0	X_14	26686
X_2	16823	Y_14	90.0
Y_2	-30.0	X_15	27507
X_3	17647	Y_15	100.0
Y_3	-20.0	X_16	28329
X_4	18468	Y_16	110.0
Y_4	-10.0	X_17	29150
X_5	19290	Y_17	120.0
Y_5	0.0	X_18	29973
X_6	20111	Y_18	130.0
Y_6	10.0	X_19	30795
X_7	20932	Y_19	140.0
Y_7	20.0	X_20	31616
X_8	21756	Y_20	150.0

3. For each AIN block connected to a WRT03A input channel, set the following AIN block parameters to read the input in Degrees C:

SCI	0
HSCO1	150
LSCO1	-40
EO1	DEG C
EXTBLK	:10CUDEGC.BLKSTA

4. To read the input in Degrees F, set the AIN block parameters as follows:

```
SCI      0
HSCO1    302
LSCO1    -40
EO1      DEG F
EXTBLK   :10CUDEGC.BLKSTA
KSCALE   1.80
BSCALE   32.0
```

120 Ohm Nickel RTD

A Characterizer (CHARC) block is used with the WRT03B and the WRF03B to convert input from a 120 ohm nickel RTD (Minco part S4-60NA) commonly used in remote "B" Cabinets. The AIN blocks that read inputs from the WRT03B or the WRF03B reference the signal conversion from the CHARC block.

To configure signal conversion for the 120 ohm nickel RTD:

1. Using the ICC or FoxCAE software, insert a CHARC block in the appropriate compound ahead of the AIN blocks that are to refer to it.
2. Configure the CHARC parameters as follows:

NAME	10NIDC	Y_8	30.0
TYPE	CHARC	X_9	29960
EXTOPT	1	Y_9	40.0
HSCI1	65535	X_10	31549
LSCI1	0	Y_10	50.0
HSCO1	150	X_11	33180
LSCO1	-40	Y_11	60.0
EO1	DEG C	X_12	34854
STARTP	1	Y_12	70.0
ENDP	20.0	X_13	36570
X_1	18551	Y_13	80.0
Y_1	-40.0	X_14	38328
X_2	19882	Y_14	90.0
Y_2	-30.0	X_15	40128
X_3	21230	Y_15	100.0
Y_3	-20.0	X_16	41971
X_4	22601	Y_16	110.0
Y_4	-10.0	X_17	43858
X_5	24000	Y_17	120.0
Y_5	0.0	X_18	45790
X_6	25434	Y_18	130.0
Y_6	10.0	X_19	47767
X_7	26904	Y_19	140.0
Y_7	20.0	X_20	49790
X_8	28412	Y_20	150.0

3. For each AIN block connected to a WRT03B or WRF03B input channel, set the following AIN block parameters to read the input in Degrees C:

```
SCI      0
HSCO1    150
LSCO1    -40
EO1      DEG C
EXTBLK   :120NIDC.BLKSTA
```

4. To read the input in Degrees F, set the AIN block parameters as follows:

```
SCI      0
HSCO1    302
LSCO1    -40
EO1      DEG F
EXTBLK   :120NDIC.BLKSTA
KSCALE   1.80
BSCALE   32.0
```

4. Installation

This chapter describes installation of the DCS Fieldbus Module subsystem in the DPU cabinet and connection to the Ethernet trunk Fieldbus or the control network.

Installation of the DCS Fieldbus Module subsystem involves the following:

- Disconnecting and removing the DPU assembly, DPU power supplies, Q-Cards, and paddle cards from the WDPF system
- For an FCP280, FCP270, or a ZCP270 using an FCM100Et or FCM100E:
  - Installing the Modular Baseplate for the FCP270(s), FCM100Et(s), or FCM100E(s).
  - Installing single or redundant 24 V dc power supplies for the Modular Baseplate.
  - Connecting the Modular Baseplate to the 24 V dc power supplies.
  - Installing the host FCM100Et(s), FCM100E(s) or FCP270(s) and connecting them to the control network.
  - Adding Termination connector to the Modular Baseplate.
- For a CP60 using WFCM10E or WFCM10Ef modules:
  - Installing the baseplate for the WFCMs.
  - Connecting the baseplate to the existing +13 V dc power supplies.
  - Connecting the WFCM10E or WFCM10Ef to the Ethernet trunk Fieldbus.
- Setting up the local Fieldbus to connect the WFCM10E, WFCM10Ef, FCP280s, FCP270s, FCM100Ets, or FCM100Es and DCS Fieldbus Modules.
- Installing the DCS Fieldbus Modules.
- Connecting the original field termination assemblies to the DCS Fieldbus Modules.
- Bringing the subsystem on-line.

⚠ CAUTION

The DCS Fieldbus Module subsystem for the WDPF system is designed to use existing +13 V dc power supplies in the DPU cabinet. **Do not** connect a baseplate with WFCM10E or WFCM10Ef modules to any supply not rated at +13 V dc.

⚠ CAUTION

Do not attempt to install WFCM10E or WFCM10Ef modules in baseplates used by other Foxboro Evo Fieldbus subsystems, or to install other FBM devices into a baseplate designed for the WDPF system migration.

⚠ CAUTION

The FCP280, FCP270, FCM100Et, and FCM100E use + 24 V dc power. Additional single or redundant + 24 V dc power supplies (FPS400-24) must be installed in the DPU cabinet.

Pre-Installation Requirements

Before starting the actual equipment installation:

1. Perform the System Definition for the new DCS Fieldbus Module subsystem (refer to "Letterbug Assignments" on page 37).
2. Perform the Integrated Control Configuration for the new DCS Fieldbus Module subsystem (refer to "Integrated Control Configuration" on page 39).
3. Determine the letterbugs that identify the DCS Fieldbus Modules.
4. Refer to "Letterbug Assignments" on page 37 and the Foxboro Evo system configuration reports.
5. Perform an orderly shutdown of the process associated with the equipment to be modified, and remove ac power from the equipment racks.
6. For WFCM10E or WFCM10Ef modules, measure and adjust the outputs of the primary and secondary +13 V power supplies to +12.9 V minimum and +13.1 V maximum.

NOTE

The FPS400-24 power supply output (+24 V dc) is not adjustable.

7. Newer versions of the replacement Q-Crate backplanes, described in the next section, require the removal the R1 resistor shown in Figure 4-1, if present. Perform the procedure in this next section if the R1 resistor is present.

Removing R1 Resistor from Applicable Q-Crates

One or more of the Q-Crates may be a later version than the other Q-Crates. These newer Q-Crates have a flat cable connector (shown in Figure 4-1) attached to the bottom of the backplane PWB, whereas the older Q-Crates do not have this connector. The R1 resistor associated with this flat cable connector on the newer Q-Crates must be removed prior to installation. If this resistor is not removed, Fieldbus B may not come on-line after the Q-Crate is installed.

To determine if a Q-Crate has this resistor, refer to Figure 4-1. If the Q-Crate's backplane is similar to the one pictured in this photograph and has the flat cable connector and the R1 resistor in the location shown, this resistor must be removed. Either:

- Unsolder one end of the resistor as shown, move it away from its connection, and put some insulation or tubing on the "floating" resistor lead. This is recommended as this allows you to reverse the migration procedure easier.
- Optionally, clip the resistor off, if you do not plan to reverse the migration procedure.

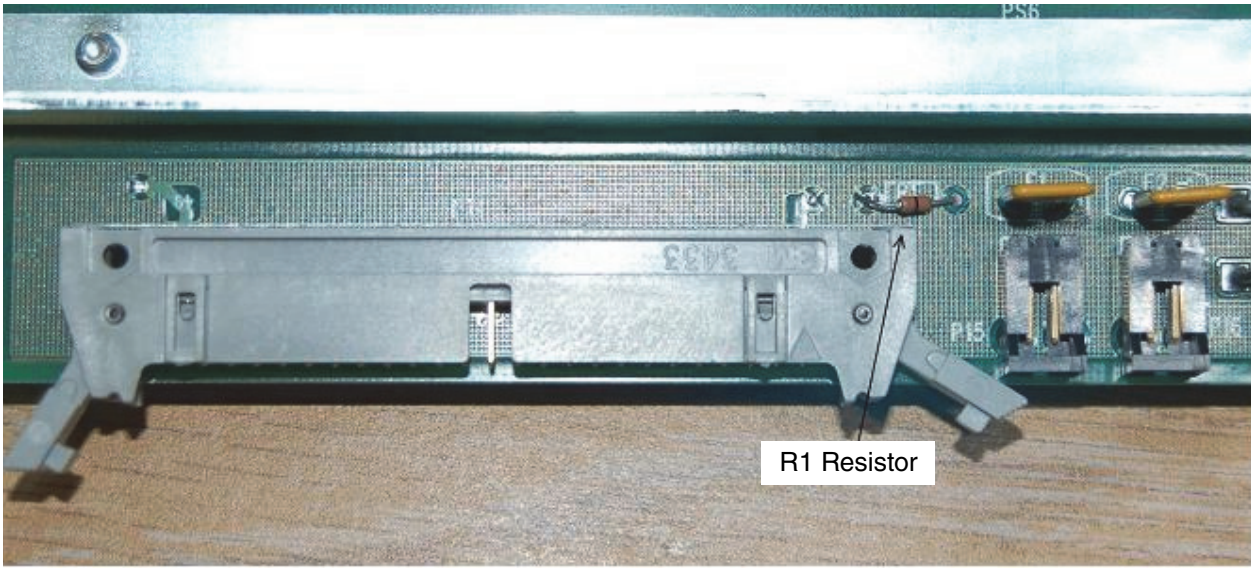


Figure 4-1. R1 Resistor in Newer Q-Crate Version

Removing WDPF Equipment

Figure 4-2 is a diagram of an "A" style DPU cabinet which identifies the major components of the original WDPF system. Refer to the diagram to identify components and procedures for removing the equipment.

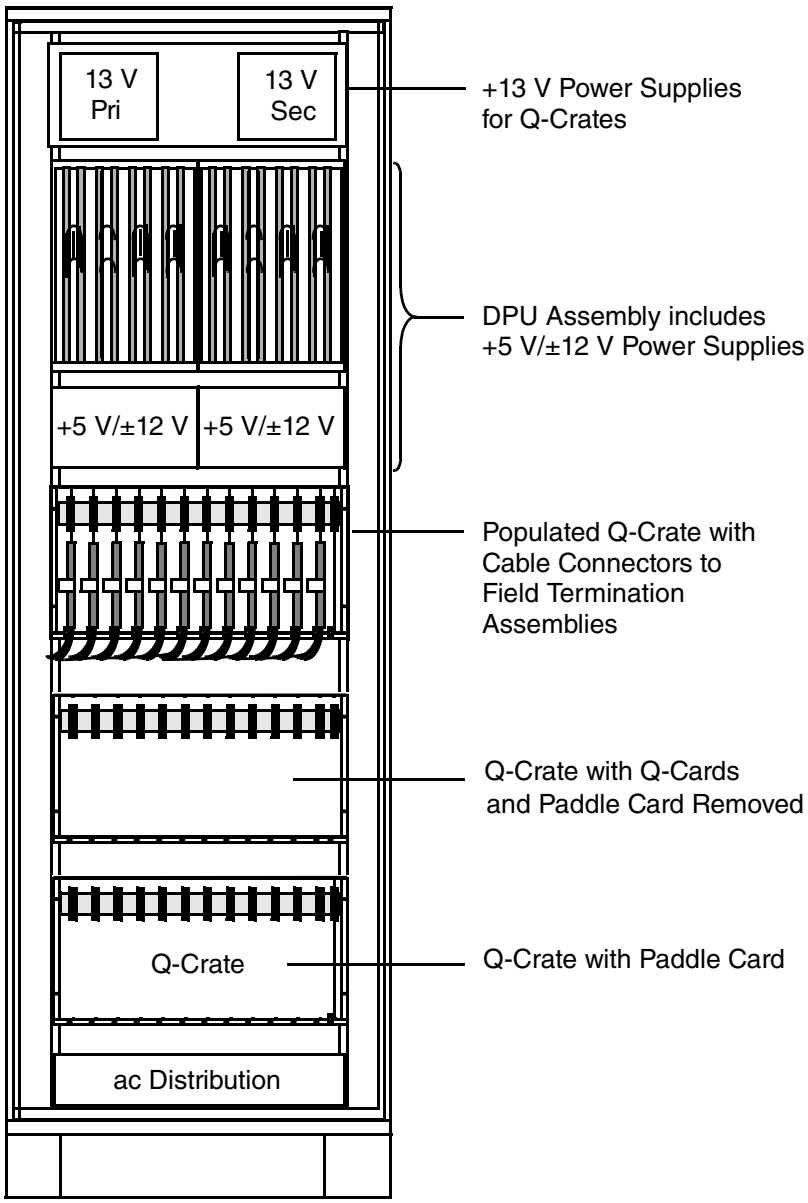


Figure 4-2. "A" Cabinet DPU Configuration

To remove the equipment to be upgraded:

1. Unplug the DPU from the Westnet Data Highway or other network connections.
2. Disconnect and unplug cables between the DPU and the paddle cards.
3. Disconnect the two DPU power supplies for ac power. These supplies are in the DPU assembly immediately below the DPU nests.

   The original +13 V dc power supplies and ac distribution modules remain in the cabinet for use with the DCS Fieldbus Module subsystem.
4. Remove the entire DPU assembly, including the DPU power supplies, from the 19-inch rack.
5. If the field termination assemblies are not already clearly identified, label each assembly with slot and crate information so it can be attached to the correct replacement for the Q-Card.
6. Disconnect the field termination assemblies from the Q-Cards and set them aside.
7. Remove all Q-Cards and paddle cards from the Q-Crates.

   The Q-Crates remain in the cabinet and the DCS Fieldbus Modules plug directly into the original backplane in the crate.

   The DCS Fieldbus Modules derive power from the existing +13 V dc power supplies via wiring to the backplanes in the Q-Crates.

   Figure 4-3 shows the cabinet with the remaining WDPF components that are to be used in the DCS Fieldbus Module subsystem.

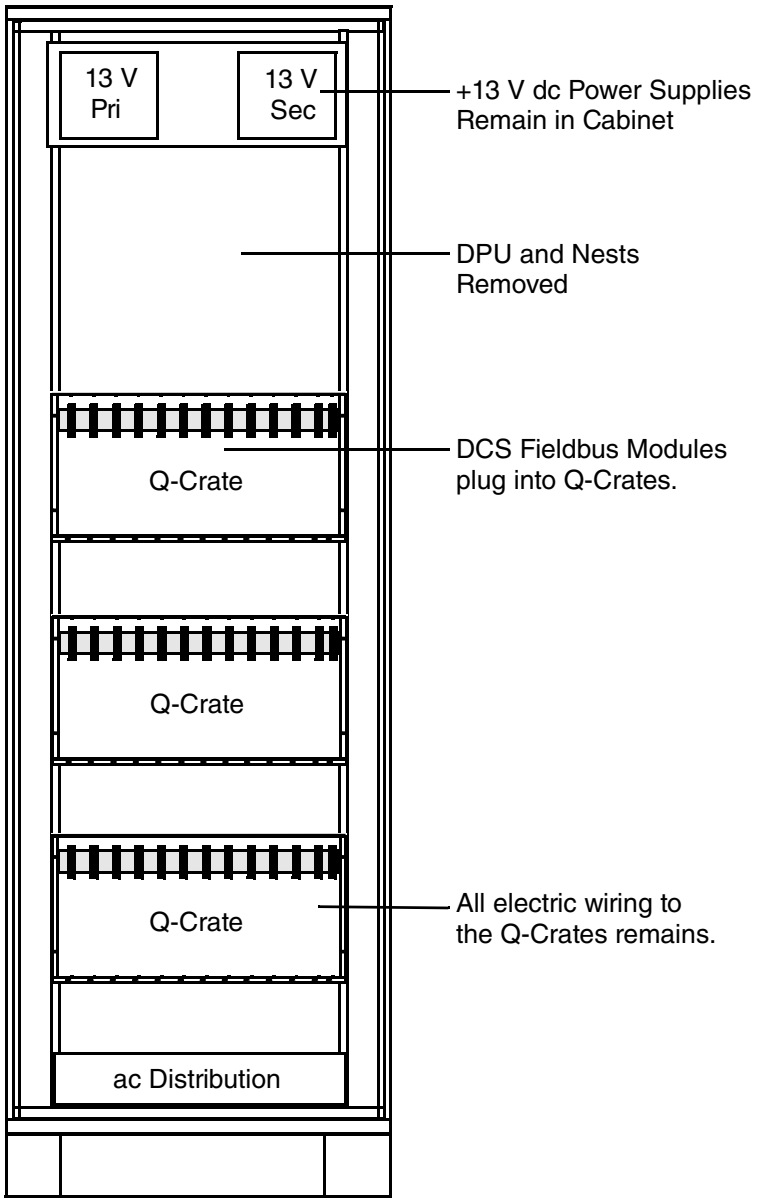


Figure 4-3. Emptied “A” Cabinet

Installing WFCM10E or WFCM10Ef Used with CP60

Baseplate Setup

Set up the DCS Fieldbus baseplate for WFCM10E or WFCM10Ef modules which includes assembling the equipment with the Baseplate Mounting kit (P0914XR) and connecting the baseplate to the power supplies.

Table 4-1 lists the contents of the assembly kit.

Table 4-1. P0914XR Baseplate Mounting Kit Contents

Part No.	Description	Qty.
P0918XX	Mounting Bracket, 6-inch deep	1
X0127DF	Screw, 0.190 x 0.5	4
X0143SC	Lockwasher	4
X0173NC	Nut clip	4
X0143AX	Flat washer, 0.250	4
X0143QY	Lockwasher, 0.250	4
X0173NB	Screw, M6 x 15mm	4
P0918QZ	DCS FCM, Baseplate	1
P0922AV	Power Cable, Baseplate	2
P0918GU	General Info Label	2
P0903AN	Migration Kit Label	1

To set up the DCS Fieldbus subsystem baseplate for WFCM10E or WFCM10Ef modules:

1. Attach the mounting bracket to the rear of the baseplate as shown in Figure 4-4.

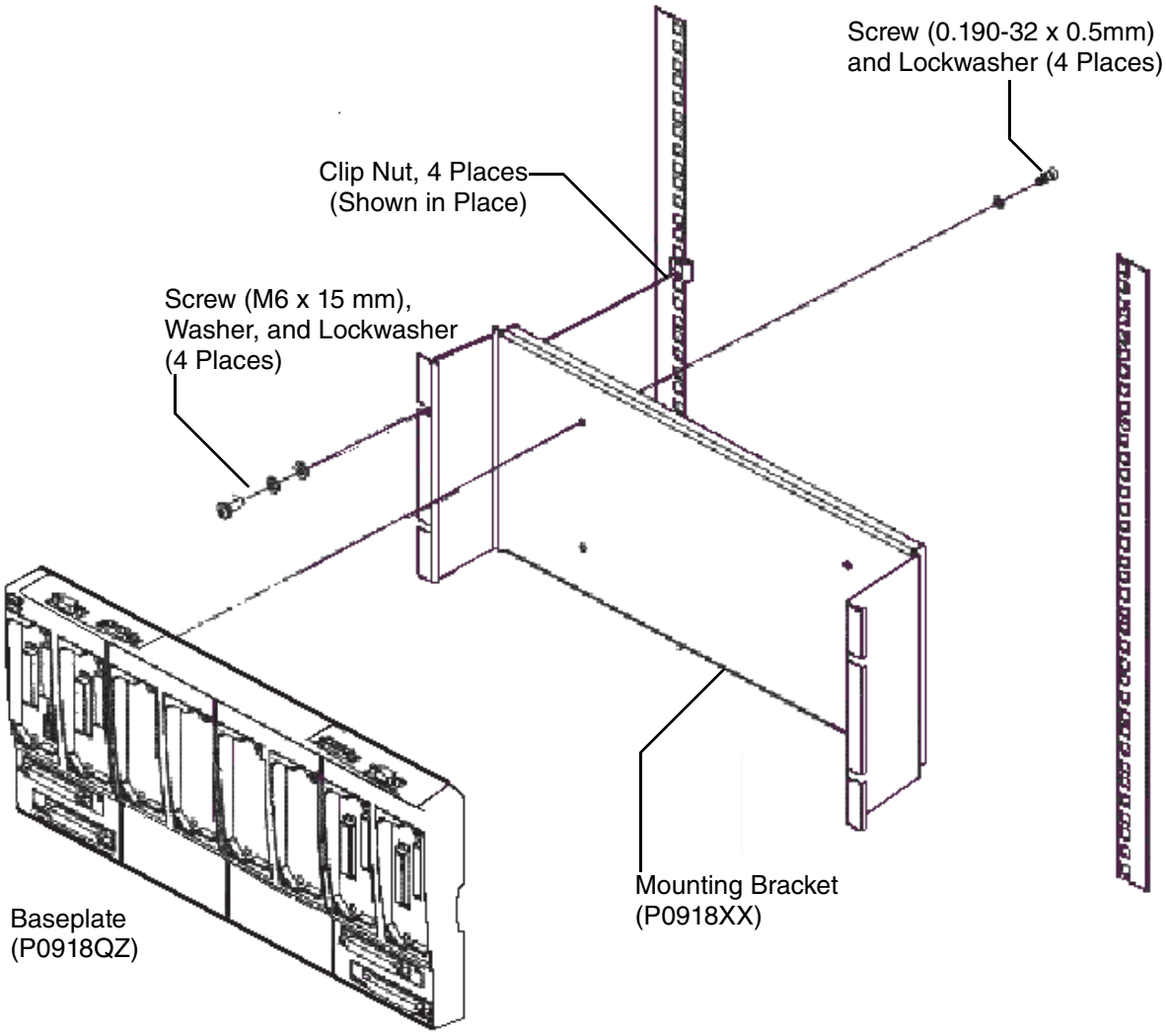


Figure 4-4. Installation of DCS Fieldbus Module Baseplate for WFCM10E or WFCM10Ef modules in "A" Cabinet

2. Install the completed assembly in the 19-inch rack below the +13 V power supplies and above the first Q-Crate.

Cabling Baseplate Power for WFCM10E or WFCM10Ef Modules

The baseplate for WFCM10E or WFCM10Ef modules receives primary and optional secondary power from the original +13 V dc DPU power supplies which remain at the top of the "A" Cabinet. Two baseplate power cables (P0922AV) are shipped with the Baseplate Mounting kit (P0914XA).

These cables have a connector on one end for connection to the baseplate, and three ring-type terminals at the other end for + and – at the power supply and ground for connection to the negative at the power supply.

The baseplate accepts one cable for primary power, and a second cable for secondary power, if applicable.

To connect the baseplate to the supplies:

1. Turn off each +13 V dc power supply.
2. Make the cable connections with the power supplies as shown in Figure 4-5.

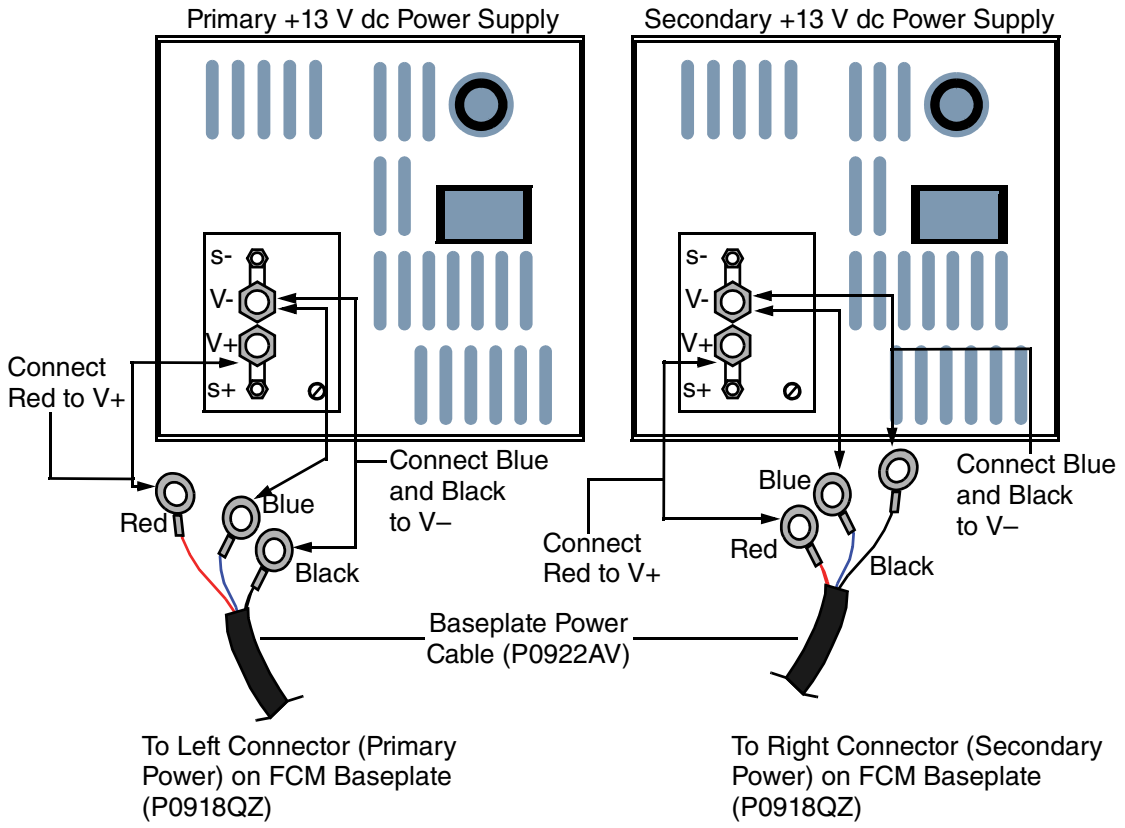


Figure 4-5. Baseplate for WFCM10E or WFCM10Ef Modules Power Cable Connections to the +13 V dc Power Supplies

⚠ WARNING

Do not touch the + and – terminals on the power supply simultaneously with any metal object (such as a screwdriver, or wristwatch band). Accidental interconnection of the two terminals can cause significant injury.

NOTE

If, during an overload or short circuit condition, the current attempts to exceed 110% of the 40°C rating, the output voltage will begin to decrease toward zero, thereby limiting the current delivered to the load.

3. Make the connections at the baseplate as shown in Figure 4-6, connecting the primary supply to the to the connector on the top left, and the backup on the top right.

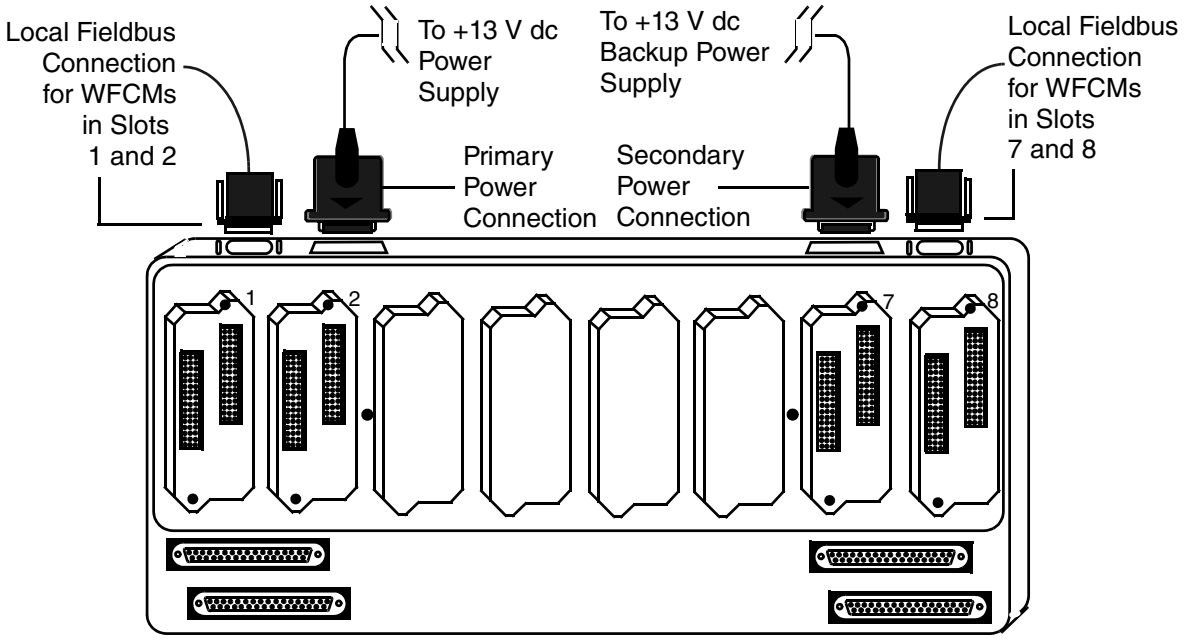


Figure 4-6. Power Supply Cable Connections at the Baseplate for WFCM10E or WFCM10Ef Modules

Installing WFCM10E or WFCM10Ef Modules

Redundant Fieldbus Communications Modules are installed in slots 1 and 2, as shown in Figure 4-7. When there is only one WFCM, it is installed in slot 1. To install the module:

1. Press the module in place on the baseplate, engaging the two connectors at the rear of the module with those on the baseplate.
2. Tighten the two self-retaining hex screws on the module using a hex driver tool (Foxboro part number X0179AZ).

⚠ CAUTION

1. When installing the modules on the baseplate, use a 5/32 hex driver tool (X0179AZ). If another type of tool must be used, make sure that it does not generate more than 12 inch/pounds of torque, or you might strip the threaded inserts out of the baseplate.
2. The modules must be screwed in place for secure operation. Do not rely on the signal connectors to hold the modules in place.
3. For safety reasons, always consider the possible impact on plant operations before removing a module from the baseplate.

NOTE

The baseplate used in WDPF system migration does not require an external termination assembly. Unlike similar baseplates used in other Foxboro Evo DIN rail products, the baseplate for WDPF migration has a built-in termination assembly.

Modules can be removed and replaced while power is applied to the baseplate without damaging the module or baseplate electronics.

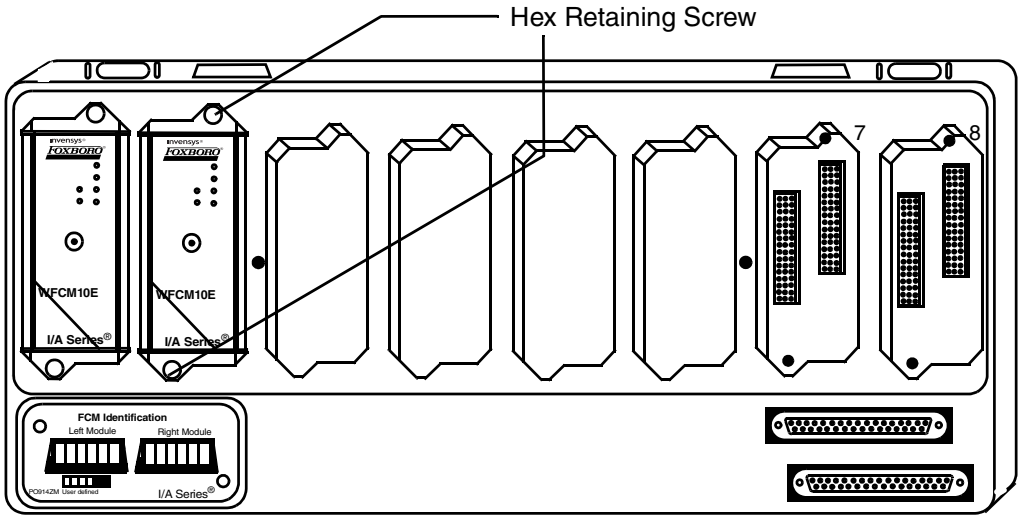


Figure 4-7. WFCM Installation on the Baseplate (P0914XA)

NOTE

Where a redundant Ethernet trunk Fieldbus is used, the WFCM10E module pair communicates on only one bus at any given time. The odd slot corresponds to bus A and the even slot to bus B.

Installing WFCM Identification Assembly

The WFCM identification assembly (P0914ZM) contains sockets for letterbug sets, which provide system addressing for the WFCMs and their associated DCS Fieldbus Modules.

1. Plug the WFCM identification assembly into the I/O connectors below the WFCM10E pair, as shown in Figure 4-8, or WFCM10Ef modules.
2. Secure the assembly in place by tightening the two common retaining screws.

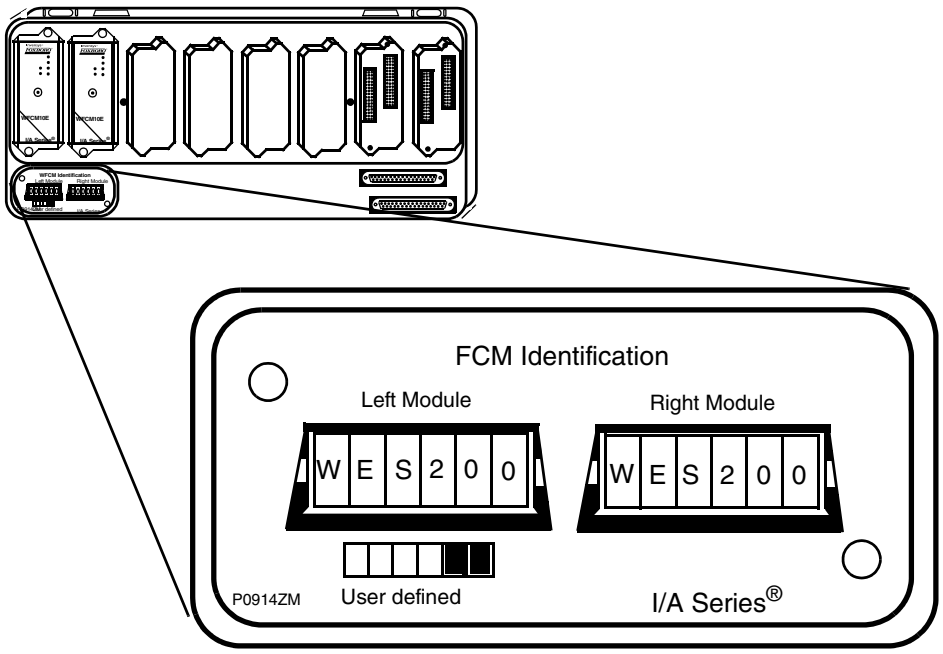


Figure 4-8. Baseplate (P0914XA) Identification Module and Letterbug Installation

3. Assemble and install the letterbug set for each WFCM module.

   The first four characters of the letterbug are user defined. The fifth and sixth characters are always 00.

   When there is only one WFCM, install the letterbug in the sockets for the left module. When there is a redundant pair, install the identical letterbug sets in the sockets for the left and right modules.

   If you are installing the DCS Fieldbus subsystem on an Enhanced Cabinet with four Q-Crates, install the second redundant pair of WFCMs in slots 7 and 8. If the trunk Fieldbus is a single-channel, install the WFCM in slot 7.

4. Install the WFCM identification module using the two connectors in the lower right corner of the baseplate. Make sure the letterbugs from the second WFCM pair are not the same as the first or any other device on the Fieldbus.

Connecting to the CP60 Ethernet Trunk Fieldbus Cable

The customer-supplied Ethernet trunk Fieldbus cabling includes 10 Mbps (10Base2) Ethernet cabling and, optionally, a fiber optic network extension. The network can be a single or redundant network connected to a fault-tolerant CP60. ThinNet (RG-58) cable is used for the 10Base2 cabling.

For information on connecting the CP 60 to the WFCMs refer to the document *Control Processor 60 and Control Processor 60S Installation and Maintenance* (B0400FB).

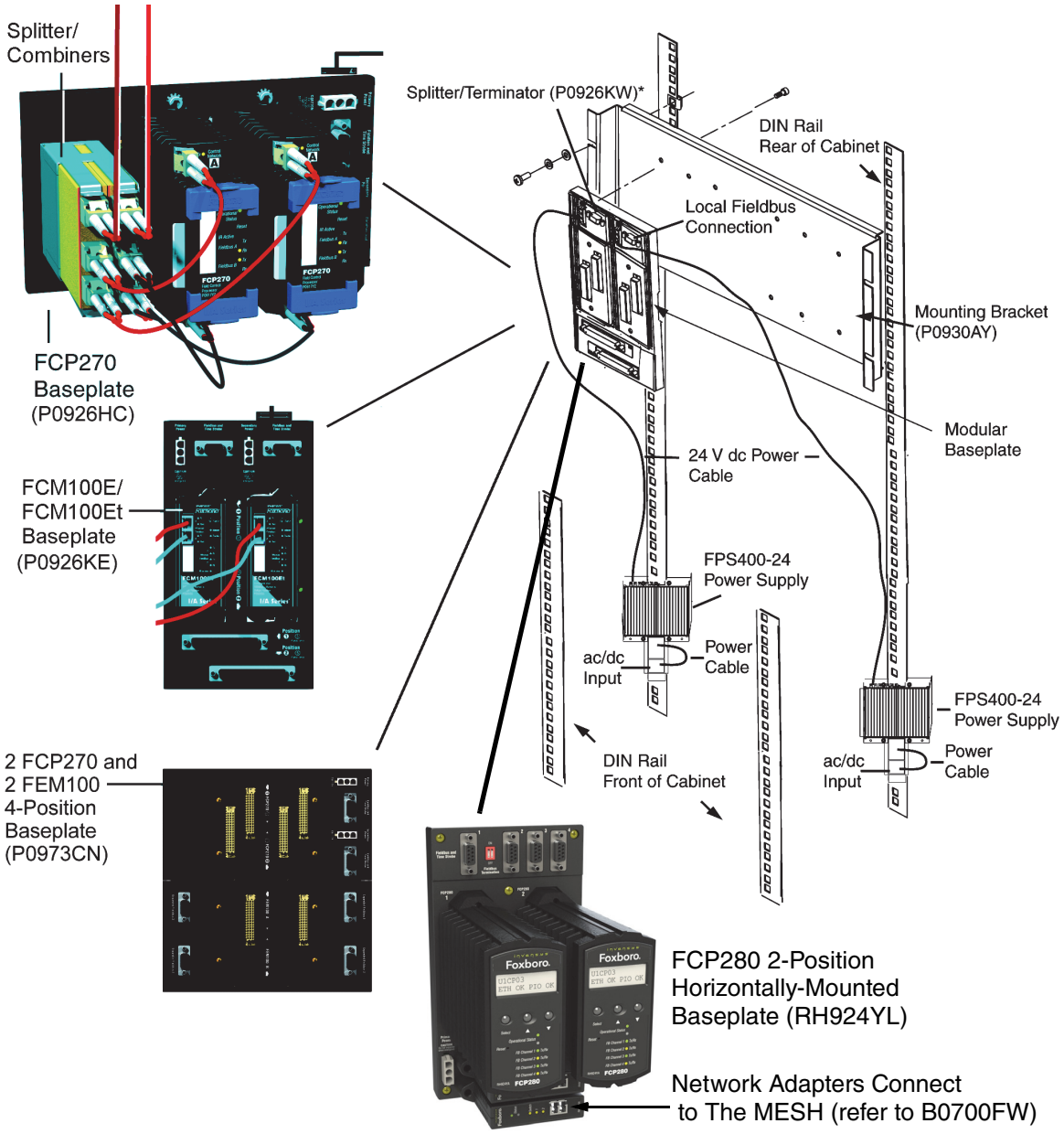
The next step is to install the local Fieldbus, see “Installing the Local Fieldbus” on page 81.

