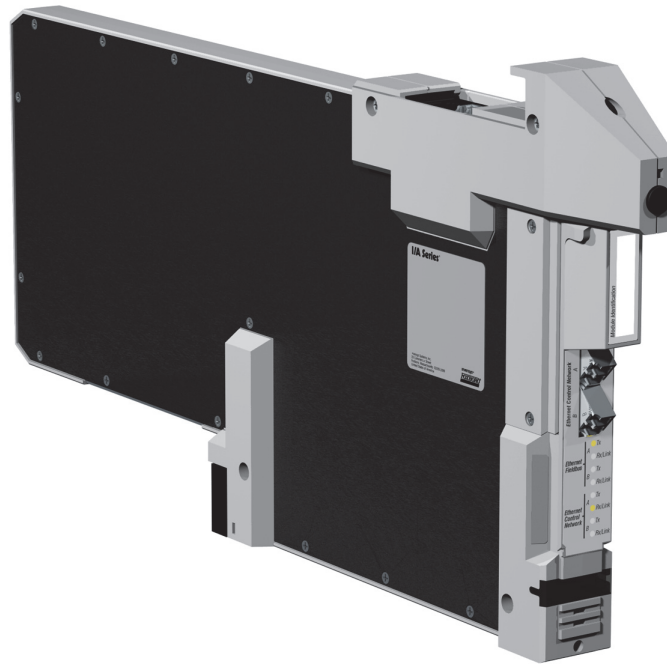


Z-Module Control Processor 270 (ZCP270)



The Z-Module Control Processor 270 is a distributed, optionally fault-tolerant controller that performs process control and alarming functions according to a user-defined control strategy.

FEATURES

- ▶ Performs regulatory, logic, timing, and sequential control together with connected Fieldbus Modules
- ▶ Supports up to 128 of the 200 Series Fieldbus Modules (FBMs - Compact or standard types) when using the FCM100Et Fieldbus Communications Module
- ▶ Supports up to 128 of the 200 Series FBMs (Compact or standard types), 100 Series FBMs, or a combination 100 Series and 200 Series FBMs when using the FCM100E Fieldbus Communications Module
- ▶ Performs data acquisition and alarm detection and notification
- ▶ Offers unique, patented, fault-tolerant operation using two control modules to greatly improve reliability relative to other process controllers
- ▶ Connects to The MESH control network via standard fiber optic 100 Mbps Ethernet
- ▶ Uses versatile control algorithms and a wide variety of FBMs to provide control capabilities for a broad range of process applications
- ▶ Supports time synchronization using optional external time from GPS satellites
- ▶ Offers on-line image update of a fault-tolerant ZCP270 without shutting down the process

- ▶ Uses soft letterbugs configurable via the I/A Series® system Letterbug Configurator.
- ▶ Supports self-hosting mode with I/A Series software v8.4-v8.8 or Foxboro Evo™ Control Core Services v9.0 or later

OVERVIEW

The Z-Module Control Processor 270 (ZCP270) is an optionally fault-tolerant, Z-form factor controller. The ZCP270 performs regulatory, logic, timing, and sequential control together with connected Fieldbus Communications Modules (FCMs) and Fieldbus Modules. It also performs data acquisition and alarm detection and notification. The ZCP270 connects to The MESH control network and FCM100Et/FCM100Es via standard fiber optic 100 Mbps Ethernet. The FCM100Et interfaces the 2 Mbps Module Fieldbus used by the 200 Series FBMs and the FCM100E interfaces the 2 Mbps Module Fieldbus used by the 200 Series FBMs or the 268 Kbps Fieldbus used by 100 Series FBMs. Depending on sizing considerations, the ZCP270 can be used with a mix of FCM100E and FCM100Et modules.

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 (see Figure 1).

EQUIPMENT MOUNTING

The Foxboro Evo architecture requires workstations and commercial-off-the-shelf (COTS) Ethernet switches, a rack room for the ZCP270 and Ethernet switches, and a field enclosure for the FCM100Et/FCM100Es, FBMs, and other I/O hardware. For more information on The MESH control network architecture, refer to PSS 21H-7C2 B3.

