The I/A Series® Control Processors/Fieldbus Communications Modules (FCP270, ZCP270, CP60/FCM100Et/FCM100E, WFCM) and distributed control system (DCS) Fieldbus Modules (FBMs) replace the Westinghouse WDPF® I or II Controllers and Q-Cards, respectively, and connect existing field devices to the I/A Series system.

**FEATURES**

Key features of the I/A Series system DCS FBMs are:

- DCS FBMs plug directly into an existing Q-Crate to replace process input and output modules
- Migration from proprietary DCS to a state-of-the-art open I/A Series system
- Advanced I/A Series control system with a single point of configuration
- More direct control performance than any gateway device can offer
- Single vendor service and supply.

**OVERVIEW**

The I/A Series DCS FBM family provides a migration path from Westinghouse WDPF I and II System process input and output (I/O) components to I/A Series display and supervisory functions. This can save significant cost over total system replacement by preserving the existing process interface and wiring and minimizing process downtime.

No additional communication devices are required.
No multi-vendor communication software licensing is required. The I/A Series DCS FBMs replace the Westinghouse WDPF I/O Q-Cards. Once integrated, the process is controlled entirely by the advanced I/A Series algorithm set.

The I/A Series DCS FBMs provide access to all process signals connected to the Westinghouse system by providing the connection between the Field Termination Assemblies (FTAs) and the I/A Series system. All process signals become fully integrated into the I/A Series system. Process data is used for: operator display, history, alarming, control. Operator functions and engineering configuration is accomplished by the I/A Series system. This migration path provides plant operations with all the power and flexibility of the I/A Series system. All process values can be used plant wide for control, display, history, alarming and information management from a single vendor source.

**FUNDAMENTAL PRINCIPLE**

Foxboro believes that it is only acceptable to interface with competing manufacturers’ operating systems at the lowest level, directly to field devices without communicating with proprietary buses or components.

The Foxboro migration product offerings adhere to this principle.

**PRODUCT DESCRIPTIONS**

The I/A Series migration strategy replaces the WDPF Distributed Process Unit (DPU) with an I/A Series control processor/FCM and provides a card-for-card replacement of I/O modules, but leaves the original process interface wiring and cabinets in place. The DPU assembly may optionally be removed from the Cabinet and replaced with a baseplate containing single or redundant FCMs or FCPS. If installing either the FCP270 or (ZCP270) and FCM100Et or FCM100E modules in the DPU cabinet, single or redundant 24 V dc power supplies

The following I/A Series control processors can be implemented:

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

The FCP270 offers direct connection of the DCS FBMs to the 2 Mbps Fieldbus. The ZCP270 requires redundant FCM100Et or FCM100E modules to communicate with the DCS FBMs. The CP60 requires redundant WFCM10E or WFCM10Ef modules to communicate with the DCS FBMs.
must be installed in the cabinet. The FCP270, or (ZCP270) and FCM100Et or FCM100E modules can be located in a nearby existing enclosure or I/A Series enclosure and the fieldbus extended to connect the modules to the Q-Crates.

**Migration with FCP270 and DCS FBMs**

The Field Control Processor 270 (FCP270) is a distributed, field-mounted controller module that supports up to 36 DCS FBMs (depending on selected scan periods) by itself, or up to 120 DCS FBMs (depending on selected scan periods) when used with the Fieldbus Expander Module (FEM100). The FCP270 connects to The MESH control network via optionally redundant 100 Mbps Ethernet fiber optic cables and Ethernet fiber switches. The FCP270 is an optionally fault-tolerant controller that communicates with connected DCS FBMs to perform data acquisition and control using I/A Series control algorithms. The FEM100 provides four Expanded Fieldbuses to the FCP270, and each Expanded Fieldbus may support up to 36 DCS FBMs.

The FCP270 mounts in a Modular Baseplate that supports a single module or a fault-tolerant module pair. The Modular Baseplate either accepts only FCP270 modules, or both FCP270 and FEM100 modules. A single/redundant FCP270 requires 24 V dc power from single/redundant power supplies. The FCP270 and FEM100 connect to an optionally redundant 2 Mbps HDLC I/O Fieldbus for communications to the DCS FBMs. The FCP270 provides galvanic isolation between the 100 Mbps MESH control network and the 2 Mbps local Fieldbus.

Fault-tolerant FCP270 modules connect to a pair of fiber optic splitter/combiners that connect to Ethernet switches in a redundant MESH control network. The splitter/combiner pair mounts in an assembly that fastens to the baseplate.

To support redundancy, a pair of FCP270s must be used for each DCS FBM grouping. In non-redundant configurations, only a single FCP270 is required for each grouping.

The maximum total cable length for the 2 Mbps Fieldbus is 60 m (198 ft) within a grouping.

For more information on the FCP270, refer to PSS 21H-1B9 B3. For more information on the FEM100, refer to PSS 21H-2Y14 B4.

**Migration with (ZCP270) with FCM100Et or FCM100E and DCS FBMs**

The FCM100Et and FCM100E modules are fiber optic communications interfaces which allow the DCS FBMs to communicate with the ZCP270 via the optionally redundant 100 Mbps Ethernet fiber optic Fieldbus. The FCM100Et and FCM100E converts 100 Mbps Ethernet signals used by the ZCP270 to 2 Mbps signals used by the DCS FBMs, and vice versa. The FCM100Et and FCM100E also provide galvanic isolation between the 100 Mbps Ethernet Fieldbus and the 2 Mbps local Fieldbus.

The FCM100Et and FCM100E mount in a module-specific Modular Baseplate that supports a single module or a fault-tolerant module pair. The single/redundant FCM100Et/FCM100E requires 24 V dc power from single/redundant power supplies. The FCM100Et/FCM100Es are used in pairs for redundancy. An FCM100Et/FCM100E (or a pair of modules) can support up to 36 DCS FBMs. The ZCP270 supports up to 30 FCM100Et/FCM100E redundant pairs connected to the 100 Mbps Ethernet Fieldbus via optionally redundant Ethernet switches and fiber optic cabling. The ZCP270 supports up to 120 DCS FBMs connected to FCM100Et/FCM100Es.

The FCM100Et/FCM100E allows the DCS FBMs to communicate with the ZCP270 over extended distances using the 100Mbps MESH control network. The FCM100Et/FCM100E provides
expanded networking and greater Fieldbus cabling distances in a fiber optic network. This configuration is ideally suited for sites in which groups of DCS FBMs are to be spread apart over greater distances. Up to 32 groupings of baseplate-mounted FCM100Ets/FCM100Es and DCS FBMs can be linked to each optionally redundant Ethernet switch, for a maximum of 120 DCS FBMs per ZCP270 (depending on selected scan periods).

To support redundancy, a pair of FCM100Ets/FCM100Es must be used for each DCS FBM grouping. In non-redundant configurations, only a single FCM100Et/FCM100E is required for each grouping. Signal transmission distances up to 2 kilometers (1.24 miles) are possible between the FCM100Ets/FCM100Es and Ethernet fiber switches, providing for wide distribution of the DCS FBM equipment groupings. The maximum total cable length for the 2 Mbps Fieldbus is 60 m (198 ft) within a grouping.

For more information on the ZCP270, refer to PSS 21H-1B10 B3. For more information on the FCM100Et, refer to PSS 21H-2Y10 B4. For more information on the FCM100E, refer to PSS 21H-2Y11 B4.

Migration with (CP60)/WFCM10E and DCS FBMs

The WFCM10E is a communications interface which allows the DCS Fieldbus Modules to communicate with the CP60 via the high speed, optionally redundant, 10 Mbps Ethernet 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 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. Up to 30 WFCM10E pairs can be connected to the Ethernet Fieldbus. The maximum total number of DCS FBMs on one CP60 is 120 (depending on selected scan periods).

