

DeltaV™ M-series Traditional I/O



The DeltaV™ I/O Subsystem is Easy to Install and Maintain.

- Decreases capital equipment costs
- Decreases installation time and expense
- Increases productivity
- Increases process availability

Introduction

Traditional I/O is a modular subsystem that offers flexibility during installation. It's designed to be installed in the field, near your devices. Traditional I/O is equipped with function and field wiring protection keys to ensure that the correct I/O card is always plugged into the corresponding terminal block. Modularity, protection keys, and plug-and-play capabilities make DeltaV™ Traditional I/O a smart choice for your process control system.

Benefits

Decreases Capital Equipment Costs

Full System Modularity: The Traditional I/O subsystem was designed with your investment in mind. All components are fully modular and may be installable under power. You add I/O interface carriers and I/O interfaces in groups of 4, 8, 16, or 32 channels as you need them. The modular design enables you to purchase the exact amount of I/O cards, 8-wide or 4-wide carriers, power/ controllers, and 2-wide carriers you need and add more DeltaV I/O as your system grows.

Reduced System Footprint: The DeltaV system's state-of-the-art form factor design of the I/O components enables you to mount the I/O interface carrier in a junction box in the field so you significantly reduce the footprint of your equipment and increase valuable control room space for other uses.

Installation: Save on wiring expenses by installing Classic Instrumentation in the field, near the actual field devices. Mounting the controller with the I/O further reduces your wiring expenditures by eliminating the need for long runs of multi-cores. The integrated design of the Traditional I/O subsystem can eliminate the need for marshalling panels. This saves you even more in your total capital costs.

The provision of in-line fuses and bussed power saves on installation costs compared with external fuses and power distribution.

Decreases Installation Time and Expense

Plug-and-play Installation Saves Money: All Traditional I/O components plug into the I/O interface carrier. You can install the I/O interface carriers to manage anticipated growth and postpone the I/O interfaces until you're ready to install your additional field devices.

Phased Installation Saves Time: As soon as you mount the I/O interface carrier, you're ready to begin installing the field devices. I/O terminal blocks plug directly onto the I/O interface carrier. There is no need to have the I/O cards installed.

Keys: Traditional I/O interfaces and terminal blocks have I/O function keys. These keys ensure that the correct I/O card is always plugged into the corresponding terminal block. It's incredibly easy to use and gives you time to do more.

This design enables you to initially install Traditional I/O quickly and efficiently. When you need to replace an I/O card, the function key design ensures that you will always install it correctly. This keying system provides a safety measure by preventing the wrong I/O interface's being installed.



Traditional I/O Terminal Block.

Increases Productivity

Real-time, Online Equipment Additions: Online addition of new I/O interfaces means your process does not get interrupted. As new equipment is added, the DeltaV Explorer acknowledges it and assigns it basic configuration.

Increases Process Availability

1:1 Redundancy for Traditional and HART I/O Cards:

DeltaV redundant I/O uses the same Series 2 I/O cards as non-redundant I/O. This allows you to leverage your investment in installed I/O and in I/O spares. No additional configuration is needed when using a redundant channel. The redundant terminal blocks provide the same field wiring connections as simplex blocks, so there is no extra wiring needed.

Autosense of Redundancy: DeltaV autosenses redundant I/O, which greatly simplifies the task of adding redundancy to the system. The redundant pair of cards is treated as one card in the system tools.

Automatic Switchover: Should a primary I/O card fail, the system automatically switches to the "standby" card without user intervention. The operator is given clear notification of a switchover at the operator display.

Product Description

The Traditional I/O Subsystem Includes:

- I/O interface carrier (a DIN rail surface mounted) on which all I/O related components are installed
- Bulk AC to 24V DC power supply for field devices
- An I/O interface consisting of an I/O card and an I/O terminal block
- A variety of analog and discrete I/O cards enclosed in a common form factor that easily plugs into the I/O interface carrier
- A variety of I/O terminal blocks mounted on the I/O interface carrier that can be pre-wired before I/O card installation

I/O Cards

A variety of analog and discrete I/O cards are available to meet your specific requirements. The following cards support simplex or redundant installation:

- AI 4-20 mA HART 8 channels
- AO-4-20 mA HART 8 channels
- DI, 24V DC Dry Contact, 8 channels
- DO 24V DC High-Side, 8 channels

