

RELIABILITY

FLEXIBILITY

FAST DELIVERY

ENGINEERING
SUPPORT

ONE STOP
I/O SHOP



8400-100L3 - 05/2015

DISTRIBUTED I/O AND SIGNAL CONDITIONERS



Ethernet, Modbus, Profibus I/O



Process Transmitters



4-20mA Isolators & Splitters

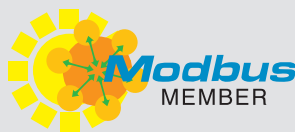


Limit Alarms / Computation

Depend on Acromag



*Experience counts:
especially when
you are selecting
an I/O partner.
And with 50+ years
of I/O experience,
Acromag can help
you to improve
reliability, increase
productivity and
reduce your costs.*



Acromag: The I/O Leader

Acromag is a customer-driven manufacturer focused on developing embedded I/O products that provide the best long term value in the industry. Compare and you'll find that Acromag products offer an unmatched balance of price, performance, and features.

50+ Years of I/O Experience

Acromag has more than 50 years of measurement and control experience. Since 1957, we have delivered nearly a million units to thousands of customers around the globe for manufacturing, power, environmental, transportation, and military applications.

Top Quality and a 2-Year Warranty

We take every measure to guarantee you dependable operation and products that perform at or beyond their specifications. Our state-of-the-art manufacturing and military-grade components add an extra degree of ruggedness. Most products qualify for an extended 2-year warranty. And with ISO9000/AS9100 certified quality control, you get full confidence.

All trademarks are the property of their respective owners.

Online Ordering

For your convenience, Acromag provides full product documentation and pricing information on our website. You can obtain quotes or even place your order directly on our website.

Fast Delivery from Stock

Most products can be shipped within 24 hours of receiving your order.

Special Services

We are happy to accommodate your special requirements and offer the following services:

- custom product development
- custom calibration
- source inspections, quality audits
- special shipping, documentation
- protective humiseal coating
- plastic and stainless steel tagging

Certification and Approvals

Many Acromag products carry globally recognized agency approvals and safety certifications.

- CE
- Ethernet conformance
- UL, cUL
- Modbus conformance
- ATEX
- Profibus certification
- CSA
- IECex

Industrial Input/Output Solutions



I/O MODULES

INPUT SIGNALS

Voltage AC/DC
Current AC/DC
Thermocouple
RTD / Resistance
Thermistor
Strain / Load Cell
Pot / Slidewire
Discrete Sensors

Amplify

Filter

Isolate

Convert

Scale

Split

Linearize

Suppress
Surges

Trip
Alarm

Integrate

Totalize

Math /
Compute

OUTPUT SIGNALS

DC Voltage
DC Current
Relay
Solid-State Switch
Frequency
Pulse Width
Modulation
Display / Readout

COMMUNICATION

Ethernet
Modbus
Profibus
HART
Peer
-to-
Peer

NETWORK I/O

Ethernet I/O



www.acromag.com/ethernet

Modbus I/O



www.acromag.com/modbus

Profibus I/O



www.acromag.com/profibus

I/O Accessories



www.acromag.com/accessories

SIGNAL CONDITIONERS

Transmitters



www.acromag.com/transmitters

Isolators / Splitters



www.acromag.com/isolators

Limit Alarms

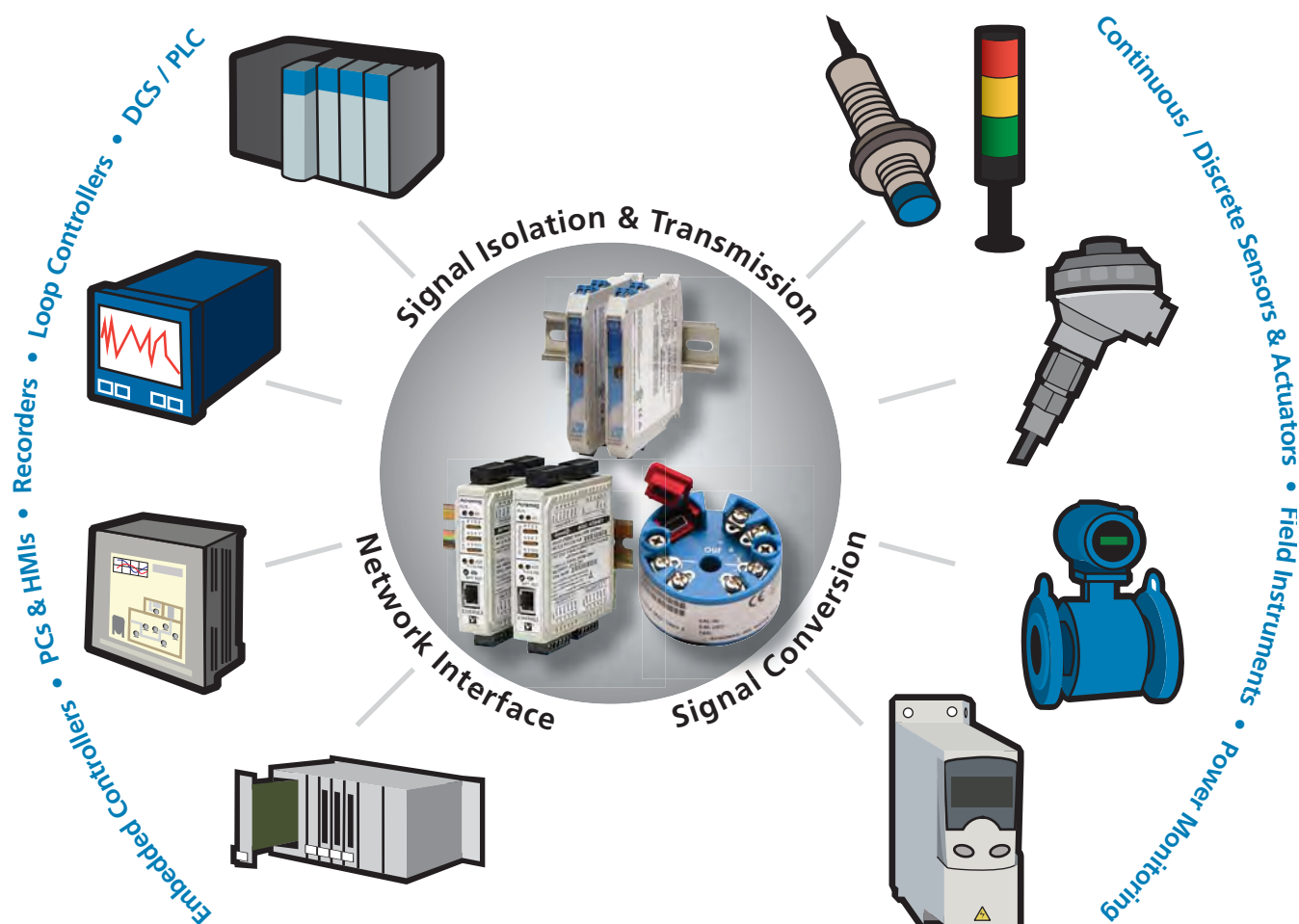


www.acromag.com/alarms

Computation



www.acromag.com/computation



How Acromag I/O Is Used

Acromag I/O is ideal for a broad range of monitoring and control operations where controllers communicate with instrumentation on the plant floor or in the field.

Acromag Advantages

- wide operating temperature ranges (up to -40 to 85°)
- high resistance to RFI, EMI, surges, electrical transients
- high-voltage isolation and built-in surge suppression
- easy to use and maintain
- high channel density to save space
- large inventory of stock items for same day shipping
- special designs and custom services available
- 7-year warranty available at no extra cost
- AS9100 and ISO 9001 certified quality management

Operation in All Locations

- safe zones and hazardous locations (Zone 2)
- explosion-proof locations (Zone 1)
- approvals from CE, UL/cUL, FM, CSA, ATEX, IECex

Controller Interface

- PLCs, PACs, controllers
- DCS distributed control systems
- PCs, embedded computers, SCADA systems
- operator interface terminals and remote terminal units

Continuous Sensors

- temperature
- flow
- speed
- position
- pressure
- level
- weight / load
- drives

Discrete Sensors and Switches

- dry contacts
- solid-state
- valves
- PNP, NPN
- proximity
- lights, horns

Actuators and Analytical Instruments

- drives, motors
- heaters, coolers
- displays, indicators
- power supplies
- valves, positioners
- recorders, analyzers



Raw Materials Processing

These industries rely on Acromag process instruments for accurate and repeatable measurements from sensor signals.

- chemical, petrochemical
- metal, glass, ceramic
- pulp, paper, textile



Factory Automation

Fast response times, high reliability, and proven compatibility with control networks make Acromag I/O popular for use on assembly lines.

- food, beverage, pharmaceutical
- automotive, electronic assembly
- building automation, HVAC



Oil, Gas, and Mining

Built for operation in extreme environments, Acromag I/O reliably interfaces sensors to actuators and controllers.

- exploration, extraction
- production
- distribution



OEM Machine Control

High channel density plus shock and vibration immunity help machine builders add more I/O to monitor and control their equipment.

- semiconductor, lithography
- boilers, furnaces, generators
- test stands, industrial machinery



Power Generation

Able to resist noise and surges from high-voltage electrical sources, Acromag I/O delivers dependable data to plant control systems.

- fossil fuels, hydroelectric, nuclear
- solar, wind, geothermal
- fuel cells, batteries



Defense, Security, and Aerospace

Acromag I/O finds a home in many military and security systems due to their ability to operate over wide temperature ranges.

- simulators and trainers
- ground / airborne / naval controls
- surveillance systems



Water / Wastewater

Offering outstanding value and easy installation, Acromag I/O is the first choice of many municipalities to help manage their water systems.

- municipal
- industrial
- desalinization
- irrigation



Research and Development

When high-resolution and high-accuracy measurements are required, Acromag I/O ensures precise data collection.

- test and measurement systems
- data acquisition systems
- scientific research
- quality control/assurance



NEW!



[www.acromag.com/
BusWorksXT](http://www.acromag.com/BusWorksXT)

BusWorks XT Series

High-performance, space-saving remote analog and discrete I/O modules - with Xtra Technology - for Ethernet networks.

- Ethernet/IP, Profinet, Modbus TCP/IP, and i2o peer-to-peer communication
- Easy PC/Windows configuration via USB
- Redundant and bussed DC power



www.acromag.com/i2o

Peer-to-Peer Communication

Many Acromag I/O modules have i2o technology for "input-to-output" peer-to-peer over Ethernet.

- Automatically transmits analog or discrete I/O information between modules
- Wire-saver, mux/de-mux, splitter tasks



[www.acromag.com/
BusWorks900](http://www.acromag.com/BusWorks900)

BusWorks 900 Series

A series of dependable, yet economical, remote analog and discrete I/O modules for Ethernet or RS485 networks.

- Ethernet/IP, Modbus TCP/IP, i2o peer-to-peer, Modbus-RTU and Profibus-DP communication
- Easy configuration using Internet browser or Windows software



www.acromag.com/8B

8B I/O Modules

Ethernet-enable panel-mounted isolation amplifiers with BusWorks or Etherstax I/O.

- Connect 8B backpanels to Acromag Ethernet I/O with DB25 cable (cables also available for 3B/5B/7B)
- Over 102 low-cost, high-isolation models
- Up to 1500V AC isolation per amplifier



[www.acromag.com/
EtherStax](http://www.acromag.com/EtherStax)

EtherStax ES2000 Series

High-density I/O blocks designed for high-reliability operation in Ethernet networks.

- Modbus TCP/IP, UDP/IP, and i2o peer-to-peer communication
- Up to 96 channels of discrete or analog I/O in a vertically-stackable unit with a small footprint
- Fast scan rates (below 1 millisecond)
- Redundant power and communication



[www.acromag.com/
software-tools](http://www.acromag.com/software-tools)

Software Tools

- OPC, .NET, ActiveX, Visual Basic/C++
- Function libraries with C source code
- Compatible with Windows, Linux, VxWorks, QNX, OS-9, and other OSs



Power Supplies

- 10W, 15W, 30W, 60W, 120W, or 240W
- Universal input (85-264V AC / 100-370V DC)

Signal Conditioning Solutions



NEW!



www.acromag.com/TT

TT230/330 Series

A high-performance line of thin transmitters and isolators offering great flexibility.

- Easy PC/Windows configuration via USB
- Inputs: voltage, current, temperature, ohmic, frequency, potentiometer
- Outputs: DC voltage, current

NEW!



www.acromag.com/ST130

ST130 Series

Low-cost, miniature head-mount (DIN Form B) transmitters that deliver outstanding accuracy, linearity and stability.

- Easy PC/Windows configuration via USB
- Inputs: temperature, voltage, ohmic
- Output: 4-20mA DC (sink)



www.acromag.com/600T

600T Series

Select from a broad line of isolators, splitters, and transmitters available in single, dual, quad-channel configurations.

- Auto-configuration and self-ranging models for easy setup
- Inputs (single and multi-channel): voltage, current, temperature, ohmic
- Outputs: DC voltage, current, splitter



www.acromag.com/1500

1500 Series

Programmable, high-performance head-mount transmitters with optional LCD display and HART protocol output.

- Easy configuration by PC, HART, or display
- Inputs: temperature, voltage, current, ohmic
- Output: 4-20mA DC (sink), optional LCD readout displays in °C/°F



www.acromag.com/IntelliPacks

IntelliPack 800 Series

Intelligent, programmable series of transmitters, math modules, and alarms for advanced processing tasks.

- PC configuration, push-button adjust
- Inputs: voltage, current, temperature, ohmic, frequency, strain/load
- Outputs: DC voltage, current, relay trip, frequency, pulse-width-modulation



www.acromag.com/fp

Flat Pack Series

A full line of analog signal conditioners (transmitters, isolators, and limit alarms)

- Wide variety of input, output, and power configurations



Accessories and Services

- Panel meters, network repeaters
- Mounting and wiring accessories
- Coatings, tags, certificates, drawings



Monitoring and Control Solutions

Product Series Selection Guide

Remote I/O	Inputs	Outputs	Network Protocol
Ethernet I/O Modules			
NEW! BusWorks XT Series	Up to 16 channels/module; analog (current, voltage), discrete	Analog (current, voltage), discrete	Modbus TCP/IP, Ethernet/IP, Profinet, i2o peer-to-peer
BusWorks 900EN Series	Up to 16 channels/module; analog (TC, RTD, current, voltage), 3B/5B/7B/8B cable interface, discrete	Analog (current, voltage), discrete	Modbus TCP/IP, Ethernet/IP, i2o peer-to-peer
Etherstax ES2000 Series	Up to 96 channels/module; analog (current, voltage), discrete	Analog (current, voltage), discrete	Modbus TCP/IP, UDP/IP, i2o peer-to-peer
RS-485 I/O Modules			
BusWorks 900MB Series	Up to 12 channels/module; analog (TC, RTD, current, voltage), discrete	Analog (current, voltage), discrete	Modbus-RTU
BusWorks 900PB	Up to 12 channels/module; analog (TC, RTD, current, voltage), discrete	Analog (current, voltage), discrete	Profibus-DP

Signal Conditioners	Inputs	Outputs	Power
Signal Isolators			
NEW! TT230 Series (TT236)	Single-channel; 4-20mA	4-20mA universal sink/source	2/3-wire; 12-32V DC (output loop power)
NEW! TT330 Series (TT336)	Single-channel; 4-20mA	4-20mA source	4-wire; 12-32V DC
630T Series (631T, 632T)	Single/dual-channel; 4-20mA	4-20mA source	4-wire; 15-36V, 125V DC; 90-250V AC
650T Series (651T, 652T)	Single/dual-channel; 4-20mA	4-20mA sink	2-wire; 12-36V DC (output loop power)
670T Series	Single/dual/quad-channel; 4-20mA	4-20mA source	2-wire; input loop power
Signal Splitters			
630T Series (633T)	Single input; 4-20mA	Dual output; 4-20mA source	4-wire; 15-36V, 125V DC; 90-250V AC
650T Series (653T)	Single input; 4-20mA	Dual output; 4-20mA sink	2-wire; 12-36V DC (output loop power)
Signal Transmitters and Converters			
NEW! ST130 Series	Single-channel; thermocouple, RTD, resistance, millivolt	4-20mA sink	2-wire; 9-32V DC (output loop power)
NEW! TT230 Series	Single-channel; current, voltage, thermocouple, RTD, thermistor, resistance, potentiometer, frequency	4-20mA universal sink/source	2/3-wire; 12-32V DC (output loop power)
NEW! TT330 Series	Single-channel; current, voltage, thermocouple, RTD, thermistor, resistance, potentiometer, frequency	Scalable $\pm 10V$, 0-10V, $\pm 20mA$, 0-20mA source	4-wire; 12-32V DC
1500 Series (151T, 155H)	Single input; thermocouple, RTD, resistance, mV, current	4-20mA sink, HART; LCD display	2-wire; 12-42V DC (output loop power)
610T Series	Single/dual-channel; current, voltage	Scalable 0-10V, 0-20mA source	4-wire; 10-36V DC
650T Series (654T)	Dual-channel; current, voltage	4-20mA sink	2-wire; 12-50V DC (output loop power)
650T Series (655T, 656T)	Single/dual-channel; thermocouple, millivolt	4-20mA sink	2-wire; 12-50V DC (output loop power)
650T Series (657T, 658T)	Single/dual-channel; RTD, resistance	4-20mA sink	2-wire; 12-50V DC (output loop power)
800T IntelliPack Series	Single/dual-channel; current, voltage, thermocouple, RTD, resistance, frequency/pulse, strain gage (bridge), load cell	Scalable 0-10V, 0-20mA source, alarm relay	4-wire; 10-36V DC
Limit Alarms			
800A IntelliPack Series	Single/dual-channel; current, voltage, thermocouple, RTD, resistance	Single DPDT or dual SPDT 5A relays	4-wire; 10-36V DC
260A / 361A / 461A Flat Pack Series	Single-channel; current, voltage	Single/dual SPDT 2A or 5A alarm relays	2/3/4-wire; input loop-powered (4-20mA); 10-36V DC; 115/230V AC
Computation			
IntelliPack (892M, 894M)	Dual/quad input; current, voltage	Single output; 0-20mA source, 0-10V	4-wire; 10-36V DC
IntelliPack (895M, 896M)	Single/dual-channel; current, voltage	Frequency, pulse, pwm, alarm relay	4-wire; 10-36V DC



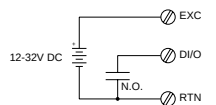
Ethernet I/O: BusWorks® XT Series

XT1110 Ethernet Discrete I/O Modules (sinking outputs)

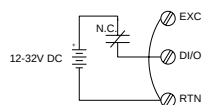


EXAMPLE INPUT CONNECTIONS

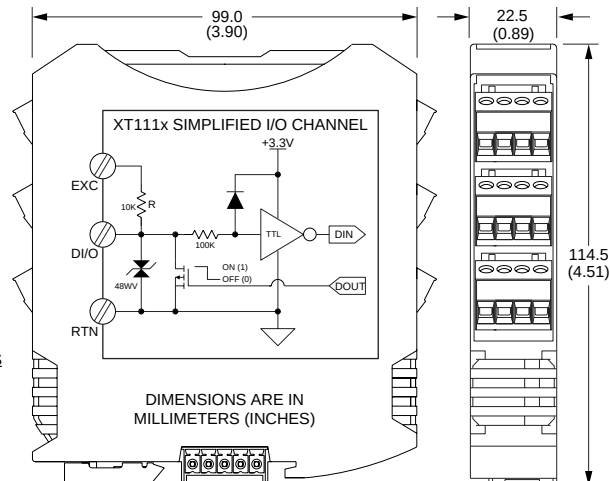
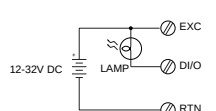
NORMALLY OPEN DRY CONTACT



NORMALLY CLOSED DRY CONTACT



EXAMPLE OUTPUT CONNECTIONS



16 discrete tandem input/output channels ♦ Modbus TCP/IP, Ethernet/IP, Profinet, or i2o communication

Description

The XT1110 interfaces discrete I/O signals between measurement and control devices over Ethernet. Channels are individually configurable for input or low-side switched output operation.

Rugged construction, high density design, and easy USB-to-PC/Windows setup combine for a very effective I/O solution. These units are ideal for remote monitoring, distributed control, or SCADA applications.

Input/Output Ranges

Input: 0-32V DC, TTL thresholds

Output: 0-32V DC, open-drain, up to 250mA

Ethernet Communication

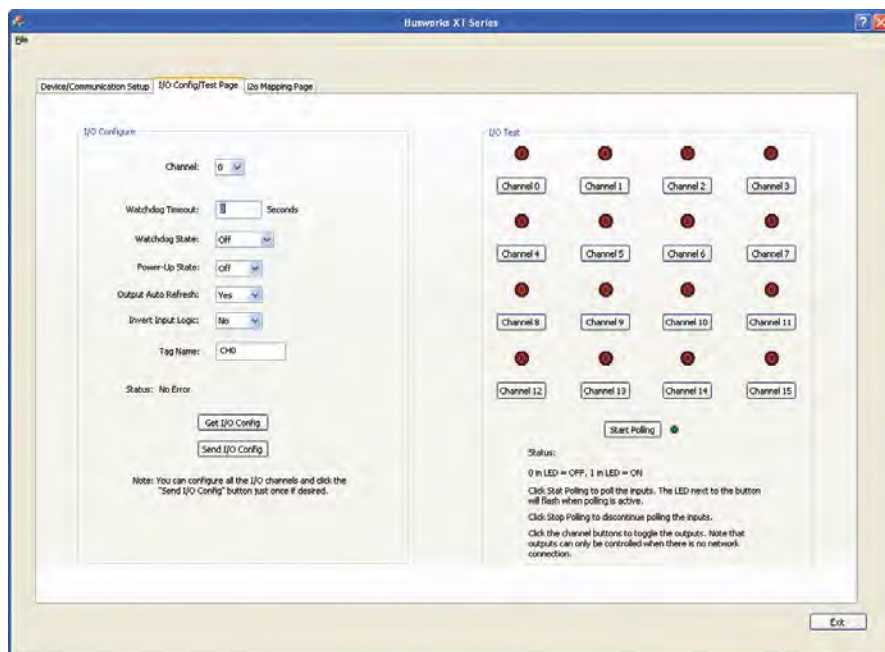
Modbus TCP/IP, Ethernet/IP, Profinet, i2o® peer-to-peer, 10/100Base-T(X) PriorityChannel™ device determinism

Power Requirement

12 to 32V DC (2.5W)

Key Features & Benefits

- 16 solid-state discrete I/O channels (any mix of inputs or outputs)
- Built-in 10K ohm pull-up resistors for 2/3-wire sensors (contacts, proximity, TTL)
- Configurable normal/reverse input logic
- Outputs include built-in read-back capability
- Easy setup with Windows software via USB
- Watchdog timer control of failsafe outputs
- Continuously changing "heart-beat" register validates module operation
- High-Density 22.5mm wide package with pluggable, front-facing terminals
- Dual Ethernet 10/100 ports (auto-negotiation) reduce switch port requirements
- 1500V AC isolation (between I/O, power, and network ports) and surge/transient protection
- Supports bussed/rail and redundant power
- -40°C to +70°C wide temperature operation
- Withstands 25g shock and 4g vibration
- CE and UL/cUL Class 1 Div 2 Zone 2 approvals



BusWorks XT software (download free from www.acromag.com) allows you to configure I/O modules offline with USB, save the file, and download settings into units later, at your convenience.



Tel 248-295-0880 ■ Fax 248-624-9234 ■ sales@acromag.com ■ www.acromag.com ■ 30765 Wixom Rd, Wixom, MI 48393 USA



Ethernet I/O: BusWorks® XT Series

XT1110 Ethernet Discrete I/O Modules (sinking outputs)

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of the USB-ISOLATOR when configuring an XT1000 I/O module.

■ USB Interface

USB Connector

Type: USB Mini-B type socket, 5-pin.
Data rate: 12Mbps. USB v1.1 and 2.0 compatible.
Maximum cable length: 5.0 meters.

USB Transient Protection

Transient voltage suppression on power and data lines.

Driver

Not required. Uses Windows HID drivers.

■ Input

Input Type

16 active-low, buffered inputs, with a common connection. Inputs are tied in tandem to output drains for optional loopback monitoring of output state.

Input Signal Voltage Range

0 to 32V DC.

Input Current

280µA, typical at 32V DC.

Input Signal Threshold

1.7V typical with 100mV of hysteresis.

Input Resistance

100K ohms, typical.

Input Response Time

10ms, nominal.

■ Output

Output Type

16 open-drain, smart, n-channel mosfet switches with a common source connection. Provides low-side (sinking) switching between the load and return.

Output Voltage

0 to 32V DC.

Output "ON" Resistance

0.8 ohms typical, 1.6 ohms maximum.

Output "ON" Current Range

0 to 250mA DC, continuous (up to 4A total for all 16 channels combined). See Operating Temperature specification for effect of channels at full load. See manual for detailed effects of operating temperature.

Output Response Time

10ms, nominal.

■ Ethernet Communication

Protocols

Modbus TCP/IP, i2o peer-to-peer, Ethernet/IP, or Profinet depending on model number.

Ethernet Communication Controller

Innovasic RapID™ Platform with PriorityChannel™ for determinism at the device regardless of network load.

Modbus TCP/IP (slave)

Port 502 reserved. Supports up to 10 sockets.

i2o Peer-to-Peer (master/slave)

Can map 4-channel input groups to output groups at two destination IP addresses. Timed or change-of-state updates. Supports GPRS/GSM systems.

Ethernet/IP (adapter)

Supports 16 connections. EDS file on website.

Profinet (server)

Supports 1 connection. GSDML file on website.

Connectors

Two shielded 8-pin RJ-45 sockets, 10BaseT/100BaseTX.

Wiring

Auto-crossover for MDI or MDI-X.

IP Address

User-configurable. 128.1.1.100 default static IP address.

Data Rate

Auto-negotiated, 10Mbps or 100Mbps.

Compliance

IEEE 802.3, 802.3u, 802.3x.

■ Environmental

Operating temperature

-40 to 70°C (-40 to 158°F). Max temperature derates -0.625°C per output channel at full load (250mA).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

12 to 32V DC (102mA maximum @ 24V).

Isolation

4-way isolation between I/O channels, network (each port), and power.

Peak: 1500V AC, ANSI/ISA-82.01-1988.

Continuous: 250V AC, 354V DC.

Shock and Vibration Immunity

Vibration: 4g, per IEC 60068-2-64.

Shock: 25g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.

RFI: BS EN 61000-6-2, IEC 61000-4-3.

Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.

ESD: BS EN 61000-6-2, IEC 61000-4-2.

EFT: BS EN 61000-6-2, IEC 61000-4-4.

Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals

CE compliant. UL/cUL Class I; Div. 2 Zone 2.

■ Physical

General

General purpose plastic enclosure for mounting on 35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General purpose NEMA Type 1 enclosure.

Circuit Board

Military grade fire-retardant epoxy glass (IPC-4101/98).

I/O Connectors

Removable plug-in type terminal blocks rated for 12A/250V; AWG #26-12, stranded/solid copper wire.

Dimensions

Width = 22.5mm (0.9 inches), Length = 114.5mm (4.51 inches), Depth = 99.0mm (3.90 inches).

Shipping Weight

0.5 pounds (0.22 Kg) packed.

Ordering Information

◆ Models

XT1111-000

Digital I/O module, Modbus/TCP and i2o protocol.

XT1112-000

Digital I/O module, Ethernet/IP protocol.

XT1113-000

Digital I/O module, Profinet protocol.

◆ Software

XT-SIP (recommend one kit per customer)

Software Interface Package. Includes software (XT-CONFIG), isolator (USB-ISOLATOR), two USB cables (4001-112, 4001-113), Ethernet cable (5035-360).

◆ Accessories

XTA-120V-6

XTA-240V-3

6-channel 120V AC/DC or 3-channel 240V AC/DC discrete input module with 5V DC logic outputs. Interfaces with sinking/sourcing DC inputs.

XTA-MRNO-6

6-ch mechanical relay output module, Form A, SPST normally open 5A relays (5/12/24V DC logic input).

XTBUS-KIT

DIN rail bus power/excitation connector kit. Includes one DIN rail bus connector (1005-070), one left-side female connector terminal block (1005-220) and one right side male connector terminal block (1005-221).

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

ISO9001
AS9100



Acromag 
THE LEADER IN INDUSTRIAL I/O

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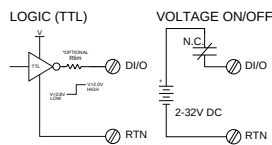


Ethernet I/O: BusWorks® XT Series

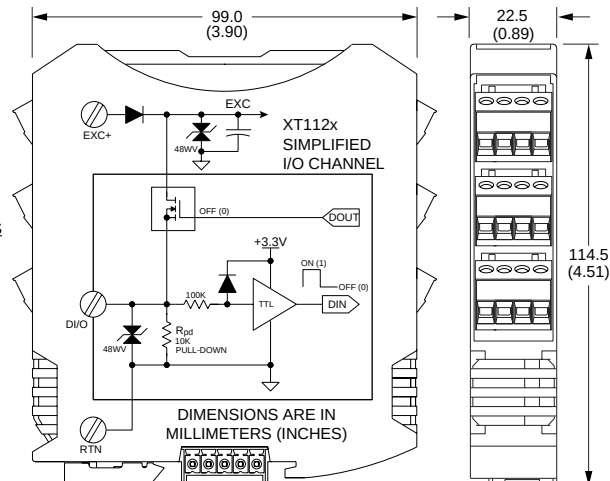
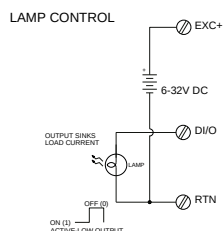
XT1120 Ethernet Discrete I/O Modules (sourcing outputs)



EXAMPLE INPUT CONNECTIONS



EXAMPLE OUTPUT CONNECTIONS



16 discrete tandem input/output channels ♦ Modbus TCP/IP, Ethernet/IP or Profinet communication

Description

The XT1120 interfaces discrete I/O signals between measurement and control devices over Ethernet. Channels are individually configurable for input or high-side switched output operation.

Rugged construction, high density design, and easy USB-to-PC/Windows setup combine for a very effective I/O solution. These units are ideal for remote monitoring, distributed control, or SCADA applications.

Input/Output Ranges

Input: 0-32V DC, TTL thresholds

Output: 0-32V DC, open-drain, up to 300mA

Ethernet Communication

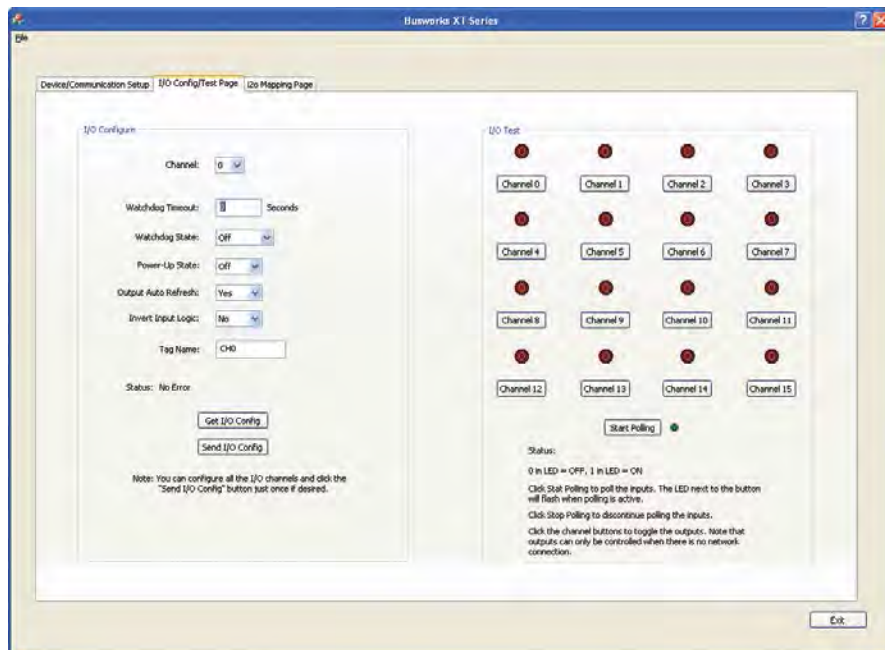
Modbus TCP/IP, Ethernet/IP, Profinet, i2o® peer-to-peer, 10/100Base-T(X) PriorityChannel™ device determinism

Power Requirement

12 to 32V DC (2.5W)

Key Features & Benefits

- 16 solid-state discrete I/O channels (any mix of inputs or outputs)
- Built-in 10K ohm pull-up resistors for 2/3-wire sensors (contacts, proximity, TTL)
- Configurable normal/reverse input logic
- Open-drain outputs switch up to 300mA each and include built-in read-back capability
- Easy setup with Windows software via USB
- Watchdog timer control of failsafe outputs
- Continuously changing "heart-beat" register validates module operation
- High-Density 22.5mm wide package with pluggable, front-facing terminals
- Dual Ethernet 10/100 ports (auto-negotiation) reduce switch port requirements
- 1500V AC isolation (between I/O, power, and network ports) and surge/transient protection
- Supports bussed/rail and redundant power
- -40°C to +70°C wide temperature operation
- Withstands 25g shock and 4g vibration
- CE and UL/cUL Class 1 Div 2 Zone 2 approvals



BusWorks XT software (download free from www.acromag.com) allows you to configure transmitters offline with USB, save the file, and download settings into units later, at your convenience.



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Ethernet I/O: BusWorks® XT Series

XT1120 Ethernet Discrete I/O Modules (sourcing outputs)

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of the USB-ISOLATOR when configuring an XT1000 I/O module.