The WFCM10Ef Fieldbus Communications Module is a fiber optic communications interface which allows the DCS Fieldbus Modules to communicate with the CP60 over extended distances using fiber optic cabling. The WFCM10Ef provides expanded networking, easy customizing, 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 high speed, optionally redundant, 10 Mbps Ethernet 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.

A Fieldbus Extender Module (WFBE) for local Fieldbus connects the FCMs to the Q-Card backplane in the Q-Card nest. The WFBE also interconnects the local Fieldbus between Q-Card nests and provides local Fieldbus termination. Migration using the WFCM10E or WFCM10Ef for connection to the CP60 is accomplished using the
DCS Fieldbus Module Migration Kit (P0918XR).

**Q-Card I/O**

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 following I/O card types are used in the system:
- Analog input card
- Analog output card
- Analog input and output card
- Digital input card
- Digital output card.

Each card type is replaced with an equivalent I/A Series DCS FBM card. All I/O wiring connected to the I/O card termination panels remain in place.

Power is derived from the original cabinet 13 V dc power supply.

### Table 1. Optional Analog Input Modules

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Module</th>
<th>Description</th>
<th>Replaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>P0918JP</td>
<td>WAH01A</td>
<td>8 Al</td>
<td>QAH-G01</td>
</tr>
<tr>
<td>P0918JR</td>
<td>WAH01B</td>
<td>8 Al</td>
<td>QAH-G02</td>
</tr>
<tr>
<td>P0918JT</td>
<td>WAH01C</td>
<td>8 Al</td>
<td>QAH-G03</td>
</tr>
<tr>
<td>P0918JV</td>
<td>WAH01D</td>
<td>8 Al</td>
<td>QAH-G04</td>
</tr>
<tr>
<td>P0918KE</td>
<td>WA01A</td>
<td>4 Al</td>
<td>QAI-G04</td>
</tr>
<tr>
<td>P0918KG</td>
<td>WA01B</td>
<td>4 Al</td>
<td>QAI-G05</td>
</tr>
<tr>
<td>P0918KJ</td>
<td>WA01C</td>
<td>4 Al</td>
<td>QAI-G06</td>
</tr>
<tr>
<td>P0918KM</td>
<td>WA01D</td>
<td>4 Al</td>
<td>QAI-G07</td>
</tr>
<tr>
<td>P0918JY</td>
<td>WA02A</td>
<td>4 TC or ±100 mV Inputs</td>
<td>QAI-G01 QAI-G02 QAI-G03 QAI-G08</td>
</tr>
</tbody>
</table>

### Table 2. Optional Analog Output Modules

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Module</th>
<th>Description</th>
<th>Replaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>P0918KX</td>
<td>WAO37A</td>
<td>4 AO</td>
<td>QAO-G01</td>
</tr>
<tr>
<td>P0918LA</td>
<td>WAO37B</td>
<td>4 AO</td>
<td>QAO-G02</td>
</tr>
<tr>
<td>P0918LC</td>
<td>WAO37C</td>
<td>4 AO</td>
<td>QAO-G03</td>
</tr>
<tr>
<td>P0918LE</td>
<td>WAO37D</td>
<td>4 AO</td>
<td>QAO-G04</td>
</tr>
<tr>
<td>P0918LG</td>
<td>WAO37E</td>
<td>4 AO</td>
<td>QAO-G05</td>
</tr>
<tr>
<td>P0918LJ</td>
<td>WAO37F</td>
<td>4 AO</td>
<td>QAO-G06 QAO-G08</td>
</tr>
<tr>
<td>P0918LL</td>
<td>WAO37G</td>
<td>4 AO</td>
<td>QAO-G07</td>
</tr>
</tbody>
</table>
### Table 3. Optional Analog Input and Analog Output Modules

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Module</th>
<th>Description</th>
<th>Replaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>P0918SQ</td>
<td>WLJ04A</td>
<td>3 Al, 1 AO</td>
<td>QLJ-G01</td>
</tr>
<tr>
<td>P0918SS</td>
<td>WLJ04B</td>
<td>3 Al, 1 AO</td>
<td>QLJ-G02</td>
</tr>
<tr>
<td>P0918SU</td>
<td>WLJ04C</td>
<td>3 Al, 1 AO</td>
<td>QLJ-G03</td>
</tr>
</tbody>
</table>

### Table 4. Optional Digital Input Modules

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Module</th>
<th>Description</th>
<th>Replaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>P0918PT</td>
<td>WCI07A</td>
<td>16 DI</td>
<td>QCI-G01</td>
</tr>
<tr>
<td>P0918PZ</td>
<td>WDI07A</td>
<td>16 DI</td>
<td>QDI-G01</td>
</tr>
<tr>
<td>P0918QC</td>
<td>WDI07B</td>
<td>16 DI</td>
<td>QDI-G03</td>
</tr>
<tr>
<td>P0918QE</td>
<td>WDI07C</td>
<td>16 DI</td>
<td>QDI-G05</td>
</tr>
<tr>
<td>P0918QH</td>
<td>WDI07D</td>
<td>16 DI</td>
<td>QDI-G07</td>
</tr>
<tr>
<td>P0918QK</td>
<td>WDI07E</td>
<td>16 DI</td>
<td>QDI-G08</td>
</tr>
<tr>
<td>P0918NA</td>
<td>WID07A</td>
<td>16 DI</td>
<td>QDI-G09</td>
</tr>
<tr>
<td>P0918ND</td>
<td>WID07B</td>
<td>8 DI</td>
<td>QDI-G02</td>
</tr>
<tr>
<td>P0918NG</td>
<td>WID07C</td>
<td>16 DI</td>
<td>QDI-G03</td>
</tr>
<tr>
<td>P0918NJ</td>
<td>WID07D</td>
<td>8 DI</td>
<td>QDI-G04</td>
</tr>
<tr>
<td>P0918NL</td>
<td>WID07E</td>
<td>16 DI</td>
<td>QDI-G05</td>
</tr>
<tr>
<td>P0918NN</td>
<td>WID07F</td>
<td>8 DI</td>
<td>QDI-G06</td>
</tr>
<tr>
<td>P0918NQ</td>
<td>WID07G</td>
<td>16 DI</td>
<td>QDI-G07</td>
</tr>
</tbody>
</table>

### Table 5. Optional Digital Output Modules

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Module</th>
<th>Description</th>
<th>Replaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>P0918PQ</td>
<td>WBO09A</td>
<td>16 DO</td>
<td>QBO-G01</td>
</tr>
<tr>
<td>P0918HZ</td>
<td>WBO09B</td>
<td>16 DO</td>
<td>QBO-G03</td>
</tr>
<tr>
<td>P0918TN</td>
<td>WRO09A</td>
<td>8 DO</td>
<td>QRO-G01</td>
</tr>
<tr>
<td>P0918RK</td>
<td>WRO09B</td>
<td>8 DO</td>
<td>QRO-G03</td>
</tr>
<tr>
<td>P0922BQ</td>
<td>WRO09C</td>
<td>8 DO</td>
<td>QRO-G04</td>
</tr>
<tr>
<td>P0922DR</td>
<td>WRO09D</td>
<td>8 DO</td>
<td>QRO-G03</td>
</tr>
<tr>
<td>P0918UH</td>
<td>WTO09</td>
<td>8 DO</td>
<td>QTO-G01</td>
</tr>
</tbody>
</table>
WFCM10E (COMMUNICATION MODULE) FUNCTIONAL SPECIFICATIONS

Description
The WFCM10E Fieldbus Communications Module is a communications interface which allows the DCS Fieldbus Modules to communicate with I/A Series control stations via the high speed, optionally redundant Fieldbus.