Installing the FCP280, FCP270, ZCP270, FCM100Et, FCM100E, or FEM100

To install a FCP280, FCP270, FCM100Et, FCM100E or FEM100 in a cabinet, you install the:

- Appropriate Modular Baseplate for the module
- FPS400-24, 24 V dc Power Supply
- FCP280, FCP270, FCM100Et, FCM100E or FEM100 Module(s)
- Connecting cables.

Figure 4-9 is an overview of the installed components.



*Splitter/Terminator (P0926KW) is **NOT** used with FCP280. Use splitter (RH928CV) instead. Refer to "Setting Termination Switches for FCP280 Baseplates" in B0700FW for FCP280 termination information.

Figure 4-9. FCP280, FCP270, FCM100Et, and FCM100E Installation Overview

Installing the Modular Baseplate in a 19-Inch Rack

Before installing a horizontally mounted Modular Baseplate in a standard 483 mm (19-inch) rack, mounting bracket kit P0930AS must be attached to the rear DIN rail of the cabinet. Table 4-2 lists the contents of this kit. It is recommended to install the mounting bracket kit in the 19-inch rack below the +13 V dc power supplies and above the first Q-Crate.

Table 4-2. P0930AS Modular Baseplate Mounting Kit Contents

Part No.	Description	Qty.
P0930AY	Mounting bracket (1-inch depth)	1
X0127DF	Screw, 0.190-32 x 0.5	4
X0143SC	Lock washer, 0.190	4
X0173NC	Nut clip	4
X0143AX	Flat washer, 0.250	4
X0143QY	Lock washer, 0.250	4
X0173NB	Screw, M6 x 15 mm (for P0972XA/XB baseplates)	4
X0167VC	Screw, self threading (for P0926HC/KE/HF/HJ/HM/HT, P0973CN or RH924YF/RH924YL Modular Baseplates)	8

To install the Modular Baseplate

1. Attach the mounting bracket and mount the Modular Baseplate on the rear DIN rails below the +13 V dc power supplies and above the first Q-Crate as shown in Figure 4-10.

⚠ CAUTION

Do not install the mounting bracket kit P0930AS on the DIN rail at the front of the cabinet. The cabinet doors when closed will hit and break the fiber optic cable connecting the FCP280, FCP270, FCM100Et, or FCM100E to the control network resulting in a loss of communications.

The mounting bracket accommodates various sizes of Modular Baseplates. Modular Baseplates (P0926HC/KE/HF/HJ/HM/HT, P0973CN or RH924YF/YL) use self-threading screws (X0167VC) that thread into the back of the baseplate. To fit any Modular Baseplate into the mounting bracket you must remove both end caps from the Modular Baseplate. More than one FCP280, FCP270, FCM100Et, or FCM100E Modular Baseplate can be installed into the mounting bracket P0930AY (see Figure 4-10). Only one 2 FCP270 and 2 FEM100 4-Position Baseplate (P0973CN) can be installed into the mounting bracket.

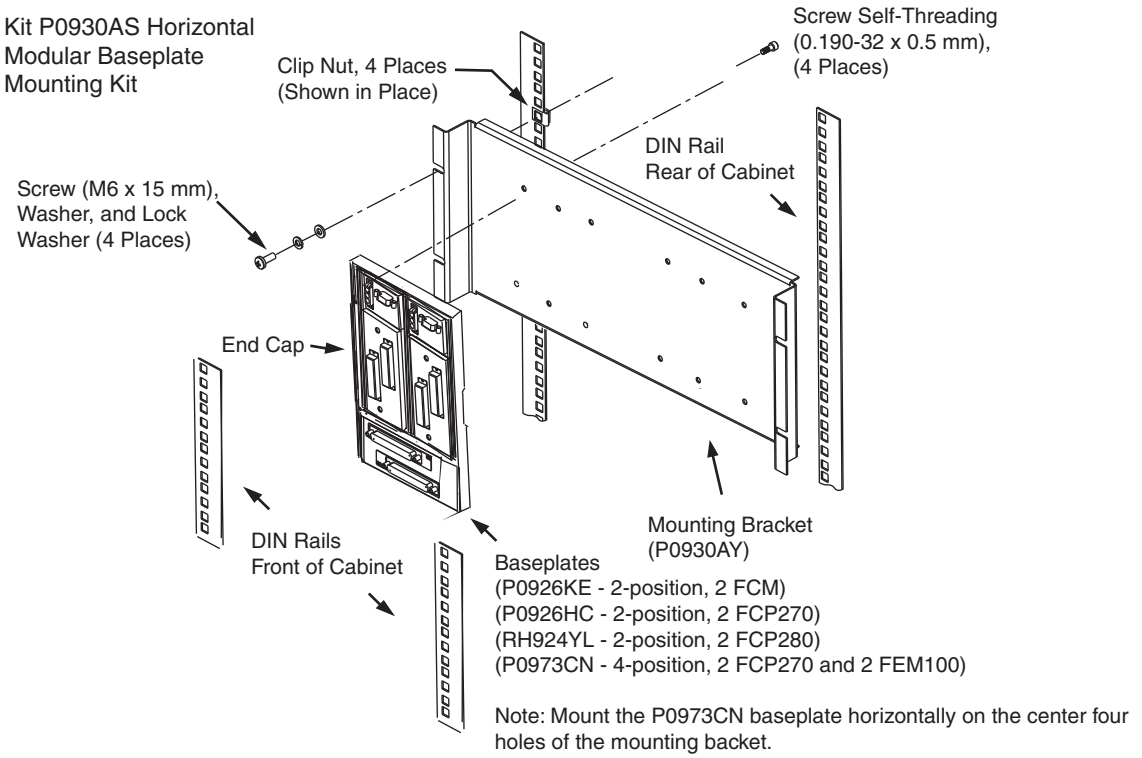


Figure 4-10. Installation of Modular Baseplate Kit in Cabinet

Installing the FPS400-24, 24 V dc Power Supply

Each baseplate receives primary and (optionally) secondary power from the FPS400-24 power supplies.

To install the FPS400-24 power supply (P0922YU or P0922YC), refer to *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA).

Connecting the Modular Baseplate Power

Each baseplate accepts one cable for primary power, and a second cable for secondary power, if applicable. For ease of cable routing, select cables with a slightly greater length than the distance between the baseplate and the power supply.

Cables for connecting the FPS400-24 power supply have a polarized, positive-locking connector on each of the cable for connection between the baseplate and the power supply.

To connect output power cables to the baseplate, refer to *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA).

Installing the FCP280, FCP270, FCM100Et, FCM100E, FEM100 Module(s) and Terminating the Fieldbus

For the FCP280, refer to *Field Control Processor 280 (FCP280) User's Guide* (B0700FW) for information on mounting the FCP280 in the baseplate and connecting the network modules to the control network. Connect one FCP280 baseplate Fieldbus port to the first set of three Q-Crates, and any other Fieldbus port to a second set. Be aware that the FCP280 supports only up to 32 DCS FBMs, 36 Westinghouse modules, or 32 200 Series FBMs or other 200 Series-based competitive migration modules per Fieldbus port.

For the FCP270 with or without an FEM100, refer to *Field Control Processor (FCP270) User's Guide* (B0700AR) for information on mounting the FCP270 (and FEM100) in the baseplate and connecting the FCP270 to the control network. If an FEM100 is used, connect one FEM100 port to the first set of three Q-Crates, and the other port to a second set.

— NOTE

Be aware when selecting the fifth letterbug character with the FEM100, that:
- port 1 excludes 4-9 and A-F,
- port 2 excludes 0-3, 8-9 and A-F,
- port 3 excludes 0-7 and C-F, and
- port 4 excludes 0-9 and A-B.

Any other letter G-Z may be used in the fifth letterbug position. There are no restrictions on the letterbugs in any of the other positions, so any letter or number may be used.

If the control station is a ZCP270, refer to:

- *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA) for instructions on mounting the FCM100Et or FCM100E in the baseplate.
- *Z-Module Control Processor (ZCP270) User's Guide* (B0700AN) to connect the FCM100Et or FCM100E to the ZCP270.

Terminate the control processor/FCM end of the fieldbus:

- For all Modular Baseplates except the FCP280, install a Splitter/Terminator (P0926KW) on the unused connector on the Modular Baseplate (see Figure 4-9 on page 77).
- To terminate Fieldbus port 1 in the FCP280 baseplate end of the HDLC fieldbus (if needed), set **both** the termination DIP switches on the FCP280 baseplate to "ON", as described in "Setting Termination Switches for FCP280 Baseplates" in *Field Control Processor 280 (FCP280) User's Guide* (B0700FW).
  Fieldbus ports 2-4 in the FCP280 baseplate are terminated internally and do not require any external hardware for termination. No action is needed to terminate the FCP280 baseplate end of the HDLC fieldbus for Fieldbus ports 2-4.

The next step is to install the local Fieldbus, see the next section.

Installing the Local Fieldbus

Fieldbus Extender Cards

The local Fieldbus is created by installing the WFBEs (Figure 4-11) in the right-most slot of each Q-Crate and connecting the cards to the baseplate using shielded twisted-pair cables. Up to three Q-Crates are connected to one single or redundant WFCM, or one single or fault-tolerant FCP280, FCP270, or FCM100Et/FCM100E via the baseplate.

The WBFE has two 9-pin connectors on the outer card edge (Figure 4-12). In the first Q-Crate, the top connector is for the cable from the baseplate, on subsequent Q-Crates the top connector is for the cable from the previous Q-Crate. The lower connector accepts the cable to the next Q-Crate on the local Fieldbus.

To install the WFBE modules, proceed as follows:

1. Check the jumper on the card near the backplane connectors.

   The pins should be jumpered on the WFBE that is installed in the last Q-Crate on the local Fieldbus.
2. Remove the jumpers if the WFBE is not going to be installed in the last Q-Crate on the local Fieldbus.
3. Insert the card into the right-most slot in the Q-Crate, which is the slot where the paddle card was installed in the WDPF system.
4. Make sure the card is engaged in the backplane connector and secure the card using the bracket on the bottom front edge of the card.

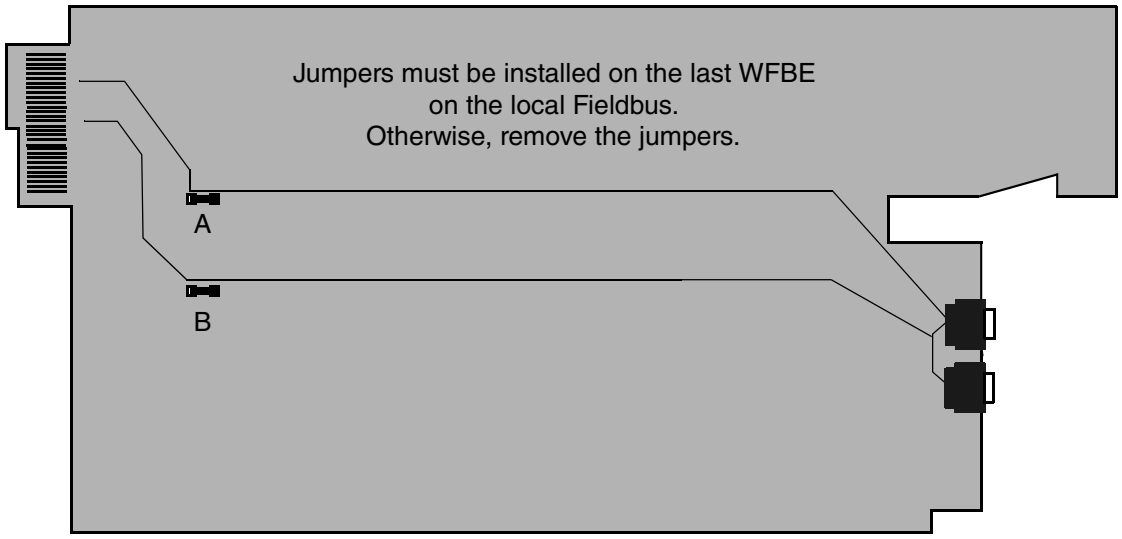


Figure 4-11. Fieldbus Termination Jumpers on the WFBE

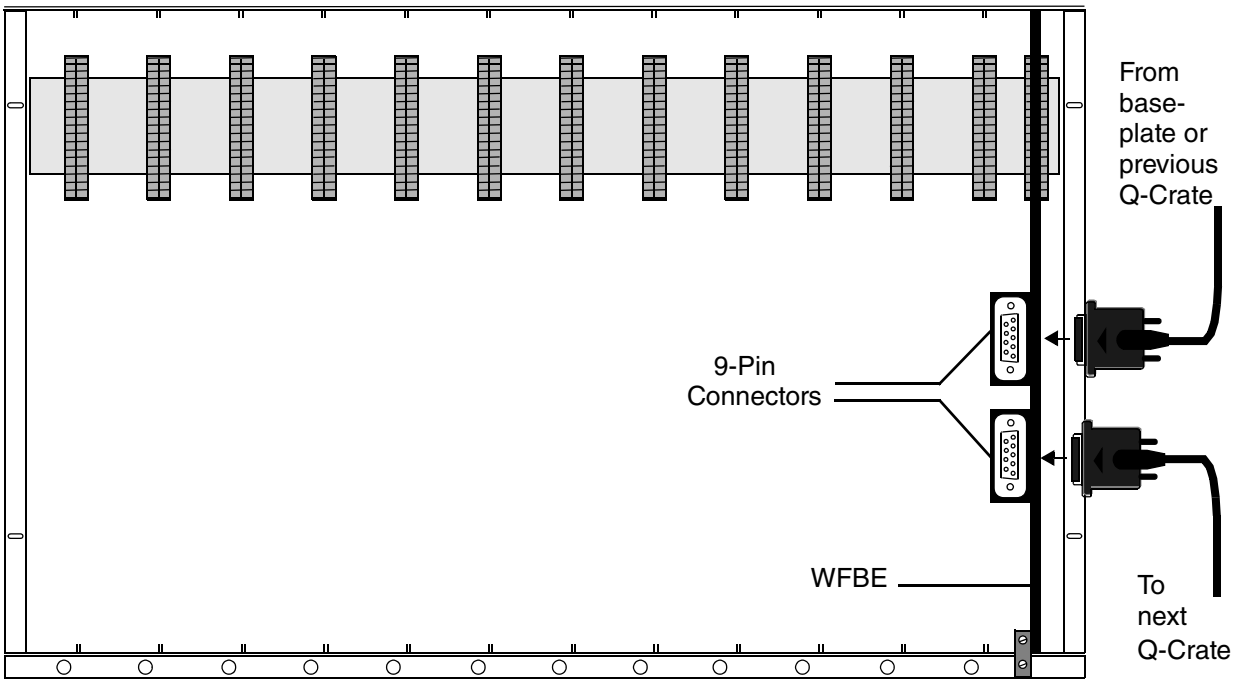


Figure 4-12. WFBE Installed in Q-Crate

Cable Connections

The WFBEs are connected to the baseplate with shielded twisted-pair cables. Three cable lengths are available, as listed in Table 4-3.

Table 4-3. Local Fieldbus Cables

Part Number	Description
P0916MZ	Cable, shielded twisted-pair, 1 meter (3.3 feet)
P0916NC	Cable, shielded twisted-pair, 3 meters (9.9 feet)
P0916NB	Cable, shielded twisted-pair, 5 meters (16.5 feet)

For baseplate P0914XA, there are two female 9-pin connectors on the top edge of the baseplate. The one on the left is for the WFCMs installed in slots 1 and 2. The one on the right is for WFCMs that may be installed in slots 7 and 8.

For Modular Baseplates with FCP270s, FCM100Ets or FCM100Es, there are two female 9-pin connectors on the Modular Baseplate. The one on the left or the right can be used to terminate the Fieldbus or to extend the Fieldbus.

To complete the cable connections, proceed as follows:

1. Refer to the diagram in Figure 4-13, which shows local Fieldbus cabling in an Enhanced DPU cabinet with four Q-Crates.
2. Select a local Fieldbus cable to connect the left connector on the baseplate to the first Q-Crate.
3. Plug the one end of the cable into the baseplate and the other end to the upper connector on the WFBE in the first Q-Crate.

4. Use the other WFBE connector to run a cable to the upper connector of the second Q-Crate.
5. Make a similar connector to the third Q-Crate.
6. If you are installing the DCS Fieldbus subsystem in an Enhanced DPU cabinet, connect the fourth Q-Crate to the WFCMs in slots 7 and 8 using the connector on the right side of the baseplate. The same connector is used to start a local Fieldbus using Q-Crates in an adjacent Expansion cabinet.

   If you are installing FCP280s, use any Fieldbus port on the FCP280 baseplate to start a local Fieldbus using Q-Crates in an adjacent Expansion cabinet.
   If you are installing FCP270s, FCM100Ets or FCM100Es, use the connector on the left or the right of the Modular Baseplate to start a local Fieldbus using Q-Crates in an adjacent Expansion cabinet.
7. Use the captive screws on each cable connector to ensure that the cables are securely fastened to the baseplate and the WFBE modules.

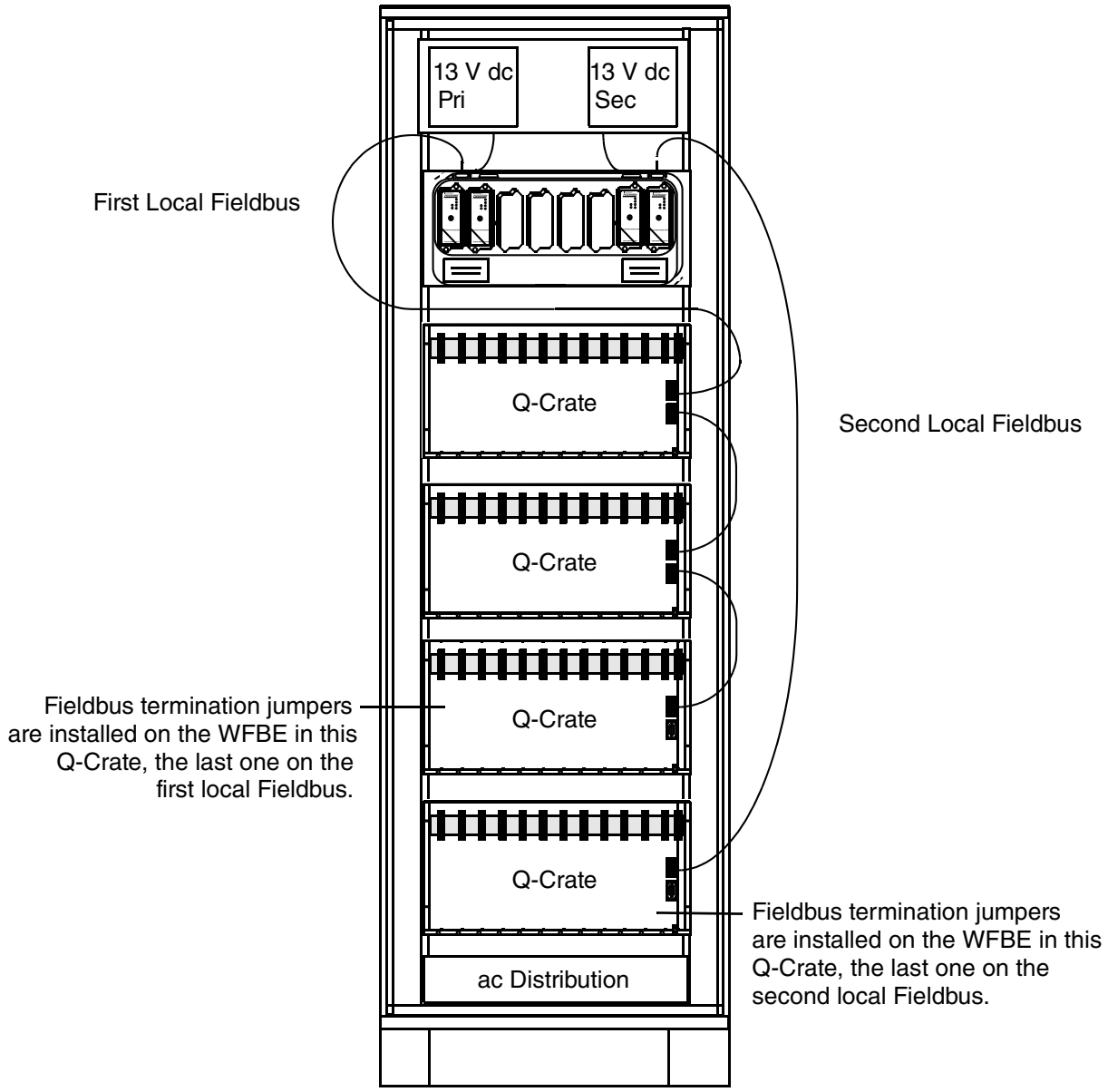


Figure 4-13. Local Fieldbus Cabling in an Enhanced DPU Cabinet

Installing the DCS Fieldbus Modules

The DCS Fieldbus Modules are direct replacements for specific WDPF Q-Cards. The modules plug directly into the Q-Crate slot, attach to the bottom edge of the crate with a bracket similar to that used by the Q-Card, and provide a front card edge connector for the field termination configuration employed in the original system. In addition to installation in the Q-Crate and connection to the field termination assembly, the setup includes installation of letterbugs on the modules and hardware settings for the following:

- Flash options on the WBO09 Series, see page 87
- Relay operation (normally open or normally closed) on the WRO09A and WRO09B, see page 89
- Self-power on the WAWO1E, see page 90
- Configuration of the WAX02A to provide power to the QAXT Terminal Block Sensor, see page 91.

Installing the Letterbugs for the DCS Fieldbus Modules

WFCM Identification Module

The WFCM Identification Module installed below the WFCM (Figure 4-8) and the determines the first four characters of the letterbug for each DCS Fieldbus Module connected to the FCM. The fifth and sixth characters are set with letterbugs installed on the individual module. This two-character set must be unique within the local Fieldbus and can be any combination of characters other than 00.

NOTE

You may want to use a numbering scheme that identifies the modules by crate and slot to ensure that adjacent modules are displayed side-by-side in System Management displays. For example, you can number modules in the first crate from 01 to 12, the second crate from 13 to 24, and so on. Or you can use ranges such as 1A to 1L, 2A to 2L, and so on.

Each letterbug is a small plastic device with a single character embossed on the front surface. Two interlocking letterbugs complete the module identifier and are plugged into a receptacle on the DCS Fieldbus Module. Figure 4-14 shows the position of the letterbug sockets in the upper front corner of a DCS Fieldbus Module.

The rear surface of each letterbug contains pins arranged in a unique configuration corresponding to the character on the front surface. The required sets of letterbugs, as specified per system configurator/autoquote references, are packaged with the DCS Fieldbus Modules.

⚠ CAUTION

It is important to wear a properly connected electrostatic discharge (ESD) wrist strap while removing, handling, and installing the DCS Fieldbus Module cards. Connect the ESD strap to the rack ground bar.
Observe the following points when handling electronic circuitry:
1. Use the static shielding bag supplied with the DCS Fieldbus Module.
2. Ground the bag before opening.
3. Avoid touching the DCS Fieldbus Module circuitry.

To assemble and install module identifiers:

1. Determine the two-character identifier that pertains to the DCS Fieldbus Module.
2. Assemble two letterbugs by inserting the dovetail end of one letterbug into the mating end of the other.
3. Orient the DCS Fieldbus Module as shown in Figure 4-14.
4. Insert the assembled module identifier into the right end of the receptacle on the DCS Fieldbus Module.

   Exercise care, ensuring that the pins properly align with the holes in the receptacle.

NOTE

You can install the first four letterbugs into the letterbug receptacle to label the module with the complete letterbug identifier. Only the fifth and sixth positions are read by the card.

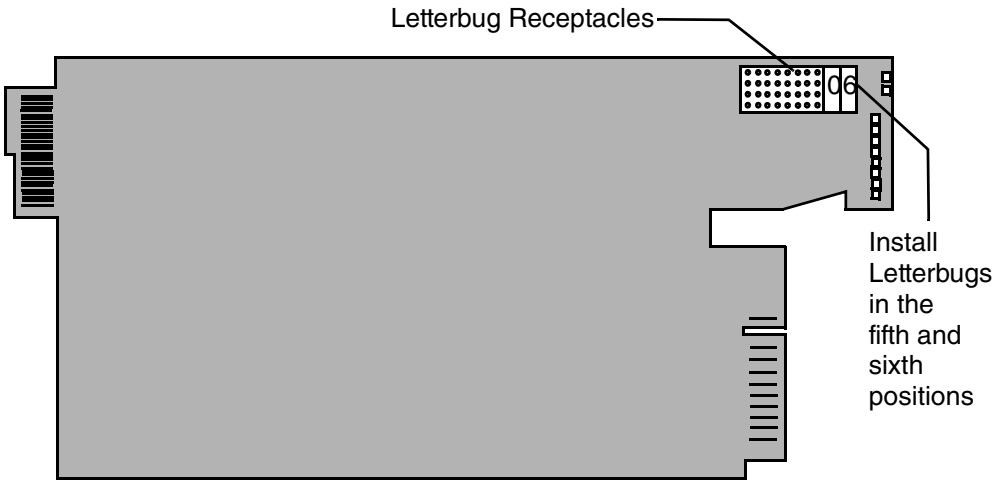


Figure 4-14. Letterbug Receptacles on a DCS Fieldbus Module

FCP280 Letterbugs

The FCP280 uses soft letterbugs that are assigned using the buttons on its faceplate. The two modules in a fault-tolerant pair share the same letterbug. Once assigned, the FCP280 letterbug can be viewed on the Liquid Crystal Display (LCD) on the faceplate of the FCP280. For instructions on configuring this letterbug, refer to "Setting the Letterbug" in *Field Control Processor 280 (FCP280) User's Guide* (B0700FW).

FCP270, ZCP270, FCM100Et and FCM100E Letterbugs

The FCP270, ZCP270, FCM100Et and FCM100E use soft letterbugs that are assigned using the Letterbug Configurator. The two modules in a fault-tolerant pair share the same letterbug. Once assigned, the FCM100Et, FCM100E, ZCP270, and FCP270 letterbugs can be read via the IR port using the Letterbug Configurator, as described in document *Letterbug Configurator USer's Guide* (B0700AY).

WAX01 Series and WAX02A Letterbugs

The WAX01 Series and WAX02A modules feature two sets of six analog input channels, and are seen by the Foxboro Evo system as two distinct FBMs. The modules have two sets of letterbug receptacles in the upper right corner of the card (see Figure 4-15), with the receptacles closer to the top edge of the card for channels 7 through 12, and the lower set for channels 1 through 6.

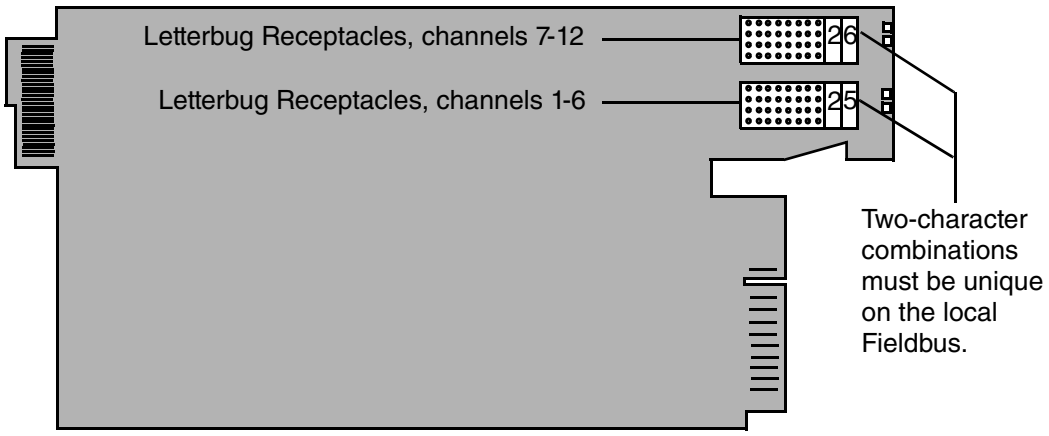


Figure 4-15. WAX01A Series and WAX02A Letterbug Locations

Module Options

WBO09 Series Options

The WBO09A is a 16-channel digital output module that replaces the WDPF QBO-G01 and QBO-G02. The WBO09B is a 16-channel digital output module that replaces the WDPF QBO-G03, QBO-G04, and QBO-G05. On both modules, two banks of eight LEDs illuminate when their respective channels are active. The DCS Fieldbus Module has the same output flash option as the QBO modules. Four rocker switches (Figure 4-16) determine whether the LEDs are continuously illuminated when channels are active or if they flash on and off at a specified rate and duty cycle. A switch is open when the rocker is pushed down on the side marked OPEN. A switch is closed when the rocker is pushed down on the side marked 1 or 2. The switch settings are the same as those on the QBO modules. The WBO09A is shipped with all four switches in the open position.

Before installing a WBO09 Series module, take the following steps:

1. Check the switch settings on the original module, or determine the LED flash option you want with the module.
2. Orient the module as shown in Figure 4-16 and locate the switch package (approximately four inches from the top and left edge of the card).

   The switches are marked A through D in etch on the card to the left of the package.

3. Refer to Table 4-4 to set the switch options.
4. Press the left side of the rocker down to open the switch; press the right side (marked 1 or 2) down to close the switch.

   The flash rate is determined by switches B and C.
5. Continue with installation of the module.

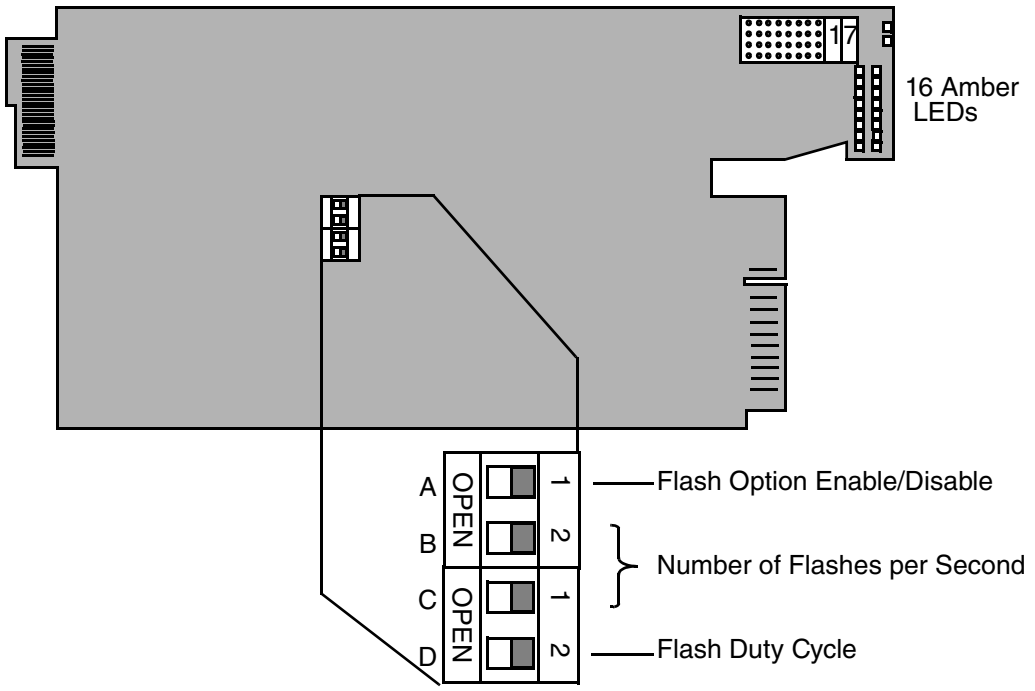


Figure 4-16. Flash Option Switch on the WBO09 Series Module

Table 4-4. WBO09 Series Output LED Flash Option

Flash Enabled		Flash Rate			Duty Cycle	
Switch A	Operation	Switch B	Switch C	Flashes per Sec.	Switch D	Cycle
Open	Steady State	Open	Open	5	Open	33% On/ 67% Off
		Open	Closed (2)	2.5		
Closed (1)	Output Flashing	Closed (1)	Open	1.25	Closed (2)	67% On/ 33% Off
		Closed (1)	Closed (2)	0.625		

WRO09 Series Options

The WRO09A and WRO09B are eight-channel relay output modules that replace QRO Series Q-Cards that interface with mercury-wetted relay output devices. On-board jumpers for each channel determine whether the channel is normally open or normally closed. (The WRO09C replaces QRO-G01 modules that interface with solid-state devices. The WRO09D replaces QRO-G03 modules that interface with solid-state devices. WRO09C and WPO09D are always normally opened.)

On the WRO09A and WRO09B there are eight sets of jumpers are installed in a row as shown in Figure 4-17. The jumper closest to the bottom of the board configures channel 1; the set closest to the top configures channel 8. The jumper positions in each set are perpendicular to each other. When the jumper is parallel to the front card edge, the channel is normally closed. When the jumper is parallel to the top edge, the channel is normally open (Figure 4-17).

Before installing a WRO09A or WRO09B, take the following steps:

1. Check the settings on the original module, or determine the configuration you want for each channel.
2. Orient the module as shown in Figure 4-17 and locate the two jumpers for each channel.
3. Set the jumpers for each channel.
4. Continue with installation of the module.

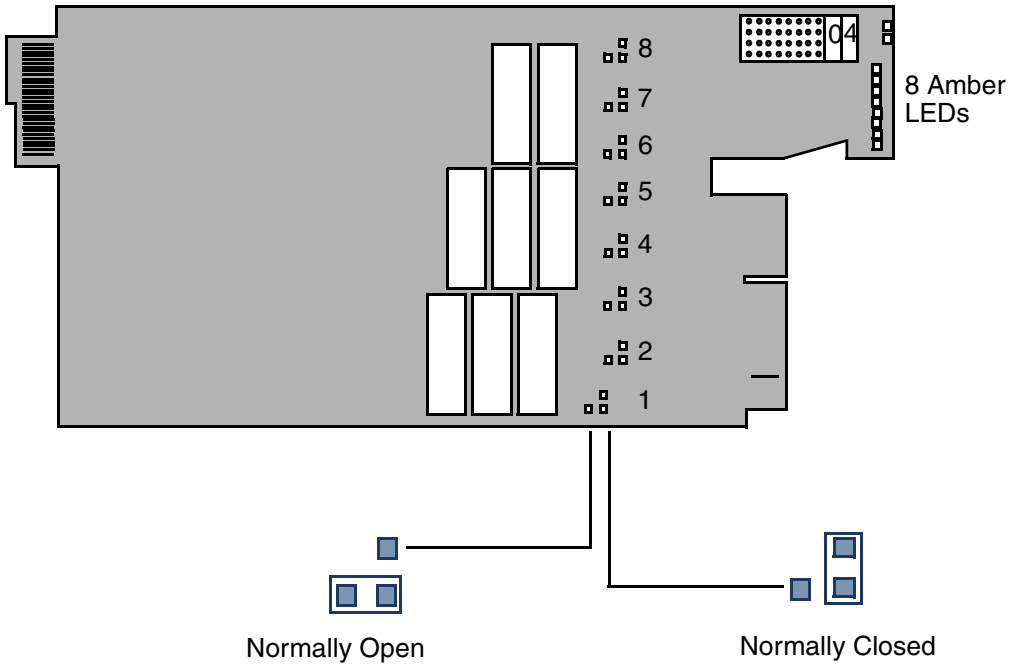


Figure 4-17. Channel Options on the WRO09A and WRO09B

WAW01E Options

The WAW01E is a six-channel 0 to +20 mA Analog Input Module which replaces the QAW-G05. Each channel can be individually configured to use the module's on-board 20 V dc power supply or an external power source. The power source is selected for a channel by jumpering two pins in a set of three. The module is shipped with all six channels configured to use the on-board power source.

To configure the power source for the WAW01E analog input channels:

1. Check the settings on the original QAW-G05 module, or determine the configuration you want for each channel.
2. Orient the WAW01E as shown in Figure 4-18, and locate the six sets of pins.

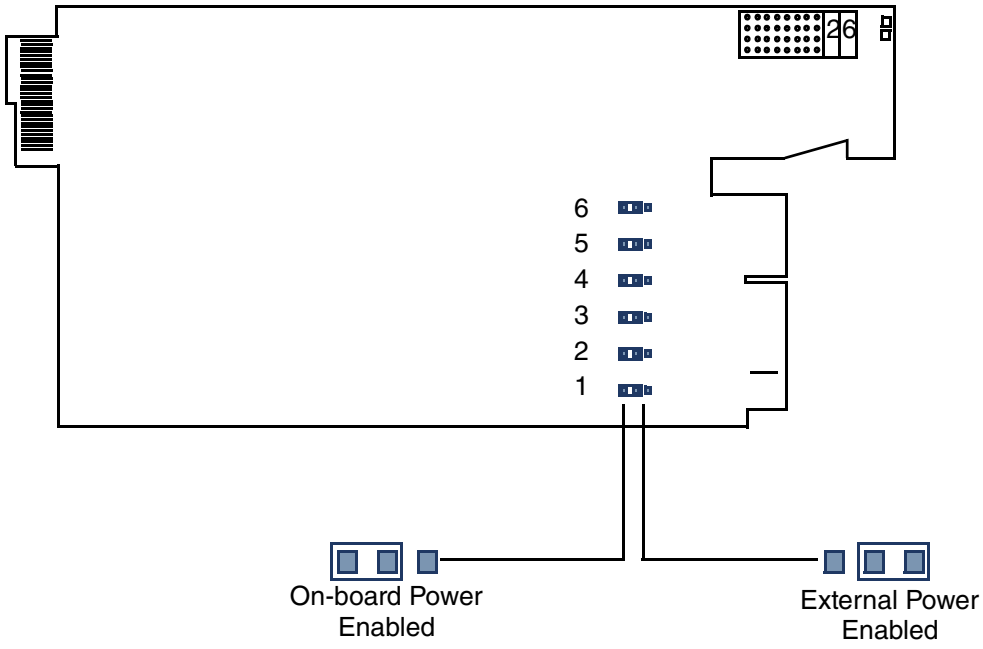


Figure 4-18. Selecting Power Sources on the WAW01E

The sets are arrayed in a row approximately 2.5 inches to the left of the front card edge connectors, with the pins for channel 6 at the top of the row about 4 inches from the top edge of the card and the pins for channel 1 at the bottom of the row 1.5 inches from the edge.