- AI (Plus) 4-20 mA HART, 16 channels
- AO (Plus) 4-20 mA HART, 16 channels
- DI (Plus) 24V DC, Dry Contact, 32 channels
- DO (Plus) 24V DC, High-Side, 32 channels

The following I/O cards are supported in simplex format to meet your field wiring needs:

- RTD, 8-channels
- Thermocouple, 8 channels
- Millivolt, 8 channels
- DI, High Density, 32 channels
- DI 24V DC Isolated, 8 channels
- Multi-Function, 4 channels (Isolated DI)
- Sequence of Event, 16 channels (DI 24 V DC)
- DI 120V AC Low Side Detection, 8 channels
- DI 120V AC Isolated, 8 channels
- DO 24V DC Isolated, 8 channels
- DO 120/230V AC High-Side, 8 channels
- DO 120/230 Isolated, 8 channels

All I/O cards are enclosed in a common form factor that plugs into the I/O interface carrier. The housing is clearly labeled with the enclosed I/O card type. All cards have power and internal error indicators. Eight-channel cards have clearly visible channel status LEDs.

All cards meet ISA G3 corrosion specifications by the careful selection of superior electronic components and the use of conformal coating.

Pulse Counters are available on most DI cards. The supported maximum frequency varies from 0.1 Hz on AC signals to 75 or 120 Hz on 24V DC inputs. For higher pulse counts, up to 50 KHz, use the Multi-Function card's high speed pulse input.

The DeltaV system provides control module level time stamping for log events and alarms. For greater event resolution, the 16-channel Sequence-of-Events DI card can provide signal driven events to a resolution of +/- 0.25 ms per card, or within 1 ms per controller. Please refer to the **Sequence of Events** PDS for more information on Sequence-of-Event data collection and system options for this feature.



A Traditional I/O Card Easily Plugs into an I/O Carrier.

I/O Card Redundancy

Redundant I/O cards are available for critical applications. The same card can be used in simplex or redundant applications. When installed on a two-wide redundant terminal block, the cards are recognized as a redundant pair by the controller. The controller scans each card and determines which card is acting as the active interface. When a fault is detected, the system automatically switches to the standby I/O card.

DeltaV Control modules reference simplex and redundant I/O channels identically and there is no special configuration required to take advantage of redundancy.

Switchover of a redundant I/O card is completed within two scans of the I/O bus. Make-before-break contacts ensure digital field instruments remain powered and the process is undisturbed. Analog output signals are briefly driven by both cards for < 5 ms during switchover of the card.

Hardware Alerts automatically report hardware integrity errors for both the primary and secondary cards. Any event that causes a switchover is also reported automatically through the system hardware alerts and is logged in the Event Chronicle.

Events that can cause a switchover include:

- Hardware failure within the active card.
- Communications failure between the active card and the controller.
- Detection of a fault in the field wiring.

A switchover may also be initiated from the diagnostics explorer, and the health and status of both cards and their channels are available in the diagnostics explorer.

The system automatically commissions a new standby card. In safe areas, failed cards can be replaced under power. In hazardous areas, appropriate installation procedures must be followed.