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 (COMMUNICATION MODULE) FUNCTIONAL SPECIFICATIONS

Description
The WFCM10Ef Fieldbus Communications Module is a fiber optic communications interface which allows the DCS Fieldbus Modules to communicate with the I/A Series control station over extended distances using fiber optic cabling.

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.

WAH01 SERIES (ANALOG INPUT) FUNCTIONAL SPECIFICATIONS

Description
The WAH01 Series consists of differential voltage input interface modules that contain eight group-isolated unipolar and bipolar input channels, with each channel accepting a 2-wire analog input voltage.

Input
Eight group-isolated and independent channels. The WAH01 Series modules, their input signal ranges, and the Q-Card equivalents are listed in Table 6.

ANALOG INPUT ACCURACY
- **Accuracy (includes linearity)**
  - ±0.03% of span

Accuracy Temperature Coefficient
- ±50 ppm/°C

Communication
The module communicates with its associated FCM 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 listed in Table 7.

Settling Time
Defined as the value settling within a 1% band of steady state for 10 to 90% input step change.

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
This 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.

Table 6. WAH01 Modules, Signal Ranges, and Q-Card Equivalents

<table>
<thead>
<tr>
<th>Module</th>
<th>Signal Range</th>
<th>Q-Card</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAH01A</td>
<td>−10.24 to +10.24 V dc</td>
<td>QAH-G01</td>
</tr>
<tr>
<td>WAH01B</td>
<td>−5.12 to +5.12 V dc</td>
<td>QAH-G02</td>
</tr>
<tr>
<td>WAH01C</td>
<td>0 to 10.24 V dc</td>
<td>QAH-G03</td>
</tr>
<tr>
<td>WAH01D</td>
<td>0 to 5.12 V dc</td>
<td>QAH-G04</td>
</tr>
</tbody>
</table>

Table 7. WAH01 Conversion Table

<table>
<thead>
<tr>
<th>Conversion Time</th>
<th>Update Time</th>
<th>Settling Time</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 ms</td>
<td>100 ms</td>
<td>50 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>100 ms</td>
<td>100 ms</td>
<td>125 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>200 ms</td>
<td>100 ms</td>
<td>200 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>500 ms</td>
<td>100 ms</td>
<td>500 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>1000 ms</td>
<td>100 ms</td>
<td>1000 ms</td>
<td>15 bits</td>
</tr>
</tbody>
</table>

WA102A (THERMOCOUPLE INPUT) MODULE FUNCTIONAL SPECIFICATIONS

Description
The WA102A is a channel-isolated thermocouple/mV input interface that contains four isolated thermocouple input channels.

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
WA102A input ranges are listed in Table 8.

Reference Junction
WA102A uses external thermocouple temperature compensation provided by Westinghouse.

“B” Cabinet mounted RTDs that are connected to WRT03 Series modules. 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 MΩ

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 FCM via the local Fieldbus.

Input Conversion Time (software configurable)
Input signal conversion time specifications for the WAI02A are listed in Table 9.

Settling Time
Defined as the value setting within a 1% band of steady state for 10 to 90% input step change.

Input Open Circuit Voltage
2.5 V dc (mV channels)

Typical Thermocouple Types

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
This 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.
WAI02A (THERMOCOUPLE INPUT) MODULE FUNCTIONAL SPECIFICATIONS (CONTINUED)

Table 8. WAI02A Input Ranges

<table>
<thead>
<tr>
<th>Range</th>
<th>DC Voltage Range</th>
<th>Raw Count Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC Full Range</td>
<td>-10.5 mV dc to +71.42 mV dc (0 to 65535 raw counts)</td>
<td></td>
</tr>
<tr>
<td>TC Normal Range</td>
<td>-10.5 mV dc to +69.5 mV dc (0 to 64000 raw counts)</td>
<td></td>
</tr>
<tr>
<td>mV Full Range</td>
<td>-105.12 mV dc to +105.12 mV dc (0 to 65535 raw counts)</td>
<td></td>
</tr>
<tr>
<td>mV Normal Range</td>
<td>-100 mV dc to +100 mV dc (1600 to 64000 raw counts)</td>
<td></td>
</tr>
</tbody>
</table>

Table 9. WAI02A Conversion Table

<table>
<thead>
<tr>
<th>Conversion Time</th>
<th>Update Time</th>
<th>Setting Time</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 ms</td>
<td>100 ms</td>
<td>50 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>100 ms</td>
<td>100 ms</td>
<td>125 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>200 ms</td>
<td>100 ms</td>
<td>200 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>500 ms</td>
<td>100 ms</td>
<td>500 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>1000 ms</td>
<td>100 ms</td>
<td>1000 ms</td>
<td>15 bits</td>
</tr>
</tbody>
</table>
WAI01 SERIES (ANALOG INPUT) MODULE FUNCTIONAL SPECIFICATIONS

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

Input
Four individually isolated and independent channels. The WAI01 Series modules, their signal ranges and the Q-Card equivalents are listed in Table 10.

Accuracy

ACCURACY (INCLUDES LINEARITY)
±0.03% of span

ACCURACY TEMPERATURE COEFFICIENT
±50 ppm/°C

Communication
Communicates with its associated FCM 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 WAI01 Series are listed in Table 11.

Settling Time
Defined as the value settling within a 1% band of steady state for 10 to 90% input step change.

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
This 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.

Table 10. WAI01 Modules, Signal Ranges, and Q-Card Equivalents

<table>
<thead>
<tr>
<th>Module</th>
<th>Signal Range</th>
<th>Q-Card</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAI01A</td>
<td>-512 to +512 mV dc</td>
<td>QAI-G04</td>
</tr>
<tr>
<td>WAI01B</td>
<td>-1.02 to +1.02 V dc</td>
<td>QAI-G05</td>
</tr>
<tr>
<td>WAI01C</td>
<td>-10.24 to +10.24 V dc</td>
<td>QAI-G06</td>
</tr>
<tr>
<td>WAI01D</td>
<td>0 to 20.48 mA</td>
<td>QAI-G07</td>
</tr>
</tbody>
</table>

Table 11. WAI01 Conversion Table

<table>
<thead>
<tr>
<th>Conversion Time</th>
<th>Update Time</th>
<th>Setting Time</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 ms</td>
<td>100 ms</td>
<td>50 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>100 ms</td>
<td>100 ms</td>
<td>125 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>200 ms</td>
<td>100 ms</td>
<td>200 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>500 ms</td>
<td>100 ms</td>
<td>500 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>1000 ms</td>
<td>100 ms</td>
<td>1000 ms</td>
<td>15 bits</td>
</tr>
</tbody>
</table>
WAO37 SERIES (ANALOG OUTPUT) MODULES FUNCTIONAL SPECIFICATIONS

Description
The WAO37 Series are channel-isolated output interface modules with four 0 to 20 mA dc or four unipolar or bipolar analog output channels, dependent upon model type.

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. The seven modules in the series, their signal ranges, and the Q-Cards they replace are listed in Table 12.

Communication
Communicates with its associated FCM via the local Fieldbus.

Power Requirements

<table>
<thead>
<tr>
<th>INPUT VOLTAGE RANGE (REDUNDANT)</th>
<th>13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONSUMPTION</td>
<td></td>
</tr>
<tr>
<td>WA037A, WA037F, WA037G</td>
<td>3.5 W (maximum) at 13 V dc</td>
</tr>
<tr>
<td>WOA37B, WA037C, WA037D</td>
<td>7 W (maximum) at 13 V dc</td>
</tr>
<tr>
<td>WA037E</td>
<td>10 W (maximum) at 13 V dc</td>
</tr>
<tr>
<td>HEAT DISSIPATION</td>
<td>3.5 W (maximum) at 13 V dc</td>
</tr>
</tbody>
</table>

Calibration Requirements
Calibration of the module is not required.