ENHANCED RELIABILITY (FAULT-TOLERANCE)

The unique and patented fault-tolerant operation of the ZCP270 greatly improves reliability relative to other process controllers. The fault-tolerant version of the ZCP270 consists of two modules operating in parallel, with two sets of Ethernet connections to The MESH network, two for the control network and two for the fieldbus network. The two ZCP270 modules, married together as a fault-tolerant pair, provide continuous operation of the controller in the event of virtually any hardware failure occurring within one module of the pair.

Both modules receive and process information simultaneously, and faults are detected by the modules themselves. One of the significant methods of fault detection is comparison of communication messages at the module external interfaces.

Messages only leave the controller when both controllers agree on the message being sent (bit for bit match). Upon detection of a fault, self-diagnostics are run by both modules to determine which module is defective. The non-defective module then assumes control without affecting normal system operations.

This fault-tolerant solution has the following major advantages over controllers that are merely redundant:

- ▶ No bad messages are sent to the field or to applications using controller data because no message is allowed out of the controller unless both modules match bit for bit on the message being sent.
- ▶ The secondary controller is synchronized with the primary one, which ensures up to the moment data in the event of a primary controller failure.
- ▶ The secondary controller will have latent flaws detected prior to any switchover because it is performing exactly the same operations as the primary controller.

