

Modicon Momentum I/O Base User Guide

(Original Document)

12/2018

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

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Failure to observe this information can result in injury or equipment damage.

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Safety Information



Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

BEFORE YOU BEGIN

Do not use this product on machinery lacking effective point-of-operation guarding. Lack of effective point-of-operation guarding on a machine can result in serious injury to the operator of that machine.

| |
|---|
|  WARNING |
| UNGUARDED EQUIPMENT |
| <ul style="list-style-type: none">• Do not use this software and related automation equipment on equipment which does not have point-of-operation protection.• Do not reach into machinery during operation. |
| Failure to follow these instructions can result in death, serious injury, or equipment damage. |

This automation equipment and related software is used to control a variety of industrial processes. The type or model of automation equipment suitable for each application will vary depending on factors such as the control function required, degree of protection required, production methods, unusual conditions, government regulations, etc. In some applications, more than one processor may be required, as when backup redundancy is needed.

Only you, the user, machine builder or system integrator can be aware of all the conditions and factors present during setup, operation, and maintenance of the machine and, therefore, can determine the automation equipment and the related safeties and interlocks which can be properly used. When selecting automation and control equipment and related software for a particular application, you should refer to the applicable local and national standards and regulations. The National Safety Council's Accident Prevention Manual (nationally recognized in the United States of America) also provides much useful information.

In some applications, such as packaging machinery, additional operator protection such as point-of-operation guarding must be provided. This is necessary if the operator's hands and other parts of the body are free to enter the pinch points or other hazardous areas and serious injury can occur. Software products alone cannot protect an operator from injury. For this reason the software cannot be substituted for or take the place of point-of-operation protection.

Ensure that appropriate safeties and mechanical/electrical interlocks related to point-of-operation protection have been installed and are operational before placing the equipment into service. All interlocks and safeties related to point-of-operation protection must be coordinated with the related automation equipment and software programming.

NOTE: Coordination of safeties and mechanical/electrical interlocks for point-of-operation protection is outside the scope of the Function Block Library, System User Guide, or other implementation referenced in this documentation.

START-UP AND TEST

Before using electrical control and automation equipment for regular operation after installation, the system should be given a start-up test by qualified personnel to verify correct operation of the equipment. It is important that arrangements for such a check be made and that enough time is allowed to perform complete and satisfactory testing.

WARNING

EQUIPMENT OPERATION HAZARD

- Verify that all installation and set up procedures have been completed.
- Before operational tests are performed, remove all blocks or other temporary holding means used for shipment from all component devices.
- Remove tools, meters, and debris from equipment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Follow all start-up tests recommended in the equipment documentation. Store all equipment documentation for future references.

Software testing must be done in both simulated and real environments.

Verify that the completed system is free from all short circuits and temporary grounds that are not installed according to local regulations (according to the National Electrical Code in the U.S.A, for instance). If high-potential voltage testing is necessary, follow recommendations in equipment documentation to prevent accidental equipment damage.

Before energizing equipment:

- Remove tools, meters, and debris from equipment.
- Close the equipment enclosure door.
- Remove all temporary grounds from incoming power lines.
- Perform all start-up tests recommended by the manufacturer.

OPERATION AND ADJUSTMENTS

The following precautions are from the NEMA Standards Publication ICS 7.1-1995 (English version prevails):

- Regardless of the care exercised in the design and manufacture of equipment or in the selection and ratings of components, there are hazards that can be encountered if such equipment is improperly operated.
- It is sometimes possible to misadjust the equipment and thus produce unsatisfactory or unsafe operation. Always use the manufacturer's instructions as a guide for functional adjustments. Personnel who have access to these adjustments should be familiar with the equipment manufacturer's instructions and the machinery used with the electrical equipment.
- Only those operational adjustments actually required by the operator should be accessible to the operator. Access to other controls should be restricted to prevent unauthorized changes in operating characteristics.

About the Book



At a Glance

Document Scope

This manual contains complete information about the Momentum I/O bases. It contains only passing references to other Momentum components, including processor adapters, option adapters, and communication adapters.

Validity Note

This document is valid for EcoStruxure™ Control Expert 14.0 or later.

The technical characteristics of the devices described in the present document also appear online. To access the information online:

| Step | Action |
|------|--|
| 1 | Go to the Schneider Electric home page www.schneider-electric.com . |
| 2 | In the Search box type the reference of a product or the name of a product range. <ul style="list-style-type: none">• Do not include blank spaces in the reference or product range.• To get information on grouping similar modules, use asterisks (*). |
| 3 | If you entered a reference, go to the Product Datasheets search results and click on the reference that interests you. If you entered the name of a product range, go to the Product Ranges search results and click on the product range that interests you. |
| 4 | If more than one reference appears in the Products search results, click on the reference that interests you. |
| 5 | Depending on the size of your screen, you may need to scroll down to see the data sheet. |
| 6 | To save or print a data sheet as a .pdf file, click Download XXX product datasheet . |

The characteristics that are presented in the present document should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the document and online information, use the online information as your reference.

Related Documents

| Title of Documentation | Reference Number |
|--|---|
| Momentum M1 Processor Adapter and Option Adapter User Guide | 31002674 (English), 31002936 (French), 31003008 (German), 31003009 (Spanish) |
| Momentum Bus Adapter for INTERBUS User Manual | 33002285 (English), 33002286 (French), 33002284 (German), 35014437 (Italian), 33002287 (Spanish), 31007108 (Chinese) |
| Momentum Communications Adapter for PROFIBUS DP User Manual | 709609 (English), 709610 (French), 709611 (German), 33003674 (Italian), 710443 (Spanish), 33003675 (Chinese) |
| Momentum Using Control Expert Fipio Communicator Setup Manual | 35008163 (English), 35008164 (French), 35008165 (German), 35014000 (Italian), 35008166 (Spanish), 35014001 (Chinese) |
| Momentum ControlNet Communication Adapter User Manual | 870 USE 007 00 |
| Momentum 170 AEC 920 00 I/O Base with 2 High-Speed Counters User Manual | 33001466 (English), 33001513 (French), 33000512 (German), 35014432 (Italian), 33001899 (Spanish), 31007103 (Chinese) |
| 170 PNT Series Modbus Plus Communication Adapters for Momentum User Manual | 31002940 (English), 31004911 (French), 33000087 (German), 35014439 (Italian), 31004913 (Spanish), 31007100 (Chinese) |

| Title of Documentation | Reference Number |
|--|---|
| 170 LNT 710 00 DeviceNet Communication Adapter for Modicon TSX Momentum User Guide | 870 USE 104 00 |
| 170 NEF Series Modbus Plus Communication Adapters for TSX Momentum User Guide | 870 USE 111 00 |
| Momentum 170ENT11001/170ENT11002 Ethernet Communications Adapter User Guide | 31004109 (English), 31004110 (French), 31004111 (German), 31007558 (Italian), 31004112 (Spanish), 31007101 (Chinese) |

You can download these technical publications and other technical information from our website at <https://www.schneider-electric.com/en/download>

Part I

Using Momentum I/O Bases

Overview

This part describes how to assemble TSX Momentum I/O bases with other Momentum components, how to mount assembled modules, and how to ground them.

What Is in This Part?

This part contains the following chapters:

| Chapter | Chapter Name | Page |
|---------|---|------|
| 1 | Introducing the TSX Momentum I/O Bases | 25 |
| 2 | Selecting Other TSX Momentum Components | 31 |
| 3 | Assembly | 43 |
| 4 | Dimensions and Mounting Instructions | 63 |
| 5 | Power and Grounding Guidelines | 71 |

Chapter 1

Introducing the TSX Momentum I/O Bases

Overview

This chapter introduces the basic features and types of TSX Momentum I/O bases.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|-----------------------------|------|
| Basic Features of I/O Bases | 26 |
| Types of I/O Bases | 28 |

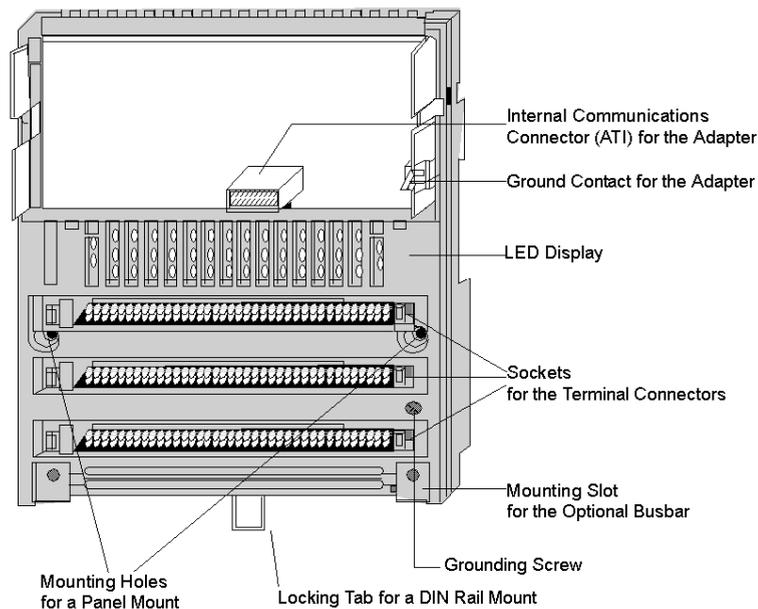
Basic Features of I/O Bases

Overview

This section provides a drawing of a typical I/O base and describes basic features of I/O bases.

Front View

The front panel components of a typical I/O base are shown in the illustration below



Internal Communications Connector

The internal communications connector on an I/O base provides automatic communication to any adapter mounted on the base.

LED Display

Each I/O base has a custom LED display, providing information about the status of input and output devices. Refer to the LED illustration and description for your I/O base for details.

Ground Contact

This contact provides an earth ground connection to any adapter mounted on the base.

Terminal Connector Sockets

Each I/O base has sockets for as many as three terminal connectors. Terminal connectors are required for connecting I/O devices and must be ordered separately. For ordering information, see *Terminal Connectors*, [page 33](#).

Busbar Slot

A slot at the bottom of the I/O base allows a busbar to be attached to support 3- and 4-wire field devices. Busbars are optional. They must be ordered separately. For ordering information, see *Busbar Numbers*, [page 60](#).

Mounting

Each I/O base has mounting holes for a panel mount and a locking tab for a DIN rail mount. For mounting instructions, see *Mounting TSX Momentum Devices*, [page 69](#).

CE Compliant

TSX Momentum I/O bases are designed to meet CE mark requirements for open equipment. Other agency approvals can be found in the specifications for each I/O base module.

Types of I/O Bases

Overview

This section provides part numbers and descriptions for the TSX Momentum I/O bases.

Analog

The following analog I/O bases are available.

| Part Number | Channels | Type | Details |
|----------------|----------|--------|-----------------------|
| 170 AAI 030 00 | 8 | input | broken wire detection |
| 170 AAI 140 00 | 16 | input | single-ended |
| 170 AAI 520 40 | 4 | input | RTD/thermocouple/mV |
| 170 AAO 120 00 | 4 | output | 0...20 mA |
| 170 AAO 921 00 | 4 | output | 4...20 mA |

Combination

The following I/O bases support a combination of analog and discrete I/O.

| Part Number | Channels | Type | Details |
|--|---|--------------|----------------------------|
| 170 AMM 090 00 | 4 analog in 2 analog out 4 discrete in 2 discrete out | input/output | 24 VDC |
| 170 AMM 090 01 ⁽¹⁾ | 4 analog in 2 analog out 4 discrete in 2 discrete out | input/output | 12 VDC |
| 170 AMM 110 30 | 2 analog in 2 analog out 8 discrete in 16 discrete out | input/output | 16...42 VDC 16...42 VDC |
| 170 ANR 120 90 unipolar | 6 analog in 4 analog out 8 discrete in 8 discrete out | input/output | 24 VDC |
| 170 ANR 120 91 bipolar | 6 analog in 4 analog out 8 discrete in 8 discrete out | input/output | 24 VDC |
| 1. This I/O base is not supported by Control Expert. | | | |

Discrete

The following discrete I/O bases are available.

| Part Number | Points | Type | Details |
|--|----------------------|-----------------|----------------------------------|
| 170 ADI 340 00 | 16 | input | 24 VDC |
| 170 ADI 350 00 | 32 | input | 24 VDC |
| 170 ADI 540 50 | 16 | input | 120 VAC |
| 170 ADI 740 50 | 16 | input | 230 VAC |
| 170 ADM 350 10 | 16 in 16 out | input output | 24 VDC, True High |
| 170 ADM 350 11 | 16 in 16 out | input output | 24 VDC, True High Fast Inputs |
| 170 ADM 350 15 | 16 in 16 out | input output | 24 VDC, True Low |
| 170 ADM 370 10 | 16 in 8 out | input output | 24 VDC @ 2 A |
| 170 ADM 390 10 ⁽¹⁾ | 16 in 12 out | input output | 24 VDC |
| 170 ADM 390 30 | 10 in 8 relay out | input output | 24 VDC |
| 170 ADM 390 31 ⁽¹⁾ | 10 in 8 relay out | input output | 24 VDC |
| 170 ADM 540 80 ⁽¹⁾ | 6 in 3 out | input output | 120 VAC |
| 170 ADM 690 51 | 10 in 8 out | input output | 120 VAC |
| 170 ADM 850 10 | 16 in 16 out | input output | 10...60 VDC 10...60 VDC |
| 170 ADO 340 00 | 16 | output | 24 VDC |
| 170 ADO 350 00 | 32 | output | 24 VDC |
| 170 ADO 530 50 | 8 | output | 115 VAC @ 2A |
| 170 ADO 540 50 | 16 | output | 120 VAC |
| 170 ADO 730 50 | 8 | output | 230 VAC @ 2A |
| 170 ADO 740 50 | 16 | output | 230 VAC |
| 170 ADO 830 30 | 8 | output | 120...230 VAC |
| 170 ARM 370 30 ⁽¹⁾ | 10 in 8 out | input output | 120 VAC powered 24 VDC in |
| 1. This I/O base is not supported by Control Expert. | | | |

NOTE: The 170 ADM 690 50 has been replaced by the 170 ADM 690 51.

Specials

The following specialty I/O bases are available.

| Part Number | Points | Type | Details |
|--|------------|----------|---------|
| 170 AEC 920 00 | 2 | counter | 24 VDC |
| 170 ANM 050 10 ⁽¹⁾ | | Seriplex | |
| 170 ADM 540 80 ⁽¹⁾ | 6 in/3 out | Modbus | 120 VAC |
| 1. This I/O base is not supported by Control Expert. | | | |

Generic

Control Expert provides the following I/O base part numbers as placeholders for third-party I/O modules with similar properties. These part numbers can be installed only on the I/O-Bus. These generic modules do not physically exist, and thus are not described in the list of I/O Base Descriptions (*see page 85*).

| Part Number | Type | Points | Description | Details |
|----------------|---------|----------------|-----------------------------------|--|
| 170 IOBUS 0203 | Digital | 32 in / 32 out | bidirectional (input & output) | 2 words of inputs, plus 2 words of outputs |

Chapter 2

Selecting Other TSX Momentum Components

Overview

A TSX Momentum I/O base must be assembled with a communication adapter or processor adapter in order to function. If you choose a processor adapter, you may also use an option adapter.

This chapter describes:

- TSX Momentum adapters
- terminal connectors
- busbars

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------------|------|
| Which Components Should I Use? | 32 |
| Communication Adapters | 34 |
| Processor Adapters | 35 |
| Option Adapters | 37 |
| Terminal Connectors | 38 |
| Busbars | 40 |

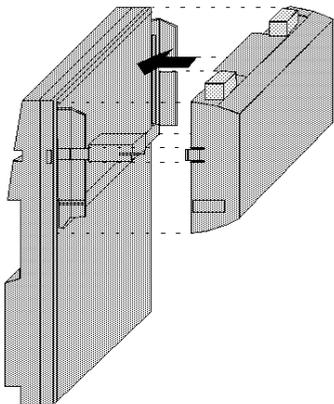
Which Components Should I Use?

Overview

This topic explains the choices you have in assembling a Momentum I/O device.

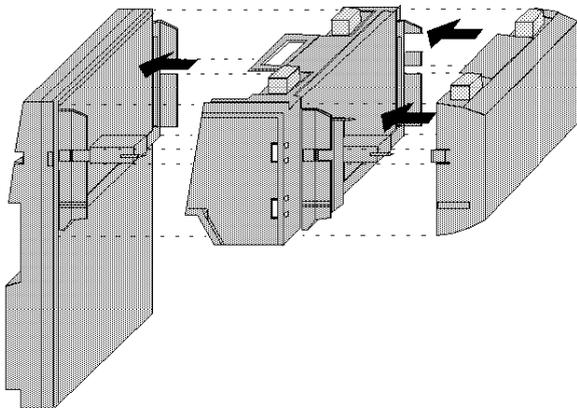
Primary Adapter

Each TSX Momentum I/O base must be assembled with a communication adapter or a processor adapter. Without one of these adapters, the I/O base will not function.



Option Adapter

If you use a processor adapter, you may add an option adapter. Option adapters cannot be used with communication adapters.



Terminal Connectors

Terminal connectors must be used to connect I/O devices to the I/O base.

Busbars

Busbars may be used to support 3- and 4-wire field devices. They are optional.

Communication Adapters

Overview

This topic describes the function of communication adapters, the types available, and where to get more information.

Function

A communication adapter provides an interface between an I/O base and a number of industry standard open-communication networks.

Types

The following communication adapters are available.

| For this Network... | Order this Adapter... | and this Manual... |
|----------------------------------|--|--------------------|
| ControlNet | 170 LNT 810 00 | 870 USE 007 |
| DeviceNet | 170 LNT 710 00 | 870 USE 104 |
| Ethernet | 170 ENT 110 01 | 870 USE 114 |
| FIPI/O | 170 FNT 110 00 | 870 USE 005 |
| InterBus | 170 INT 110 00 170 INT 110 01 170 INT 120 00 | 870 USE 009 |
| Modbus Plus (IEC data format) | 170 PNT 110 20 (Single Port) 170 PNT 160 20 (Dual Port) | 870 USE 103 |
| Modbus Plus (984 data format) | 170 NEF 110 21 (Single Port) 170 NEF 160 21 (Dual Port) | 870 USE 111 |
| Profibus-DP | 170 DNT 110 00 | 870 USE 004 |

Processor Adapters

Overview

This topic describes the function of processor adapters, the types available, and where to get more information.

Function

A processor adapter is a programmable logic controller (PLC). The adapter stores and executes a logic program, and controls I/O points over a common communication bus. This adapter is designed to mount on any Momentum I/O base and control its points as local I/O.

The following Momentum processor adapters are available.

| Model | Internal Memory | Flash RAM | Clock Speed | Communication Ports |
|----------------|-----------------|------------|-------------|------------------------|
| 171 CCS 700 00 | 64K bytes | 256K bytes | 20 MHz | one Modbus RS-232 port |
| 171 CCS 700 10 | 64K bytes | 256K bytes | 32 MHz | one Modbus RS-232 port |
| 171 CCS 760 00 | 256K bytes | 256K bytes | 32 MHz | one Modbus RS-232 port |
| | | | | one I/O bus port |
| 171 CCC 760 10 | 512K bytes | 512K bytes | 32 MHz | one Modbus RS-232 port |
| | | | | one I/O bus port |
| 171 CCS 780 00 | 64K bytes | 256K bytes | 20 MHz | one Modbus RS-232 port |
| | | | | one Modbus RS-485 port |
| 171 CCC 780 10 | 512K bytes | 512K bytes | 32 MHz | one Modbus RS-232 port |
| | | | | one Modbus RS-485 port |
| 171 CCC 960 20 | 512K bytes | 512K bytes | 50 MHz | one Ethernet port |
| | | | | one I/O bus port |
| 171 CCC 960 30 | 512K bytes | 512K bytes | 50 MHz | one Ethernet port |
| | | | | one I/O bus port |
| 171 CCC 980 20 | 512K bytes | 1 M bytes | 50 MHz | one Ethernet port |
| | | | | one Modbus RS-485 port |
| 171 CCC 980 30 | 512K bytes | 1 M bytes | 50 MHz | one Ethernet port |
| | | | | one Modbus RS-485 port |
| 171 CCC 960 91 | 512K bytes | 512K bytes | 50 MHz | one Ethernet port |
| | | | | one I/O bus port |

| Model | Internal Memory | Flash RAM | Clock Speed | Communication Ports |
|----------------|-----------------|-----------|-------------|----------------------------|
| 171 CCC 980 91 | 512K bytes | 1 M bytes | 50 MHz | one Ethernet port |
| | | | | one Modbus RS-485 port |
| 171 CBB 970 30 | 512K bytes | 1 M bytes | 50 MHz | four Ethernet ports |
| | | | | one Modbus RS-232/485 port |

NOTE: The modules listed above can be configured using Concept IEC programming software. They cannot be configured in Control Expert.

For More Information

For detailed descriptions of all the processor adapters, refer to the *TSX Momentum Processor Adapter and Option Adapter User Guide*.

Option Adapters

Overview

This section describes the function of option adapters, the types available, and where to get more information.

Function

An option adapter is used in conjunction with a processor adapter and an I/O base to provide:

- a time-of-day clock
- a battery backup
- one or more additional communication ports

Types

The following option adapters are available

| For These Communication Ports... | Order Adapter Part Number... |
|--|------------------------------|
| one user-selectable RS-232/RS-485 port | 172 JNN 210 32 |
| one Modbus Plus port | 172 PNN 210 22 |
| two (redundant) Modbus Plus ports | 172 PNN 260 22 |

NOTE: The modules listed above are not compatible with the 171 CBU 780 90, 171 CBU 980 90, and 171 CBU 980 91 processors. These modules can be configured using Concept IEC programming software. They cannot be configured with Control Expert.

For More Information

For detailed descriptions of all option adapters, refer to the *TSX Momentum Processor Adapter and Option Adapter User Guide*.

Terminal Connectors

Overview

This section describes:

- the function of terminal connectors
- the coding key feature
- types of terminal connectors available
- how many are needed
- how to order them

Function

Terminal connectors are used to connect I/O field devices and the power supply to the I/O base. While busbars may also be used, terminal connectors are electrically connected to the module, busbars are not.

Coding Key Feature

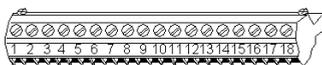
Some I/O bases can be operated over dangerous voltage ranges (above 42.4 VAC and above 60 VDC). Coding keys shipped with the I/O base and coding tabs shipped with the terminal connector can be used to prevent the accidental insertion into an I/O base of a terminal connector wired for the wrong voltage range.

For information on using coding keys, see [Using Terminal Connector Coding Keys](#) (*see page 57*).

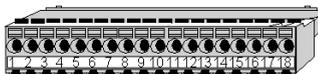
NOTE: For maximum protection, key coding is required during installation.

Types

Terminal connectors are available in screw-in and spring-clip versions.



Screw-type terminal block



Spring-clip terminal block

How Many Do I Need?

One terminal connector is required for each row of terminals that you will connect to the module's operating voltages and field devices.

Ordering Information

Terminal connectors must be ordered separately. They are available in kits of three. They are not shipped with the Momentum I/O bases.

| Type | Kit Part Number | Wire Type | Wire Size |
|--|-----------------|-------------------|---|
| Screw-in (set of 3) Note: The recommended maximum torque for the screws on these connectors is 4.4 in/lb (0.5 Nm). | 170 XTS 001 00 | Solid or stranded | If one wire, use 12AWG (2.5mm ²) max. If two wires, use 14AWG (1.5mm ²) max. |
| Spring-clip (set of 3) | 170 XTS 002 00 | Solid only | |

Busbars

Overview

This section describes:

- The function of busbars
- Types of busbars
- How to choose a busbar
- How to order a busbar

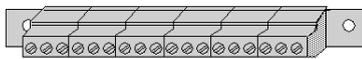
Function

A busbar may be plugged into the fourth row of an I/O base. Busbars provide a common connection for the field devices and serve as protective distribution connectors, for instance to PE. Each row of terminals on the busbar is connected internally. There is no electrical connection to the I/O base.

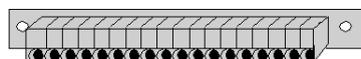
Types

Depending on the I/O base and the type and number of field devices to which it is connected, a 1-, 2-, or 3-row busbar may be used.

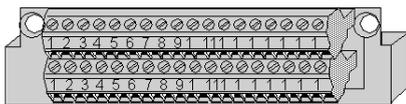
They are available in screw-in and spring-clip versions.



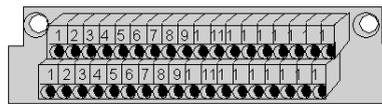
Screw-in 1-row busbar



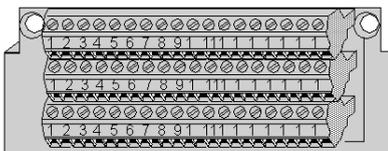
Spring-clip 1-row busbar



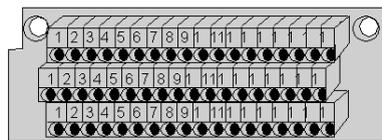
Screw-in 2-row busbar



Spring-clip 2-row busbar



Screw-in 3-row busbar



Spring-clip 3-row busbar

Specifications

Busbars have the following specifications:

| Busbar type | Screw-in | Spring-clip |
|-------------------------------|--------------------------|--------------------------|
| Max. load at 20 deg. C | 250 V 14 A | 250 V 17.5 A |
| Short circuit | 100 A 30 s | 100 A 30 s |
| Test voltage | 2.2 kV | 2.2 kV |
| Creepage / air dist. | per IEC 664A | per IEC 664A |
| Pollution | Degree 2 | Degree 2 |
| Contact derating at 70 deg. C | ca. 60% of nominal value | ca. 60% of nominal value |

How to Choose a Busbar

See the internal pin connections and field wiring diagrams associated with your I/O base to determine whether or not you need a busbar and which busbar best suits your needs.

Ordering Information

Busbars should be ordered separately. They are not shipped with I/O bases.

| Busbar Type | Part Number | # of Rows | Wire Size |
|-------------|----------------|-----------|---|
| Screw-in | 170 XTS 006 01 | 1 | If one wire, use 10AWG (4mm ²) max. If two wires, use 14AWG (2.5mm ²) max. |
| | 170 XTS 005 01 | 2 | One or two wires 14AWG (2.5mm ²) max. |
| | 170 XTS 004 01 | 3 | One or two wires 14AWG (2.5mm ²) max. |
| Spring-clip | 170 XTS 007 01 | 1 | If one wire, use 10AWG (4mm ²) max. If two wires, use 14AWG (2.5mm ²) max. |
| | 170 XTS 008 01 | 2 | One or two wires 14AWG (2.5mm ²) max. |
| | 170 XTS 003 01 | 3 | One or two wires 14AWG (2.5mm ²) max. |

Chapter 3

Assembly

Overview

This chapter describes how to assemble and disassemble the components of a TSX Momentum device:

- I/O bases
- communication adapters or processor adapters
- option adapters
- terminal connectors
- busbars
- labels

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--|------|
| Assembling an Adapter and an I/O Base | 44 |
| Disassembling an Adapter from an I/O Base | 47 |
| Assembling a Processor Adapter and an Option Adapter | 49 |
| Mounting the Assembled Adapters on the I/O Base | 51 |
| Disassembling a Module with an Option Adapter | 54 |
| Using Terminal Connector Coding Keys | 57 |
| Inserting Terminal Connectors | 58 |
| Removing a Terminal Connector | 59 |
| Attaching a Busbar | 60 |
| Labeling the Components in the Assembly | 61 |

Assembling an Adapter and an I/O Base

Overview

A processor adapter or communication adapter can be snapped directly onto a Momentum I/O base. This section contains safety precautions for handling components and an assembly procedure.

Connection Points

The adapter and I/O base connect at these three points.

- The plastic snap extensions on the two sides of the adapter fit into the two slots on the sides of the I/O base.
- The 12-pin AT1 connectors on the two units mate together.

No Tools Required

NOTICE

STATIC ELECTRICITY DAMAGE

Use proper ESD procedures when handling the adapter, and do not touch the internal elements. The adapter's electrical elements are sensitive to static electricity.

Failure to follow these instructions can result in equipment damage.

DANGER

RISK OF ELECTRICAL SHOCK

Make sure that the I/O base is not under power when it does not have an adapter mounted on it. Electrical circuitry on the I/O base may be exposed when a Momentum adapter is not mounted.

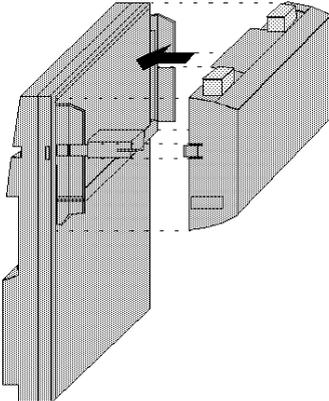
To make sure that power is not present, do not insert the wiring connectors to the I/O base until after the adapter has been mounted.

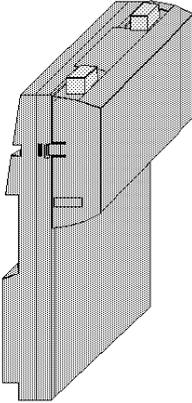
Failure to follow these instructions will result in death or serious injury.

The components can be snapped together by hand. No assembly tools are required.

Procedure

Follow the steps in the table below to assemble an adapter and an I/O base.

| Step | Action |
|------|--|
| 1 | Choose a clean environment to assemble the I/O base and adapter to protect the circuitry from contamination. |
| 2 | Make sure that the I/O base is not under power while you assemble the module. |
| 3 | <p>Align the two plastic snap extensions on the adapter with the slots on the sides of the I/O base. The 12-pin ATI connectors will automatically line up when the units are in this position. The two devices should be oriented such that their communication ports are facing out on the back side of the assembly.</p>  |

| Step | Action |
|------|---|
| 4 | <p>Push the adapter onto the base, gently pressing the locking tabs inward.</p> <p>Result: The locking tabs on each side of the adapter slide inside the I/O base and out through the locking slot. The 12-pin ATI connectors on the two units are mated to each other in the process.</p>  |

Next Step

Once the adapter and I/O base have been assembled, the device can be mounted on a DIN rail or surface-mounted inside a panel enclosure.

A Momentum device is classified as open equipment; i.e., electrical circuitry on the unit may be exposed. Open equipment should be installed in an industry-standard enclosure, and direct access must be restricted to qualified service personnel.

Disassembling an Adapter from an I/O Base

Overview

This section contains safety precautions and a procedure for disassembling an adapter from an I/O base.

Tools Required

DANGER

RISK OF ELECTRICAL SHOCK

Before removing an adapter from the base, disconnect the wiring connectors.

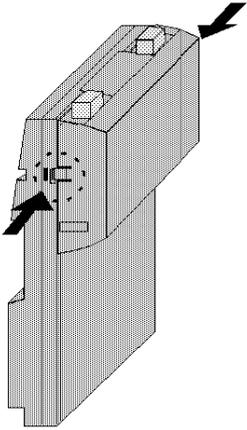
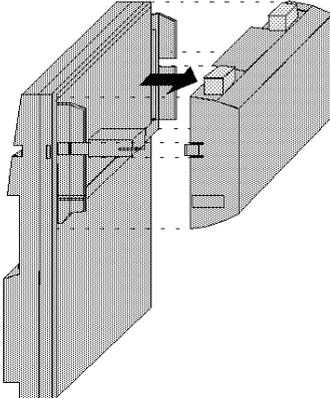
Make sure that the I/O base is not under power when it does not have a Momentum adapter mounted on it.

Failure to follow these instructions will result in death or serious injury.

A flat-head screw driver.

Procedure

Follow the steps in the table below to remove an adapter from an I/O base.

| Step | Action |
|------|---|
| 1 | Choose a clean environment to disassemble the unit, in order to protect the circuitry from contamination. |
| 2 | Make sure that the I/O base is not under power by removing the terminal connectors from the I/O base. |
| 3 | <p>Use a screwdriver to push the clips on both sides of the adapter inward, as shown in the illustration below.</p>  |
| 4 | <p>Lift off the adapter.</p>  |

Assembling a Processor Adapter and an Option Adapter

Overview

If a TSX Momentum option adapter is used, it is mounted between an M1 processor adapter and an I/O base in a three-tiered stack.

This section contains guidelines, safety precautions and a procedure for assembling a processor adapter and an option adapter.

Guidelines

We recommend that you snap together the option adapter and the M1 processor adapter before mounting them on the I/O base.

Connection Points

The option adapter and M1 processor connect at these four points.

- The plastic snap extensions on the two sides of the processor adapter fit into the two slots on the sides of the option adapter.
- The 12-pin ATI connectors on the center of the back walls of the two units mate together.
- The 34-pin processor extension connectors that run along the left sidewalls of the components mate together.

No Tools Required

The components can be snapped together by hand; no assembly tools are required. A flat-head screw driver is required to disassemble the unit.

Procedure

Follow the steps in the table below to assemble an option adapter and an M1 processor adapter.

| Step | Action |
|------|---|
| 1 | Choose a clean environment to assemble the option adapter and processor to protect the circuitry from contamination. |
| 2 | Align the two plastic snap extensions on the sides of the M1 processor adapter with the slots on the sides of the option adapter. The 12-pin ATI connectors and processor extension connectors will automatically line up when the units are in this position. The two devices should be oriented such that their communication ports are facing out on the back side of the assembly. |

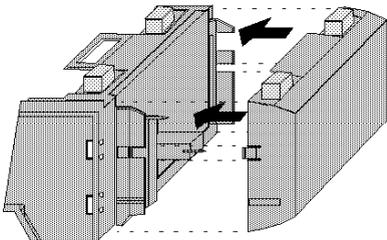
NOTICE

PIN ALIGNMENT

Do not connect one side and try to rotate the M1 onto the option adapter.

Proper assembly requires that the 34 pins on the processor extension connector be aligned correctly with the mating socket on the M1 processor adapter.

Failure to follow these instructions can result in equipment damage.

| | |
|---|--|
| 3 | <p>Push the processor adapter onto the option adapter, gently pressing the locking tabs inward.</p>  <p>Result: The locking tabs on each side of the Processor Adapter slide inside the Option Adapter and out through the locking slot. The 12-pin ATI connectors on the two units are mated to each other in the process.</p> |
|---|--|

Next Step

Follow the directions in the next section to mount the assembled adapters on the I/O base.

Mounting the Assembled Adapters on the I/O Base

Overview

This section gives guidelines, safety precautions and a procedure for mounting the assembled processor and option adapter on an I/O base.

Connection Points

The assembled adapters connect with the I/O base at these seven points.

- Two plastic snaps on the front of the option adapter fit into two slots on the front of the I/O base.
- The plastic snap extensions on the two sides of the option adapter fit into the two slots on the sides of the I/O base.
- The 12-pin ATI connectors on the center of the back walls of the two units mate together.
- The plastic stirrup on the back of the option adapter clips onto the bottom of the I/O base.

No Tools Required

DANGER

RISK OF ELECTRICAL SHOCK

Make sure that the I/O base is not under power when it does not have an adapter mounted on it. Electrical circuitry on the I/O base may be exposed when a Momentum adapter is not mounted.

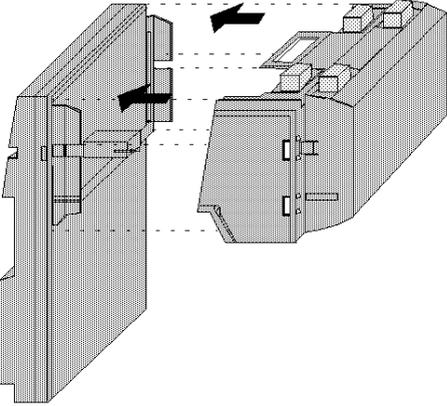
To make sure that power is not present, do not insert the wiring connectors to the I/O base until after the adapter has been mounted.

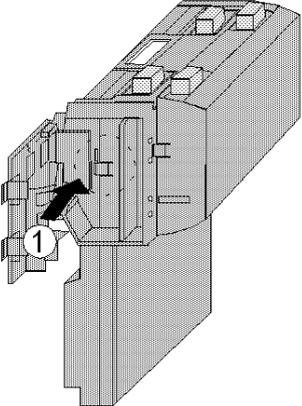
Failure to follow these instructions will result in death or serious injury.

The components can be snapped together by hand; no assembly tools are required. A flat-head screw driver is required to disassemble the unit.

Procedure

Follow the steps in the table below to mount the assembly on an I/O base

| Step | Action |
|------|---|
| 1 | Make sure that the I/O base is not under power when you assemble the module. |
| 2 | <p>Align the four plastic snap extensions (on the front and sides of the option adapter) with the slots on the I/O base.</p> <p>The 12-pin ATI connectors will automatically line up when the units are in this position. The devices should be oriented such that their communication ports are facing out on the back side of the assembly.</p>  |

| Step | Action |
|------|--|
| 3 | <p>Push the assembled adapters onto the base, gently pressing the locking tabs inward. Snap #1 shown in the illustration below will not align properly with the mating slot in the I/O base unless the option adapter is placed straight onto the base. Do not attach just one latch and rotate the option adapter onto the I/O base.</p>  <p>Result: The locking tabs on each side of the option adapter slide inside the I/O base and out through the locking slot. The 12-pin ATI connectors on the two units are mated to each other in the process.</p> |
| 4 | <p>Apply slight pressure to the top of the stirrup on the back of the option adapter so that it snaps into place on the bottom of the I/O base.</p> |

Disassembling a Module with an Option Adapter

Overview

The three-tiered assembly is designed to fit together tightly so it can withstand shock and vibration in an operating environment.

This section contains two procedures:

- removing the assembled adapters from the I/O base
- removing the option adapter from the processor

Tools Required

Flat-head screwdriver.

Procedure 1

Follow the steps in the table below to remove the assembled option adapter and M1 processor adapter from the I/O base.

| Step | Action |
|------|--|
| 1 | Make sure that the power is off by removing the terminal connectors from the I/O base. |
| 2 | Remove the assembled unit from its wall or DIN rail mounting surface. |

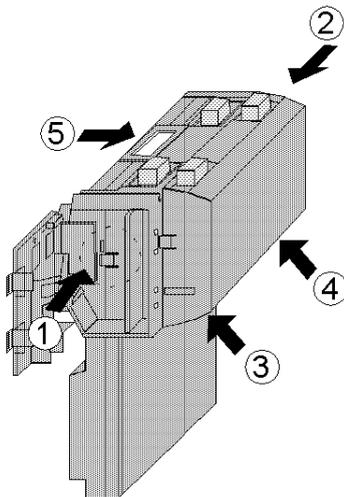
NOTICE

RISK OF DETERIORATION OF CIRCUITRY IN BATTERY COMPARTMENT

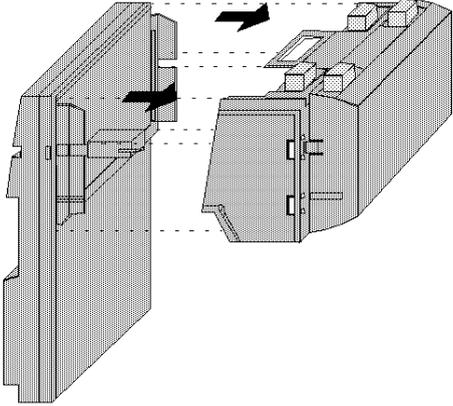
Use care when you insert a screwdriver in the battery compartment so that you do not scratch any exposed elements.

Failure to follow these instructions can result in equipment damage.

- 3 Open the battery door and use a flat-head screwdriver to release snaps 1 and 2 as shown in the illustration below.

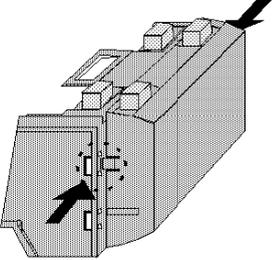


- 4 Once snaps 1 and 2 have been disengaged, use the screwdriver to release snaps 3 and 4 on the front of the assembly.

| Step | Action |
|------|---|
| 5 | <p>Gently lift the stirrup on the back of the option adapter with your fingers until it disengages from the bottom of the I/O base. Then lift the option adapter and M1 assembly from the I/O base.</p>  |
| 6 | <p>Follow the directions in the next procedure to remove the option adapter from the Processor.</p> |

Procedure 2

Follow the steps in the table below to remove the option adapter from the M1 processor.

| Step | Action |
|------|---|
| 1 | <p>Use a screwdriver to push the clips on both sides of the adapter inward.</p>  |
| 2 | <p>Lift off the adapter.</p> |

Using Terminal Connector Coding Keys

Overview

This section describes how to use terminal connector coding keys. It also provides an illustrated example of coded terminals.

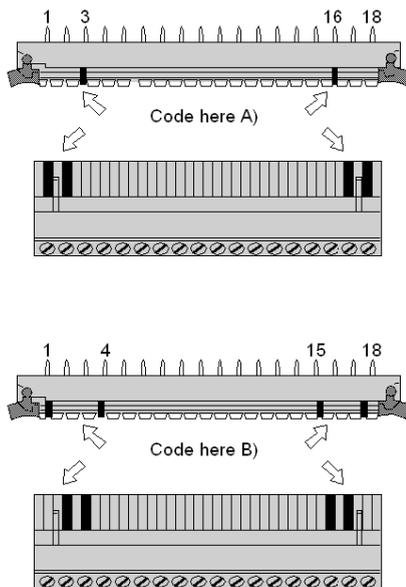
How Coding Keys Work

Each I/O base has a series of slots into which you can insert one or more of the coding keys. Each terminal connector has a similar series of slots into which you can insert one or more of the coding tabs. When a key and a tab are inserted into slots that should mate, the I/O base and the connector cannot be physically connected.

NOTE: For maximum protection, key coding is required during installation.

Example

An example of a key-coded screw-in terminals is shown in the figure below.



- A) Coding for Voltage Range I (≤ 42.4 VAC / ≤ 60 VDC) e.g. 24 VDC
- B) Coding for Voltage Range II (≥ 42.4 VAC / ≥ 60 VDC) e.g. 60 VDC

Inserting Terminal Connectors

Overview

⚠ DANGER

RISK OF ELECTRIC SHOCK

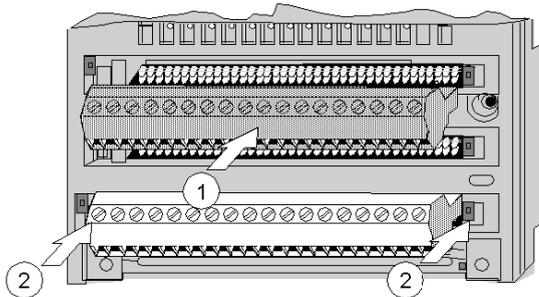
Make sure that power is not present while you are handling the coding keys on the I/O base and on the terminal connectors. Electrical voltages are present when the I/O base is under power.

Failure to follow these instructions will result in death or serious injury.

This section contains safety precautions and a diagram illustrating how to insert terminal connectors in a TSX Momentum I/O base.

Inserting a Terminal Connector

Install the terminal connectors by pushing them into the coded pin connectors (row 1 ... 3 of the I/O base).



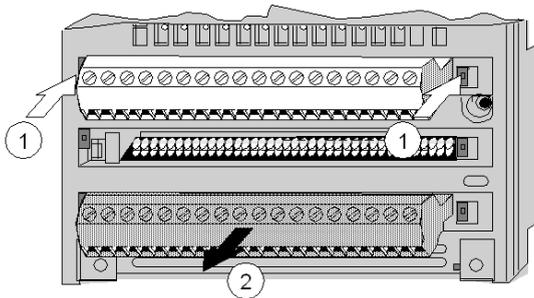
Removing a Terminal Connector

Overview

This section describes how to remove a terminal connector from a TSX Momentum I/O base.

Diagram

To remove a terminal connector, press the two tabs at the ends of the row (labeled 1 in the figure below).



Attaching a Busbar

Overview

This section describes how to attach a busbar to an I/O base.

General

An optional busbar may be inserted into the fourth row of an I/O base. Busbars provide a common connection for the field devices and serve as protective distribution connectors, for instance to PE. Each row of terminals on the busbar is connected internally. There is no connection to the I/O base.

NOTE: See the internal pin connections and field wiring diagrams associated with your I/O base to determine whether or not you need a busbar and which busbar best suits your needs.

Busbar Types

Depending on the I/O base and the type and number of field devices to which it is connected, a 1-, 2-, or 3-row busbar may be used. Busbars are separately ordered items; they are not shipped with the I/O bases. They are available in either screw-in and spring-clip versions.

Screw Size

For a screw-in type busbar, use the two, self-tapping Phillips head machine screws provided, to fasten it to the I/O base.

Busbar Numbers

The following table provides ordering information on the different busbar types:

| Busbar Type | Part Number | # of Rows | Wire Size |
|-------------|----------------|-----------|--|
| Screw-in | 170 XTS 006 01 | 1 | One or two wires up to 10 AWG (4 mm ²) |
| | 170 XTS 005 01 | 2 | One or two wires up to 14 AWG (1.5 mm ²) |
| | 170 XTS 004 01 | 3 | |
| Spring-clip | 170 XTS 007 01 | 1 |   Screw-in 1 -row busbar Spring-clip 1-row busbar |
| | 170 XTS 008 01 | 2 |   Screw-in 2 -row busbar Spring-clip 2-row busbar |
| | 170 XTS 003 01 | 3 |   Screw-in 3 -row busbar Spring-clip 3-row busbar |

Labeling the Components in the Assembly

Overview

A fill-in label is shipped with each I/O base. This label should be attached to the face of the communication adapter or M1 processor adapter that you mount on that base.

This section describes the label and provides an illustrated example.

Fill-In Label

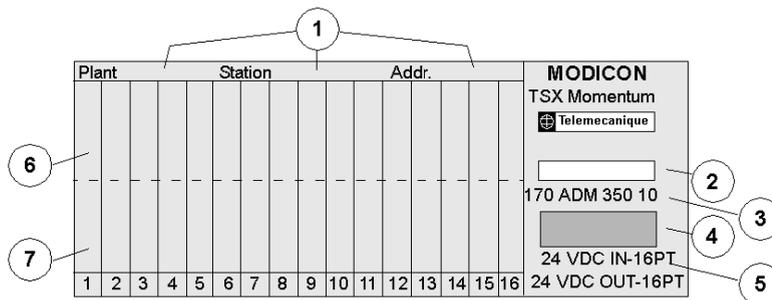
A completed label provides information about the assembled module and its I/O field devices that can be used by service and maintenance personnel.

The model number of the I/O base is pre-screened onto the fill-in label directly above the color code. The cutout area above the I/O model number allows the pre-screened model number of the adapter to show through.

NOTE: An option adapter may also be used in the assembled module. You will find its model number printed in the upper left corner of option adapter housing.

Example of a Fill-In Label

A sample fill-in label is illustrated in the diagram below. The numbered pointers in the diagram refer to the descriptions in the table that follows.



- 1 fields for plant name, station name and network address
- 2 cutout—the model number of the adapter shows through
- 3 model number of the I/O base
- 4 color code of the I/O base
- 5 short description of the I/O base
- 6 field for the symbol name of inputs
- 7 field for the symbol name of outputs

Chapter 4

Dimensions and Mounting Instructions

Overview

This chapter gives dimensions of assembled TSX Momentum devices and describes how to mount them on a DIN rail or wall.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|---|------|
| Dimensions of Assembled TSX Momentum Devices | 64 |
| Standard Adapter on a Typical Base | 65 |
| Standard Adapter on a Discrete VAC Base | 66 |
| Processor and Option Adapter on a Typical Base | 67 |
| Processor and Option Adapter on a Discrete VAC Base | 68 |
| Mounting TSX Momentum Devices | 69 |

Dimensions of Assembled TSX Momentum Devices

Overview

This section contains general information about the dimensions of TSX Momentum assemblies.

Dimension Factors

The following factors influence the dimensions of the assembly:

- the type of I/O base
- use of an option adapter
- use of busbars

Mandatory Vertical Clearances

The vertical clearances illustrated in the dimension drawings must be maintained to assure proper heat dissipation.

Horizontal Clearances

Maintain 1 in of clearance between Momentum devices and the edge of the cabinet.

Standard Adapter on a Typical Base

Overview

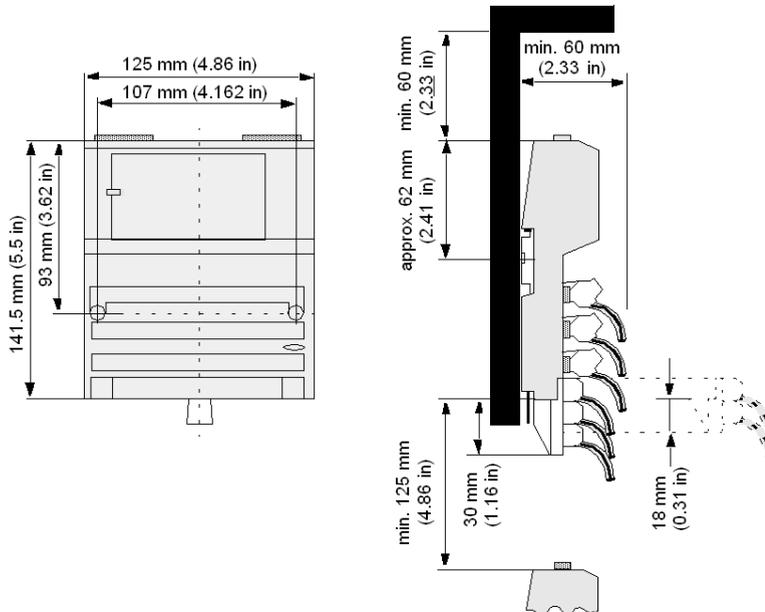
This section provides dimensions for a standard processor adapter or communications adapter mounted on a typical analog or VDC I/O base.

Notes

The wiring from the terminal connectors dictates the minimum depth (60 mm) of this assembly. The figure on the right shows an additional 30 mm length dimension for an optional three-row busbar.

Illustration

The following illustration shows dimensions for this assembly.



Standard Adapter on a Discrete VAC Base

Overview

If you are using a discrete VAC I/O base such as a 170 ADI 540 50 or a 170 ADO 540 50, refer to the drawing below for your dimensions.

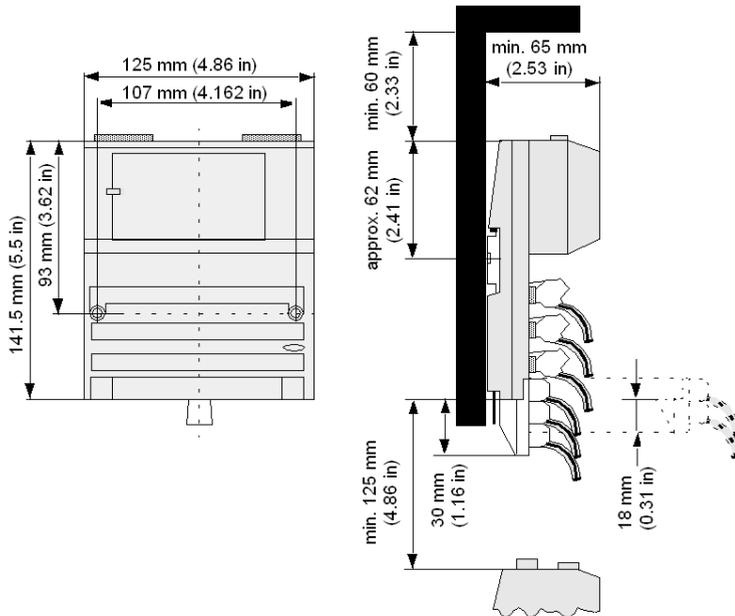
Notes

The minimum depth dimension (65 mm) is determined by the unit housings, not the wiring terminals.

The figure on the right shows an addition 30 mm length dimension for an optional three-row busbar.

Illustration

The following illustration shows dimensions for this assembly.



Processor and Option Adapter on a Typical Base

Overview

This section provides dimensions for a processor adapter and an option adapter mounted on a typical analog or VDC I/O base.

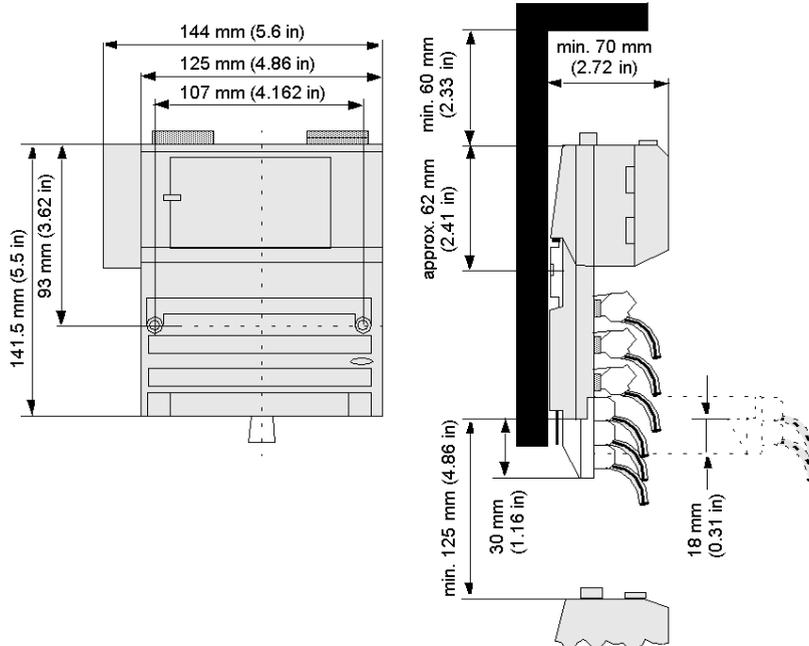
Notes

The option adapter adds to the width of this assembly (total 144 mm).

The figure on the right shows an addition 30 mm length dimension for an optional three-row busbar.

Illustration

The following illustration provides dimensions for this assembly.



Processor and Option Adapter on a Discrete VAC Base

Overview

This section provides dimensions for using processor and option adapters with a discrete VAC base.

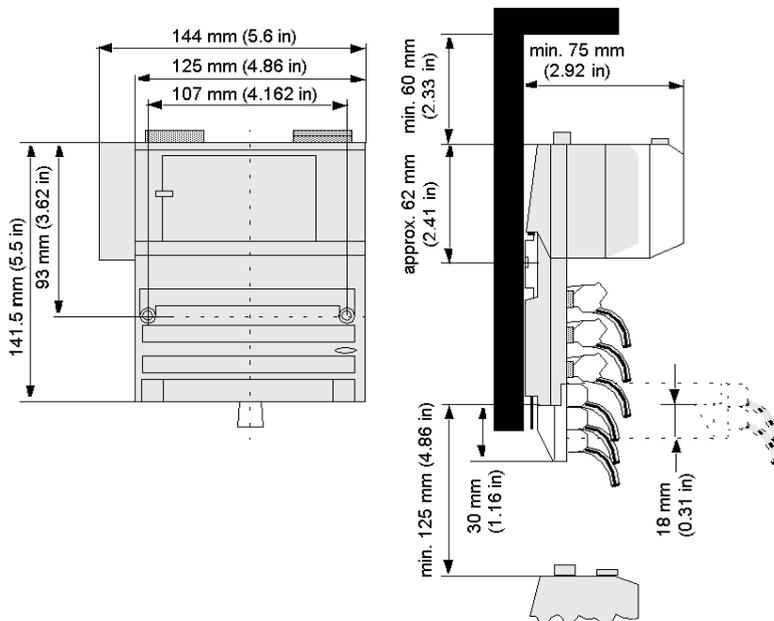
Notes

The minimum depth (75 mm) includes both the option adapter and the built-in extender ring on the I/O base.

The figure on the right shows an addition 30 mm length dimension for an optional three-row busbar.

Illustration

The following illustration shows dimensions for this assembly.



Mounting TSX Momentum Devices

Overview

This section contains guidelines for installation and drawings which illustrate how to mount a TSX Momentum assembly on a DIN rail or wall.

Guidelines

TSX Momentum components are designed as open equipment per IEC 1131-2, 1.4.20. Open equipment should be installed in industry-standard enclosures, and access should be restricted to authorized personnel.

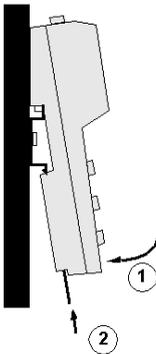
Chassis Ground

Contact springs on the back of the I/O base establish electrical contact (chassis ground) with the DIN rail mounting track.

To establish chassis ground in a wall-mount situation, you will need to obtain two mounting screws for each unit. The body of the screws should be 4mm (0.16 in) in diameter and at least 25mm (0.97 in) long. The head of the screw must not exceed 8mm (0.31 in) in diameter.

Mounting on a DIN Rail

The numbers in the following illustration refer to the steps in the procedure below.



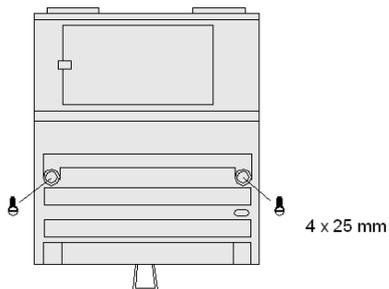
Procedure

Follow the steps in the table below to mount a TSX Momentum assembly on a DIN rail.

| Step | Action |
|------|---|
| 1 | Hook the plastic tabs on the back of the device onto the DIN rail and swing the module down to rest against the rail. |
| 2 | Push the locking tab upward to secure the device in place. |

Mounting on a Wall

Secure the device to the wall with two screws, as shown in the illustration below. The head of the screws must not exceed 8mm (0.31 in) in diameter.



Chapter 5

Power and Grounding Guidelines

Overview

This chapter provides information about power supplies, circuits, and grounding.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|---|------|
| Voltage Types | 72 |
| Structuring Your Power Supply System | 73 |
| Selecting Power Supplies | 74 |
| Single Power Supply Configuration | 75 |
| Protective Circuits for DC Actuators | 77 |
| Protective Circuits for AC Actuators | 79 |
| Grounding Momentum Devices | 80 |
| Grounding DIN Rail Terminals and Cabinets | 82 |
| Grounding Analog I/O Lines | 83 |

Voltage Types

Overview

In planning your circuit layout, you must differentiate between operating voltage, input voltage, and output voltage.

Operating Voltage

The operating voltage feeds the internal logic of the individual I/O bases. (Abbreviations: L+ / M- for direct current; L1 / N for alternating current.)

Input Voltage

The input voltage supplies the sensors. (Abbreviations, where the leading numbers specify the groups: 1L+ / 1M-, 2L+ / 2M-, ... for direct current; 1L1 / 1N, 2L1 / 2N, ... for alternating current.)

Output Voltage

The output voltage drives the actuators. (Abbreviations equivalent to those for input voltage.)

Common Reference Potential

When two or more circuits have a common reference potential (i.e., they are not isolated), their corresponding reference conductors are abbreviated identically— for example, L+ / M- and 1L+ / M- are used when L+ and 1L+ are not isolated.

Structuring Your Power Supply System

Overview

This section contains guidelines for planning and wiring your power supply system.

Use Separate Power Supply for Outputs

Operating voltage and input voltage can be derived from one power supply (PS). We recommend that the output voltage be drawn from a separate power supply (e.g., 10 A or 25 A, referred to as PS1 and PS2).

A separate output voltage supply prevents interferences caused by switching processes from affecting the voltage supply to the electronics. Where larger output currents are involved, provide additional power supplies for the output voltage (PS3, ...).

Use Star Configuration

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP/POWER-DOWN SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring diagrams. An unprotected module may be subject to short circuits and/or power-up/power-down spikes.

Failure to follow these instructions can result in injury or equipment damage.

Each I/O base should be fed by the power supply in star configuration, i.e., separate leads from the power supply to each module.

Avoid Induction Loops

Do not create any induction loops. (This can be caused by laying out the supply conductors L+/M-, ... in pairs.) As a remedy, use twisted-pair wiring.

Avoid Series Connections

The series connections often found in automatic circuit breakers should be avoided since they increase the inductive component in the output-voltage leads.

Potential-Isolated Fieldbus Islands

The potential relationships of the bus adapters are designed so that the individual I/O stations form potential-isolated islands (e.g., by isolating the incoming remote bus of InterBus). To decide whether potential balancing is necessary, refer to the installation guidelines of the used communication adapter.

Selecting Power Supplies

Overview

This section provides guidelines for selecting power supplies.

Using Three-Phase Bridges

| |
|--|
|  CAUTION |
|--|

| |
|---------------------------------|
| RISK OF ELECTRICAL SHOCK |
|---------------------------------|

| |
|---|
| Do electrically isolate the AC-to-DC converter between the input (primary) and output (secondary). Otherwise, voltage levels can be propagated to the output if the AC-to-DC converter fails. |
|---|

| |
|---|
| Failure to follow these instructions can result in injury or equipment damage. |
|---|

Unfiltered three-phase bridges can be used in 24 VDC power supplies for the I/O bases, the sensors, and the actuators. In view of the maximum permissible ripple of 5%, monitoring for phase failure is necessary. For single-phase rectification, the 24 VDC must be buffered to ensure conformance to the specifications in System Specifications (*see page 693*) (20...30V; max. ripple 5 %).

Provide Reserve Capacity

Startup transients, extra long cables, and low cross-sectional efficiency can lead to voltage supply breakdowns. Therefore, you should select power supplies with enough reserve capacity and select the proper cable lengths and cross sections.

Single Power Supply Configuration

Overview

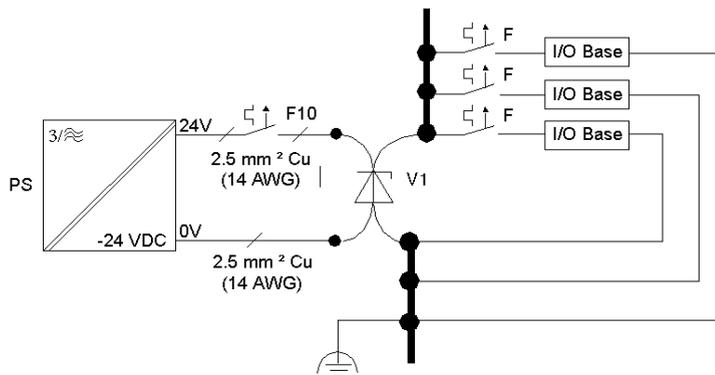
This section contains illustrations of a sample circuit layout, potential bundling, and potential isolation for a single power supply configuration.

Fusing in Circuit Layout

Each of the following circuit branches must be fuse-protected (F in the figure below). In the case of long lines, the circuit branch must be provided with a suppressor circuit OVP 001/OVP 248. This protection selectively shuts off a circuit branch through the associated fuse even if the diode is short-circuited.

Illustration

The following illustration shows a sample circuit layout for a single power supply configuration.



F automatic circuit breaker or fuse (see appropriate field wiring illustration in I/O base description)

F10 optional circuit breaker (with over-voltage protection)

PS power supply 24 VDC, max. 25 A

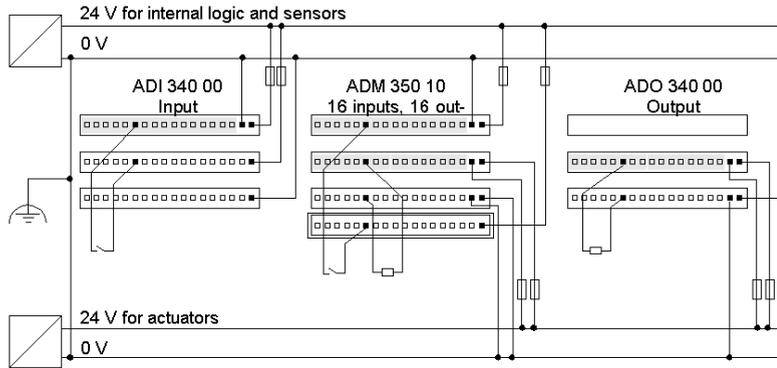
V1 overvoltage protection circuit OVP 001, OVP 002

Fusing in Wiring Illustrations

The fuses shown in the illustrations below must be selected on the basis of the type and number of the sensors and actuators used.

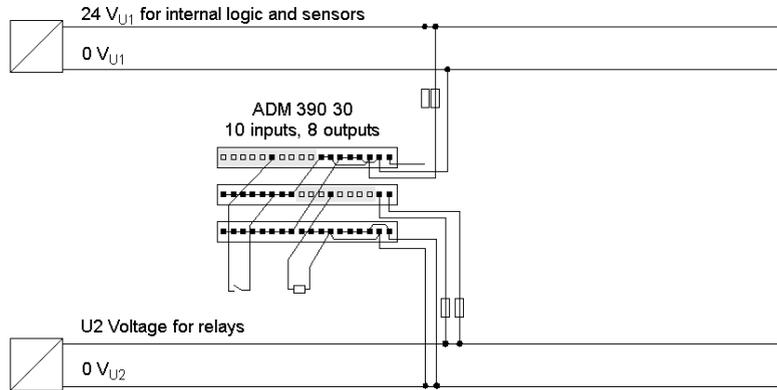
Potential Bundling

In this example, the output voltage is drawn from a separate power supply.



Potential Isolation

In this example, the output voltage is drawn from a separate power supply



Protective Circuits for DC Actuators

Overview

This section discusses specific cases when inductive loads at output points require additional protective circuits (directly on the actuator) and provides two examples of protective circuitry.

Case 1

When there are contacted circuit elements (e.g. for safety interlocks) in the output conductors.

Case 2

When the leads are very long.

Case 3

Where inductive actuators are operated via relay contacts of the I/O base (to extend contact life and for EMC considerations).

Protective Circuit Types

In all three cases, the protective circuit is a clamping diode.

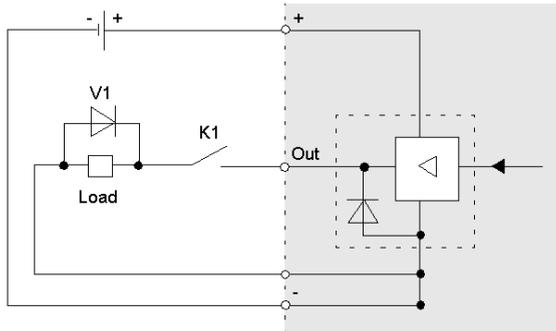
The following table provides generic selection guidelines.

| Type of Load | Suppression Device | Minimum Component Rating |
|--------------|---|---|
| DC circuits | a reverse-biased clamping diode across the load | 2 A and greater than twice the maximum load voltage |

Consult relay and contactor manufacturers' catalogs for commercial suppression devices matched to your particular products.

Example 1

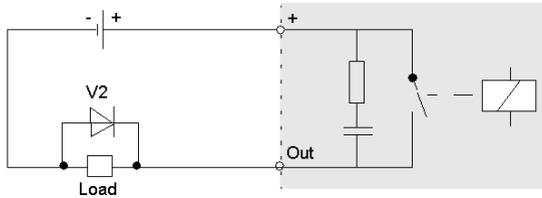
An example of a protective circuit for inductive DC actuators is illustrated below:



- K1** contact, e.g., for safety interlocks
- V1** clamping diode as the protective circuit

Example 2

Another example of a protective circuit for inductive DC actuators is illustrated below:



- V2** clamping diode as the protective circuit

Protective Circuits for AC Actuators

Overview

To reduce noise potentials and for EMC considerations you may need to equip the inductive actuators with noise suppressors, e.g., anti-interference capacitors, at the point of interference.

Protective Circuit Types

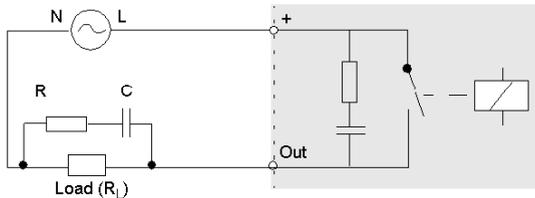
The following table provides generic selection guidelines.

| Type of Load | Suppression Device | Minimum Component Rating | |
|--------------|--|---------------------------|---------|
| AC circuits | 50 Ω resistor in series with a 0.47 μ fd nonpolarized capacitor across the load | for 120 VAC-powered loads | 200 VAC |
| | | for 220 VAC-powered loads | 400 VAC |

Consult relay and contactor manufacturers' catalogs for commercial suppression devices matched to your particular products.

Example

An example of a protective circuit for inductive AC actuators is illustrated below:



Grounding Momentum Devices

Overview

This section describes how to provide two types of grounding for assembled Momentum devices:

- functional earth (FE), used to discharge high frequency disturbances, guaranteeing proper EMC behavior
- protective earth (PE), used to protect against personal injuries according to IEC and VDE

Grounding Momentum Devices

Momentum devices consist of an I/O base assembled with a communications adapter or a processor adapter and possibly an option adapter. The PE of the adapters is electrically connected with the PE of the I/O base; you do not have to provide any further grounding of the adapter.

Grounding Guidelines

Follow these guidelines.

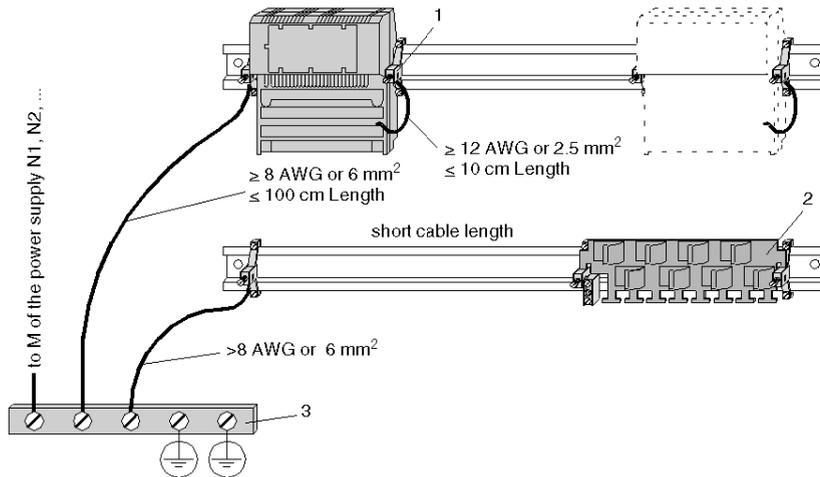
- Be sure you establish good ground contacts.
- Connect the grounding screw to protective earth (PE) for AC and DC modules with a recommended maximum torque of 4.4 in/lb (0.5 Nm) using a PZ2 driver.

Cable Specifications

When you are using ground cable up to 10 cm (4 in) long, its diameter should be at least 12 AWG (or 2.5 mm²). When longer cables are used, larger cable diameters are required, as shown in the following illustration.

Grounding Scheme

The illustration below illustrates properly grounding modules and tracks.



- 1 grounding clamp, such as EDS 000
- 2 cable grounding rail (CER 001), an optional component for grounding lines close to PE/FE rail
- 3 PE/FE rail in the cabinet or PE/FE screw in terminal cabinet

NOTE: The lower DIN rail shows a cable grounding rail (CER 001), an optional component for grounding analog lines. For a procedure for grounding analog I/O Lines (*see page 83*).

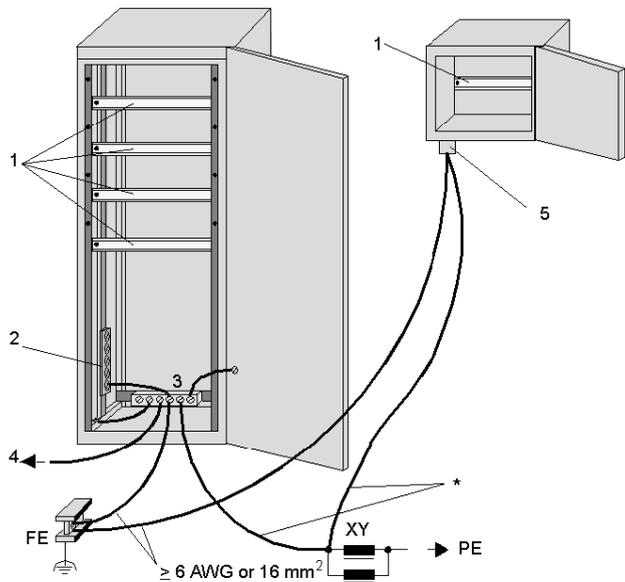
Grounding DIN Rail Terminals and Cabinets

Overview

This section shows how to ground DIN rail terminals and cabinets.

Illustration

The following illustration shows how to ground DIN rail terminals and cabinets:



- 1 DIN rail for connecting the Momentum device and its accessories
- 2 reference conductor system or rail (solid copper or connected terminals)
- 3 grounding bar in the cabinet
- 4 next cabinet
- 5 grounding screw (PE/FE) in cabinet
- FE functional earth
- PE protective earth
- XY protective earth choke
- * conductor cross section depends on the load of the system

Grounding Analog I/O Lines

Overview

Analog wires must be grounded directly when entering the cabinet. You may use commercial cleats or clamps or an analog cable grounding rail. This section describes both approaches.

Principle

High frequency interference can only be discharged via big surfaces and short cable lengths.

Guidelines

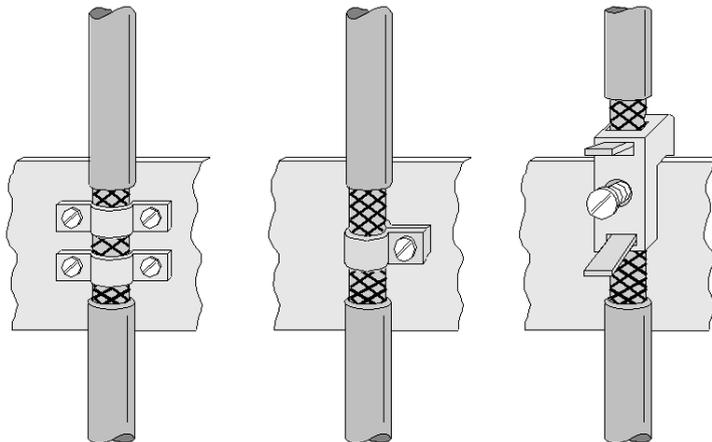
Follow these wiring guidelines:

- Use shielded, twisted-pair cabling
- Expose the shielding on one side (for instance, at the console exit)
- Make sure the track is properly grounded (*see page 80*)

Grounding of the bus cable is determined by the bus adapter used. Look for details in your *bus adapter manual*.

Using Cleats or Clamps

Cleats or clamps can be mounted directly on the ground rail (PE/FE rail) in the cabinet, as shown in the illustration below. Be sure the cleats or clamps make proper contact.



Part II

I/O Base Descriptions

Purpose

This part provides descriptions of each I/O base.

What Is in This Part?

This part contains the following chapters:

| Chapter | Chapter Name | Page |
|---------|--|------|
| 6 | 170 AAI 030 00 Analog 8 Channel Differential Input Module Base | 87 |
| 7 | 170 AAI 140 00 Analog 16 Channel Single-Ended Input Module Base | 105 |
| 8 | 170 AAI 520 40 Analog 4 Channel RTD, Therm. and mV Input Module Base | 121 |
| 9 | 170 AAO 120 00 Analog 4 Channel Output Module Base +/- 10 V, 0 - 20 mA | 147 |
| 10 | 170 AAO 921 00 Analog 4 Channel Output Module Base +/- 10 V, 4 ... 20 mA | 161 |
| 11 | 170 ADI 340 00 24 VDC - 16 Pt. Discrete Input Module Base | 175 |
| 12 | 170 ADI 350 00 24 VDC - 32 Pt. Discrete Input Module Base | 189 |
| 13 | 170 ADI 540 50 120 VAC - 16 Point Discrete Input Module Base | 203 |
| 14 | 170 ADI 740 50 230 VAC - 16 Point Discrete Input Module Base | 217 |
| 15 | 170 ADM 350 10 24 VDC - 16 Pt. In / 16 Pt. Out Module Base | 231 |
| 16 | 170 ADM 350 11 24 VDC - 16 Pt. In / 16 Pt. Out Module Base | 249 |
| 17 | 170 ADM 350 15 24 VDC - 16 Pt. In / 16 Pt. Out Module Base | 267 |
| 18 | 170 ADM 370 10 24 VDC - 16 Pt. In / 8 Pt. Out @ 2 Amp. Module Base | 281 |
| 19 | 170 ADM 390 10 24 VDC - 16 Pt. In / 12 Pt. Out Monitored Module Base | 299 |
| 20 | 170 ADM 390 30 24 VDC - 10 Pt. In / 8 Pt. Relay Out Module Base | 315 |
| 21 | 170 ADM 390 31 24 VDC - 10 Pt. In / 8 Pt. Relay Out Module Base | 331 |
| 22 | 170 ADM 540 80 120 VAC - 6 Pt. In / 3 Pt. Out Discrete MCC Module Base | 347 |
| 23 | 170 ADM 690 50 120 VAC - 10 Pt. In / 8 Pt. Out Module Bases | 379 |
| 24 | 170 ADM 690 51 120 VAC - 10 Pt. In / 8 Pt. Out Module Bases | 395 |
| 25 | 170 ADM 850 10 10 to 60 VDC Module Base | 411 |
| 26 | 170 ADO 340 00 24 VDC - 16 Pt. Discrete Output Module Base | 429 |
| 27 | 170 ADO 350 00 24 VDC - 32 Pt. Discrete Output Module Base | 443 |
| 28 | 170 ADO 530 50 120 VAC - 8 Point Discrete Output @ 2A Module Base | 457 |
| 29 | 170 ADO 540 50 120 VAC - 16 Point Discrete Output Module Base | 473 |
| 30 | 170 ADO 730 50 230 VAC - 8 Point Discrete Output @ 2A Module Base | 489 |

| Chapter | Chapter Name | Page |
|----------------|--|-------------|
| 31 | 170 ADO 740 50 230 VAC - 16 Point Discrete Output Module Base | 505 |
| 32 | 170 ADO 830 30 6 Pt. Relay Out Module Base | 521 |
| 33 | 170 AMM 090 00 Analog 4 Ch. In / 2 Ch. Out Module Base w/ 24 VDC I/O Pts | 535 |
| 34 | 170 AMM 090 01 Analog 4 Ch. In / 2 Ch. Out Module Base w/ 12 VDC I/O Pts | 563 |
| 35 | 170AMM11030 Analog 2 Ch. In / 2 Ch. Out Module Base with 16 Discrete Inputs and 8 Discrete Output Points | 591 |
| 36 | 170 ANR 120 90 Unipolar Analog 6 Ch. In / 4 Ch. Out Module Base with 24 VDC I/O Points | 615 |
| 37 | 170 ANR 120 91 Bipolar Analog 6 Ch. In / 4 Ch. Out Module Base with 24 VDC I/O Points | 639 |
| 38 | 170 ARM 370 30 24 VDC - 10 Pt. In / 8 Pt. Relay Out Module Base (120 VAC Powered) | 663 |
| 39 | 170 CPS 111 00 TIO Power Supply Module | 679 |

Chapter 6

170 AAI 030 00 Analog 8 Channel Differential Input Module Base

Overview

This chapter describes the 170 AAI 030 00 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|---------------------------|------|
| Front Panel Components | 88 |
| Specifications | 90 |
| Internal Pin Connections | 92 |
| Field Wiring Guidelines | 93 |
| Wiring Illustrations | 95 |
| I/O Mapping | 96 |
| Analog Channel Parameters | 97 |
| Analog Inputs | 99 |
| Input Measuring Ranges | 101 |

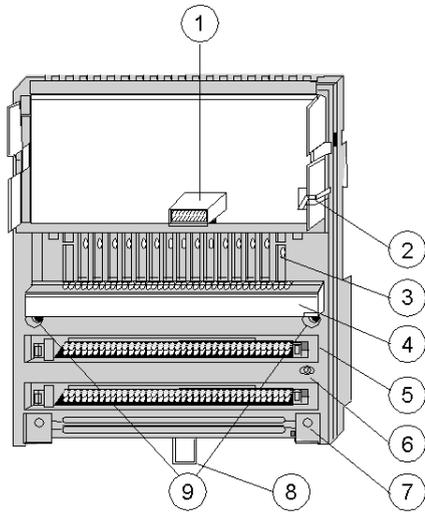
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 AAI 030 00 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

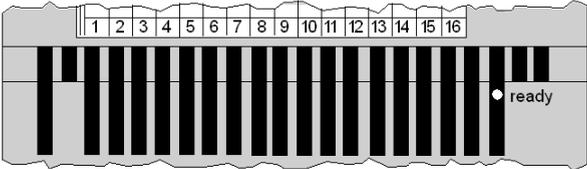


Components of the I/O module

| Label | Description |
|-------|--|
| 1 | Internal interface (ATI) connector |
| 2 | Locking and ground contact for the adapter |
| 3 | LED status display |
| 4 | Protective cover |
| 5 | Sockets for the terminal connectors |
| 6 | Grounding screw |
| 7 | Busbar mounting slot |
| 8 | Locking tab for DIN rail mount |
| 9 | Mounting holes for panel mount |

LED Illustration

This I/O base has one LED, the ready indicator shown in the illustration below.



LED Descriptions

The ready indicator is described in the table below.

| Indicator | Condition | Message |
|-----------|-----------|--|
| Ready | Green | Module is ready to communicate. Operating voltage for internal logic is present and self-test has been passed. |
| | Off | Module is not ready. Operating voltage is not present or module is defective. |

Specifications

Overview

This section contains specifications for the 170 AAI 030 00 I/O base.

General Specifications

| | |
|----------------------------|----------------------------------|
| Module type | 8 analog inputs |
| Input voltage range | +/- 10 V, +/- 5 V, 1 ... 5 V |
| Input current range | +/- 20 mA, 4 ... 20 mA |
| Supply voltage | 24 VDC |
| Supply voltage range | 20 ... 30 VDC |
| Supply current consumption | max. 362 mA at 24 VDC |
| Power dissipation | 3.73 W typical 6.58 W maximum |
| I/O map | 8 input words 2 output words |

Isolation

| | |
|-----------------------------------|------------------------------|
| Between channels | 140 VAC Hz or 200 VDC, 1 min |
| Between input channels and ground | 500 VAC |

Fuses

| | |
|---------------------------------|---|
| Internal (not user-replaceable) | 2 A slow-blow |
| External (recommended) | 1 A slow-blow (Bussmann GDC-1A or equivalent) |

EMC

| | |
|------------------|---|
| Immunity | IEC 1131-2 Surge on auxiliary power supply 500 V |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE, FM Class 1 Div.2 pending |

Physical Dimensions

| | |
|-------------------------|-----------------------------|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) no busbar |
| Weight | 215 g (0.45 lb) |

Analog Inputs

| | |
|--|---|
| Surge tolerance: input voltage input current | +/- 30 VDC +/- 25 mA |
| Number of channels | 8 |
| Format of transmitted data | full 16 bits signed (2's complement) |
| Protection | polarity inversion |
| Error indication | none |
| Common mode rejection | 250 VAC @ 47 ... 63 Hz or 100 VDC channel-to-ground |
| Update time for the inputs (in ms) | 1.33 + n x 1.33 n = number of declared channels |
| Filtering | low pass with cutoff frequency 18 kHz |

Range Specific Data

| Range | +/- 10 V | +/- 5 V | 1 ... 5 V | +/- 20 mA | 4 ... 20 mA |
|----------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Input impedance | 20 MOhm | 20 MOhm | 20 MOhm | 250 Ohm | 250 Ohm |
| Error at 25 deg. C | 0.27% PE* | 0.21% PE* | 0.13% PE* | 0.32% PE* | 0.28% PE* |
| Error at 60 deg. C | 0.32% PE* | 0.26% PE* | 0.19% PE* | 0.41% PE* | 0.38% PE* |
| Temperature drift (60 deg. C) | 14 ppm PE*/ deg. C | 14 ppm PE*/ deg. C | 18 ppm PE*/ deg. C | 24 ppm PE*/ deg. C | 30 ppm PE*/ deg. C |
| Resolution | 14 bits + sign | 14 bits + sign | 15 bits | 14 bits + sign | 15 bits |

NOTE: *Not to be confused with Protective Earth. PE is used here as a European notation for full scale, with the following values:

- 10 V in range of +/- 10 V
- 5 V in range of +/- 5 V
- 4 V in range of 1 ... 5 V
- 20 mA in range of +/- 20 mA
- 16 mA in range of 4 ... 20 mA

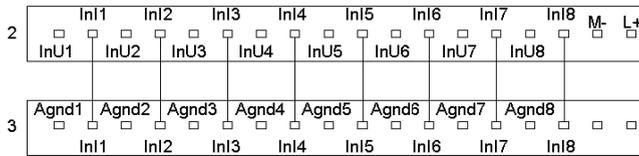
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base.

Illustration

The following illustration shows the internal connections between terminals.



Field Wiring Guidelines

Overview

This section contains wiring guidelines and precautions.

Required Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Mapping Terminal Blocks

| |
|---|
| ⚠ CAUTION |
| POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES |
| Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes. |
| Failure to follow these instructions can result in injury or equipment damage. |

Mapping terminal blocks are described in the table below.

| Row | Terminal No. | Description | Function |
|-----|----------------------------|-----------------|---------------------------------|
| 2 | 1, 3, 5, 7, 9,11, 13, 15 | InU1 ... InU8 | Voltage input, channel 1 ... 8 |
| | 2, 4, 6, 8, 10, 12, 14, 16 | InI1 ... InI8 | Current input, channel 1 ... 8 |
| | 17 | M- | - return (of operating voltage) |
| | 18 | L+ | + 24 VDC Operating voltage |
| 3 | 1, 3, 5, 7, 9,11, 13, 15 | Agnd1 ... Agnd8 | Analog ground, channel 1 ... 8 |
| | 2, 4, 6, 8, 10, 12, 14, 16 | InI1 ... InI8 | Current input, channel 1 ... 8 |

Signal Protection

To protect the signal from external noise induced in serial or common mode, we recommend the following precautions.

- Use shielded twisted-pair cables with a minimum conductor size of 24 AWG or 0.22 mm².
- Connect the cable shield to ground via the cable grounding rail (part number CER 001).
- You may combine the analog inputs on this I/O base in one multi-pair cable provided the same ground is used.
- When wiring the voltage supply, use sensors that do not have ground reference.

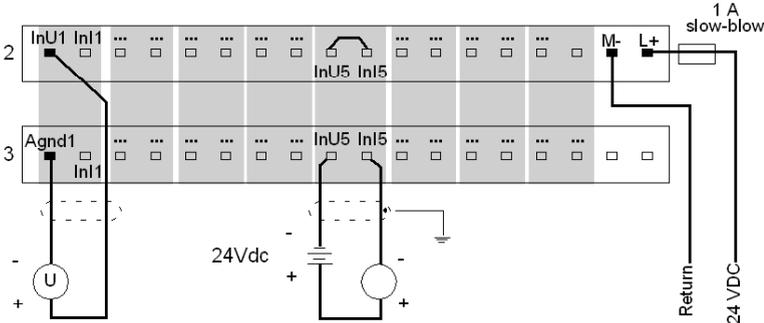
Wiring Illustrations

Overview

This section contains an illustration to assist you in wiring the I/O base.

Illustration

The illustration below shows an example of wiring for voltage input and for current input.



Examples

- * Channel1, wired for voltage input
- * Channel 5, wired for current input

I/O Mapping

Overview

The 170 AAI 030 00 TSX Momentum I/O base supports 8 analog inputs. This section contains information about the mapping of the analog input values into input words and the usage of output words for channel configuration.

I/O Map

The I/O base must be mapped as eight contiguous input words and two contiguous output words, as follows:

| Word | Input Data | Output Data |
|------|------------------------|---------------------------------------|
| 1 | Value, input channel 1 | Parameters for input channels 1 ... 4 |
| 2 | Value, input channel 2 | Parameters for input channels 5 ... 8 |
| 3 | Value, input channel 3 | Not used |
| 4 | Value, input channel 4 | Not used |
| 5 | Value, input channel 5 | Not used |
| 6 | Value, input channel 6 | Not used |
| 7 | Value, input channel 7 | Not used |
| 8 | Value, input channel 8 | Not used |

Analog Channel Parameters

Overview

Parameters must be set for all of the analog channels before the module can be commissioned. This section provides the codes for setting the parameters and gives examples of parameter settings.

NOTE: If you set new parameters for the module, always send a complete set of parameters (all channels, inputs and outputs), even if you only want to change a single parameter. Otherwise the module will refuse the new parameters and continue working with the old ones.

Key

This section focuses on output words 1 and 2, as highlighted in the table below:

| Word | Input Data | Output Data |
|------|------------------------|--|
| 1 | Value, input channel 1 | Parameters for input channels 1 ... 4 |
| 2 | Value, input channel 2 | Parameters for input channels 5 ... 8 |
| 3 | Value, input channel 3 | Not used |
| 4 | Value, input channel 4 | Not used |
| 5 | Value, input channel 5 | Not used |
| 6 | Value, input channel 6 | Not used |
| 7 | Value, input channel 7 | Not used |
| 8 | Value, input channel 8 | Not used |

Illustration

Parameters are set by entering a four-bit code in output words 1 and 2, as follows:

| Output Word 1 (Register 4x) | | | | | | | | | | | | | | | |
|-----------------------------|----|----|----|---------------------|----|---|---|---------------------|---|---|---|---------------------|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| for input channel 4 | | | | for input channel 3 | | | | for input channel 2 | | | | for input channel 1 | | | |

| Output Word 2 (Register 4x+1) | | | | | | | | | | | | | | | |
|-------------------------------|----|----|----|---------------------|----|---|---|---------------------|---|---|---|---------------------|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| for input channel 8 | | | | for input channel 7 | | | | for input channel 6 | | | | for input channel 5 | | | |

Codes for Analog Input Parameters

Use the following codes to set the parameters for each analog input channel:

| Code (binary) | Code (hex) | Parameter |
|---------------|------------|--------------------------------------|
| 0000 | 0 | Reserved value (see note below) |
| 0010 | 2 | +/-5V and +/-20mA input range |
| 0011 | 3 | +/-10V input range |
| 0100 | 4 | Channel inactive |
| 1010 | A | 1 ... 5V and 4 ... 20 mA input range |

NOTE: The 0000 reserved value is more a control than a parameter. It forces the I/O base into a default condition where it continues to receive field inputs according to the previous channel parameters.

Analog Inputs

Overview

This section describes how to interpret the value of the analog input channels.

Key

This section describes input words 1 ... 8, as highlighted in the table below:

| Word | Input Data | Output Data |
|------|------------------------|---------------------------------------|
| 1 | Value, input channel 1 | Parameters for input channels 1 ... 4 |
| 2 | Value, input channel 2 | Parameters for input channels 5 ... 8 |
| 3 | Value, input channel 3 | Not used |
| 4 | Value, input channel 4 | Not used |
| 5 | Value, input channel 5 | Not used |
| 6 | Value, input channel 6 | Not used |
| 7 | Value, input channel 7 | Not used |
| 8 | Value, input channel 8 | Not used |

Bit Assignments

The following table tells how bits are assigned:

| | |
|------------------------------|---|
| Analog-to-digital conversion | Carried out on 14 bits + sign for bipolar input ranges, 15 bits for unipolar ranges |
| Bit 15 | Sign bit |
| Bits 14 ... 0 | Input channel values |

Analog Input Values

Mapping of analog input values is shown below.

| Input Word 1 (Register $3x$, analog value returned on channel 1) | | | | | | | | | | | | | | | |
|--|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

| Input Word 2 (Register $3x+1$, analog value returned on channel 2) | | | | | | | | | | | | | | | |
|--|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

| Input Word 3 (Register $3x+2$, analog value returned on channel 3) | | | | | | | | | | | | | | | |
|--|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

| Input Word 8 (Register $3x+7$, analog value returned on channel 8) | | | | | | | | | | | | | | | |
|--|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

Broken Wire Indication

Broken wire detection is possible for the 4 ... 20 mA range. In this case, a current signal that is less than 1 mA on one of the inputs is detected as a broken wire. The input word of that channel returns the signed value -32,768. A broken wire indication has the following binary format:

| Broken wire indication in an input word | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Input Measuring Ranges

Overview

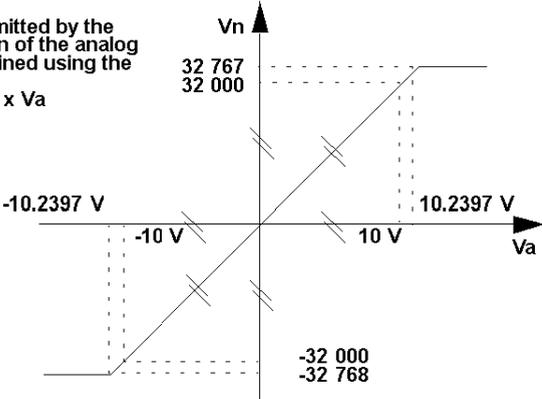
This section contains illustrations explaining the analog/digital relation for the three input measuring ranges.

+/- 10 V

The following illustration shows the analog/digital relation at +/- 10 V:

The digital value transmitted by the input base as a function of the analog input voltage is determined using the formula:

$$V_n = 3200 \times V_a$$

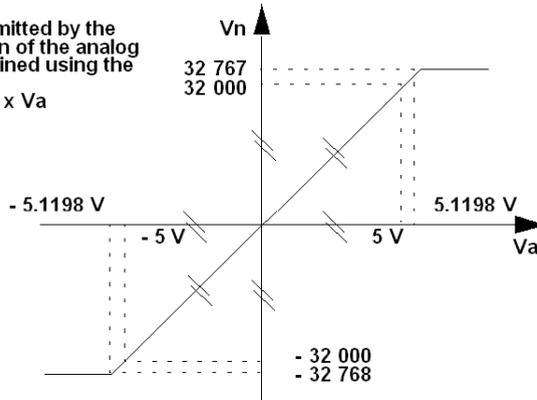


+/- 5 V

The following illustration shows the analog/digital relation at +/- 5 V:

The digital value transmitted by the input base as a function of the analog input voltage is determined using the formula:

$$V_n = 6400 \times V_a$$

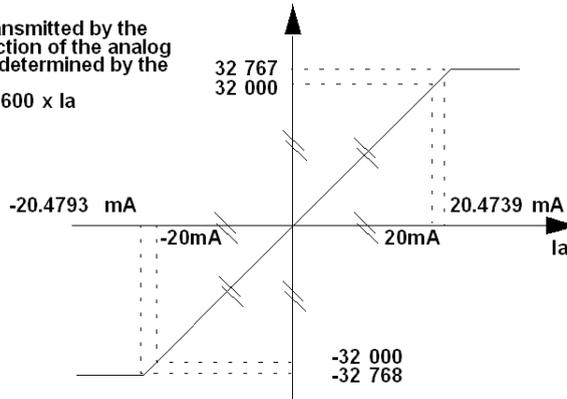


+/- 20 mA

The following illustration shows the analog/digital relation for the input measuring range +/- 20 mA

The digital value transmitted by the input base as a function of the analog input current (I_a) is determined by the formula:

$$V_n = 1600 \times I_a$$



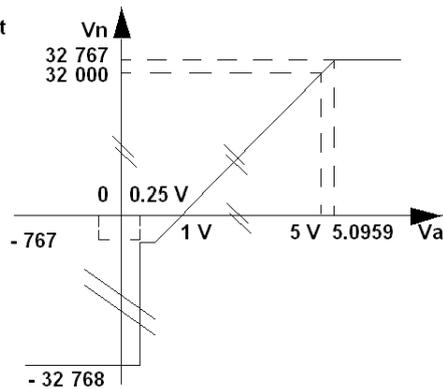
1 ... 5 V

The following illustration shows the analog/digital relation for the input measuring range 1 ... 5 V.

The digital value transmitted by the input base as a function of the input voltage (V_a) is determined by the formula:

$$V_n = 8000 \times V_a - 8000$$

in the voltage range:
0.9041 ... 5.0959



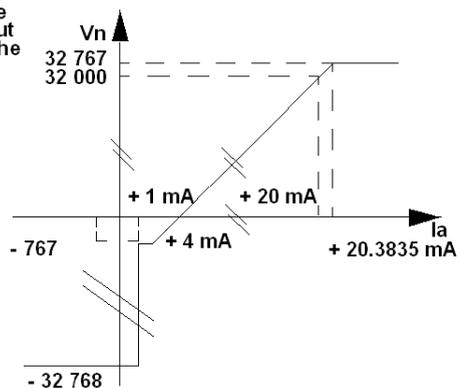
4 ... 20 mA

The following illustration shows the analog/digital relation at 4 ... 20 mA current:

The digital value transmitted by the input base as a function of the input current (I_a) is determined using the formula:

$$V_n = 2000 \times I_a - 8000$$

in the current range:
3.6165 ... 20.3835 mA



Chapter 7

170 AAI 140 00 Analog 16 Channel Single-Ended Input Module Base

Overview

This chapter describes the 170 AAI 140 00 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|---------------------------|------|
| Front Panel Components | 106 |
| Specifications | 108 |
| Internal Pin Connections | 110 |
| Field Wiring Guidelines | 111 |
| Wiring Diagrams | 113 |
| I/O Mapping | 114 |
| Analog Channel Parameters | 115 |
| Analog Inputs | 117 |
| Input Measuring Ranges | 119 |

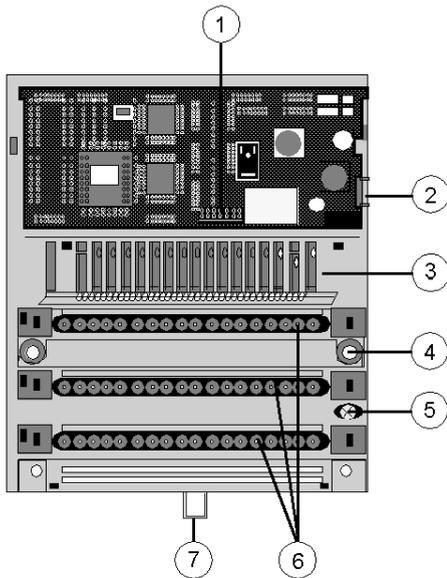
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 AAI 140 00 I/O base and a description of the LEDs.

Front Panel Illustration

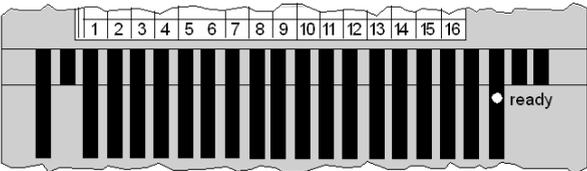
The front panel of the I/O base is shown in the illustration below.



| Label | Description |
|-------|--|
| 1 | Internal interface (ATI) connector |
| 2 | Locking and ground contact for the adapter |
| 3 | LED status display |
| 4 | Mounting holes for panel mount |
| 5 | Grounding screw |
| 6 | Sockets for the terminal connectors |
| 7 | Locking tab for DIN rail mount |

LED Illustration

This I/O base has one LED, the ready indicator shown in the illustration below.



LED Descriptions

The ready indicator is described in the table below.

| Indicator | Condition | Message |
|-----------|-----------|--|
| Ready | Green | Module is ready to communicate. Operating voltage for internal logic is present and self-test has been passed. |
| | Off | Module is not ready. Operating voltage is not present or module is defective. |

Specifications

Overview

This section contains specifications for the 170 AAI 140 00 I/O base.

General Specifications

| | |
|--|----------------------------------|
| Module type | 16 analog inputs |
| Input voltage range | +/- 10 V, +/- 5 V |
| Input current range | 4 ... 20 mA |
| Field device output driving capability | 6K or less |
| Supply voltage | 24 VDC |
| Supply voltage range | 20 ... 30 VDC |
| Supply current consumption | max. 305 mA at 24 VDC |
| Power dissipation | 4.95 W typical 5.55 W maximum |
| I/O map | 16 input words 4 output words |

Isolation

| | |
|-----------------------------------|----------------|
| Between channels | none |
| Between base supply and ground | 500 VDC, 1 min |
| Between input channels and ground | 500 VAC, 1 min |

Fuses

| | |
|---------------------------------|---|
| Internal (not user-replaceable) | 2 A slow-blow |
| External (recommended) | 1 A slow-blow (Bussmann GDC-1A or equivalent) |

EMC

| | |
|------------------|---|
| Immunity | IEC 1131-2 Surge on auxiliary power supply 500 V |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE, FM Class 1 Div. 2 |

Physical Dimensions

| | |
|-------------------------|-----------------------------|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) no busbar |
| Weight | 215 g (0.45 lb) |

Analog Inputs

| | |
|--|---|
| Surge tolerance: input voltage input current | +/- 30 VDC +/- 25 mA |
| Number of channels | 16 |
| Format of transmitted data | full 16 bits signed (2's complement) |
| Protection | polarity inversion |
| Error indication | none |
| Common mode rejection | 250 VAC @ 47 ... 63 Hz or 100 VDC channel-to-ground |
| Update time for the inputs (in ms) | 1 + 1.5 x n n = number of declared channels |
| Filtering | low pass with cutoff frequency 10 kHz |
| Maximum Sensor Impedance In | 6K ohms with AAI 14000 at PV02 |
| Voltage Mode | 1.5K ohms with AAI 14000 at PV01 |

Range Specific Data

| Range | +/- 10 V | +/- 5 V | 4 ... 20 mA |
|-------------------------------|--------------------|--------------------|--------------------|
| Input impedance | 20 MOhm | 20 MOhm | 250 Ohm |
| Error at 25 deg. C | 0.27% PE* | 0.21% PE* | 0.28% PE* |
| Error at 60 deg. C | 0.32% PE* | 0.26% PE* | 0.38% PE* |
| Temperature drift (60 deg. C) | 14 ppm PE*/ deg. C | 14 ppm PE*/ deg. C | 30 ppm PE*/ deg. C |
| Resolution | 14 bits + sign | 14 bits + sign | 15 bits |

NOTE: *Not to be confused with Protective Earth. PE is used here as a European notation for full scale, with the following values:

- 10 V in range of +/- 10 V
- 5 V in range of +/- 5 V
- 16 mA in range of 4 ... 20 mA

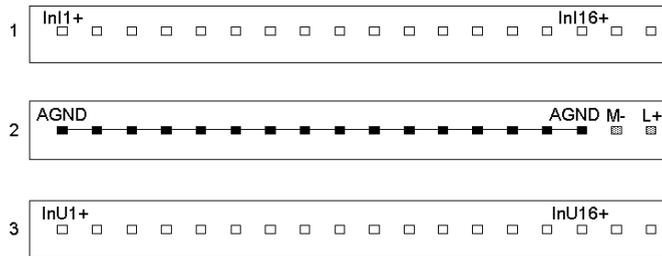
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base.

Illustration

The following illustration shows the internal connections between terminals.