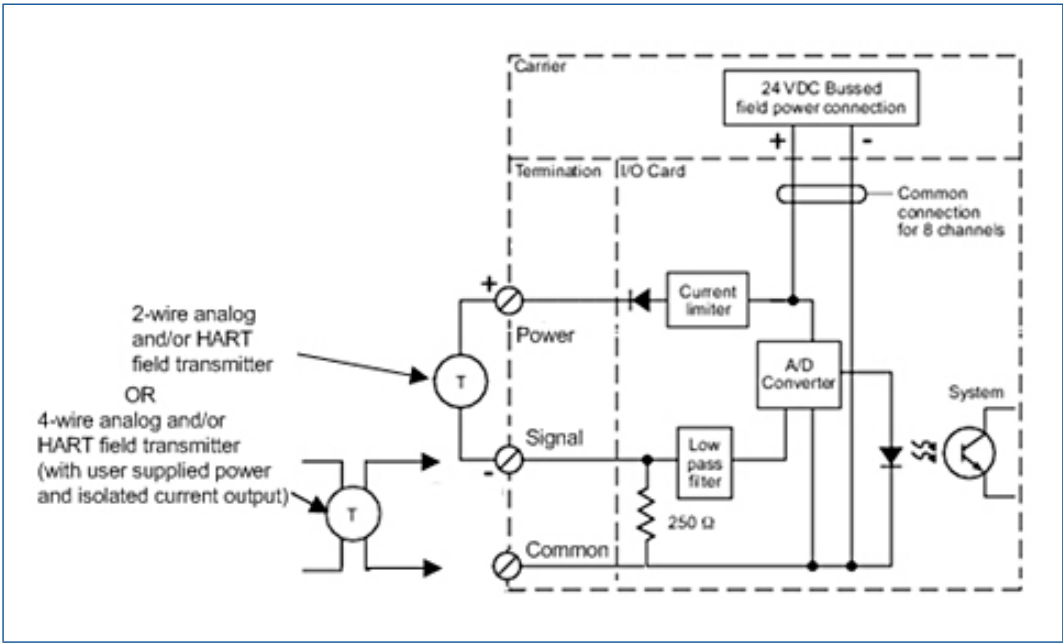
Hardware Specifications

Common Environmental Specifications for all I/O Interfaces	
Category	Specifications
Operating Temperature*	-40 to 70°C (-40 to 158°F)
Storage Temperature	-40 to 85°C (-40 to 185°F)
Relative Humidity	5 to 95%, non-condensing
Airborne Contaminants	ISA-S71.04-1985 Airborne Contaminants Class G3 Conformal coating
Protection Rating	IP 20
Shock	10 g ½-sine wave for 11 ms
Vibration	1 mm peak-to-peak from 5 to 16 Hz; 0.5 g from 16 to 150 Hz
Dimensions	H 10.7 cm (4.2 in.) W 4.1 cm (1.6 in.) Depth 10.5 cm (4.1 in.)

*Operating any electronics at the higher end of its temperature range for long periods of time will shorten its expected lifetime, see **Effects of Heat and Airflow Inside an Enclosure** White Paper for more information.