Connecting the left and center pins enables the on-board power option for the channel; connecting the center and right pins configures the channel for external power. The module is shipped with on-board power enabled for each channel.

3. Change the jumpers for these channels using external power.
4. Continue with the installation of the module.

WAX02A and QAXT Terminal Block Sensor

The WAX02A is a 12-channel thermocouple/millivolt input module that replaces QAX Series Q-Cards. The 12th channel can be used to read a QAXT Terminal Block Sensor to provide a reference temperature for the thermocouple input on the other 11 channels. A jumper setting on the WAX02A allows you to have the module to provide power to the QAXT.

The option is selected with three posts and a jumper located near the top center of the module when the card is oriented as shown in Figure 4-19.

A replaceable fuse to the left of the jumper protects the circuit to the QAXT. A yellow LED on the card edge indicates when power is being supplied to the sensor.

To configure the WAX02A to provide power to QAXT:

1. Orient the WAX02A as shown in Figure 4-19, and locate the set of pins.

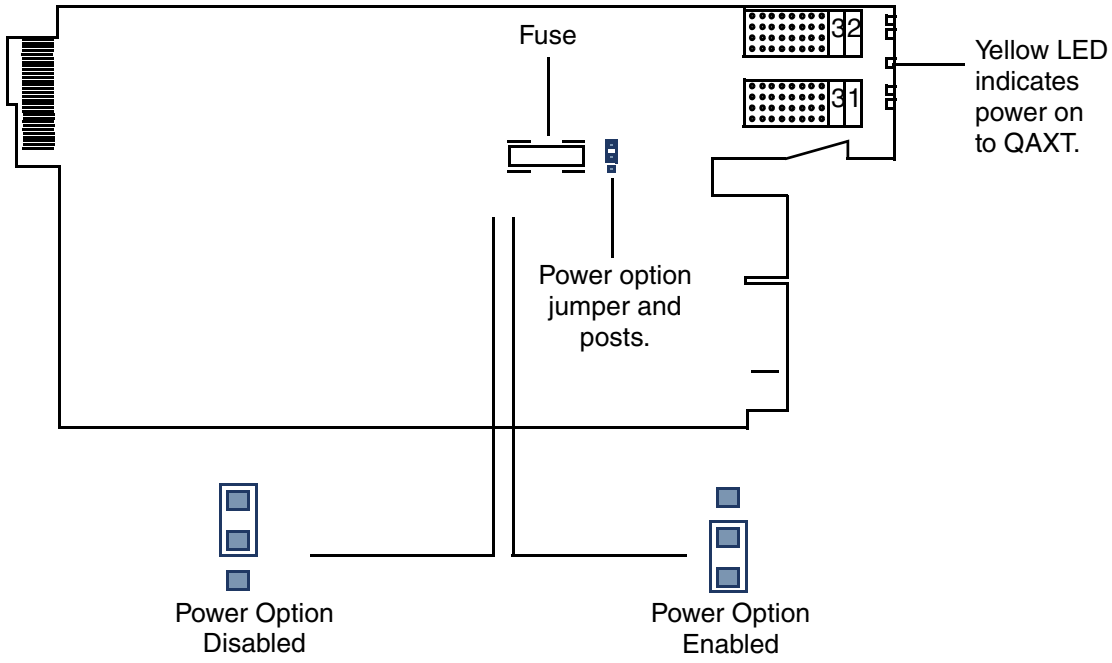


Figure 4-19. Enabling the WAX02A to Provide Power to the QAXT

When the upper and center pins are connected, the WAX02A does not power the QAXT. This is the factory setting. If you are using the 12th channel for thermocouple input, do not change the jumper setting.

2. If you are using the QAXT as a temperature reference, move the jumper to connect the center and lower pins.
3. Continue with installation of the module.

Refer to “Thermocouple Signal Range” on page 47 and “Configuring TC Temperature Compensation RTDs” on page 55 for information regarding the required software configuration for the WAX02A.

Connecting to the Field Terminations

The next step is to plug the DCS Fieldbus Modules into the Q-Crate and attach the field termination edge connector or cable assembly to the front edge of the modules.

To install a DCS Fieldbus Module:

1. Turn the card on edge so that the components are facing to the left and the LEDs and letterbug assembly are in the upper corner closest to you.
2. Slide the card into the Q-crate using the card guides on the top and bottom of the nest.
3. Plug the card into the backplane by giving the card a gentle push.
4. Secure the card to the bottom of the Q-Crate using the small bracket on the left side of the card.
5. Attach the field termination edge connector or cable to the front edge of the module.

Final Installation Operations

Final installation operations include:

- Power Switch On
- On-Line Operation
- Cable Dressing.

⚠ CAUTION

Before applying power to the DCS Fieldbus Module, make sure the outputs of both the primary and secondary power supplies are between +12.9 V and +13.1 V.

Power Switch-On

Power to the equipment racks may be switched on after all associated equipment has been installed. The DCS Fieldbus Modules and WFCMs, FCP280s, FCP270s, FCM100Ets, FCM100Es, FPS-24 and FPS-400 power supplies have status indicators that report operating conditions. When power is first applied, each DCS Fieldbus Module undergoes a power-on self-diagnostic that tests its operating status.

Operating Status

The operating status of the DCS Fieldbus Modules is reported by the Control Core Services software using on-screen messages. Control Core Services software regards each DCS Fieldbus Module subsystem as a cluster of standard 200 Series Fieldbus modules and shows them in a two-level display, which includes the WFCM10E or WFCM10Ef on PIO bus network with other Fieldbus subsystems and its associated DCS Fieldbus Modules displayed on the next level. The DCS Fieldbus Modules are identified by their letterbugs and with the name of their 200 Series FBM equivalents (see Table 6-1 on page 111).

Refer to *System Manager* (B0750AP) and *System Management Displays* (B0193JC) for more information on the reporting of equipment operating status and errors.

LED Indicators

Red and green LED indicators at the front of the DCS Fieldbus Module indicate the operational status of these devices (Figure 4-20).

Amber LED indicators at the front of the DCS Fieldbus Module digital I/O cards indicate the ON/OFF status of each digital channel. Eight-channel digital I/O cards have 8 LEDs. Sixteen-channel digital I/O cards have 16 LEDs.

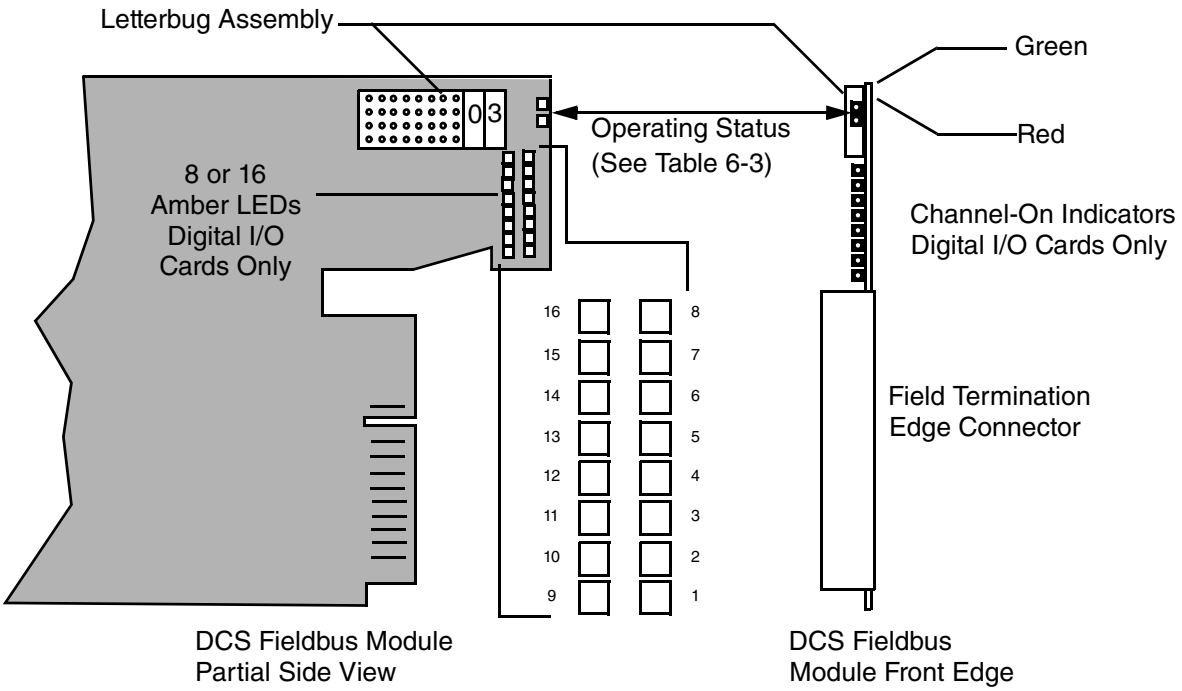


Figure 4-20. DCS Fieldbus Module Operating Status LEDs

The red and green LEDs at the front of each DCS Fieldbus Module provide indications of operating status, as listed in Table 4-5. The LEDs illuminate red and green, respectively, when they are on. They appear white when they are off.

The WAX01 Series and WAX02A modules feature two sets of six analog input channels, and are seen by the Foxboro Evo system as two distinct FBMs. The modules have two pairs of LEDs on the front edge (refer to Figure 4-15). The upper red and green LEDs display the status of channels 7 through 12, and the lower pair indicate the operating status of channels 1 through 6.

In addition to the two pairs of module operation LEDs, the WAX02A has a yellow LED to indicate when the QAXT Temperature Sensor is receiving power from the DCS Fieldbus Module. See Figure 4-19.

Table 4-5. DCS Fieldbus Module Operating Status LEDs

Red LED	Green LED	Status
Off	Off	Power to the card failed.
On	Flashing	Failure detected during start-up diagnostics: RAM test – Green LED flashing once every five seconds indicates a failure in the low byte RAM chip; twice every five seconds indicates a failure in the high byte RAM chip. HDLC, DMA, Timer, and Interrupt Controller tests – Green LED flashing three times every five seconds indicates a failure (an ASIC problem). ROM test – Green LED flashing four times every five seconds indicates a ROM checksum error was detected in the primary or secondary ROM, or in the ROM copy of the Product Data Block. An associated error message is printed on the system alarm printer.
On	On	DCS Fieldbus Module has passed diagnostics and is ready to be brought on-line by the CP. This is the normal off-line functional state.
Off	On	DCS Fieldbus Module is on-line and functional. This is the normal run state.
Off	Flashing	The FBM experienced a break in communications with the Foxboro Evo control station and reverted to its fail-safe mode. Refer to “Fail-Safe Operation” on page 48.

Going On-Line

Once the DCS Fieldbus Module subsystem equipment has been installed and power is applied to the equipment racks, you must bring the subsystem on-line from the workstation with Control Core Services software. You must have already performed integrated control configuration and FixAll, otherwise the System Management Display Handler (SMDH) does not recognize the DCS Fieldbus Module subsystem.

NOTE

Do not perform an EEPROM update for the DCS Fieldbus Module subsystem, as all necessary software has been loaded during manufacturing. For these modules, EEPROM updating is only necessary when specifically required by an Control Core Services software update.

In general, you want to 1) bring the control processor online, then 2) if there is an FCM or WFCM associated with that CP, bring those modules online, and finally 3) bring whatever FBMs you have online.

You must bring the FCM on each DCS Fieldbus Module on-line using the System Manager or SMDH Equipment Change Displays.

- To perform these operations from the System Manager, refer to the "Go On-line and Go Off-line" section of the "Fieldbus Modules" chapter in *System Manager* (B0750AP).
- To perform these operations from the System Management Displays via SMDH, refer to "Go On-Line or Go Off-Line" in *System Management Displays* (B0193JC).

The procedures for bringing the modules on-line vary depending on the type of control processor; FCP280, FCP270, ZCP270, or CP60.

Going On-Line via System Manager

Proceed as follows:

1. Invoke System Manager as described in "Starting System Manager" in *System Manager* (B0750AP).
2. Locate the control processor to which the modules are attached in the Navigation pane (see "Identification of Control Stations, ATSs, and LIs" in *System Manager* (B0750AP)) and expand the node to show the Primary ECB for that control processor. Expand the Primary ECB for the list of FBMs associated with that control processor.
3. For each FBM, right-click the FBM and click **Download**. This action takes the FBM off line, loads the FBM's control configuration from the control station, and brings the FBM back on-line. For the details of this operation, refer to "Download or Reboot" in *System Manager* (B0750AP).
4. For each FBM, right-click the FBM and click **Go On-line**. For the details of this operation, refer to "Go On-line and Go Off-line" in *System Manager* (B0750AP).

Going On-Line with FCP280 or FCP270 via SMDH

If the control processor is an FCP280 or FCP270, follow these steps:

1. At the Control Core Services workstation, click the **System** button in the upper left corner of the FoxView™ screen to display the System Monitor Domains screen.
2. Select the FCP280 or FCP270 to which the modules are attached and click the **CONFIG** button to display the field devices connected to the control station (the PIO BUS display).

   Figure 4-21 shows the configuration of a redundant FCP270 pair (**FCP271/F270 FT**), its Primary ECB (**FCP271/FBM 0**), and a network map showing the FBMs contained in the DCS Fieldbus Modules attached to the station.

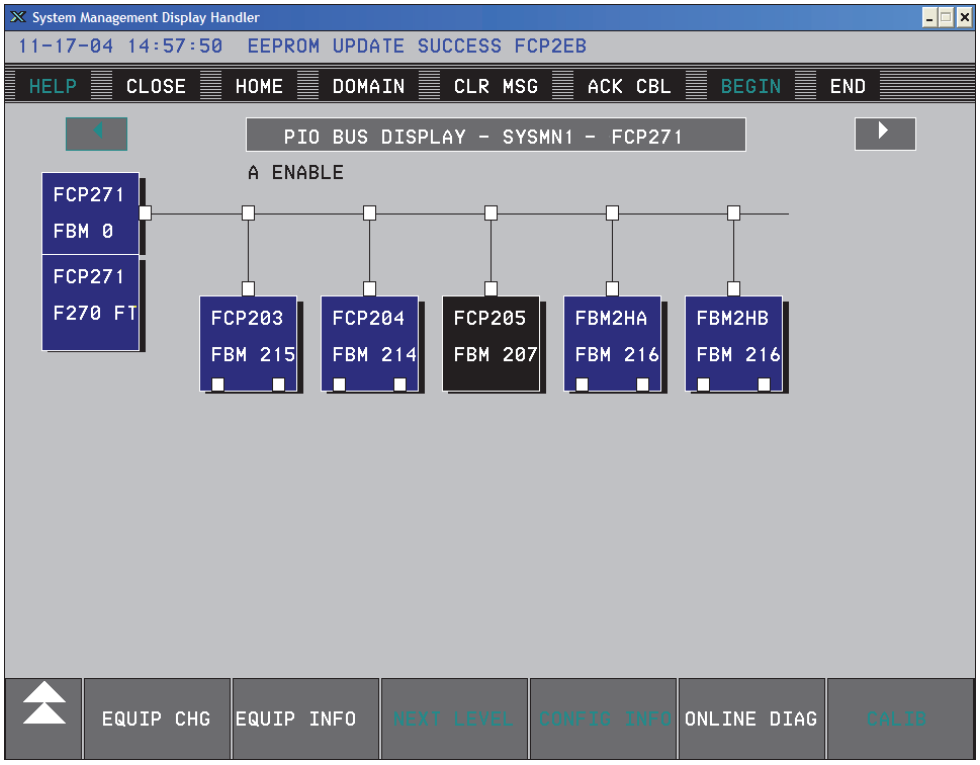


Figure 4-21. PIO Bus Display FCP205 Selected (FCP270 Shown)

3. Do the following to bring the all connected DCS Fieldbus modules on-line at the same time:
   a. Select the Primary ECB (**FCP271/FBM 0** in Figure 4-21) and click the **EQUIP CHG** button to display the equipment change commands.

      The currently enabled actions are displayed in white.

   b. Click **GENERAL DOWNLOAD**.
4. Do the following to bring the modules on-line one at a time:
   a. Select the DCS Fieldbus module (**FCP205** is selected in Figure 4-21) and click **EQUIP CHG** to display the Equipment Change display for the module.

      The currently enabled actions are displayed in white (Figure 4-22).

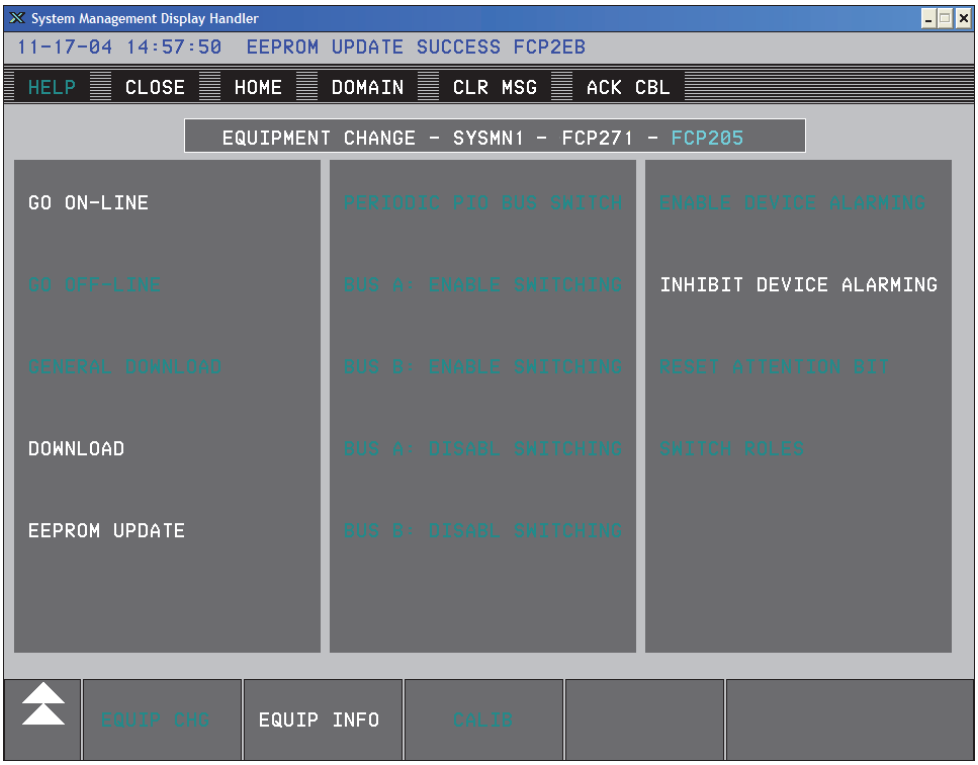


Figure 4-22. Equipment Change Display (FCP270 Shown)

b. Select **GO ON-LINE**.

c. Select an FBM and click **EQUIP INFO** to check its status.

   Refer to Chapter 5 “Process Displays and System Management Displays” for descriptions of the Equipment Information pages for the DCS Fieldbus Modules.

d. Click the double up arrow to return to the PIO Network display and bring the remaining DCS Fieldbus Modules on-line.

Going On-Line with ZCP270 via SMDH

If the control processor is a ZCP270, you must first bring the FCM100Et or FCM100E on-line. To bring these modules on-line via SMDH, proceed as follows:

— NOTE

Information on the FCMs is only behind the ZCP270.

1. At the Control Core Services workstation, click the **System** button in the upper left corner of the FoxView screen to display the System Monitor Domains screen.
2. Select the ZCP270 to which the modules are attached and click the **CONFIG** button to display the FCMs connected to the control station (the PIO BUS display).
3. Select the host FCM100Et or FCM100E and click the **EQUIP CHG** button at the bottom of the screen.
4. Click **GO ON-LINE.**
5. Click **EQUIP INFO** to check the status of the FCM100Et or FCM100E.

6. Click the double up arrow to return to the PIO Bus display.
7. Select the FCM and click **Next Level** to display the attached DCS Fieldbus Modules.

   SMDH displays a PIO BUS display similar to the one in Figure 4-21 with the FCM100Et/FCM100E and its primary ECB shown where the FCP270 and its Primary ECB are depicted.
8. Do the following to bring the all connected DCS Fieldbus modules on-line at the same time:
   a. Select the Primary ECB (*FCM Letterbug*/**FBM 0**) and click the **EQUIP CHG** button to display the equipment change commands.

      The currently enabled actions are displayed in white.
   b. Click **GENERAL DOWNLOAD**.
9. Do the following to bring the modules on-line one at a time:
   a. Select the DCS Fieldbus module and click **EQUIP CHG** to display the Equipment Change display for the module.

      The currently enabled actions are displayed in white (Figure 4-22).
   b. Select **GO ON-LINE**.
   c. Select an FBM and click **EQUIP INFO** to check its status.

      Refer to Chapter 5 “Process Displays and System Management Displays” for descriptions of the Equipment Information pages for the DCS Fieldbus Modules.
   d. Click the double up arrow to return to the PIO Network display and bring the remaining DCS Fieldbus Modules on-line.

As you bring the modules on line, the **Op Status** LEDs on the front of each module indicate the operational status of the module, as described in “Operating Status” on page 111.

Going On-Line with CP60 via SMDH

To bring the DCS Fieldbus Module subsystem on-line with SMDH, proceed as follows:

— NOTE

Information on the FCMs is only behind the CP60.

1. Access the Equipment Change Display for the DCS Fieldbus Module:
   a. Choose **Sys > Sys_Mgmt.** from the Display Manager top menu bar.
   b. Select the appropriate System Monitor.
   c. Click the letterbug of the CP60 to which the DCS Fieldbus Module subsystem is attached.
   d. Click **Config**.

      The SMDH displays the PIO Bus Display in which the WFCM10E or WFCM10Ef modules are identified by letterbug (WES200, for example) and module type (FCM) as shown in Figure 4-23.

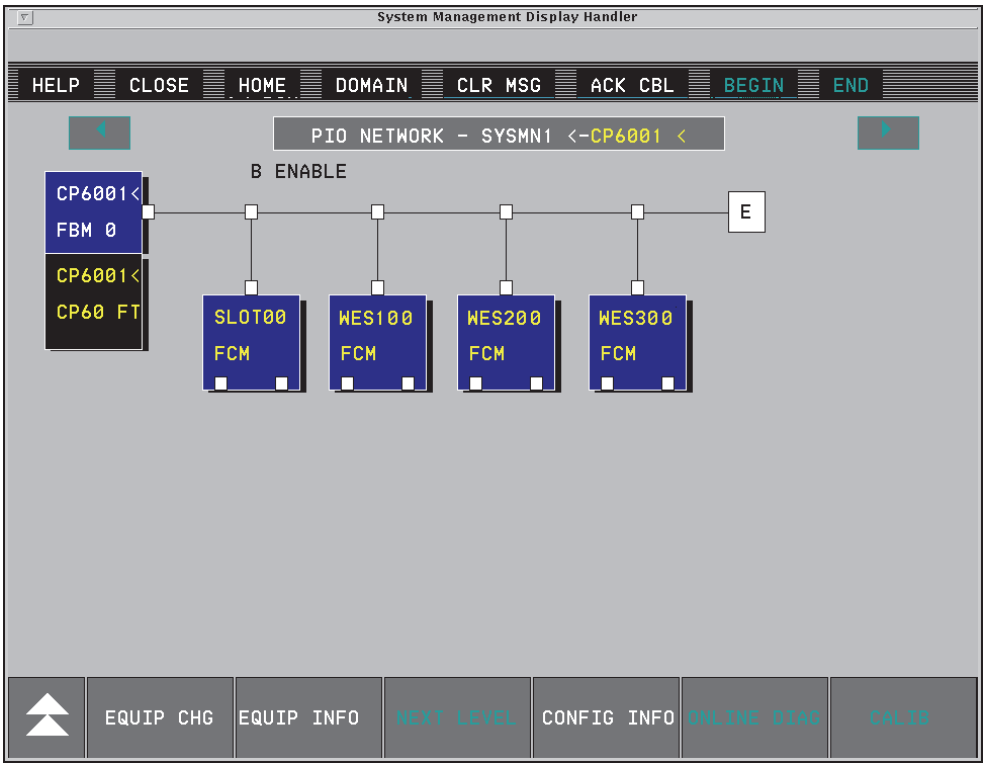


Figure 4-23. PIO Bus Display with WFCM10E (WES200) Selected

2. Select the FCM Module, and click **EQUIP CHG**.

   The action raises the Equipment Change display. The currently enabled actions are displayed in white (Figure 4-24).

Figure 4-24. Equipment Change Display

3. Select **GO ON-LINE**.

   The FCM goes on-line.
4. Click the double up arrow to return to the PIO Network display.
5. Click **NEXT LEVEL** to display the PIO Sub Network, that is, the DCS Fieldbus Modules attached to the selected WFCM10E or WFCM10Ef.
6. For each DCS Fieldbus Module:
   a. Select the module.
   b. Click **EQUIP CHG**.
   c. Click **GO ON-LINE** on the Equipment Change display.
   d. Click the double up-arrow to start another DCS Fieldbus Module.

Cable Dressing

When all DCS Fieldbus Module subsystem equipment has been installed and the subsystem is operational, dress all excess local and remote Fieldbus cables for neatness using the rack wireways.

5. Process Displays and System Management Displays

This chapter provides information on the process displays and System Management displays used with the DCS Fieldbus Module subsystem.

Process Displays

The Foxboro Evo system provides the following types of displays for performance of process control operations:

- Select Screen Display (compound and block overview display)
- Group Displays
- User-Generated Displays
- Block Detail Displays
- Compound Detail Displays
- Station Displays.

For information on these displays, refer to *System Manager* (B0750AP) and *Process Operations and Displays* (B0193MM).

System Management Displays

The System Manager and System Management Display Handler (SMDH) obtain current and historical information about the system, display it, and allow you to intervene in system operations and perform diagnostics. The System Manager and SMDH provide a two-level display of the DCS Fieldbus Module subsystem from which you can select screens for managing the FCM or WFCM (if present), and DCS Fieldbus modules:

- On the CP60, the Fieldbus-level PIO Network display shows the WFCM, along with the host control processor. On the ZCP270, the Fieldbus-level PIO Network display shows the FCM100E or FCM100Et, along with the host control processor.
- A Fieldbus level display (PIO Bus display), which shows the FCP280, FCP270, and connected Fieldbus devices, or the FCM or WFCM and its associated Fieldbus devices.
- The PIO Bus display shows the individual DCS Fieldbus Modules.

Refer to *System Manager* (B0750AP) for detailed information on the use of the System Manager.

Refer to *System Management Displays* (B0193JC) for detailed information on the use of the System Management displays.

PIO Network Display

To access the PIO Network display that includes the FCM:

1. Access the System Monitor display in SMDH.
2. Select the control processor and click **CONFIG**.

   SMDH displays the PIO Network for the selected CP (Figure 5-1).

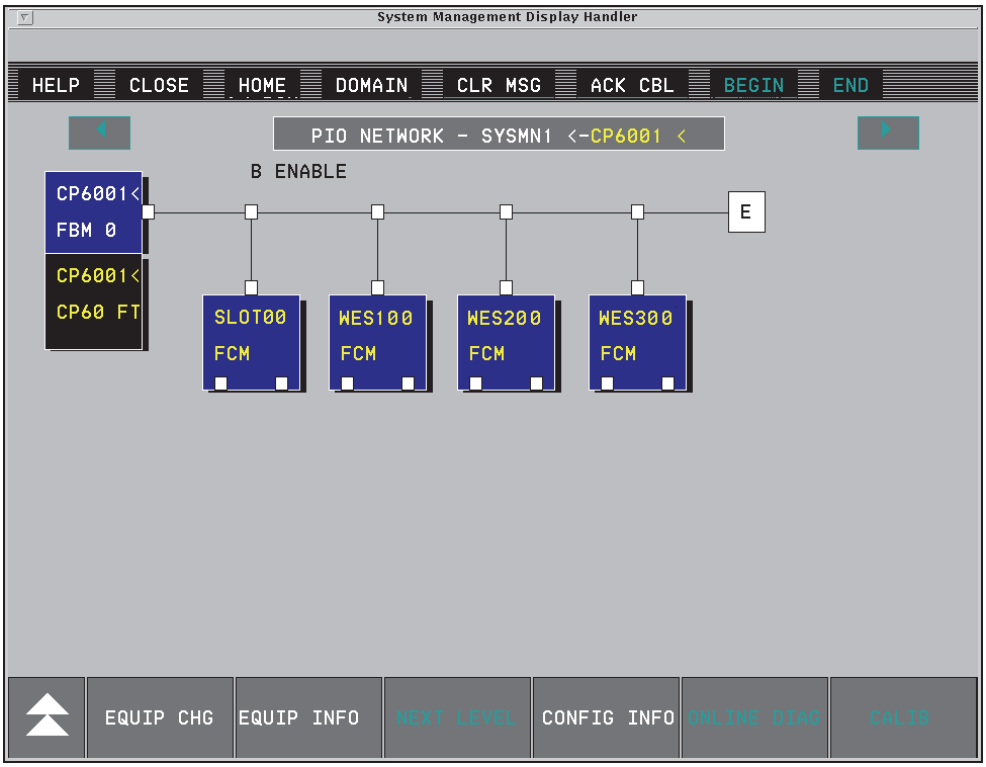


Figure 5-1. Sample PIO Bus Display

The example PIO Network display in Figure 5-1 includes the host control station, a fault-tolerant CP60, and four Fieldbus subsystems connected to the CP via a trunk Ethernet Fieldbus. The subsystems are identified by a blue square with the letterbug (SLOT00, for example) and the device type (FCM). The two white squares along the bottom edge of each FCM icon indicate that another level of display is available. In this example, WES100, WES200, and WES300 are WFCM10Es. The WFCM10Ef is represented in the same way. The white square with the letter E represents the end of the Fieldbus.

3. Select the FCM of interest.

SMDH enables three command buttons at the bottom of the display:

EQUIP CHG	Displays the Equipment Change screen for the selected FCM (Figure 5-2).
EQUIP INFO	Raises the Equipment Information overlay which provides detailed information status and configuration (Figure 5-2).
NEXT LEVEL	Changes to the PIO Sub Network display showing the individual DCS Fieldbus Modules on the local Fieldbus hosted by the FCM.

FCM Equipment Change Display

Figure 5-2 is an example of an Equipment Change display for a WFCM10E or WFCM10Ef. From this display you can:

- Toggle the entire subsystem between on and off-line.
- Download configuration information from the control processor and restart the subsystem.
- Enable or inhibit Device Alarming. When device alarming is enabled, the FCM passes alarms from the DCS Fieldbus Modules and its own alarms to the next higher level, the control processor.

To use this display:

1. Select the FCM and click **EQUIP CHG**.

Figure 5-2. Sample Equipment Change Display for a WFCM10E

The currently enabled command is displayed in white.

2. Click the desired command.

   When you click a toggle command, the command is disabled and its opposite is enabled.

3. Click the double up arrow to return to the PIO Network display.

Equipment Information Overlay

Figure 5-3 and Figure 5-4 show the two parts of a FCM100E or WFCM10Ef Equipment Information display. The single up and down arrows on the lower right allow you to change between to the two parts of the display. The text fields (Name, Type, and so forth) are described in Table 5-1. In the text fields in the FCM Equipment Information display, an A or B indicates that the field pertains to Module A or Module B of the pair. The absence of an A or B indicates that the field pertains to either module.

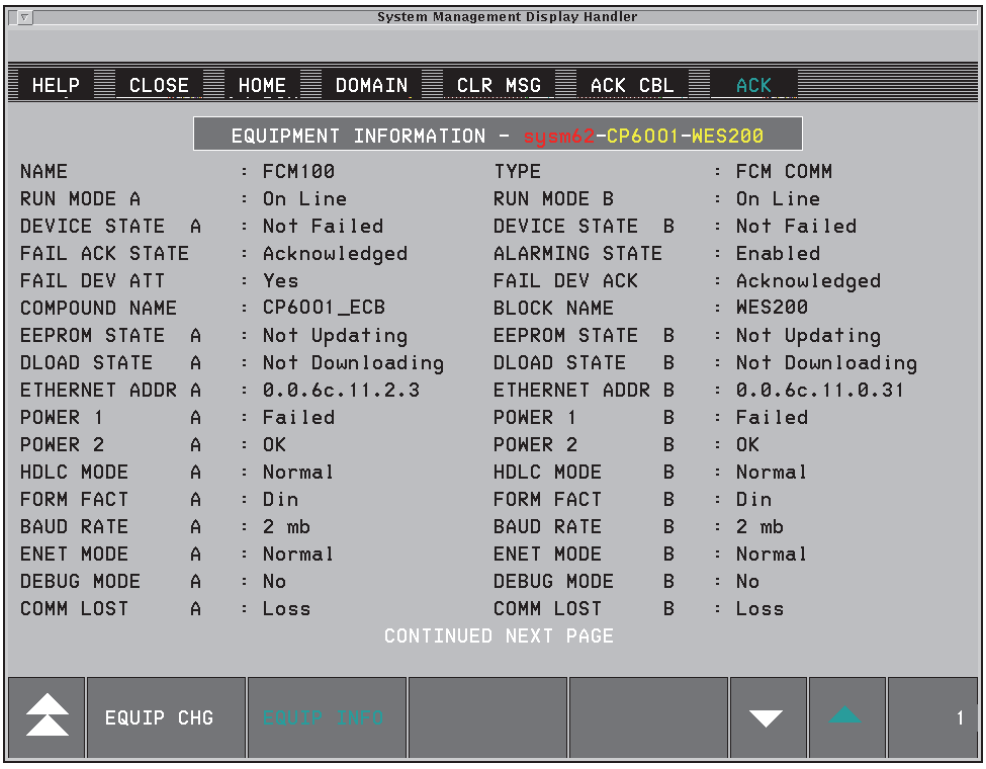


Figure 5-3. FCM Equipment Information Display (1 of 2)

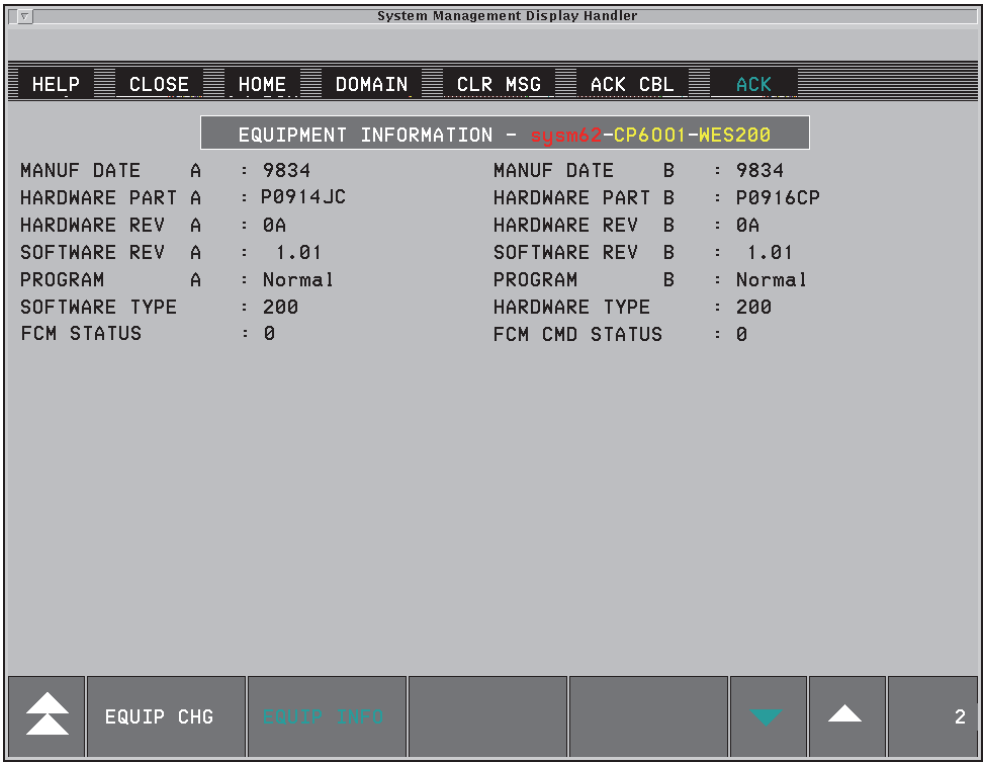


Figure 5-4. FCM Equipment Information Display (2 of 2)

Table 5-1. FCM Equipment Information Display Fields

Field	Explanation
Name	User-supplied ECB name.
Type	User-supplied ECB type descriptor.
Run Mode	On-line or Off-line (as controlled by the operator using the Equipment Change display).
Device State	Failed or not failed. This field is initially not failed. This field changes to failed if hardware problem (including a possible communications cable brake) causes the WFCM10E to fail.
Fail Ack. State	Acknowledged or Not Acknowledged. This field is initially set to Acknowledged. If the DEVICE STATE changes from Not Failed to Failed, the FAIL ACK STATE field changes to Not Acknowledged to indicate this transition, and will remain until the WFCM10E failure is acknowledged by the user.
Alarming State	Indicates whether alarming is Enabled or Inhibited for the device. When alarming is Inhibited, the System Monitor continues to indicate overall system and network health (a green SYS BAR) while equipment is failed or off-line.
Fail Dev. Att.	A device (FBM) connected to the WFCM10E has failed.
Fail Dev. Ack.	Acknowledgement of Fail Dev. Att. (Acknowledgement of a failure in a device attached to the FCM.)
Compound Name	Name of the compound that contains the FCM ECB.