Analog Accuracy

<table>
<thead>
<tr>
<th>ACCURACY (INCLUDES LINEARITY)</th>
<th>±0.05% of span</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCURACY TEMPERATURE COEFFICIENT</td>
<td>±50 ppm/°C</td>
</tr>
<tr>
<td>OUTPUT PROCESSING DELAY</td>
<td>30 ms maximum</td>
</tr>
<tr>
<td>RESOLUTION</td>
<td>13 bits</td>
</tr>
</tbody>
</table>

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
This 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.

<table>
<thead>
<tr>
<th>Module</th>
<th>Signal Range</th>
<th>Q-Card</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAO37A</td>
<td>0 to 20.48 mA, 0 to 1 K load, 40 V dc internal power</td>
<td>QAO-G01</td>
</tr>
<tr>
<td>WAO37B</td>
<td>0 to 10.24 V dc, 500 Ω load minimum</td>
<td>QAO-G02</td>
</tr>
<tr>
<td>WAO37C</td>
<td>–10.24 to +10.24 V dc, 500 Ω load minimum</td>
<td>QAO-G03</td>
</tr>
<tr>
<td>WAO37D</td>
<td>0 to 5.12 V dc, 500 Ω load minimum</td>
<td>QAO-G04</td>
</tr>
<tr>
<td>WAO37E</td>
<td>–5.12 to +5.12 V dc, 500 Ω load minimum</td>
<td>QAO-G05</td>
</tr>
<tr>
<td>WAO37F</td>
<td>–10.24 to +10.24 V dc, 500 Ω load minimum, single output</td>
<td>QAO-G06</td>
</tr>
<tr>
<td>WAO37G</td>
<td>0 to 20.48 mA, 0 to 1 K load, 40 V dc external power</td>
<td>QAO-G07</td>
</tr>
</tbody>
</table>
WAV02A (THERMOCOUPLE INPUT) MODULE FUNCTIONAL SPECIFICATIONS

Description
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).

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

Input Range
See Table 13.

Reference Junction
WAV02A has an 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 FUNCTIONAL 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 MΩ
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 FCM via the local Fieldbus.

Input Conversion Time (software configurable)
Input signal conversion time specifications for the WAV02A are listed in Table 14.

Settling Time
Defined as the value settling within a 1% band of steady state for 10 to 90% input step change.

Input Open Circuit Voltage
2.5 V dc (mV channels)

Typical Thermocouple Types

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
This 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.
### WAV02A (THERMOCOUPLE INPUT) MODULE FUNCTIONAL SPECIFICATIONS (CONTINUED)

Table 13. WAV02A Input Ranges

<table>
<thead>
<tr>
<th>Range Type</th>
<th>Range Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC Full Range</td>
<td>−10.5 mV dc to +71.42 mV dc (0 to 65535 raw counts)</td>
</tr>
<tr>
<td>TC Normal Range</td>
<td>−10.5 mV dc to +69.5 mV dc (0 to 64000 raw counts)</td>
</tr>
<tr>
<td>mV Full Range</td>
<td>−105.12 mV dc to +105.12 mV dc (0 to 65535 raw counts)</td>
</tr>
<tr>
<td>mV Normal Range</td>
<td>−100 mV dc to +100 mV dc (1600 to 64000 raw counts)</td>
</tr>
</tbody>
</table>

Table 14. WAV02A Conversion Table

<table>
<thead>
<tr>
<th>Conversion Time</th>
<th>Update Time</th>
<th>Setting Time</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 ms</td>
<td>100 ms</td>
<td>50 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>100 ms</td>
<td>100 ms</td>
<td>125 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>200 ms</td>
<td>100 ms</td>
<td>200 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>500 ms</td>
<td>100 ms</td>
<td>500 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>1000 ms</td>
<td>100 ms</td>
<td>1000 ms</td>
<td>15 bits</td>
</tr>
</tbody>
</table>
**WAW01 Series (Analog Input) Modules Functional Specifications**

**Description**
WAW01 Series voltage and current input interface modules contain six individually isolated unipolar input channels, each channel accepting a 2-wire analog input.

**Input**
Six individually isolated and independent channels. The modules, their signal ranges, and the Q-Cards they replace are listed in Table 15.

**Analog Accuracy**
- **Accuracy (includes linearity)** ±0.03% of span
- **Accuracy temperature coefficient** ±50 ppm/°C

**Communication**
The module communicates with its associated FCM 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**
  - 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 listed in Table 16.

**Settling Time**
Defined as the value settling within a 1% band of steady state for 10 to 90% input step change.

**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**
This 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.
### Table 15. WAW01 Modules, Signal Ranges, and Q-Card Equivalents

<table>
<thead>
<tr>
<th>Module</th>
<th>Signal Range</th>
<th>Q-Cards</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAW01A</td>
<td>0 to 1.02 V dc, 1 K maximum source impedance</td>
<td>QAW-G01</td>
</tr>
<tr>
<td>WAW01B</td>
<td>0 to 5.12 V dc, 5 K maximum source impedance</td>
<td>QAW-G02</td>
</tr>
<tr>
<td>WAW01C</td>
<td>0 to 10.24 V dc, 10 K maximum source impedance</td>
<td>QAW-G03</td>
</tr>
<tr>
<td>WAW01D</td>
<td>0 to 20.48 mA requires external transducer power or self-powered transducer.</td>
<td>QAW-G04</td>
</tr>
<tr>
<td>WAW01E</td>
<td>0 to 20.48 mA (jumper-selectable and self-powered), 20 V dc minimum at 20 mA, current limit of 40 mA</td>
<td>QAW-G05</td>
</tr>
<tr>
<td>WAW01F</td>
<td>0 to 51.2 mA requires external transducer power or self-powered transducer.</td>
<td>QAW-G06</td>
</tr>
</tbody>
</table>

### Table 16. WAW01 Conversion Table

<table>
<thead>
<tr>
<th>Conversion Time</th>
<th>Update Time</th>
<th>Setting Time</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 ms</td>
<td>100 ms</td>
<td>50 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>100 ms</td>
<td>100 ms</td>
<td>125 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>200 ms</td>
<td>100 ms</td>
<td>200 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>500 ms</td>
<td>100 ms</td>
<td>500 ms</td>
<td>15 bits</td>
</tr>
</tbody>
</table>
WAX01 SERIES (ANALOG INPUT) MODULES FUNCTIONAL SPECIFICATIONS

Description
The WAX01 Series modules are channel-isolated voltage input modules that contain 12 isolated unipolar voltage input channels. Each channel accepts a 2-wire voltage input. WAX01 Series modules have two sets of six individually isolated channels and two letterbugs.

Input
12 isolated and independent voltage input channels. The WAX01 Series modules, their signal ranges, and the Q-Cards they replace are listed in Table 17.

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 13 V dc

HEAT DISSIPATION
5 W (maximum) at 13 V dc

Communication
The module communicates with its associated FCM via the local Fieldbus.

Input Conversion Time (software configurable)
Input signal conversion time specifications for the WAX01 Series are shown in Table 18.

Settling Time
Defined as the value settling within a 1% band of steady state for 10 to 90% input step change.

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
This 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.