■ USB Interface

USB Connector

Type: USB Mini-B type socket, 5-pin.
Data rate: 12Mbps. USB v1.1 and 2.0 compatible.
Maximum cable length: 5.0 meters.

USB Transient Protection

Transient voltage suppression on power and data lines.

Driver

Not required. Uses Windows HID drivers.

■ Input

Input Type

16 active-high, buffered inputs, with a common connection. Inputs are tied in tandem to output drains for optional loopback monitoring of output state.

Input Signal Voltage Range

0 to 32V DC.

Input Current

280µA, typical at 32V DC.

Input Signal Threshold

1.7V typical with 100mV of hysteresis.

Input Resistance

100K ohms, typical.

Input Response Time

10ms, nominal.

■ Output

Output Type

16 open-source, smart, p-channel mosfet switches with a common drain connection. Provides high-side (sourcing) switching between excitation and load.

Output Voltage

0 to 32V DC.

Output "ON" Resistance

0.8 ohms typical, 1.6 ohms maximum.

Output "ON" Current Range

0 to 300mA DC, continuous (up to 4.8A total for all 16 channels combined). See Operating Temperature specification for effect of channels at full load. See manual for detailed effects of operating temperature.

Output Response Time

10ms, nominal.

■ Ethernet Communication

Protocols

Modbus TCP/IP, i2o peer-to-peer, Ethernet/IP, or Profinet depending on model number.

Ethernet Communication Controller

Innovasic RapID™ Platform with PriorityChannel™ for determinism at the device regardless of network load.

Modbus TCP/IP (slave)

Port 502 reserved. Supports up to 10 sockets.

i2o Peer-to-Peer (master/slave)

Can map 4-channel input groups to output groups at two destination IP addresses. Timed or change-of-state updates. Supports GPRS/GSM systems.

Ethernet/IP (adapter)

Supports 16 connections. EDS file on website.

Profinet (server)

Supports 1 connection. GSDML file on website.

Connectors

Two shielded 8-pin RJ-45 sockets, 10BaseT/100BaseTX.

Wiring

Auto-crossover for MDI or MDI-X.

IP Address

User-configurable. 128.1.1.100 default static IP address.

Data Rate

Auto-negotiated, 10Mbps or 100Mbps.

Compliance

IEEE 802.3, 802.3u, 802.3x.

■ Environmental

Operating temperature

-40 to 70°C (-40 to 158°F). Max temperature derates -0.625°C per output channel at full load (300mA).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

12 to 32V DC (95mA maximum @ 24V).

Isolation

4-way isolation between I/O channels, network (each port); and power.

Peak: 1500V AC, ANSI/ISA-82.01-1988.

Continuous: 250V AC, 354V DC.

Shock and Vibration Immunity

Vibration: 4g, per IEC 60068-2-64.

Shock: 25g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.

RFI: BS EN 61000-6-2, IEC 61000-4-3.

Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.

ESD: BS EN 61000-6-2, IEC 61000-4-2.

EFT: BS EN 61000-6-2, IEC 61000-4-4.

Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals

CE compliant. UL/cUL Class I; Div. 2 Zone 2.

■ Physical

General

General purpose plastic enclosure for mounting on 35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General purpose NEMA Type 1 enclosure.

Circuit Board

Military grade fire-retardant epoxy glass (IPC-4101/98).

I/O Connectors

Removable plug-in type terminal blocks rated for 12A/250V; AWG #26-12, stranded/solid copper wire.

Dimensions

Width = 22.5mm (0.9 inches), Length = 114.5mm (4.51 inches), Depth = 99.0mm (3.90 inches).

Shipping Weight

0.5 pounds (0.22 Kg) packed.

Ordering Information

◆ Models

XT1121-000

Digital I/O module, Modbus/TCP and i2o protocol.

XT1122-000

Digital I/O module, Ethernet/IP protocol.

XT1123-000

Digital I/O module, Profinet protocol.

◆ Software

XT-SIP (recommend one kit per customer)

Software Interface Package. Includes software (XT-CONFIG), isolator (USB-ISOLATOR), two USB cables (4001-112, 4001-113), Ethernet cable (5035-360).

◆ Accessories

XTA-120V-6

XTA-240V-3

6-channel 120V AC/DC or 3-channel 240V AC/DC discrete input module with 5V DC logic outputs. Interfaces with sinking/sourcing DC inputs.

XTA-MRNO-6

6-ch mechanical relay output module, Form A, SPST normally open 5A relays (5/12/24V DC logic input).

XTBUS-KIT

DIN rail bus power/excitation connector kit. Includes one DIN rail bus connector (1005-070), one left-side female connector terminal block (1005-220) and one right side male connector terminal block (1005-221).

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

ISO9001
AS9100



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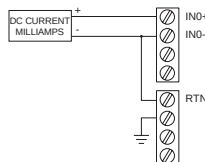
Ethernet I/O: BusWorks® XT Series

XT1210 Ethernet Analog Current Input Modules

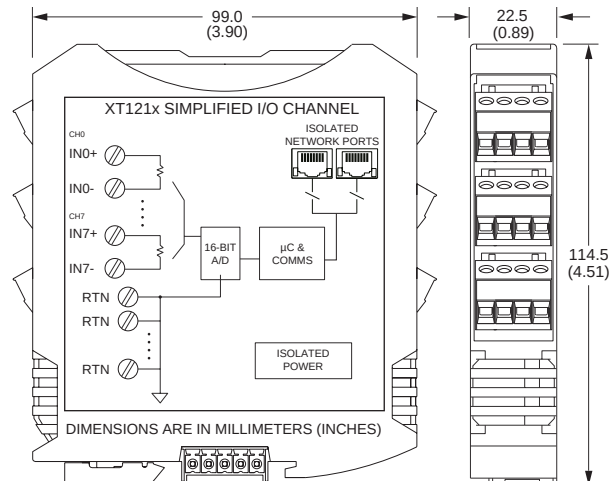
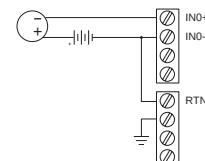


EXAMPLE INPUT CONNECTIONS

SOURCED DC CURRENT



TWO-WIRE CONNECTION



8-channel differential analog current input ♦ Modbus TCP/IP, Ethernet/IP, Profinet, or i2o communication

Description

The XT1210 offers an isolated Ethernet network interface for up to eight differential current input channels. Isolated differential inputs deliver better measurements, superior noise rejection, and eliminate the need for current loop isolators.

Rugged construction, high density design, and easy USB-to-PC/Windows setup combine for a very effective and reliable module. These units are ideal for remote monitoring, distributed control, or SCADA applications.

Input Ranges

0 to 11mA, 0 to 20mA, 4 to 20mA, ± 20 mA.
0 to 20 amps AC (with optional AC sensor)

Ethernet Communication

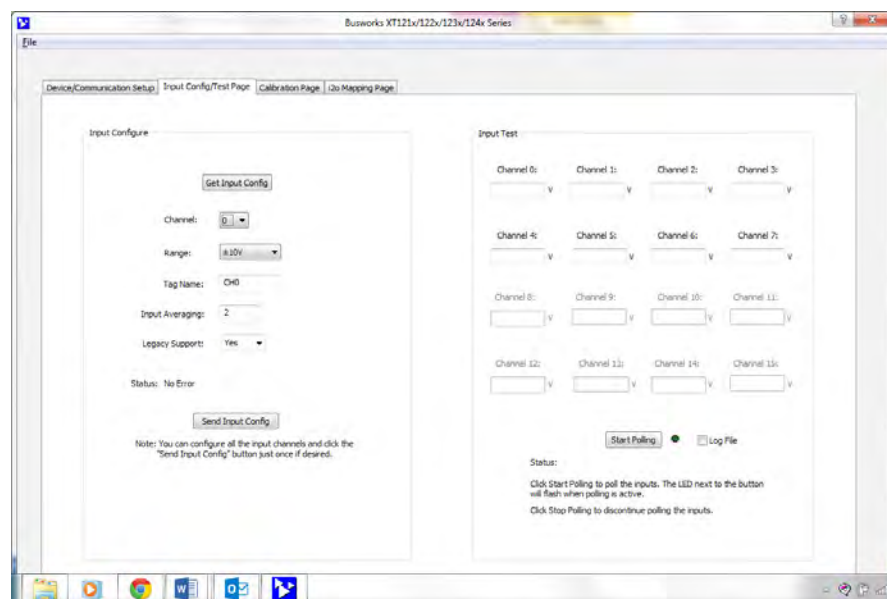
Modbus TCP/IP, Ethernet/IP, Profinet,
i2o® peer-to-peer, 10/100Base-T(X)
PriorityChannel™ device determinism

Power Requirement

12 to 32V DC (2.8W)

Key Features & Benefits

- Easy setup with Windows software via USB
- Low input impedance (27 ohms) reduces loading on current loops
- User-configurable sample averaging (1-200) on a per-channel basis
- 10ms network updates for all 8 input channels
- i2o peer-to-peer updates based on percent-of-change and/or timed updates
- High-resolution 16-bit $\Sigma\Delta$ A/D converter ensures precise, high accuracy measurements
- High-Density 22.5mm wide package with pluggable, front-facing terminals
- Dual Ethernet 10/100 ports (auto-negotiation) reduce switch port requirements
- 1500V AC isolation (between I/O, power, and network ports) and surge/transient protection
- Supports bussed/rail and redundant power
- -40°C to +70°C wide temperature operation
- Withstands 25g shock and 4g vibration
- CE compliant. UL/cUL Class 1 Div 2 Zone 2 approval



BusWorks XT software (download free from www.acromag.com) allows you to configure I/O modules offline with USB or save the configuration file and download settings into units later at your convenience.



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Ethernet I/O: BusWorks® XT Series

XT1210 Ethernet Analog Current Input Modules

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of the USB-ISOLATOR when configuring an XT1000 I/O module.

■ USB Interface

USB Connector

Type: USB Mini-B type socket, 5-pin.
Data rate: 12Mbps. USB v1.1 and 2.0 compatible.
Maximum cable length: 5.0 meters.

USB Transient Protection

Transient voltage suppression on power and data lines.

Driver

Not required. Uses Windows HID drivers.

■ Input

Accuracy

±0.05% of span, typical for nominal input ranges.

Analog to Digital Converter (A/D)

16-bit $\Sigma\Delta$ converter. 1.476uA/bit resolution.

Noise Rejection

Better than -110dB @ 60Hz.

Input Filter Bandwidth

-3dB at 25KHz, typical.

Input Conversion Rate

10ms for all 8 input channels.

Input Impedance

27.4 ohms.

■ Ethernet Communication

Protocols

Modbus TCP/IP, i2o peer-to-peer, Ethernet/IP, or Profinet depending on model number.

Ethernet Communication Controller

Innovasic RapID™ Platform with PriorityChannel™ for determinism at the device regardless of network load.

Modbus TCP/IP (slave)

Port 502 reserved. Supports up to 10 sockets.

i2o Peer-to-Peer (master/slave)

Can map each of 8 analog input channels separately to output channels. Timed (1-65535 sec) or percent-of-change updates. Supports GPRS/GSM systems.

Ethernet/IP (adapter)

Supports 10 connections. EDS file on website.

Profinet (server)

Supports 1 connection. GSDML file on website.

Connectors

Two shielded 8-pin RJ-45 sockets, 10BaseT/100BaseTX.

Wiring

Auto-crossover for MDI or MDI-X.

IP Address

User-configurable. 192.168.1.100 default IP address.

Data Rate

Auto-negotiated, 10Mbps or 100Mbps.

Compliance

IEEE 802.3, 802.3u, 802.3x.

■ Environmental

Operating temperature

-40 to 70°C (-40 to 158°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

12 to 32V DC, 2.8W maximum
(116mA maximum @ 24V).

Isolation

4-way isolation between I/O channels, network (each port), and power.

Peak: 1500V AC, ANSI/ISA-82.01-1988.

Continuous: 250V AC, 354V DC.

Shock and Vibration Immunity

Vibration: 4g, per IEC 60068-2-64.

Shock: 25g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.

RFI: BS EN 61000-6-2, IEC 61000-4-3.

Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.

ESD: BS EN 61000-6-2, IEC 61000-4-2.

EFT: BS EN 61000-6-2, IEC 61000-4-4.

Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals

CE compliant. UL/cUL listed.

Designed for Class I; Division 2; Groups ABCD; Zone 2.

■ Physical

General

General purpose plastic enclosure for mounting on 35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General purpose NEMA Type 1 enclosure.

Circuit Board

Military grade fire-retardant epoxy glass (IPC-4101/98).

I/O Connectors

Removable plug-in type terminal blocks rated for 12A/250V; AWG #26-12, stranded/solid copper wire.

Dimensions

Width = 22.5mm (0.9 inches), Length = 114.5mm (4.51 inches), Depth = 99.0mm (3.90 inches).

Shipping Weight

0.5 pounds (0.22 Kg) packed.

Ordering Information

◆ Models

XT1211-000

8-channel differential current input module, Modbus/TCP and i2o protocol.

XT1212-000

8-channel differential current input module, Ethernet/IP protocol.

XT1213-000

8-channel differential current input module, Profinet protocol.

◆ Software

XT-SIP (recommend one kit per customer)

Software Interface Package. Includes software (XT-CONFIG), isolator (USB-ISOLATOR), two USB cables (4001-112, 4001-113), Ethernet cable (5035-360).

◆ Accessories

XTBUS-KIT

DIN rail bus power/excitation connector kit. Includes one DIN rail bus connector (1005-070), one left-side female connector terminal block (1005-220) and one right side male connector terminal block (1005-221).

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

5020-350

AC current sensor (toroidal transformer). Converts 0-20A AC to 0-11.17mA DC.

PS5R-SD24

Power supply (24V DC, 2.5A).

DIN RAIL 3.0

DIN RAIL 16.7

DIN rail strip, Type T, 3 inches (75mm) or 16.7 (425mm).

20RM-16-DIN

19" rack-mount kit with DIN rail.

ISO9001
AS9100



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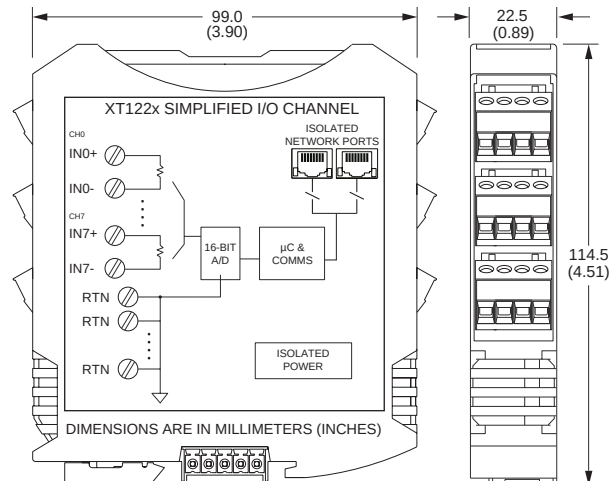
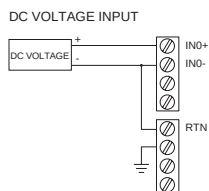


Ethernet I/O: BusWorks® XT Series

XT1220 Ethernet Analog Voltage Input Modules



EXAMPLE INPUT CONNECTIONS



8-channel differential analog voltage input ♦ Modbus TCP/IP, Ethernet/IP, Profinet, or i2o communication

Description

The XT1220 offers an isolated Ethernet network interface for up to eight differential voltage input channels. Isolated differential inputs deliver better measurements, superior noise rejection, and eliminate the need for signal isolators.

Rugged construction, high density design, and easy USB-to-PC/Windows setup combine for a very effective and reliable module. These units are ideal for remote monitoring, distributed control, or SCADA applications.

Input Ranges

$\pm 5V$, $\pm 10V$, 0 to 5V, 0 to 10V.

Ethernet Communication

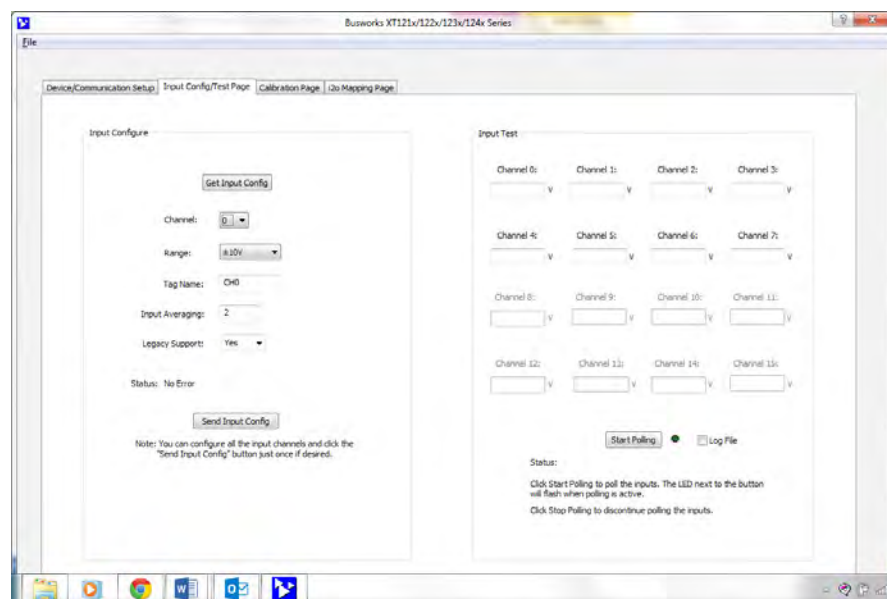
Modbus TCP/IP, Ethernet/IP, Profinet, i2o® peer-to-peer, 10/100Base-T(X) PriorityChannel™ device determinism

Power Requirement

12 to 32V DC (2.8W)

Key Features & Benefits

- Easy setup with Windows software via USB
- High input impedance (100K ohms) reduces loading on voltage loops
- User-configurable sample averaging (1-200) on a per-channel basis
- 10ms network updates for all 8 input channels
- i2o peer-to-peer updates based on percent-of-change and/or timed updates
- High-resolution 16-bit $\Sigma\Delta$ A/D converter ensures precise, high accuracy measurements
- High-Density 22.5mm wide package with pluggable, front-facing terminals
- Dual Ethernet 10/100 ports (auto-negotiation) reduce switch port requirements
- 1500V AC isolation (between I/O, power, and network ports) and surge/transient protection
- Supports bussed/rail and redundant power
- -40°C to +70°C wide temperature operation
- Withstands 25g shock and 4g vibration
- CE compliant. UL/cUL Class 1 Div 2 Zone 2 approval



BusWorks XT software (download free from www.acromag.com) allows you to configure I/O modules offline with USB or save the configuration file and download settings into units later at your convenience.



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Ethernet I/O: BusWorks® XT Series

XT1220 Ethernet Analog Input Modules

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of the USB-ISOLATOR when configuring an XT1000 I/O module.

■ USB Interface

USB Connector

Type: USB Mini-B type socket, 5-pin.
Data rate: 12Mbps. USB v1.1 and 2.0 compatible.
Maximum cable length: 5.0 meters.

USB Transient Protection

Transient voltage suppression on power and data lines.

Driver

Not required. Uses Windows HID drivers.

■ Input

Accuracy

±0.05% of span, typical for nominal input ranges.

Analog to Digital Converter (A/D)

16-bit $\Sigma\Delta$ converter. 334.85uV/bit resolution.

Noise Rejection

Better than -110dB @ 60Hz.

Input Filter Bandwidth

-3dB at 25KHz, typical.

Input Conversion Rate

10ms for all 8 input channels.

Input Impedance

100.2K ohms.

■ Ethernet Communication

Protocols

Modbus TCP/IP, i2o peer-to-peer, Ethernet/IP, or Profinet depending on model number.

Ethernet Communication Controller

Innovasic RapID™ Platform with PriorityChannel™ for determinism at the device regardless of network load.

Modbus TCP/IP (slave)

Port 502 reserved. Supports up to 10 sockets.

i2o Peer-to-Peer (master/slave)

Can map each of 8 analog input channels separately to output channels. Timed (1-65535 sec) or percent-of-change updates. Supports GPRS/GSM systems.

Ethernet/IP (adapter)

Supports 10 connections. EDS file on website.

Profinet (server)

Supports 1 connection. GSDML file on website.

Connectors

Two shielded 8-pin RJ-45 sockets, 10BaseT/100BaseTX.

Wiring

Auto-crossover for MDI or MDI-X.

IP Address

User-configurable. 192.168.1.100 default IP address.

Data Rate

Auto-negotiated, 10Mbps or 100Mbps.

Compliance

IEEE 802.3, 802.3u, 802.3x.

■ Environmental

Operating temperature

-40 to 70°C (-40 to 158°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

12 to 32V DC, 2.8W maximum
(116mA maximum @ 24V).

Isolation

4-way isolation between I/O channels, network (each port), and power.

Peak: 1500V AC, ANSI/ISA-82.01-1988.

Continuous: 250V AC, 354V DC.

Shock and Vibration Immunity

Vibration: 4g, per IEC 60068-2-64.

Shock: 25g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.

RFI: BS EN 61000-6-2, IEC 61000-4-3.

Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.

ESD: BS EN 61000-6-2, IEC 61000-4-2.

EFT: BS EN 61000-6-2, IEC 61000-4-4.

Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals

CE compliant. UL/cUL listed.

Designed for Class I; Division 2; Groups ABCD; Zone 2.

■ Physical

General

General purpose plastic enclosure for mounting on 35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General purpose NEMA Type 1 enclosure.

Circuit Board

Military grade fire-retardant epoxy glass (IPC-4101/98).

I/O Connectors

Removable plug-in type terminal blocks rated for 12A/250V; AWG #26-12, stranded/solid copper wire.

Dimensions

Width = 22.5mm (0.9 inches), Length = 114.5mm (4.51 inches), Depth = 99.0mm (3.90 inches).

Shipping Weight

0.5 pounds (0.22 Kg) packed.

Ordering Information

◆ Models

XT1221-000

8-channel differential voltage input module, Modbus/TCP and i2o protocol.

XT1222-000

8-channel differential voltage input module, Ethernet/IP protocol.

XT1223-000

8-channel differential voltage input module, Profinet protocol.

◆ Software

XT-SIP (recommend one kit per customer)

Software Interface Package. Includes software (XT-CONFIG), isolator (USB-ISOLATOR), two USB cables (4001-112, 4001-113), Ethernet cable (5035-360).

◆ Accessories

XTBUS-KIT

DIN rail bus power/excitation connector kit. Includes one DIN rail bus connector (1005-070), one left-side female connector terminal block (1005-220) and one right side male connector terminal block (1005-221).

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

PS5R-SD24

Power supply (24V DC, 2.5A).

DIN RAIL 3.0

DIN RAIL 16.7

DIN rail strip, Type T, 3 inches (75mm) or 16.7 (425mm).

20RM-16-DIN

19" rack-mount kit with DIN rail.

ISO9001
AS9100



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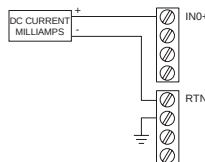
Ethernet I/O: BusWorks® XT Series

XT1230 Ethernet Analog Input Modules

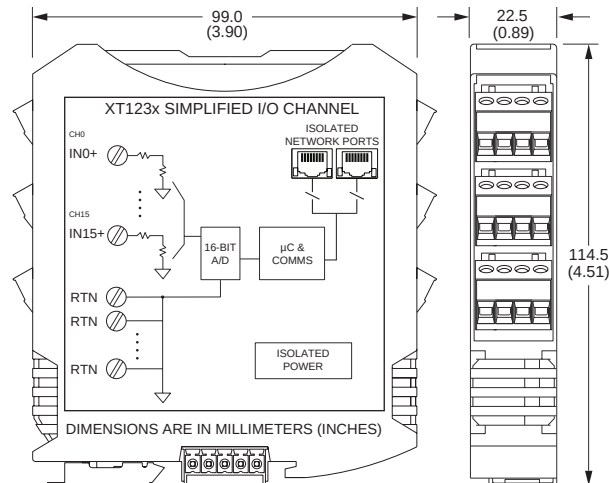
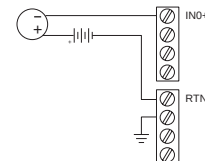


EXAMPLE INPUT CONNECTIONS

SOURCED DC CURRENT



TWO-WIRE CONNECTION



16-channel single-ended analog current input ♦ Modbus TCP/IP, Ethernet/IP, Profinet, or i2o communication

Description

The XT1230 offers an isolated Ethernet network interface for up to sixteen single-ended current input channels. Single-ended inputs enable a higher channel density to save space and a lower cost per channel.

Rugged construction, high density design, and easy USB-to-PC/Windows setup combine for a very effective and reliable module. These units are ideal for remote monitoring, distributed control, or SCADA applications.

Input Ranges

DC Current:
0 to 11mA, 0 to 20mA, 4 to 20mA, ± 20 mA.
0 to 20 amps AC (with optional AC sensor)

Ethernet Communication

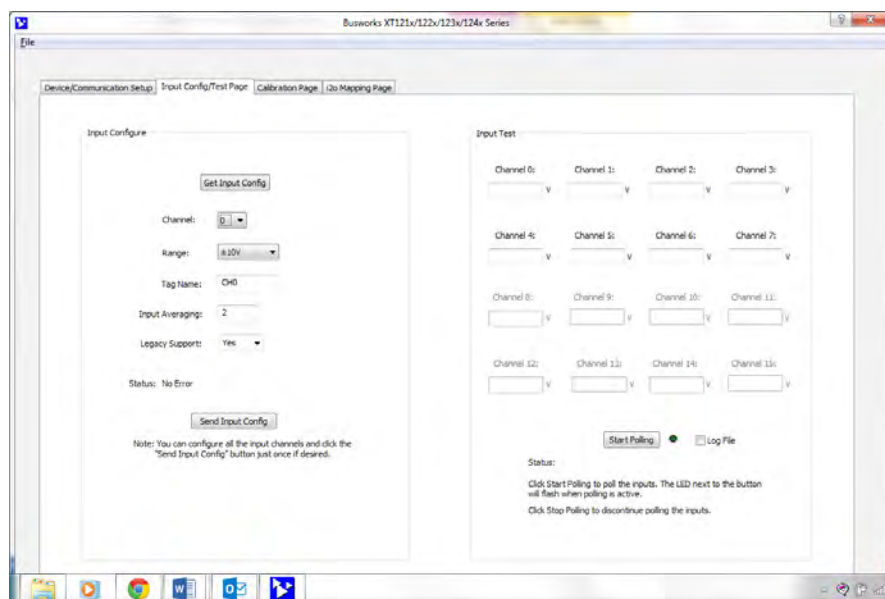
Modbus TCP/IP, Ethernet/IP, Profinet,
i2o® peer-to-peer, 10/100Base-T(X)
PriorityChannel™ device determinism

Power Requirement

12 to 32V DC (2.8W)

Key Features & Benefits

- Easy setup with Windows software via USB
- Low input impedance (27 ohms) reduces loading on current loops
- User-configurable sample averaging (1-200) on a per-channel basis
- 10ms network updates for all 16 input channels
- i2o peer-to-peer updates based on percent-of-change and/or timed updates
- High-resolution 16-bit $\Sigma\Delta$ A/D converter ensures precise, high accuracy measurements
- High-Density 22.5mm wide package with pluggable, front-facing terminals
- Dual Ethernet 10/100 ports (auto-negotiation) reduce switch port requirements
- 1500V AC isolation (between I/O, power, and network ports) and surge/transient protection
- Supports bussed/rail and redundant power
- -40°C to +70°C wide temperature operation
- Withstands 25g shock and 4g vibration
- CE compliant. UL/cUL Class 1 Div 2 Zone 2 approvals



BusWorks XT software (download free from www.acromag.com) allows you to configure I/O modules offline with USB or save the configuration file and download settings into units later at your convenience.



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Ethernet I/O: BusWorks® XT Series

XT1230 Ethernet Analog Input Modules

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of the USB-ISOLATOR when configuring an XT1000 I/O module.

■ USB Interface

USB Connector

Type: USB Mini-B type socket, 5-pin.
Data rate: 12Mbps. USB v1.1 and 2.0 compatible.
Maximum cable length: 5.0 meters.

USB Transient Protection

Transient voltage suppression on power and data lines.

Driver

Not required. Uses Windows HID drivers.

■ Input

Accuracy

±0.05% of span, typical for nominal input ranges.

Analog to Digital Converter (A/D)

16-bit $\Sigma\Delta$ converter. 1.476uA/bit resolution.

Noise Rejection

Better than -110dB @ 60Hz.

Input Filter Bandwidth

-3dB at 25KHz, typical.

Input Conversion Rate

10ms for all 16 input channels.

Input Impedance

27.4 ohms.

■ Ethernet Communication

Protocols

Modbus TCP/IP, i2o peer-to-peer, Ethernet/IP, or Profinet depending on model number.

Ethernet Communication Controller

Innovasic RapID™ Platform with PriorityChannel™ for determinism at the device regardless of network load.

Modbus TCP/IP (slave)

Port 502 reserved. Supports up to 10 sockets.

i2o Peer-to-Peer (master/slave)

Can map each of 16 analog input channels separately to output channels. Timed (1-65535 sec) or percent-of-change updates. Supports GPRS/GSM systems.

Ethernet/IP (adapter)

Supports 10 connections. EDS file on website.

Profinet (server)

Supports 1 connection. GSDML file on website.

Connectors

Two shielded 8-pin RJ-45 sockets, 10BaseT/100BaseTX.

Wiring

Auto-crossover for MDI or MDI-X.

IP Address

User-configurable. 192.168.1.100 default IP address.

Data Rate

Auto-negotiated, 10Mbps or 100Mbps.

Compliance

IEEE 802.3, 802.3u, 802.3x.

■ Environmental

Operating temperature

-40 to 70°C (-40 to 158°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

12 to 32V DC, 2.8W maximum
(113mA maximum @ 24V).

Isolation

4-way isolation between I/O channels, network (each port), and power.

Peak: 1500V AC, ANSI/ISA-82.01-1988.

Continuous: 250V AC, 354V DC.

Shock and Vibration Immunity

Vibration: 4g, per IEC 60068-2-64.

Shock: 25g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.

RFI: BS EN 61000-6-2, IEC 61000-4-3.

Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.

ESD: BS EN 61000-6-2, IEC 61000-4-2.

EFT: BS EN 61000-6-2, IEC 61000-4-4.

Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals

CE compliant. UL/cUL listed.

Designed for Class I; Division 2; Groups ABCD; Zone 2.

■ Physical

General

General purpose plastic enclosure for mounting on 35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General purpose NEMA Type 1 enclosure.

Circuit Board

Military grade fire-retardant epoxy glass (IPC-4101/98).

I/O Connectors

Removable plug-in type terminal blocks rated for 12A/250V; AWG #26-12, stranded/solid copper wire.

Dimensions

Width = 22.5mm (0.9 inches), Length = 114.5mm (4.51 inches), Depth = 99.0mm (3.90 inches).

Shipping Weight

0.5 pounds (0.22 Kg) packed.

Ordering Information

◆ Models

XT1231-000

16-channel single-ended current input module, Modbus/TCP and i2o protocol.

XT1232-000

16-channel single-ended current input module, Ethernet/IP protocol.

XT1233-000

16-channel single-ended current input module, Profinet protocol.

◆ Software

XT-SIP (recommend one kit per customer)

Software Interface Package. Includes software (XT-CONFIG), isolator (USB-ISOLATOR), two USB cables (4001-112, 4001-113), Ethernet cable (5035-360).

◆ Accessories

XTBUS-KIT

DIN rail bus power/excitation connector kit. Includes one DIN rail bus connector (1005-070), one left-side female connector terminal block (1005-220) and one right side male connector terminal block (1005-221).

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

5020-350

AC current sensor (toroidal transformer). Converts 0-20A AC to 0-11.17mA DC.

PS5R-SD24

Power supply (24V DC, 2.5A).

DIN RAIL 3.0

DIN RAIL 16.7

DIN rail strip, Type T, 3 inches (75mm) or 16.7 (425mm).

20RM-16-DIN

19" rack-mount kit with DIN rail.

ISO9001
AS9100



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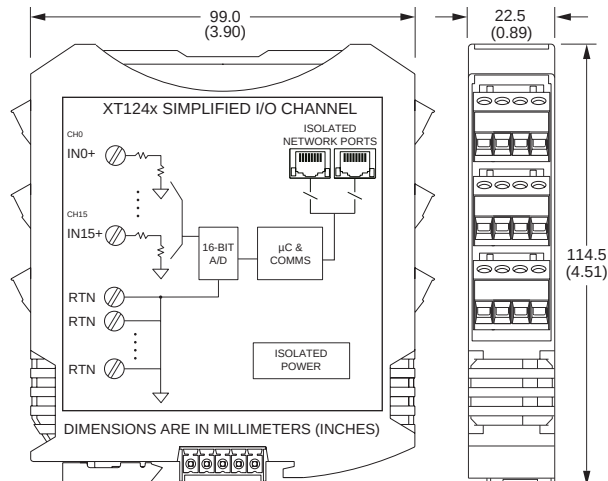
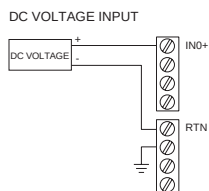


Ethernet I/O: BusWorks® XT Series

XT1240 Ethernet Analog Input Modules



EXAMPLE INPUT CONNECTIONS



16-channel single-ended analog voltage input ♦ Modbus TCP/IP, Ethernet/IP, Profinet, or i2o communication

Description

The XT1240 offers an isolated Ethernet network interface for up to sixteen single-ended voltage input channels. Single-ended inputs enable a higher channel density to save space and a lower cost per channel.

Rugged construction, high density design, and easy USB-to-PC/Windows setup combine for a very effective and reliable module. These units are ideal for remote monitoring, distributed control, or SCADA applications.