Field Wiring Guidelines

Overview

This section contains wiring guidelines and precautions.

Required Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Mapping Terminal Blocks

| |
|---|
| ⚠ CAUTION |
| POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES |
| Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes. |
| Failure to follow these instructions can result in injury or equipment damage. |

Mapping terminal blocks is described in the table below

| Row | Terminal No. | Description | Function |
|-----|--------------|------------------|---------------------------------------|
| 1 | 1 ... 16 | InI1+ ... InI16+ | Input current mode, channel 1 ... 16 |
| | 17, 18 | - | Not used |
| 2 | 1 ... 16 | AGND | Analog ground connections (0 V input) |
| | 17 | M- | - Return (of operating voltage) |
| | 18 | L+ | + 24 VDC Operating voltage |
| 3 | 1 ... 16 | InU1+ ... InU16+ | Input voltage mode, channel 1 ... 16 |
| | 17, 18 | - | Not used |

Signal Protection

To protect the signal from external noise induced in serial or common mode, we recommend the following precautions.

- Use shielded twisted-pair cables with a minimum conductor cross section of 24 AWG or 0.22 mm².
- Connect the cable shield to ground via the cable grounding rail (part number CER 001).
- You may combine the analog inputs on this I/O base in one multi-pair cable provided the same ground is used.
- When wiring the voltage supply, use sensors that do not have ground reference.

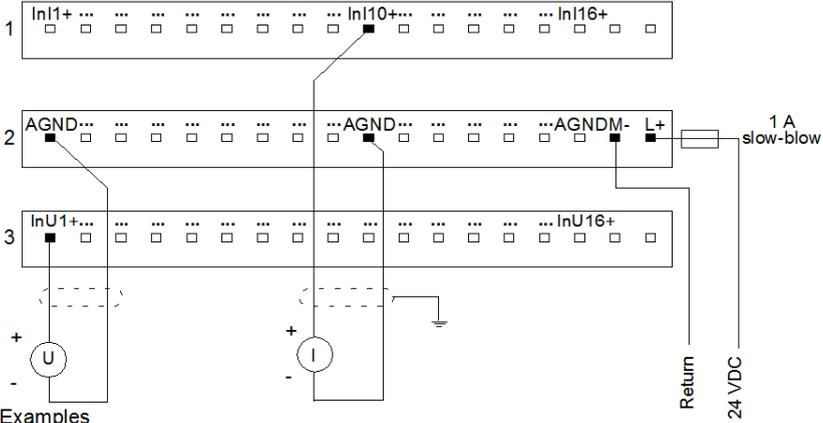
Wiring Diagrams

Overview

This section contains a diagram to assist you in wiring this I/O base for voltage input and current input.

Diagram

The diagram below shows an example of wiring for voltage input and for current input.



- Examples
- * Channel 1, wired for voltage input
 - * Channel 10, wired for current input

I/O Mapping

Overview

The 170 AAI 140 00 TSX Momentum I/O base supports 16 analog inputs. This section contains information about the mapping of the analog input values into input words and the usage of output words for channel configuration.

I/O Map

The I/O base must be mapped as 16 contiguous input words and four contiguous output words, as follows:

| Word | Input Data | Output Data |
|----------|-------------------------------|---|
| 1 = LSW | Value, input channel 1 | Parameters for input channels 1 ... 4 |
| 2 | Value, input channel 2 | Parameters for input channels 5 ... 8 |
| 3 | Value, input channel 3 | Parameters for input channels 9 ... 12 |
| 4 | Value, input channel 4 | Parameters for input channels 13 ... 16 |
| 5 ... 15 | Value, input channel 5 ... 15 | Not used |
| 16 = MSW | Value, input channel 16 | Not used |

Analog Channel Parameters

Overview

Parameters must be set for all of the analog channels before the module can be commissioned. This section provides the codes for setting the parameters and gives examples of parameter settings.

NOTE: If you set new parameters for the module, always send a complete set of parameters (all channels, inputs and outputs), even if you only want to change a single parameter. Otherwise the module will refuse the new parameters and continue working with the old ones.

Key

This section focuses on output words 1 ... 4, as highlighted in the table below:

| Word | Input Data | Output Data |
|----------|-------------------------------|--|
| 1 = LSW | Value, input channel 1 | Parameters for input channels 1 ... 4 |
| 2 | Value, input channel 2 | Parameters for input channels 5 ... 8 |
| 3 | Value, input channel 3 | Parameters for input channels 9 ... 12 |
| 4 | Value, input channel 4 | Parameters for input channels 13 ... 16 |
| 5 ... 15 | Value, input channel 5 ... 15 | Not used |
| 16 = MSW | Value, input channel 16 | Not used |

Illustration

Parameters are set by entering a four-bit code in output words 1 ... 4, as follows:

| Output Word 1 (Register 4x) | | | | | | | | | | | | | | | |
|-----------------------------|----|----|----|---------------------|----|---|---|---------------------|---|---|---|---------------------|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| for input channel 4 | | | | for input channel 3 | | | | for input channel 2 | | | | for input channel 1 | | | |

| Output Word 2 (Register 4x+1) | | | | | | | | | | | | | | | |
|-------------------------------|----|----|----|---------------------|----|---|---|---------------------|---|---|---|---------------------|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| for input channel 8 | | | | for input channel 7 | | | | for input channel 6 | | | | for input channel 5 | | | |

| Output Word 3 (Register 4x+2) | | | | | | | | | | | | | | | |
|-------------------------------|----|----|----|----------------------|----|---|---|----------------------|---|---|---|---------------------|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| for input channel 12 | | | | for input channel 11 | | | | for input channel 10 | | | | for input channel 9 | | | |

| Output Word 4 (Register 4x+3) | | | | | | | | | | | | | | | |
|-------------------------------|----|----|----|----------------------|----|---|---|----------------------|---|---|---|----------------------|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| for input channel 16 | | | | for input channel 15 | | | | for input channel 14 | | | | for input channel 13 | | | |

Codes for Analog Input Parameters

Use the following codes to set the parameters for each analog input channel:

| Code (binary) | Code (hex) | Parameter |
|---------------|------------|---------------------------------|
| 0000 | 0 | Reserved value (see note below) |
| 1010 | A | +/-5V input range |
| 1011 | B | +/-10V input range |
| 1100 | C | Channel inactive |
| 1110 | E | 4 ... 20 mA |

NOTE: The 0000 reserved value is more a control than a parameter. It forces the I/O base into a default condition where it continues to receive field inputs according to the previous channel parameters.

Analog Inputs

Overview

This section describes how to interpret the value of the analog input channels.

Key

This section describes input words 1 ... 16, as highlighted in the table below:

| Word | Input Data | Output Data |
|----------|--------------------------------------|---|
| 1 = LSW | Value, input channel 1 | Parameters for input channels 1 ... 4 |
| 2 | Value, input channel 2 | Parameters for input channels 5 ... 8 |
| 3 | Value, input channel 3 | Parameters for input channels 9 ... 12 |
| 4 | Value, input channel 4 | Parameters for input channels 13 ... 16 |
| 5 ... 15 | Value, input channel 5 ... 15 | Not used |
| 16 | Value, input channel 16 | Not used |

Bit Assignments

The following table tells how bits are assigned:

| | |
|------------------------------|---|
| Analog-to-digital conversion | Carried out on 12 bits + sign |
| Bit 15 | Sign bit |
| Bits 14 ... 3 | Input channel values |
| Bits 2 ... 0 | Unused. Because these bits are always 0, the value of the word changes in increments of 8 |

Analog Input Values

Mapping of analog input values is shown below.

| Input Word 1 (Register $3x$, analog value returned on channel 1) | | | | | | | | | | | | | | | |
|--|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

| Input Word 2 (Register $3x+1$, analog value returned on channel 2) | | | | | | | | | | | | | | | |
|--|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

| Input Word 3 (Register $3x+2$, analog value returned on channel 3) | | | | | | | | | | | | | | | |
|--|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

| Input Word 8 (Register $3x+15$, analog value returned on channel 16) | | | | | | | | | | | | | | | |
|--|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

Broken Wire Indication

Broken wire detection is possible for the 4 ... 20 mA range. In this case, a current signal that is less than 1 mA on one of the inputs is detected as a broken wire. The input word of that channel returns the value -32,768. A broken wire indication has the following binary format:

| Broken wire indication in an input word | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Input Measuring Ranges

Overview

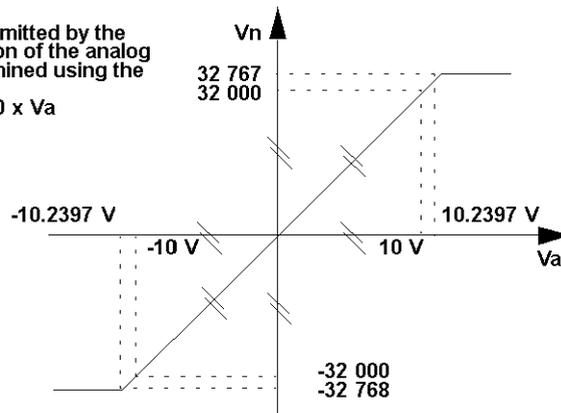
This section contains illustrations explaining the analog/digital relation for the three input measuring ranges.

+/- 10 V

The following illustration shows the analog/digital relation at +/- 10 V:

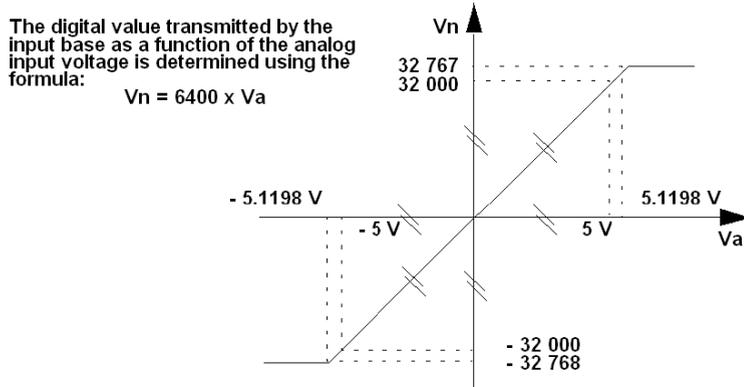
The digital value transmitted by the input base as a function of the analog input voltage is determined using the formula:

$$V_n = 3200 \times V_a$$



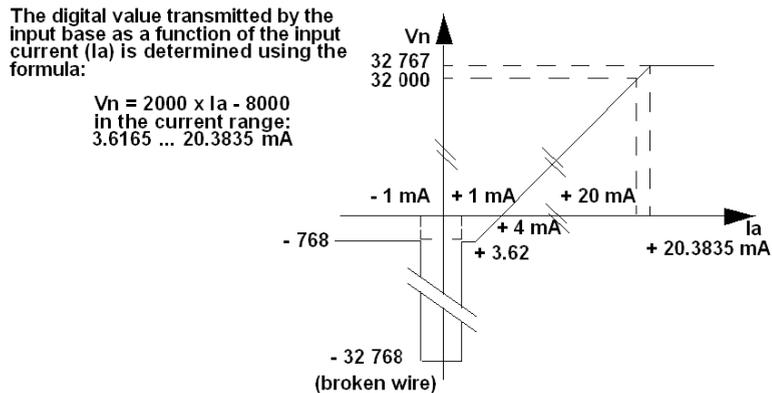
+/- 5 V

The following illustration shows the analog/digital relation at +/- 5 V:



4 ... 20 mA

The following illustration shows the analog/digital relation for the input measuring at 4 ... 20 mA current:



Chapter 8

170 AAI 520 40 Analog 4 Channel RTD, Therm. and mV Input Module Base

Overview

This chapter describes the 170 AAI 520 40 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|---|------|
| Front Panel Components | 122 |
| Specifications | 124 |
| Internal Pin Connections | 132 |
| Field Wiring Guidelines | 133 |
| Wiring Diagrams | 135 |
| I/O Mapping | 136 |
| Analog Channel Parameters | 137 |
| Analog Inputs | 142 |
| RTD, Thermocouple and mV Input Measuring Ranges | 144 |

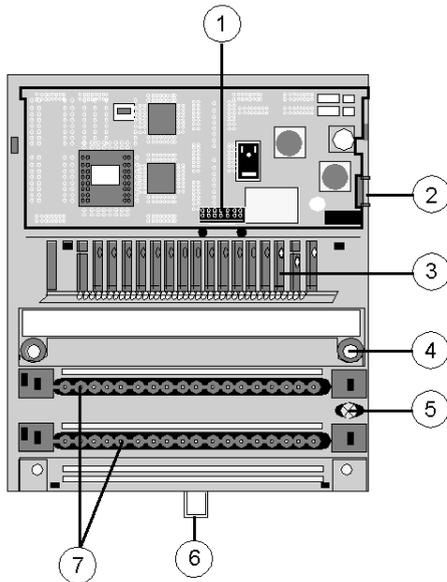
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 AAI 520 40 I/O base and a description of the LEDs.

Front Panel Illustration

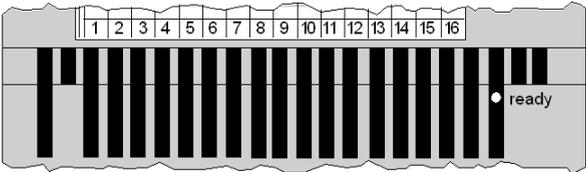
The front panel of the I/O base is shown in the illustration below.



| Label | Description |
|-------|--|
| 1 | Internal interface (ATI) connector |
| 2 | Locking and ground contact for the adapter |
| 3 | LED status display |
| 4 | Mounting holes for panel mount |
| 5 | Grounding screw |
| 6 | Locking tab for DIN rail mount |
| 7 | Sockets for the terminal connectors |

LED Illustration

This I/O base has one LED, the ready indicator shown in the illustration below.



LED Descriptions

The ready indicator is described in the table below.

| Indicator | Condition | Message |
|-----------|-----------|--|
| Ready | Green | Module is ready to communicate. Operating voltage for internal logic is present and self-test has been passed. |
| | Off | Module is not ready. Operating voltage is not present or module is defective. |

Specifications

Overview

This section contains specifications for the 170 AAI 520 40 I/O base.

General Specifications

| | |
|----------------------------|---------------------------------|
| Module type | 4 analog inputs |
| Range - mV | +/- 100 mV, +/- 25 mV |
| Types - RTD | Pt100, Pt 1000, Ni100 or Ni1000 |
| Types - Thermocouple | B, E, J, K, N, R, S or T |
| Supply voltage | 24 VDC |
| Supply voltage range | 20 ... 30 VDC |
| Supply current consumption | max. 330 mA at 24 VDC |
| Power dissipation | 3.5 W typical 5.5 W maximum |
| I/O map | 4 input words 4 output words |

Isolation

| | |
|--|---|
| Between channels | 400 VDC |
| Between base supply and ground | 500 Vcc, 1 min |
| Between input channels and ground | 500 VAC, 1 min |
| Common mode channel/ground voltage | +/-100 VDC, 250 VAC |
| Common mode voltage between channels | 200 VDC, 115 VAC single- or three-phase or 250 VAC single phase |
| Common mode rejection between channel and ground | 135 dB DC, 145 dB AC 50 Hz, 155 dB AC 60 Hz |
| Common mode rejection between channels | 120 dB DC, 130 dB AC 50 Hz, 140 dB AC 60 Hz |
| Serial-mode rejection | 35 dB AC 50 Hz, 45 dB AC 60 Hz |
| Input protection | +/- 30 VDC |

Fuses

| | |
|---------------------------------|---|
| Internal (not user-replaceable) | 2 A slow-blow |
| External (recommended) | 1 A slow-blow (Bussmann GDC-1A or equivalent) |

EMC

| | |
|------------------|---|
| Immunity | IEC 1131-2 Surge on auxiliary power supply 500 V |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE, FM Class 1 Div. 2 |

Physical Dimensions

| | |
|-------------------------|-----------------------------|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) no busbar |
| Weight | 215 g (0.45 lb) |

Analog Inputs mV Range

| | | |
|-----------------------------------|--|--------------------------------------|
| Surge tolerance: input voltage | +/- 30 VDC | |
| Number of channels | 4 differential inputs | |
| Format of transmitted data | full 16 bits signed (2's complement) | |
| Current source | 0.125 mA (for Pt1000 or Ni 1000 probe) | 1.25 mA (for Pt 100 or Ni 100 probe) |
| Update time for the inputs | 500 ms | |
| Voltage range | +/-25 mV | +/-100 mV |
| Input impedance | > 10 MOhm | > 10 MOhm |
| Error at 25 degrees C | +/- 21 microV | +/- 27 microV |
| Error at 60 degrees C | +/- 46 microV | +/- 94 microV |
| Resolution | 15 bits + sign | 15 bits + sign |

RTD Ranges for Pt100/Pt1000

| Range | Pt100 (IEC751) | Pt100 (US/JIS) | Pt1000 (IEC751) | Pt1000 (US/JIS) |
|-----------------------------|--|--|--|--|
| Input Span | -200...+850 deg. C -328...+1562 deg. F | -200...+510 deg. C -328...+950 deg. F | -200...+850 deg. C -328...+1562 deg. F | -200...+510 deg. C -328...+950 deg. F |
| Resolution of conversion | 0.029...0.043 deg. C 0.052...0.077 deg. F | 0.029...0.037 deg. C 0.053...0.067 deg. F | 0.029...0.043 deg. C 0.052...0.077 deg. F | 0.029...0.037 deg. C 0.053...0.067 deg. F |
| Display resolution | 0.1 deg. C 0.1 deg. F |

Errors for Pt100/Pt1000

Maximum error at 25 degrees C in degrees C (1)

| Temperature | Wiring Type | | | | | | | |
|-------------|----------------|-----------|----------------|-----------|-----------------|-----------|-----------------|-----------|
| | Pt100 (IEC751) | | Pt100 (US/JIS) | | Pt1000 (IEC751) | | Pt1000 (US/JIS) | |
| | 2/4 wires | 3 wires | 2/4 wires | 3 wires | 2/4 wires | 3 wires | 2/4 wires | 3 wires |
| -200 deg. C | 0.2 [0.7] | 0.4 [0.8] | 0.2 [0.7] | 0.4 [0.8] | 0.2 [0.6] | 0.4 [0.8] | 0.2 [0.6] | 0.4 [0.8] |
| -100 deg. C | 0.2 [0.9] | 0.4 [1.0] | 0.2 [0.9] | 0.4 [1.0] | 0.3 [0.8] | 0.4 [1.0] | 0.3 [0.8] | 0.4 [1.0] |
| 0 deg. C | 0.3 [1.1] | 0.4 [1.2] | 0.3 [1.1] | 0.4 [1.2] | 0.3 [1.0] | 0.4 [1.2] | 0.3 [1.0] | 0.4 [1.2] |
| 100 deg. C | 0.3 [1.2] | 0.4 [1.4] | 0.3 [1.3] | 0.4 [1.4] | 0.3 [1.2] | 0.4 [1.4] | 0.3 [1.2] | 0.4 [1.4] |
| 200 deg. C | 0.3 [1.4] | 0.4 [1.5] | 0.3 [1.4] | 0.4 [1.5] | 0.3 [1.4] | 0.5 [1.5] | 0.3 [1.4] | 0.5 [1.6] |
| 300 deg. C | 0.3 [1.6] | 0.5 [1.8] | 0.3 [1.7] | 0.5 [1.8] | 0.3 [1.6] | 0.5 [1.8] | 0.4 [1.6] | 0.5 [1.8] |
| 400 deg. C | 0.3 [1.8] | 0.5 [2.0] | 0.3 [1.8] | 0.5 [2.0] | 0.4 [1.8] | 0.5 [2.0] | 0.4 [1.8] | 0.5 [2.0] |
| 500 deg. C | 0.3 [2.1] | 0.5 [2.2] | 0.3 [2.1] | 0.5 [2.2] | 0.4 [2.0] | 0.5 [2.2] | 0.4 [2.0] | 0.5 [2.2] |
| 600 deg. C | 0.4 [2.3] | 0.5 [2.5] | | | 0.4 [2.3] | 0.5 [2.4] | | |
| 700 deg. C | 0.4 [2.5] | 0.5 [2.7] | | | 0.4 [2.5] | 0.6 [2.7] | | |
| 800 deg. C | 0.4 [2.7] | 0.6 [2.9] | | | 0.5 [2.8] | 0.6 [2.9] | | |
| -300 deg. F | 0.4 [1.3] | 0.5 [1.5] | 0.4 [1.3] | 0.5 [1.5] | 0.4 [1.2] | 0.6 [1.4] | 0.4 [1.1] | 0.6 [1.4] |
| -100 deg. F | 0.4 [1.6] | 0.6 [1.9] | 0.4 [1.6] | 0.6 [1.9] | 0.5 [1.5] | 0.6 [1.8] | 0.5 [1.5] | 0.6 [1.8] |
| 100 deg. F | 0.5 [2.0] | 0.6 [2.3] | 0.5 [2.0] | 0.6 [2.2] | 0.5 [1.9] | 0.7 [2.2] | 0.5 [1.9] | 0.7 [2.2] |
| 300 deg. F | 0.5 [2.4] | 0.6 [2.6] | 0.5 [2.3] | 0.6 [2.6] | 0.5 [2.3] | 0.7 [2.6] | 0.5 [2.2] | 0.7 [2.5] |
| 500 deg. F | 0.5 [2.8] | 0.7 [3.0] | 0.5 [2.7] | 0.7 [3.0] | 0.5 [2.7] | 0.8 [3.0] | 0.5 [2.7] | 0.7 [3.0] |
| 700 deg. F | 0.6 [3.1] | 0.7 [3.4] | 0.5 [3.1] | 0.7 [3.4] | 0.6 [3.1] | 0.8 [3.4] | 0.6 [3.1] | 0.8 [3.4] |
| 900 deg. F | 0.6 [3.6] | 0.8 [3.9] | 0.6 [3.5] | 0.8 [3.8] | 0.6 [3.5] | 0.8 [3.9] | 0.6 [3.5] | 0.8 [3.8] |
| 1100 deg. F | 0.6 [4.0] | 0.9 [4.3] | | | 0.7 [4.0] | 0.9 [4.4] | | |
| 1300 deg. F | 0.7 [4.6] | 0.9 [4.8] | | | 0.7 [4.5] | 1.0 [4.8] | | |
| 1500 deg. F | 0.7 [5.0] | 0.9 [5.3] | | | 0.8 [5.0] | 1.1 [5.3] | | |

(1) The values shown in brackets correspond to the maximum errors for temperatures in the range 0 ... 60 degrees C or 32 and 140 degrees F.

Maximum Cable Resistance for Pt100/Pt1000

| Wiring type | Pt100 (IEC751) | | Pt100 (US/JIS) | | Pt1000 (IEC751) | | Pt1000 (US/JIS) | |
|---------------------------|----------------------|-------------|-----------------------|-------------|-----------------------|--------------|-----------------------|--------------|
| | 2/4 wires | 3 wires | 2/4 wires | 3 wires | 2/4 wires | 3 wires | 2/4 wires | 3 wires |
| Max. resistance per cable | 50 Ohms with 4 wires | 20 Ohms (1) | 500 Ohms with 4 wires | 20 Ohms (1) | 500 Ohms with 4 wires | 200 Ohms (1) | 500 Ohms with 4 wires | 200 Ohms (1) |

(1) Matching of line resistance for 3-conductor cables is < 0.02%.

RTD Ranges for Ni100/Ni1000

| Range | Ni100 DIN43760 | Ni1000 DIN43760 |
|--------------------------|--|---|
| Input Span | -60...+250 deg. C -76...+482 deg. F | -60...+250 deg. C -76...+482 deg. F |
| Resolution of conversion | 0.026...0.012 deg. C 0.047...0.022 deg. F | 0.026...0.0120 deg. C 0.047...0.022 deg. F |
| Display resolution | 0.1 deg. C 0.1 deg. F | 0.1 deg. C 0.1 deg. F |

Errors for Ni100/Ni1000

Maximum error at 25 degrees C in degrees C (1)

| Temperature | Wiring Type | | | |
|-------------|----------------|-----------|-----------------|-----------|
| | Ni100 DIN43760 | | Ni1000 DIN43760 | |
| -50 deg. C | 0.3 [0.8] | 0.3 [1.0] | 0.3 [0.8] | 0.4 [0.9] |
| 0 deg. C | 0.2 [0.8] | 0.3 [1.0] | 0.3 [0.8] | 0.3 [0.9] |
| 50 deg. C | 0.2 [0.8] | 0.3 [0.9] | 0.3 [0.8] | 0.3 [0.9] |
| 100 deg. C | 0.2 [0.8] | 0.3 [0.9] | 0.3 [0.8] | 0.3 [0.9] |
| 150 deg. C | 0.2 [0.8] | 0.3 [0.9] | 0.2 [0.8] | 0.3 [0.9] |
| 200 deg. C | 0.2 [0.8] | 0.3 [0.9] | 0.2 [0.8] | 0.3 [0.8] |
| 250 deg. C | 0.2 [0.8] | 0.3 [0.8] | 0.2 [0.8] | 0.3 [0.8] |
| 0 deg. F | 0.4 [1.4] | 0.5 [1.6] | 0.4 [1.3] | 0.6 [1.6] |
| 100 deg. F | 0.4 [1.4] | 0.5 [1.6] | 0.4 [1.4] | 0.5 [1.5] |
| 200 deg. F | 0.4 [1.4] | 0.5 [1.5] | 0.4 [1.4] | 0.5 [1.5] |
| 300 deg. F | 0.4 [1.4] | 0.5 [1.5] | 0.4 [1.4] | 0.5 [1.5] |
| 400 deg. F | 0.4 [1.4] | 0.5 [1.5] | 0.4 [1.4] | 0.5 [1.5] |

(1) The values shown in brackets correspond to the maximum errors for temperatures in the range 0 ... 60 degrees C or 32 and 140 degrees F.

Maximum Cable Resistance for Ni100/Ni1000

| Wiring Type | Ni100 DIN43760 | | Ni1000 DIN43760 | |
|----------------------------------|------------------------|--------------|------------------------|--------------|
| | 2/4 wires | 3 wires | 2/4 wires | 3 wires |
| Max. resistance per cable | 1000 Ohms with 4 wires | 200 Ohms (1) | 1000 Ohms with 4 wires | 200 Ohms (1) |

(1) Matching of line resistance for 3-conductor cables is < 0.02%.

Thermocouple Ranges in Degrees C

Input span and resolution in degrees C

| | Thermocouple Type | | | | | | | |
|--------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| | B | E | J | K | N | R | S | T |
| Input Span | 0.0 +1802.0 | -270.0 +1000.0 | -210.0 +1200.0 | -270.0 +1372.0 | -270.0 +1300.0 | -50.0 +1769.0 | -50.0 +1769.0 | -270.0 +400.0 |
| Resolution of conversion | 0.78... ...0.07 | 1.12... ...0.04 | 0.15... ...0.05 | 0.83... ...0.30 | 1.67... ...0.03 | 0.26... ...0.08 | 0.24... ...0.09 | 0.50... ...0.02 |
| Display resolution | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |

Thermocouple Errors in Degrees C

Maximum error at 25 degrees C in degrees C (1)

| Temperature | Thermocouple Type | | | | | | | |
|-------------|-------------------|------------|-----------|-----------|-----------|-----------|-----------|-----------|
| | B | E | J | K | N | R | S | T |
| -200 deg. C | | 5.8 [11.8] | | 6.9[14.6] | 8.0[18.3] | | | 6.8[14.8] |
| -100 deg. C | | 3.4 [6.7] | | 3.6 [7.5] | 4.0 [8.9] | | | 4.0 [8.4] |
| 0 deg. C | | 2.7 [5.3] | 2.8 [5.5] | 2.9 [6.0] | 3.3 [7.3] | 6.4[13.1] | 6.3[12.8] | 3.0 [6.3] |
| 100 deg. C | | 2.5 [4.8] | 2.7 [5.2] | 2.9 [5.8] | 3.1 [6.6] | 4.7 [9.5] | 4.8 [9.6] | 2.6 [5.4] |
| 200 deg. C | | 2.4 [4.5] | 2.7 [5.3] | 3.2 [6.2] | 2.8 [6.1] | 4.2 [8.2] | 4.4 [8.5] | 2.4 [4.9] |
| 300 deg. C | | 2.4 [4.5] | 2.9 [5.5] | 3.1 [6.1] | 2.7 [5.8] | 3.9 [7.7] | 4.1 [8.1] | 2.3 [4.7] |
| 400 deg. C | | 2.4 [4.5] | 3.0 [5.7] | 3.2 [6.2] | 2.8 [5.7] | 3.8 [7.4] | 4.0 [7.9] | |
| 500 deg. C | | 2.4 [4.6] | 3.1 [5.7] | 3.3 [6.3] | 2.8 [5.7] | 3.7 [7.2] | 4.1 [7.8] | |
| 600 deg. C | 5.1 [9.5] | 2.7 [4.8] | 3.1 [5.7] | 3.4 [6.5] | 2.8 [5.8] | 3.7 [7.0] | 4.1 [7.7] | |
| 700 deg. C | 4.5 [8.4] | 2.8 [5.0] | 3.0 [5.5] | 3.6 [6.7] | 3.0 [5.9] | 3.7 [6.9] | 4.1 [7.7] | |
| 800 deg. C | 4.2 [7.7] | 3.0 [5.3] | | 3.8 [7.0] | 3.0 [6.1] | 3.7 [6.9] | 4.1 [7.6] | |
| 900 deg. C | 4.0 [7.2] | | | 4.0 [7.5] | 3.2 [6.3] | 3.7 [6.7] | 4.1 [7.5] | |
| 1000 deg. C | 3.8 [6.8] | | | 4.2 [7.8] | 3.3 [6.5] | 3.7 [6.7] | 4.1 [7.5] | |
| 1100 deg. C | 3.6 [6.5] | | | 4.5 [8.2] | 3.6 [6.8] | 3.7 [6.7] | 4.2 [7.5] | |
| 1200 deg. C | 3.6 [6.3] | | | 4.7 [8.7] | 3.7 [7.1] | 3.7 [6.7] | 4.2 [7.5] | |
| 1300 deg. C | 3.6 [6.2] | | | | | 3.9 [6.8] | 4.3 [7.7] | |
| 1400 deg. C | 3.6 [6.2] | | | | | 4.0 [6.9] | 4.4 [7.8] | |
| 1500 deg. C | 3.6 [6.1] | | | | | 4.1 [7.1] | 4.6 [8.1] | |
| 1600 deg. C | 3.8 [6.3] | | | | | 4.3 [7.4] | 4.8 [8.3] | |
| 1700 deg. C | 3.8 [6.5] | | | | | | | |

| Temperature | Thermocouple Type | | | | | | | |
|---------------------|-------------------|----------|----------|----------|----------|----------|----------|---------|
| | B | E | J | K | N | R | S | T |
| Overflow code | + 1802.1 | + 1000.1 | + 1200.1 | + 1372.1 | + 1300.1 | + 1769.1 | + 1769.1 | + 400.1 |
| Underflow code | - 0.1 | - 270.1 | - 210.1 | - 270.1 | - 270.1 | - 50.1 | - 50.1 | - 270.1 |
| Wiring default code | - 0.2 | - 270.2 | - 210.2 | - 270.2 | - 270.2 | - 50.2 | - 50.2 | - 270.2 |

(1) The values shown in brackets correspond to the maximum errors for temperatures in the range 0...60 degrees C or 32 and 140 degrees F.

Thermocouple Ranges in Degrees F

Input span and resolution in degrees F

| | Thermocouple Type | | | | | | | |
|--------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| | B | E | J | K | N | R | S | T |
| Input span | 32.0 +3275.6 | -454.1 +1832.0 | -346.1 +2192.0 | -454.1 +2501.6 | -454.1 +2372.0 | -58.1 +3216.2 | -58.1 +3216.2 | -454.1 +752.0 |
| Resolution of conversion | 1.40... ...0.12 | 2.01... ...0.07 | 0.27... ...0.09 | 1.50... ...0.05 | 3.00... ...0.05 | 0.47... ...0.15 | 0.43... ...0.16 | 0.90... ...0.04 |
| Display resolution | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |

Thermocouple Errors in Degrees F

Maximum error at 77 degrees F in degrees F (1)

| Temperature | Thermocouple Type | | | | | | | |
|-------------|-------------------|------------|-----------|-------------|-------------|-------------|-------------|-------------|
| | B | E | J | K | N | R | S | T |
| -300 deg. F | | 9.1 [18.5] | | 10.8 [22.3] | 11.9 [27.5] | | | 10.9 [23.5] |
| -200 deg. F | | | | | | | | 7.8[17.1] |
| -100 deg. F | | 5.7[11.1] | | 6.1[12.4] | 6.6[14.6] | | | 6.5[13.8] |
| 0 deg. F | | | 5.1[10.0] | | | 12.7 [26.0] | 12.3 [25.2] | 5.6 [11.9] |
| 100 deg. F | | 4.7[9.2] | | 5.1[10.5] | 5.8[12.8] | | | 5.0[10.7] |
| 200 deg. F | | | 4.9[9.4] | | | 8.6[17.4] | 8.7[17.5] | 4.7[9.8] |
| 300 deg. F | | 4.4[8.3] | | 5.5[10.9] | 5.2[11.5] | | | 4.4[9.2] |
| 400 deg. F | | | 4.9[9.5] | | | 7.5[14.8] | 7.8[15.3] | 4.3[8.8] |
| 500 deg. F | | 4.3[8.1] | | 5.7[11.2] | 5.1[10.8] | | | 4.3[8.5] |
| 600 deg. F | | | 5.3[9.9] | | | 6.9[13.6] | 7.4[14.4] | 4.2[8.3] |
| 700 deg. F | | 4.4[8.1] | | 5.7[11.2] | 4.9[10.5] | | | 4.1[8.2] |

| Temperature | Thermocouple Type | | | | | | | |
|----------------------------|-------------------|----------|-----------|-----------|-----------|-----------|-----------|--------|
| | B | E | J | K | N | R | S | T |
| 800 deg. F | | | 5.5[10.3] | | | 6.8[13.1] | 7.3[14.2] | |
| 900 deg. F | | 4.6[8.3] | | 5.9[11.3] | 5.1[10.4] | | | |
| 1000 deg. F | | | 5.5[10.3] | | | 6.7[12.8] | 7.4[14.0] | |
| 1100 deg. F | 9.2[17.1] | 4.8[8.7] | | 6.1[11.7] | 5.1[10.4] | | | |
| 1200 deg. F | | | 5.5[10.0] | | | 6.7[12.6] | 7.3[13.8] | |
| 1300 deg. F | 8.1[15.1] | 5.0[9.1] | | 6.5[12.1] | 5.3[10.6] | | | |
| 1400 deg. F | | | 5.3[9.8] | | | 6.6[12.4] | 7.3[13.7] | |
| 1500 deg. F | 7.4[13.7] | 5.4[9.6] | | 6.9[12.9] | 5.6[11.1] | | | |
| 1600 deg. F | | | | | | 6.6[12.3] | 7.3[13.7] | |
| 1700 deg. F | 7.1[12.8] | | | 7.3[13.5] | 5.8[11.5] | | | |
| 1800 deg. F | | | | | | 6.7[12.1] | 7.3[13.6] | |
| 1900 deg. F | 6.7[12.0] | | | 7.8[14.2] | 6.2[11.9] | | | |
| 2000 deg. F | | | | | | 6.7[12.0] | 7.4[13.6] | |
| 2100 deg. F | 6.5[11.5] | | | 8.2[15.1] | 6.6[12.4] | | | |
| 2200 deg. F | | | | | | 6.8[11.9] | 7.6[13.6] | |
| 2300 deg. F | 6.4[11.3] | | | 8.9[16.2] | 7.0[13.1] | | | |
| 2400 deg. F | | | | | | 6.8[12.0] | 7.8[13.8] | |
| 2500 deg. F | 6.4[11.1] | | | | | | | |
| 2600 deg. F | | | | | | 6.9[11.9] | 8.0[14.2] | |
| 2700 deg. F | 6.5[11.1] | | | | | | | |
| 2800 deg. F | | | | | | 6.9[11.9] | 8.3[14.7] | |
| 2900 deg. F | 6.6[11.3] | | | | | | | |
| 3000 deg. F | | | | | | 7.0[12.0] | 8.8[15.4] | |
| 3100 deg. F | 6.6[11.7] | | | | | | | |
| Overflow code | +3275.7 | +1832.1 | +2192.1 | +2501.7 | +2372.1 | +3216.3 | +3216.3 | +752.1 |
| Underflow code | +31.9 | -454.2 | -346.2 | -454.2 | -454.2 | -58.2 | -58.2 | -454.2 |
| Wiring default code | +31.8 | -454.3 | -346.3 | -454.3 | -454.3 | -58.3 | -58.3 | -454.3 |

(1) The values shown in brackets correspond to the maximum errors for temperatures in the range 0...60 degrees C or 32 and 140 degrees F.

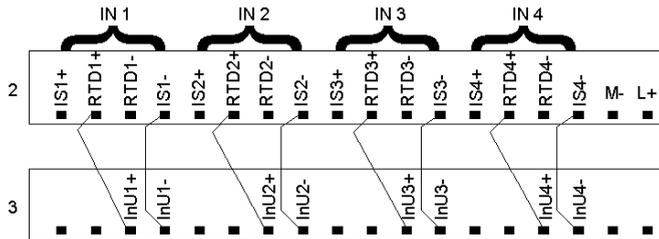
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base.

Illustration

The following illustration shows the internal connections between terminals.



Field Wiring Guidelines

Overview

This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Mapping Terminal Blocks

Mapping terminal blocks is described in the table below.

| Row | Terminal No. | Description | Function |
|-----|-------------------------|------------------------------|---|
| 2 | 1, 5, 9, 13 | IS1+,IS2+ IS3+,IS4+ | +Current source output, Channels 1 ... 4 |
| | 2, 6, 10, 14 | RTD1+, RTD2+ RTD4+, RTD4+ | +RTD input, Channels 1 ... 4 |
| | 3, 7, 11, 15 | RTD1-, RTD2- RTD4-, RTD4- | -RTD input, Channels 1 ... 4 |
| | 4, 8, 12, 16 | IS1-,IS2- IS3-,IS4- | -Current source output, Channels 1 ... 4 |
| | 17 | M- | - power supply return |
| | 18 | L+ | Module power supply + 24 V |
| 3 | 1, 2, 5, 6, 9,10,13, 14 | - | Not used |
| | 3, 7, 11, 15 | InU1+,InU2+ InU3+,InU4+ | + thermocouple or voltage mode input, channels 1 ... 4 |
| | 4, 8, 12, 16 | InU1-,InU2- InU-+,InU4- | - thermocouple or voltage mode input, Channels 1 ... 4 |
| | 17, 18 | - | Not used |

Signal Protection

To protect the signal from external noise induced in serial or common mode, we recommend the following precautions.

- Use shielded twisted-pair cables with a minimum conductor cross section of 24 AWG or 0.22 mm².
- Connect the cable shield to ground via the cable grounding rail (part number CER 01).
- You may combine the analog inputs on this I/O base in one multi-pair cable provided the same ground is used.
- When wiring the voltage supply, use sensors that do not have ground reference.

Thermocouple Measurement Precautions

For thermocouple measurements (except with thermocouple B), observe the following precautions to obtain the accuracies indicated in the performance tables.

- Wait 45 min. after powering up the base (the time required for the module to warm up to the temperature balance needed for internal cold junction compensation) prior to taking any measurements.
- The air circulation must not exceed a rate of 0.1 m/s; air circulation in excess of this amount will affect the thermal balance inside the base.
- Keep the rate of temperature fluctuations outside the base to less than 10 deg./hr.
- Keep the distance between the base and any heat source greater than 100 mm.

Wiring Diagrams

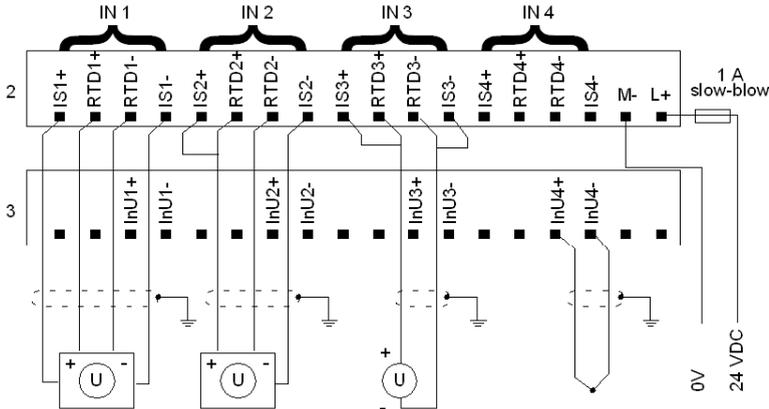
Overview

This section contains an illustration to assist you in wiring the following types of devices:

- RTD 4-wire configuration
- RTD 3-wire configuration
- RTD 2-wire configuration
- Thermocouple input

Diagram

Examples of wiring are shown in the diagram below:



Examples

- * Channel 1, RTD input, 4 - wire configuration
- * Channel 2, RTD input, 3 - wire configuration
- * Channel 3, RTD input, 2 - wire configuration
- * Channel 4, thermocouple input

I/O Mapping

Overview

The 170 AAI 520 40 TSX Momentum I/O base supports 4 analog inputs. This section contains information about the mapping of the analog input values into input words and the usage of output words for channel configuration.

I/O Map

The I/O base must be mapped as four contiguous input words and four contiguous output words, as follows:

| Word | Input Data | Output Data |
|---------|------------------------|---------------------------------|
| 1 = LSW | Value, input channel 1 | Parameters for input channels 1 |
| 2 | Value, input channel 2 | Parameters for input channels 2 |
| 3 | Value, input channel 3 | Parameters for input channels 3 |
| 4 = MSW | Value, input channel 4 | Parameters for input channels 4 |

Analog Channel Parameters

Overview

Parameters must be set for all of the analog channels before the module can be commissioned. This section provides the codes for setting the parameters and gives examples of parameter settings.

NOTE: If you set new parameters for the module, always send a complete set of parameters (all channels, inputs and outputs), even if you only want to change a single parameter. Otherwise, the module will refuse the new parameters and continue working with the old ones.

Key

This section focuses on output words 1 ... 4, as highlighted in the table below:

| Word | Input Data | Output Data |
|---------|------------------------|--|
| 1 = LSW | Value, input channel 1 | Parameters for input channels 1 |
| 2 | Value, input channel 2 | Parameters for input channels 2 |
| 3 | Value, input channel 3 | Parameters for input channels 3 |
| 4 = MSW | Value, input channel 4 | Parameters for input channels 4 |

Illustration

Parameters are set by entering a four-bit code in output words 1 ... 4, as follows:

| Output Word 1 (Register 4x, to parameterize input channel 1) | | | | | | | | | | | | | | | |
|---|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

| Output Word 2 (Register 4x+1, to parameterize input channel 2) | | | | | | | | | | | | | | | |
|---|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

| Output Word 3 (Register 4x+2, to parameterize input channel 3) | | | | | | | | | | | | | | | |
|---|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

| Output Word 4 (Register 4x+3, to parameterize input channel 4) | | | | | | | | | | | | | | | |
|---|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

Parameters

For each input channel, you may set the following parameters:

| Parameter | Options |
|-----------------------|--|
| Input range | Type B,E,J,K,N,R,S or T thermocouple (according to IEC584 standard, June 1989) with internal cold junction compensation |
| RTD | Pt100 or Pt1000 RTDs (according to IEC751, June 1986; or JIS C1604, January 1989), and Ni100 or Ni1000 RTDs (according to DIN standard 43.760, September 1987), with 2-, 3- or 4 wires |
| Low voltage range | +/-100 mV or +/-25 mV |
| Broken wire detection | Enabled or disabled |

NOTE: The 0000 reserved value is more a control than a parameter. It forces the I/O base into a default condition where it continues to receive field inputs according to the previous channel parameters.

Thermocouple Parameter Codes

Use the following codes to set your choice of parameters:

| Input range | Temperature unit | Broken-wire detection | Parameter code (hex) |
|----------------|------------------|-----------------------|----------------------|
| Thermocouple B | 1/10 degrees C | disabled | 2201 |
| | | enabled | 2301 |
| | 1/10 degrees F | disabled | 2281 |
| | | enabled | 2381 |
| Thermocouple E | 1/10 degrees C | disabled | 1202 |
| | | enabled | 1302 |
| | 1/10 degrees F | disabled | 1282 |
| | | enabled | 1382 |
| Thermocouple J | 1/10 degrees C | disabled | 1203 |
| | | enabled | 1303 |
| | 1/10 degrees F | disabled | 1283 |
| | | enabled | 1383 |
| Thermocouple K | 1/10 degrees C | disabled | 1204 |
| | | enabled | 1304 |
| | 1/10 degrees F | disabled | 1284 |
| | | enabled | 1384 |

| Input range | Temperature unit | Broken-wire detection | Parameter code (hex) |
|----------------|------------------|-----------------------|----------------------|
| Thermocouple N | 1/10 degrees C | disabled | 1205 |
| | | enabled | 1305 |
| | 1/10 degrees F | disabled | 1285 |
| | | enabled | 1385 |
| Thermocouple R | 1/10 degrees C | disabled | 2206 |
| | | enabled | 2306 |
| | 1/10 degrees F | disabled | 2286 |
| | | enabled | 2386 |
| Thermocouple S | 1/10 degrees C | disabled | 2207 |
| | | enabled | 2307 |
| | 1/10 degrees F | disabled | 2287 |
| | | enabled | 2387 |
| Thermocouple T | 1/10 degrees C | disabled | 2208 |
| | | enabled | 2308 |
| | 1/10 degrees F | disabled | 2288 |
| | | enabled | 2388 |

RTD Parameter Codes

Use the following codes to set your choice of parameters:

| Input range | Wiring configuration | Temperature unit | Broken-wire detection | Parameter code (hex) |
|------------------|----------------------|------------------|-----------------------|----------------------|
| IEC PT100 RTD | 2- or 4-wire | 1/10 degrees C | disabled | 0A20 |
| | | | enabled | 0B20 |
| | | 1/10 degrees F | disabled | 0AA0 |
| | | | enabled | 0BA0 |
| | 3-wire | 1/10 degrees C | disabled | 0E20 |
| | | | enabled | 0F20 |
| | | 1/10 degrees F | disabled | 0EA0 |
| | | | enabled | 0FA0 |
| IEC PT1000 RTD | 2- or 4-wire | 1/10 degrees C | disabled | 0221 |
| | | | enabled | 0321 |
| | | 1/10 degrees F | disabled | 02A1 |
| | | | enabled | 03A1 |
| | 3-wire | 1/10 degrees C | disabled | 0621 |
| | | | enabled | 0721 |
| | | 1/10 degrees F | disabled | 06A1 |
| | | | enabled | 07A1 |
| US/JIS PT100 RTD | 2- or 4-wire | 1/10 degrees C | disabled | 0A60 |
| | | | enabled | 0B60 |
| | | 1/10 degrees F | disabled | 0AE0 |
| | | | enabled | 0BE0 |
| | 3-wire | 1/10 degrees C | disabled | 0E60 |
| | | | enabled | 0F60 |
| | | 1/10 degrees F | disabled | 0EE0 |
| | | | enabled | 0FE0 |

| Input range | Wiring configuration | Temperature unit | Broken-wire detection | Parameter code (hex) |
|-------------------|----------------------|------------------|-----------------------|----------------------|
| US/JIS PT1000 RTD | 2- or 4-wire | 1/10 degrees C | disabled | 0261 |
| | | | enabled | 0361 |
| | | 1/10 degrees F | disabled | 02E1 |
| | | | enabled | 03E1 |
| | 3-wire | 1/10 degrees C | disabled | 0661 |
| | | | enabled | 0761 |
| 1/10 degrees F | disabled | 06E1 | | |
| | enabled | 07E1 | | |
| DIN Ni100 RTD | 2- or 4-wire | 1/10 degrees C | disabled | 0A23 |
| | | | enabled | 0B23 |
| | | 1/10 degrees F | disabled | 0AA3 |
| | | | enabled | 0BA3 |
| | 3-wire | 1/10 degrees C | disabled | 0E23 |
| | | | enabled | 0F23 |
| 1/10 degrees F | disabled | 0EA3 | | |
| | enabled | 0FA3 | | |
| DIN Ni1000 RTD | 2- or 4-wire | 1/10 degrees C | disabled | 0222 |
| | | | enabled | 0322 |
| | | 1/10 degrees F | disabled | 02A2 |
| | | | enabled | 03A2 |
| | 3-wire | 1/10 degrees C | disabled | 0622 |
| | | | enabled | 0722 |
| 1/10 degrees F | disabled | 06A2 | | |
| | enabled | 07A2 | | |

Low Voltage Parameter Codes

Use the following codes to set your choice of parameters:

| Input range | Broken-wire detection | Parameter code (hex) |
|-------------|-----------------------|----------------------|
| +/-25mV | disabled | 2210 |
| | enabled | 2310 |
| +/-100mV | enabled | 1211 |
| | disabled | 1311 |

Analog Inputs

Overview

This section describes how to interpret the value of the analog input channels.

Key

This section describes input words 1 ... 8, as highlighted in the table below:

| Word | Input Data | Output Data |
|---------|------------------------|---------------------------------|
| 1 = LSW | Value, input channel 1 | Parameters for input channels 1 |
| 2 | Value, input channel 2 | Parameters for input channels 2 |
| 3 | Value, input channel 3 | Parameters for input channels 3 |
| 4 = MSW | Value, input channel 4 | Parameters for input channels 4 |

Analog Input Values

Mapping of analog input values is shown below.

| Input Word 1 (Register $3x$, analog value returned on channel 1) | | | | | | | | | | | | | | | |
|--|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

| Input Word 2 (Register $3x+1$, analog value returned on channel 2) | | | | | | | | | | | | | | | |
|--|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

| Input Word 3 (Register $3x+2$, analog value returned on channel 3) | | | | | | | | | | | | | | | |
|--|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

| Input Word 4 (Register $3x+3$, analog value returned on channel 4) | | | | | | | | | | | | | | | |
|--|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

Broken Wire Indication

A broken wire indication has the following values:

| | +/-25mv | +/-100mv | Ni100 | Ni1000 | Pt100 | Pt1000 | T | S | R | N | K | J | E | B |
|---------------------|----------------|-----------------|--------------|---------------|--------------|---------------|----------|----------|----------|----------|----------|----------|----------|----------|
| value | -32768 | -32768 | | | | | | | | | | | | |
| cel- sius | | | -602 | -602 | -2002 | -2002 | -2702 | -502 | -502 | -2702 | -2702 | -2102 | -2702 | -2 |
| Far- en- heit | | | -762 | -762 | -3283 | -3283 | -4542 | -582 | -582 | -4542 | -4542 | -3462 | -4542 | 318 |

RTD, Thermocouple and mV Input Measuring Ranges

Overview

This section contains illustrations explaining the analog/digital relation for the various input measuring ranges.

RTD or Thermocouple

If a RTD or thermocouple input range is chosen, the digital value transmitted is the temperature value expressed as either a tenth of a degree Centigrade or a tenth of a degree Fahrenheit, depending on the temperature unit chosen in the configuration.

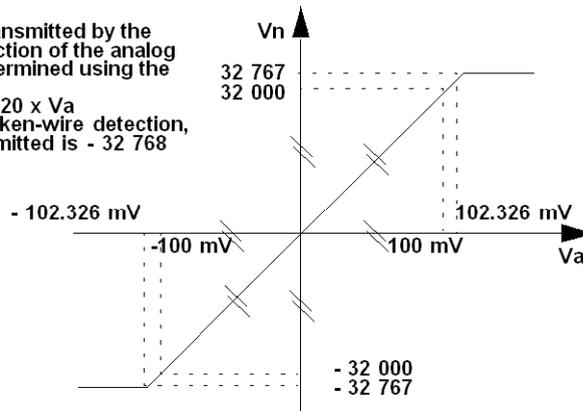
+/- 100 mV

The following illustration shows the analog/digital relation at +/- 100 mV:

The digital value transmitted by the input base as a function of the analog input voltage is determined using the formula:

$$V_n = 320 \times V_a$$

In the case of broken-wire detection, the value transmitted is - 32 768



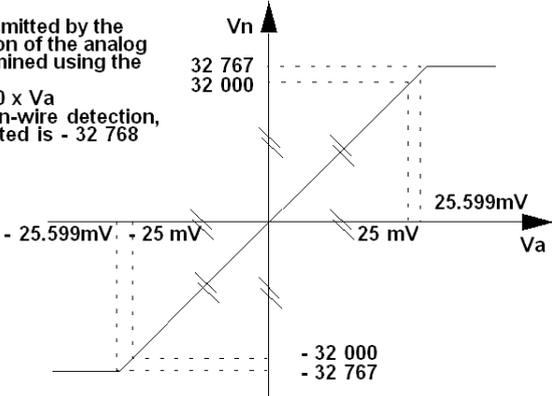
+/- 25 mV

The following illustration shows the analog/digital relation at +/- 25 mV:

The digital value transmitted by the input base as a function of the analog input voltage is determined using the formula:

$$V_n = 1280 \times V_a$$

In the case of broken-wire detection, the value transmitted is - 32 768



Chapter 9

170 AAO 120 00 Analog 4 Channel Output Module Base +/- 10 V, 0 - 20 mA

Overview

This chapter describes the 170 AAO 120 00 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|---------------------------|------|
| Front Panel Components | 148 |
| Specifications | 150 |
| Internal Pin Connections | 152 |
| Field Wiring Guidelines | 153 |
| Wiring Diagrams | 155 |
| I/O Mapping | 156 |
| Analog Channel Parameters | 157 |
| Analog Outputs | 159 |
| Output Ranges | 160 |

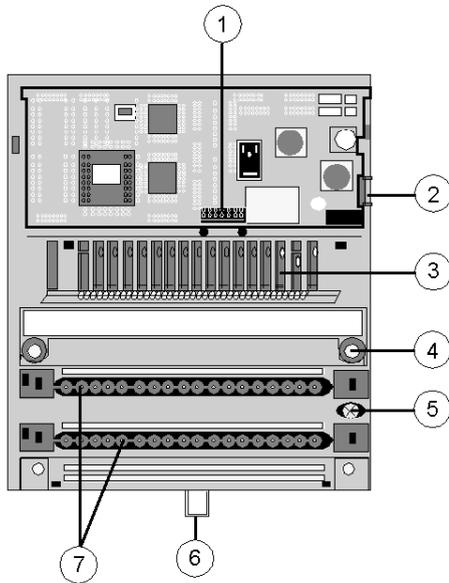
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 AAO 120 00 I/O base and a description of the LEDs.

Front Panel Illustration

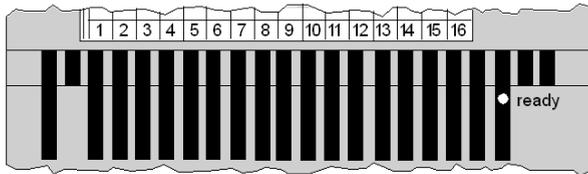
The front panel of the I/O base is shown in the illustration below.



| Label | Description |
|-------|--|
| 1 | Internal interface (ATI) connector |
| 2 | Locking and ground contact for the adapter |
| 3 | LED status display |
| 4 | Mounting holes for panel mount |
| 5 | Grounding screw |
| 6 | Locking tab for DIN rail mount |
| 7 | Sockets for the terminal connectors |

LED Illustration

This I/O base has one LED, the ready indicator shown in the illustration below.



LED Descriptions

The ready indicator is described in the table below.

| Indicator | Condition | Message |
|-----------|-----------|--|
| Ready | Green | Module is ready to communicate. Operating voltage for internal logic is present and self-test has been passed. |
| | Off | Module is not ready. Operating voltage is not present or module is defective. |

Specifications

Overview

This section contains specifications for the 170 AAO 120 00 I/O base.

General Specifications

| | |
|--|---------------------------------|
| Module type | 4 analog outputs |
| Output range | +/- 10 V 0 ... 20 mA |
| Supply voltage | 24 VDC |
| Supply voltage range | 20 ... 30 VDC |
| Supply current consumption (base) | max. 530 mA at 24 VDC |
| Supply current consumption (actuators) | max. 150 mA at 24 VDC (+/- 5 %) |
| Power dissipation | 5.6 W typical 8.5 W maximum |
| I/O map | 5 output words |

Isolation

| | |
|--------------------------------------|---|
| Between channels | none |
| Between base power supply and ground | 500 Vcc, 1 min |
| Between channels and ground | 500 VAC, 1 min |
| Output protections | short circuits (in voltage) circuits open in current polarity inversion |
| Base power supply protection | +/- 30 V (voltage or current output) |
| Common mode rejection | 250 VAC @ 47 ... 63 or 250 VDC Channel-to-ground |

Fuses

| | |
|----------------------------------|---|
| Internal (not user-replaceable) | 2 A slow-blow |
| External (actuator power supply) | 1 A slow-blow (Bussmann GDC-1A or equivalent) |
| External (operating voltage) | 1 A slow-blow (Bussmann GDC-1A or equivalent) |

EMC

| | |
|------------------|---|
| Immunity | IEC 1131-2 Surge on auxiliary power supply 500V |
| Radiated noise | EN 50081-2 |
| Agency approvals | UL, CSA, CE, FM Class 1 Div.2 pending |

Physical Dimensions

| | |
|-------------------------|---|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) with no or one busbar |
| Weight | 240 g (0.55 lb) |

NOTE: The 24 VDC actuator power supply is protected in the same way as the analog outputs (different from the base power supply).

Analog Outputs

| | | |
|---------------------------------|--------------------------------------|--------------------------------------|
| Number of channels | 4 | |
| Format of transmitted data | full 16 bits signed (2's complement) | |
| Protection (base and actuators) | polarity inversion | |
| Range | +/- 10 V | 0 ... 20 mA (current source or sink) |
| Load impedance | 1 KOhm minimum | 600 Ohms maximum |
| Capacitive load | < 1 micro F | < 1 micro F |
| Error at 25 deg. C | 0.2% PE* | 0.3% PE* |
| Error at 60 deg. C | 0.25% PE* | 0.4% PE* |
| Temperature drift (60 deg. C) | 10ppmPE*/ deg. C | 30ppmPE*/ deg. C |
| Resolution | 12 bits + sign | 12 bits + sign |
| Update time for the 4 outputs | < 2 ms | |

NOTE: *Not to be confused with Protective Earth. PE is used here as a European notation for full scale, with the following values:

- 10 V in range of +/- 10 V
- 20mA in range of 0 ... 20 mA

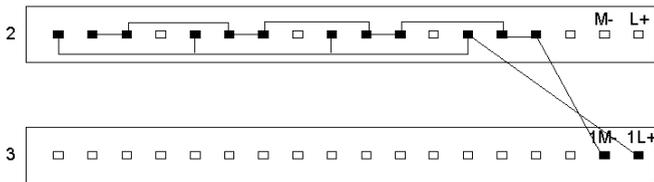
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base.

Illustration

The following illustration shows the internal connections between terminals.



Field Wiring Guidelines

Overview

This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Mapping Terminal Blocks

| |
|---|
| ⚠ CAUTION |
| POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES |
| Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes. |
| Failure to follow these instructions can result in injury or equipment damage. |

Mapping terminal blocks is described in the table below.

| Row | Terminal No. | Description | Function |
|-----|----------------------------|-------------|---------------------------------------|
| 2 | 4, 8, 12, 16 | - | Not used |
| | 1, 5, 9, 13 | 1L+ | +24 V actuator power supply output |
| | 2, 3, 6, 7, 10, 11, 14, 15 | 1M- | Actuator power supply neg. 0 V return |
| | 17 | M- | Module power supply 0 V |
| | 18 | L+ | Module power supply +24V |

| Row | Terminal No. | Description | Function |
|-----|--------------|----------------------------------|--|
| 3 | 1, 5, 9, 13 | OUT11-, OUTI2- OUTI3-, OUTI4- | Output current mode (sink) Channels 1 ... 4 |
| | 2, 6, 10, 14 | OUTI1+, OUTI2+ OUTI3+, OUTI4+ | Output current mode (source) Channels 1 ... 4 |
| | 3, 7, 11, 15 | OUTU1+, OUTU2+ OUTU3+, OUTU4+ | Output voltage mode Channels 1 ... 4 |
| | 4, 8, 12, 16 | - | Not used |
| | 17 | 1M- | Actuator power supply neg. 0 V return |
| | 18 | 1L+ | +24 V actuator power supply output |

Fuse Required

The 1 A slow-blow fuse shown in the wiring diagram (*see page 155*) must be wired into the actuator power supply.

Signal Protection

To protect the signal from external noise induced in serial or common mode, we recommend the following precautions.

- Use shielded twisted-pair cables with a minimum conductor cross section of 24 AWG or 0.22mm².
- Connect the cable shield to ground via the cable grounding rail (part number CER 001).
- You may combine the analog inputs on this I/O base in one multi-pair cable provided they have the same reference relative to ground.
- The actuator power supply must be protected in the same way as the signal itself.

Wiring Diagrams

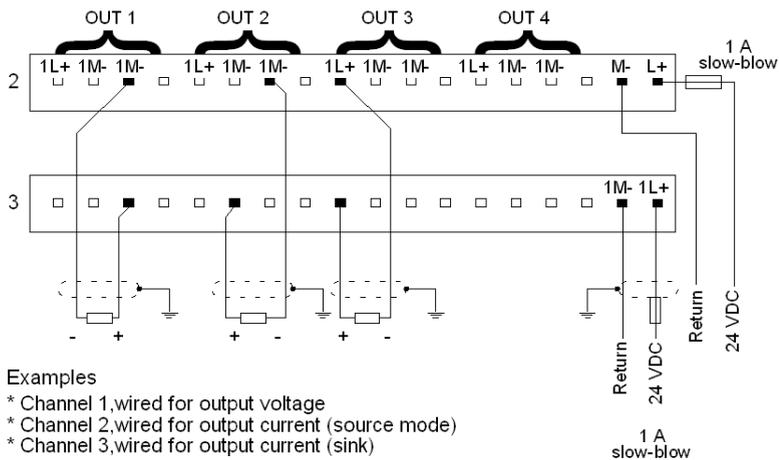
Overview

This section contains a diagram to assist you in wiring the following types of devices:

- output voltage
- output current (source mode)
- output current (sink) voltage

Diagram

Examples of wiring are shown in the diagram below:



I/O Mapping

Overview

The 170 AAO 120 00 TSX Momentum I/O base supports 4 analog outputs. This section contains information about the mapping of the output words into the analog output values and the usage of output words for channel configuration.

I/O Map

The I/O base must be mapped as five contiguous output words, as follows:

| Word | Output Data |
|---------|--|
| 1 = LSW | Parameters for output channels 1 ... 4 |
| 2 | Value, output channel 1 |
| 3 | Value, output channel 2 |
| 4 | Value, output channel 3 |
| 5 = MSW | Value, output channel 4 |

Analog Channel Parameters

Overview

Parameters must be set for all of the analog channels before the module can be commissioned. This section provides the codes for setting the parameters and gives examples of parameter settings.

NOTE: If you set new parameters for the module, always send a complete set of parameters (all channels, inputs and outputs), even if you only want to change a single parameter. Otherwise the module will refuse the new parameters and continue working with the old ones.

Key

This section focuses on output word 1, as highlighted in the table below:

| Word | Output Data |
|---------|---|
| 1 = LSW | Parameters for output channels 1 ... 4 |
| 2 | Value, output channel 1 |
| 3 | Value, output channel 2 |
| 4 | Value, output channel 3 |
| 5 = MSW | Value, output channel 4 |

Illustration

Parameters are set by entering a four-bit code in output word 1, as follows:

| Output Word 1 (Register 4x, parameter word) | | | | | | | | | | | | | | | |
|---|----|----|----|----------------------|----|---|---|----------------------|---|---|---|----------------------|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| for output channel 4 | | | | for output channel 3 | | | | for output channel 2 | | | | for output channel 1 | | | |

Parameter Codes

The value entered in this word defines the behaviour of the I/O module in case of loss of communication. Each 4-bit nibble in output word 1 must be configured with one of the following binary codes to define the channel parameters. Parameters must be set for all four channels before the module can be commissioned.

In each case, the x may be a 0 or a 1:

| Code | Output Parameter) | Function |
|------|-------------------|--|
| 0000 | Reserved value | Forces the I/O base into a default condition where it continues to receive field inputs according to the previous received-channel parameters. |
| 00x1 | Output to Zero | Sends a value to the base that causes it to apply zero at the field output. |
| 01x1 | Full Range | Sends a value to the base that causes it to apply full scale (+10 V or + 20 mA) at the field output. |
| 10x1 | Output Last Value | Sends a value to the base that causes it to apply the last received value at the field output. |

Analog Outputs

Overview

This section describes how to interpret the value of the analog output channels.

Key

This section describes output words 2 ... 5, as highlighted in the table below:

| Word | Output Data |
|---------|---------------------------------------|
| 1 = LSW | Parameters for input channels 1 ... 4 |
| 2 | Value, output channel 1 |
| 3 | Value, output channel 2 |
| 4 | Value, output channel 3 |
| 5 = MSW | Value, output channel 4 |

Analog Output Values

Mapping of analog output values is shown below.

| Output Word 2 (Register $4x+1$, analog value sent on channel 1) | | | | | | | | | | | | | | | |
|---|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

| Output Word 3 (Register $4x+2$, analog value sent on channel 2) | | | | | | | | | | | | | | | |
|---|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

| Output Word 4 (Register $4x+3$, analog value sent on channel 3) | | | | | | | | | | | | | | | |
|---|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

| Output Word 5 (Register $4x+4$, analog value sent on channel 4) | | | | | | | | | | | | | | | |
|---|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

Output Ranges

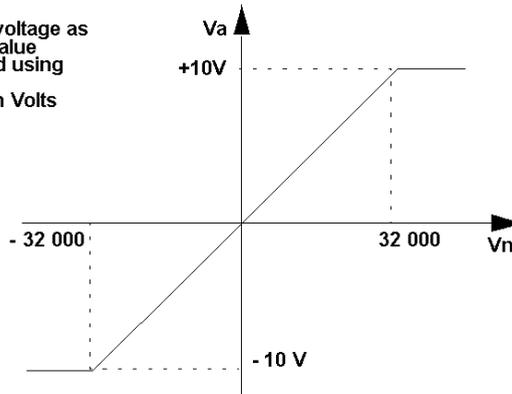
Overview

This section contains illustrations explaining the analog/digital relation for the voltage and current output ranges.

Voltage

The following illustration shows the analog/digital relation for voltage:

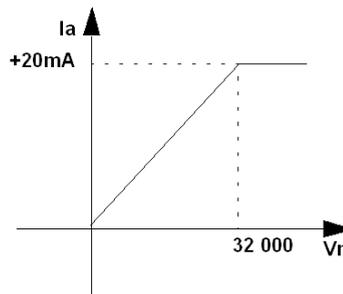
The value of the output voltage as a function of the digital value transmitted is determined using the formula:
 $V_a = 1/3200 \times V_n$ in Volts



Current

The following illustration shows the analog/digital relation for current:

The value of the output current as a function of the digital value transmitted is determined using the formula:
 $I_a = 1/1600 \times V_n$ in mA



Chapter 10

170 AAO 921 00 Analog 4 Channel Output Module Base +/- 10 V, 4 ... 20 mA

Overview

This chapter describes the 170 AAO 921 00 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|---------------------------|------|
| Front Panel Components | 162 |
| Specifications | 164 |
| Internal Pin Connections | 166 |
| Field Wiring Guidelines | 167 |
| Wiring Diagrams | 169 |
| I/O Mapping | 170 |
| Analog Channel Parameters | 171 |
| Analog Outputs | 173 |
| Output Ranges | 174 |

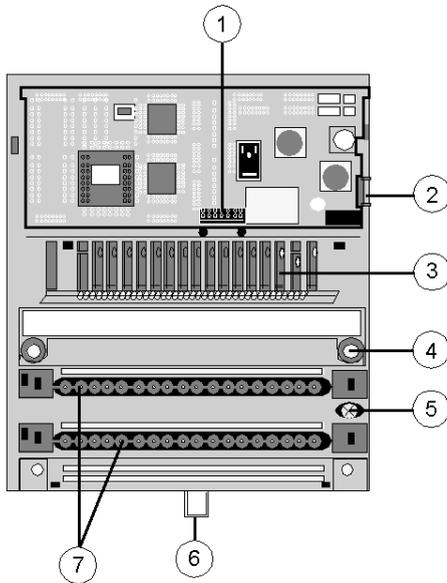
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 AAO 921 00 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

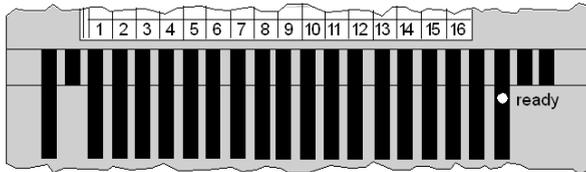


Components of the I/O module

| Label | Description |
|-------|--|
| 1 | Internal interface (ATI) connector |
| 2 | Locking and ground contact for the adapter |
| 3 | LED status display |
| 4 | Mounting holes for panel mount |
| 5 | Grounding screw |
| 6 | Locking tab for DIN rail mount |
| 7 | Sockets for the terminal connectors |

LED Illustration

This I/O base has one LED, the ready indicator shown in the illustration below.



LED Descriptions

The ready indicator is described in the table below.

| Indicator | Condition | Message |
|-----------|-----------|--|
| Ready | Green | Module is ready to communicate. Operating voltage for internal logic is present and self-test has been passed. |
| | Off | Module is not ready. Operation voltage is not present or module is defective. |

Specifications

Overview

This section contains specifications for the 170 AAO 921 00 I/O base.

General Specifications

| | |
|--|---------------------------------|
| Module type | 4 analog outputs |
| Output range | +/- 10 V 4 ... 20 mA |
| Supply voltage | 24 VDC |
| Supply voltage range | 20 ... 30 VDC |
| Supply current consumption (base) | max. 530 mA at 24 VDC |
| Supply current consumption (actuators) | max. 150 mA at 24 VDC (+/- 5 %) |
| Power dissipation | 5.6 W typical 8.5 W maximum |
| I/O map | 5 output words |

Isolation

| | |
|--------------------------------------|---|
| Between channels | none |
| Between base power supply and ground | 500 Vcc, 1 min |
| Between channels and ground | 500 VAC, 1 min |
| Output protections | short circuits (in voltage) circuits open in current polarity inversion |
| Base power supply protection | +/- 30 V (voltage or current output) |
| Common mode rejection | 250 VAC @ 47 ... 63 Hz or 250 VDC Channel-to-ground |

Fuses

| | |
|----------------------------------|---|
| Internal (not user-replaceable) | 2 A slow-blow |
| External (actuator power supply) | 1 A slow-blow (Bussmann GDC-1A or equivalent) |

EMC

| | |
|------------------|---|
| Immunity | IEC 1131-2 Surge on auxiliary power supply 500V |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE, FM Class 1 Div. 2 pending |

Physical Dimensions

| | |
|-------------------------|---|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) with no or one busbar |
| Weight | 215 g (0.45 lb) |

NOTE: The 24 VDC actuator power supply is protected in the same way as the analog outputs (different from the base power supply).

Analog Outputs

| | | |
|---------------------------------|--------------------------------------|--------------------------------------|
| Number of channels | 4 | |
| Format of transmitted data | full 16 bits signed (2's complement) | |
| Protection (base and actuators) | polarity inversion | |
| Range | +/-10 V | 4 ... 20 mA (current source or sink) |
| Load impedance | 1 KOhm minimum | 600 Ohms maximum |
| Capacitive load | < 1 micro F | < 1 micro F |
| Error at 25 deg. C | 0.2% PE* | 0.4% PE* |
| Error at 60 deg. C | 0.25% PE* | 0.5% PE* |
| Temperature drift (60 deg. C) | 10ppmPE*/ deg. C | 30ppmPE*/ deg. C |
| Resolution | 12 bits + sign | 12 bits + sign |
| Update time for the 4 outputs | 2 ms | |

NOTE: *Not to be confused with Protective Earth. PE is used here as a European notation for full scale, with the following values:

- 10 V in range of +/- 10 V
- 20mA in range of 4 ... 20 mA

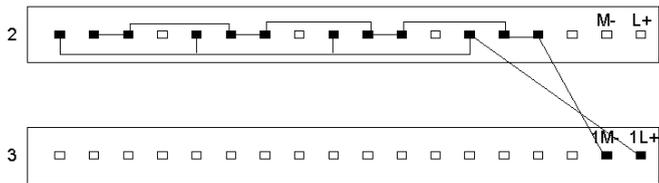
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base.

Illustration

The following illustration shows the internal connections between terminals.



Field Wiring Guidelines

Overview

This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Mapping Terminal Blocks

| |
|---|
| ⚠ CAUTION |
| POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES |
| Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes. |
| Failure to follow these instructions can result in injury or equipment damage. |

Mapping terminal blocks is described in the table below.

| Row | Terminal No. | Description | Function |
|-----|----------------------------|-------------|---------------------------------------|
| 2 | 4, 8, 12, 16 | - | Not used |
| | 1, 5, 9, 13 | 1L+ | +24 V actuator power supply output |
| | 2, 3, 6, 7, 10, 11, 14, 15 | 1M- | Actuator power supply neg. 0 V return |
| | 17 | M- | Module power supply 0 V |
| | 18 | L+ | Module power supply +24V |

| Row | Terminal No. | Description | Function |
|-----|--------------|----------------------------------|--|
| 3 | 1, 5, 9, 13 | OUT11-, OUTI2- OUTI3-, OUTI4- | Output current mode (sink) Channels 1 ... 4 |
| | 2, 6, 10, 14 | OUTI1+, OUTI2+ OUTI3+, OUTI4+ | Output current mode (source) Channels 1 ... 4 |
| | 3, 7, 11, 15 | OUTU1+, OUTU2+ OUTU3+, OUTU4+ | Output voltage mode Channels 1 ... 4 |
| | 4, 8, 12, 16 | - | Not used |
| | 17 | 1M- | Actuator power supply neg. 0 V return |
| | 18 | 1L+ | +24 V actuator power supply output |

Fuse Required

The 1 A slow-blow fuse shown in the wiring diagram (*see page 169*) must be wired into the actuator power supply.

Signal Protection

To protect the signal from external noise induced in serial or common mode, we recommend the following precautions.

- Use shielded twisted-pair cables with a minimum conductor cross section of 24 AWG or 0.22mm².
- Connect the cable shield to ground via the cable grounding rail (part number CER 001).
- You may combine the analog inputs on this I/O base in one multi-pair cable provided they have the same reference relative to ground.
- The actuator power supply must be protected in the same way as the signal itself.

Wiring Diagrams

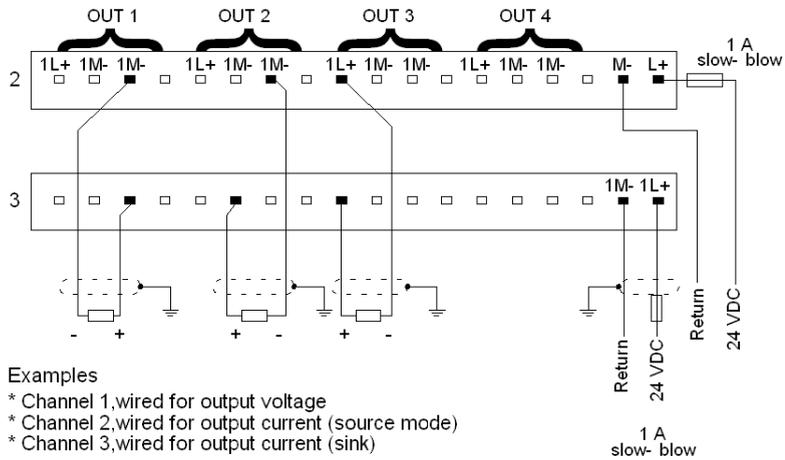
Overview

This section contains a diagram to assist you in wiring the following types of devices:

- output voltage
- output current (source mode)
- output current (sink) voltage

Diagram

Examples of wiring are shown in the diagram below:



I/O Mapping

Overview

The 170 AAO 921 00 TSX Momentum I/O base supports four analog output channels. This section contains information about the mapping of the I/O data into input words.

I/O Map

The I/O base must be mapped as five contiguous output words, as follows:

| Word | Output Data |
|---------|--|
| 1 = LSW | Parameters for output channels 1 ... 4 |
| 2 | Value for output channel 1 |
| 3 | Value for output channel 2 |
| 4 | Value for output channel 3 |
| 5 = MSW | Value for output channel 4 |

Analog Channel Parameters

Overview

Parameters must be set for all of the analog channels before the module can be commissioned. This section provides the codes for setting the parameters and gives examples of parameter settings.

NOTE: If you set new parameters for the module, always send a complete set of parameters (all channels, inputs and outputs), even if you only want to change a single parameter. Otherwise the module will refuse the new parameters and continue working with the old ones.

Key

This section focuses on output word 1, as highlighted in the table below:

| Word | Output Data |
|---------|---|
| 1 = LSW | Parameters for Output channels 1 ... 4 |
| 2 | Value, output channel 1 |
| 3 | Value, output channel 2 |
| 4 | Value, output channel 3 |
| 5= MSW | Value, output channel 4 |

Illustration

Parameters are set by entering a four-bit code in output word 1, as follows:

| Output Word 1 (Register 4x, parameter word) | | | | | | | | | | | | | | | |
|---|----|----|----|----------------------|----|---|---|----------------------|---|---|---|----------------------|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| for output channel 4 | | | | for output channel 3 | | | | for output channel 2 | | | | for output channel 1 | | | |

Parameter Codes

The value entered in this word defines the behaviour of the I/O module in case of loss of communication. Each 4-bit nibble in output word 1 must be configured with one of the following binary codes to define the channel parameters. Parameters must be set for all four channels before the module can be commissioned.

In each case, the x may be a 0 or a 1:

| Code | Output Parameter) | Function |
|------|-------------------|--|
| 0000 | Reserved value | Forces the I/O base into a default condition where it continues to receive field inputs according to the previous received channel parameters. |
| 00x1 | Output to Zero | Sends a value to the base that causes it to apply zero at the field output. |
| 01x1 | Full Range | Sends a value to the base that causes it to apply full scale (+10 V or + 20 mA) at the field output. |
| 10x1 | Output Last Value | Sends a value to the base that causes it to apply the last received value at the field output. |

Analog Outputs

Overview

This section describes how to interpret the value of the analog output channels.

Key

This section describes output words 2 ... 5, as highlighted in the table below:

| Word | Output Data |
|------|--|
| 1 | Parameters for output channels 1 ... 4 |
| 2 | Value, output channel 1 |
| 3 | Value, output channel 2 |
| 4 | Value, output channel 3 |
| 5 | Value, output channel 4 |

Analog Output Values

Mapping of analog output values is shown below.

| Output Word 2 (Register $4x+1$, analog value sent on channel 1) | | | | | | | | | | | | | | | |
|---|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

| Output Word 3 (Register $4x+2$, analog value sent on channel 2) | | | | | | | | | | | | | | | |
|---|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

| Output Word 4 (Register $4x+3$, analog value sent on channel 3) | | | | | | | | | | | | | | | |
|---|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

| Output Word 5 (Register $4x+4$, analog value sent on channel 4) | | | | | | | | | | | | | | | |
|---|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

Output Ranges

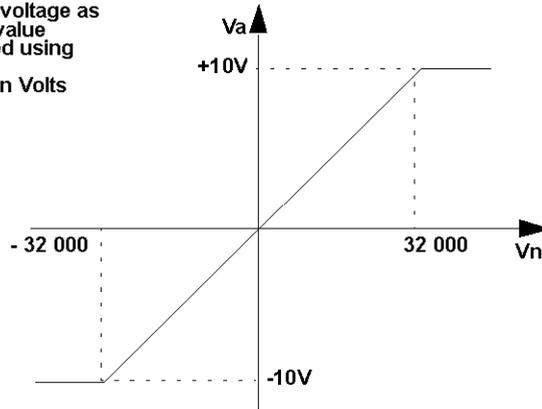
Overview

This section contains illustrations explaining the analog/digital relation for the voltage and current output ranges.

+/- 10 V

The following illustration shows the analog/digital relation at +/- 10 V:

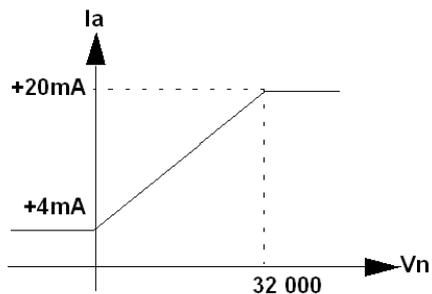
The value of the output voltage as a function of the digital value transmitted is determined using the formula:
 $V_a = 1/3200 \times V_n$ in Volts



4 ... 20 mA

The following illustration shows the analog/digital relation at 4 ... 20 mA current:

The value of the output current as a function of the digital value transmitted is determined using the formula:
 $I_a = 1/20000 \times V_n + 4$ in mA



Chapter 11

170 ADI 340 00 24 VDC - 16 Pt. Discrete Input Module Base

Overview

This chapter describes the 170 ADI 340 00 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------|------|
| Front Panel Components | 176 |
| Specifications | 178 |
| Internal Pin Connections | 180 |
| Field Wiring Guidelines | 181 |
| Wiring Diagrams | 183 |
| I/O Mapping | 185 |

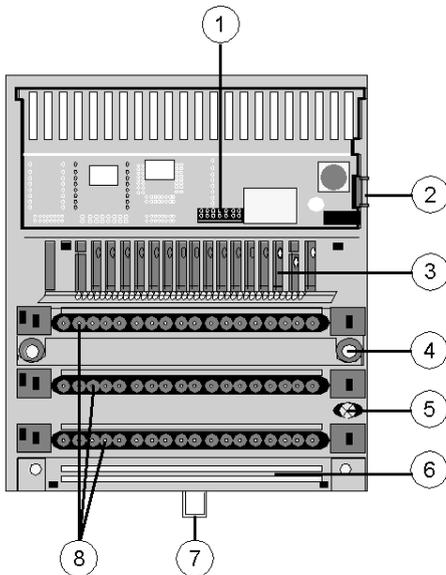
Front Panel Components

Overview

This section contains a photograph of the front panel of the 170 ADI 340 00 I/O base and a description of the LEDs.

Front Panel Illustration

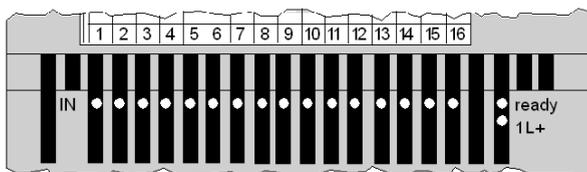
The front panel of the I/O base is shown in the illustration below.



| Label | Description |
|-------|--|
| 1 | Internal interface (ATI) connector |
| 2 | Locking and ground contact for the adapter |
| 3 | LED status display |
| 4 | Mounting holes for panel mount |
| 5 | Grounding screw |
| 6 | Busbar Mounting Slot |
| 7 | Locking tab for DIN rail mount |
| 8 | Sockets for the terminal connectors |

LED Illustration

This I/O base has one LED, the ready indicator shown in the illustration below.



LED Descriptions

The ready indicator is described in the table below.

| Indicator | Condition | Message |
|--------------|-----------|--|
| Ready | Green | Module is ready to communicate. Operating voltage for internal logic is present and self-test has been passed. |
| | Off | Module not ready |
| 1L+ | Green | Input voltage 1L+ of inputs 1 ... 16 is present |
| | Off | Input voltage of inputs 1 ... 16 is not present |
| IN 1...16 | Green | Input status (an LED per input); input point active, i.e. input carries a 1 signal (logically ON) |
| | Off | Input status (an LED per input); input point inactive, i.e. input carries a 0 signal (logically OFF) |

Specifications

Overview

This section contains specifications for the 170 ADI 340 00 I/O base.

General Specifications

| | |
|----------------------------|--|
| Module type | 16 discrete inputs in 1 group |
| Supply voltage | 24 VDC |
| Supply voltage range | 20...30 VDC |
| Supply current consumption | max. 250 mA at 24 VDC |
| Power dissipation | 6 W + (# of input points on x .144 W) |
| I/O map | 1 input word |

Isolation

| | |
|--------------------------------|---------------------------------------|
| Input to input | none |
| Field to communication adapter | Defined by Communication Adapter type |

Fuses

| | |
|-----------------------------|---|
| Internal | none |
| External: operating voltage | 1 A slow-blow (Bussmann GDC-1A or equivalent) |
| External: input voltage | According to the supply of the connected sensors—not to exceed 4A fast-blow |

EMC

| | |
|------------------|--|
| Immunity | IEC 1131-2 Surge on auxiliary power supply 500V |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE, FM Class 1 Div. 2 |

Physical Dimensions

| | |
|-------------------------|--|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars |
| Weight | 190 g (0.42 lb) |

Discrete Inputs

| | |
|---------------------|--|
| Number of points | 16 |
| Number of groups | 1 |
| Points per group | 16 |
| Signal type | True High |
| IEC 1131 type | 1+ (See appendix <i>IEC 1131 Input Types</i> , page 701 for definitions of IEC input types.) |
| ON voltage | +11 ... +30 VDC |
| OFF voltage | -3 ... +5 VDC |
| Input current | 2.5 mA minimum ON (6 mA at 24 VDC 1.2 mA maximum OFF) |
| Input voltage range | -3 ... +30 VDC |
| Input resistance | 4 kOhm |
| Response time | 2.2 ms OFF to ON 3.3 ms ON to OFF |

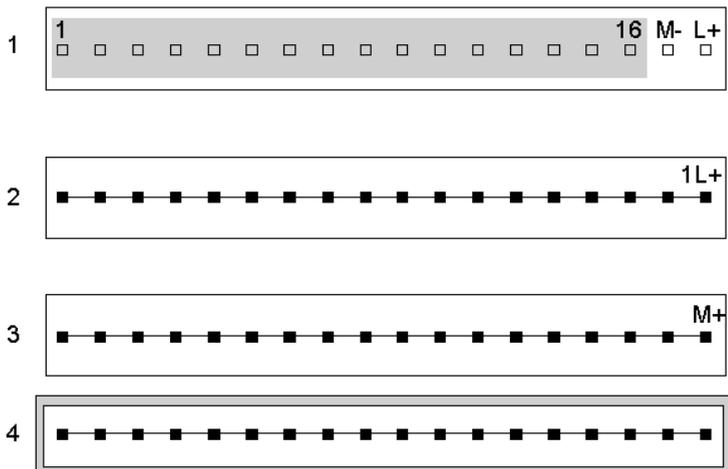
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional one-row busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 shows the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 1 of the base. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

If you are using 4-wire devices, you will need a 1-row busbar to connect them to protective earth (PE).

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 006 01 |
| Spring-clip | 170 XTS 007 01 |

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

A busbar may be attached to this I/O base to provide a fourth row for protective earth (PE).

| Row | Terminal | Function |
|-----|----------|---|
| 1 | 1...16 | Inputs |
| | 17 | Return (M-) |
| | 18 | + 24 VDC Operating voltage (L+) |
| 2 | 1 ... 17 | Sensor/input device voltages |
| | 18 | + 24 VDC for inputs |
| 3 | 1 ... 17 | Returns for sensor/input devices (for 3-and 4-wire devices) |
| | 18 | Return for inputs |
| 4 | 1 ... 18 | Protective earth (PE) |

Wiring Diagrams

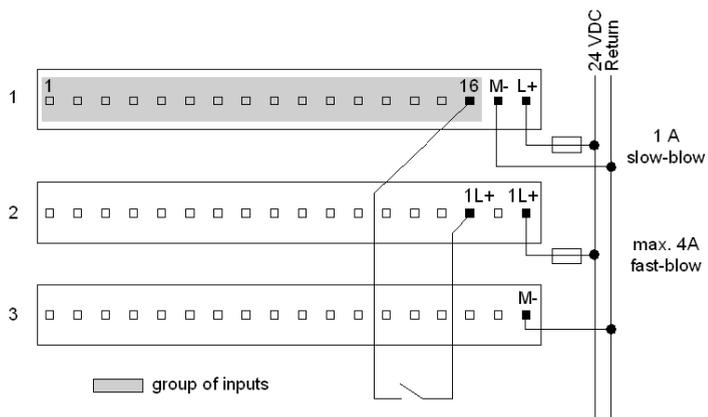
Overview

This section contains an illustration to assist you in wiring the following types of devices:

- 4-wire configuration
- 3-wire configuration
- 2-wire configuration

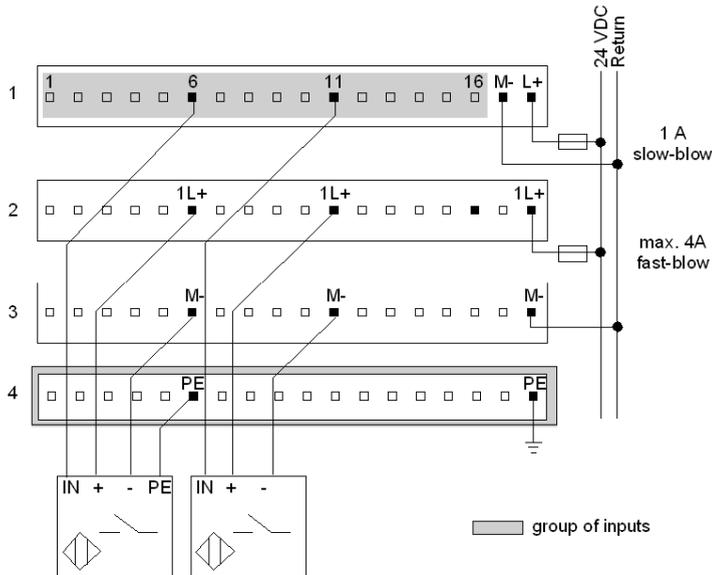
2-Wire Devices

The diagram below shows an example of wiring for 2-wire devices:



3- and 4-Wire Devices

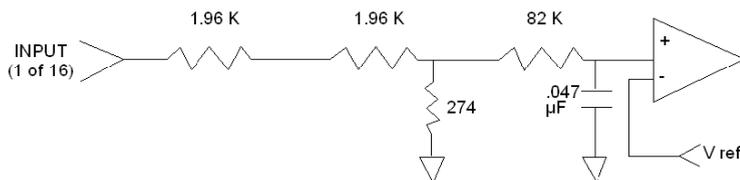
The diagram below shows an example of wiring for 3- and 4-wire devices:



A 1-row busbar is used to provide PE for the 4-wire sensor. No busbar would be required if only 2- and/or 3-wire sensors were used.

Simplified Schematics

The following diagram shows the field-side input circuitry.



I/O Mapping

Overview

The 170 ADI 340 00 TSX Momentum I/O base supports 16 discrete inputs. This section contains information about the mapping of the I/O data into input words.

I/O Map

The I/O base may be mapped as one input word, or as 16 discrete input points.

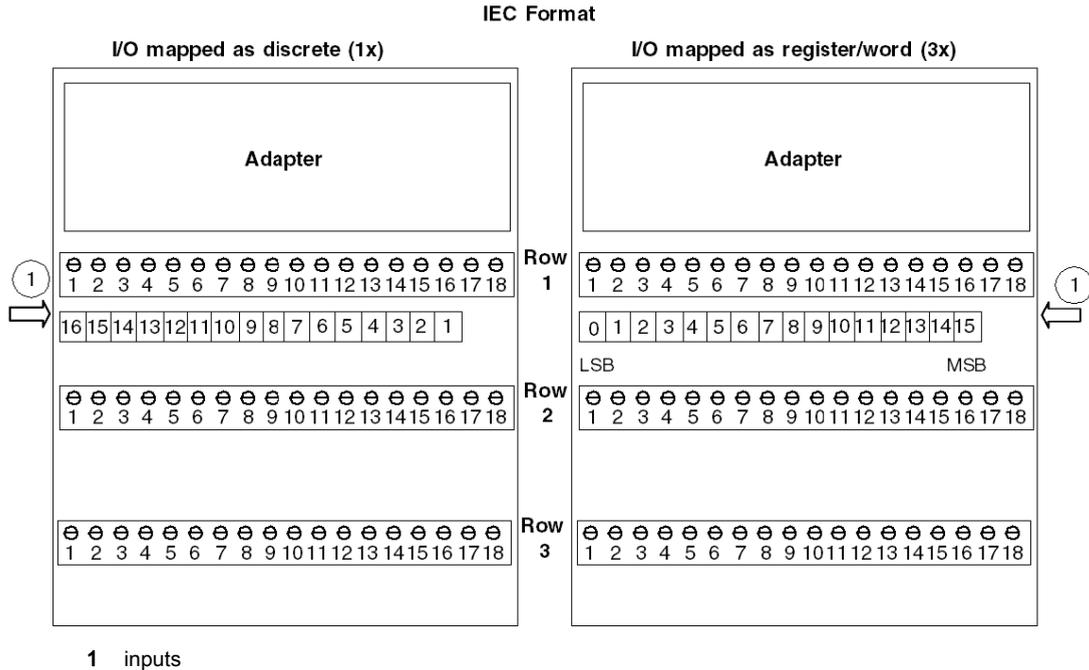
IEC vs. Ladder Logic

In order to correctly field wire the inputs and map the input data, you need to know which type of Momentum Adapter is mounted on the base. Adapters may either be IEC compliant or 984 Ladder Logic compliant.

| | IEC Compliant | 984 Ladder Logic Compliant |
|---------------------------------|---|--|
| Momentum Processor Adapters | All | None |
| Momentum Communication Adapters | All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 | 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 |

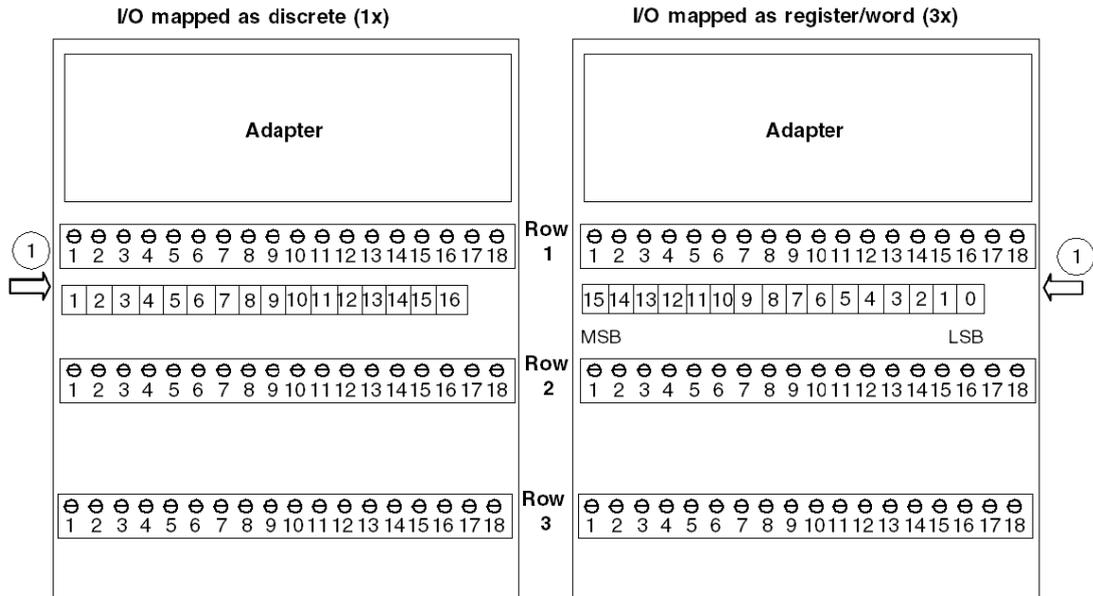
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (1x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (3x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



The figure below shows how data is mapped on the I/O base with a 984 Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (1x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (3x), the MSB is assigned to Pin 1 (bit 15) and the LSB (bit 0) is assigned to Pin 16.

984 Format



1 inputs

Chapter 12

170 ADI 350 00 24 VDC - 32 Pt. Discrete Input Module Base

Overview

This chapter describes the 170 ADI 350 00 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------|------|
| Front Panel Components | 190 |
| Specifications | 192 |
| Internal Pin Connections | 194 |
| Field Wiring Guidelines | 195 |
| Wiring Diagrams | 197 |
| I/O Mapping | 199 |

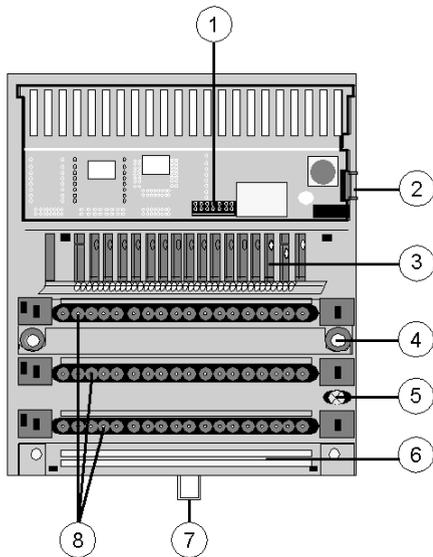
Front Panel Components

Overview

This section contains a photograph of the front panel of the 170 ADI 350 00 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

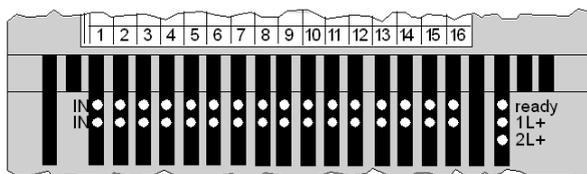


Components of the I/O module

| Label | Description |
|-------|--|
| 1 | Internal interface (ATI) connector |
| 2 | Locking and ground contact for the adapter |
| 3 | LED status display |
| 4 | Mounting holes for panel mount |
| 5 | Grounding screw |
| 6 | Busbar Mounting Slot |
| 7 | Locking tab for DIN rail mount |
| 8 | Sockets for the terminal connectors |

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

| Indicator | Condition | Message |
|----------------------------|-----------|--|
| Ready | Green | Module is ready to communicate. Operating voltage for internal logic (5 V) is present |
| | Off | Module not ready |
| 1L+ | Green | Input voltage 1L+ of inputs 1 ... 16 (group 1) is present |
| | Off | Input voltage of inputs 1 ... 16 (group 1) is not present |
| 2L+ | Green | Input voltage 2L+ of inputs 17 ... 32 (group 2) is present |
| | Off | Input voltage of inputs 17 ... 32 (group 2) is not present |
| Upper row IN 1...16 | Green | Input status (an LED per input) group 1; input point active, i.e. input carries a 1 signal (logically ON) |
| | Off | Input status (an LED per input) group 1; input point inactive, i.e. input carries a 0 signal (logically OFF) |
| Middle row IN 1...16 | Green | Input status (an LED per input) group 2; input point active, i.e. input carries a 1 signal (logically ON) |
| | Off | Input status (an LED per input) group 2; input point inactive, i.e. input carries a 0 signal (logically OFF) |

Specifications

Overview

This section contains specifications for the 170 ADI 350 00 I/O base.

General Specifications

| | |
|----------------------------|--|
| Module type | 32 discrete inputs in 2 groups (16 inputs per group) |
| Supply voltage | 24 VDC |
| Supply voltage range | 20...30 VDC |
| Supply current consumption | max. 250 mA at 24 VDC |
| Power dissipation | 6 W + (# of input points on x .144 W) |
| I/O map | 2 input word |

Isolation

| | |
|--------------------------------|---------------------------------------|
| Input to input | none |
| Field to communication adapter | Defined by Communication Adapter type |

Fuses

| | |
|-----------------------------|---|
| Internal | none |
| External: operating voltage | 1 A slow-blow (Bussmann GDC-1A or equivalent) |
| External: input voltage | According to the supply of the connected sensors—not to exceed 4A fast-blow |

EMC

| | |
|------------------|--|
| Immunity | IEC 1131-2 Surge on auxiliary power supply 500V |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE, FM Class 1 Div.2 pending |

Physical Dimensions

| | |
|-------------------------|--|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars |
| Weight | 200 g (0.44 lb) |

Discrete Inputs

| | |
|---------------------|--|
| Number of points | 32 |
| Number of groups | 2 |
| Points per group | 16 |
| Signal type | True High |
| IEC 1131 type | 1+ (See appendix <i>IEC 1131 Input Types</i> , page 701 for definitions of IEC input types.) |
| ON voltage | +11 ... +30 VDC |
| OFF voltage | -3 ... +5 VDC |
| Input current | 2.5 mA minimum ON(6 mA at 24 VDC 1.2 mA maximum OFF |
| Input voltage range | -3 ... +30 VDC |
| Input resistance | 4 kOhm |
| Response time | 2.2 ms OFF to ON 3.3 ms ON to OFF |

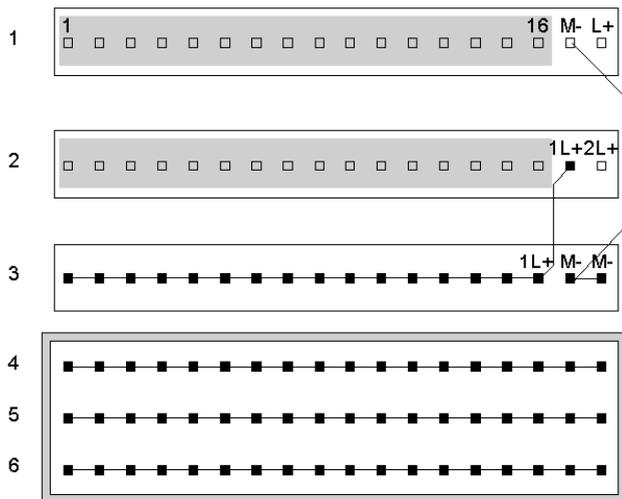
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 6 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3- row busbar. The following busbars are available from Schneider Electric:

| Type | Number of Rows | Part Number |
|-------------|----------------|----------------|
| Screw-in | 1 - row | 170 XTS 006 01 |
| | 2 - row | 170 XTS 005 01 |
| | 3 - row | 170 XTS 004 01 |
| Spring-clip | 1 - row | 170 XTS 007 01 |
| | 2 - row | 170 XTS 008 01 |
| | 3 - row | 170 XTS 003 01 |

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

| Row | Terminal | Function |
|-----|----------|--|
| 1 | 1...16 | Inputs for group 1 |
| | 17 | Return (M-) |
| | 18 | + 24 VDC Operating voltage (L+) |
| 2 | 1 ... 16 | Inputs for group 2 |
| | 17/18 | + 24 VDC for input group 1 (1L+) and group 2 (2L+) |
| 3 | 1 ... 16 | Input voltage for inputs 1 ... 16 |
| | 17/18 | Return (M-) |
| 4 | 1 ... 18 | Input voltage for inputs 17 ... 32 |
| 5 | 1 ... 18 | Return (M-) |
| 6 | 1 ... 18 | Return (M-) or Protective earth (PE) |

Wiring Diagrams

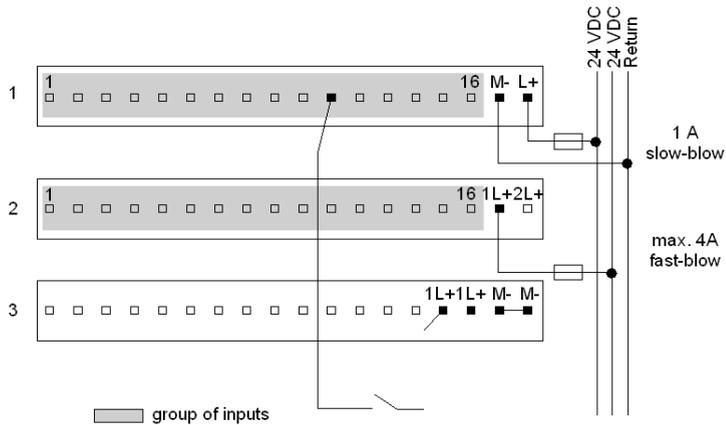
Overview

This section contains a diagram to assist you in wiring the following types of devices:

- 2-wire configuration
- 3-wire configuration

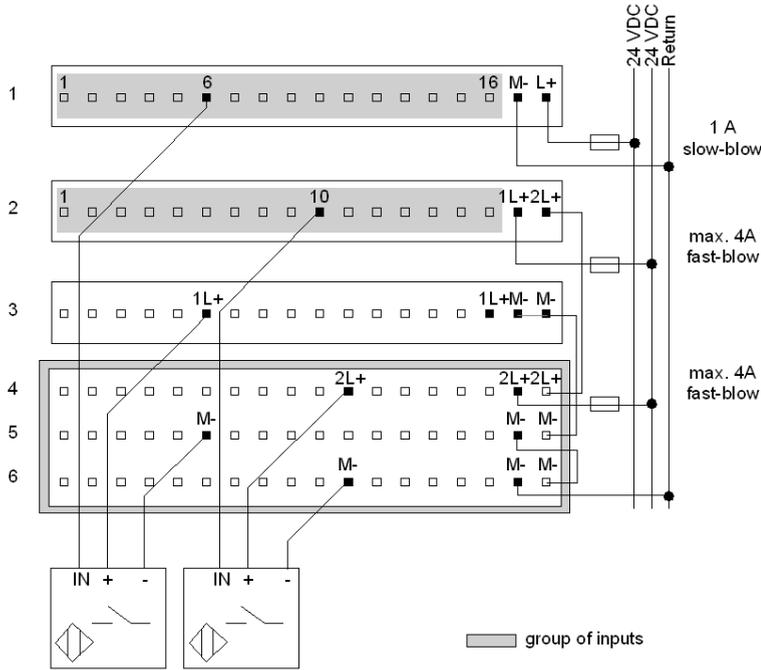
2-Wire Devices

The diagram below shows an example of wiring for two-wire devices. This example uses an input from one group of input points. If you feed inputs using points from both input groups, you will need a busbar.