Table 17. WAX01 Modules, Signal Ranges, and Q-Card Equivalents

<table>
<thead>
<tr>
<th>Module</th>
<th>Signal Range</th>
<th>Q-Card</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAX01A</td>
<td>0 to +1.02 V dc, 1 K maximum source impedance</td>
<td>QAX-G04</td>
</tr>
<tr>
<td>WAX01B</td>
<td>0 to +5.12 V dc, 5 K maximum source impedance</td>
<td>QAX-G05</td>
</tr>
<tr>
<td>WAX01C</td>
<td>0 to +10.24 V dc, 10 K maximum source impedance</td>
<td>QAX-G06</td>
</tr>
</tbody>
</table>

Table 18. WAX01 Conversion Table

<table>
<thead>
<tr>
<th>Conversion Time</th>
<th>Update Time</th>
<th>Setting Time</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 ms</td>
<td>100 ms</td>
<td>50 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>100 ms</td>
<td>100 ms</td>
<td>125 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>200 ms</td>
<td>100 ms</td>
<td>200 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>500 ms</td>
<td>100 ms</td>
<td>500 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>1000 ms</td>
<td>100 ms</td>
<td>1000 ms</td>
<td>15 bits</td>
</tr>
</tbody>
</table>
WAX02A (THERMOCOUPLE INPUT) MODULE FUNCTIONAL SPECIFICATIONS

Description
The WAX02A Series modules are channel-isolated voltage input modules that contain 12 isolated unipolar voltage input channels. Each channel accepts a two-wire voltage input. WAX02A Series modules have two sets of six individually isolated channels and two letterbugs.

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

Input Range
See Table 19.

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 on WAX02A, a yellow LED on the WAX02A card edge indicates when power is being supplied to the terminal 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.

See Table 20 for the range of the channel 12 input which is based on the Westinghouse card group being replaced.

Accuracy

**MILLIVOLT INPUT**
±0.03% of span (±27 µV) at 25°C

**THERMOCOUPLE CONFORMITY**
±0.25°C

**ACCURACY TEMPERATURE COEFFICIENT**
±50 ppm/°C

Accuracy (Continued)

**DIFFERENTIAL INPUT IMPEDANCE**
10 MΩ

**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 FCM via the local Fieldbus.

Input Conversion Time (software configurable)
Input signal conversion time specifications for the WAX02A are listed in Table 21.

Settling Time
Defined as the value settling within a 1% band of steady state for 10 to 90% input step change.

Input Open Circuit Voltage
2.5 V dc (mV channels)

Typical Thermocouple Types

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.
WAX02A (THERMOCOUPLE INPUT) MODULE FUNCTIONAL SPECIFICATIONS (CONTINUED)
CAUTION

This 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.

Table 19. WAX02A Input Ranges

<table>
<thead>
<tr>
<th></th>
<th>TC Full Range</th>
<th>TC Normal Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>mV Full Range</td>
<td>-10.5 mV dc to +71.42 mV dc (0 to 65535 raw counts)</td>
<td>-10.5 mV dc to +69.5 mV dc (0 to 64000 raw counts)</td>
</tr>
<tr>
<td>mV Normal Range</td>
<td>-105.12 mV dc to +105.12 mV dc (0 to 65535 raw counts)</td>
<td>-100 mV dc to +100 mV dc (1600 to 64000 raw counts)</td>
</tr>
</tbody>
</table>

Table 20. WAX02A Channel 12 Input Ranges

<table>
<thead>
<tr>
<th>Channel</th>
<th>Scales to</th>
<th>0.2 mV/C for QAX-G01 cards, Standard half-shells. 0 mV at 0°C, 20 mV at 100°C</th>
<th>0.5 mV/C for QAX-G02 cards, Standard half-shells. 0 mV at 0°C, 50 mV at 100°C</th>
<th>1.0 mV/C for QAX-G03 cards, Standard half-shells. 0 mV at 0°C, 100 mV at 100°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>G01</td>
<td>Scales to</td>
<td>0.2 mV/C for QAX-G01 cards, Standard half-shells. 0 mV at 0°C, 20 mV at 100°C</td>
<td>0.5 mV/C for QAX-G02 cards, Standard half-shells. 0 mV at 0°C, 50 mV at 100°C</td>
<td>1.0 mV/C for QAX-G03 cards, Standard half-shells. 0 mV at 0°C, 100 mV at 100°C</td>
</tr>
<tr>
<td>G02</td>
<td>Scales to</td>
<td>0.5 mV/C for QAX-G02 cards, Standard half-shells. 0 mV at 0°C, 50 mV at 100°C</td>
<td>0.5 mV/C for QAX-G02 cards, Standard half-shells. 0 mV at 0°C, 50 mV at 100°C</td>
<td>0.5 mV/C for QAX-G02 cards, Standard half-shells. 0 mV at 0°C, 50 mV at 100°C</td>
</tr>
<tr>
<td>G03</td>
<td>Scales to</td>
<td>1.0 mV/C for QAX-G03 cards, Standard half-shells. 0 mV at 0°C, 100 mV at 100°C</td>
<td>1.0 mV/C for QAX-G03 cards, Standard half-shells. 0 mV at 0°C, 100 mV at 100°C</td>
<td>1.0 mV/C for QAX-G03 cards, Standard half-shells. 0 mV at 0°C, 100 mV at 100°C</td>
</tr>
</tbody>
</table>

Table 21. WAX02A Conversion Table

<table>
<thead>
<tr>
<th>Conversion Time</th>
<th>Update Time</th>
<th>Settling Time</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 ms</td>
<td>100 ms</td>
<td>50 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>100 ms</td>
<td>100 ms</td>
<td>125 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>200 ms</td>
<td>100 ms</td>
<td>200 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>500 ms</td>
<td>100 ms</td>
<td>500 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>1000 ms</td>
<td>100 ms</td>
<td>1000 ms</td>
<td>15 bits</td>
</tr>
</tbody>
</table>
WBO09 SERIES (DISCRETE OUTPUT) MODULES FUNCTIONAL SPECIFICATIONS

Description
The WBO09 Series consists of channel-isolated discrete output interface modules that contain 16 discrete output channels which are sourced externally. The WBO09 Series modules include an output LED flash option. A 4-position rocker switch selects the rate and duty cycle at which the corresponding output LEDs on the front of the card flash.

Output Channels
16 isolated channels. The WBO09 Series modules, their signal ranges, and the Q-Cards they replace are listed in Table 22.

Communication
The module communicates with its associated FCM via the local Fieldbus.

Power Requirements

<table>
<thead>
<tr>
<th>INPUT VOLTAGE RANGE (RENDUNDANT)</th>
<th>13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)</th>
</tr>
</thead>
</table>

CONSUMPTION

<table>
<thead>
<tr>
<th>Module</th>
<th>3 W (maximum) at 13 V dc</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBO09A</td>
<td>WBO09B</td>
</tr>
</tbody>
</table>

HEAT DISSIPATION

<table>
<thead>
<tr>
<th>Module</th>
<th>14 W (maximum) at 13 V dc, all outputs on at maximum load current.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBO09A</td>
<td>WBO09B</td>
</tr>
</tbody>
</table>

| Module | 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

<table>
<thead>
<tr>
<th>Module</th>
<th>60 V dc (maximum) at 300 mA maximum load current</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBO09A</td>
<td></td>
</tr>
<tr>
<td>WBO09B</td>
<td></td>
</tr>
</tbody>
</table>

On-State Voltage Drop

<table>
<thead>
<tr>
<th>Module</th>
<th>2 V (maximum) at 300 mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBO09A</td>
<td>WBO09B</td>
</tr>
</tbody>
</table>

Off-State Leakage Current

<table>
<thead>
<tr>
<th>Module</th>
<th>0.5 mA (maximum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBO09A</td>
<td>WBO09B</td>
</tr>
</tbody>
</table>

Inductive Loads
WBO09A module can handle inductive loads.

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 two channels.

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.

Table 22. WBO09 Modules, Signal Ranges, and Q-Card Equivalents

<table>
<thead>
<tr>
<th>Module</th>
<th>Signal Range</th>
<th>Q-Cards</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBO09A</td>
<td>60 V dc maximum at 300 mA maximum</td>
<td>QBO-G01 and QBO-G02</td>
</tr>
<tr>
<td>WBO09B</td>
<td>20 V dc maximum at 16 mA maximum</td>
<td>QBO-G03, QBO-G04, and QBO-G05</td>
</tr>
</tbody>
</table>
WC107A (CONTACT INPUT) MODULE FUNCTIONAL SPECIFICATIONS

Description
The WC107A is a channel-isolated contact sense input interface module that functions as a 16-channel contact sensor. 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. The WC107A is designed to replace the following Q-Cards: QCI-G01, QCI-G02, QSE-G01, and QSE-G02.