Table 5-1. FCM Equipment Information Display Fields (Continued)

Field	Explanation
Block Name	The text string configured (using ICC) for the ECB's NAME.
EEPROM State	FCM software updating/not updating.
DLOAD State	FCM software downloading/not downloading.
Ethernet Addr.	Network address of the FCM on the Ethernet network.
Power 1, 2	Failed/OK state of associated primary (1) and backup (2) power supplies.
HDLC Mode	0 = normal
Form Fact.	Form factor of FCM.
Baud Rate	Baud rate of associate module Fieldbus.
ENET Mode	0 = normal
Dbug Mode	0 = off
Comm Lost	0 = normal communication, 1 = communication lost
Manuf. Date	Date of FCM manufacture.
Hardwr. Part	Part number of FCM.
Hardwr. Rev.	Hardware revision of FCM.
Softwr. Rev.	Software revision of FCM.
Program	Status of FCM is either Normal or Backup; Backup indicates a problem.
Softwr. Type	User-entered value, as configured with the ICC for the ECB.
Hardwr. Type	User-entered value, as configured with the ICC for the ECB.
FCM Cmd. Status	Hexadecimal value associated with the return status, included in the header of every response from the FCM and the station: Hex value = 1 (bit position set = 0): Command not understood. Hex value = 2 (bit position set = 1): Command understood, but unable to take action. Hex value = 4 (bit position set = 2): Invalid argument.
FCM Status	Hexadecimal value relating to the current FCM status. Typically, the value is 4, indicating the instructions are valid (Bit 2 is set). Listed below are explanations of the bits (set to 1) relating to the FCM status: Bit 0: Set if the FCM status changes. Bit 1: Set of the Diagnostic Register is non-zero. The FCM does not start if this bit is set. Bit 2: Not used. Bit 3: Not used. Bit 4: Not used. Bit 5: Not used. Bit 6: Set only if the FCM is off-line. Bit 7: Set if initialization is taking place.

PIO Sub-Network Display

The PIO Sub-Network display shows the individual DCS Fieldbus Modules in the subsystem and provides access to Equipment Change, Equipment Information, and On-Line Diagnostics displays for each device.

To use the PIO Sub-Network display:

1. Select the FCM in the PIO Network display and click **Next Level**.

   SMDH raises the PIO Sub-Network display (Figure 5-5).

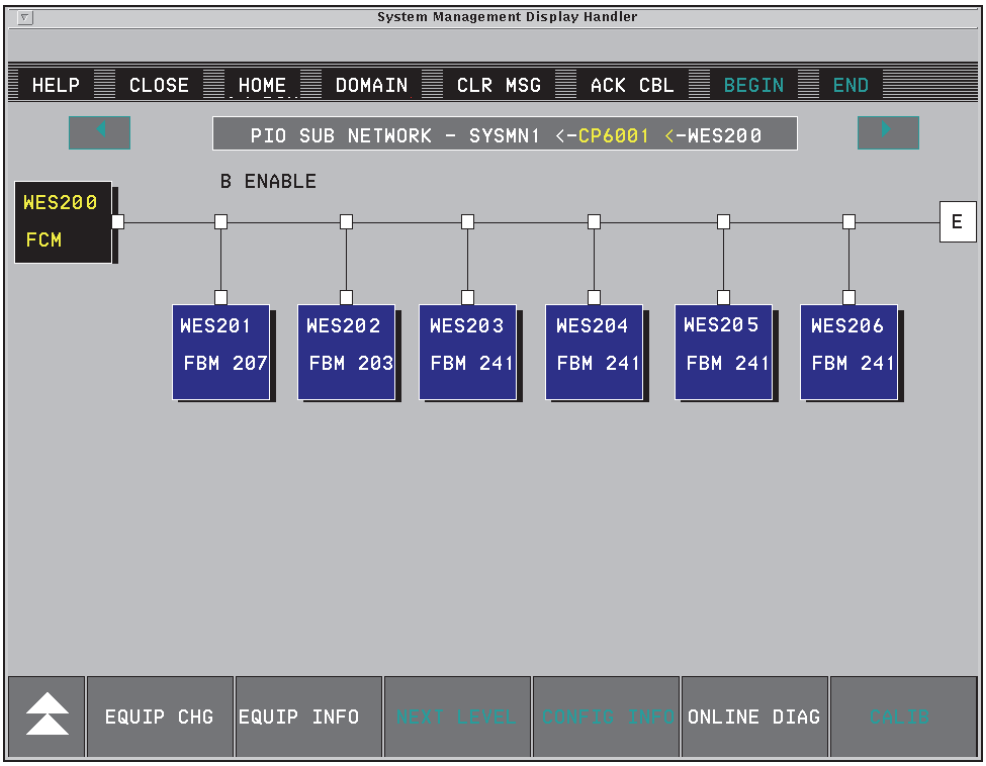


Figure 5-5. PIO Sub-Network Display for DCS Fieldbus Module Subsystem

The selected FCM is displayed on the left and identified by its letterbug and device type (**WES200** and **FCM**, in Figure 5-5). Each DCS Fieldbus Module in the subsystem is represented by a rectangle suspended from the network line and identified by its letterbug and FBM type (**WES201** in Figure 5-5 is an FBM207 equivalent). When the end-of-network symbol (**E** in a white square) does not appear at the right end of the line, click the right-pointing arrow in the upper right corner to scroll the display and view additional devices.

2. Select the DCS Fieldbus Module of interest.

   SMDH enables the command buttons at the bottom of the display:

EQUIP CHG	Displays the Equipment Change display for the selected module (Figure 5-6).
EQUIP INFO	Raises the Equipment Information overlay which provides detailed information status and configuration (Figure 5-7).
ONLINE DIAG	Displays configuration display for on-line diagnostics (Figure 5-8).

FBM Equipment Change Display

The Equipment Change display for a DCS Fieldbus Module (Figure 5-6) is virtually identical to the Equipment Change display for the parent FCM, except that the command applies only to the DCS Fieldbus Module itself and not to the entire subsystem. Refer to “FCM Equipment Change Display” on page 103.

Figure 5-6. Equipment Change Display Selected from a DCS Fieldbus Module

FBM Equipment Information Display

Figure 5-7 is an example of an Equipment Information display of a DCS Fieldbus Module. The display uses text fields (Name, Type, and so forth) used for all other Fieldbus Modules in the Foxboro Evo system. Refer to *System Manager* (B0750AP) or *System Management Displays* (B0193JC).

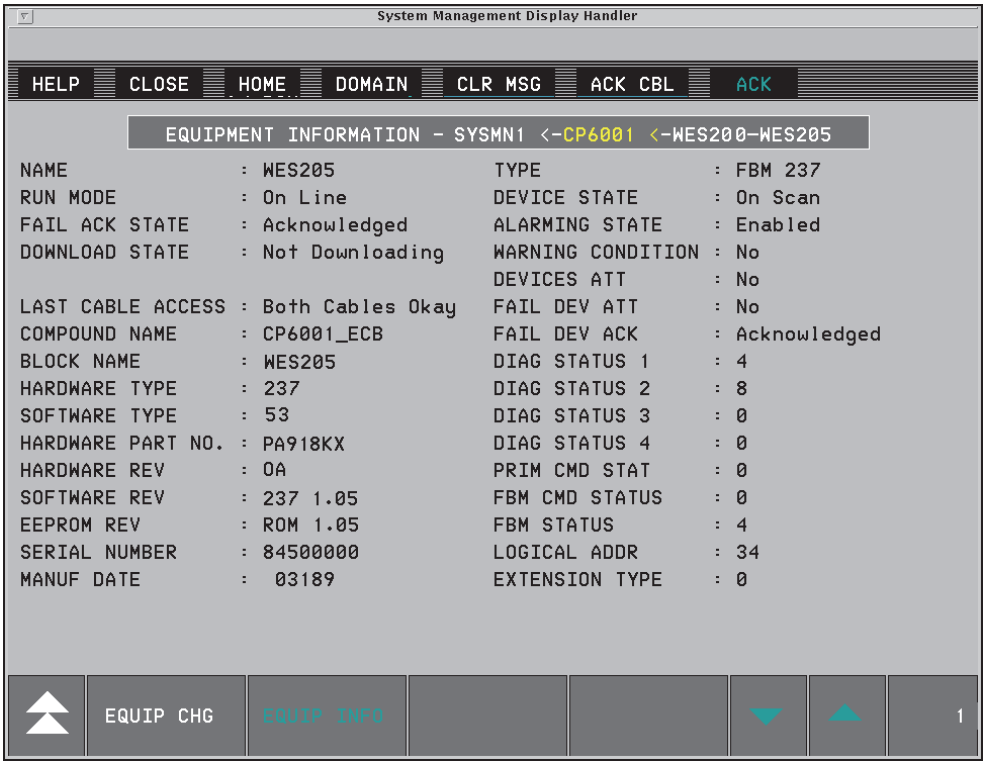


Figure 5-7. Equipment Information Display Selected for an FBM

FBM On-Line Diagnostics

The On-Line Diagnostics display allows you to configure device alarming for each channel.

To use the On-Line Diagnostics display:

1. Select DCS Fieldbus Module in the PIO Sub-Network display.
2. Click **ONLINE DIAG**.

   SMDH raises the On-Line Diagnostics display (Figure 5-8 on page 110).
3. Enable or inhibit Alarming by clicking the appropriate command.

   As set in Figure 5-8 on page 110, alarms are propagated on the B Fieldbus channel but not on the A channel.
4. Click the double up arrows to return to the PIO Sub-Network display.

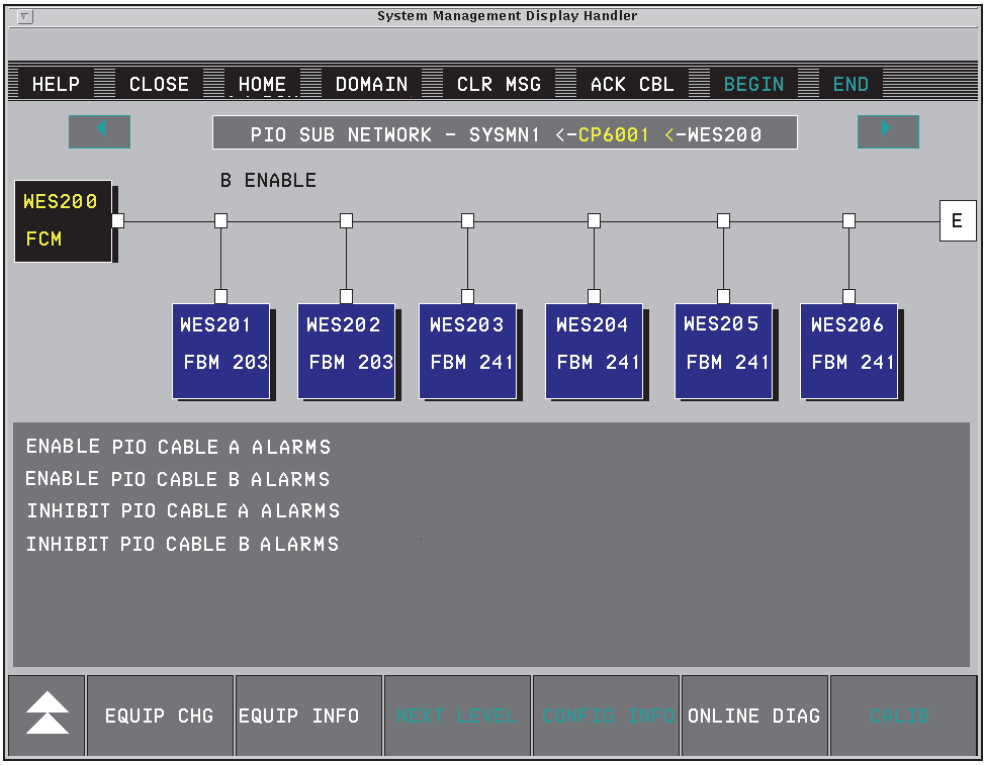


Figure 5-8. On-Line Diagnostics Display for a DCS Fieldbus Module

6. Maintenance

This chapter provides maintenance information for the DCS Fieldbus Module subsystem.

The original maintenance and preventive maintenance philosophies for the WDPF equipment racks, power supplies, and field terminations are maintained. This includes periodic inspection and cleaning, checking the status of LED indicators, and checking for loose cable connections.

For information on maintaining the control processors, refer to the following documents:

- *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA)
- *Field Control Processor 280 (FCP280) User's Guide* (B0700FW)
- *Field Control Processor 270 (FCP270) User's Guide* (B0700AR)
- *Z-Module Control Processor 270 (ZCP270) User's Guide* (B0700AN)
- *Control Processor 60 and Control Processor 60S Installation and Maintenance (DM)* (B0400FB)

Operating Status

The operating status of the DCS Fieldbus Module subsystem is reported by the Control Core Services software using on-screen messages. The Control Core Services software regards each DCS Fieldbus Module as an equivalent 200 Series Fieldbus module (FBM), as listed in Table 6-1.

Table 6-1. DCS Fieldbus Modules and Connectable Points

DCS Fieldbus Module	Equivalent FBM	Valid Points
WAH01A through WAH01D	FBM211	Points 1 through 8, analog inputs
WAI01A through WAI01D	FBM201	Points 1 through 4, analog inputs
WAI02A	FBM202	Points 1 through 4, thermocouple inputs
WAO37A through WAO37E, WAO37G	FBM237	Points 1 through 4, analog outputs
WAO37F	FBM237	Point 1, analog output
WAV02A	FBM202	Points 1 through 6, thermocouple inputs Point 9 for on-board RTD for thermocouple temperature compensation

Table 6-1. DCS Fieldbus Modules and Connectable Points (Continued)

DCS Fieldbus Module	Equivalent FBM	Valid Points
WAW01A through WAW01F	FBM201	Points 1 through 6, analog inputs
WAX01A through WAX01C	Two FBM201s	Points 1 through 6 on two ECBs, analog inputs
WAX02A	Two FBM202s	Points 1 through 6 on two ECBs, thermocouple or millivolt analog inputs Point 6 on second ECB reads QAXT terminal block sensor
WBO09A WBO09B	FBM242	Points 1 through 16, digital outputs
WCI07A	FBM207c	Points 1 through 16, digital inputs
WDI07A through WDI07G	FBM207	Points 1 through 16, digital inputs
WID07A WID07C WID07E WID07G WID07H WID07I WID07J WID07L WID07N WID07P	FBM207	Points 1 through 16, digital inputs
WID07B WID07D WID07F WID07M WID07O	FBM207	Points 1 through 8, digital inputs
WLJ04A through WLJ04C	FBM204	Points 1 through 3, analog inputs Point 4 for readback of the analog output Point 5 for the analog output
WPA06A	FBM206	Points 1 through 4, pulse input
WRF03A WRF03B	FBM203	Points 1 through 6, analog input from 4-wire RTDs
WRO09A through WRO09D	FBM242	Points 1 through 8, digital outputs
WRT03A WRT03B	FBM203	Points 1 through 4, analog inputs
WTO09	FBM242	Points 1 through 8, digital outputs

Refer to *System Manager* (B0750AP) or *System Management Displays* (B0193JC) for information on the reporting of equipment operating status and errors.

LED Indicators

WFCM10E and the WFCM10Ef LED Indicators

LED indicators at the front of the WFCM10E and the WFCM10Ef (Figure 6-1) indicate operational status of the devices. Table 6-2 lists an explanation of the various operational status indicators.

Table 6-2. WFCM10E and WFCM10Ef LEDs

Indicator	Meaning	Troubleshooting/ Repair Action
Operational Status, Run	When illuminated (green), indicates that the FCM is operational.	None required
Operational Status, Fail	When illuminated (red), indicates a problem with the input power, or a fault within the FCM.	Check the power supply output and associated cabling. If the power is OK, replace the FCM.
Fieldbus	When illuminated (amber), indicates communication activity between the FCM and the connected FBMs.	If the LED fails to illuminate, check the local Fieldbus, particularly the connection at the FCM. If the local Fieldbus is OK, replace the FCM.
Ethernet WFCM10E	When illuminated (amber), indicates communication activity between the WFCM10E and the CP60.	If the LED fails to illuminate, check the Ethernet cabling, including the media converters and the connection at the WFCM10E. If these prove OK, replace the WFCM10E.
Fiber WFCM10Ef	When illuminated (amber), indicates communication activity between the WFCM10Ef and the CP60 via the multiport fiber optic converter (hub) and the Ethernet trunk Fieldbus.	If the LED fails to illuminate, check the Ethernet fiber optic cabling and the associated media converters, particularly the connections at hub and the WFCM10Ef. If these prove OK, replace the WFCM10Ef.

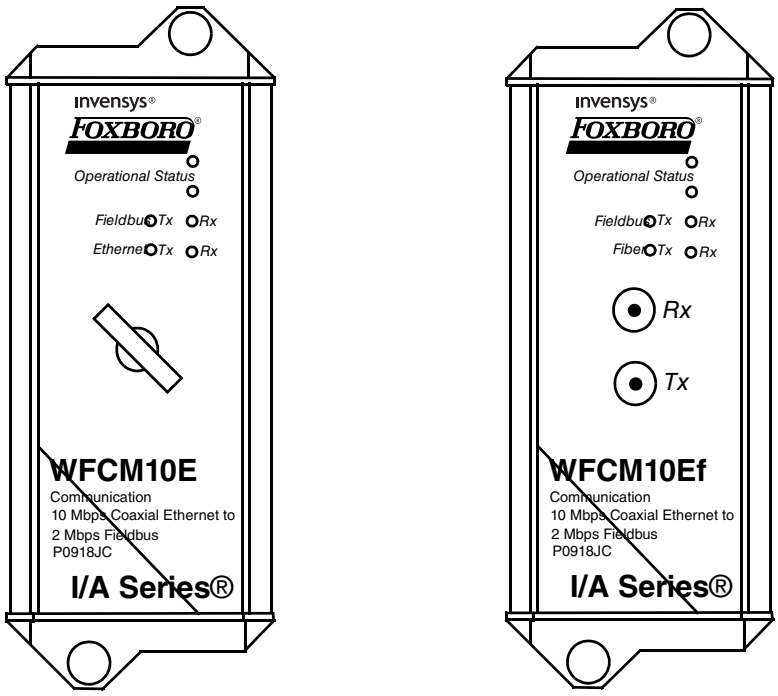


Figure 6-1. WFCM10E and WFCM10Ef LED Indicators

FCM100Et and FCM100E LED Indicators

Refer to the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA) for the FCM100Et and FCM100E LED indicators.

DCS Fieldbus Module LED Indicators

A red and a green LED at the front of each DCS Fieldbus Module (Figure 6-2) provide indications of the operating status, as listed in Table 6-3. The LEDs illuminate red and green, respectively, when they are on. They appear white when they are off.

Table 6-3. DCS Fieldbus Module Operating Status LEDs

Red LED	Green LED	Status
Off	Off	Power to the card failed.
On	Flashing	Failure detected during start-up diagnostics: RAM test – Green LED flashing once every five seconds indicates a failure in the low byte RAM chip; twice every five seconds indicates a failure in the high byte RAM chip. HDLC, DMA, Timer, and Interrupt Controller tests – Green LED flashing three times every five seconds indicates a failure (an ASIC problem). ROM test – Green LED flashing four times every five seconds indicates a ROM checksum error was detected in the primary or secondary ROM, or in the ROM copy of the Product Data Block. An associated error message is printed on the system alarm printer.

Table 6-3. DCS Fieldbus Module Operating Status LEDs (Continued)

Red LED	Green LED	Status
On	On	DCS Fieldbus Module has passed diagnostics and is ready to be brought on-line by the CP. This is the normal off-line functional state.
Off	On	DCS Fieldbus Module is on-line and functional. This is the normal run state.
Off	Flashing	The FBM experienced a break in communication with the Foxboro Evo control station and reverted to its fail-safe mode. Refer to "Fail-Safe Operation" on page 48.

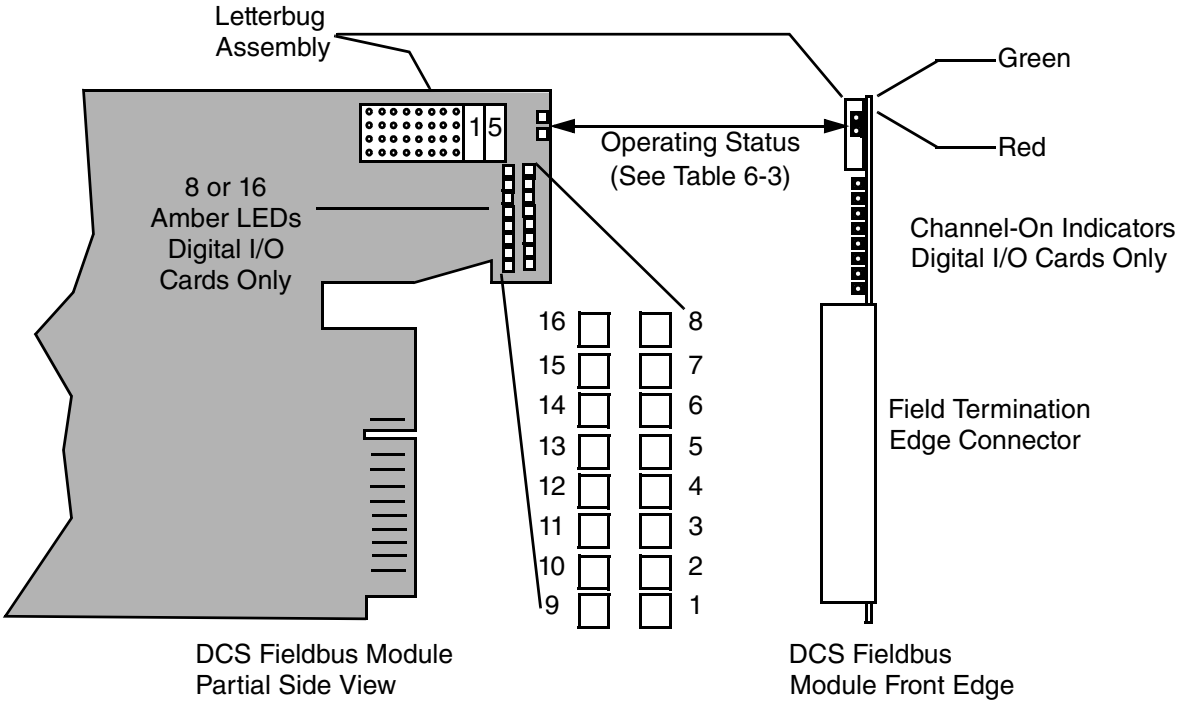


Figure 6-2. DCS Fieldbus Module LED Indicators

On digital input and output modules there are one or two banks of amber LEDs that indicate channel activity. The LED is illuminated when the channel is ON. The channels are numbered from bottom to top, with the channels 1 through 8 closest to the card edge.

The WAX01 Series and WAX02A modules feature two sets of six analog input channels, and are seen by the Foxboro Evo system as two distinct FBMs. The modules have two pairs of LEDs on the front edge (refer to Figure 4-15). The upper red and green LEDs display the status of channels 7 through 12, and the lower pair indicate the operating status of channels 1 through 6.

Control Processor LED Indicators

For information on the control processor's LED indicators, refer to the following documents:

- *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA)
- *Field Control Processor 280 (FCP280) User's Guide* (B0700FW)
- *Field Control Processor 270 (FCP270) User's Guide* (B0700AR)
- *Z-Module Control Processor 270 (ZCP270) User's Guide* (B0700AN)
- *Control Processor 60 and Control Processor 60S Installation and Maintenance (DM)* (B0400FB)

Technical Support

If technical support is needed, call Global Customer Support at 1-866-746-6477 or visit *https://support.ips.invensys.com.*

Module Removal/Replacement

FCMs

Subsystem modules, including the FCM100Et, FCM100E, WFCM10E and WFCM10Ef, can be removed or replaced with power on without causing damage to the modules. Take care to ensure that process operations are not disrupted.

For a redundant FCM module pair, either module in the pair can be removed at any time without disrupting communications. The opposite module immediately assumes full communication functionality.

Control Processors

For information on removing/replacing control processors, refer to the following documents:

- *Field Control Processor 280 (FCP280) User's Guide* (B0700FW)
- *Field Control Processor 270 (FCP270) User's Guide* (B0700AR)
- *Z-Module Control Processor 270 (ZCP270) User's Guide* (B0700AN)
- *Control Processor 60 and Control Processor 60S Installation and Maintenance (DM)* (B0400FB)

Replacing Fuses

There is a single replaceable fuse (3AG type, 0.5 A, fast blo) on the following WID07 Series DCS Fieldbus Modules:

WID07A (5 V dc, 16-point digital input)

WID07C (24 V ac/dc, 16-point digital input)

WID07E (48 V ac/dc, 16-point digital input)

WID07G (120 V ac, 16-point digital input)

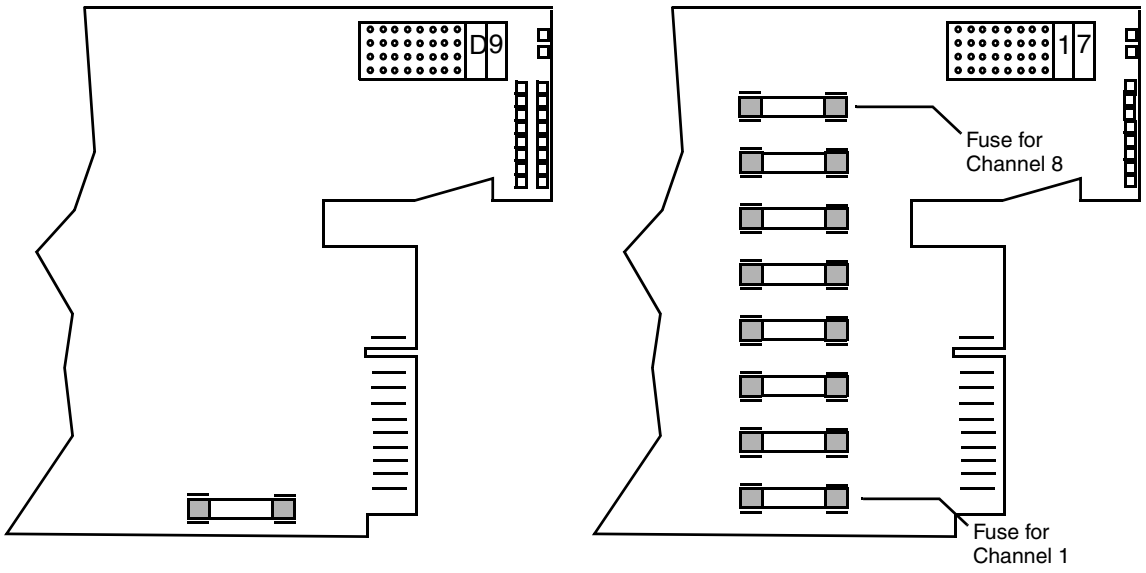
WID07H (12 V dc, 16-point digital input)

WID07I (12 V dc, 16-point digital input)

WID07L (120 V ac, high-threshold, 16-point digital input).

The WTO09 TRIAC output module has eight replaceable fuses (3AG type, 4.0 A, fast blo), one for each channel. The row of fuses is arranged in channel order with the fuse for channel 8 at the top of the card closest to the letterbug receptacle and the fuse for channel 1 at the bottom.

Figure 6-3 has a partial view of both module types to show the location of the fuses.



Location of the replaceable fuse on the WID07 Series modules
3AG type, 0.5 A, fast blo

Location of the replaceable fuses on the WTO09
8 each, 3AG type, 4 A, fast blo

Figure 6-3. Location of Replaceable Fuses on Digital DCS Fieldbus Modules

The WAX02A thermocouple/millivolt input module can be configured to power Westinghouse QAXT Terminal Block Sensor. Refer to “WAX02A and QAXT Terminal Block Sensor” on page 89 for information on setting up the WAX02A to provide QAXT power. The power connection to the external sensor is protected by a 2AG, 0.25A replaceable fuse. A yellow LED on the card edge indicates when the WAX02A is supplying power to the QAXT. The fuse is blown when the power option is enabled and the power is connected to a device other than the QAXT. Figure 6-4 shows the location of the 2AG, 0.25A, fast blo fuse to the left of the power option jumper.

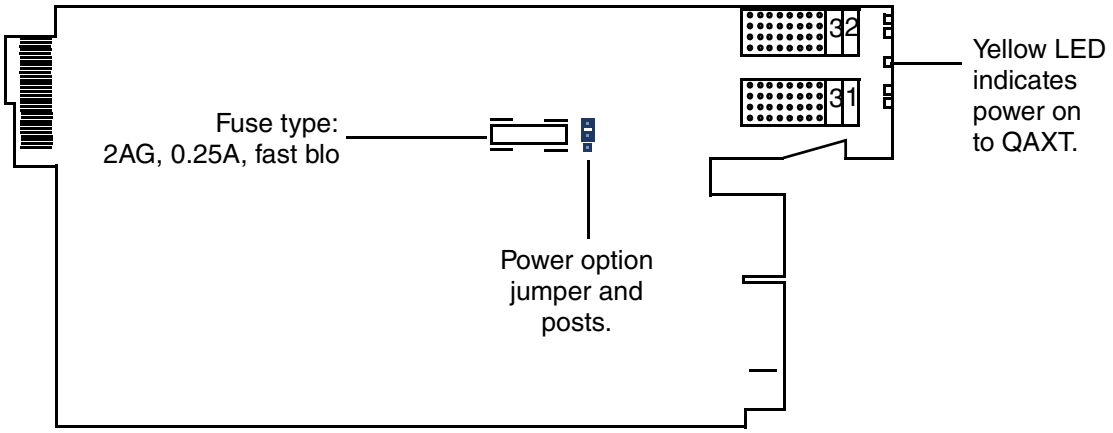


Figure 6-4. Location of the Replaceable Fuse of the WAX02A DCS Fieldbus Module

Module Return Procedure

Contact the Global Customer Support for a Return Authorization Number and the shipping address at 1-866-746-6477 or visit *https://support.ips.invensys.com*.

Appendix A. Hardware Specifications

This appendix provides hardware specifications for the DCS Fieldbus Modules subsystem.

Field Control Processor 280 (FCP280)

For the Field Control Processor 280 (FCP280) hardware specifications, refer to:

- *Field Control Processor 280 (FCP280)* (PSS 31H-1FCP280)
- *Field Control Processor 280 (FCP280) User's Guide* (B0700FW)
- *Standard 200 Series Power Supply -FPS400-24* (PSS 31H-2W3)

The latest revisions of these documents are available through the Global Customer Support at *https://support.ips.invensys.com.*

Field Control Processor 270 (FCP270)

The Field Control Processor 270 (FCP270) connects to the control network via standard fiber optic 100 Mbps Ethernet cable.

The fault-tolerant version of the FCP270 consists of two processor modules. These modules install in adjacent FCP270 slots in a baseplate for high speed communication between the modules. In non-redundant configurations, only a single FCP270 module is required.

The FCP270 connects to the 2 Mbps HDLC fieldbus for communications to all Westinghouse® DCS Fieldbus Modules competitive migration modules.

Up to 32 DCS Fieldbus Modules or 36 Westinghouse modules can be supported per FCP270 (depending on selected scan periods). For more information, refer to the Product Specification Sheet, *Field Control Processor 270 (FCP270)* (PSS 21H-1B9).

The FCP270 can support additional Fieldbus Modules when used with an FEM100 module. For more information, refer to the Product Specification Sheet, *FEM100 Fieldbus Expansion Module* (PSS 31H-2Y14).

FCP270 Module Design

FCP270 modules convert 2 Mbps signals used by the DCS Fieldbus Modules to 100 Mbps fiber optic Ethernet signals used with fiber optic cabling, and vice versa. FCP270 modules have a compact design, with a rugged extruded aluminum exterior for physical protection of the circuits. The FCP270 can be removed and replaced from the baseplate without removing power. LEDs on the front of the FCP270 indicate the status of network activity to/from the associated DCS Fieldbus Modules, the FCP270's operational status and rack power status.

Baseplate Module Mounting

The FCP270 mounts on a baseplate, which is either DIN rail mounted or rack-mounted and includes signal connectors for Fieldbus, power, and I/O cable connections. Modular Baseplates can be selected that support one set of redundant FCP270s or a single (non-redundant) FCP270. 21.6 V dc minimum to 26.4 V dc maximum (single or redundant) is required to power the Modular Baseplate and the FCP270. For more information, refer to the Product Specification Sheet, *Standard 200 Series Power Supply -FPS400-24* (PSS 31H-2W3).

Functional Specifications

Power Requirements

Input Voltage Range (Redundant): 24 V dc nominal (21.6 V dc minimum, 25.2 V dc maximum)

Consumption 8.5 W (maximum) at 24 V dc

Heat Dissipation 8.5 W (maximum) at 24 V dc

Power Monitoring

Primary and backup rack power sources are monitored and alarmed at the system level if either voltage drops below acceptable levels.

Calibration Requirements

Calibration of the module is not required.

Z-Module Control Processor 270 (ZCP270)

For the Z-Module Control Processor 270 (ZCP270) hardware specifications, refer to:

- *Z-Module Control Processor 270 (ZCP270)* (PSS 21H-1B10).
- *Z-Module Control Processor 270 (ZCP270) User's Guide* (B0700AN).
- *1x8 Mounting Structure and 1x8 FBM Mounting Structure* (PSS 21H-5B9 B4).

The latest revisions of these documents are available through the Global Customer Support at *https://support.ips.invensys.com*.

Control Processor 60 (CP60)

For the Control Processor 60 (CP60) hardware specifications, refer to:

- *Control Processor 60* (PSS 21H-1B7 B3)
- *Control Processor 60 and Control Processor 60S Installation and Maintenance* (B0400FB)
- "10, 30, 40, 60 Series Communications and Control Processor Modules" chapter in *Site Planning* (B0193AB).

The latest revisions of these documents are available through the Global Customer Support at *https://support.ips.invensys.com*.

Fieldbus Communication Modules

FCM100Et

The FCM100Et Fieldbus Communications Module is a fiber optic communications interface which allows the DCS Fieldbus Modules to communicate with the Z-Module Control Processor 270 (ZCP270) over extended distances using fiber optic cabling. The FCM100Et provides expanded networking and greater overall cabling distances in a fiber optic network. This configuration is ideally suited for sites in which groups of DCS Fieldbus Modules are to be spread apart over greater distances. FCM100Et modules connect to the control network via the optionally redundant 100 Mbps Ethernet Network. Up to 120 DCS Fieldbus Modules can be supported per the ZCP270 (depending on selected scan periods). Up to 36 DCS Fieldbus Modules can be supported per FCM100Et.

To support redundancy, a pair of FCM100Et modules must be used for each DCS Fieldbus Module grouping. In non-redundant configurations, only a single FCM100Et is required for each grouping. For more information, refer to the Product Specification Sheet, *Z-Module Control Processor 270 (ZCP270)* (PSS 21H-1B10).

FCM100Et Module Design

Fcm100Et modules convert 2 Mbps signals used by the DCS Fieldbus Modules to 100 Mbps fiber optic Ethernet signals used with fiber optic cabling, and vice versa. FCM100Et modules have a compact design, with a rugged extruded aluminum exterior for physical protection of the circuits. The FCM100Et can be removed and replaced from the baseplate without removing power. LEDs on the front of the FCM100Et indicate the status of network activity to/from the associated DCS Fieldbus Modules, the FCM100Et's operational status and rack power status.

Baseplate Module Mounting

The FCM100Et mounts on a baseplate, which is either DIN rail mounted or rack-mounted and includes signal connectors for Fieldbus, power, and I/O cable connections. A baseplate can support up to two sets of redundant (four) FCM100Ets. 21.6 V dc minimum to 26.4 V dc maximum (single or redundant) is required to power the Modular Baseplate and the FCM100Et. For more information, refer to the Product Specification Sheet, *Standard 200 Series Power Supply - FPS400-24* (PSS 31H-2W3).

Functional Specifications

Power Requirements

Input Voltage Range (Redundant): 24 V dc nominal (21.6 V dc minimum, 25.2 V dc maximum)

Consumption 7 W (maximum) at 24 V dc

Heat Dissipation 7 W (maximum) at 24 V dc

Power Monitoring

Primary and backup rack power sources are monitored and alarmed at the system level if either voltage drops below acceptable levels.

Calibration Requirements

Calibration of the module is not required.

FCM100E

The FCM100E Fieldbus Communications Module is a fiber optic communications interface which allows the DCS Fieldbus Modules to communicate with the Z-Module Control Processor 270 (ZCP270) over extended distances using fiber optic cabling. The FCM100E provides expanded networking and greater overall cabling distances in a fiber optic network. This configuration is ideally suited for sites in which groups of DCS Fieldbus Modules are to be spread apart over greater distances. FCM100E modules connect to the control network via the optionally redundant 100 Mbps Ethernet Network. Up to 120 DCS Fieldbus Modules can be supported per the ZCP270 (depending on selected scan periods). Up to 36 DCS Fieldbus Modules can be supported per FCM100E.

To support redundancy, a pair of FCM100E modules must be used for each DCS Fieldbus Module grouping. In non-redundant configurations, only a single FCM100E is required for each grouping. For more information, refer to the Product Specification Sheet, *Z-Module Control Processor 270 (ZCP270)* PSS 21H-1B10.

FCM100E Module Design

FCM100E modules convert 2 Mbps signals used by the DCS Fieldbus Modules to 100 Mbps fiber optic Ethernet signals used with fiber optic cabling, and vice versa. FCM100E modules have the same compact design as the FCM100Et modules, with a rugged extruded aluminum exterior for physical protection of the circuits. The FCM100E can be removed and replaced from the baseplate without removing power. LEDs on the front of the FCM100E indicate the status of network activity to/from the associated DCS Fieldbus Modules, the FCM100E's operational status and rack power status.

Baseplate Module Mounting

The FCM100E mounts on a baseplate, which is either DIN rail mounted or rack-mounted and includes signal connectors for Fieldbus, power, and I/O cable connections. A baseplate can support up to two sets of redundant (four) FCM100Es. 21.6 V dc minimum to 26.4 V dc maximum (single or redundant) is required to power the Modular Baseplate and the FCM100E. For more information, refer to the Product Specification Sheet, *Standard 200 Series Power Supply -FPS400-24* (PSS 31H-2W3).

Functional Specifications

Power Requirements

Input Voltage Range (Redundant): 21 to 42 V dc

Consumption 5 W (maximum)

Power Monitoring

Primary and backup rack power sources are monitored and alarmed at the system level if either voltage drops below acceptable levels.

Calibration Requirements

Calibration of the module is not required.