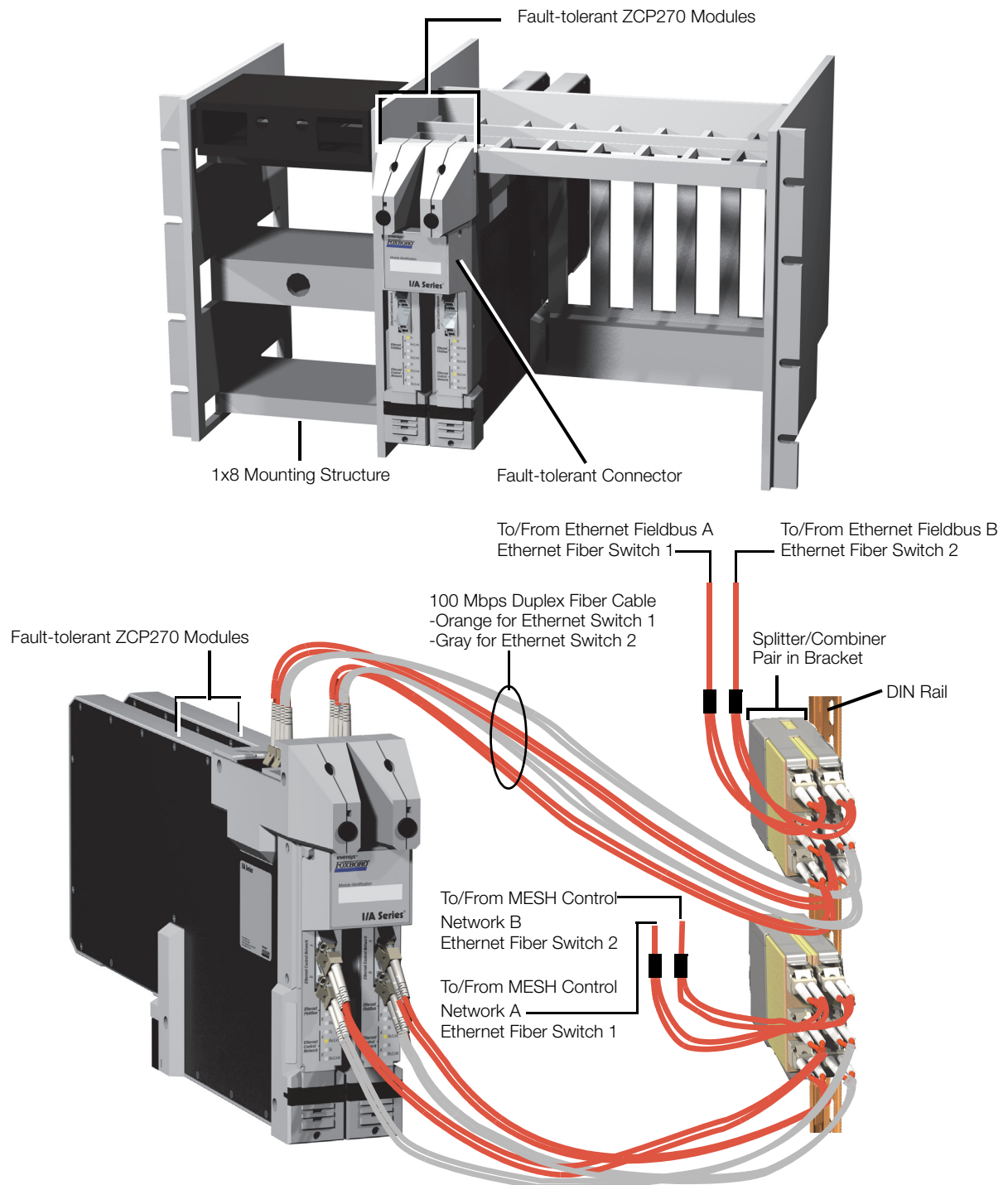


Figure 1. Fault-Tolerant ZCP270 Module Pair Mounted in 1x8 Mounting Structure

SPLITTER/COMBINER

Fault-tolerant ZCP270 modules connect to two pair of fiber optic splitter/combiners (see Figure 1). One splitter/combiner pair connects redundant Ethernet ports on the front of each module to redundant Ethernet switches in the control network. The other splitter/combiner pair connects redundant Ethernet fieldbus ports on the top of each module to redundant Ethernet switches in the control network.

For each module, the splitter/combiners provide separate transmit/receive fiber connections for each Ethernet control network and Ethernet fieldbus port. Fiber cables are connected so that splitter/combiners pass inbound traffic from a switch to both modules, and pass outbound traffic from the primary module to a switch.

Each splitter/combiner pair mounts in an assembly that either mounts in a chassis assembly for 19-inch racks or fastens to the DIN rail in the enclosure. The splitter/combiner is a passive device that does not require electrical power.

ENHANCED COMMUNICATIONS

The Foxboro Evo architecture uses an Ethernet control network with 100 Mbps data communications between the ZCP270s and the Ethernet switches (see Figure 2).

The ZCP270 can also communicate with serial and Ethernet devices, such as PLCs, via Field Device System Integrators and FCM100Ets/FCM100Es. This allows connection to new device interfaces without any changes to the controller software.

ON-LINE IMAGE UPDATE

For fault-tolerant ZCP270 modules, on-line image update replaces the executable image (operating system) of a running ZCP270 with a newer image without having to shut down the equipment being controlled by the ZCP270. New product enhancements can be brought on-line in 1.5 seconds for heavily loaded controllers; less for lightly loaded controllers.

Because the ZCP270 contains its executable image in internal flash memory, and has sufficient RAM to hold a new executable image at the same time, on-line image updates are now much easier to perform.

TIME SYNCHRONIZATION, SOE, TDRA

The Foxboro Evo system supports time synchronization using either an externally maintained optional source of Universal Coordinated Time (UTC) from GPS satellites or an internal source using proprietary software. ZCP270s and their FCM100Ets receiving time updates via the external time source synchronize their FBMs to 1 ms. For more information, refer to PSS 21S-1C2 B3.

Time stamping is used for alarm messages, values sent to the historian, and the new Sequence Of Events (SOE) and Transient Data Recorder and Analyzer (TDRA) features.

SOE data are discrete points that are time stamped at the FBM, optionally to 1 ms, and sent to the workstation on a change basis. TDRA data are analog points that are time stamped at the FBM and sent to the workstation every 10 ms. These new features are supported by client software in the workstation. To support SOE and TDRA, the FCM100Et must be installed on the same network as the workstation collecting the data. For information on this software, refer to PSS 21S-2B9 B4 and PSS 21S-2B10 B4.

SOFTWARE FEATURES

The ZCP270 performs regulatory, logic, timing, and sequential control, as well as data acquisition, alarm detection, and alarm notification. Process variables are controlled using time-proven algorithms (mathematical computations performing specific functions). The algorithms are contained in functional control blocks, which are configured by on-site process engineers to implement the desired control strategies. The versatility of the algorithms, coupled with the variety of FBMs available, provides control capabilities suited to a broad range of process applications. Control strategies ranging from simple feedback and cascade loops to highly sophisticated feedforward, nonlinear, and complex characterization control schemes are readily implemented.