Input
16 single-ended independent contact input channels.

Communication
The module communicates with its associated FCM via the local Fieldbus.

Power Requirements

<table>
<thead>
<tr>
<th>INPUT VOLTAGE RANGE (REDUNDANT)</th>
<th>13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONSUMPTION</td>
<td>3.5 W (maximum) at 13 V dc</td>
</tr>
<tr>
<td>HEAT DISSIPATION</td>
<td>5 W (maximum) at 13 V dc all channels on at maximum load</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>INPUT RANGE (EACH CHANNEL)</th>
<th>Contact open (off) or closed (on)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPEN-CIRCUIT VOLTAGE</td>
<td>48 V dc ±15%</td>
</tr>
<tr>
<td>SHORT-CIRCUIT CURRENT</td>
<td>2.5 mA (maximum)</td>
</tr>
<tr>
<td>ON-STATE RESISTANCE</td>
<td>1.0 kΩ (maximum)</td>
</tr>
<tr>
<td>OFF-STATE RESISTANCE</td>
<td>100 kΩ (minimum)</td>
</tr>
</tbody>
</table>

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 (DIGITAL INPUT) MODULES WITH EXTERNAL SUPPLY**

**FUNCTIONAL SPECIFICATIONS**

**Description**
The WDI07 Series of channel-isolated input interface modules provide 16 channels of contact sensor input. Each channel accepts a 2-wire input from a pair of contacts or solid-state switches. Inputs include 5, 12, 24, 48, or 120 Volts.

**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 23.

**Communication**
The module communicates with its associated FCM 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 plus power dissipated at inputs. Refer to Table 24.

**Calibration Requirements**
The module requires no calibration.

**Filter/Debounce Time**
Configurable (4, 8, 16, or 32 ms)

**Loop Power Supply Protection**
On-card 1.0 A replaceable fuse and an external 1.0 A fuse located between terminal block (“A”) and the half-shell extension (“B”) block.

**Contact Sensor Function**
Table 24 lists the specifications for the contact sensor functions of each model.

- 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.
- Contact open is OFF; contact closed is ON.
- Power in front end is typical with all inputs on.

**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 (Digital Input) Modules with External Supply Functional Specifications (Continued)

**Table 23. WDI07 Modules, Signal Ranges, and Q-Card Equivalents**

<table>
<thead>
<tr>
<th>Module</th>
<th>Signal Range</th>
<th>Q-Card</th>
</tr>
</thead>
<tbody>
<tr>
<td>WDI07A</td>
<td>5 V dc</td>
<td>QDI-G01</td>
</tr>
<tr>
<td>WDI07B</td>
<td>24 V ac/dc</td>
<td>QDI-G03</td>
</tr>
<tr>
<td>WDI07C</td>
<td>48 V ac/dc</td>
<td>QDI-G05</td>
</tr>
<tr>
<td>WDI07D</td>
<td>120 V ac/dc</td>
<td>QDI-G07</td>
</tr>
<tr>
<td>WDI07E</td>
<td>12 V dc, logic oriented</td>
<td>QDI-G08</td>
</tr>
</tbody>
</table>

**Table 24. WDI07 Series Contact Sensor Function Specifications**

<table>
<thead>
<tr>
<th>DCS Fieldbus Module</th>
<th>On/Off Voltage (V dc or V ac RMS)</th>
<th>On/Off Current (mA)</th>
<th>Front End Power (All Inputs On)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WDI07A</td>
<td>4 V dc</td>
<td>6 V dc</td>
<td>0.9 V dc</td>
</tr>
<tr>
<td>WDI07B</td>
<td>20 V ac/dc</td>
<td>30 V ac/dc</td>
<td>3 V ac/dc</td>
</tr>
<tr>
<td>WDI07C</td>
<td>40 V ac/dc</td>
<td>60 V ac/dc</td>
<td>9 V ac/dc</td>
</tr>
<tr>
<td>WDI07D</td>
<td>100 V ac/dc</td>
<td>150 V ac/dc</td>
<td>6 V ac/dc</td>
</tr>
<tr>
<td>WDI07E</td>
<td>10 V dc</td>
<td>15 V dc</td>
<td>2 V dc</td>
</tr>
</tbody>
</table>
**Description**
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 2-wire input from a pair of contacts or solid-state switches. Eight-input modules are 2-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.

**Input**
The WID07 Series includes sixteen 8-channel (differential 2-wire) and 16-channel (single-ended) digital input modules designed to replace selected QID, QDI, and QBI Series cards, as listed in Table 25.

**Communication**
The module communicates with its associated FCM 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 plus power dissipated at inputs. Refer to Table 26.

**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 1.0 A replaceable fuse and an external 1.0 A fuse located between terminal block (“A”) and the half-shell extension (“B”) block. The on-card and external fuse is 2.0 A for WID07N and WID07P.

**Loop Power Supply Protection (Continued)**

### 8 CHANNEL MODULES
An external 1.0 A fuse is required for contact wetting supply.

**Contact Sensor Function**
Table 26 lists specifications for the contact sensor functions of each model.
- 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.

**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 (DIGITAL INPUT) MODULES FUNCTIONAL SPECIFICATIONS (CONTINUED)

#### Table 25. WID07 Modules, Signal Formats, and Q-Card Equivalents

<table>
<thead>
<tr>
<th>Module</th>
<th>Channel</th>
<th>Signal Format</th>
<th>Q-Cards</th>
</tr>
</thead>
<tbody>
<tr>
<td>WID07A</td>
<td>16</td>
<td>5 V ac/dc</td>
<td>QID-G01, QBI-G01</td>
</tr>
<tr>
<td>WID07B</td>
<td>8</td>
<td>24 V ac/dc</td>
<td>QID-G02, QBI-G02</td>
</tr>
<tr>
<td>WID07C</td>
<td>16</td>
<td>24 V ac/dc</td>
<td>QID-G03, QBI-G04, QBI-G10</td>
</tr>
<tr>
<td>WID07D</td>
<td>8</td>
<td>48 V ac/dc</td>
<td>QID-G04, QDI-G04</td>
</tr>
<tr>
<td>WID07E</td>
<td>16</td>
<td>48 V ac/dc</td>
<td>QID-G05, QBI-G05, QBI-G06</td>
</tr>
<tr>
<td>WID07F</td>
<td>8</td>
<td>120 V ac/dc</td>
<td>QID-G06, QDI-G06</td>
</tr>
<tr>
<td>WID07G</td>
<td>16</td>
<td>120 V ac/dc</td>
<td>QID-G07, QBI-G07, QBI-G08</td>
</tr>
<tr>
<td>WID07H</td>
<td>16</td>
<td>12 V dc, logic oriented</td>
<td>QID-G08, QBI-G02</td>
</tr>
<tr>
<td>WID07I</td>
<td>16</td>
<td>12 V ac/dc</td>
<td>QID-G09, QBI-G03, QBI-G09</td>
</tr>
<tr>
<td>WID07J</td>
<td>16</td>
<td>48 V dc, pulse</td>
<td>QID-G10</td>
</tr>
<tr>
<td>WID07K</td>
<td>8</td>
<td>120 V ac, high threshold</td>
<td>QID-G11, QDI-G11</td>
</tr>
<tr>
<td>WID07L</td>
<td>16</td>
<td>120 V ac, high threshold</td>
<td>QID-G12, QBI-G11</td>
</tr>
<tr>
<td>WID07M</td>
<td>8</td>
<td>220 V ac</td>
<td>QID-G13</td>
</tr>
<tr>
<td>WID07N</td>
<td>16</td>
<td>220 V ac</td>
<td>QID-G14</td>
</tr>
<tr>
<td>WID07O</td>
<td>8</td>
<td>220 V dc</td>
<td>QID-G15</td>
</tr>
<tr>
<td>WID07P</td>
<td>16</td>
<td>220 V ac, high threshold</td>
<td>QID-G16</td>
</tr>
</tbody>
</table>
### WID07 SERIES (DIGITAL INPUT) MODULES FUNCTIONAL SPECIFICATIONS (CONTINUED)