WFCM10E

The WFCM10E Fieldbus Communications Module is a communications interface which allows the DCS Fieldbus Modules to communicate with the Control Processor 60 (CP60) via an optionally redundant 10 Mbps Ethernet trunk Fieldbus. The WFCM10E converts 10 Mbps Ethernet signals used by the control station to 2 Mbps signals used by the DCS Fieldbus Modules, and vice versa. The WFCM10E also provides galvanic isolation between the 10 Mbps Ethernet trunk Fieldbus and the 2 Mbps local Fieldbus. The WFCM10Es are used in pairs for redundancy.

A WFCM10E (or pair of WFCM10Es) can support up to 36 DCS Fieldbus Modules. WFCM10Es have a compact design, with a rugged extruded aluminum exterior for physical protection of the circuits. Up to 30 WFCM10E pairs can be connected to the Ethernet trunk Fieldbus. Maximum total number of FCMs on one CP60 is 120.

The WFCM10E can be removed and replaced without removing power or communications cabling. Six light-emitting diodes (LEDs) on the front of the WFCM10E Fieldbus Communications Modules indicate the status of network activity to/from the control station and the associated DCS Fieldbus Modules, the operational status of the WFCM10E and rack power status. For redundant configurations, two WFCM10Es are required for each DCS Fieldbus Module grouping. A non-redundant configuration requires a single WFCM for each grouping.

Baseplate Module Mounting

The WFCM10E mounts on a baseplate, which is either DIN rail mounted or rack-mounted and includes signal connectors for Fieldbus, power, and I/O cable connections. A baseplate can support up to two sets of redundant (four) WFCM10Es.

Functional Specifications

Power Requirements

Input Voltage Range (Redundant): 13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)

Consumption: 7 W (maximum) at 13 V dc

Heat Dissipation: 7 W (maximum) at 13 V dc

Power Monitoring

Primary and backup rack power sources are monitored and alarmed at the system level if either voltage drops below acceptable levels.

Calibration Requirements

Calibration of the module is not required.

WFCM10Ef

The WFCM10Ef Fieldbus Communications Module is a fiber optic communications interface which allows the DCS Fieldbus Modules to communicate with the Control Processor 60 (CP60) over extended distances using fiber optic cabling. The WFCM10Ef provides expanded networking and greater overall cabling distances in a fiber optic network. This configuration is ideally suited for sites in which groups of DCS Fieldbus Modules are to be spread apart over greater distances. WFCM10Ef modules are used with multiport fiber optic converters (hubs), which connect to the CP60 via the optionally redundant 10 Mbps Ethernet trunk Fieldbus. Up to six groupings of baseplate-mounted WFCM10Ef modules and DCS Fieldbus Modules can be linked to each optionally redundant hub, for a maximum of 120 DCS Fieldbus Modules per CP60 (depending on selected scan periods).

To support redundancy, a pair of WFCM10Ef modules must be used for each DCS Fieldbus Module grouping. In non-redundant configurations, only a single WFCM10Ef is required for each grouping. Signal transmission distances up to 2 kilometers (1.24 miles) are possible between the WFCM10Ef modules and hubs, providing for wide distribution of the DCS Fieldbus Module equipment groupings. Extended transmission distances using fiber optic cabling are also possible within the groupings, and between the hubs and the CP60.

WFCM10Ef Module Design

WFCM10Ef modules convert 2 Mbps signals used by the DCS Fieldbus Modules to 10 Mbps fiber optic Ethernet signals used with fiber optic cabling, and vice versa. WFCM10Ef modules have a compact design, with a rugged extruded aluminum exterior for physical protection of the circuits. The WFCM10Ef can be removed and replaced from the baseplate without removing power. Six LEDs on the front of the WFCM10Ef indicate the status of network activity to/from the associated DCS Fieldbus Modules, the WFCM10Ef's operational status and rack power status.

Functional Specifications

Power Requirements

Input Voltage Range (Redundant): 13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)

Consumption 7 W (maximum) at 13 V dc

Heat Dissipation 7 W (maximum) at 13 V dc

Power Monitoring

Primary and backup rack power sources are monitored and alarmed at the system level if either voltage drops below acceptable levels.

Calibration Requirements

Calibration of the module is not required.

WFBE Fieldbus Extender Module

The Fieldbus Extender Module for local Fieldbus is a connection from the Foxboro Evo baseplates containing FCM(s) or FCP270(s) to the Q-Bus backplane in the Q-card nest. The WFBE also interconnects the local Fieldbus between Q-card nests and provides local Fieldbus termination.

DCS Fieldbus Modules

WAH01 Series Analog Input Modules

The WAH01 Series consists of differential voltage input interface modules that contain eight group-isolated unipolar and bipolar input channels, each channel accepting a two-wire analog input voltage. Each channel has a differential input to allow voltage differences between channels without introducing errors.

The module performs the signal conversion required to interface the electrical input signals from the field sensors to the optionally redundant Fieldbus. The modules execute an Analog Input application program, which provides the Conversion Time and Rate of Change Limits configurable options. For high accuracy, the module incorporates a multiplexed Sigma-Delta converter shared by all channels, which can provide new analog input readings every 100 ms, and a configurable moving average filter to remove any process noise and power line frequencies. LEDs on the front of the module provide visual status indications of DCS Fieldbus Module functions. The module can be removed/replaced without removing power or communications cabling.

Functional Specifications

Input

Eight group-isolated and independent channels. Table A-1 lists the WAH01 Series modules, their input signal ranges, and the Q-Card equivalents.

Table A-1. WAH01 Series Analog Input Modules

Module	Signal Range	Q-Cards
WAH01A	–10.24 to +10.24 V dc	QAH-G01
WAH01B	–5.12 to +5.12 V dc	QAH-G02
WAH01C	0 to 10.24 V dc	QAH-G03
WAH01D	0 to 5.12 V dc	QAH-G04

Analog Input Accuracy

Accuracy (includes linearity): ±0.03% of span

Accuracy temperature coefficient: ±50 ppm/°C

Communication

The module communicates with its associated WFCM/FCM100Et/FCM100E, or FCP270 via the local Fieldbus.

Power Requirements

Input Voltage Range (Redundant): 13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)

Consumption: 2.5 W (maximum) at 13 V dc

Heat Dissipation: 2.5 W (maximum) at 13 V dc

Calibration Requirements

Calibration of the module is not required.

Input Signal A/D Conversion

Multiplexer converter shared by all channels.

Input Conversion Time (software configurable)

Input signal conversion time specifications for the WAH01 Series modules are shown in Table A-2. **Settling Time** (Column 3) is defined as the value settling within a 1% band of steady state for 10% to 90% input step change.

Table A-2. WAH01 Series Input Signal Conversion

Conversion Time	Update Time	Settling Time	Resolution
50 ms	100 ms	50 ms	15 bits
100 ms	100 ms	125 ms	15 bits
200 ms	100 ms	200 ms	15 bits
500 ms	100 ms	500 ms	15 bits
1000 ms	100 ms	1000 ms	15 bits

Common Mode Input Range

±5 V dc or ac peak channel-to-channel maximum.

Channel Isolation

Each channel has a differential input to allow voltage differences between channels without introducing errors. The channels are not galvanically isolated from each other, but are galvanically isolated from ground and module logic. Differential group isolated inputs use the FBM subsystem power supply for field power. The module withstands, without damage, a potential of 600 V ac applied for one minute between the differential isolated channels and earth (ground).

⚠ CAUTION

The Channel Isolation statement does not imply that these channels are intended for permanent connection to voltages of these levels. Exceeding the limits for input voltages, as stated elsewhere in this specification, violates electrical safety codes and may expose users to electric shock.

WAI02A Thermocouple Input Module

The WAI02A is a channel-isolated thermocouple/mV Input interface that contains four isolated thermocouple input channels.

Each thermocouple/mV channel accepts standard thermocouples for various temperature ranges, and each provides thermocouple burnout detection (up-scale). The inputs are galvanically isolated from other channels and ground. The module performs the signal conversion required to interface the electrical input signals from the field sensors to the optionally redundant Fieldbus. It executes an Analog Input application program, which provides conversion time and Rate of Change Limits configurable options. For high accuracy, the module incorporates Sigma-Delta data conversion on a per channel basis, which can provide new analog input readings every 25 ms, and a configurable moving average filter to remove any process noise and power line frequencies.

LEDs on the front of the module provide visual status indications of DCS Fieldbus Module functions. The module can be removed/replaced without removing power, or communications cabling.

Functional Specifications

Input

Four isolated and independent thermocouple/mV input channels. Inputs are preset to read thermocouple inputs. The range of each individual channel can be re-configured to read ±100 mV.

Input Range

TC Full Range: –10.5 mV dc to +71.42 mV dc (0 to 65535 raw counts)

TC Normal Range: –10.5 mV dc to +69.5 mV dc (0 to 64000 raw counts)

mV Full Range: –105.12 mV dc to +105.12 mV dc (0 to 65535 raw counts)

mV Normal Range: –100 mV dc to +100 mV dc (1600 to 64000 raw counts)

Reference Junction

WAI02A uses external thermocouple temperature compensation provided by Westinghouse "B" Cabinet mounted RTDs that are connected to WRT03 Series modules (refer "WRT03 Series RTD Input Modules" on page 156 for specifications). The user must determine the RTD type used in the "B" Cabinet to properly configure the WRT03 Series inputs. The WRT03 Series input is used as an external reference for the AIN blocks connected to the thermocouple input channels.

Accuracy

Millivolt Input: ±0.03% of span (±27 µV) at 25°C

Thermocouple Conformity: ±0.25°C

Accuracy Temperature Coefficient: ±50 ppm/°C

Differential Input Impedance: 10 M ohms

Common Mode Voltage

Up to 30 V ac or 60 V dc

Power Requirements

Input Voltage Range (Redundant): 13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)

Consumption: 3 W (maximum)

Heat Dissipation: 3 W (maximum)

Communication

The module communicates with its associated WFCM/FCM100Et/FCM100E or FCP270 via the local Fieldbus.

Input Conversion Time (software configurable)

Input signal conversion time specifications for the WAI02A are shown in Table A-3. **Settling Time** (Column 3) is defined as the value settling within a 1% band of steady state for 10% to 90% input step change.

Table A-3. WAI02A Input Signal Conversion

Conversion Time	Update Time	Settling Time	Resolution
50 ms	100 ms	50 ms	15 bits
100 ms	100 ms	125 ms	15 bits
200 ms	100 ms	200 ms	15 bits
500 ms	100 ms	500 ms	15 bits
1000 ms	100 ms	1000 ms	15 bits

Input Open Circuit Voltage

2.5 V dc (mV channels)

Typical Thermocouple Types

B, E, J, K, N, R, S, T, and other millivolt signals

Input Signal A/D Conversion

Each channel performs A/D signal conversion using an independent Sigma-Delta converter.

Calibration Requirements

Calibration of the module is not required.

Channel Isolation

Each channel is galvanically isolated from all other channels and earth (ground). The module withstands, without damage, a potential of 600 V ac applied for one minute between any channel and ground, or between a given channel and any other channel.

⚠ CAUTION

The Channel Isolation statement does not imply that these channels are intended for permanent connection to hazardous voltage circuits. Connection of these channels to voltages greater than 30 V ac or 60 V dc violates electrical safety code requirements and may expose users to electric shock.

WAI01 Series

The channel-isolated WAI01 Series input interface modules contain four isolated input channels. Each channel accepts a 2 wire analog input voltage or 4-20 mA input depending upon the model type. The inputs are galvanically isolated from other channels and ground.

The module performs the signal conversion required to interface the electrical input signals from the field sensors to the optionally redundant Fieldbus. It executes an Analog Input application program, which provides conversion time and Rate of Change Limits configurable options. For high accuracy, the module incorporates Sigma-Delta data conversion on a per channel basis, which can provide new analog input readings every 25 ms, and a configurable moving average filter to remove any process noise and power line frequencies.

LEDs on the front of the module provide visual status indications of DCS Fieldbus Module functions. The module can be removed/replaced without removing power, or communications cabling.

Functional Specifications

Input

Four individually isolated and independent channels: Table A-4 lists the WAI01 Series modules, their signal ranges and the Q-Card equivalents.

Table A-4. WAI01 Series Analog Input Modules

Module	Signal Range	Q-Cards
WAI01A	–512 to +512 mV dc 5 k max source impedance	QAI-G04
WAI01B	–1.02 to +1.02 V dc 10 k max source impedance	QAI-G05
WAI01C	–10.24 to +10.24 V dc 10 k max source impedance	QAI-G06
WAI01D	0 to 20.48 mA	QAI-G07

Accuracy (includes linearity)

±0.03% of span

Accuracy temperature coefficient: ±50 ppm/°C

Communication

Communicates with its associated WFCM/FCM100Et/FCM100E or FCP270 via the local Fieldbus.

Power Requirements

Input Voltage Range (Redundant): 13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)

Consumption: 3 W (maximum) at 13 V dc

Heat Dissipation: 3 W (maximum) at 13 V dc

Calibration Requirements

Calibration of the module is not required.

Input Signal A/D Conversion

Each channel performs A/D signal conversion using an independent Sigma-Delta converter.

Input Signal Conversion (software configurable)

Input signal conversion time specifications for the WAI01 Series are shown in Table A-5. **Settling Time** (Column 3) is defined as the value settling within a 1% band of steady state for 10% to 90% input step change.

Table A-5. WAI01 Series Input Signal Conversion

Conversion Time	Update Time	Settling Time	Resolution
50 ms	100 ms	50 ms	15 bits
100 ms	100 ms	125 ms	15 bits
200 ms	100 ms	200 ms	15 bits
500 ms	100 ms	500 ms	15 bits
1000 ms	100 ms	1000 ms	15 bits

Channel Isolation

Each channel is galvanically isolated from all other channels and earth (ground). The module withstands, without damage, a potential of 600 V ac applied for one minute between any channel and ground, or between a given channel and any other channel.

⚠ CAUTION

The Channel Isolation statement does not imply that these channels are intended for permanent connection to voltages of these levels. Exceeding the limits for input voltages, as stated elsewhere in this specification, violates electrical safety codes and may expose users to electric shock.

WAO37 Series Analog Output Modules

The channel-isolated WAO37 Series output interface modules contains four 0 to 20 mA dc or four unipolar or bipolar analog output channels dependent upon model type. Each output channel drives an external load and produces a 0 to 20 mA or voltage output. WAW04 executes the Analog I/O application program, which provides the following configurable options: Conversion Time, Fail-Safe Configuration (Hold/Fallback), and Analog Output Fail-Safe Fallback Data (on a per channel basis). LEDs on the front of the module provide visual status indications of Fieldbus Module functions.

The module can be removed and replaced without removing field device termination cabling, or power or communications cabling.

Functional Specifications

Output Channels

Four 20 mA dc or unipolar or bipolar analog output channels, except the WAO37F, which has only one channel. Each channel is isolated and independent. Table A-6 lists the seven modules in the series, their signal ranges, and the Q-Cards they replace.

Table A-6. WAO37 Series Analog Output Modules

Module	Signal Range	Q-Cards
WAO37A	0 to 20.48 mA 0-1 k load, 40 V dc internal power	QAO-G01
WAO37B	0 to 10.24 V dc 500 ohm load minimum	QAO-G02
WAO37C	–10.24 to +10.24 V dc 500 ohm load minimum	QAO-G03
WAO37D	0 to 5.12 V dc 500 ohm load minimum	QAO-G04
WAO37E	–5.12 to +5.12 V dc 500 ohm load minimum	QAO-G05
WAO37F	–10.24 to +10.24 V dc 500 ohm load minimum, single output	QAO-G06
WAO37G	0 to 20.48 mA 0-1 k load, 40 V dc external power	QAO-G07

Communication

Communicates with its associated WFCM/FCM100Et/FCM100E or FCP270 via the local Fieldbus.

Power Requirements

Input Voltage Range (Redundant): 13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)

Consumption:

WAO37A, WAO37F, WAO37G: 3.5 W (maximum) at 13 V dc

WOA37B, WAO37C, WAO37D: 7 W (maximum) at 13 V dc

WAO37E: 10 W (maximum) at 13 V dc

Heat Dissipation: 3.5 W (maximum) at 13 V dc

Calibration Requirements

Calibration of the module is not required.

Analog Accuracy:

Accuracy (includes linearity): ±0.05% of span

Accuracy temperature coefficient: ±50 ppm/°C

Output Processing Delay: 30 ms maximum

Resolution: 13 bits

Channel Isolation

Each channel is galvanically isolated from all other channels and earth (ground). The module withstands, without damage, a potential of 600 V ac applied for one minute between any channel and ground, or between a given channel and any other channel.

⚠ CAUTION

The Channel Isolation statement does not imply that these channels are intended for permanent connection to voltages of these levels. Exceeding the limits for input voltages, as stated elsewhere in this specification, violates electrical safety codes and may expose users to electric shock.

WAV02A Thermocouple Input Module

The WAV02A is a channel-isolated thermocouple/mV input interface that contains six isolated thermocouple input channels with on-card temperature compensation. Each thermocouple/mV channel accepts standard thermocouples for various temperature ranges, and provides thermocouple burnout detection (up-scale).

The inputs are galvanically isolated from other channels and ground.

The module performs the signal conversion required to interface the electrical input signals from the field sensors to the optionally redundant Fieldbus. It executes an Analog Input application program, which provides conversion time and Rate of Change Limits configurable options. For high accuracy, the module incorporates Sigma-Delta data conversion on a per channel basis, which can provide new analog input readings every 25 ms, and a configurable moving average filter to remove any process noise and power line frequencies.

LEDs on the front of the module provide visual status indications of DCS Fieldbus Module functions. The module can be removed and replaced without removing power, or communications cabling.

The WAV02A replaces QAV Series modules (601 through 609).

Functional Specifications

Input

Six isolated and independent thermocouple/mV input channels. Inputs are preset to read thermocouple inputs. The range of each individual channel can be re-configured to read ±100 mV.

Input Range

TC Full Range: –10.5 mV dc to +71.42 mV dc (0 to 65535 raw counts)

TC Normal Range: –10.5 mV dc to +69.5 mV dc (0 to 64000 raw counts)

mV Full Range: –105.12 mV dc to +105.12 mV dc (0 to 65535 raw counts)

mV Normal Range: –100 mV dc to +100 mV dc (1600 to 64000 raw counts)

Reference Junction

WAV02A has on-card thermocouple temperature compensation sensor that is mapped into channel 9 in the ECB. On-card thermocouple temperature compensation is only used when thermocouples are directly connected to the card edge termination assembly found typically in remote Q-Line termination cabinets. External thermocouple temperature compensation is provided by “B” Cabinet mounted RTDs that are connected to WRT03 Series modules (see “WRT03 Series RTD Input Modules” on page 156 for specifications).

You must determine the RTD type used in the "B" Cabinet to properly configure the WRT03 Series module inputs. The WRT03 Series module inputs are used as external references for the AIN blocks connected to the thermocouple input channels.

Accuracy

Millivolt Input: ±0.03% of span (±27 µV) at 25°C

Thermocouple Conformity: ±0.25°C

Accuracy Temperature Coefficient: ±50 ppm/°C

Differential Input Impedance: 10 M ohms

Common Mode Voltage: Up to 30 V ac or 60 V dc

Power Requirements

Input Voltage Range (Redundant): 13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)

Consumption 2.5 W (maximum) at 13 V dc

Heat Dissipation 2.5 W (maximum) at 13 V dc

Communication

The module communicates with its associated WFCM/FCM100Et/FCM100E or FCP270 via the local Fieldbus.

Conversion Time (software configurable)

Input signal conversion time specifications for the WAV02A are shown in Table A-7. **Settling Time** (Column 3) is defined as the value settling within a 1% band of steady state for 10% to 90% input step change.

Table A-7. WAV02A Input Signal Conversion

Conversion Time	Update Time	Settling Time	Resolution
50 ms	100 ms	50 ms	15 bits
100 ms	100 ms	125 ms	15 bits
200 ms	100 ms	200 ms	15 bits
500 ms	100 ms	500 ms	15 bits
1000 ms	100 ms	1000 ms	15 bits

Input Open Circuit Voltage

2.5 V dc (mV channels)

Typical Thermocouple Types

B, E, J, K, N, R, S, T, and other millivolt signals

Input Signal A/D Conversion

Each channel performs A/D signal conversion using an independent Sigma-Delta converter.

Calibration Requirements

Calibration of the module is not required.

Channel Isolation

Each channel is galvanically isolated from all other channels and earth (ground). The module withstands, without damage, a potential of 600 V ac applied for one minute between any channel and ground, or between a given channel and any other channel.

⚠ CAUTION

The Channel Isolation statement does not imply that these channels are intended for permanent connection to hazardous voltage circuits. Connection of these channels to voltages greater than 30 V ac or 60 V dc violates electrical safety code requirements and may expose users to electric shock.

WAW01 Series Analog Input Modules

WAW01 Series voltage and current input interface modules contain six individually isolated unipolar input channels, each channel accepting a 2-wire analog input. The inputs are galvanically isolated from other channels and ground.

The modules perform the signal conversion required to interface the electrical input signals from the field sensors to the optionally redundant Fieldbus. The modules execute an Analog Input application program, which provides the Conversion Time and Rate of Change Limits configurable options. For high accuracy, the module incorporates a multiplexed Sigma-Delta conversion on a per channel basis which can provide new analog input readings every 25 ms, and a configurable moving average filter to remove any process noise and power line frequencies. LEDs on the front of the module provide visual status indications of DCS Fieldbus Module functions. The module can be removed and replaced without removing power or communications cabling.

Functional Specifications

Input

Six individually isolated and independent channels. Table A-8 lists the modules, their signal ranges, and the Q-Cards they replace.

Table A-8. WAW01 Series Analog Input Modules

Module	Signal Range	Q-Cards
WAW01A	0 to 1.02 V dc 1 k max source impedance	QAW-G01
WAW01B	0 to 5.12 V dc 5 k max source impedance	QAW-G02
WAW01C	0 to 10.24 V dc 10 k max source impedance	QAW-G03
WAW01D	0 to 20.48 mA Requires external transducer power or self-powered transducer.	QAW-G04
WAW01E	0 to 20.48 mA (jumper-selectable self-powered), 20 V dc minimum at 20 mA, current limit of 40 mA	QAW-G05

Table A-8. WAW01 Series Analog Input Modules (Continued)

Module	Signal Range	Q-Cards
WAW01F	0 to 51.2 mA Requires external transducer power or self-powered transducer.	QAW-G06

Analog Accuracy

Accuracy (includes linearity): ±0.03% of span

Accuracy temperature coefficient: ±50 ppm/°C

Communication

The module communicates with its associated WFCM/FCM100Et/FCM100E or FCP270 via the local Fieldbus.

Power Requirements

Input Voltage Range (Redundant): 13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)

Consumption:

WAW01A/B/C/D/F: 2.5 W (maximum) at 13 V dc

WAW01E: 7.5 W (maximum) at 13 V dc

Heat Dissipation 3 W (maximum) at 13 V dc

WAW01A/B/C/D/F: 2.5 W (maximum) at 13 V dc

WAW01E: 7.5 W (maximum) at 13 V dc, transmitter power selected and inputs at maximum.

Calibration Requirements

Calibration of the module is not required.

Input Signal A/D Conversion

Each channel performs A/D signal conversion using an independent Sigma-Delta converter.

Input Conversion Time (software configurable)

Input signal conversion time specifications for the WAW01 Series are shown in Table A-9. **Settling Time** (Column 3) is defined as the value settling within a 1% band of steady state for 10% to 90% input step change.

Table A-9. WAW01 Series Input Signal Conversion

Conversion Time	Update Time	Settling Time	Resolution
50 ms	100 ms	50 ms	15 bits
100 ms	100 ms	125 ms	15 bits
200 ms	100 ms	200 ms	15 bits
500 ms	100 ms	500 ms	15 bits
1000 ms	100 ms	1000 ms	15 bits

Channel Isolation

Each channel is galvanically isolated from all other channels and earth (ground). The module withstands, without damage, a potential of 600 V ac applied for one minute between any channel and ground, or between a given channel and any other channel.

⚠ CAUTION

The Channel Isolation statement does not imply that these channels are intended for permanent connection to voltages of these levels. Exceeding the limits for input voltages, as stated elsewhere in this specification, violates electrical safety codes and may expose users to electric shock.

WAX01 Series Analog Input Modules

The WAX01 Series modules are channel-isolated voltage input modules that contain 12 isolated unipolar voltage input channels. Each channel accepts a two-wire voltage input. WAX01 Series modules have two sets of six individually isolated channels. Each set has its own separate power and ASIC circuitry and its own letterbug. The card is configured as two separate DCS Fieldbus Modules. Channels 1through 6 of the first set are connected to inputs 1 through 6, and channels 1through 6 of the second set are connected to channels 7 through 12.

The inputs are galvanically isolated from other channels and ground.

The module performs the signal conversion required to interface the electrical input signals from the field sensors to the optionally redundant Fieldbus. It executes an Analog Input application program, which provides conversion time and Rate of Change Limits configurable options. For high accuracy, the module incorporates Sigma-Delta data conversion on a per channel basis, which can provide new analog input readings every 25 ms, and a configurable moving average filter to remove any process noise and power line frequencies. LEDs on the front of the module provide visual status indications of DCS Fieldbus Module functions. The module can be removed and replaced without removing power, or communications cabling.

Functional Specifications

Input

12 isolated and independent voltage input channels. Table A-10 lists the WAX01 Series modules, their signal ranges, and the Q-Cards they replace.

Table A-10. WAX01 Series Analog Input Modules

Module	Signal Range	Q-Card
WAX01A	0 to +1.02 V dc 1 k max source impedance	QAX-G04
WAX01B	0 to +5.12 V dc 5 k max source impedance	QAX-G05
WAX01C	0 to +10.24 V dc 10 k max source impedance	QAX-G05

Analog Accuracy

Accuracy (includes linearity): ±0.03% of span

Accuracy temperature coefficient: ±50 ppm/°C

Power Requirements

Input Voltage Range (Redundant): 13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)

Consumption 5 W (maximum) at 13V dc

Heat Dissipation 5 W (maximum) at 13V dc

Communication

The module communicates with its associated WFCM/FCM100Et/FCM100E or FCP270 via the local Fieldbus.

Input Conversion Time (software configurable)

Input signal conversion time specifications for the WAX01 Series are shown in Table A-11. **Settling Time** (Column 3) is defined as the value settling within a 1% band of steady state for 10% to 90% input step change.

Table A-11. WAX01 Series Input Signal Conversion

Conversion Time	Update Time	Settling Time	Resolution
50 ms	100 ms	50 ms	15 bits
100 ms	100 ms	125 ms	15 bits
200 ms	100 ms	200 ms	15 bits
500 ms	100 ms	500 ms	15 bits
1000 ms	100 ms	1000 ms	15 bits

Input Signal A/D Conversion

Each channel performs A/D signal conversion using an independent Sigma-Delta converter.

Calibration Requirements

Calibration of the module is not required.

Channel Isolation

Each channel is galvanically isolated from all other channels and earth (ground). The module withstands, without damage, a potential of 600 V ac applied for one minute between any channel and ground, or between a given channel and any other channel.

⚠ CAUTION

The Channel Isolation statement does not imply that these channels are intended for permanent connection to hazardous voltage circuits. Connection of these channels to voltages greater than 30 V ac or 60 V dc violates electrical safety code requirements and may expose users to electric shock.

WAX02A Thermocouple Input Module

The WAX02A channel-isolated thermocouple/mV input interface contains 12 isolated thermocouple input channels. Each thermocouple/mV channel accepts standard thermocouples for various temperature ranges, and each provides thermocouple burnout detection (up-scale). The range of each individual channel can be re-configured to read ±100 mV.

WAX02A modules have two sets of six individually isolated channels. Each set has its own separate power and ASIC circuitry and its own letterbug. The card is configured as two separate DCS Fieldbus Modules. Channels 1-6 of the first set are connected to inputs 1 through 6, and channels 1through 6 of the second set are connected to channels 7 through 12. When the WAX02A is used to read thermocouples, channel 12 (channel 6 of the second set) is used to read the QAXT Terminal Block Temperature Sensor located at point 12 on the input termination assembly. See “Reference Junction” on page 138.

The inputs are galvanically isolated from other channels and ground The module performs the signal conversion required to interface the electrical input signals from the field sensors to the optionally redundant Fieldbus. It executes an Analog Input application program, which provides conversion time and Rate of Change Limits configurable options. For high accuracy, the module incorporates Sigma-Delta data conversion on a per channel basis, which can provide new analog input readings every 25 ms, and a configurable moving average filter to remove any process noise and power line frequencies. LEDs on the front of the module provide visual status indications of DCS Fieldbus Module functions. The module can be removed and replaced without removing power, or communications cabling.

The WAX02A replaces QAX Series modules G01, G02 and G03.

Functional Specifications

Input

12 isolated and independent thermocouple/mV input channels. Inputs are preset to read thermocouple inputs. The range of each individual channel can be re-configured to read ±100 mV.

Input Range

TC Full Range: –10.5 mV dc to +71.42 mV dc (0 to 65535 raw counts)

TC Normal Range: –10.5 mV dc to +69.5 mV dc (0 to 64000 raw counts)

mV Full Range: –105.12 mV dc to +105.12 mV dc (0 to 65535 raw counts)

mV Normal Range: –100 mV dc to +100 mV dc (1600 to 64000 raw counts)

Reference Junction

When the WAX02A is used to read thermocouples, channel 12 (channel 6 of the second set) is used to read the QAXT Terminal Block Temperature Sensor connected to point 12 on the input termination assembly. The input is read by using an AIN block connected to channel 12 and used as an external reference for the AIN blocks connected to the other 11 thermocouple input channels. In this configuration the WAX02A card provides the QAXT card with 12 V dc power via the channel 12 shield. Supplying power to the QAXT is a jumper-selectable option. When the jumper is installed in the powered position on the WAX02A, a yellow LED on the WAX02A card edge indicates when power is being supplied to the Temperature

Sensor. The connection is protected by a replaceable fuse on the WAX02A. The ground return is via the "B" Cabinet to "A" Cabinet ground connection.

The range of the channel 12 input is based upon the Westinghouse card group replaced.

G01	Scales to 0.2mV/C for QAX-G01 cards, Standard half-shells. 0 mV at 0°C, 20 mV at 100°C
G02	Scales to 0.5mV/C for QAX-G02 cards, Standard half-shells. 0 mV at 0°C, 50 mV at 100°C
G03	Scales to 1.0mV/C for QAX-G03 cards, Standard half-shells. 0 mV at 0°C, 100 mV at 100°C

Accuracy

Millivolt Input: ±0.03% of span (±27 µV) at 25°C

Thermocouple Conformity: ±0.25°C

Accuracy Temperature Coefficient: ±50 ppm/°C

Differential Input Impedance: 10 M ohms

Common Mode Voltage: Up to 30 V ac or 60 V dc

Power Requirements

Input Voltage Range (Redundant): 13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)

Consumption: 5 W (maximum)

Heat Dissipation: 5 W (maximum)

Communication

The module communicates with its associated WFCM/FCM100Et/FCM100E or FCP270 via the local Fieldbus.

Input Conversion Time (software configurable)

Input signal conversion time specifications for the WAX02A are shown in Table A-12. **Settling Time** (Column 3) is defined as the value settling within a 1% band of steady state for 10% to 90% input step change.

Table A-12. WAX02A Input Signal Conversion

Conversion Time	Update Time	Settling Time	Resolution
50 ms	100 ms	50 ms	15 bits
100 ms	100 ms	125 ms	15 bits
200 ms	100 ms	200 ms	15 bits
500 ms	100 ms	500 ms	15 bits
1000 ms	100 ms	1000 ms	15 bits

Input Open Circuit Voltage

2.5 V dc (mV channels)

Typical Thermocouple Types

B, E, J, K, N, R, S, T, and other millivolt signals.

Input Signal A/D Conversion

Each channel performs A/D signal conversion using an independent Sigma-Delta converter.

Calibration Requirements

Calibration of the module is not required.

Channel Isolation

Each channel is galvanically isolated from all other channels and earth (ground). The module withstands, without damage, a potential of 600 V ac applied for one minute between any channel and ground, or between a given channel and any other channel.

⚠ CAUTION

The Channel Isolation statement does not imply that these channels are intended for permanent connection to hazardous voltage circuits. Connection of these channels to voltages greater than 30 V ac or 60 V dc violates electrical safety code requirements and may expose users to electric shock.

WBO09 Series Discrete Output Modules

The WBO09 Series consists of channel-isolated discrete output interface modules that contain 16 discrete output channels, which are sourced externally. Each output is fully isolated from other channels and ground.

The module interfaces electrical output signals from a control processor to the field devices. It executes a Digital I/O application program, which provides a Fail-Safe Configuration option. LEDs on the front of the module provide visual indication of the module operational status, as well as the discrete states of the individual output points.

The module can be removed and replaced without removing power or communications cabling.

The WBO09A and WBO09B include an output LED flash option. A four-position rocker switch is used to select the rate and duty cycle at which the output and corresponding LEDs on the front of the card flash (Table A-13). Note the switch positions are the same as the original WDPF QBO cards.

Table A-13. WBO09 Series Output LED Flash Option Switch Settings

Flash Enabled		Flash Rate			Duty Cycle	
Switch A	Operation	Switch B	Switch C	Flashes per Sec.	Switch D	Cycle
Open	Steady State	Open	Open	5	Open	33% On/ 67% Off
		Open	Closed (2)	2.5		
Closed (1)	Output Flashing	Closed (1)	Open	1.25	Closed (2)	67% On/ 33% Off
		Closed (1)	Closed (2)	0.625		

Functional Specifications

Output Channels

16 isolated channels. Table A-14 lists the WBO09 Series modules, their signal ranges, and the Q-Cards they replace.

Table A-14. WBO09 Series Discrete Output Modules

Module	Signal Range	Q-Card
WBO09A	60 V dc maximum at 300 mA maximum	QBO-G01 and QBO-G02
WBO09B	20 V dc maximum at 16 mA maximum	QBO-G03, QBO-G04, and QBO-G05

Communication

The module communicates with its associated WFCM/FCM100Et/FCM100E or FCP270 via the local Fieldbus.

Power Requirements

Input Voltage Range (Redundant): 13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)

Consumption

WBO09A: 3 W (maximum) at 13 V dc

WBO09B: 3 W (maximum) at 13 V dc

Heat Dissipation

WBO09A: 14 W (maximum) at 13 V dc, all outputs on at maximum load current.

WBO09B: 3 W (maximum) at 13 V dc, all outputs on at maximum load current.

Calibration Requirements

Calibration of the module is not required.

Applied Voltage

WBO09A: 60 V dc (maximum) at 300 mA maximum load current

WBO09B: 20 V dc (maximum) at 16 mA maximum load current

On-State Voltage Drop

WBO09A: 2 V (maximum) at 300 mA

WBO09B: 0.5 V (maximum) at 16 mA

Off-State Leakage Current

WBO09A: 0.5 mA (maximum)

WBO09B: 0.1 mA (maximum)

Inductive Loads

WBO09A Module is equipped to handle inductive loads.

Channel Isolation

Each channel is galvanically isolated from each other channel and earth (ground). The module withstands, without damage, a potential of 600 V ac applied for one minute between any channel and ground, or between a given channel and any other channel.

⚠ CAUTION

The Channel Isolation statement does not imply that these channels are intended for permanent connection to voltages of these levels. Exceeding the limits for input voltages, as stated elsewhere in this specification, violates electrical safety codes and may expose users to electric shock.

WCI07A Contact Input Module

The WCI07A is a channel-isolated contact sense input interface module that functions as a 16-channel contact sensor. Each channel accepts a two-wire input from a pair of contacts or solid state switches. The 16 single-ended contact sensor inputs share a common 48 V dc on-board power supply and a common return line. Each discrete input is optically isolated from logic ground. The module performs signal conversion required to interface electrical input signals from field sensors to the optionally redundant Fieldbus. It executes a Discrete Input program, ladder logic program, Pulse Count Inputs or Sequence of Events Monitor program, all with configurable options of Input Filter Time and Fail-Safe Configuration. LEDs on the front of the module provide visual indication of the DCS Fieldbus Module operational status, as well as the discrete states of the individual input points. The module can be removed and replaced without removing power, or communications cabling.

WCI07A is designed to replace the following Q-Cards: QCI-G01, QCI-G02, QSE-G01, and QSE-G02.

Functional Specifications

Input

16 single-ended independent contact input channels.

Communication

The module communicates with its associated WFCM/FCM100Et/FCM100E or FCP270 via the local Fieldbus.

Power Requirements

Input Voltage Range (Redundant): 13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)

Consumption: 3.5 W Maximum at 13 V dc

Heat Dissipation: 5 W Maximum at 13 V dc all channels on at maximum load.

Calibration Requirements

Calibration of the module is not required.

Filter/Debounce Time

Configurable (4, 8, 16, or 32 ms)

Loop Power Supply Protection

On-card 48 V dc power supply is current-limited at each channel to 2.5 mA maximum.

Contact Sensor Function

Input Range (each channel): Contact open (off) or closed (on)

Open-Circuit Voltage: 48 V dc ±15%

Short-Circuit Current: 2.5 mA (maximum)

On-State Resistance: 1.0 k ohm (maximum)

Off-State Resistance: 100 k ohm (minimum)

Channel Isolation

Each channel is optically isolated from earth (ground). The module withstands, without damage, a potential of 600 V ac applied for one minute between any channel and ground.

⚠ CAUTION

The Channel Isolation statement does not imply that these channels are intended for permanent connection to voltages of these levels. Exceeding the limits for input voltages, as stated elsewhere in this specification, violates electrical safety codes and may expose users to electric shock.

WDI07 Series Contact Input Modules with External Supply

The WDI07 Series of channel-isolated input interface modules that provide 16 channels of contact sensor input. Each channel accepts a two-wire input from a pair of contacts or solid state switches. Inputs include 5, 12, 24, 48, or 120 Volts. Each single-ended discrete input is optically isolated from logic ground and shares a common return line.

The module performs signal conversion required to interface electrical input signals from field sensors to the optionally redundant Fieldbus. It executes a Discrete Input or Ladder Logic program, with configurable options of Input Filter Time and Fail-Safe Configuration. LEDs on the front of the module provide visual indication of the DCS Fieldbus Module operational status, as well as the discrete states of the individual input points. The module can be removed and replaced without removing power, or communications cabling.

Functional Specifications

Input

The WDI07 Series consists of seven 16-channel digital input interface cards that replace selected QDI Series digital input modules, as listed in Table A-15.