The ZCP270 also provides the following features:

- ▶ Infrared communications with the controller enables you to set and read the controller letterbug via the Letterbug Configurator.
- ▶ Alarm enhancements to the function blocks: re-alarmed on changes to alarm priority, re-alarmed based upon a configurable time delay deadband, and alarm suppression based upon time.
- ▶ Optional UTC external time synchronization.
- ▶ Improved controller performance.
- ▶ Optional self-hosting mode (I/A Series software v8.4-v8.8 or Control Core Services v9.0 or later) allows the ZCP270 to start up and run, executing its configured control scheme using the checkpoint file stored in flash memory. This allows the ZCP270 to boot itself with a valid control database even if its host workstation is not present.

Self-Hosting Feature, Available with 200 Series FBMs Only

The self-hosting feature is recommended only for use in ZCP270s which are used with 200 Series FBMs. All of the information necessary to reboot 200 Series FBMs is included in non-volatile flash memory on the ZCP270. However, the flash memory on the 100 Series FBMs and related products on the 268k fieldbus does not include this information, and they require the workstation host to be present to reboot. More details on the self-hosting feature are available in *DIN Rail Mounted FBM Subsystem User's Guide* (B0400FA).

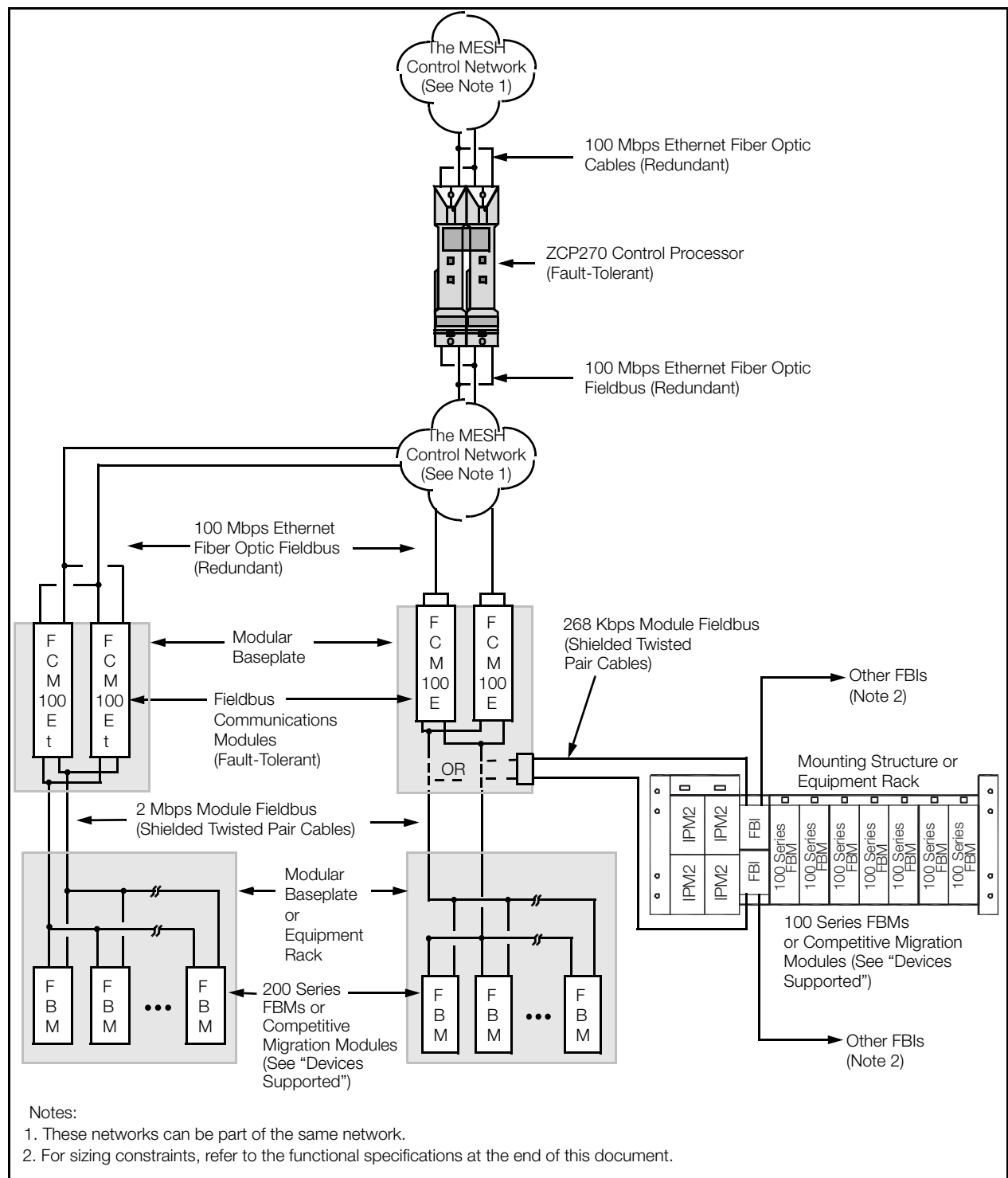


Figure 2. Typical ZCP270 Network Configuration (Simplified)

DEVICES SUPPORTED

The ZCP270 with FCM100Es supports the following devices:

- ▶ All 200 series FBMs (FBM201, FBM202, and so forth)
- ▶ Field Device Systems Integrator (FDSI) modules
- ▶ Intrinsically Safe I/O Subsystem (ISCM)
- ▶ DCS Fieldbus Modules for Siemens APACS+™ Systems
- ▶ DCS Fieldbus Modules for Westinghouse WDPF® Systems.
- ▶ DCS Fieldbus Modules for Fisher's PROVOX® Series 20 Migration with HART.
- ▶ DCS Fieldbus Modules for Honeywell® TDC 2000 Systems with HART.

The ZCP270 with FCM100Es supports the following devices on the 2 Mbps module Fieldbus:

- ▶ All 200 Series FBMs (FBM201, FBM202, and so forth) - both Compact or standard types
- ▶ Field Device Systems Integrator (FDSI) modules
- ▶ Intrinsically Safe I/O Subsystem (ISCM)
- ▶ DCS Fieldbus Modules for Siemens APACS+™ Systems
- ▶ DCS Fieldbus Modules for Westinghouse WDPF® Systems.
- ▶ DCS Fieldbus Modules for Fisher's PROVOX® Series 20 Migration with HART.
- ▶ DCS Fieldbus Modules for Honeywell® TDC 2000 Systems with HART.

The ZCP270 with FCM100Es supports the following devices on the 268 Kbps Fieldbus:

- ▶ 100 series FBMs (FBM01, FBM02, and so forth)
- ▶ Fieldbus Cluster I/O via FBP10 Fieldbus processor module
- ▶ Foxboro® Hydrostatic Interface Unit (HIU)⁽¹⁾
- ▶ Foxboro Mass Flowmeter
- ▶ Foxboro Panel Display Stations
- ▶ SPECTRUM™ Migration Integrators
- ▶ SPEC 200™ Control Integrators
- ▶ SPEC 200 MICRO™ Control Integrators
- ▶ SPEC 200 CCM Control Integrators
- ▶ DCS Fieldbus Modules for Honeywell® TDC 2000 and TDC 3000 systems
- ▶ DCS Fieldbus Modules for Bailey® Net90 and Infi90 systems
- ▶ DCS Fieldbus Modules for Fisher's PROVOX® Series 10, Series 20 and Controller Series systems.

MOUNTING STRUCTURE

The ZCP270 are installed in the 1x8 and 2x8 mounting structures. The two modules of a fault-tolerant ZCP270 must be mounted in adjacent mounting structure slots to allow for installation of the interconnecting fault-tolerant connector.

(1) Although FBM23 (HIU) IOM software is included with I/A Series software v8.x or Control Core Services v9.0 or later, the module's configurator, Intelligent Transmitter Maintenance Workbench (IT_Maint), is not supported. You must configure all FBM23s with the hand-held terminal FIU. Refer to *Configuration - Handheld Terminal (FIU)*, Foxboro M&I document number MI 020-065.

LED INDICATORS

Light-emitting diodes (LEDs) on the front of the ZCP270 module provide visual indication of the:

- ▶ ZCP270 operational status
- ▶ Communications activity of Ethernet control network A and B links
- ▶ Communications activity of Ethernet fieldbus A and B.