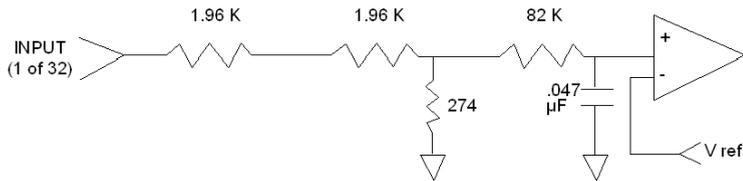
3-Wire Devices

The diagram below shows an example of wiring for 3-wire devices:



Simplified Schematics

The following diagram shows the field-side input circuitry.



I/O Mapping

Overview

The 170 ADI 350 00 TSX Momentum I/O base supports 32 discrete inputs. This section contains information about the mapping of the I/O data into input words.

I/O Map

The I/O base may be mapped as two 16-bit input words, or as 32 discrete input points.

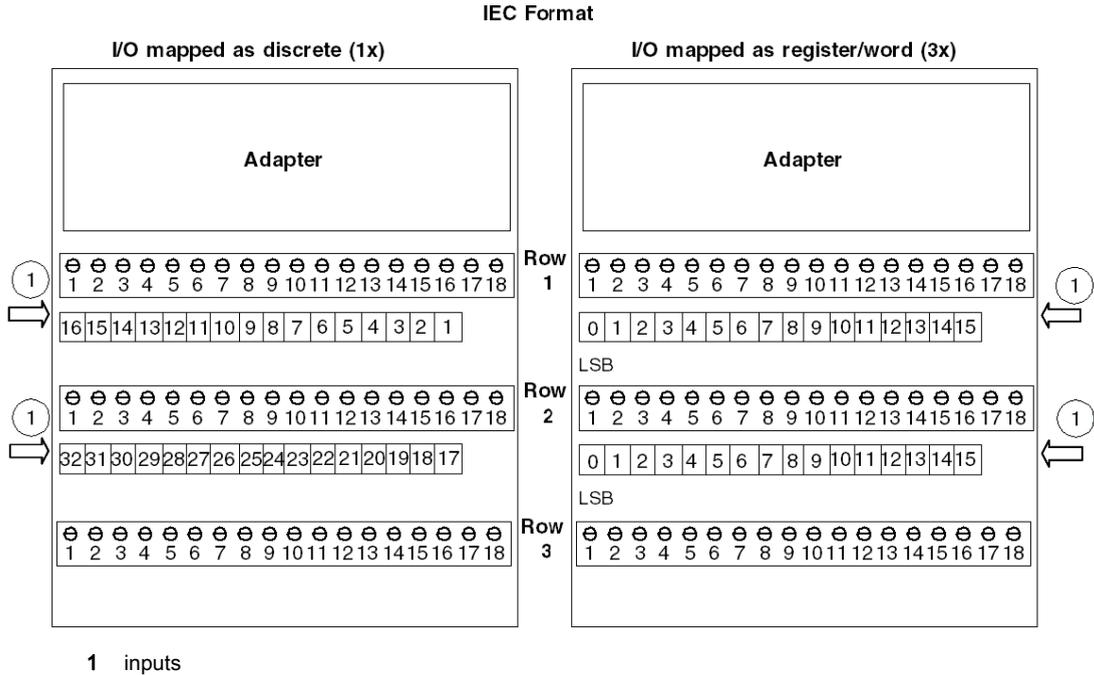
IEC vs. Ladder Logic

In order to correctly field wire the inputs and map the input data, you need to know which type of Momentum Adapter is mounted on the base. Adapters may be either IEC compliant or 984 Ladder Logic compliant:

| | IEC Compliant | 984 Ladder Logic Compliant |
|---------------------------------|---|--|
| Momentum Processor Adapters | All | None |
| Momentum Communication Adapters | All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 | 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 |

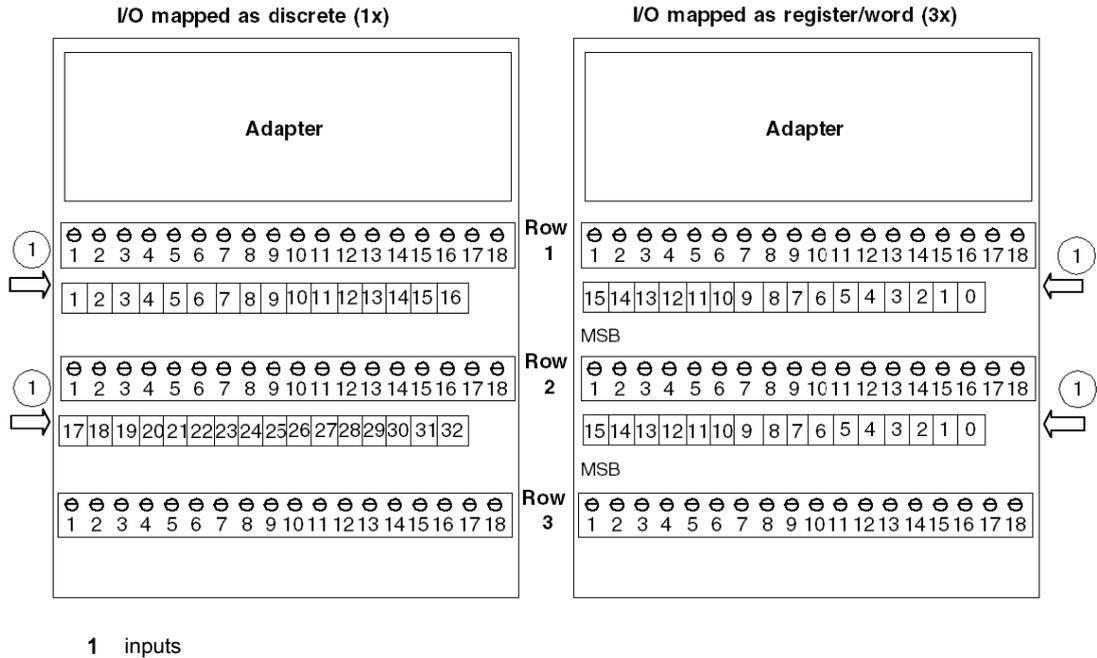
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (1x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (3x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



The figure below shows how data is mapped on the I/O base with a 984 Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (1x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (3x), the MSB (bit15) is assigned to Pin 1 and the LSB (bit 0) is assigned to Pin 16.

984 Format



Chapter 13

170 ADI 540 50 120 VAC - 16 Point Discrete Input Module Base

Overview

This chapter describes the 170 ADI 540 50 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------|------|
| Front Panel Components | 204 |
| Specifications | 206 |
| Internal Pin Connections | 209 |
| Field Wiring Guidelines | 210 |
| Wiring Diagrams | 211 |
| I/O Mapping | 213 |

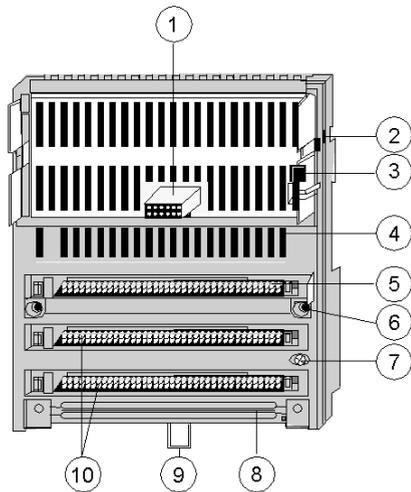
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADI 540 50 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

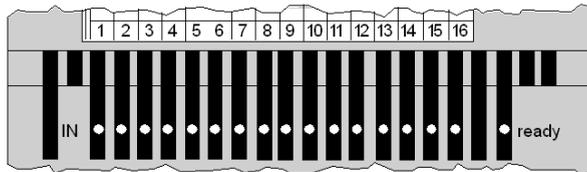


Components of the I/O module

| Label | Description |
|-------|-------------------------------------|
| 1 | Internal interface (ATI) connector |
| 2 | Locking tab for the adapter |
| 3 | Ground contact for the adapter |
| 4 | LED status display |
| 5 | Module power and field inputs |
| 6 | Mounting holes for panel mount |
| 7 | Grounding screw |
| 8 | Busbar Mounting Slot |
| 9 | Locking tab for DIN rail mount |
| 10 | Sockets for the terminal connectors |

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

| Indicator | Condition | Message |
|--------------------------|-----------|--|
| Ready | Green | Module is ready to communicate on network |
| | Off | Module not ready to communicate |
| Upper row IN 1 ... 16 | Green | Input status (an LED per input); input point active, i.e. input carries a 1 signal (logically ON) |
| | Off | Input status (an LED per input); input point inactive, i.e. input carries a 0 signal (logically OFF) |

Specifications

Overview

This section contains specifications for the 170 ADI 540 50 I/O base.

General Specifications

| | |
|----------------------------|---------------------------------------|
| Module type | 16 discrete inputs in 2 groups |
| Supply voltage | 120 VAC |
| Supply voltage range | 85 ... 132 VAC RMS @ 47 ... 63 Hz |
| Supply current consumption | 125 mA at 120 VAC |
| Power dissipation | 4 W + (# of input points on x .62 W) |
| I/O map | 1 input word |

Isolation

| | |
|--------------------------------|----------|
| Input to input | none |
| Group to Group | 1780 VAC |
| Field to communication adapter | 1780 VAC |

Fuses

| | |
|----------------------------|--|
| Internal (non-replaceable) | 200 mA slow-blow |
| External (module power) | 200 mA slow-blow (Wickmann 19502000 mA or equivalent) |

EMC

| | |
|------------------|--|
| Immunity | IEC 1131-2 Surge on auxiliary power supply 2 kV |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE FM Class 1, Div. 2 |

Physical Dimensions

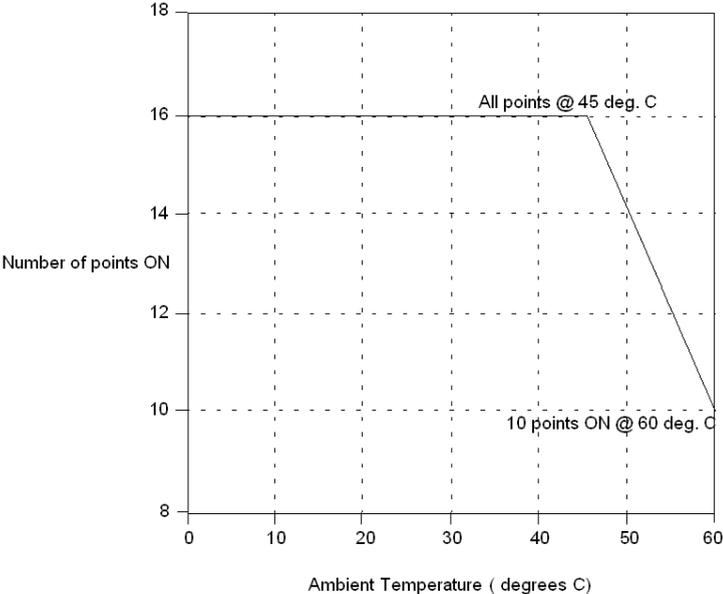
| | |
|-------------------------|--|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 52 mm (2.05 in) |
| Length | 141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars |
| Weight | 284 g (10 oz) |

Discrete Inputs

| | |
|----------------------------|---|
| Number of points | 16 |
| Number of groups | 2 |
| Points per group | 8 |
| Signal type | True High |
| Input current | 10 mA minimum ON 2 mA maximum OFF |
| Input resistance (nominal) | 9.5 kOhm @ 50 7.5 kOhm @ 60 |
| Switching level | 74 VAC minimum ON 20 VAC minimum OFF |
| Response time | 35 ms @ 60 Hz ON to OFF 10 ms @ 60 Hz OFF to ONF |

Derating Curve

The diagram below depicts the derating curve for this I/O base.



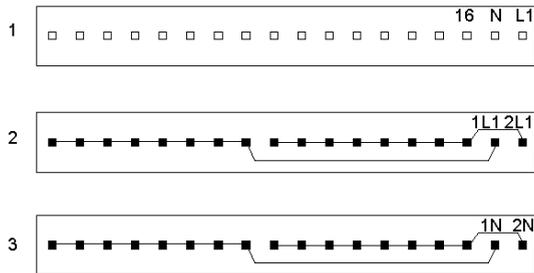
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base.

Illustration

The following illustration shows the internal connections between terminals.



Field Wiring Guidelines

Overview

Inputs are field wired to row 1 of the base. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks.

| Row | Terminal | Function |
|-----|----------|----------------------------------|
| 1 | 1...16 | Inputs |
| | 17 | Neutral - 120 VAC for module (N) |
| | 18 | Line - 120 VAC for module (L1) |
| 2 | 1 ... 8 | Input group 1 - line (1L1) |
| | 9 ... 16 | Input group 2 - line (2L1) |
| | 17 | Line for inputs group 1 (1L1) |
| | 18 | Line for inputs group 2 (2L1) |
| 3 | 1 ... 8 | Input group 1 - neutral (1N) |
| | 9 ... 16 | Input group 2 - neutral (2N) |
| | 17 | Neutral for inputs group 1 (1N) |
| | 18 | Neutral for inputs group 2 (2N1) |

Wiring Diagrams

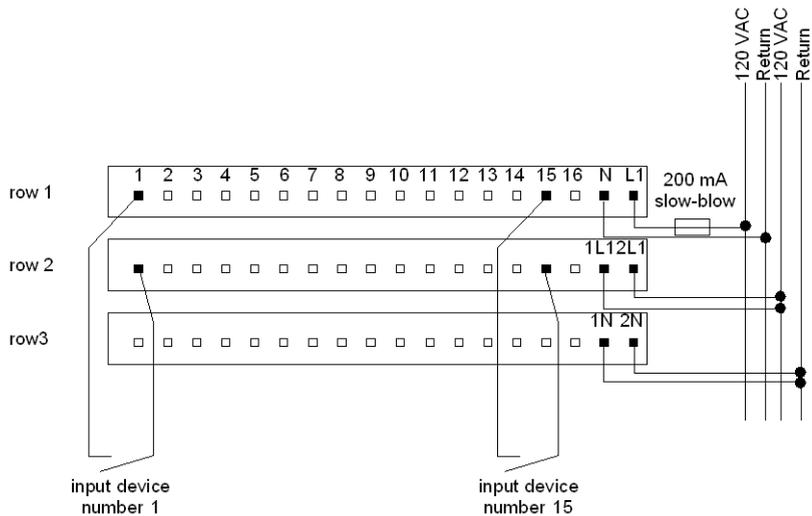
Overview

This section contains diagrams to assist you in wiring the following types of devices:

- 2-wire configuration
- 3-wire configuration

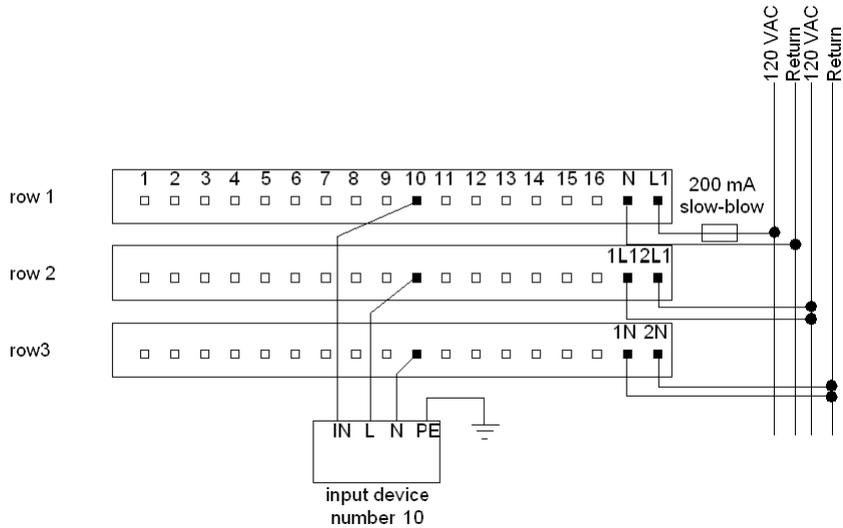
2-Wire Devices

The diagram below shows an example of wiring for 2-wire devices:



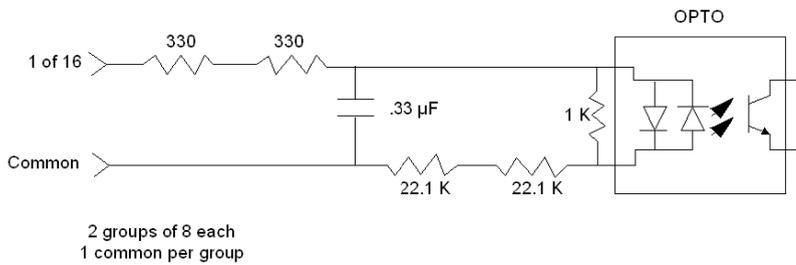
3-Wire Devices

The diagram below shows an example of wiring for 3-wire devices:



Simplified Schematics

The following diagram shows the field-side input circuitry.



I/O Mapping

Overview

The 170 ADI 540 50 TSX Momentum I/O base supports 16 discrete inputs. This section contains information about the mapping of the I/O data into input words.

I/O Map

The I/O base may be mapped as one input word, or as 16 discrete input points.

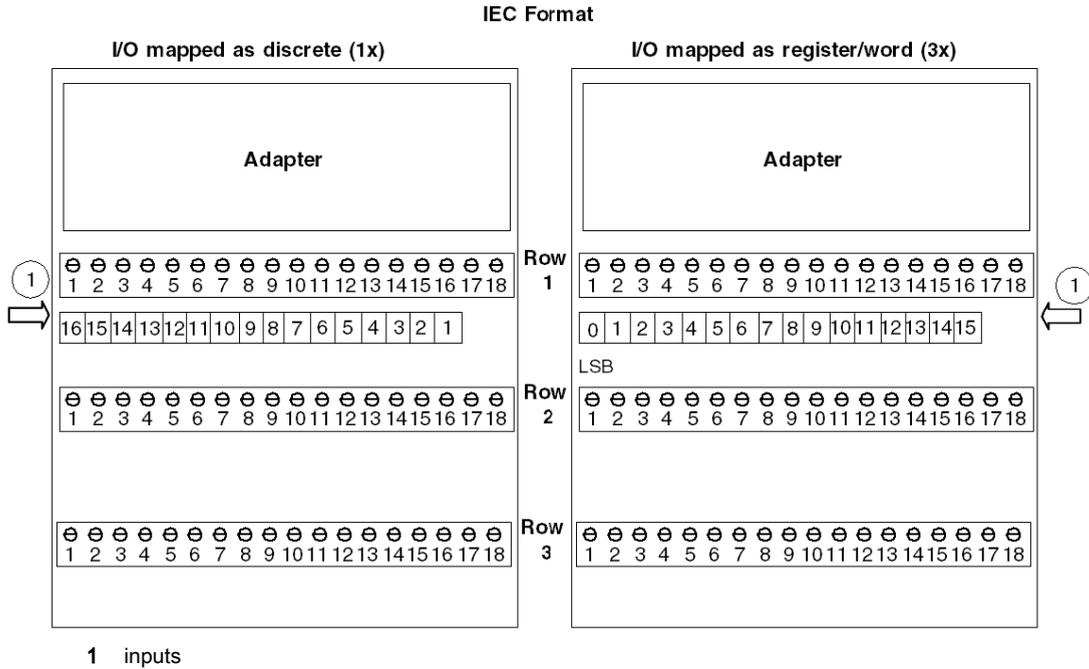
IEC vs. Ladder Logic

In order to correctly field wire the inputs and map the input data, you need to know which type of Momentum adapter is mounted on the base. Adapters may be either IEC compliant or 984 ladder logic compliant.

| | IEC Compliant | 984 Ladder Logic Compliant |
|---------------------------------|---|--|
| Momentum Processor Adapters | All | None |
| Momentum Communication Adapters | All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 | 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 |

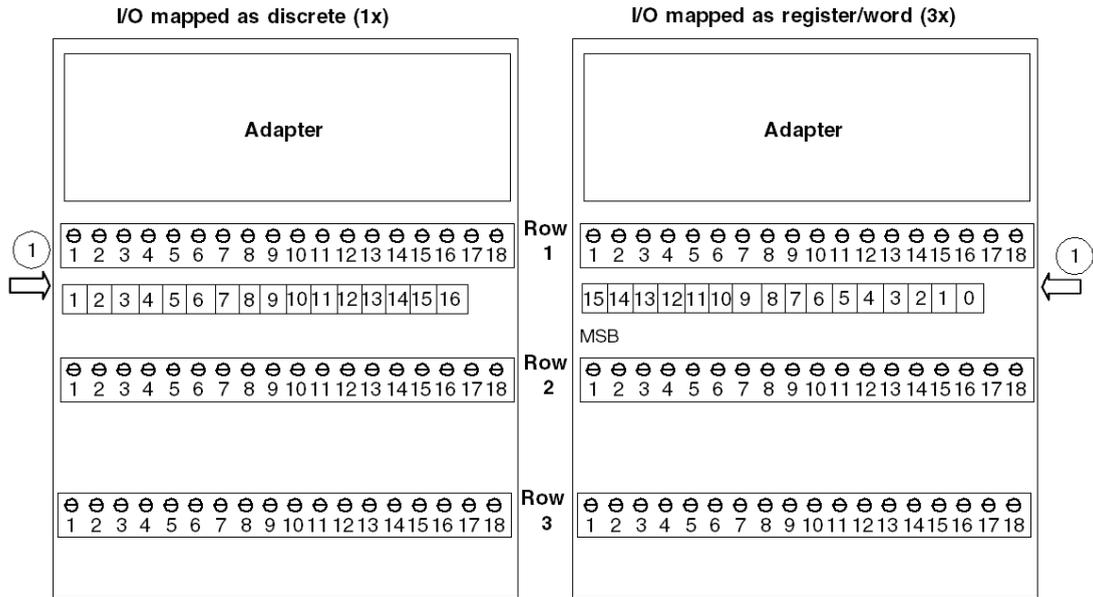
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC compliant adapter. When the I/O is mapped as discrete points (1x), the MSB is assigned to pin 1 and the LSB is assigned to pin 16. When the I/O is mapped as a word or register (3x), the MSB (bit 15) is assigned to pin 16 and the LSB (bit 0) is assigned to pin 1.



The figure below shows how data is mapped on the I/O base with a 984 ladder logic compliant adapter. When the I/O is mapped as discrete points (1x), the MSB is assigned to pin 16 and the LSB is assigned to pin 1. When the I/O is mapped as a word or register (3x), the MSB (bit 15) is assigned to pin 1 and the LSB (bit 0) is assigned to pin 16.

984 Format



1 inputs

Chapter 14

170 ADI 740 50 230 VAC - 16 Point Discrete Input Module Base

Overview

This chapter describes the 170 ADI 740 50 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------|------|
| Front Panel Components | 218 |
| Specifications | 220 |
| Internal Pin Connections | 223 |
| Field Wiring Guidelines | 224 |
| Wiring Diagrams | 225 |
| I/O Mapping | 227 |

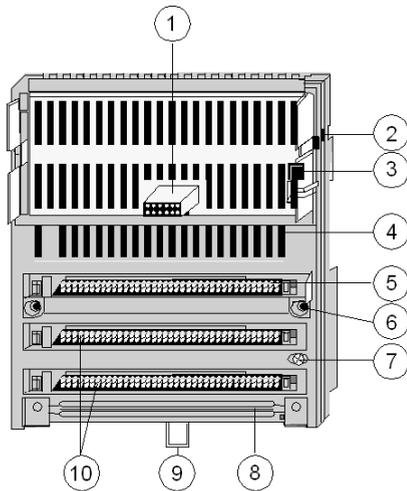
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADI 740 50 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

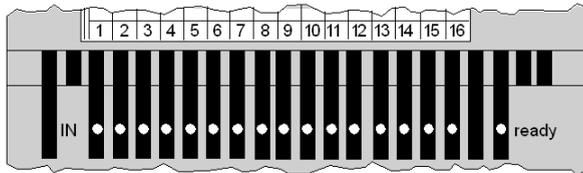


Components of the I/O module

| Label | Description |
|-------|-------------------------------------|
| 1 | Internal interface (ATI) connector |
| 2 | Locking tab for the adapter |
| 3 | Ground contact for the adapter |
| 4 | LED status display |
| 5 | Module power and field inputs |
| 6 | Mounting holes for panel mount |
| 7 | Grounding screw |
| 8 | Busbar Mounting Slot |
| 9 | Locking tab for DIN rail mount |
| 10 | Sockets for the terminal connectors |

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

| Indicator | Condition | Message |
|--------------------------|-----------|---|
| Ready | Green | Module is ready to communicate on network |
| | Off | Module not ready to communicate |
| Upper row IN 1 ... 16 | Green | Input status (an LED per input); input point active, i.e. input carries a 1 signal (logically ON) |
| | Off | Input status (an LED per input); input point inactive, i.e. input carries a 0 signal (logically OFF) |

Specifications

Overview

This section contains specifications for the 170 ADI 740 50 I/O base.

General Specifications

| | |
|----------------------------|---------------------------------------|
| Module type | 16 discrete inputs in 2 groups |
| Supply voltage | 230 VAC |
| Supply voltage range | 164 - 253 VAC RMS @ 47 ... 63 Hz |
| Supply current consumption | 50 mA at 230 VAC |
| Power dissipation | 4 W + (# of input points on x .62 W) |
| I/O map | 1 input word |

Isolation

| | |
|--------------------------------|----------|
| Input to input | none |
| Group to Group | 1780 VAC |
| Field to communication adapter | 1780 VAC |

Fuses

| | |
|----------------------------|--|
| Internal (non-replaceable) | 200 mA slow-blow |
| External (module power) | 200 mA slow-blow (Wickmann 195020000 mA or equivalent) |

EMC

| | |
|------------------|--|
| Immunity | IEC 1131-2 Surge on auxiliary power supply 2 kV |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE FM Class 1, Div.2 pending |

Physical Dimensions

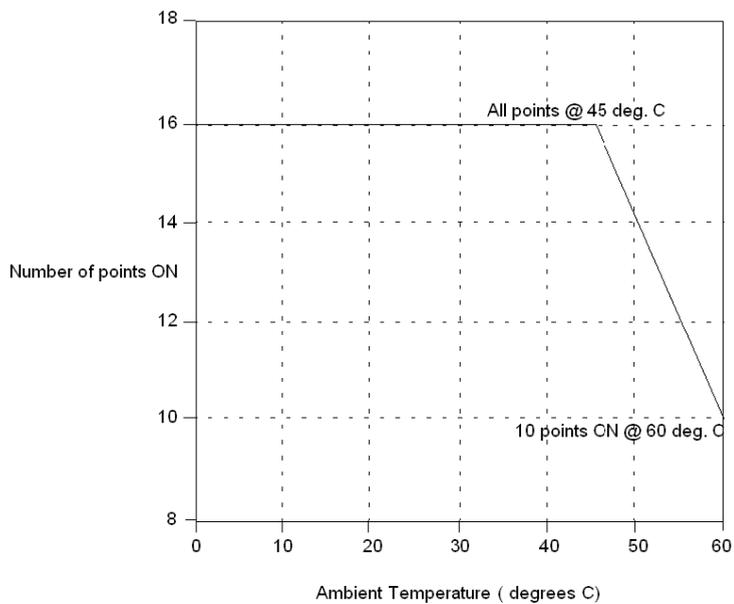
| | |
|-------------------------|--|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 52 mm (2.05 in) |
| Length | 141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars |
| Weight | 284 g (10 oz) |

Discrete Inputs

| | |
|----------------------------|---|
| Number of points | 16 |
| Number of groups | 2 |
| Points per group | 8 |
| Signal type | True High |
| Input current | 10 mA minimum ON 2 mA maximum OFF |
| Input resistance (nominal) | 9.5 kOhm @ 50 Hz 7.5 kOhm @ 60 Hz |
| Switching level | 164 VAC minimum ON 40 VAC minimum OFF |
| Response time | 13.3 ms @ 60 Hz ON to OFF 13.0 ms @ 60 Hz OFF to ONF |

Derating Curve

The diagram below depicts the derating curve for this I/O base.



At 60 degrees C and maximum input voltage, the number of points allowed ON is 10.

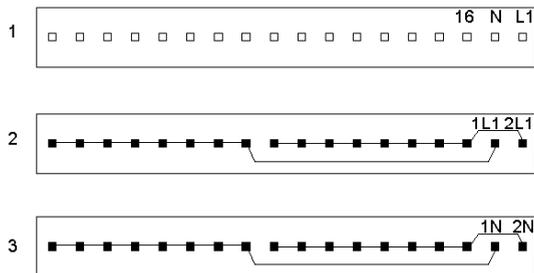
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base.

Illustration

The following illustration shows the internal connections between terminals.



Field Wiring Guidelines

Overview

Inputs are field wired to row 1 of the base. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks

| Row | Terminal | Function |
|-----|----------|----------------------------------|
| 1 | 1...16 | Inputs |
| | 17 | Neutral - 230 VAC for module (N) |
| | 18 | Line - 230 VAC for module (L1) |
| 2 | 1 ... 8 | Input group 1 - line (1L1) |
| | 9 ... 16 | Input group 2 - line (2L1) |
| | 17 | Line for inputs group 1 (1L1) |
| | 18 | Line for inputs group 2 (2L1) |
| 3 | 1 ... 8 | Input group 1 - neutral (1N) |
| | 9 ... 16 | Input group 2 - neutral (2N) |
| | 17 | Neutral for inputs group 1 (1N) |
| | 18 | Neutral for inputs group 2 (2N1) |

Wiring Diagrams

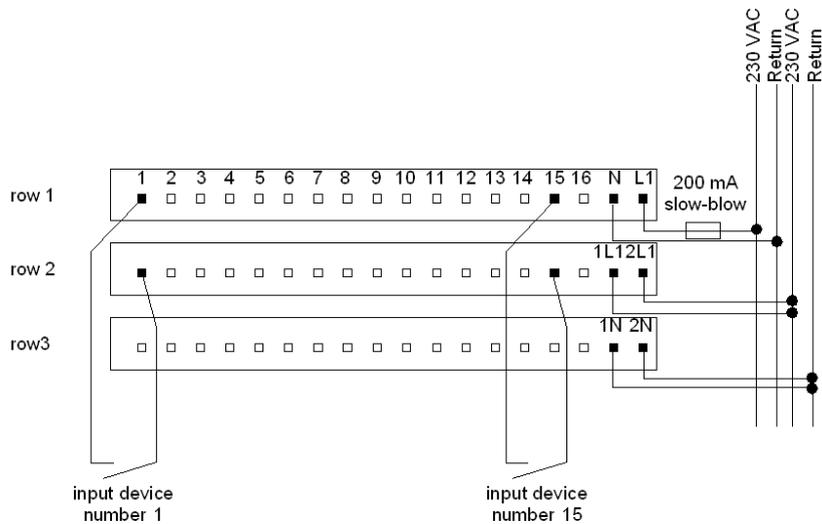
Overview

This section contains diagrams to assist you in wiring the following types of devices:

- 2-wire configuration
- 3-wire configuration

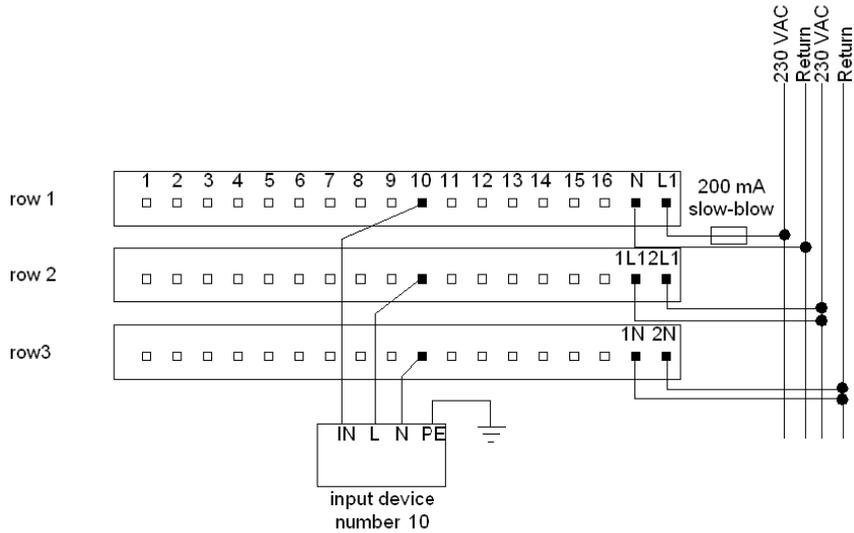
2-Wire Devices

The diagram below shows an example of wiring for 2-wire devices:



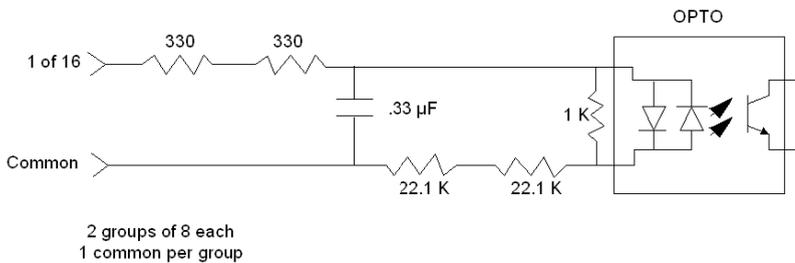
3-Wire Devices

The diagram below shows an example of wiring for 3-wire devices:



Simplified Schematics

The following diagram shows the field-side input circuitry.



I/O Mapping

Overview

The 170 ADI 740 50 TSX Momentum I/O base supports 16 discrete inputs. This section contains information about the mapping of the I/O data into input words.

I/O Map

The I/O base may be mapped as one input word, or as 16 discrete input points.

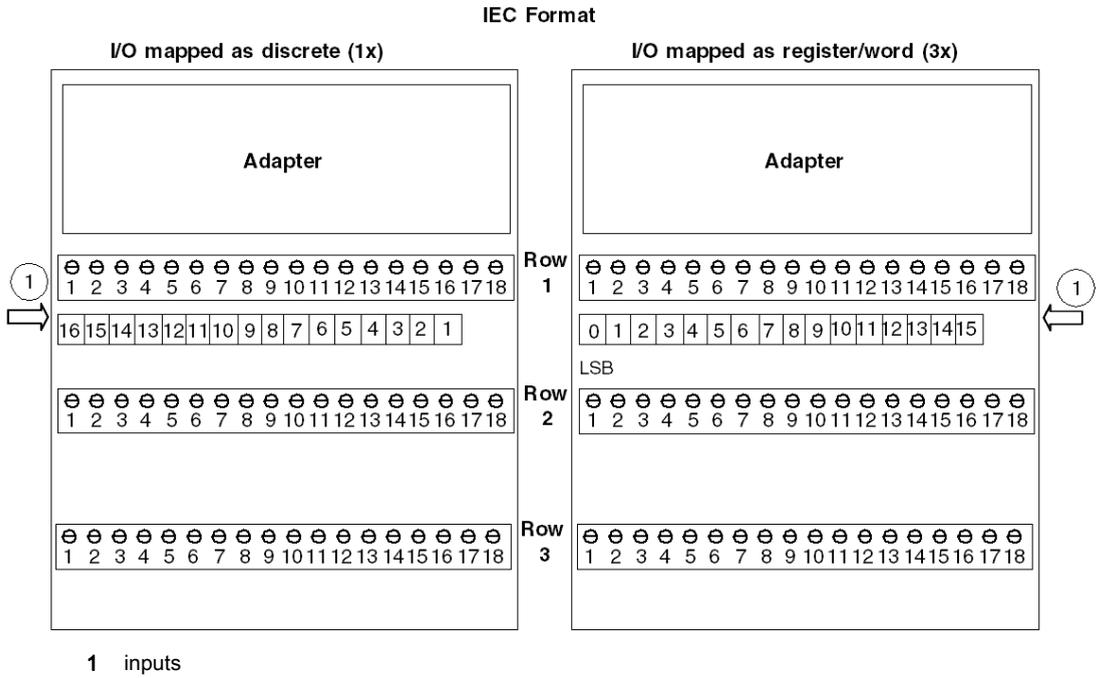
IEC vs. Ladder Logic

In order to correctly field wire the inputs and map the input data, you need to know which type of Momentum Adapter is mounted on the base. Adapters may be either IEC compliant or 984 Ladder Logic compliant.

| | IEC Compliant | 984 Ladder Logic Compliant |
|---------------------------------|---|--|
| Momentum Processor Adapters | All | None |
| Momentum Communication Adapters | All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 | 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 |

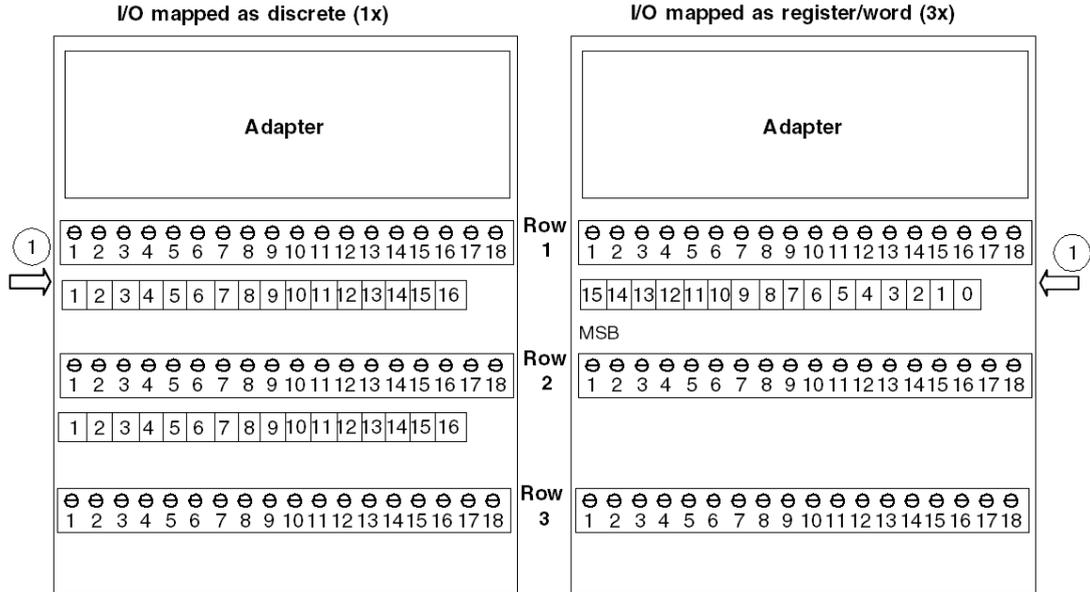
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (1x) the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (3x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



The figure below shows how data is mapped on the I/O base with a 984 Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (1x) the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (3x), the MSB (bit 15) is assigned to Pin 1 and the LSB (bit 0) is assigned to Pin 16.

984 Format



1 inputs

Chapter 15

170 ADM 350 10 24 VDC - 16 Pt. In / 16 Pt. Out Module Base

Overview

This chapter describes the 170ADM 350 10 TSX Momentum I/O base.

See also 170 ADM 350 11 (*see page 249*) and 170 ADM 350 15 (*see page 267*).

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------|------|
| Front Panel Components | 232 |
| Specifications | 234 |
| Internal Pin Connections | 237 |
| Field Wiring Guidelines | 238 |
| Wiring Diagrams | 240 |
| I/O Mapping | 245 |

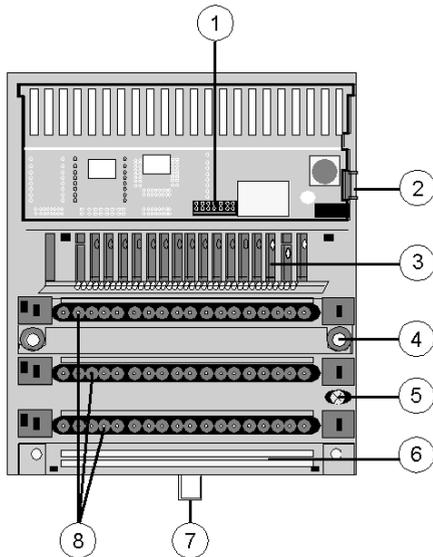
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADI 350 10 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

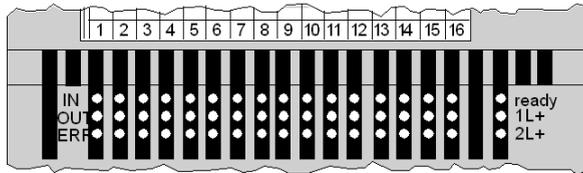


Components of the I/O module

| Label | Description |
|-------|--|
| 1 | Internal interface (ATI) connector |
| 2 | Locking and ground contact for the adapter |
| 3 | LED status display |
| 4 | Mounting holes for panel mount |
| 5 | Grounding screw |
| 6 | Busbar Mounting Slot |
| 7 | Locking tab for DIN rail mount |
| 8 | Sockets for the terminal connectors |

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

| Indicator | Condition | Message |
|--------------------------|-----------|--|
| Ready | Green | Module is ready to communicate. Operating voltage for internal logic (5 V) is present. |
| | Off | Module is not ready. |
| 1L+ | Green | Output voltage 1L+ for outputs 1 ... 8 (group 1) is present |
| | Off | Output voltage for outputs 1 ... 8 (group 1) is not present |
| 2L+ | Green | Output voltage 2L+ for outputs 9 ... 16 (group 2) is present |
| | Off | Output voltage for outputs 9 ... 16 (group 2) is not present |
| Upper row IN 1...16 | Green | Input status (an LED per input); Input point active, ie. input carries a 1 signal (logically ON) |
| | Off | Input point inactive, ie. input carries a 0 signal (logically OFF) |
| Middle row OUT 1...16 | Green | Output status (an LED per output); Output point active, ie. output carries a 1 signal (logically ON) |
| | Off | Output point inactive, ie. Output carries a 0 signal (logically OFF) |
| Lower row ERR 1...16 | Red | Output overload (an LED per output). Short circuit or overload on the corresponding output. |
| | Off | Outputs 1 ... 16 operating normally. |

Specifications

Overview

This section contains specifications for the 170 ADM 350 10 I/O base.

General Specifications

| | |
|----------------------------|--|
| Module type | 16 discrete inputs in 1 group 16 discrete outputs in 2 groups (8 pts/group) |
| Supply voltage | 24 VDC |
| Supply voltage range | 20...30 VDC |
| Supply current consumption | max. 250 mA at 24 VDC |
| Power dissipation | $6\text{ W} + ((\# \text{ of input points on } x .144\text{ W}) + (\# \text{ of output points on } x .25\text{ W}))$ |
| I/O map | 1 input word 1 output word |

Isolation

| | |
|--------------------------------|---------------------------------------|
| Input to input | none |
| Output group to output group | none |
| Input to output group | none |
| Field to communication adapter | Defined by communication adapter type |

Fuses

| | |
|-----------------------------|---|
| Internal | none |
| External: operating voltage | 1 A slow-blow (Bussman GDC-1A or equivalent) |
| External: input voltage | According to the supply of the connected sensors—not to exceed 4A fast-blow |
| External: output voltage | According to the supply of the connected actuators—not to exceed 4 A fast-blow/ group |

EMC

| | |
|------------------|--|
| Immunity | IEC 1131-2 Surge on auxiliary power supply 2 kV |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE, FM Class 1, Div. 2 pending |

Physical Dimensions

| | |
|-------------------------|--|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars |
| Weight | 200 g (0.44 lb) |

Discrete Inputs

| | |
|---------------------|--|
| Number of points | 16 |
| Number of groups | 1 |
| Points per group | 16 |
| Signal type | True High |
| IEC 1131 type | 1+ (See Appendix <i>IEC 1131 Input Types</i> , page 701 for definitions of IEC input types.) |
| ON voltage | +11 ... +30 VDC |
| OFF voltage | -3 ... +5 VDC |
| Input current | 10.0 mA minimum ON 2.0 mA maximum OFF |
| Input voltage range | -3 ... +30 VDC |
| Input resistance | 4 kOhm |
| Response time | 2.2 ms OFF to ON 3.3 ms ON to OFF |

Discrete Outputs

| | |
|---|--|
| Output type | Solid state switch |
| Output supply voltage | 24 VDC |
| Output supply voltage range | 20 ... 30 VDC |
| Output voltage | External supply - .5 VDC |
| Number of points | 16 |
| Number of groups | 2 |
| Points per group | 8 |
| Current capacity | 0.5 A/point maximum 4 A/group 8 A/module |
| Signal type | True High |
| Leakage current (output out) | < 1 mA @ 24 VDC |
| Surge (inrush) current | 5 A for 1 ms |
| On state voltage drop | < 0.5 VDC @ 0.5 A |
| Fault sensing (See Note Below) | Outputs are electronically safeguarded to assist in short circuit and overload protection |
| Fault reporting | 1 red LED/point (row 3) ON when short current/ overload occurs |
| Error indication | Output overload for at least one out put (I/O-Error) to communication adapter |
| Response time (resistive load / 0.5 A) | < 0.1 ms OFF to ON < 0.1 ms ON to OFF |
| Maximum switching cycles | 1000/h for 0.5 A inductive load 100/s for 0.5 A resistive load 8/s for 1.2 W Tungsten load |

NOTE: Discrete 24 VDC outputs incorporate thermal shutdown and overload protection. The output current of a shortened output is limited to a nondestructive value. The short circuit heats the output driver and the output will switch off. The output will switch on again if the driver leaves the overtemperature condition. If the short circuit still exists, the driver will reach the overtemperature condition again and will switch off again.

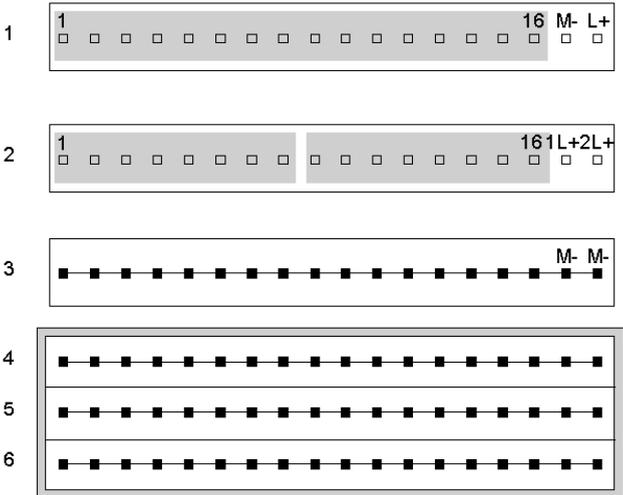
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 6 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 1 of the base. The outputs are field wired to row 2. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3- row busbar. The following busbars are available from Schneider Electric.

| Type | Number of Rows | Part Number |
|-------------|----------------|----------------|
| Screw-in | 1 - row | 170 XTS 006 01 |
| | 2 - row | 170 XTS 005 01 |
| | 3 - row | 170 XTS 004 01 |
| Spring-clip | 1 - row | 170 XTS 007 01 |
| | 2 - row | 170 XTS 008 01 |
| | 3 - row | 170 XTS 003 01 |

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

| Row | Terminal | Function |
|-----|----------|---|
| 1 | 1...16 | Inputs |
| | 17 | Return (M-) |
| | 18 | + 24 VDC Operating voltage (L+) |
| 2 | 1 ... 8 | Outputs for group 1 |
| | 9 ... 16 | Outputs for group 2 |
| | 17/18 | + 24 VDC for output group 1 (1L+) and group 2 (2L+) |
| 3 | 1 ... 16 | Return for outputs |
| | 17/18 | Return (M-) |
| 4 | 1 ... 18 | Input voltage for inputs I1 ... I16 or PE |
| 5 | 1 ... 18 | Return (M-) |
| 6 | 1 ... 18 | Protective earth (PE) |

Protective Circuit May Be Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit parallel to the operating coil.

Wiring Diagrams

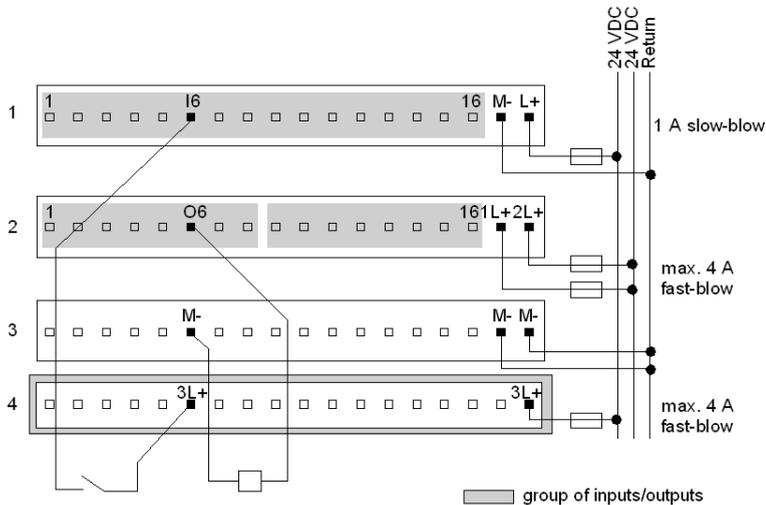
Overview

This section provides diagrams to assist you in wiring the following types of devices:

- 2-wire devices
- sensors activated by an output
- 4-wire sensors with a 2-wire actuator
- broken wire detection

2-Wire Devices

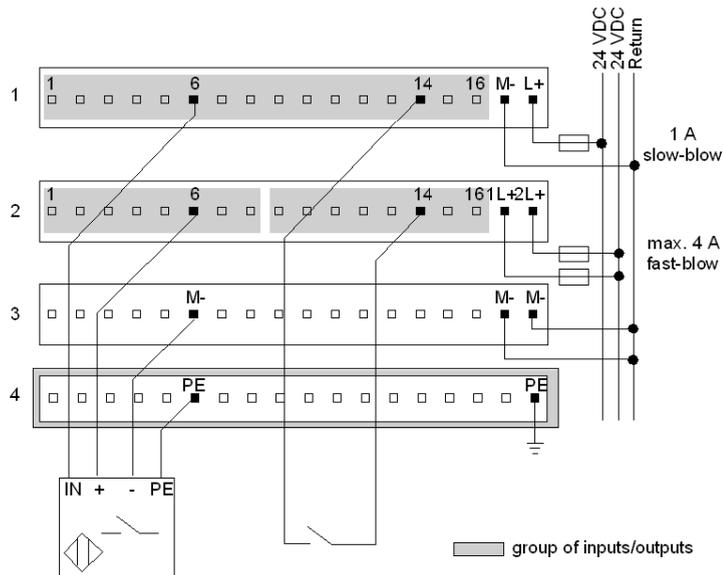
The diagram below shows an example of wiring for two-wire devices. Separate connections to pins 17 and 18 are shown on row 3, even though these two pins are internally connected. This is done to halve the load.



Sensor Activated by Output

The wiring diagram below shows an example of a sensor activated by an output. The diagram shows the sensors being supplied with voltage only when the outputs on pins 6 and 14, row 2, are high. The inputs from pins 6 and 14, row 1, can be high only when one of the associated outputs is high.

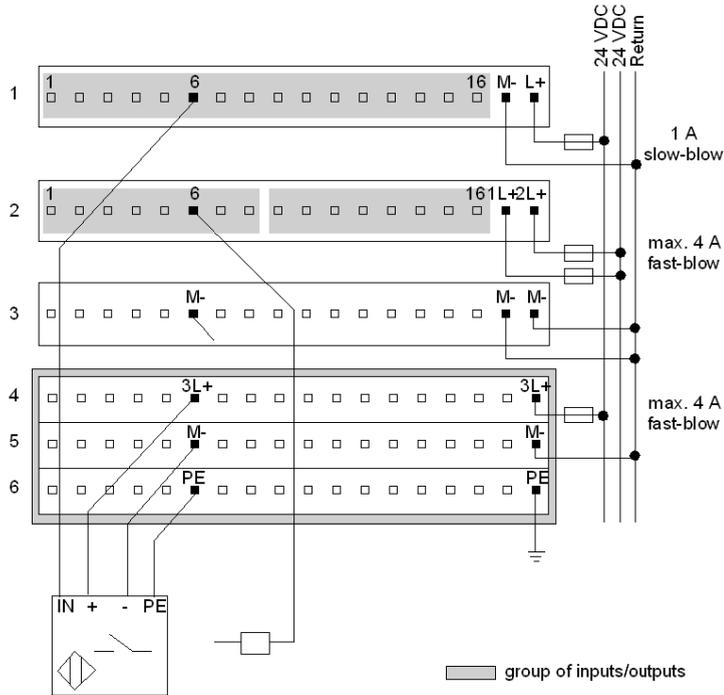
Separate connections to pins 17 and 18 are shown on row 3, even though these two pins are internally connected. This is done to halve the load.



Four-Wire Sensor with a Two-Wire Actuator

The diagram below shows a four-wire sensor with a two-wire actuator. The process of wiring a 3-wire sensor is very similar to the one below. Because 3-wire sensors do not require PE, a 2-row busbar could be used instead of the 3-row busbar shown.

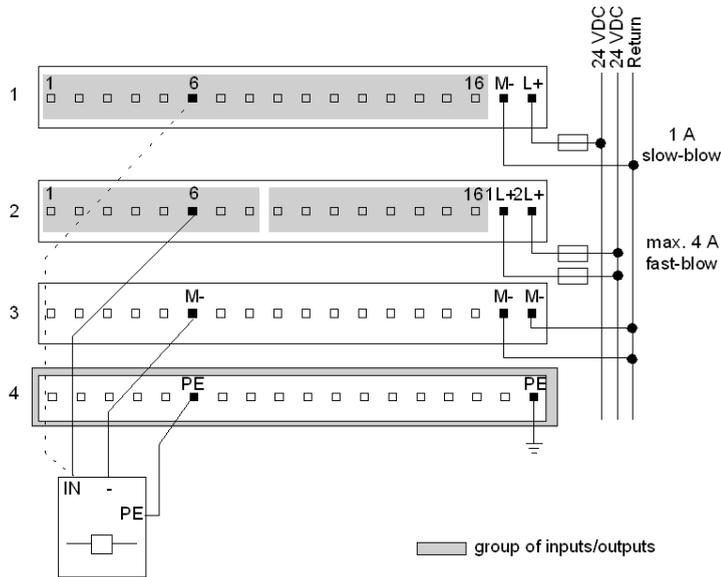
Separate connections to pins 17 and 18 are shown on row 3, even though these two pins are internally connected. This is done to halve the load.



Broken Wire Detection

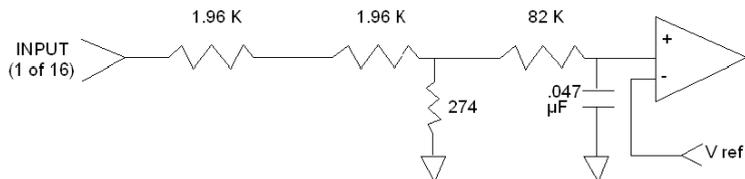
The diagram below shows a three-wire actuator with an optional wiring scheme for broken wire detection. The dotted line reads back whether or not current has reached the actuator. When the output on pin 6, row 2, is high, the input from pin 6, row 1, must also be high.

Separate connections to pins 17 and 18 are shown on row 3, even though these two pins are internally connected. This is done to halve the load.



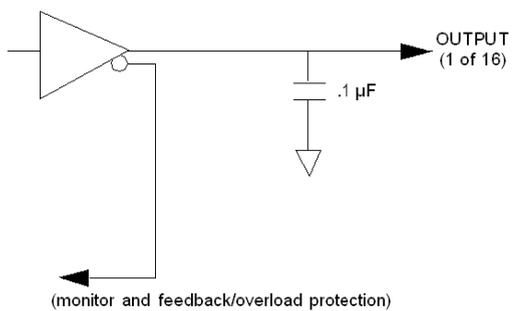
Simplified Input Schematics

The following diagram shows the field-side input circuitry.



Simplified Output Schematics

The following diagram shows the field-side output circuitry.



I/O Mapping

Overview

The 170 ADM 350 10 TSX Momentum I/O base supports 16 discrete inputs and 16 discrete outputs. This section contains information about the mapping of the I/O data into input words and output words.

I/O Map

The I/O base may be mapped as one input word and as one output word, or as 16 discrete input points and as 16 discrete output points.

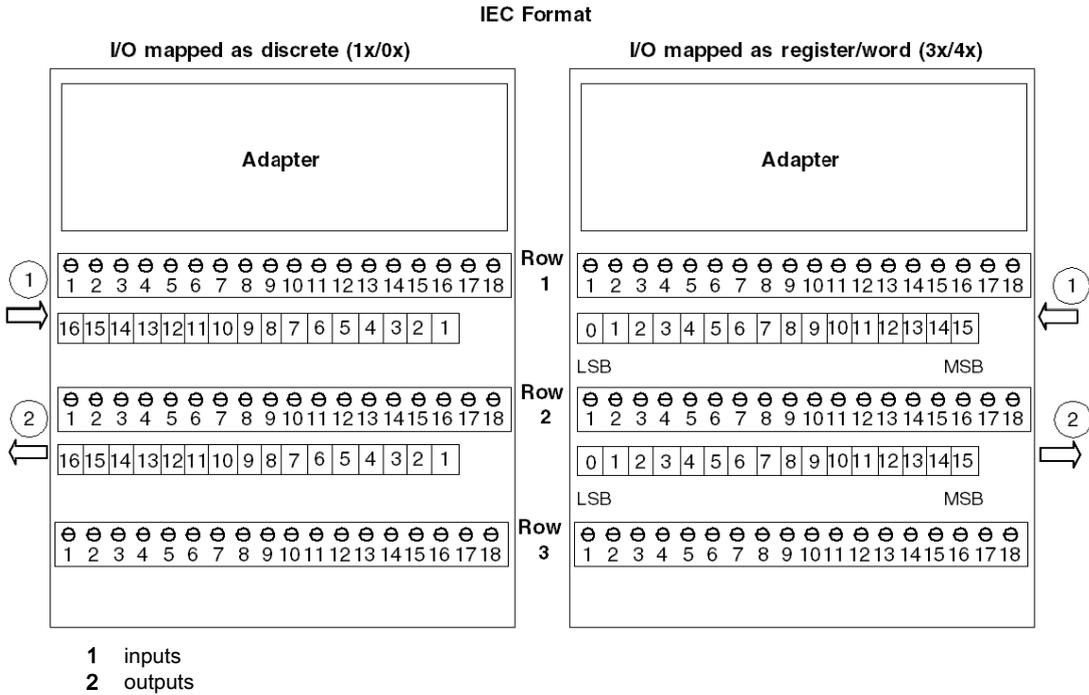
IEC vs. Ladder Logic

In order to correctly field wire the inputs/outputs and map the input/outputs data, you need to know which type of Momentum Adapter is mounted on the base. Adapters may be either IEC compliant or 984 Ladder Logic compliant.

| | IEC Compliant | 984 Ladder Logic Compliant |
|---------------------------------|---|--|
| Momentum Processor Adapters | All | None |
| Momentum Communication Adapters | All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 | 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 |

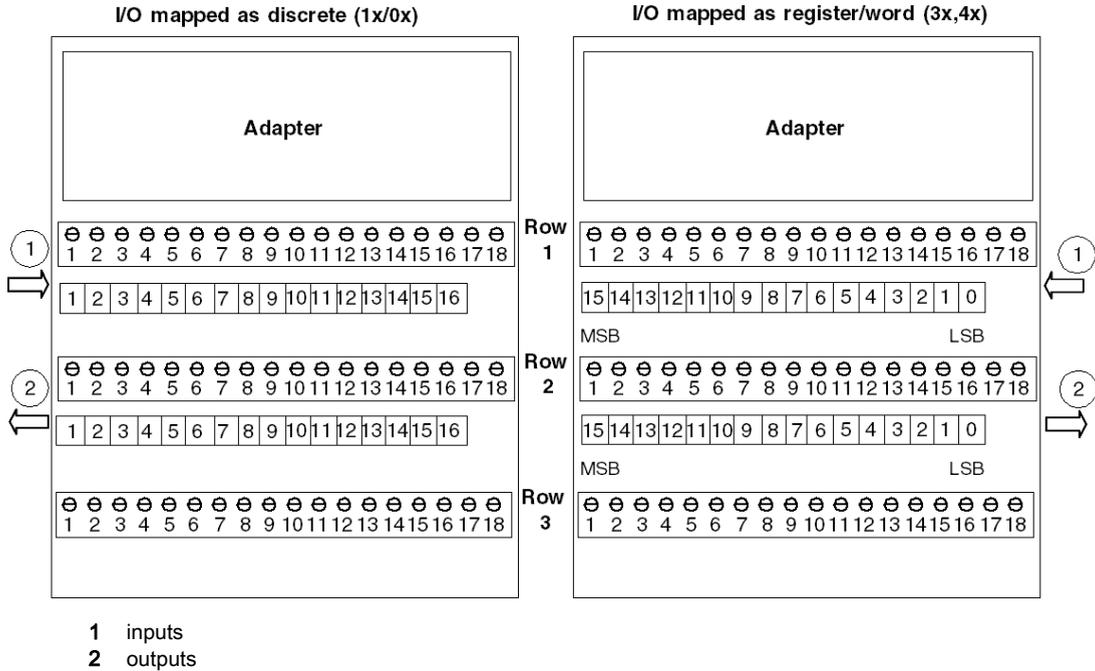
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



The figure below shows how data is mapped on the I/O base with a 984 Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 1 and the LSB (bit 0) is assigned to Pin 16

984 Format



Chapter 16

170 ADM 350 11 24 VDC - 16 Pt. In / 16 Pt. Out Module Base

Overview

This chapter describes the 170 ADM 350 11 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------|------|
| Front Panel Components | 250 |
| Specifications | 252 |
| Internal Pin Connections | 255 |
| Field Wiring Guidelines | 256 |
| Wiring Diagrams | 258 |
| I/O Mapping | 263 |

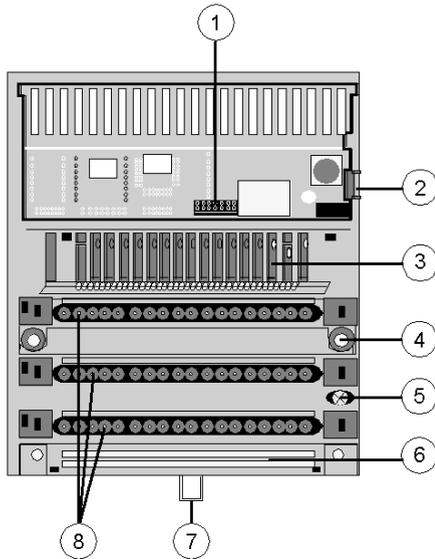
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADI 350 11 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

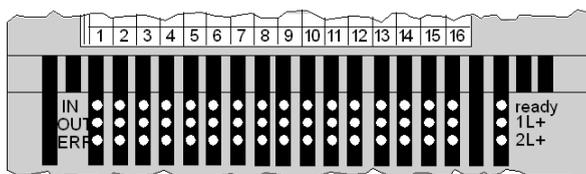


Components of the I/O module

| Label | Description |
|-------|--|
| 1 | Internal interface (ATI) connector |
| 2 | Locking and ground contact for the adapter |
| 3 | LED status display |
| 4 | Mounting holes for panel mount |
| 5 | Grounding screw |
| 6 | Busbar Mounting Slot |
| 7 | Locking tab for DIN rail mount |
| 8 | Sockets for the terminal connectors |

LED Illustration

This I/O base has one LED, the ready indicator shown in the illustration below.



LED Descriptions

The ready indicator is described in the table below.

| Indicator | Condition | Message |
|--------------------------|-----------|--|
| Ready | Green | Module is ready to communicate. Operating voltage for internal logic (5 V) is present. |
| | Off | Module is not ready. |
| 1L+ | Green | Output voltage 1L+ of inputs 1 ... 8 (group 1) is present |
| | Off | Output voltage of inputs 1 ... 8 (group 1) is not present |
| 2L+ | Green | Output voltage 2L+ of inputs 9 ... 16 (group 2) is present |
| | Off | Output voltage of inputs 9 ... 16 (group 2) is not present |
| Upper row IN 1...16 | Green | Input status (an LED per input); Input point active, ie. input carries a 1 signal (logically ON) |
| | Off | Input point inactive, ie. input carries a 0 signal (logically OFF) |
| Middle row OUT 1...16 | Green | Output status (an LED per output); Output point active, ie. output carries a 1 signal (logically ON) |
| | Off | Output point inactive, ie. Output carries a 0 signal (logically OFF) |
| Lower row ERR 1...16 | Red | Output overload (an LED per output). Short circuit or overload on the corresponding output. |
| | Off | Outputs 1 ... 16 operating normally. |

Specifications

Overview

This section contains specifications for the 170 ADM 350 11 I/O base.

General Specifications

| | |
|----------------------------|--|
| Module type | 16 discrete inputs in 1 group 16 discrete outputs in 2 groups (8 pts/group) |
| Supply voltage | 24 VDC |
| Supply voltage range | 20...30 VDC |
| Supply current consumption | max. 250 mA at 24 VDC |
| Power dissipation | $6\text{ W} + ((\# \text{ of input points on } \times .144\text{ W}) + (\# \text{ of output points on } \times .25\text{ W}))$ |
| I/O map | 1 input word 1 output word |

Isolation

| | |
|--------------------------------|---------------------------------------|
| Input to input | none |
| Output group to output group | none |
| Input to output group | none |
| Field to communication adapter | Defined by Communication Adapter type |

Fuses

| | |
|-----------------------------|---|
| Internal | none |
| External: operating voltage | 1 A slow-blow (Bussmann GDC-1A or equivalent) |
| External: input voltage | According to the supply of the connected sensors—not to exceed 4A fast-blow |
| External: output voltage | According to the supply of the connected actuators—not to exceed 4 A fast-blow/ group |

EMC

| | |
|------------------|--|
| Immunity | IEC 1131-2 Surge on auxiliary power supply 500V |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE, FM Class 1, Div. 2 pending |

Physical Dimensions

| | |
|-------------------------|--|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars |
| Weight | 200 g (0.44 lb) |

Discrete Inputs

| | |
|---------------------|--|
| Number of points | 16 |
| Number of groups | 1 |
| Points per group | 16 |
| Signal type | True High |
| IEC 1131 type | 1+ (See Appendix <i>IEC 1131 Input Types</i> , page 701 for definitions of IEC input types.) |
| ON voltage | +11 ... +30 VDC |
| OFF voltage | -3 ... +5 VDC |
| Input current | 2.5 mA minimum ON (6 mA at 24 VDC) 1.2 mA maximum OFF |
| Input voltage range | -3 ... +30 VDC |
| Input resistance | 4 kOhm |
| Response time | 60 microsec OFF to ON 80 microsec ON to OFF |

Discrete Outputs

| | |
|---|--|
| Output type | Solid state switch |
| Output supply voltage | 24 VDC |
| Output supply voltage range | 20 ... 30 VDC |
| Output voltage | External supply - .5 VDC |
| Number of points | 16 |
| Number of groups | 2 |
| Points per group | 8 |
| Current capacity | 0.5 A/point maximum 4 A/group 8 A/module |
| Signal type | True High |
| Leakage current (output out) | < 1 mA @ 24 VDC |
| Surge (inrush) current | 5 A for 1 ms |
| On state voltage drop | < 0.5 VDC @ 0.5 A |
| Fault sensing (See Note Below) | Outputs are electronically safeguarded to assist in short circuit and overload protection |
| Fault reporting | 1 red LED/point (row 3) ON when short current/ overload occurs |
| Error indication | Output overload for at least one out put (I/O-Error) to communication adapter |
| Response time (resistive load / 0.5 A) | < 0.1 ms OFF to ON < 0.1 ms ON to OFF |
| Maximum switching cycles | 1000/h for 0.5 A inductive load 100/s for 0.5 A resistive load 8/s for 1.2 W Tungsten load |

NOTE: Discrete 24 VDC outputs incorporate thermal shutdown and overload protection. The output current of a shortened output is limited to a nondestructive value. The short circuit heats the output driver and the output will switch off. The output will switch on again if the driver leaves the overtemperature condition. If the short circuit still exists, the driver will reach the overtemperature condition again and will switch off again.

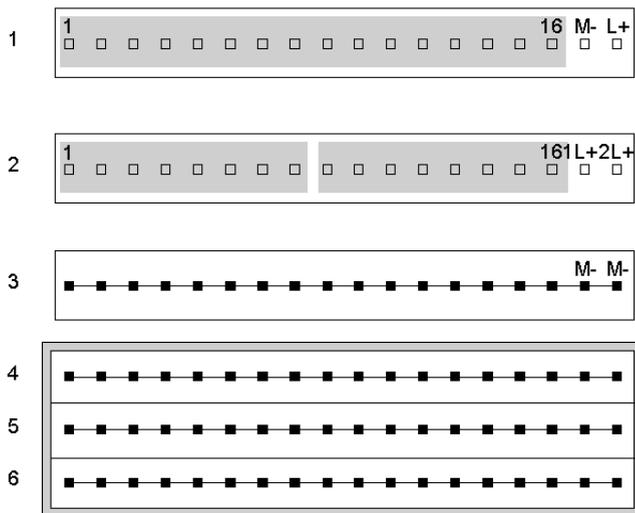
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 6 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 1 of the base. The outputs are field wired to row 2. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3- row busbar. The following busbars are available from Schneider Electric.

| Type | Number of Rows | Part Number |
|-------------|----------------|----------------|
| Screw-in | 1 - row | 170 XTS 006 01 |
| | 2 - row | 170 XTS 005 01 |
| | 3 - row | 170 XTS 004 01 |
| Spring-clip | 1 - row | 170 XTS 007 01 |
| | 2 - row | 170 XTS 008 01 |
| | 3 - row | 170 XTS 003 01 |

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

| Row | Terminal | Function |
|-----|----------|---|
| 1 | 1...16 | Inputs |
| | 17 | Return (M-) |
| | 18 | + 24 VDC Operating voltage (L+) |
| 2 | 1 ... 8 | Outputs for group 1 |
| | 9 ... 16 | Outputs for group 2 |
| | 17/18 | + 24 VDC for output group 1 (1L+) and group 2 (2L+) |
| 3 | 1 ... 16 | Return for outputs |
| | 17/18 | Return (M-) |
| 4 | 1 ... 18 | Input voltage for inputs I1 ... I16 or PE |
| 5 | 1 ... 18 | Return (M-) |
| 6 | 1 ... 18 | Protective earth (PE) |

Protective Circuit May Be Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit parallel to the operating coil.

Wiring Diagrams

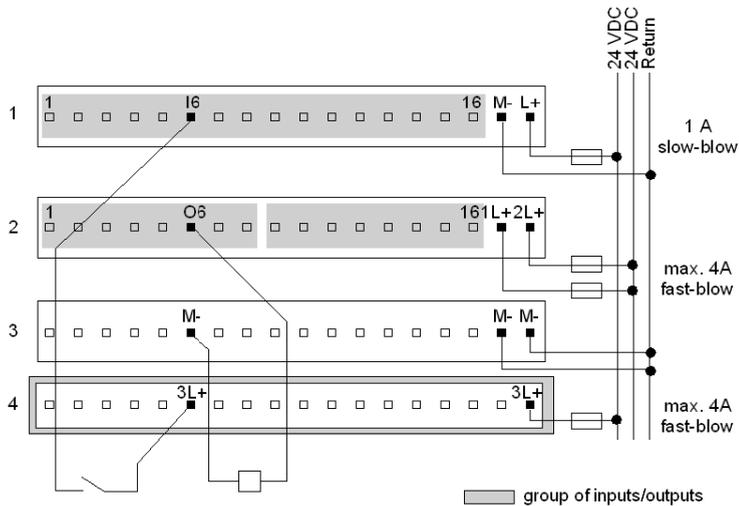
Overview

This section provides diagrams to assist you in wiring the following types of devices:

- 2-wire devices
- sensors activated by an output
- 4-wire sensors with a 2-wire actuator
- broken wire detection

2-Wire Devices

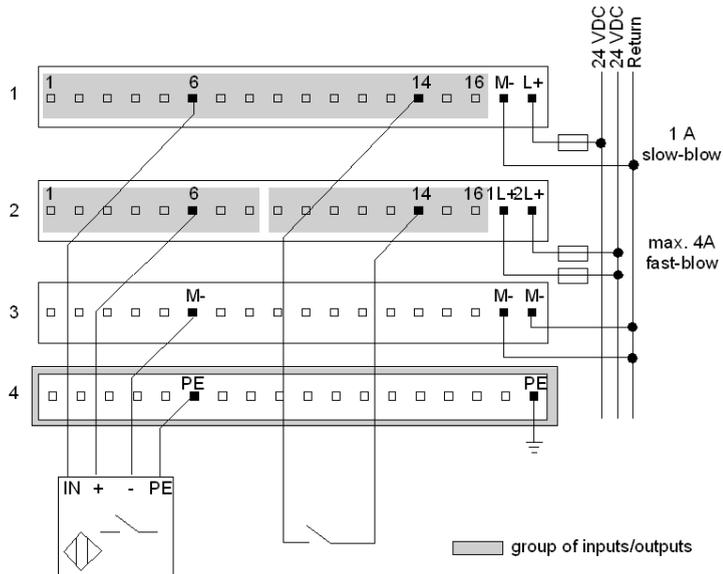
The diagram below shows an example of wiring for two-wire devices. Separate connections to pins 17 and 18 are shown on row 3, even though these two pins are internally connected. This is done to halve the load.



Sensor Activated by Output

The wiring diagram below shows an example of a sensor activated by an output. The diagram shows the sensors being supplied with voltage only when the outputs on pins 6 and 14, row 2, are high. The inputs from pins 6 and 14, row 1, can be high only when one of the associated outputs is high.

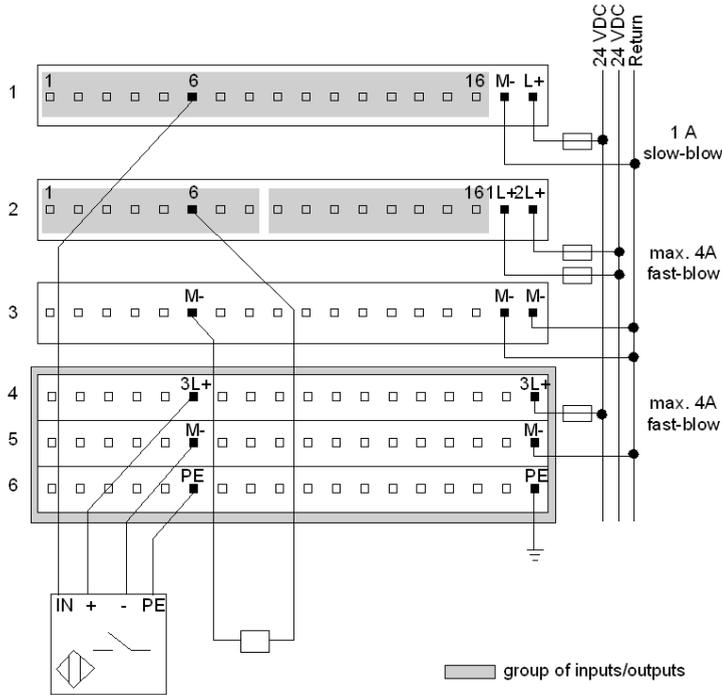
Separate connections to pins 17 and 18 are shown on row 3, even though these two pins are internally connected. This is done to halve the load.



Four-Wire Sensor with a Two-Wire Actuator

The diagram below shows a four-wire sensor with a two-wire actuator. The process of wiring a 3-wire sensor is very similar to the one below. Because 3-wire sensors do not require PE, a 2-row busbar could be used instead of the 3-row busbar shown.

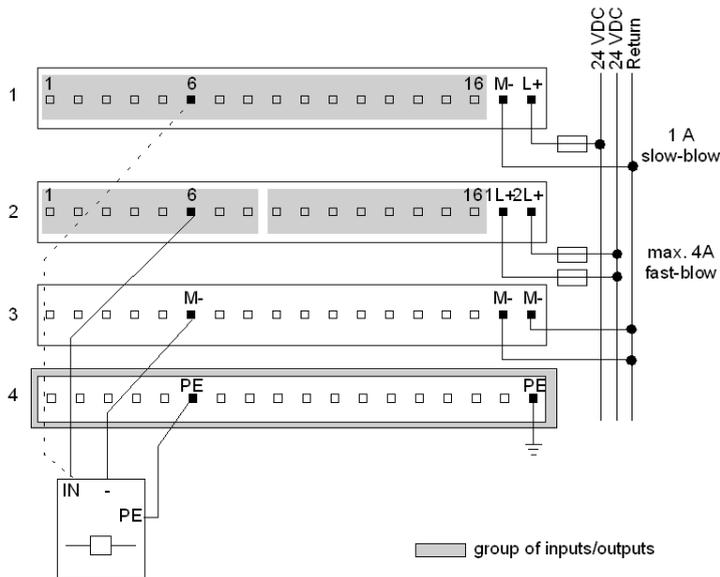
Separate connections to pins 17 and 18 are shown on row 3, even though these two pins are internally connected. This is done to halve the load.



Broken Wire Detection

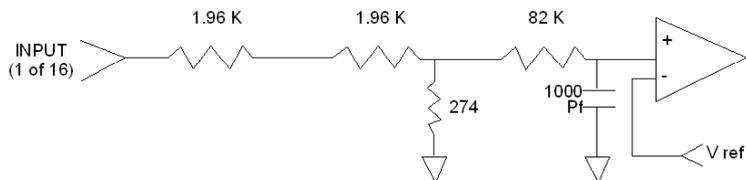
The diagram below shows a three-wire actuator with an optional wiring scheme for broken wire detection. The dotted line reads back whether or not current has reached the actuator. When the output on pin 6, row 2, is high, the input from pin 6, row 1, must also be high.

Separate connections to pins 17 and 18 are shown on row 3, even though these two pins are internally connected. This is done to halve the load.



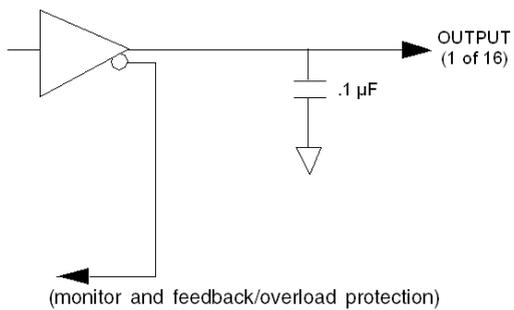
Simplified Input Schematics

The following diagram shows the field-side input circuitry.



Simplified Output Schematics

The following diagram shows the field-side output circuitry.



I/O Mapping

Overview

The 170 ADM 350 11 TSX Momentum I/O base supports 16 discrete inputs and 16 discrete outputs. This section contains information about the mapping of the I/O data into input words and output words.

I/O Map

The I/O base may be mapped as one input word and one output word, or as 16 discrete input points and 16 discrete output points.

IEC vs. Ladder Logic

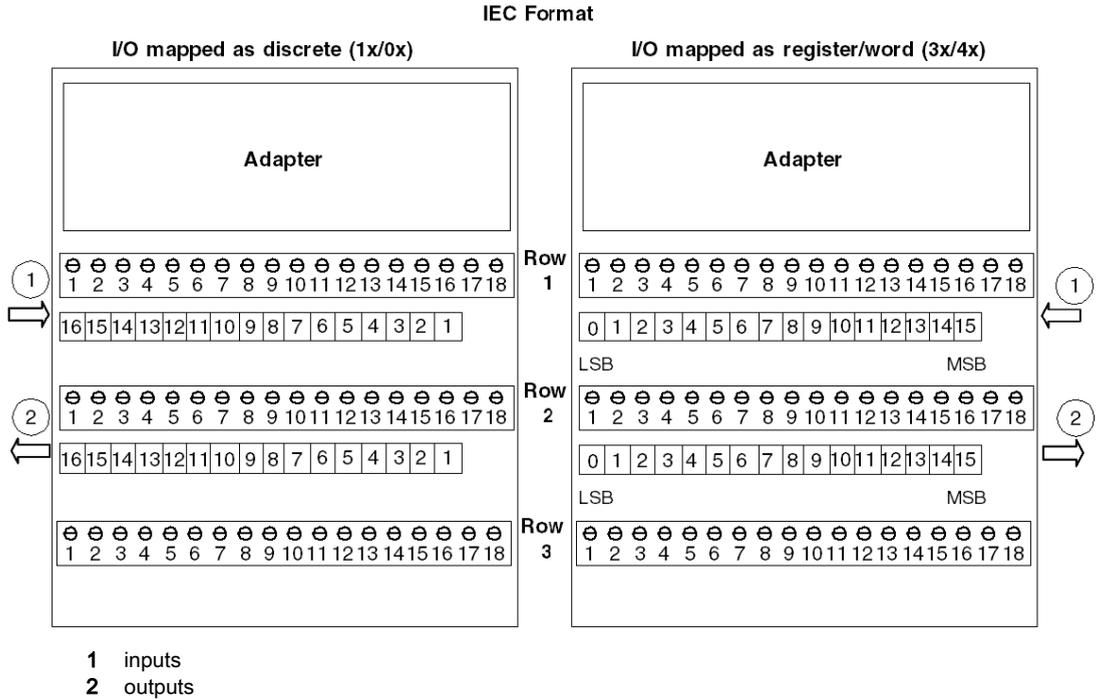
In order to correctly field wire the inputs/outputs and map the input/output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

| | IEC Compliant | 984 Ladder Logic Compliant |
|---------------------------------|---|--|
| Momentum Processor Adapters | All | None |
| Momentum Communication Adapters | All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 | 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 |

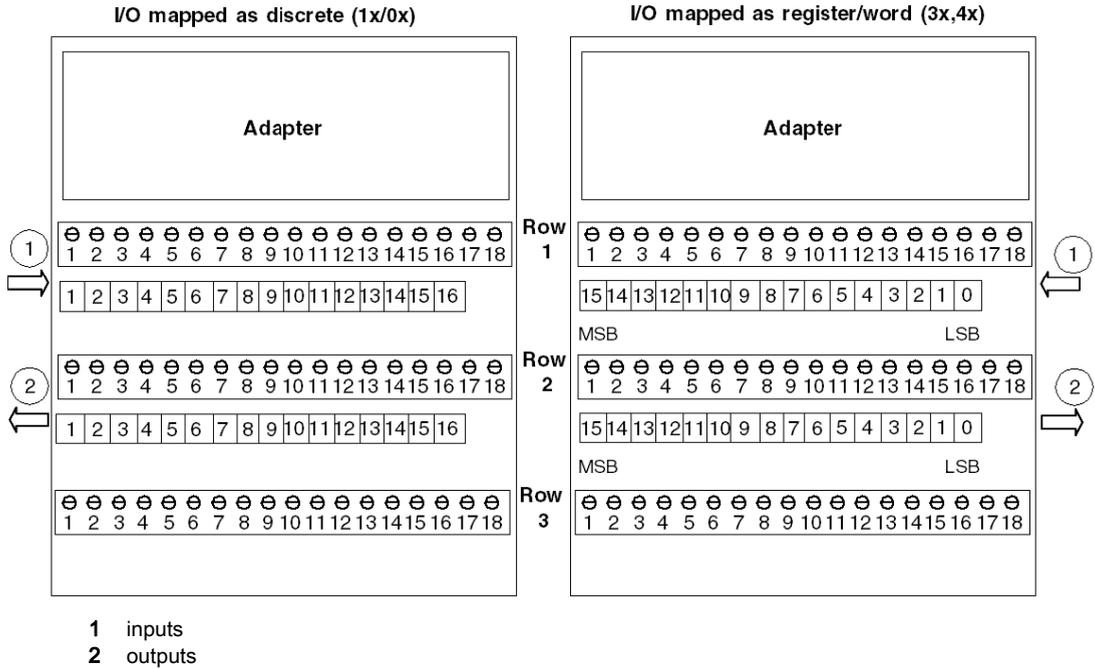
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 1 and the LSB (bit 0) is assigned to Pin 16.

984 Format



Chapter 17

170 ADM 350 15 24 VDC - 16 Pt. In / 16 Pt. Out Module Base

Overview

This chapter describes the 170 ADM 350 15 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------|------|
| Front Panel Components | 268 |
| Specifications | 270 |
| Internal Pin Connections | 273 |
| Field Wiring Guidelines | 274 |
| Wiring Diagrams | 276 |
| I/O Mapping | 277 |

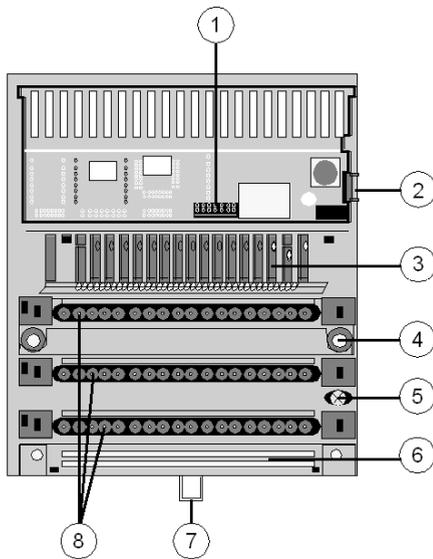
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADI 350 15 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

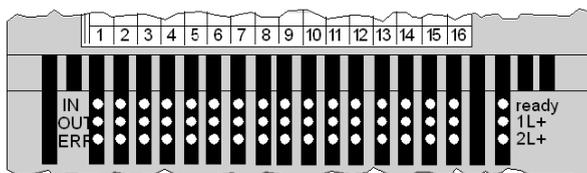


Components of the I/O module

| Label | Description |
|-------|--|
| 1 | Internal interface (ATI) connector |
| 2 | Locking and ground contact for the adapter |
| 3 | LED status display |
| 4 | Mounting holes for panel mount |
| 5 | Grounding screw |
| 6 | Busbar Mounting Slot |
| 7 | Locking tab for DIN rail mount |
| 8 | Sockets for the terminal connectors |

LED Illustration

This I/O base has one LED, the ready indicator shown in the illustration below.



LED Descriptions

The ready indicator is described in the table below.

| Indicator | Condition | Message |
|-----------------------------|-----------|--|
| Ready | Green | Module is ready to communicate. Operating voltage for internal logic (5 V) is present. |
| | Off | Module is not ready. |
| 1L+ | Green | Output voltage 1L+ of inputs 1 ... 8 (group 1) is present |
| | Off | Output voltage of inputs 1 ... 8 (group 1) is not present |
| 2L+ | Green | Output voltage 2L+ of inputs 9 ... 16 (group 2) is present |
| | Off | Output voltage of inputs 9 ... 16 (group 2) is not present |
| Upper row IN 1...16 | Green | Input status (an LED per input); Input point active, ie. input carries a 1 signal (logically ON) |
| | Off | Input point inactive, ie. input carries a 0 signal (logically OFF) |
| Middle row OUT 1...16 | Green | Output status (an LED per output); Output point active, ie. output carries a 1 signal (logically ON) |
| | Off | Output point inactive, ie. Output carries a 0 signal (logically OFF) |
| Lower row ERR 1...16 | Red | Output overload (an LED per output). Short circuit or overload on the corresponding output. |
| | Off | Outputs 1 ... 16 operating normally. |

Specifications

Overview

This section contains specifications for the 170 ADM 350 15 I/O base.

NOTE: In order for the 170 ADM 350 15 module to comply with the Directives 73/23/EEC (LV) and 89/336/EEC (EMC) and the IEC standards, EN 61131-2:2003 and EN 55011, the module must be used with a Telemecanique power supply, model numbers ABL7 RE2403, ABL RE2405, or ABL RE2410.

General Specifications

| | |
|----------------------------|--|
| Module type | 16 discrete inputs in 1 group 16 discrete outputs in 2 groups (8 pts/group) |
| Supply voltage | 24 VDC |
| Supply voltage range | 20-30 VDC |
| Supply current consumption | max. 250 mA at 24 VDC |
| Power dissipation | $6\text{ W} + ((\text{\# of input points on x} .144\text{ W}) + (\text{\# of output points on x} .25\text{ W}))$ |
| I/O map | 1 input word 1 output word |

Isolation

| | |
|---------------------------------------|----------------------|
| Input to input | none |
| Output to output | none |
| Input to output group | 500 VAC for 1 minute |
| I/O Points to Communication Interface | 500 VAC for 1 minute |
| Module power to logic | none |
| Module power to I/O points | 500 VAC for 1 minute |

Fuses

| | |
|------------------------|--|
| Internal | none |
| External: module power | 1 A slow-blow (Bussmann GDC-1A or equivalent) |
| External: input power | 1 A slow-blow (Bussmann GDC-1A or equivalent) |
| External: output power | According to the supply of the connected actuators—not to exceed 6.3 A fast-blow/group |

EMC

| | |
|------------------|--|
| Immunity | IEC 1131-2 Surge on auxiliary power supply 500V |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE, FM Class 1, Div. 2 pending |

Physical Dimensions

| | |
|-------------------------|--|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars |
| Weight | 200 g (0.44 lb) |

Discrete Inputs

| | |
|---------------------|---|
| Number of points | 16 |
| Number of groups | 1 |
| Points per group | 16 |
| Signal type | True Low |
| IEC 1131 type | 1 (See Appendix <i>IEC 1131 Input Types</i> , page 701 for definitions of IEC input types.) |
| ON voltage | 0 ... 5 VDC |
| OFF voltage | 15 ... 30 VDC |
| Input current | 2.0 mA minimum ON 0.5 mA maximum OFF |
| Input voltage range | 0 ... +30 VDC |
| Input resistance | 4 kOhm |
| Response time | 2.2 ms OFF to ON 3.3 ms ON to OFF |

Discrete Outputs

| | |
|---|--|
| Output type | Solid state switch (sinking) |
| Output supply voltage | 24 VDC |
| Output supply voltage range | 20-30 VDC |
| Number of points | 16 |
| Number of groups | 1 |
| Current capacity | 0.5 A/point maximum 5 A/module |
| Signal type | True Low |
| Leakage current (output out) | < 1 mA @ 24 VDC |
| Surge (inrush) current | 1 A for 1 ms Current limited |
| On state voltage drop | < 0.5 VDC @ 0.5 A |
| Fault sensing (See Note Below) | Outputs are electronically safeguarded to assist in short circuit and overload protection |
| Fault indication | 1 red LED/point (row 3) ON when short current/ overload occurs |
| Error reporting | none |
| Response time (resistive load / 0.5 A) | < 1 ms OFF to ON < 1 ms ON to OFF |
| Maximum switching cycles | 1000/h for 0.5 A inductive load 100/s for 0.5 A resistive load 8/s for 1.2 W Tungsten load |
| Loads | |
| Inductive | 500 mH @ 0.5 Hz |
| Capacitance | 50 microfarads |
| Tungsten Load | 12 W |
| Input Voltage Surge | 45 Volt for 10 ms 56 Volt for 1.3 mS decaying pulse |

NOTE: Discrete 24 VDC outputs incorporate thermal shutdown and overload protection. The output current of a shortened output is limited to a nondestructive value. The short circuit heats the output driver and the output will switch off. The output will switch on again if the driver leaves the over temperature condition. If the short circuit still exists, the driver will reach the over temperature condition again and will switch off again.

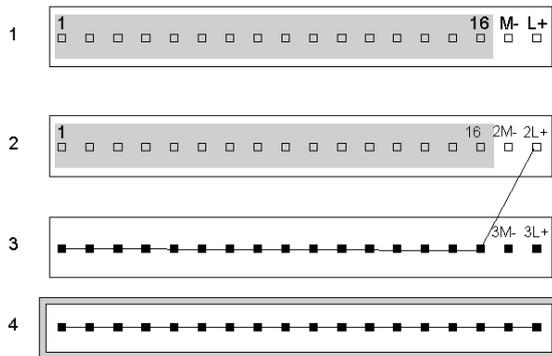
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 6 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 1 of the base. The outputs are field wired to row 2. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3- row busbar. The following busbars are available from Schneider Electric.

| Type | Number of Rows | Part Number |
|-------------|----------------|----------------|
| Screw-in | 1 - row | 170 XTS 006 01 |
| | 2 - row | 170 XTS 005 01 |
| | 3 - row | 170 XTS 004 01 |
| Spring-clip | 1 - row | 170 XTS 007 01 |
| | 2 - row | 170 XTS 008 01 |
| | 3 - row | 170 XTS 003 01 |

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

| Row | Terminal | Function |
|-----|----------|----------------------------------|
| 1 | 1...16 | Inputs |
| | 17 | Return Inputs |
| | 18 | + 24 VDC Power inputs |
| 2 | 1 ... 16 | Outputs |
| | 17 | Return for outputs |
| | 18 | + 24 VDC Power for outputs |
| 3 | 1 ... 16 | + 24 VDC Power for outputs (2L+) |
| | 17 | Return Module power |
| | 18 | + 24 VDC Power |
| 4 | 1 ... 18 | Return (M-) |

Protective Circuit May Be Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit parallel to the operating coil.

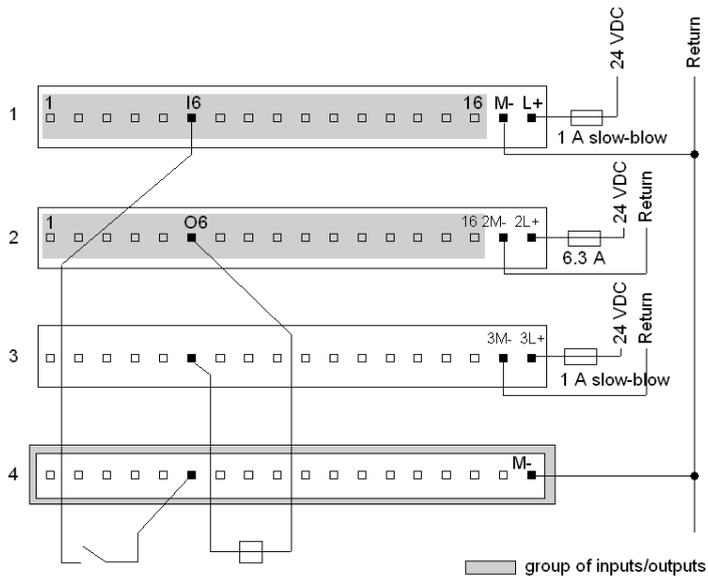
Wiring Diagrams

Overview

This section provides a diagram to assist you in wiring 2-wire devices.

2-Wire Devices

The diagram below shows an example of wiring for two-wire devices.



I/O Mapping

Overview

The 170 ADM 350 15 TSX Momentum I/O base supports 16 discrete inputs and 16 discrete outputs. This section contains information about the mapping of the I/O data into input words and output words.

I/O Map

The I/O base may be mapped as one input word, and one input word, or as 16 discrete input points and 16 discrete output points.

IEC vs. Ladder Logic

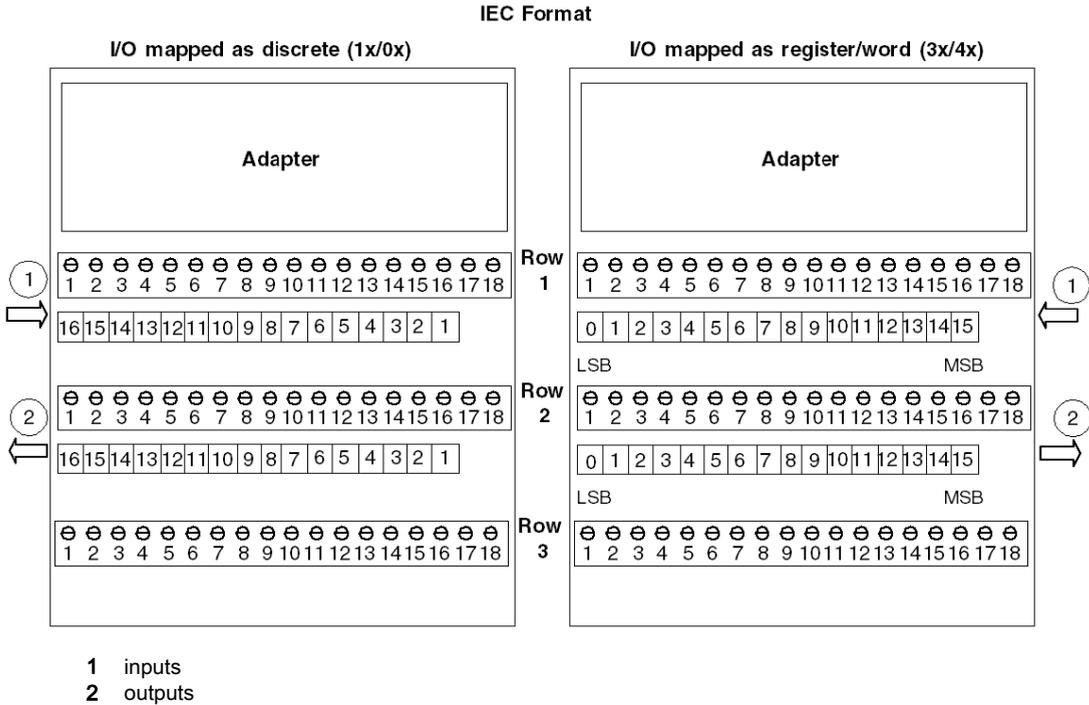
In order to correctly field wire the inputs/outputs and map the input/output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

| | IEC Compliant | 984 Ladder Logic Compliant |
|---------------------------------|---|--|
| Momentum Processor Adapters | All | None |
| Momentum Communication Adapters | All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 | 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 |

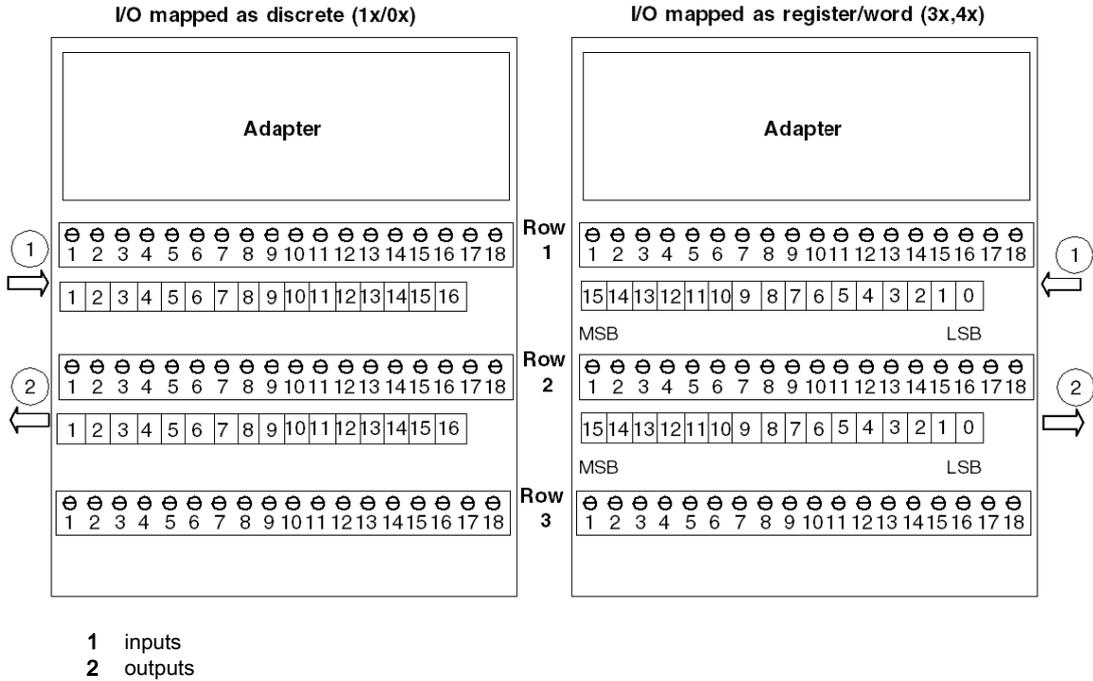
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 1 and the LSB (bit 0) is assigned to Pin 16.