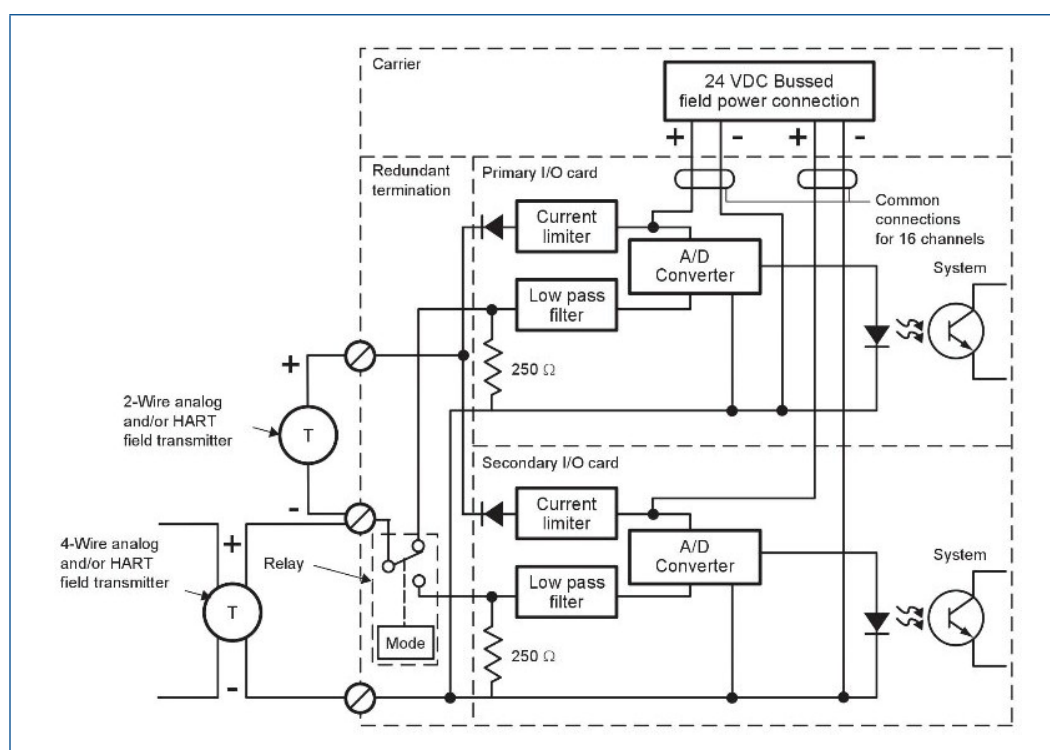
Analog Input I/O Cards

Specifications for HART AI-Card, 8-channel, 4 to 20 mA	
Number of Channels	Eight
Isolation	Each channel is optically isolated from the system and factory tested to 1500V DC
Nominal Signal Range (span)	4 to 20 mA
Full Signal Range	1 to 22.5 mA, with over range checking
LocalBus Current (12V DC nominal) per Card	Simplex: 120 mA typical, 150 mA maximum Redundant: 175 mA typical, 250 mA maximum (per card)
Field Circuit Power per Card	300 mA maximum at 24V DC (+10%)
Accuracy Over Temperature Range	0.1% of span
Resolution	16-bits A/D converter
Repeatability	0.05% of span
Roll-off Frequency	-3 dB at 2.7 Hz, -20.5 dB at ½ the sampling frequency
Calibration	None required
Optional Fuse	2.0 A
Communications Support	HART pass-through for AMS Device Manager Field device variable and status reporting for control functions
Hart Scan Time	600 – 800 ms (typical) per enabled channel



Simplified Circuit and Connection Diagram for Simplex AI Card, 8-channel, 4 to 20 mA, HART.

Specifications for AI (Plus) Card, 16-channel, 4 to 20 mA, HART	
Number of Channels	16
Input Sensor Types	4 to 20 mA (span), 2-wire
Full Signal Range	2 to 22 mA, with over range checking
Transmitter Power	13.5 V minimum at 20 mA (max current limited at 29 mA)
Accuracy Over Temperature Range	0.2% of span
Repeatability	0.05% of span
Resolution	16-bit A/D converter
Roll-off Frequency (Anti-aliasing)	-3 dB at 2.7 Hz; -20.5 dB at 20 Hz
Calibration	None required
Local Bus Current per Card (12V DC nominal)	Simplex: 85 mA typical, 150 mA maximum Redundant: 110 mA typical, 200 mA maximum
Field Circuit Power per Card	500 mA maximum @ 24V DC (+/-10%)
Isolation	Each channel is optically isolated from the system and factory tested to 1000V DC
HART Communications Support	HART pass-through for AMS Device Manager HART variable and status reporting for control functions
Hart Scan Time	600 – 800 mS (typical) per enabled channel

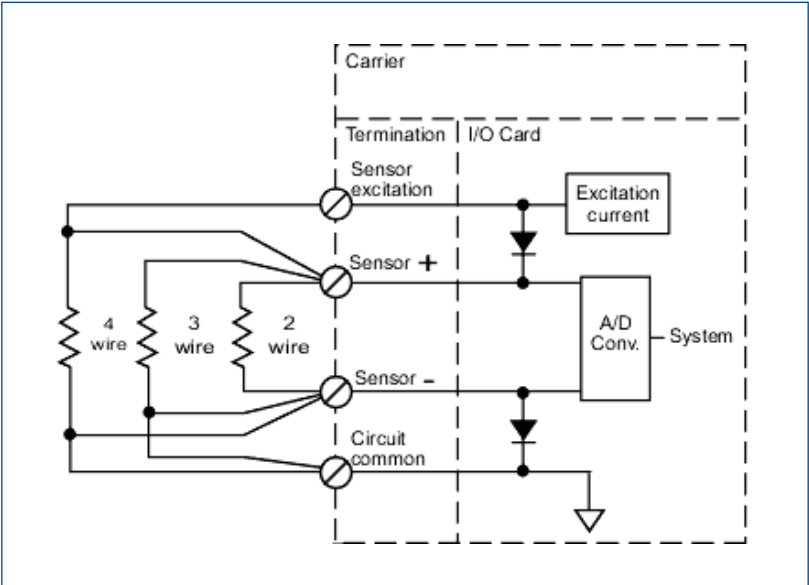


Simplified Circuit and Connection Diagram for Redundant AI Plus Card, 16-channel, 4 to 20 mA, HART.