Input Ranges

DC Voltage:
±5V, ±10V, 0 to 5V, 0 to 10V.

Ethernet Communication

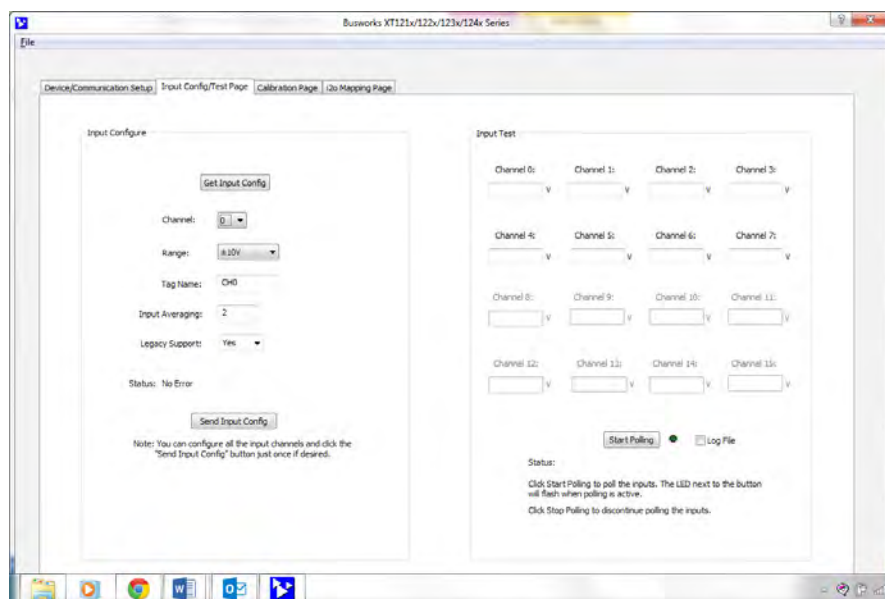
Modbus TCP/IP, Ethernet/IP, Profinet, i2o® peer-to-peer, 10/100Base-T(X) PriorityChannel™ device determinism

Power Requirement

12 to 32V DC (2.8W)

Key Features & Benefits

- Easy setup with Windows software via USB
- High input impedance (100K ohms) reduces loading on voltage loops
- User-configurable sample averaging (1-200) on a per-channel basis
- 10ms network updates for all 16 input channels
- i2o peer-to-peer updates based on percent-of-change and/or timed updates
- High-resolution 16-bit $\Sigma\Delta$ A/D converter ensures precise, high accuracy measurements
- High-Density 22.5mm wide package with pluggable, front-facing terminals
- Dual Ethernet 10/100 ports (auto-negotiation) reduce switch port requirements
- 1500V AC isolation (between I/O, power, and network ports) and surge/transient protection
- Supports bussed/rail and redundant power
- -40°C to +70°C wide temperature operation
- Withstands 25g shock and 4g vibration
- CE compliant. UL/cUL Class 1 Div 2 Zone 2 approvals



BusWorks XT software (download free from www.acromag.com) allows you to configure I/O modules offline with USB or save the configuration file and download settings into units later at your convenience.



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Ethernet I/O: BusWorks® XT Series

XT1240 Ethernet Analog Input Modules

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of the USB-ISOLATOR when configuring an XT1000 I/O module.

■ USB Interface

USB Connector

Type: USB Mini-B type socket, 5-pin.
Data rate: 12Mbps. USB v1.1 and 2.0 compatible.
Maximum cable length: 5.0 meters.

USB Transient Protection

Transient voltage suppression on power and data lines.

Driver

Not required. Uses Windows HID drivers.

■ Input

Accuracy

±0.05% of span, typical for nominal input ranges.

Analog to Digital Converter (A/D)

16-bit $\Sigma\Delta$ converter. 351.6uV/bit resolution.

Noise Rejection

Better than -110dB @ 60Hz.

Input Filter Bandwidth

-3dB at 25KHz, typical.

Input Conversion Rate

10mS for all 16 input channels.

Input Impedance

105.2K ohms.

■ Ethernet Communication

Protocols

Modbus TCP/IP, i2o peer-to-peer, Ethernet/IP, or Profinet depending on model number.

Ethernet Communication Controller

Innovasic RapID™ Platform with PriorityChannel™ for determinism at the device regardless of network load.

Modbus TCP/IP (slave)

Port 502 reserved. Supports up to 10 sockets.

i2o Peer-to-Peer (master/slave)

Can map each of 16 analog input channels separately to output channels. Timed (1-65535 sec) or percent-of-change updates. Supports GPRS/GSM systems.

Ethernet/IP (adapter)

Supports 10 connections. EDS file on website.

Profinet (server)

Supports 1 connection. GSDML file on website.

Connectors

Two shielded 8-pin RJ-45 sockets, 10BaseT/100BaseTX.

Wiring

Auto-crossover for MDI or MDI-X.

IP Address

User-configurable. 192.168.1.100 default IP address.

Data Rate

Auto-negotiated, 10Mbps or 100Mbps.

Compliance

IEEE 802.3, 802.3u, 802.3x.

■ Environmental

Operating temperature

-40 to 70°C (-40 to 158°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

12 to 32V DC, 2.8W maximum
(113mA maximum @ 24V).

Isolation

4-way isolation between I/O channels, network (each port), and power.

Peak: 1500V AC, ANSI/ISA-82.01-1988.

Continuous: 250V AC, 354V DC.

Shock and Vibration Immunity

Vibration: 4g, per IEC 60068-2-64.

Shock: 25g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.

RFI: BS EN 61000-6-2, IEC 61000-4-3.

Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.

ESD: BS EN 61000-6-2, IEC 61000-4-2.

EFT: BS EN 61000-6-2, IEC 61000-4-4.

Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals

CE compliant. UL/cUL listed.

Designed for Class I; Division 2; Groups ABCD; Zone 2.

■ Physical

General

General purpose plastic enclosure for mounting on 35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General purpose NEMA Type 1 enclosure.

Circuit Board

Military grade fire-retardant epoxy glass (IPC-4101/98).

I/O Connectors

Removable plug-in type terminal blocks rated for 12A/250V; AWG #26-12, stranded/solid copper wire.

Dimensions

Width = 22.5mm (0.9 inches), Length = 114.5mm (4.51 inches), Depth = 99.0mm (3.90 inches).

Shipping Weight

0.5 pounds (0.22 Kg) packed.

Ordering Information

◆ Models

XT1241-000

16-channel single-ended voltage input module, Modbus/TCP and i2o protocol.

XT1242-000

16-channel single-ended voltage input module, Ethernet/IP protocol.

XT1243-000

16-channel single-ended voltage input module, Profinet protocol.

◆ Software

XT-SIP (recommend one kit per customer)

Software Interface Package. Includes software (XT-CONFIG), isolator (USB-ISOLATOR), two USB cables (4001-112, 4001-113), Ethernet cable (5035-360).

◆ Accessories

XTBUS-KIT

DIN rail bus power/excitation connector kit. Includes one DIN rail bus connector (1005-070), one left-side female connector terminal block (1005-220) and one right side male connector terminal block (1005-221).

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

PS5R-SD24

Power supply (24V DC, 2.5A).

DIN RAIL 3.0

DIN RAIL 16.7

DIN rail strip, Type T, 3 inches (75mm) or 16.7 (425mm).

20RM-16-DIN

19" rack-mount kit with DIN rail.

ISO9001
AS9100



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Ethernet I/O: BusWorks® XT Series

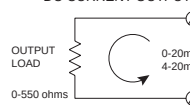
XT1530 Ethernet Multi-Function Analog Output & Digital I/O Modules



**USB
Configured**

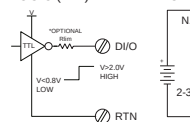
ANALOG OUTPUT EXAMPLES

DC CURRENT OUTPUT

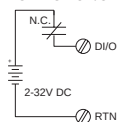


DISCRETE INPUT EXAMPLES

LOGIC (TTL)

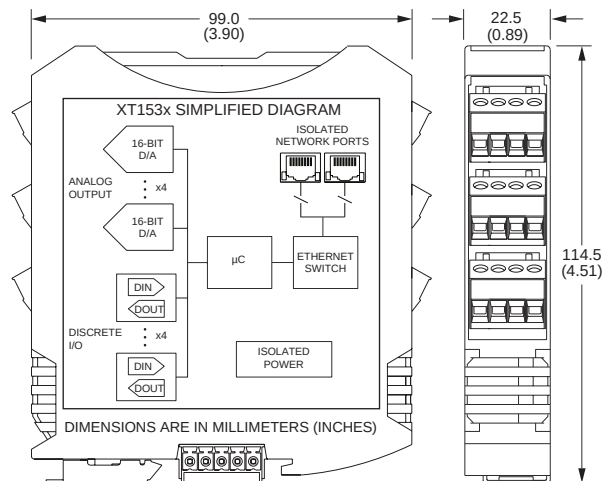
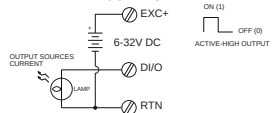


VOLTAGE ON/OFF



DISCRETE OUTPUT EXAMPLES

LAMP CONTROL



4 analog current outputs, 4 discrete I/O channels ♦ Modbus TCP/IP, Ethernet/IP, Profinet, or i2o communication

Description

The XT1530 interfaces analog output and discrete I/O signals between measurement and control devices over Ethernet. Discrete I/O are individually configurable for input or high-side switched output operation.

Rugged construction, high density design, and easy USB-to-PC/Windows setup combine for a very effective I/O solution. These units are ideal for remote monitoring, distributed control, or SCADA applications.

Analog Output Ranges

0-20mA DC, 4-20mA DC

Discrete Input/Output Ranges

Input: 0-32V DC, TTL thresholds

Output: 0-32V DC, open-source, up to 250mA

Ethernet Communication

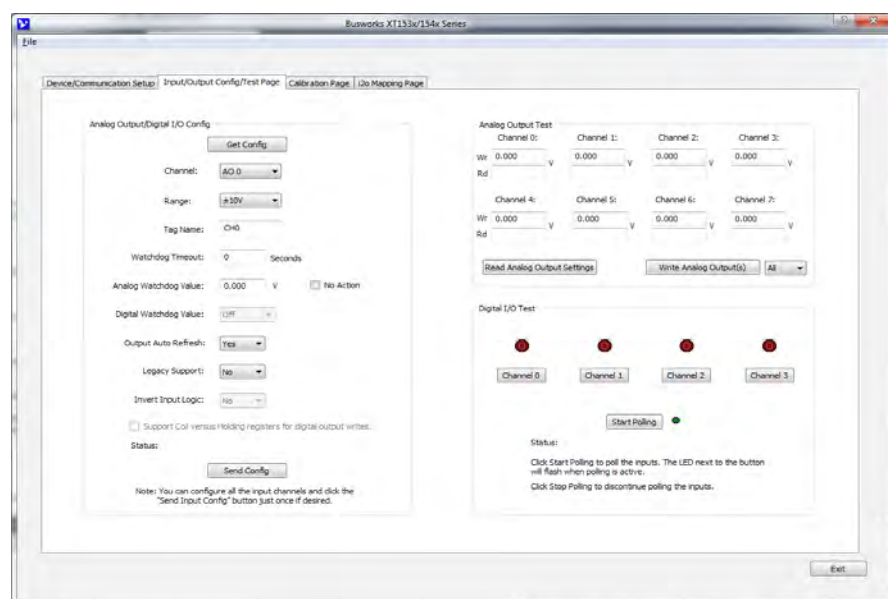
Modbus TCP/IP, Ethernet/IP, Profinet, i2o® peer-to-peer, 10/100Base-T(X) PriorityChannel™ device determinism

Power Requirement

12 to 32V DC (2.8W)

Key Features & Benefits

- Multi-function, multi-channel stand alone module is very economical
- Easy setup with Windows software via USB
- Dual Ethernet 10/100 ports with built-in switch enables daisy-chain networking to reduce costs
- i2o technology for peer-to-peer communication without a network controller
- Four analog output channels (16-bit DACs) to drive remote instruments, controllers, recorders
- Four discrete input/output channels support loopback monitoring of output levels
- Built-in 10K ohm pull-down resistors for use with 2/3-wire sensors (contacts, proximity, TTL)
- Configurable normal/reverse input logic
- Various diagnostics validate module operation
- 1500V AC isolation (between I/O, power, and network ports) and surge/transient protection
- Slim 22.5mm housing with pluggable terminals
- Supports bussed/rail and redundant power
- -40°C to +60°C wide temperature operation
- CE and UL/cUL Class 1 Div 2 Zone 2 approvals



BusWorks XT software (download free from www.acromag.com) allows you to configure I/O modules offline with USB, save the file, and download settings into units later, at your convenience.



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Ethernet I/O: BusWorks® XT Series

XT1530 Ethernet Multi-Function Analog Output & Digital I/O Modules

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of the USB-ISOLATOR when configuring an XT1000 I/O module.

■ USB Interface

USB Connector

Type: USB Mini-B type socket, 5-pin.
Data rate: 12Mbps. USB v1.1 and 2.0 compatible.
Maximum cable length: 5.0 meters.

USB Transient Protection

Transient voltage suppression on power and data lines.

Driver

Not required. Uses Windows HID drivers.

■ Analog Output

Configuration

4 output channels, each with a 16-bit D/A converter.

Output Type

0-20mA DC or 4-20mA DC, configurable by channel.

Accuracy

Better than $\pm 0.1\%$ of span.

Output Excitation

Separate inputs for 12V (10-15V) and 24V (20-28V) power sources. Diode-coupled to support redundancy.

■ Discrete Input

Input Type

4 active-high, buffered inputs, with a common connection. Inputs are tied in tandem to output drains for optional loopback monitoring of output state.

Input Signal Voltage Range

0 to 32V DC.

Input Current

280 μ A, typical at 32V DC.

Input Signal Threshold

1.7V DC typical with 100mV of hysteresis.

Input Resistance

10K ohms, typical.

Input Response Time

10ms, nominal.

■ Discrete Output

Output Type

4 open-source, smart, p-channel mosfet switches with a common drain connection. Provides high-side (sourcing) switching between the load and return.

Output Signal Voltage Range

0 to 32V DC. 6-32V excitation source required.

Output "ON" Resistance

0.5 ohms typical, 1.0 ohms maximum.

Output "ON" Current Range

0 to 250mA DC, continuous (up to 1A total for all 4 channels combined).

Output Response Time

10ms, nominal.

■ Ethernet Communication

Protocols

Modbus TCP/IP, i2o peer-to-peer, Ethernet/IP, or Profinet depending on model number.

Ethernet Communication Controller

Innovasic RapID™ Platform with PriorityChannel™ for determinism at the device regardless of network load.

Modbus TCP/IP (slave)

Port 502 reserved. Supports up to 10 sockets.

i2o Peer-to-Peer (master/slave)

Can map 4-channel input groups to output groups at two destination IP addresses. Timed or change-of-state updates. Supports GPRS/GSM systems.

Ethernet/IP (adapter)

Supports 16 connections. EDS file on website.

Profinet (server)

Supports 1 connection. GSDML file on website.

Connectors

Two shielded 8-pin RJ-45 sockets, 10BaseT/100BaseTX.

Wiring

Auto-crossover for MDI or MDI-X.

IP Address

User-configurable. 192.168.1.100 default static IP address.

Data Rate

Auto-negotiated, 10Mbps or 100Mbps.

Compliance

IEEE 802.3, 802.3u, 802.3x.

■ Environmental

Operating and Storage Temperature

Operating: -40 to 60°C (-40 to 140°F).
Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity

5 to 95% non-condensing.

Power Requirement

12 to 32V DC (110mA maximum @ 24V).

Isolation

I/O channels (as a group), network (each port), and power circuits isolated from each other.
Peak: 1500V AC, ANSI/ISA-82.01-1988.
Continuous: 250V AC, 354V DC.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.
RFI: BS EN 61000-6-2, IEC 61000-4-3.
Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.
ESD: BS EN 61000-6-2, IEC 61000-4-2.
EFT: BS EN 61000-6-2, IEC 61000-4-4.
Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Shock and Vibration Immunity

Vibration: 4g, per IEC 60068-2-64.
Shock: 25g, per IEC 60068-2-27.

Approvals

CE. UL/cUL Class I; Div. 2 Zone 2 approvals (pending)

■ Physical

General

General purpose plastic enclosure for mounting on 35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General purpose NEMA Type 1 enclosure.

Circuit Board

Military grade fire-retardant epoxy glass (IPC-4101/98).

I/O Connectors

Removable plug-in type terminal blocks rated for 12A/250V; AWG #26-12, stranded/solid copper wire.

Dimensions

Width = 22.5mm (0.9 inches), Length = 114.5mm (4.51 inches), Depth = 99.0mm (3.90 inches).

Shipping Weight

0.5 pounds (0.22 Kg) packed.

Ordering Information

◆ Models

XT1531-000

Multi-function 4-ch analog current output, 4-ch digital I/O module, Modbus/TCP and i2o protocol.

XT1532-000

Multi-function 4-ch analog current output, 4-ch digital I/O module, Ethernet/IP protocol.

XT1533-000

Multi-function 4-ch analog current output, 4-ch digital I/O module, Profinet protocol.

◆ Software

XT-SIP (recommend one kit per customer)

Software Interface Package. Includes software (XT-CONFIG), isolator (USB-ISOLATOR), two USB cables (4001-112, 4001-113), Ethernet cable (5035-360).

◆ Accessories

XTBUS-KIT

DIN rail bus power/excitation connector kit. Includes one DIN rail bus connector (1005-070), one left-side female connector terminal block (1005-220) and one right side male connector terminal block (1005-221).

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

ISO9001
AS9100



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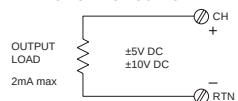
Ethernet I/O: BusWorks® XT Series

XT1540 Ethernet Multi-Function Analog Output & Digital I/O Modules



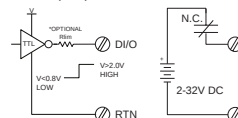
ANALOG OUTPUT EXAMPLES

DC VOLTAGE OUTPUT

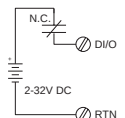


DISCRETE INPUT EXAMPLES

LOGIC (TTL)

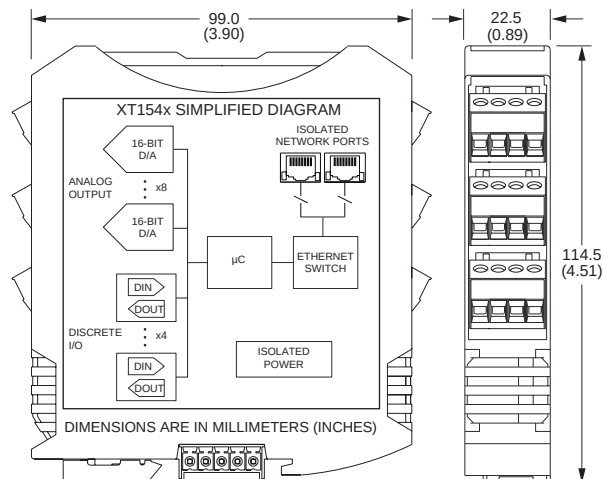
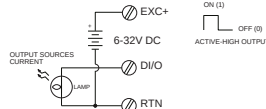


VOLTAGE ON/OFF



DISCRETE OUTPUT EXAMPLES

LAMP CONTROL



8 analog voltage outputs, 4 discrete I/O channels ♦ Modbus TCP/IP, Ethernet/IP, Profinet, or i2o communication

Description

The XT1540 interfaces analog output and discrete I/O signals between measurement and control devices over Ethernet. Discrete I/O are individually configurable for input or high-side switched output operation.

Rugged construction, high density design, and easy USB-to-PC/Windows setup combine for a very effective I/O solution. These units are ideal for remote monitoring, distributed control, or SCADA applications.

Analog Output Ranges

±5V, ±10V DC

Discrete Input/Output Ranges

Input: 0-32V DC, TTL thresholds

Output: 0-32V DC, open-source, up to 250mA

Ethernet Communication

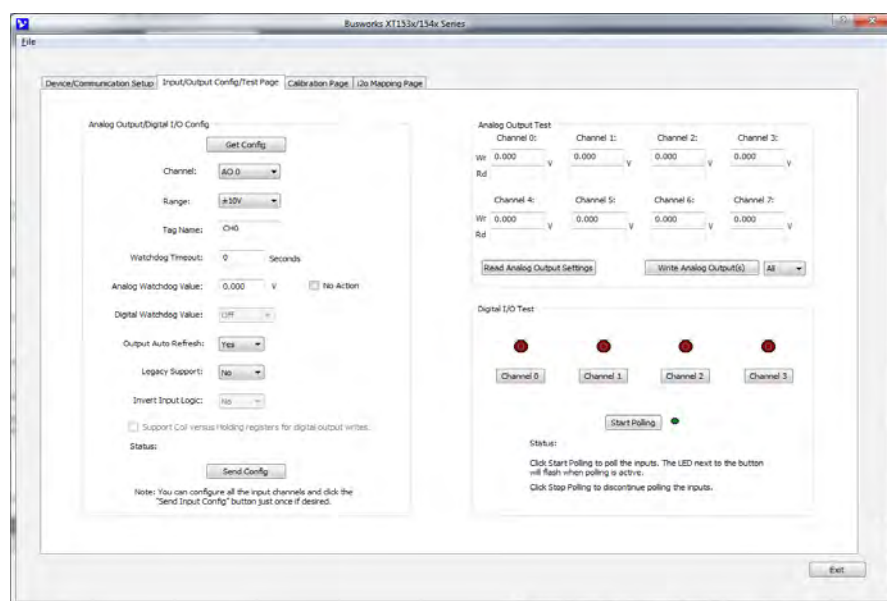
Modbus TCP/IP, Ethernet/IP, Profinet, i2o® peer-to-peer, 10/100Base-T(X) PriorityChannel™ device determinism

Power Requirement

12 to 32V DC (2.8W)

Key Features & Benefits

- Multi-function, multi-channel stand alone module is very economical
- Easy setup with Windows software via USB
- Dual Ethernet 10/100 ports with built-in switch enables daisy-chain networking to reduce costs
- i2o technology for peer-to-peer communication without a network controller
- Eight analog output channels (16-bit DACs) to drive remote instruments, controllers, recorders
- Four discrete input/output channels support loopback monitoring of output levels
- Built-in 10K ohm pull-down resistors for use with 2/3-wire sensors (contacts, proximity, TTL)
- Configurable normal/reverse input logic
- Various diagnostics validate module operation
- 1500V AC isolation (between I/O, power, and network ports) and surge/transient protection
- Slim 22.5mm housing with pluggable terminals
- Supports bussed/rail and redundant power
- -40°C to +65°C wide temperature operation
- CE and UL/cUL Class 1 Div 2 Zone 2 approvals



BusWorks XT software (download free from www.acromag.com) allows you to configure I/O modules offline with USB, save the file, and download settings into units later, at your convenience.



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Ethernet I/O: BusWorks® XT Series

XT1540 Ethernet Multi-Function Analog Output & Digital I/O Modules

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of the USB-ISOLATOR when configuring an XT1000 I/O module.

■ USB Interface

USB Connector

Type: USB Mini-B type socket, 5-pin.
Data rate: 12Mbps. USB v1.1 and 2.0 compatible.
Maximum cable length: 5.0 meters.

USB Transient Protection

Transient voltage suppression on power and data lines.

Driver

Not required. Uses Windows HID drivers.

■ Analog Output

Configuration

8 output channels, each with a 16-bit D/A converter.

Input Type

±10V or ±5V DC, configurable by channel.

Accuracy

Better than ±0.1% of span.

■ Discrete Input

Input Type

4 active-high, buffered inputs, with a common connection. Inputs are tied in tandem to output drains for optional loopback monitoring of output state.

Input Signal Voltage Range

0 to 32V DC.

Input Current

280µA, typical at 32V DC.

Input Signal Threshold

1.7V DC typical with 100mV of hysteresis.

Input Resistance

10K ohms, typical.

Input Response Time

10ms, nominal.

■ Discrete Output

Output Type

4 open-source, smart, p-channel mosfet switches with a common drain connection. Provides high-side (sourcing) switching between the load and return.

Output Signal Voltage Range

0 to 32V DC. 6-32V excitation source required.

Output "ON" Resistance

0.5 ohms typical, 1.0 ohms maximum.

Output "ON" Current Range

0 to 250mA DC, continuous (up to 1A total for all 4 channels combined).

Output Response Time

10ms, nominal.

■ Ethernet Communication

Protocols

Modbus TCP/IP, i2o peer-to-peer, Ethernet/IP, or Profinet depending on model number.

Ethernet Communication Controller

Innovasic RapID™ Platform with PriorityChannel™ for determinism at the device regardless of network load.

Modbus TCP/IP (slave)

Port 502 reserved. Supports up to 10 sockets.

i2o Peer-to-Peer (master/slave)

Can map 4-channel input groups to output groups at two destination IP addresses. Timed or change-of-state updates. Supports GPRS/GSM systems.

Ethernet/IP (adapter)

Supports 16 connections. EDS file on website.

Profinet (server)

Supports 1 connection. GSDML file on website.

Connectors

Two shielded 8-pin RJ-45 sockets, 10BaseT/100BaseTX.

Wiring

Auto-crossover for MDI or MDI-X.

IP Address

User-configurable. 192.168.1.100 default static IP address.

Data Rate

Auto-negotiated, 10Mbps or 100Mbps.

Compliance

IEEE 802.3, 802.3u, 802.3x.

■ Environmental

Operating and Storage Temperature

Operating: -40 to 65°C (-40 to 149°F).
Storage: -40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

12 to 32V DC (110mA maximum @ 24V).

Isolation

I/O channels (as a group), network (each port), and power circuits isolated from each other.
Peak: 1500V AC, ANSI/ISA-82.01-1988.
Continuous: 250V AC, 354V DC.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.
RFI: BS EN 61000-6-2, IEC 61000-4-3.
Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.
ESD: BS EN 61000-6-2, IEC 61000-4-2.
EFT: BS EN 61000-6-2, IEC 61000-4-4.
Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Shock and Vibration Immunity

Vibration: 4g, per IEC 60068-2-64.
Shock: 25g, per IEC 60068-2-27.

Approvals

CE. UL/cUL Class I; Div. 2 Zone 2 approvals (pending)

■ Physical

General

General purpose plastic enclosure for mounting on 35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General purpose NEMA Type 1 enclosure.

Circuit Board

Military grade fire-retardant epoxy glass (IPC-4101/98).

I/O Connectors

Removable plug-in type terminal blocks rated for 12A/250V; AWG #26-12, stranded/solid copper wire.

Dimensions

Width = 22.5mm (0.9 inches), Length = 114.5mm (4.51 inches), Depth = 99.0mm (3.90 inches).

Shipping Weight

0.5 pounds (0.22 Kg) packed.

Ordering Information

◆ Models

XT1541-000

Multi-function 8-ch analog voltage output, 4-ch digital I/O module, Modbus/TCP and i2o protocol.

XT1542-000

Multi-function 8-ch analog voltage output, 4-ch digital I/O module, Ethernet/IP protocol.

XT1543-000

Multi-function 8-ch voltage output, 4-ch digital I/O module, Profinet protocol.

◆ Software

XT-SIP (recommend one kit per customer)

Software Interface Package. Includes software (XT-CONFIG), isolator (USB-ISOLATOR), two USB cables (4001-112, 4001-113), Ethernet cable (5035-360).

◆ Accessories

XTBUS-KIT

DIN rail bus power/excitation connector kit. Includes one DIN rail bus connector (1005-070), one left-side female connector terminal block (1005-220) and one right side male connector terminal block (1005-221).

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

ISO9001
AS9100



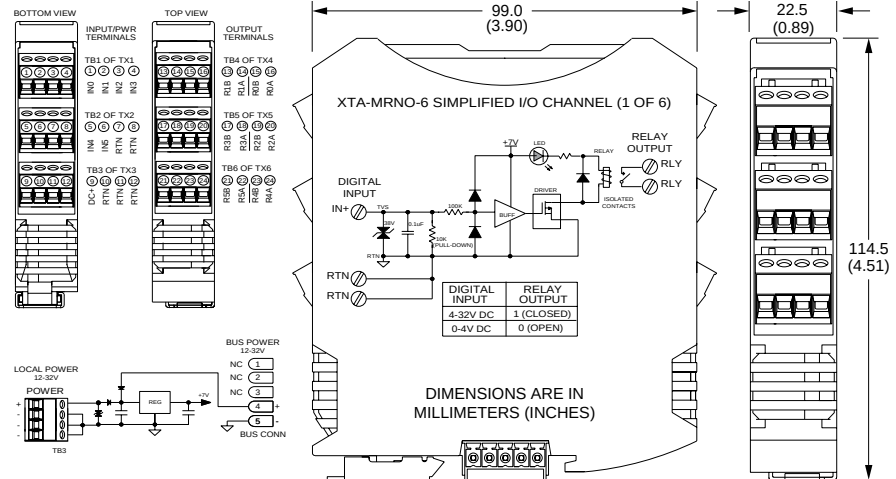
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Ethernet I/O: BusWorks® XT Series

XTA-MRNO Mechanical Relay Output Modules



6 discrete input/output channels ♦ Form A normally open SPST 5A relays ♦ 4-32V logic input

Description

The XTA-MRNO-6 is an interposing relay module with six digital inputs and six mechanical relay outputs. It is intended for use with BusWorks XT Series discrete I/O or other digital output modules for the purpose of driving high energy loads. This module serves as an interim digital interface to switch high voltage devices at high currents based on digital logic inputs. Each pair of output contacts are individually isolated.

These modules are very easy to use. Removable front-facing terminal blocks on the module's top and bottom greatly simplify field wiring. Individual channel LEDs indicate the output state for convenient troubleshooting.

Rugged construction and high density design combine for a very effective I/O solution. These units are ideal for remote monitoring, distributed control, or SCADA applications.

Input Ranges

4-32V digital logic (0V OFF, 4-32V ON)

Output Ranges

Relays drive up to 250V AC / 30V DC at 5A

Power Requirement

12 to 32V DC

Key Features & Benefits

- Six buffered digital logic inputs
- Six mechanical relay outputs
- Normally open, sealed, Form A mechanical relay contacts (SPST-NO)
- Switches both AC and DC voltage loads
- 1500V AC isolation (between each I/O channel and power) and surge/transient protection
- High-Density 22.5mm wide package with pluggable, front-facing terminals
- Individual LEDs for each channel
- Supports bussed/rail and redundant power
- -40°C to +80°C wide temperature operation
- Withstands 25g shock and 4g vibration
- CE and UL/CUL Class 1 Div 2 Zone 2 approvals



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Ethernet I/O: BusWorks® XT Series

XTA-MRNO Mechanical Relay Output Modules

Performance Specifications

■ Digital Inputs (Logic Side)

Configuration

Six DC voltage inputs share return with power.

Input Signal Voltage Range

0 to +32V DC, 36V peak.

Input Signal Threshold

4V DC typical w/100mV hysteresis.

Input Impedance

10KΩ typical, input includes 10KΩ pull-down to return.

Input Response Time

See Output Response Time.

Input Over-Voltage Protection

Bipolar transient voltage suppression (TVS diodes) and capacitive filtering (0.1μF) is included at every input. TVS diodes are rated for a working voltage up to 38V DC, a breakdown voltage of 72V DC, and a damping voltage of 100V DC.

Input Current

3.2 mA at 32V DC, typical. Inputs include 10KΩ pull-downs to return.

■ Relay Outputs (Field Side)

Configuration

Six normally open, isolated, SPST, mechanical relay contacts.

Contact Type

1 Form A (Six Channels), plastic-sealed contacts.

Contact Material

Gold overlay silver-Nickel alloy (Au + Ag 90 Ni 10).

Maximum Switching Voltage

Up to 277 V AC or 125V DC, maximum.

Maximum Switching Current

5A maximum.

Minimum Load

1mA, 5V DC

Maximum Switching Power

Up to 1,250VA or 150W, maximum.

Contact Resistance

1000mΩ at 500V DC, minimum (initial contact resistance).

Dielectric Strength

750V AC (50/60Hz) for 1 minute between open contacts, 3000V AC (50/60Hz) for 1 minute from contacts to input coil.

Mechanical Life

20 x 10⁶ operations, minimum. External contact protection is required for use with inductive loads.

Electrical Life

100 x 10³ operations, minimum at 3A & 250V AC, 30V DC resistive. 50 x 10³ operations, minimum at 5A & 250V AC, 30V DC resistive w/ switching frequency at 20 times/minute.

Note: It is not recommended to switch mechanical relay contacts at high frequencies for long periods of time as this will quickly degrade the life of the relay.

Output Response Time

5.25ms typical, 10ms maximum, no bounce measured from input trigger to corresponding output contact closure.

Note: External relay contact protection is required for use with inductive loads. Failure to use adequate protection may reduce contact life or damage the unit.

■ Environmental

Operating Temperature

-40 to 80°C (-40 to 176°F).

Storage Temperature

-40 to 80°C (-40 to 176°F).

Relative Humidity

5 to 95% non-condensing.

Power Requirement

12–32V DC SELV (Safety Extra Low Voltage), 0.9W. Current draw varies with power voltage as follows (current indicated is with all six relays energized).

Power Supply	Current Draw
12V DC	62mA typical, 68mA maximum
15V DC	50mA typical, 55mA maximum
24V DC	32mA typical, 35mA maximum
32V DC	25mA typical, 27mA maximum

Isolation

Channel-to-channel and power isolation.

Peak: 1500V AC, ANSI/ISA-82.01-1988.

Continuous: 250V AC, 354V DC.

Shock and Vibration Immunity

Vibration: 4g, per IEC 60068-2-64.

Shock: 25g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.