Table A-15. WDI07 Series Digital Input Modules

Module	Signal Range	Q-Cards
WDI07A	5 V dc	QDI-G01
WDI07B	24 V ac/dc	QDI-G03
WDI07C	48 V ac/dc	QDI-G05
WDI07D	120 V ac/dc	QDI-G07
WDI07E	12 V dc, logic oriented	QDI-G08

Communication

The module communicates with its associated WFCM/FCM100Et/FCM100E or FCP270 via the local Fieldbus.

Power Requirements

Input Voltage Range (Redundant): 13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)

Consumption: 2 W maximum at 13 V dc

Heat Dissipation: 1.25 W maximum at 13 V dc plus power dissipated at inputs.

See Table A-16.

Calibration Requirements

The module requires no calibration.

Filter/Debounce Time

Configurable (4, 8, 16, or 32 ms)

Loop Power Supply Protection

On-card 1 A replaceable fuse and an external 1 A fuse located between Terminal Block (“A”) and the Half-Shell Extension (“B”) Block.

Contact Sensor Function

Table A-16 on page 145 provides specifications for each model’s contact sensor functions. The following definitions apply the individual module descriptions:

- Field input voltages equal to or less than the maximum Off Input Voltage or current equal to or less than the maximum Off Input Current guarantee input OFF state.
- Field input voltages within the range of the On Input Voltage guarantees input ON state.

- On Input Current gives the range of the input current for the specified on Input Voltage. Minimum On Input Current does not guarantee input ON state.
- Contact open is OFF; contact closed is ON.
- Power in Front End is typical with all inputs on.

Table A-16. WDI07 Field Input Power

DCS Fieldbus Module	On/Off Voltage (V dc or V ac RMS)			On/Off Current (mA)		Power in Front End All Inputs On
	Max. On	Min. On	Max. Off	Max. On	Min. On	
WDI07A	4 V dc	6 V dc	0.9 V dc	10 mA	15 mA	1.75 W
WDI07B	20 V ac/dc	30 V ac/dc	3 V ac/dc	10 mA	15 mA	2.75 W
WDI07C	40 V ac/dc	60 V ac/dc	9 V ac/dc	10 mA	15 mA	5.50 W
WDI07D	100 V ac/dc	150 V ac/dc	6 V ac/dc	10 mA	15 mA	23.0 W
WDI07E	10 V dc	15 V dc	2 V dc	10 mA	15 mA	2.00 W

Channel Isolation

Each channel is optically isolated from earth (ground). The module withstands, without damage, a potential of 600 V ac applied for one minute between any channel and ground.

⚠ CAUTION

The Channel Isolation statement does not imply that these channels are intended for permanent connection to voltages of these levels. Exceeding the limits for input voltages, as stated elsewhere in this specification, violates electrical safety codes and may expose users to electric shock.

WID07 Series Contact Input Modules

The WID07 Series are channel-isolated contact input modules with an external supply. Each module functions as an 8-channel or 16-channel contact sensor. Each channel accepts a two-wire input from a pair of contacts or solid state switches. Eight-input modules are two-wire differential. 16-input modules are single ended inputs which share a common return line. Inputs include 5, 12, 24, 48, 120, or 220 Volts.

Each discrete input is optically isolated from logic ground. The module performs signal conversion required to interface electrical input signals from field sensors to the optionally redundant Fieldbus. It executes a Discrete Input or Ladder Logic program, with configurable options of Input Filter Time and Fail-Safe Configuration. LEDs on the front of the module provide visual indication of the DCS Fieldbus Module operational status, as well as the discrete states of the individual input points. The module can be removed and replaced without removing power, or communications cabling.

Functional Specifications

Input

The WID07 Series includes sixteen 8-channel (differential two-wire) and 16-channel (single-ended) digital input modules designed to replace selected QID, QDI, and QBI Series, as listed in Table A-17.

Table A-17. WID07 Series Digital Input Modules

Module	Channels	Signal Format	Q-Cards
WID07A	16	5 V ac/dc	QID-G01, QBI-G01
WID07B	8	24 V ac/dc	QID-G02, QDI-G02
WID07C	16	24 V ac/dc	QID-G03, QBI-G04, QBI-G10
WID07D	8	48 V ac/dc	QID-G04, QDI-G04
WID07E	16	48 V ac/dc	QID-G05, QBI-G05, QBI-G06
WID07F	8	120 V ac/dc	QID-G06, QDI-G06
WID07G	16	120 V ac/dc	QID-G07, QBI-G07, QBI-G08
WID07H	16	12 V dc, logic oriented	QID-G08, QBI-G02
WID07I	16	12 V ac/dc	QID-G09, QBI-G03, QBI-G09
WID07J	16	48 V dc, pulse	QID-G10
WID07K	8	120 V ac, high threshold	QID-G11, QDI-G11
WID07L	16	120 V ac, high threshold	QID-G12, QBI-G11
WID07M	8	220 V ac	QID-G13
WID07N	16	220 V ac	QID-G14
WID07O	8	220 V dc	QID-G15
WID07P	16	220 V ac, high threshold	QID-G16

Communication

The module communicates with its associated WFCM/FCM100Et/FCM100E or FCP270 via the local Fieldbus.

Power Requirements

Input Voltage Range (Redundant): 13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)

Consumption: 2 W Maximum at 13 V dc

Heat Dissipation: 1.25 W Maximum at 13 V dc plus power dissipated at inputs.

See Table A-18.

Calibration Requirements

The module requires no calibration.

Filter/Debounce Time

Configurable (4, 8, 16, or 32 ms)

Loop Power Supply Protection

16 Channel Modules: On-card 1 A replaceable fuse and an external 1 A fuse located between Terminal Block (“A”) and the Half-Shell Extension (“B”) Block.
Note: On-card and external fuse is 2A for WID07N and WID07P.

8 Channel Modules: An external 1.0 A fuse is required for contact wetting supply.

Contact Sensor Function

Table A-18 provides specifications for each model’s contact sensor functions. The following definitions apply the individual module descriptions:

- Field input voltages equal to or less than the maximum Off Input Voltage or current equal to or less than the maximum Off Input Current guarantee input OFF state.
- Field input voltages within the range of the On Input Voltage guarantees input ON state.
- On Input Current gives the range of the input current for the specified on Input Voltage. Minimum On Input Current does not guarantee input on state.
- Contact open is Off; contact closed is On.
- Power in Front End is typical with all inputs on.

Table A-18. WID07 Field Input Power

DCS Fieldbus Module	On/Off Voltage (V dc or V ac RMS)			On/Off Current (mA)			Power in Front End All Inputs On
	Max. On	Min. On	Max. Off	Max. On	Min. On	Off	
WID07A	2.4 V dc	7 V dc	0.9 V dc	2 mA	10 mA	0.5 mA	0.75 W
WID07B	20 V ac/dc	30 V	7 V	2 mA	10 mA	3.0 mA	1.5 W
WID07C	20 V ac/dc	30 V	7 V	5 mA	10 mA	3.0 mA	2.75 W
WID07D	40 V ac/dc	60 V	17 V	7 mA	12 mA	5.0 mA	2.75 W
WID07E	40 V ac/dc	40 V ac/dc	17 V ac/dc	7 mA	12 mA	5.0 mA	5.5 W
WID07F	100 V ac/dc	150 V ac/dc	40 V ac/dc	6 mA	10 mA	3.8 mA	7.25 W
WID07G	100 V ac/dc	150 V ac/dc	40 V ac/dc	6 mA	10 mA	3.8 mA	14.25 W
WID07H	10 V dc	15 V dc	3 V dc	5 mA	10 mA	2.0 mA	1.75 W
WID07I	10 V ac/dc	15 V ac/dc	3 V ac/dc	5 mA	10 mA	2.0 mA	1.75 W
WID07J	40 V dc	60 V dc	24 V dc	7mA	12 mA	5.0 mA	5.5 W
WID07K	95 V ac	150 V ac	60 V ac	16 mA	27 mA	8.4 mA	11.75 W
WID07L	95 V ac	150 V ac	60 V ac	6 mA	27 mA	8.4 mA	23.50 W
WID07M	190 V ac	264 V ac	120V ac	30 mA	43 mA	11.4 mA	23.75 W
WID07N	190 V ac	264 V ac	120 V ac	30 mA	43 mA	11.4 mA	47.25 W
WID07O	180 V dc	264V dc	110 V dc	6 mA	10 mA	3.8 mA	12.50 W
WID07P	180 V dc	264 V dc	110 V dc	6 mA	10 mA	3.8 mA	23.55 W

Channel Isolation

Each channel is optically isolated from earth (ground). The module withstands, without damage, a potential of 600 V ac applied for one minute between any channel and ground.

⚠ CAUTION

The Channel Isolation statement does not imply that these channels are intended for permanent connection to voltages of these levels. Exceeding the limits for input voltages, as stated elsewhere in this specification, violates electrical safety codes and may expose users to electric shock.

WLJ04 Series Analog I/O Modules

The WLJ04 Series Modules contains three analog inputs (channels 1 through 3) for field signals, one analog input (channel 4) for output readback and one analog output (channel 5). Each field input channel accepts an analog sensor input such as a 4 to 20 mA transmitter, a self-powered 20 mA or voltage source. The readback input channel 4 reads the output value to provide to the user the capability to validate the desired output. The output channel drives an external load and produces a 0 to 20 mA output or a 0 to 10 V dc output. The module performs the signal conversion required to interface the electrical input/output signals from the field sensors to the optionally redundant Fieldbus. The WLJ04 executes the Analog I/O application program, which provides the following configurable options: Conversion Time, Fail-Safe Configuration (Hold/Fallback), and Analog Output Fail-Safe Fallback Data (on a per channel basis). For high accuracy, the module incorporates Sigma-Delta data conversion on a per channel basis, which provides new analog input readings every 25 ms, and a configurable moving average filter to remove any process noise and power line frequencies. LEDs incorporated into the front of the module provide visual status indications of Fieldbus Module functions. The module can be removed/replaced without removing power or communications cabling.

Functional Specifications

External Power Requirements

WLJ04 Series cards may require an external 24 V dc power supply to the card edge I/O connector to power input transmitters if so configured.

The Q-Crate delivers 13 V dc at the rear edge pin connectors to power the on-card processor and communications.

I/O Channel Configurations

The WLJ04 Series offers three combination cards to replace the QLJ Series. Each DCS Fieldbus Module provides three analog inputs and one analog output with readback. Table A-19 on page 149 lists the modules in the series, their signal ranges and the Q-Cards they replace.

Table A-19. WLJ04 Series Analog Input and Output Modules

Module	Input Signal	Output and Readback Signals	Q-Card
WLJ04A	0 to 10.24 V dc 10 K max source impedance	0 to 10.24 V dc 500 ohm load minimum	QLJ-G01
WLJ04B	0 to 5.12 V dc 5 K max source impedance	0 to 10.24 V dc 500 ohm load minimum	QLJ-G02
WLJ04C	0 to 20.48 mA externally powered	4 to 20.48 mA 0-850 ohm load maximum, self-powered	QLJ-G03

Analog Input Accuracy

All 4 channels, (includes linearity) ±0.03% of span

Accuracy temperature coefficient: ±50 ppm/°C

Conversion Time (software configurable)

Input signal conversion time specifications for the WLJ04 Series are shown in Table A-20. **Settling Time** (Column 3) is defined as the value settling within a 1% band of steady state for 10% to 90% input step change.

Table A-20. WLJ04 Series Input Signal Conversion

Conversion Time	Update Time	Settling Time	Resolution
50 ms	100 ms	50 ms	15 bits
100 ms	100 ms	125 ms	15 bits
200 ms	100 ms	200 ms	15 bits
500 ms	100 ms	500 ms	15 bits
1000 ms	100 ms	1000 ms	15 bits

Analog Output Accuracy

Accuracy (includes linearity): ±0.05% of span

Accuracy temperature coefficient: ±50 ppm/°C

Analog Output Processing Delay

30 ms maximum

Analog Output Resolution

13 bits

Communication

The module communicates with its associated WFCM/FCM100Et/FCM100E or FCP270 via the local Fieldbus.

Power Requirements

Input Voltage Range (Redundant): 13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)

Consumption: 5 W maximum at 13 V dc

Heat Dissipation: 5 W maximum at 13 V dc

Calibration Requirements

Calibration of the module is not required.

Channel Isolation

Each field connected analog channel is galvanically isolated from earth (ground) and the other field connected channels. The output read-back channel is not isolated from the output channel. The module withstands, without damage, a potential of 600 V ac applied for one minute between any channel and ground.

⚠ CAUTION

The Channel Isolation statement does not imply that these channels are intended for permanent connection to voltages of these levels. Exceeding the limits for input voltages, as stated elsewhere in this specification, violates electrical safety codes and may expose users to electric shock.

WPA06A Pulse Accumulator Module

The WPA06A channel-isolated pulse input interface module contains four configurable channels that accept a pulse input with a maximum rate of 25 kHz. Input devices include vortex and turbine meters, solid state or electromechanical contacts and other sensors with similar pulse outputs. The module performs the signal conversion required to interface the electrical input signals from the field sensors to the redundant Fieldbus. The input channels are galvanically isolated from ground and from each other. This module executes the Pulse Input application program. The configurable options for this program are Pulse Rate Totalization and Resolution (on a per module basis) and Meter Scaling Factor. The module can be removed and replaced without removing field device power or communications cabling.

The WPA06A DCS Fieldbus Modules replaces the QPA-G04 card.

Functional Specifications

Input

4 isolated 48 V dc (external supply) pulse input channels

Accuracy

Pulse Count: No missing pulses

Pulse Rate: 0.01% of reading, independent of rate

Input Pulse Characteristics

Pulse Input Ranges (each channel):

Minimum On voltage: 40 V dc

Maximum On voltage: 60 V dc

Maximum Off voltage: 2 V dc

Maximum Off current: 0.35 mA

Nominal On current: 3.35 mA @ 48 V dc, 4.35 mA @ 60 V dc

Notes:

- Field input voltages equal to or less than the maximum Off Input Voltage or current equal to or less than the maximum Off Input Current guarantee input OFF state. Field input voltages within the range of the On Input Voltage guarantees input ON state.
- On Input Current gives the range of the input current for the specified on Input Voltage. Minimum On Input Current does not guarantee input ON state.
- Contact open is Off; contact closed is On.

Input Duty Cycle (each channel)

Minimum pulse width on/off: 4 µs, duty cycle is 10% to 90%.

Input Resistance: 10 k ohms

Communication

The module communicates with its associated WFCM/FCM100Et/FCM100E or FCP270 via the local Fieldbus.

Power Requirements

Input Voltage Range (Redundant): 13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)

Consumption: 3 W (maximum) at 13 V dc

Heat Dissipation: 3 W (maximum) at 13 V dc

Calibration Requirements

The module is self-calibrating.

Loop Power Supply Protection

The channel is channel-to-logic and channel-to-channel galvanically isolated, current limited, and voltage regulated.

Field Device Cabling Distance

Maximum distance of the field device from the FBM is a function of compliance voltage, wire gauge, and voltage drop at the field device.

Channel Isolation

Each channel is optically isolated from logic. The module withstands, without damage, a potential of 600 V ac applied for one minute between channel and earth (ground).

⚠ CAUTION

The Channel Isolation statement does not imply that these channels are intended for permanent connection to voltages of these levels. Exceeding the limits for input voltages, as stated elsewhere in this specification, violates electrical safety codes and may expose users to electric shock.

WRF03 Series RTD Input Modules

The WRF03 Series DCS Fieldbus Modules replace the selected QRF Series RTD input cards:

- WRF03A is a 0-640 ohm input module that replaces the QRF-G01 and G03
- WRF03B is a 0-320 ohm input module that replaces the QRF-G02 and G04

The WRF03 Series modules are channel-isolated platinum/nickel RTD input interfaces that contain six resistance temperature detector input channels. Each channel accepts a four-wire RTD sensor input, within a 0 to 640 ohm resistance range or 0 to 320 ohm resistance range dependent upon module type. Each analog input is galvanically isolated from other channels and ground. The module performs the signal conversion required to interface the electrical input signals from the field sensors to the optionally redundant Fieldbus.

The WRF03 executes an Analog Input application program, which provides conversion time (on a per module basis) and Rate of Change Limits configurable options. For high accuracy, the module incorporates Sigma-Delta data conversion on a per channel basis, which provides new analog input readings every 25 ms, and a configurable moving-average filter to remove any process noise and power line frequencies. LEDs incorporated into the front of the module provide visual status indications of Fieldbus Module functions. The module can be removed and replaced without removing power, or communications cabling.

Functional Specifications

Input

4 isolated and independent channels

Input Range (each channel)

WRF03A: 200 Platinum, 0 to 640 ohm, 0° C to 370° C

WRF03B: 100 Platinum, 0 to 320 ohm, 0° C to 290° C

Sensor Current

WRF03A: 0.098 mA dc

WRF03B: 0.197 mA dc

Input Accuracy

Accuracy (includes linearity): ±0.03% of span

Accuracy temperature coefficient: ±50 ppm/°C

Communication

The module communicates with its associated WFCM/FCM100Et/FCM100E or FCP270 via the local Fieldbus.

Power Requirements

Input Voltage Range (Redundant): 13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)

Consumption: 3 W (maximum) at 13 V dc

Heat Dissipation: 3 W (maximum) at 13 V dc

Calibration Requirements: Calibration of the module is not required.

Input Signal A/D Conversion

Each channel performs A/D signal conversion using an independent Sigma-Delta converter.

Input Conversion Time (software configurable)

Input signal conversion time specifications for the WRF03 Series are shown in Table A-21. **Settling Time** (Column 3) is defined as the value settling within a 1% band of steady state for 10% to 90% input step change.

Table A-21. WRF03 Series Input Signal Conversion

Conversion Time	Update Time	Settling Time	Resolution
50 ms	100 ms	50 ms	15 bits
100 ms	100 ms	125 ms	15 bits
200 ms	100 ms	200 ms	15 bits
500 ms	100 ms	500 ms	15 bits
1000 ms	100 ms	1000 ms	15 bits

Typical Resistance Temperature Sensors

WRF03A: 200 Platinum, 0°C to 370°C

WRF03B: 100 Platinum, 0°C to 290°C

Input Signal

Supports four-wire variable-resistance temperature sensors.

Channel Isolation

Each channel is galvanically isolated from all other channels and earth (ground). The module withstands, without damage, a potential of 600 V ac applied for one minute between any channel and ground, or between a given channel and any other channel.

⚠ CAUTION

The Channel Isolation statement does not imply that these channels are intended for permanent connection to voltages of these levels. Exceeding the limits for input voltages, as stated elsewhere in this specification, violates electrical safety codes and may expose users to electric shock.

WRO09 Series Relay Output Modules

The channel-isolated WRO09 Series relay output interface module contains 8 discrete output channels, which are sourced externally. Each output is fully isolated from other channels and ground. Each mercury-wetted relay output card type may be jumper selectable for normally open or normally closed. The Solid State Switch type card is normally opened only. The module interfaces electrical output signals from a control processor to the field devices. It executes a Digital I/O application program, which provides a Fail-Safe Configuration option. LEDs on the front of the module provide visual indication of the module operational status, as well as the discrete states

of the individual output points. The module can be removed/replaced without removing power, or communications cabling.

Functional Specifications

Output Channels

8 isolated channels. Table A-22 lists the modules in the series, their operation, and the Q-Cards they replace.

Table A-22. WRO09 Series Relay Output Modules

Module	Operation	Q-Cards
WRO09A	Switches inductive loads with mercury-wetted relay output devices. Jumper-selectable normally open or normally closed.	QRO-G01 QRO-G02
WRO09B	Switches non-inductive resistive loads with mercury-wetted relay output devices. Jumper-selectable normally open or normally closed.	QRO-G03 QRO-G04
WRO09C	Switches inductive loads, normally opened only, with solid-state relay output devices.	QRO-G01
WRO09D	Switches non-inductive resistive loads, normally opened only, with solid-state relay output devices.	QRO-G03

Communication

The module communicates with its associated WFCM/FCM100Et/FCM100E or FCP270 via the local Fieldbus.

Power Requirements

Input Voltage Range (Redundant): 13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)

Consumption:

WRO09A and WRO09B: 5 W (maximum) at 13 V dc

WRO09C and WRO09D: 4 W (maximum) at 13 V dc

Heat Dissipation:

WRO09A and WRO09B: 13 W (maximum) at 13 V dc, all outputs on at maximum load current.

WRO09C and WRO09D: 12 W (maximum) at 13 V dc, all outputs on at maximum load current.

Calibration Requirements

Calibration of the module is not required.

Applied Voltage

WRO09A: 330 V dc/250 V ac (max) @ 0.5 A, Switches inductive loads

WRO09B: 330 V dc/250 V ac (max) @ 0.5 A, Non-inductive resistive loads only

WRO09C: 330 V dc/250 V ac (max) @ 0.5 A, Switches inductive loads

WRO09D: 330 V dc/250 V ac (max) @ 0.5 A, Non-inductive resistive loads only

Power

100 VA (maximum) dc at peak ac

Speed

2 ms typical (operate)

10 ms typical (release)

Contact Resistance

WRO09A and WRO09B: Closed 2 ohm maximum

Impedance

WRO09A: Open 25 k ohm minimum

WRO09B: Open 300 k ohm minimum

On-State Voltage Drop

WRO09C: 2.0 V (maximum) at 0.5 A

WRO09D: 2.0 V (maximum) at 0.5 A

Off-State Leakage Current

WRO09C: 0.01 mA (maximum) at 330 V dc/250 V ac

WRO09D: 0.01 mA (maximum) at 330 V dc/250 V ac

Duty Cycle

The output should not open more than once every 10 ms (at rated voltage)

Inductive Loads

WRO09A and WRO09C are equipped to handle inductive loads.

Channel Isolation

Each channel is optically isolated from each other channel and earth (ground). The module withstands, without damage, a potential of 600 V ac applied for one minute between any channel and ground, or between a given channel and any other channel.

⚠ CAUTION

The Channel Isolation statement does not imply that these channels are intended for permanent connection to voltages of these levels. Exceeding the limits for input voltages, as stated elsewhere in this specification, violates electrical safety codes and may expose users to electric shock.

WRT03 Series RTD Input Modules

The WRT03 Series modules are channel-isolated platinum/nickel RTD input interfaces that contain four resistance temperature detector (RTD) input channels. Each channel accepts a 3-wire RTD sensor input, within a 0 to 320 ohm resistance range or 0 to 30 ohm resistance range dependent upon module type. Each analog input is galvanically isolated from other channels and ground. The module performs the signal conversion required to interface the electrical input signals from the field sensors to the optionally redundant Fieldbus. The WRT03 executes an Analog Input application program, which provides conversion time (on a per module basis) and Rate of Change Limits configurable options. For high accuracy, the module incorporates Sigma-Delta data conversion on a per channel basis, which provides new analog input readings every 25 ms, and a configurable moving average filter to remove any process noise and power line frequencies. LEDs incorporated into the front of the module provide visual status indications of Fieldbus Module functions. The module can be removed and replaced without removing power, or communications cabling.

The WRT03 Series modules replace the selected QRT Series RTD input cards:

- WRT03A replaces the QRT-G01 and provides four 0-30 ohm inputs.
- WRT03B replaces the QRT-G02 and provides four 0-320 ohm inputs.

Functional Specifications

Input

4 isolated and independent channels

Input Range (each channel)

WRT03A: 0 to 30 ohm

WRT03B: 0 to 320 ohm

Sensor Current

WRT03A: 0.539 mA dc

WRT03B: 0.197 mA dc

Input Accuracy

Accuracy (includes linearity): ±0.03% of span

Accuracy temperature coefficient: ±50 ppm/ºC

Communication

The modules communicates with its associated WFCM/FCM100Et/FCM100E or FCP270 via the local Fieldbus.

Power Requirements

Input Voltage Range (Redundant): 13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)

Consumption: 2 W (maximum) at 13 V dc

Heat Dissipation: 2 W (maximum) at 13 V dc

Calibration Requirements

Calibration of the module is not required.

Input Signal A/D Conversion

Each channel performs A/D signal conversion using an independent Sigma-Delta converter.

Input Conversion Time (software configurable)

Input signal conversion time specifications for the WRT03 Series are shown in Table A-23. **Settling Time** (Column 3) is defined as the value settling within a 1% band of steady state for 10% to 90% input step change.

Table A-23. WRT03 Series Input Signal Conversion

Conversion Time	Update Time	Settling Time	Resolution
50 ms	100 ms	50 ms	15 bits
100 ms	100 ms	125 ms	15 bits
200 ms	100 ms	200 ms	15 bits
500 ms	100 ms	500 ms	15 bits
1000 ms	100 ms	1000 ms	15 bits

Typical Resistance Temperature Sensors

WRT03A: Copper

WRT03B: Platinum (DIN), Platinum (SAMA), Platinum (IEC), or Nickel

Input Signal

Supports 2-wire or 3-wire variable-resistance temperature sensors.

Channel Isolation

Each channel is galvanically isolated from all other channels and earth (ground). The module withstands, without damage, a potential of 600 V ac applied for one minute between any channel and ground, or between a given channel and any other channel.

⚠ CAUTION

The Channel Isolation statement does not imply that these channels are intended for permanent connection to voltages of these levels. Exceeding the limits for input voltages, as stated elsewhere in this specification, violates electrical safety codes and may expose users to electric shock.

WTO09 TRIAC Output Module

The WTO09A is an externally sourced TRIAC digital output module designed to replace the 8-channel QTO-G01. This channel-isolated interface contains 8 discrete output channels. Each output is fully isolated from other channels and ground. The module interfaces electrical output signals from a control processor to the field devices. It executes a Digital I/O application program, which provides a Fail-Safe Configuration option. LEDs on the front of the module provide visual indication of the module operational status, as well as the discrete states of the individual output points. The module can be removed/replaced without removing power or communications cabling.

Functional Specifications

Output Channels

Eight isolated channels

Communication

The module communicates with its associated WFCM/FCM100Et/FCM100E or FCP270 via the local Fieldbus.

Power Requirements

Input Voltage Range (Redundant): 13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)

Consumption: 2 W (maximum) at 13 V dc

Heat Dissipation: 20 W (maximum) at 13 V dc, with all outputs on at maximum load current.

Calibration Requirements

Calibration of the module is not required.

Output Capabilities

Table A-24 describes the output capabilities of the WTO09. Note that the load current must be above 75 mA to fire the TRIAC.

Table A-24. WTO09 TRIAC Output Module Capabilities

Characteristic	Minimum	Typical	Maximum
Voltage (RMS)	80	115	140 V ac
Current (On)	0.075	–	1.8 RMS (Continuous) 10 A RMS (T < 5 cycles)
Frequency	47	–	63 Hz
Common Mode Voltage	–	–	500 V dc (Peak) 300 V ac (RMS, line frequency)
Current (Off)	–	–	8 mA (RMS)

Channel Isolation

Each channel is optically isolated from each other channel and earth (ground). The module withstands, without damage, a potential of 600 V ac applied for one minute between any channel and ground, or between a given channel and any other channel.

⚠ CAUTION

The Channel Isolation statement does not imply that these channels are intended for permanent connection to voltages of these levels. Exceeding the limits for input voltages, as stated elsewhere in this specification, violates electrical safety codes and may expose users to electric shock.

Appendix B. Edge Connector Wiring Diagrams

This appendix consists of wiring diagrams showing the connections between the DCS Fieldbus Module edge connectors and the WDPF field terminations.

This appendix includes wiring diagrams for the DCS Fieldbus Modules as follows:

WAH01 Series

Figure B-1 shows the card edge connections for the WAH01 Series analog input modules. As illustrated in the drawing, common is connected to system ground at one point only. Analog common is used for all eight channels.

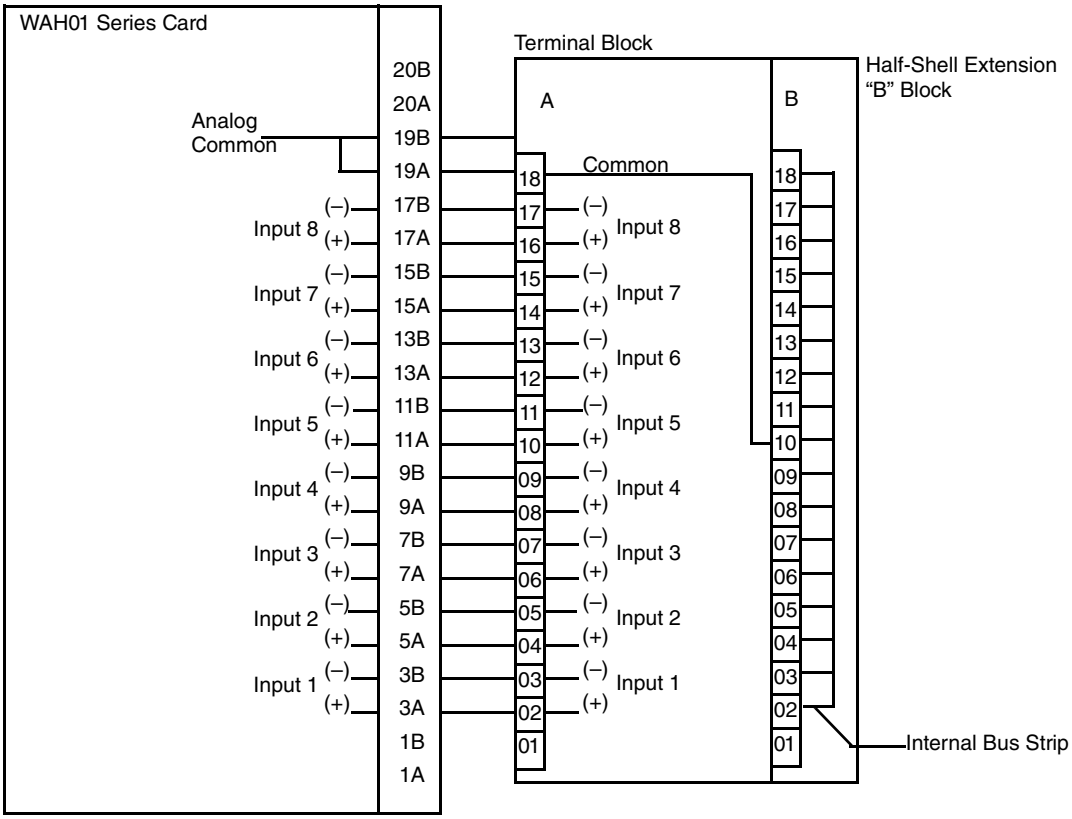


Figure B-1. WAH01 Series Edge Connector Wiring

WAI01 Series and WAI02A Module

Figure B-2 shows the card edge connections for the WAI01 Series and the WAI02A analog input modules.

For these modules, shields may be grounded in the field as shown in Figure B-2 or at the "B" Cabinet. If inputs are to be grounded at the system end, install a #6 screw and nut in the hole located near the shield terminal on terminal block A. Then add two jumpers at terminal A between the #6 screw, the shield, and the (–) input of each channel. Holes have been drilled next to terminals 2, 5, 8, 11, 14, and 17 for this purpose.

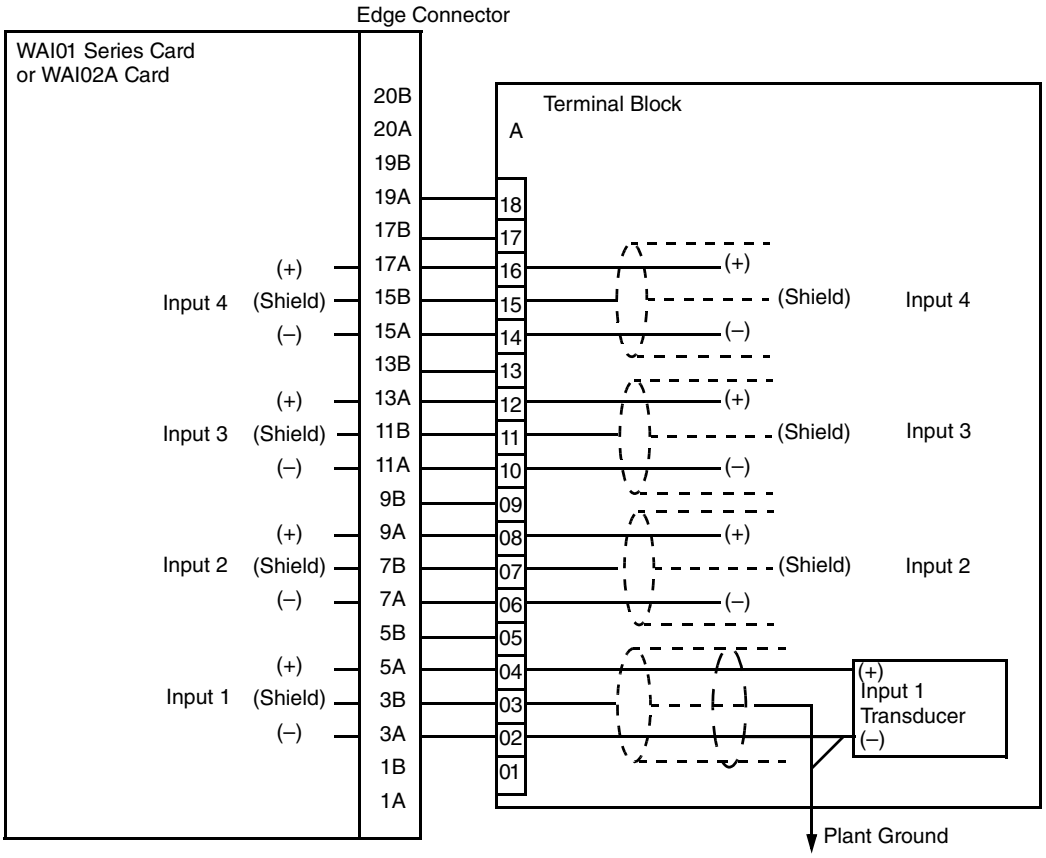


Figure B-2. WAI01 Series and WAI02A Edge Connector Wiring

WA037 Series

Figure B-3 is an edge connector wiring diagram for the WAO37 Series analog output modules.

The WAO37A and WAO37G must have the shield and return connected to each other and to ground at the "B" Cabinet. Install #6 screw and nut in the hole located near the shield terminal on terminal block A. Then add two jumpers at terminal A between the #6 screw, the shield, and the (–) input of each channel. Holes have been drilled next to terminals 2, 5, 8, 11, 14, and 17 for this purpose.

The WAO37B through WAO37F have the shield and return connected together and to earth ground in the field or at the "B" Cabinet.

The single-output WAO37F uses Output 1 only.

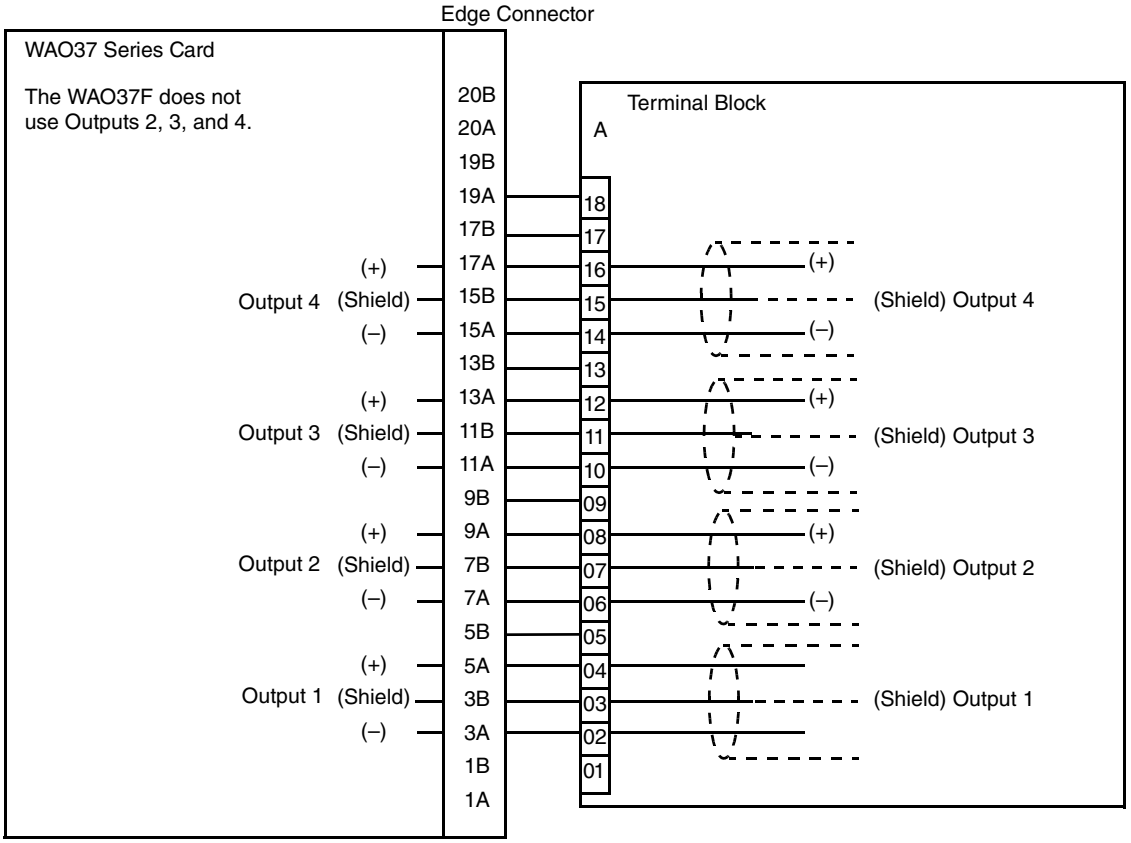


Figure B-3. WAO37 Series Edge Connector Wiring

WAV02A Module

The edge connector wiring for the WAV02A thermocouple/millivolt input module is shown in Figure B-4.

The drawing shows input grounded at the signal source with both shield and (–) input grounded. If inputs are to be grounded at the system end, install a #6 screw and nut in the hole located near the shield terminal on terminal block A. Then add two jumpers at terminal A between the #6 screw, the shield, and the (–) input of each channel. Holes have been drilled next to terminals 2, 5, 8, 11, 14, and 17 for this purpose.