Specifications for RTD Input Card, 8-channel	
RTD Channels per Card	Eight
Sensor Types	2 wire, 3 wire, or 4 wire
Sensor Configuration	Resistance, Pt100, Pt200, Pt500, Ni120, Cu10, User Defined
Full Scale Signal Range	See table next page
Accuracy	See table next page
Repeatability	0.05% of span
A/D Resolution	16-bit
Calibration	None required
Units	°C, °F
Sensor Excitation Current	100 μ A
Common Mode Rejection	120 dB at 50/60 Hz
Common Mode Impedance	> 10 mega ohms
LocalBus Current (12V DC nominal)	160 mA
Open Sensor Detection Time	1 second
Open mV Lead Detection Time	15 seconds

RTD, ohms Sensor Type Specifications					
Sensor Type	Full Scale	Operating Range	25°C Reference Accuracy	Temperature Drift	Resolution
Resistance	0 to 2,000 Ω	0 to 2,000 Ω	± 6.2 Ω	± 0.112 Ω/°C	~0.02 Ω
Pt100	-200 to 850°C	-200 to 850°C	± 0.5°C	± 0.018°C/°C	~0.05°C
Pt200	-200 to 850°C	-200 to 850°C	± 0.5°C	± 0.012°C/°C	~0.05°C
Pt500	-200 to 850°C	-200 to 850°C	± 3.5°C	± 0.063°C/°C	~0.18°C
Ni120	-70 to 300°C	70 to 300°C	± 0.2°C	± 0.006°C/°C	~0.02°C
Cu10	-30 to 140°C	-30 to 140°C	± 2.0°C	± 0.157°C/°C	~0.23°C
User Defined*	0 to 1000 Ω	0 to 1000 Ω	± 0.4 Ω	± 0.009 Ω/°C	~0.05 Ω

*The Callendar-Van Dusen linearization equation can be used with user defined Pt RTDs. Refer to Recommended I/O Practices in DeltaV™ Books online for usage information.

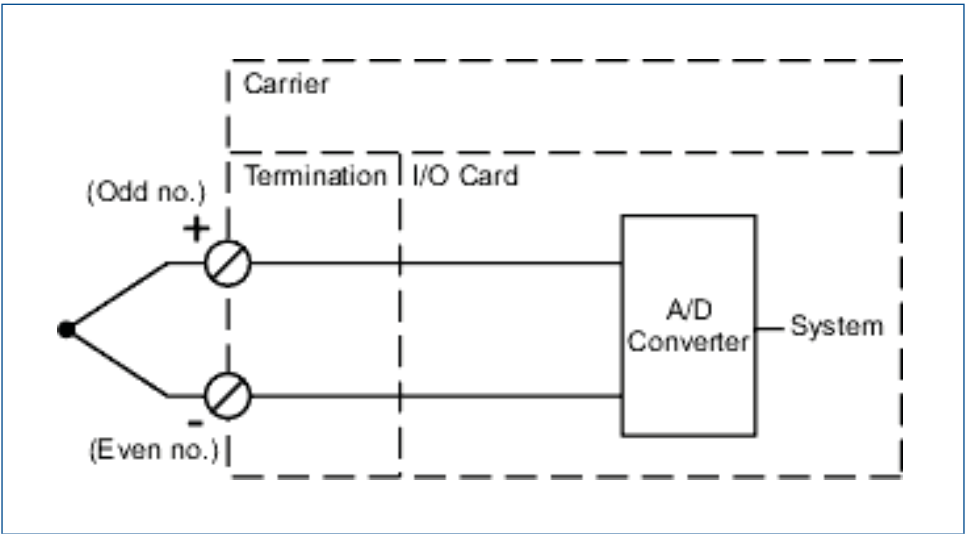


Simplified Circuit Diagram for RTD Input Card, 8 Channels.

Specifications for Thermocouple/mV Input Card, 8-channel	
Channels per Card	Eight
Sensor Types Thermocouple mV	B, E, J, K, N, R, S, T, uncharacterized Low level voltage source
Sensor Ranges	See table next page
Repeatability	0.05% of span
A/D Resolution	16-bit
Calibration	None required
Units	°C, °F
Cold Junction Compensation (Not available on mV channels)	Local: Integrally mounted in terminal block External: Configure one channel as external cold junction compensation for remaining inputs
Isolation	Each channel is optically isolated from the system and factory tested to 1500V DC ■ Channels 1, 2, 3, and 4 are isolated from channels 5, 6, 7, and 8 (verified by 1500V DC factory test) ■ Thermocouples attached to channels 1, 2, 3, and 4 are not electrically isolated and should be within + 0.7V DC of each other ■ Thermocouples attached to channels 5, 6, 7, and 8 are not electrically isolated and should be within + 0.7V DC of each other
Common Mode Rejection	120 dB at DC/50/60 Hz
Common Mode Impedance	> 10 mega ohms
Normal Mode Rejection	60 dB at 60 Hz
LocalBus Current (12V DC nominal)	210 mA
Open Sensor Detection	Yes (< 70 nA)
Open Sensor Detection Time	10 seconds