RFI: BS EN 61000-6-2, IEC 61000-4-3.

Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.

ESD: BS EN 61000-6-2, IEC 61000-4-2.

EFT: BS EN 61000-6-2, IEC 61000-4-4.

Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals

CE compliant. UL/cUL Class I; Div. 2 Zone 2.

■ Physical

General

General purpose plastic enclosure for mounting on 35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General purpose NEMA Type 1 enclosure.

Circuit Board

Military grade fire-retardant epoxy glass per IPC-4101/98 with humi-seal conformal coating.

I/O Connectors

Removable plug-in type terminal blocks rated for 12A/250V; AWG #26-12, stranded/solid copper wire.

Dimensions

Width = 22.5mm (0.9 inches), Length = 114.5mm (4.51 inches), Depth = 99.0mm (3.90 inches).

Shipping Weight

0.5 pounds (0.22 Kg) packed.

Ordering Information

◆ Models

XTA-MRNO-6

6-channel mechanical relay output module

◆ Accessories

XTBUS-KIT

DIN rail bus power/excitation connector kit. Includes one DIN rail bus connector (1005-070), one left-side female connector terminal block (1005-220) and one right side male connector terminal block (1005-221).

ISO9001
AS9100

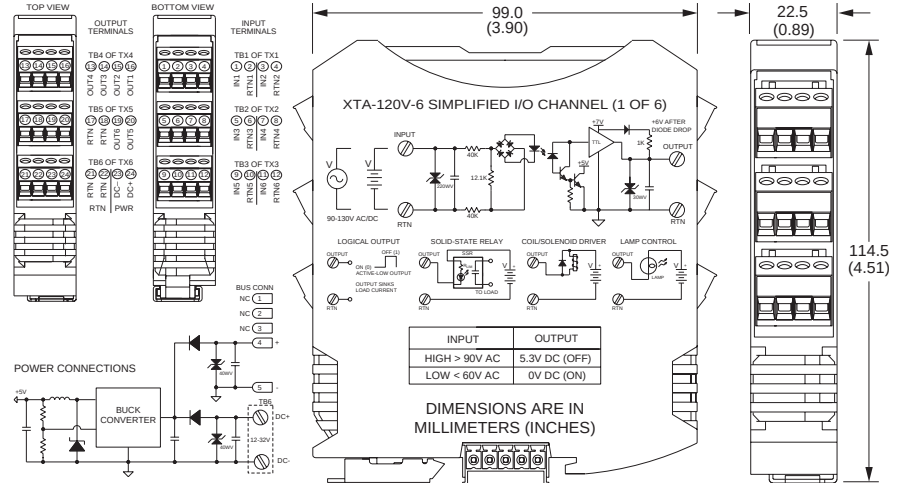


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Ethernet I/O: BusWorks® XT Series

XTA-120V-6 Optocoupler Modules



6 discrete input/output channels ♦ Senses on/off status of AC/DC voltages ♦ Supports 5-32V logic output

Description

The XTA-120V-6 optocoupler module provides six individually isolated 120V AC/DC digital (discrete) inputs to sense on/off levels and drive open-drain outputs. It is intended for use with BusWorks XT Series discrete I/O and other digital input modules to monitor contact closures or mains power supply high/low voltage levels.

Each channel senses the presence or absence of high-level voltage to determine the status of proximity switches, limit switches, toggle switches, push buttons, contacts, and other devices. Opto-isolators control an open-drain output to safely interface the status of the monitored signal.

These modules are very easy to use. Removable front-facing terminal blocks on the module's top and bottom greatly simplify field wiring.

Rugged construction and high density design combine for a very effective I/O solution. These units are ideal for remote monitoring, distributed control, or SCADA applications.

Key Features & Benefits

- Six high-level voltage input channels
- Six logic-level output channels (open-drain, low-side switches)
- Built-in hysteresis optimized for mains power at 120VRMS
- Outputs include 1KΩ pull-ups to +5.3V DC
- High-density 22.5mm wide package with pluggable, front-facing terminals
- 1500V AC isolation (between each input and power/output) and surge/transient protection
- Supports bussed/rail and redundant power
- -40°C to +70°C wide temperature operation
- Withstands 25g shock and 4g vibration
- CE and UL/cUL Class 1 Div 2 Zone 2 approvals

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Ethernet I/O: BusWorks® XT Series

XTA-120V-6 Optocoupler Modules

Performance Specifications

■ Input

Input Type

Six individually isolated voltage inputs interface voltage levels. Built-in hysteresis provides a sensing threshold for monitoring mains power.

Input Signal Voltage Range

0-130V_{RMS}, 130V DC.

Input Signal Threshold

Low-to-High threshold: 90V AC or DC, typical.
High-to-Low threshold: 60V AC (55V DC), typical.

Input Hysteresis

30V DC, typical.

Input Impedance

46K ohms, typical.

Input Over-Voltage Protection

Metal Oxide Varistors (MOV) at every channel input.
Rated Continuous Voltage: 130V_{RMS}, 130V DC.
Rated Maximum Clamping Voltage: 340V DC.
Input channels also include capacitive filtering, and series resistance.

■ Output

Output Type

Six open-drain, mosfet switches with a common source connection at output return. Low-side (sinking) switching between load and return for DC voltage and current-sinking applications only. Output channels are pulled up to +5.3V with 1KΩ resistors.

Output "OFF" Voltage Range

0-32V DC maximum.

Output "OFF" Leakage Current

1μA typical, 50μA maximum
(mosfet only, 25°C, 32V DC).

Output Pull-Ups

1KΩ pull-ups to 5.3V DC.

Output Activation

Input	Output
HIGH > 90V AC/DC	5.3V (OFF)
LOW < 60V AC/DC	0V (ON)

Output "ON" Current Range

0 to 150mA DC, continuous, each channel.

Output R_{ds} On Resistance

2.5 ohms, maximum (150mA, 85°C).

Output Response Time

45ms, typical
(measured from input transition to output).

Output Pull-ups

Individual output channels include 1KΩ pull-ups to the internal +5.3V DC rail. If a stronger pull-up (lower resistance) is required, a resistor will have to be wired externally in parallel with the output channel.

Note: Do not exceed 150mA of drain current per output channel.

■ Environmental

Operating Temperature

-40 to 70°C (-40 to 158°F).

Storage Temperature

-40 to 85°C (-40 to 185°F).

Relative Humidity

5 to 95% non-condensing.

Power Requirement

12-32V DC SELV (Safety Extra Low Voltage). Current draw varies with power voltage as follows (current indicated is with all outputs ON).

Power Supply	Current Draw
12V DC	23mA typical, 25mA maximum
15V DC	19mA typical, 21mA maximum
24V DC	13mA typical, 15mA maximum
32V DC	11mA typical, 12mA maximum

Power Supply Effect

Less than ±0.001% of output span effect per volt DC of supply change.

Isolation

Inputs isolated from each other (channel-to-channel) and from output/power.

Peak: 1500V AC, ANSI/ISA-82.01-1988.

Continuous: 250V AC, 354V DC.

Shock and Vibration Immunity

Vibration: 4g, per IEC 60068-2-64.

Shock: 25g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.

RFI: BS EN 61000-6-2, IEC 61000-4-3.

Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.

ESD: BS EN 61000-6-2, IEC 61000-4-2.

EFT: BS EN 61000-6-2, IEC 61000-4-4.

Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals

CE compliant. UL/cUL Class I; Div. 2 Zone 2..

■ Physical

General

General purpose plastic enclosure for mounting on 35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General purpose NEMA Type 1 enclosure.

Circuit Board

Military grade fire-retardant epoxy glass per IPC-4101/98 with humi-seal conformal coating.

I/O Connectors

Removable plug-in type terminal blocks rated for 12A/250V; AWG #26-12, stranded/solid copper wire.

Dimensions

Width = 22.5mm (0.9 inches), Length = 114.5mm (4.51 inches), Depth = 99.0mm (3.90 inches).

Shipping Weight

0.5 pounds (0.22 Kg) packed.

Ordering Information

◆ Models

XTA-120V-6

6-channel 120V AC/DC discrete input module with open-drain outputs.

◆ Accessories

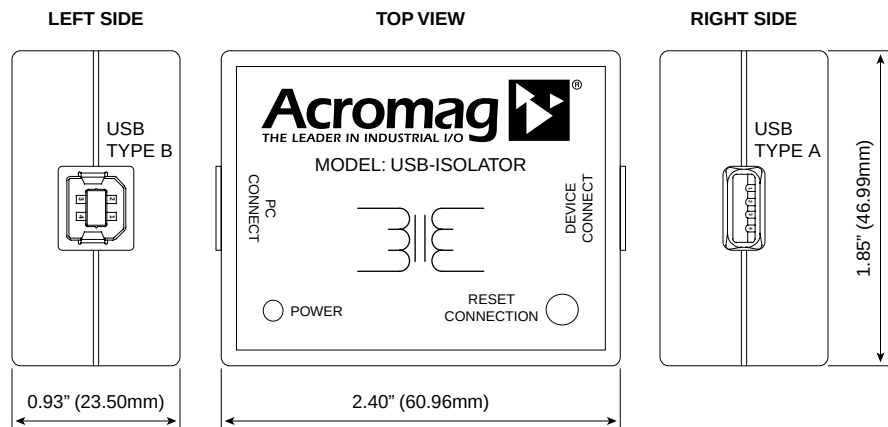
XTBUS-KIT

DIN rail bus power/excitation connector kit. Includes one DIN rail bus connector (1005-070), one left-side female connector terminal block (1005-220) and one right side male connector terminal block (1005-221).



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USB-ISOLATOR USB-to-USB Isolator



USB-powered, USB 2.0 and 1.1 compatible ♦ 1500V AC / 2100V DC isolation ♦ No drivers required

Description

This compact, industrial-grade isolator provides a high-voltage isolation barrier between a computer and a connected USB device. The isolation protects equipment from electrical surges and transient voltage spikes. It also eliminates ground loop currents flowing between the PC and peripherals which can cause damage and inaccurate measurements. Additionally, isolation minimizes conducted noise from static discharge, magnetic fields, and radio frequency interference.

Acromag's USB isolator is very easy to use. The isolator inserts in-line with the USB connection and operates transparently. No special software drivers are required. The unit receives power from the PC's USB port and isolates that power to the connected device. High noise immunity and low radiated emissions ensure reliable data transfer in sensitive applications.

A number of high-performance features help provide convenient and dependable operation. The green LED indicates that power is being received and blinks if the connected device draws too much current. An internal jumper lets you switch from Full Speed (12 Mbps) to Low Speed (1.5 Mbps) communication. The reset button offers a simple way to reinitialize a connected device without breaking the cable connection. High-retention USB sockets keep cables securely attached under shock and vibration.

Key Features & Benefits

- Isolates and protects a USB peripheral from a USB host
- Electrical isolation up to 1500V AC / 2100V DC
- Common mode filtering on all data lines
- Built-in surge/transient suppression up to 8kV on all ports
- Self-powered through the USB port
- Supports USB 2.0 full speed (12 Mbps) and USB 1.1 low speed (1.5 Mbps) data rates with jumper-selection
- LED for power indication and diagnostics
- Reset button to reinitialize and re-enumerate peripheral devices
- Output short circuit protection with auto-retry
- No software or configuration required (transparent operation)
- Uses standard high-retention USB Type A/B cable connections (includes 1m cable)
- Compact size and rugged design for harsh environments
- Wide ambient temperature operation -40 to 70°C (-40 to 158°F)
- CE, FCC, UL/cUL approvals

Ordering Information

Models

USB-ISOLATOR

USB isolator, includes USB cable (Part # 4001-112) for isolator-to-PC connection

XT-SIP

CD-ROM (Part #5041-094), USB isolator, two USB cables (Part # 4001-112, 4001-113), and one Ethernet cable (Part # 5035-360) for configuration of Acromag BusWorks XT Series Ethernet modules.

Accessories

4001-112

USB cable, 1 meter, with Type A to Type B plugs

4001-113

USB cable, 1 meter, with Type A to Mini-B plugs

5035-360

Ethernet crossover cable, 5 feet, Single-shielded category 5e STP cable with a drain wire and an RJ45 plug at each end.





USB-ISOLATOR USB-to-USB Isolator

Performance Specifications

■ USB Port Interface

Standards

USB 1.1 and 2.0 compatible, full speed (12Mbps, default) and low speed (1.5Mbps) data rates supported. For low speed data rates, an internal jumper is provided for user setting. Connection is transparent, no software or configuration is required. Isolator will not be enumerated in the device manager.

■ Physical

Dimensions

2.40" Length x 1.85" Wide x 0.925" High
(60.96mm x 46.99mm x 23.495mm).

Connectors

Standard high retention USB A/B connectors with minimum withdrawal force of 15 Newtons. 1 meter A/B cable included.

PC Connector

USB Type B receptacle

Device Connector

USB Type A receptacle

LED Indicator

Green LED indicates isolator receiving 5V power from the USB computer bus. Flashing indicates short circuit/ retries on peripheral side.

Reset Button

Resets the connection to the USB peripheral device for reinitialization and re-enumeration.

Enclosure Material

ABS Resin, UL94 rated, IP30 plastic case.

■ Environmental

Operating temperature

-40 to 70°C (-40° to 158°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power

PC Connect Side: Standard USB bus power (5V DC).

Device Connect Side: 5V DC / 120mA with full power connection from PC. Includes over-current protection with auto-retry.

Isolation

1500V AC / 2100V DC peak isolation.

250V AC continuous safety isolation.

Agency Approvals:

CE and FCC compliant. UL/cUL Class 1 Div. 2 Zone 2.

Radiated Field Immunity (RFI)

Designed to comply with IEC1000-4-3 Level 3 and EN50082-1.

Electromagnetic Compatibility (EMC)

Minimum immunity per EN61000-6-2:2001

Electrostatic Discharge (ESD) Immunity

Per IEC61000-4-2.

Radiated Field Immunity (RFI)

Per IEC61000-4-3.

Electrical Fast Transient Immunity (EFT)

Per IEC61000-4-4. Complies with IEC1000-4-4 Level 3 and EN50082-1.

Surge Immunity

Complies with IEC1000-4-5 Level 3 and EN50082-1.

Per IEC61000-4-5.

Conducted RF Immunity (CRFI)

Per IEC61000-4-6.

Emissions

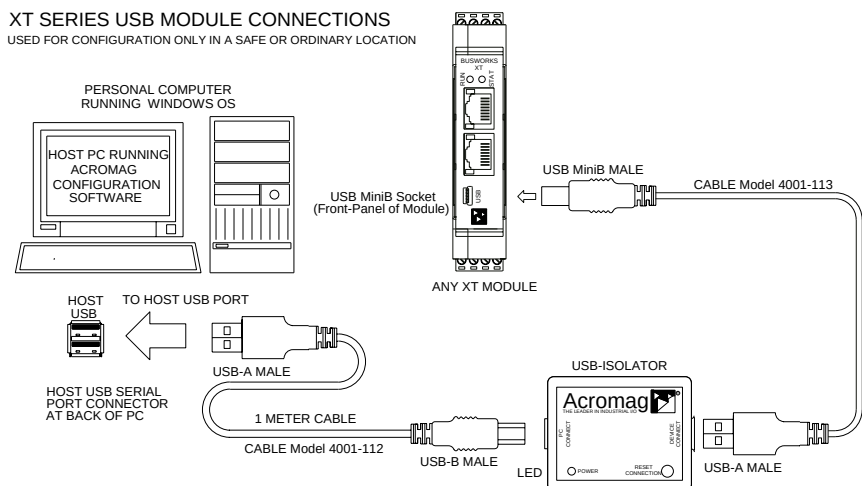
Per EN61000-6-4:2001.

Radiated Frequency Emissions

Per CISPR11 Class A. Meets or exceeds EN50081-1 for Class B equipment.

XT SERIES USB MODULE CONNECTIONS

USED FOR CONFIGURATION ONLY IN A SAFE OR ORDINARY LOCATION



ISO9001
AS9100



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ETHERNET I/O: HIGH-DENSITY

*Rugged and reliable
Ethernet I/O modules
are ready for your
most challenging
monitoring & control
applications.*



EtherStax I/O Blocks

EtherStax I/O blocks provide a rugged, high-density solution to interface many analog or discrete signals to your control system. Modbus TCP/UDP/IP support enables reliable host data transfer or peer-to-peer communication. Web-based configuration simplifies setup with any web browser. For OEM systems requiring special mounting, enclosureless versions are available. EtherStax are ideal for a broad range of monitoring and control or SCADA applications.

Rugged, Industrial-Grade Design

EtherStax are designed for high-reliability operation in hostile environments. Units are shock/vibration-resistant and feature 3-way isolation with surge protection. I/O circuitry has over-temperature, over-voltage, and over-current protection.

Redundant Power & Communication

Self-healing, redundant communication paths support dual copper or fiber-optic media. Dual DC power connections for battery backup ensure dependable operation. If host communication is lost, outputs fail safely and a relay provides local alarming or shutdown functions.

Stackable, High-Density I/O

Get up to 96 channels on a single unit to monitor sensors, control devices, or add local alarms. Aluminum enclosures interlock for secure stacking that saves space mounting on a surface or rail.

i2o peer-to-peer communication

Input channels on one unit can write directly to outputs on another unit without a host controller in between.

Inputs

- Analog current/voltage
- 8B signal conditioning modules
- Discrete level (on/off, open/close, hi/lo)

Outputs

- Discrete switches and relays

Power

- 18-36V DC

Communication

- Modbus TCP/UDP/IP, i2o peer-to-peer

Software Support

- Modbus C library

Approvals

- CE, UL/cUL Class I Div 2
- Modbus TCP/IP conformance

Call 877-214-6267 or 248-295-0880 for technical assistance.



Ethernet I/O: EtherStax® Series

ES2000 Series Rugged, High-Density Ethernet I/O



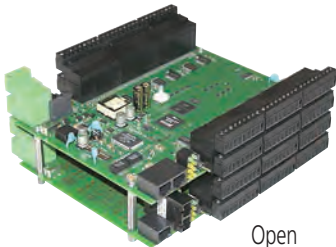
Front



Back



Stacked



Open

EtherStax ES2000 Series Rugged, Stackable Ethernet I/O

EtherStax I/O blocks provide a ruggedized, high-density solution to interface many analog and discrete signals to your control system. A stackable aluminum housing maintains a small footprint and stands up to industrial environments. The Ethernet interface supports Modbus TCP/UDP/IP for reliable host data transfer or peer-to-peer communication. Web-based configuration simplifies setup with any web browser. For OEM systems, or those that require specialized housings, an open-board version without the enclosure is available. EtherStax are ideal for a broad range of measurement and control applications.

Rugged, Industrial-Grade Design

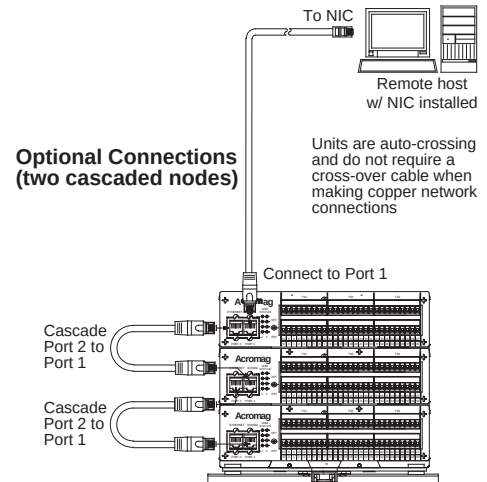
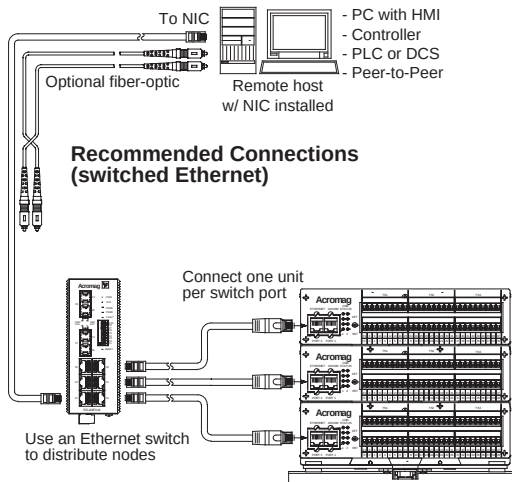
EtherStax are designed for high-reliability operation. Units feature 3-way isolation and surge protection. The I/O circuitry has over-temperature, over-voltage, and over-current protection. Redundant communication paths and DC power ensure dependable operation. If network communication is lost, outputs fail safely and a relay provides local alarming or shutdown functions.

Stackable, High-Density I/O

A variety of models offer a mix of analog and discrete I/O interfaces with up to 96 channels on a single unit. Monitor sensors, control devices, or add local alarms. The units interlock for secure stacking that consumes little space when mounted on a surface or DIN rail.

Key Features & Benefits

- High-density industrial Ethernet I/O:
Put hundreds of I/O channels in less panel space.
- Stackable aluminum or open-board packaging:
Choose industrial-strength or low-cost mounting.
- Rugged, shock and vibration-resistant design:
Mounts on machinery, DIN rail, wall, or flat surface.
- Modbus TCP/UDP/IP or i2o peer-to-peer network:
Reliable communication to host or between nodes.
- Easy web configuration with copy function:
Quickly set up units with any web browser.
- Dual-port Ethernet hub or switch w/MDI/MDI-X:
Get diagnostics, redundancy, and easy expansion.
- Ready for STP, RSTP, other redundancy schemes:
Supports dual-path communication via copper and fiber.
- Local failsafe SPST 5A fault relay:
Provides alarm/shutdown if network or power fails.
- Surge suppression and 1500Vrms isolation:
Protects power, relay, I/O, and each Ethernet Port.
- Redundant DC power w/internal diode coupling:
For "bump-less" transfer to back-up power.
- Extended operating temperature of -40 to 70°C
- Designed for CE and UL/cUL Class1 Div 2 ABCD



Ethernet I/O: EtherStax® Series



ES2000 Series Rugged, High-Density Ethernet I/O

Features

High-strength aluminum packaging
Dove-tailed grooves on top for stacking and interlocking units

Dual Ethernet ports
Two Cu or one Cu / one fiber

Locking Ethernet connection
RJ45 clip frame provides secure media connections resistant to shock and vibration when used with compatible cables.

High-density industrial I/O
Up to 96 channels per unit with pluggable terminal blocks.

Default/Reset toggle switch
Restore communication to factory configuration or reset the unit.

Port status LEDs
Indicate switch/hub mode, link, activity, 10/100Mbps, port faults

7.25" Depth
2.444" Height

8.226" Width

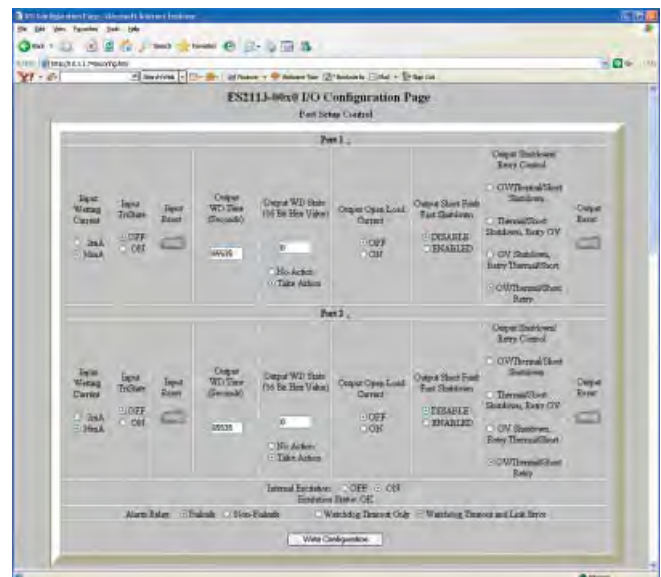
Status LEDs
Power, I/O, relay status

Fault relay
Local 5A Form A relay

Redundant DC Power
Pluggable terminals

Earth ground terminal
One on each side

Network and I/O Configuration Screens





Ethernet I/O: EtherStax® Series

Easy Peer-to-Peer Communication with Acromag i2o®

i2o input-to-output messaging

Acromag's i2o technology is the easy way to transmit input values for remote output without a PLC, PC or master CPU.

With i2o, many Ethernet I/O modules have the ability to operate like a long-distance transmitter. You can convert your sensor inputs at Point A to process control signals at Point B. Or, you can monitor discrete devices at one site by reproducing the discrete levels with a relay output at another location.

Use your existing Ethernet lines to save time and wiring expenses

Connect input modules to output modules using your existing copper/fiber infrastructure or with a single new cable. Multiple I/O modules can be multiplexed through a switch or wireless radios.

No complicated controllers.

No software. No programming.

Acromag Ethernet I/O modules have a built-in web page making it simple to configure using your standard web browser. Just click a few menu settings, enter the IP addresses, and you are done. Fast and easy.



BusWorks 900EN Series I/O Modules

Up to 12 channels per module and reliable, failsafe communication

Monitor up to a dozen devices with a single pair of I/O modules. Discrete I/O modules have twelve channels that you can set up as inputs or as outputs in four-channel groups. This allows bi-directional communication between two modules. Analog input modules measure up to six current, voltage, thermocouple, or RTD sensor signals. This data is then transmitted to a six-channel analog output module providing DC current or voltage output signals.

Wire-saving applications

Our i2o technology lets an input module speak directly to an output module. It is ideal for non-critical projects that don't need a PLC or PC master. Reproduce remote signals based on timed or event updates.

- Remote monitoring of process variables (temperature, pressure, level, flow) and discrete devices
- Remote data display, recording, alarms, or control
- Signal splitters
- Analyzer system monitoring
- Power and water utility monitoring
- Tank level, pump, and valve control
- Remote monitoring of motor loads and contactor status
- Remote control switching stations
- Environmental control systems
- Process shutdown, alarming, and annunciator systems
- RFID systems

Peer-to-Peer Communication

Analog Inputs

4-20mA,
0-10V DC,
thermocouple,
RTD/resistance

Discrete Inputs

on/off,
high/low,
open/close,
momentary
push-buttons

Any Ethernet Media

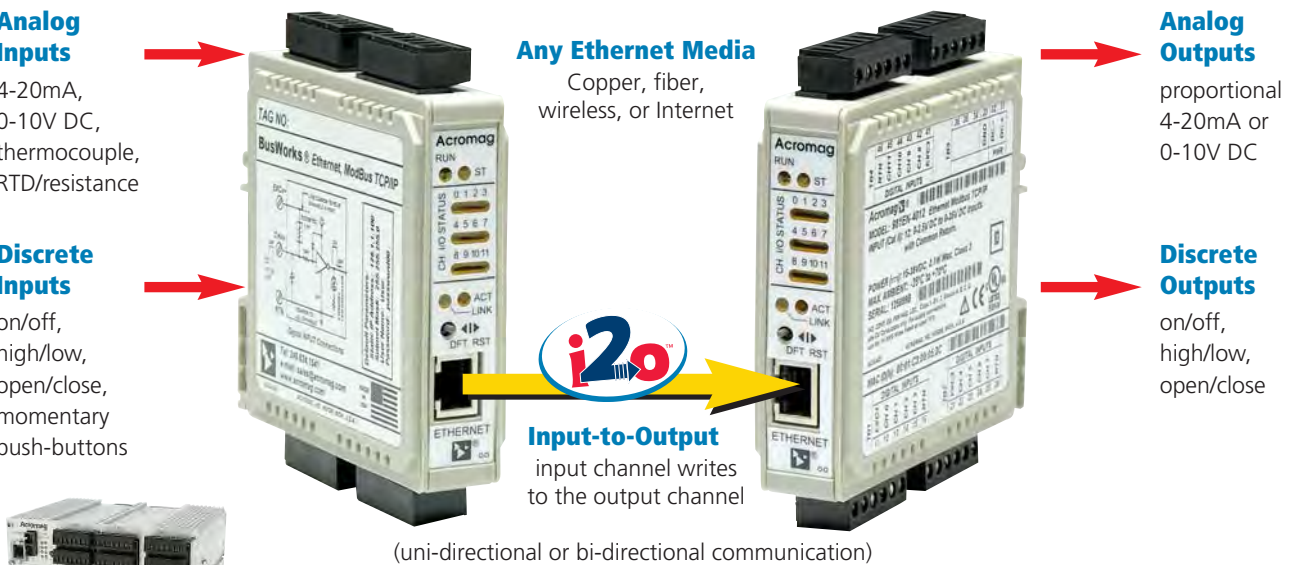
Copper, fiber,
wireless, or Internet

Analog Outputs

proportional
4-20mA or
0-10V DC

Discrete Outputs

on/off,
high/low,
open/close



EtherStax I/O® also supports i2o

Ethernet I/O: EtherStax® Series



Acromag i2o® Technology for Peer-to-Peer Communication

ES2000 Series Units with i2o

◆ Analog Input Modules

ES2153

16 analog current inputs,
16 analog voltage or 8B inputs

◆ Analog Output Modules

ES2171

16 current outputs

ES2172

16 voltage outputs

◆ Analog I/O Modules

ES2151

16 analog current inputs,
16 analog voltage or 8B inputs,
16 analog current outputs

ES2152

16 analog current inputs,
16 analog voltage or 8B inputs,
16 analog voltage or 8B outputs

◆ Discrete I/O Modules

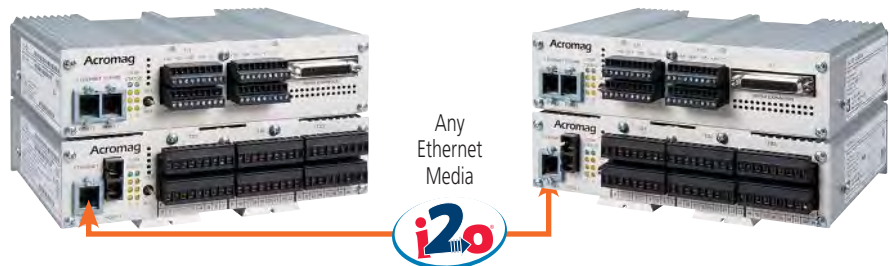
ES2113

96 solid-state input/outputs

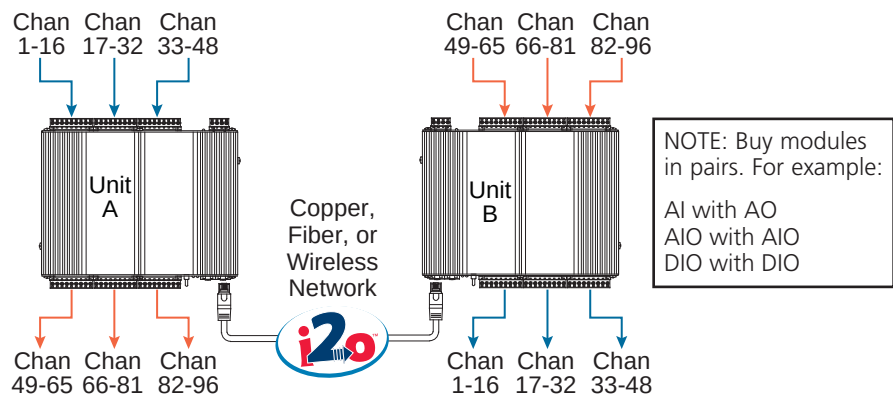
ES2117

32 solid-state inputs

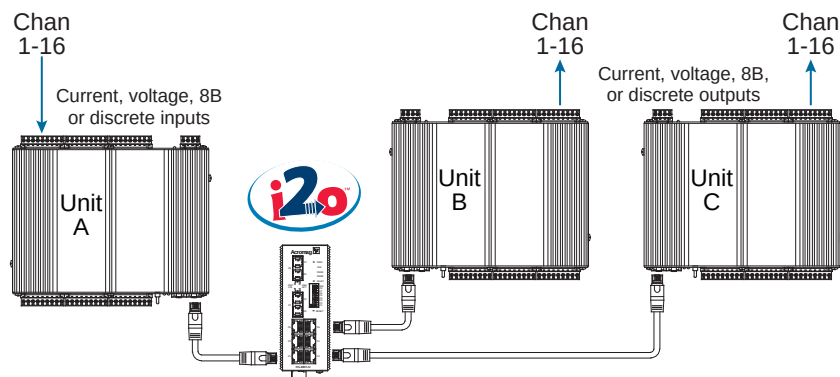
16 relay outputs



Installation #1: Peer-to-Peer Bi-directional Communication



Installation #2: Peer-to-Peer Signal Splitter (dual outputs)



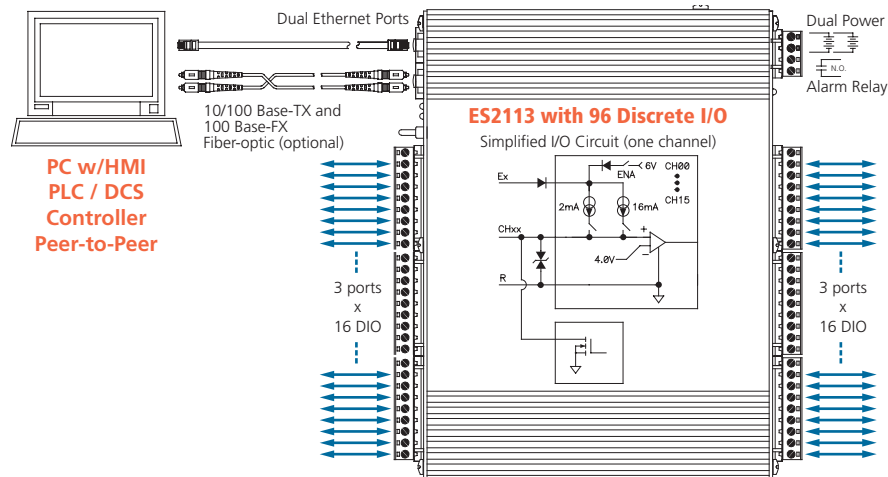
i2o® Configuration Page						
Port Number	% Span Change	Update Time(100ms)	Map To IP Address	Map To Holding Register	Mapping Method	Map To Internal Outputs
Port 1 Voltage	0.0	100	128.1.1.102	40251	☐ Unipolar to Unipolar ☐ Bipolar to Unipolar ☐ Bipolar to Bipolar ☐ Unipolar to Bipolar	☐ NO ☒ YES
Port 2 Voltage	0.0	0	0.0.0.0	0	☐ Unipolar to Unipolar ☐ Bipolar to Unipolar ☐ Bipolar to Bipolar ☐ Unipolar to Bipolar	☐ NO ☒ YES
Port 1 Current	0.0	0	0.0.0.0	0	☐ Unipolar to Unipolar ☐ Bipolar to Unipolar ☐ Bipolar to Bipolar ☐ Unipolar to Bipolar	
Port 2 Current	0.0	0	0.0.0.0	0	☐ Unipolar to Unipolar ☐ Bipolar to Unipolar ☐ Bipolar to Bipolar ☐ Unipolar to Bipolar	

Analog I/O module (ES2152) configuration screen

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Ethernet I/O: EtherStax® Series

ES2113 Ethernet Discrete I/O Modules



96 bi-directional discrete I/O channels ♦ Modbus TCP/IP, i2o peer-to-peer communication

Description

EtherStax I/O blocks provide a ruggedized, high-density solution to interface a very large quantity of discrete I/O signals to your control system. A stackable aluminum housing maintains a small footprint and stands up to harsh, industrial environments. Web-based configuration simplifies setup with any web browser.