The control network path Tx LEDs indicate which controller is primary as well as the network path it is using; these LEDs are only active on the primary module.

FUNCTIONAL SPECIFICATIONS

Processor Type

CONTROL PROCESSOR

Microprocessor-based AMD Elan SC520 (running at 100 MHz) with stored programs, using high-speed communication capability.

Memory (per processor)

SIZE

16 MB SDRAM
32 MB flash memory

ERROR DETECTION

ECC providing single-bit error detection and correction as well as multiple-bit error detection.

Process I/O Communications (with FCMs)

100 MBPS FAST ETHERNET

Transmission Rate
100 Mbps to the FCM100Et or FCM100E

Cable Lengths

ZCP270, FCM100Et or FCM100E TO ETHERNET SWITCH

2 km (1.24 mi) maximum

Process I/O Capacity

WITH FCM100Et

FCM100Et Modules
32 (maximum) per ZCP270 Ethernet trunk fieldbus
200 Series FBMs
128 (maximum) Fieldbus Modules depending on the number of FCM100EtS implemented and control processor sizing constraints (refer to *ZCP270 Sizing Guidelines* [B0700AW]).

WITH FCM100E

FCM100E Modules
32 (maximum) per ZCP270 Ethernet trunk fieldbus
200 Series FBMs
128 (maximum) Fieldbus Modules depending on the number of FCM100Es implemented and control processor sizing constraints (refer to *ZCP270 Sizing Guidelines* [B0700AW]).

WITH FCM100E (CONT.)

100 Series FBMs

64 (maximum) per ZCP270 Ethernet trunk
128 (maximum) Fieldbus Modules depending on the number of FCM100Es implemented and control processor sizing constraints (refer to *ZCP270 Sizing Guidelines* [B0700AW]).

Maximum Number of Blocks Configured

The maximum number of blocks that can be configured for the ZCP270 (or fault-tolerant ZCP270 pair) is 4000.

Memory Allocation for Blocks

5.8 MB

Block Executions Per Second

10,000 blocks/second, maximum

Maximum Blocks Processed

The number of blocks that can be processed per basic processing cycle (BPC) time interval depends on control processor sizing constraints and block type selection. These blocks include all types (control blocks, ECBs, compounds, data blocks, and so forth). For sizing guidelines, refer to *ZCP270 Sizing Guidelines* (B0700AW).

Minimum Block Processing Cycle (BPC)

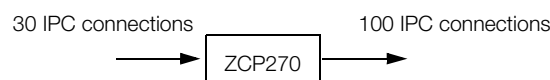
50 ms

Sequence Block Size

32 KB maximum for each block

Maximum Number of IPC Connections

131; 100 connections for source points; 30 connections for sink points; 1 connection for internal use only.



Maximum Number of OM Sink Lists

50

Maximum OM Scanner Database

12,000 points for BPC $\geq$ 200 ms
5,000 points for BPC $\leq$ 100 ms

FUNCTIONAL SPECIFICATIONS (CONTINUED)

Maximum Number of OM Sink Points

7,500

Configurable Block Periods

0.05, 0.1, 0.2, 0.5, 0.6, 1, 2, 5, 6, 10, 30 seconds
1, 10, 60 minutes

Basic Processing Cycle

0.05, 0.1, 0.2, 0.5, and 1.0 seconds, selectable at system configuration time

Time to Marry Fault-Tolerant Modules

<1s

Internal Diagnostics

Self-checking performed at power-up. Run-time checks and the watchdog timer function performed during operation.

Infrared Communications

Letterbug assignment via the Letterbug Configurator. Letterbug or Hardware ID readout via the Letterbug Configurator.

Power Requirements

INPUT VOLTAGE (REDUNDANT VOLTAGE)

39 V dc typical

CONSUMPTION (PER NON-FAULT-TOLERANT MODULE)

15 W, maximum

Regulatory Compliance

CE CERTIFICATION

For the ZCP270 to meet CE certifications required in European installations, shielded enclosures are required as described in *Power, Earthing (Grounding), EMC and CE Compliance* (B0700AU).