#### Table 26. WID07 Series Contact Sensor Function Specifications

<table>
<thead>
<tr>
<th>DCS Fieldbus Module</th>
<th>On/Off Voltage (V dc or V ac RMS)</th>
<th>On/Off Current (mA)</th>
<th>Front End Power (All Inputs On)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WID07A</td>
<td>2.4 V dc</td>
<td>7 V dc</td>
<td>0.9 V dc</td>
</tr>
<tr>
<td>WID07B</td>
<td>20 V ac/dc</td>
<td>30 V</td>
<td>7 V</td>
</tr>
<tr>
<td>WID07C</td>
<td>20 V ac/dc</td>
<td>30 V</td>
<td>7 V</td>
</tr>
<tr>
<td>WID07D</td>
<td>40 V ac/dc</td>
<td>60 V</td>
<td>17 V</td>
</tr>
<tr>
<td>WID07E</td>
<td>40 V ac/dc</td>
<td>40 V ac/dc</td>
<td>17 V ac/dc</td>
</tr>
<tr>
<td>WID07F</td>
<td>100 V ac/dc</td>
<td>150 V ac/dc</td>
<td>40 V ac/dc</td>
</tr>
<tr>
<td>WID07G</td>
<td>100 V ac/dc</td>
<td>150 V ac/dc</td>
<td>40 V ac/dc</td>
</tr>
<tr>
<td>WID07H</td>
<td>10 V dc</td>
<td>15 V dc</td>
<td>3 V dc</td>
</tr>
<tr>
<td>WID07I</td>
<td>10 V ac/dc</td>
<td>15 V ac/dc</td>
<td>3 V ac/dc</td>
</tr>
<tr>
<td>WID07J</td>
<td>40 V dc</td>
<td>60 V dc</td>
<td>24 V dc</td>
</tr>
<tr>
<td>WID07K</td>
<td>95 V ac</td>
<td>150 V ac</td>
<td>60 V ac</td>
</tr>
<tr>
<td>WID07L</td>
<td>95 V ac</td>
<td>150 V ac</td>
<td>60 V ac</td>
</tr>
<tr>
<td>WID07M</td>
<td>190 V ac</td>
<td>264 V ac</td>
<td>120 V ac</td>
</tr>
<tr>
<td>WID07N</td>
<td>190 V ac</td>
<td>264 V ac</td>
<td>120 V ac</td>
</tr>
<tr>
<td>WID07O</td>
<td>180 V dc</td>
<td>264 V dc</td>
<td>110 V dc</td>
</tr>
<tr>
<td>WID07P</td>
<td>180 V dc</td>
<td>264 V dc</td>
<td>110 V dc</td>
</tr>
</tbody>
</table>
WLJ04 SERIES (ANALOG I/O) MODULES FUNCTIONAL SPECIFICATIONS

Description
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 transmitter or voltage source. The readback input channel 4 reads the output value to enable the user 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.

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

Analog Input Accuracy
ACCURACY (INCLUDES LINEARITY)
±0.03% of span (all four input channels)

ACCURACY TEMPERATURE COEFFICIENT
±50 ppm/°C

Input Conversion Time (software configurable)
Input signal conversion time specifications for the WLJ04 Series are listed in Table 28.

Settling Time
Defined as the value settling within a 1% band of steady state for 10 to 90% input step change.

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 FCM via the local Fieldbus.

Power Requirements

<table>
<thead>
<tr>
<th>INPUT VOLTAGE RANGE (REDUNDANT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 V dc nominal (12.4 V dc minimum,</td>
</tr>
<tr>
<td>13.1 V dc maximum)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONSUMPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 W (maximum) at 13 V dc</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HEAT DISSIPATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 W (maximum) at 13 V dc</td>
</tr>
</tbody>
</table>

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.
### WLJ04 Series (Analog I/O) Modules Functional Specifications (Continued)

**Table 27. WLJ04 Modules, Signal Ranges and Q-Card Equivalents**

<table>
<thead>
<tr>
<th>Module</th>
<th>Input and Readback Signal</th>
<th>Output Signal</th>
<th>Q-Card</th>
</tr>
</thead>
<tbody>
<tr>
<td>WLJ04A</td>
<td>0 to 10.24 V dc, 10 K maximum source impedance</td>
<td>0 to 10.24 V dc, 500 Ω load minimum</td>
<td>QLJ-G01</td>
</tr>
<tr>
<td>WLJ04B</td>
<td>0 to 5.12 V dc, 5 K maximum source impedance</td>
<td>0 to 10.24 V dc, 500 Ω load minimum</td>
<td>QLJ-G02</td>
</tr>
<tr>
<td>WLJ04C</td>
<td>0 to 20.48 mA externally powered</td>
<td>4 to 20.48 mA, 0 to 850 Ω load maximum, self-powered</td>
<td>QLJ-G03</td>
</tr>
</tbody>
</table>

**Table 28. WLJ04 Conversion Table**

<table>
<thead>
<tr>
<th>Conversion Time</th>
<th>Update Time</th>
<th>Settling Time</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 ms</td>
<td>100 ms</td>
<td>50 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>100 ms</td>
<td>100 ms</td>
<td>125 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>200 ms</td>
<td>100 ms</td>
<td>200 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>500 ms</td>
<td>100 ms</td>
<td>500 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>1000 ms</td>
<td>100 ms</td>
<td>1000 ms</td>
<td>15 bits</td>
</tr>
</tbody>
</table>
WPA06A (PULSE ACCUMULATOR) MODULE FUNCTIONAL SPECIFICATIONS

Description
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 WPA06A DCS Fieldbus Module replaces the QPA-G04 card.

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 at 48 V dc, 0.35 mA at 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)
- **DUTY CYCLE**
  10 to 90%

- **MINIMUM PULSE WIDTH ON/OFF**
  4 µs

- **INPUT RESISTANCE**
  10 kΩ

Communication
The module communicates with its associated FCM 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 FUNCTIONAL SPECIFICATIONS

Description
The WRF03 Series modules are channel-isolated platinum/nickel RTD input interfaces that contain six resistance temperature detector input channels. Each channel accepts a 4-wire RTD sensor input, within a 0 to 200 $\Omega$ resistance range or 0 to 100 $\Omega$ resistance range dependent upon module type. The WRF03A is a 0 to 640 $\Omega$ input module that replaces the QRF-G01 and G03 Series RTD input cards. The WRF03B is a 0 to 320 $\Omega$ input module that replaces the QRF-G02 and G04 Series RTD input cards.

Input
4 isolated and independent channels.

Input Range (each channel)
- **WRF03A**
  - 200 Platinum, 0 to 640 $\Omega$, 0°C to 370°C
- **WRF03B**
  - 100 Platinum, 0 to 320 $\Omega$, 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 FCM 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 listed in Table 29.

Settling Time
Defined as the value settling within a 1% band of steady state for 10 to 90% input step change.