Input Ranges

0 to 28V DC, active-low inputs

Output Range

0 to 28V DC (0.5A/ch) low-side switches

Ethernet Communication

10/100Base-T(X) and 100Base-FX
Modbus TCP/IP or UDP/IP protocol
Acromag i2o® peer-to-peer technology

Power Requirement

18 to 36V DC (redundancy-ready)

Approvals

CE, UL, & cUL listed
Class 1; Division 2; Groups A, B, C, D.

- **96 discrete I/O channels:**
Bi-directional channels support any input/output mix in a single unit.
- **High-density stackable unit:**
Stacked mounting puts a lot of I/O in a very small footprint to save panel space.
- **High Speed Channel Updates:**
Updates all 96 channels in 1mS.
- **Modbus TCP/IP or UDP/IP protocol:**
I/O functions as slave to host controller.
- **Peer-to-peer i2o communication:**
Inputs to one unit automatically update outputs on another over Ethernet link.
- **Change-of-state or timed updates:**
Event-driven updates transmit data in less than 5mS between peers with i2o.
- **10 Modbus TCP/IP sockets/sessions:**
Multiple masters can talk to an EtherStax unit at the same time.
- **Self-test checks I/O operation:**
Test I/O channels from a web browser before wiring terminals to devices.
- **Selectable input "wetting" current:**
Internal current source eliminates pull-ups and improves dry contact interface.
- **Automatic change of state detection:**
Inputs detect quick momentary changes of state that occur between polling.
- **Internal or external port excitation:**
Selectable source on each 16-channel port simplifies wiring and adds flexibility for use with 5-28V DC logic.
- **Loop-back monitoring on all channels:**
Inputs confirm output states for increased system reliability.
- **Watchdog timers and failsafe outputs:**
Communication fault sends output to a pre-defined state or holds the last value.
- **Output open-load detection:**
Output fault detection is selectable on individual channels.
- **Thermal, current, voltage protection:**
I/O is protected from excessive levels to reduce downtime.



Open circuit board versions also available.

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Performance Specifications

◆ General Specifications

See Page 7 for communication and other specs.

◆ Inputs

Configuration (active-low inputs)

96 channels (six 16-ch ports) with a common return (RTN). Each input is connected in tandem with open-drains of output mosfets. Any mix of I/O occurs as all channels are high impedance inputs unless written. Output channels can be read back at any time (loop-back monitoring).

Input Signal Voltage Range

0 to 28VDC, 31V maximum. Surge protected.

Input Threshold Detection and Sensitivity

4V DC threshold. Level or latching inputs.

Input "Wetting" Current

Built-in current sources switch from 16mA initially (20ms) to 2mA (continuous), default mode. Sources can be changed to 2mA or turned off.

Excitation

Internal (default): 6V DC, 400mA.

External: 6 to 28V DC typical. Separate excitation terminal (logic) for each 16-channel port. Internal and external supplies are diode-blocked from each other. Includes reverse polarity protection.

Peer-to-peer (i2o) communication

Change-of-state updates: Less than 5ms events.
Timed updates: Configurable for 1-90 seconds.

◆ Outputs

Configuration (low-side switches)

96 channels (six 16-ch ports) of open-drain mosfet switches with common source connection at port RTN terminal. Each output is connected in tandem with buffered inputs.

Output "OFF" Voltage Range

0 to 28V DC, 31V maximum. Surge protected.

Output "ON" Current Range

0 to 300mA DC continuous, each output.

Output "ON" Maximum Current

450mA DC maximum with any 8 channels "on" continuously per 16 channel port

Output Port Maximum Current

4.8A: 16 channels @ 300mA continuous
3.6A: 8 channels "off" & 8 channels @ 450mA

◆ Local Alarm Output

Configuration

Isolated relay de-energizes (failsafe) or energizes (non-failsafe) as configured when the watchdog timer detects a media or communication failure.

Type

SPST-NO, 1 Form A, Class I, Division II approved.

Rating

5A @ 24VDC/250VAC, 6000 cycles resistive.
3A @ 24VDC/250VAC, 100,000 cycles general.
2A @ 24VDC/250V AC, Hazardous locations

Maximum Switching Voltage

250VAC, 125VDC.

◆ Enclosure and Physical

Housing Classification and Dimensions

IP20: 8.226" x 2.444" x 7.25".
4 lbs. (1.8 kg) packed (unit weighs 3.4 lbs).
Without enclosure: 7.920" x 1.875" x 7.25".
1.65 lbs. (0.75 kg) packed (unit weighs 1.05 lbs).

Safety Approvals

CE marked and UL/cUL Listed.

Hazardous Locations: Class 1; Div. 2; A B C D.

Open board units: UL Recognized

Shock and Vibration Immunity

Rating for single surface-mount unit in enclosure.

Mechanical Shock: 50g, 3ms, with 3 half-sine shock pulses in each direction along 3 axes (18 shocks), and 30g, 11ms, with 3 half-sine shock pulses in each direction along 3 axes (18 shocks), per IEC60068-2-27.

Random Vibration: 5g, 5-500Hz, in 3 axes at 2 hours/axis per IEC60068-2-64.

◆ Environmental

Operating and Storage Temperature

Operating: Open bd, -40 to 75°C (-40 to +167°F)
Enclosed bd, -40 to 75°C (all outputs "off")
-40 to 70°C (all outputs "on" at rated Max.).
Storage: -40 to +85°C (-40 to +185°F).

Power Requirements

18-36V DC. Redundant, diode-coupled terminals.
Dual copper ports: 2.5W with external excitation, 3.5W with internal excitation.
Fiber optic units: Call factory.

Isolation

I/O, power, relay and Ethernet port-to-port.
Peak: 1500V AC, ANSI/ISA-82.01-1988.
Continuous: 250V AC, 354V DC.

◆ Ethernet Interface

Internal Switch or Hub/Repeater

Dual-port Ethernet switch. Web-configurable as a true switch (default mode) or hub.

Network Connector [10/100 Base-T(X)Copper]

One or two 8-pin RJ-45 connectors. Automatic MDI/MDI-X. 100m communication distance.

Network Connector (100 Base-FX Fiber-optic)

One multi-mode with SC connector. 2km communication distance. Full/half-duplex, selectable.

Protocols and Addressing

Modbus TCP/IP or UDP/IP. i2o peer-to-peer.
StaticIP, DHCP, BootP. Configurable IP addresses.

Ethernet Modbus TCP/IP Sockets/Sessions

1-10 socket/sessions programmable via web page.

Ethernet Redundancy

Compatible with STP, RSTP, proprietary schemes.

Ordering Information

◆ I/O Modules

ES2113-0000

96 DIO, two copper ports, IP20 enclosure

ES2113-0010

96 DIO, two copper ports, open circuit board

ES2113-1000

96 DIO, one Cu & one fiber port, IP20 enclosure

ES2113-1010

96 DIO, one Cu & one fiber port, open board

◆ Accessories

Industrial Ethernet Switches

See Page 33.

Hardware Accessories and Power Supplies

See Page 34.

Software Support

See Page 36.

Ethernet I/O: EtherStax® Series

ES2117 Ethernet Discrete I/O Modules



PC w/HMI
PLC / DCS
Controller
Peer-to-Peer

Dual Ethernet Ports

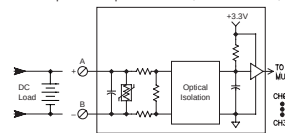
10/100 Base-TX and
100 Base-FX
Fiber-optic (optional)

Optocoupler
Inputs 0-15

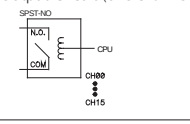
Mech Relay
Outputs 0-7

ES2117 with 48 Discrete I/O

Simplified Input Circuit (one channel)



Simplified Output Circuit (one channel)



Dual Power

Alarm Relay

Optocoupler
Inputs 16-31

Mech Relay
Outputs 8-15

48 Channel-Isolated Discrete I/O (32 DC inputs, 16 AC/DC outputs) ♦ Modbus TCP/IP, i2o peer-to-peer

Description

EtherStax I/O blocks provide a ruggedized, high-density solution to interface a large quantity of isolated discrete I/O signals to your control system. A stackable aluminum housing maintains a small footprint and stands up to harsh, industrial environments. Web-based configuration simplifies setup with any web browser.

Input Range

20-36V DC

Output Range

Outputs: 2A @ 250V AC or 110V DC SPST
Alarm: 2A @ 240V AC or 125V DC SPST

Ethernet Communication

10/100Base-T(X) and 100Base-FX
Modbus TCP/IP or UDP/IP protocol
Acromag i2o® peer-to-peer technology

Power Requirement

18 to 36V DC (redundancy-ready)

Approvals

CE, UL, & cUL listed:
Class 1; Division 2; Groups A, B, C, D.

- Fully isolated between all circuits:
Inputs, outputs, alarm, network ports, enclosure, and power are isolated from each other for safety and noise immunity.
- High-density stackable unit:
Stacked mounting puts a lot of I/O in a very small footprint to save panel space.
- Modbus TCP/IP or UDP/IP protocol:
I/O functions as slave to host controller.
- Peer-to-peer i2o communication:
Inputs to one unit automatically actuate outputs on another over Ethernet link.
- Channel-to channel input isolation:
Inputs provide high or low-side sensing for AC or DC circuits.
- Automatic change of state detection:
Inputs detect quick momentary changes of state that occur between polling.
- Logic inversion (i2o only):
Active high inputs can switch remote peer-to-peer outputs on or off.
- Change-of-state or timed updates:
Event-driven updates transmit data in less than 10ms between peers with i2o.
- 10 Modbus TCP/IP sockets/sessions:
Multiple masters can talk to unit at same time.
- Local alarm function:
Dedicated failsafe relay is controlled via watchdog timer and link-loss conditions.
- Heavy-duty 2A relays:
16 SPST outputs provide high/low-side 2A switching up to 250V AC or 110VDC
- Programmable outputs:
Normally open relays are configurable to energize or de-energize on power-up.
- Built-in slave relays:
Inputs can control outputs on same unit to provide slave relay interface.
- Self-test checks I/O operation:
Unit checks internal I/O communication and allows verification via web browser.
- Watchdog timers:
Communication fault sends output to a pre-defined state or holds the last value.



Open circuit board versions also available.

Acromag 
THE LEADER IN INDUSTRIAL I/O

Tel: 248-295-0880 ■ Fax: 248-624-9234 ■ sales@acromag.com ■ www.acromag.com ■ 30765 S Wixom Rd, Wixom, MI 48393 USA



Performance Specifications

◆ General Specifications

See Page 7 for communication and other specs.

◆ Inputs

Configuration

32 individually isolated, buffered inputs grouped in two 16-ch ports. Active-high operation.

Input Voltage Range

20-32V DC, 36V DC max.

Max voltage/operating temperature:

36V DC @ 65°C max.

Input Signal Threshold and Hysteresis

OFF-ON: 13V min, 20V max, 16V DC typical.

ON-OFF: 11V max, 7V min, 9V DC typical.

Input Impedance

6k ohms

Input Isolation:

Channel-to-channel: 150V AC isolation rating.

Port-to-port: 250V AC safety isolation rating.

Input Response Time

Less than 5ms.

Peer-to-peer (i2o) communication

Change-of-state updates: Less than 10ms events.

Timed updates: Configurable for 1-90 seconds.

◆ Outputs

Configuration

One 16-ch port of isolated SPST-NO mech. relays.

Maximum Switching Voltage / Load Rating

250V AC, 110V DC @ 2A.

Mechanical Life

20 million operations minimum.

Electrical Life (@ 20 cycles per minute)

100k operations minimum at 2A.

Contact Resistance (Initial)

30 milliohms, maximum.

Output Response Time

Less than 5ms.

Minimum Load

100µA/100mV DC.

◆ Local Alarm Output

Configuration

Failsafe or non-failsafe (software-configurable) relay trips on power or link-loss failure.

Type

SPST-NO, 1 Form A, Class I, Division II approved.

Maximum Switching Voltage/Load Rating

240V AC, 125V DC @ 2A

100K operations minimum.

◆ Ethernet Interface

Internal Switch or Hub/Repeater

Dual-port Ethernet switch. Web-configurable as a true switch (default mode) or low-latency hub.

Network Connector [10/100 Base-T(X)Copper]

One or two 8-pin RJ-45 connectors. Automatic MDI/MDI-X. 100m communication distance.

Network Connector (100 Base-FX Fiber-optic)

One multi-mode with SC connector. 2km communication distance. Full/half-duplex, selectable.

Protocols and Addressing

Modbus TCP/IP or UDP/IP. i2o peer-to-peer.

StaticIP, DHCP, BootP. Configurable IP addresses.

Ethernet Modbus TCP/IP Sockets/Sessions

1-10 socket/sessions programmable via web page.

Ethernet Redundancy

Compatible with STP, RSTP, proprietary schemes.

◆ Environmental

Operating and Storage Temperature*

Operating: -40 to 65°C

Storage: -40 to 85°C (-40 to 185°F).

Power Requirements

18-36V DC. Redundant, diode-coupled terminals.

4.7W (copper ports), 6.0W (fiber-optic ports).

Isolation

I/O, power, relay and Ethernet port-to-port.

Peak: 1500V AC, ANSI/ISA-82.01-1988.

Continuous: 250V AC, 354V DC (150V AC ch-ch).

See User Manual for full temperature specs.

◆ Enclosure and Physical

Housing Classification and Dimensions

IP20: 8.226" x 2.444" x 7.25", 4 lbs. packed.

PCB: 7.920" x 1.875" x 7.25", 1.65 lbs. packed.

Safety Approvals (pending)

CE marked and UL/cUL Listed.

Hazardous Locations: Class I; Div 2; A, B, C, D.

Open board units: UL Recognized.

Shock and Vibration Immunity (in enclosure)

Mechanical Shock: 50g (3ms), 30g (11ms).

Random Vibration: 5g, (5-500Hz).

Ordering Information

◆ EtherStax I/O Units

All units have 32 inputs, 16 AC/DC outputs and i2o peer-to-peer communication capability.

ES2117-0000

20-36V DC inputs, two Cu ports, IP20 enclosure

ES2117-0010

20-36V DC inputs, two Cu ports, open board

ES2117-1000

20-36V DC inputs, Cu & fiber ports, IP20

ES2117-1010

20-36V DC inputs, Cu & fiber ports, open board

◆ Accessories

Industrial Ethernet Switches

See Page 33.

Hardware Accessories and Power Supplies

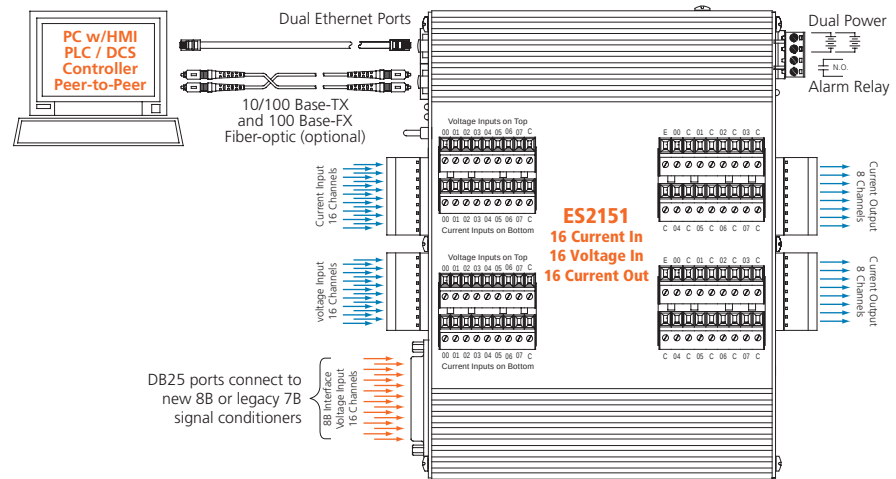
See Page 34.

Software Support

See Page 36.

Ethernet I/O: EtherStax® Series

ES2151 Ethernet Analog Input/Output Modules



32 analog current/voltage inputs ♦ 16 analog current outputs ♦ Modbus TCP/UDP, i2o communication

Description

These EtherStax I/O units provide a rugged, high-density, and high-speed solution to interface a large quantity of analog input signals. Units accept 16 single-ended analog voltage inputs and 16 single-ended current inputs. The ES2151 also provides 16 analog current outputs. Two DB25 ports support an alternate interface of voltage I/O from 8B input or output modules. This combination of high-density analog inputs and outputs is ideal for many sensor interface applications in remote zones.

EtherStax units are built and tested for high reliability and dependable performance in hostile environments. Available in an aluminum enclosure or as an open circuit board, both formats stack vertically to maintain a very small footprint.



Interface to 8B signal conditioning modules.

Input Ranges

±5V, ±10V, ±20mA, 0-20mA, 4-20mA DC

Output Ranges

0-20mA, 4-20mA DC

Ethernet Communication

10/100Base-T(X) and 100Base-FX, Automatic MDI/MDI-X on all copper ports, Modbus TCP/IP or UDP/IP protocol i2o peer-to-peer

Power Requirement

18 to 36V DC (redundancy-ready)

Approvals

CE, UL/cUL:
Zone 2, Class 1, Division 2, Groups ABCD



Open circuit board versions are also available.



Select from more than 100 8B input modules.

Key Features & Benefits

- 48-channel high-density combination of analog inputs and outputs
- DB25 ports for alternate voltage I/O from 8B signal conditioning backpanels
- 4-way isolation and surge suppression
- High-resolution 16-bit A/D and D/A's
- High-speed scanning for 10 millisecond update of all 48 channels
- Automatic zero/span calibration
- Built-in loop-back circuit verifies outputs
- On-demand self-test verifies calibration
- Web browser configuration
- User-configurable sample averaging and integration/totalization function with non-volatile registers
- Dual-format data registers support 16-bit integers or 32-bit floating point
- Scaling registers on all channels
- Peer-to-peer i2o communication with percent-of-span and timed updates

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Performance Specifications

◆ General Specifications

See Page 7 for communication and other specs.

◆ Analog Field Inputs

Input Channel Configuration

16 single-ended analog voltage inputs and
16 single-ended analog current inputs.

Input Ranges (select on per-channel basis)

±5V, ±10V, ±20mA, 0-20mA, or 4-20mA DC.

Input Scaling (per-channel basis)

Floating Point Format: IEEE-754.

Input Resolution

16-bit maximum, 0.00166% (1 part in 60,000).

Input Accuracy

Current Input: Better than 0.1% of range.

Voltage Input: Better than 0.05% of range.

Input Impedance

Voltage: 4M ohms minimum.

Current: 100 ohms.

Input Scan Groups and Scan Times

Eight user-enabled 4-channel scan groups. 770µS
update/group (5mS for all 32 channels) with averaging,
loopback, and totalization functions disabled.

Input Overvoltage Protection

Bipolar Transient Voltage Suppressors (TVS),
18V clamp level typical.

Noise Rejection

CMR (50-60Hz): Better than -72dB.

Sample Averaging (user-configurable)

0-500 samples. One register for all channels.

◆ External 8B Input and Output Modules

See Bulletin 8400-479 for details.

◆ Analog Field Outputs

Output Channel Configuration

16 current outputs.

9-16V DC external excitation required.

Output Ranges (per-channel basis)

0-20mA or 4-20mA DC sourced.

User-configured on a per-channel basis.

Maximum Output Load at Excitation

265 ohms @ 9V.

400 ohms @ 12V.

540 ohms @ 15V.

Output Resolution and Accuracy

Resolution: 13-bit maximum, 0.0122%.

Accuracy: Better than 0.1% of range.

◆ Local Alarm Output

Configuration

Failsafe or non-failsafe (user-configurable) relay trips on
power or link-loss failure.

Type

SPST-NO, 1 Form A, Class I, Division II approved.

Rating

3A @ 24V DC/250V AC, 100,000 cycles general.

2A @ 24V DC/250V AC, Hazardous locations.

Maximum Switching Voltage and Power

250V AC / 750VA, 125V DC / 90W.

◆ i2o Peer-to-Peer Communication

Each port of 8 input channels can be mapped to out-
put ports of two ES215x units. Updates based on time
(100mS resolution) or percent of range change (0.1%
resolution).

◆ Ethernet Interface

Internal Switch or Hub/Repeater

Dual-port Ethernet switch. User-configurable as a true
switch (default mode) or low-latency hub.

Network Connector [10/100 Base-T(X)Copper]

One or two 8-pin RJ-45 connectors. Automatic MDI/
MDI-X. 100m communication distance.

Network Connector (100 Base-FX Fiber-optic)

One multi-mode with SC connector. 2km communica-
tion distance. Full/half-duplex, selectable.

Protocols

Modbus TCP/IP, UDP/IP, i2o peer-to-peer.

Addressing

StaticIP, DHCP, BootP.

Ethernet Modbus TCP/IP Sockets/Sessions

1-10 socket/sessions user-configurable.

Ethernet Redundancy

Compatible with STP, RSTP, or any ring scheme.

◆ Environmental

Operating and Storage Temperature

Operating: -40 to 70°C (-40 to 158°F).

Storage: -40 to 85°C (-40 to 185°F).

Power Requirements

18-36V DC. Redundant, diode-coupled terminals.

4.8W (copper ports), 5.8W (fiber-optic ports).

Isolation

I/O, power, relay and Ethernet port-to-port.

Peak: 1500V AC, ANSI/ISA-82.01-1988.

Continuous: 250V AC, 354V DC (150V AC ch-ch).

◆ Enclosure and Physical

Housing Classification and Dimensions

IP20: 8.226 x 2.444 x 7.25", 4 lbs. packed.

PCB: 7.920 x 1.875 x 7.25", 1.65 lbs. packed.

Safety Approvals

CE marked and UL/cUL Listed.

Hazardous Locations: Class I; Div 2; A, B, C, D.

Open board units: UL Recognized.

Shock and Vibration Immunity (in enclosure)

Mechanical Shock: 50g (3ms), 30g (11ms).

Random Vibration: 5g, (5-500Hz).

Ordering Information

◆ EtherStax I/O Units

ES2151-0000

Current/voltage inputs, current outputs,
two Cu ports, IP20 enclosure

ES2151-0010

Current/voltage inputs, current outputs,
two Cu ports, open board (no IP20 enclosure)

ES2151-1000

Current/voltage inputs, current outputs,
Cu & fiber ports, IP20 enclosure

ES2151-1010

Current/voltage inputs, current outputs,
Cu & fiber ports, open board (no IP20 enclosure)

◆ Accessories

8B Modules and Backpanels

See Page 32.

Industrial Ethernet Switches

See Page 33.

Hardware Accessories and Power Supplies

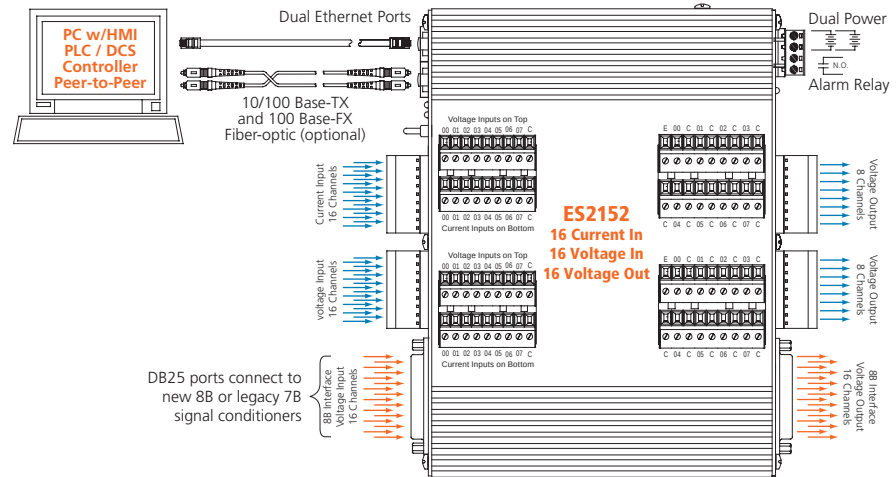
See Page 34.

Software Support

See Page 36.

Ethernet I/O: EtherStax® Series

ES2152 Ethernet Analog Input/Output Modules



32 analog current/voltage inputs ♦ 16 analog voltage outputs ♦ Modbus TCP/UDP, i2o communication

Description

These EtherStax I/O units provide a rugged, high-density, and high-speed solution to interface a large quantity of analog input signals. Units accept 16 single-ended analog voltage inputs and 16 single-ended current inputs. The ES2152 also provides 16 analog voltage outputs. Two DB25 ports support an alternate interface of voltage I/O from 8B input or output modules. This combination of high-density analog inputs and outputs is ideal for many sensor interface applications in remote zones.

EtherStax units are built and tested for high reliability and dependable performance in hostile environments. Available in an aluminum enclosure or as an open circuit board, both formats stack vertically to maintain a very small footprint.



Interface to 8B signal conditioning modules.

Input Ranges

±5V, ±10V, ±20mA, 0-20mA, 4-20mA DC

Output Ranges

±5V, ±10 V DC

Ethernet Communication

10/100Base-T(X) and 100Base-FX, Automatic MDI/MDI-X on all copper ports, Modbus TCP/IP or UDP/IP protocol i2o peer-to-peer

Power Requirement

18 to 36V DC (redundancy-ready)

Approvals

CE, UL/cUL:
Zone 2, Class 1, Division 2, Groups ABCD



Open circuit board versions are also available.



Select from more than 100 8B input modules.

Key Features & Benefits

- 48-channel high-density combination of analog inputs and outputs
- DB25 ports for alternate voltage I/O from 8B signal conditioning backpanels
- 4-way isolation and surge suppression
- High-resolution 16-bit A/D and D/A's
- High-speed scanning for 10 millisecond update of all 48 channels
- Automatic zero/span calibration
- Built-in loop-back circuit verifies outputs
- On-demand self-test verifies calibration
- Web browser configuration
- User-configurable sample averaging and integration/totalization function with non-volatile registers
- Dual-format data registers support 16-bit integers or 32-bit floating point
- Scaling registers on all channels
- Peer-to-peer i2o communication with percent-of-span and timed updates

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Performance Specifications

◆ General Specifications

See Page 7 for communication and other specs.

◆ Analog Field Inputs

Input Channel Configuration

16 single-ended analog voltage inputs and
16 single-ended analog current inputs.

Input Ranges (select on per-channel basis)

±5V, ±10V, ±20mA, 0-20mA, or 4-20mA DC.

Input Scaling (per-channel basis)

Floating Point Format: IEEE-754.

Input Resolution

16-bit maximum, 0.00166% (1 part in 60,000).

Input Accuracy

Current Input: Better than 0.1% of range.

Voltage Input: Better than 0.05% of range.

Input Impedance

Voltage: 4M ohms minimum.

Current: 100 ohms.

Input Scan Groups and Scan Times

Eight user-enabled 4-channel scan groups. 770µS
update/group (5mS for all 32 channels) with averaging,
loopback, and totalization functions disabled.

Input Overvoltage Protection

Bipolar Transient Voltage Suppressors (TVS),
18V clamp level typical.

Noise Rejection

CMR (50-60Hz): Better than -72dB.

Sample Averaging (user-configurable)

0-500 samples. One register for all channels.

◆ External 8B Input and Output Modules

See Bulletin 8400-479 for details.

◆ Analog Field Outputs

Output Channel Configuration

16 DC voltage outputs.

Output Ranges (per-channel basis)

±5V, ±10V DC (at ±1mA).

User-configured on a per-channel basis.

Output Impedance

1 ohm maximum.

Output Resolution and Accuracy

Resolution (±10V): 16-bit maximum, 0.00166%.

Resolution (±5V): 15-bit maximum, 0.00305%.

Accuracy: Better than 0.05% of range.

◆ Local Alarm Output

Configuration

Failsafe or non-failsafe (user-configurable) relay trips on
power or link-loss failure.

Type

SPST-NO, 1 Form A, Class I, Division II approved.

Rating

3A @ 24V DC/250V AC, 100,000 cycles general.

2A @ 24V DC/250V AC, Hazardous locations.

Maximum Switching Voltage and Power

250V AC / 750VA, 125V DC / 90W.

◆ i2o Peer-to-Peer Communication

Each port of 8 input channels can be mapped to out-
put ports of two ES215x units. Updates based on time
(100mS resolution) or percent of range change (0.1%
resolution).

◆ Ethernet Interface

Internal Switch or Hub/Repeater

Dual-port Ethernet switch. User-configurable as a true
switch (default mode) or low-latency hub.

Network Connector [10/100 Base-T(X)Copper]

One or two 8-pin RJ-45 connectors. Automatic MDI/
MDI-X. 100m communication distance.

Network Connector (100 Base-FX Fiber-optic)

One multi-mode with SC connector. 2km communica-
tion distance. Full/half-duplex, selectable.

Protocols

Modbus TCP/IP, UDP/IP, i2o peer-to-peer.

Addressing

StaticIP, DHCP, BootP.

Ethernet Modbus TCP/IP Sockets/Sessions

1-10 socket/sessions user-configurable.

Ethernet Redundancy

Compatible with STP, RSTP, or any ring scheme.

◆ Environmental

Operating and Storage Temperature

Operating: -40 to 70°C (-40 to 158°F).

Storage: -40 to 85°C (-40 to 185°F).

Power Requirements

18-36V DC. Redundant, diode-coupled terminals.

4.8W (copper ports), 5.8W (fiber-optic ports).

Isolation

I/O, power, relay and Ethernet port-to-port.

Peak: 1500V AC, ANSI/ISA-82.01-1988.

Continuous: 250V AC, 354V DC (150V AC ch-ch).

◆ Enclosure and Physical

Housing Classification and Dimensions

IP20: 8.226 x 2.444 x 7.25", 4 lbs. packed.

PCB: 7.920 x 1.875 x 7.25", 1.65 lbs. packed.

Safety Approvals

CE marked and UL/cUL Listed.

Hazardous Locations: Class I; Div 2; A, B, C, D.

Open board units: UL Recognized.

Shock and Vibration Immunity (in enclosure)

Mechanical Shock: 50g (3ms), 30g (11ms).

Random Vibration: 5g, (5-500Hz).

Ordering Information

◆ EtherStax I/O Units

ES2152-0000

Current/voltage inputs, voltage outputs,
two Cu ports, IP20 enclosure

ES2152-0010

Current/voltage inputs, voltage outputs,
two Cu ports, open board (no IP20 enclosure)

ES2152-1000

Current/voltage inputs, voltage outputs,
Cu & fiber ports, IP20 enclosure

ES2152-1010

Current/voltage inputs, voltage outputs,
Cu & fiber ports, open board (no IP20 enclosure)

◆ Accessories

8B Modules and Backpanels

See Page 32.

Industrial Ethernet Switches

See Page 33.

Hardware Accessories and Power Supplies

See Page 34.

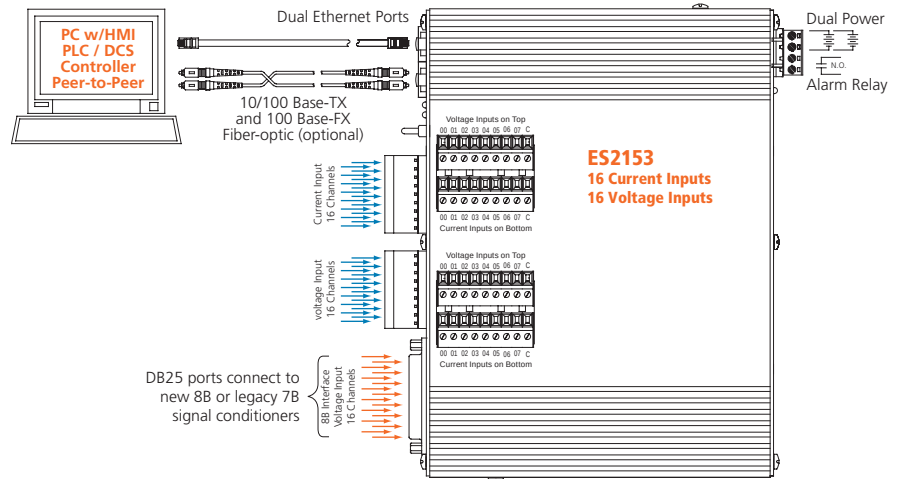
Software Support

See Page 36.