ELECTROMAGNETIC COMPATIBILITY (EMC)

European EMC Directive 89/336/EEC

Meets: EN 50081-2 Emission standard
EN 50082-2 Immunity standard
EN 61326 Annex A for Industrial Environments

Regulatory Compliance (Continued)

CISPR 11, Industrial Scientific and Medical (ISM) Radio-frequency Equipment - Electromagnetic Disturbance Characteristics - Limits and Methods of Measurement

Meets: Class A Limits

IEC 61000-4-2 ESD Immunity

Contact 6 kV, air 8 kV

IEC 61000-4-3 Radiated Field Immunity

10 V/m at 80 to 1000 MHz

IEC 61000-4-4 Electrical Fast Transient/Burst Immunity

±2 kV on I/O, dc power and communication lines

IEC 61000-4-5 Surge Immunity

±2 kV on ac and dc power lines; ±1 kV on I/O and communications lines

IEC 61000-4-6 Immunity to Conducted Disturbances Induced by Radio-frequency Fields

10 V (rms) at 150 kHz to 80 MHz on I/O, dc power and communication lines

IEC 61000-4-8 Power Frequency Magnetic Field Immunity

30 A/m at 50 and 60 Hz

SECURITY

Worldtech Achilles Certification™ Level One

ENVIRONMENTAL SPECIFICATIONS⁽²⁾

Operating

TEMPERATURE

0 to +60°C (+32 to +140°F)

RELATIVE HUMIDITY

5 to 95% (Noncondensing)

ALTITUDE

-300 to +3,000 m (-1,000 to +10,000 ft)

VIBRATION

0.5 g (5 to 500 Hz)

Storage

TEMPERATURE

-40 to +70°C (-40 to +158°F)

RELATIVE HUMIDITY

5 to 95% (Noncondensing)

ALTITUDE

-300 to +12,000 m (-1,000 to +40,000 ft)

PHYSICAL SPECIFICATIONS

Configuration

Single-width processor module. The fault-tolerant version consists of two single-width processor modules, with an interconnecting fault-tolerant connector.

Mass (Maximum)

1.7 kg (3.75 lb) for a single, non-fault-tolerant module.

Mounting

May be placed in any of the following I/A Series mounting structures:

- ▶ 1x8 Mounting Structure
- ▶ 2x8 Mounting Structure⁽³⁾

In the fault-tolerant version, the two modules must be mounted in adjacent mounting structure slots to allow for installation of the interconnecting fault-tolerant connector.

Dimensions - Module

HEIGHT

228 mm (8.97 in)

WIDTH

34.3 mm (1.35 in)

DEPTH

447 mm (17.6 in)

Fiber Optic Cabling – Ethernet Switch to ZCP270

CONNECTORS

Ethernet Switch Connector

One MT-RJ Connector

ZCP270 or Splitter/Combiner Connector

Two ceramic type LC connectors with clip

Fiber Optic Cabling – Ethernet Switch to ZCP270 (Continued)

FIBER OPTIC CABLE

Cable Material

Multi-mode fiber (MMF) 62.5/125 µm plenum

Cable Lengths

3 m (9.9 ft), 15 m (49.5 ft), 50 m (165 ft)

greater than 50 m – user supplied

Maximum Length

2 km (6,560 ft) from the Ethernet switch to the ZCP270.

(2) The environmental ranges can be extended by the type of enclosure containing the module. [Refer to the applicable Product Specification Sheet (PSS) which describes the specific enclosure that is to be used.]

(3) The 2x8 mounting structure is shipped as part of the Industrial Enclosures - IE16 and IE32. This mounting structure cannot be ordered as a separate structure.

PHYSICAL SPECIFICATIONS (CONTINUED)

Fiber Optic Cabling – Splitter/Combiner to ZCP270

CONNECTORS

Two ceramic type LC connectors with clip on each end

FIBER OPTIC CABLE

Cable Material

Multi-mode fiber (MMF) 62.5/125 µm

Cable Lengths

0.5 m (1.6 ft), 1.0 m (3.3ft), 3.0 m (9.9 ft),

15 m (49.5 ft), 50 m (165 ft)

greater than 50 m – user supplied

Maximum Length

2 km (6,560 ft) total from the Ethernet switch to the ZCP270, including the cabling to the splitter/combiner.

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