Typical Resistance Temperature Sensors
- **WRF03A**
  - 200 Platinum, 0°C to 370°C
- **WRF03B**
  - 100 Platinum, 0°C to 290°C

Input Signal
Supports 4-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.
### Table 29. WRF03 Conversion Table

<table>
<thead>
<tr>
<th>Conversion Time</th>
<th>Update Time</th>
<th>Settling Time</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 ms</td>
<td>100 ms</td>
<td>50 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>100 ms</td>
<td>100 ms</td>
<td>125 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>200 ms</td>
<td>100 ms</td>
<td>200 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>500 ms</td>
<td>100 ms</td>
<td>500 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>1000 ms</td>
<td>100 ms</td>
<td>1000 ms</td>
<td>15 bits</td>
</tr>
</tbody>
</table>
WRO09 SERIES (RELAY OUTPUT) MODULES FUNCTIONAL SPECIFICATIONS

Description
The channel-isolated WRO09 Series relay output interface module contains eight 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.

Output Channels
8 isolated channels. The modules in the series, their function, and the Q-Cards they replace are listed in Table 30.

Communication
The module communicates with its associated FCM 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 (maximum) at 0.5 A, switches inductive loads
WRO09B
330 V dc/250 V ac (maximum) at 0.5 A, non-inductive resistive loads only

WRO09C
330 V dc/250 V ac (maximum) at 0.5 A, switches inductive loads
WRO09D
330 V dc/250 V ac (maximum) at 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 Ω maximum

Impedance
WRO09A
Open 25 KΩ (minimum)
WRO09B
Open 300 KΩ (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 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.

Table 30. WRO09 Modules, Function and Q-Card Equivalents

<table>
<thead>
<tr>
<th>Module</th>
<th>Function</th>
<th>Q-Cards</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRO09A</td>
<td>Switches inductive loads with mercury-wetted relay output devices. Jumper-selectable normally open or normally closed.</td>
<td>QRO-G01, QRO-G02</td>
</tr>
<tr>
<td>WRO09B</td>
<td>Switches non-inductive resistive loads with mercury-wetted relay output devices. Jumper-selectable normally open or normally closed.</td>
<td>QRO-G03, QRO-G04</td>
</tr>
<tr>
<td>WRO09C</td>
<td>Switches inductive loads, normally opened only, with solid-state relay output devices.</td>
<td>QRO-G01</td>
</tr>
<tr>
<td>WRO09D</td>
<td>Switches non-inductive resistive loads, normally opened only, with solid-state relay output devices.</td>
<td>QRO-G03</td>
</tr>
</tbody>
</table>
**WRT03 SERIES (RTD INPUT) MODULES FUNCTIONAL SPECIFICATIONS**

**Description**
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 Ω resistance range or 0 to 30 Ω resistance range dependent upon module type. The WRT03A module replaces the QRT-G01 and provides four 0 to 30 Ω inputs. The WRT03B module replaces the QRT-G02 and provides four 0 to 320 Ω inputs.

**Input**
4 isolated and independent channels.

**Input Range (each channel)**
- **WRT03A**: 0 to 30 Ω
- **WRT03B**: 0 to 320 Ω

**Sensor Current**
- **WRT03A**: 0.539 mA dc
- **WRT03B**: 0.197 mA dc

**Input Accuracy**

<table>
<thead>
<tr>
<th>Module</th>
<th>Accuracy (includes linearity)</th>
<th>Accuracy temperature coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRT03A</td>
<td>±0.15% of span</td>
<td>±50 ppm/°C</td>
</tr>
<tr>
<td>WRT03B</td>
<td>±0.03% of span</td>
<td></td>
</tr>
</tbody>
</table>

**Communication**
The module communicates with its associated FCM via the local Fieldbus.

**Power Requirements**

<table>
<thead>
<tr>
<th>Input Voltage Range (redundant)</th>
<th>Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 V dc nominal (12.4 V dc minimum, 13.1 V dc maximum)</td>
<td>2 W (maximum) at 13 V dc</td>
</tr>
</tbody>
</table>

**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 31.

**Settling Time**
Defined as the value settling within a 1% band of steady state for 10 to 90% input step change.

**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.
Table 31. WRT03 Conversion Table

<table>
<thead>
<tr>
<th>Conversion Time</th>
<th>Update Time</th>
<th>Settling Time</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 ms</td>
<td>100 ms</td>
<td>50 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>100 ms</td>
<td>100 ms</td>
<td>125 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>200 ms</td>
<td>100 ms</td>
<td>200 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>500 ms</td>
<td>100 ms</td>
<td>500 ms</td>
<td>15 bits</td>
</tr>
<tr>
<td>1000 ms</td>
<td>100 ms</td>
<td>1000 ms</td>
<td>15 bits</td>
</tr>
</tbody>
</table>
WTO09 TRIAC OUTPUT MODULE FUNCTIONAL SPECIFICATIONS

Description
The WTO09A is an externally sourced TRIAC digital output module designed to replace the 8-channel QTO-G01. This channel-isolated interface contains eight 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.

Output Channels
Eight isolated channels

Communication
The module communicates with its associated FCM 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 32 describes the output capabilities of the WTO09. Note that the load current must be above 75 mA to fire the TRIAC.

Channel Isolation
Each channel is optically 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.

Table 32. WTO09 Output Capabilities

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Minimum</th>
<th>Typical</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage (RMS)</td>
<td>80</td>
<td>115</td>
<td>140 V ac</td>
</tr>
<tr>
<td>Current (On)</td>
<td>0.075</td>
<td>----</td>
<td>1.8 RMS (continuous)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 A RMS (T &lt; 5 cycles)</td>
</tr>
<tr>
<td>Frequency</td>
<td>47</td>
<td>----</td>
<td>63 Hz</td>
</tr>
<tr>
<td>Common Mode Voltage</td>
<td>----</td>
<td>----</td>
<td>500 V dc (peak)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>300 V ac (RMS, line frequency)</td>
</tr>
<tr>
<td>Current (Off)</td>
<td>----</td>
<td>----</td>
<td>8 mA (RMS)</td>
</tr>
</tbody>
</table>
RELATED PRODUCT SPECIFICATION SHEETS

For reference purposes, Table 33 lists the Product Specification Sheets (PSSs) for additional hardware and software elements in the DIN rail mounted subsystem. The ZCP270 is mounted in 1x8 Mounting Structure, but is listed herein for its relationship to the migration components.

<table>
<thead>
<tr>
<th>PSS Number</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSS 21H-2W3 B4</td>
<td>DIN Rail Mounted Power Supplies</td>
</tr>
<tr>
<td>PSS 21H-2W6 B4</td>
<td>DIN Rail Mounted Modular Baseplates</td>
</tr>
<tr>
<td>PSS 21H-1B9 B3</td>
<td>Field Control Processor 270 (FCP270)</td>
</tr>
<tr>
<td>PSS 21H-2Y10 B4</td>
<td>Field Communication Module 100 Et (FCM100Et)</td>
</tr>
<tr>
<td>PSS 21H-2Y11 B4</td>
<td>Field Communication Module 100 E (FCM100E)</td>
</tr>
<tr>
<td>PSS 21H-2Y14 B4</td>
<td>FEM100 Fieldbus Expansion Module</td>
</tr>
<tr>
<td>PSS 21H-1B10 B3</td>
<td>Z-Module Control Processor 270 (ZCP270)</td>
</tr>
</tbody>
</table>

MIGRATION KITS/COMPONENTS

Migration kits and components for Westinghouse® Process Control WDPF I and II Systems are listed in the document DCSFieldbusModulesforWestinghouseWDPF®SystemsUser’sGuide(B0400BA). In the User’s Guide B0400BA, refer to:

- Table 2-11 Control Processor 60 DCS Fieldbus Module Migration Kit (P0918XR)
- Table 2-12 Field Control Processor 270 DCS Fieldbus Module Migration Parts
- Table 2-13 Z-Module Control Processor 270 DCS Fieldbus Module Migration Parts