Ethernet I/O: EtherStax® Series

ES2153 Ethernet Analog Input Modules



32 analog inputs (16 current + 16 voltage)s ♦ Modbus TCP/IP, UDP/IP, i2o® peer-to-peer communication

Description

These EtherStax I/O units provide a rugged, high-density, and high-speed solution to interface a large quantity of analog input signals. Units accept 16 single-ended analog voltage inputs and 16 single-ended current inputs. A DB25 port supports an alternate interface of voltage inputs from 8B signal conditioning modules. This combination of high-density analog current and voltage inputs is ideal for many sensor interface applications in remote zones.

EtherStax units are built and tested for high reliability and dependable performance in hostile environments. Available in an aluminum enclosure or as an open circuit board, both formats stack vertically to maintain a very small footprint.



Interface to 8B signal conditioning modules.

Input Ranges

±5V, ±10V, ±20mA, 0-20mA, 4-20mA DC

Ethernet Communication

10/100Base-T(X) and 100Base-FX, Automatic MDI/MDI-X on all copper ports, Modbus TCP/IP or UDP/IP protocol i2o peer-to-peer

Power Requirement

18 to 36V DC (redundancy-ready)

Approvals

CE, UL/cUL:
Zone 2, Class 1, Division 2, Groups ABCD



Open circuit board versions are also available.



Select from more than 100 8B input modules.

Key Features & Benefits

- 32-channel high-density combination of analog current and voltage inputs
- DB25 ports for alternate voltage I/O from 8B signal conditioning backpanels
- 3-way isolation and surge suppression
- High-resolution 16-bit A/Ds
- High-speed scanning for 10 millisecond update of all 32 channels
- Automatic zero/span calibration
- On-demand self-test verifies calibration
- Web browser configuration
- User-configurable sample averaging and integration/totalization function with non-volatile registers
- Dual-format data registers support 16-bit integers or 32-bit floating point
- Scaling registers on all channels
- Peer-to-peer i2o communication with percent-of-span and timed updates

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Performance Specifications

◆ General Specifications

See Page 7 for communication and other specs.

◆ Analog Field Inputs

Input Channel Configuration

16 single-ended analog voltage inputs and
16 single-ended analog current inputs.

Input Ranges (select on per-channel basis)

±5V, ±10V, ±20mA, 0-20mA, or 4-20mA DC.

Input Scaling (per-channel basis)

Floating Point Format: IEEE-754.

Input Resolution

16-bit maximum, 0.00166% (1 part in 60,000).

Input Accuracy

Current Input: Better than 0.1% of range.

Voltage Input: Better than 0.05% of range.

Input Impedance

Voltage: 4M ohms minimum.

Current: 100 ohms.

Input Scan Groups and Scan Times

Eight user-enabled 4-channel scan groups. 770µS
update/group (5mS for all 32 channels) with averaging,
loopback, and totalization functions disabled.

Input Overvoltage Protection

Bipolar Transient Voltage Suppressors (TVS),
18V clamp level typical.

Noise Rejection

CMR (50-60Hz): Better than -72dB.

Sample Averaging (user-configurable)

0-500 samples. One register for all channels.

◆ External 8B Input and Output Modules

See Bulletin 8400-479 for details.

◆ Local Alarm Output

Configuration

Failsafe or non-failsafe (user-configurable) relay trips on
power or link-loss failure.

Type

SPST-NO, 1 Form A, Class I, Division II approved.

Rating

3A @ 24V DC/250V AC, 100,000 cycles general.

2A @ 24V DC/250V AC, Hazardous locations.

Maximum Switching Voltage and Power

250V AC / 750VA, 125V DC / 90W.

◆ Ethernet Interface

Internal Switch or Hub/Repeater

Dual-port Ethernet switch. User-configurable as a true
switch (default mode) or low-latency hub.

Network Connector [10/100 Base-T(X)Copper]

One or two 8-pin RJ-45 connectors. Automatic MDI/
MDI-X. 100m communication distance.

Network Connector (100 Base-FX Fiber-optic)

One multi-mode with SC connector. 2km communica-
tion distance. Full/half-duplex, selectable.

Protocols

Modbus TCP/IP, UDP/IP, i2o peer-to-peer.

Addressing

StaticIP, DHCP, BootP.

Ethernet Modbus TCP/IP Sockets/Sessions

1-10 socket/sessions user-configurable.

Ethernet Redundancy

Compatible with STP, RSTP, or any ring scheme.

◆ i2o Peer-to-Peer Communication

Each port of 8 input channels can be mapped to out-
put ports of two ES215x units. Updates based on time
(100mS resolution) or percent of range change (0.1%
resolution).

◆ Environmental

Operating and Storage Temperature

Operating: -40 to 70°C (-40 to 158°F).

Storage: -40 to 85°C (-40 to 185°F).

Power Requirements

18-36V DC. Redundant, diode-coupled terminals.

4.8W (copper ports), 5.8W (fiber-optic ports).

Isolation

I/O, power, relay and Ethernet port-to-port.

Peak: 1500V AC, ANSI/ISA-82.01-1988.

Continuous: 250V AC, 354V DC (150V AC ch-ch).

◆ Enclosure and Physical

Housing Classification and Dimensions

IP20: 8.226 x 2.444 x 7.25", 4 lbs. packed.

PCB: 7.920 x 1.875 x 7.25", 1.65 lbs. packed.

Safety Approvals

CE marked and UL/cUL Listed.

Hazardous Locations: Class I; Div 2; A, B, C, D.

Open board units: UL Recognized.

Shock and Vibration Immunity (in enclosure)

Mechanical Shock: 50g (3ms), 30g (11ms).

Random Vibration: 5g, (5-500Hz).

Ordering Information

◆ EtherStax I/O Units

ES2153-0000

Current/voltage inputs, two Cu ports,
IP20 enclosure

ES2153-0010

Current/voltage inputs, two Cu ports,
open board (no IP20 enclosure)

ES2153-1000

Current/voltage inputs, Cu & fiber ports,
IP20 enclosure

ES2153-1010

Current/voltage inputs, Cu & fiber ports,
open board (no IP20 enclosure)

◆ Accessories

8B Modules and Backpanels

See Page 32.

Industrial Ethernet Switches

See Page 33.

Hardware Accessories and Power Supplies

See Page 34.

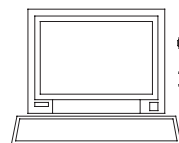
Software Support

See Page 36.



Ethernet I/O: EtherStax® Series

ES2161 Ethernet Analog Input Modules

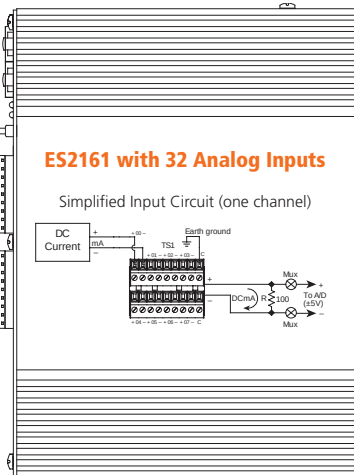


PC w/HMI
PLC / DCS
Controller

Dual Ethernet Ports
10/100 Base-TX
and 100 Base-FX
Fiber-optic (optional)

Analog Input
Channels 0 - 7

Analog Input
Channels 8 - 15



Dual Power
Alarm Relay

Analog Input
Channels 16 - 23

32-channel differential analog current input ♦ Modbus TCP/IP or UDP/IP communication

Description

These EtherStax I/O units provide a rugged, high-density, and high-speed solution to interface a large quantity of analog input signals. Units accept 32 differential analog current inputs, which are ideal for many sensor interface applications in remote zones. Available in an aluminum enclosure or as an open circuit board, both packages stack vertically to maintain a very small footprint. Many other features help increase reliability, improve performance and protect from harsh environments.

Input Ranges

$\pm 20\text{mA}$, 0-20mA, 4-20mA DC

Ethernet Communication

10/100Base-T(X) and 100Base-FX,
Automatic MDI/MDI-X on all copper ports,
Modbus TCP/IP or UDP/IP protocol

Power Requirement

18 to 36V DC (redundancy-ready)

Approvals

CE, UL/cUL:
Zone 2, Class 1, Division 2, Groups ABCD

Key Features & Benefits

- 32 differential current analog inputs
- 4-way isolation and surge suppression
- Configurable from any web browser
- High-resolution 16-bit A/D
- Fast scanning up to 1KHz
- Dual-format data registers support both 16-bit signed integers and 32-bit floating point formats
- User-configurable IEEE-754 32-bit floating point scaling registers on all channels
- User-configurable integration function on all channels with totalizing 32-bit non-volatile counter registers
- User-configurable sample averaging and integration/totalization function with non-volatile registers
- Built-in precision voltage source for automatic calibration
- On-demand self-test with built-in calibration sources





Performance Specifications

◆ General Specifications

See Page 7 for communication and other specs.

◆ Analog Field Inputs

Input Channel Configuration

32 differential analog inputs. 16 channels on front and rear panels of unit.

DC Current Input Ranges (per-channel basis)

±20mA, 0-20mA, or 4-20mA DC (default).

User-configured on a per-channel basis.

Input Scaling (per-channel basis)

Floating Point Format: IEEE-754 32-bit configurable for 12 digits with 4 decimal places.

16-bit Signed Integer Format: All channels are represented as ±30,000.

Input Resolution and Accuracy

Resolution: 15-bit maximum, 0.003%.

Accuracy: Better than 0.02% of range.

Input Impedance

100 ohms.

Input Scan Groups and Scan Times

Eight user-enabled 4-channel scan groups.

5mS (200Hz) update of all 32 channels.

8mS (125Hz) update when totalizing.

First 4-channel group updates in 770µS (1.3KHz). Each additional 4-channel group adds 590µS to update time.

Sample Averaging

0 to 500 samples, user-configurable.

Input Overvoltage Protection

Bipolar Transient Voltage Suppressors (TVS),

18V clamp level typical.

Noise Rejection

Common Mode (50-60Hz): Better than 72dB.

◆ Local Alarm Output

Configuration

Failsafe or non-failsafe (software-configurable) relay trips on power or link-loss failure.

Type

SPST-NO, 1 Form A, Class I, Division II approved.

Rating

5A @ 24V DC/250V AC, 6000 cycles resistive.

3A @ 24V DC/250V AC, 100,000 cycles general.

2A @ 24V DC/250V AC, Hazardous locations.

Maximum Switching Voltage and Power

250V AC / 750VA, 125V DC / 90W.

◆ Ethernet Interface

Internal Switch or Hub/Repeater

Dual-port Ethernet switch. Web-configurable as a true switch (default mode) or low-latency hub.

Network Connector [10/100 Base-T(X)Copper]

One or two 8-pin RJ-45 connectors. Automatic MDI/MDI-X. 100m communication distance.

Network Connector (100 Base-FX Fiber-optic)

One multi-mode duplex SC connector. 2km communication distance. Full/half-duplex, selectable.

Protocols and Addressing

Modbus TCP/IP or UDP/IP. StaticIP, DHCP, BootP.

Configurable IP addresses.

Ethernet Modbus TCP/IP Sockets/Sessions

1-10 socket/sessions programmable via web page.

Ethernet Redundancy

Compatible with STP, RSTP, proprietary schemes.

◆ Environmental

Operating and Storage Temperature

Operating Ranges:

-40 to 70°C (-40 to 158°F).

Storage Range: -40 to 85°C (-40 to 185°F).

Power Requirements

18-36V DC. Redundant, diode-coupled terminals.

4.2W (copper ports), 5.25W (fiber-optic ports).

Ambient Temperature Effect

Less than 25ppm/°C (0.0025%/°C).

Isolation

I/O, power, relay and Ethernet port-to-port.

Peak: 1500V AC, ANSI/ISA-82.01-1988.

Continuous: 250V AC, 354V DC.

◆ Enclosure and Physical

Housing Classification and Dimensions

IP20: 8.226" x 2.444" x 7.25", 4 lbs. packed.

PCB: 7.920" x 1.875" x 7.25", 1.65 lbs. packed.

Safety Approvals

CE marked and UL/cUL Listed.

Hazardous Locations: Class I; Div 2; A, B, C, D.

Open board units: UL Recognized.

Shock and Vibration Immunity (in enclosure)

Mechanical Shock: 50g (3ms), 30g (11ms).

Random Vibration: 5g, (5-500Hz).

Ordering Information

◆ Models

ES2161-0000

Current inputs, two Cu ports, IP20 enclosure

ES2161-0010

Current inputs, two Cu ports, open board

ES2161-1000

Current inputs, Cu & fiber ports, IP20 enclosure

ES2161-1010

Current inputs, Cu & fiber ports, open board

◆ Accessories

Industrial Ethernet Switches

See Page 33.

Hardware Accessories and Power Supplies

See Page 34.

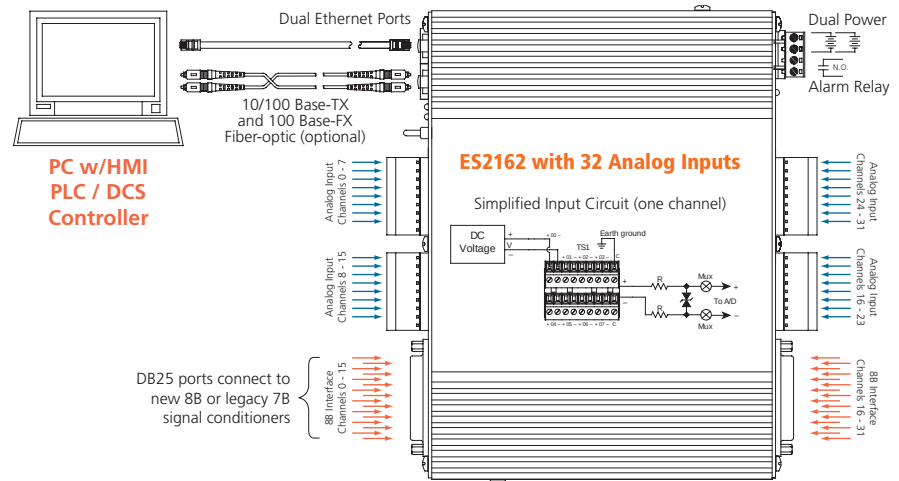
Software Support

See Page 36.



Ethernet I/O: EtherStax® Series

ES2162 Ethernet Analog Input Modules



32-channel differential analog voltage input with 8B interface ♦ Modbus TCP/IP or UDP/IP communication

Description

These EtherStax I/O units provide a rugged, high-density, and high-speed solution to interface a large quantity of analog input signals. Units natively accept 32 differential high-level analog voltage inputs, which are ideal for most sensor interface applications in remote zones. For systems requiring high channel-to-channel isolation or a variety of input signals (voltage, current, temperature, frequency, load cell, etc.), the ES2162 has two ports that will each interface 16 inputs from an 8B signal conditioner backpanel. Available in an aluminum enclosure or as an open circuit board, both packages stack vertically to maintain a very small footprint. Many other features help increase reliability, improve performance and protect from harsh industrial environments.



Interface to 8B signal conditioning modules.

Input Ranges

±5V, ±10V DC

8B Signal Conditioner Interface

Dual DB25 ports provide alternate interface to 8B signal conditioner backpanel systems

Ethernet Communication

10/100Base-T(X) and 100Base-FX, Automatic MDI/MDI-X on all copper ports, Modbus TCP/IP or UDP/IP protocol

Power Requirement

18 to 36V DC (redundancy-ready)

Approvals

CE, UL/cUL:
Zone 2, Class 1, Division 2, Groups ABCD



Open circuit board versions are also available.



Select from more than 100 8B input modules.

Key Features & Benefits

- 32 differential high-level voltage analog inputs
- Dual DB25 ports for alternate interface to 8B signal conditioning backpanels
- 4-way isolation and surge suppression
- Configurable from any web browser
- High-resolution 16-bit A/D
- Fast scanning up to 1KHz
- Dual-format data registers support both 16-bit signed integers and 32-bit floating point formats
- User-configurable IEEE-754 32-bit floating point scaling registers on all channels
- User-configurable integration function on all channels with totalizing 32-bit non-volatile counter registers
- User-configurable sample averaging and integration/totalization function with non-volatile registers
- Built-in precision voltage source for automatic calibration
- On-demand self-test with built-in calibration sources





Performance Specifications

◆ General Specifications

See Page 7 for communication and other specs.

◆ Analog Field Inputs

Input Channel Configuration

32 differential analog inputs. 16 channels on front and rear panels of unit.

DC Voltage Input Ranges (per-channel basis)

±5V or ±10V DC (default).

User-configured on a per-channel basis.

Input Scaling (per-channel basis)

Floating Point Format: IEEE-754 32-bit configurable for 12 digits with 4 decimal places.

16-bit Signed Integer Format: All channels are represented as ±30,000.

Input Resolution and Accuracy

Resolution: 16-bit maximum, 0.00167%.

Accuracy: Better than 0.02% of range.

Input Impedance

Greater than 1M ohms.

Input Scan Groups and Scan Times

Eight user-enabled 4-channel scan groups.

5mS (200Hz) update of all 32 channels.

8mS (125Hz) update when totalizing.

First 4-channel group updates in 770µS (1.3KHz). Each additional 4-ch. group adds 590µS to update time.

Sample Averaging

0 to 500 samples, user-configurable.

Input Overvoltage Protection

Bipolar Transient Voltage Suppressors (TVS),

18V clamp level typical.

Noise Rejection

Common Mode (50-60Hz): Better than 72dB.

◆ 8B External Inputs

See Bulletin 8400-479 for details.

Compatible 8B Modules and Backpanels

Dual DB25 (front and rear) ports provide cable connection to industry-standard 8B backpanels with analog input modules only. Each DB25 port alternately connects up to 16 input channels to any 8B backpanel via an SCMXA006 cable. NOTE: Differential input channels are disabled in 8-channel groups when DB25 port(s) are used.

Input Configuration (per-channel basis)

Web page configuration sets channels to sense inputs via screw terminals or DB25 port.

8B Input Module Outputs

All 8B input modules provide 0-5V, 1-5V or ±5V DC outputs.

8B Input Module Power

8Bs require 5V DC ±5%. For other power options, order one (1) supply per backpanel.

7-34V DC: Model 8BPWR-2 power supply.

AC power: Model P55R-B05 or PWR-4505.

8B Input Isolation (CMV Input-to-Output)

1500Vrms channel-to-channel isolation.

◆ Local Alarm Output

Configuration

Failsafe or non-failsafe (software-configurable) relay trips on power or link-loss failure.

Type

SPST-NO, 1 Form A, Class I, Division II approved.

Rating

5A @ 24V DC/250V AC, 6000 cycles resistive.

3A @ 24V DC/250V AC, 100,000 cycles general.

2A @ 24V DC/250V AC, Hazardous locations.

Maximum Switching Voltage and Power

250V AC / 750VA, 125V DC / 90W.

◆ Ethernet Interface

Internal Switch or Hub/Repeater

Dual-port Ethernet switch. Web-configurable as a true switch (default mode) or low-latency hub.

Network Connector [10/100 Base-T(X)Copper]

One or two 8-pin RJ-45 connectors. Automatic MDI/MDI-X. 100m communication distance.

Network Connector (100 Base-FX Fiber-optic)

One multi-mode duplex SC connector. 2km communication distance. Full/half-duplex, selectable.

Protocols and Addressing

Modbus TCP/IP or UDP/IP. StaticIP, DHCP, BootP.

Configurable IP addresses.

Ethernet Modbus TCP/IP Sockets/Sessions

1-10 socket/sessions programmable via web page.

Ethernet Redundancy

Compatible with STP, RSTP, proprietary schemes.

◆ Environmental

Operating and Storage Temperature

Operating Ranges:

-40 to 70°C (-40 to 158°F).

Storage Range: -40 to 85°C (-40 to 185°F).

Power Requirements

18-36V DC. Redundant, diode-coupled terminals.

4.4W (copper ports), 5.5W (fiber-optic ports).

Isolation

I/O, power, relay and Ethernet port-to-port.

Peak: 1500V AC, ANSI/ISA-82.01-1988.

Continuous: 250V AC, 354V DC.

◆ Enclosure and Physical

Housing Classification and Dimensions

IP20: 8.226" x 2.444" x 7.25", 4 lbs. packed.

PCB: 7.920" x 1.875" x 7.25", 1.65 lbs. packed.

Safety Approvals

CE marked and UL/cUL Listed.

Hazardous Locations: Class I; Div 2; A, B, C, D.

Open board units: UL Recognized.

Shock and Vibration Immunity (in enclosure)

Mechanical Shock: 50g (3ms), 30g (11ms).

Random Vibration: 5g, (5-500Hz).

Ordering Information

◆ Models

ES2162-0000

ES2162-0010

Voltage inputs, two copper ports.

IP20 enclosure (-0000) or open board (-0010).

ES2162-1000

ES2162-1010

Voltage inputs, one copper and one fiber port.

IP20 enclosure (-1000) or open board (-1010).

◆ Accessories

8B Modules and Backpanels

See Page 32.

Industrial Ethernet Switches

See Page 33.

Hardware Accessories and Power Supplies

See Page 34.

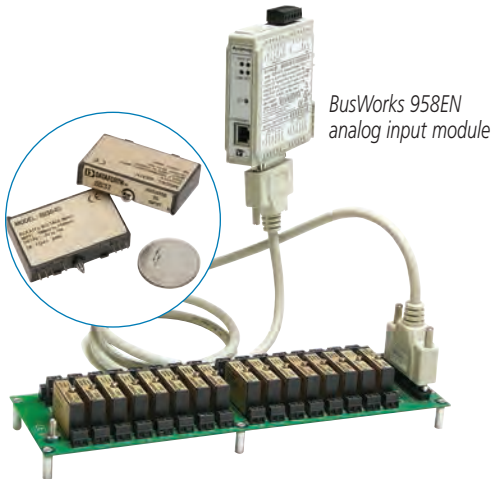
Software Support

See Page 36.

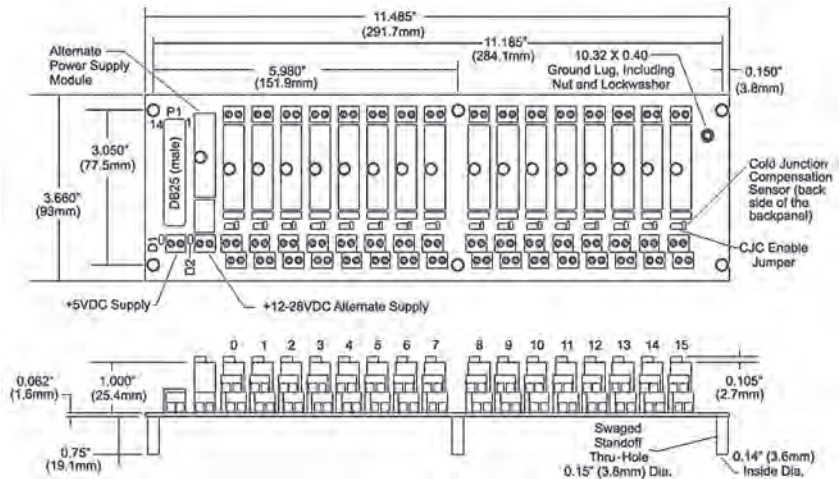


Ethernet I/O: EtherStax® Series

8B Signal Conditioning Modules



*BusWorks 958EN
analog input module*



High-density isolation amplifiers ♦ Parallel interface connects to Ethernet Analog Input Modules

Description

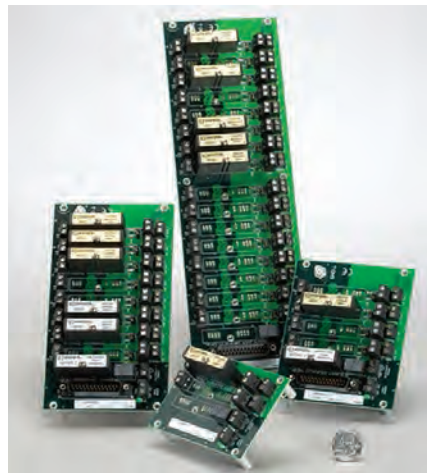
This new line of high-density isolated signal conditioners provides 17 family groups with a total of 102 models that interface to a wide variety of voltage, current, temperature, position, frequency, and strain measuring devices. Housed in a package only one-fifth the size of competing products, the 8B module series offers instrument-class performance with superior specifications for accuracy, linearity, filtering, isolation, output noise and much more.

Key Features & Benefits

- ±0.05% accuracy
- ±0.02% linearity
- 1500Vrms isolation
- 3- to 5-pole low-pass filter
- 120dB CMR
- ANSI/IEEE C37.90.1 transient protection
- Field I/O protection from 30 to 240V AC continuous
- -40°C to 85° operating temperature range
- DB25 connector for Ethernet interface to Acromag BusWorks or EtherStax I/O modules
- CE compliant
- UL/cUL listing pending for Class 1, Division 2

Applications

- Systems requiring high channel-to-channel isolation, noise rejection, surge suppression, and amplification
- Designed for front-end signal conditioning or embedded applications:
- DCS, PLC, controllers, data acquisition, remote I/O, recorders, etc.
- On-board embedded OEM applications
- Protects equipment, increases accuracy, and installs/expands easily
- Low-cost, high-density amplifier system



Ordering Information

NOTE: Please refer to Acromag Bulletin #8400-479 or visit www.acromag.com for full ordering information.

♦ Input Modules

- Current input
- Voltage input; 1kHz, 20kHz, or narrow bandwidth
- RTD input; linearized; 2-, 3-, or 4-wire RTD
- Thermocouple input; linearized or non-linearized
- Strain gage input; wide or narrow bandwidth
- Potentiometer input
- Frequency input

♦ Accessories

- 2-, 4-, 8-, and 16-position analog I/O backpanels
- Power supplies
- Interface cables
- 19-Inch metal mounting rack

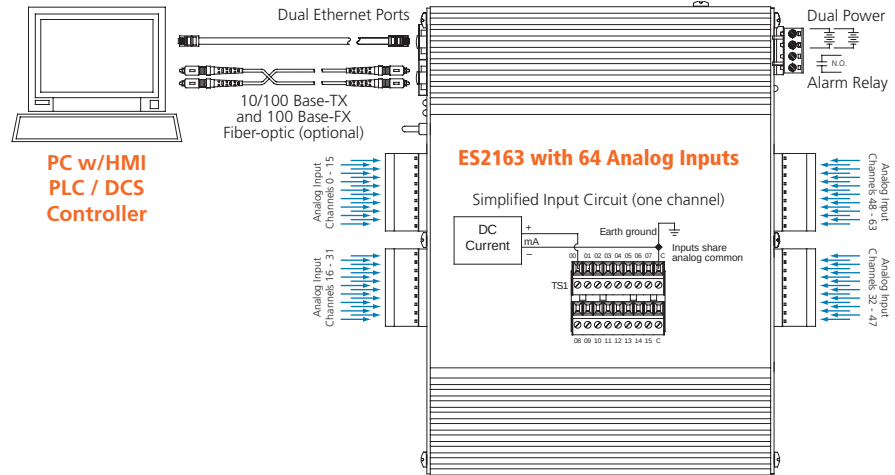


8Bs also connect to EtherStax analog I/O modules (ES2151, ES2152, ES2153, ES2162, ES2172 models)

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Ethernet I/O: EtherStax® Series

ES2163 Ethernet Analog Input Modules



64-channel single-ended analog current input ♦ Modbus TCP/IP or UDP/IP communication

Description

These EtherStax I/O modules provide a rugged, high-density, and high-speed solution to interface a large quantity of analog input signals to SCADA and distributed I/O systems. Each unit converts up to 64 single-ended analog current signals from various sensors and instruments for transmission to an Ethernet-based control network. Typical applications include process control, automated manufacturing, remote data acquisition, test and measurement, embedded computing, and supervisory monitoring systems.

EtherStax units are built and tested to deliver high reliability and dependable performance in hostile environments. Many features help increase reliability, improve performance and protect from harsh environments. Available in an aluminum enclosure or as an open circuit board, both formats stack vertically to maintain a very small footprint.

Input Ranges

±20mA, 0-20mA, 4-20mA DC

Ethernet Communication

10/100Base-T(X) and 100Base-FX, Automatic MDI/MDI-X on all copper ports, Modbus TCP/IP or UDP/IP protocol

Power Requirement

18 to 36V DC (redundancy-ready)

Approvals

CE, UL/cUL:
Zone 2, Class 1, Division 2, Groups ABCD



Open circuit board versions are also available.

Key Features & Benefits

- 64 single-ended analog current inputs
- 4-way isolation and surge suppression
- High-resolution 16-bit A/D
- High-speed scanning with 10 millisecond update of all 64 channels
- Automatic zero/span calibration
- On-demand self-test verifies calibration
- Configurable from any web browser
- User-configurable sample averaging and integration/totalization function with non-volatile registers
- Dual-format data registers support 16-bit integers or 32-bit floating point
- Scaling registers on all channels

Acromag 
THE LEADER IN INDUSTRIAL I/O

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Performance Specifications

◆ General Specifications

See Page 7 for communication and other specs.

◆ Analog Field Inputs

Input Channel Configuration

64 single-ended analog inputs. 32 channels on front and rear panels of unit.

DC Current Input Ranges

±20mA, 0-20mA, or 4-20mA DC (default).
User-configured on a per-channel basis.

Input Scaling (per-channel basis)

Floating Point Format: IEEE-754 32-bit configurable for 12 digits with 4 decimal places.

16-bit Signed Integer Format: All channels represented as ±30,000.

Input Resolution and Accuracy

Resolution: 15-bit maximum, 0.003%.
Accuracy: Better than 0.1% of range.

Input Impedance

100 ohms.

Input Scan Groups and Scan Times

Eight user-enabled 8-channel scan groups.
10mS (100Hz) update of all 64 channels.

First 8-channel group updates in 1.80mS (555Hz).
Each additional 8-channel group adds 1.20mS to the update time.

Sample Averaging

0 to 500 samples, user-configurable.

Input Overvoltage Protection

Bipolar Transient Voltage Suppressors (TVS),
14V working voltage.

Noise Rejection

Common Mode (50-60Hz): Better than 72dB.

◆ Local Alarm Output

Configuration

Failsafe or non-failsafe (software-configurable) relay trips on power or link-loss failure.

Type

SPST-NO, 1 Form A, Class I, Division II approved.

Rating

5A @ 24V DC/250V AC, 6000 cycles resistive.
3A @ 24V DC/250V AC, 100,000 cycles general.
2A @ 24V DC/250V AC, Hazardous locations.

Maximum Switching Voltage and Power

250V AC / 750VA, 125V DC / 90W.

◆ Ethernet Interface

Internal Switch or Hub/Repeater

Dual-port Ethernet switch. Web-configurable as a true switch (default mode) or low-latency hub.

Network Connector (10/100 Base-TX Copper)

One or two 8-pin RJ-45 connectors. Automatic MDI/MDI-X. 100m communication distance.

Network Connector (100 Base-FX Fiber-optic)

One multi-mode duplex SC connector. Full-duplex only. 2km communication distance.

Protocols and Addressing

Modbus TCP/IP or UDP/IP. StaticIP, DHCP, BootP. Configurable IP addresses.

Ethernet Modbus TCP/IP Sockets/Sessions

1-10 socket/sessions programmable via web page.

Ethernet Redundancy

Compatible with STP, RSTP, proprietary schemes.

◆ Environmental

Operating and Storage Temperature

Operating Range: -40 to 70°C (-40 to 158°F).
Storage Range: -40 to 85°C (-40 to 185°F).

Power Requirements

18-36V DC. Redundant, diode-coupled terminals.
4.4W (copper ports), 5.5W (fiber-optic ports).

Ambient Temperature Effect

Less than 35ppm/°C (0.0035%/°C).

Isolation

I/O, power, relay and Ethernet port-to-port.
Peak: 1500V AC, ANSI/ISA-82.01-1988.
Continuous: 250V AC, 354V DC.

◆ Enclosure and Physical

Housing Classification and Dimensions

IP20: 8.226" x 2.444" x 7.25", 4 lbs. packed.
PCB: 7.920" x 1.875" x 7.25", 1.65 lbs. packed.

Safety Approvals

CE marked and UL/cUL Listed.

Hazardous Locations: Class I; Division 2; A, B, C, D.
Open board units: UL Recognized.

Shock and Vibration Immunity (in enclosure)

Mechanical Shock: 50g (3ms), 30g (11ms).

Random Vibration: 5g, (5-500Hz).

Ordering Information

◆ Models

ES2163-0000

Current inputs, two Cu ports, IP20 enclosure

ES2163-0010

Current inputs, two Cu ports, open board

ES2163-1000

Current inputs, Cu & fiber ports, IP20 enclosure

ES2163-1010

Current inputs, Cu & fiber ports, open board

◆ Accessories

Industrial Ethernet Switches

See Page 33.

Hardware Accessories and Power Supplies

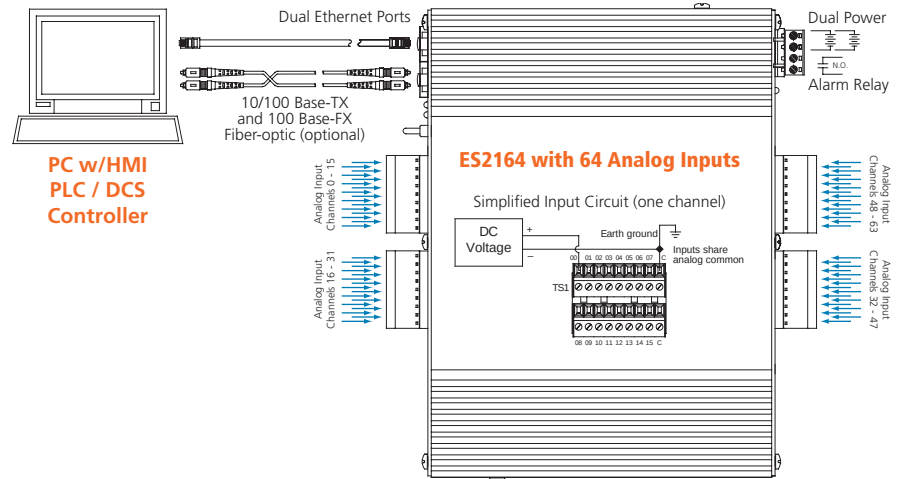
See Page 34.