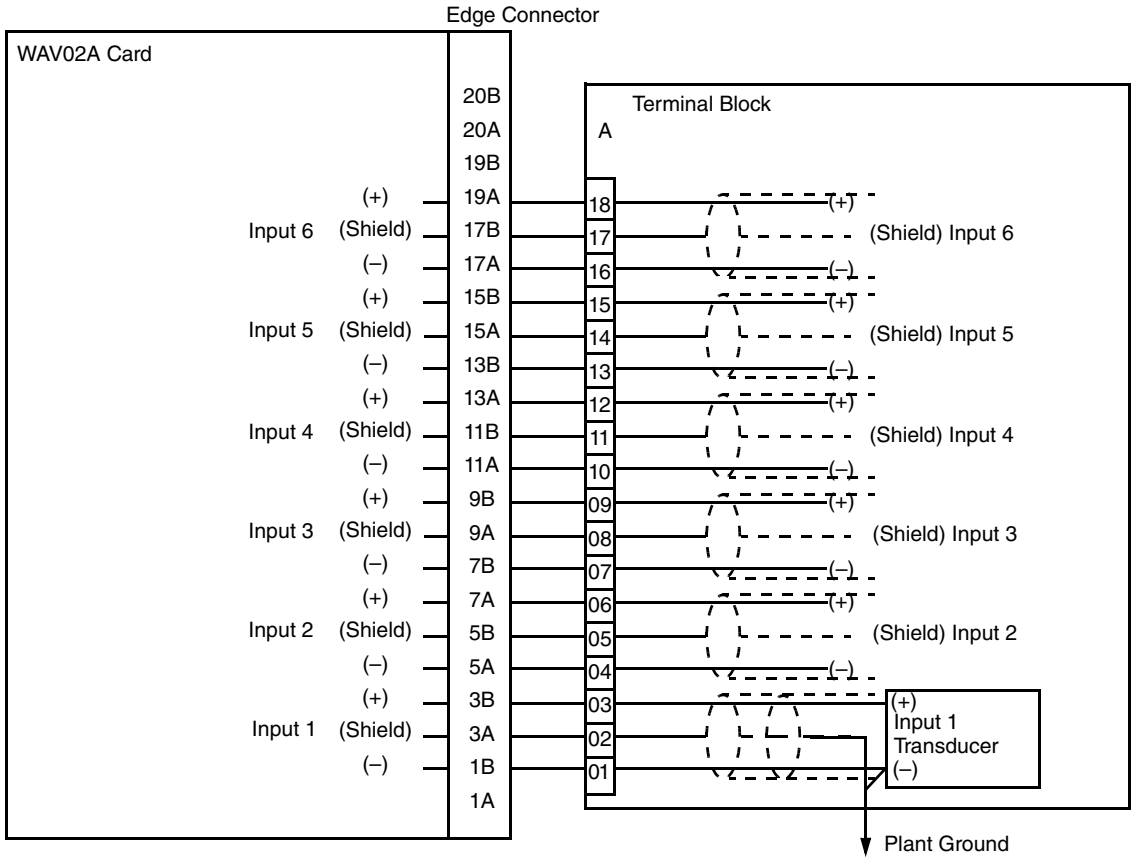


Figure B-4. WAV02A DCS Fieldbus Module Edge Connector Wiring

WAW01 Series

The edge connector wiring for the WAW01 Series analog input modules is shown in two different drawings:

- Figure B-5 is a wiring diagram for the WAW01A, WAW01B, WAW01C, and WAW01E.
- Figure B-6 is a wiring diagram for the WAW01D and WAW01F.

Both drawings show input grounded at the signal source with both shield and (–) input grounded. If inputs are to be grounded at the system end, install a #6 screw and nut in the hole located near the shield terminal on terminal block A. Then add two jumpers at terminal A between the #6 screw, the shield, and the (–) input of each channel. Holes have been drilled next to terminals 2, 5, 8, 11, 14, and 17 for this purpose.

WAW01A, WAW01B, WAW01C, and WAW01E

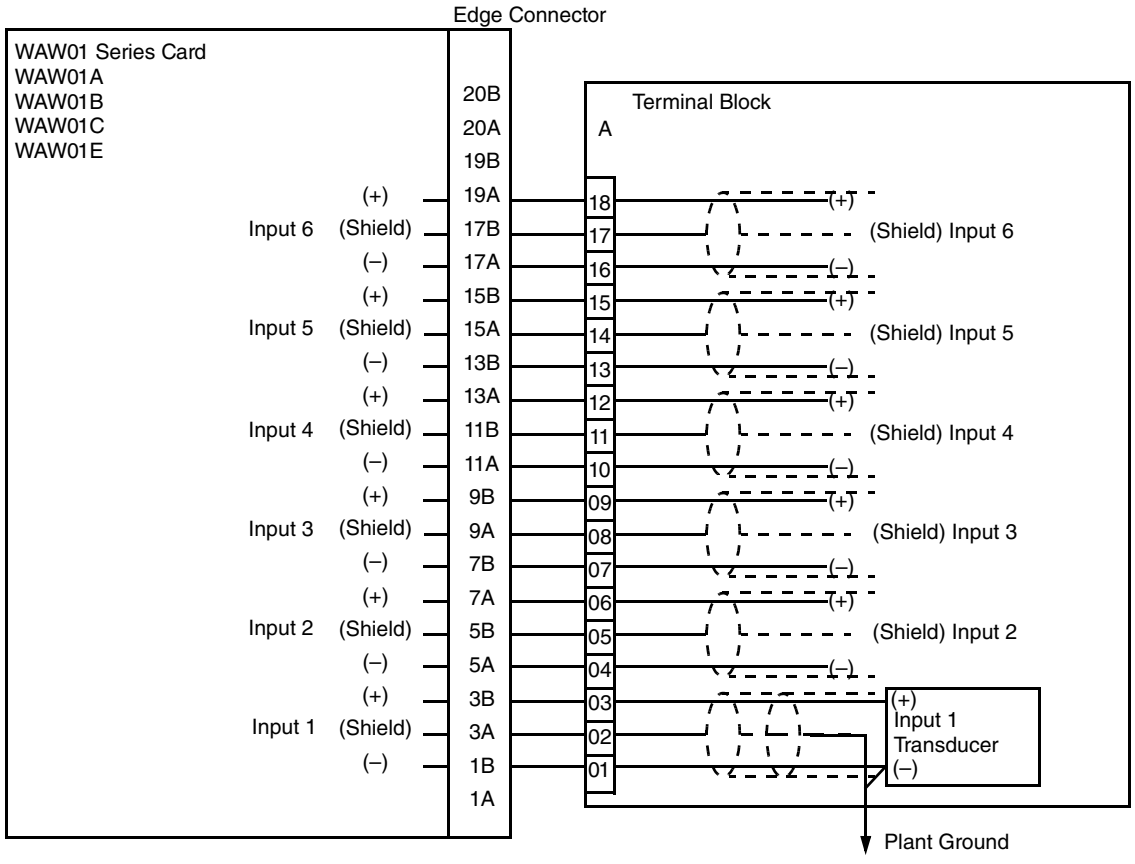


Figure B-5. WAW01A, WAW01B, WAW01C, and WAW01E Edge Connector Wiring

WAW01D and WAW01F

The WAW01D and the WAW01F require external transducer power or a self-powered transducer.

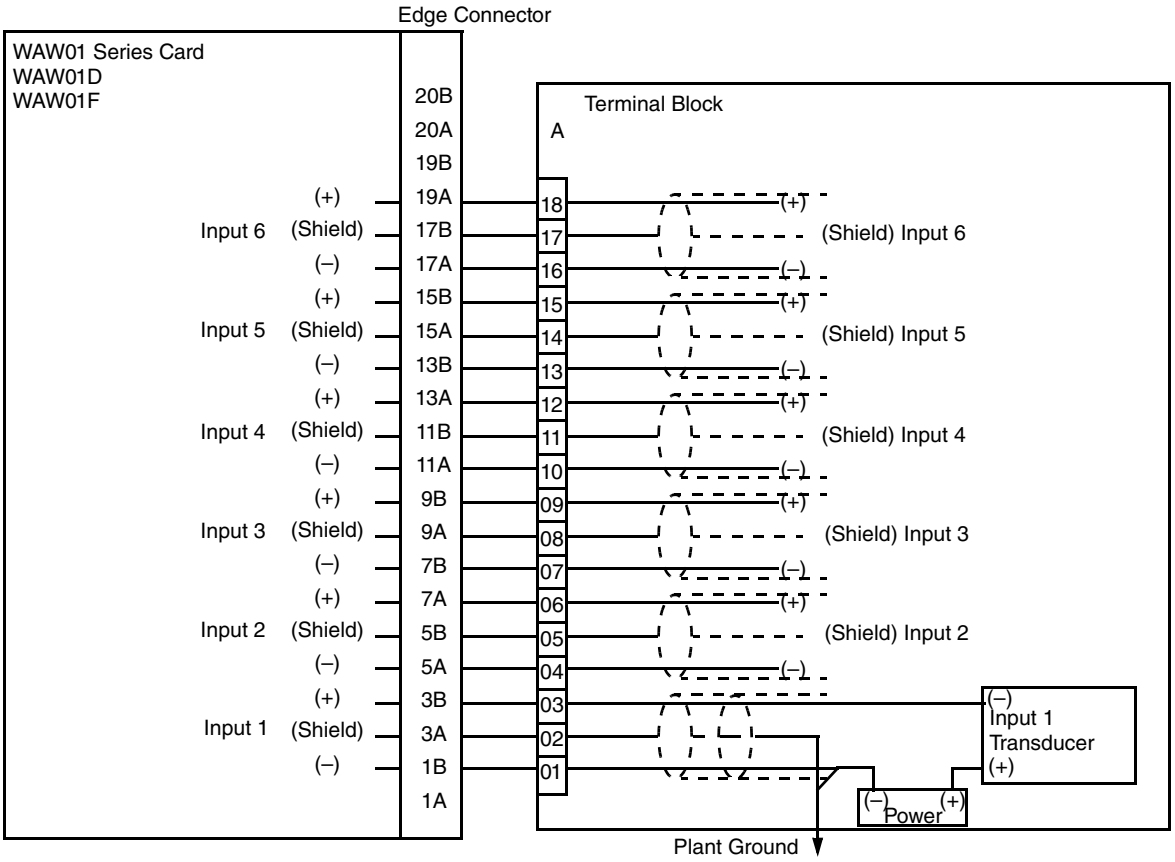


Figure B-6. WAW01D and WAW01F Edge Connector Wiring

WAX01 Series

Figure B-7 shows edge connector wiring for the WAX01 Series 12-channel analog input modules. The drawing shows input grounded at the single source with both shield and (–) input grounded. If inputs are to be grounded at the system end, install a #6 screw and nut in the hole located near the shield terminal on terminal block A. Then add two jumpers at terminal A between the #6 screw, the shield, and the (–) input of each channel. Holes have been drilled next to terminals 2, 5, 8, 11, 14, and 17 for this purpose.

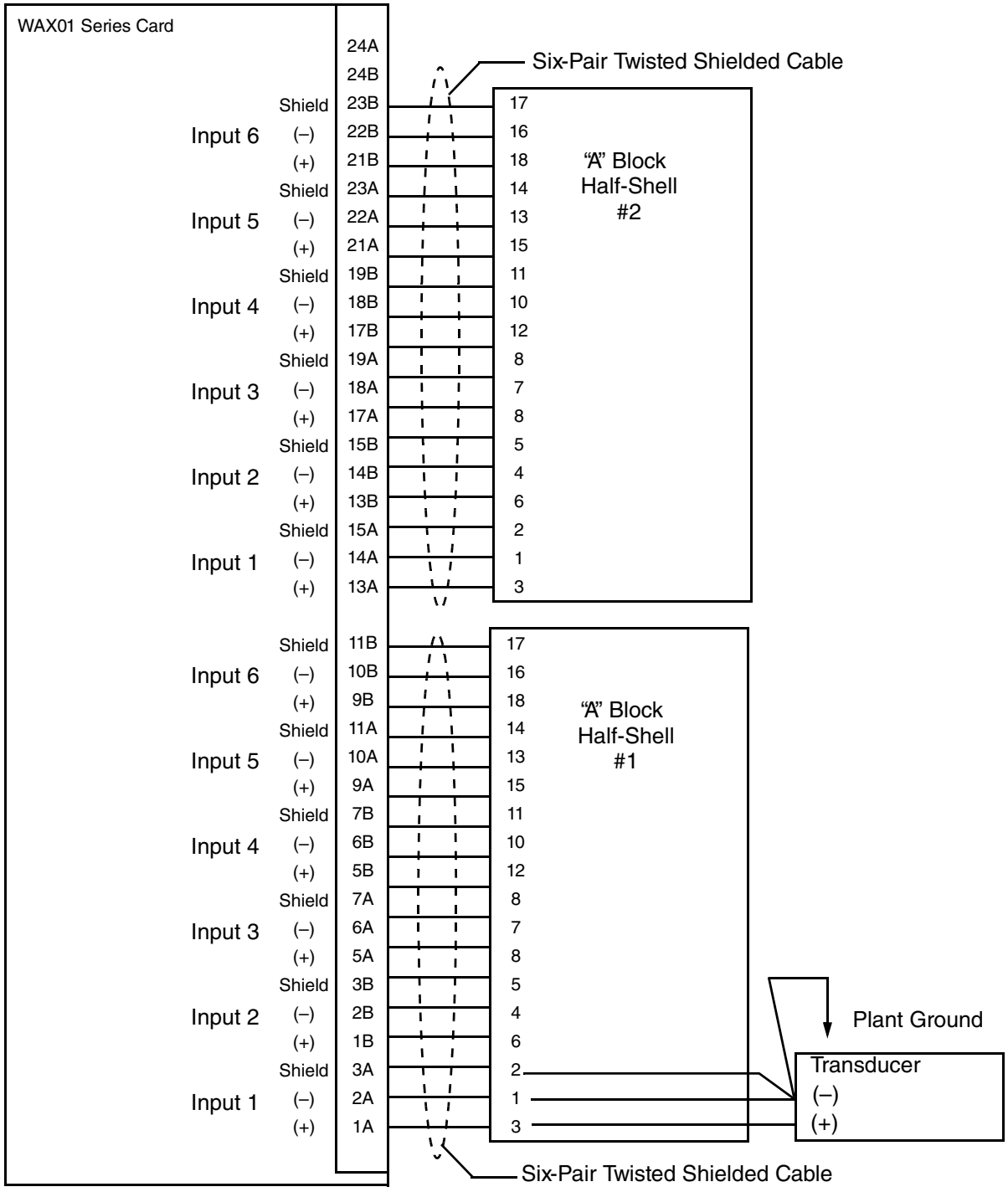


Figure B-7. WAX01 Series Edge Connector Wiring

WAX02A Module

Figure B-8 shows edge connector wiring for the WAX02A 12-channel analog input modules.

The drawing shows input grounded at the signal source with both shield and (–) input grounded. If inputs are to be grounded at the system end, install a #6 screw and nut in the hole located near the shield terminal on terminal block A. Then add two jumpers at terminal A between the #6 screw, the shield, and the (–) input of each channel. Holes have been drilled next to terminals 2, 5, 8, 11, 14, and 17 for this purpose.

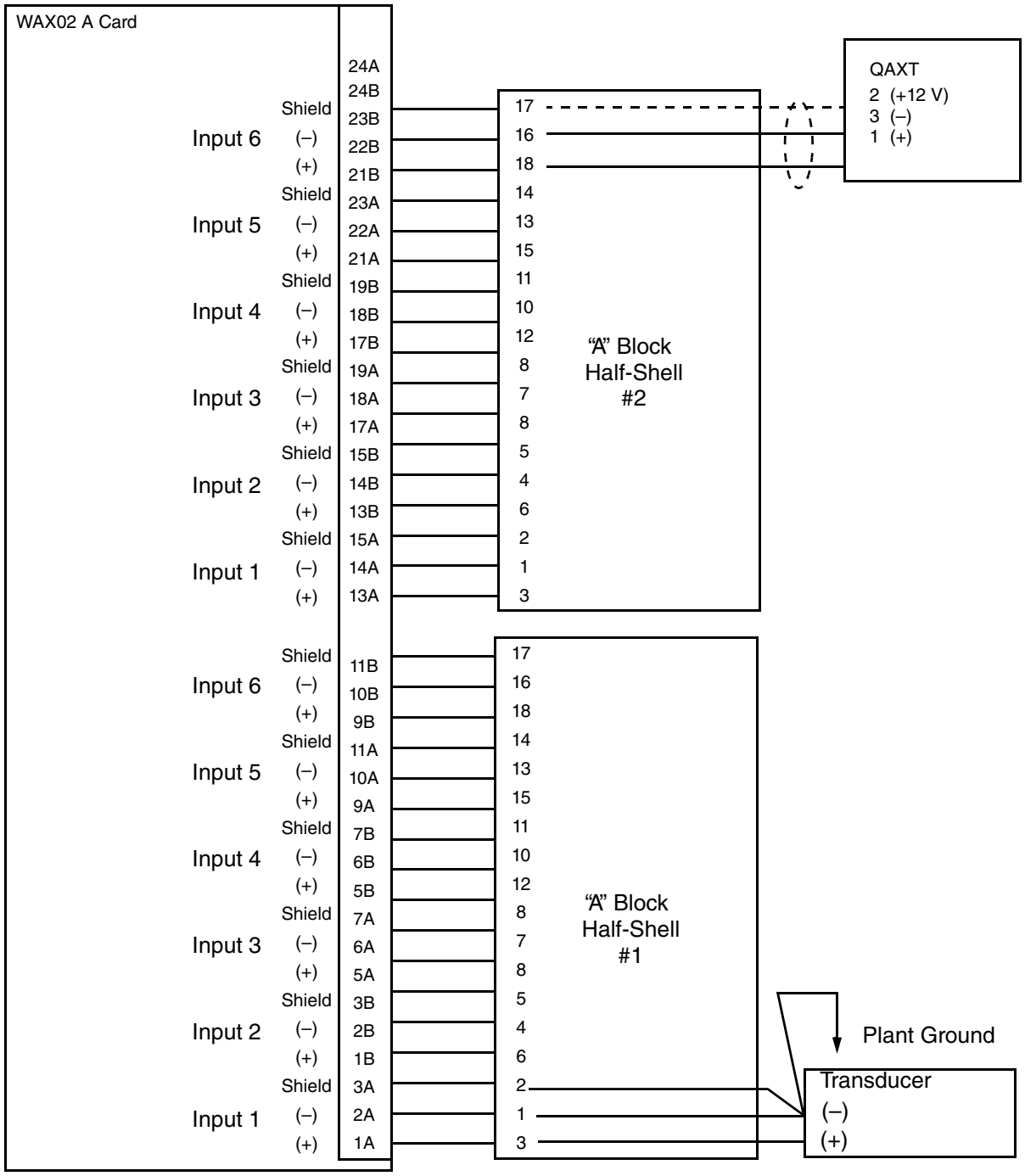


Figure B-8. WAX02A DCS Fieldbus Module Edge Connector Wiring

WBO09 Series

Figure B-9 shows edge connector wiring for the WBO09 Series 16-channel digital output modules.

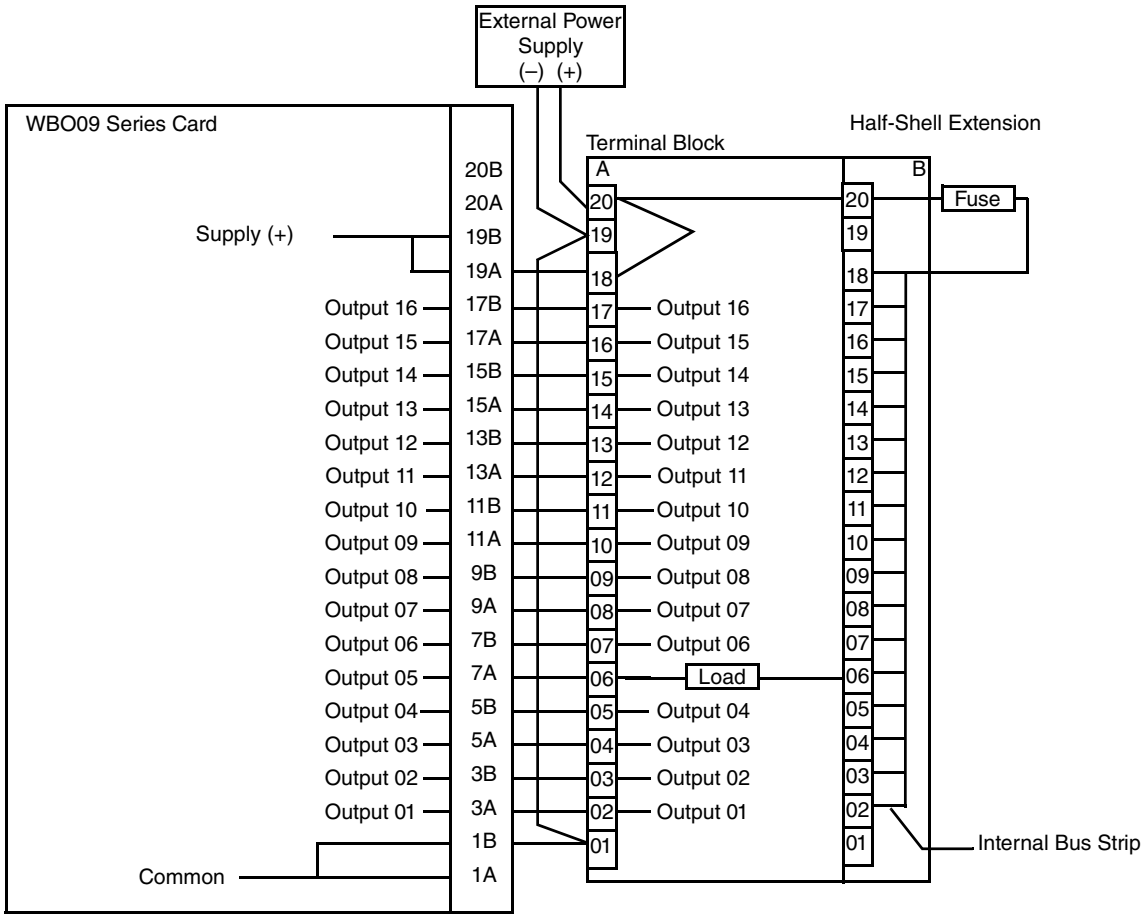


Figure B-9. WBO09 Series Edge Connector Wiring

WCI07A Module

Figure B-10 is an edge connector wiring diagram for the WCI07A DCS Fieldbus Module, which provides 16 contact inputs.

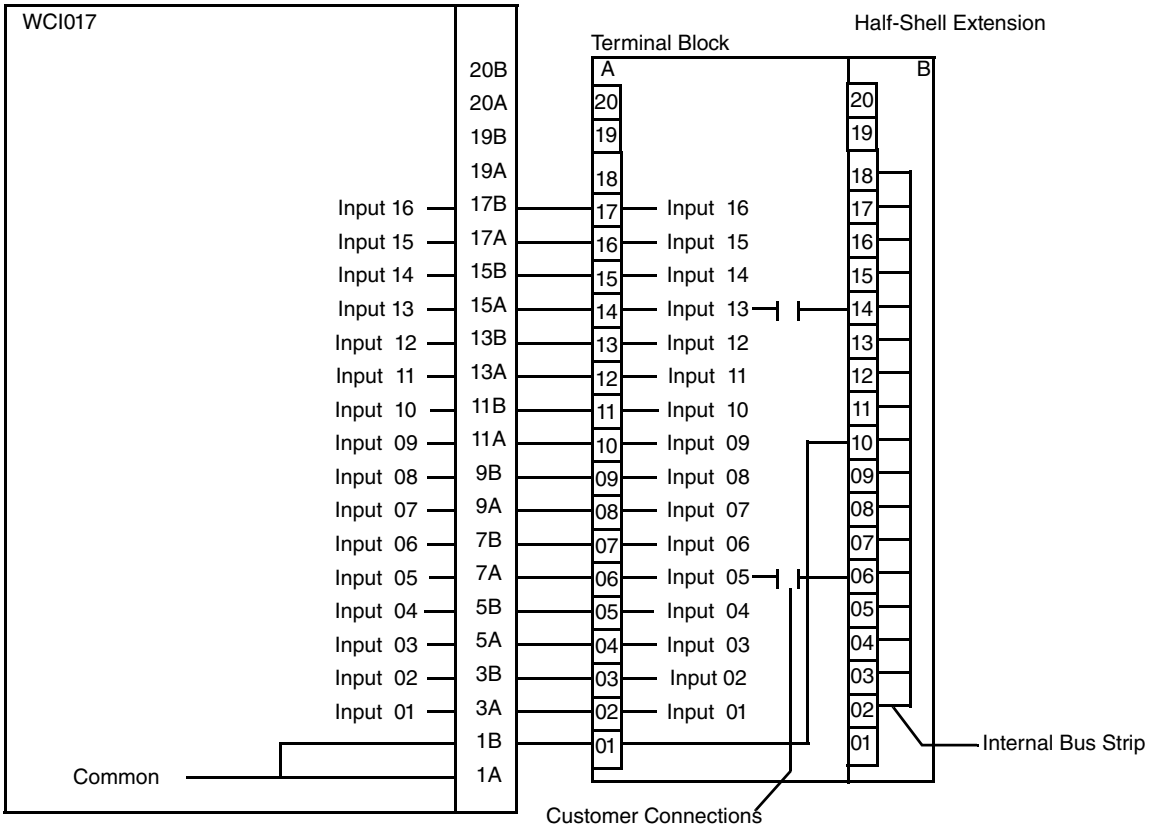


Figure B-10. WCI07A DCS Fieldbus Module Edge Connector Wiring

WDI07 Series

Figure B-11 shows the edge connector wiring diagram for the WDI07 Series of 16-channel digital input modules. The same edge connector wiring is used with the WID07J. Supply to pin 18 on terminal block A is positive when dc supply is used.

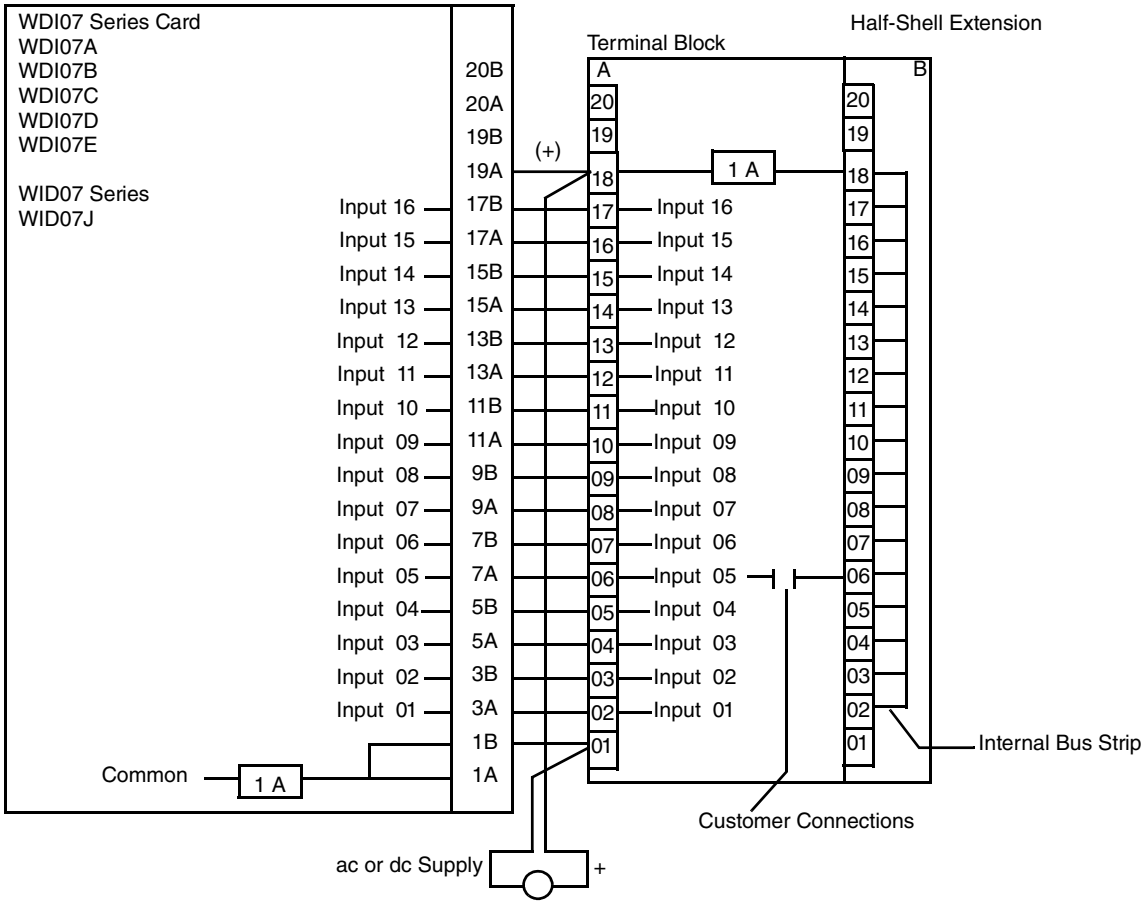


Figure B-11. WDI07 Series Edge Connector Wiring

WID07 Series

Edge connector wiring for the WID07 Series is shown in two diagrams:

- Figure B-12 diagrams connections used by the 16-channel modules in the series.
- Figure B-13 diagrams connections used by the 8-channel modules in the series.

The edge connector wiring for the WID07J is shown in Figure B-11. The supply to pin 18 on terminal block A is positive when dc power supply is used.

16-Channel Modules

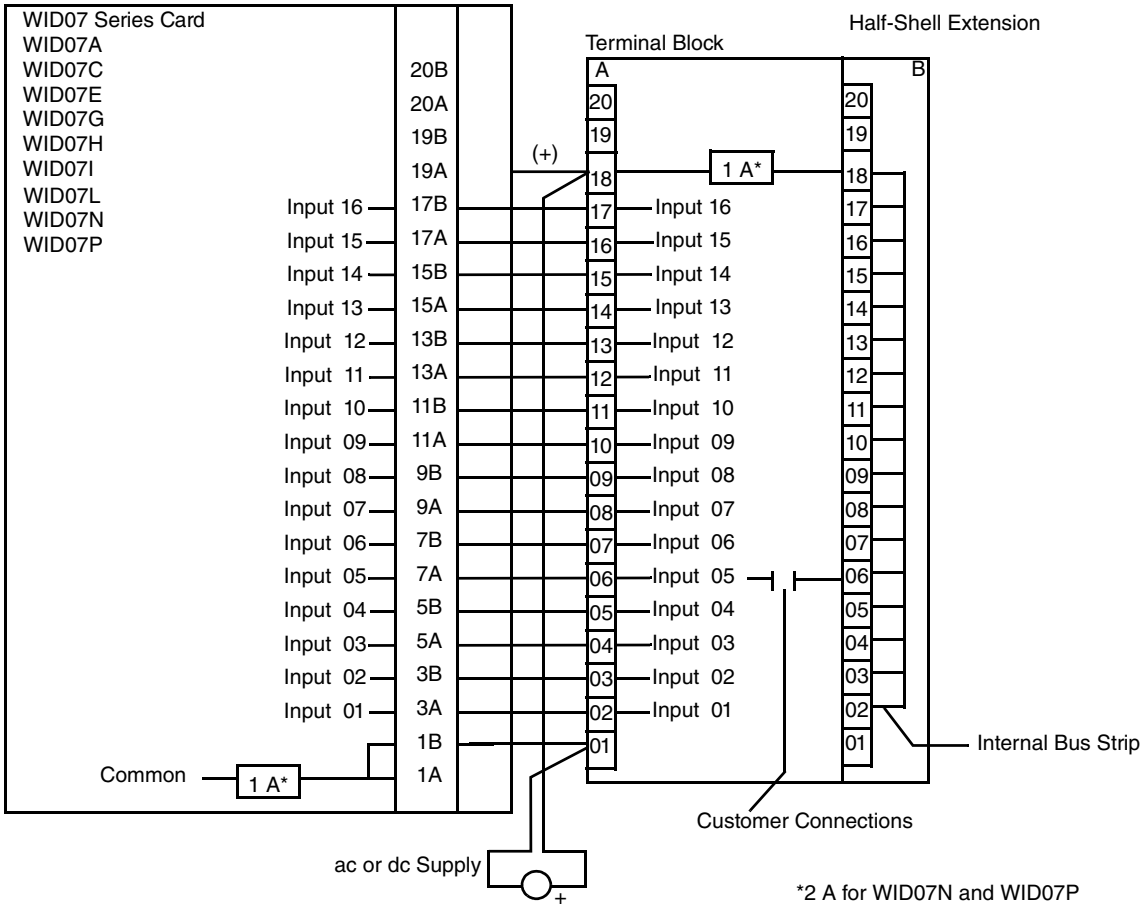


Figure B-12. WID07 Series Edge Connector Wiring: 16-Channel Modules

8-Channel Modules

For the WID07M and WID07O used with #6 terminal blocks, all neutral returns of the wetting voltages must be connected to even-numbered terminal blocks (terminals 2, 4, 6, 8, 10, 12, 14, and 16).

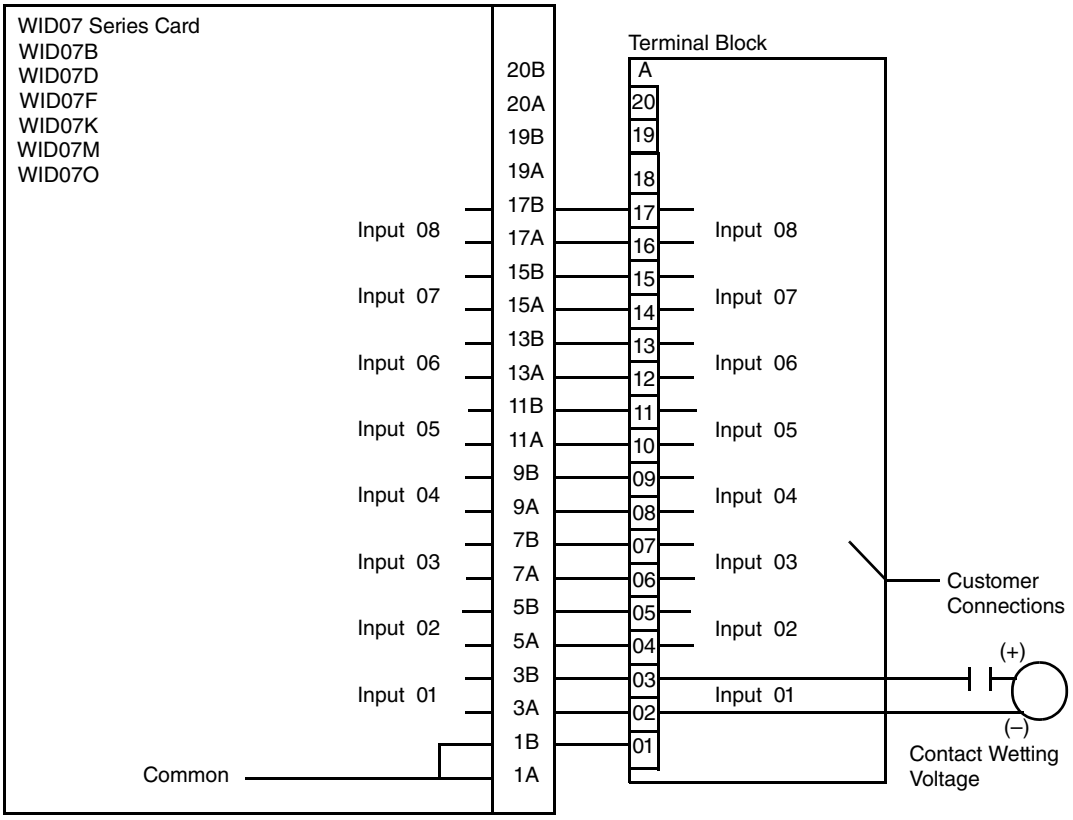


Figure B-13. WID07 Series Edge Connector Wiring: 8-Channel Modules

WLJ04 Series

There are two wiring diagrams for the WLJ04 Series analog IO interface modules:

- The diagram in Figure B-14 is for installation where grounding is at the signal source.
- The diagram in Figure B-15 is for fused half-shell extension wiring.

Jumpers between terminal block screws 3, 4, 5, 7, 8, 10 and 11 must be installed to connect shields and negative inputs of analog inputs.

Grounding at Signal Source

Figure B-14 shows input grounded at the single source with both shield and (–) input grounded. If inputs are to be grounded at the system end, install a #6 screw and nut in the hole located near the shield terminal on terminal block A. Then add two jumpers at terminal A between the #6 screw, the shield, and the (–) input of each channel. Holes have been drilled next to terminals 2, 5, 8, 11, 14, and 17 for this purpose.

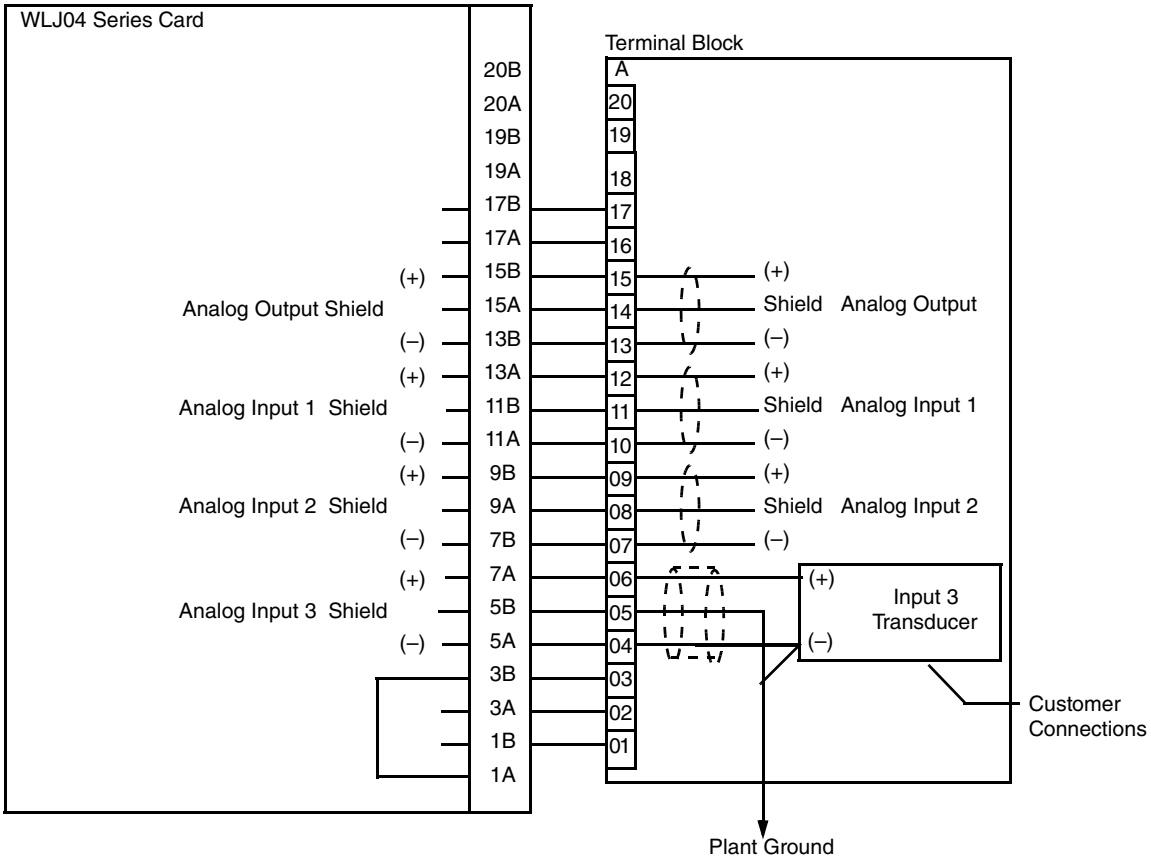


Figure B-14. WLJ04 Series Edge Connector Wiring

Fused Half-Shell Extension Wiring

Figure B-15 illustrates WLJ04 Series edge connector wiring when a half-shell extension is employed. The extension includes four 1/32 A fuses.