984 Format



Chapter 18

170 ADM 370 10 24 VDC - 16 Pt. In / 8 Pt. Out @ 2 Amp. Module Base

Overview

This chapter describes the 170 ADM 370 10 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------|------|
| Front Panel Components | 282 |
| Specifications | 284 |
| Internal Pin Connections | 287 |
| Field Wiring Guidelines | 288 |
| Wiring Diagrams | 290 |
| I/O Mapping | 295 |

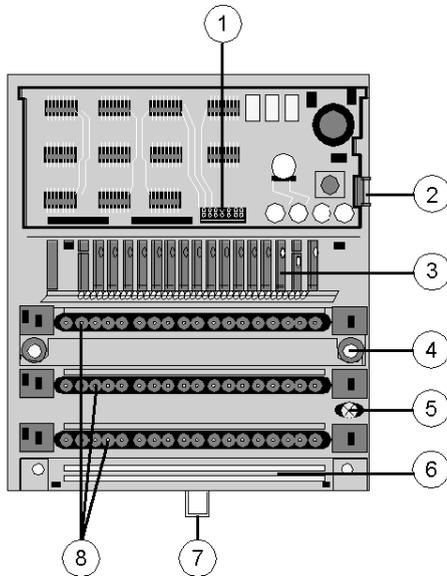
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADM 370 10 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

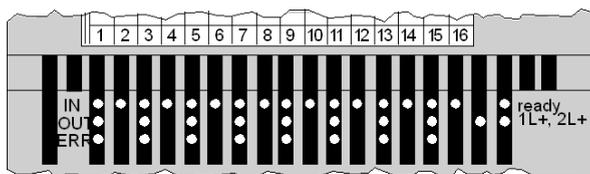


Components of the I/O module

| Label | Description |
|-------|--|
| 1 | Internal interface (ATI) connector |
| 2 | Locking and ground contact for the adapter |
| 3 | LED status display |
| 4 | Mounting holes for panel mount |
| 5 | Grounding screw |
| 6 | Busbar Mounting Slot |
| 7 | Locking tab for DIN rail mount |
| 8 | Sockets for the terminal connectors |

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

| Indicator | Condition | Message |
|---|-----------|---|
| Ready | Green | Module is ready to communicate. Operating voltage for internal logic (5 V) is present. |
| | Off | Module not ready. |
| 1L+ | Green | Output voltage 1L+ of inputs 1 ... 4 (group 1) is present |
| | Off | Output voltage of inputs 1 ... 4 (group 1) is not present |
| 2L+ | Green | Output voltage 2L+ of inputs 5 ... 8 (group 2) is present |
| | Off | Output voltage of inputs 5... 8 (group 2) is not present |
| Upper row IN 1...16 | Green | Input status (an LED per input); Input point active, ie. input carries a 1 signal (logically ON) |
| | Off | Input status (an LED per input); Input point inactive, ie. input carries a 0 signal (logically OFF) |
| Middle row OUT 1,3, 5, 7, 9, 11, 13, 15 | Green | Output status (an LED per output); Output point active, ie. output carries a 1 signal (logically ON) |
| | Off | Output status (an LED per output); Output point inactive, ie. Output carries a 0 signal (logically OFF) |
| Lower row ERR 1,3, 5, 7, 9, 11, 13, 15 | Red | Output overload (an LED per output). Overload on the corresponding output. |
| | Off | Outputs 1 ... 8 operating normally. |
| The following functionality and LEDs have been removed in PV02 units and later. | | |
| Lower row ERR 2, 6, 10, 14 | Red | Input sensor leads shorted circuit or overloaded (one LED per sensor supply line). |
| | Off | Input sensor current applied |

Specifications

Overview

This section contains specifications for the 170 ADM 370 10 I/O base.

General Specifications

| | |
|----------------------------|---|
| Module type | 16 discrete inputs in 1 group 8 discrete outputs in 2 groups (4 pts/group) |
| Supply voltage | 24 VDC |
| Supply voltage range | 20...30 VDC |
| Supply current consumption | max. 250 mA at 24 VDC |
| Power dissipation | $6 \text{ W} + (\# \text{ of input points on } x .144 \text{ W}) + (\# \text{ of output points on } x 1 \text{ W})$ |
| I/O map | 1 input word 1 output word |

Isolation

| | |
|--------------------------------|---------------------------------------|
| Input to input | none |
| Output group to output group | 500 VAC |
| Input to output group | 500 VAC |
| Field to communication adapter | Defined by communication adapter type |

Fuses

| | |
|---------------------------------------|--|
| Internal | none |
| External: operating and input voltage | According to the supply of the connected sensors—not to exceed 4A fast-blow |
| External: output voltage | According to the supply of the connected actuators—not to exceed 8 A slow-blow |

EMC

| | |
|------------------|--|
| Immunity | IEC 1131-2 Surge on auxiliary power supply 500V |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE, FM Class 1 Div. 2 pending |

Physical Dimensions

| | |
|-------------------------|--|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars |
| Weight | 220 g (0.49 lb) |

Discrete Inputs

| | |
|---------------------|--|
| Number of points | 16 |
| Number of groups | 4 |
| Points per group | 4 |
| Signal type | True High |
| IEC 1131 type | 1+ (See Appendix <i>IEC 1131 Input Types</i> , page 701 for definitions of IEC input types.) |
| ON voltage | +11 ... +30 VDC |
| OFF voltage | -3 ... +5 VDC |
| Input current | 2.5 mA minimum ON (6 mA at 24 VDC) 1.2 mA maximum OFF |
| Input voltage range | -3 ... +30 VDC |
| Input resistance | 4 kOhm |
| Response time | 2.2 ms OFF to ON 3.3 ms ON to OFF |

Discrete Outputs

| | |
|---|--|
| Output type | Solid state switch |
| Output supply voltage | 24 VDC |
| Output supply voltage range | 20 ... 30 VDC |
| Output voltage | External supply - .5 VDC |
| Number of points | 8 |
| Number of groups | 2 |
| Points per group | 4 |
| Current capacity | 2 A/point maximum 8 A/group 16 A/module |
| Signal type | True High |
| Leakage current (output out) | < 1 mA @ 24 VDC |
| Surge (inrush) current | 2.8 A for 10 s max. |
| On state voltage drop | < 0.5 VDC @ 2 A |
| Fault sensing | Outputs are electronically safeguarded to assist in short circuit and overload protection |
| Fault reporting outputs | 1 red LED/point (row 3) ON when overload occurs |
| Fault reporting input voltage | 1 red LED (row 3) signals the state of 4 inputs belonging to the input power supply group |
| Error indication | In the event of an overload for on least 1 output, for a short-circuit or overload in one of the 4 encoder supply groups, (I/O-Error) to communication adapter |
| Response time (resistive load / 2 A) | < 0.1 ms OFF to ON < 0.1 ms ON to OFF |
| Maximum switching cycles | 1000/h for 2 A inductive load (for inductances > 100 mH and switching currents > 1A, a clamping diode must be installed) 100/s for 2 A resistive load 10/s for 1.2 W Tungsten load (when the startup-current factor <= 10 the nominal current) |

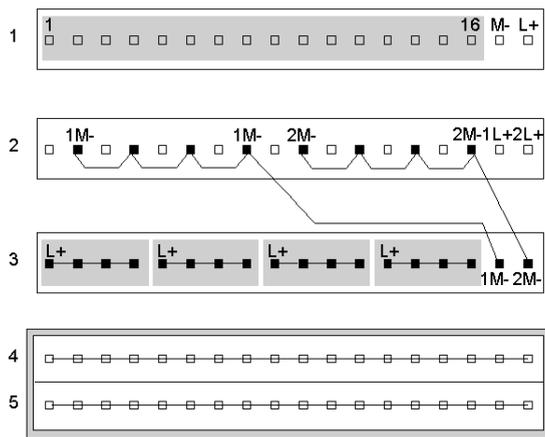
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 5 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 1 of the base. The outputs are field wired to row 2. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3- row busbar. The following busbars are available from Schneider Electric.

| Type | Number of Rows | Part Number |
|-------------|----------------|----------------|
| Screw-in | 1 - row | 170 XTS 006 01 |
| | 2 - row | 170 XTS 005 01 |
| Spring-clip | 1 - row | 170 XTS 007 01 |
| | 2 - row | 170 XTS 008 01 |

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

| Row | Terminal | Function |
|-----|----------------|---|
| 1 | 1...16 | Inputs |
| | 17 | Return (M-) |
| | 18 | + 24 VDC Operating voltage (L+) |
| 2 | 1, 3, 5, 7 | Outputs for group 1 |
| | 9, 11, 13, 15 | Outputs for group 2 |
| | 2, 4, 6, 8 | Return (1M-) group 1 outputs |
| | 10, 12, 14, 16 | Return (2M-) group 2 outputs |
| | 17/18 | + 24 VDC for output group 1 (1L+) and group 2 (2L+) |
| 3 | 1 ... 4 | Input voltage for terminal pins 1 ... 4 (L+) |
| | 5 ... 8 | Input voltage for terminal pins 5 ... 8 (L+) |
| | 9 ... 12 | Input voltage for terminal pins 9 ... 12 (L+) |
| | 13 ... 16 | Input voltage for terminal pins 13 ... 16 (L+) |
| | 17/18 | Return (1M-, 2M-) |
| 4 | 1 ... 18 | Return (M-) for sensors |
| 5 | 1 ... 18 | Protective earth (PE) |

Protective Circuit May Be Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit parallel to the operating coil.

Wiring Diagrams

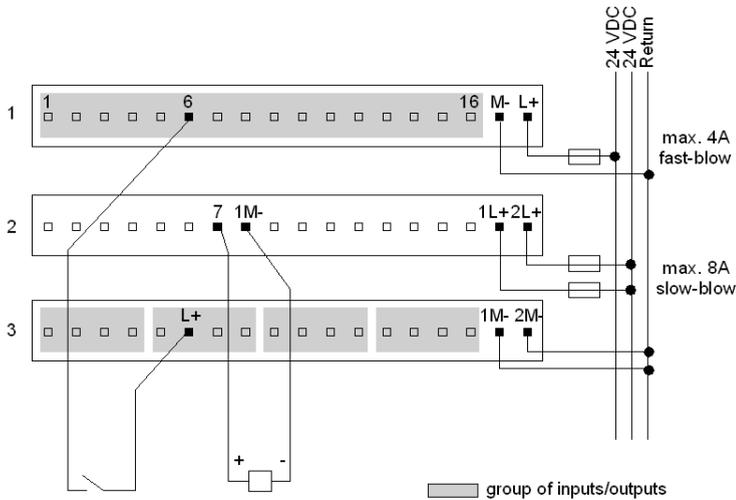
Overview

This section provides diagrams to assist you in wiring the following types of devices:

- 2-wire devices
- sensors activated by an output
- 4-wire sensors with a 2-wire actuator
- broken wire detection

2-Wire Devices

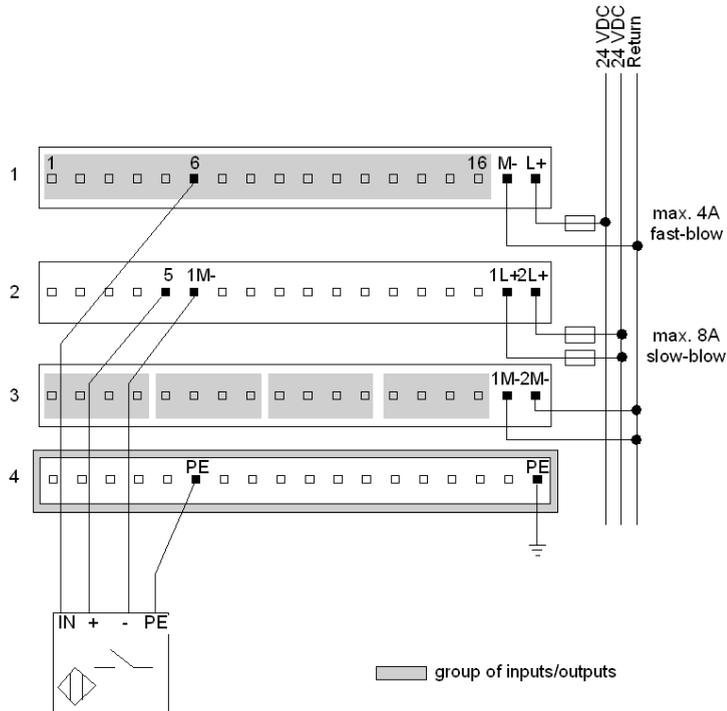
The diagram below shows an example of wiring for two-wire devices.



Sensor Activated by Output

The wiring diagram below shows an example of a sensor activated by an output.

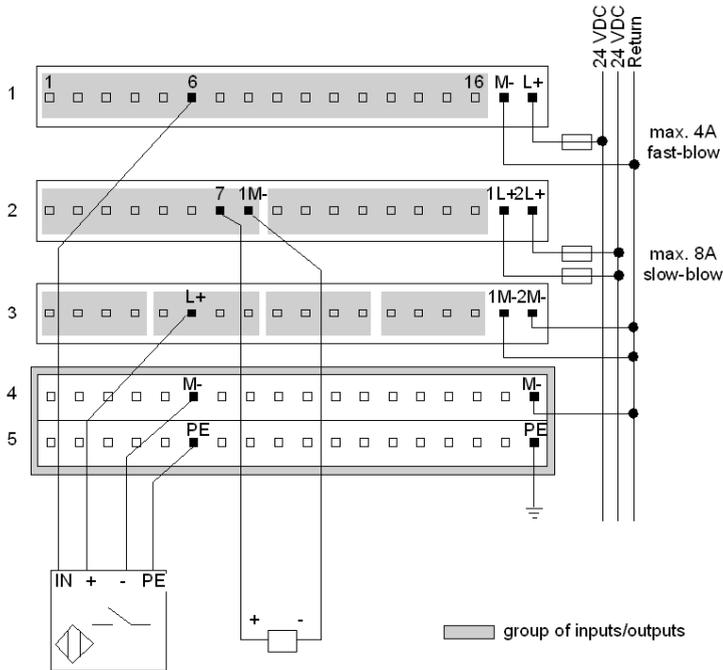
The diagram shows the sensors being supplied with voltage only when the corresponding output delivers a high signal. A similar wiring connection scheme can be used with 2- and 3-wire sensors.



Four-Wire Sensor with a Two-Wire Actuator

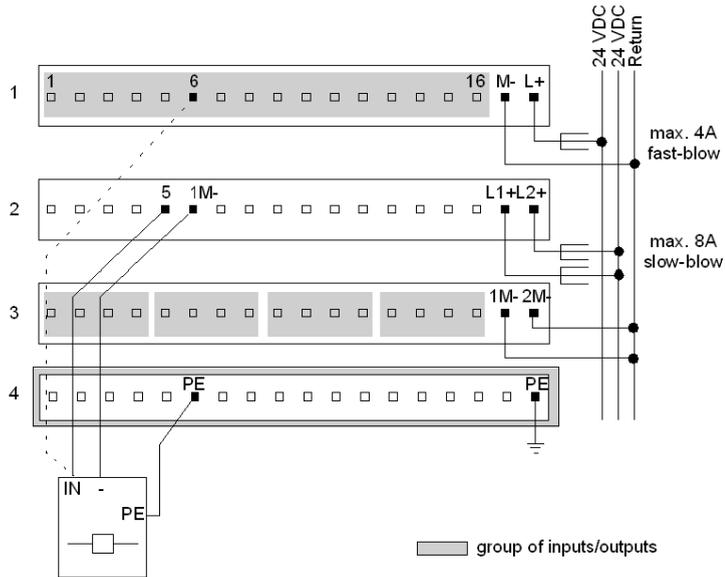
The diagram below shows a four-wire sensor with a two-wire actuator. The process of wiring a 3-wire sensor is very similar to the one below. Because 3-wire sensors do not require PE, a 1-row busbar could be used instead of the 2-row busbar shown.

Separate connections to pins 17 and 18 are shown on row 3, even though these two pins are internally connected. This is done to halve the load.



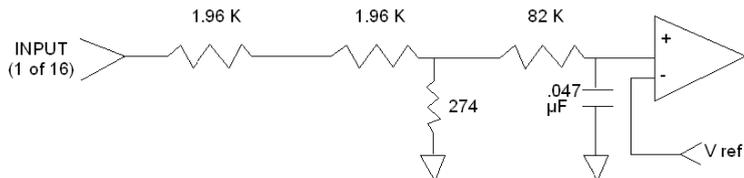
Broken Wire Detection

The diagram below shows a three-wire actuator with an optional wiring scheme for broken wire detection. The dotted line reads back whether or not current has reached the actuator. When the output on pin 5, row 2, is high, the input from pin 6, row 1, must also be high.



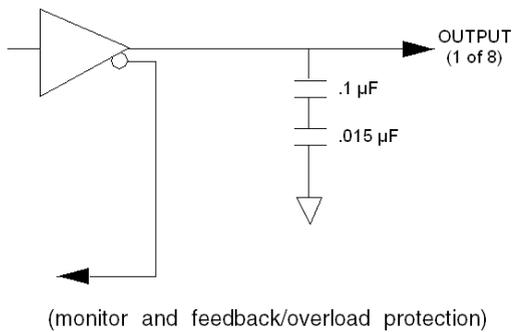
Simplified Input Schematics

The following diagram shows the field-side input circuitry.



Simplified Output Schematics

The following diagram shows the field-side output circuitry.



I/O Mapping

Overview

The 170 ADM 370 10 TSX Momentum I/O base supports 16 discrete inputs and 8 discrete outputs. This section contains information about the mapping of the I/O data into input words and output words.

I/O Map

The I/O base may be mapped as one input word and one output word or as 16 discrete input points and 8 discrete output points.

IEC vs. Ladder Logic

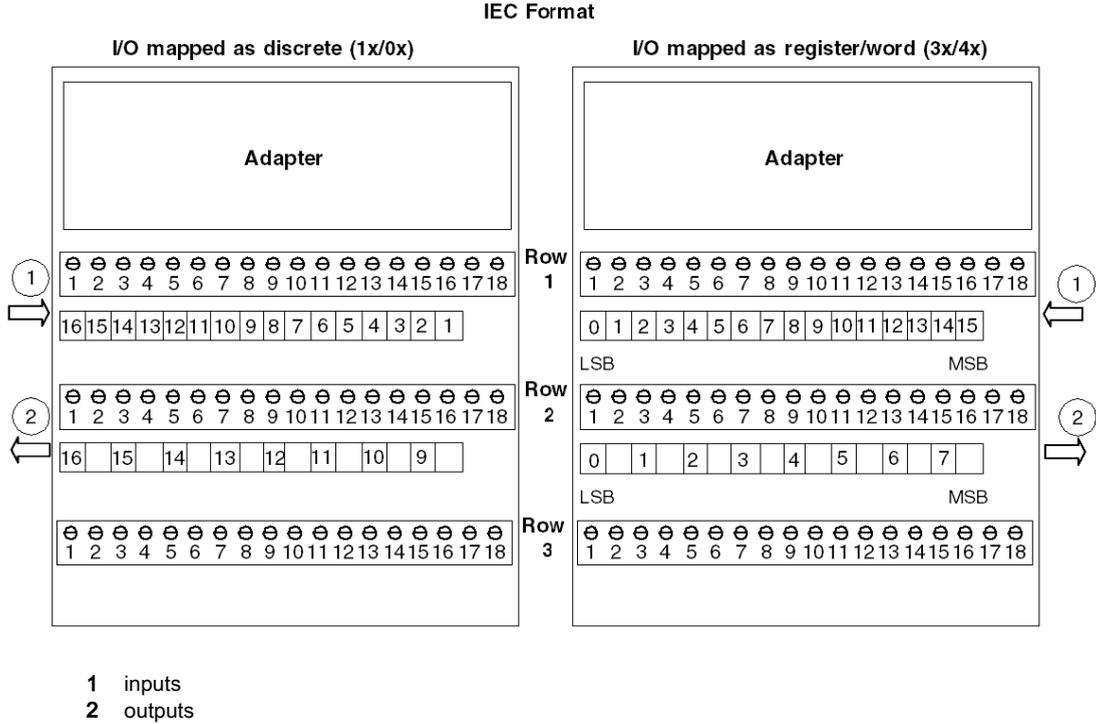
In order to correctly field wire the inputs/output and map the input/output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

| | IEC Compliant | 984 Ladder Logic Compliant |
|---------------------------------|---|--|
| Momentum Processor Adapters | All | None |
| Momentum Communication Adapters | All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 | 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 |

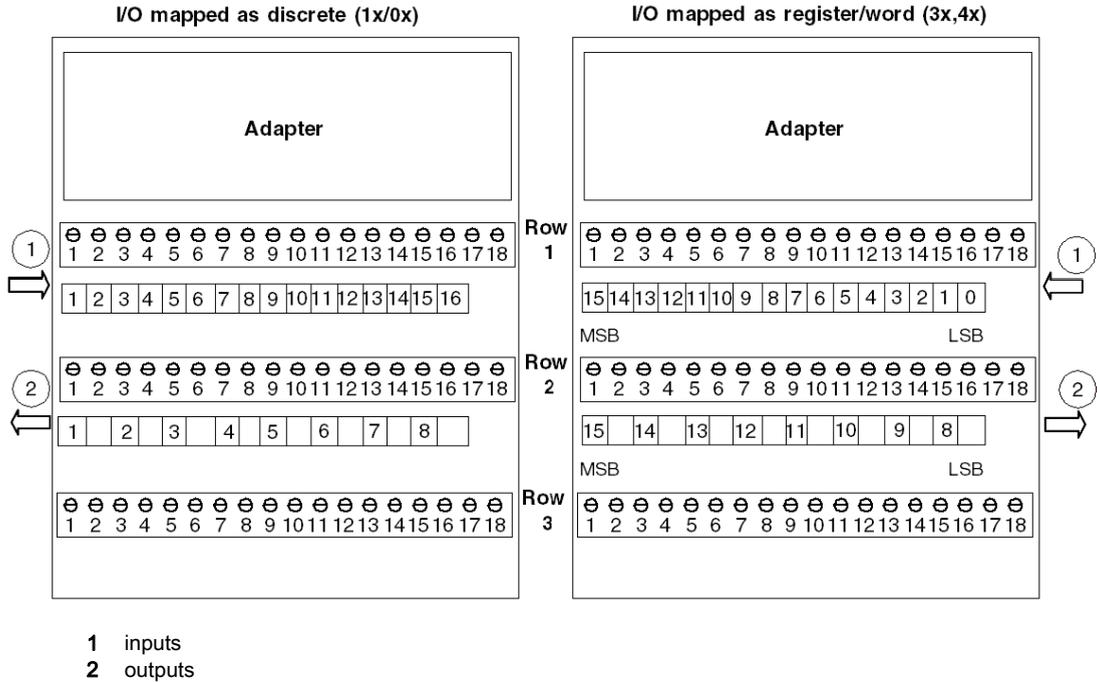
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register, the MSB (bit 15) is assigned to Pin 1 and the LSB (bit 0) is assigned to Pin 16.

984 Format



Chapter 19

170 ADM 390 10 24 VDC - 16 Pt. In / 12 Pt. Out Monitored Module Base

Overview

This chapter describes the 170 ADM 390 10 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------|------|
| Front Panel Components | 300 |
| Specifications | 302 |
| Internal Pin Connections | 305 |
| Field Wiring Guidelines | 306 |
| Wiring Diagrams | 308 |
| I/O Mapping | 311 |

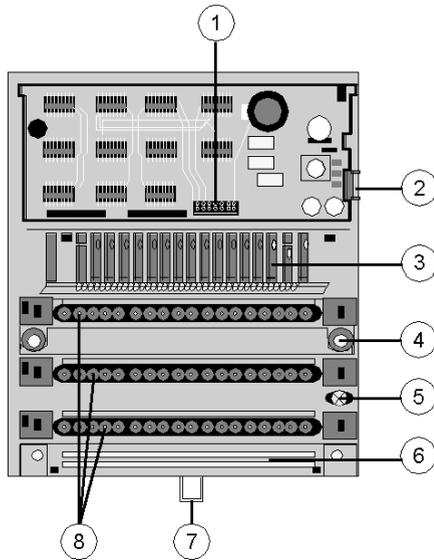
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADM 390 10 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

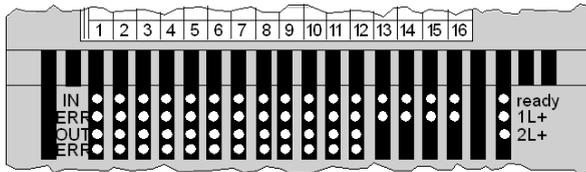


Components of the I/O module

| Label | Description |
|-------|--|
| 1 | Internal interface (ATI) connector |
| 2 | Locking and ground contact for the adapter |
| 3 | LED status display |
| 4 | Mounting holes for panel mount |
| 5 | Grounding screw |
| 6 | Busbar Mounting Slot |
| 7 | Locking tab for DIN rail mount |
| 8 | Sockets for the terminal connectors |

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

| Indicator | Condition | Message |
|------------------------|-----------|---|
| Ready | Green | Module is ready to communicate. Operating voltage L+ for internal logic (5 V) is present. |
| | Off | Module is not ready. |
| 1L+ | Green | Output voltage 1L+ of inputs 1 ... 8 (group 1) is present |
| | Off | Output voltage of inputs 1 ... 8 (group 1) is not present |
| 2L+ | Green | Output voltage 2L+ of inputs 9 ... 12 (group 2) is present |
| | Off | Output voltage of inputs 9 ... 12 (group 2) is not present |
| Row 1 IN 1...16 | Green | Input status (an LED per input); Input point active, ie. input carries a 1 signal (logically ON) |
| | Off | Input point inactive, ie. input carries a 0 signal (logically OFF) |
| Row 2 ERR 1...16 | RED | Input detects broken wire (an LED per input) |
| | Off | Inputs 1 ... 16 operating normally. |
| Row 3 OUT 1...12 | Green | Output status (an LED per output); Output point active, ie. output carries a 1 signal (logically ON) |
| | Off | Output status (an LED per output); Output point inactive, ie. Output carries a 0 signal (logically OFF) |
| Row 4 ERR 1...12 | Red | Output overload (an LED per output). Short circuit or overload on the corresponding output. |
| | Off | Outputs 1 ... 16 operating normally. |

Specifications

Overview

This section contains specifications for the 170 ADM 390 10 I/O base.

General Specifications

| | |
|----------------------------|--|
| Module type | 16 discrete inputs in 1 group 12 discrete outputs in 2 groups (8 pts/group 1 and 4 pts/group 2) |
| Supply voltage | 24 VDC |
| Supply voltage range | 20...30 VDC |
| Supply current consumption | max. 180 mA at 24 VDC |
| Power dissipation | $6\text{ W} + ((\# \text{ of input points on } x .125\text{ W}) + (\# \text{ of output points on } x .25\text{ W}))$ |
| I/O map | 3 input word 1 output word |

Isolation

| | |
|--------------------------------|---------------------------------------|
| Input to input | none |
| Output group to output group | none |
| Input to output group | none |
| Field to communication adapter | Defined by communication adapter type |

Fuses

| | |
|-------------------|---|
| Internal | none |
| Operating voltage | 1 A slow-blow (Bussmann GDC-1A or equivalent) |
| Input voltage | According to the supply dimensioning of the connected sensors—not to exceed 4 A fast-blow/group |
| Output voltage | According to the supply dimensioning of the connected actuators—not to exceed 4 A fast-blow/group |

EMC

| | |
|------------------|--|
| Immunity | IEC 1131-2 Surge on auxiliary power supply 500V |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE, FM Class 1, Div. 2 |

Physical Dimensions

| | |
|-------------------------|--|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars |
| Weight | 200 g (0.495lb) |

Discrete Inputs

| | |
|-----------------------|---|
| Number of points | 16 |
| Number of groups | 1 |
| Points per group | 16 |
| Signal type | True High |
| IEC 1131 type | 1+ (see appendix <i>IEC 1131 Input Types</i> , page 701 for definitions of IEC input types) |
| ON voltage | +11 ... +30 VDC |
| OFF voltage | -3 ... +5 VDC |
| Input current | 2.5 mA minimum ON (5.7 mA at 24 VDC) 1.2 mA maximum OFF |
| Broken wire detection | Input current less than 0.2 mA (0.3 mA required as minimum current for logical zero) |
| Input resistance | 4 kOhm |
| Response time | 2.2 ms OFF to ON 3.3 ms ON to OFF |
| Fault reporting | 1 red LED/point (row 2) ON when indicating a broken wire |
| Error indication | Broken wire detection for on least 1 input (I/O-Error) to communication adapter |

Discrete Outputs

| | |
|---|--|
| Output type | Solid state switch |
| Output supply voltage | 24 VDC |
| Output supply voltage range | 20 ... 30 VDC |
| Output voltage | External supply - .5 VDC |
| Number of points | 12 |
| Number of groups | 2 |
| Points per group | 8 (Group 1) and 4 (Group 2) |
| Current capacity | 0.5 A/point maximum 4 A/group 1 2 A/group 2 6 A/module |
| Signal type | True High |
| Leakage current (output out) | < 1 mA @ 24 VDC |
| On state voltage drop | < 0.5 VDC @ 0.5 A |
| Fault sensing | Outputs are electronically safeguarded to assist in short circuit and overload protection |
| Fault reporting | 1 red LED/point (row 4) ON when overload occurs |
| Fault reporting input voltage | 1 red LED (row 3) signals the state of 4 inputs belonging to the input power supply group |
| Response time (resistive load / 0.5 A) | < 0.1 ms OFF to ON < 0.1 ms ON to OFF |
| Maximum switching cycles | 1000/h for 0.5 A inductive load 100/s for 0.5 A resistive load 8/s for 1.2 W bulb load |

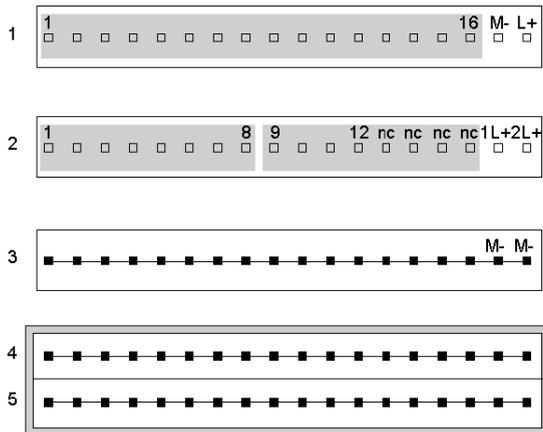
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 5 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 1 of the base. The outputs are field wired to row 2. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3- row busbar. The following busbars are available from Schneider Electric.

| Type | Number of Rows | Part Number |
|-------------|----------------|----------------|
| Screw-in | 1 - row | 170 XTS 006 01 |
| | 2 - row | 170 XTS 005 01 |
| Spring-clip | 1 - row | 170 XTS 007 01 |
| | 2 - row | 170 XTS 008 01 |

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

| Row | Terminal | Function |
|-----|----------|--|
| 1 | 1...16 | Inputs |
| | 17 | Return (M-) |
| | 18 | + 24 VDC Operating voltage (L+) |
| 2 | 1...8 | Outputs for group 1 |
| | 9...12 | Outputs for group 2 |
| | 13...16 | not connected (nc) |
| | 17/18 | + 24 VDC for output group 1 (1L+) and group 2 (2L+) |
| 3 | 1 ... 18 | - Return (M-) |
| 4 | 1 ... 18 | Input voltage for terminal pins 1...16, row 1, or PE |
| 5 | 1 ... 18 | Protective earth (PE) |

Protective Circuit May Be Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit parallel to the operating coil.

Wiring Diagrams

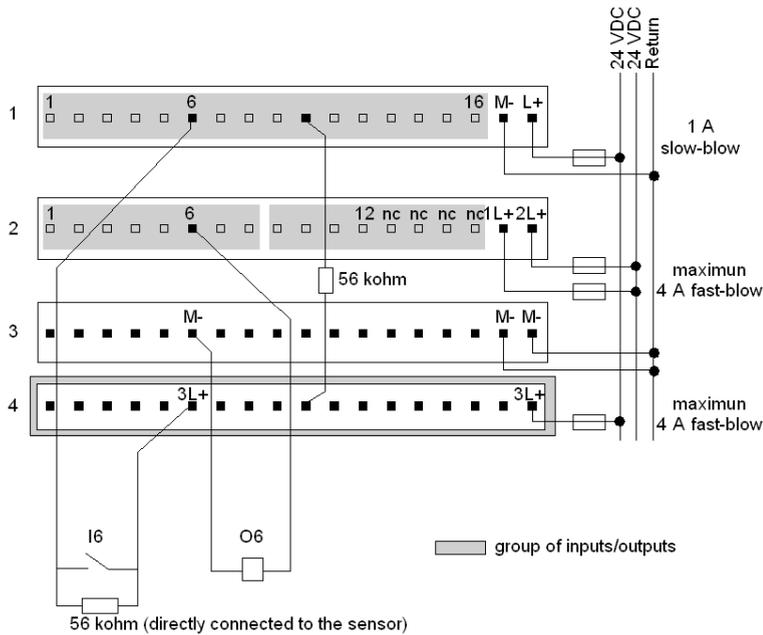
Overview

This section provides diagrams to assist you in wiring the following types of devices:

- 2-wire configuration
- 3-wire configuration
- 4-wire configuration

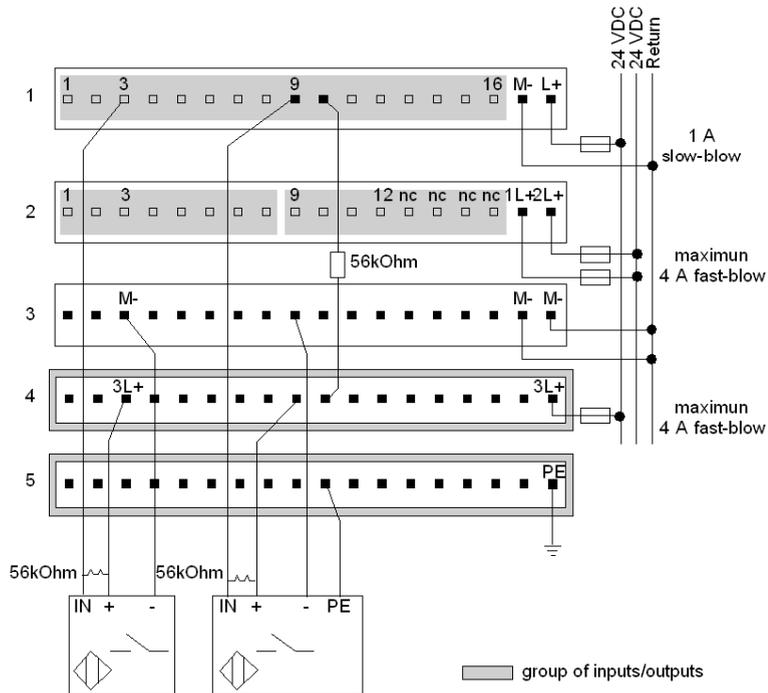
2-Wire Devices

The diagram below shows an example of wiring for 2-wire devices. Use a 1-row busbar for this configuration.



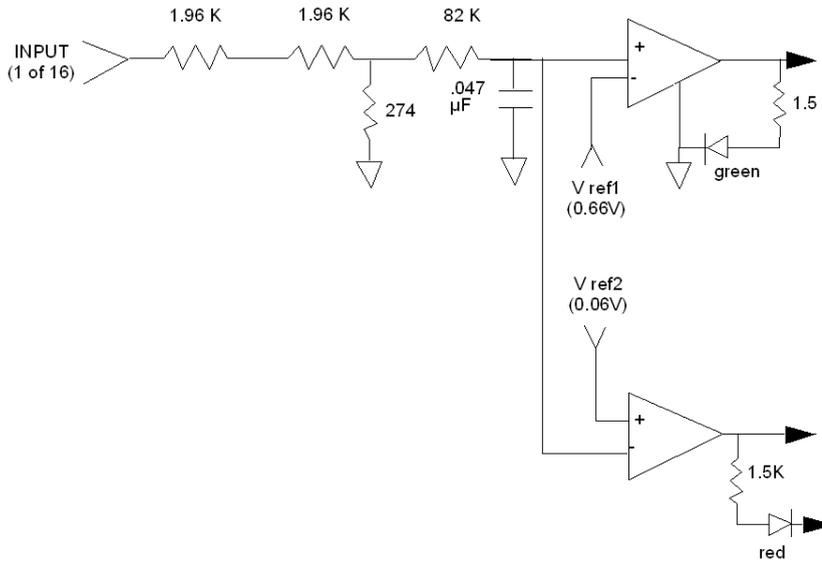
3- and 4-Wire Devices

To connect a 3- or 4-wire sensor, you need a 2-row busbar.



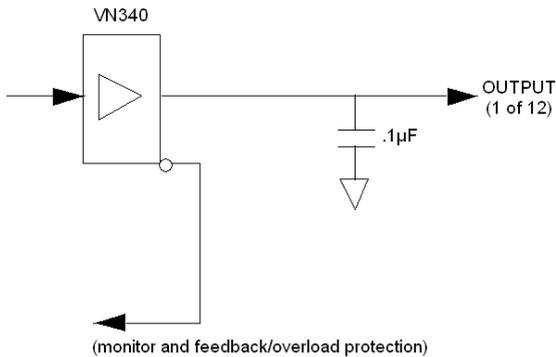
Simplified Input Schematics

The following diagram shows the field-side input circuitry.



Simplified Output Schematics

The following diagram shows the field-side output circuitry.



I/O Mapping

Overview

The 170 ADM 390 10 TSX Momentum I/O base supports 16 discrete inputs and 12 discrete outputs. This section contains information about the mapping of the I/O data into input words and output words.

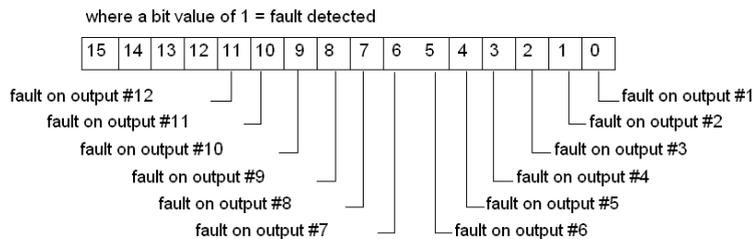
I/O Map

The I/O base must be mapped as three input word and one output word, as follows:

| Word | Input Data | Output Data |
|------|--|------------------------------------|
| 1 | Fault detection status on the 12 outputs | Value for output channels 1 ... 12 |
| 2 | Fault detection status on the 16 inputs | not used |
| 3 | Value for input channels 1 ... 16 | not used |

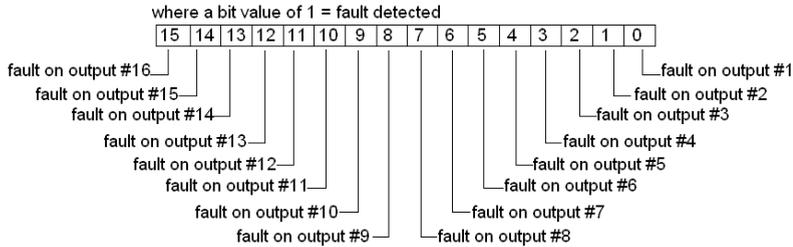
Fault Detection for Outputs

The following diagram shows how bits are assigned in the first input word:



Fault Detection for Inputs

The following diagram shows how bits are assigned in the second input word:



IEC vs. Ladder Logic

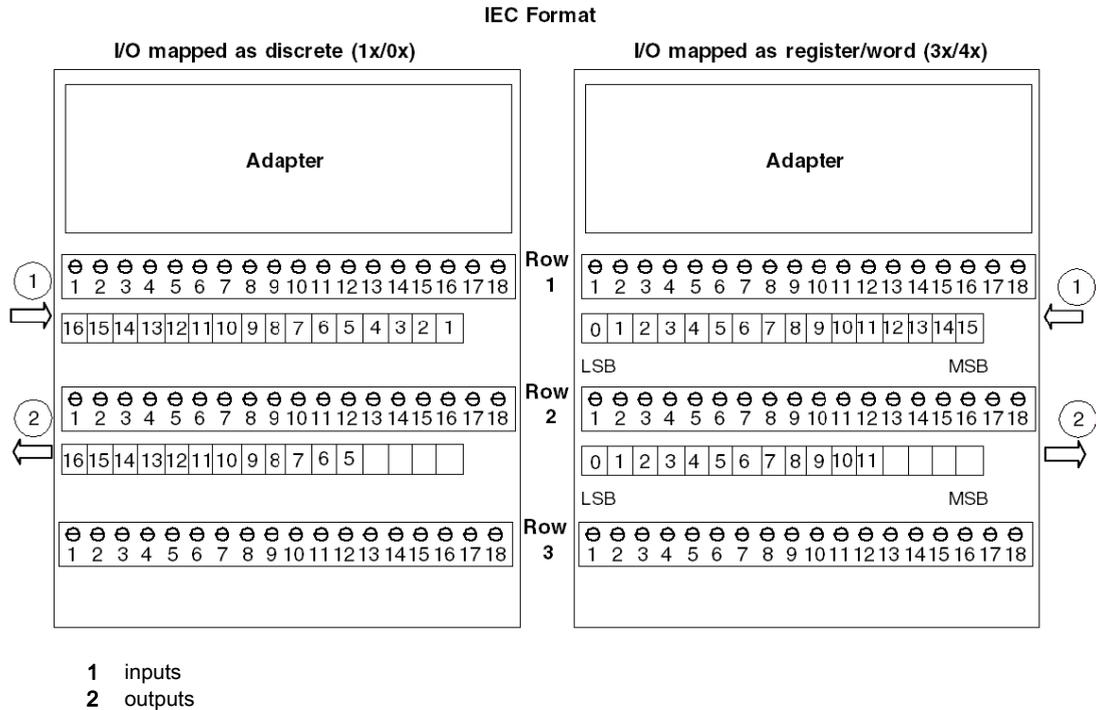
In order to correctly field wire the inputs/outputs and map the input/output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

| | IEC Compliant | 984 Ladder Logic Compliant |
|---------------------------------|---|--|
| Momentum Processor Adapters | All | None |
| Momentum Communication Adapters | All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 | 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 |

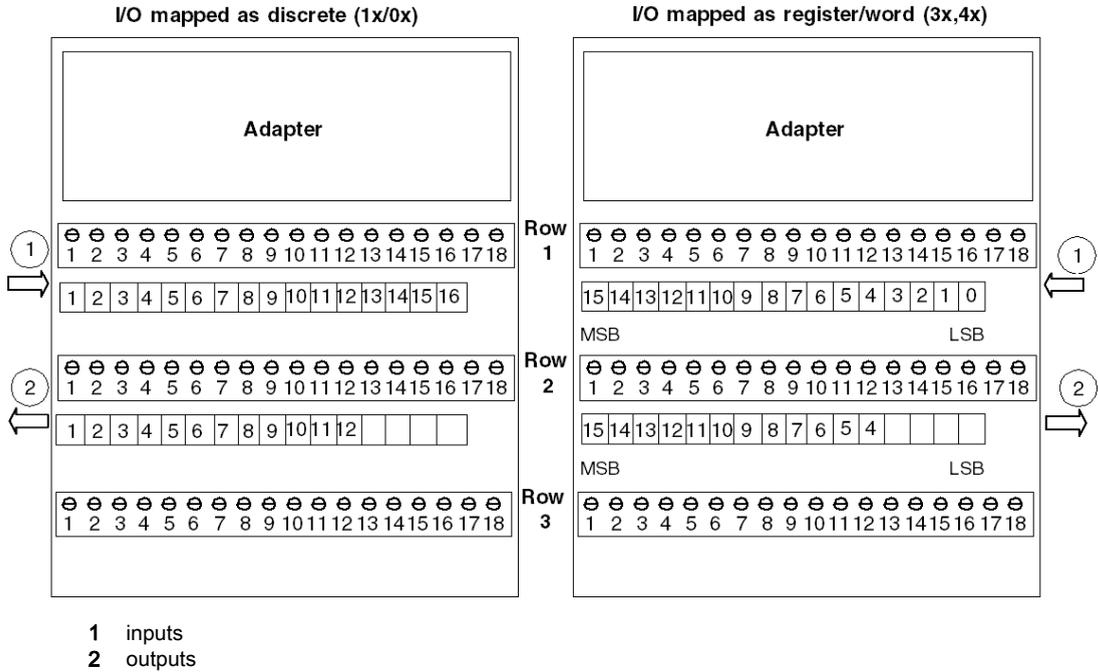
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (1x/0x) the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (3x/4x) the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1.



The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (1x/0x) the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (3x/4x) the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16.

984 Format



Chapter 20

170 ADM 390 30 24 VDC - 10 Pt. In / 8 Pt. Relay Out Module Base

Overview

This chapter describes the 170 ADM 390 30 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------|------|
| Front Panel Components | 316 |
| Specifications | 318 |
| Internal Pin Connections | 321 |
| Field Wiring Guidelines | 322 |
| Wiring Diagrams | 325 |
| I/O Mapping | 328 |

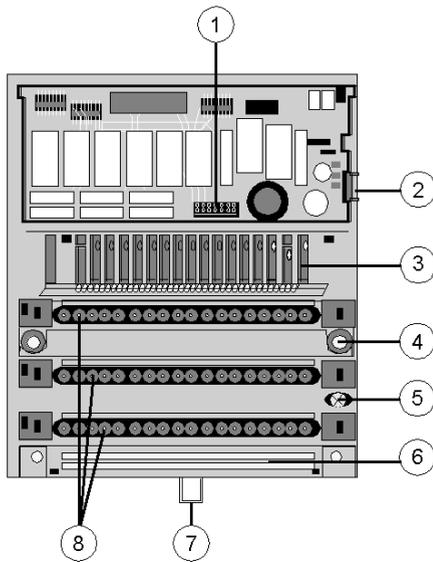
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADM 390 30 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

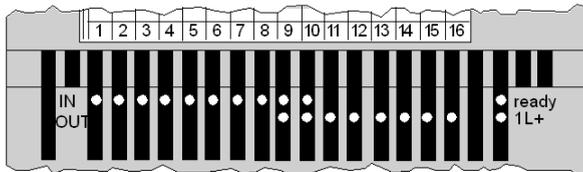


Components of the I/O module

| Label | Description |
|-------|--|
| 1 | Internal interface (ATI) connector |
| 2 | Locking and ground contact for the adapter |
| 3 | LED status display |
| 4 | Mounting holes for panel mount |
| 5 | Grounding screw |
| 6 | Busbar Mounting Slot |
| 7 | Locking tab for DIN rail mount |
| 8 | Sockets for the terminal connectors |

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

| Indicator | Condition | Message |
|---------------------------|-----------|--|
| Ready | Green | Module is ready to communicate. Operating voltage for internal logic (5 V) is present. |
| | Off | Module is not ready. |
| 1L+ | Green | Input voltage 1L+ of inputs 1 ... 10 is present |
| | Off | Input voltage of inputs 1 ... 10 is not present |
| Upper row IN 1...10 | Green | Input status (an LED per input); Input point active, ie. input carries a 1 signal (logically ON) |
| | Off | Input status (an LED per input); Input point inactive, ie. input carries a 0 signal (logically OFF) |
| Middle row OUT 9 ...16 | Green | Output status (an LED per output); Output point active, ie. output carries a 1 signal (logically ON) |
| | Off | Output status (an LED per output) Output point inactive, ie. Output carries a 0 signal (logically OFF) |

Specifications

Overview

This section contains specifications for the 170 ADM 390 30 I/O base.

General Specifications

| | |
|----------------------------|---|
| Module type | 10 discrete inputs in 1 group 8 relay outputs as normally open contacts in 2 groups, 4 pts/group |
| Supply voltage | 24 VDC |
| Supply voltage range | 20...30 VDC |
| Supply current consumption | max. 250 mA at 24 VDC |
| Power dissipation | 6 W + (# of input points on x .144 W) |
| I/O map | 1 input word 1 output word |

Protective Circuit Required

To reduce the effects of radiated noise, you must add snubbing components across inductive load devices. The following table provides generic selection guidelines.

| Type of Load | Suppression Device | Minimum Component Rating | |
|--------------|--|---|---------|
| AC circuits | 50 Ω resistor in series with a 0.47 μ fd nonpolarized capacitor across the load | for 120 VAC-powered loads | 200 VAC |
| | | for 220 VAC-powered loads | 400 VAC |
| DC circuits | a reverse-biased clamping diode across the load | 2 A and greater than twice the maximum load voltage | |

Consult relay and contactor manufacturers' catalogs for commercial suppression devices matched to your particular products.

Isolation

| | |
|---------------------------------------|---------------------------------------|
| Input to input | none |
| Output group to output group | 1 780 VAC RMS |
| Input to output | 1 780 VAC RMS |
| Output group to communication adapter | 1 780 VAC RMS |
| Field to communication adapter | Defined by communication adapter type |

Fuses

| | |
|-------------------------------------|--|
| Internal | none |
| External: operating voltage (L+) | 1 A slow-blow (Bussmann GDC-1A or equivalent) |
| External: input voltage (1L+) | max. 4 A fast-blow (Wickmann 19193-4A or equivalent) |
| External: output voltage (1L1, 2L1) | According to the supply of the connected actuators—not to exceed 8 A slow-blow/ group. |

EMC

| | |
|------------------|--|
| Immunity | IEC 1131-2 Surge on auxiliary power supply AC 2 KV to PE, 1 KV to differential surge on auxiliary power supply DC 0.5 KV, |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE, FM Class 1 Div. 2 pending |

Physical Dimensions

| | |
|-------------------------|--|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) no or one busbar 159.5mm (6.3 in) two busbars 171.5 mm (6.75 in) three busbars |
| Weight | 260 g (0.57lb) |

Discrete Inputs

| | |
|---------------------|--|
| Number of points | 10 |
| Number of groups | 1 |
| Signal type | True High |
| IEC 1131 type | 1+ (See Appendix <i>IEC 1131 Input Types</i> , page 701 for definitions of IEC input types.) |
| ON voltage | +11 ... +30 VDC |
| OFF voltage | -3 ... +5 VDC |
| Input current | 2.5 mA minimum ON (6 mA at 24 VDC) 1.2 mA maximum OFF |
| Input voltage range | -3 ... +30 VDC |
| Input resistance | 4 kOhm |
| Response time | 2.2 ms OFF to ON 3.3 ms ON to OFF |

Relay Outputs

| | | |
|--|---------|--|
| Output type | | Relay normally open output |
| Number of points | | 8 |
| Number of groups | | 2 |
| Points per group | | 4 |
| Current capacity | 20 VDC | > 5 mA (but only for new contacts) max 2 A (switching current \leq 5 A) ohmic load max 1 A (L/R \leq 40 ms) inductive load |
| | 115 VDC | max. 0.5 A (switching current \leq 1.5 A) ohmic load max. 0.15 A (L/R \leq 40 ms) inductive load |
| | 24 VAC | max. 2A (switching current \leq 5 A) $\cos = 1$ max. 1 A $\cos = 0.5$ |
| | 230 VAC | max. 2A (switching current \leq 5 A) $\cos = 1$ max. 1 A $\cos = 0.5$ |
| Relay type | | Normally Open |
| Leakage current (output out) | | < 1.2 mA @ 230 VAC |
| Fault sensing | | These contacts have an internal suppressor circuit. |
| Fault reporting | | None |
| Error indication | | None |
| Response time (resistive load / 0.5 A) | | 10 ms @ 60 Hz OFF to ON 10 ms @ 60 Hz ON to OFF |
| Maximum switching cycles | | > 3 x 10 ⁶ (mechanical) >=1 x 10 ⁵ (inductive load with external protective circuitry) |

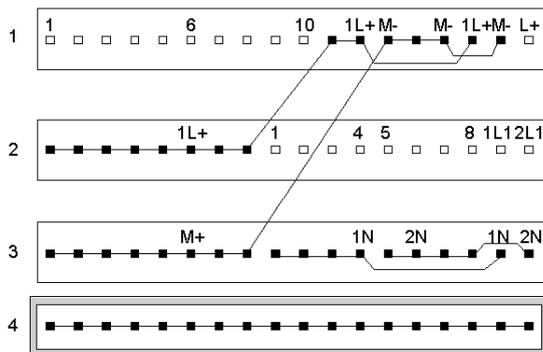
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 shows the internal connections on the optional busbar.



■—■ internally connected

Field Wiring Guidelines

Overview

Inputs are field wired to row 1 of the base. The outputs are field wired to row 2. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-row busbar. The following busbars are available from Schneider Electric.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 006 01 |
| Spring-clip | 170 XTS 007 01 |

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

| Row | Terminal | Function |
|-----|----------------|---|
| 1 | 1...10 | Inputs |
| | 11, 12, 16 | Input voltage for terminal pins 1 ... 10, (1L+) |
| | 13, 14, 15 | Return (M-) for the inputs |
| | 17 | Return (M-) for the module |
| | 18 | + 24 VDC Operating voltage (L+) |
| 2 | 1 ... 8 | Input voltage for pins 1 ... 8, (1L+) |
| | 9 ... 12 | Outputs for group 1 |
| | 13 ... 16 | Outputs for group 2 |
| | 17 | Output Voltage for relays 1 ... 4 (1L1, 20 ... 115 VDC or 24 ... 230 VDC) |
| | 18 | Output Voltage for relays 5 ... 8 (2L1, 20 ... 115 VDC or 24 ... 230 VDC) |
| 3 | 1 ... 8 | Return (M-) for the inputs |
| | 9, 10, 11, 12 | Return (1N) for the relays 1 ... 4 |
| | 13, 14, 15, 16 | Return (1N) for the relays 5 ... 8 |
| | 17/18 | Return/Neutral for relay outputs |
| 4 | 1 ... 18 | Protective earth (PE) |

Protective Circuit Required

To reduce the effects of radiated noise, you must add snubbing components across inductive load devices. The following table provides generic selection guidelines.

| Type of Load | Suppression Device | Minimum Component Rating | |
|--------------|--|---|---------|
| AC circuits | 50 Ω resistor in series with a 0.47 μ fd nonpolarized capacitor across the load | for 120 VAC-powered loads | 200 VAC |
| | | for 220 VAC-powered loads | 400 VAC |
| DC circuits | a reverse-biased clamping diode across the load | 2 A and greater than twice the maximum load voltage | |

Consult relay and contactor manufacturers' catalogs for commercial suppression devices matched to your particular products.

Wiring Diagrams

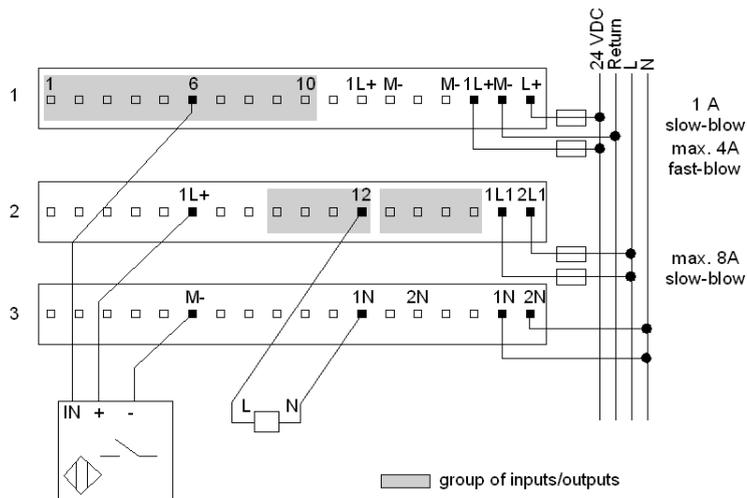
Overview

This section provides diagrams to assist you in wiring the following types of devices:

- 3-wire sensor with a 2-wire actuator
- 4-wire sensor with a 3-wire actuator

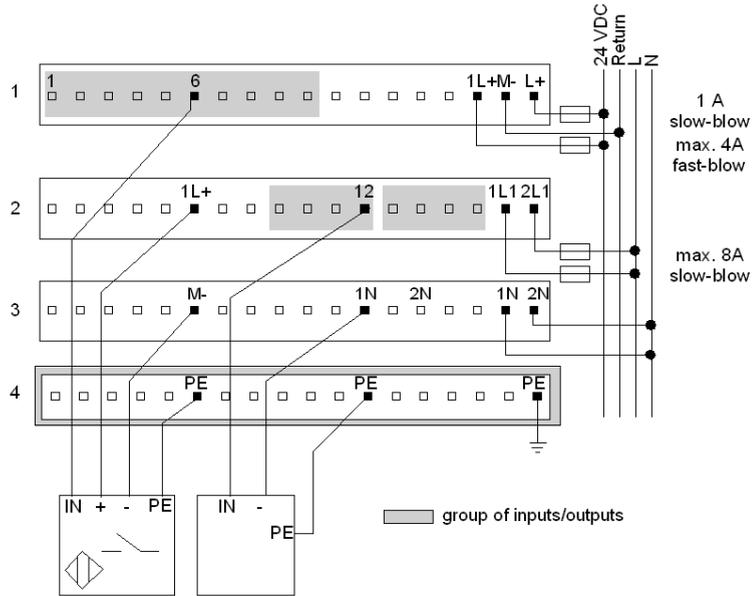
3-Wire Sensor with a 2-Wire Actuator

The diagram below shows field wiring for a 3-wire (24 VDC) sensor and a 2-wire (230 VAC) actuator.



4-Wire Sensor with a 3-Wire Actuator

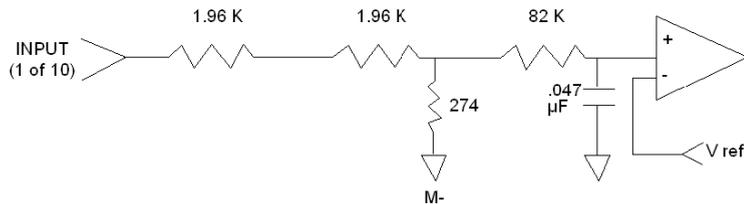
The diagram below shows field wiring for a 4-wire (24 VDC) sensor and a 3-wire (230 VAC) actuator.



A 1-row busbar is used to provide PE for the 4-wire sensor. No busbar would be required if only 2- and/or 3-wire sensors were used.

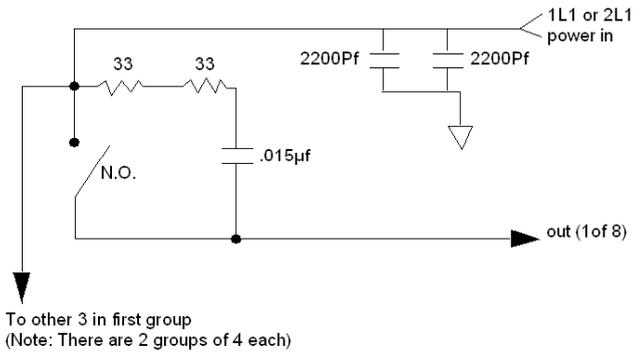
Simplified Input Schematics

The following diagram shows the field-side input circuitry.



Simplified Output Schematics

The following diagram shows the field-side output circuitry.



I/O Mapping

Overview

The 170 ADM 390 30 TSX Momentum I/O base supports 10 discrete inputs and 8 discrete outputs. This section contains information about the mapping of the I/O data into input words and output words.

I/O Map

The I/O base may be mapped as one input word and one output word, or as 10 discrete input points and 8 discrete output points.

IEC vs. Ladder Logic

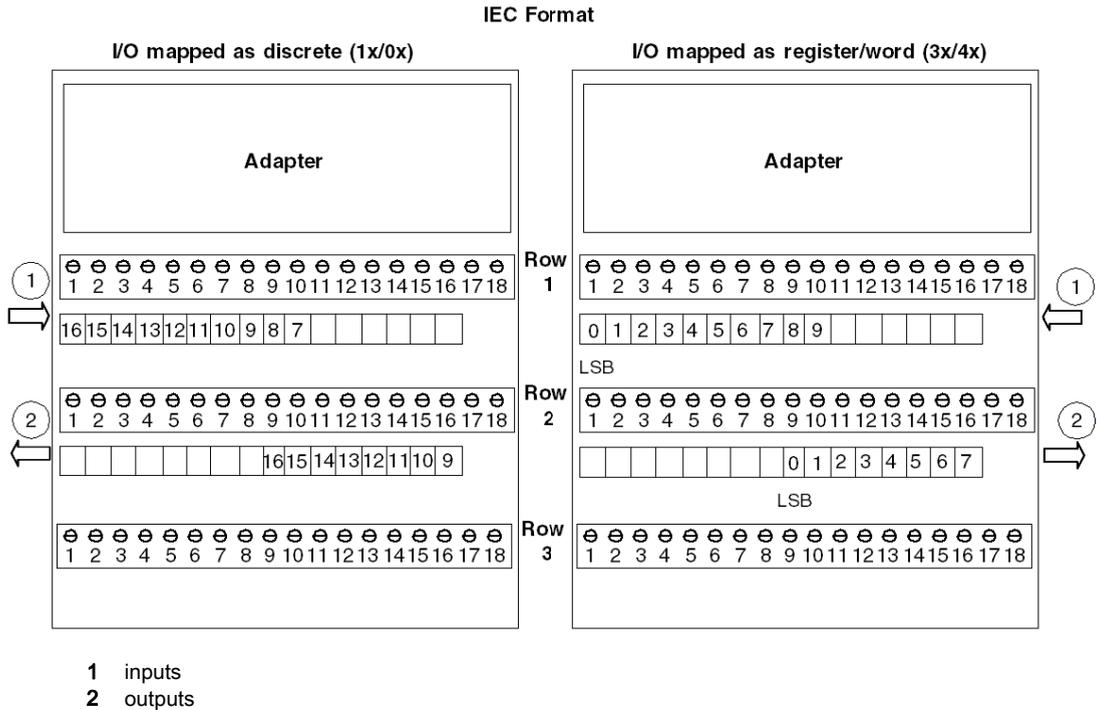
In order to correctly field wire the inputs/outputs and map the input/output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

| | IEC Compliant | 984 Ladder Logic Compliant |
|---------------------------------|---|--|
| Momentum Processor Adapters | All | None |
| Momentum Communication Adapters | All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 | 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 |

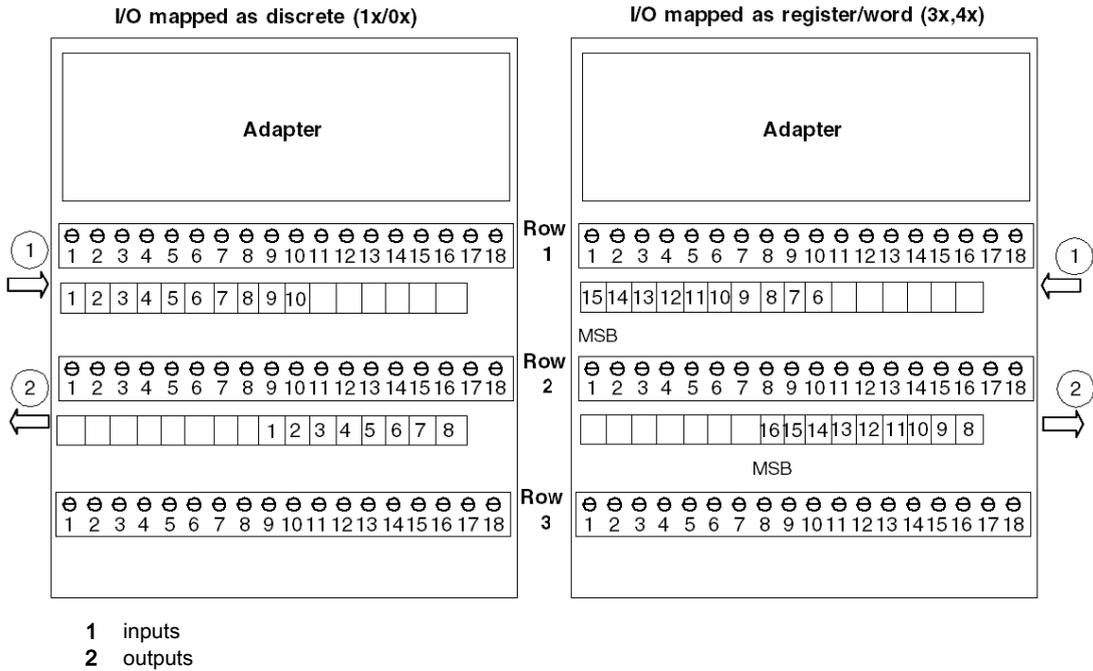
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 16 and LSB (bit 0) is assigned to Pin 1.



The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 1 and LSB (bit 0) is assigned to Pin 16.

984 Format



Chapter 21

170 ADM 390 31 24 VDC - 10 Pt. In / 8 Pt. Relay Out Module Base

Overview

This chapter describes the 170 ADM 390 31 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------|------|
| Front Panel Components | 332 |
| Specifications | 334 |
| Internal Pin Connections | 337 |
| Field Wiring Guidelines | 338 |
| Wiring Diagrams | 340 |
| I/O Mapping | 343 |

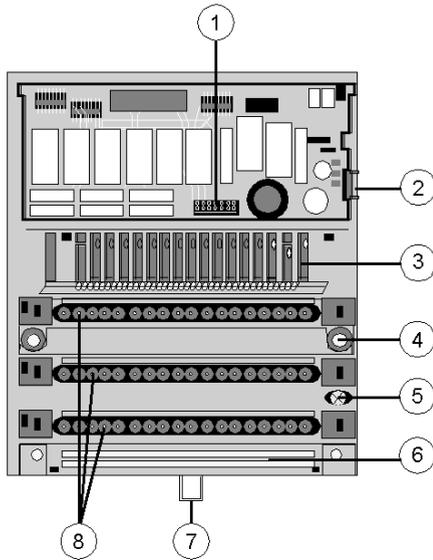
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADM 390 31 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

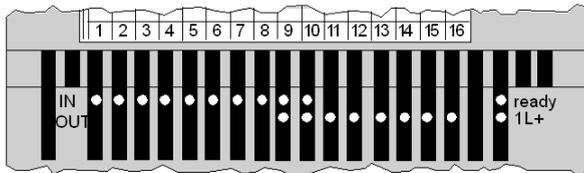


Components of the I/O module

| Label | Description |
|-------|--|
| 1 | Internal interface (ATI) connector |
| 2 | Locking and ground contact for the adapter |
| 3 | LED status display |
| 4 | Mounting holes for panel mount |
| 5 | Grounding screw |
| 6 | Busbar Mounting Slot |
| 7 | Locking tab for DIN rail mount |
| 8 | Sockets for the terminal connectors |

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

| Indicator | Condition | Message |
|---------------------------|-----------|--|
| Ready | Green | Module is ready to communicate. Operating voltage for internal logic (5 V) is present. |
| | Off | Module is not ready. |
| 1L+ | Green | Input voltage 1L+ of inputs 1 ... 10 is present |
| | Off | Input voltage of inputs 1 ... 10 is not present |
| Upper row IN 1...10 | Green | Input status (an LED per input); Input point active, ie. input carries a 1 signal (logically ON) |
| | Off | Input status (an LED per input); Input point inactive, ie. input carries a 0 signal (logically OFF) |
| Middle row OUT 9 ...16 | Green | Output status (an LED per output); Output point active, ie. output carries a 1 signal (logically ON) |
| | Off | Output status (an LED per output) Output point inactive, ie. Output carries a 0 signal (logically OFF) |

Specifications

Overview

This section contains specifications for the 170 ADM 390 31 I/O base.

General Specifications

| | |
|----------------------------|---|
| Module type | 10 discrete inputs in 1 group 8 relay outputs as normally open contacts in 2 groups, 4 pts/group |
| Supply voltage | 24 VDC |
| Supply voltage range | 20...30 VDC |
| Supply current consumption | max. 250 mA at 24 VDC |
| Power dissipation | 6 W + (# of input points on x .144 W) |
| I/O map | 1 input word 1 output word |

Protective Circuit Required

To reduce the effects of radiated noise, you must add snubbing components across inductive load devices. The following table provides generic selection guidelines.

| Type of Load | Suppression Device | Minimum Component Rating |
|--------------|---|---|
| DC circuits | a reverse-biased clamping diode across the load | 2 A and greater than twice the maximum load voltage |

Consult relay and contactor manufacturers' catalogs for commercial suppression devices matched to your particular products.

Isolation

| | |
|---------------------------------------|---------------------------------------|
| Input to input | none |
| Output group to output group | 1 780 VAC RMS |
| Input to output | 1 780 VAC RMS |
| Output group to communication adapter | 1 780 VAC RMS |
| Field to communication adapter | Defined by communication adapter type |

Fuses

| | |
|-------------------------------------|--|
| Internal | none |
| External: operating voltage (L+) | 1 A slow-blow (Bussmann GDC-1A or equivalent) |
| External: input voltage (1L+) | max. 4 A fast-blow (Wickmann 19193-4A or equivalent) |
| External: output voltage (1L1, 2L1) | According to the supply of the connected actuators—not to exceed 8 A slow-blow/ group. |

EMC

| | |
|------------------|--|
| Immunity | IEC 1131-2 Surge on auxiliary power supply AC 2 KV to PE, 1 KV to differential surge on auxiliary power supply DC 0.5 KV, |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE, FM Class 1 Div. 2 pending |

Physical Dimensions

| | |
|-------------------------|--|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) no or one busbar 159.5mm (6.3 in) two busbars 171.5 mm (6.75 in) three busbars |
| Weight | 260 g (0.57lb) |

Discrete Inputs

| | |
|---------------------|--|
| Number of points | 10 |
| Number of groups | 1 |
| Signal type | True High |
| IEC 1131 type | 1+ (See Appendix for definitions of IEC input types.) |
| ON voltage | +11 ... +30 VDC |
| OFF voltage | -3 ... +5 VDC |
| Input current | 2.5 mA minimum ON (6 mA at 24 VDC) 1.2 mA maximum OFF |
| Input voltage range | -3 ... +30 VDC |
| Input resistance | 4 kOhm |
| Response time | 2.2 ms OFF to ON 3.3 ms ON to OFF |

Relay Outputs

| | | |
|--|--------|--|
| Output type | | Relay normally open output |
| Number of points | | 8 |
| Number of groups | | 2 |
| Points per group | | 4 |
| Current capacity | 20 VDC | > 5 mA (but only for new contacts) max 2 A (switching current \leq 5 A) ohmic load max 1 A (L/R \leq 40 ms) inductive load |
| | 24 VAC | max. 2A (switching current \leq 5 A) $\cos = 1$ max. 1 A $\cos = 0.5$ |
| Relay type | | Normally Open |
| Leakage current (output) | | < 0.2 mA @ 24 VAC |
| Fault sensing | | These contacts have an internal suppressor circuit. |
| Fault reporting | | None |
| Error indication | | None |
| Response time (resistive load / 0.5 A) | | 10 ms @ 60 Hz OFF to ON 10 ms @ 60 Hz ON to OFF |
| Maximum switching cycles | | > 3×10^6 (mechanical) >= 1×10^5 (inductive load with external protective circuitry) |

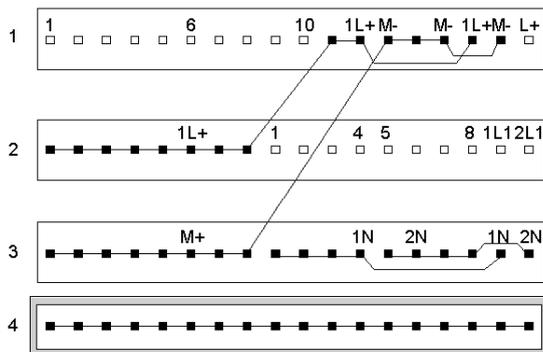
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 shows the internal connections on the optional busbar.



■—■ internally connected

Field Wiring Guidelines

Overview

Inputs are field wired to row 1 of the base. The outputs are field wired to row 2. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-row busbar. The following busbars are available from Schneider Electric.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 006 01 |
| Spring-clip | 170 XTS 007 01 |

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

| Row | Terminal | Function |
|-----|----------------|--|
| 1 | 1...10 | Inputs |
| | 11, 12, 16 | Input voltage for terminal pins 1 ... 10, (1L+) |
| | 13, 14, 15 | Return (M-) for the inputs |
| | 17 | Return (M-) for the module |
| | 18 | + 24 VDC Operating voltage (L+) |
| 2 | 1 ... 8 | Input voltage for pins 1 ... 8, (1L+) |
| | 9 ... 12 | Outputs for group 1 |
| | 13 ... 16 | Outputs for group 2 |
| | 17 | Output Voltage for relays 1 ... 4 (1L1, 20 ... 24 VDC) |
| | 18 | Output Voltage for relays 5 ... 8 (2L1, 20 ... 24 VDC) |
| 3 | 1 ... 8 | Return (M-) for the inputs |
| | 9, 10, 11, 12 | Return (1N) for the relays 1 ... 4 |
| | 13, 14, 15, 16 | Return (1N) for the relays 5 ... 8 |
| | 17/18 | Return/Neutral for relay outputs |
| 4 | 1 ... 18 | Protective earth (PE) |

Protective Circuit Required

To reduce the effects of radiated noise, you must add snubbing components across inductive load devices. The following table provides generic selection guidelines.

| Type of Load | Suppression Device | Minimum Component Rating |
|--------------|---|---|
| DC circuits | a reverse-biased clamping diode across the load | 2 A and greater than twice the maximum load voltage |

Consult relay and contactor manufacturers' catalogs for commercial suppression devices matched to your particular products.

Wiring Diagrams

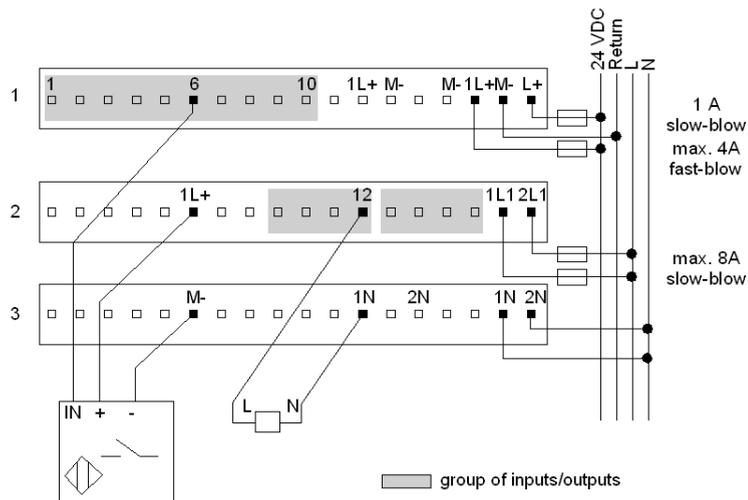
Overview

This section provides diagrams to assist you in wiring the following types of devices:

- 3-wire sensor with a 2-wire actuator
- 4-wire sensor with a 3-wire actuator

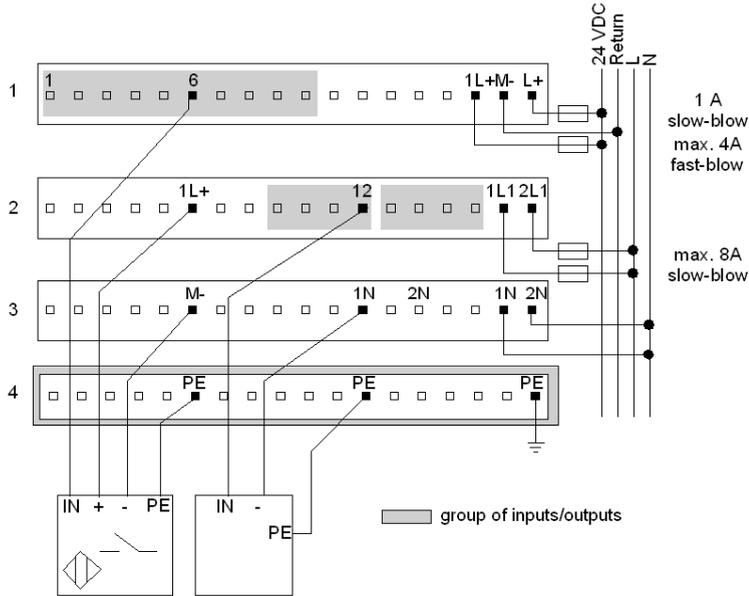
3-Wire Sensor with a 2-Wire Actuator

The diagram below shows field wiring for a 3-wire (24 VDC) sensor and a 2-wire actuator.



4-Wire Sensor with a 3-Wire Actuator

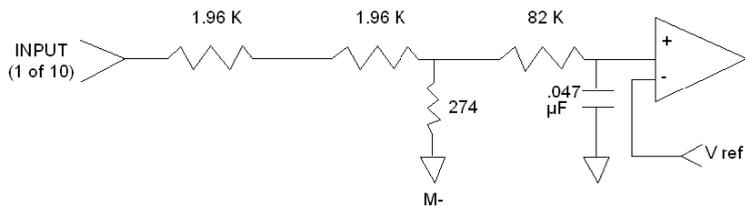
The diagram below shows field wiring for a 4-wire (24 VDC) sensor and a 3-wire actuator.



A 1-row busbar is used to provide PE for the 4-wire sensor. No busbar would be required if only 2- and/or 3-wire sensors were used.

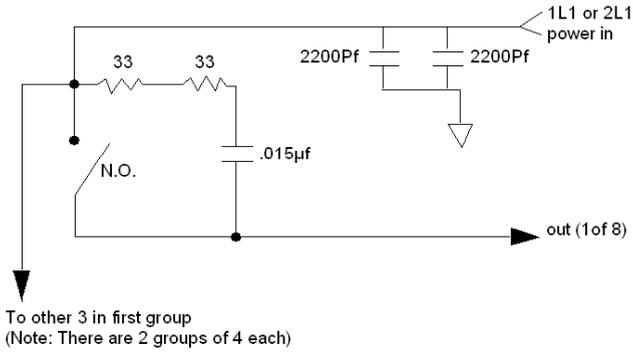
Simplified Input Schematics

The following diagram shows the field-side input circuitry.



Simplified Output Schematics

The following diagram shows the field-side output circuitry.



I/O Mapping

Overview

The 170 ADM 390 31 TSX Momentum I/O base supports 10 discrete inputs and 8 discrete outputs. This section contains information about the mapping of the I/O data into input words and output words.

I/O Map

The I/O base may be mapped as one input word and one output word, or as 10 discrete input points and 8 discrete output points.

IEC vs. Ladder Logic

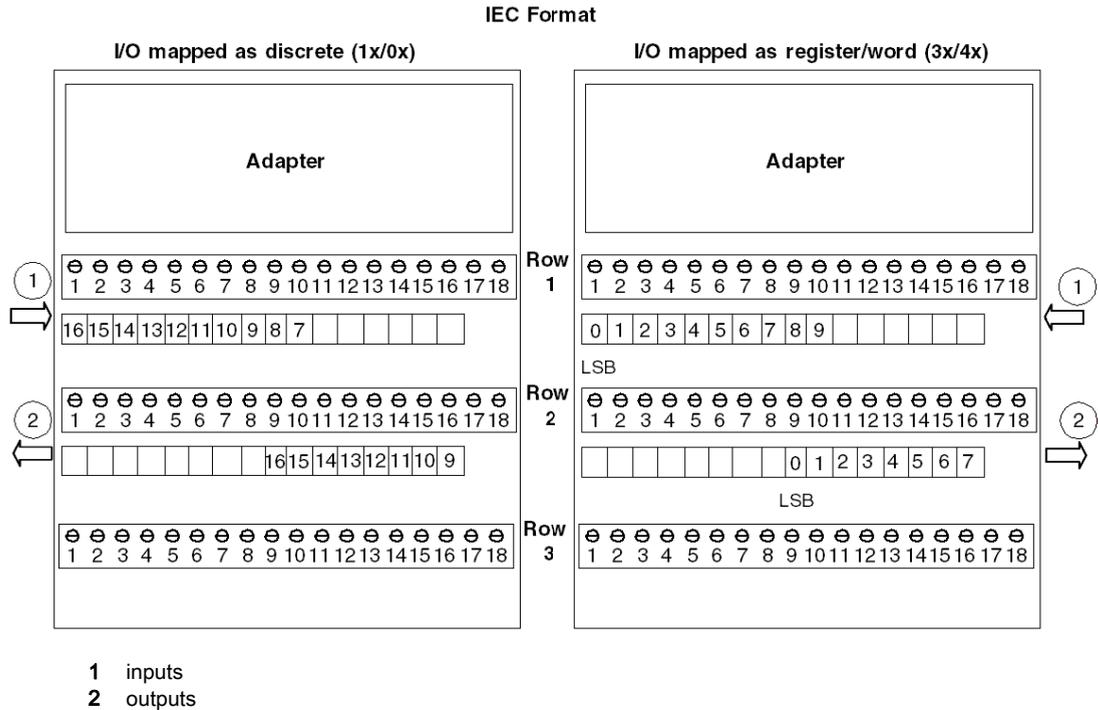
In order to correctly field wire the inputs/outputs and map the input/output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

| | IEC Compliant | 984 Ladder Logic Compliant |
|---------------------------------|---|--|
| Momentum Processor Adapters | All | None |
| Momentum Communication Adapters | All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 | 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 |

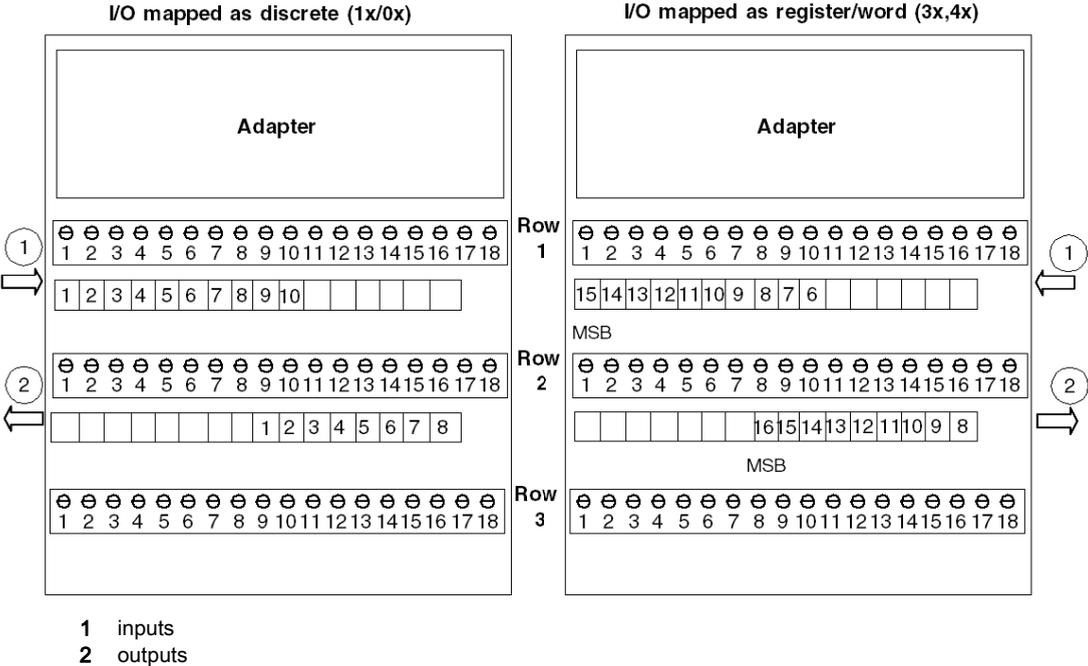
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 16 and LSB (bit 0) is assigned to Pin 1.



The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 1 and LSB (bit 0) is assigned to Pin 16.

984 Format



Chapter 22

170 ADM 540 80 120 VAC - 6 Pt. In / 3 Pt. Out Discrete MCC Module Base

Overview

This chapter describes the 170 ADM 540 80 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|------------------------------|------|
| Front Panel Components | 348 |
| Specifications | 350 |
| Internal Pin Connections | 354 |
| Field Wiring Guidelines | 355 |
| Wiring Diagrams | 358 |
| I/O Mapping | 359 |
| General Modbus Message Rules | 361 |
| Output Words | 364 |
| Output Words Control Modes | 368 |
| Input Words | 373 |
| Input Words Control Modes | 375 |

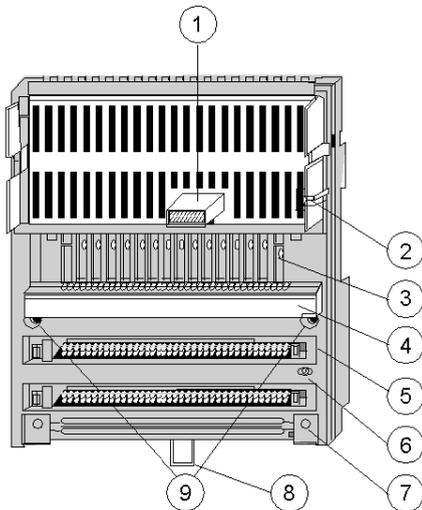
Front Panel Components

Overview

This section contains a photograph of the front panel of the 170 ADM 540 80 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

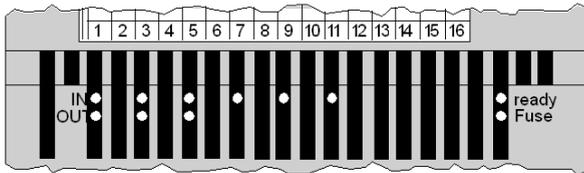


Components of the I/O module

| Label | Description |
|-------|--|
| 1 | Internal interface (ATI) connector |
| 2 | Locking and ground contact for the adapter |
| 3 | LED status display |
| 4 | Protective cover |
| 5 | Sockets for the terminal connectors |
| 6 | Grounding screw |
| 7 | Busbar mounting slot |
| 8 | Locking tab for DIN rail mount |
| 9 | Mounting holes for panel mount |

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

| Indicator | Condition | Message |
|----------------|-----------|---|
| Ready | Green | Module has power. |
| | Off | Module has no power. Check the L1 voltage source. |
| FUSE | Green | Output voltage present and fuse 1 (group output) and field power is OK. |
| | Off | Output voltage not present or fuse 1 or field power is not OK. |
| IN 1 ... 6 | Green | Input status (an LED per input); input point active. |
| | Off | Input status (an LED per input); input point inactive. |
| OUT 1 ... 3 | Green | Output status (an LED per output); output point active. |
| | Off | Output status (an LED per output); output point inactive. |

Specifications

Overview

This section contains specifications for the 170 ADM 540 80 I/O base.

General Specifications

| | |
|-------------------|-------------------------------|
| Module type | 6 inputs / 3 outputs, 120VAC |
| Operating Voltage | 120 VAC |
| Range | 85 ... 132 VAC @ 47 ... 63 Hz |
| Current | 125 mA |

Isolation

| | |
|---|--------------------------|
| Point to Point | None |
| I.O points to communication adapter | 1250V RMS for one minute |
| Module field power to communication adapter | 1250V RMS for one minute |
| Module power to I.O field power | 1250V RMS for one minute |
| Field input to field input | 1250V RMS for one minute |
| Modbus Port RS485 to communication adapter | Not isolated |

Fuses

| | |
|----------------------------|---|
| Internal (replaceable) | 2.5 A slow-blow (Wickmann 195125000 or equivalent) |
| Internal (non-replaceable) | 200 mA slow-blow |
| External (field power) | 2 A slow-blow (Wickmann 195120000 or equivalent) |
| External (module power) | 200 mA slow-blow (Wickmann 195020000 or equivalent) |

EMC

| | |
|------------------|--|
| Immunity | IEC 1131-2 |
| Emissions | EN 50081-2 |
| Agency Approvals | UL, CSA, CE FM Class 1, Div. 2 pending |

Physical Dimensions

| | |
|-------------------------|---|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 52 mm (2.05 in) |
| Length | 141.1 mm (5.6 in) no or one busbar 159.5 mm (6.3 in) two busbars 171.5 mm (6.75 in) three busbars |
| Weight | 284 g (10 oz) |

Discrete Inputs

| | |
|------------------------|---|
| Number of Points | 6 |
| Number of Groups | 1, Non-isolated |
| Points per Group | 6 |
| For range 47 ... 53 Hz | |
| ON Voltage | 85VAC |
| Off Voltage | 20VAC |
| ON current | 5.5mA rms |
| OFF current | 1.9mA rms |
| For range 57 ... 63 Hz | |
| ON Voltage | 79VAC |
| Off Voltage | 20VAC |
| ON current | 5.5mA rms |
| OFF current | 1.9mA rms |
| Absolute Maximum Input | 132VAC rms continuous |
| Input Response | 1 line cycle maximum ON to OFF, 1 line cycle maximum OFF to ON |
| Internal Impedance | 12k ohms (nominal) @ 60Hz, predominantly capacitive |
| Input Protection | Resistor limited |

Discrete Outputs

| | |
|-----------------------------|--|
| Number of Points | 3 |
| Number of Groups | 1 fuse group |
| Points per Group | 3 |
| Output Voltage | 85 ... 120 ... 132 VACVAC @ 47 ... 63 Hz |
| Surge Voltage | 150 VAC for 10 sec 200 VAC for 1 cycle |
| On State Voltage Drop | 1.5 VAC max @ 0.5 A |
| Output (Load) Current | 0.5 A / point, 1.5 A / module |
| Minimum Output Current | 30 mA |
| Maximum Surge Current (rms) | 7.5 A per point, one cycle 5 A per point, two cycles |
| Output Protection | RC snubber suppression, varistor |
| Leakage Current | 1.9 mA @ 120 VAC |
| Applied dV / dT | 400 V / microseconds |
| Response Time | 0.5 of one line cycle max OFF to ON 0.5 of one line cycle max ON to OFF |

Modbus Port

| | |
|----------------|---|
| Baud | 9600, 19200 |
| Parity | Even, odd or none |
| Mode/data bits | 8 bit RTU, 7 bit ASCII |
| Stop bit | 1 or 2 |
| Modbus Address | 0 ... 247 |
| RS485 | 2 or 4 wire |
| Timeout | 150ms (after transmission, waiting for reception) |

Modbus Port Tests

| Test | Spec Reference | Conditions/Levels |
|------------------------------|----------------|----------------------------------|
| Radiated | EN61000-4-3 | 80 ... 1000Mhz, 10V/M |
| Fast transients | EN61000-4-4 | 1kV, CM, cap clamp |
| Surge withstand (transients) | EN61000-4-5 | 1kV, CM, 42Ω source Z |
| Electrostatic discharge | EN61000-4-2 | 8kV, air discharge, 4kV, contact |
| Conducted RF | ENV61000-4-6 | 0.15 ... 80Mhz 10 VRMS |
| Pulsed modulated field | ENV 50140 | 10V/M |

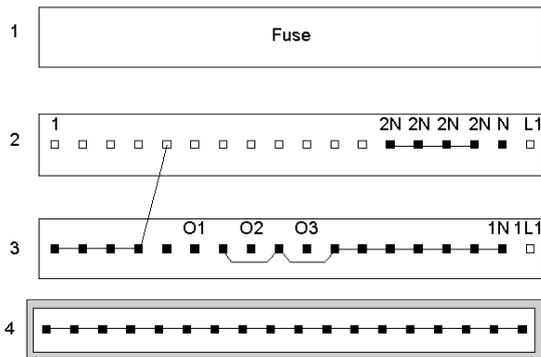
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional one-row busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 shows the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 2 of the base. The outputs are field wired to row 3. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-row busbar. The following busbars are available from Schneider Electric.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 006 01 |
| Spring-clip | 170 XTS 007 01 |

Mapping Terminal Blocks

CAUTION

VOLTAGE SPIKE MAY BE SUFFICIENT TO DAMAGE OR DESTROY MODULE

If an external switch is wired to control an inductive load in parallel with the module output, then an external varistor (Harris V390ZA05 or equivalent) must be wired in parallel with the switch.

Failure to follow these instructions can result in injury or equipment damage.

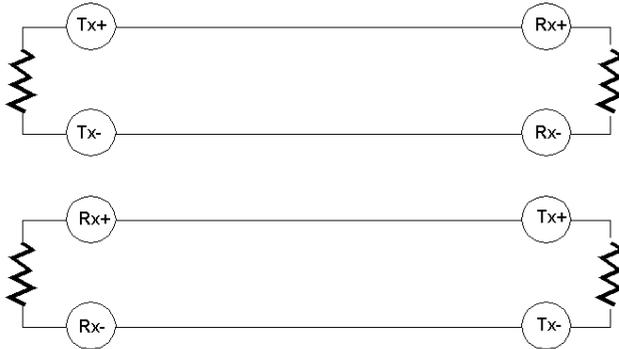
The following table shows mapping terminal blocks and optional busbars.

| Row | Terminal | Connection | |
|-----|-----------------|------------|---|
| 2 | 1 | RxHi | Modbus Master RS485 |
| | 2 | RxLo | Modbus Master RS485 |
| | 3 | TxHi | Modbus Master RS485 |
| | 4 | TxLo | Modbus Master RS485 |
| | 5 | PE | Earth Ground |
| | 6 | - | Not Used |
| | 7 ... 12 | I1 ... I6 | Inputs 1 ... 6 |
| | 13 ... 16 | 2N | Voltage for input field devices, Neutral |
| | 17 | N | Module operating voltage, Neutral |
| | 18 | L1 | Module operating voltage, Line |
| 3 | 1 ... 4 | PE | Earth Ground |
| | 5 | - | Not Used |
| | 6, 8, 10 | O1 ... O3 | Outputs 1 ... 3 |
| | 7, 9, 11 ... 16 | 1N | Voltage for output field devices, Neutral |
| | 17 | 1N | Voltage for output field devices, Neutral |
| | 18 | 1L1 | Voltage for field devices, Line |
| 4 | 18 | PE | Earth Ground |

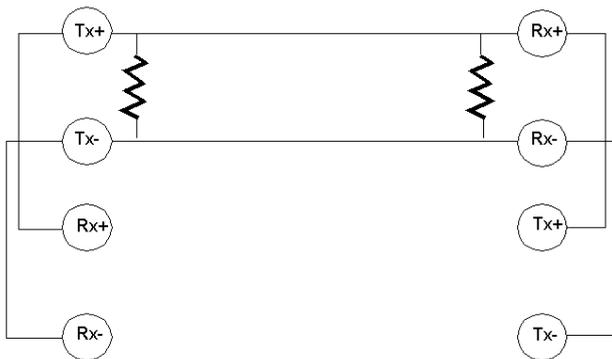
NOTE: Rows 4, 5, 6 may be added by mounting a separate terminal block to the I/O base at the grounding busbar slot.

Module RS-485 Termination

The illustration below shows how to properly terminate the module's RS-485 connector. Y-wire terminals with 120 Ohm only at each end of the network.



OR: 2 wire the terminals with 120 Ω only at each end of the network.



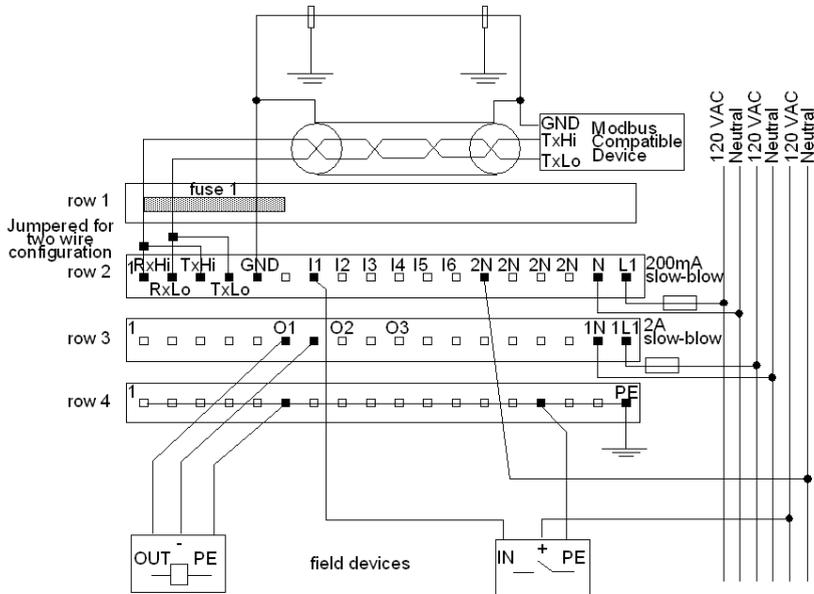
Wiring Diagrams

Overview

This section contains a diagram to assist you in wiring 2-wire field devices.

2-Wire Devices

The diagram below shows an example of wiring for 2-wire devices.



The communication cable should be twisted shielded cable. Tie shield on both ends to earth ground near the associated Modbus equipment.

I/O Mapping

Overview

The 170 ADM 540 80 TSX Momentum I/O base supports 6 discrete inputs and 3 discrete outputs. This section contains information about the mapping of the I/O data into input words and output words.

I/O Map

This module is I/O mapped as 6 input words and 3 output words. The Processor sends 3 bits of discrete output data to the 170 ADM 540 80 base as a single low byte (8-bits), and the base returns 6 input data bits in a single low byte (8-bits) to the processor. The inputs are field wired to row 2, and the outputs are field wired to row 3 of the base.

IEC vs. Ladder Logic

In order to correctly field wire the inputs/outputs and map the input /output data, you need to know which type of Momentum Adapter is mounted on the base.

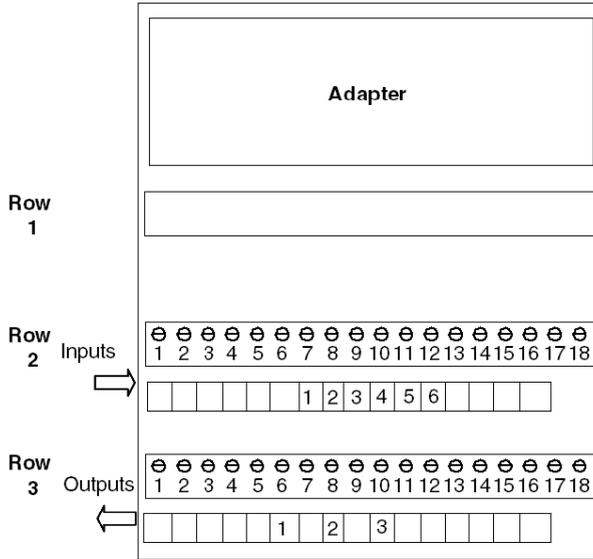
Adapters are either IEC compliant or 984 Ladder Logic compliant.

| | IEC Compliant | 984 Ladder Logic Compliant |
|---------------------------------|---|--|
| Momentum Processor Adapters | All | None |
| Momentum Communication Adapters | All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110.01 | 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 |

Data Mapping

The figure below shows how data is mapped.

IEC and 984 Format



General Modbus Message Rules

Purpose

The following rules state what is expected of the user and what the expected response is.

Sequence Number

A change in the sequence number starts any and all Modbus transactions. The I/O module contains the last sequence number written and starts with 0 at power-up. The sequence number is echoed to the input buffer after the Modbus message is complete. Continuous read data can be obtained after the first initial read, by incrementing the sequence number only every scan.

Command and Response

See Output Words Control Modes (*see page 368*) and Input Words Control Modes (*see page 375*). No more than 4 commands can be requested at any one time (Control Modes 4 ... 8). The response for the requests are returned in the response registers.

Block Read Response

All read commands are contiguous, incrementing up from the starting address to the numbers specified by length. The first read command with a length of zero or a length that is larger than the allocated response buffer will end further Modbus processing and the remainder of the input data field will be zeroed. The first read command starts at the end of the buffer, (words 15 and 16). The first word of the response data is placed in word 5 of the input buffer. After word 5 all read data values fill in consecutively as executed.

Block Write Response

All block write commands (Control Modes 2 and 3) are contiguous, incrementing up from the starting address to the numbers specified by length. Block write commands with a length of zero or a length that is larger than the allocated command buffer will not be executed. However, the read in control mode 3 will be executed regardless of the write command.

Single Write Response

All single write commands (Control Modes 4 ... 8) will be executed. Zero is a legal start address and a legal data value.

Read / Write Commands

All Write commands precede the read response.

Modbus Message Time Out

The Modbus message time out is fixed in the firmware at 200 msec and cannot be altered.

Start Address

Start address of 0 = Modbus register 400001. For example: A Modbus start address of 0 is actually Modbus register 400001. A value of 9 is actually 400010.

Modbus Protocol

For a better understanding of Modbus protocol, refer to PI-MBus-300, Modbus Protocol Reference Guide.

General Modbus Response

The table below lists the possible Modbus response codes.

| Response | Code |
|----------------------------|--------|
| Illegal function | 01 Hex |
| Illegal data address | 02 Hex |
| Illegal data value | 03 Hex |
| Device failure | 04 Hex |
| Acknowledge | 05 Hex |
| Busy, message rejected | 06 Hex |
| Bad Modbus state Rcv_int | 1C Hex |
| Bad comm state trn_asc | 1F Hex |
| Bad comm state trn_rtu | 1D Hex |
| Bad comm state rcv_asc | 20 Hex |
| Command buffer full error | 21 Hex |
| Bad comm state rcv_rtu | 22 Hex |
| Bad frame type put_chr | 23 Hex |
| Bad transmit comm state | 25 Hex |
| Bad receive comm state | 26 Hex |
| Bad Modbus state tmr0_evt | 27 Hex |
| 3 char timeout ASCII mode | 28 Hex |
| No message requested | 29 Hex |
| Bad data length | 2A Hex |
| CRC error | 2B Hex |
| Illegal control mode (> 8) | 2C Hex |
| Control mode 0 failed | 30 Hex |
| Control mode 1 failed | 31 Hex |
| Control mode 2 failed | 32 Hex |
| Control mode 3 failed | 33 Hex |

| Response | Code |
|-----------------------|-------------|
| Control mode 4 failed | 34 Hex |
| Control mode 5 failed | 35 Hex |
| Control mode 6 failed | 36 Hex |
| Control mode 7 failed | 37 Hex |
| Control mode 8 failed | 38 Hex |
| Message Mismatch | 50 Hex |
| Message accepted | 55 Hex |

Output Words

Output Words 4x ... 4x + 15

16 words of output data are used for 3 120VAC output points and commands for the Modbus master device.