Software Support

See Page 36.

Ethernet I/O: EtherStax® Series

ES2164 Ethernet Analog Input Modules



64-channel single-ended analog voltage input ♦ Modbus TCP/IP or UDP/IP communication

Description

These EtherStax I/O modules provide a rugged, high-density, and high-speed solution to interface a large quantity of analog input signals to SCADA and distributed I/O systems. Each unit converts up to 64 single-ended analog voltage signals from various sensors and instruments for transmission to an Ethernet-based control network. Typical applications include process control, automated manufacturing, remote data acquisition, test and measurement, embedded computing, and supervisory monitoring systems.

EtherStax units are built and tested to deliver high reliability and dependable performance in hostile environments. Many features help increase reliability, improve performance and protect from harsh environments. Available in an aluminum enclosure or as an open circuit board, both formats stack vertically to maintain a very small footprint.

Input Ranges

±5V, ±10V DC

Ethernet Communication

10/100Base-T(X) and 100Base-FX, Automatic MDI/MDI-X on all copper ports, Modbus TCP/IP or UDP/IP protocol

Power Requirement

18 to 36V DC (redundancy-ready)

Approvals

CE, UL/cUL:
Zone 2, Class 1, Division 2, Groups ABCD



Open circuit board versions are also available.

Key Features & Benefits

- 64 single-ended analog voltage inputs
- 4-way isolation and surge suppression
- High-resolution 16-bit A/D
- High-speed scanning with 10 millisecond update of all 64 channels
- Automatic zero/span calibration
- On-demand self-test verifies calibration
- Configurable from any web browser
- User-configurable sample averaging and integration/totalization function with non-volatile registers
- Dual-format data registers support 16-bit integers or 32-bit floating point
- Scaling registers on all channels

Acromag 
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Performance Specifications

◆ General Specifications

See Page 7 for communication and other specs.

◆ Analog Field Inputs

Input Channel Configuration

64 single-ended analog inputs. 32 channels on front and rear panels of unit.

DC Voltage Input Ranges (per-channel basis)

±5V or ±10V DC (default).

User-configured on a per-channel basis.

Input Scaling

Floating Point Format: IEEE-754 32-bit configurable for 12 digits with 4 decimal places.

16-bit Signed Integer Format: All channels represented as ±30,000.

Input Resolution and Accuracy

Resolution: 16-bit maximum, 0.00167%.

Accuracy: Better than 0.05% of range.

Input Impedance

Greater than 1M ohms.

Input Scan Groups and Scan Times

Eight user-enabled 8-channel scan groups.

10mS (100Hz) update of all 64 channels.

First 8-channel group updates in 1.80mS (555Hz).

Each additional 8-channel group adds 1.20mS to the update time.

Sample Averaging

0 to 500 samples, user-configurable.

Input Overvoltage Protection

Bipolar Transient Voltage Suppressors (TVS),

14V working voltage.

Noise Rejection

Common Mode (50-60Hz): Better than 72dB.

◆ Local Alarm Output

Configuration

Failsafe or non-failsafe (software-configurable) relay trips on power or link-loss failure.

Type

SPST-NO, 1 Form A, Class I, Division II approved.

Rating

5A @ 24V DC/250V AC, 6000 cycles resistive.

3A @ 24V DC/250V AC, 100,000 cycles general.

2A @ 24V DC/250V AC, Hazardous locations.

Maximum Switching Voltage and Power

250V AC / 750VA, 125V DC / 90W.

◆ Ethernet Interface

Internal Switch or Hub/Repeater

Dual-port Ethernet switch. Web-configurable as a true switch (default mode) or low-latency hub.

Network Connector (10/100 Base-TX Copper)

One or two 8-pin RJ-45 connectors. Automatic MDI/MDI-X. 100m communication distance.

Network Connector (100 Base-FX Fiber-optic)

One multi-mode duplex SC connector. Full-duplex only. 2km communication distance.

Protocols and Addressing

Modbus TCP/IP or UDP/IP. StaticIP, DHCP, BootP.

Configurable IP addresses.

Ethernet Modbus TCP/IP Sockets/Sessions

1-10 socket/sessions programmable via web page.

Ethernet Redundancy

Compatible with STP, RSTP, proprietary schemes.

◆ Environmental

Operating and Storage Temperature

Operating Range: -40 to 70°C (-40 to 158°F).

Storage Range: -40 to 85°C (-40 to 185°F).

Power Requirements

18-36V DC. Redundant, diode-coupled terminals.

4.4W (copper ports), 5.5W (fiber-optic ports).

Ambient Temperature Effect

Less than 25ppm/°C (0.0025%/°C).

Isolation

I/O, power, relay and Ethernet port-to-port.

Peak: 1500V AC, ANSI/ISA-82.01-1988.

Continuous: 250V AC, 354V DC.

◆ Enclosure and Physical

Housing Classification and Dimensions

IP20: 8.226" x 2.444" x 7.25", 4 lbs. packed.

PCB: 7.920" x 1.875" x 7.25", 1.65 lbs. packed.

Safety Approvals

CE marked and UL/cUL Listed.

Hazardous Locations: Class I; Division 2; A, B, C, D.

Open board units: UL Recognized.

Shock and Vibration Immunity (in enclosure)

Mechanical Shock: 50g (3ms), 30g (11ms).

Random Vibration: 5g, (5-500Hz).

Ordering Information

◆ Models

ES2164-0000

Voltage inputs, two Cu ports, IP20 enclosure

ES2164-0010

Voltage inputs, two Cu ports, open board

ES2164-1000

Voltage inputs, Cu & fiber ports, IP20 enclosure

ES2164-1010

Voltage inputs, Cu & fiber ports, open board

◆ Accessories

Industrial Ethernet Switches

See Page 33.

Hardware Accessories and Power Supplies

See Page 34.

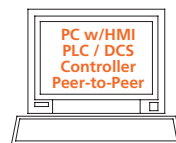
Software Support

See Page 36.



Ethernet I/O: EtherStax® Series

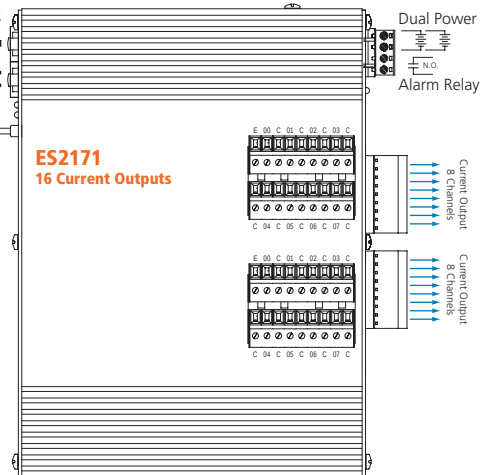
ES2171 Ethernet Analog Output Modules



Dual Ethernet Ports
10/100 Base-TX and 100 Base-FX
Fiber-optic (optional)



Rear view



16 analog current outputs ♦ Modbus TCP/IP, UDP/IP, i2o® peer-to-peer communication

Description

These EtherStax I/O units provide a rugged, high-density, and high-speed solution to interface analog output signals. Each unit provides 16 high-level analog current outputs to control various industrial devices.

Typical applications include driving indicators, display devices, and chart recorders. The outputs can also control variable speed drives, solenoid valves, motors, positioners and other actuators. Another common use is for re-transmission of analog signals to remote SCADA, PLC, or DCS systems.

EtherStax units are built and tested for high reliability and dependable performance in hostile environments. Available in an aluminum enclosure or as an open circuit board, both formats stack vertically to maintain a very small footprint.

Output Ranges

0-20mA, 4-20mA DC

Ethernet Communication

10/100Base-T(X) and 100Base-FX, Automatic MDI/MDI-X on all copper ports, Modbus TCP/IP or UDP/IP protocol i2o peer-to-peer

Power Requirement

18 to 36V DC (redundancy-ready)
9 to 16V DC output excitation required

Approvals

CE, UL/cUL:
Zone 2, Class 1, Division 2, Groups ABCD



Open circuit board versions are also available.

Key Features & Benefits

- 16-channel high-density analog output
- 3-way isolation and surge suppression
- High-resolution 16-bit D/A
- High-speed updates of less than 4 milliseconds for all channels
- Built-in loop-back circuit verifies outputs
- On-demand self-test verifies calibration
- Web browser configuration
- Peer-to-peer i2o communication output target device for Model ES215x inputs

i2o Peer-to-Peer Messaging

With Acromag's i2o technology, you can map inputs from ES215x units to output channels on an ES2171 module. Select updates based on time or on a percent of range change (100mS or 0.1% resolution).





Performance Specifications

◆ Analog Field Outputs

Output Channel Configuration

16 single-ended current outputs.
9-16V DC external excitation required.

Output Ranges (per-channel basis)

0-20mA or 4-20mA DC sourced.
User-configured on a per-channel basis.

Maximum Output Load at Excitation

265 ohms @ 9V.
400 ohms @ 12V.
540 ohms @ 15V.

Output Resolution and Accuracy

Resolution: 13-bit maximum, 0.0122%.
Accuracy: Better than 0.1% of range.

Output Response Time

1 channel: Less than 3mS, typical.
16 channels: Less than 4mS, typical.

◆ Local Alarm Output

Configuration

Failsafe or non-failsafe (user-configurable) relay trips on power or link-loss failure.

Type

SPST-NO, 1 Form A, Class I, Division II approved.

Rating

3A @ 24V DC/250V AC, 100,000 cycles general.
2A @ 24V DC/250V AC, Hazardous locations.

Maximum Switching Voltage and Power

250V AC / 750VA, 125V DC / 90W.

◆ Ethernet Interface

Internal Switch or Hub/Repeater

Dual-port Ethernet switch. User-configurable as a true switch (default mode) or low-latency hub.

Network Connector [10/100 Base-T(X) Copper]

One or two 8-pin RJ-45 connectors. Automatic MDI/MDI-X. 100m communication distance.

Network Connector (100 Base-FX Fiber-optic)

One multi-mode with SC connector. 2km communication distance. Full/half-duplex, selectable.

Protocols

Modbus TCP/IP, UDP/IP, i2o peer-to-peer.

Addressing

StaticIP, DHCP.

Ethernet Modbus TCP/IP Sockets/Sessions

1-10 socket/sessions user-configurable.

Ethernet Redundancy

Compatible with STP, RSTP, or any ring scheme.

Port Number	% Span Change	Update Time(100mS)	Map To IP Address	Map To Holding Register	Mapping Method	Map To Internal Outputs
Port 1 Voltage	0.0 0.0	150 0	128.1.1.102 0.0.0.0	40351 0	☐ Unipolar to Unipolar ☐ Bipolar to Unipolar ☐ Bipolar to Bipolar ☐ Unipolar to Bipolar	☐ NO ☐ YES
Port 2 Voltage	0.0 0.0	0 0	0.0.0.0 0.0.0.0	0 0	☐ Unipolar to Unipolar ☐ Bipolar to Unipolar ☐ Bipolar to Bipolar ☐ Unipolar to Bipolar	☐ NO ☐ YES
Port 1 Current	0.0 0.0	0 0	0.0.0.0 0.0.0.0	0 0	☐ Unipolar to Unipolar ☐ Bipolar to Unipolar ☐ Bipolar to Bipolar ☐ Unipolar to Bipolar	
Port 2 Current	0.0 0.0	0 0	0.0.0.0 0.0.0.0	0 0	☐ Unipolar to Unipolar ☐ Bipolar to Unipolar ☐ Bipolar to Bipolar ☐ Unipolar to Bipolar	

Example i2o peer-to-peer mapping configuration screen from input source module (ES215x model).

◆ i2o Peer-to-Peer Communication

Each port of 8 output channels can serve as a target for mapped inputs from ES215x units. Updates are based on time (100mS resolution) or percent of range change (0.1% resolution).

◆ Environmental

Operating and Storage Temperature

Operating: -40 to 70°C (-40 to 158°F).
Storage: -40 to 85°C (-40 to 185°F).

Power Requirements

18-36V DC. Redundant, diode-coupled terminals.
3.3W (copper ports), 4.6W (fiber-optic ports), not including excitation power.
9-16V DC @ 400mA external power required for driving the outputs.

Isolation

I/O, power, relay and Ethernet port-to-port.
Peak: 1500V AC, ANSI/ISA-82.01-1988.
Continuous: 250V AC, 354V DC (150V AC ch-ch).

◆ Enclosure and Physical

Housing Classification and Dimensions

IP20: 8.226 x 2.444 x 7.25", 4 lbs. packed.
PCB: 7.920 x 1.875 x 7.25", 1.65 lbs. packed.

Safety Approvals

CE marked and UL/cUL Listed.

Hazardous Locations: Class I; Div 2; A, B, C, D.

Open board units: UL Recognized.

Shock and Vibration Immunity (in enclosure)

Mechanical Shock: 50g (3ms), 30g (11ms).
Random Vibration: 5g, (5-500Hz).

Ordering Information

◆ Models

ES2171-0000

Current outputs, two Cu ports, IP20 enclosure

ES2171-0010

Current outputs, two Cu ports, open board (no IP20 enclosure)

ES2171-1000

Current outputs, Cu & fiber ports, IP20 enclosure

ES2171-1010

Current outputs, Cu & fiber ports, open board (no IP20 enclosure)

◆ Accessories

Industrial Ethernet Switches

See Page 33.

Hardware Accessories and Power Supplies

See Page 34.

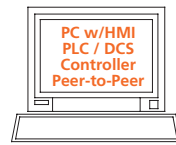
Software Support

See Page 36.



Ethernet I/O: EtherStax® Series

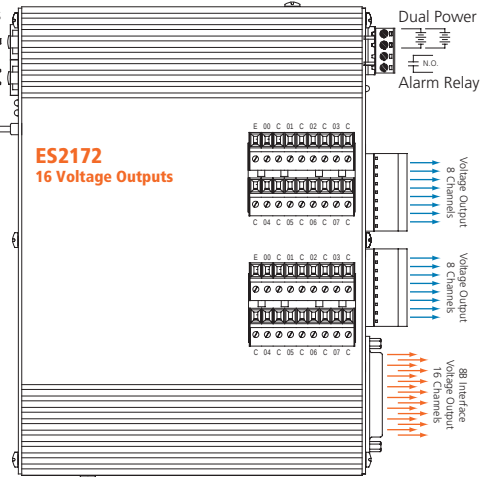
ES2172 Ethernet Analog Output Modules



Dual Ethernet Ports
10/100 Base-TX and 100 Base-FX
Fiber-optic (optional)



Rear view



16 analog voltage outputs ♦ Modbus TCP/IP, UDP/IP, i2o® peer-to-peer communication

Description

These EtherStax I/O units provide a rugged, high-density, and high-speed solution to interface analog output signals. Each unit provides 16 high-level analog voltage outputs to control various industrial devices.

Typical applications include driving indicators, display devices, and chart recorders. The outputs can also control variable speed drives, solenoid valves, motors, positioners and other actuators. Another common use is for re-transmission of analog signals to remote SCADA, PLC, or DCS systems.

EtherStax units are built and tested for high reliability and dependable performance in hostile environments. Available in an aluminum enclosure or as an open circuit board, both formats stack vertically to maintain a very small footprint.



Open circuit board versions are also available.

Output Ranges

±5V, ±10 V DC

Ethernet Communication

10/100Base-T(X) and 100Base-FX, Automatic MDI/MDI-X on all copper ports, Modbus TCP/IP or UDP/IP protocol i2o peer-to-peer

Power Requirement

18 to 36V DC (redundancy-ready)

Approvals

CE, UL/cUL:
Zone 2, Class 1, Division 2, Groups ABCD



Interface to isolated 8B analog output modules.



Select from a dozen 8B output modules.

Key Features & Benefits

- 16-channel high-density analog output
- 3-way isolation and surge suppression
- High-resolution 16-bit D/A
- High-speed updates of less than 4 milliseconds for all channels
- Built-in loop-back circuit verifies outputs
- On-demand self-test verifies calibration
- Web browser configuration
- Peer-to-peer i2o communication output target device for Model ES215x inputs

i2o Peer-to-Peer Messaging

With Acromag's i2o technology, you can map inputs from ES215x units to output channels on an ES2172 module. Select updates based on time or on a percent of range change (100mS or 0.1% resolution).





Performance Specifications

◆ Analog Field Outputs

Output Channel Configuration

16 single-ended DC voltage outputs.

Output Ranges (per-channel basis)

±5V, ±10V DC (at ±1mA).

User-configured on a per-channel basis.

Output Impedance

1 ohm maximum.

Output Resolution and Accuracy

Resolution (±10V): 16-bit maximum, 0.00166%.

Resolution (±5V): 15-bit maximum, 0.00305%.

Accuracy: Better than 0.05% of range.

Output Response Time

1 channel: Less than 3mS, typical.

16 channels: Less than 4mS, typical.

◆ External 8B Output Modules

See Bulletin 8400-479 for details.

◆ Local Alarm Output

Configuration

Failsafe or non-failsafe (user-configurable) relay trips on power or link-loss failure.

Type

SPST-NO, 1 Form A, Class I, Division II approved.

Rating

3A @ 24V DC/250V AC, 100,000 cycles general.

2A @ 24V DC/250V AC, Hazardous locations.

Maximum Switching Voltage and Power

250V AC / 750VA, 125V DC / 90W.

◆ Ethernet Interface

Internal Switch or Hub/Repeater

Dual-port Ethernet switch. User-configurable as a true switch (default mode) or low-latency hub.

Network Connector [10/100 Base-T(X) Copper]

One or two 8-pin RJ-45 connectors. Automatic MDI/MDI-X. 100m communication distance.

Network Connector (100 Base-FX Fiber-optic)

One multi-mode with SC connector. 2km communication distance. Full/half-duplex, selectable.

Protocols

Modbus TCP/IP, UDP/IP, i2o peer-to-peer.

Addressing

StaticIP, DHCP.

Ethernet Modbus TCP/IP Sockets/Sessions

1-10 socket/sessions user-configurable.

Ethernet Redundancy

Compatible with STP, RSTP, or any ring scheme.

Example i2o peer-to-peer mapping configuration screen from input source module (ES215x model).

◆ i2o Peer-to-Peer Communication

Each port of 8 output channels can serve as a target for mapped inputs from ES215x units. Updates are based on time (100mS resolution) or percent of range change (0.1% resolution).

◆ Environmental

Operating and Storage Temperature

Operating: -40 to 70°C (-40 to 158°F).

Storage: -40 to 85°C (-40 to 185°F).

Power Requirements

18-36V DC. Redundant, diode-coupled terminals.

3.3W (copper ports), 4.6W (fiber-optic ports), not including excitation power.

Isolation

I/O, power, relay and Ethernet port-to-port.

Peak: 1500V AC, ANSI/ISA-82.01-1988.

Continuous: 250V AC, 354V DC (150V AC ch-ch).

◆ Enclosure and Physical

Housing Classification and Dimensions

IP20: 8.226 x 2.444 x 7.25", 4 lbs. packed.

PCB: 7.920 x 1.875 x 7.25", 1.65 lbs. packed.

Safety Approvals

CE marked and UL/cUL Listed.

Hazardous Locations: Class I; Div 2; A, B, C, D.

Open board units: UL Recognized.

Shock and Vibration Immunity (in enclosure)

Mechanical Shock: 50g (3ms), 30g (11ms).

Random Vibration: 5g, (5-500Hz).

Ordering Information

◆ Models

ES2172-0000

Voltage outputs, two Cu ports, IP20 enclosure

ES2172-0010

Voltage outputs, two Cu ports, open board (no IP20 enclosure)

ES2172-1000

Voltage outputs, Cu & fiber ports, IP20 enclosure

ES2172-1010

Voltage outputs, Cu & fiber ports, open board (no IP20 enclosure)

◆ Accessories

8B Modules and Backpanels

See Page 32.

Industrial Ethernet Switches

See Page 33.

Hardware Accessories and Power Supplies

See Page 34.

Software Support

See Page 36.



ETHERNET I/O: COMPACT SIZE

These independent, compact I/O modules are ideal when you need to interface a small quantity of I/O channels to your system quickly, easily, and economically.



BusWorks I/O Modules for EtherNet/IP, Modbus TCP/IP

Acromag's BusWorks 900EN I/O modules are the best way to monitor or control a few I/O devices without all the hassles and expensive startup costs you get with complex block I/O systems.

Each inch-wide module has its own EtherNet/IP or Modbus TCP/IP network port and up to 16 I/O channels. No buscouplers, CPUs, I/O racks, or special power supplies are required. Just connect your sensors, valves, motors, or other devices and the I/O modules will link the data to your control network. If you need any extra channels in the future, just add another I/O module.

Setup is fast and easy, too. A web browser is the only software you need. An embedded web page provides a simple configuration menu to help you quickly set desired operating parameters and functions.

Commercial or Industrial-Grade I/O

Ask about commercial-grade models to save money on less demanding projects.

Peer-to-peer communication with i2o

Input modules can write directly to remote output modules without a PLC or a PC in between.

Acromag also offers isolated, industrial-grade 5-port switches to simplify your network connections.

Inputs

- Thermocouple
- RTD/resistance
- Millivolt
- DC current/voltage
- AC current
- Discrete level/status
- 8B signal conditioning modules

Outputs

- DC voltage
- DC current
- Discrete switches

Power

- 15-36V DC

Software Support

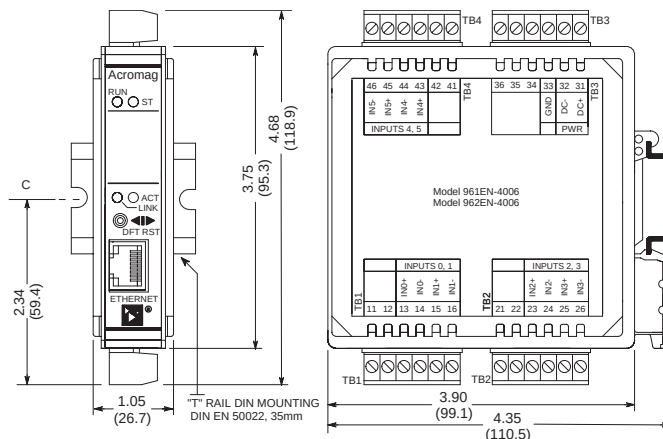
- Configuration via web browser
- Modbus C library
- Ethernet/IP .eds files
- Utilities

Approvals

- CE, ATEX, UL/cUL Class I Div 2
- EtherNet/IP, Modbus TCP/IP conformance

For more information, visit our website at www.acromag.com/BusWorks-900EN

2*
YEAR
WARRANT



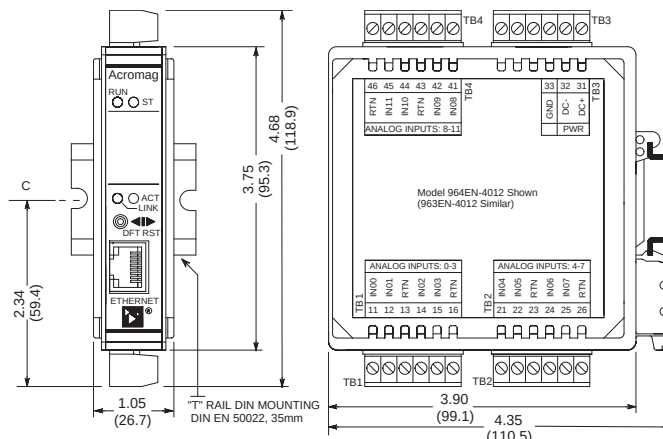
Modbus/TCP
conformance tested

Acromag
THE LEADER IN INDUSTRIAL I/O

Ethernet I/O: BusWorks® Series



963EN, 964EN Ethernet Analog Input Modules



Standard model includes cage clamp terminal blocks. Optional terminals are available (see Page 26).

EtherNet/IP™
conformance tested

Modbus/TCP
conformance tested

12-channel single-ended analog current or voltage input ♦ Ethernet/IP or Modbus TCP/IP communication

Description

Models

963EN: 12 DC current input channels

964EN: 12 DC voltage input channels

These modules provide an isolated Ethernet network interface for twelve analog input channels. Compact design saves space and lowers system costs. Multi-range inputs accept signals from a variety of sensors and devices. High-resolution, low noise, A/D converters deliver high accuracy and reliability.

Input Ranges

Ranges user-selectable on each terminal block for a group of four input channels (4-channel basis).

DC Current:

0 to 1mA, 0 to 11mA, 0 to 20mA, 4 to 20mA
0 to 20 amps AC (with optional AC sensor)

DC Voltage:

±1V, ±5V, or ±10V DC

Network Communication

EtherNet/IP or Modbus TCP/IP 10/100Mbps

Power Requirement

15 to 36V DC supply (2 Watts) required

Approvals

CE/ATEX marked.

UL, cUL listed, Class I; Div. 2; Groups A, B, C, D.

EtherNet/IP, Modbus/TCP conformance tested.

Key Features & Benefits

- Configurable from standard web browser
- EtherNet/IP or Modbus TCP/IP communication with auto 10/100Mbps data rate negotiation
- 12-input module has very low cost per channel
- Universal DC inputs support a wide variety of industrial sensors and signals
- High-resolution 16-bit Σ - Δ A/D converters ensure precise, high accuracy measurements
- Wide operational temperature range permits installation in extreme environments

Performance Specifications

♦ Input

Accuracy

Better than $\pm 0.05\%$ of span for nominal input ranges.

Analog to Digital Converter (A/D)

16-bit Σ - Δ converter. 0.005% (1/20000) resolution.

Noise Rejection

Normal Mode: Better than 40dB @ 60Hz.

Common Mode: Better than 140dB @ 60Hz.

Input Filter Bandwidth

-3dB at 3Hz, typical.

Input Conversion Rate

180mS per channel.

Input Impedance

DC Current Input: 49.9 ohms.

DC Voltage Input: Greater than 110.5K ohms.

♦ Environmental

Ambient Temperature and Humidity

Operating: -25 to 70°C (-13 to 158°F).

Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity: 5 to 95%, non-condensing.

Isolation

1500V AC for 60 seconds or 250V AC continuous.

3-way isolation between I/O, network, and power.

Inputs share a common.

Ordering Information

♦ I/O Modules

963EN-4012

Current input, 12-channel, Ethernet Modbus TCP/IP

963EN-6012

Current input, 12-channel, EtherNet/IP

964EN-4012

Voltage input, 12-channel, Ethernet Modbus TCP/IP

964EN-6012

Voltage input, 12-channel, EtherNet/IP

♦ Accessories

Industrial Ethernet Switches

See Page 25.

Hardware Accessories and Power Supplies

See Page 26.

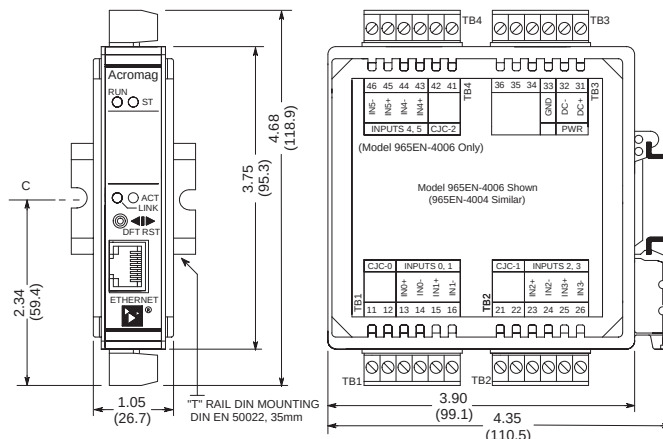
Software Support

See Page 27.

Acromag 
THE LEADER IN INDUSTRIAL I/O

Ethernet I/O: BusWorks® Series

965EN Ethernet Temperature Input Modules



Standard model includes cage clamp terminal blocks. Optional terminals are available (see Page 26).

EtherNet/IP™
conformance tested

Modbus/TCP
conformance tested

4 or 6-channel thermocouple/millivolt input ♦ Ethernet/IP, Modbus TCP/IP, i2o peer-to-peer messaging

Description

These modules provide an isolated Ethernet network interface for up to six input channels. Differential inputs eliminate ground noise and each terminal block includes a cold junction compensation (CJC) sensor for more precise temperature measurements. Multi-range inputs accept signals from a variety of sensors and devices. High-resolution, low noise, A/D converters deliver high accuracy and reliability.

Input Ranges

Ranges are selectable for a 3-channel group.

Thermocouple (user-selectable type)

Type J, K, T, R, S, E, B, or N

DC Millivolts (user-selectable range)

±100mV or ±1V DC

Network Communication

EtherNet/IP or Modbus TCP/IP 10/100Mbps with automatic data rate negotiation

Power Requirement

15 to 36V DC supply (2 Watts) required

Approvals

CE/ATEX marked.

UL, cUL listed, Class I; Div. 2; Groups A, B, C, D.

EtherNet/IP, Modbus/TCP conformance tested.

Key Features & Benefits

- Configurable from standard web browser
- Universal inputs support a variety of sensors
- Thermocouple break detection (upscale or downscale) identifies sensor wiring failures
- High-resolution 16-bit Σ - Δ A/D converters ensure precise, high accuracy measurements
- Wide operational temperature range

Performance Specifications

♦ Input

Input	Input Range	Accuracy (typical)
Type J	-210 to 760°C	±0.5°C
Type K	-200 to 1372°C	±0.5°C
Type T	-260 to 400°C	±0.5°C
Type R	-50 to 1768°C	±1.0°C
Type S	-50 to 1768°C	±1.0°C
Type E	-200 to 1000°C	±0.5°C
Type B	260 to 1820°C	±1.0°C
Type N	-230 to -170°C	±1.0°C
Type N	-170 to 1300°C	±0.5°C
Voltage	±100mV or ±1V DC	±0.1% of span

Cold Junction Compensation (CJC) Accuracy: ±0.5°C.

Noise Rejection

Normal Mode: Better than 40dB @ 60Hz.

Common Mode: Better than 140dB @ 60Hz.

Input Filter Bandwidth

-3dB at 3Hz, typical.

Input Conversion Rate

80mS per channel.

♦ Environmental

Ambient Temperature and Humidity

Operating: -25 to 70°C (-13 to 158°F).

Storage: -40 to 85°C (-40 to 185°F).

Relative humidity: 5 to 95%, non-condensing.

Isolation

1500V AC for 60 seconds or 250V AC continuous.

3-way isolation between I/O, network, and power.

Ordering Information

NOTE: i2o function only available on 6-channel Modbus TCP/IP modules

♦ I/O Modules

965EN-4004

4-channel TC/mV input, Ethernet Modbus TCP/IP

965EN-6004

4-channel TC/mV input, EtherNet/IP

965EN-4006

6-channel TC/mV input, Ethernet Modbus TCP/IP, i2o

965EN-6006

6-channel TC/mV input, EtherNet/IP interface

♦ Accessories

Industrial Ethernet Switches

See Page 25.

Hardware Accessories and Power Supplies

See Page 26.

Software Support

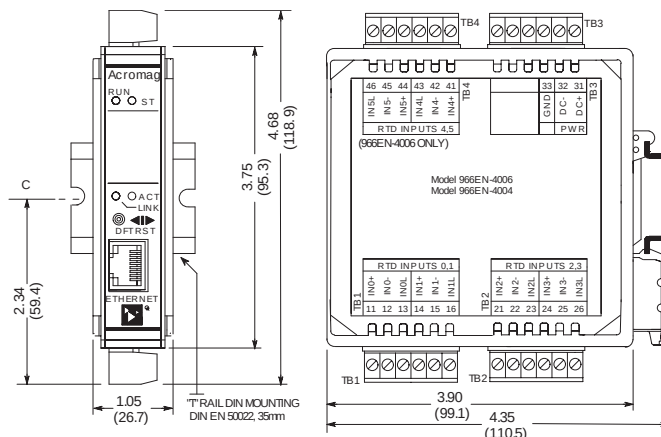
See Page 27.

Acromag 
THE LEADER IN INDUSTRIAL I/O

Ethernet I/O: BusWorks® Series



966EN Ethernet Temperature Input Modules



Standard model includes cage clamp terminal blocks. Optional terminals are available (see Page 26).

EtherNet/IP™
conformance tested

Modbus/TCP
conformance tested

4 or 6-channel RTD/resistance input ♦ Ethernet/IP, Modbus TCP/IP, i2o peer-to-peer messaging

Description

These modules provide an isolated Ethernet network interface for up to six input channels. Multi-range inputs accept signals from a variety of sensors and devices. High-resolution, low noise, A/D converters deliver high accuracy and reliability. 3-way isolation further improves the system performance.

Input Ranges

Input ranges are selectable for a 3-channel group.

RTD

2-wire and 3-wire RTDs are supported.

Platinum 100 ohm (alpha = 1.3850 or 1.3911)

Nickel 120 ohm

Copper 10 ohm

Resistance

0 to 500 ohms

Network Communication

EtherNet/IP or Modbus TCP/IP 10/100Mbps with automatic data rate negotiation

Power Requirement

15 to 36V DC supply (2 Watts) required

Approvals

CE/ATEX marked.

UL, cUL listed, Class I; Div. 2; Groups A, B, C, D.

EtherNet/IP, Modbus/TCP conformance tested.