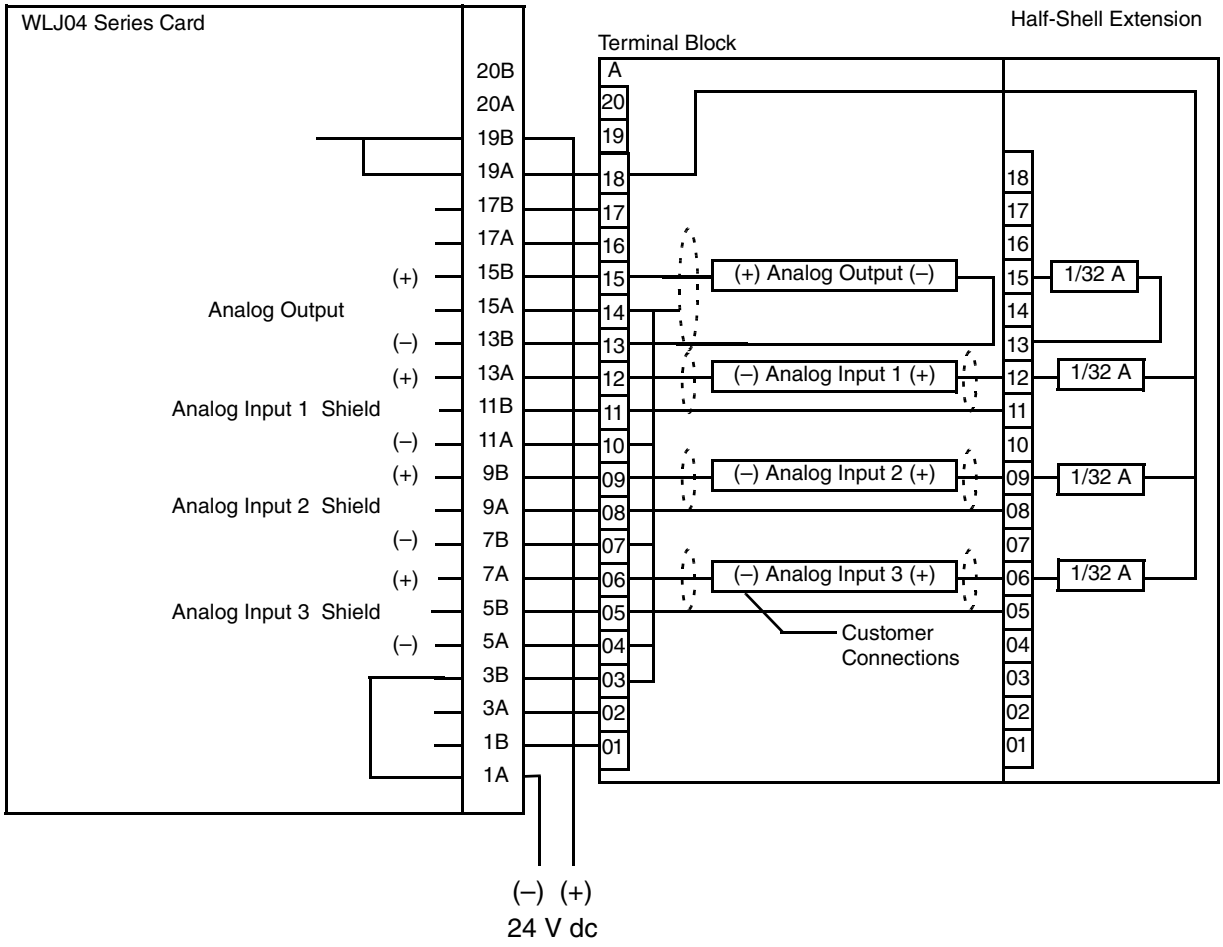


Figure B-15. WLJ04 Series Edge Connector Wiring

WPA06A Module

The edge connector wiring for the WPA06A pulse accumulator module is shown in Figure B-16.

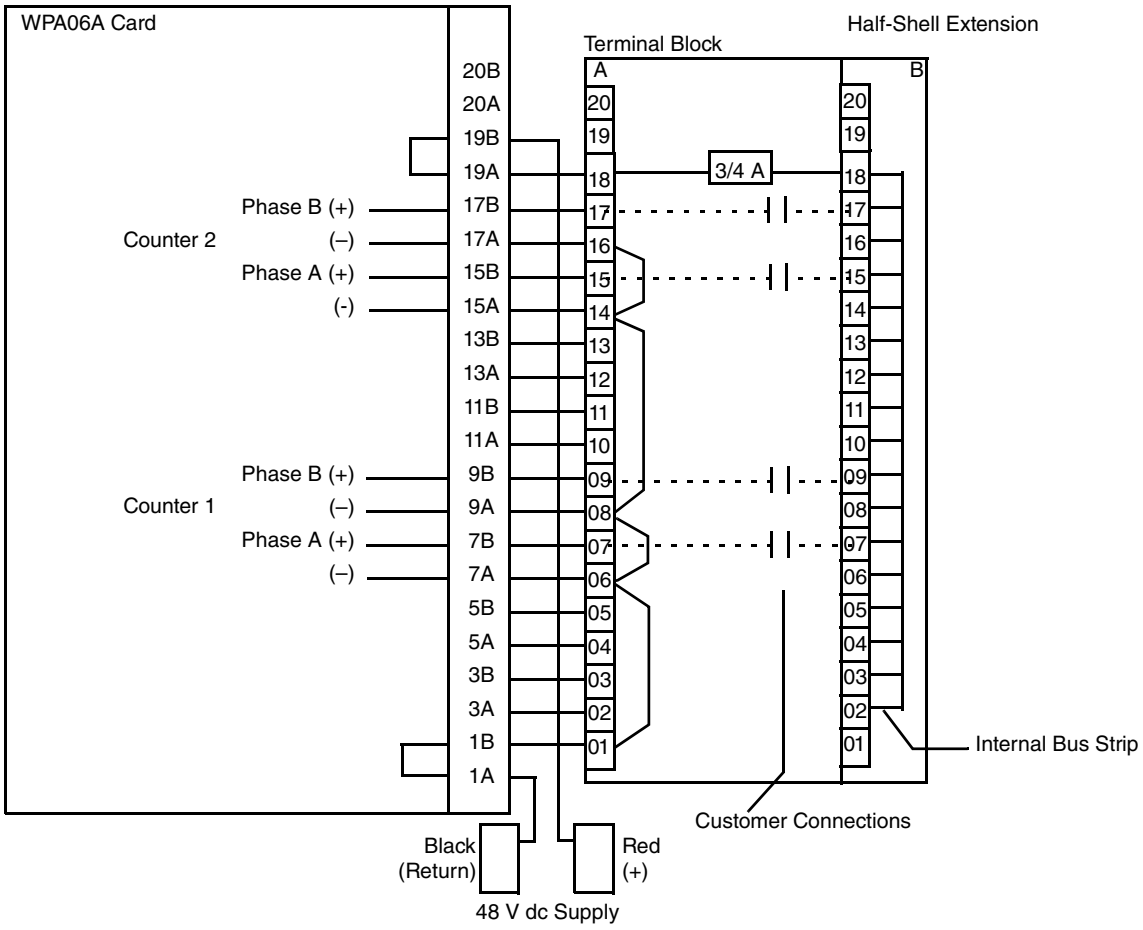


Figure B-16. WPA06A DCS Fieldbus Module Edge Connector Wiring

WRF03 Series

Figure B-17 shows the edge connector wiring for the WRF03A and WRF03B RTD input modules.

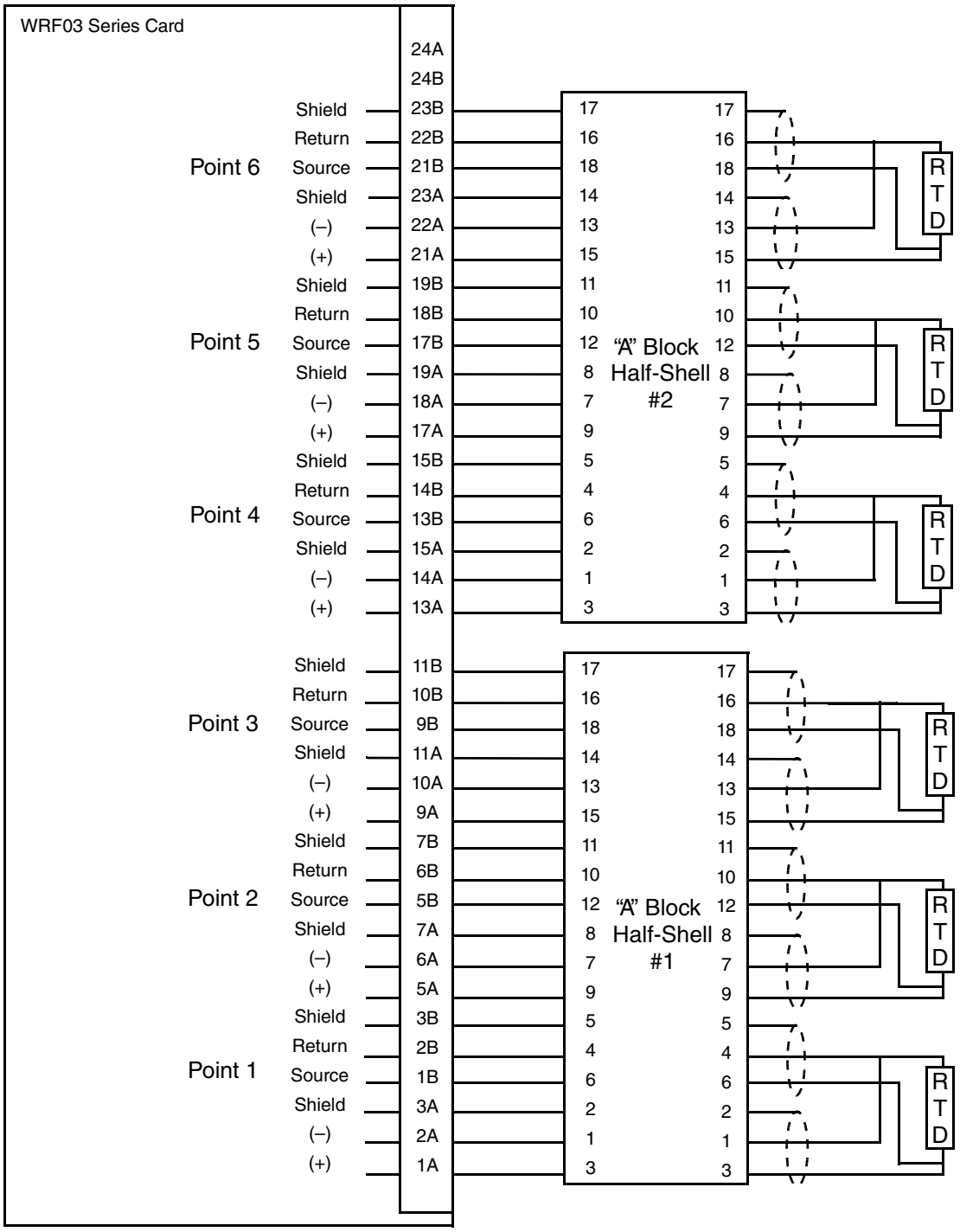


Figure B-17. WRF03 Series Edge Connector Wiring

WRO09 Series

Figure B-18 shows the edge connector wiring for the WRO09 Series relay output modules.

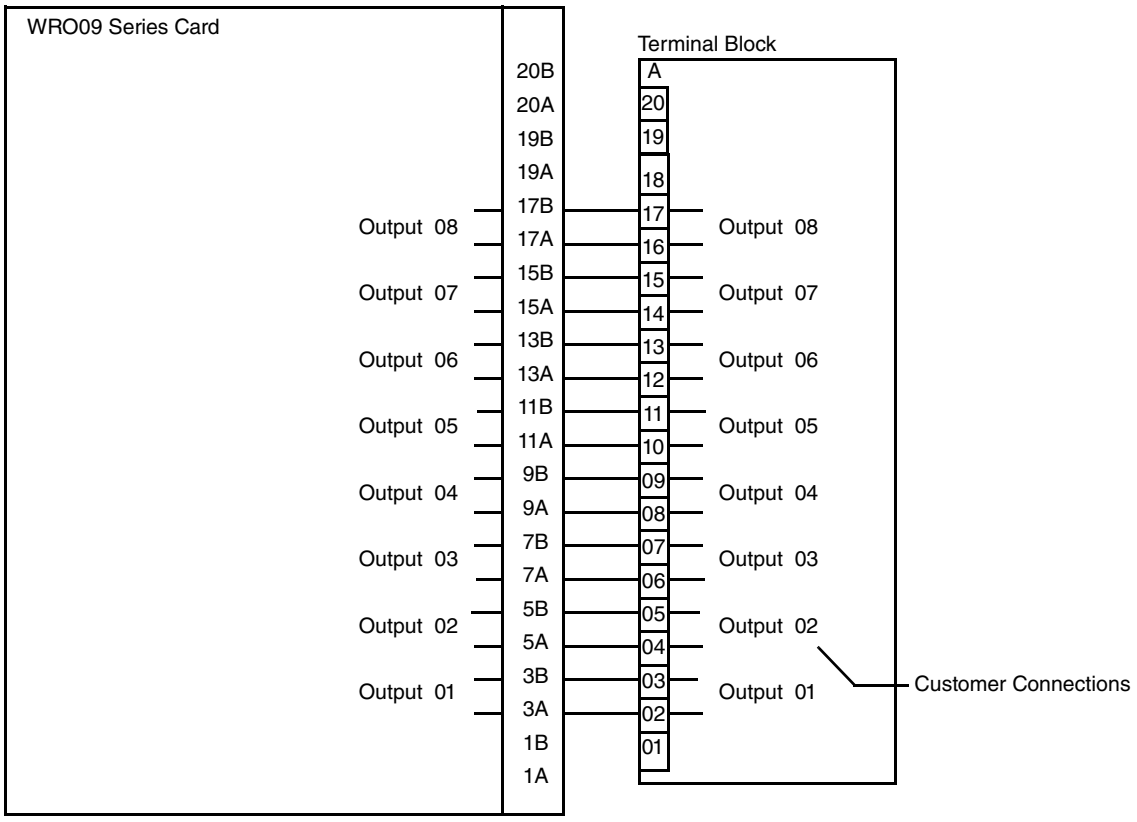


Figure B-18. WRO09 Series Edge Connector Wiring

WRT03 Series

There are two wiring diagrams for the WRT03 Series RTD input modules:

- The diagram in Figure B-19 is for configurations with rack-grounded RTDs.
- Figure B-20 shows the wiring when the RTDs are grounded at the signal source.

  Holes are provided in the half-shell terminal block A for cabinet grounding of RTDs. Install #6 screw and nut in the hole located next to terminals 5 and 14 to ground the input shields.

Rack-Grounded RTDs

Separate shields for channels 1 and 2, and for channels 3 and 4 are connected on the card. Each set is available at terminals 5 and 14 for ground connection as shown.

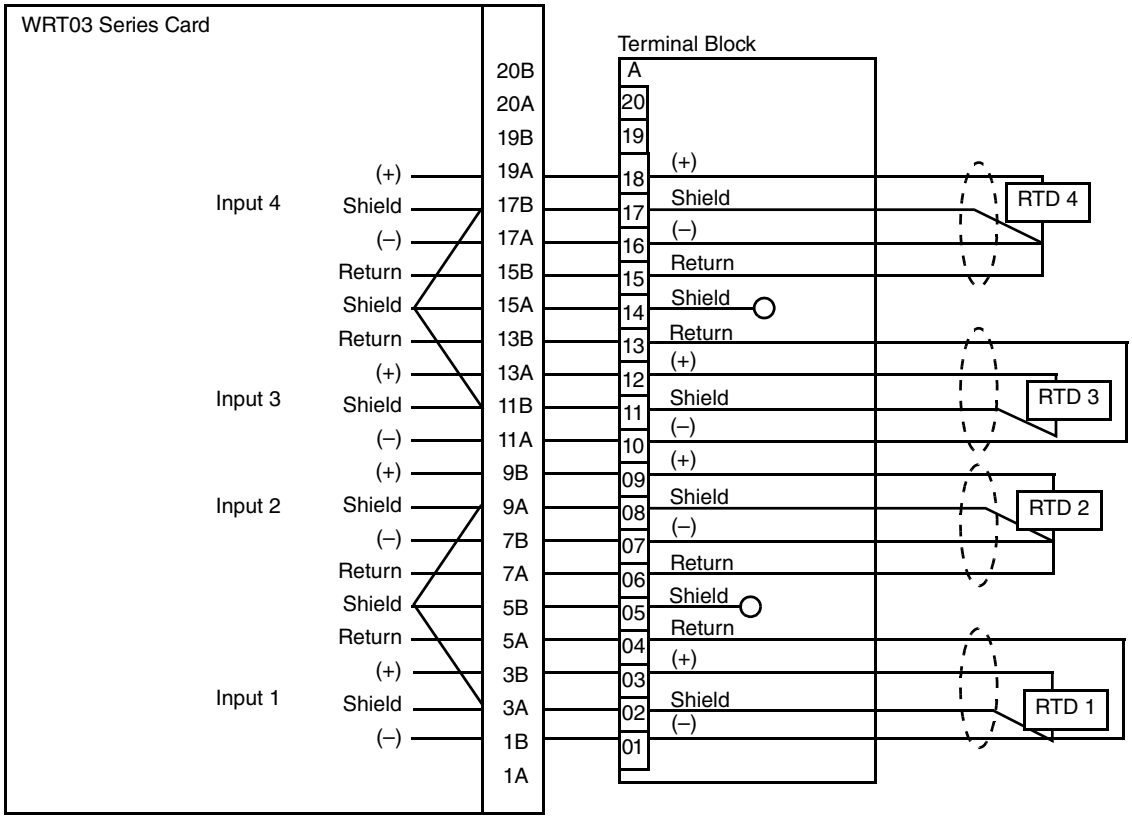


Figure B-19. WRT03 Series Edge Connector Wiring: Rack-Grounded RTDs

Plant-Grounded RTDs

Separate shields for channels 1 and 2, and for channels 3 and 4 are connected on the card. Each set can be separately grounded as shown.

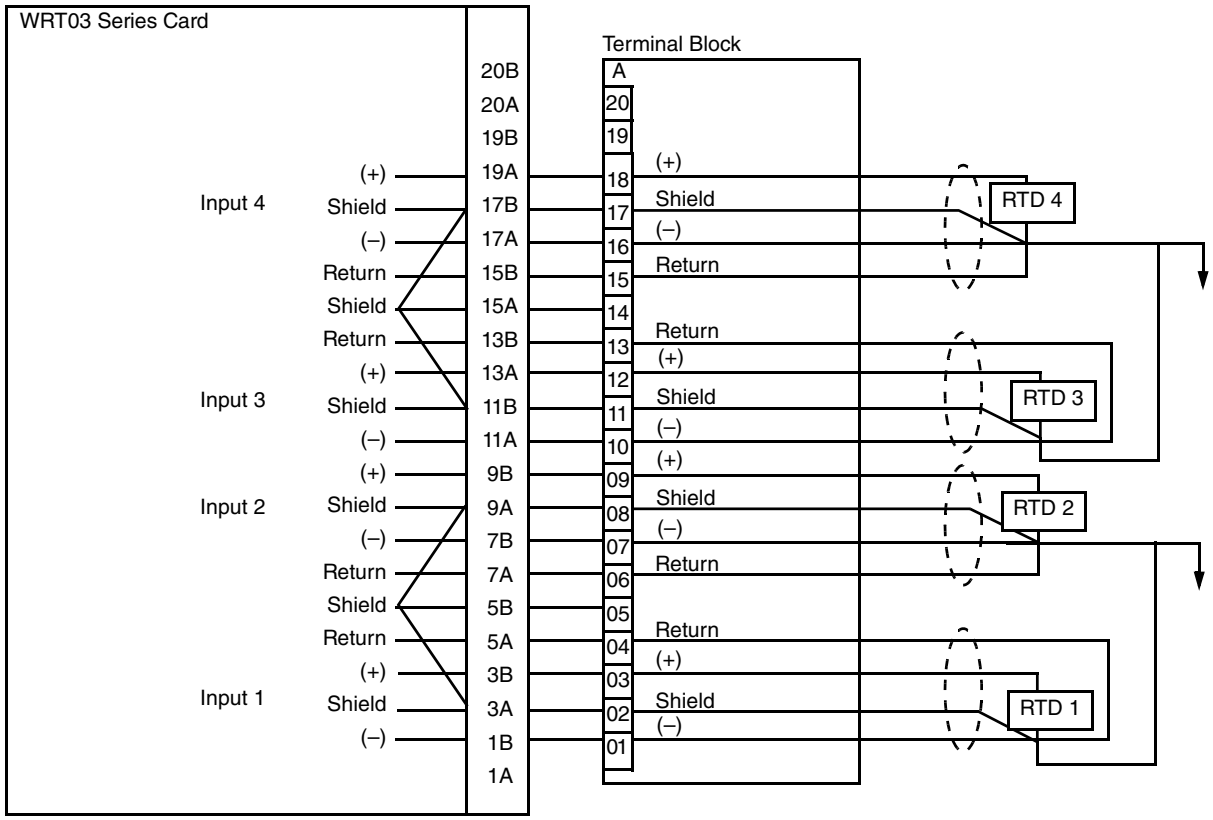


Figure B-20. WRT03 Series Edge Connector Wiring: Plant-Grounded RTDs

WTO09 Module

Figure B-21 shows the edge connector wiring for the WTO09 DCS Fieldbus Module, which provides eight outputs to TRIAC devices.

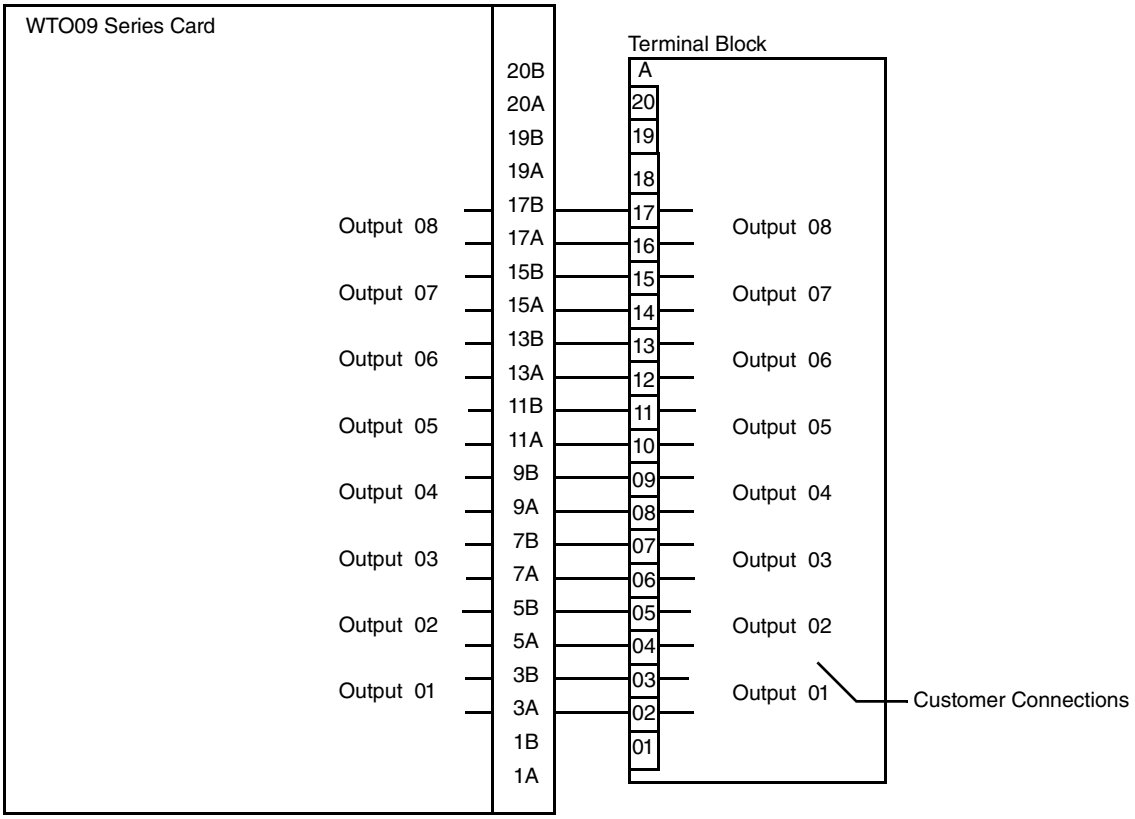


Figure B-21. WTO09 DCS Fieldbus Module Edge Connector Wiring

I/O Edge Connector Pin Assignments (20-Pin Connector)

Table B-3 and Table B-4 map the I/O edge connector pin numbers on the DCS Fieldbus Module to the comparable pin assignments on the WDPF Q-Cards. Table B-3 identifies the numbers on the etch side of the 20-pin connector, while Table B-4 identifies the numbers on the component side. Pin 1A is located closest to the corner on the etch side of the Q-card. Pin 1B is located closest to the corner on the component side.

Table B-1. I/O Edge Connector Pin Assignments, 20-Pin Connector Etch Side

DCS Fieldbus Module	Q-Card
1	1A
3	3A
5	5A
7	7A
9	9A
11	11A
13	13A
15	15A
17	17A
19	19A

Table B-2. I/O Edge Connector Pin Assignments, 20-Pin Connector Component Side

DCS Fieldbus Module	Q-Card
2	1B
4	3B
6	5A
8	7B
10	9B
12	11B
14	13B
16	15B
18	17B
20	20A

I/O Edge Connector Pin Assignments (56-Pin Connector)

Table B-3 and Table B-4 map the I/O edge connector pin numbers on the DCS Fieldbus Module to the comparable pin assignments on the WDPF Q-Cards. Table B-3 identifies the numbers on the etch side of the 56-pin connector, while Table B-4 identifies the numbers on the component side. Pin 1A is located closest to the corner on the etch side of the Q-card. Pin 1B is located closest to the corner on the component side.

Table B-3. I/O Edge Connector Pin Assignments, 56-Pin Connector Etch Side

DCS Fieldbus Module	Q-Card
1	1A
3	2A
5	3A
7	4A
9	5A
11	6A
13	7A
15	8A
17	9A
19	10A
21	11A
23	12A
25	13A
27	14A
29	15A
31	16A
33	17A
35	18A
37	19A
39	20A
41	21A
43	22A
45	23A
47	24A
49	25A
51	26A
53	27A
55	28A

Table B-4. I/O Edge Connector Pin Assignments, 56-Pin Connector Component Side

DCS Fieldbus Module	Q-Card
2	1B
4	2B
6	3B
8	4B
10	5B
12	6B
14	7B
16	8B
18	9B
20	10B
22	11B
24	12B
26	13B
28	14B
30	15B
32	16B
34	17B
36	18B
38	19B
40	20B
42	21B
44	22B
46	23B
48	24B
50	25B
52	26B
54	27B
56	28B

Appendix C. Power Supply Replacement

The following procedures describe how to replace power supplies used in the Westinghouse WDPF equipment racks:

- The power supply which powers the Q-Crate and Q-Cards is replaced with a new power supply (p/n P0928HX).

These power supplies are not included in the Migration Kit, but are ordered separately from Invensys Systems, Inc.

Q-Crate and Q-Card Power Supply Replacement

⚠ CAUTION

The following procedure assumes that power has been removed from the existing power supplies. Before switching off power to the existing power supplies, ensure that such action will not adversely affect the process.

The Q-Crates and Q-Cards have redundant power supplies, and both must be replaced. The replacement power supplies (P0928HX), are shown in Figure C-1. Proceed as follows:

1. Remove the power-in and power-out cables from the power supplies, noting (for future reference) which cables are connected to which input/output terminals.
2. Referring to Figure C-1, remove the screws holding each power supply mounting bracket in place, and then the screws attaching each power supply to the bracket and set the screws aside.
3. Remove each power supply from the rack, and replace each with the new Foxboro power supply (P0928HX).
4. Using new supplied screws, secure each power supply to the mounting bracket rack, and then secure the mounting brackets to the rack using the original screws
5. Make the power-in and power-out cable connections as indicated in Figure C-1. A label on top of each new (Foxboro) power supply describes all possible cable connections, as well as jumper and switch settings. If external indication of the power supply status is to be employed, refer to “Power Supply Status Cable Installation” on page 188 for information on installing the power supply status cable.

When attaching the power cables to the newly installed power supply, use the new screws provided on the terminal blocks. Use of the old screws may cause impaired current conductivity.

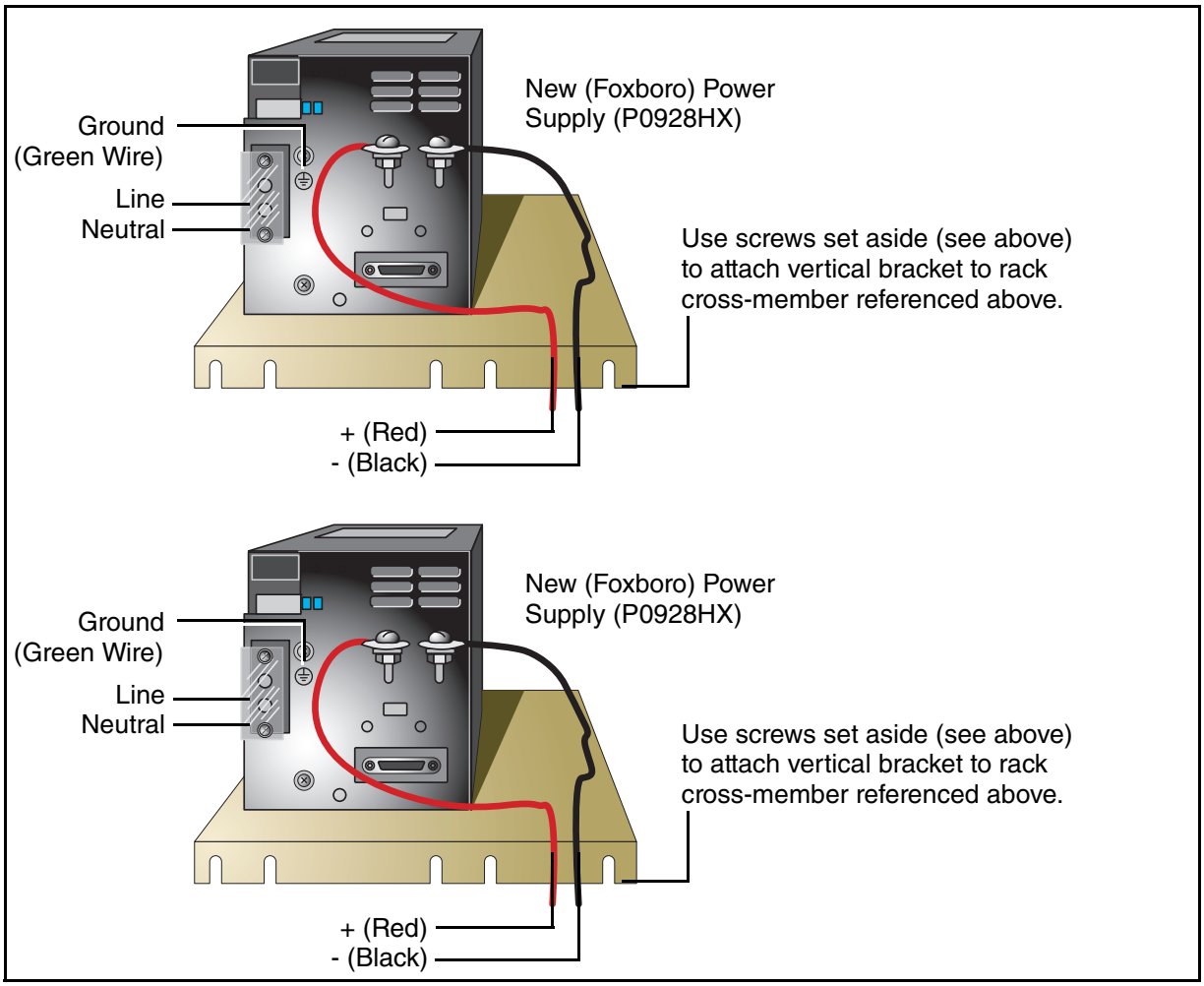
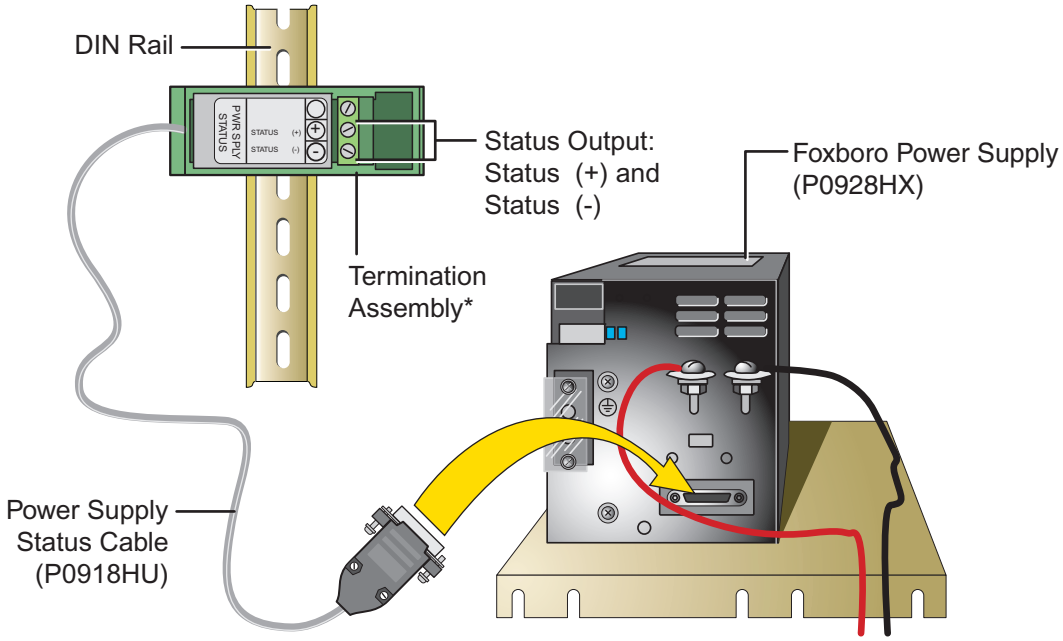


Figure C-1. Q-Crate and Q-Card Power Supply Replacement

Power Supply Status Cable Installation

A status cable (Foxboro part number P0918HU) can be used in conjunction with appropriate indicator circuitry to provide indication of the power supply's operating status. When the power supply output is good (above its minimum specified value), the power supply produces a switch closure condition at the status cable output points, which are labeled **`Status (+)`** and **`Status (-)`**. If the power supply should fail (or lose input power), the power supply produces and open switch condition. The status output is from an opto transistor (inside the power supply) capable of switching 1 mA dc, with an ON voltage less than 0.4 V at 1 mA. Open circuit voltage at the **`Status (+)`** and **`Status (-)`** output points must not exceed 30 V. Be sure that the connections to the status cable outputs are wired according to the polarity as marked.

Install the power supply status cable as shown in Figure C-2, mounting the termination assembly (part of cable assembly P0918HU) on a DIN rail in the equipment cabinet.



* The Termination Assembly is a part of the Power Supply Status Cable assembly (P0918HU).

Figure C-2. Power Supply Status Cable Installation

Appendix D. CP60 Upgrade To FCP280, FCP270, or ZCP270

This appendix provides the procedure to upgrade CP60 control processors to FCP280, FCP270, or ZCP270 control processors on existing Foxboro Evo systems.

To replace the CP60 control processors with the FCP280, FCP270, or ZCP270 perform the following:

NOTE

The FCP280 is supported by Control Core Services software v9.0 or later.
The FCP270 is supported by I/A Series software v8.1.1-v8.8 or Control Core Services software v9.0 or later.
The ZCP270 is supported by I/A Series software v8.4-v8.8 or Control Core Services software v9.0 or later.

1. Install the appropriate version of the Control Core Services software on the Foxboro Evo system which contains your control processors - see the note above. Refer to the Global Customer Support website (*https://support.ips.invensys.com*) for the latest version of Control Core Services software and its documentation.
2. After the system has been upgraded to the appropriate version of the Control Core Services software, the CP60s can be replaced with FCP280, FCP270, or ZCP270 control processors.
   - To install the FCP280, refer to *Field Control Processor 280 (FCP280) Upgrade Guide* (B0700GC) for instructions on replacing the CP60s, and refer to the chapter "Installing the Field Control Processor 280" in *Field Control Processor 280 (FCP280) User's Guide* (B0700FW) for instructions on installing the FCP280.
   - To install the FCP270, follow the instructions in *Field Control Processor 270 (FCP270) User's Guide* (B0700AR).
   - To install the ZCP270, follow the instructions in *Z-Module Control Processor 270 (ZCP270) User's Guide* (B0700AN).
   - To cable the Fieldbus to the FCP280, FCP270, or ZCP270, follow the instructions in "Installing the FCP280, FCP270, ZCP270, FCM100Et, FCM100E, or FEM100" on page 77.

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