The following table shows the function of the output words.

| Output Words | | |
|---------------|----------------------|------------|
| Word 1 | Sequence # | |
| Word 2 | Output configuration | AC output |
| Word 3 | Control mode | |
| Word 4 | Port configuration | Slave Node |
| Word 5 ... 16 | Message data field | |

Depending on how the application is written, moving a block of data to the registers, which includes a change in the sequence number, is acceptable.

Output Word 1

CAUTION

INVALID DATA - OUTPUT SHUT DOWN

Do not use a zero value in word one, which will cause an output shut down state.

Failure to follow these instructions can result in injury or equipment damage.

- Valid settings are 1 ... FFFF.
- The module defaults to zero at power-up (module shut down).
- Whenever the module is set to zero, it goes to the module shut down state.
- When the value in the first output word is not equal to the first input word, then a Modbus message will be sent.. When they are equal, there will be no message activity.
- A change in the sequence word value starts the Modbus command execution. It is your responsibility to change the output data for the Modbus message. The sequence number must be the last word of information written in order to ensure Modbus messages are correctly handled.

Module Shut Down Definition

The Module shut down behaviour may be set to:

- hold last value
 - or -
- user defined
 - or -
- minimum output (OFF)

NOTE: When the sequence number is 1 ... FFFF, the 120 VAC output and input data are collected every scan and are not affected by the sequence number. A sequence number of zero causes shutdown status, but inputs continue to be updated.

Output Word 2

Output word 2 contains 3 bits of 120 VAC discrete output data, 3 bits of user defined output data shut down values, and 2 bits for user shut down state.

| Word 2 High Byte (Shut down states) | |
|-------------------------------------|---|
| Bit 15 | 0= Shut down state minimum output 1= Check bit 14 for shut down state |
| Bit 14 | 0= Hold last value (shut down state) 1= User defined (shut down state) |
| Bit 13 ... 11 | Not used |
| Bit 10 | User defined value for output 3 (shut down) |
| Bit 9 | User defined value for output 2 (shut down) |
| Bit 8 | User defined value for output 1 (shut down) |

| Word 2 Low Byte (120 VAC output data) | |
|---------------------------------------|----------|
| Bit 7 ... 3 | Not used |
| Bit 2 | Output 3 |
| Bit 1 | Output 2 |
| Bit 0 | Output 1 |

Output Word 3

Output word 3 contains the Modbus message control mode.

| Word 3 Control Modes | | | |
|-----------------------------|-------|-----------------------------------|--|
| Mode | Value | Function | Description |
| Mode 0 | 0 | Idle | No Modbus activity. Input buffer to zero |
| Mode 1 | 1 | Modbus message | The I/O module executes the data field from a user-defined Modbus message |
| Mode 2 | 2 | Block write | The I/O module performs a block write command (Modbus function code 16) |
| Mode 3 | 3 | Block write and Block read | The I/O module performs mode 2 plus a block read command |
| Mode 4 | 4 | 4 single writes | The I/O module performs 4 Modbus function code 06 commands (single writes) |
| Mode 5 | 5 | 3 single writes and 1 block read | The I/O module performs 3 Modbus function code 06 commands (single writes) and Modbus function code 03 (1 block read command) |
| Mode 6 | 6 | 2 single writes and 2 block reads | The I/O module performs 2 Modbus function code 06 commands (single writes) and Modbus function code 03 (2 block read commands) |
| Mode 7 | 7 | 1 single writes and 3 block reads | The I/O module performs 1 Modbus function code 06 commands (single writes) and Modbus function code 03 (3 block read commands) |
| Mode 8 | 8 | 4 block reads | The I/O module performs Modbus function code 03 (4 block read commands) |
| Others | - | Illegal command | Response = illegal control mode |

Output Word 4

Output word 4 contains the port configuration parameters (high byte) and the Modbus slave address (low byte).

| Word 4 - Port Configuration | |
|-----------------------------|--------------------------------------|
| High Byte | |
| Bit 15 | 0= 1 stop bit 1= 2 stop bits |
| Bit 14 | 0= 7 data bits 1= 8 data bits |
| Bit 13 | 0= no parity 1= parity enabled |
| Bit 12 | 0= odd parity 1= even parity |
| Bits 11 ... 8 | 0010= 19.2 baud others= 9600 baud |
| Low Byte | |
| Bits 7 ... 1 | Modbus slave node address |

Output Words Control Modes

Purpose

This section describes output words 5 ... 16 control modes.

Output Words 5 ... 16

Output words 5 ... 16 are used as data for specific control modes.

NOTE: Be sure you read General Modbus Message Rules (*see page 361*).

Output Words Mode Memory Allocation

Output word modes are used for message data. The table below describes the specific memory allocation for each control mode.

Control Mode 0

Control Mode 0 - Idle, Clear Response Buffer

| | | |
|-----------------------|-----------------------|--------------------|
| Word 1 | Sequence # | |
| Word 2 | Output Configuration | Output |
| Word 3 | Control Mode 0 | |
| Word 4 | Port Configuration | Slave node address |
| Words 5 ... 16 | Not used | |

Control Mode 1

Control Mode 1 - Modbus Message

| | | |
|-----------------------|--|-----------------------|
| Word 1 | Sequence # | |
| Word 2 | Output Configuration | Output |
| Word 3 | Control Mode 1 | |
| Word 4 | Port Configuration | Message length |
| Words 5 ... 16 | 12 words of message output data | |

Control Mode 2

Control Mode 2 - Block Write

| | | |
|-----------------------|---|--------------------|
| Word 1 | Sequence # | |
| Word 2 | Output Configuration | Output |
| Word 3 | Control Mode 2 | |
| Word 4 | Port Configuration | Slave node address |
| Word 5 | Start address - value of 0 = 400001 | |
| Word 6 | Number of data words, 1 ... 10 are valid | |
| Words 7 ... 16 | 10 words of message output data | |

Control Mode 3

Control Mode 3 - 1 Block Write And 1 Block Read Command

| | | |
|-----------------------|--|--------------------|
| Word 1 | Sequence # | |
| Word 2 | Output Configuration | Output |
| Word 3 | Control Mode 3 | |
| Word 4 | Port Configuration | Slave node address |
| Word 5 | First write command address - value of 0 = 400001 | |
| Word 6 | Number of data words, 1 ... 8 are valid | |
| Words 7 ... 14 | 8 words of message output data | |
| Word 15 | First read command address | |
| Word 16 | Number of data words to read, 1 ... 12 are valid | |

Control Mode 4

Control Mode 4 - 4 Single Write Commands

| | | |
|------------------------|--|--------------------|
| Word 1 | Sequence # | |
| Word 2 | Output Configuration | Output |
| Word 3 | Control Mode 4 | |
| Word 4 | Port Configuration | Slave node address |
| Word 5 | First single write command address - value of 0 = 400001 | |
| Word 6 | 1 word of message output data | |
| Word 7 | Second single write command address - value of 0 = 400001 | |
| Word 8 | 1 word of message output data | |
| Word 9 | Third single write command address - value of 0 = 400001 | |
| Word 10 | 1 word of message output data | |
| Word 11 | Fourth single write command address - value of 0 = 400001 | |
| Word 12 | 1 word of message output data | |
| Words 13 ... 16 | Not used | |

Control Mode 5

Control Mode 5 - 3 Single Writes and 1 Block Read Command

| | | |
|------------------------|--|--------------------|
| Word 1 | Sequence # | |
| Word 2 | Output Configuration | Output |
| Word 3 | Control Mode 5 | |
| Word 4 | Port Configuration | Slave node address |
| Word 5 | First single write command address - value of 0 = 400001 | |
| Word 6 | 1 word of message output data | |
| Word 7 | Second single write command address - value of 0 = 400001 | |
| Word 8 | 1 word of message output data | |
| Word 9 | Third single write command address - value of 0 = 400001 | |
| Word 10 | 1 word of message output data | |
| Words 11 ... 14 | Not used | |
| Word 15 | First block read command address | |
| Word 16 | Number of data words to read, 1 ... 12 are valid | |

Control Mode 6

Control Mode 6 - 2 Single Writes And 2 Block Read Commands

| | | |
|-----------------------|--|--------------------|
| Word 1 | Sequence # | |
| Word 2 | Output Configuration | Output |
| Word 3 | Control Mode 6 | |
| Word 4 | Port Configuration | Slave node address |
| Word 5 | First single write command address - value of 0 = 400001 | |
| Word 6 | 1 word of message output data | |
| Word 7 | Second single write command address - value of 0 = 400001 | |
| Word 8 | 1 word of message output data | |
| Words 9 ... 12 | Not used | |
| Word 13 | Second block read command address | |
| Word 14 | Number of data words to read | |
| Word 15 | First block read command address | |
| Word 16 | Number of data words to read | |

NOTE: With control mode 6, words 14 and 16 combined length must be 1 ... 12.

Control Mode 7

Control Mode 7 - 1 Write And 3 Block Read Commands

| | | |
|-----------------------|---|--------------------|
| Word 1 | Sequence # | |
| Word 2 | Output Configuration | Output |
| Word 3 | Control Mode 7 | |
| Word 4 | Port Configuration | Slave node address |
| Word 5 | First single write command address - value of 0 = 400001 | |
| Word 6 | 1 word of message output data | |
| Words 7 ... 10 | Not used | |
| Word 11 | Third block read command address | |
| Word 12 | Number of data words to read | |
| Word 13 | Second block read command address | |
| Word 14 | Number of data words to read | |
| Word 15 | First block read command address | |
| Word 16 | Number of data words to read | |

NOTE: With control mode 7, words 14 and 16 combined length must be 1 ... 12.

Control Mode 8

Control Mode 8 - 4 Block Read Commands

| | | |
|----------------------|--|--------------------|
| Word 1 | Sequence # | |
| Word 2 | Output Configuration | Output |
| Word 3 | Control Mode 8- 4 block read commands | |
| Word 4 | Port Configuration | Slave node address |
| Words 5 ... 8 | Not used | |
| Word 9 | Fourth block read command address | |
| Word 10 | Number of data words to read | |
| Word 11 | Third block read command address | |
| Word 12 | Number of data words to read | |
| Word 13 | Second block read command address | |
| Word 14 | Number of data words to read | |
| Word 15 | First block read command address | |
| Word 16 | Number of data words to read | |

NOTE: With control mode 8, words 10, 14 and 16 combined length must be 1 ... 12.

Input Words

Purpose

This section describes input words.

Input Words $3x \dots 3x + 15$

16 words of input data are used for 6 120VAC input points and the Modbus master response buffer.

Input Words Control Mode 1

| | | |
|---------------|-----------------------------|----------|
| Word 1 | Sequence # | |
| Word 2 | Status | AC input |
| Word 3 ... 16 | Message response data field | |

Input Words Control Modes 2 ... 8

| | | |
|---------------|-----------------------------|--------------------|
| Word 1 | Sequence # | |
| Word 2 | Status | AC input |
| Word 3 | Message 1 response | Message 2 response |
| Word 4 | Message 3 response | Message 4 response |
| Word 5 ... 16 | Message response data field | |

Input Word 1

Input word 1 contains an echo of the sequence number.

- Valid settings are 1 ... FFFF
- Whenever the module is set to zero, it goes to the module shut down state.
- When the value in the first input word is not equal to the output word then a Modbus message will be sent. If not, when they are equal, there will be no message activity.
- A change in the sequence word value starts the Modbus command execution. It is your responsibility to change the output data for the Modbus message. The sequence number must be the last word of information written in order to ensure Modbus messages are correctly handled.

Input Word 2

Input word 2 contains 6 bits of 120 VAC input data and 8 bits for module status.

Input Word 1 High Byte (Status).

| | |
|--------------|---|
| Bit 15 (MSB) | 0= message processing done 1= message in process |
| Bit 14 | Copy of output 3 |
| Bit 13 | Copy of output 2 |
| Bit 12 | Copy of output 1 |
| Bit 11 | Not used |
| Bit 9 | 1= fuse ok 0= fuse blown |
| Bit 8 | 1= module healthy 0= module not healthy |

Input Word 1 Low Byte (Input Data Values).

| | |
|-------------|----------|
| Bit 7 ... 6 | Not used |
| Bit 5 | Input 6 |
| Bit 4 | Input 5 |
| Bit 3 | Input 4 |
| Bit 2 | Input 3 |
| Bit 1 | Input 2 |
| Bit 0 (LSB) | Input 1 |

Input Words Control Modes

Purpose

This section describes input words control modes.

Input Words 3 ... 4

NOTE: In control mode 0, input words 3 and 4 are zeroed.

NOTE: The message response code is contained in the Modbus message itself, so control mode 1, input buffer words 3 ... 16 are used as the actual message.

NOTE: For control modes 2 ... 8, all four response fields are present whether used or not. The table below shows the input message responses to words 3 and 4.

Control Modes 2 ... 8

| Input Word 3 High Byte | Input Word 3 Low Byte |
|------------------------|-----------------------|
| Message 1 response | Message 2 response |
| Input Word 4 High Byte | Input Word 4 Low Byte |
| Message 3 response | Message 4 response |

Input Words 5 ... 16

Input words 5 ... 16 contain Modbus message response data.

NOTE: Refer to *General Modbus Message Rules*, [page 361](#).

Input Words Mode Memory Allocation

The tables below describe the specific memory allocation for each control mode.

Control Mode 0

Control Mode 0 - Idle, Clear Response Buffer

| | | |
|----------------------|--------------------------------------|-----------------|
| Word 1 | Sequence # | |
| Word 2 | Status | 6 120Vac inputs |
| Word 3 ... 16 | Message data field = (00) hex | |

Control Mode 1

Control Mode 1 - Modbus Message

| | | |
|----------------------|-------------------------------------|-----------------|
| Word 1 | Sequence # | |
| Word 2 | Status | 6 120Vac inputs |
| Word 3 ... 16 | Modbus Message data response | |

Control Mode 2 and 4

Control Mode 2 and 4 - Write Commands

| | | |
|----------------------|--|--------------------|
| Word 1 | Sequence # | |
| Word 2 | Status | 6 120Vac inputs |
| Word 3 | Message 1 response | Message 2 response |
| Word 4 | Message 3 response | Message 4 response |
| Word 5 ... 16 | Not used. Input data values are 0 | |

Control Mode 3 and 5

Control Mode 3 and 5 - 1 Write Command and 1 Block Read Command

| | | |
|----------------------|---------------------------------------|--------------------|
| Word 1 | Sequence # | |
| Word 2 | Status | 6 120Vac inputs |
| Word 3 | Message 1 response | Message 2 response |
| Word 4 | Message 3 response | Message 4 response |
| Word 5 ... 16 | 12 words of message input data | |

Control Mode 6

Control Mode 6 - 2 Single Write Commands and 2 Block Read Commands

| | | |
|----------------------|--|--------------------|
| Word 1 | Sequence # | |
| Word 2 | Status | 6 120Vac inputs |
| Word 3 | Message 1 response | Message 2 response |
| Word 4 | Message 3 response | Message 4 response |
| Word 5 ... 16 | 12 words shared between 2 input responses | |

Control Mode 7

Control Mode 7 - 1 Write Command and 3 Block Read Commands

| | | |
|----------------------|--|--------------------|
| Word 1 | Sequence # | |
| Word 2 | Status | 6 120Vac inputs |
| Word 3 | Message 1 response | Message 2 response |
| Word 4 | Message 3 response | Message 4 response |
| Word 5 ... 16 | 12 words shared between 3 input responses | |

Control Mode 8

Control Mode 8 - 4 Block Read Commands

| | | |
|----------------------|--|--------------------|
| Word 1 | Sequence # | |
| Word 2 | Status | 6 120Vac inputs |
| Word 3 | Message 1 response | Message 2 response |
| Word 4 | Message 3 response | Message 4 response |
| Word 5 ... 16 | 12 words shared between 4 input responses | |

Chapter 23

170 ADM 690 50 120 VAC - 10 Pt. In / 8 Pt. Out Module Bases

Overview

This chapter describes the 170 ADM 690 50 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------|------|
| Front Panel Components | 380 |
| Specifications | 382 |
| Internal Pin Connections | 385 |
| Field Wiring Guidelines | 386 |
| Wiring Diagrams | 388 |
| I/O Mapping | 391 |

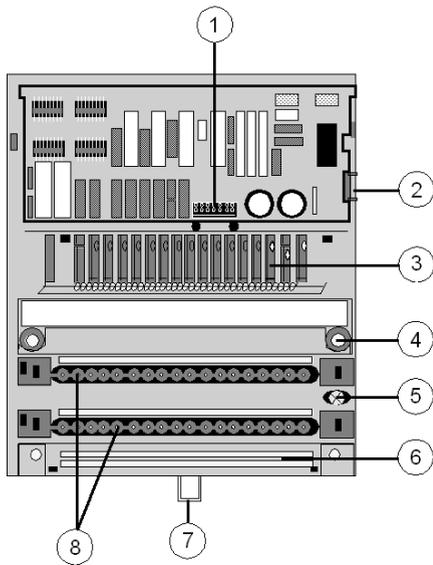
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADM 690 50 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

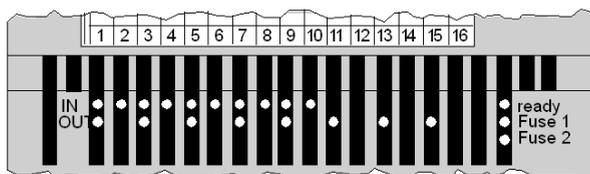


Components of the I/O module

| Label | Description |
|-------|--|
| 1 | Internal interface (ATI) connector |
| 2 | Locking and ground contact for the adapter |
| 3 | LED status display |
| 4 | Mounting holes for panel mount |
| 5 | Grounding screw |
| 6 | Busbar Mounting Slot |
| 7 | Locking tab for DIN rail mount |
| 8 | Sockets for the terminal connectors |

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

| Indicator | Condition | Message |
|---|-----------|---|
| Ready | Green | Module is ready to communicate. Operating voltage for internal logic (5 V) is present. |
| | Off | Module not ready. |
| FUSE 1 | Green | Output voltage of outputs 1 ... 4 (one common output voltage for group 1) present and fuse 1 is OK. |
| | Off | Output voltage of outputs 1 ... 4 (one common output voltage for group 1) is not present and/or fuse 1 is defective |
| FUSE 2 | Green | Output voltage of outputs 5 ... 8 (one common output voltage for group 2) present and fuse 1 is OK. |
| | Off | Output voltage of outputs 5 ... 8 (one common output voltage for group 2) is not present and/or fuse 1 is defective |
| Upper row IN 1...10 | Green | Input status (an LED per input); Input point active, ie. input carries a 1 signal (logically ON) |
| | Off | Input status (an LED per input); Input point inactive, ie. input carries a 0 signal (logically OFF) |
| Middle row OUT 1,3 ,5 ,7 , 9, 11, 13, 15 | Green | Output status (an LED per output); Output point active, ie. output carries a 1 signal (logically ON) |
| | Off | Output status (an LED per output) Output point inactive, ie. Output carries a 0 signal (logically OFF) |

Specifications

Overview

This section contains specifications for the 170 ADM 690 50 I/O base.

General Specifications

| | |
|----------------------------|---|
| Module type | 10 discrete inputs in 1 group 8 triac outputs in 1 group (in 2 fuse groups) |
| Supply voltage | 120 VAC |
| Supply voltage range | 100 ... 132 VAC @ 47...63Hz |
| Supply current consumption | max. 160 mA at 120 VAC |
| Power dissipation | $6 \text{ W} + (\# \text{ of input points on } \times .144 \text{ W}) + (\# \text{ of output points on } \times .75 \text{ W})$ |
| I/O map | 1 input word 1 output word |

Isolation

| | |
|--------------------------------|-------------------------------|
| Input to input | none |
| Output group to output group | none |
| Input to output group | 125 VAC, tested with 1780 VAC |
| Field to communication adapter | 125 VAC, tested with 1780 VAC |

Fuses

| | |
|----------------------------------|--|
| Internal | Wickman 19195-2.5 ANote If you replace this fuse, you must use a Ferraz type W 020547 (UL listed). |
| External: operating voltage (L1) | 315 mA fast-blow, 250 V |
| External: input voltage (2L1) | max. 4 A fast-blow, 250 V |
| External: output voltage (1L1) | According to the supply of the connected actuators—not to exceed 8 A slow-blow |

EMC

| | |
|------------------|--|
| Immunity | IEC 1131-2 Surge on auxiliary power supply 2 KV to PE, 1 KV to differential |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE, FM Class 1 Div. 2 |

Physical Dimensions

| | |
|-------------------------|--|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars |
| Weight | 220 g (0.49 lb) |

Discrete Inputs

| | |
|---------------------|---|
| Number of points | 10 |
| Number of groups | 1 |
| Signal type | 120 VAC |
| IEC 1131 type | 2 (See Appendix <i>IEC 1131 Input Types</i> , page 701 for definitions of IEC input types.) |
| ON voltage | 74 AC |
| OFF voltage | 20 AC |
| Input current | 6 mA minimum ON 2.6 mA maximum OFF |
| Input voltage range | 74 ... 132 VAC |
| Input resistance | 4 kOhm |
| Response time | max. 1/2 x 1/f ms OFF to ON max. 1/2 x 1/f ms ON to OFF |

Discrete Outputs

| | |
|---|--|
| Output type | Triac |
| Output supply voltage | 120 AC |
| Output supply voltage range | 100 ... 132 VAC |
| Output voltage | External supply - 1.5 VAC |
| Number of points | 8 |
| Number of groups | 1 |
| Points per group | 8, but 2 fuses |
| Current capacity | 0.5 A/point maximum, 30 mA/point minimum 2 A/group 4 A/module |
| Signal type | True High |
| Leakage current (output out) | < 1.3 mA @120 VAC |
| On state voltage drop | < 1.5 VAC @ 0.5 A |
| Fault sensing | One common voltage supply for output 1 .. 4 and output 5 ... 8, each is protected by an internal fuse against short-circuits (but not against overload). Each output is provided with an RC network (normal mode noise voltage rejection) and a Varistor (surge protection). |
| Fault reporting | none |
| Error indication | none |
| Response time (resistive load / 0.5 A) | max. 1/2 x 1/f ms OFF to ON max. 1/2 x 1/f ms ON to OFF |
| Maximum switching cycles | 3000/h for 0.5 A inductive load |

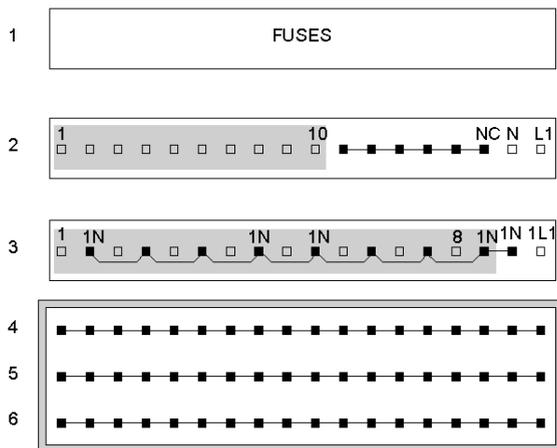
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 6 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 2 of the I/O base. Outputs are field wired to row 3. This section contains wiring guidelines and precautions for wiring the 170 ADM 690 50 TSX Momentum I/O base.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3- row busbar. The following busbars are available from Schneider Electric.

| Type | Number of Rows | Part Number |
|-------------|----------------|----------------|
| Screw-in | 1 - row | 170 XTS 006 01 |
| | 2 - row | 170 XTS 005 01 |
| | 3 - row | 170 XTS 004 01 |
| Spring-clip | 1 - row | 170 XTS 007 01 |
| | 2 - row | 170 XTS 008 01 |
| | 3 - row | 170 XTS 003 01 |

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

| Row | Terminal | Function |
|-----|----------------------------|---|
| 1 | FUSE 1, FUSE 2 | Internal fuses for output voltages |
| 2 | 1 ... 10 | Inputs |
| | 11 ... 16 | Connected internally within the row, for general purpose use |
| | 17 | Return (N) |
| | 18 | 120 VAC Operating voltage (L1) |
| 3 | 1, 3, 5, 7, 9, 11, 13, 15 | Outputs |
| | 2, 4, 6, 8, 10, 12, 14, 16 | Return (1N) for the actuators |
| | 17 | Return for the output voltage |
| | 18 | 20 ... 132 VAC Output voltage for terminal pins 1 ... 8 (1L1) |
| 4 | 1 ... 18 | 120 VAC Input voltage (2L1) |
| 5 | 1 ... 18 | Return (2N) for sensors |
| 6 | 1 ... 18 | Protective earth (PE) |

Wiring Diagrams

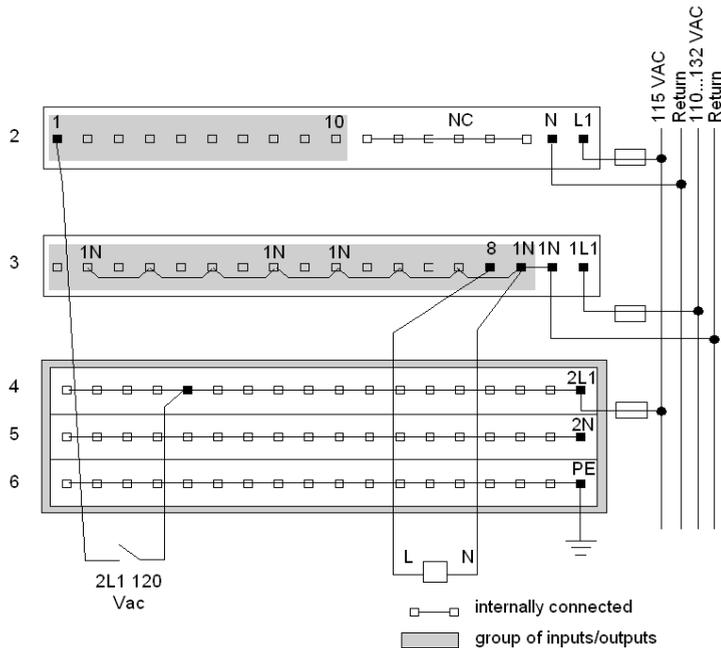
Overview

This section provides diagrams to assist you in wiring the following types of devices:

- 2-wire sensor with a 2-wire actuator
- 4-wire sensor with a 3-wire actuator

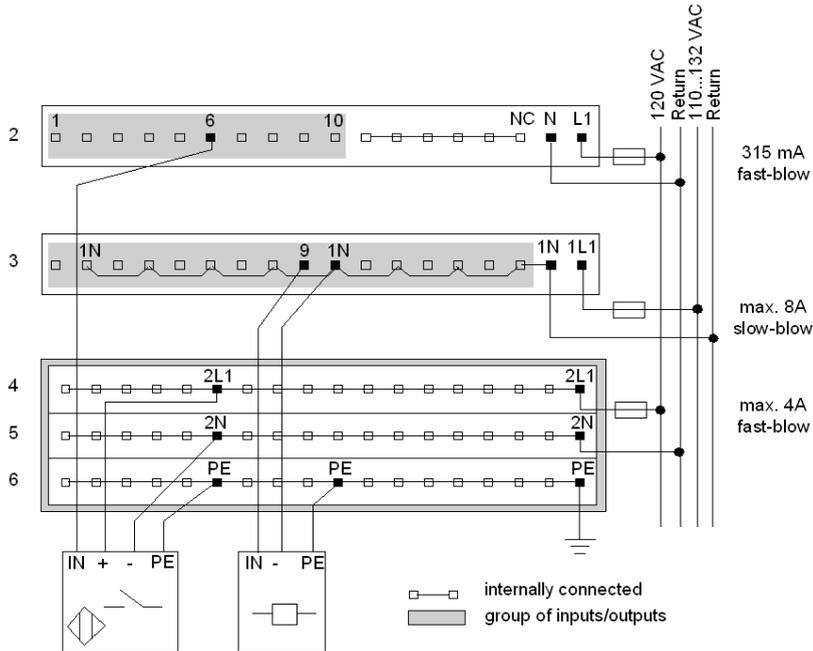
2-Wire Sensor with a 2-Wire Actuator

The diagram below shows field wiring for a 2-wire sensor and a 2-wire actuator.



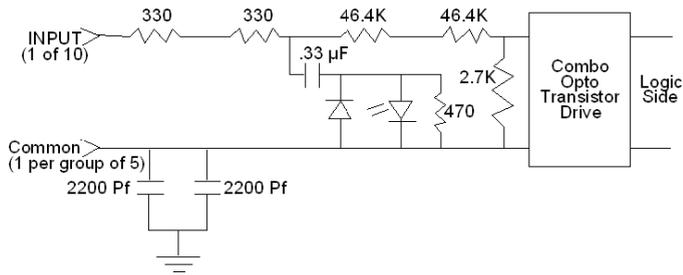
4-Wire Sensor with a 3-Wire Actuator

The diagram below shows field wiring for a 4-wire sensor and a 3-wire actuator. When using 3-phase current for supply L1, 1L1 and 2L1 must come from one phase.



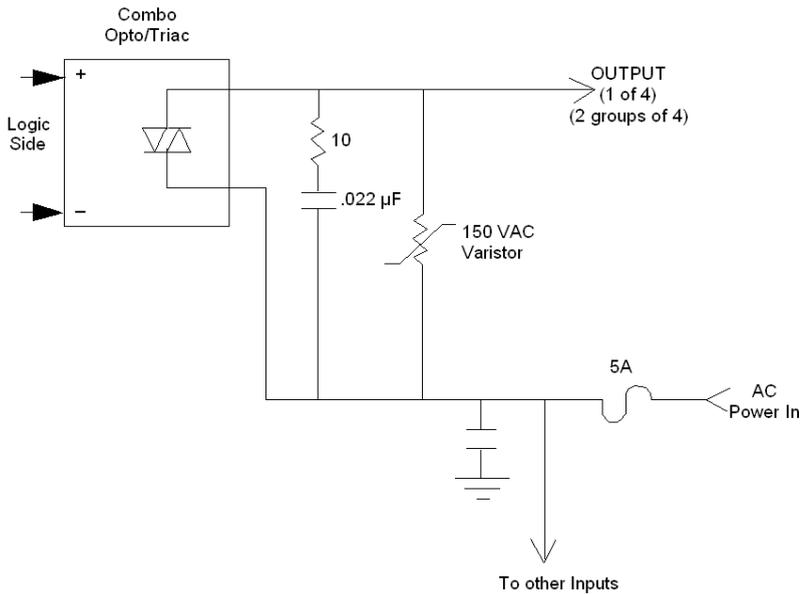
Simplified Input Schematics

The following diagram shows the field-side input circuitry.



Simplified Output Schematics

The following diagram shows the field-side output circuitry.



I/O Mapping

Overview

The 170 ADM 690 50 TSX Momentum I/O base supports 10 discrete inputs and 8 discrete outputs. This section contains information about the mapping of the I/O data into input words and output words.

I/O Map

The I/O base may be mapped as one input word and one output word, or as 10 discrete input points and 8 discrete output points.

IEC vs. Ladder Logic

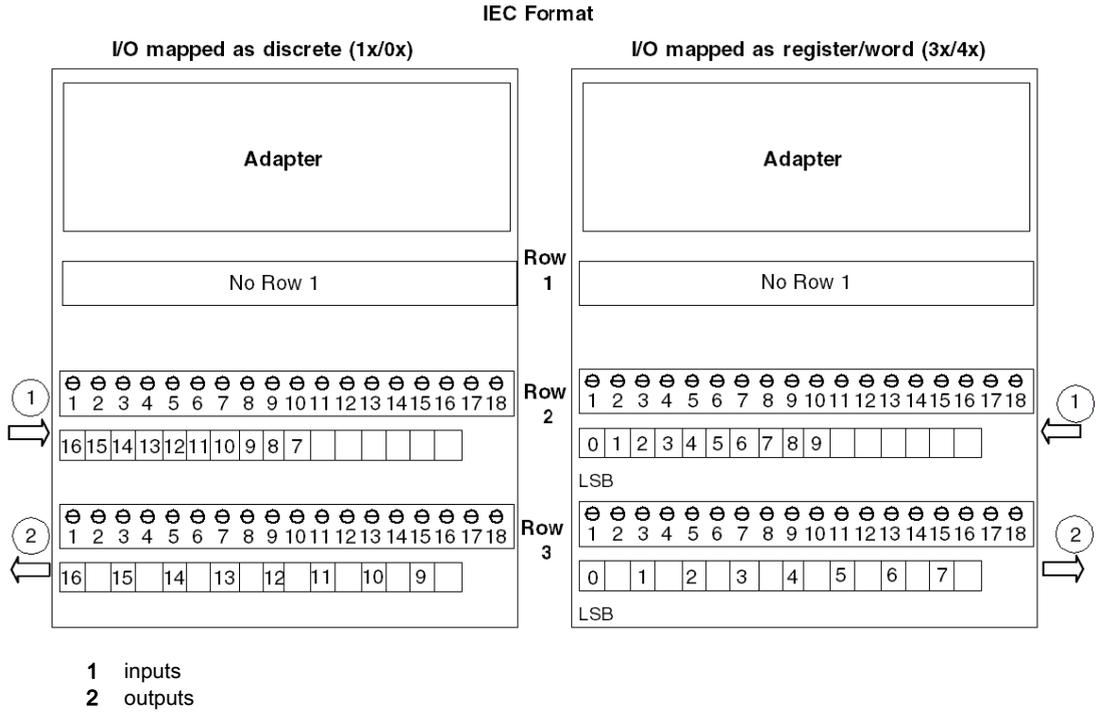
In order to correctly field wire the inputs/outputs and map the input /output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

| | IEC Compliant | 984 Ladder Logic Compliant |
|---------------------------------|---|--|
| Momentum Processor Adapters | All | None |
| Momentum Communication Adapters | All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 | 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 |

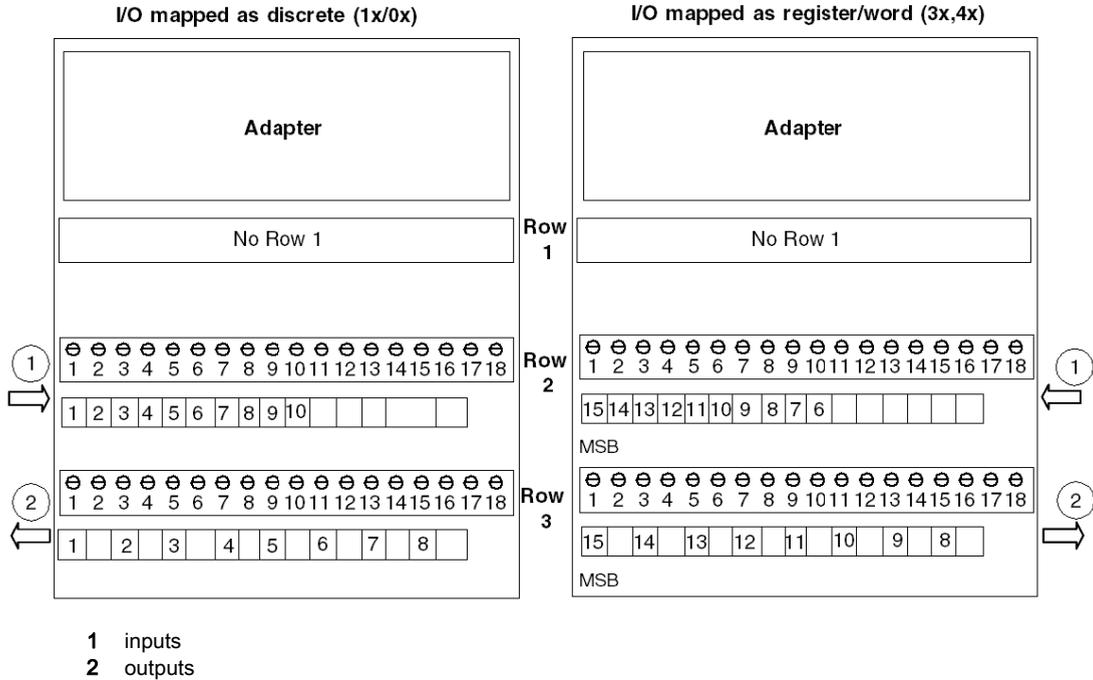
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 1 and the LSB (bit 0) is assigned to Pin 16.

984 Format



Chapter 24

170 ADM 690 51 120 VAC - 10 Pt. In / 8 Pt. Out Module Bases

Overview

This chapter describes the 170 ADM 690 51 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------|------|
| Front Panel Components | 396 |
| Specifications | 398 |
| Internal Pin Connections | 401 |
| Field Wiring Guidelines | 402 |
| Wiring Diagrams | 404 |
| I/O Mapping | 408 |

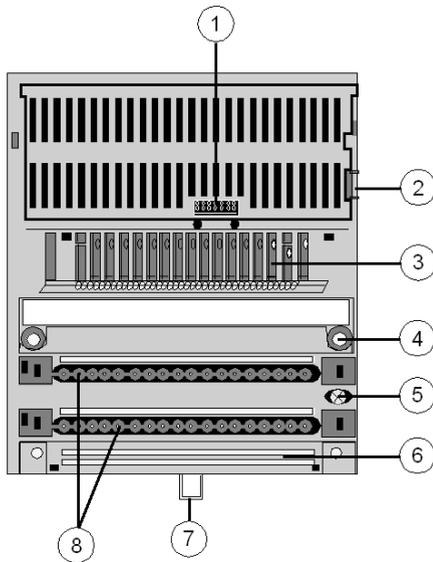
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADM 690 51 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

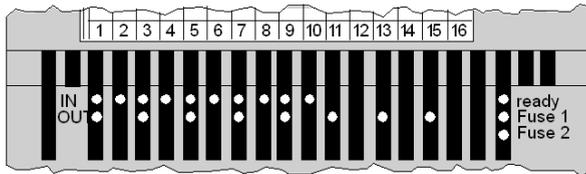


Components of the I/O module

| Label | Description |
|-------|--|
| 1 | internal interface (ATI) connector |
| 2 | locking and ground contact for the adapter |
| 3 | LED status display |
| 4 | mounting holes for panel mount |
| 5 | grounding screw |
| 6 | busbar mounting slot |
| 7 | locking tab for DIN rail mount |
| 8 | sockets for the terminal connectors |

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

| Indicator | Condition | Message |
|---|-----------|---|
| Ready | Green | Module is ready to communicate. Operating voltage for internal logic (5 V) is present. |
| | Off | Module not ready. |
| FUSE 1 | Green | Output voltage of outputs 1 ... 4 (one common output voltage for group 1) present and fuse 1 is OK. |
| | Off | Output voltage of outputs 1 ... 4 (one common output voltage for group 1) is not present and/or fuse 1 is defective |
| FUSE 2 | Green | Output voltage of outputs 5 ... 8 (one common output voltage for group 2) present and fuse 1 is OK. |
| | Off | Output voltage of outputs 5 ... 8 (one common output voltage for group 2) is not present and/or fuse 1 is defective |
| Upper row IN 1...10 | Green | Input status (an LED per input); Input point active, i.e., input carries a 1 signal (logically ON) |
| | Off | Input status (an LED per input); Input point inactive, i.e., input carries a 0 signal (logically OFF) |
| Middle row OUT 1,3 ,5 ,7 , 9, 11, 13, 15 | Green | Output status (an LED per output); Output point active, i.e., output carries a 1 signal (logically ON) |
| | Off | Output status (an LED per output) Output point inactive, i.e., output carries a 0 signal (logically OFF) |

Specifications

Overview

This section contains specifications for the 170 ADM 690 51 I/O base.

General Specifications

| | |
|----------------------------|---|
| Module type | 10 discrete inputs in 1 group 8 triac outputs in 1 group (in 2 fuse groups) |
| Supply voltage | 120 VAC |
| Supply voltage range | 100 ... 132 VAC @ 47...63Hz |
| Supply current consumption | max. 160 mA at 120 VAC |
| Power dissipation | $6 \text{ W} + (\# \text{ of input points on } \times .144 \text{ W}) + (\# \text{ of output points on } \times .75 \text{ W})$ |
| I/O map | 1 input word 1 output word |

Isolation

| | |
|--------------------------------|-------------------------------|
| Input to input | none |
| Output group to output group | none |
| Input to output group | 125 VAC, tested with 1780 VAC |
| Field to communication adapter | 125 VAC, tested with 1780 VAC |

Fuses

| | |
|----------------------------------|--|
| Internal | Wickman 19195-2.5 A Note If you replace this fuse, you must use a Ferraz type W 020547 (UL listed). |
| External: operating voltage (L1) | 315 mA fast-blow, 250 V |
| External: input voltage (2L1) | max. 4 A fast-blow, 250 V |
| External: output voltage (1L1) | According to the supply of the connected actuators—not to exceed 8 A slow-blow |

EMC

| | |
|------------------|--|
| Immunity | IEC 1131-2 Surge on auxiliary power supply 2 KV to PE, 1 KV to differential |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE, FM Class 1 Div. 2 |

Physical Dimensions

| | |
|-------------------------|--|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars |
| Weight | 220 g (0.49 lb) |

Discrete Inputs

| | |
|---------------------|---|
| Number of points | 10 |
| Number of groups | 1 |
| Signal type | 120 VAC |
| IEC 1131 type | 2 (See Appendix <i>IEC 1131 Input Types</i> , page 701 for definitions of IEC input types.) |
| ON voltage | 74 AC |
| OFF voltage | 20 AC |
| Input current | 6 mA minimum ON 2.6 mA maximum OFF |
| Input voltage range | 74 ... 132 VAC |
| Input resistance | 4 kOhm |
| Response time | max. 1/2 x 1/f ms OFF to ON max. 1/2 x 1/f ms ON to OFF |

Discrete Outputs

| | |
|---|--|
| Output type | Triac |
| Output supply voltage | 120 AC |
| Output supply voltage range | 100 ... 132 VAC |
| Output voltage | External supply - 1.5 VAC |
| Number of points | 8 |
| Number of groups | 1 |
| Points per group | 8, but 2 fuses |
| Current capacity | 0.5 A/point maximum, 30 mA/point minimum 2 A/group 4 A/module |
| Signal type | True High |
| Leakage current (output out) | < 1.3 mA @120 VAC |
| On state voltage drop | < 1.5 VAC @ 0.5 A |
| Fault sensing | One common voltage supply for output 1 .. 4 and output 5 ... 8, each is protected by an internal fuse against short-circuits (but not against overload). Each output is provided with an RC network (normal mode noise voltage rejection) and a Varistor (surge protection). |
| Fault reporting | none |
| Error indication | none |
| Response time (resistive load / 0.5 A) | max. 1/2 x 1/f ms OFF to ON max. 1/2 x 1/f ms ON to OFF |
| Maximum switching cycles | 3000/h for 0.5 A inductive load |

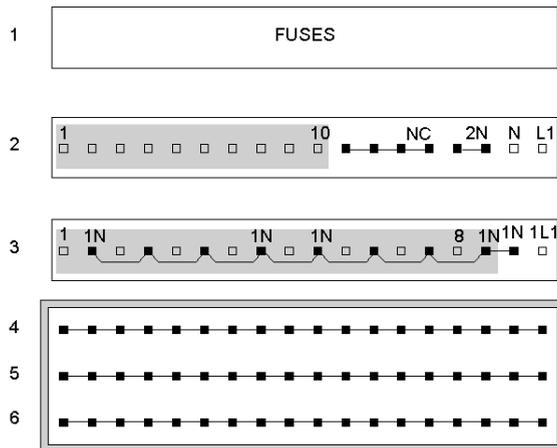
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 6 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 2 of the I/O base. Outputs are field wired to row 3. This section contains wiring guidelines and precautions for wiring the 170 ADM 690 51 TSX Momentum I/O base.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3- row busbar. The following busbars are available from Schneider Electric.

| Type | Number of Rows | Part Number |
|-------------|----------------|----------------|
| Screw-in | 1 - row | 170 XTS 006 01 |
| | 2 - row | 170 XTS 005 01 |
| | 3 - row | 170 XTS 004 01 |
| Spring-clip | 1 - row | 170 XTS 007 01 |
| | 2 - row | 170 XTS 008 01 |
| | 3 - row | 170 XTS 003 01 |

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

| Row | Terminal | Function |
|-----|----------------------------|---|
| 1 | FUSE 1, FUSE 2 | Internal fuses for output voltages |
| 2 | 1 ... 10 | Inputs |
| | 11 ... 14 | Connected internally within the row, for general purpose use |
| | 15 ... 16 | 2N for inputs |
| | 17 | Return (N) |
| | 18 | 120 VAC Operating voltage (L1) |
| 3 | 1, 3, 5, 7, 9, 11, 13, 15 | Outputs |
| | 2, 4, 6, 8, 10, 12, 14, 16 | Return (1N) for the actuators |
| | 17 | Return for the output voltage |
| | 18 | 20 ... 132 VAC Output voltage for terminal pins 1 ... 8 (1L1) |
| 4 | 1 ... 18 | 120 VAC Input voltage (2L1) |
| 5 | 1 ... 18 | Return (2N) for sensors |
| 6 | 1 ... 18 | Protective earth (PE) |

Wiring Diagrams

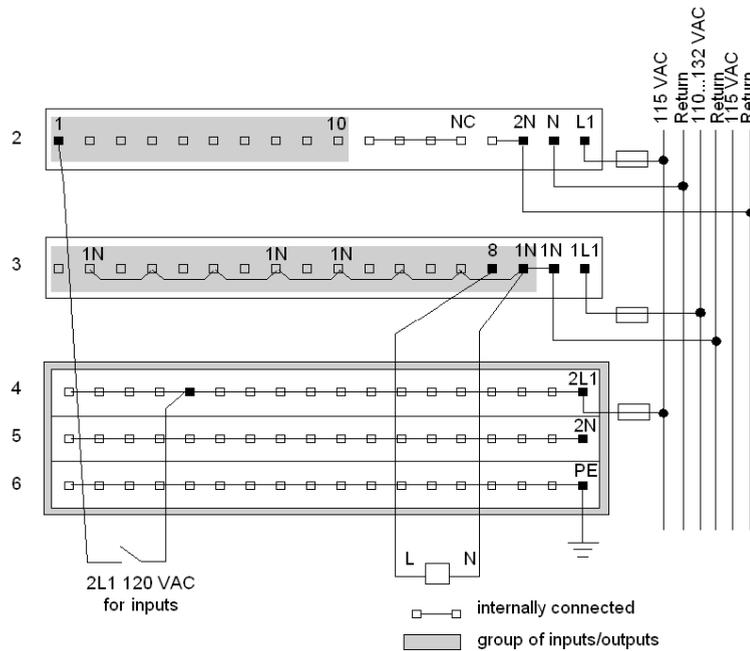
Overview

This section provides diagrams to assist you in wiring the following types of devices:

- 2-wire sensor with a 2-wire actuator
- 4-wire sensor with a 3-wire actuator
- Wiring a 170 ADM 690 51 as a 170 ADM 690 50

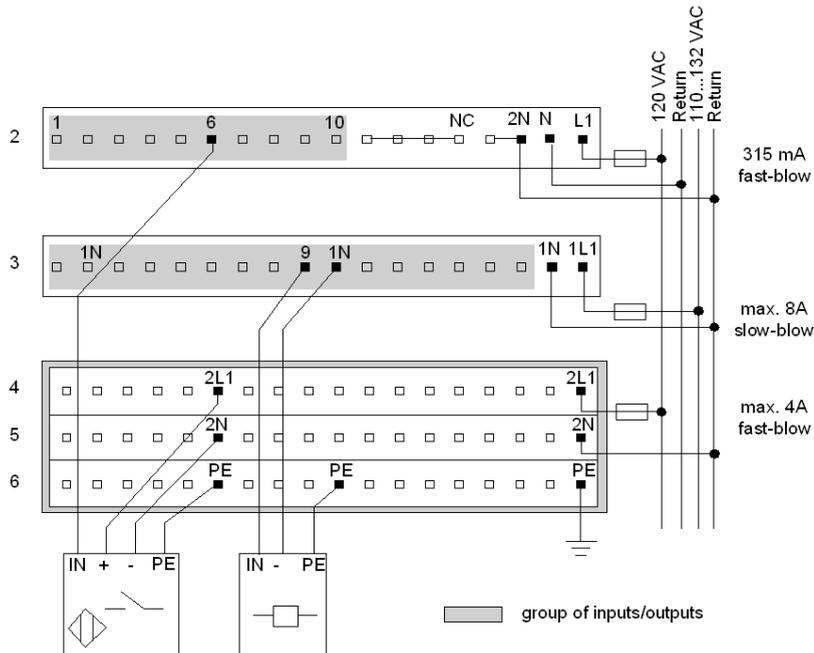
2-Wire Sensor with a 2-Wire Actuator

The diagram below shows field wiring for a 2-wire sensor and a 2-wire actuator.



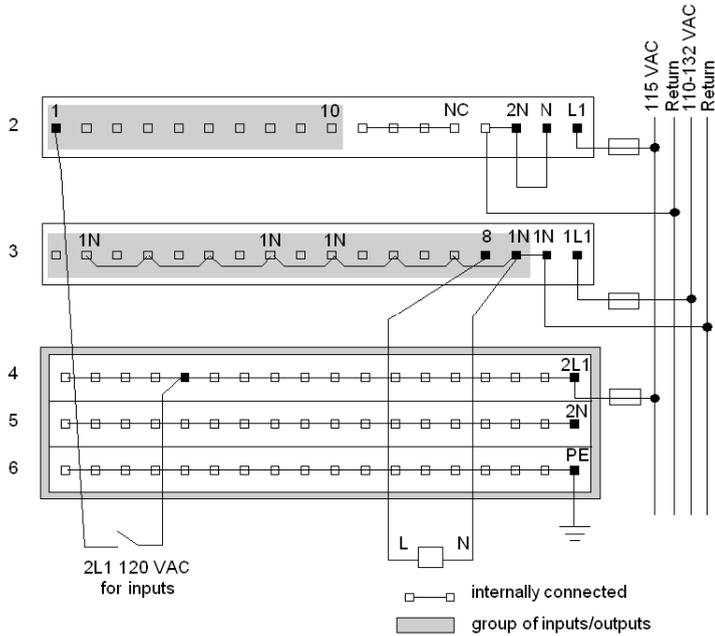
4-Wire Sensor with a 3-Wire Actuator

The diagram below shows field wiring for a 4-wire sensor and a 3-wire actuator. When using 3-phase current for supply L1, 1L1 and 2L1 must come from one phase.



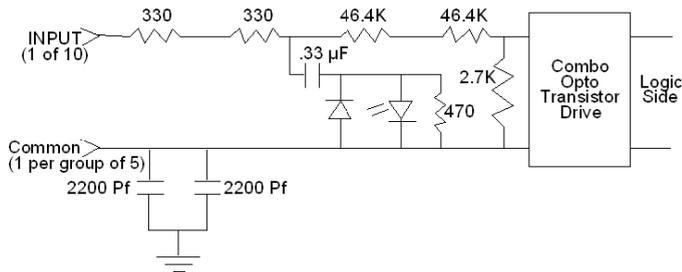
Wiring a 170 ADM 690 51 as a 170 ADM 690 50

The following diagram shows the field-side input circuitry.



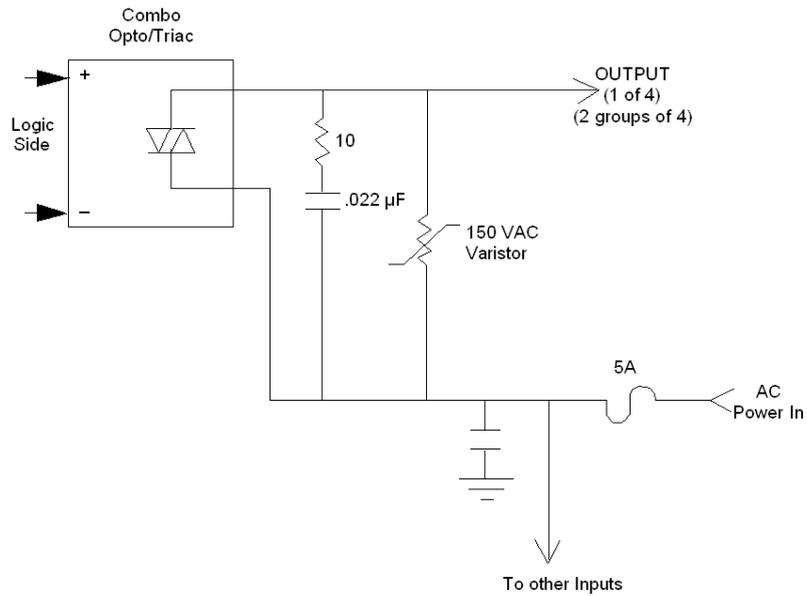
Simplified Input Schematics

The following diagram shows the field-side input circuitry.



Simplified Output Schematics

The following diagram shows the field-side output circuitry.



I/O Mapping

Overview

The 170 ADM 690 51 TSX Momentum I/O base supports 10 discrete inputs and 8 discrete outputs. This section contains information about the mapping of the I/O data into input words and output words.

I/O Map

The I/O base may be mapped as one input word and one output word, or as 10 discrete input points and 8 discrete output points.

IEC vs. Ladder Logic

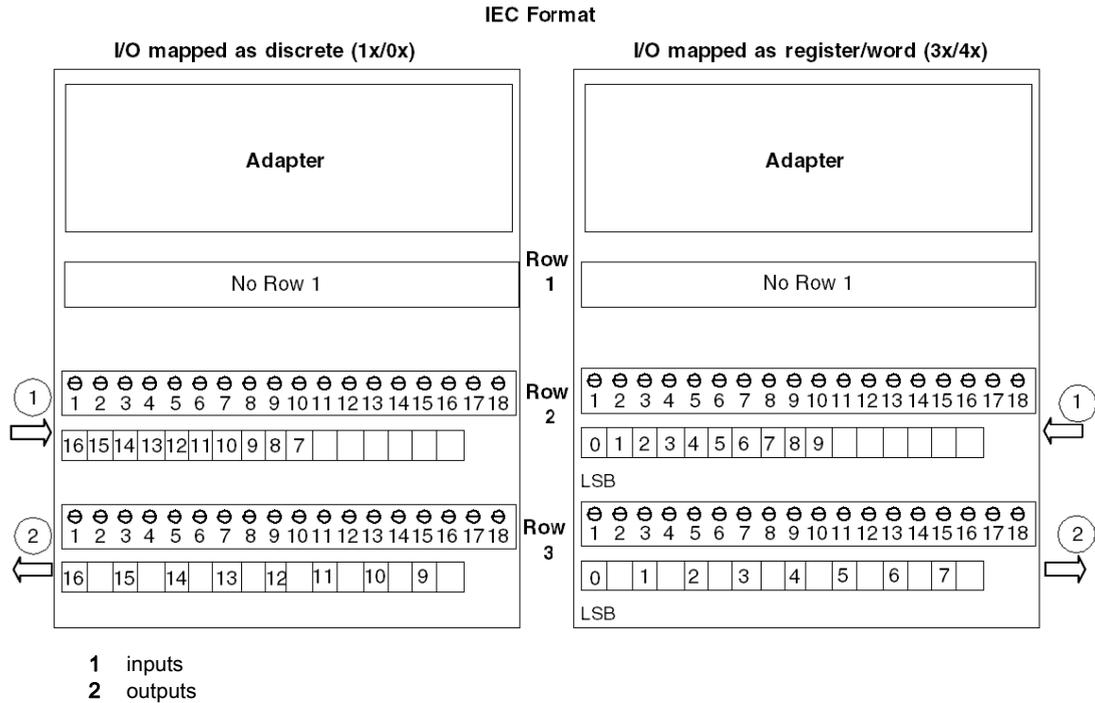
In order to correctly field wire the inputs/outputs and map the input/output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

| | IEC Compliant | 984 Ladder Logic Compliant |
|---------------------------------|---|--|
| Momentum Processor Adapters | All | None |
| Momentum Communication Adapters | All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 | 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 |

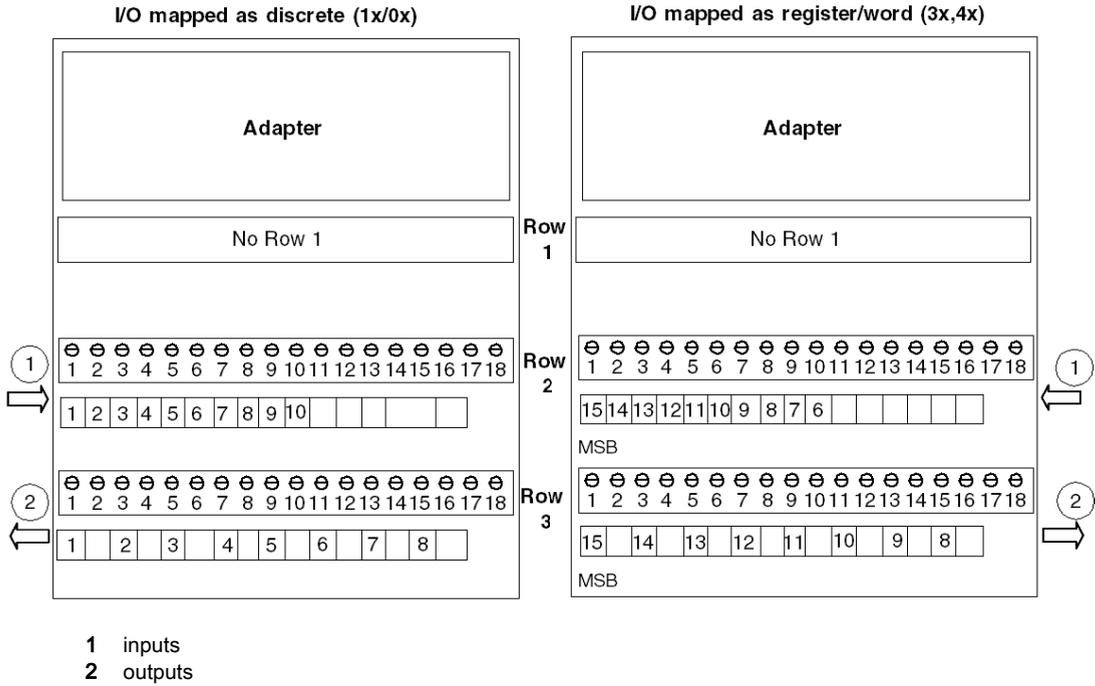
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as a discrete (1x/0x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as a discrete (1x/0x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 1 and the LSB (bit 0) is assigned to Pin 16.

984 Format



Chapter 25

170 ADM 850 10 10 to 60 VDC Module Base

Overview

This chapter describes the 170 ADM 850 10 module base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------|------|
| Front Panel Components | 412 |
| Specifications | 414 |
| Internal Pin Connections | 417 |
| Field Wiring Guidelines | 418 |
| Wiring Diagrams | 420 |
| I/O Mapping | 425 |

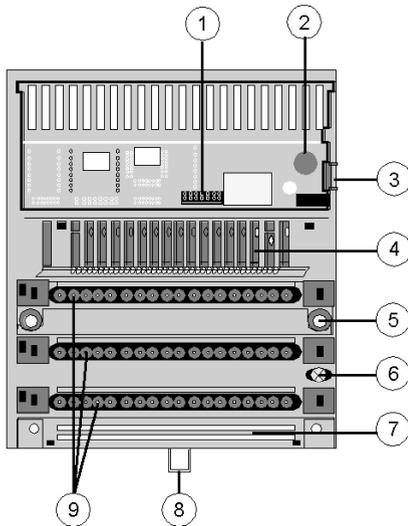
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADM 850 10 Momentum I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

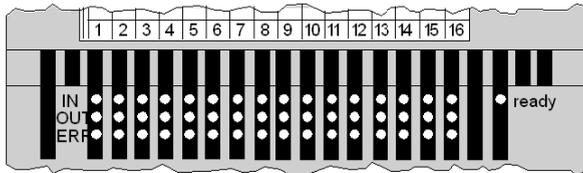


Components of the I/O module:

| Label | Description |
|-------|--|
| 1 | Internal interface (ATI) connector |
| 2 | Ground nut standoff |
| 3 | Locking and ground contact for the adapter |
| 4 | LED status display |
| 5 | Mounting holes for panel mount |
| 6 | Grounding screw |
| 7 | Busbar Mounting Slot |
| 8 | Locking tab for DIN rail mount |
| 9 | Sockets for the terminal connectors |

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

| Indicator | Condition | Message |
|--------------------------|-----------|--|
| Ready | Green | Module is ready to communicate. Operating voltage for internal logic (5 V) is present. |
| | Off | Module not ready. |
| Upper row IN 1...16 | Green | Input status (an LED per input); Input point active, ie. input carries a 1 signal (logically ON) |
| | Off | Input point inactive, ie. input carries a 0 signal (logically OFF) |
| Middle row OUT 1...16 | Green | Output status (an LED per output); Output point active, ie. output carries a 1 signal (logically ON) |
| | Off | Output point inactive, ie. Output carries a 0 signal (logically OFF) |
| Lower row ERR 1...16 | Red | Output overload (an LED per output). Short circuit or overload on the corresponding output. |
| | Off | Outputs 1 ... 16 operating normally. |

Specifications

Overview

This section contains specifications for the 170 ADM 850 10 Momentum I/O base.

General Specifications

| | |
|--------------------------------|---|
| module type | 16 discrete inputs in 1 group 16 discrete outputs in 1 group |
| supply voltage | 10-60 VDC |
| supply voltage range | 10-60 VDC |
| supply current consumption max | 500 mA at 12 VDC 250 mA at 24 VDC 125 mA at 48 VDC |
| power dissipation | $6 \text{ W} + (\# \text{ of input points on } \times .144 \text{ W}) + (\# \text{ of output points on } \times .25 \text{ W})$ |
| I/O map | 1 input word or 16 discrete inputs 1 output word or 16 discrete outputs |

Isolation

| | |
|--------------------------------|---------------------------------------|
| input to input | none |
| output group to output group | none |
| input to output | 707 VDC |
| logic to output | 707 VDC |
| field to protective earth | 707 VDC |
| input to output | 707 VDC |
| field to communication adapter | defined by communication adapter type |

Fuses

| | |
|---|--|
| internal | none |
| external: operating voltage (row 1) | 1 A slow-blow |
| external: input reference voltage (row 3) | 1 A slow-blow (Bussmann GDC-1A or equivalent) |
| external: output voltage (row 2) | according to the supply of the connected actuators, not to exceed 8 A fast-blow. |

EMC

| | |
|------------------|---|
| immunity | IEC 1131-2 Surge on auxiliary power supply, 500V |
| emissions | EN 50081-2 (limitation A) |
| agency approvals | UL, CSA, CE, FM Class 1, Div. 2 pending |

Physical Dimensions

| | |
|-------------------------|--|
| width | 125 mm (4.9 in) |
| depth (with no adapter) | 40 mm (1.54 in) |
| length | 141.5 mm (5.5 in) with or without one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars |
| weight | 200 g (0.44 lb) |

Discrete Inputs

| | |
|---------------------------|---|
| number of points | 16 |
| number of groups | 1 |
| points per group | 16 |
| signal type | true high |
| IEC 1131 type | 1+ (See Appendix for definitions of IEC input types.) |
| input voltage level | |
| 12 VDC +20%,-15% | >7.5 VDC On, <2.5 VDC Off |
| 24 VDC +25%,-20% | >11 VDC On, <5 VDC Off |
| 48 VDC +25%,-20% | >30 VDC On, <10 VDC Off |
| OFF state leakage current | |
| 12 VDC | 1.5 mA and lower |
| 24 VDC | 1.5 mA and lower |
| 48 VDC | 1.5 mA and lower |
| input operating current | |
| 12 VDC ON current | 2.3 mA |
| 24 VDC ON current | 2.7 mA |
| 48 VDC ON current | 2.9 mA |

| | |
|---------------------|--------------------------------------|
| input voltage range | 10-60 VDC |
| input voltage surge | 75 volts peak for 10ms |
| response time | 3.5 ms OFF to ON 5.5 ms ON to OFF |

NOTE: Discrete 10-60 VDC inputs require an Input Voltage Reference (row 3 terminal block, terminals 17 and 18). The Input Voltage Reference must be the same voltage level as the voltage level as supplied to the inputs. This reference is required for the module to select the correct Turn On and Turn Off thresholds for the inputs.

Discrete Outputs

| | |
|--|---|
| output type | solid state switch |
| output supply voltage | 10-60 VDC |
| number of points | 16 |
| number of groups | 1 |
| current capacity | 460 mA/point maximum up to 40 degrees C 430 mA/point from 40 degrees C to 50 degrees C 375 mA/point from 50 degrees C to 60 degrees C |
| signal type | true high (sourcing) |
| leakage current (output out) | < 1 mA @ 60 VDC |
| surge (inrush) current | 5 A for 1 ms |
| on state voltage drop | < 1.0 VDC @ 0.5 A |
| fault sensing (See Note below.) | Outputs are electronically safeguarded to assist in short circuit and overload protection. |
| fault reporting | 1 red LED/point (row 3) ON when short current/ overload occurs |
| error indication | output overload for at least one output (I/O-error) to communication adapter |
| response time (resistive load / 460 mA) | < 3 ms OFF to ON < 3 ms ON to OFF |
| maximum switching cycles | 1000/h for 0.5 A inductive load 100/s for 0.5 A resistive load 8/s for 1.2 W Tungsten load |

NOTE: Discrete 10-60 VDC outputs incorporate thermal shutdown and overload protection. The output current of a shortened output is limited to a nondestructive value. The short circuit heats the output driver and the output will switch off. The output will switch on again if the driver drops below the overtemperature threshold. If the short circuit still exists, the driver will reach the overtemperature condition again and will switch off again.

NOTE: Confirm that the I/O base is powered on at the same time or before the CPU is powered on. If not, the output channels may not be stable during I/O base power on.

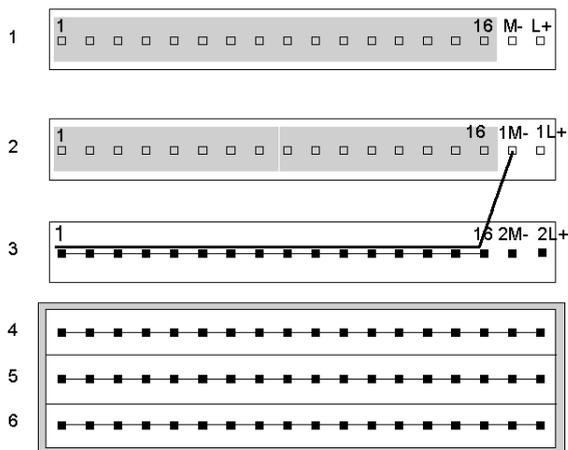
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 6 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 1 of the base. The outputs are field wired to row 2. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Automation sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3- row busbar. The following busbars are available from Schneider Automation.

| Type | Number of Rows | Part Number |
|-------------|----------------|----------------|
| Screw-in | 1 - row | 170 XTS 006 01 |
| | 2 - row | 170 XTS 005 01 |
| | 3 - row | 170 XTS 004 01 |
| Spring-clip | 1 - row | 170 XTS 007 01 |
| | 2 - row | 170 XTS 008 01 |
| | 3 - row | 170 XTS 003 01 |

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

| Row | Terminal | Function |
|-----|--------------|---|
| 1 | 1 through 16 | Inputs 1 through 16 |
| 1 | 17 | Power supply return for module (M-) |
| 1 | 18 | +10 to 60 VDC power for module (L+) |
| 2 | 1 through 16 | Outputs 1 through 16 |
| 2 | 17 | Power supply return for outputs (1M-) |
| 2 | 18 | +10 to 60 VDC power for outputs (1L+) |
| 3 | 1 through 16 | Return connections for outputs |
| 3 | 17 | Power supply return for input voltage reference (2M-) |
| 3 | 18 | +10 to 60 VDC input reference voltage (2L+) |
| 4 | 1 through 18 | Input voltage for I1...I16 or PE |
| 5 | 1 through 18 | Return (M-) |
| 6 | 1 through 18 | Protective Earth (PE) |

Protective Circuit May Be Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit parallel to the operating coil.

Wiring Diagrams

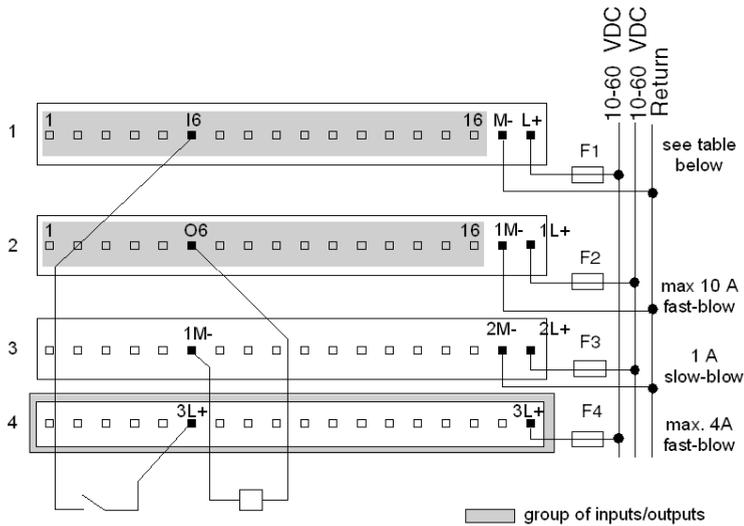
Overview

This section provides diagrams to assist you in wiring the following types of devices:

- 2-wire devices
- sensors activated by an output
- 4-wire sensors with a 2-wire actuator
- broken wire detection

2-Wire Devices

The diagram below shows an example of wiring two-wire devices.

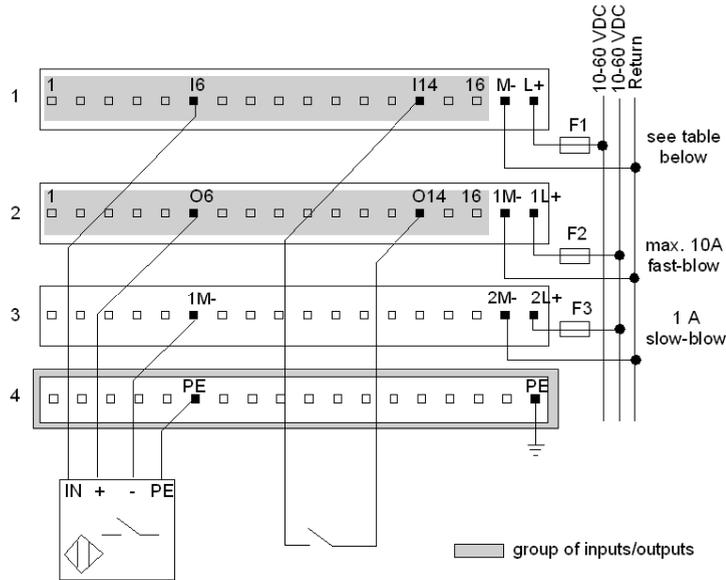


Fuse table for F1

| Voltage | Fuse |
|---------|---------------|
| 12 VDC | 1 A slow-blow |
| 24 VDC | 1 A slow-blow |
| 48 VDC | 1 A slow-blow |

Sensor Activated by Output

The wiring diagram below shows an example of a sensor activated by an output. The diagram shows the sensors being supplied with voltage only when the outputs on pins 6 and 14, row 2, are high. The inputs from pins 6 and 14, row 1, can be high only when the associated outputs are high.

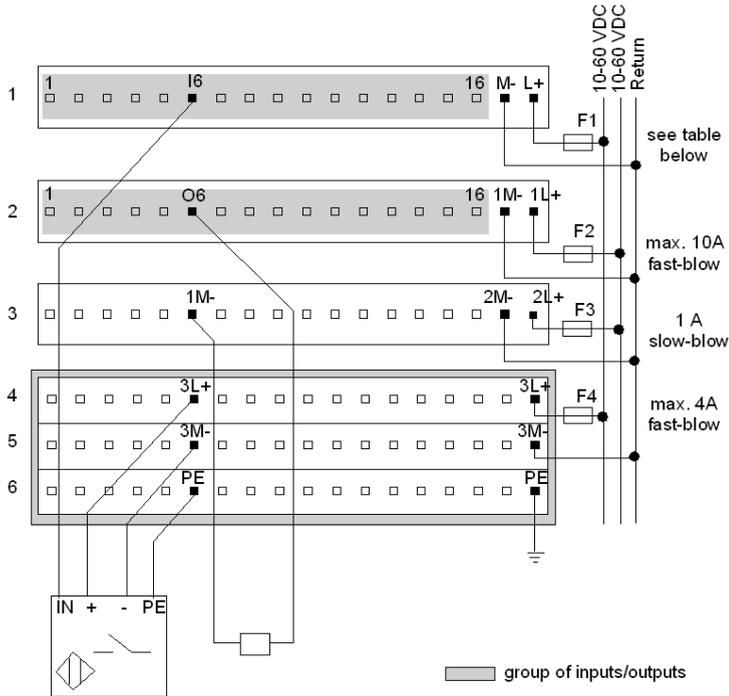


Fuse table for F1

| Voltage | Fuse |
|---------|---------------|
| 12 VDC | 1 A slow-blow |
| 24 VDC | 1 A slow-blow |
| 48 VDC | 1 A slow-blow |

Four-Wire Sensor with a Two-Wire Actuator

The diagram below shows a four-wire sensor with a two-wire actuator. The process of wiring a three-wire sensor is very similar to the one below. Because three-wire sensors do not require PE, a two-row busbar could be used instead of the three-row busbar shown.

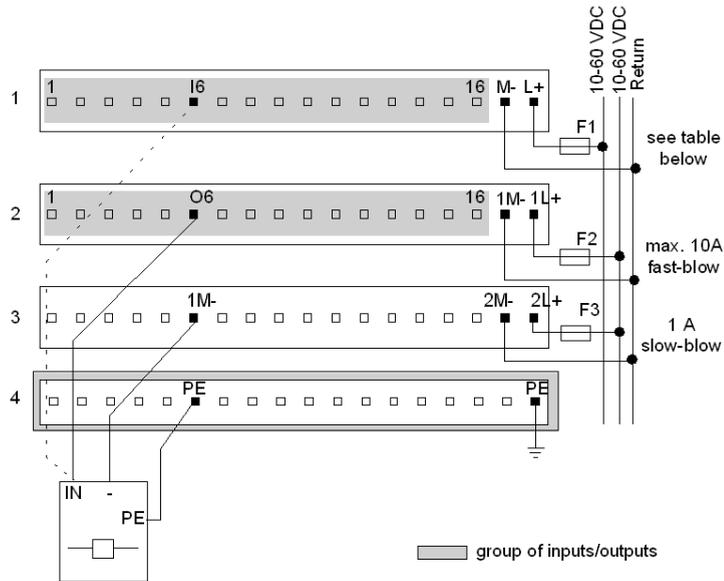


Fuse table for F1

| Voltage | Fuse |
|---------|---------------|
| 12 VDC | 1 A slow-blow |
| 24 VDC | 1 A slow-blow |
| 48 VDC | 1 A slow-blow |

Broken Wire Detection

The diagram below shows a three-wire actuator with an optional wiring scheme for broken wire detection. The dotted line reads back whether or not current has reached the actuator. When the output on pin 6, row 2, is high, the input from pin 6, row 1, must also be high.

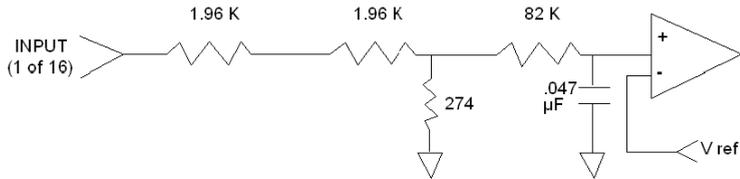


Fuse table for F1

| Voltage | Fuse |
|---------|---------------|
| 12 VDC | 1 A slow-blow |
| 24 VDC | 1 A slow-blow |
| 48 VDC | 1 A slow-blow |

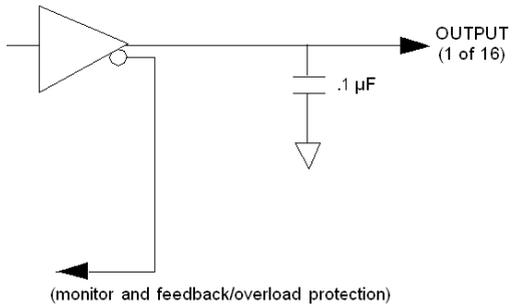
Simplified Input Schematics

The following diagram shows the field-side input circuitry.



Simplified Output Schematics

The following diagram shows the field-side output circuitry.



I/O Mapping

Overview

The 170 ADM 850 10 TSX Momentum I/O base supports 16 discrete inputs and 16 discrete outputs. This section contains information about the mapping of the I/O data into input words and output words.

I/O Map

The I/O base may be mapped as one input word and as one output word, or as 16 discrete input points and as 16 discrete output points.

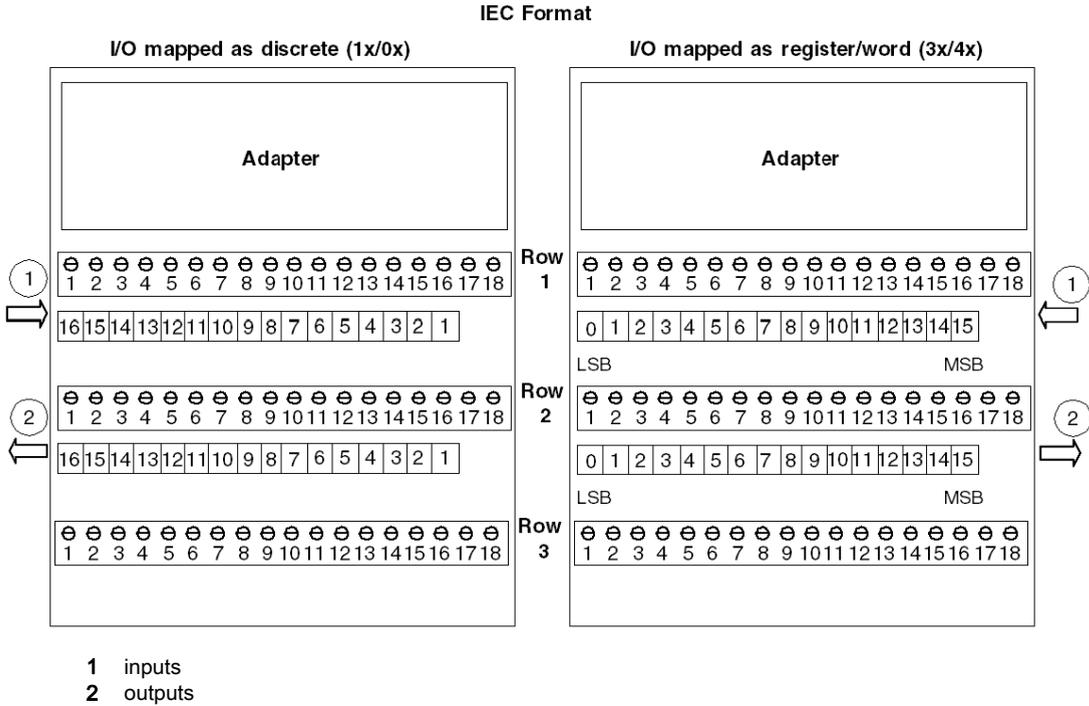
IEC vs. Ladder Logic

In order to correctly field wire the inputs/outputs and map the inputs/outputs data, you need to know which type of Momentum Adapter is mounted on the base. Adapters may be either IEC compliant or 984 Ladder Logic compliant.

| | IEC Compliant | 984 Compliant |
|---------------------------------|---|--|
| Momentum Processor Adapters | All | None |
| Momentum Communication Adapters | All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 | 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 |

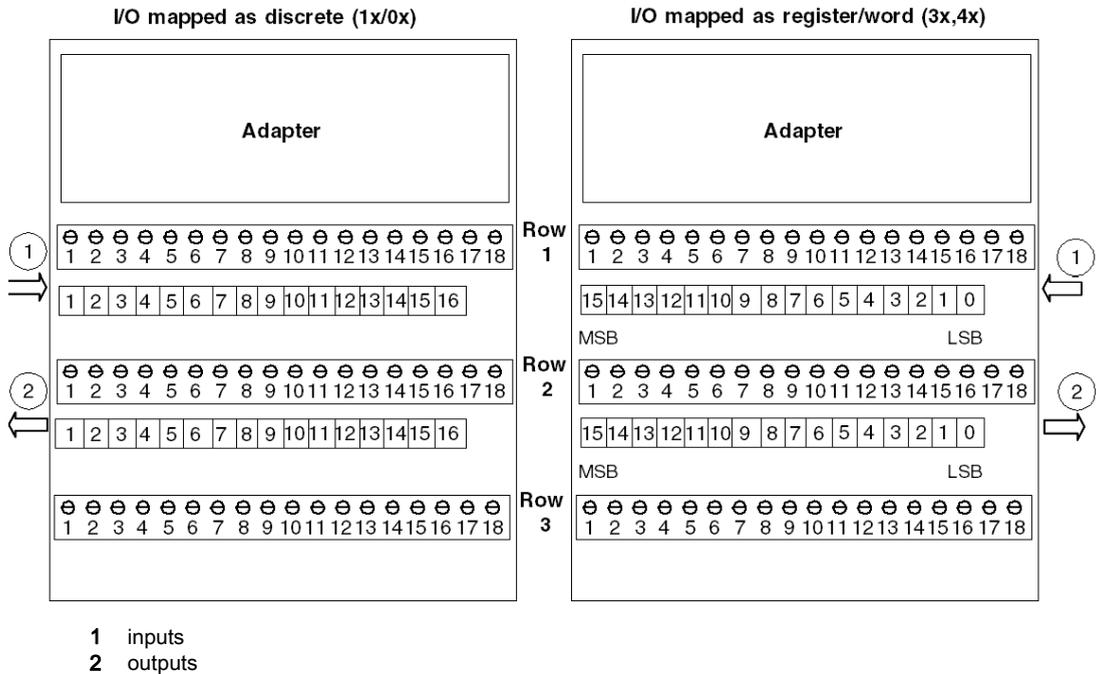
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



The figure below shows how data is mapped on the I/O base with a 984 Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (1x/0x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (3x/4x), the MSB (bit 15) is assigned to Pin 1 and the LSB (bit 0) is assigned to Pin 16.

984 Format



Chapter 26

170 ADO 340 00 24 VDC - 16 Pt. Discrete Output Module Base

Overview

This chapter describes the 170 ADO 340 00 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------|------|
| Front Panel Components | 430 |
| Specifications | 432 |
| Internal Pin Connections | 434 |
| Field Wiring Guidelines | 435 |
| Wiring Diagrams | 437 |
| I/O Mapping | 439 |

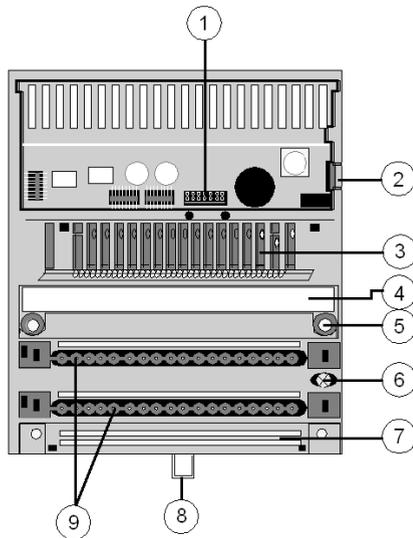
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADO 340 00 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

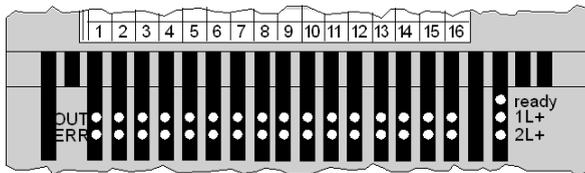


Components of the I/O module

| Label | Description |
|-------|--|
| 1 | Internal interface (ATI) connector |
| 2 | Locking and ground contact for the adapter |
| 3 | LED status display |
| 4 | Protective cover |
| 5 | Mounting holes for panel mount |
| 6 | Grounding screw |
| 7 | Grounding Busbar Mounting Slot |
| 8 | Locking tab for DIN rail mount |
| 9 | Sockets for the terminal connectors |

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

| Indicator | Condition | Message |
|--------------------------|-----------|--|
| Ready | Green | Module is ready to communicate. Operating voltage for internal logic (5 V) is present. |
| | Off | Module not ready. |
| 1L+ | Green | Output voltage 1L+ of inputs 1 ... 8 (group 1) is present |
| | Off | Output voltage of inputs 1 ... 8 (group 1) is not present |
| 2L+ | Green | Output voltage 2L+ of inputs 9 ... 16 (group 2) is present |
| | Off | Output voltage of inputs 9 ... 16 (group 2) is not present |
| Middle row OUT 1...16 | Green | Output status (an LED per output); Output point active, ie. output carries a 1 signal (logically ON) |
| | Off | Output status (an LED per output); Output point inactive, ie. output carries a 0 signal (logically OFF) |
| Lower row ERR 1...16 | Red | Output overload (an LED per output). Short circuit or overload on the corresponding output. |
| | Off | Outputs 1 ... 16 operating normally. |

Specifications

Overview

This section contains specifications for the 170 ADO 340 00 I/O base.

General Specifications

| | |
|----------------------------|---|
| Module type | 16 discrete outputs in 2 groups (8 pts/group) |
| Supply voltage | 24 VDC |
| Supply voltage range | 20...30 VDC |
| Supply current consumption | max. 250 mA at 24 VDC |
| Power dissipation | 6 W + (# of output points on x .25 W) |
| I/O map | 1 output word |

Isolation

| | |
|--------------------------------|---------------------------------------|
| Output group to output group | none |
| Field to communication adapter | Defined by communication adapter type |

Fuses

| | |
|-----------------------------|---|
| Internal | none |
| External: operating voltage | 1 A slow-blow (Bussmann GDC-1A or equivalent) |
| External: output voltage | According to the supply of the connected actuators—not to exceed 4 A slow-blow/ group |

EMC

| | |
|------------------|---|
| Immunity | IEC 1131-2 Surge on auxiliary power supply 500 V |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE, FM Class 1 Div. 2 pending |

Physical Dimensions

| | |
|-------------------------|--|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars |
| Weight | 210 g (0.46 lb) |

Discrete Outputs

| | |
|---|--|
| Output type | Solid state switch |
| Output supply voltage | 24 VDC |
| Output supply voltage range | 20 ... 30 VDC |
| Output voltage | External supply - .5 VDC |
| Number of points | 16 |
| Number of groups | 2 |
| Points per group | 8 |
| Current capacity | 0.5 A/point maximum 4 A/group 8 A/module |
| Signal type | True High |
| Leakage current (output out) | < 1 mA @ 24 VDC |
| Surge (inrush) current | 5 A for 1 ms |
| On state voltage drop | < 0.5 VDC @ 0.5 A |
| Fault sensing | Outputs are electronically safeguarded to assist in short circuit and overload protection |
| Fault reporting | 1 red LED/point (row 3) ON when short current/ overload occurs |
| Error indication | Output overload for at least one output (I/O-Error) to communication adapter |
| Response time (resistive load / 0.5 A) | < 0.1 ms OFF to ON < 0.1 ms ON to OFF |
| Maximum switching cycles | 1000/h for 0.5 A inductive load 100/s for 0.5 A resistive load 8/s for 1.2 W Tungsten load |

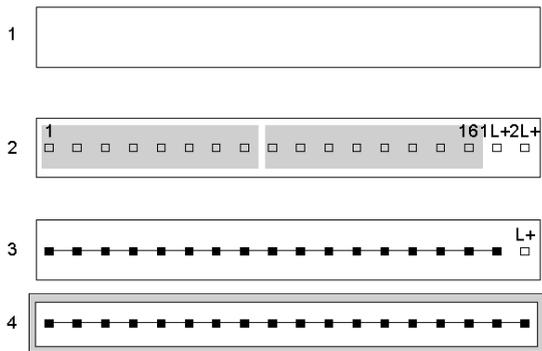
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional one-row busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 shows the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

The outputs are field wired to row 2 of the base. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-row busbar. The following busbars are available from Schneider Electric.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 006 01 |
| Spring-clip | 170 XTS 007 01 |

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

| Row | Terminal | Function |
|-----|----------|---|
| 1 | Not used | |
| 2 | 1 ... 8 | Outputs for group 1 |
| | 9 ... 16 | Outputs for group 2 |
| | 17/18 | 24 VDC for output groups 1 and 2 (1L+, 2L+) |
| 3 | 1 ... 16 | Return (M-) for outputs |
| | 17 | Return (M-) for module and outputs |
| | 18 | + 24 VDC Operating voltage (L+) |
| 4 | 1 ... 18 | Protective earth (PE) |

Protective Circuit Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit parallel to the operating coil.

Wiring Diagrams

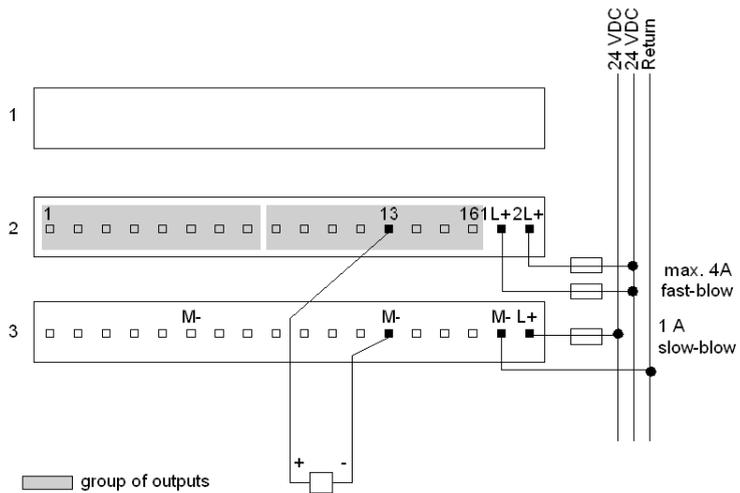
Overview

This section provides diagrams to assist you in wiring the following types of devices:

- 2-wire actuators
- 3-wire actuators

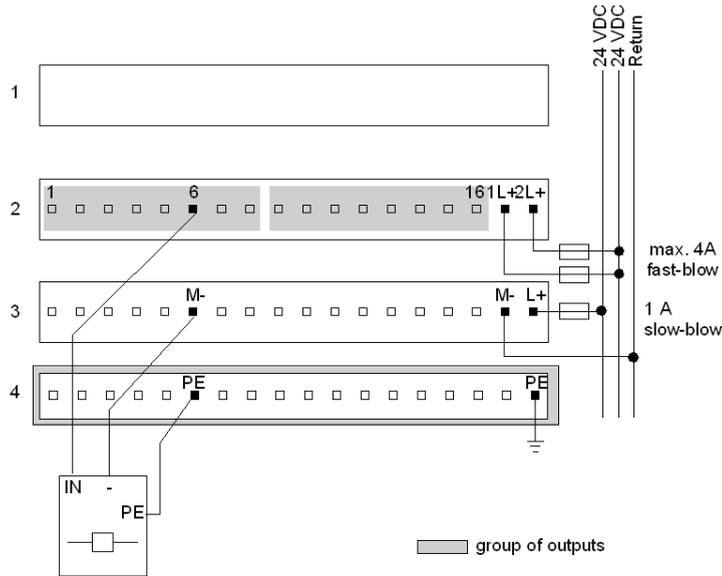
2-Wire Actuators

The diagram below shows an example of wiring for a 2-wire actuator.



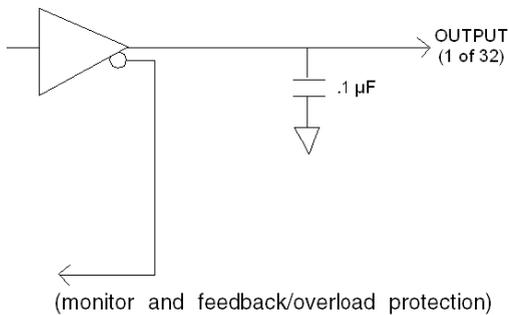
3-Wire Actuator

The diagram below shows an example of wiring for 3-wire actuator.



Simplified Schematics

The following diagram shows the field-side output circuitry.



I/O Mapping

Overview

The 170 ADO 340 00 TSX Momentum I/O base supports 16 discrete outputs. This section contains information about the mapping of the I/O data into output words.

I/O Map

The I/O base may be mapped as one output word, or as 16 discrete output points.

IEC vs. Ladder Logic

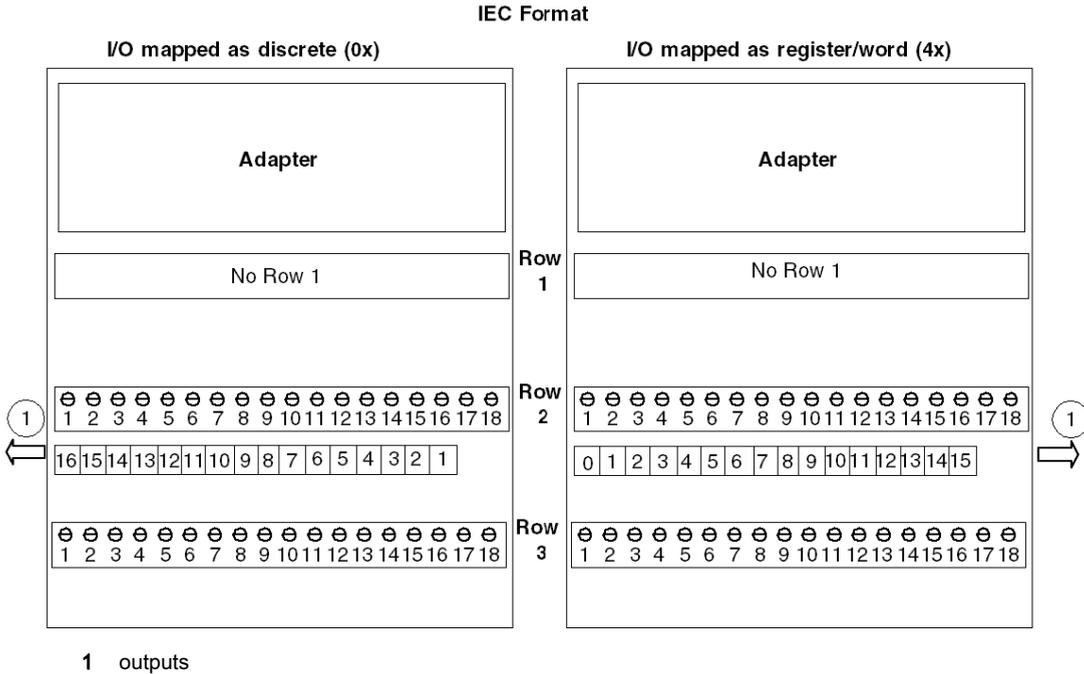
In order to correctly field wire the outputs and map the output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters may be either IEC or 984 Ladder Logic Compliant.

| | IEC Compliant | 984 Ladder Logic Compliant |
|---------------------------------|---|--|
| Momentum Processor Adapters | All | None |
| Momentum Communication Adapters | All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 | 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 |

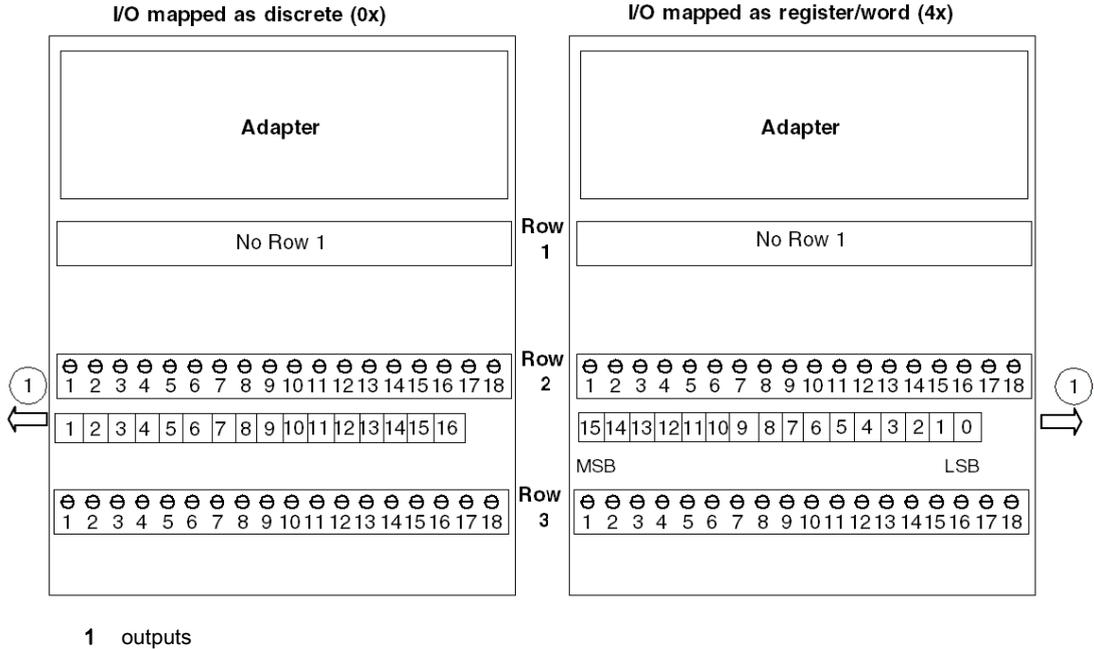
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (0x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word/register (4x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (0x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word/register (4x), the MSB (bit 15) is assigned to Pin 1 and the LSB (bit 0) is assigned to Pin 16.

984 Format



Chapter 27

170 ADO 350 00 24 VDC - 32 Pt. Discrete Output Module Base

Overview

This chapter describes the 170 ADO 350 00 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------|------|
| Front Panel Components | 444 |
| Specifications | 446 |
| Internal Pin Connections | 448 |
| Field Wiring Guidelines | 449 |
| Wiring Diagrams | 451 |
| I/O Mapping | 453 |

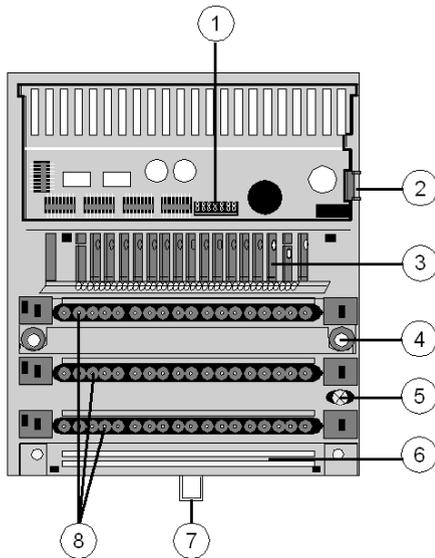
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADO 350 00 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

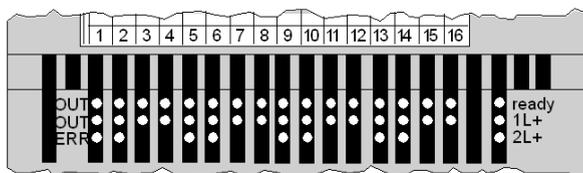


Components of the I/O module

| Label | Description |
|-------|--|
| 1 | Internal interface (ATI) connector |
| 2 | Locking and ground contact for the adapter |
| 3 | LED status display |
| 4 | Mounting holes for panel mount |
| 5 | Grounding screw |
| 6 | Grounding busbar mounting Slot |
| 7 | Locking tab for DIN rail mount |
| 8 | Sockets for the terminal connectors |

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

| Indicator | Condition | Message |
|-------------------------------|-----------|--|
| Ready | Green | Module is ready to communicate. Operating voltage for internal logic (5 V) is present. |
| | Off | Module not ready. |
| 1L+ | Green | Output voltage 1L+ of inputs 1 ... 8 (group 1) is present |
| | Off | Output voltage of inputs 1 ... 8 (group 1) is not present |
| 2L+ | Green | Output voltage 2L+ of inputs 9 ... 16 (group 2) is present |
| | Off | Output voltage of inputs 9 ... 16 (group 2) is not present |
| Upper row OUT 1...16 | Green | Status of outputs 1 ... 16 (an LED per output); Output point active, ie. output carries a 1 signal (logically ON) |
| | Off | Status of outputs 1 ... 16 (an LED per output); Output point inactive, ie. output carries a 0 signal (logically OFF) |
| Middle row OUT 1...16 | Green | Status of outputs 17 ... 32 (an LED per output); Output point active, ie. output carries a 1 signal (logically ON) |
| | Off | Status of outputs 17 ... 32 (an LED per output); Output point inactive, ie. output carries a 0 signal (logically OFF) |
| Lower row ERR 1, 5, 9, 13 | Red | Output overload in group 1 (one LED for every 4 outputs). Short circuit or overload on the corresponding output. |
| | Off | Outputs 1 ... 16 operating normally. |
| Lower row ERR 2, 6, 10, 14 | Red | Output overload in group 2 (one LED for every 4 outputs). Short circuit or overload on the corresponding output. |
| | Off | Outputs 7 ... 32 operating normally. |

Specifications

Overview

This section contains specifications for the 170 ADO 350 00 I/O base.