Thermocouple Sensor Type Specifications					
Sensor Type	Full Scale	Operating Range	25°C Reference Accuracy	Temperature Drift	Resolution
Uncharacterized (no linearization, no cold junction compensation.)	-100 to 100 mV	-100 to 100 mV	0.1 mV	$\pm 0.002 \text{ mV/}^\circ\text{C}$	$\sim 0.003 \text{ mV}$
B	250 to 1810°C	500 to 1810°C	$\pm 2.4^\circ\text{C}$	$\pm 0.056^\circ\text{C/}^\circ\text{C}$	$\sim 0.18^\circ\text{C}$
E	-200 to 1000°C	-200 to 1000°C	$\pm 0.6^\circ\text{C}$	$\pm 0.008^\circ\text{C/}^\circ\text{C}$	$\sim 0.07^\circ\text{C}$
J	-210 to 1200°C	-190 to 1200°C	$\pm 0.8^\circ\text{C}$	$\pm 0.011^\circ\text{C/}^\circ\text{C}$	$\sim 0.05^\circ\text{C}$
K	-270 to 1372°C	-200 to 1372°C	$\pm 0.5^\circ\text{C}$	$\pm 0.016^\circ\text{C/}^\circ\text{C}$	$\sim 0.18^\circ\text{C}$
N	-270 to 1300°C	-190 to 1300°C	$\pm 1.0^\circ\text{C}$	$\pm 0.007^\circ\text{C/}^\circ\text{C}$	$\sim 0.10^\circ\text{C}$
R	-50 to 1768°C	-50 to 1768°C	$\pm 2.1^\circ\text{C}$	$\pm 0.013^\circ\text{C/}^\circ\text{C}$	$\sim 0.14^\circ\text{C}$
S	-50 to 1768°C	-40 to 1768°C	$\pm 2.2^\circ\text{C}$	$\pm 0.067^\circ\text{C/}^\circ\text{C}$	$\sim 0.24^\circ\text{C}$
T	-270 to 400°C	-200 to 400°C	$\pm 0.7^\circ\text{C}$	$\pm 0.001^\circ\text{C/}^\circ\text{C}$	$\sim 0.04^\circ\text{C}$

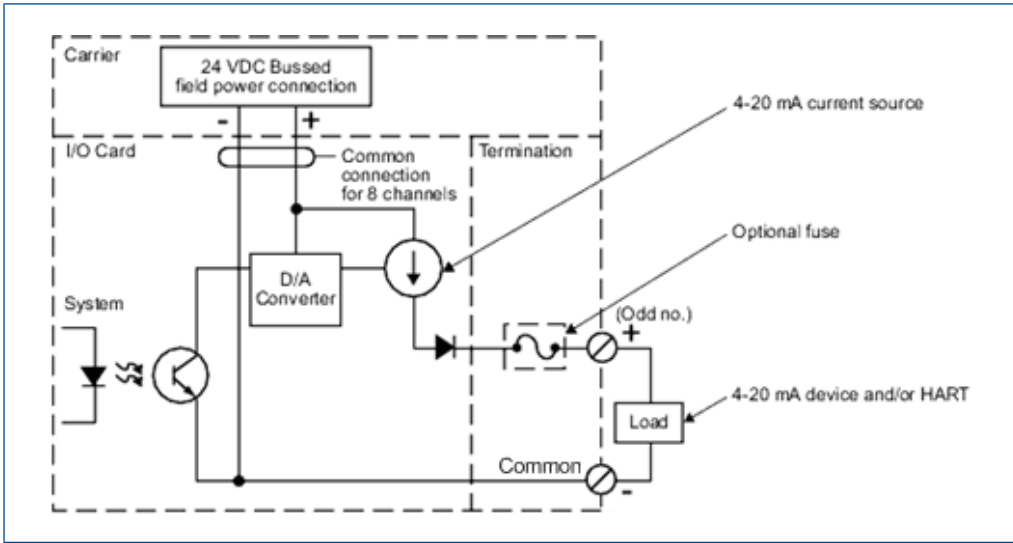
RTD, ohms Sensor Type Specifications					
Sensor Type	Full Scale	Operating Range	25°C Reference Accuracy	Temperature Drift	Resolution
Low-level Voltage Source	-100 to 100 mV	-100 to 100 mV	0.1 mV	$0.002 \text{ mV/}^\circ\text{C}$	$\sim 0.003 \text{ mV}^\circ$



Simplified Circuit Diagram of Thermocouple/mV card, 8 Channels.

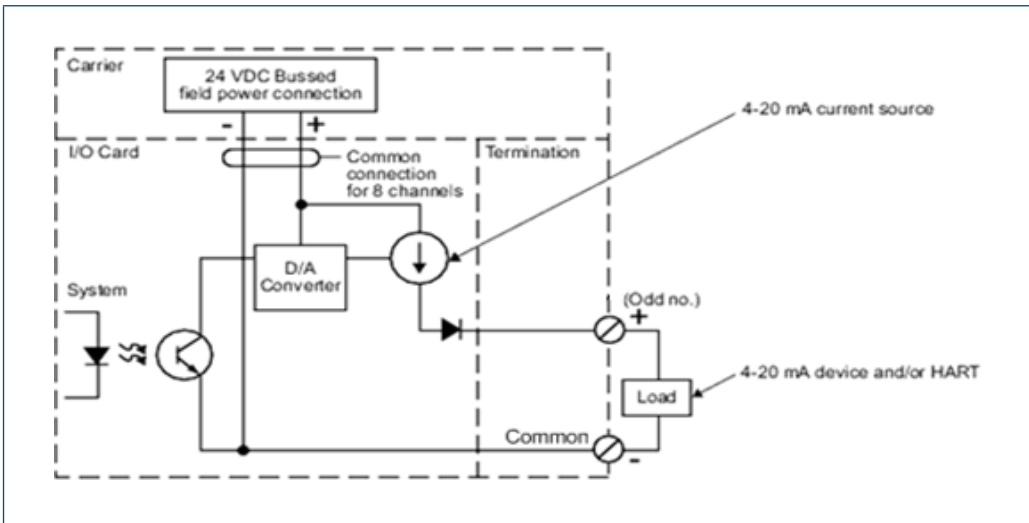
Analog Output I/O Cards

Item	Specification
Number of Channels	Eight
Isolation	Each channel is optically isolated from the system and factory tested to 1500V DC
Nominal Signal Range (span)	4 to 20 mA
Full Signal Range	1 to 23 mA
LocalBus Current (12V DC nominal) per Card	100 mA typical, 150 mA maximum
Field Circuit Power per Card	300 mA maximum @ 24V DC (+/-10%)
Accuracy Over Temperature Range	0.25% of span
Resolution	12-bit
Output Compliance	20 mA at 21.6V DC supply into 700 ohms load
Calibration	Information stored on card.
Optional Fuse	2.0 A



Simplified Circuit and Connection Diagram for Simplex AO Card, 8-channel, 4 to 20 mA, HART.

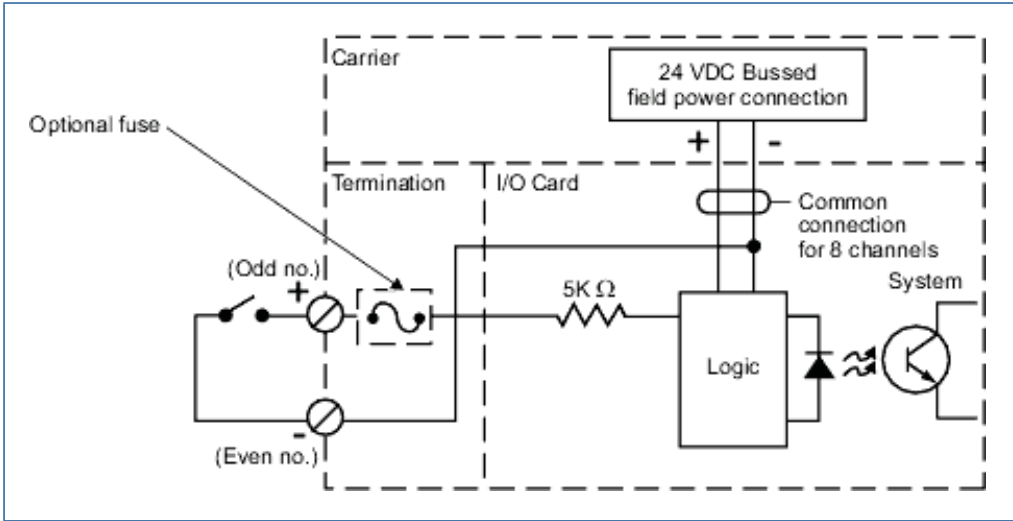
Specifications for AO (Plus) Card, 16-Channel, 4 to 20 mA, HART	
Number of Channels	16
Device Types	4 to 20 mA
Full Signal Range	1 to 23 mA
Accuracy Over Temperature Range	0.25% of span
Resolution	14-bit A/D converter
Calibration	None required
Local Bus Current per Card (12V DC nominal)	Simplex: 85 mA typical, 150 mA maximum Redundant: 110 mA typical, 260 mA maximum
Field Circuit Power per Card	400 mA maximum @ 24V DC (+/-10%)
Isolation	Each channel is optically isolated from the system and factory tested to 1000V DC
HART Communications Support	HART pass-through for AMS Device Manager HART variable and status reporting for control functions
Hart Scan Time	600 – 800 mS (typical) per enabled channel