General Specifications

| | |
|----------------------------|--|
| Module type | 32 discrete outputs in 2 groups (16 pts/group) |
| Supply voltage | 24 VDC |
| Supply voltage range | 20...30 VDC |
| Supply current consumption | max. 250 mA at 24 VDC |
| Power dissipation | 6 W + (# of output points on x .25 W) |
| I/O map | 2 output word |

Isolation

| | |
|--------------------------------|---------------------------------------|
| Output group to output group | none |
| Field to communication adapter | Defined by communication adapter type |

Fuses

| | |
|-----------------------------|---|
| Internal | none |
| External: operating voltage | 1 A slow-blow (Bussmann GDC-1A or equivalent) |
| External: output voltage | According to the supply of the connected actuators—not to exceed 8 A slow-blow/ group |

EMC

| | |
|------------------|---|
| Immunity | IEC 1131-2 Surge on auxiliary power supply 500 V |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE, FM Class 1 Div. 2 pending |

Physical Dimensions

| | |
|-------------------------|--|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars |
| Weight | 210 g (0.46 lb) |

Discrete Outputs

| | |
|---|--|
| Output type | Solid state switch |
| Output supply voltage | 24 VDC |
| Output supply voltage range | 20 ... 30 VDC |
| Output voltage | External supply - .5 VDC |
| Number of points | 32 |
| Number of groups | 2 |
| Points per group | 16 |
| Current capacity | 0.5 A/point maximum 8 A/group 16 A/module |
| Signal type | True High |
| Leakage current (output out) | < 1 mA @ 24 VDC |
| Surge (inrush) current | 5 A for 1 ms |
| On state voltage drop | < 0.5 VDC @ 0.5 A |
| Fault sensing | Outputs are electronically safeguarded to assist in short circuit and overload protection |
| Fault reporting | 1 red LED/point (row 3) ON when short current/ overload occurs |
| Error indication | Output overload for at least one out put (I/O-Error) to communication adapter |
| Response time (resistive load / 0.5 A) | < 0.1 ms OFF to ON < 0.1 ms ON to OFF |
| Maximum switching cycles | 1000/h for 0.5 A inductive load 100/s for 0.5 A resistive load 8/s for 1.2 W Tungsten load |

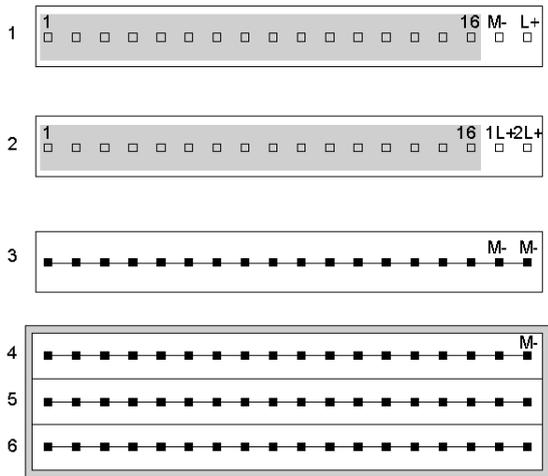
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 6 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3- row busbar. The following busbars are available from Schneider Electric.

| Type | Number of Rows | Part Number |
|-------------|----------------|----------------|
| Screw-in | 1 - row | 170 XTS 006 01 |
| | 2 - row | 170 XTS 005 01 |
| | 3 - row | 170 XTS 004 01 |
| Spring-clip | 1 - row | 170 XTS 007 01 |
| | 2 - row | 170 XTS 008 01 |
| | 3 - row | 170 XTS 003 01 |

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars

| Row | Terminal | Function |
|-----|----------|---|
| 1 | 1...16 | Outputs for group 1 |
| | 17 | Return (M-) for the module |
| | 18 | + 24 VDC Operating voltage (L+) |
| 2 | 1 ... 16 | Outputs for group 2 |
| | 17/18 | + 24 VDC for output group 1 (1L+) and group 2 (2L+) |
| 3 | 1 ... 16 | Return (M-)for the outputs |
| | 17/18 | Return (M-)for the output groups |
| 4 | 1 ... 18 | Return (M-) |
| 5 | 1 ... 18 | Protective earth (PE) |
| 6 | 1 ... 18 | Protective earth |

Protective Circuit May Be Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit parallel to the operating coil.

Wiring Diagrams

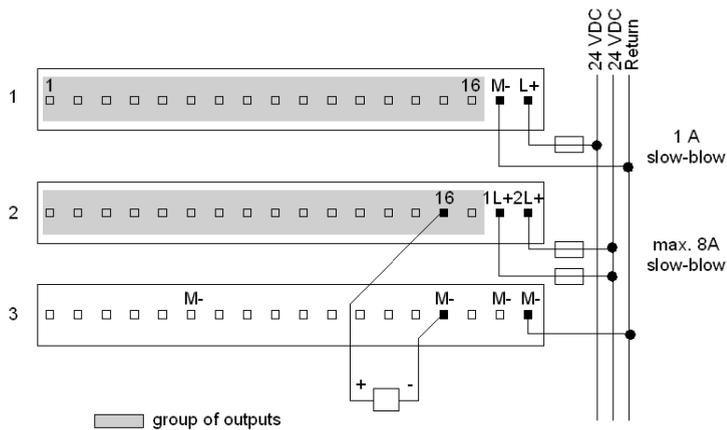
Overview

This section provides diagrams to assist you in wiring the following types of devices:

- 2-wire actuators
- 3-wire actuators

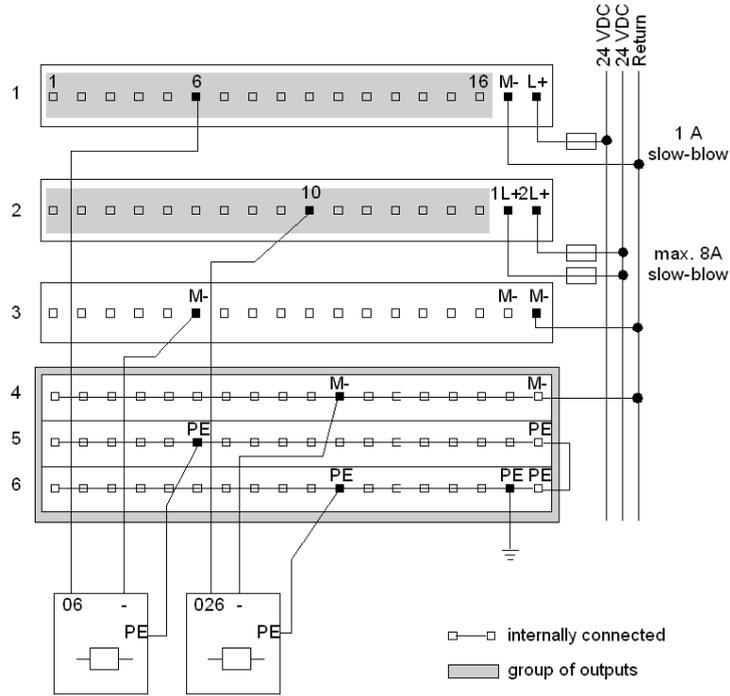
2-Wire Actuators

The diagram below shows an example of wiring for a 2-wire actuator.



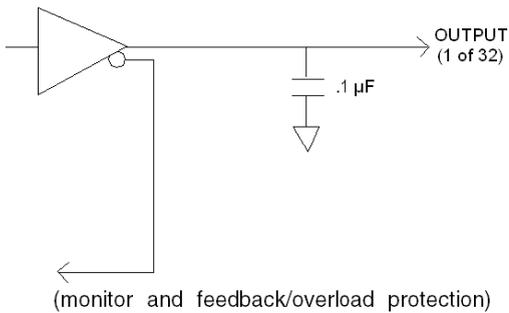
3-Wire Actuator

The diagram below shows an example of wiring for 3-wire actuator.



Simplified Schematics

The following diagram shows the field-side output circuitry.



I/O Mapping

Overview

The 170 ADO 350 00 TSX Momentum I/O base supports 32 discrete outputs. This section contains information about the mapping of the I/O data into output words.

I/O Map

The I/O base may be mapped as two output words, or as 32 discrete output points.

IEC vs. Ladder Logic

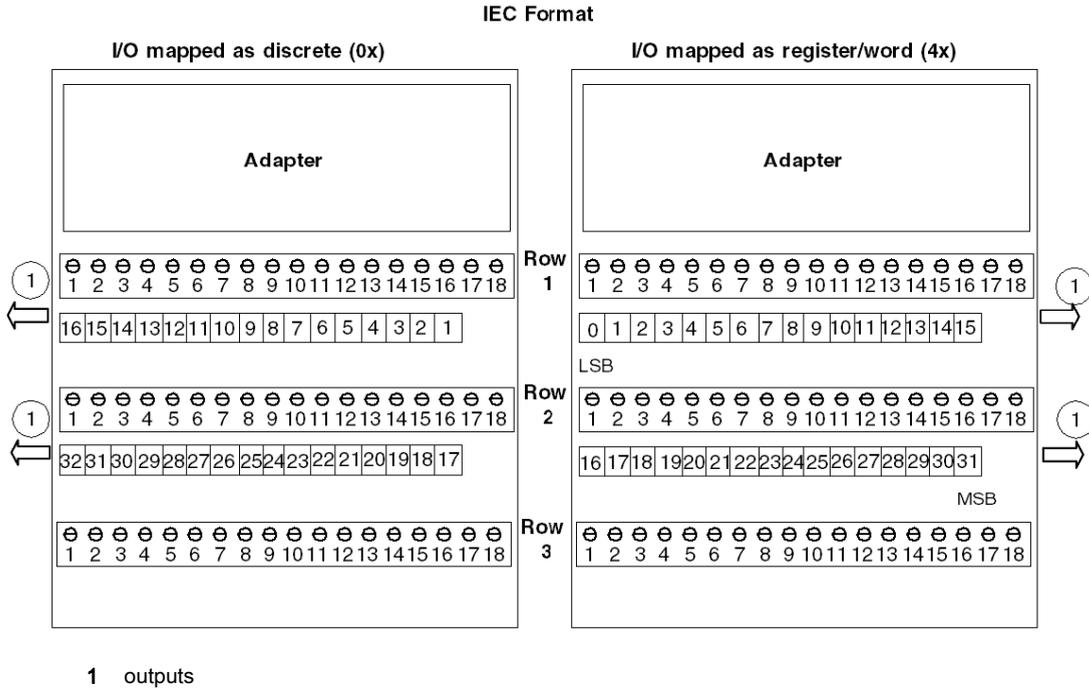
In order to correctly field wire the outputs and map the output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

| | IEC Compliant | 984 Ladder Logic Compliant |
|---------------------------------|---|--|
| Momentum Processor Adapters | All | None |
| Momentum Communication Adapters | All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 | 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 |

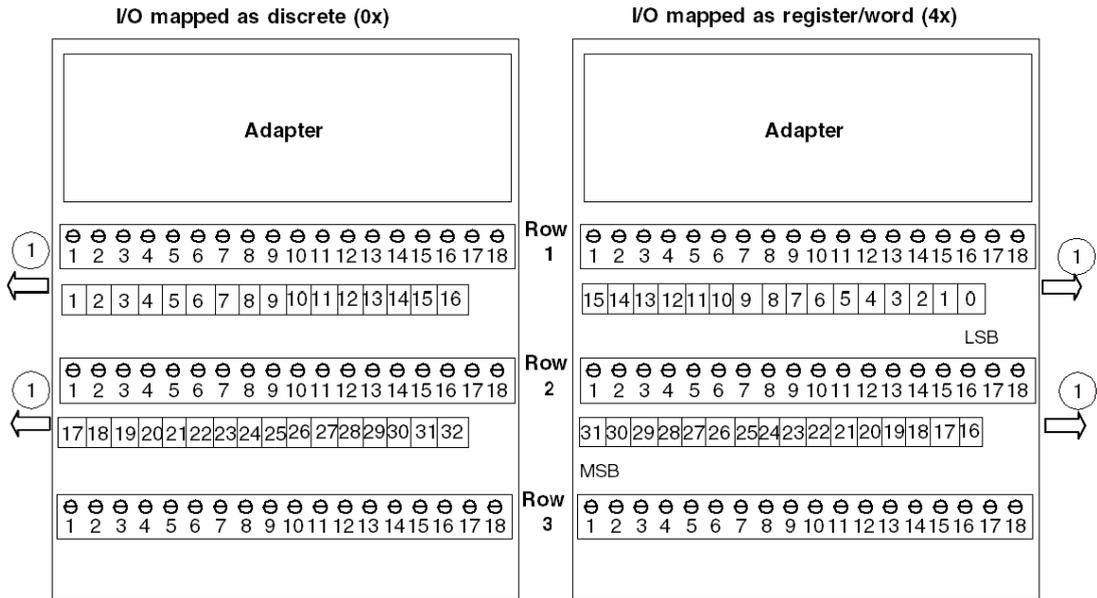
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (0x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as word or register (4x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (0x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as word or register (4x), the MSB (bit 15) is assigned to Pin 1 and the LSB (bit 0) is assigned to Pin 16.

984 Format



1 outputs

Chapter 28

170 ADO 530 50 120 VAC - 8 Point Discrete Output @ 2A Module Base

Overview

This chapter describes the 170 ADO 530 50 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------|------|
| Front Panel Components | 458 |
| Specifications | 460 |
| Internal Pin Connections | 463 |
| Field Wiring Guidelines | 464 |
| Wiring Diagrams | 466 |
| I/O Mapping | 469 |

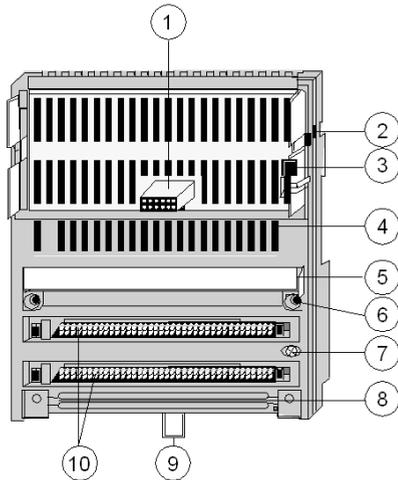
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADO 530 50 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

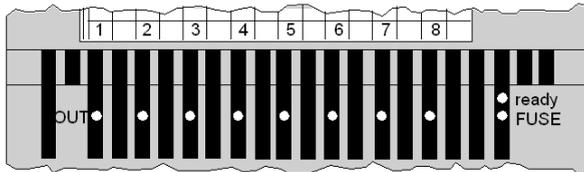


Components of the I/O module

| Label | Description |
|-------|-------------------------------------|
| 1 | Internal interface (ATI) connector |
| 2 | Locking tab for the adapter |
| 3 | Ground contact for the adapter |
| 4 | LED status display |
| 5 | Fuses (under the cover) |
| 6 | Mounting holes for panel mount |
| 7 | Grounding screw |
| 8 | BGrounding busbar Mounting Slot |
| 9 | Locking tab for DIN rail mount |
| 10 | Sockets for the terminal connectors |

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

| Indicator | Condition | Message |
|----------------|-----------|---|
| Ready | Green | Module is ready to communicate on network |
| | Off | Module is not ready to communicate |
| FUSE | Green | Output voltage is present and fuse 1 and fuse 2 are OK. |
| | Off | Output voltage is not present or fuse 1 or fuse 2 is not OK. |
| OUT 1 ... 8 | Green | Output status (an LED per output); Output point active, i.e. Output carries a 1 signal (logically ON) |
| | Off | Output status (an LED per output); Output point inactive, i.e. Output carries a 0 signal (logically OFF) |

Specifications

Overview

This section contains specifications for the 170 ADO 530 50 I/O base.

General Specifications

| | |
|----------------------------|---|
| Module type | 8 discrete outputs in 2 groups (4 points/group) |
| Supply voltage | 120 VAC |
| Supply voltage range | 85 ... 132 VAC @ 47...63Hz |
| Supply current consumption | 125 mA |
| Power dissipation | 5 W + (# of output points on x 3 W) |
| I/O map | 1 output word |

Isolation

| | |
|--------------------------------|----------|
| Point to point | none |
| Group to group | none |
| Field to communication adapter | 1780 VAC |

Fuses

| | |
|----------------------------|---|
| Internal (replaceable) | 5 A slow-blow (Wickmann 195150000 or equivalent) |
| Internal (non-replaceable) | 200 mA slow-blow |
| External (field power) | 10 A slow-blow (Wickmann 195210000 or equivalent) |
| External (module power) | 200 mA slow-blow (Wickmann 195020000 or equivalent) |

EMC

| | |
|------------------|--|
| Immunity | IEC 1131-2 Surge on auxiliary power supply 2 KV |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE FM Class 1, Div. 2 |

Physical Dimensions

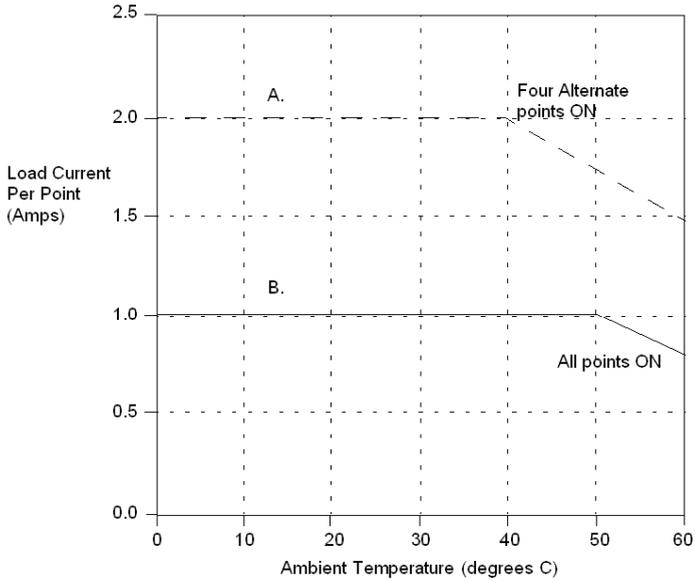
| | |
|-------------------------|--|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 52 mm (2.05 in) |
| Length | 141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars |
| Weight | 319 g (11.25 oz) |

Discrete Outputs

| | |
|-----------------------------|--|
| Number of points | 8 |
| Number of groups | 2 fuse groups, non-isolated |
| Points per group | 4 |
| Output supply voltage | 120 AC |
| Output supply voltage range | 85 ... 132 VAC |
| Output voltage | External supply - 1.5 VAC |
| Surge voltage | 300 VAC for 10 s 400 VAC for 1 cycle |
| On state voltage drop | 1.5 VAC max @ 2 A |
| Output (load) current | 2 A/point (see derating curve) 4 A/group 8 A/module |
| Minimum output current | 5 mA |
| Maximum surge current (rms) | 15 A/point, one cycle 10 A/point, two cycle 5 A/point, three cycle |
| Output protection | RC snubber |
| Signal type | True High |
| Leakage current | 1.9 mA @ 120 VAC max |
| Applied dV / dT | 400 V / microsecond |
| Response time | .5 of one line cycle max OFF to ON .5 of one line cycle max ON to OFF |

Derating Curve

The diagram below shows the ambient temperature in relation to the load current per point in amps.



A. Four alternate points. Maximum current per group is 4 A at 0 ... 60 degrees C.

B. All points ON.

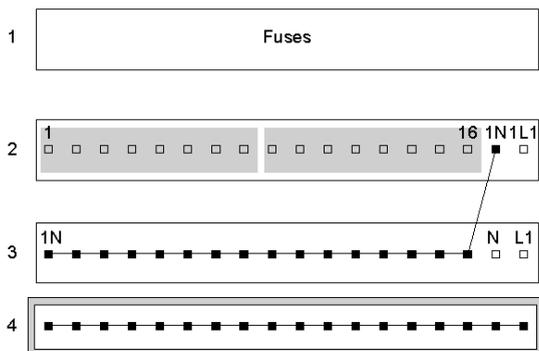
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional one-row busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 shows the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-row busbar. The following busbars are available from Schneider Electric.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 006 01 |
| Spring-clip | 170 XTS 007 01 |

Mapping Terminal Blocks

CAUTION

VOLTAGE SPIKE MAY BE SUFFICIENT TO DAMAGE OR DESTROY MODULE

If an external switch is wired to control an inductive load in parallel with the module output, then an external varistor (Harris V390ZA05 or equivalent) must be wired in parallel with the switch.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

| Row | Terminal | Function |
|-----|----------------|-------------------------------------|
| 1 | Fuse 1, Fuse 2 | Output fuses |
| 2 | 1, 3, 5, 7 | Outputs for group 1 |
| | 9, 11, 13, 15 | Outputs for group 2 |
| | 17 | Neutral for outputs (1N) |
| | 18 | Line for outputs (1L1) |
| 3 | 1 ... 16 | Neutral for individual outputs (1N) |
| | 17 | Neutral 120 VAC for module (N) |
| | 18 | Line 120 VAC for module (L1) |
| 4 | 1 ... 18 | Protective earth (PE) |

Wiring Diagrams

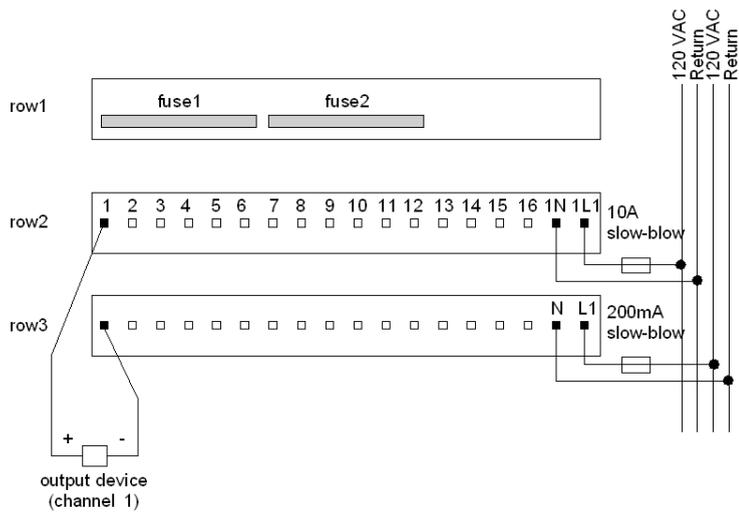
Overview

This section provides diagrams to assist you in wiring the following types of devices:

- 2-wire field devices
- 3-wire field devices

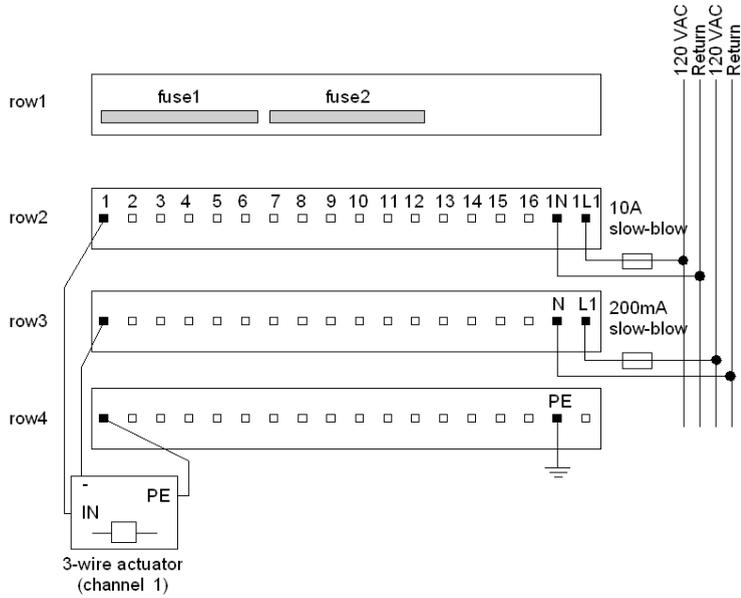
2-Wire Devices

The diagram below shows an example of wiring for 2-wire devices:



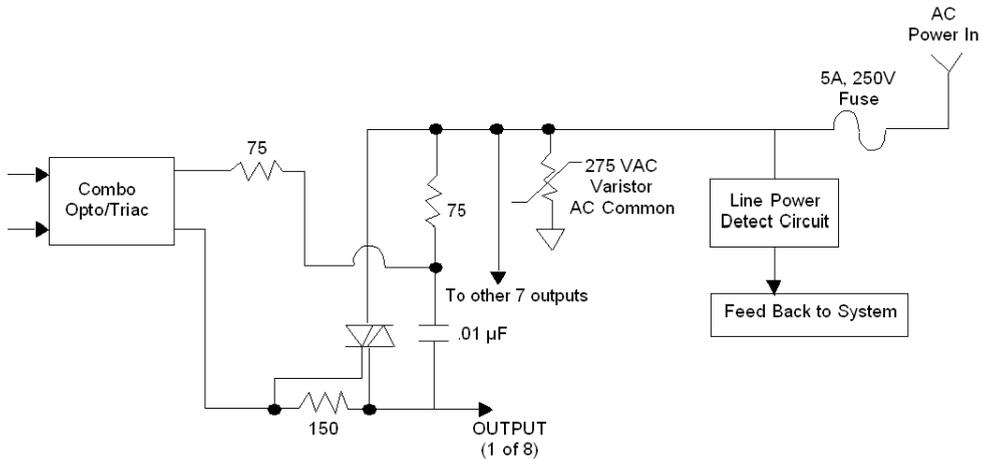
3-Wire Devices

The diagram below shows an example of wiring for 3-wire devices:



Simplified Schematics

The following diagram shows the field-side output circuitry.



Output Behavior

The snubber circuit is there to protect the triac. When the triac is turned on, it is almost a short and AC voltage and current travels through it to the output. When the triac is not turned on, AC voltage will still pass through the snubber, as AC will pass through a capacitor, but the impedance through the snubber circuit is so high that usually only 5 mA maximum can flow. (This is generally referred to as leakage current.) Read the specifications for the field device to make sure it cannot be turned on by this leakage current.

I/O Mapping

Overview

The 170 ADO 530 50 TSX Momentum I/O base supports 8 discrete outputs. This section contains information about the mapping of the I/O data into output words.

I/O Map

The I/O base may be mapped as one output word, or as 8 discrete output points.

IEC vs. Ladder Logic

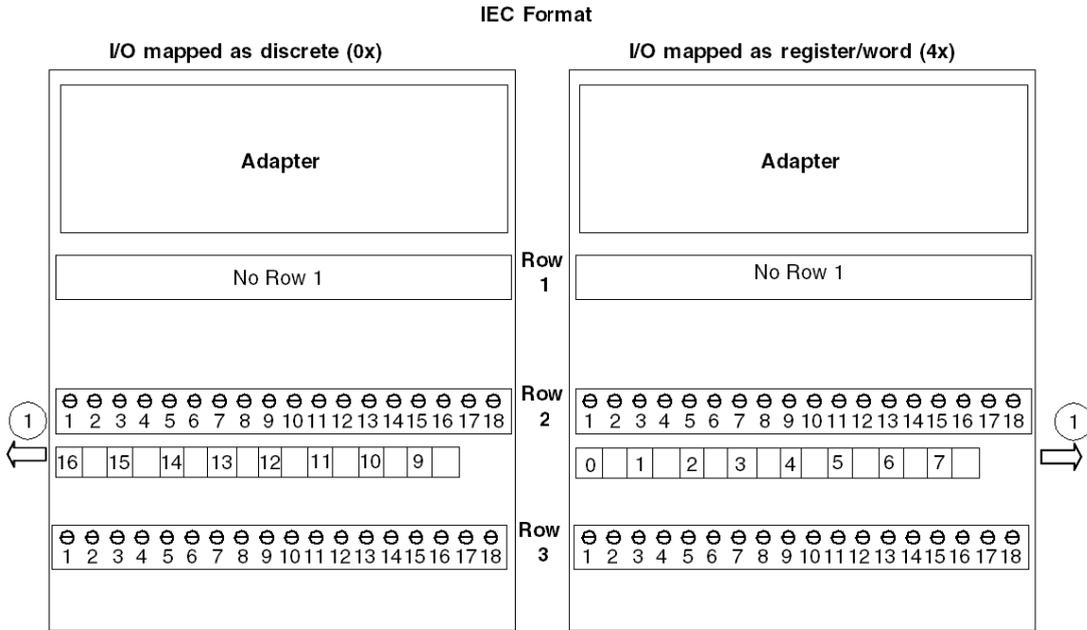
In order to correctly field wire the outputs and map the output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

| | IEC Compliant | 984 Ladder Logic Compliant |
|---------------------------------|---|--|
| Momentum Processor Adapters | All | None |
| Momentum Communication Adapters | All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 | 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 |

Data Mapping

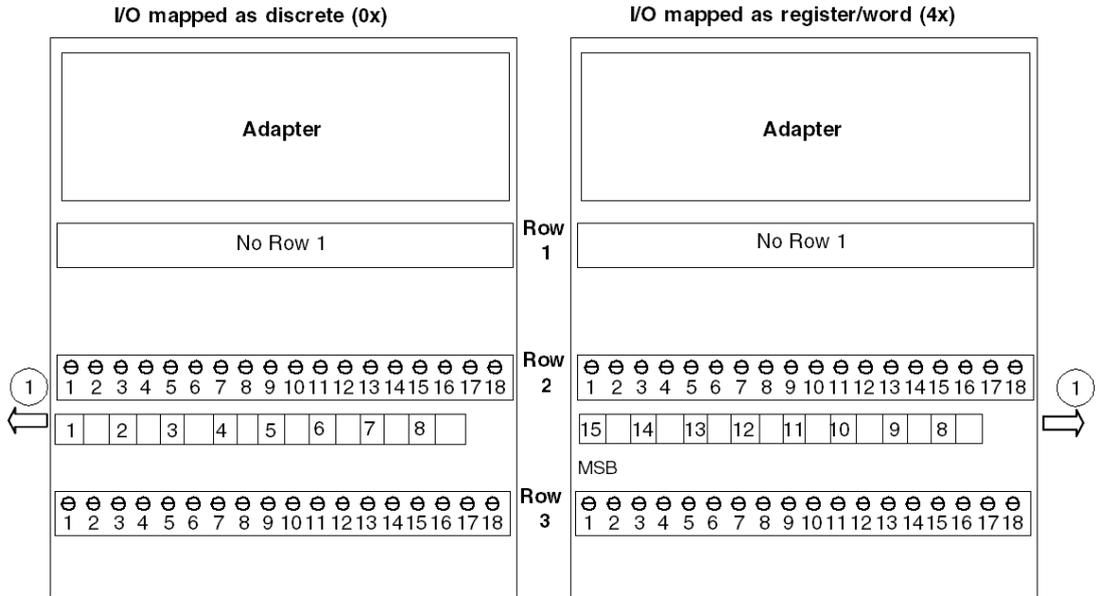
The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (0x), the MSB is assigned to Pin 1. When the I/O is mapped as a word or register (4x) the LSB (bit 0) is assigned to Pin 1.



1 outputs

The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (0x), the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (4x) the MSB (bit 15) is assigned to Pin 1.

984 Format



1 outputs

Chapter 29

170 ADO 540 50 120 VAC - 16 Point Discrete Output Module Base

Overview

This chapter describes the 170 ADO 540 50 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------|------|
| Front Panel Components | 474 |
| Specifications | 476 |
| Internal Pin Connections | 479 |
| Field Wiring Guidelines | 480 |
| Wiring Diagrams | 482 |
| I/O Mapping | 485 |

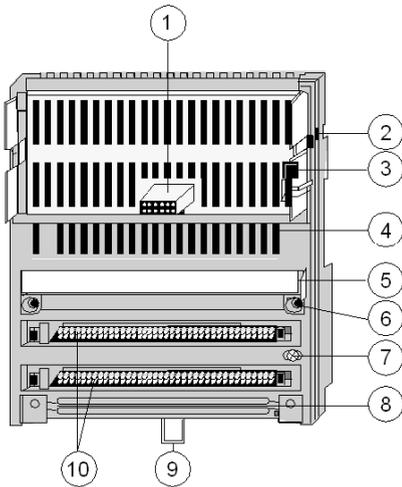
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADO 540 50 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

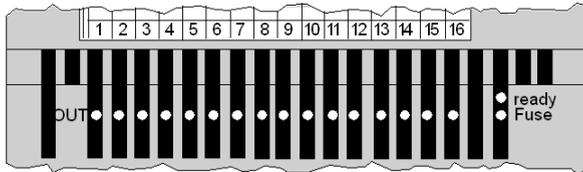


Components of the I/O module

| Label | Description |
|-------|-------------------------------------|
| 1 | Internal interface (ATI) connector |
| 2 | Locking tab for the adapter |
| 3 | Ground contact for the adapter |
| 4 | LED status display |
| 5 | Fuses (under the cover) |
| 6 | Mounting holes for panel mount |
| 7 | Grounding screw |
| 8 | Busbar Mounting Slot |
| 9 | Locking tab for DIN rail mount |
| 10 | Sockets for the terminal connectors |

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

| Indicator | Condition | Message |
|----------------|-----------|---|
| Ready | Green | Module is ready to communicate on network |
| | Off | Module is not ready to communicate |
| FUSE | Green | Output voltage is present and fuse 1 and fuse 2 are OK. |
| | Off | Output voltage is not present or fuse 1 or fuse 2 is not OK. |
| OUT 1 ... 8 | Green | Output status (an LED per output); Output point active, i.e. Output carries a 1 signal (logically ON) |
| | Off | Output status (an LED per output); Output point inactive, i.e. Output carries a 0 signal (logically OFF) |

Specifications

Overview

This section contains specifications for the 170 ADO 540 50 I/O base.

General Specifications

| | |
|----------------------------|--|
| Module type | 16 discrete outputs in 2 groups (8 points/group) |
| Supply voltage | 120 VAC |
| Supply voltage range | 85 ... 132 VAC @ 47...63Hz |
| Supply current consumption | 125 mA |
| Power dissipation | 5 W + (# of output points on x .75 W) |
| I/O map | 1 output word |

Isolation

| | |
|--------------------------------|----------|
| Point to point | none |
| Group to group | none |
| Field to communication adapter | 1780 VAC |

Fuses

| | |
|----------------------------|---|
| Internal (replaceable) | 5 A slow-blow (Wickmann 195150000 or equivalent) |
| Internal (non-replaceable) | 200 mA slow-blow |
| External (field power) | 10 A slow-blow (Wickmann 195210000 or equivalent) |
| External (module power) | 200 mA slow-blow (Wickmann 195020000 or equivalent) |

EMC

| | |
|------------------|--|
| Immunity | IEC 1131-2 Surge on auxiliary power supply 2 KV |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE FM Class 1, Div. 2 |

Physical Dimensions

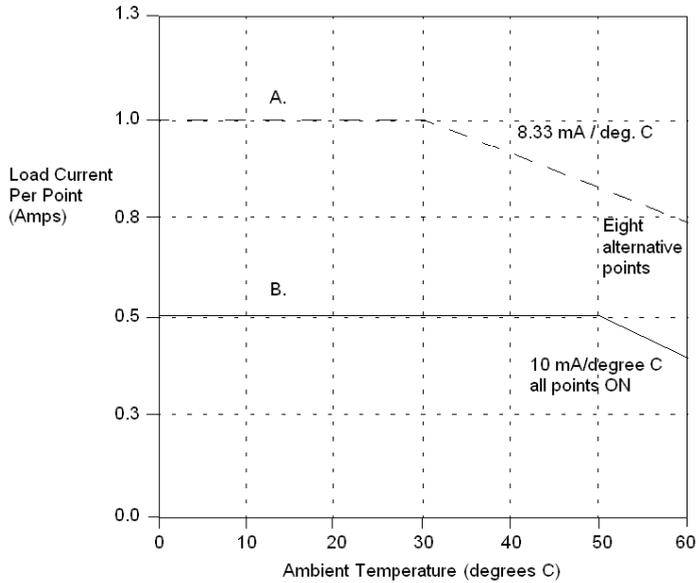
| | |
|-------------------------|--|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 52 mm (2.05 in) |
| Length | 141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars |
| Weight | 284 g (10 oz) |

Discrete Outputs

| | |
|-----------------------------|---|
| Number of points | 16 |
| Number of groups | 2 fuse groups, non-isolated |
| Points per group | 8 |
| Output supply voltage | 120 AC |
| Output supply voltage range | 85 ... 132 VAC |
| Output voltage | External supply - 1.5 VAC |
| Surge voltage | 300 VAC for 10 s 400 VAC for 1 cycle |
| On state voltage drop | 1.5 VAC max @ 0.5 A |
| Output (load) current | 0.5 A/point (see derating curve in next section) 4 A/group 8 A/module |
| Minimum output current | 30 mA |
| Maximum surge current (rms) | 15 A/point, one cycle 10 A/point, two cycle 5 A/point, three cycle |
| Output protection | RC snubber |
| Signal type | True High |
| Leakage current | 1.9 mA @ 120 VAC max |
| Applied dV / dT | 400 V / microsecond |
| Response time | .5 of one line cycle max OFF to ON .5 of one line cycle max ON to OFF |

Derating Curve

The diagram depicts the derating curve for this I/O base.



- A. Eight alternate points. Maximum current per group is 3 A at 60 degrees C.
- B. Sixteen points. Maximum current per point is .4 A at 60 degrees C. Maximum current per group is 3.2 A at 60 degrees C.

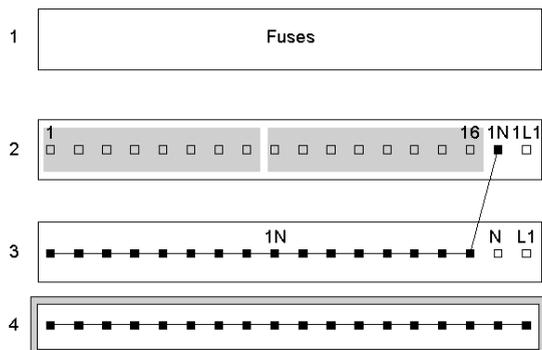
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional one-row busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 shows the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

Inputs are field wired to row 2 of the base. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-row busbar. The following busbars are available from Schneider Electric.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 006 01 |
| Spring-clip | 170 XTS 007 01 |

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

| Row | Terminal | Function |
|-----|----------------|-------------------------------------|
| 1 | Fuse 1, Fuse 2 | Output fuses |
| 2 | 1 ... 8 | Outputs for group 1 |
| | 9 ... 16 | Outputs for group 2 |
| | 17 | Neutral for outputs (1N) |
| | 18 | Line for inputs (1L1) |
| 3 | 1 ... 16 | Neutral for individual outputs (1N) |
| | 17 | Neutral for module (N) |
| | 18 | Line 120 VAC for module (L1) |
| 4 | 1 ... 18 | Protective earth (PE) |

Protective Circuit Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit parallel to the operating coil.

Wiring Diagrams

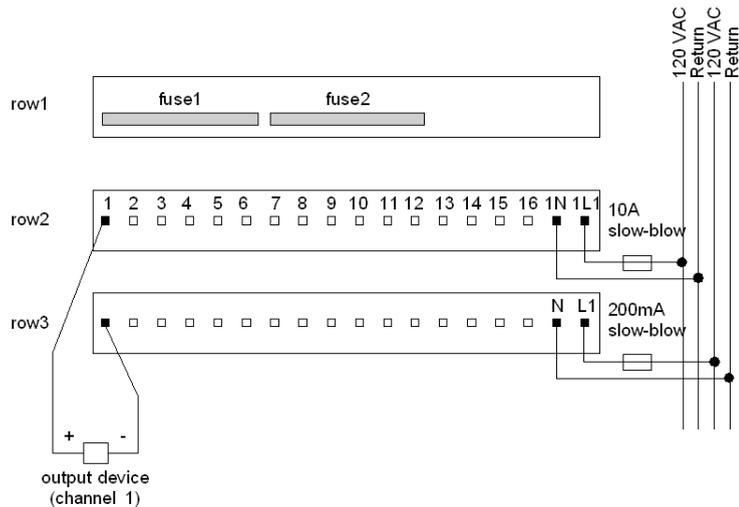
Overview

This section provides diagrams to assist you in wiring the following types of devices:

- 2-wire field devices
- 3-wire field devices

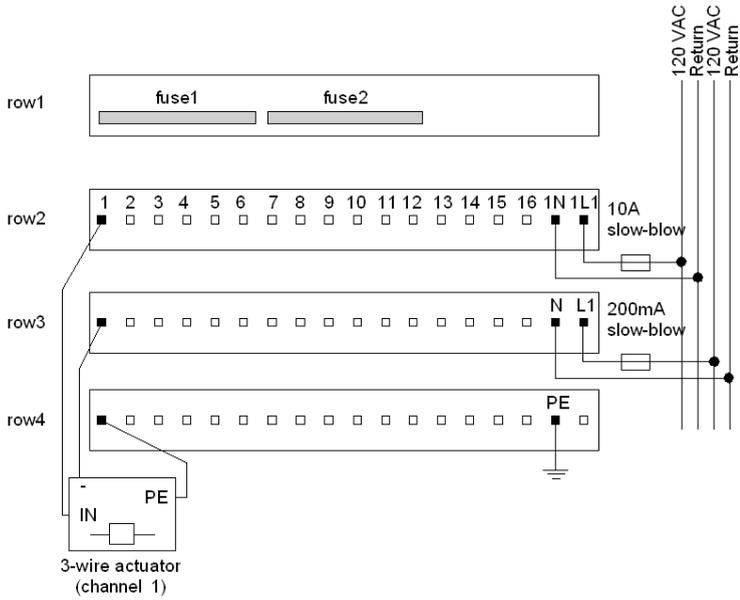
2-Wire Devices

The diagram below shows an example of wiring for 2-wire devices:



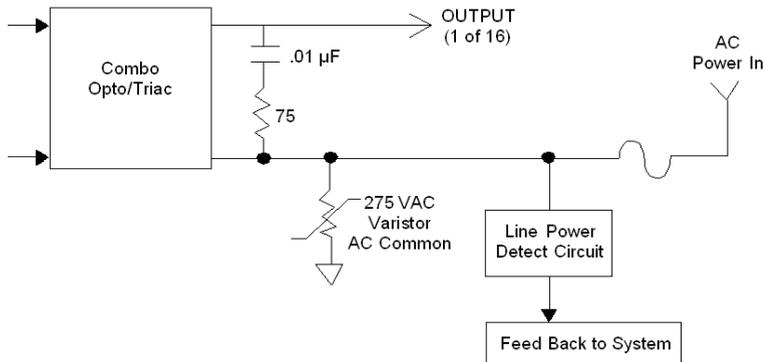
3-Wire Devices

The diagram below shows an example of wiring for 3-wire devices:



Simplified Schematics

The following diagram shows the field-side output circuitry.



Output Behavior

The snubber circuit is there to protect the triac. When the triac is turned on, it is almost a short and AC voltage and current travels through it to the output. When the triac is not turned on, AC voltage will still pass through the snubber, as AC will pass through a capacitor, but the impedance through the snubber circuit is so high that usually only 5 mA maximum can flow. (This is generally referred to as leakage current.) Read the specifications for the field device to make sure it cannot be turned on by this leakage current.

I/O Mapping

Overview

The 170 ADO 540 50 TSX Momentum I/O base supports 16 discrete outputs. This section contains information about the mapping of the I/O data into output words.

I/O Map

The I/O base may be mapped as one output word, or as 16 discrete output points.

IEC vs. Ladder Logic

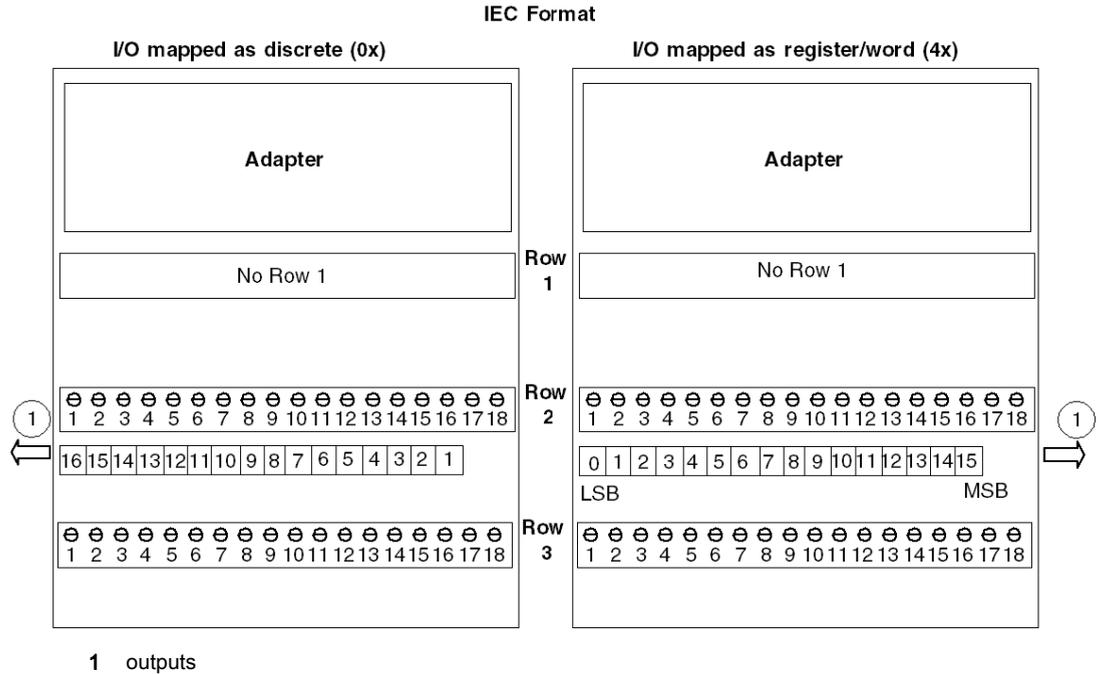
In order to correctly field wire the outputs and map the output data, you need to know which type of Momentum adapter is mounted on the base.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

| | IEC Compliant | 984 Ladder Logic Compliant |
|---------------------------------|---|--|
| Momentum Processor Adapters | All | None |
| Momentum Communication Adapters | All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 1100 00 170 FNT 1100 01 | 170 NEF 110 21 170 NEF 160 21 170 FNT 1100 00 170 FNT 1100 01 |

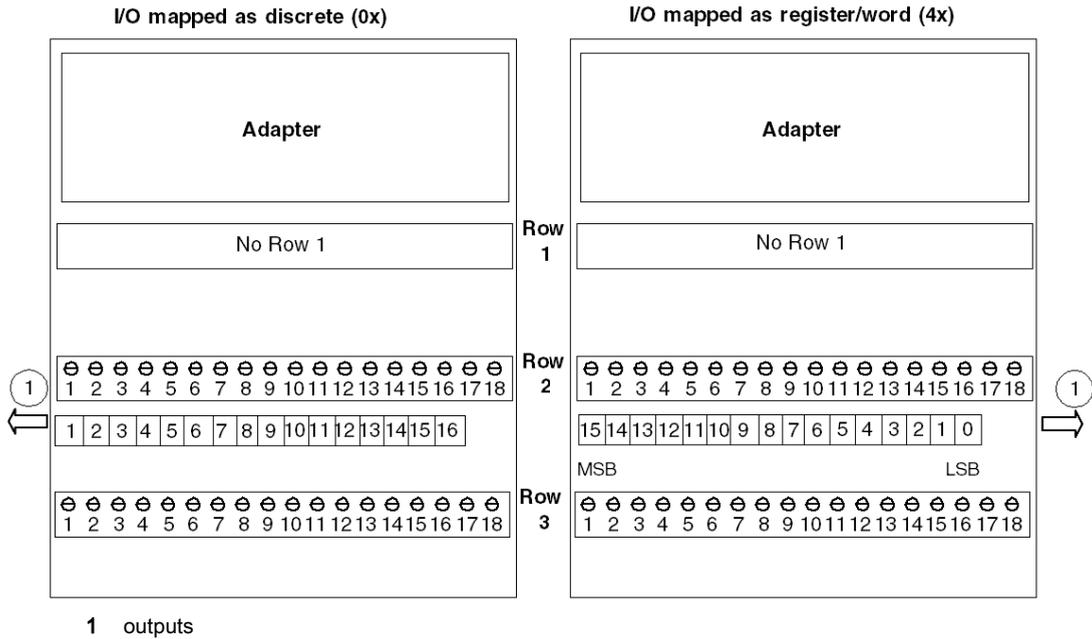
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (0x), the MSB is assigned to Pin 1, and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (4x), the MSB (bit 15) is assigned to Pin 16, and the LSB (bit 0) is assigned to Pin 1.



The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (0x), the MSB is assigned to Pin 16 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (4x), the MSB (bit 15) is assigned to Pin 1, and the LSB (bit 0) is assigned to Pin 16.

984 Format



Chapter 30

170 ADO 730 50 230 VAC - 8 Point Discrete Output @ 2A Module Base

Overview

This chapter describes the 170 ADO 730 50 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------|------|
| Front Panel Components | 490 |
| Specifications | 492 |
| Internal Pin Connections | 495 |
| Field Wiring Guidelines | 496 |
| Wiring Diagrams | 498 |
| I/O Mapping | 501 |

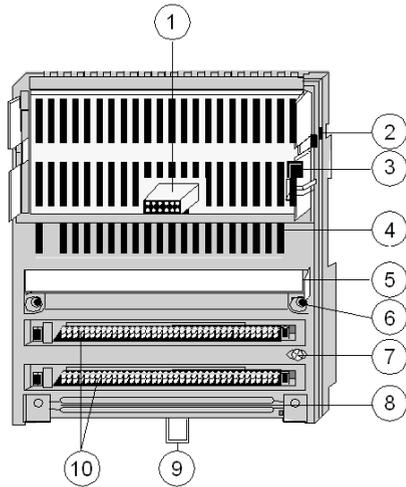
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADO 730 50 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

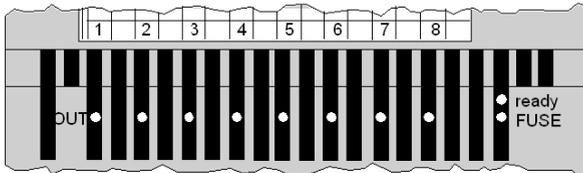


Components of the I/O module

| Label | Description |
|-------|-------------------------------------|
| 1 | Internal interface (ATI) connector |
| 2 | Locking tab for the adapter |
| 3 | Ground contact for the adapter |
| 4 | LED status display |
| 5 | Fuses (under the cover) |
| 6 | Mounting holes for panel mount |
| 7 | Grounding screw |
| 8 | Busbar Mounting Slot |
| 9 | Locking tab for DIN rail mount |
| 10 | Sockets for the terminal connectors |

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

| Indicator | Condition | Message |
|----------------|-----------|---|
| Ready | Green | Module is ready to communicate on network |
| | Off | Module is not ready to communicate |
| FUSE | Green | Output voltage is present and fuse 1 and fuse 2 are OK. |
| | Off | Output voltage is not present or fuse 1 or fuse 2 is not OK. |
| OUT 1 ... 8 | Green | Output status (an LED per output); Output point active, i.e. Output carries a 1 signal (logically ON) |
| | Off | Output status (an LED per output); Output point inactive, i.e. Output carries a 0 signal (logically OFF) |

Specifications

Overview

This section contains specifications for the 170 ADO 730 50 I/O base.

General Specifications

| | |
|----------------------------|---|
| Module type | 8 discrete outputs in 2 groups (4 points/group) |
| Supply voltage | 230 VAC |
| Supply voltage range | 170 ... 264 VAC @ 47...63Hz |
| Supply current consumption | 65 mA |
| Power dissipation | 5 W + (# of output points on x 3 W) |
| I/O map | 1 output word |

Isolation

| | |
|--------------------------------|----------|
| Point to point | none |
| Group to group | none |
| Field to communication adapter | 1780 VAC |

Fuses

| | |
|----------------------------|---|
| Internal (replaceable) | 5 A slow-blow (Wickmann 195150000 or equivalent) |
| Internal (non-replaceable) | 200 mA slow-blow |
| External (field power) | 10 A slow-blow (Wickmann 195210000 or equivalent) |
| External (module power) | 200 mA slow-blow (Wickmann 195020000 or equivalent) |

EMC

| | |
|------------------|--|
| Immunity | IEC 1131-2 Surge on auxiliary power supply 2 KV |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE, FM Class 1, Div. 2 |

Physical Dimensions

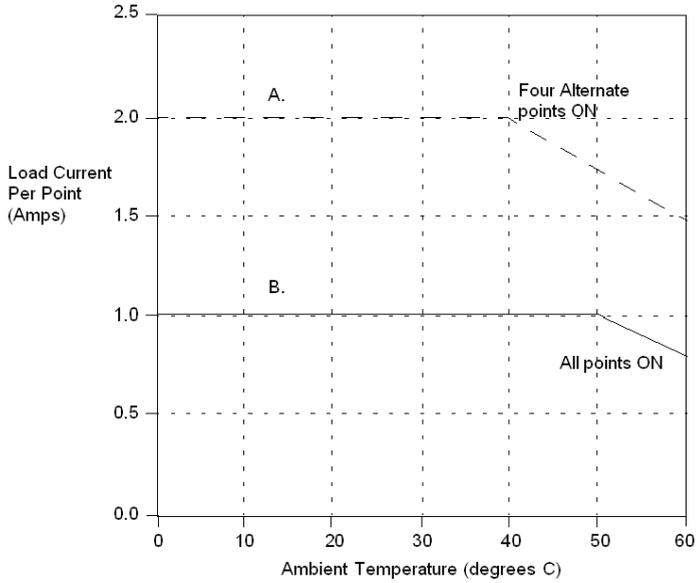
| | |
|-------------------------|--|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 52 mm (2.05 in) |
| Length | 141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars |
| Weight | 284 g (10 oz) |

Discrete Outputs

| | |
|-----------------------------|--|
| Number of points | 8 |
| Number of groups | 2 fuse groups, non-isolated |
| Points per group | 4 |
| Output supply voltage | 230 AC |
| Output supply voltage range | 170 ... 264 VAC |
| Output voltage | External supply - 1.5 VAC |
| Surge voltage | 300 VAC for 10 s 400 VAC for 1 cycle |
| On state voltage drop | 1.5 VAC max @ 2 A |
| Output (load) current | 2 A/point (see derating curve) 4 A/group 8 A/module |
| Minimum output current | 5 mA |
| Maximum surge current (rms) | 15 A/point, one cycle 10 A/point, two cycle 5 A/point, three cycle |
| Output protection | RC snubber |
| Signal type | True High |
| Leakage current | 2.5 mA @ 230 VAC max |
| Applied dV / dT | 400 V / microsecond |
| Response time | .5 of one line cycle max OFF to ON .5 of one line cycle max ON to OFF |

Derating Curve

The diagram below shows the ambient temperature in relation to the load current per point in amps.



A. Four alternate points. Maximum current per group is 4 A at 0 ... 60 degrees C.

B. All points ON.

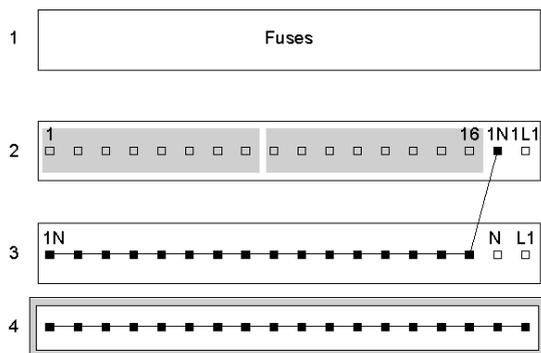
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional one-row busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 shows the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-row busbar. The following busbars are available from Schneider Electric.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 006 01 |
| Spring-clip | 170 XTS 007 01 |

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

| Row | Terminal | Function |
|-----|----------------|-------------------------------------|
| 1 | Fuse 1, Fuse 2 | Output fuses |
| 2 | 1, 3, 5, 7 | Outputs for group 1 |
| | 9,11 ,13, 15 | Outputs for group 2 |
| | 17 | Neutral for outputs (1N) |
| | 18 | Line for outputs (1L1) |
| 3 | 1 ... 16 | Neutral for individual outputs (1N) |
| | 17 | Neutral 120 VAC for module (N) |
| | 18 | Line 120 VAC for module (L1) |
| 4 | 1 ... 18 | Protective earth (PE) |

Wiring Diagrams

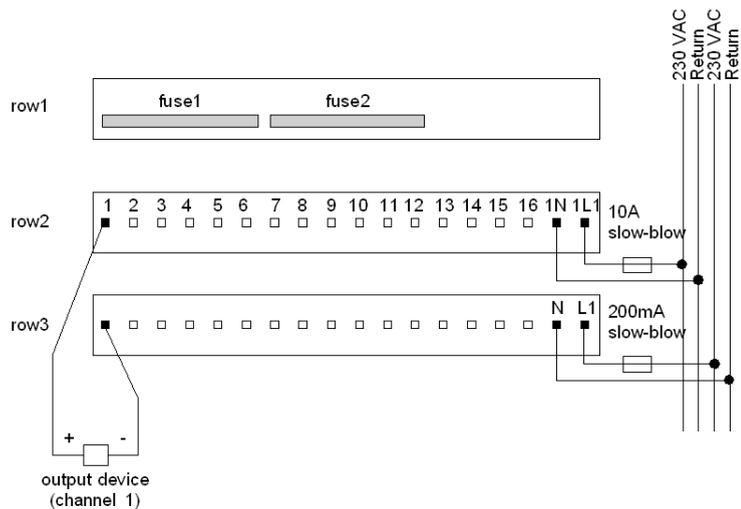
Overview

This section provides diagrams to assist you in wiring the following types of devices:

- 2-wire field devices
- 3-wire field devices

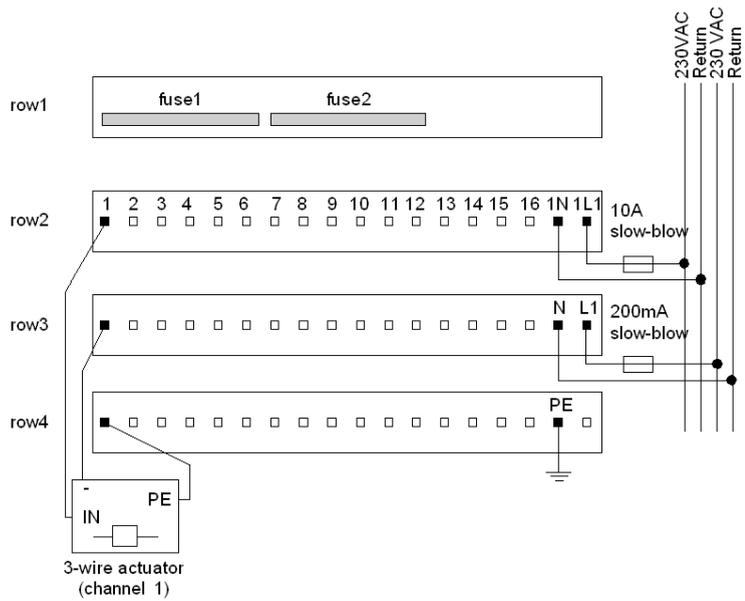
2-Wire Devices

The diagram below shows an example of wiring for 2-wire devices:



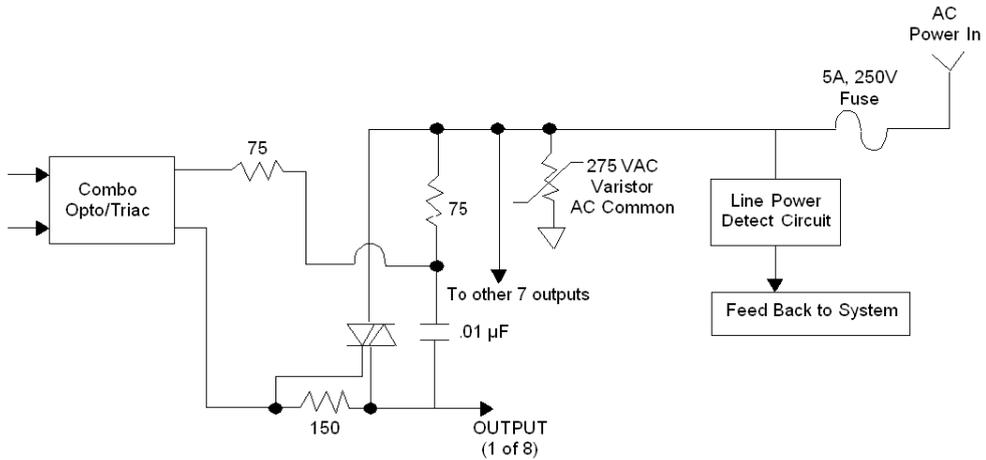
3-Wire Devices

The diagram below shows an example of wiring for 3-wire devices:



Simplified Schematics

The following diagram shows the field-side output circuitry.



Output Behavior

The snubber circuit is there to protect the triac. When the triac is turned on, it is almost a short and AC voltage and current travels through it to the output. When the triac is not turned on, AC voltage will still pass through the snubber, as AC will pass through a capacitor, but the impedance through the snubber circuit is so high that usually only 5 mA maximum can flow. (This is generally referred to as leakage current.) Read the specifications for the field device to make sure it cannot be turned on by this leakage current.

I/O Mapping

Overview

The 170 ADO 730 50 TSX Momentum I/O base supports 8 discrete outputs. This section contains information about the mapping of the I/O data into output words.

I/O Map

The I/O base may be mapped as one output word, or as 8 discrete output points.

IEC vs. Ladder Logic

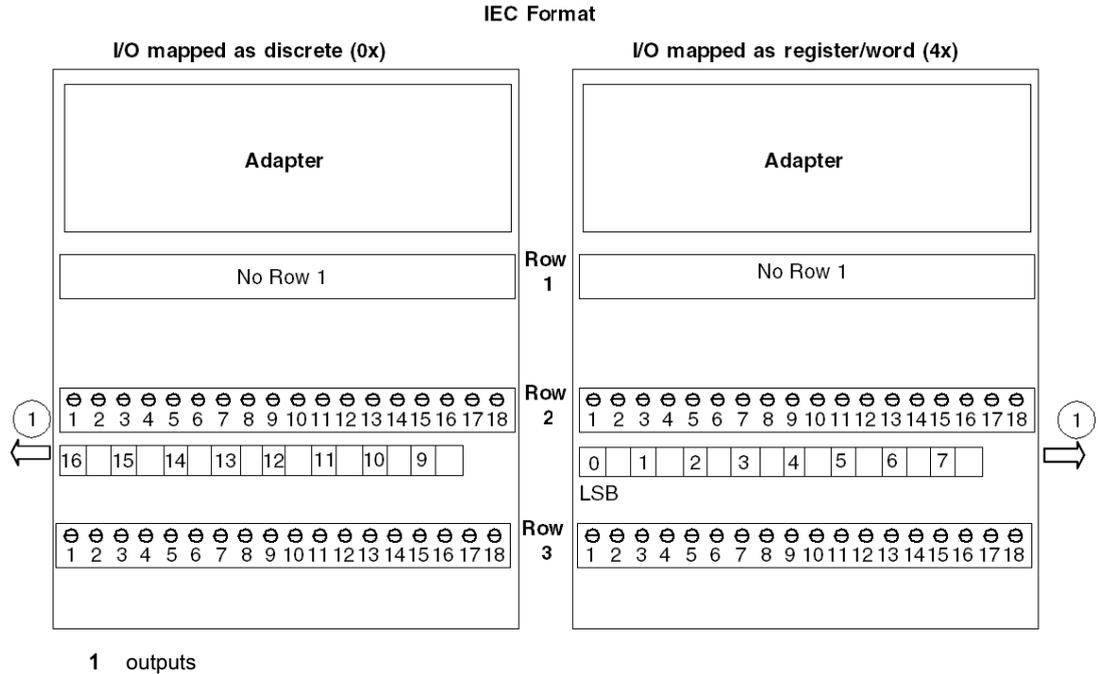
In order to correctly field wire the outputs and map the output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

| | IEC Compliant | 984 Ladder Logic Compliant |
|---------------------------------|---|--|
| Momentum Processor Adapters | All | None |
| Momentum Communication Adapters | All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 | 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 |

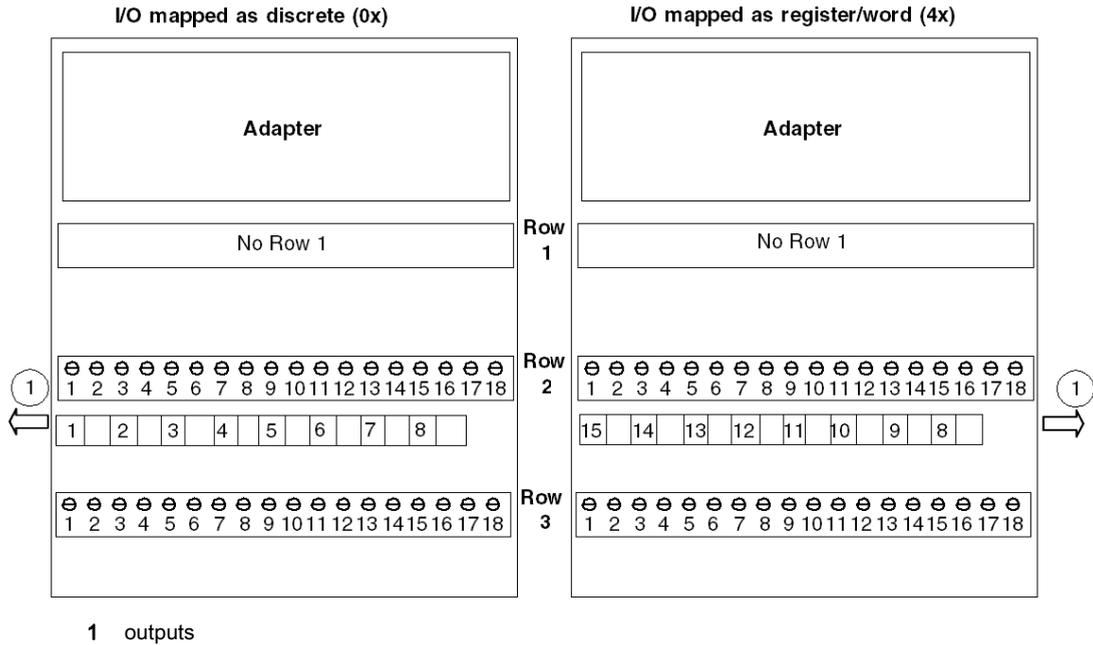
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (0x), the MSB is assigned to Pin 1. When the I/O is mapped as word or register (4x), the LSB (bit 0) is assigned to Pin 1.



The figure below shows how data is mapped on the I/O base with a Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (0x), the LSB is assigned to Pin 1. When the I/O is mapped as word or register (4x), the MSB (bit 15) is assigned to Pin 1.

984 Format



Chapter 31

170 ADO 740 50 230 VAC - 16 Point Discrete Output Module Base

Overview

This chapter describes the 170 ADO 740 50 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------|------|
| Front Panel Components | 506 |
| Specifications | 508 |
| Internal Pin Connections | 511 |
| Field Wiring Guidelines | 512 |
| Wiring Diagrams | 514 |
| I/O Mapping | 517 |

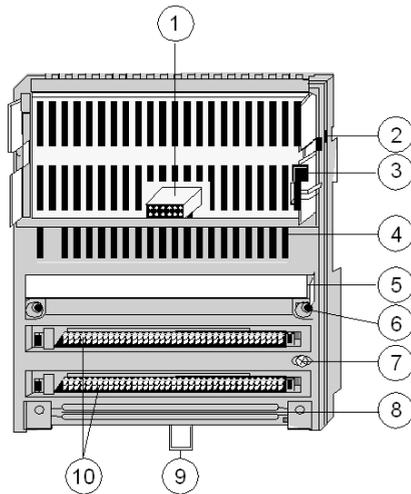
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADO 740 50 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

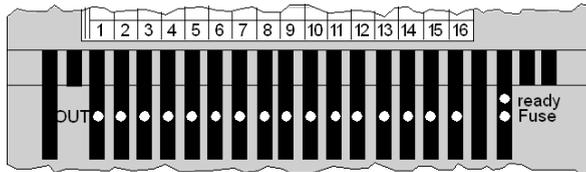


Components of the I/O module

| Label | Description |
|-------|-------------------------------------|
| 1 | Internal interface (ATI) connector |
| 2 | Locking tab for the adapter |
| 3 | Ground contact for the adapter |
| 4 | LED status display |
| 5 | Fuses (under the cover) |
| 6 | Mounting holes for panel mount |
| 7 | Grounding screw |
| 8 | Grounding busbar Mounting Slot |
| 9 | Locking tab for DIN rail mount |
| 10 | Sockets for the terminal connectors |

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

| Indicator | Condition | Message |
|-----------------|-----------|---|
| Ready | Green | Module is ready to communicate on network |
| | Off | Module is not ready to communicate |
| FUSE | Green | Output voltage is present and fuse 1 and fuse 2 are OK. |
| | Off | Output voltage is not present or fuse 1 or fuse 2 is not OK. |
| OUT 1 ... 16 | Green | Output status (an LED per output); Output point active, i.e. Output carries a 1 signal (logically ON) |
| | Off | Output status (an LED per output); Output point inactive, i.e. Output carries a 0 signal (logically OFF) |

Specifications

Overview

This section contains specifications for the 170 ADO 740 50 I/O base.

General Specifications

| | |
|----------------------------|--|
| Module type | 16 discrete outputs in 2 groups (8 points/group) |
| Supply voltage | 230 VAC |
| Supply voltage range | 170 ... 264 VAC @ 47...63Hz |
| Supply current consumption | 65 mA |
| Power dissipation | 5 W + (# of output points on x .75 W) |
| I/O map | 1 output word |

Isolation

| | |
|--------------------------------|----------|
| Point to point | none |
| Group to group | none |
| Field to communication adapter | 1780 VAC |

Fuses

| | |
|----------------------------|--|
| Internal (replaceable) | 5 A slow-blow (Wickmann 195150000 or equivalent) |
| Internal (non-replaceable) | 200 mA slow-blow |
| External (field power) | 10 A slow-blow (Wickmann 195210000 or equivalent) |
| External (module power) | 200 mA slow-blow (Wickmann 1915020000 or equivalent) |

EMC

| | |
|------------------|--|
| Immunity | IEC 1131-2 Surge on auxiliary power supply 2 KV |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE FM Class 1, Div. 2 |

Physical Dimensions

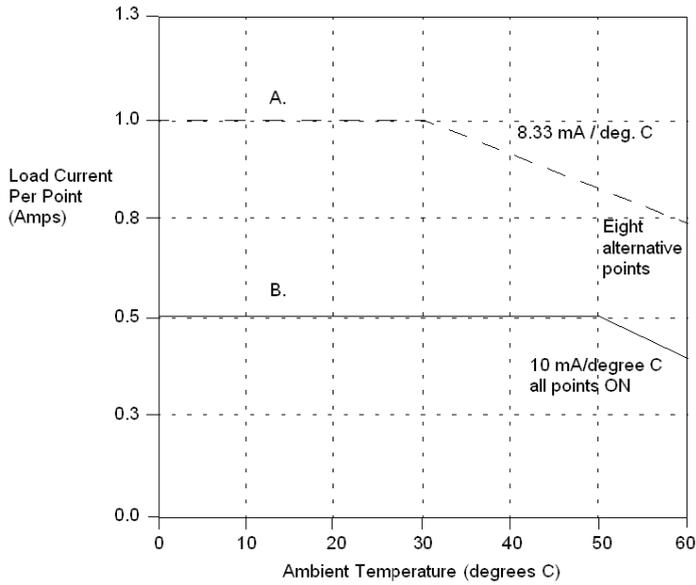
| | |
|-------------------------|--|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 52 mm (2.05 in) |
| Length | 141.5 mm (5.5 in) no or one busbar 159.5mm (6.3 in) two busbars 171.5 mm (6.75 in) three busbars |
| Weight | 284 g (10 oz) |

Discrete Outputs

| | |
|-----------------------------|--|
| Number of points | 16 |
| Number of groups | 2 fuse groups, non-isolated |
| Points per group | 8 |
| Output supply voltage | 230 AC |
| Output supply voltage range | 170 ... 264 VAC |
| Output voltage | External supply - 1.5 VAC |
| Surge voltage | 300 VAC for 10 s 400 VAC for 1 cycle |
| On state voltage drop | 1.5 VAC max @ 2 A |
| Output (load) current | 0.5 A/point (see derating curve) 4 A/group 8 A/module |
| Minimum output current | 30 mA |
| Maximum surge current (rms) | 15 A/point, one cycle 10 A/point, two cycle 5 A/point, three cycle |
| Output protection | RC snubber |
| Signal type | True High |
| Leakage current | 2.4 mA @ 230 VAC max |
| Applied dV / dT | 400 V / microsecond |
| Response time | .5 of one line cycle max OFF to ON .5 of one line cycle max ON to OFF |

Derating Curve

The diagram below shows the ambient temperature in relation to the load current per point in amps.



- A. Eight alternate points. Maximum current per group is 3 A at 60 degrees C.
- B. Sixteen points. Maximum current per point is .4 A at 60 degrees C. Maximum current per group is 3.2 A at 60 degrees C.

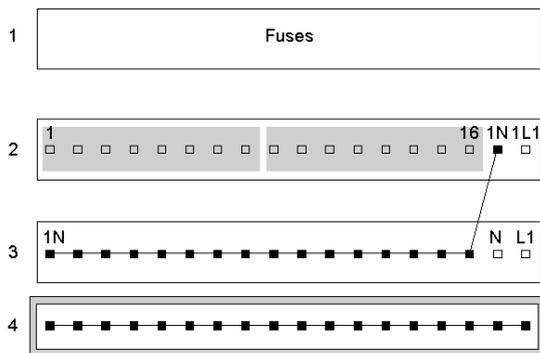
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional one-row busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 shows the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

The outputs are field wired to row 2 of the base. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-row busbar. The following busbars are available from Schneider Electric.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 006 01 |
| Spring-clip | 170 XTS 007 01 |

Mapping Terminal Blocks

CAUTION

VOLTAGE SPIKE MAY BE SUFFICIENT TO DAMAGE OR DESTROY MODULE

If an external switch is wired to control an inductive load in parallel with the module output, then an external varistor (Harris V390ZA05 or equivalent) must be wired in parallel with the switch.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

| Row | Terminal | Function |
|-----|----------------|-------------------------------------|
| 1 | Fuse 1, Fuse 2 | Output fuses |
| 2 | 1 ... 8 | Outputs for group 1 |
| | 9 ... 16 | Outputs for group 2 |
| | 17 | Neutral for outputs (1N) |
| | 18 | Line for outputs (1L1) |
| 3 | 1 ... 16 | Neutral for individual outputs (1N) |
| | 17 | Neutral 230 VAC for module (N) |
| | 18 | Line 230 VAC for module (L1) |
| 4 | 1 ... 18 | Protective earth (PE) |

Wiring Diagrams

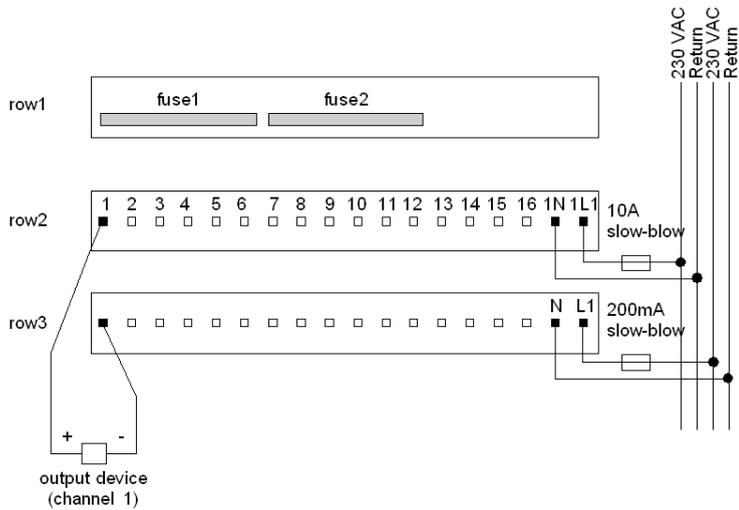
Overview

This section provides diagrams to assist you in wiring the following types of devices:

- 2-wire field devices
- 3-wire field devices

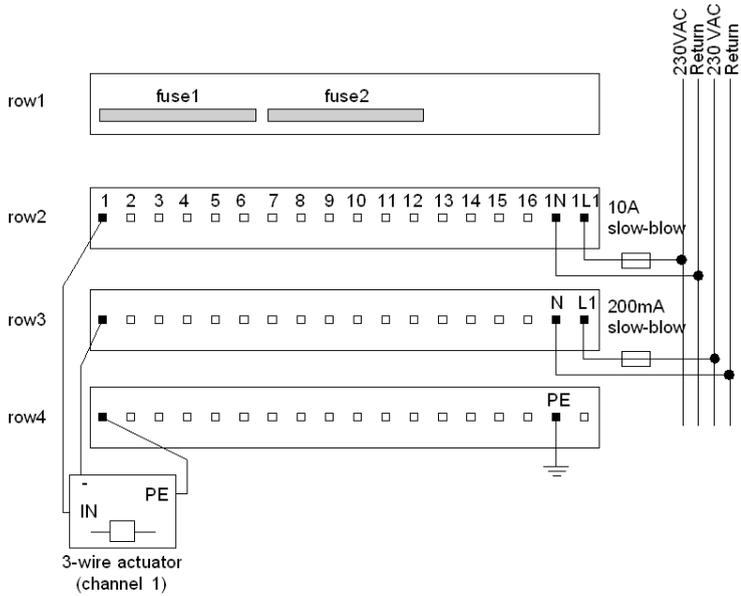
2-Wire Devices

The diagram below shows an example of wiring for 2-wire devices:



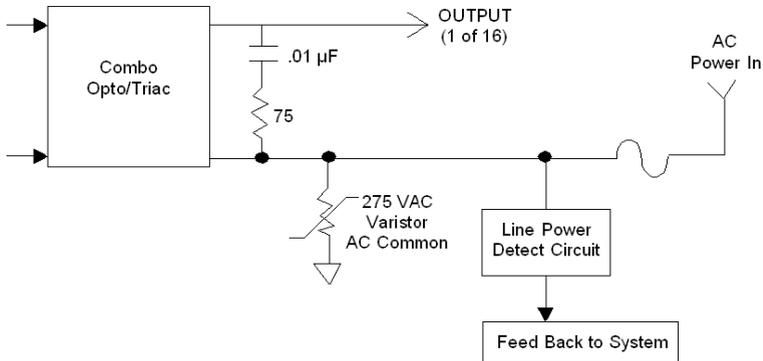
3-Wire Devices

The diagram below shows an example of wiring for 3-wire devices:



Simplified Schematics

The following diagram shows the field-side output circuitry.



Output Behavior

The snubber circuit is there to protect the triac. When the triac is turned on, it is almost a short and AC voltage and current travels through it to the output. When the triac is not turned on, AC voltage will still pass through the snubber, as AC will pass through a capacitor, but the impedance through the snubber circuit is so high that usually only 5 mA maximum can flow. (This is generally referred to as leakage current.) Read the specifications for the field device to make sure it cannot be turned on by this leakage current.

I/O Mapping

Overview

The 170 ADO 740 50 TSX Momentum I/O base supports 16 discrete outputs. This section contains information about the mapping of the I/O data into output words.

I/O Map

The I/O base may be mapped as one output word, or as 16 discrete output points.

IEC vs. Ladder Logic

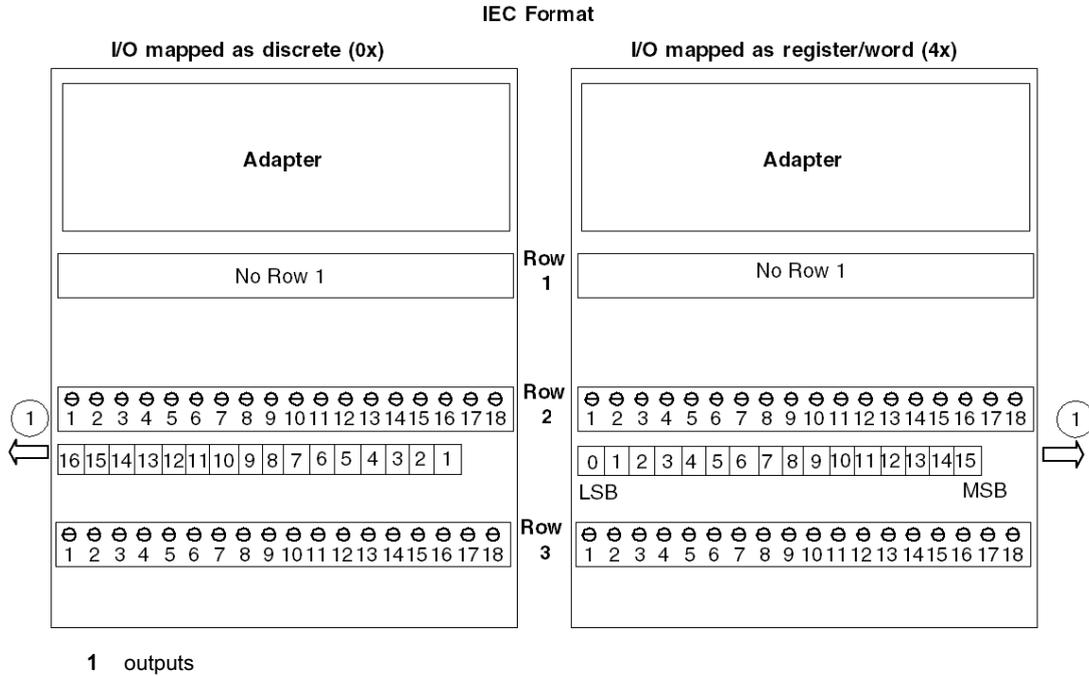
In order to correctly field wire the outputs and map the output data, you need to know which type of Momentum Adapter is mounted on the base.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

| | IEC Compliant | 984 Ladder Logic Compliant |
|---------------------------------|---|--|
| Momentum Processor Adapters | All | None |
| Momentum Communication Adapters | All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 | 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 |

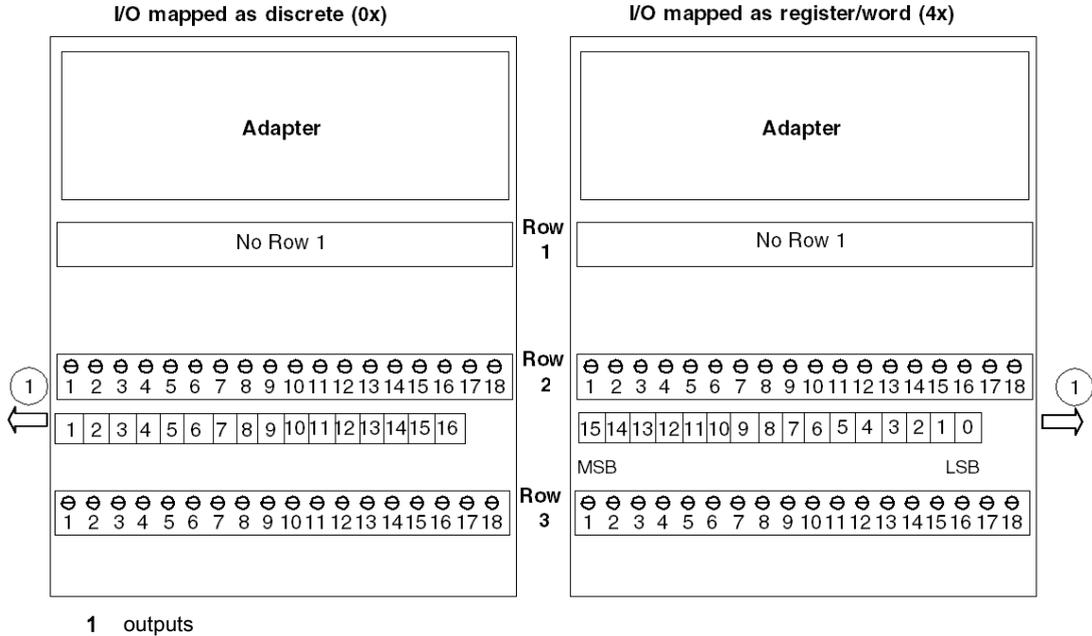
Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (0x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 16. When the I/O is mapped as a word or register (4x), the MSB (bit 15) is assigned to Pin 16 and the LSB (bit 0) is assigned to Pin 1.



The figure below shows how data is mapped on the I/O base with a 984 Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (0x), the MSB is assigned to Pin 1 and the LSB is assigned to Pin 1. When the I/O is mapped as a word or register (4x), the MSB (bit 15) is assigned to Pin 1 and the LSB (bit 0) is assigned to Pin 16.

984 Format



Chapter 32

170 ADO 830 30 6 Pt. Relay Out Module Base

Overview

This chapter describes the 170 ADO 830 30 Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------|------|
| Front Panel Components | 522 |
| Specifications | 524 |
| Internal Pin Connections | 527 |
| Field Wiring Guidelines | 528 |
| Wiring Diagrams | 530 |
| I/O Mapping | 532 |

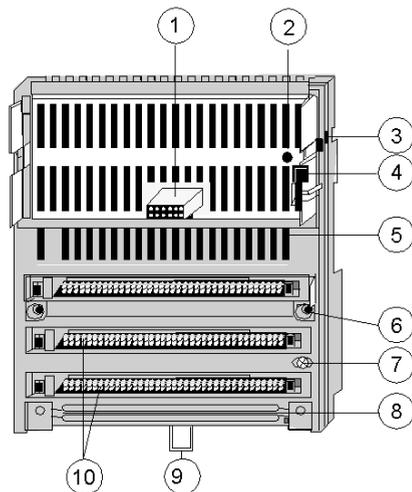
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ADO 830 30 Relay I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown below.

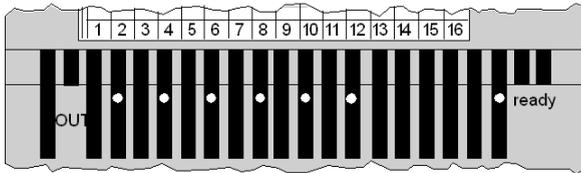


Components of the I/O module

| Label | Description |
|-------|-------------------------------------|
| 1 | Internal interface (ATI) connector |
| 2 | Ground nut standoff |
| 3 | Locking tab for the adapter |
| 4 | Ground contact for the adapter |
| 5 | LED status display |
| 6 | Mounting holes for panel mount |
| 7 | Grounding screw |
| 8 | Grounding busbar mounting slot |
| 9 | Locking tab for DIN rail mount |
| 10 | Sockets for the terminal connectors |

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

| Indicator | Condition | Message |
|----------------------|-----------|--|
| Ready | Green | Module is ready to communicate. Operating voltage for internal logic (5 V) is present. |
| | Off | Module not ready. |
| OUT 2,4,6,8,10,12 | Green | Output status (an LED per output); Output point active, (logically ON): For Normally Closed (N/C) Relay wiring, the output relay opens. For Normally Open (N/O) Relay wiring, the output relay closes. |
| | Off | Output status (an LED per output); Output point inactive, (logically OFF): For Normally Closed (N/C) Relay wiring, the output relay is closed. For Normally Open (N/O) Relay wiring, the output relay is opened. |

Specifications

Overview

This section contains specifications for the 170 ADO 830 30 I/O base.

General Specifications

| | |
|-----------------------------------|--|
| Module type | 6 relay outputs normally open /normally closed |
| Module supply voltage | 120 to 230 VAC |
| Module supply current consumption | 125 mA at 120 VAC; 65 mA at 230 VAC |
| Power dissipation | 15 W |
| I/O map | 1 output word |

Isolation

| | |
|--------------------------------|--|
| Output to output | 1780 VAC RMS for 1 minute |
| Field to logic | 1780 VAC RMS for 1 minute 2500 VDC RMS for 1 minute |
| Field to Protective Earth | 1780 VAC RMS for 1 minute |
| Field to communication adapter | Defined by communication adapter type |

Fuses

| | |
|----------------------------------|--------------------------------------|
| Internal | none |
| External: operating voltage (L+) | 315 mA fast-blow (Wickman1930315000) |

EMC

| | |
|------------------|--|
| Immunity | IEC 1131-2 Surge on auxiliary power supply AC 2 KV to PE, 1 KV to differential surge on auxiliary power supply DC 0.5 KV. |
| Emissions | EN 50081-2 |
| Agency approvals | UL, CSA, CE FM Class 1 Div.2 pending |

Physical Dimensions

| | |
|-------------------------|--|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) with or without one busbar 159.5mm (6.3 in) two busbars 171.5 mm (6.75 in) three busbars |
| Weight | 260 g (0.57lb) |

Relay Outputs

| | |
|--------------------------------|--|
| Output type | Form C relay, NO/NC contact |
| Relay contact material | Gold lash over silver alloy |
| Number of points | 6 |
| Number of groups | 6 |
| Points per group | 1 |
| Switched Output Voltage | |
| AC | 20-250 VAC |
| DC | 30-150 VDC |
| Maximum Load Current | |
| AC | 5A @ 250 VAC @ 60 degrees C resistive load 2A Tungsten lamp load 3A @ power factor 0.4 |
| DC | 300mA resistive @ 60 degree C resistive load 100mA (L/R=10msec) 5A @ 5-30VDC @ 60 degrees C resistive load |
| Minimum Load Current | |
| AC | 0.5mA |
| DC | 0.5mA |
| Maximum surge current | 20A each point (cap. load @ 10 ms.) |
| Maximum switching capability | 1250 VAC (resistive load) |
| Maximum module current | 21A at 60 degrees C 25A at 30 degrees C |

| | |
|--------------------------|--|
| Output leakage current | < 100 microamps |
| Fault sensing | None |
| Fault reporting | None |
| Error indication | None |
| Response time | 10 ms @ 60 Hz OFF to ON 20 ms @ 60 Hz ON to OFF |
| Maximum switching cycles | > 30 x 10 ⁶ (mechanical) >=1 x 10 ⁵ (inductive load with external protective circuitry) |

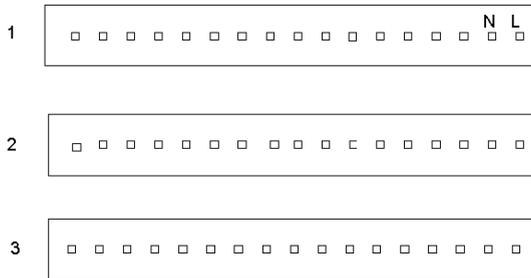
Internal Pin Connections

Overview

This section contains an illustration of the I/O base.

Illustration

There are no internal connections between terminals on the I/O base.



Field Wiring Guidelines

Overview

This section contains wiring guidelines and precautions.

Terminal Connector

With respect to the terminal connector, the guidelines are as follows:

- Screw type, 17 pin, field connectors are included with this module and do not have to be ordered separately.
- Note that pin 1 has been removed and the connector begins at pin 2.
- 18 pin connectors that are used on other Momentum I/O Bases, cannot be used with this module.

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-row busbar. The following busbars are available from Schneider Automation.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 006 01 |
| Spring-clip | 170 XTS 007 01 |

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

| Row | Terminal | Function |
|-----|---------------|--|
| 1 | 2,4,6,8,10,12 | Relay Output 1 through 6 (normally open) |
| | 17 | module neutral |
| | 18 | 120 to 230 VAC module power |
| 2 | 2,4,6,8,10,12 | Relay Output 1 through 6 (normally closed) |
| 3 | 2,4,6,8,10,12 | Relay Output Common 1 through 6 |
| 4 | 1 ... 18 | Protective earth (PE) |

Protective Circuit Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit parallel to the operating coil.

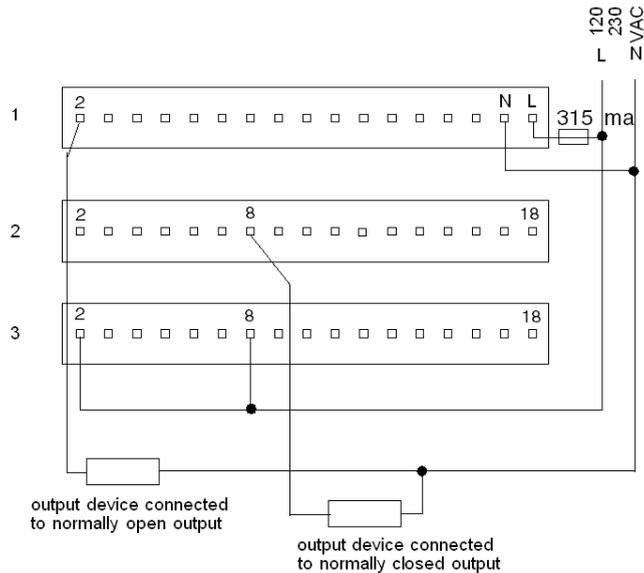
Wiring Diagrams

Overview

This section provides a diagram to assist you in wiring a 2-wire actuator.

2-Wire Actuator

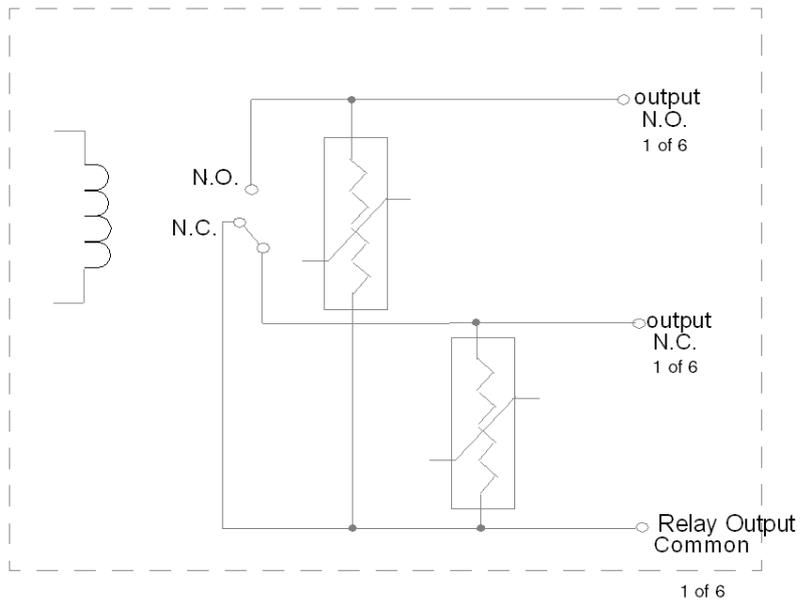
The diagram below shows field wiring for 2-wire 120 VAC actuators using a normally open and normally closed relay output.



NOTE: The 6 relay outputs are individually isolated. This allows for the use of separate power sources for each output if individual isolation is required.

Simplified Output Schematics

The following diagram shows the relay output circuitry.



I/O Mapping

Overview

The 170 ADO 830 30 TSX Momentum I/O base supports 6 relay outputs. This section contains information about the mapping of the I/O data into one output word.

I/O Map

The I/O base may be mapped as one output word, or as 16 discrete output points.

IEC vs. Ladder Logic

In order to correctly field wire the outputs and map the output data, you need to know which type of Momentum Adapter is mounted on the base.

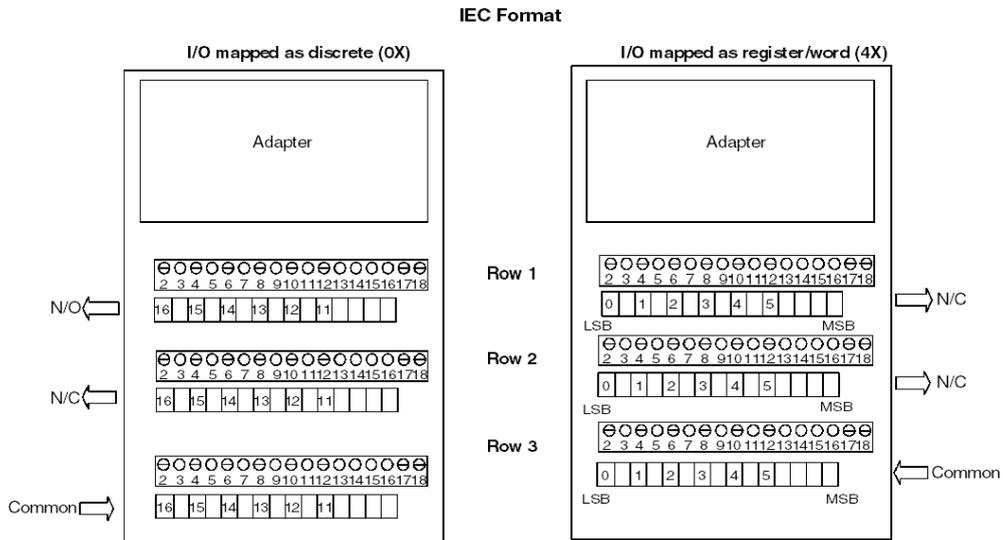
NOTE: Pin 1 of the module has been eliminated and the relay begins with pin 2. The field connectors come with the relay module and do not need to be ordered separately.

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

| | IEC Compliant | 984 Compliant |
|---------------------------------|---|--|
| Momentum Processor Adapters | All | None |
| Momentum Communication Adapters | All, except 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 | 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 |

Data Mapping

The figure below shows how data is mapped on the I/O base with an IEC Compliant adapter. When the I/O is mapped as discrete points (0x), the MSB is assigned to Pin 2. When I/O is mapped as a word or register (4x), the LSB (bit 0) is assigned to Pin 2.



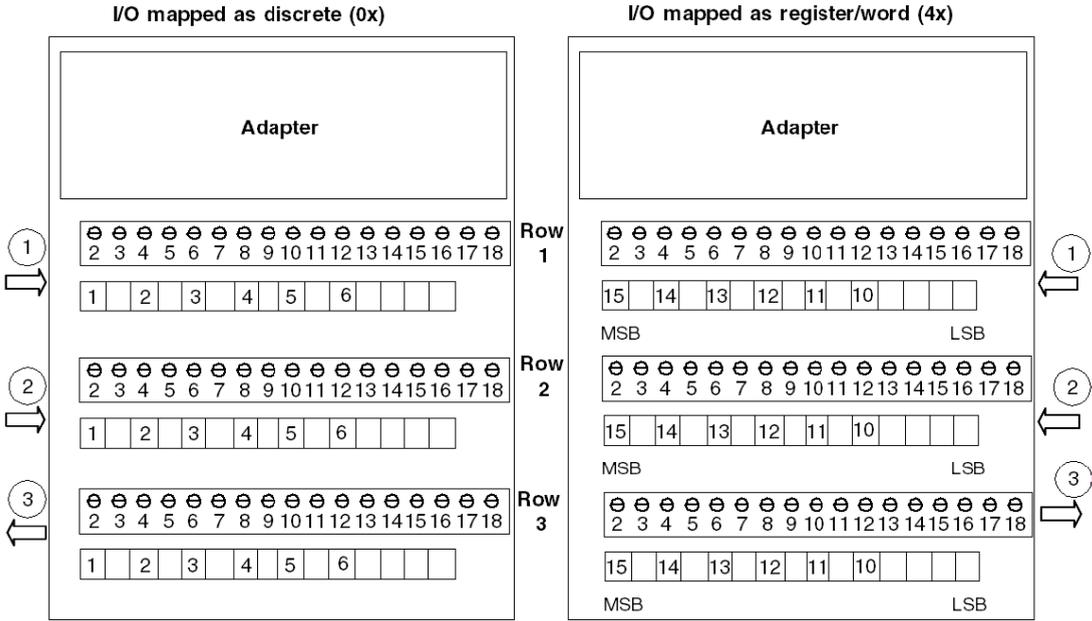
NOTE: The terminal connectors have the following features:

- Screw type, 17 pin, field connectors that are included with this module and do not have to be purchased separately.
- Pin 1 has been removed and the connector begins at pin 2.
- 18 pin connectors that are used on other Momentum I/O Bases, cannot be used with this module.
- Connector part number: 170XTS01000 (contains 3 connectors).

Data Mapping

The figure below shows how data is mapped on the I/O base with a 984 Ladder Logic Compliant adapter. When the I/O is mapped as discrete points (0x), the LSB is assigned to Pin 2. When I/O is mapped as a word or register (4x), the MSB (bit 15) is assigned to Pin 2.

984 Format



- 1 NO
- 2 NC
- 3 Common

NOTE: The terminal connectors have the following features:

- Screw type, 17 pin, field connectors that are included with this module and do not have to be purchased separately.
- Pin 1 has been removed and the connector begins at pin 2.
- 18 pin connectors that are used on other Momentum I/O Bases, cannot be used with this module.
- Connector part number : 170XTS01000 (contains 3 connectors).

Chapter 33

170 AMM 090 00 Analog 4 Ch. In / 2 Ch. Out Module Base w/ 24 VDC I/O Pts

Overview

This chapter describes the 170 AMM 090 00 TSX Momentum I/O base. See also 170 AMM 090 01 (*see page 563*).

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|-----------------------------|------|
| Front Panel Components | 536 |
| Specifications | 538 |
| Internal Pin Connections | 542 |
| Field Wiring Guidelines | 543 |
| Wiring Diagrams | 545 |
| I/O Mapping | 548 |
| Analog Channel Parameters | 549 |
| Analog Outputs | 551 |
| Analog Inputs | 552 |
| Discrete Inputs and Outputs | 553 |
| Input Measuring Ranges | 554 |
| Error Messages | 560 |

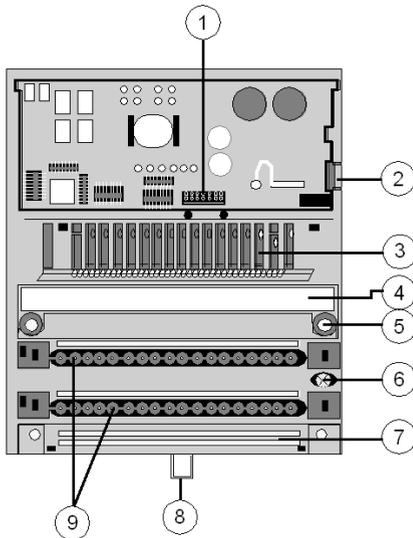
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 AMM 090 00 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

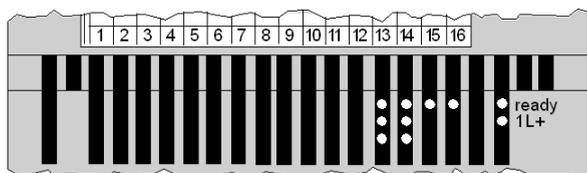


Components of the I/O module

| Label | Description |
|-------|-------------------------------------|
| 1 | Internal interface (ATI) connector |
| 2 | Ground contact for the adapter |
| 3 | LED status display |
| 4 | Protective cover |
| 5 | Mounting holes for panel mount |
| 6 | Grounding screw |
| 7 | Busbar Mounting Slot |
| 8 | Locking tab for DIN rail mount |
| 9 | Sockets for the terminal connectors |

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

| Indicator | Condition | Message |
|----------------------|-----------|---|
| Ready | Green | Module is ready to communicate on network. Operating voltage for internal logic is present and self-test has been passed. |
| | Off | Module is not ready. |
| 1L+ | Green | Supply voltage for outputs 1, 2 applied. |
| | Off | Supply voltage for outputs 1, 2 not applied. |
| Top row 13 ... 16 | Green | Discrete input status (an LED per input). Input point active, i.e. input carries "1" signal (logically "ON"). |
| | Off | Discrete input status (an LED per input). Input point inactive, i.e. input carries "0" signal (logically "OFF"). |
| Middle row 13, 14 | Green | Discrete output status (an LED per output). Output point active, i.e. output carries "1" signal (logically "ON"). |
| | Off | Discrete output status (an LED per output). Output point inactive, i.e. output carries "0" signal (logically "OFF"). |
| Bottom row 13, 14 | Red | Discrete output overload (one LED per output). Output concerned short-circuited or overloaded. |
| | Off | Discrete outputs 1 ... 2 operating normally. |

Specifications

Overview

This section contains specifications for the 170 AMM 090 00 I/O base.