Simplified Circuit and Connection Diagram for Simplex AO (Plus) Card, 16-channel, 4 to 20 mA, HART.

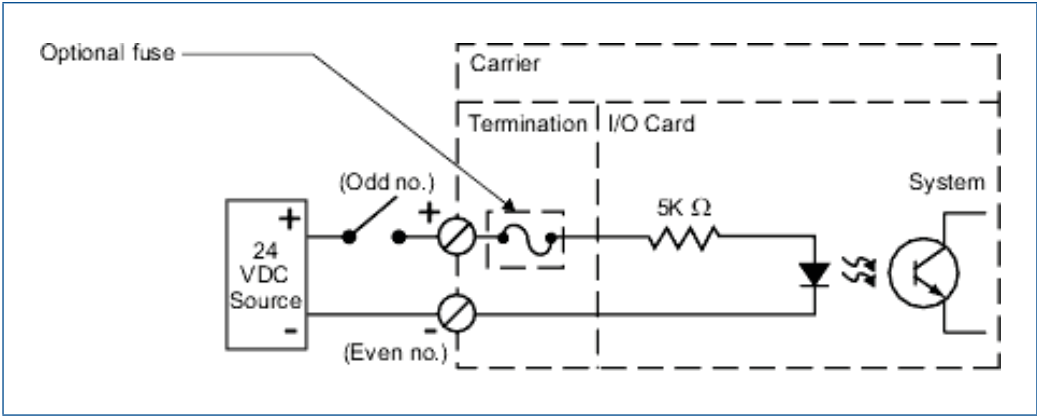
Discrete Input I/O Cards

Specifications for DI Card, 8-channel, 24V DC, Dry Contact	
Number of Channels	Eight
Input Compatibility	Dry Contact (known to operate with many NAMUR sensors)
Detection Level for On	>2.2 mA
Detection Level for Off	<1 mA
Input Impedance	5 K Ω (approximate)
Wetting Voltage	15 Volts
Fault Detection Capable	Field resistor pack (known to operate with many NAMUR sensors)
Configurable Channel Types: ■ Discrete Input ■ Pulse Count	Input Dry contact or discrete state sensor changing <2 Hz Pulse train <75 Hz
Local Bus current (12V DC nominal) per Card	Simplex: 75 mA typical, 100 mA maximum Redundant: 90 mA typical, 150 mA maximum
Field Circuit Power per Card	100 mA at 24V DC ($\pm 10\%$)
Isolation	Each channel is optically isolated from the system and factory tested to 1500V DC
Optional Fuse	2.0 A (Terminal block option)



Simplified Circuit and Connection Diagram for DI Card, 8-channel, 24V DC, Dry Contact.

Specifications for DI Card, 8-channel, 24V DC, Isolated	
Number of Channels	Eight
Isolation	Each channel is optically isolated from the system and from each other and factory tested to 1500V DC
Detection Level for On	>10V DC
Detection Level for Off	<5V DC
Input Impedance	5 mA at 24V
LocalBus Current (12V DC nominal) per Card	75 mA typical, 100 mA maximum
Field Circuit Power per Card	None
Optional Fuse	2.0 A



Simplified Circuit and Connection Diagram for DI Card, 8-channel, 24V DC, Isolated.