General Specifications

| | |
|----------------------------|---|
| Module type | 4 differential inputs, 2 outputs (analog) 4 inputs, 2 outputs (discrete) |
| Supply voltage | 24 VDC |
| Supply voltage range | 20 ... 30 VDC |
| Supply current consumption | max. 350 mA at 24 VDC |
| Power dissipation | 4 W typical 6 W maximum |
| I/O map | 5 input words 5 output words |

Isolation

| | |
|--|----------------|
| Discrete inputs from outputs | none |
| Analog inputs from outputs | none |
| Analog inputs and outputs from operating voltage | 500 VDC, 1 min |
| Operating voltage and all inputs and outputs from ground | 500 VDC, 1 min |

Fuses

| | |
|----------------------|--|
| Internal | none |
| Operating voltage L+ | 1 A slow-blow (Bussmann GDC-1A or equivalent) |
| Output voltage 1L+ | Depending on the application, max. 5 A fast-blow |
| Input voltage 1L+ | Depending on the application, max. 1 A fast-blow |

EMC

| | |
|------------------|---|
| Immunity | IEC 1131-2 (500 V disturbance pulse in operating voltage) |
| Radiated noise | EN 50081-2 |
| Agency approvals | UL, CSA, CE, FM Class 1, Div 2 |

Physical Dimensions

| | |
|-------------------------|--|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) no busbar 159.5 mm (6.3 in) with two-row busbar 171.5 mm (6.75 in) with three-row busbar |
| Weight | 240 g (0.55 lb) |

Analog Inputs

| | |
|--------------------------------------|--|
| Number of channels | 4 differential inputs |
| Common mode voltage | Input voltage from Ag +/- 11 V |
| Common mode suppression | > 54 dB |
| Overvoltage (1 input) Static Dynamic | Voltage ranges +/- 30 V when voltage source is 24 V +/- 50 V max. 100 s Current ranges, input current < 48 mA |
| Input resistance | > 1 MOhm voltage range 250 Ohm current range |
| Input filter time constant | 120 microsec. (typ.) |
| Crosstalk | Input channel from input channel approx -80 dB |

Range Specific Data

| Range | +/- 10 V | +/- 5 V | 1 ... 5 V | +/- 20 mA | 4 ... 20 mA |
|-------------------------------|--|--|--|--|--|
| Conversion time | 10 ms for all channels |
| Conversion error at 25 deg. C | max. 0.08 % of upper measuring range value | max. 0.16 % of upper measuring range value | max. 0.16 % of upper measuring range value | max. 0.16 % of upper measuring range value | max. 0.16 % of upper measuring range value |
| Error at 0 ... 60 deg. C | max. 0.15 % of upper measuring range value | max. 0.3 % of upper measuring range value | max. 0.3 % of upper measuring range value | max. 0.3 % of upper measuring range value | max. 0.3 % of upper measuring range value |
| Conversion consistency | max. 0.02 % of upper measuring range value | max. 0.04 % of upper measuring range value | max. 0.04 % of upper measuring range value | max. 0.04 % of upper measuring range value | max. 0.04 % of upper measuring range value |
| Resolution) | 14 bits | 13 bits | 12 bits | 13 bits | 12 bits |

Analog Outputs

| | | |
|-------------------------------|--|----------------------------|
| Number of channels | 2 | |
| Conversion time | 1 ms for all channels | |
| Conversion error at 25 deg. C | max +/- 0.35 % of upper measuring range value | |
| Loop power supply | None required | |
| Error at 0 ... 60 deg. C | max +/- 0.7 % of upper measuring range value | |
| Linearity | +/- 1 LSB (monotonous) | |
| Crosstalk | Output channel from output channel approx. - 80 dB | |
| Range | +/-10 V Voltage | 0 ... 20 mA Current |
| Output load | >= 3 KOhm | <= 600 Ohms |
| Resolution | 12 bits | 12 bits |

Discrete Inputs

| | |
|---------------------|--|
| Number of points | 4 |
| Number of groups | 1 |
| Points per group | 4 |
| Signal type | True High |
| IEC 1131 type | 1+ (See Appendix <i>IEC 1131 Input Types</i> , page 701 for definitions of IEC input types.) |
| ON voltage | +11 ... +30 VDC |
| OFF voltage | -3 ... +5 VDC |
| Input current | 2.5 mA minimum ON (6 mA at 24 VDC) 1.2 mA maximum OFF |
| Input voltage range | -3 ... +30 VDC |
| Input resistance | 4 kOhm |
| Response time | 2.2 ms OFF to ON 2.2 ms ON to OFF |

Discrete Outputs

A 2-point temperature monitoring circuit protects each discrete output against short-circuiting and overload. The outputs will keep disconnecting and reconnecting until the cause of the error has been eliminated.

| | |
|---|--|
| Output type | Semiconductor |
| Output voltage | External supply - .5 VDC |
| Number of points | 2 |
| Number of groups | 1 |
| Points per group | 2 |
| Current capacity | 1 A/point maximum 2 A/group 2 A/module |
| Signal type | True High |
| Leakage current (output out) | < 1 mA @ 24 VDC |
| On state voltage drop | < 0.5 VDC @ 0.5 A |
| Output protection (See Note Below) | Outputs are electronically safeguarded to assist in short circuit and overload protection |
| Fault reporting | 1 red LED/point (row 3) ON when short current/ overload occurs |
| Error indication | Message "I/O Error" on bus adapter if module is defective |
| Response time (resistive load / 0.5 A) | < 0.1 ms OFF to ON < 0.1 ms ON to OFF |
| Maximum switching cycles | 1000/h for 0.5 A inductive load 100/s for 0.5 A resistive load 8/s for 1.2 W Tungsten load |

NOTE: Discrete 24 VDC outputs incorporate thermal shutdown and overload protection. The output current of a shortened output is limited to a nondestructive value. The short circuit heats the output driver and the output will switch off. The output will switch on again if the driver leaves the overtemperature condition. If the short circuit still exists, the driver will reach the overtemperature condition again and will switch off again.

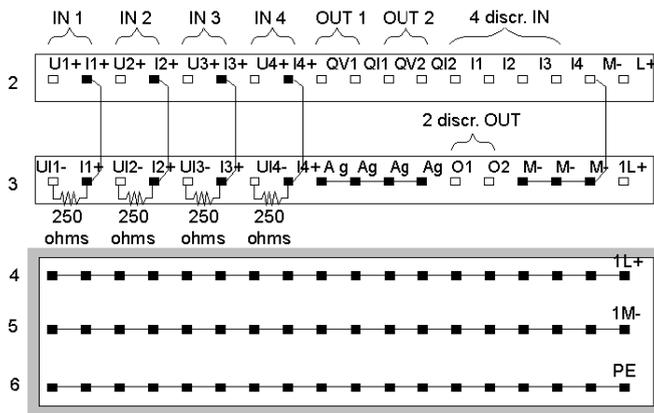
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 6 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

The discrete input points are field wired to row 2 of the base. The discrete output points are wired to row 3. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3- row busbar. The following busbars are available from Schneider Electric.

| Type | Number of Rows | Part Number |
|-------------|----------------|----------------|
| Screw-in | 1 - row | 170 XTS 006 01 |
| | 2 - row | 170 XTS 005 01 |
| | 3 - row | 170 XTS 004 01 |
| Spring-clip | 1 - row | 170 XTS 007 01 |
| | 2 - row | 170 XTS 008 01 |
| | 3 - row | 170 XTS 003 01 |

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

Mapping terminal blocks and busbars is described in the table below.

| Row | Connection | Signal | Meaning |
|-----|------------|---------------|---|
| 2 | 1, 3, 5, 7 | U1+ ... U4+ | pos. voltage input (analog) |
| | 2, 4, 6, 8 | IS1 ... IS4 | current sensing inputs (analog) |
| | 9, 11 | QV1, QV2 | analog output channels 1 ... 2 (voltage mode) |
| | 10, 12 | QI1, QI2 | analog outputs, channels 1 ... 2 (current mode) |
| | 13 ... 16 | I1 ... I4 | discrete inputs 1...4 |
| | 17/ 18 | M-/ L+ | reference potential and operating voltage |
| 3 | 1, 3, 5, 7 | UI1- ... UI4- | neg. voltage mode and current mode inputs (analog) |
| | 2, 4, 6, 8 | I1+ ... I4+ | pos. analog inputs, channels 1 ... 4 (current mode) |
| | 9 ... 12 | Ag | reference potential for analog channels |
| | 13, 14 | O1, O2 | discrete outputs 1,2 |
| | 15, 16, 17 | M- | reference potential for discrete outputs |
| | 18 | 1L+ | output voltage mode for discrete outputs |
| 4 | 1 ... 18 | 1L+ | sensor supply |
| 5 | 1 ... 18 | 1M- | reference potential for sensors |
| 6 | 1 ... 18 | PE | protective ground |

Protective Circuit May Be Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit parallel to the operating coil.

Wiring Diagrams

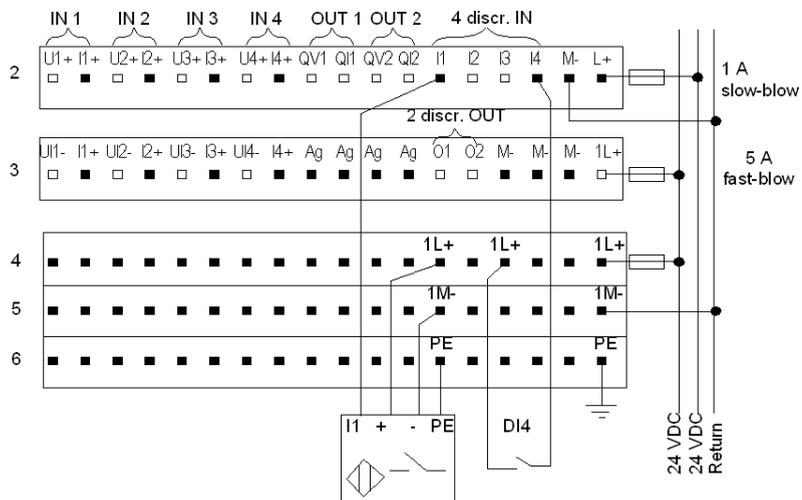
Overview

This section contains diagrams to assist you in wiring the following types of devices:

| I/O Type | Diagram |
|-----------------|-----------------------|
| Discrete input | 2- and 4-wire sensors |
| Discrete output | 3-wire actuators |
| Analog output | 2-wire actuators |
| Analog input | 3-wire sensors |

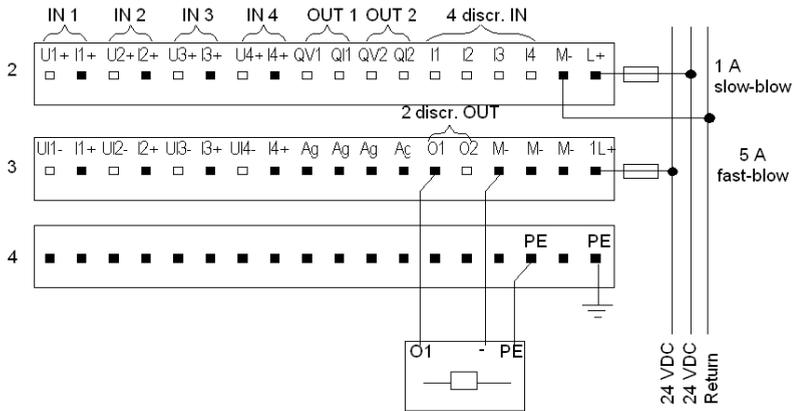
Discrete Inputs

The diagram below shows an example of wiring for discrete inputs:



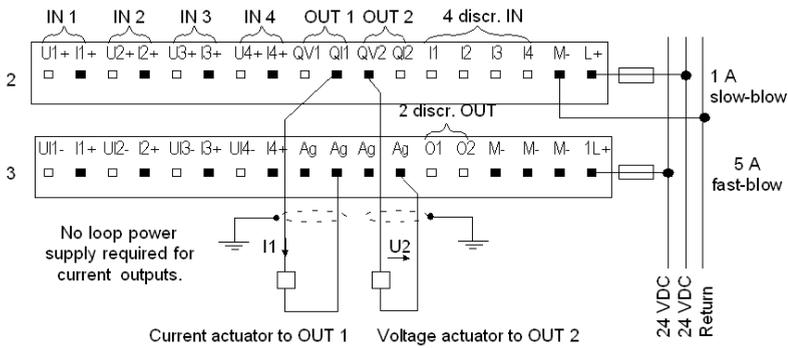
Discrete Outputs

The diagram below shows an example of wiring for discrete outputs:



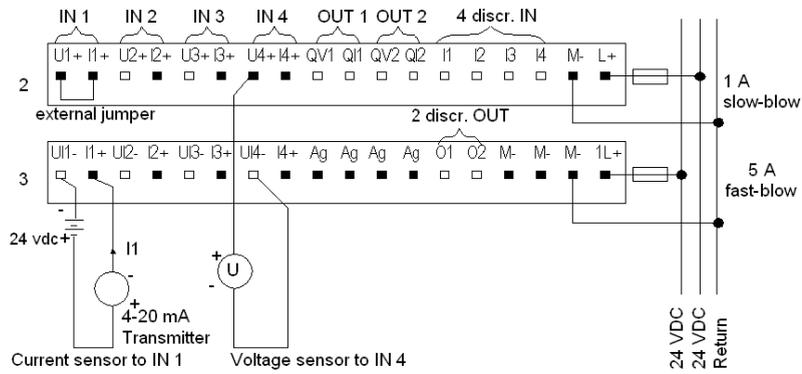
Analog Outputs

The diagram below shows an example of wiring for analog outputs:



Analog Inputs

The diagram below shows an example of wiring for analog inputs:



I/O Mapping

Overview

The 170 AMM 090 00 TSX Momentum I/O base supports 4 analog inputs, 2 analog outputs, 4 discrete inputs and 2 discrete outputs. This section contains information about the mapping of the output words into the analog/discrete output values, the usage of output words for channel configuration and the mapping of analog/discrete input values into input words.

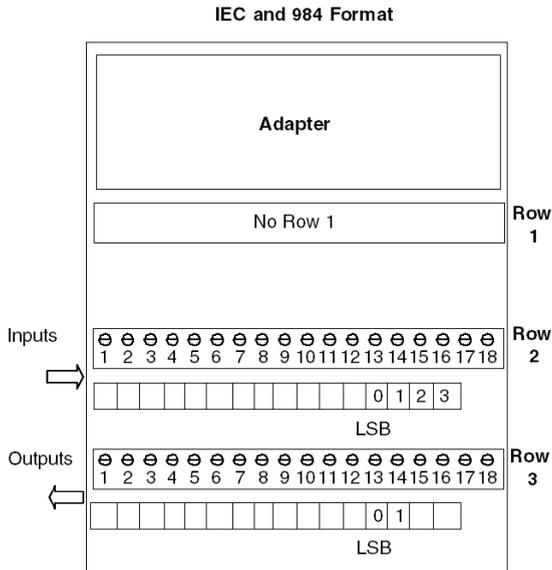
I/O Map

The I/O base may be mapped as five contiguous input words and five contiguous output words, as follows:

| Word | Input Data | Output Data |
|---------|------------------------|---------------------------------------|
| 1 = LSW | Value, input channel 1 | Parameters for input channels 1 ... 4 |
| 2 | Value, input channel 2 | Parameters for output channels 1,2 |
| 3 | Value, input channel 3 | Value, output channel 1 |
| 4 | Value, input channel 4 | Value, output channel 2 |
| 5 = MSW | Discrete inputs | Discrete outputs |

Discrete I/O Mapping

The figure below shows how data is mapped with an IEC Compliant adapter.



Analog Channel Parameters

Overview

Parameters must be set for all of the analog channels before the module can be commissioned. This section provides the codes for setting the parameters and gives examples of parameter settings.

NOTE: If you set new parameters for the module, always send a complete set of parameters (all channels, inputs and outputs), even if you only want to change a single parameter. Otherwise the module will refuse the new parameters and continue working with the old ones.

Key

This section focuses on output words 1 and 2, as highlighted in the table below:

| Word | Input Data | Output Data |
|---------|------------------------|---|
| 1 = LSW | Value, input channel 1 | Parameters for input channels 1 ... 4 |
| 2 | Value, input channel 2 | Parameters for output channels 1 ... 2 |
| 3 | Value, input channel 3 | Not used |
| 4 | Value, input channel 4 | Not used |
| 5 = MSW | Value, input channel 5 | Not used |

Illustration

Parameters are set by entering a four-bit code in output words 1 and 2, as follows:

| Output Word 1 | | | | | | | | | | | | | | | |
|---------------------|----|----|----|---------------------|----|---|---|---------------------|---|---|---|---------------------|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| for input channel 4 | | | | for input channel 3 | | | | for input channel 2 | | | | for input channel 1 | | | |

| Output Word 2 | | | | | | | | | | | | | | | |
|---------------|----|----|----|----------|----|---|---|----------------------|---|---|---|----------------------|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| not used | | | | not used | | | | for output channel 2 | | | | for output channel 1 | | | |

Codes for Analog Input Parameters

Use the following codes to set the parameters for each analog input channel:

| Code (binary) | Code (hex) | Parameter |
|---------------|------------|-------------------------------------|
| 0100 | 4 | Channel inactive |
| 0010 | 2 | +/-5V or +/-20mA input range |
| 0011 | 3 | +/-10V input range |
| 1010 | A | 1 ... 5V or 4 ... 20 mA input range |

Example of Analog Input Parameters

If output word 1 is initialized as A324 hex, then the input channels have the following parameters:

| Channel | Parameter |
|---------|--------------|
| 1 | Disabled |
| 2 | at +/- 5 V |
| 3 | at +/- 10 V |
| 4 | at 1 ... 5 V |

Codes for Analog Output Parameters

Use the following codes to set the codes for each analog output channel. The remaining bit combinations are reserved.

| Code (Binary) | Code (Hex) | Parameter | Reset Behavior of Outputs |
|---------------|------------|------------------|---------------------------|
| 0 1 0 0 | 4 | Channel inactive | 0 V / 0 mA |
| 0 0 0 1 | 1 | 0 ... 20 mA | 0 mA |
| 0 0 1 1 | 3 | + / - 10 VDC | 0 V |
| 0 1 0 1 | 5 | 0 ... 20 mA | 20 mA |
| 0 1 1 1 | 7 | + / - 10 VDC | + 10 VDC |
| 1 0 0 1 | 9 | 0 ... 20 mA | Output is held |
| 1 0 1 1 | B | + / - 10 VDC | Output is held |

Example of Analog Output Parameters

If output word 2 is initialized as 0091 hex, then the output channels have the following parameters:

| Channel | Parameter |
|---------|--------------------------------|
| 1 | 0 ... 20 mA with reset to 0 |
| 2 | 0 ... 20 mA with reset to hold |

Analog Outputs

Overview

This section describes how to interpret the value of the analog output channels.

Key

This section describes output words 3 and 4, as highlighted in the table below:

| Word | Input Data | Output Data |
|---------|------------------------|---------------------------------------|
| 1 = LSW | Value, input channel 1 | Parameters for input channels 1 ... 4 |
| 2 | Value, input channel 2 | Parameters for output channels 1, 2 |
| 3 | Value, input channel 3 | Value, output channel 1 |
| 4 | Value, input channel 4 | Value, output channel 2 |
| 5 = MSW | Discrete inputs | Discrete outputs |

Diagram

The following diagrams explain how to interpret the value of output words 3 and 4. .

| Output Word 3 | | | | | | | | | | | | | | | |
|---------------|------------------------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| sign | value output channel 1 | | | | | | | | | | | | | | |

| Output Word 4 | | | | | | | | | | | | | | | |
|---------------|------------------------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| sign | value output channel 2 | | | | | | | | | | | | | | |

Analog Inputs

Overview

This section describes how to interpret the value of the analog input channels.

Key

This section describes input words 1 ... 4, as highlighted in the table below:

| Word | Input Data | Output Data |
|---------|-------------------------------|---------------------------------------|
| 1 = LSW | Value, input channel 1 | Parameters for input channels 1 ... 4 |
| 2 | Value, input channel 2 | Parameters for output channels 1, 2 |
| 3 | Value, input channel 3 | Value, output channel 1 |
| 4 | Value, input channel 4 | Value, output channel 2 |
| 5 = MSW | Discrete inputs | Discrete outputs |

Analog Input Values

Mapping of analog input values is shown below.

| Input Word 1 | | | | | | | | | | | | | | | |
|--------------|----|-----------------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| sign | | value input channel 1 | | | | | | | | | | | | | |

|
|
|
|

| Input Word 4 | | | | | | | | | | | | | | | |
|--------------|----|-----------------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| sign | | value input channel 4 | | | | | | | | | | | | | |

Resolution

The resolution of the module is 12-, 13- or 14-bit, depending on the range.

Discrete Inputs and Outputs

Overview

The 170 AMM 090 00 TSX Momentum I/O base supports 4 discrete inputs and 2 discrete outputs. This section describes how to map I/O data between the I/O base and the CPU.

NOTE: You cannot commission the discrete I/O until parameters have been set for all six analog channels.

You must configure analog inputs and outputs, even if they are not being used, for the discrete inputs and outputs to operate.

Key

The discrete inputs and outputs are I/O mapped as word 5, the most significant word, as shown in the table below:

| Word | Input Data | Output Data |
|---------|------------------------|---------------------------------------|
| 1 = LSW | Value, input channel 1 | Parameters for input channels 1 ... 4 |
| 2 | Value, input channel 2 | Parameters for output channels 1,2 |
| 3 | Value, input channel 3 | Value, output channel 1 |
| 4 | Value, input channel 4 | Value, output channel 2 |
| 5 = MSW | Discrete inputs | Discrete outputs |

Number of Words

The processor sends two discrete output data bits in one 16-bit word to the I/O base.

The base returns four discrete input data bits, and possibly an error message, if one has been detected, to the processor in one 16-bit word.

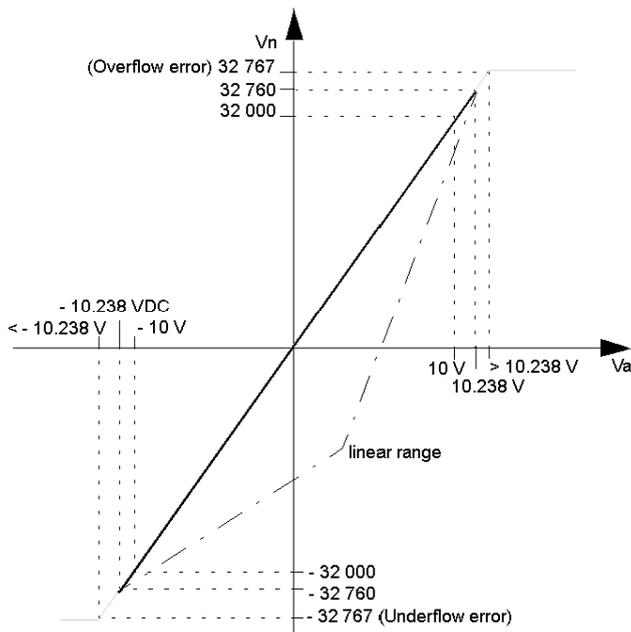
Input Measuring Ranges

Overview

This section contains illustrations explaining the analog/digital relation for the various input and output measuring ranges.

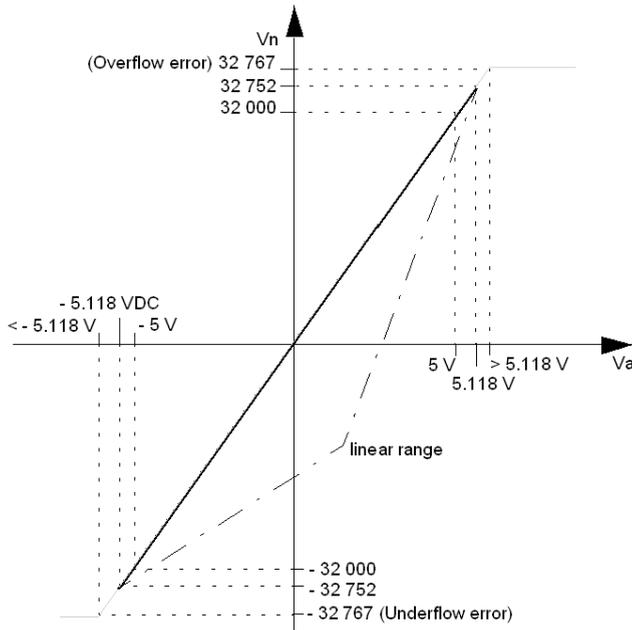
Input Range +/- 10 V

The following diagram shows the analog/digital relation for the input measuring range +/- 10 V. The voltage value is calculated along the following formula using the digital measurand: $V_n = 3200 \times V_a$ (for the linear range):



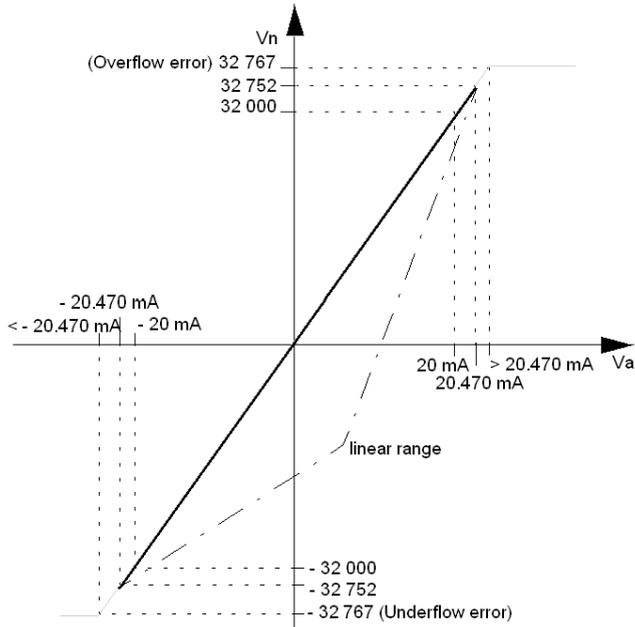
Input Range +/- 5 V

The following diagram shows the analog/digital relation for the input measuring range +/- 5 V. The voltage value is calculated along the following formula using the digital measurand: $V_n = 6400 \times V_a$ (for the linear range):



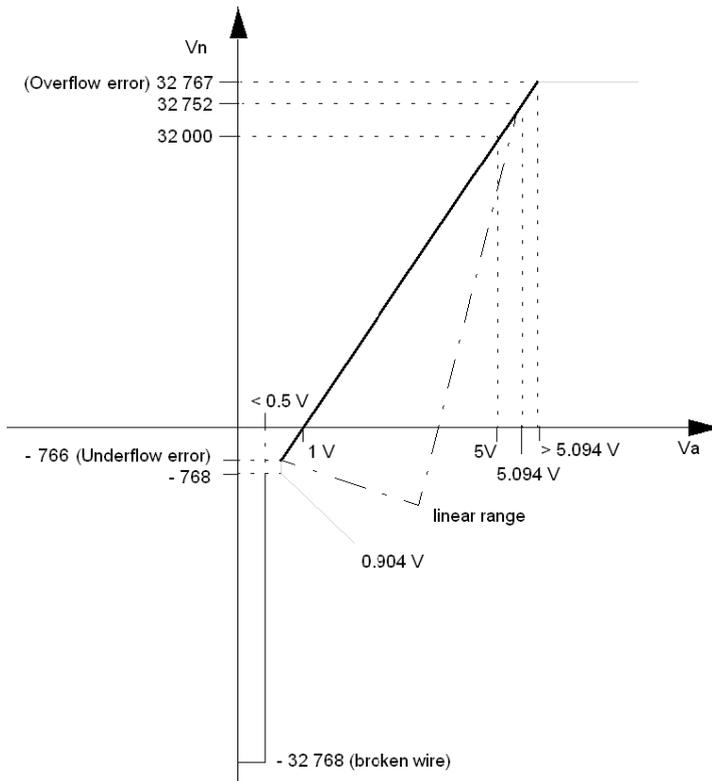
Input Range +/- 20 mA

The following diagram shows the analog/digital relation for the input measuring range +/- 20 mA. The current value is calculated along the following formula using the digital measurand: $V_n = 1600 \times I_a$ (for the linear range):



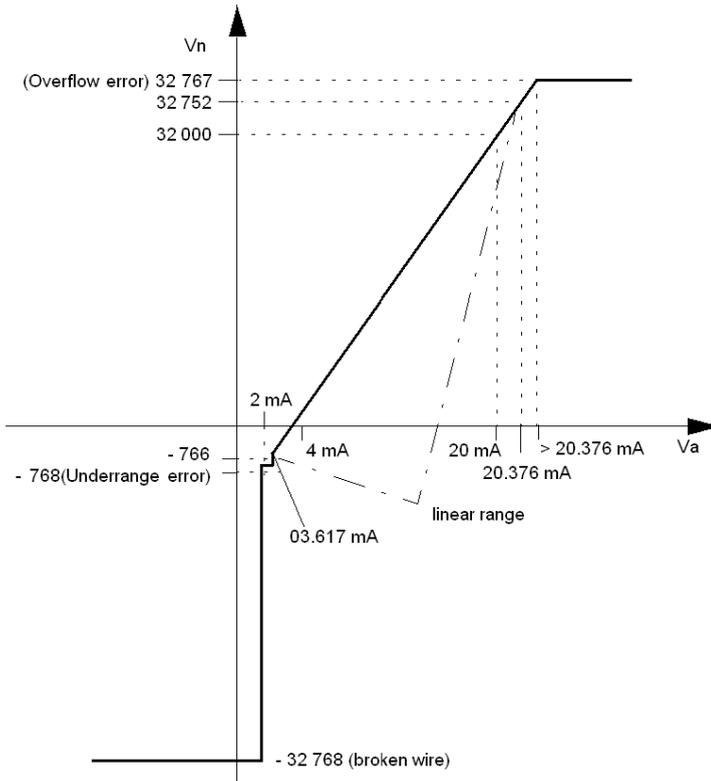
Input Range 1 ... 5 V

The following diagram shows the analog/digital relation for the input measuring range 1 ... 5 V. The voltage value is calculated along the following formula using the digital measurand: $V_n = 8000 \times V_a - 8000$ (for the linear range):



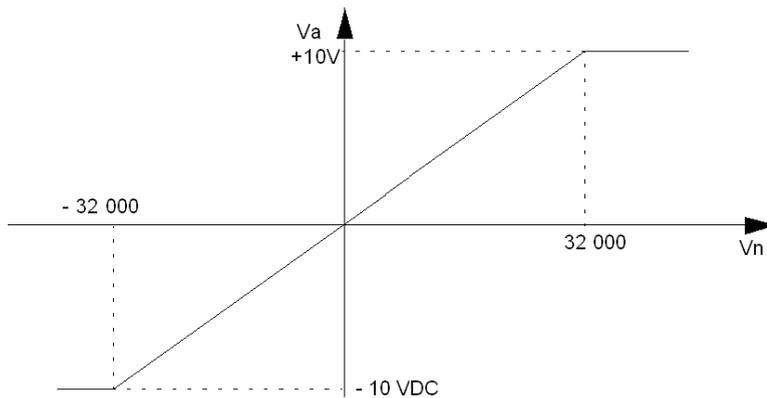
Input Range 4 ... 20 mA

The following diagram shows the analog/digital relation for the input measuring range 4 ... 20 mA. The current value is calculated along the following formula using the digital measurand: $V_n = 2000 \times I_a - 8000$ (for the linear range). Disabled channels deliver a value of 0.



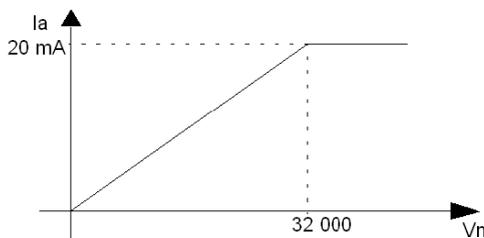
Output Range +/- 10 V

The following diagram shows the analog/digital relation for the output range +/- 10 V. When the bus is reset, the outputs use the configured parameters. If the module does not have valid parameters, the outputs will go to 0 V resp. 0 mA. The output voltage value is calculated along the following formula using the digital default value: $V_a = 1/3200 \times V_n$.



Output Range 0 ... 20 mA

The following diagram shows the analog/digital relation for the output range 0 ... 20 mA. When the bus is reset, the outputs use the configured parameters. If the module does not have valid parameters, the outputs will go to 0 V resp. 0 mA. The output current value is calculated along the following formula using the digital default value: $I_a = 1/1600 \times V_n$.



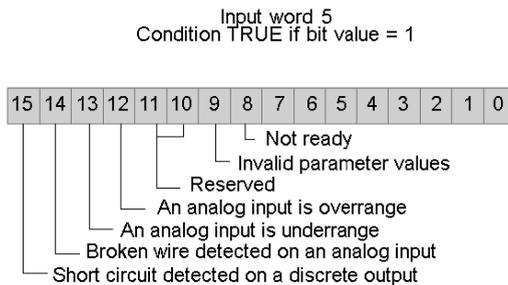
Error Messages

Overview

Error messages are stored in input word 5 (the $3x + 4$ register). This section explains how to interpret the bits in that register.

Diagram

This diagram explains the error message displayed by each bit. A value of 1 indicates the error has occurred.



Not Ready (Bit 8)

This error occurs when the I/O base has not yet received valid parameters or has just received parameters for the first time and is checking them.

Invalid Parameters (Bit 9)

This error occurs when the I/O base refuses one or more invalid parameters. The base will continue working with the old parameters until it receives a complete set of valid parameters.

Ovrange Indication (Bit 12)

This error occurs when the I/O base detects an overrange analog input value. The threshold is range-dependent.

Underrange Indication (Bit 13)

This error occurs when the I/O base detects an underrange analog input value. The threshold is range-dependent.

Broken Wire Detection (Bit 14))

Broken wire detection is possible for the 4 ... 20 mA range. In this case, a current signal that is less than 2 mA on one of the inputs is detected as a broken wire. The input word of that channel returns the value -32,768.

In the 1 ... 5 VDC range, broken wire detection is correctly seen as undervoltage detection. A voltage of less than 0.5 VDC on one of the input channels is recognized as broken wire. The input word of that channel returns the value -32,768.

In case of a broken wire, the input floats and bit 14 sets to one, only if a resistor is wired in parallel to the input terminals. This resistor discharges the input capacity, and broken wire detection will be available.

The value of this resistor depends on internal resistance of the sensor. Values too low might influence the input signal and values too high lengthen the time for broken wire detection. Normally, values of less than 100 kOhm are appropriate.

Short Circuit (Bit 15)

This error occurs when the I/O base detects a short circuit on a discrete output.

Chapter 34

170 AMM 090 01 Analog 4 Ch. In / 2 Ch. Out Module Base w/ 12 VDC I/O Pts

Overview

This chapter describes the 170 AMM 090 01 Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|-----------------------------------|------|
| Front Panel Components | 564 |
| Specifications | 566 |
| Internal Pin Connections | 570 |
| Field Wiring Guidelines | 571 |
| Wiring Diagrams | 573 |
| I/O Mapping | 576 |
| Analog Channel Parameters | 578 |
| Analog Outputs | 580 |
| Analog Inputs | 581 |
| Discrete Inputs and Outputs | 582 |
| Input and Output Measuring Ranges | 583 |
| Error Messages | 589 |

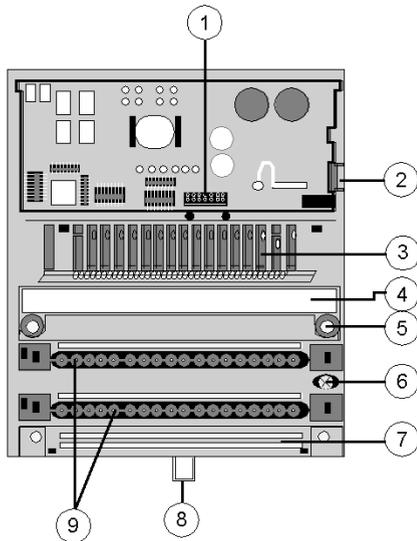
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 AMM 090 01 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

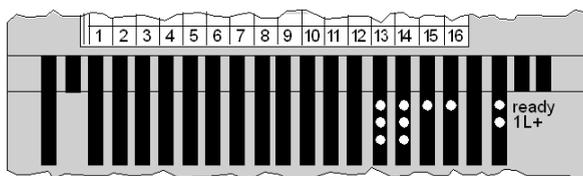


Components of the I/O Module

| Label | Description |
|-------|-------------------------------------|
| 1 | Internal interface (ATI) connector |
| 2 | Ground contact for the adapter |
| 3 | LED status display |
| 4 | Protective cover |
| 5 | Mounting holes for panel mount |
| 6 | Grounding screw |
| 7 | Busbar Mounting Slot |
| 8 | Locking tab for DIN rail mount |
| 9 | Sockets for the terminal connectors |

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

| Indicator | Condition | Message |
|----------------------|-----------|---|
| Ready | Green | Module is ready to communicate on network. Operating voltage for internal logic is present and self-test has been passed. |
| | Off | Module is not ready. |
| 1L+ | Green | Supply voltage for outputs 1, 2 applied. |
| | Off | Supply voltage for outputs 1, 2 not applied. |
| Top row 13 ... 16 | Green | Discrete input status (an LED per input). Input point active, i.e. input carries "1" signal (logically "ON"). |
| | Off | Discrete input status (an LED per input). Input point inactive, i.e. input carries "0" signal (logically "OFF"). |
| Middle row 13, 14 | Green | Discrete output status (an LED per output). Output point active, i.e. output carries "1" signal (logically "ON"). |
| | Off | Discrete output status (an LED per output). Output point inactive, i.e. output carries "0" signal (logically "OFF"). |
| Bottom row 13, 14 | Red | Discrete output overload (one LED per output). Output concerned short-circuited or overloaded. |
| | Off | Discrete outputs 1 ... 2 operating normally. |

Specifications

Overview

This section contains specifications for the 170 AMM 090 01 I/O base.

General Specifications

| | |
|----------------------------|---|
| Module type | 4 differential inputs, 2 outputs (analog) 4 inputs, 2 outputs (discrete) |
| Supply voltage | 12 VDC |
| Supply voltage range | 9.6 ... 14.4 VDC |
| Supply current consumption | max. 750 mA at 12 VDC |
| Power dissipation | 4 W typical 6 W maximum |
| I/O map | 5 input words 5 output words |

Isolation

| | |
|--|----------------|
| Discrete inputs from outputs | none |
| Analog inputs from outputs | none |
| Analog inputs and outputs from operating voltage | 500 VDC, 1 min |
| Operating voltage and all inputs and outputs from ground | 500 VDC, 1 min |

Fuses

| | |
|----------------------|--|
| Internal | none |
| Operating voltage L+ | 1 A slow-blow (Bussmann GDC-1A or equivalent) |
| Output voltage 1L+ | Depending on the application, max. 5 A fast-blow |
| Input voltage 1L+ | Depending on the application, max. 1 A fast-blow |

EMC

| | |
|------------------|---|
| Immunity | IEC 1131-2 (500 V disturbance pulse in operating voltage) |
| Radiated noise | EN 50081-2 |
| Agency approvals | UL, CSA, CE |

Physical Dimensions

| | |
|-------------------------|--|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) no busbar 159.5 mm (6.3 in) with two-row busbar 171.5 mm (6.75 in) with three-row busbar |
| Weight | 240 g (0.55 lb) |

Analog Inputs

| | |
|--------------------------------------|--|
| Number of channels | 4 differential inputs |
| Common mode voltage | Input voltage from Ag +/- 11 V |
| Common mode suppression | > 54 dB |
| Overvoltage (1 input) Static Dynamic | Voltage ranges +/- 30 V when voltage source is 24 V +/- 50 V max. 100 s Current ranges, input current < 48 mA |
| Input resistance | > 1 MOhm voltage range 250 Ohm current range |
| Input filter time constant | 120 microsec. (typ.) |
| Crosstalk | Input channel from input channel approx -80 dB |

Range Specific Data

| Range | +/- 10 V | +/- 5 V | 1 ... 5 V | +/- 20 mA | 4 ... 20 mA |
|-------------------------------|--|--|--|--|--|
| Conversion time | 10 ms for all channels |
| Conversion error at 25 deg. C | max. 0.08 % of upper measuring range value | max. 0.16 % of upper measuring range value | max. 0.16 % of upper measuring range value | max. 0.16 % of upper measuring range value | max. 0.16 % of upper measuring range value |
| Error at 0 ... 60 deg. C | max. 0.15 % of upper measuring range value | max. 0.3 % of upper measuring range value | max. 0.3 % of upper measuring range value | max. 0.3 % of upper measuring range value | max. 0.3 % of upper measuring range value |
| Conversion consistency | max. 0.02 % of upper measuring range value | max. 0.04 % of upper measuring range value | max. 0.04 % of upper measuring range value | max. 0.04 % of upper measuring range value | max. 0.04 % of upper measuring range value |
| Resolution) | 14 bits | 13 bits | 12 bits | 13 bits | 12 bits |

Analog Outputs

| | | |
|-------------------------------|--|----------------------------|
| Number of channels | 2 | |
| Conversion time | 1 ms for all channels | |
| Conversion error at 25 deg. C | max +/- 0.35 % of upper measuring range value | |
| Loop power supply | None required | |
| Error at 0 ... 60 deg. C | max +/- 0.7 % of upper measuring range value | |
| Linearity | +/- 1 LSB (monotonous) | |
| Crosstalk | Output channel from output channel approx. - 80 dB | |
| Range | +/-10 V Voltage | 0 ... 20 mA Current |
| Output load | >= 3 KOhm | <= 600 Ohms |
| Resolution | 12 bits | 12 bits |

Discrete Inputs

| | |
|---------------------|--|
| Number of points | 4 |
| Number of groups | 1 |
| Points per group | 4 |
| Signal type | True High |
| ON voltage | +7.5 ... +15 VDC |
| OFF voltage | -1.5 ... +2.5 VDC |
| Input current | 2.5 mA minimum ON (5.5 mA at 12 VDC) 1.5 mA maximum OFF |
| Input voltage range | -1.5 ... +15 VDC |
| Input resistance | 2.1 kOhm |
| Response time | 2.2 ms OFF to ON 3.3 ms ON to OFF |

Discrete Outputs

A 2-point temperature monitoring circuit protects each discrete output against short-circuiting and overload. The outputs will keep disconnecting and reconnecting until the cause of the error has been eliminated.

| | |
|---|--|
| Output type | Semiconductor |
| Output voltage | External supply - .5 VDC |
| Number of points | 2 |
| Number of groups | 1 |
| Points per group | 2 |
| Current capacity | 1 A/point maximum 2 A/group 2 A/module |
| Signal type | True High |
| Leakage current (output out) | < 1 mA @ 12 VDC |
| On state voltage drop | < 0.5 VDC @ 0.5 A |
| Output protection (See Note Below) | Outputs are electronically safeguarded to assist in short circuit and overload protection |
| Fault reporting | 1 red LED/point (row 3) ON when short current/ overload occurs |
| Error indication | Message "I/O Error" on bus adapter if module is defective |
| Response time (resistive load / 0.5 A) | < 0.1 ms OFF to ON < 0.1 ms ON to OFF |
| Maximum switching cycles | 1000/h for 0.5 A inductive load 100/s for 0.5 A resistive load 8/s for 1.2 W Tungsten load |

NOTE: Discrete 12 VDC outputs incorporate thermal shutdown and overload protection. The output current of a shortened output is limited to a nondestructive value. The short circuit heats the output driver and the output will switch off. The output will switch on again if the driver leaves the overtemperature condition. If the short circuit still exists, the driver will reach the overtemperature condition again and will switch off again.

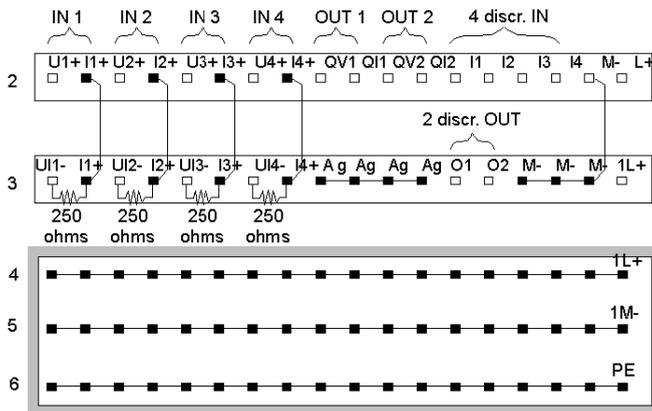
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 through 6 show the internal connections on the optional busbar.



Field Wiring Guidelines

Overview

The discrete input points are field wired to row 2 of the base. The discrete output points are wired to row 3. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3- row busbar. The following busbars are available from Schneider Electric.

| Type | Number of Rows | Part Number |
|-------------|----------------|----------------|
| Screw-in | 1 - row | 170 XTS 006 01 |
| | 2 - row | 170 XTS 005 01 |
| | 3 - row | 170 XTS 004 01 |
| Spring-clip | 1 - row | 170 XTS 007 01 |
| | 2 - row | 170 XTS 008 01 |
| | 3 - row | 170 XTS 003 01 |

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

Mapping terminal blocks and busbars is described in the table below.

| Row | Connection | Signal | Meaning |
|-----|------------|---------------|---|
| 2 | 1, 3, 5, 7 | U1+ ... U4+ | pos. voltage input (analog) |
| | 2, 4, 6, 8 | IS1 ... IS4 | current sensing inputs (analog) |
| | 9, 11 | QV1, QV2 | analog output channels 1 ... 2 (voltage mode) |
| | 10, 12 | QI1, QI2 | analog outputs, channels 1 ... 2 (current mode) |
| | 13 ... 16 | I1 ... I4 | discrete inputs 1...4 |
| | 17/ 18 | M-/ L+ | reference potential and operating voltage |
| 3 | 1, 3, 5, 7 | UI1- ... UI4- | neg. voltage mode and current mode inputs (analog) |
| | 2, 4, 6, 8 | I1+ ... I4+ | pos. analog inputs, channels 1 ... 4 (current mode) |
| | 9 ... 12 | Ag | reference potential for analog channels |
| | 13, 14 | O1, O2 | discrete outputs 1,2 |
| | 15, 16, 17 | M- | reference potential for discrete outputs |
| | 18 | 1L+ | output voltage mode for discrete outputs |
| 4 | 1 ... 18 | 1L+ | sensor supply |
| 5 | 1 ... 18 | 1M- | reference potential for sensors |
| 6 | 1 ... 18 | PE | protective ground |

Protective Circuit May Be Required

When contacted switches are used on the input lines or when lines to the peripherals are very long, the outputs of inductive loads require protective circuitry with a clamping/suppressor diode. Install the protective circuit parallel to the operating coil.

Wiring Diagrams

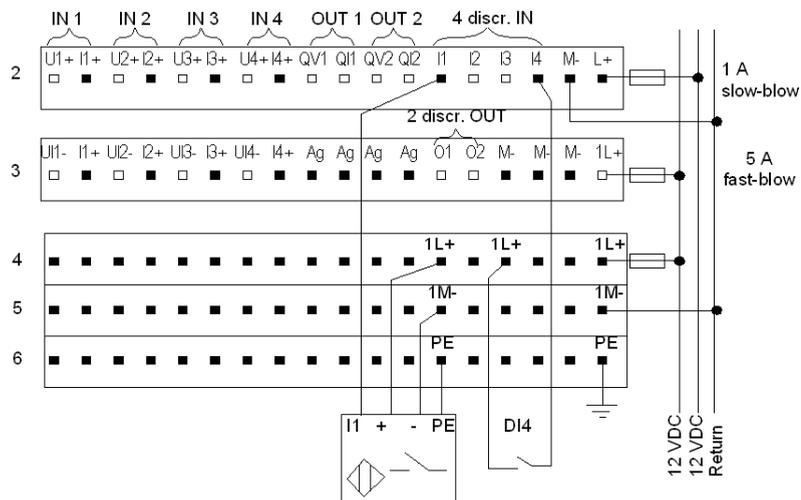
Overview

This section contains diagrams to assist you in wiring the following types of devices:

| I/O Type | Diagram |
|-----------------|-----------------------|
| Discrete input | 2- and 4-wire sensors |
| Discrete output | 3-wire actuators |
| Analog output | 2-wire actuators |
| Analog input | 3-wire sensors |

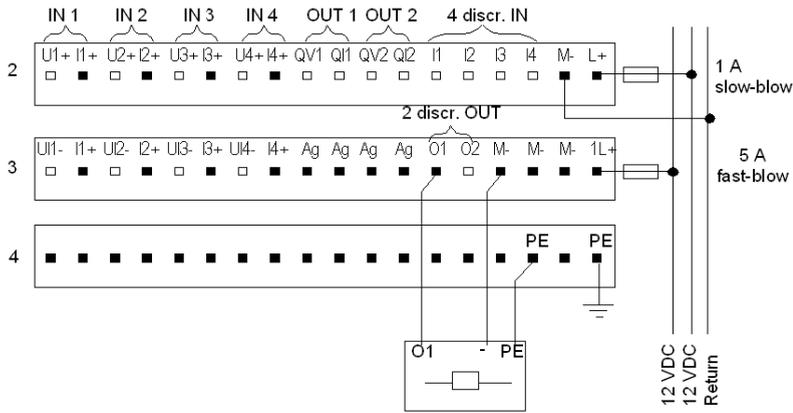
Discrete Inputs

The diagram below shows an example of wiring for discrete inputs:



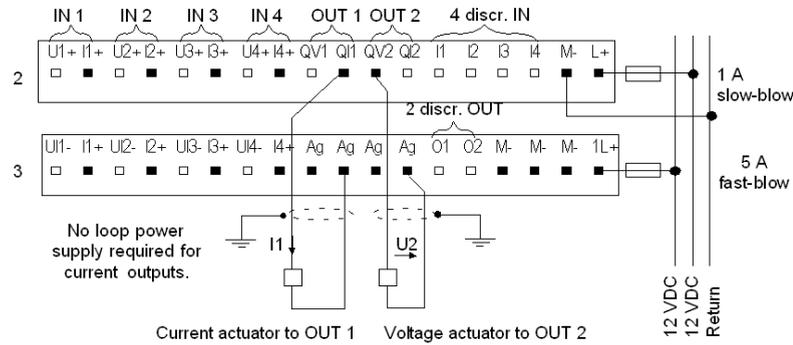
Discrete Outputs

The diagram below shows an example of wiring for discrete outputs:



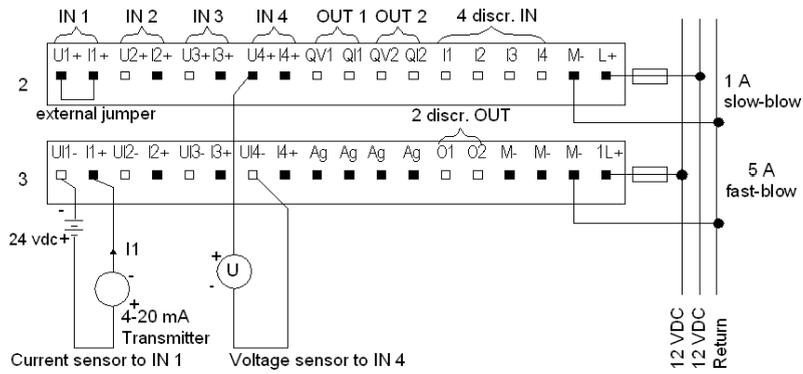
Analog Outputs

The diagram below shows an example of wiring for analog outputs:



Analog Inputs

The diagram below shows an example of wiring for analog inputs:



I/O Mapping

Overview

The 170 AMM 090 01 TSX Momentum I/O base supports 4 analog inputs, 2 analog outputs, 4 discrete inputs and 2 discrete outputs. This section contains information about the mapping of the output words into the analog/discrete output values, the usage of output words for channel configuration and the mapping of analog/discrete input values into input words.

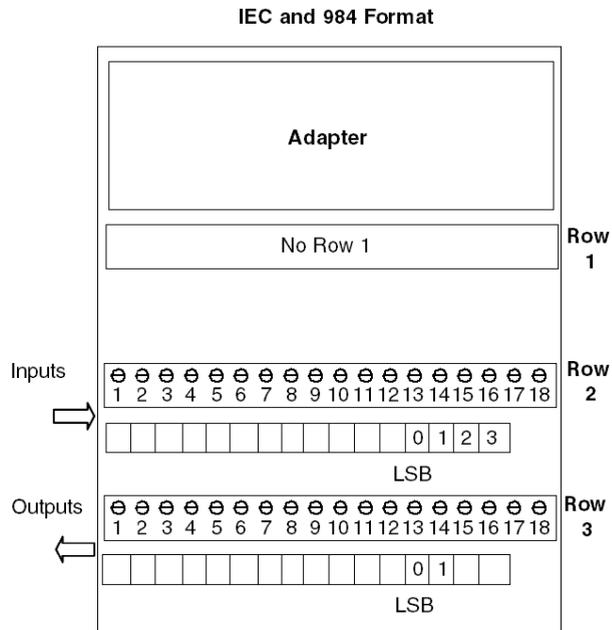
I/O Map

The I/O base may be mapped as five contiguous input words and five contiguous output words, as follows:

| Word | Input Data | Output Data |
|---------|------------------------|---------------------------------------|
| 1 = LSW | Value, input channel 1 | Parameters for input channels 1 ... 4 |
| 2 | Value, input channel 2 | Parameters for output channels 1,2 |
| 3 | Value, input channel 3 | Value, output channel 1 |
| 4 | Value, input channel 4 | Value, output channel 2 |
| 5 = MSW | Discrete inputs | Discrete outputs |

Discrete I/O Mapping

The figure below shows how data is mapped with an IEC Compliant adapter.



Analog Channel Parameters

Overview

Parameters must be set for all of the analog channels before the module can be commissioned. This section provides the codes for setting the parameters and gives examples of parameter settings.

NOTE: If you set new parameters for the module, always send a complete set of parameters (all channels, inputs and outputs), even if you only want to change a single parameter. Otherwise the module will refuse the new parameters and continue working with the old ones.

Key

This section focuses on output words 1 and 2, as highlighted in the table below:

| Word | Input Data | Output Data |
|---------|------------------------|--|
| 1 = LSW | Value, input channel 1 | Parameters for input channels 1 ... 4 |
| 2 | Value, input channel 2 | Parameters for input channels 5 ... 8 |
| 3 | Value, input channel 3 | Not used |
| 4 | Value, input channel 4 | Not used |
| 5 = MSW | Value, input channel 5 | Not used |

Illustration

Parameters are set by entering a four-bit code in output words 1 and 2, as follows:

| Output Word 1 | | | | | | | | | | | | | | | |
|---------------------|----|----|----|---------------------|----|---|---|---------------------|---|---|---|---------------------|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| for input channel 4 | | | | for input channel 3 | | | | for input channel 2 | | | | for input channel 1 | | | |

| Output Word 2 | | | | | | | | | | | | | | | |
|---------------|----|----|----|----------|----|---|---|----------------------|---|---|---|----------------------|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| not used | | | | not used | | | | for output channel 2 | | | | for output channel 1 | | | |

Codes for Analog Input Parameters

Use the following codes to set the parameters for each analog input channel:

| Code (binary) | Code (hex) | Parameter |
|---------------|------------|-------------------------------------|
| 0100 | 4 | Channel inactive |
| 0010 | 2 | +/-5V or +/-20mA input range |
| 0011 | 3 | +/-10V input range |
| 1010 | A | 1 ... 5V or 4 ... 20 mA input range |

Example of Analog Input Parameters

If output word 1 is initialized as A324 hex, then the input channels have the following parameters:

| Channel | Parameter |
|---------|--------------|
| 1 | Disabled |
| 2 | at +/- 5 V |
| 3 | at +/- 10 V |
| 4 | at 1 ... 5 V |

Codes for Analog Output Parameters

Use the following codes to set the codes for each analog output channel. The remaining bit combinations are reserved.

| Code (Binary) | Code (Hex) | Parameter | Reset Behavior of Outputs |
|---------------|------------|------------------|---------------------------|
| 0 1 0 0 | 4 | Channel inactive | 0 V / 0 mA |
| 0 0 0 1 | 1 | 0 ... 20 mA | 0 mA |
| 0 0 1 1 | 3 | + / - 10 VDC | 0 V |
| 0 1 0 1 | 5 | 0 ... 20 mA | 20 mA |
| 0 1 1 1 | 7 | + / - 10 VDC | + 10 VDC |
| 1 0 0 1 | 9 | 0 ... 20 mA | Output is held |
| 1 0 1 1 | B | + / - 10 VDC | Output is held |

Example of Analog Output Parameters

If output word 2 is initialized as 0091 hex, then the output channels have the following parameters:

| Channel | Parameter |
|---------|--------------------------------|
| 1 | 0 ... 20 mA with reset to 0 |
| 2 | 0 ... 20 mA with reset to hold |

Analog Outputs

Overview

This section describes how to interpret the value of the analog output channels.

Key

This section describes output words 3 and 4, as highlighted in the table below:

| Word | Input Data | Output Data |
|---------|------------------------|---------------------------------------|
| 1 = LSW | Value, input channel 1 | Parameters for input channels 1 ... 4 |
| 2 | Value, input channel 2 | Parameters for output channels 1, 2 |
| 3 | Value, input channel 3 | Value, output channel 1 |
| 4 | Value, input channel 4 | Value, output channel 2 |
| 5 = MSW | Discrete inputs | Discrete outputs |

Diagram

The following diagrams explain how to interpret the value of output words 3 and 4.

| Output Word 3 | | | | | | | | | | | | | | | |
|---------------|------------------------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| sign | value output channel 1 | | | | | | | | | | | | | | |

| Output Word 4 | | | | | | | | | | | | | | | |
|---------------|------------------------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| sign | value output channel 2 | | | | | | | | | | | | | | |

Analog Inputs

Overview

This section describes how to interpret the value of the analog input channels.

Key

This section describes input words 1 ... 4, as highlighted in the table below:

| Word | Input Data | Output Data |
|---------|-------------------------------|---------------------------------------|
| 1 = LSW | Value, input channel 1 | Parameters for input channels 1 ... 4 |
| 2 | Value, input channel 2 | Parameters for output channels 1, 2 |
| 3 | Value, input channel 3 | Value, output channel 1 |
| 4 | Value, input channel 4 | Value, output channel 2 |
| 5 = MSW | Discrete inputs | Discrete outputs |

Analog Input Values

Mapping of analog input values is shown below.

| Input Word 1 | | | | | | | | | | | | | | | |
|--------------|-----------------------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| sign | value input channel 1 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| Input Word 4 | | | | | | | | | | | | | | | |
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| sign | value input channel 4 | | | | | | | | | | | | | | |

Resolution

The resolution of the module is 12-, 13- or 14-bit, depending on the range.

Discrete Inputs and Outputs

Overview

The 170 AMM 090 01 TSX Momentum I/O base supports 4 discrete inputs and 2 discrete outputs. This section describes how to map I/O data between the I/O base and the CPU.

NOTE: You cannot commission the discrete I/O until parameters have been set for all six analog channels.

You must configure analog inputs and outputs, even if they are not being used, for the discrete inputs and outputs to operate.

Key

The discrete inputs and outputs are I/O mapped as word 5, the most significant word, as shown in the table below:

| Word | Input Data | Output Data |
|---------|------------------------|---------------------------------------|
| 1 = LSW | Value, input channel 1 | Parameters for input channels 1 ... 4 |
| 2 | Value, input channel 2 | Parameters for output channels 1,2 |
| 3 | Value, input channel 3 | Value, output channel 1 |
| 4 | Value, input channel 4 | Value, output channel 2 |
| 5 = MSW | Discrete inputs | Discrete outputs |

Number of Words

The processor sends two discrete output data bits in one 16-bit word to the I/O base.

The base returns four discrete input data bits, and possibly an error message, if one has been detected, to the processor in one 16-bit word.

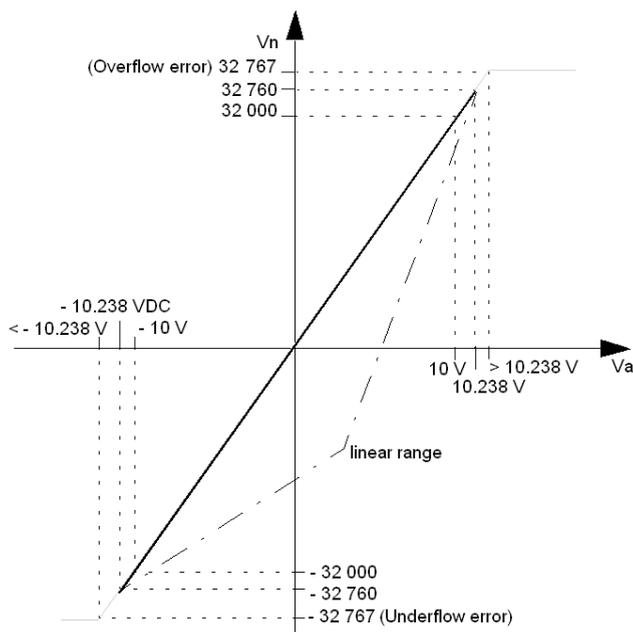
Input and Output Measuring Ranges

Overview

This section contains illustrations explaining the analog/digital relation for the various input and output measuring ranges.

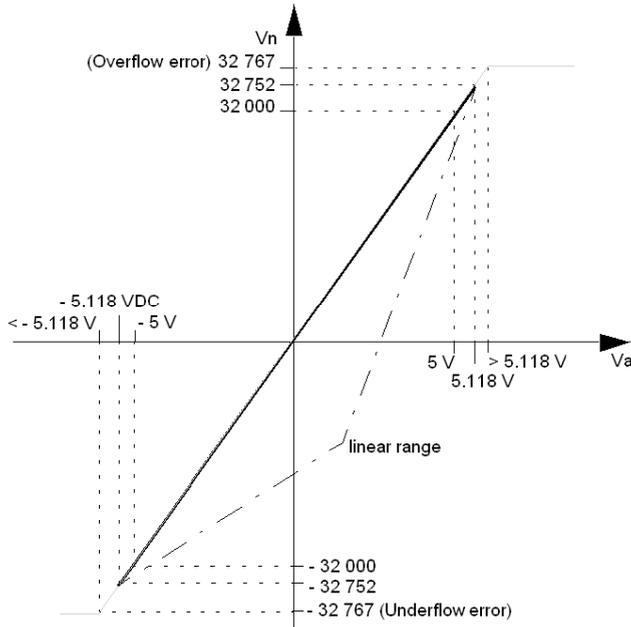
Input Range +/- 10 V

The following diagram shows the analog/digital relation for the input measuring range +/- 10 V. The voltage value is calculated along the following formula using the digital measurand: $V_n = 3200 \times V_a$ (for the linear range):



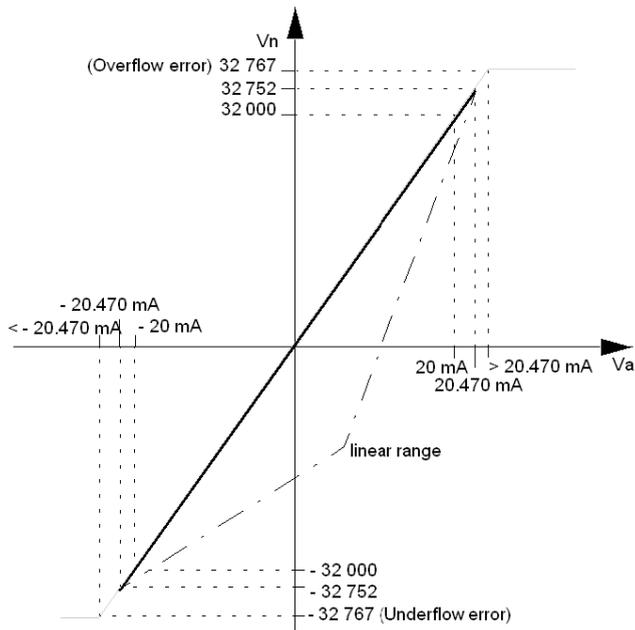
Input Range +/- 5 V

The following diagram shows the analog/digital relation for the input measuring range +/- 5 V. The voltage value is calculated along the following formula using the digital measurand: $V_n = 6400 \times V_a$ (for the linear range):



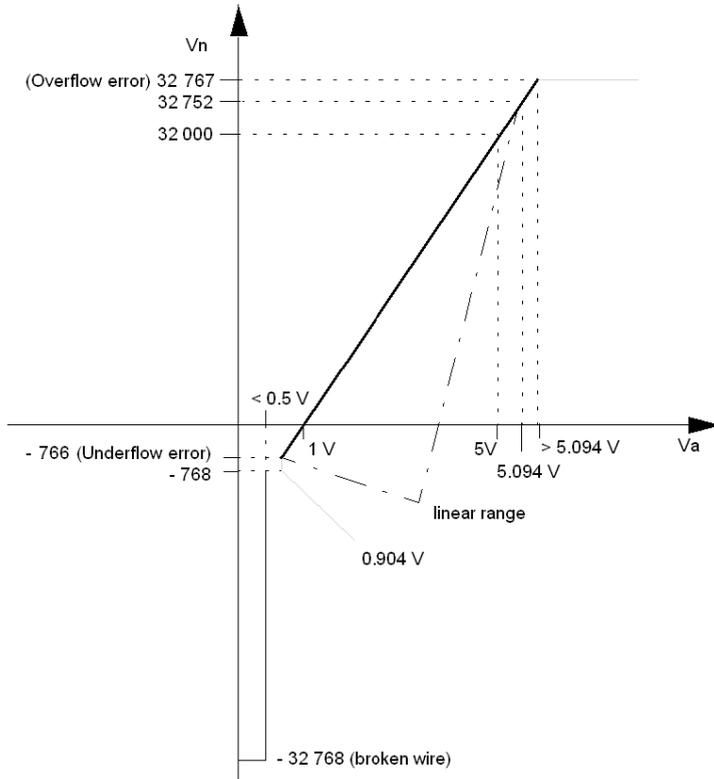
Input Range +/- 20 mA

The following diagram shows the analog/digital relation for the input measuring range +/- 20 mA. The current value is calculated along the following formula using the digital measurand: $V_n = 1600 \times I_a$ (for the linear range):



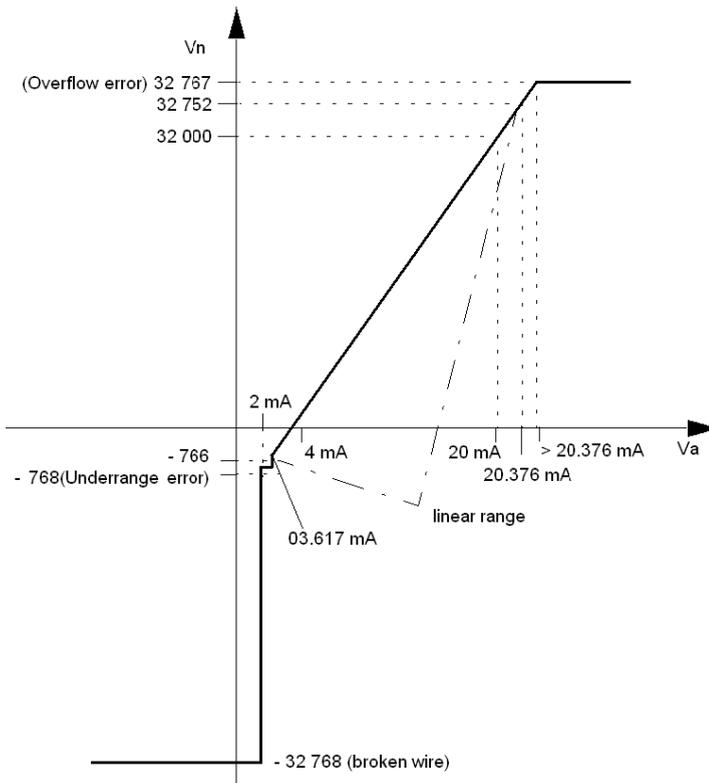
Input Range 1 ... 5 V

The following diagram shows the analog/digital relation for the input measuring range 1 ... 5 V. The voltage value is calculated along the following formula using the digital measurand: $V_n = 8000 \times V_a - 8000$ (for the linear range):



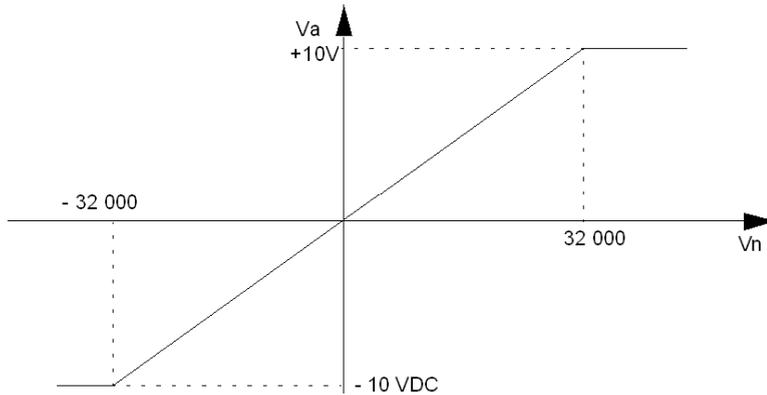
Input Range 4 ... 20 mA

The following diagram shows the analog/digital relation for the input measuring range 4... 20 mA. The current value is calculated along the following formula using the digital measurand: $V_n = 2000 \times I_a - 8000$ (for the linear range). Disabled channels deliver a value of 0.



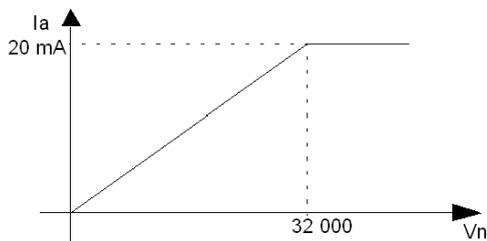
Output Range +/- 10 V

The following diagram shows the analog/digital relation for the output range +/- 10 V. When the bus is reset, the outputs use the configured parameters. If the module does not have valid parameters, the outputs will go to 0 V resp. 0 mA. The output voltage value is calculated along the following formula using the digital default value: $V_a = 1/3200 \times V_n$.



Output Range 0 ... 20 mA

The following diagram shows the analog/digital relation for the output range 0 ... 20 mA. When the bus is reset, the outputs use the configured parameters. If the module does not have valid parameters, the outputs will go to 0 V resp. 0 mA. The output current value is calculated along the following formula using the digital default value: $I_a = 1/1600 \times V_n$.



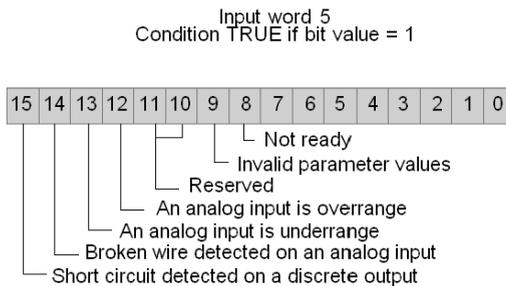
Error Messages

Overview

Error messages are stored in input word 5 (the $3x + 4$ register). This section explains how to interpret the bits in that register.

Diagram

This diagram explains the error message displayed by each bit. A value of 1 indicates the error has occurred



Not Ready (Bit 8)

This error occurs when the I/O base has not yet received valid parameters or has just received parameters for the first time and is checking them.

Invalid Parameters (Bit 9)

This error occurs when the I/O base refuses one or more invalid parameters. The base will continue working with the old parameters until it receives a complete set of valid parameters.

Overrange Indication (Bit 12)

This error occurs when the I/O base detects an overrange analog input value. The threshold is range-dependent.

Underrange Indication (Bit 13)

This error occurs when the I/O base detects an underrange analog input value. The threshold is range-dependent.

Broken Wire Detection (Bit 14))

Broken wire detection is possible for the 4 ... 20 mA range. In this case, a current signal that is less than 2 mA on one of the inputs is detected as a broken wire. The input word of that channel returns the value -32,768.

In the 1 ... 5 VDC range, broken wire detection is correctly seen as undervoltage detection. A voltage of less than 0.5 VDC on one of the input channels is recognized as broken wire. The input word of that channel returns the value -32,768.

In case of a broken wire, the input floats and bit 14 is not set in all cases. A reliable broken wire detection is only possible if a resistor is wired in parallel to the input terminals. This resistor will discharge the input capacity and broken wire detection will be available.

The value of this resistor depends on internal resistance of the sensor. Values too low might influence the input signal and values too high lengthen the time for broken wire detection. Normally, values of less than 100 kOhm are appropriate.

Short Circuit (Bit 15)

This error occurs when the I/O base detects a short circuit on a discrete output.

Chapter 35

170AMM11030 Analog 2 Ch. In / 2 Ch. Out Module Base with 16 Discrete Inputs and 8 Discrete Output Points

Purpose

This chapter describes the 170AMM11030 analog/discrete Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--|------|
| Front Panel Components | 592 |
| Specifications | 594 |
| Internal Pin Connections | 599 |
| Field Wiring Guidelines | 600 |
| Wiring Diagrams | 602 |
| I/O Map | 604 |
| Register for Outputs | 605 |
| 4x Registers | 608 |
| Register for Inputs | 609 |
| Analog Map | 611 |
| Discrete I/O Points and IEC Compliant Data Mapping | 612 |
| Input and Output Ranges | 613 |

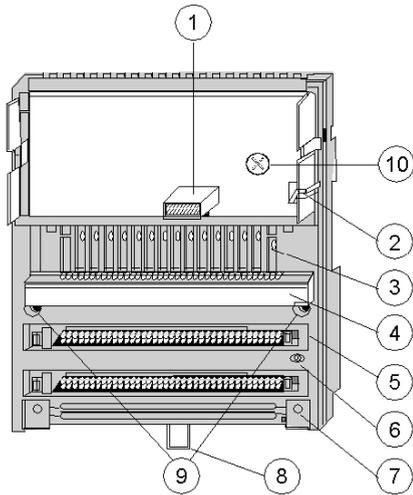
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170AMM11030 I/O base and a description of the LEDs.

Front Panel Illustration

The illustration below shows the front panel of the I/O base.

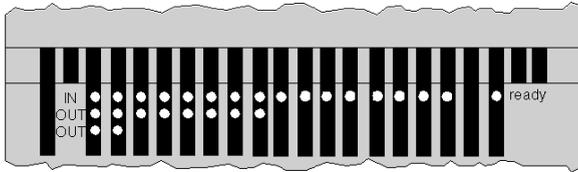


Components of the I/O Module:

| Label | Description |
|-------|--|
| 1 | Internal interface (ATI) connector |
| 2 | Locking and ground contact for the adapter |
| 3 | LED status display |
| 4 | Protective cover |
| 5 | Sockets for the terminal connectors |
| 6 | Grounding screw |
| 7 | Busbar mounting slot |
| 8 | Locking tab for DIN rail mount |
| 9 | Mounting holes for panel mount |
| 10 | Standoff -- ground nut |

LED Illustration

The illustration below shows the LEDs.



LED Descriptions

The following table describes the LEDs.

| LED | Color | Status | Meaning |
|---|-------|--------|--|
| Ready | Green | ON | I/O base is communicating with the comm adapter/CPU top hat. CPU must be in RUN state. |
| I1, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, I15, I16 | Green | ON | Indicates the corresponding input point is ON. |
| O1, O2, O3, O4, O5, O6, O7, O8 | Green | ON | Indicates the corresponding discrete output point is ON. |
| AO1, AO2 | Green | ON | Indicates the corresponding analog output channel is active. |

Specifications

Overview

This section contains specifications for the 170AMM11030 Momentum I/O base.

General Specifications

The following table contains general specifications for the I/O base. Each discrete output is protected against short-circuiting and overload.

| | |
|--|---|
| External Power Requirement | |
| Normal Operating Voltage Range | 16 to 42 VDC |
| Absolute Minimum Voltage | 12 VDC |
| Absolute Maximum Voltage | 45 VDC |
| Electrical | |
| Module Current | 400 mA at 24 VDC |
| EMC for Industrial Environment | |
| Immunity | IEC 1131-2 Surge on auxiliary power supply 500 V |
| Emissions | EN 50081-2 |
| ENV 50140 | 10 V/M |
| Agency Approvals | UL, CSA, CE, FM Class 1, Div. 2 (pending) |
| Isolation | |
| Discrete I/O point to discrete I/O point | None |
| Field to ground | 500 VAC |
| Field to communication adapter | 500 VAC |
| Analog output channel to channel | 700 VDC |
| Environmental | |
| Storage Temperature | -40 to 85° C |
| Operating Temperature | 0 to 60° C |
| Humidity Operating | 95% RH @ 60° C |
| Humidity Non-Operating | 95% RH @ 60° C |
| Vibration Operating | 10 - 57 HZ 0.075 MMDA 57 - 150 HZ 1 G |
| Shock Non-Operating | 15 G, 11 MS, 3 shocks/axis |
| Free Fall (Unpackaged) | 0.1 meter |

Analog Inputs

The following table contains specifications for analog inputs.

| | |
|---|--|
| Number of Channels | 2 |
| Input Ranges | ± 10 VDC |
| Input Type | Single-ended |
| Resolution | 14 bit |
| Surge Tolerance | |
| Voltage Input | ± 30 VDC |
| Over-range Tolerance | 5% full scale |
| Protection | Polarity inversion |
| Common Mode Rejection | 250 VAC @ 47 to 63 HZ or 250 VDC channel to ground |
| Cross Talk Between Channels | \pm lowest significant bit |
| Common Mode Rejection Ration @ DC | \pm lowest significant bit |
| Common Mode Rejection Ration @ 50/60 | \pm lowest significant bit |
| Maximum Input Signal | 15 VDC for voltage input |
| Filtering | Low pass with cutoff frequency 900 Hz |
| Conversion Times | 1.6 ms maximum for 2 input channels |
| Sampling Period | 3.2 ms per channel |
| Range | ± 10 VDC |
| Input Impedance | > 2.2 MOhm |
| Error @ 25°C | 0.2% for full scale |
| Error @ 60°C | 0.55% for full scale |
| Temperature Drift @ 60°C | 100ppm full scale /°C |

Analog Outputs

The following table contains specifications for analog outputs.

| | |
|---|--|
| Number of Channels | 2 |
| Output Ranges | ± 10 VDC |
| Resolution | 14 Bit |
| Conversion Times | 1.60 ms for all channels |
| Output Setting Time | 3.2 ms to 0.1% of final value |
| Accuracy | Max. error @ 25°C $\pm 0.4\%$ for -10 to +10 VDC |
| Linearity | ± 1 LSB, Guaranteed Monotonic |
| Output Impedance | < 0.2 Ohms |
| Maximum Output Current | 5 mA |
| Maximum Temperature Drift @ 60°C | ± 100 ppm of full scale per °C |
| Data Format | Left justified |
| Crosstalk Between Channels | 80 dB |
| Load | > 2K Ohms @ ± 10 VDC |
| Channel to Channel Isolation | 700 VDC |

Discrete Inputs

The following table contains specifications for discrete inputs.

| | |
|-----------------------------------|---|
| Operating Voltage | 16 to 42 VDC |
| Absolute Minimum Voltage | 12 VDC |
| Absolute Maximum Voltage | 45 VDC |
| Number of Points | 16 |
| Number of Groups | 1 |
| Points per Group | 16 |
| Type of Signal | True high (sourcing) |
| IEC 1131 I/O Type @ 24 VDC | 1+ |
| Minimum ON Voltage | > 11 VDC |
| Maximum OFF Voltage | < 5 VDC |
| Input Operating Current | 1.2 mA and lower, off 2.5 to 10 mA, on |

| | |
|----------------------|--|
| Input Voltage | |
| Range | 16 to +42 VDC |
| Surge | 75 volt peak for 10 ms |
| Response Time | 6.2 ms OFF to ON @ 24 VDC 7.3 ms ON to OFF @ 24 VDC |

Discrete Outputs

The following table contains specifications for discrete outputs.

| | |
|---------------------------------|--------------------------------------|
| Description | Solid state switch |
| Operating Voltage | 16 - 42 VDC |
| Absolute Minimum Voltage | 12 VDC |
| Absolute Maximum Voltage | 45 VDC |
| Maximum Voltage | 50 VDC for 1 ms |
| Number of Points | 8 |
| Number of Groups | 1 |
| Points per Group | 8 |
| Current Capacity | 250 mA per point 2 amps per module |
| Type of Signal | True high (sourcing) |
| Leakage Current | < 1 mA @ 42 VDC |
| Surge Current | 5 amps for 1 ms |
| On State Voltage Drop | < 1.0 VDC max at 0.25 amp current |
| Fault Sensing | Overload and short circuit |
| Fault Reporting | System bit |
| Response Time | 1.8 ms OFF to ON 1.8 ms ON to OFF |

CAUTION

Discrete VDC outputs incorporate thermal shutdown and overload protection.

The output current of a shorted output is limited to a nondestructive value. The short circuit heats the output driver, and the output will switch off. The output will switch on again if the driver leaves the over temperature condition and the user resets the output under program control. If the short circuit still exists after the output point is reset, the driver will reach the over temperature condition again and will switch off again.

Failure to follow these instructions can result in injury or equipment damage.

Physical Dimensions

The following table outlines physical dimensions for the I/O base.

| | |
|-------------------------|---|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) no or one busbar 159.5 mm (6.3 in) two busbars 171.5 mm (6.75 in) three busbars |
| Weight | 220 g (0.49 lb) |

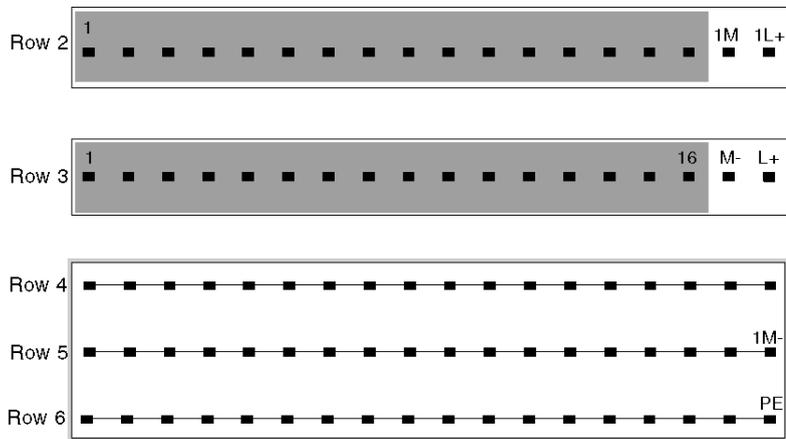
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

The following illustration shows the internal connections between terminals.



NOTE: AGND and DGND are connected at a single point inside the module. External digital inputs must be returned to the DGND terminal. External analog circuits must be returned to AGND terminals.

Field Wiring Guidelines

Overview

This section contains wiring guidelines and precautions for wiring the 170AMM11030 Momentum I/O base.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3- row busbar. The following busbars are available from Schneider Electric.

| Type | Number of Rows | Part Number |
|-------------|----------------|----------------|
| Screw-in | 1 - row | 170 XTS 006 01 |
| | 2 - row | 170 XTS 005 01 |
| | 3 - row | 170 XTS 004 01 |
| Spring-clip | 1 - row | 170 XTS 007 01 |
| | 2 - row | 170 XTS 008 01 |
| | 3 - row | 170 XTS 003 01 |

Mapping Terminal Blocks and Busbars

The following table shows the mapping of terminal blocks and optional busbars.

| Row # | Terminal # | Connection | Function |
|-------|------------|------------|--|
| 2 | 1-8 | 01 ... 08 | Discrete outputs 1-8 |
| | 9-10 | AI1, AI2 | Analog inputs 1-2 |
| | 11 & 13 | AO1+, AO2+ | Analog outputs 1-2 |
| | 12 & 14 | AO1-, AO2- | Return for analog outputs 1-2 |
| | 15 | AGND | Return for analog inputs |
| | 16 | | Return for discrete outputs |
| | 17 | | Return for outputs |
| | 18 | | +DC power for outputs |
| 3 | 1-16 | I1 ... I16 | Discrete inputs 1-16 |
| | 17 | | Return |
| | 18 | | +DC power |
| 4 | 1-18 | PE | Earth ground for field devices, PE analog ground |

Wiring Diagrams

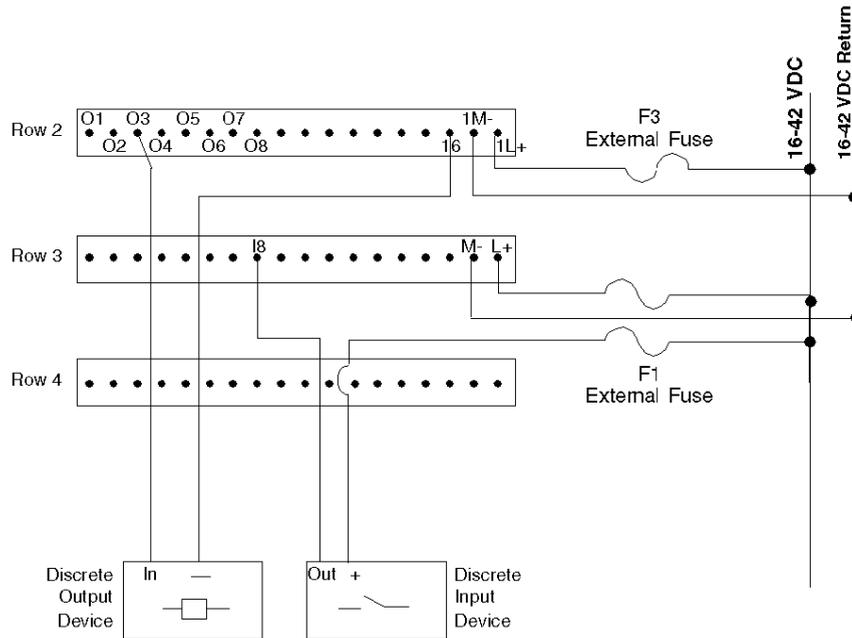
Overview

This section contains diagrams to assist you in wiring the following types of devices.

- discrete input and output
- analog input and output

Discrete I/O Devices

The diagram below shows field wiring for discrete input and discrete output devices.

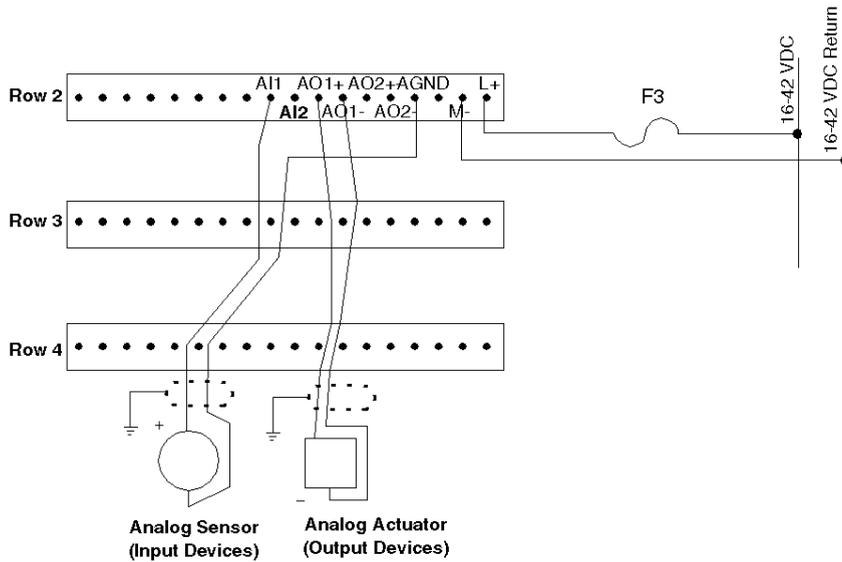


Recommended fuses:

- F1, F3: Use a 1A fuse, Wickman 19181-1A or equivalent.
- F2: Use a 2.5A fuse, Wickman 19181-2.5A or equivalent.

Analog I/O Devices

The diagram below shows field wiring for analog input and analog output devices.



Recommended fuses:

- F3: Use a 1A fuse, Wickman 19181-1A or equivalent.

I/O Map

I/O Map Module Configuration

The module must be I/O mapped as 8 contiguous input words and 8 contiguous output words.

Register for Outputs

Overview

170AMM11030 analog and discrete output channels are configured by entering the appropriate information in output words 1 through 5 as follows.

NOTE: The module will go to fail state values if network or communication adapter ATI communication is lost.

| Word | Function |
|------|---|
| 1 | System information |
| 2 | Register for discrete reaction in a fail state |
| 3 | Register for analog reaction in a fail state |
| 4 | User defined analog fail state values for channel 1 |
| 5 | User defined analog fail state values for channel 2 |
| 6 | State of the 8 discrete outputs |
| 7 | Analog output word channel 1 |
| 8 | Analog output word channel 2 |

Word 1

System Info Register

This word enables the module's operation, and specifies if user shutdown values are expected.

CAUTION

Zero is an illegal value for the parameter field (words 1-5).

A zero value in the parameter field will cause an output shut down state, and no inputs or outputs are updated. Any bit set in the parameter field, including those defined as not used, will enable the module.

Failure to follow these instructions can result in injury or equipment damage.

| Word 1 | Description |
|---------------|---|
| Bits 0 ... 14 | Not used |
| Bit 15 | 0 = Disables user defined shutdown values. 1 = Enables user defined shutdown values. |

- Valid setting for word one are 0001 ... FFFF
- The module's default value at power-up for this register is zero (module shut down).

Word 2

Discrete Fail State Reaction and Value Register

This word combines the discrete reaction in a fail state and values.

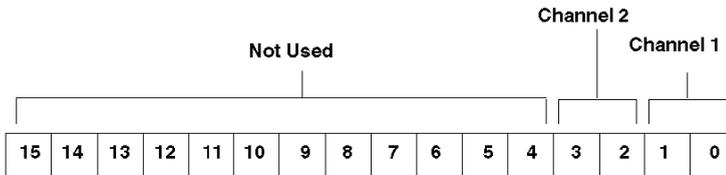
| Word 2 | Description |
|---------------|---|
| Bit 0 ... 7 | Discrete fail state value for outputs 1 ... 8 |
| Bits 8 ... 13 | Not used |
| Bit 14 | 0 = hold last value, 1 = user defined value |
| Bit 15 | 0 = all outputs reset, 1 = check bit 14 |

Word 3

Analog Fail State Reaction Register

This word contains two 2 bit fields that define the fail state for each channel. The four possible values of fail state are as follows.

| 2 Bit Value | Fail State |
|-------------|-------------------------------------|
| 00 | Minimum output voltage |
| 01 | Hold last value (default) |
| 10 | User defined shutdown value |
| 11 | Hold last value (not normally used) |

**Words 4 ... 5**

Analog Fail State Value Register

The module always expects two words of user defined data, even if the data is not used. The first word of the user shutdown field is used for channel 1, the second for channel 2.

4x Registers

Overview

The 4x registers traffic copped to this module are used for output data as follows.

| I/O Map Register | Data Type |
|------------------|----------------------------------|
| 4x + 5 | Data for discrete output |
| 4x + 6 | Data for analog output channel 1 |
| 4x + 7 | Data for analog output channel 2 |

Range

Output Operating Range

| | Output Voltage | Data is Left Justified | Comment |
|---------------------|---------------------|------------------------|------------------------------------|
| Output Range | -10.000 ... +10.000 | 00382 ... 32382 | Nominal output voltage range |
| Output Over Range | +10.000 ... +10.238 | 32384 ... 32764 | Linear over range output voltage |
| Output Out of Range | ≥ 10.238 | 32766 (7FFE Hex) | Threshold limited to 32766 decimal |
| Output Under Range | -10.238 ... -10.000 | 00002 ... 00382 | Linear under voltage range |
| Output Out of Range | ≤ -10.238 | 00000 | Threshold limited to 00000 |

Register for Inputs

Overview

The input register is arranged as follows.

| Word | Function |
|---------|---------------------------------|
| 1 | Status word (module status) |
| 2 | State of the 16 discrete inputs |
| 3 | Analog input word channel 1 |
| 4 | Analog input word channel 2 |
| 5 ... 8 | Not used |

Word 1

The status word (word 1) contains information about the health of the module and the status of the discrete outputs, including over temperature or short circuit of the discrete outputs.

| Bit(s) | Description |
|---------------|--|
| 15 ... 9 | Not used |
| 8 | 0 = bad module health (loss of communication to the base) 1 = healthy module) |
| 7 (Channel 8) | 0 = fault 1 = no fault |
| 6 (Channel 7) | 0 = fault 1 = no fault |
| 5 (Channel 6) | 0 = fault 1 = no fault |
| 4 (Channel 5) | 0 = fault 1 = no fault |
| 3 (Channel 4) | 0 = fault 1 = no fault |
| 2 (Channel 3) | 0 = fault 1 = no fault |
| 1 (Channel 2) | 0 = fault 1 = no fault |
| 0 (Channel 1) | 0 = fault 1 = no fault |

NOTE: The output fault bits and the corresponding discrete output are latched OFF when a short circuit or over temperature condition is detected. To reset the fault condition and make the output operational, the output bit that faulted needs to be set to an OFF state.

Word 2

Discrete Input Register

This word contains a right justified binary 16 bit data field.

| | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|
| 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

Words 3 ... 4

Analog Input Register

Each word in this range contains a left justified 15 bit data field. The range is from 0H to 7FFE hex, but the resolution is 14 bit (0 ... 32766 decimal or 0 ... 7FFE hex).

Words 5 ... 8

Words 5 ... 8 are not used.

3x Registers

The 3x registers traffic copped to this module are used for input data as follows.

| I/O Map Register | Data Type |
|------------------|---------------------------------|
| 3x + 1 | Data for discrete input |
| 3x + 2 | Data for analog input channel 1 |
| 3x + 3 | Data for analog input channel 2 |

Range

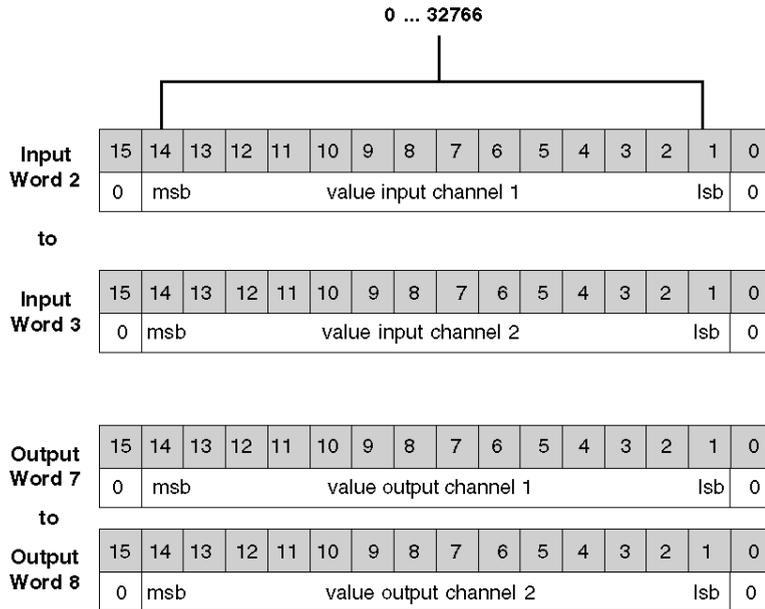
| | Input Voltage | Data is Left Justified | Comment |
|--------------------|---------------------|------------------------|--|
| Input Range | -10.000 ... +10.000 | 00382 ... 32382 | Nominal input voltage range |
| Input Over Range | +10.000 ... +10.238 | 32384 ... 32764 | Linear over range input voltage |
| Input Out of Range | ≥ 10.238 | 32766 (7FFE Hex) | Input voltage exceeding threshold may damage the module. |
| Input Under Range | -10.238 ... -10.000 | 00002 ... 00382 | Linear under voltage range |
| Input Out of Range | ≤ -10.238 | 00000 | Input voltage exceeding threshold may damage the module. |

Analog Map

Overview

170AMM11030 analog values are mapped as follows.

NOTE: The display is standardized, and, in each case, the analog value will appear left justified.

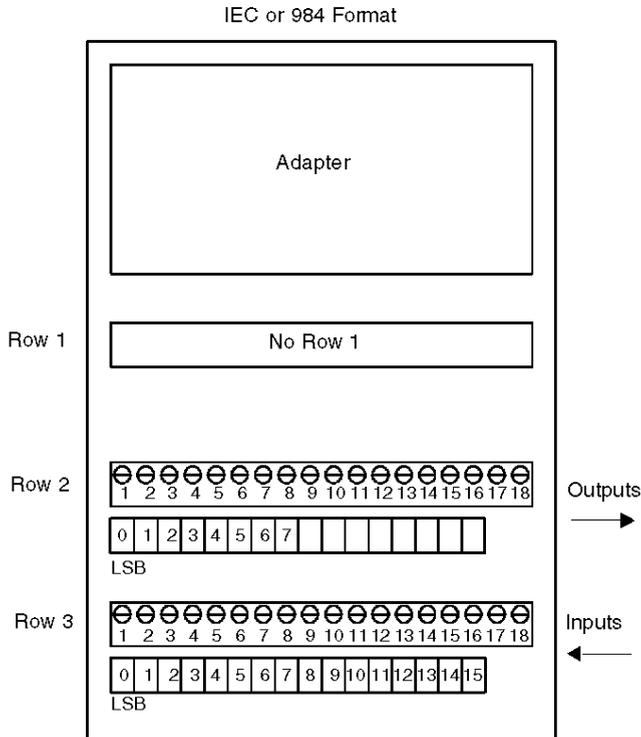


NOTE: The module resolution is 14-bit (0 ... 32766 decimal or 0 ... 7FFE hex).

Discrete I/O Points and IEC Compliant Data Mapping

Overview

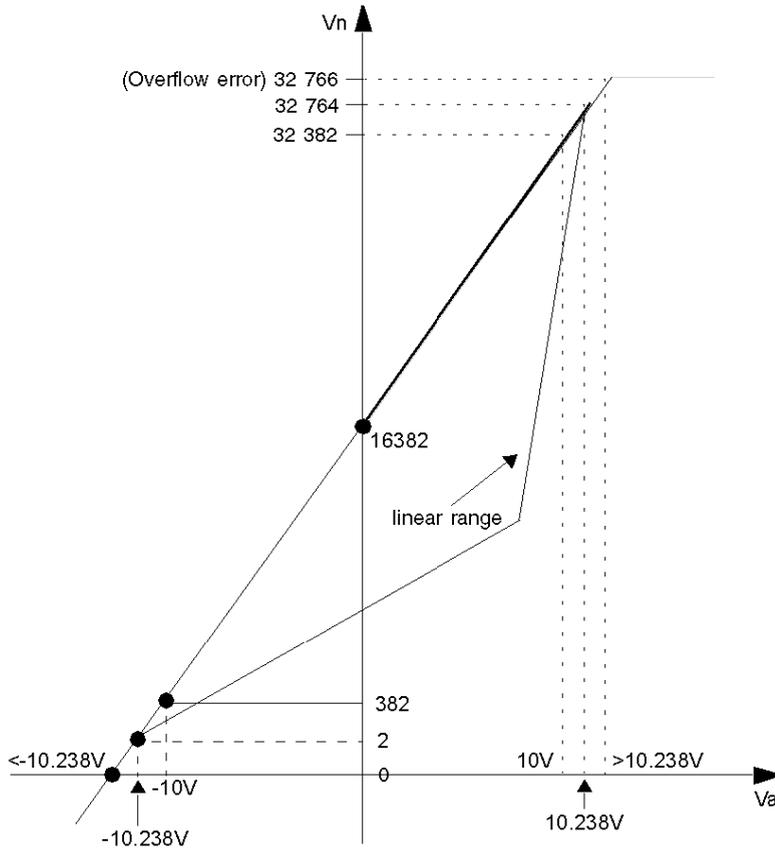
The 170AMM11030 base returns 16 discrete input bits to the processor in one 16-bit word (3x). The input points are field wired to row 2 of the base. The processor sends 8 discrete output bits to the base as a single 16-bit word (4x). The output points are field wired to row 3.



Input and Output Ranges

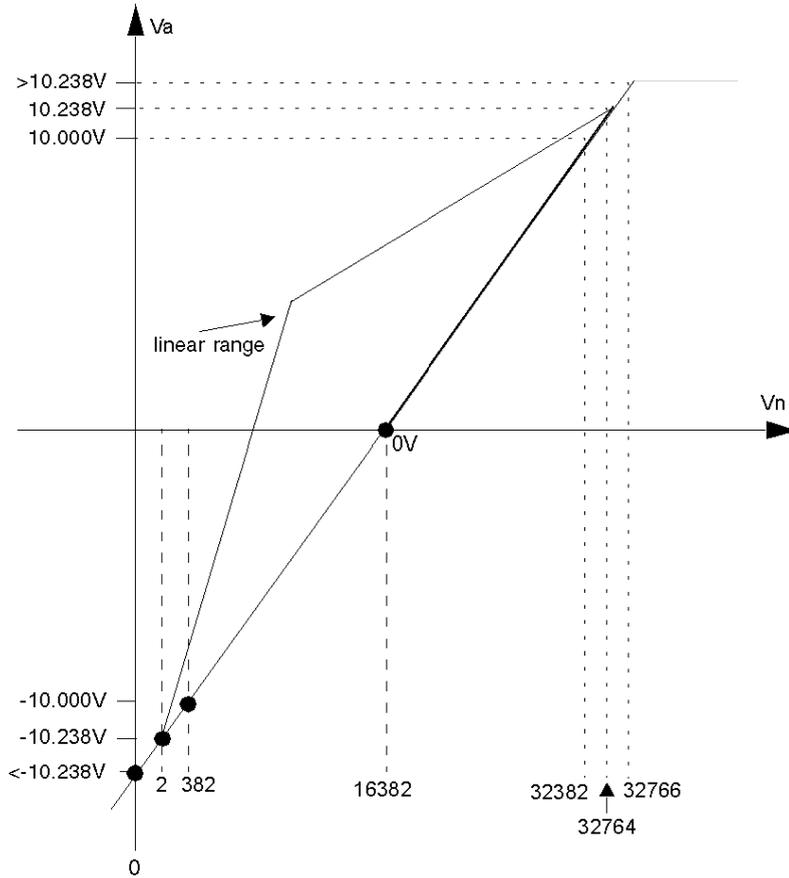
Ranges and Decimal Values Input Measuring Range $\pm 10\text{ V}$

The voltage value is calculated with the following formula using the digital measurand: $V_n = 1600 V_a + 16382$ (for the linear range).



Output Measuring Range $\pm 10\text{ V}$

The voltage value is calculated with the following formula using the digital measurand: $V_n = 1600 V_a + 16382$ (for the linear range).



Chapter 36

170 ANR 120 90 Unipolar Analog 6 Ch. In / 4 Ch. Out Module Base with 24 VDC I/O Points

Overview

This chapter describes the 170 ANR 120 90 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|-----------------------------------|------|
| Front Panel Components | 616 |
| Specifications | 618 |
| Internal Pin Connections | 622 |
| Field Wiring Guidelines | 623 |
| Wiring Diagrams | 625 |
| I/O Mapping | 627 |
| Output Words | 630 |
| Inputs Words | 634 |
| Input and Output Measuring Ranges | 636 |
| Error Messages | 638 |

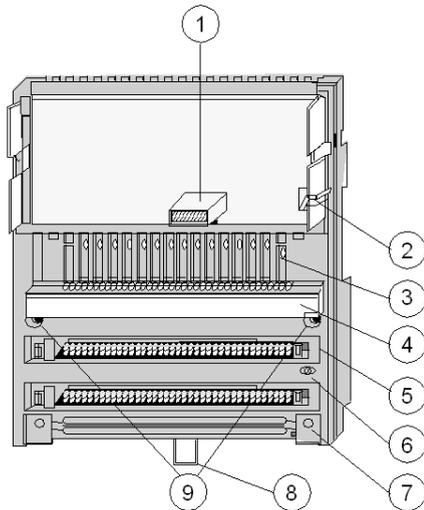
Front Panel Components

Overview

This section contains a photograph of the front panel of the 170 ANR 120 90 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

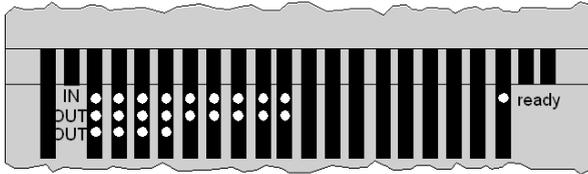


Components of the I/O module

| Label | Description |
|-------|--|
| 1 | Internal interface (ATI) connector |
| 2 | Locking and ground contact for the adapter |
| 3 | LED status display |
| 4 | Protective cover |
| 5 | Sockets for the terminal connectors |
| 6 | Grounding screw |
| 7 | Busbar mounting slot |
| 8 | Locking tab for DIN rail mount |
| 9 | Mounting holes for panel mount |

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

| LED | Color | Status | Meaning |
|--------------------------------|-------|--------|--|
| Ready | Green | ON | I/O base is communicating with the comm adapter/CPU top hat. CPU must be in RUN state. |
| O1, O2, O3, O4, O5, O6, O7, O8 | Green | ON | Indicates the corresponding discrete output point is ON |
| I1, I2, I3, I4, I5, I6, I7, I8 | Green | ON | Indicates the corresponding input point is ON |
| AO1, AO2, AO3, AO4 | Green | ON | Indicates the corresponding analog output channel is active |

Specifications

Overview

This section contains specifications for the 170 ANR 120 90 I/O base.

NOTE: In order for the 170 ANR 120 90 module to comply with the Directives 73/23/EEC (LV) and 89/336/EEC (EMC) and the IEC standards, EN 61131-2:2003 and EN 55011, the module must be used with a Telemecanique power supply, model numbers ABL7 RE2403, ABL RE2405, or ABL RE2410.

General Specifications

| | |
|----------------------------|--|
| Module type | Analog 6 inputs / 4 outputs Discrete 8 inputs / 8 outputs |
| Supply voltage | 24 VDC |
| Supply voltage range | 20-30 VDC |
| Supply current consumption | max. 400 mA |
| I/O map | 12 input words 12 output words |

Isolation

| | |
|---------------------------|---------|
| Between points | none |
| Between groups | none |
| Field to protective Earth | 500 VAC |

Protection

| | |
|------------------|---|
| Discrete outputs | protected against overload and short-circuiting |
|------------------|---|

EMC

| | |
|-----------------|---|
| Immunity | IEC 1131-2 Surge on auxiliary power supply 500 V |
| Emissions | EN 50081-2 |
| ENV 50140 | 10 V/M |
| Agency Approval | UL, CSA, CE |

Environment

| | |
|------------------------|--------------------------------------|
| Storage temperature | -40 TO 85 °C |
| Operating temperature | 0 TO 60 °C |
| Humidity operating | 95% RH @ 60 °C |
| Humidity non-operating | 95% RH @ 60 °C |
| Vibration operating | 10 - 57 HZ 0.075 MMDA 57-150 HZ 1 |
| Shock non-operating | 15 G, 11MS, 3 shocks/axis |
| Free fall (unpackaged) | 0.1 meter |

Physical Dimensions

| | |
|-------------------------|---|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) no or one busbar 159.5 mm (6.3 in) two busbars 171.5 mm (6.75 in) three busbars |
| Weight | 220 g (0.49 lb) |

Analog Inputs

| | |
|--------------------------|-------------------------------|
| Number of input channels | Six single-ended |
| Range | 0 to 10V |
| Input impedance | >1 megohm |
| Resolution | 14 bits |
| Accuracy, 25 °C | 0.2% |
| Linearity | |
| Integral linearity | 0.006% |
| Differential linearity | Guaranteed monotonic |
| Temp coefficient | + 100PPM/° C |
| Update time | 0.75msec for all six channels |
| Data format | Left justified |

Analog Outputs

| | |
|---------------------------|---------------------------------|
| Number of output channels | 4 |
| Range | 0 to 10V |
| Resolution | 14 bits |
| Accuracy, 25 °C | 0.4% |
| Linearity | |
| Integral linearity | 0.018% |
| Differential linearity | Guaranteed monotonic |
| Temp coefficient | + 100PPM/° C |
| Update time | 1.20 msec for all four channels |
| Data format | Left justified |

Discrete Inputs

| | |
|---------------------------------------|-----------------------------|
| Number of points | 8 sinking, type 2 |
| Voltage and current thresholds | |
| ON (voltage) | >11VDC |
| OFF (voltage) | <5VDC |
| ON (current) | >6mA |
| OFF (current) | <2mA |
| Absolute maximum input Continuous | 32VDC |
| Input response ON - OFF, OFF - ON | 1.20msec maximum |
| Input protection | Resistor limited, varistors |

Discrete Outputs

NOTE: The output current of a shortened output is limited to a nondestructive value. The short circuit heats the output driver and the output will switch off.

The output will switch on again if the driver leaves the overtemperature condition and the user resets the output under program control.

If the short circuit still exists after the output point is reset, the driver will reach the overtemperature condition again and will switch off again.

| | |
|------------------------------------|--|
| Number of output points | 8 sourcing |
| Operating voltage | |
| Working | 10 ... 30VDC |
| Absolute maximum | 50VDC for 1msec |
| ON state drop / point | 0.4VDC max at 0.25A |
| Maximum load current | |
| Each point | 0.25A |
| Per module | 2A |
| Off state leakage / point (max) | 0.4mA @ 30VDC |
| Surge current maximum Per point | 2.5A for 1msec |
| Response OFF-ON, ON-OFF | 1.20msec max |
| Output protection (internal) | Voltage suppressor diodes, Wickman 2.5A Fuse |

High-Speed Inputs and Electrical Noise

NOTE: When using high speed inputs on the 170 ANR 120 90 and 170 ANR 120 91 modules, the normal filtering of electrical transient events is not as effective as with other modules, and the inputs may respond to electrical noise in some environments.

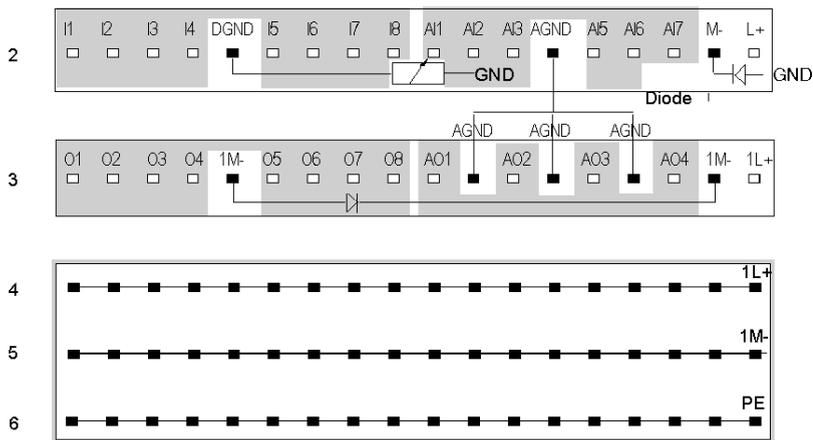
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

Rows 2 and 3 show the internal connections between terminals on the I/O base. Row 4 through 6 show the internal connections on the optional busbar.



NOTE: AGND and DGND are separated internally inside the module. External digital inputs must be returned to the DGND terminal. External analog circuits must be returned to AGND terminals.

Field Wiring Guidelines

Overview

Inputs are field wired to row 2 of the I/O base. Outputs are field wired to row 3. This section contains wiring guidelines and precautions for wiring the 170 ANR 120 90 TSX Momentum I/O base.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3- row busbar. The following busbars are available from Schneider Electric.

| Type | Number of Rows | Part Number |
|-------------|----------------|----------------|
| Screw-in | 1 - row | 170 XTS 006 01 |
| | 2 - row | 170 XTS 005 01 |
| | 3 - row | 170 XTS 004 01 |
| Spring-clip | 1 - row | 170 XTS 007 01 |
| | 2 - row | 170 XTS 008 01 |
| | 3 - row | 170 XTS 003 01 |

Mapping Terminal Blocks

The following table shows mapping terminal blocks and optional busbars.

| Row | Terminal | Connection | Description |
|-----|----------------|--------------------|---|
| 2 | 1-4 | I1 ... I4 | Discrete inputs 1 through 4 |
| | 5 | Digital ground | Return for discrete inputs |
| | 6-9 | I5 ... I8 | Discrete inputs 5 through 8 |
| | 10-12 | AI1 ... AI3 | Analog inputs 1, 2, 3 |
| | 13 | Analog ground | Return for analog inputs |
| | 14-16 | AI4 ... AI6 | Analog inputs 4, 5, 6 |
| | 17 | M- | Module operating voltage, 24VDC return |
| | 18 | L+ | Module operating voltage, 24VDC |
| 3 | 1-4 | O1 ... O4 | Discrete outputs 1 through 4 |
| | 5 | 1M- | Return for discrete outputs |
| | 6-9 | O5 ... O8 | Discrete outputs 5 through 8 |
| | 10, 12, 14, 16 | AO1, AO2, AO3, AO4 | Analog outputs 1, 2, 3, 4 |
| | 11, 13, 15 | Analog ground | Return for analog outputs |
| | 17 | 1M- | Voltage for field devices, 24VDC return |
| | 18 | 1L+ | Voltage for field devices, 24VDC |
| 4 | 1-18 | PE | Earth ground for field devices |

Wiring Diagrams

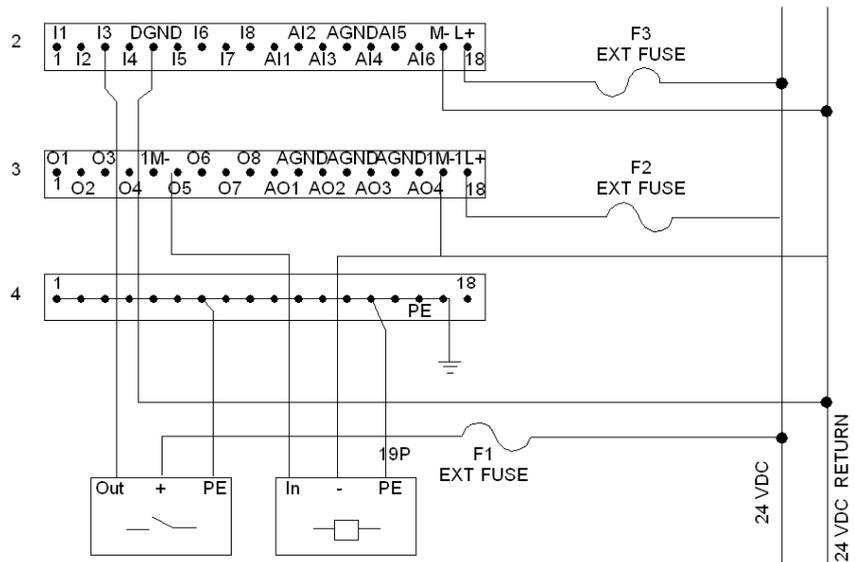
Overview

This section contains diagrams to assist you in wiring the following types of devices:

- Discrete input and output
- Analog input and output

Discrete I/O Devices

The diagram below shows an example of wiring for discrete I/O devices:

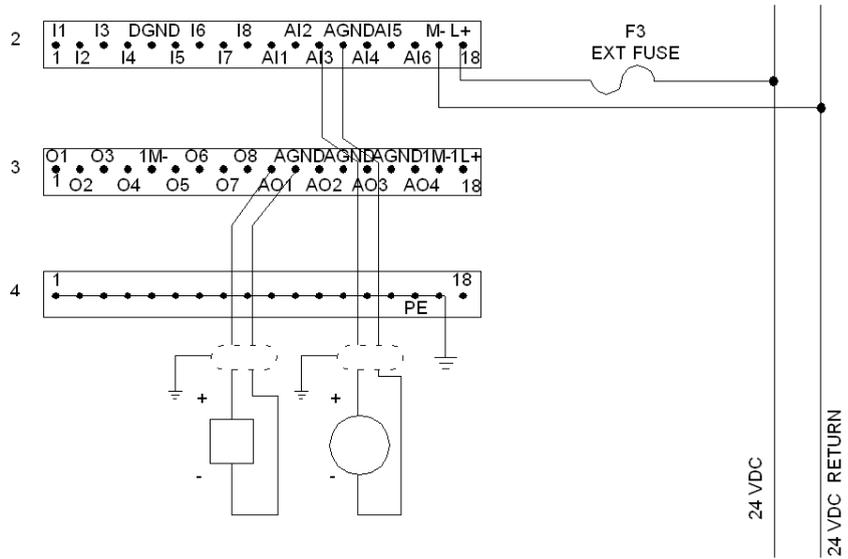


Recommended fuses:

- F1, F3 - use a 1A fuse, Wickman 181110000 or equivalent
- F2 - use a 2.5A fuse, Wickman 181125000 or equivalent

Analog I/O Devices

The diagram below shows an example of wiring for Analog I/O devices:



Recommended fuses:

- F3-use a 1A fuse, Wickman 18111000 or equivalent

I/O Mapping

Overview

The 170 ANR 120 90 TSX Momentum I/O base supports 6 analog inputs, 4 analog outputs, 8 discrete inputs and 8 discrete outputs. This section contains information about the mapping of the output words into the analog/discrete output values, the usage of output words for channel configuration and the mapping of analog/discrete input values into input words.

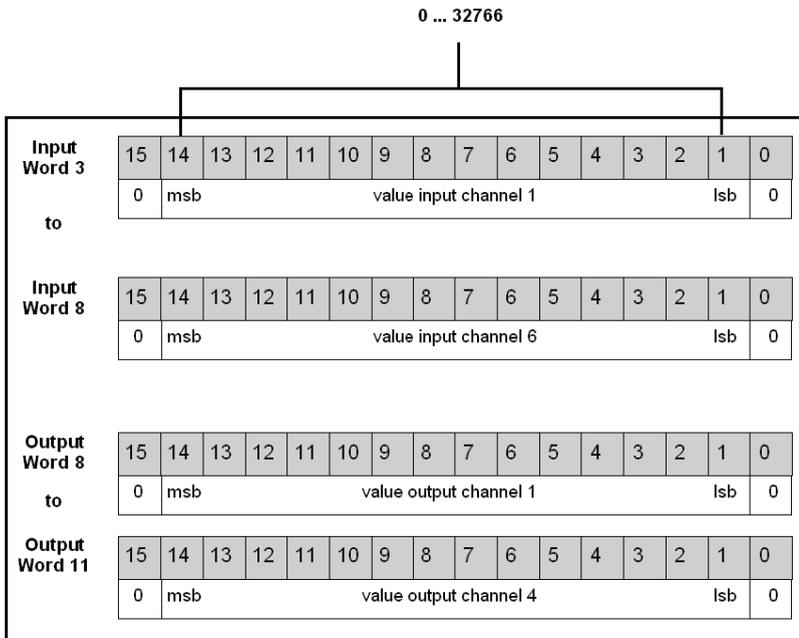
I/O Map

The I/O base must be mapped as 12 contiguous input words and 12 contiguous output words, as follows:

| Word | Input Data | Output Data |
|------|--------------------------------|---|
| 1 | Status word (module status) | System information |
| 2 | State of the 8 discrete inputs | Register for discrete reaction in a fail state |
| 3 | Analog input word channel 1 | Register for analog reaction in a fail state |
| 4 | Analog input word channel 2 | User defined analog fail state values for channel 1 |
| 5 | Analog input word channel 3 | User defined analog fail state values for channel 2 |
| 6 | Analog input word channel 4 | User defined analog fail state values for channel 3 |
| 7 | Analog input word channel 5 | User defined analog fail state values for channel 4 |
| 8 | Analog input word channel 6 | State of the 8 discrete outputs |
| 9 | Not used | Analog output word channel 1 |
| 10 | Not used | Analog output word channel 2 |
| 11 | Not used | Analog output word channel 3 |
| 12 | Not used | Analog output word channel 4 |

Analog I/O MAP

170 ANR 120 90 analog values are mapped as follows:

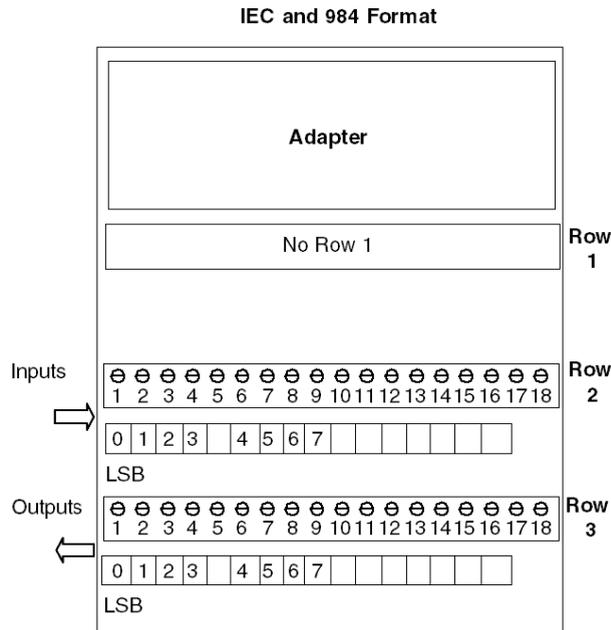


NOTE: The display is standardized and in each case the analog value will appear flush left.

Discrete I/O MAP

The 170 ANR 120 90 base returns eight discrete input bits to the Processor in one 16-bit word (3x). The input points are field wired to row 2 of the base. The Processor sends eight discrete output bits to the base as a single 16-bit word (4x). The output points are field wired to row 3. The figure below shows how the data is mapped between the base and the CPU.

:



Output Words

Overview

This section describes how to use the output words to configure the analog and discrete I/O channels.

Words Used

170 ANR 120 90 analog and discrete output channels are configured by entering the appropriate information in output words 1 through 7 as follows.

NOTE: If you are using Modsoft, the parameter words are modified through the zoom screen.

The I/O base must be mapped as 12 contiguous input words and 12 contiguous output words, as follows:

| Word | Output Data |
|------|---|
| 1 | System information |
| 2 | Register for discrete reaction in a fail state |
| 3 | Register for analog reaction in a fail state |
| 4 | User defined analog fail state values for channel 1 |
| 5 | User defined analog fail state values for channel 2 |
| 6 | User defined analog fail state values for channel 3 |
| 7 | User defined analog fail state values for channel 4 |
| 8 | State of the 8 discrete outputs |
| 9 | Analog output word channel 1 |
| 10 | Analog output word channel 2 |
| 11 | Analog output word channel 3 |
| 12 | Analog output word channel 4 |

Word 1

CAUTION

INVALID DATA CAUSE OUTPUT SHUT DOWN

Do not use a zero value in word one because it causes an output shut down state, and no inputs or outputs are updated.

Failure to follow these instructions can result in injury or equipment damage.

System information

The following table tells how bits are assigned:

| Word 1 | Description |
|---------------|--|
| Bits 0 ... 14 | Not used or can be used to start the module. (Turns on the Ready LED with any value greater than zero.) |
| Bit 15 | 1= Enable user defined shutdown values 2= Disables user defined shutdown values |

- Valid setting for word one are 0001 ... FFFF It is essential for the module's operation to have a value larger than 0 in this register.
- The module's default value at power-up for this register is zero (module shut down).

Word 2

Discrete Fail State Reaction and Value Register

This word combines the value and reaction in a fail state:

| Word 2 | Description |
|---------------|---|
| Bits 0 ... 7 | Discreet fail state value for outputs 1 8 |
| Bits 8 ... 13 | Not used |
| Bit 14 | 0= hold last value, 1= user defined value |
| Bit 15 | 0= all outputs reset, 1=check bit 14 |

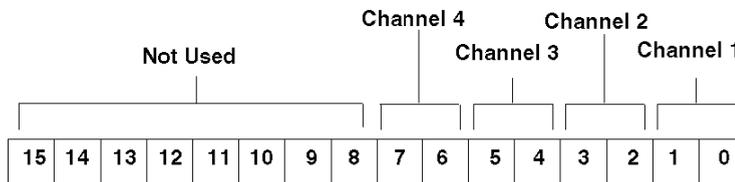
Word 3

Analog Fail State Reaction Register

This word contains four 2 bit fields which define the fail state for each channel. The four possible values of fail state are as follows:

| 2 bit value | Fail State |
|-------------|-----------------------------|
| 00 | Minimum output voltage |
| 01 | Hold last value (default) |
| 10 | User defined shutdown value |
| 11 | Hold last value |

The following picture shows how the channels are mapped into word 3:

**Words 4 ... 7**

Analog Fail State Value Register

The module always expects four words of user defined data, even if the data is not used. The first word of the user shutdown field is used for channel 1, the second for channel 2, . . .

Word 8

Discrete Output Register This word contains a right justified binary eight bit data field.

Words 9 ... 12

Map to Analog Output Register

Each word in this range contains a left justified, binary 15 bit data field. The range is 0 ... 7FFE hex (0 ... 32766 decimal), but the resolution is only 14 bit (See *Analog I/O MAP, page 628*).

NOTE: If a user shutdown value is greater than the count range for the channel, then the count range maximum value will be used as the shutdown value.

4x Registers

The 4x registers traffic copped to this module are used for output data as follows.

| I/O Map Register | Data Type |
|------------------|----------------------------------|
| 4x + 7 | Data for discrete output |
| 4x + 8 | Data for analog output channel 1 |
| 4x + 9 | Data for analog output channel 2 |
| 4x + 10 | Data for analog output channel 3 |
| 4x + 11 | Data for analog output channel 4 |

Range

Output operating range

| | Output Voltage | Data is left justified | Comment |
|---------------------|--------------------|------------------------|---|
| Output Range | 0 ... 10.000V | 0 ... 32000 | Nominal Output Voltage Range |
| Output Over Range | 10.000 ... 10.238V | 32002 ... 32764 | Linear Over Range Output Voltage |
| Output Out of Range | >=10.238 | 32766 (7FFE Hex) | Threshold Will Be Limited To 32766 Decimal |

Inputs Words

Overview

This section describes how to interpret the value of the input words.

Words Used

The status of the 170 ANR 120 90 module and the values of the analog and discrete input channels are contained in input words 1 through 8 as follows:

| Word | Input Data |
|----------|--------------------------------|
| 1 | Status word (module status) |
| 2 | State of the 8 discrete inputs |
| 3 | Analog input word channel 1 |
| 4 | Analog input word channel 2 |
| 5 | Analog input word channel 3 |
| 6 | Analog input word channel 4 |
| 7 | Analog input word channel 5 |
| 8 | Analog input word channel 6 |
| 9 ... 12 | Not used |

Word 1

The Status word (word 1) contains information about the health of the module and the status of the discrete outputs. Word 1 also contains network communication loss, over temperature of the discrete outputs and short circuit at the discrete outputs.

| Bits 15 ... 9 | Bit 8 | Bits 7 ... 4 | Bit 3 (Channel 7, 8) |
|---------------|---|--------------|---------------------------|
| Not used | 0 = Bad module health (module lost communication) 1 = Healthy module | Not used | 0 = Fault 1 = No fault |

| Bit 2 (Channel 5, 6) | Bit 1 (Channel 4, 3) | Bit 0 (Channel 1, 2) |
|---------------------------|---------------------------|---------------------------|
| 0 = Fault 1 = No fault | 0 = Fault 1 = No fault | 0 = Fault 1 = No fault |

Word 2

Discrete input register

This word contains a right justified binary eight bit data field.

Words 3 ... 8

Analog input register

Words 3 ... 8 map to the analog input register. Each word in this range contains a left justified 15 bit data field. The range is from 0H to 7FFE hex, but the resolution is 14 bit. (0 ... 32766 decimal or 0 ... 7FFE hex). See Analog I/O Map ([see page 628](#)).

Words 9 ...12

Words 9 ... 12 are not used.

3x Registers

The 3x registers traffic copped to this module are used for input data as follows.

| I/O Map Register | Data Type |
|------------------|---------------------------------|
| 3x + 1 | Data for discrete input |
| 3x + 2 | Data for analog input channel 1 |
| 3x + 3 | Data for analog input channel 2 |
| 3x + 4 | Data for analog input channel 3 |
| 3x + 5 | Data for analog input channel 4 |
| 3x + 6 | Data for analog input channel 5 |
| 3x + 7 | Data for analog input channel 6 |

Range

Input operating range

| | Input Voltage | Data is left justified | Comment |
|--------------------|--------------------|------------------------|--|
| Input Range | 0 ... 10.000V | 0 ... 32000 | Nominal Input Voltage Range |
| Input Over Range | 10.000 ... 10.238V | 32002 ... 32764 | Nondestructive Tolerated Input Over Range Voltage |
| Input Out of Range | >=10.238 | 32766 (7FFE Hex) | Input Voltage Exceeding This Threshold May Damage The Module |

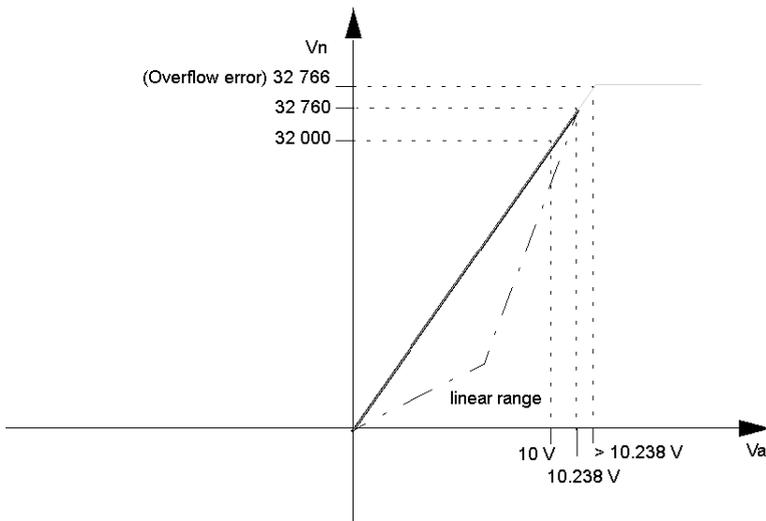
Input and Output Measuring Ranges

Overview

This section contains illustrations explaining the analog/digital relation for the various input and output measuring ranges.

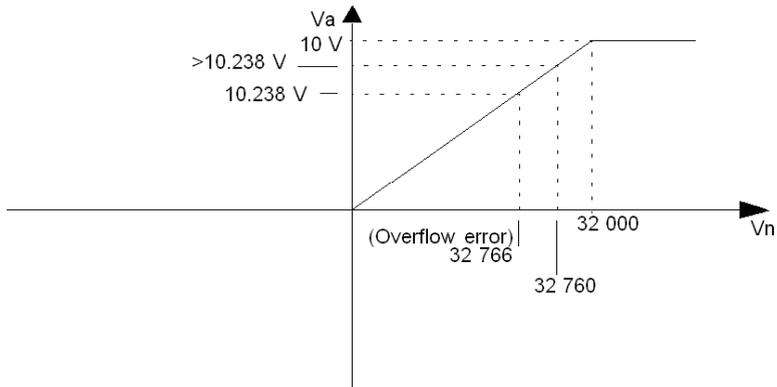
Input Range 0 -10 V

The following diagram shows the analog/digital relation for the input measuring range 0 - 10 V. The voltage value is calculated along the following formula using the digital measurand: $V_n = 3200 \times V_a$ (for the linear range):



Output Range 0 -10 V

The following diagram shows the analog/digital relation for the output measuring range 0 -10 V. The voltage value is calculated along the following formula using the digital measurand: $V_n = 3200 \times V_a$ (for the linear range):



Error Messages

Interpreting the Error Bits

If an internal error is detected in the module, the module becomes nonoperational. Other error messages are posted in the four least significant bits of the status word.

Chapter 37

170 ANR 120 91 Bipolar Analog 6 Ch. In / 4 Ch. Out Module Base with 24 VDC I/O Points

Overview

This chapter describes the 170 ANR 120 91 bipolar analog TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--|------|
| Front Panel Components | 640 |
| Specifications | 642 |
| Internal Pin Connections | 645 |
| Field Wiring Guidelines | 646 |
| Wiring Diagrams | 648 |
| I/O Map | 650 |
| Register for Outputs | 651 |
| 4x Registers | 654 |
| Register for Inputs | 655 |
| Analog Map | 657 |
| Discrete I/O Points and IEC Compliant Data Mapping | 658 |
| Input and Output Ranges | 659 |
| Interpreting the Error Bits | 661 |

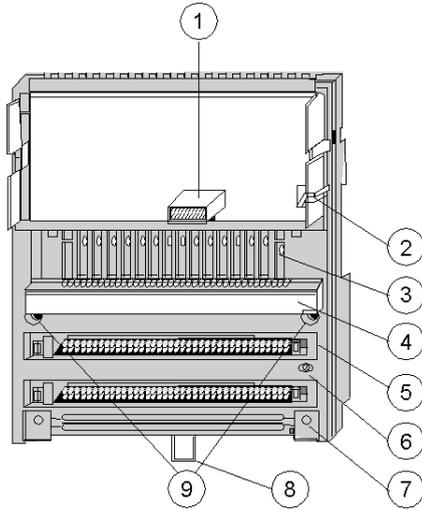
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ANR 120 91 I/O base and a description of the LEDs.

Front Panel Illustration

The illustration below shows the front panel of the I/O base.

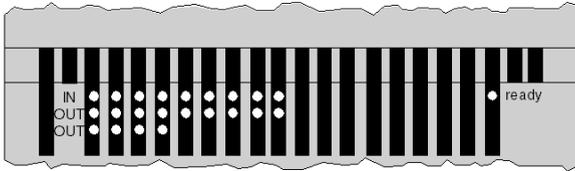


Components of the I/O Module:

| Label | Description |
|-------|--|
| 1 | Internal interface (ATI) connector |
| 2 | Locking and ground contact for the adapter |
| 3 | LED status display |
| 4 | Protective cover |
| 5 | Sockets for the terminal connectors |
| 6 | Grounding screw |
| 7 | Busbar mounting slot |
| 8 | Locking tab for DIN rail mount |
| 9 | Mounting holes for panel mount |

LED Illustration

The illustration below shows the LEDs.



LED Descriptions

The following table describes the LEDs.

| LED | Color | Status | Meaning |
|--------------------------------|-------|--------|--|
| Ready | Green | ON | I/O base is communicating with the comm adapter/CPU top hat. CPU must be in RUN state. |
| O1, O2, O3, O4, O5, O6, O7, O8 | Green | ON | Indicates the corresponding discrete output point is ON. |
| I1, I2, I3, I4, I5, I6, I7, I8 | Green | ON | Indicates the corresponding input point is ON. |
| AO1, AO2, AO3, AO4 | Green | ON | Indicates the corresponding analog output channel is active. |

Specifications

Overview

This section contains specifications for the 170 ANR 120 91 TSX Momentum I/O base.

NOTE: In order for the 170 ANR 120 91 module to comply with the Directives 73/23/EEC (LV) and 89/336/EEC (EMC) and the IEC standards, EN 61131-2:2003 and EN 55011, the module must be used with a Telemecanique power supply, model numbers ABL7 RE2403, ABL RE2405, or ABL RE2410.

General Specifications

The following table contains general specifications for the I/O base. Each discrete output is protected against short-circuiting and overload.

| | |
|---------------------------------------|---|
| Electrical | |
| Module current | 400 mA at 19.2 Vdc to 30 Vdc |
| EMC for industrial environment | |
| Immunity | IEC 1131-2 Surge on auxiliary power supply 500 V |
| Emissions | EN 50081-2 |
| ENV 50140 | 10 V/M |
| Agency approvals | UL, CSA, CE |
| Isolation | |
| Between points | None |
| Between groups | None |
| Field to protective Earth | 500 VAC |
| Environmental | |
| Storage temperature | -40 to 85° C |
| Operating temperature | 0 to 60° C |
| Humidity operating | 95% RH @ 60° C |
| Humidity non-operating | 95 RH @ 60° C |
| Vibration operating | 10 - 57 HZ 0.075 MMDA 57 - 150 HZ 1 G |
| Shock non-operating | 15 G, 11 MS, 3 shocks/axis |
| Free fall (unpackaged) | 0.1 meter |

Analog Inputs

| | |
|--|--------------------------------|
| Number of input channels | Six single-ended |
| Range | $\pm 10V$ |
| Input impedance | >1 megohm |
| Resolution | 14 bits |
| Accuracy, 25 °C | 0.2% |
| Linearity integral Linearity differential | 0.006% Guaranteed monotonic |
| Temp coefficient | + 100PPM/° C |
| Update time | 0.75 msec for all six channels |
| Data format | Left justified |

Analog Outputs

| | |
|--|---------------------------------|
| Number of input Channels | 4 |
| Range | $\pm 10V$ |
| Resolution | 14 bits |
| Accuracy, 25 °C | 0.4% |
| Linearity integral Linearity differential | 0.018% Guaranteed monotonic |
| Temp coefficient | + 100PPM/° C |
| Update time | 1.20 msec for all four channels |
| Data format | Left justified |

Discrete Inputs

| | |
|--------------------------------------|-----------------------------|
| Number of points | 8 sinking, type 2 |
| Voltage and current thresholds | |
| ON (voltage) | >11 VDC |
| OFF (voltage) | <5 VDC |
| ON (current) | >6 mA |
| OFF (current) | <2 mA |
| Absolute maximum input Continuous | 32 VDC |
| Input response ON - OFF, OFF - ON | 1.20 msec maximum |
| Input protection | Resistor limited, varistors |

Discrete Outputs

NOTE: The output current of a shortened output is limited to a nondestructive value. The short circuit heats the output driver, and the output will switch off.

The output will switch on again if the driver leaves the over temperature condition and the user resets the output under program control.

If the short circuit still exists after the output point is reset, the driver will reach the over temperature condition again, and will switch off again.

| | |
|---------------------------------|--|
| Number of output points | 8 sourcing |
| Operating voltage | |
| Working | 10 ... 30 VDC |
| Absolute maximum | 50 VDC for 1 msec |
| ON state drop / point | 0.4 VDC max at 0.25 A |
| Maximum load current | |
| Each point | 0.25 A |
| Per module | 2A |
| Off state leakage / point (max) | 0.4 mA @ 30 VDC |
| Surge current maximum | |
| Per point | 2.5 A for 1 msec |
| Response | |
| OFF-ON, ON-OFF | 1.20 msec max |
| Output protection (internal) | Voltage suppressor diodes, Wickman 2.5A fuse |

Physical Dimensions

| | |
|-------------------------|---|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) no or one busbar 159.5 mm (6.3 in) two busbars 171.5 mm (6.75 in) three busbars |
| Weight | 220 g (0.49 lb) |

High-Speed Inputs and Electrical Noise

NOTE: When using high speed inputs on the 170 ANR 120 90 and 170 ANR 120 91 modules, the normal filtering of electrical transient events is not as effective as with other modules, and the inputs may respond to electrical noise in some environments.

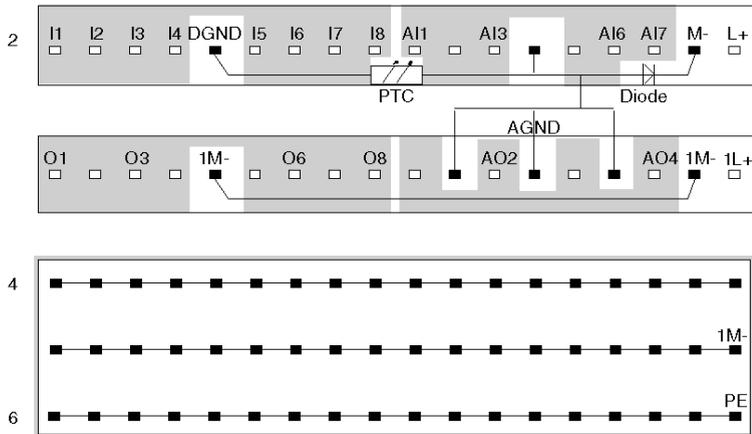
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base and an optional busbar.

Illustration

The following illustration shows the internal connections between terminals.



NOTE: AGND and DGND are connected at a single point inside the module. External digital inputs must be returned to the DGND terminal. External analog circuits must be returned to AGND terminals.

Field Wiring Guidelines

Overview

This section contains wiring guidelines and precautions for wiring the 170 ANR 120 91 TSX Momentum I/O base.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Automation sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-, 2-, or 3- row busbar. The following busbars are available from Schneider Automation.

| Type | Number of Rows | Part Number |
|-------------|----------------|----------------|
| Screw-in | 1 - row | 170 XTS 006 01 |
| | 2 - row | 170 XTS 005 01 |
| | 3 - row | 170 XTS 004 01 |
| Spring-clip | 1 - row | 170 XTS 007 01 |
| | 2 - row | 170 XTS 008 01 |
| | 3 - row | 170 XTS 003 01 |

Mapping Terminal Blocks and Busbars

The following table shows mapping terminal blocks and optional busbars.

| Row | Terminal | Connection | Description |
|-----|----------------|--------------------|---|
| 2 | 1-4 | I1 ... I4 | Discrete inputs 1 through 4 |
| | 5 | Digital ground | Return for discrete inputs |
| | 6-9 | I5 ... I8 | Discrete inputs 5 through 8 |
| | 10-12 | AI1 ... AI3 | Analog inputs 1, 2, 3 |
| | 13 | Analog ground | Return for analog inputs |
| | 14-16 | AI4 ... AI6 | Analog inputs 4, 5, 6 |
| | 17 | M- | Module operating voltage, 24VDC return |
| | 18 | L+ | Module operating voltage, 24VDC |
| 3 | 1-4 | O1 ... O4 | Discrete outputs 1 through 4 |
| | 5 | 1M- | Return for discrete outputs |
| | 6-9 | O5 ... O8 | Discrete outputs 5 through 8 |
| | 10, 12, 14, 16 | AO1, AO2, AO3, AO4 | Analog outputs 1, 2, 3, 4 |
| | 11, 13, 15 | Analog ground | Return for analog outputs |
| | 17 | 1M- | Voltage for field devices, 24VDC return |
| | 18 | 1L+ | Voltage for field devices, 24VDC |
| 4 | 1-18 | PE | Earth ground for field devices |

Wiring Diagrams

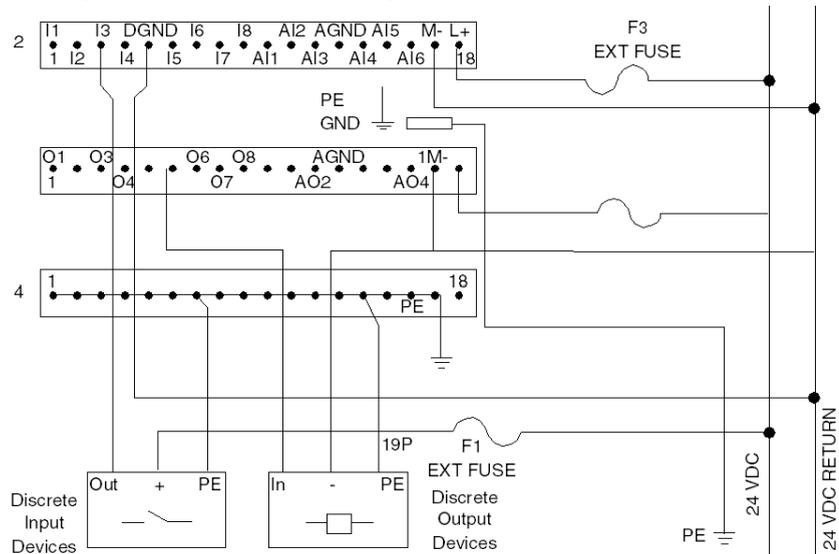
Overview

This section contains diagrams to assist you in wiring the following types of devices:

- Discrete input and output
- Analog input and output

Discrete I/O Devices

The diagram below shows field wiring for discrete input and discrete output devices.

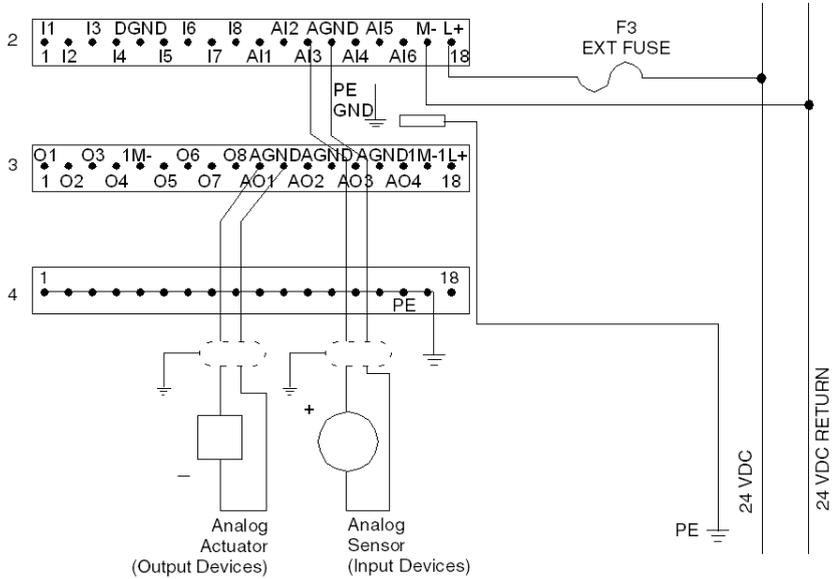


Recommended fuses:

- F1,F3-use a 1A fuse, Wickman 19181-1A or equivalent
- F2 -use a 2.5A fuse, Wickman 19181-2.5A or equivalent

Analog I/O Devices

The diagram below shows field wiring for analog input and analog output devices.



Recommended fuses:

- F3-use a 1A fuse, Wickman 19181-1A or equivalent

I/O Map

I/O Map Module Configuration

The module must be I/O mapped as 12 contiguous input and output words. The first 7 output words are parameter data.

Register for Outputs

Overview

170 ANR 120 91 analog and discrete output channels are configured by entering the appropriate information in output words 1 through 7 as follows.

NOTE: The module will go to fail state values if network or communication adapter ATI communication is lost.

| Word | Function |
|------|---|
| 1 | System information |
| 2 | Register for discrete reaction in a fail state |
| 3 | Register for analog reaction in a fail state |
| 4 | User defined analog fail state values for channel 1 |
| 5 | User defined analog fail state values for channel 2 |
| 6 | User defined analog fail state values for channel 3 |
| 7 | User defined analog fail state values for channel 4 |
| 8 | State of the 8 discrete outputs |
| 9 | Analog output word channel 1 |
| 10 | Analog output word channel 2 |
| 11 | Analog output word channel 3 |
| 12 | Analog output word channel 4 |

Word 1

CAUTION

INVALID DATA CAUSE OUTPUT SHUT DOWN

Do not use a zero value in word one because it causes an output shut down state, and no inputs or outputs are updated.

Failure to follow these instructions can result in injury or equipment damage.

System Info Register

This word enables the module's operation, and specifies if user shutdown values are expected.

| Word 1 | Description |
|---------------|---|
| Bits 0 ... 14 | Not used or can be used to start the module. (Turns on the Ready LED with any value greater than zero.) |
| Bit 15 | 1 = Enable user defined shutdown values. 2 = Disables user defined shutdown values. |

- Valid setting for word one are 0001 ... FFFF.
It is essential for the module's operation to have a value larger than 0 in this register.
- The module's default value at power-up for this register is zero (module shut down).

Word 2

Discrete Fail State Reaction and Value Register

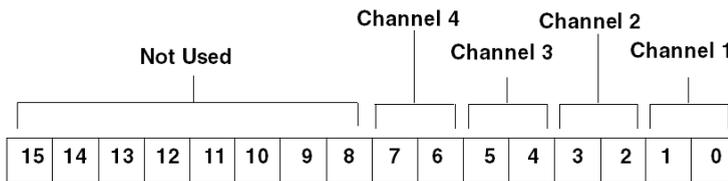
This word combines the value and reaction in a fail state.

| Word 2 | Description |
|---------------|---|
| Bit 0 ... 7 | Discrete fail state value for outputs 1 ... 8 |
| Bits 8 ... 13 | Not used |
| Bit 14 | 0 = hold last value, 1 = user defined value |
| Bit 15 | 0 = all outputs reset, 1 = check bit 14 |

Word 3**Analog Fail State Reaction Register**

This word contains four 2 bit fields that define the fail state for each channel. The four possible values of fail state are as follows.

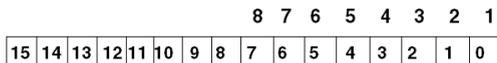
| 2 Bit Value | Fail State |
|-------------|-------------------------------------|
| 00 | Minimum output voltage |
| 01 | Hold last value (default) |
| 10 | User defined shutdown value |
| 11 | Hold last value (not normally used) |

**Words 4 ... 7****Analog Fail State Value Register**

The module always expects four words of user defined data, even if the data is not used. The first word of the user shutdown field is used for channel 1, the second for channel 2, . . .

Word 8**Discrete Output Register**

This word contains a right justified binary eight bit data field.

**Words 9 ... 12****Map to Analog Output Register**

Each word in this range contains a left justified binary 15 bit data field. The range is 0 ... 7FFE hex (0 ... 32766 decimal), but the resolution is only 14 bit (*see page 657*).

NOTE: If a user shutdown value is greater than the count range for the channel, then the count range maximum value will be used as the shutdown value.

4x Registers

Overview

The 4x registers traffic copped to this module are used for output data as follows.

| I/O Map Register | Data Type |
|------------------|----------------------------------|
| 4x + 7 | Data for discrete output |
| 4x + 8 | Data for analog output channel 1 |
| 4x + 9 | Data for analog output channel 2 |
| 4x + 10 | Data for analog output channel 3 |
| 4x + 11 | Data for analog output channel 4 |

Range

Output Operating Range

| | Output Voltage | Data is Left Justified | Comment |
|---------------------|---------------------|------------------------|---|
| Output Range | -10.000 ... +10.000 | 00382 ... 32382 | Nominal output voltage range |
| Output Over Range | +10.000 ... +10.238 | 32384 ... 32764 | Linear over range output voltage |
| Output Out of Range | ≥ 10.238 | 32766 (7FFE Hex) | Threshold will be limited to 32766 decimal. |
| Output Under Range | -10.238 ... -10.000 | 00002 ... 00382 | Linear under voltage range |
| Output Out of Range | ≤ -10.238 | 00000 | Threshold limited to 00000. |

Register for Inputs

Overview

The Input Register is arranged as follows.

| Word | Function |
|----------|------------------------------------|
| 1 | Status word (module status) |
| 2 | State of the eight discrete inputs |
| 3 | Analog input word channel 1 |
| 4 | Analog input word channel 2 |
| 5 | Analog input word channel 3 |
| 6 | Analog input word channel 4 |
| 7 | Analog input word channel 5 |
| 8 | Analog input word channel 6 |
| 9 ... 12 | Not used |

Word 1

The status word (word 0) contains information about the health of the module and the status of the discrete outputs. Word 0 also contains network communication loss, over temperature of the discrete outputs and short circuit at the discrete outputs.

| Bits 15 ... 9 | Bit 8 | Bits 7 ... 4 | Bit 3 (Channel 7, 8) |
|---------------|--|--------------|------------------------|
| Not used | 0 = Bad module health (module lost communication) 1 = Healthy module | Not used | 0 = Fault 1 = No Fault |

| Bit 2 (Channel 5, 6) | Bit 1 (Channel 4, 3) | Bit 0 (Channel 1, 2) |
|------------------------|------------------------|------------------------|
| 0 = Fault 1 = No fault | 0 = Fault 1 = No fault | 0 = Fault 1 = No fault |

Word 2

Discrete Input Register

This word contains a right justified binary eight bit data field.

| | | | | | | | | | | | | | | | | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | |

Words 3 ... 8

Analog Input Register Words 3 ... 8 map to the analog input register. Each word in this range contains a left justified 15 bit data field. The range is from 0H to 7FFE hex, but the resolution is 14 bit (0 ... 32766 decimal or 0 ... 7FFE hex).

Words 9 ... 12

Words 9 ... 12 are not used.

3x Registers

The 3x registers traffic copped to this module are used for input data as follows.

| I/O Map Register | Data Type |
|------------------|---------------------------------|
| 3x + 1 | Data for discrete input |
| 3x + 2 | Data for analog input channel 1 |
| 3x + 3 | Data for analog input channel 2 |
| 3x + 4 | Data for analog input channel 3 |
| 3x + 5 | Data for analog input channel 4 |
| 3x + 6 | Data for analog input channel 5 |
| 3x + 7 | Data for analog input channel 6 |

Range

Input Operating Range

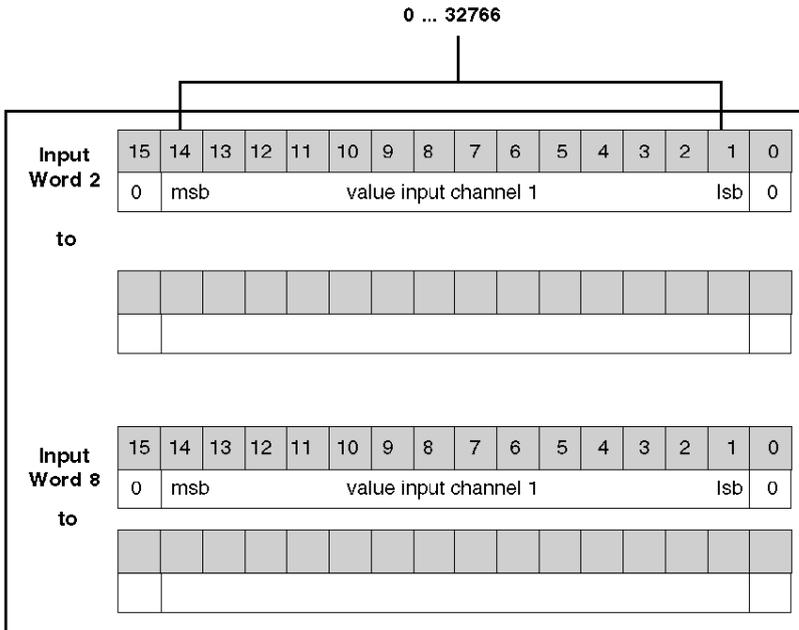
| | Input Voltage | Data is Left Justified | Comment |
|--------------------|---------------------|------------------------|--|
| Input Range | -10.000 ... +10.000 | 00382 ... 32382 | Nominal input voltage range |
| Input Over Range | +10.000 ... +10.238 | 32384 ... 32764 | Linear over range input voltage |
| Input Out of Range | ≥ 10.238 | 32766 (7FFE Hex) | Input voltage exceeding threshold may damage the module. |
| Input Under Range | -10.238 ... -10.000 | 00002 ... 00382 | Linear under voltage range |
| Input Out of Range | ≤ -10.238 | 00000 | Input voltage exceeding threshold may damage the module. |

Analog Map

Overview

170 ANR 120 91 analog values are mapped as follows.

NOTE: The display is standardized, and, in each case, the analog value will appear flush left.

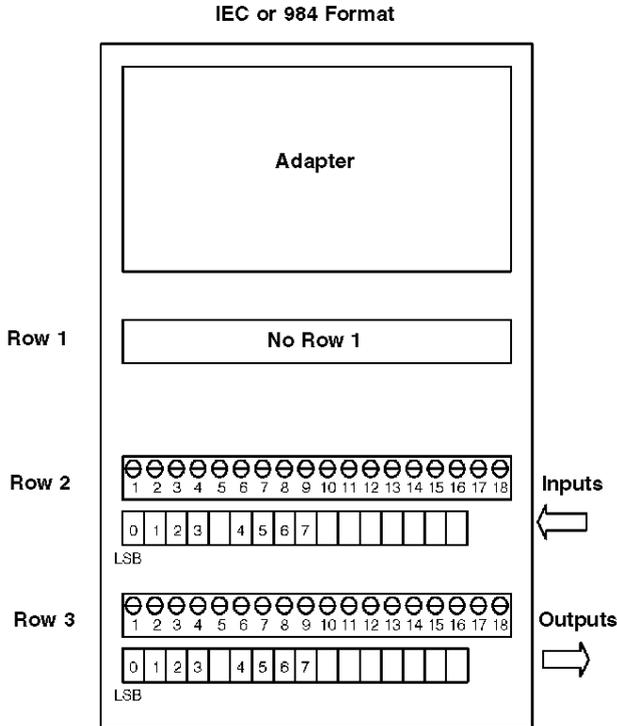


NOTE: The module resolution is 14-bit (0 ... 32766 decimal or 0 ... 7FFE hex).

Discrete I/O Points and IEC Compliant Data Mapping

Overview

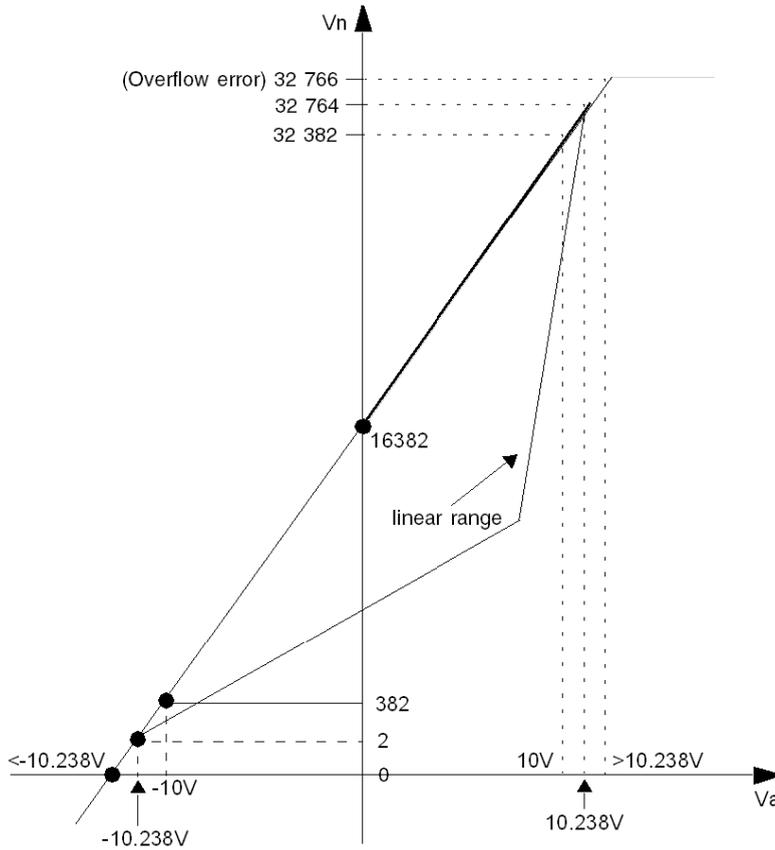
The 170 ANR 120 91 base returns eight discrete input bits to the processor in one 16-bit word (3x). The input points are field wired to row 2 of the base. The processor sends eight discrete output bits to the base as a single 16-bit word (4x). The output points are field wired to row 3.



Input and Output Ranges

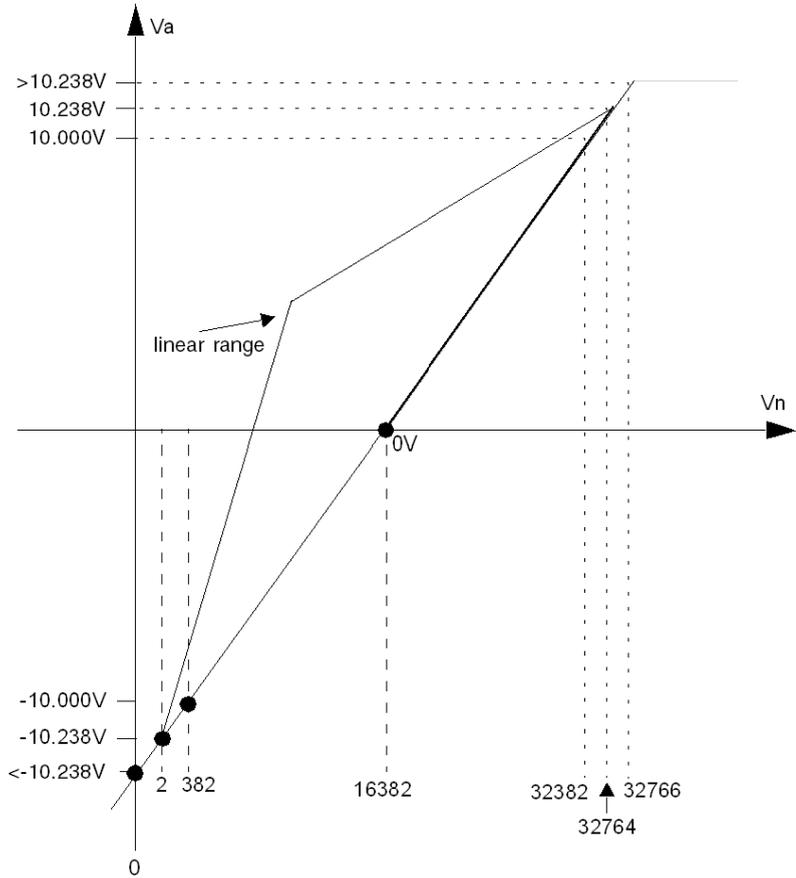
Ranges and Decimal Values Input Measuring Range ± 10 V

The voltage value is calculated with the following formula using the digital measurand: $V_n = 1600 V_a + 16382$ (for the linear range).



Output Measuring Range ±10 V

The voltage value is calculated with the following formula using the digital measurand: $V_n = 1600 V_a + 16382$ (for the linear range).



Interpreting the Error Bits

Overview

If an internal error is detected in the module, the module becomes non-operational. Other error messages are posted in the four least significant bits of the status word.

Chapter 38

170 ARM 370 30 24 VDC - 10 Pt. In / 8 Pt. Relay Out Module Base (120 VAC Powered)

Overview

This chapter describes the 170 ARM 370 30 TSX Momentum I/O base.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------|------|
| Front Panel Components | 664 |
| Specifications | 666 |
| Internal Pin Connections | 669 |
| Field Wiring Guidelines | 670 |
| Wiring Diagrams | 673 |
| I/O Mapping | 676 |

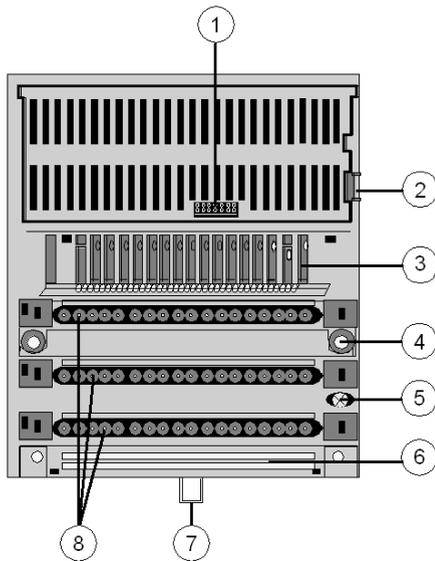
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 ARM 370 30 I/O base and a description of the LEDs.

Front Panel Illustration

The front panel of the I/O base is shown in the illustration below.

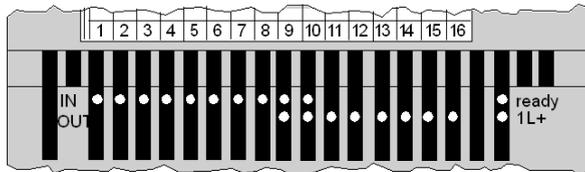


Components of the I/O module

| Label | Description |
|-------|--|
| 1 | Internal interface (ATI) connector |
| 2 | Locking and ground contact for the adapter |
| 3 | LED status display |
| 4 | Mounting holes for panel mount |
| 5 | Grounding screw |
| 6 | Busbar Mounting Slot |
| 7 | Locking tab for DIN rail mount |
| 8 | Sockets for the terminal connectors |

LED Illustration

The LEDs are shown in the illustration below.



LED Descriptions

The LEDs are described in the table below.

| Indicator | Condition | Message |
|----------------------------|-----------|--|
| Ready | Green | Module is ready to communicate. Operating voltage for internal logic (5 V) is present. |
| | Off | Module not ready. |
| 1L+ | Green | Input voltage of inputs 1 ... 10 is present |
| | Off | Input voltage of inputs 1 ... 10 is not present |
| Upper row IN 1...10 | Green | Input status (an LED per input); Input point active, ie. input carries a 1 signal (logically ON) |
| | Off | Input status (an LED per input); Input point inactive, ie. input carries a 0 signal (logically OFF) |
| Middle row OUT 9 ... 16 | Green | Output status (an LED per output); Output point active, ie. output carries a 1 signal (logically ON) |
| | Off | Output status (an LED per output) Output point inactive, ie. Output carries a 0 signal (logically OFF) |

Specifications

Overview

This section contains specifications for the 170 ARM 370 30 I/O base.

General Specifications

| | |
|----------------------------|---|
| Module type | 10 discrete inputs in 1 group 8 relay outputs as normally open contacts in 2 groups, 4 pts/group |
| Supply voltage | 120 VAC |
| Supply voltage range | 85 ... 132 VAC RMS @ 47 ... 63 Hz |
| Supply current consumption | max. 250 mA at 120 VAC |
| Power dissipation | 5.5 W typical 8.5 W max |
| I/O map | 1 input word 1 output word |

Isolation

| | |
|---------------------------------------|---------------------------------------|
| Input to input | none |
| Output group to output group | 1 780 VAC RMS |
| Input to output | 1 780 VAC RMS |
| Output group to communication adapter | 1 780 VAC RMS |
| Field to communication adapter | Defined by communication adapter type |

Fuses

| | |
|-------------------------------------|--|
| Internal | 1A slowblow |
| External: input voltage (1L+) | max. 4 A fast-blow (193140000 or equivalent) |
| External: output voltage (1L1, 2L1) | According to the supply of the connected actuators— not to exceed 8 A slow-blow/ group. |

Physical Dimensions

| | |
|-------------------------|--|
| Width | 125 mm (4.9 in) |
| Depth (with no adapter) | 40 mm (1.54 in) |
| Length | 141.5 mm (5.5 in) no or one busbar 159.5mm (6.3in) two busbars 171.5 mm (6.75in) three busbars |
| Weight | 260 g (0.57lb) |

Discrete Inputs

| | |
|---------------------|---|
| Number of points | 10 |
| Number of groups | 1 |
| Signal type | True High |
| IEC 1131 type | 1+ (see appendix (see page 701) for definitions of IEC input types) |
| ON voltage | +11 ... +30 VDC |
| OFF voltage | -3 ... +5 VDC |
| Input current | 2.5 mA minimum ON (6 mA at 24 VDC) 1.2 mA maximum OFF |
| Input voltage range | -3 ... +30 VDC |
| Input resistance | 4 kOhm |
| Response time | 2.2 ms OFF to ON 3.3 ms ON to OFF |

Relay Outputs

| | | |
|--|--------------|---|
| Output type | | Relay normally open output |
| Number of points | | 8 |
| Number of groups | | 2 |
| Points per group | | 4 |
| Current capacity | 24 VDC | > 5 mA (but only for new contacts) 2 A per point, 6 A per group (switching current ≤ 5 A) ohmic load max 1 A (L/R ≤ 40 ms) inductive load |
| | 24...120 VAC | For 120 VAC: 0.5 A per point For 24 VAC: 2 A per point, 6 A per group (switching current ≤ 5 A) $\cos \phi = 1$ max. 1 A $\cos \phi = 0.5$ |
| Relay type | | Normally Open |
| Leakage current (output out) | | < 1.2 mA @ 115 VAC |
| Fault sensing | | None |
| Fault reporting | | None |
| Error indication | | None |
| Response time (resistive load / 0.5 A) | | 10 ms @ 60 Hz OFF to ON 10 ms @ 60 Hz ON to OFF |
| Maximum switching cycles | | > 30×10^6 (mechanical) > 1×10^5 (inductive load with external protective circuitry) |

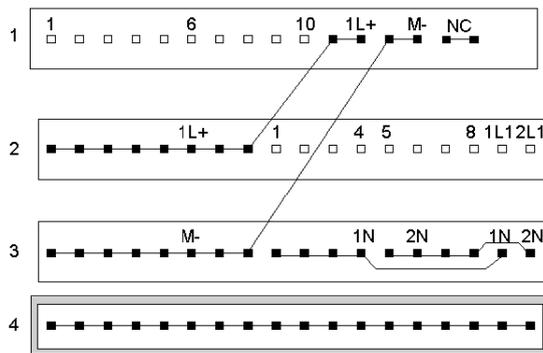
Internal Pin Connections

Overview

This section contains an illustration showing the internal connections between terminals on the I/O base.

Illustration

Rows 1 through 3 show the internal connections between terminals on the I/O base. Row 4 shows the internal connections on the optional busbar.



■—■ internally connected

Field Wiring Guidelines

Overview

Inputs are field wired to row 1 of the base. The outputs are field wired to row 2. This section contains wiring guidelines and precautions.

Terminal Connector

To connect field devices to the I/O base, you need a field wiring terminal connector. Schneider Electric sells terminal connectors in sets of three.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 001 00 |
| Spring-clip | 170 XTS 002 00 |

Busbar May Be Required

Depending on the type of field devices you are using, you may need a 1-row busbar. The following busbars are available from Schneider Electric.

| Type | Part Number |
|-------------|----------------|
| Screw-in | 170 XTS 006 01 |
| Spring-clip | 170 XTS 007 01 |

Mapping Terminal Blocks

CAUTION

POTENTIAL FOR SHORT CIRCUITS AND/OR POWER-UP SPIKES

Provide external fuses on the operating voltage to protect the module. Appropriate fuse values are shown in the wiring illustration. An unprotected module may be subject to short circuits and/or power-up spikes.

Failure to follow these instructions can result in injury or equipment damage.

The following table shows mapping terminal blocks and optional busbars.

| Row | Terminal | Function |
|-----|----------------|--|
| 1 | 1...10 | Inputs |
| | 11, 12 | Input voltage for terminal pins 9 ... 10, (1L+) |
| | 13, 14 | Return (M-) for the inputs |
| | 15, 16 | Not connected |
| | 17 | Return (N) for the module's operating voltage |
| | 18 | 120 VAC Operating voltage (L1) |
| 2 | 1 ... 8 | Input voltage for pins 1 ... 8, (1L+) |
| | 9 ... 12 | Outputs for group 1 |
| | 13 ... 16 | Outputs for group 2 |
| | 17 | Output Voltage for relays 1 ... 4 (1L1, 20 ... 115 VDC or 24 ... 115 VAC |
| | 18 | Output Voltage for relays 5 ... 8 (2L1, 20 ... 115 VDC or 24 ... 115 VAC |
| 3 | 1 ... 8 | Return (M-) for the inputs |
| | 9, 10, 11, 12 | Return (1N) for the relays 1 ... 4 |
| | 13, 14, 15, 16 | Return (2N) for the relays 5 ... 8 |
| | 17/18 | Return/Neutral for relay outputs |
| 4 | 1 ... 18 | Protective earth (PE) |

Protective Circuit Required

To reduce the effects of radiated noise, you must add snubbing components across inductive load devices. The following table provides generic selection guidelines:

| Type of Load | Suppression Device | Minimum Component Rating |
|--------------|---|---|
| AC circuits | 50 Ω resistor in series with a 0.47 μ f nonpolarized capacitor across the load | for 120 VAC-powered loads 200_VAC |
| DC circuits | a reverse-biased clamping diode across the load | 2 A and greater than twice the maximum load voltage |

Consult relay and contactor manufacturers' catalogs for commercial suppression devices matched to your particular products.

Wiring Inputs to Avoid Error Messages

To avoid I/O error messages, follow these guidelines when wiring.

- Inputs require a 56 k Ω resistor parallel to the contact. Otherwise the I/O error signal will be active as long as the input carries 0 signal.
- Unused inputs have to be wired to the sensor supply or to L+ on row 3 directly (logical 1) or with 56 k Ω (logical 0) to avoid permanently active I/O error message.

Wiring Diagrams

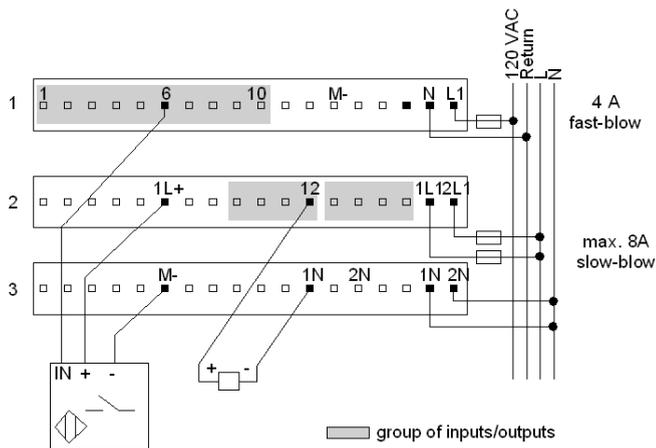
Overview

This section provides diagrams to assist you in wiring the following types of devices:

- 3-wire sensor with a 2-wire actuator
- 4-wire sensor with a 3-wire actuator

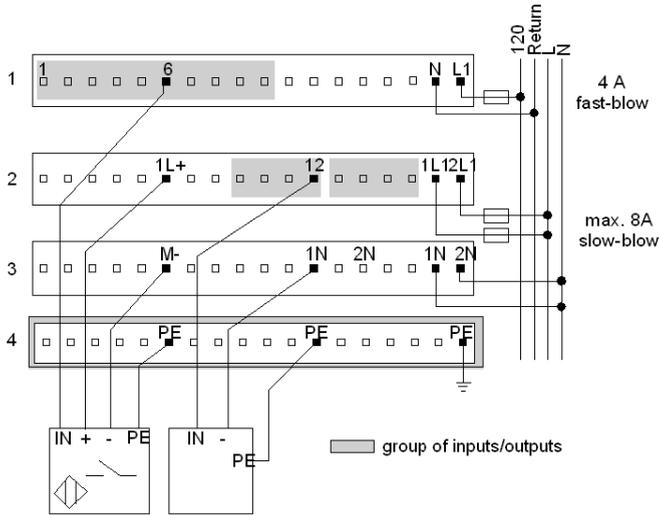
3-Wire Sensor with a 2-Wire Actuator

The diagram below shows field wiring for a 3-wire (24 VDC) sensor and a 2-wire (115 VAC) actuator.



4-Wire Sensor with a 3-Wire Actuator

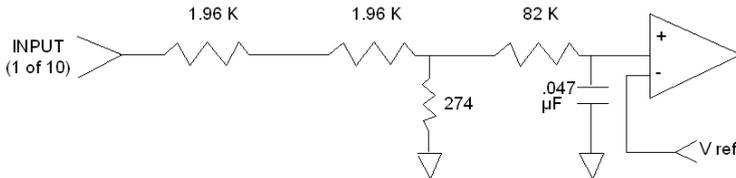
The diagram below shows field wiring for a 4-wire (24 VDC) sensor and a 3-wire (115 VAC) actuator.



A 1-row busbar is used to provide PE for the 4-wire sensor. No busbar would be required if only 2- and/or 3-wire sensors were used.

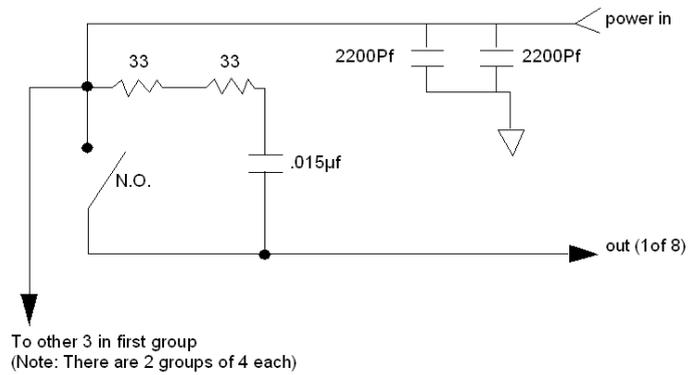
Simplified Input Schematics

The following diagram shows the field-side input circuitry.



Simplified Output Schematics

The following diagram shows the field-side output circuitry.



I/O Mapping

Overview

The 170 ARM 370 30 TSX Momentum I/O base supports 10 discrete inputs and 8 relay outputs. This section contains information about the mapping of the I/O data into input words and output words.

I/O Map

The I/O base must be mapped as one input word and one output word, or as 10 discrete inputs and 8 discrete outputs.

IEC vs. Ladder Logic

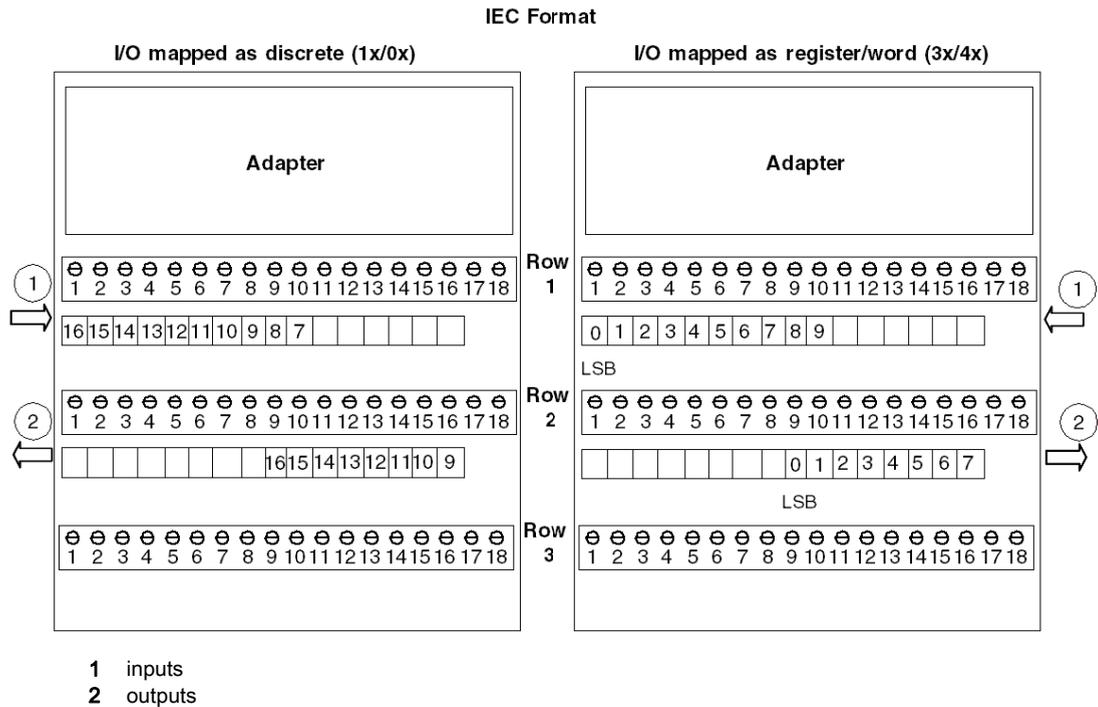
In order to correctly field wire the inputs/outputs and map the input/output data, you need to know which type of Momentum Adapter is mounted on the base .

Adapters may be either IEC compliant or 984 Ladder Logic compliant.

| | IEC Compliant | 984 Ladder Logic Compliant |
|---------------------------------|--|--|
| Momentum Processor Adapters | All | None |
| Momentum Communication Adapters | All, except 170 NEF 110 21 170 NEF 160 21 170 FNT110 00 170 FNT 110 01 | 170 NEF 110 21 170 NEF 160 21 170 FNT 110 00 170 FNT 110 01 |

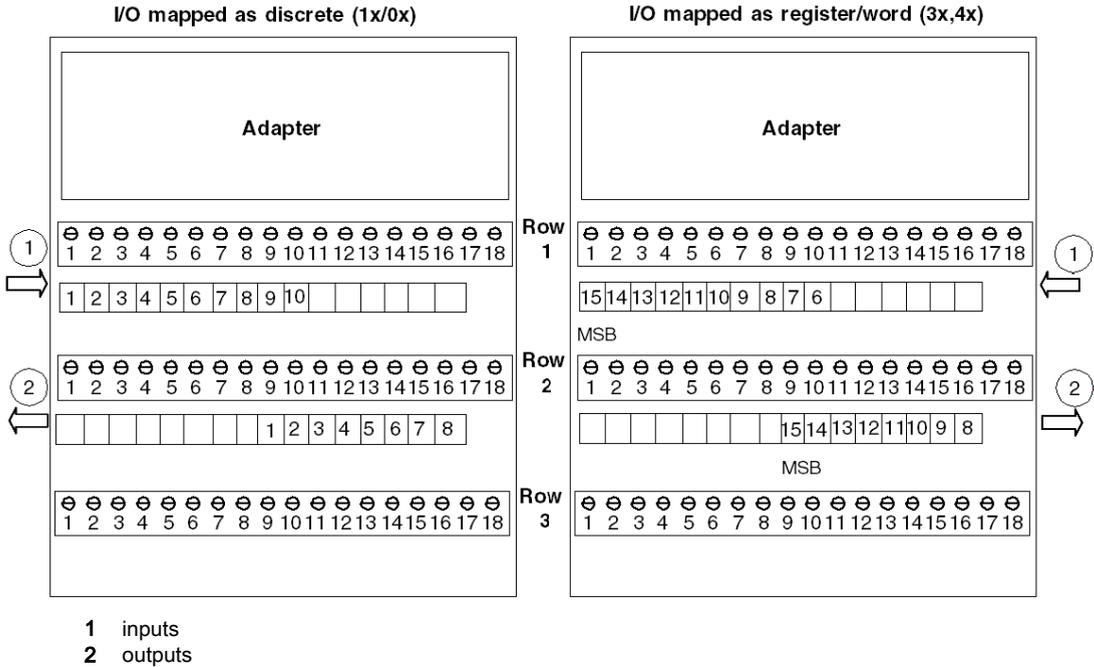
Data Mapping

The figure below shows how data is mapped with an IEC Compliant Adapter. When the I/O is mapped as a discrete input point (1x) the MSB is assigned to Pin 1. When mapped as a discrete output (0x) the MSB is assigned to Pin 9. When the I/O is mapped as an input word/register (3x) the LSB is assigned to Pin 1. When mapped as an output word/register, the LSB is assigned to Pin 9.



The figure below shows how data is mapped with a Ladder Logic Compliant Adapter. When the I/O is mapped as discrete input points (0x) the LSB is assigned to Pin 1. When mapped as a discrete output points, the LSB is assigned to Pin 9. When the I/O is mapped as an input word/register (3x) the MSB is assigned to Pin 1. When mapped as an output word/register (4x) , the MSB is assigned to Pin 9.

984 Format



Chapter 39

170 CPS 111 00 TIO Power Supply Module

Overview

This chapter describes the 170 CPS 111 00 TIO power supply module. The module provides a regulated output voltage with protection against overload and overvoltage. It can be used to power TSX Momentum I/O bases.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--|------|
| Front Panel Components | 680 |
| Specifications | 682 |
| Terminal Connectors | 686 |
| External Operating Voltage Connections | 688 |

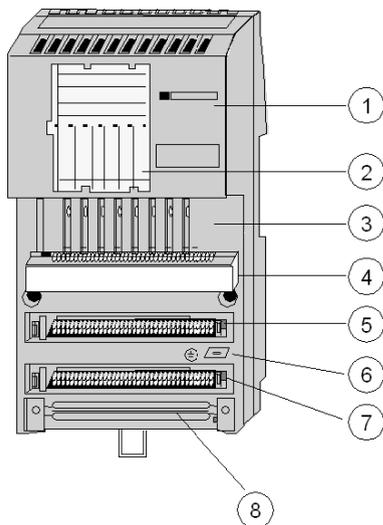
Front Panel Components

Overview

This section contains an illustration of the front panel of the 170 CPS 111 00 Power Supply and a description of the LEDs.

Front Panel Illustration

The front panel of the power supply module is shown in the illustration below.

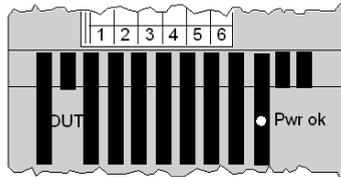


Components of the power supply module

| Label | Description |
|-------|--|
| 1 | Module identifier |
| 2 | Identification label |
| 3 | LED status display |
| 4 | Protective cover |
| 5 | Input voltage (AC) terminal strip connector mounting slot |
| 6 | PE spade-lug connector |
| 7 | Output voltage (DC) terminal strip connector mounting slot |
| 8 | Grounding busbar connector mounting slot |

LED Illustration

This Module has one LED which is shown in the illustration below.



LED Descriptions

The Pwr OK LED is described in the table below.

| Indicator | Condition | Message |
|-----------|-----------|-------------------------------|
| Pwr ok | Green | Power supply module is ready |
| | Off | Power supply module not ready |

Specifications

Overview

This section contains specifications for the 170 CPS 111 00 power supply module.

General Specifications

| | |
|-----------------------------------|--|
| Module type | Power Supply |
| Nominal Input voltage | 230 VAC or 120 VAC (jumper selectable) |
| Nominal Output voltage | 24 VDC |
| Maximum Output Current (isolated) | 0.7 A |

Protective Circuitry

| | |
|---------|--|
| Inputs | Self-restoring fuse |
| Outputs | Overvoltage protection: limited by a transzorb diode (type: SM6T30A) |
| | Overload protection: by thermal current limiting (should the thermal current limiting respond, the input voltage must be switched -- off/on for reactivation). |

Power

| | |
|----------------------------|--------------------------------|
| Frequency | |
| Input voltage | 50/60 Hz + 5% |
| Internal chopper frequency | 90 ... 110 kHz |
| Power | |
| Efficiency | Typically 0.76 for IA = 0.7 A |
| Apparent power | Typically 32 VA for IA = 0.7 A |
| Effective power | Typically 21 W for IA = 0.7 A |

Isolation

| | |
|-----------------------------------|------------------------------|
| Input/Output voltage | L, N, PE isolated from UB, M |
| Between base supply and ground | 500 VDC, 1 min |
| Between input channels and ground | 500 VDC, 1 min |

Fuses

| | |
|---------------------------------|---|
| Internal (not user-replaceable) | Internal self-restoring fuse |
| External | Min external F1: for 230 VAC, 0.315 A, slow-blow Min external F1: for 120 VAC, 0.63 A, slow-blow |

Fault Information

| | |
|---------|--|
| Inputs | None |
| Outputs | Green status LED for output voltage ok |

Physical Dimensions

| | |
|--------|----------|
| Width | 74.2 mm |
| Depth | 40 mm |
| Length | 141.5 mm |

Environmental Conditions

| | |
|--|---|
| Regulations | VDE 0160, UL 508 |
| Permissible operating and ambient temperatures | GUF (-40 ... +60 deg. C) adhering to DIN 40040, refer to the derating curve for uninhibited convection, operation orientation is vertical |
| Permissible storage temperature | -40 ... +85 deg. C |
| Internal power dissipation | Roughly $1.2 + 5 \times I_A$ (in W, I_A in A) |
| Noise immunity | EN 50081-2 |
| Safety classification | Class 1 (VDE 0160, IEC 1131-2) |

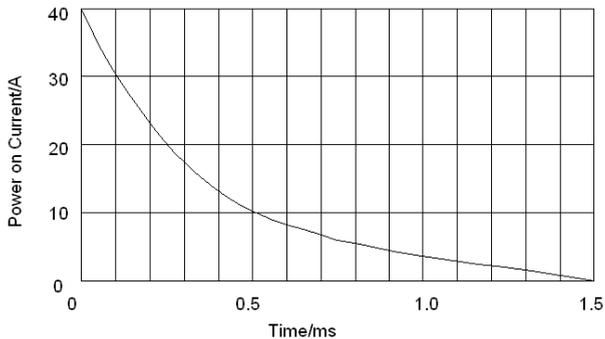
AC Input Voltage

Selectable by jumper

| | |
|------------------------|----------------------------------|
| Input Voltage | |
| EX - EY not jumpered | L/N = 230 VAC |
| EX - EY jumpered | L/N = 120 VAC |
| Limiting Values | |
| With jumper | 100 Veff -15% to 120 Veff +10% |
| Without jumper | 230 Veff -15% to 240 Veff +10% |
| Power Failure | |
| Half wave loss at | 100 Veff -15% |
| Min. of a half wave at | >= 100 Veff |
| Min. of a half wave at | 230 Veff -15% |
| Input Current | |
| For 85 Veff | Typically 0.366 Aeff, IA = 0.7 A |
| For 170 Veff | Typically 0.188 Aeff, IA = 0.7 A |
| For 230 Veff | Typically 0.188 Aeff, IA = 0.7 A |
| Power on Current | |
| I ² T | 0.3 A ² s |
| IT | 0.02 As |

Power on Surge Current Curve

The following chart shows power on surge current for 120 VAC + 10% or 240 VAC + 10%

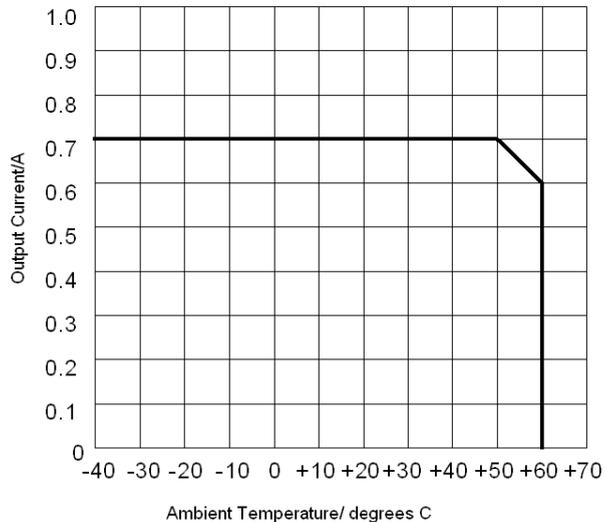


DC Output Voltage

| | |
|--------------------|--|
| Number | 1 x UB = 24 VDC, max. 0.7 A, isolated |
| Limiting Values | |
| UBmin | 21 VDC |
| UBmax | 30 VDC |
| Output Current | |
| IA | 0 ... 0.7 A |
| Output Ripple | |
| Typical | 150 mV/p-p (max. 20 MHz) |
| Max. | 250 mV/p-p (max. 20 MHz) - measured with a 0.1 microF capacitor |
| Voltage Regulation | Typically +500 mV for 0.7A after 0.35 A Typically -500 mV for 0.35A after 0.7 A |

Output Current Chart

The following chart shows output current (derating) for uninhibited vertical convection.



Terminal Connectors

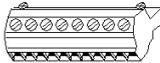
Available Types

Power is supplied to the module through an 8-pole terminal connector. Two types of terminal connectors are available:

- screw-in
- spring-clip

Screw-In Version

Screw-in terminals can be used with cable with a diameter of up to 12 AWG (2.5 mm²). They come in sets of three. The part number is 170 XTS 011 00.



Spring-Clip Version

Spring-clip terminals can be used with cable with a diameter of up to 14 AWG (1.5 mm²). They come in sets of three. The part number is 170 XTS 012 00.



Safety Requirement

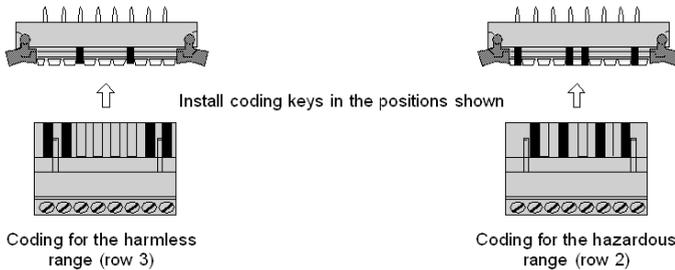
This module is used in hazardous and harmless voltage ranges. For safety, code the terminal connectors and the power supply module to prevent inadvertent exchanges of terminal blocks.

Coding Set

To complete the coding described below, order the 170 XCP 200 00 coding set. This set contains coding keys and combs.

Coding Illustration

Install coding keys in the positions shown in the following illustration:



Mounting the Terminal Connectors

To mount a terminal connector, press it into the module's pin connector.

Mounting the Terminal Connectors

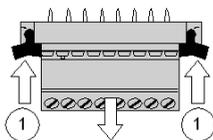
 **DANGER**

RISK OF ELECTRIC SHOCK

Only mount and remove terminal connectors when the module is not under power.

Failure to follow these instructions will result in death or serious injury.

To remove a terminal connector, press both extractors, as shown in the illustration below:



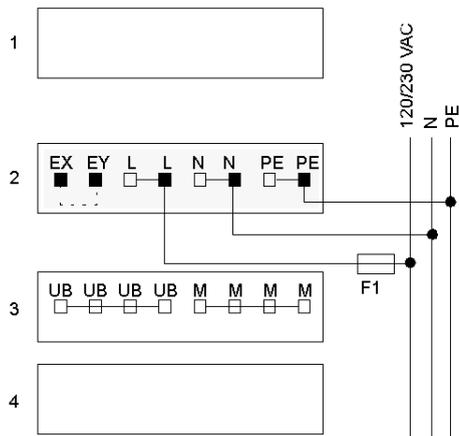
External Operating Voltage Connections

Overview

This section contains a illustration of the external operating voltage connections and explanatory notes.

Illustration

The following illustration shows the external operating voltage connections for the 170 CPS 111 00 Power Supply module:



| Row | Terminal | Connection | Function |
|-----|------------|------------|---------------------------|
| 2 | 1 | EX | Jumper connection |
| 2 | 2 | EY | Jumper connection |
| 2 | 3, 4 | L | AC input voltage, line |
| 2 | 5, 6 | N | AC input voltage, neutral |
| 2 | 7, 8 | PE | Earth ground |
| 3 | 1, 2, 3, 4 | UB | DC output voltage |
| 3 | 5, 6, 7, 8 | M | DC output voltage return |

Grounding

The spade-lug connector on the front of the module provides a short, secure PE grounding surface.

Electrical safety

Power supply modules may not be operated in parallel. Physically separate input cabling from output cabling.

Fusing

Dimension the F1 fuse to match the operative load, observing the minimum values in the following table:

| Voltage | Jumper Placement | External Fusing (min. F1) |
|----------------|-------------------------|----------------------------------|
| 120 VAC | Mounted | 0.63 A slow-blow |
| 230 VAC | Removed | 0.315 A slow-blow |

Appendices



Overview

The appendices contain general information common to the Momentum I/O bases.

What Is in This Appendix?

The appendix contains the following chapters:

| Chapter | Chapter Name | Page |
|---------|--------------------------|------|
| A | System Specifications | 693 |
| B | Interference Suppression | 699 |
| C | IEC 1131 Input Types | 701 |
| D | Field Wire Length | 703 |
| E | IEC Symbols | 705 |

Appendix A

System Specifications

Overview

This appendix provides system specifications for all TSX Momentum I/O bases.

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|------------------------------|------|
| Power Supply Specifications | 694 |
| Field Device Interfaces | 695 |
| Environmental Specifications | 696 |

Power Supply Specifications

Overview

This section contains power supply specifications for the following types of TSX Momentum I/O bases:

- 24 VDC
- AC voltages

24 VDC

Power supply specifications for 24 VDC modules are contained in the table below.

| | |
|---|---|
| Operating voltage (internal logic) | 20 ... 24 ... 30 VDC |
| Input voltage (discrete inputs) | 20 ... 24 ... 30 VDC |
| Output voltage for electronic outputs | 20 ... 24 ... 30 VDC |
| Output voltage for relay outputs | 24 ... 115 VDC |
| Ripple | max. 5 % effective, corresp. to relat. total oscillation amplitude per DIN 40 110 (unfiltered three-phase bridge permissible) |
| Periodic peak values (including ripple) | 18 ... 33 VDC |
| Nonperiodic peak values | max. 35 V at t <500 ms max. 45 V at t <10 ms |
| Line power dropout | max. 1 ms, repetition rate 1 s |

AC Voltages

Power supply specifications for AC voltage modules are contained in the table below.

| | |
|---------------------------------------|---|
| Operating voltage (internal logic) | 100 ... 115 ... 132 VAC, 47 ... 63 Hz |
| Input voltage (discrete inputs) | 85 ... 115 ... 132 VAC, 47 ... 63 Hz |
| Output voltage for electronic outputs | 20 ... 115 ... 132 VAC, 47 ... 63 Hz |
| Output voltage for relay outputs | 24 ... 230 VAC |
| Line power dropout | max. 10 ms or 1 half-wave, repetition rate 1s |

Field Device Interfaces

Overview

This section contains specifications for:

- operating thresholds, input current
- discrete outputs
- relay outputs

Operating Thresholds, Input Current

The table below contains specifications for operating thresholds, input current.

| | | |
|----------------------------|----------------------------------|----------------|
| Rated voltage | 24 VDC | 115 VAC |
| Signal level of "1"-signal | +11 ... +30 VDC | 74 ... 132 VAC |
| Signal level of "0"-signal | -3 ... +5 VDC | 0 ... 20 VAC |
| Minimum ON-voltage | min. 2.5 mA, 6 mA at 24 VDC | min. 6 mA |
| Maximum OFF-voltage | max. 1.2 mA | max. 2.6 mA |
| Input delay | 0 -> 1: 2.2 ms 1 -> 0: 3.3 ms | < 1 half-wave |

Discrete Outputs

The table below contains specifications for discrete outputs.

| | | | |
|-------------------------------|----------------------------------|---------------|------------|
| Rated voltage | 24 VDC | 115 VAC | 230 VAC |
| Voltage drop on "1"-Signal | max. 0.5 V | max. 1.5 V | max. 1.5 V |
| Leakage current on "0"-Signal | max. 1 mA | max. 1.3 mA | - |
| Load current per output | max. 500 mA 2 A at ADM 370 10 | 30 ... 500 mA | - |
| Simultaneity factor | 100 % | 100 % | 100 % |
| Operating delay | 3 ms | < 1 half-wave | - |

Relay Outputs

The table below contains specifications for relay outputs.

| | |
|--------------------------|--|
| Rated voltage | 24 ... 230 VAC 20 ... 115 VDC |
| Relay type | Normally open (NO) contact |
| Rated current per output | 0.5 ... 2 A, depending on operating voltage and power factor |

Environmental Specifications

Overview

All Momentum I/O bases share the following environmental specifications.

General

The table below contains general environmental specifications:

| | |
|----------------------------------|---|
| Safety Class | Class 1, IEC 536 |
| Safety Type | IEC 529: IP20 |
| Temperature range (operating) | 0 ... +60 oC air intake temperature (without forced ventilation). Under more difficult ventilation conditions, power dissipation must be taken into account (refer to the module descriptions). |
| Temperature range (storage) | -40 ... +85 oC (without battery) -40 ... +70 oC (with battery) |
| Relative humidity | 95 % continuous for 30 days 75 % annual average, noncondensing |
| Atmospheric pressure (operating) | >=700 hPa (700 mbar) |
| Atmospheric pressure (transport) | >=230 hPa (230 mbar) |
| Pollutants | Maximum at 60% relative humidity, noncondensing SO ₂ <= 0.5 ml/m ³ H ₂ S <= 0.1 ml/m ³ |
| Shock | 15 g at 147 m/s ² for 11 ms Three shocks/axis per IEC 68.2-6EC |
| Vibration | 10...57 Hz @ 0.075mm d.a.57...150Hz @ 1 g per IEC 68.2-27EA |
| Dielectric strength | Conforms to IEC 664 |
| Norms and Standards | CE, UL, CSA, FM |
| Equipment definition | Open equipment (IEC 1131-2) |

Noise Immunity

The tables below contain specifications for noise immunity to line-conducted phenomena.

| Circuits | RatedVoltage | Fast transients / Burst per IEC61000-4-4 |
|-------------------------------|-------------------|--|
| Power mains | 24 VDC / 230 VAC | +/-2 kV |
| BinaryDiscrete inputs | 24 VDC 230 VAC | +/-1 kV +/-2 kV |
| Analog inputs | - | +/-1 kV |
| Discrete outputs (electronic) | 24 VDC | +/-1 kV |
| Analog outputs | - | +/-1 kV |
| Relay outputs | 24 VDC / 230 VAC | +/-1 kV |
| Shielded cables | - | +/-1 kV |

| | |
|--|--|
| Noise immunity to electrostatic discharge | +/-4 kV for indirect contact discharge |
| Noise immunity to electromagnetic fields | 10 V/m |
| RFI suppression | Limit curve A |

Appendix B

Interference Suppression

Interference Suppression

Overview

This section explains the interference suppression properties of TSX Momentum components, guidelines for interference suppression of your system, and recommendations for obtaining permits.

TSX Momentum Components

Under the RF Equipment Act, individual components and individually nonoperational subassemblies are not subject to the mandatory PT&T classification or registration rules.

The components of the TSX Momentum are interference-suppressed to within EN 55011 Limit Curve A.

Your System

Assuming adherence to the configuration guidelines, even a total system constructed from TSX Momentum components typically meets this requirement, if:

- third-party add-on equipment and components are equally RFI-suppressed
- the operating instructions regarding RF suppression are adhered to, e.g.:
 - filtering the line voltage using RFI filters
 - noise filtering using anti-interference capacitors
 - equipping inductive consumers with clamping diodes (suppressor diodes) to prevent the injection of RF noise potentials into neighboring lines

Permits

In some cases, so-called operating permits may be required. Obtaining the operating permit for the total system from the local RFI control agency is the responsibility of the user. It usually applies to systems operated in residential and mixed-zoning areas, government offices, hospitals and airports, but not within industrial zones.

In the event of any problems with the operating permit or license, consult the system supplier first. In case of doubt, the latter can direct questions to the local distributor.

Appendix C

IEC 1131 Input Types

Input Voltage and Current Thresholds

Overview

This section describes the voltage and current thresholds for three types of input, as defined by IEC 1131.

Thresholds

The following table shows the voltage and current thresholds for three input types at 24 VDC, as defined by IEC 1131.

| Input Type | On Voltage | On Current | Off Voltage | Off Current |
|------------|---------------|---------------|-------------|-------------|
| Type 1 | +15 ... +30 V | 2 ... 15 mA | -3 ... +5 V | ... 15 mA |
| Type 1+ | +11 ... +30 V | 2.5 ... 10 mA | -3 ... +5 V | ... 10 mA |
| Type 2 | +11 ... +30 V | 6 ... 30 mA | -3 ... +5 V | ... 30 mA |

Type 1+

This type is often used for active sensors and relays because the minimum on and maximum off current thresholds are higher.

Appendix D

Field Wire Length

Calculating Field Wire Length for AC and DC Devices

Introduction

This section describes some considerations in calculating field wire length.

Effect of IR Drop

The IR drop is the product of the resistance of the wire (depends on wire gauge size) and the current drawn by the load. (IR = volts) After calculating the IR drop of the field wire, what you have left is available at the module input.

Example

The following example shows how to calculate the IR drop to see if enough is left over to turn on an I/O base's input point.

| Step | Action |
|------|--|
| 1 | Assume an I/O base needs 80 VAC minimum to turn on voltage and assume a field source of 120 VAC. |
| 2 | Assume the current drawn by the I/O base is 6 mA. |
| 3 | Consult the vendor of the wire to get the resistance of the wire (usually given in Ohms per 1000 feet, this depends on the gauge and length of the wire). For this example, assume the total resistance of the wire length is 1000 Ohms. |
| 4 | Calculate $.006 \text{ A} \times 1000 \text{ Ohms} = 6 \text{ VAC}$. This is the IR drop. |
| 5 | Calculate $120 \text{ VAC} - 6 \text{ VAC} = 114 \text{ VAC}$. This is plenty to turn on the inputs, as the minimum required is 80 VAC. |

Empirical Testing Required

The IR drop calculation can only be a rough estimate. Empirical testing is required to fine-tune the wiring length. The result will depend on the following variables:

- shielded vs. unshielded wire
- single vs. wiring pairs
- wire impedance
- electrical noise
- routing of wiring, such as running in parallel with high voltage that can induce capacitive and inductive coupling of noise spikes

Appendix E

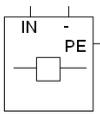
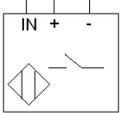
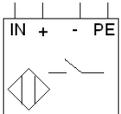
IEC Symbols

Glossary of IEC Symbols

Overview

This appendix contains illustrations and definitions of common IEC symbols used in describing TSX Momentum components.

IEC Symbols

| Symbol | Definition |
|---|--|
|  | Actuator/output, e.g. contactor, lamp, valve, heating, etc. |
|  | 3-wire actuator |
|  | Digital sensor/input, e.g. contact, switch, initiator, light barrier, etc. |
|  | 3-wire sensor |
|  | 4-wire sensor |

| Symbol | Definition |
|---|--------------------------|
|  | Change-over break |
|  | Analog sensor (voltage) |
|  | Analog sensor (current) |
|  | Thermocouple Element |
|  | Resistor, general symbol |
|  | Fuse |
|  | Electrolytic Capacitor |
|  | Earth Ground |



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 - 170AMM11030, *600*
- terminal connectors, *38*

V

voltage

I/O bases, *71*

W

wire length, *703*