Key Features & Benefits

- Configurable from standard web browser
- 6-input stand-alone module has much lower start-up cost than multi-piece block I/O systems
- Versatile RTD or ohmic inputs support a wide variety of industrial sensors and devices
- RTD break detection (upscale or downscale) identifies sensor wiring failures
- High-resolution 16-bit Σ - Δ A/D converters ensure precise, high accuracy measurements
- Wide operational temperature range permits installation in extreme environments

Performance Specifications

Input

Accuracy

Input Type	Input Range	Accuracy (typical)
Pt 100 ohm	-200 to 850°C	±0.25°C
Ni 120 ohm	-80 to 320°C	±0.25°C
Cu 10 ohm	-200 to 260°C	±1.25°C
Resistance	0 to 500 ohms	±0.05 ohms

RTD Break Detection

Upscale or downscale selection applies to all channels.

Noise Rejection

Normal Mode: Better than 40dB @ 60Hz.

Common Mode: Better than 130dB @ 60Hz.

Input Filter Bandwidth

-3dB at 3Hz, typical.

Input Conversion Rate

80mS per channel.

Excitation Current

1mA DC typical, all RTD types.

Environmental

Ambient Temperature and Humidity

Operating: -25 to 70°C (-13 to 158°F).

Storage: -40 to 85°C (-40 to 185°F).

Relative humidity: 5 to 95%, non-condensing.

Isolation

1500V AC for 60 seconds or 250V AC continuous.

3-way isolation between I/O, network, and power.

Inputs share a common.

Ordering Information

NOTE: i2o function only available on 6-channel Modbus TCP/IP modules

I/O Modules

966EN-4004

4-channel RTD input, Ethernet Modbus TCP/IP

966EN-6004

4-channel RTD input, EtherNet/IP interface

966EN-4006

6-channel RTD input, Ethernet Modbus TCP/IP, i2o

966EN-6006

6-channel RTD input, EtherNet/IP interface

Accessories

Industrial Ethernet Switches

See Page 25.

Hardware Accessories and Power Supplies

See Page 26.

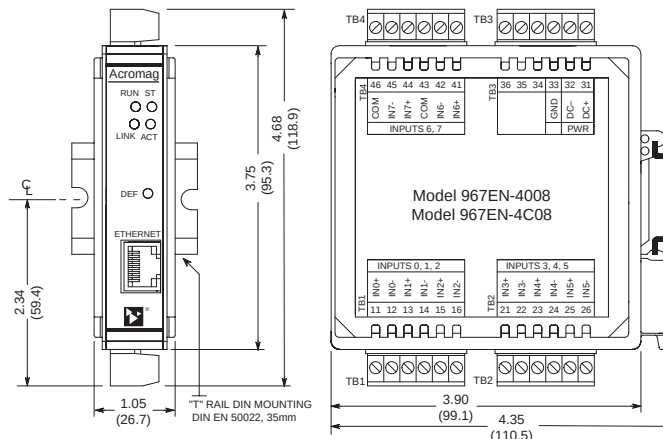
Software Support

See Page 27.

Acromag 
THE LEADER IN INDUSTRIAL I/O

Ethernet I/O: BusWorks® Series

967EN Ethernet Analog Input Modules



Standard model includes cage clamp terminal blocks. Optional terminals are available (see Page 26).

Modbus/TCP
conformance tested

8-channel differential current input ♦ Modbus TCP/IP, i2o® peer-to-peer communication

Description

Models

967EN-4008: Industrial-grade units
967EN-4C08: Commercial-grade units

These modules interface high-level analog input signals to an Ethernet network. A high-performance design ensures reliable measurements and dependable operation.

Industrial-grade models add a configurable integrator/totalizer plus superior accuracy and temperature performance compared to the economical commercial-grade version.

Input Ranges

±20mA, 0-20mA, 4-20mA DC
(selectable on each channel)

Ethernet Communication

Modbus TCP/IP, 10/100Base-T(X),
i2o peer-to-peer

Power Requirement

18 to 36V DC, 2.4W

Approvals

CE, UL/cUL (industrial-grade units only)
Zone 2, Class 1, Division 2, ABCD

Key Features & Benefits

- High-resolution 16-bit A/D
- Fast scanning of all channels in 8mS
- 3-way isolation and surge suppression
- Peer-to-peer i2o communication with percent-of-span or timed-based updates
- Configurable integration/totalization function with non-volatile registers
- Dual-format 16/32-bit data registers
- Scaling registers on all channels
- Configurable sample averaging
- Automatic calibration and self-test
- User-adjustable TCP Ports 1-99,999 for advanced network configuration
- Web browser configuration with copy utility for fast setup

i2o Peer-to-Peer Messaging

With Acromag's i2o technology, you can map each input channel to any output channel on a 97xEN-400x output unit. Select updates based on time or on a percent of range change (100mS or 0.1% resolution).

Performance Specifications

Accuracy

967EN-4008: Less than 0.05% of range.
967EN-4C08: Less than 0.10% of range.

Input Impedance

200 ohms.

Operating Temperature and Humidity Ranges

967EN-4008: -40 to 70°C (-40 to 158°F).
967EN-4C08: 0 to 55°C (32 to 131°F).
Relative humidity: 5 to 95%, non-condensing.

Isolation

3-way isolation of I/O, power, network circuits.
Peak: 1500V AC, ANSI/ISA-82.01-1988.
Continuous: 250V AC, 354V DC.

Ordering Information

♦ I/O Modules

967EN-4008 {industrial-grade}
8-ch current input module with integrator

967EN-4C08 {commercial-grade*}
8-ch current input module

* CE approval only, no integrator function

♦ Accessories

Industrial Ethernet Switches
See Page 25.

Hardware Accessories and Power Supplies
See Page 26.

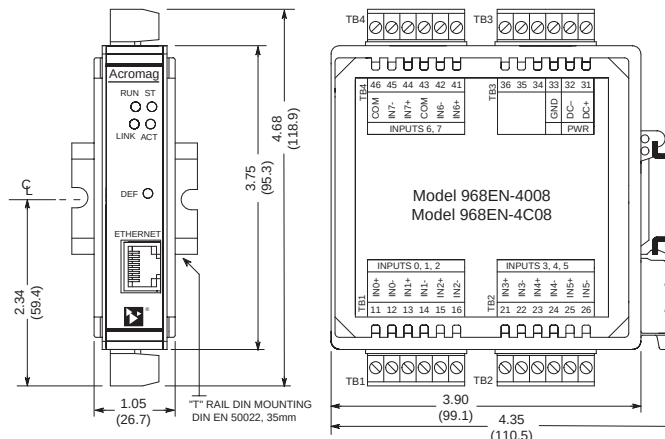
Software Support
See Page 27.

Acromag 
THE LEADER IN INDUSTRIAL I/O

Ethernet I/O: BusWorks® Series



968EN Ethernet Analog Input Modules



Standard model includes cage clamp terminal blocks. Optional terminals are available (see Page 26).

Modbus/TCP
conformance tested

8-channel differential analog voltage input ♦ Modbus TCP/IP, i2o® peer-to-peer communication

Description

Models

968EN-4008: Industrial-grade units

968EN-4C08: Commercial-grade units

These modules interface high-level analog input signals to an Ethernet network. A high-performance design ensures reliable measurements and dependable operation.

Industrial-grade models add a configurable integrator/totalizer plus superior accuracy and temperature performance compared to the economical commercial-grade version.

Input Ranges

±5V, ±10V DC
(selectable on each channel)

Ethernet Communication

Modbus TCP/IP, 10/100Base-T(X),
i2o peer-to-peer

Power Requirement

18 to 36V DC, 2.4W

Approvals

CE, UL/cUL (industrial-grade units only)
Zone 2, Class 1, Division 2, ABCD

Key Features & Benefits

- High-resolution 16-bit A/D
- Fast scanning of all channels in 8mS
- 3-way isolation and surge suppression
- Peer-to-peer i2o communication with percent-of-span or timed-based updates
- Configurable integration/totalization function with non-volatile registers
- Dual-format 16/32-bit data registers
- Scaling registers on all channels
- Configurable sample averaging
- Automatic calibration and self-test
- User-adjustable TCP Ports 1-99,999 for advanced network configuration
- Web browser configuration with copy utility for fast setup

i2o Peer-to-Peer Messaging

With Acromag's i2o technology, you can map each input channel to any output channel on a 97xEN-400x output unit. Select updates based on time or on a percent of range change (100mS or 0.1% resolution).

Performance Specifications

Accuracy

968EN-4008: Less than 0.05% of range.
968EN-4C08: Less than 0.10% of range.

Input Impedance

4M ohms.

Operating Temperature and Humidity Ranges

968EN-4008: -40 to 70°C (-40 to 158°F).
968EN-4C08: 0 to 55°C (32 to 131°F).
Relative humidity: 5 to 95%, non-condensing.

Isolation

3-way isolation of I/O, power, network circuits.
Peak: 1500V AC, ANSI/ISA-82.01-1988.
Continuous: 250V AC, 354V DC.

Ordering Information

♦ I/O Modules

968EN-4008 {industrial-grade}
8-ch voltage input module with integrator

968EN-4C08 {commercial-grade*}
8-ch voltage input module

* CE approval only, no integrator function

♦ Accessories

Industrial Ethernet Switches
See Page 25.

Hardware Accessories and Power Supplies
See Page 26.

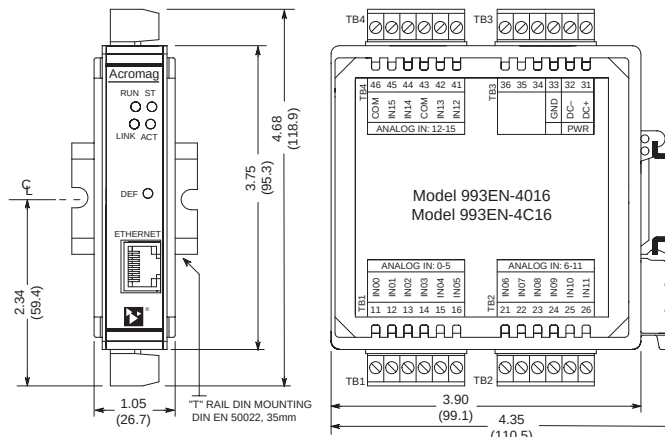
Software Support
See Page 27.

Acromag 
THE LEADER IN INDUSTRIAL I/O

Ethernet I/O: BusWorks® Series



993EN Ethernet Analog Input Modules



Standard model includes cage clamp terminal blocks. Optional terminals are available (see Page 26).

Modbus/TCP
conformance tested

16-channel single-ended analog current input ♦ Modbus TCP/IP communication

Description

Models

993EN-4016: Industrial-grade units

993EN-4C16: Commercial-grade units

These modules interface high-level analog input signals to an Ethernet control network. A high-performance design ensures reliable measurements and dependable operation.

Industrial-grade models add a configurable integrator/totalizer plus superior accuracy and temperature performance compared to the economical commercial-grade version.

Input Ranges

±20mA, 0-20mA, 4-20mA DC
(selectable on each channel)

Ethernet Communication

Modbus TCP/IP, 10/100Base-T(X)

Power Requirement

18 to 36V DC, 2.0W

Approvals

CE, UL/cUL (industrial-grade units only)
Zone 2, Class 1, Division 2, ABCD

Key Features & Benefits

- High-resolution 16-bit A/D
- Fast scanning of all channels in 8mS
- 3-way isolation and surge suppression
- Configurable integration/totalization function with non-volatile registers
- Dual-format 16/32-bit data registers
- Scaling registers on all channels
- Configurable sample averaging
- Automatic calibration and self-test
- User-adjustable TCP Ports 1-99,999 for advanced network configuration
- Web browser configuration with copy utility for fast setup

Performance Specifications

Accuracy

993EN-4016: Less than 0.05% of range.
993EN-4C16: Less than 0.10% of range.

Input Impedance

200 ohms.

Operating Temperature and Humidity Ranges

993EN-4016: -40 to 70°C (-40 to 158°F).
993EN-4C16: 0 to 55°C (32 to 131°F).
Relative humidity: 5 to 95%, non-condensing.

Isolation

3-way isolation of I/O, power, network circuits.
Peak: 1500V AC, ANSI/ISA-82.01-1988.
Continuous: 250V AC, 354V DC.

Ordering Information

♦ I/O Modules

993EN-4016 {industrial-grade}
16-ch current input module with integrator

993EN-4C16 {commercial-grade*}
16-ch current input module

* CE approval only, no integrator function

♦ Accessories

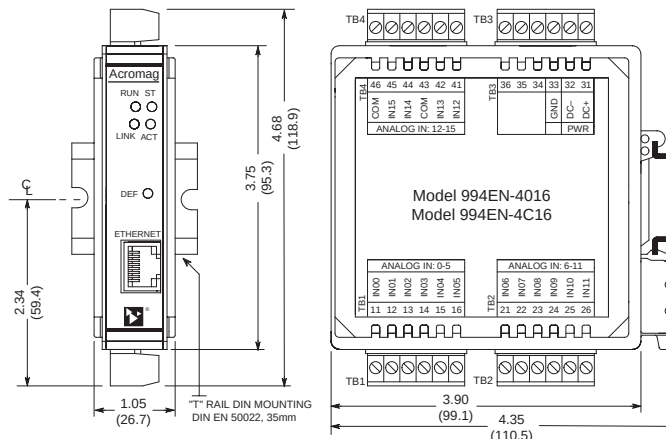
Industrial Ethernet Switches
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Hardware Accessories and Power Supplies
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Software Support
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Acromag 
THE LEADER IN INDUSTRIAL I/O

2
YEAR
WARRANTY



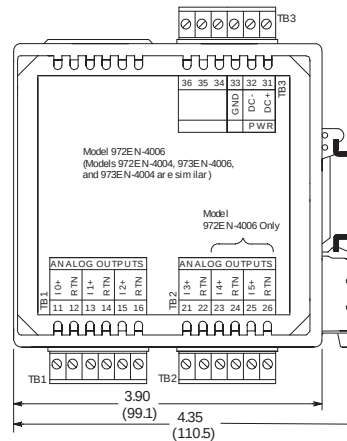
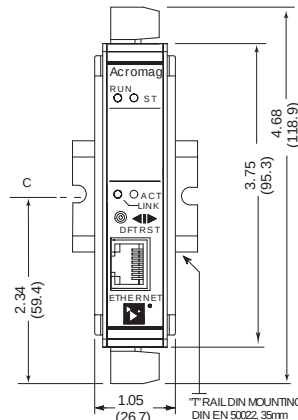
Modbus/TCP
conformance tested

Acromag
THE LEADER IN INDUSTRIAL I/O



Ethernet I/O: BusWorks® Series

972EN, 973EN Ethernet Analog Output Modules



Standard model includes cage clamp terminal blocks. Optional terminals are available (see Page 26).

EtherNet/IP™
conformance tested

Modbus/TCP
conformance tested

4 or 6-channel DC current or voltage output ♦ Ethernet/IP, Modbus TCP/IP, i2o peer-to-peer messaging

Description

Models

972EN: DC current output channels

973EN: DC voltage output channels

These modules provide up to six channels of analog output. Multi-range outputs support a wide variety of industrial devices. They can drive displays and recorders, control drives, or send analog signals to other systems. High-resolution, low noise, D/A converters deliver high accuracy and reliability. 3-way isolation further improves system performance.

Output Ranges

Ranges selectable on channel to channel basis.

DC Current (user-selectable ranges)
0 to 1mA, 0 to 20mA, or 4 to 20mA

DC Voltage (user-selectable ranges)
0 to 1V, 0 to 5V, or 0 to 10V DC

Network Communication

EtherNet/IP or Modbus TCP/IP/100Mbps with automatic data rate negotiation

Power Requirement

15 to 36V DC supply required
4.6 Watts (972EN) or 2.3 Watts (973EN)

Approvals

CE/ATEX marked.
UL, cUL listed, Class I; Div. 2; Groups A, B, C, D.
EtherNet/IP, Modbus/TCP conformance tested.

Key Features & Benefits

- Configurable from standard web browser
- 6-input stand-alone module has much lower start-up cost than multi-piece block I/O systems
- Universal DC outputs support a wide variety of signals and industrial devices
- Three selectable failsafe modes (0%, last-state, or pre-defined) help prevent unsafe conditions
- Wide operational temperature range permits installation in extreme environments

Performance Specifications

♦ Output

Accuracy

Better than $\pm 0.1\%$ of span, typical.
1.6% for 0 to 1mA range. 0.8% for 0 to 1V range.

Digital to Analog Converter (D/A)
12-bit converter.

Current Output Compliance
12V minimum, 13V typical.

Current Output Load Resistance Range
0 to 625 ohms, typical.

Voltage Output Source Current
0 to 10mA DC, maximum.

♦ Environmental

Ambient Temperature and Humidity
Operating:

972EN models: -25 to 60°C (-13 to 140°F).

973EN models: -25 to 70°C (-13 to 158°F).

Storage: -40 to 85°C (-40 to 185°F).

Relative humidity: 5 to 95%, non-condensing.

Isolation

1500V AC for 60 seconds or 250V AC continuous.
3-way isolation between I/O, network, and power.
Outputs share a common.

Ordering Information

NOTE: i2o function only on Modbus TCP/IP modules

♦ I/O Modules

972EN-4004

4-ch. current output, Ethernet Modbus TCP/IP, i2o

972EN-6006

6-ch. current output, Ethernet Modbus TCP/IP, i2o

972EN-6004

4-channel current output, EtherNet/IP

972EN-6006

6-channel current output, EtherNet/IP

973EN-4004

4-ch. voltage output, Ethernet Modbus TCP/IP, i2o

973EN-4006

6-ch. voltage output, Ethernet Modbus/TCP, i2o

973EN-6004

4-channel voltage output, EtherNet/IP

973EN-6006

6-channel voltage output, EtherNet/IP

♦ Accessories

Industrial Ethernet Switches
See Page 25.

Hardware Accessories and Power Supplies
See Page 26.

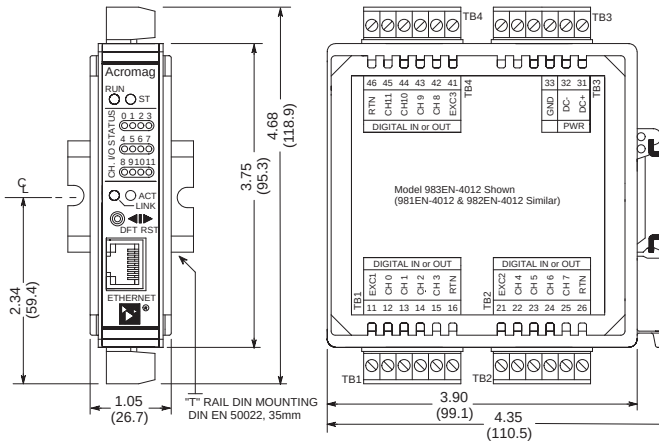
Software Support
See Page 27.

Acromag 
THE LEADER IN INDUSTRIAL I/O

Ethernet I/O: BusWorks® Series



981EN, 982EN, 983EN Ethernet Discrete I/O Modules



Standard model includes cage clamp terminal blocks. Optional terminals are available (see Page 26).

EtherNet/IP™
conformance tested

Modbus/TCP
conformance tested

12-channel discrete input and/or output ♦ Ethernet/IP, Modbus TCP/IP, i2o peer-to-peer messaging

Description

Models

981EN: 12 input channels

982EN: 12 output channels

983EN: 12 input/output channels

These modules provide an isolated Ethernet network interface for twelve discrete input and/or output channels. The outputs provide direct on/off, high/low, or open/close control of industrial devices. The inputs sense the status of motors, pumps, valves and other equipment. The 983EN model with tandem I/O provides output level control and status verification in one unit.

Input Range

0 to 35V DC

Output Range

0 to 35V DC

Network Communication

EtherNet/IP or Modbus TCP/IP 10/100Mbps with automatic data rate negotiation

Power Requirement

15 to 36V DC supply (2 Watts) required

Approvals

CE/ATEX marked.

UL, cUL listed, Class I; Div. 2; Groups A, B, C, D. EtherNet/IP, Modbus/TCP conformance tested.

Key Features & Benefits

- Configurable from standard web browser
- 12-channel stand-alone module has far lower start-up cost than multi-piece block I/O systems
- 0-35V DC solid-state logic interface can monitor or control a wide variety of devices
- Bidirectional I/O models facilitate loopback monitoring of the output state
- Socketed SIP resistors provide input and output 5.6K ohm pull-ups to the excitation supply
- Three selectable failsafe modes (off, last-state, or pre-defined) help prevent unsafe conditions

Performance Specifications

♦ Input (981 & 983 models)

Input Type

Twelve active-low, buffered inputs, with a common connection. Built-in 5.6K ohm pullups to excitation terminal socketed for 4-channel groups.

Input Signal Voltage Range
0 to 35V DC, maximum.

Input Impedance
100K ohms, typical.

Input Signal Threshold
TTL compatible with 100mV of hysteresis, typical.

♦ Output (982 & 983 models)

Output Type

12 independent, open-drain, MOSFET switches.

Output Voltage and ON Resistance
0 to 35V DC max. (0 to 500mA/channel continuous).
0.28 ohms maximum ON resistance.

♦ Environmental

Ambient Temperature and Humidity
Operating: -25 to 70°C (-13 to 158°F).
Storage: -40 to 85°C (-40 to 185°F).
Relative Humidity: 5 to 95%, non-condensing.

Isolation

1500V AC for 60 seconds or 250V AC continuous.
3-way isolation between I/O, network, and power.

Ordering Information

NOTE: i2o function only on Modbus TCP/IP modules

♦ I/O Modules

981EN-4012

Discrete input, Ethernet Modbus TCP/IP

981EN-6012

Discrete input, EtherNet/IP

982EN-4012

Discrete output, Ethernet Modbus TCP/IP, i2o

982EN-6012

Discrete output, EtherNet/IP

983EN-4012

Discrete input/output, Ethernet Modbus TCP/IP, i2o

983EN-6012

Discrete input/output, EtherNet/IP

♦ Accessories

Industrial Ethernet Switches

See Page 25.

Hardware Accessories and Power Supplies

See Page 26.

Software Support

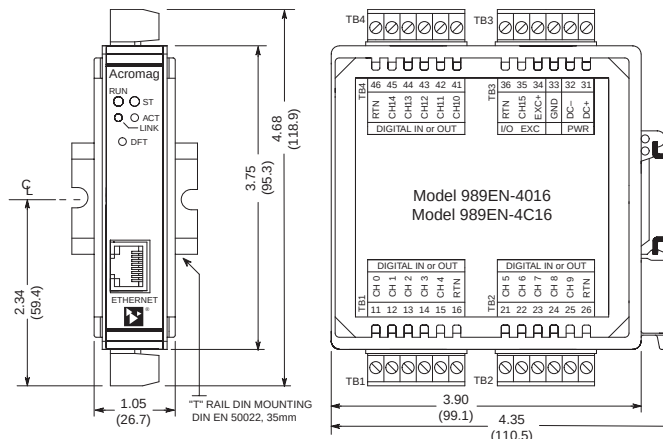
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Ethernet I/O: BusWorks® Series

989EN Ethernet Discrete I/O Modules with Counter/Timers



Standard model includes cage clamp terminal blocks. Optional terminals are available (see Page 26).

Modbus/TCP
conformance tested

16-channel discrete I/O ♦ 8 counter/timers ♦ Modbus TCP/IP communication

Description

Models

989EN-4016: Industrial-grade version

989EN-4C16: Commercial-grade (no counters)

These modules provide an isolated Ethernet interface for any input/output mix of up to 16 discrete signals. Inputs sense the status of dry contacts, switches, power supplies, and DC logic. Industrial-grade units have eight 32-bit counters with timers, alarms, and non-volatile memory for metering, totalizing, and low-frequency periodic measurement. The outputs control solid-state switching of lamps, horns, and other devices.

Input/Output Ranges

Input: 0-28V DC, 31V DC maximum

Output: 0-28V DC, 0.5A/ch max, 2A total

Counter/Timers

(Industrial-grade units)

8 up/down counters, 32-bit, 150Hz max

8 timers, 16-bit, 1mS resolution

Ethernet Communication

Modbus TCP/IP, 10/100Base-T(X)

Power Requirement

18 to 36V DC (1.33 W)

Approvals (industrial-grade only)

CE, UL/cUL

Zone 2, Class 1, Division 2, ABCD

Key Features & Benefits

- 16 solid-state discrete I/O channels (any mix of inputs/outputs)
- 3-way isolation and surge suppression
- Web browser configuration
- Automatic MDI/MDI-X negotiation
- Inputs accept 2- or 3-wire sensors and active logic switches (dry contacts, proximity, namur, 5-28V DC logic)
- Inputs detect level and change of state
- 8 configurable counter/timers
 - 32-bit up/down pulse/event counters (with non-volatile memory)
 - 16-bit periodic timers for "last pulse"
 - Momentary/latch alarms (each counter)
- Programmable debounce (0-65 seconds with 1mS resolution)
- Programmable power-up conditions
- Over-temperature, over-current, and over-voltage output protection
- Ability to "read-back" output states
- Watchdog timer output configurable for fail-safe or hold-last-value operation
- Self-test and auto-copy functions

Performance Specifications

♦ Environmental

Operating Temperature Range

989EN-4016: -40 to 65°C (-40 to 149°F).

989EN-4C16: 0 to 55°C (32 to 131°F).

Storage Temperature Range

989EN-4016: -40 to 85°C (-40 to 185°F).

989EN-4C16: 0 to 70°C (32 to 158°F).

Relative Humidity

5 to 95%, non-condensing.

Isolation

3-way isolation of I/O, power, network circuits.

Peak: 1500V AC, ANSI/ISA-82.01-1988.

Continuous: 250V AC, 354V DC.

Ordering Information

♦ I/O Modules

989EN-4016

16 I/O channels with pulse counter/timers

989EN-4C16

Commercial-grade, 16 I/O, no counter/timers

♦ Accessories

Industrial Ethernet Switches

See Page 25.

Hardware Accessories and Power Supplies

See Page 26.

Software Support

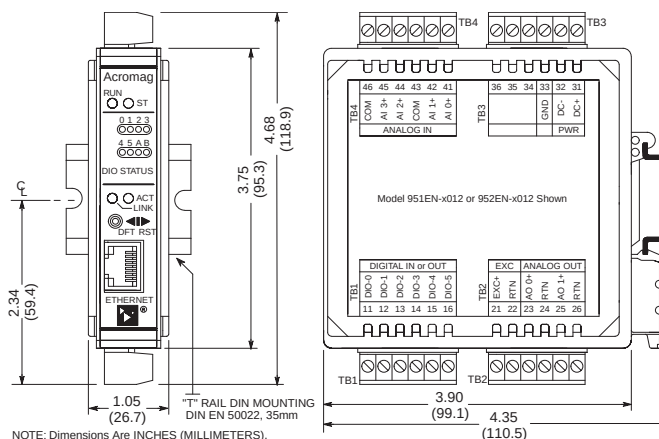
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Ethernet I/O: BusWorks® Series

951EN, 952EN Ethernet Analog and Discrete I/O Modules



Standard model includes cage clamp terminal blocks. Optional terminals are available (see Page 26).

EtherNet/IP™
conformance tested

Modbus/TCP
conformance tested

4 analog inputs, 2 analog outputs, 6 discrete I/O channels ♦ Ethernet/IP, Modbus TCP/IP, i2o peer-to-peer

Description

Models

951EN: Combo module, analog current inputs

952EN: Combo module, analog voltage inputs

These modules provide an isolated Ethernet network interface for analog and discrete I/O signals. Multi-range analog inputs and outputs support a wide variety of industrial devices. High-resolution, low noise, A/D and D/A converters deliver high accuracy and reliability. 3-way isolation further improves system performance. The discrete I/O provide monitoring and control of on/off, high/low, or open/close industrial devices. Tandem I/O provides output level control and status verification in one unit.

The i2o function lets inputs on one module write directly to outputs on another module.

Analog Input Ranges

DC Current (user-selectable ranges)
0 to 1mA, 0 to 11mA, 0 to 20mA, 4 to 20mA
0 to 20 amps AC (with optional AC sensor)

DC Voltage (user-selectable ranges)
±1V, ±5V, ±10V DC

Analog Output Ranges

DC Current (user-selectable ranges)
0 to 1mA, 0 to 20mA, or 4 to 20mA
(0 to 625 ohm loads, typical)

Discrete I/O Range

0 to 35V DC active-high inputs
Current sourcing (high-side switched) outputs

Network Communication

EtherNet/IP or Modbus TCP/IP 10/100 network

Power Requirement

15 to 36V DC supply (3.3 Watts) required

Approvals

CE/ATEX marked.
UL, cUL listed, Class I; Div. 2; Groups A, B, C, D.
EtherNet/IP, Modbus/TCP conformance tested.

Key Features & Benefits

- Configurable from standard web browser
- EtherNet/IP or Modbus TCP/IP communication with automatic 10/100Mbps negotiation
- i2o technology for peer-to-peer communication without a network controller (see Page 6)
- Multi-function, multi-channel stand-alone module is very economical
- High-resolution 16-bit Σ - Δ A/D and D/A converters ensure precise measurements
- 0-35V DC solid-state logic interface can monitor or control a wide variety of devices
- Discrete I/O channels are individually configurable as inputs or outputs in any combination
- Bi-directional discrete I/O facilitates read-back monitoring of the output state
- Built-in 5.6K ohm pull-down SIP resistors (socketed)
- Selectable failsafe modes (0%, off, last-state, or pre-defined) help prevent unsafe conditions
- Compact packaging with pluggable terminals saves space and simplifies wiring
- Wide operational temperature range permits installation in extreme environments

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Performance Specifications

◆ General Specifications

See Page 9 for communication and other specs.

◆ Analog Input

Configuration

Four input channels. Input range is selectable as a 4-channel group.

Accuracy

Better than $\pm 0.05\%$ of span (0.1% for 0-1mA range), typical. Accuracy near or below 0mA or 0V is degraded if input COM shares AO/DIO RTNs.

Analog to Digital Converter (A/D)

16-bit $\Sigma\Delta$ converter.

Resolution: 0.005% or 1 part in 20000.

Noise Rejection

Normal Mode: Better than 40dB @ 60Hz.

Common Mode: Better than 140dB @ 60Hz.

Input Conversion Rate

Less than 50mS per channel.

Input Impedance

DC current input (951EN): 49.9 ohms.

DC voltage input (952EN): Greater than 110.5K ohms.

◆ Analog Output

Configuration

Two output channels. Individually selectable ranges.

Accuracy

Better than $\pm 0.05\%$ of span (0.1% for 0-1mA range), typical.

Digital to Analog Converter (D/A)

16-bit converter.

Current Output Compliance

12V minimum, 13V typical.

Current Output Load Resistance Range

0 to 625 ohms, typical.

◆ Discrete Input

Input Type

Six independent, active-high, buffered inputs with a common connection. Built-in 5.6K ohm pull-down resistors socketed for 3-channel groups.

Input Signal Voltage Range

0 to 35V DC, maximum.

Input Impedance

100K ohms, typical.

Input Signal Threshold

TTL compatible with 100mV of hysteresis, typical.

◆ Discrete Output

Output Type

Six independent, open-source, MOSFET switches.

Output Voltage and ON Resistance

Up to 35V DC max. (0 to 330mA/ch continuous).

0.15 ohms maximum ON resistance.

◆ Environmental

Ambient Temperature and Humidity

Operating: -25 to 70°C (-13 to 158°F).

Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity: 5 to 95%, non-condensing.

Isolation

1500V AC for 60 seconds or 250V AC continuous.

3-way isolation between I/O, network, and power.

Ordering Information

NOTE: i2o function only on Modbus TCP/IP modules

◆ I/O Modules

951EN-4012

Combo module, current inputs, Ethernet Modbus TCP/IP interface, i2o communication

951EN-6012

Combo module, current inputs, EtherNet/IP interface

952EN-4012

Combo module, voltage inputs, Ethernet Modbus TCP/IP interface, i2o communication

952EN-6012

Combo module, voltage inputs, EtherNet/IP interface

◆ Accessories

Industrial Ethernet Switches

See Page 25.

Hardware Accessories and Power Supplies

See Page 26.

Software Support

See Page 27.

i2o™ Input-to-Output Peer-to-Peer Communication

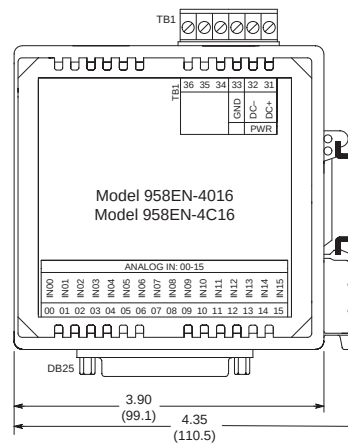
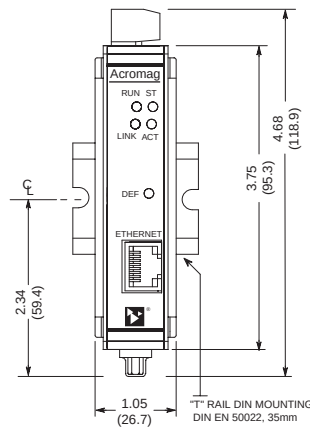


Acromag's i2o technology allows modules to talk directly to another module across any Ethernet media without a PLC, PC, or other controller in between. Input channels on one module can write to output channels on a remote module.



Ethernet I/O: BusWorks® Series

958EN Ethernet 8B Interface Modules (Analog Input)



Standard model includes cage clamp terminal blocks. Optional terminals are available (see Page 26).

Modbus/TCP
conformance tested

16-channel single-ended voltage input ♦ DB25 port for 8B modules ♦ Modbus TCP/IP communication

Description

Models

958EN-4016: Industrial-grade units

958EN-4C16: Commercial-grade units

These modules interface high-level analog input signals to an Ethernet control network. A high-performance design ensures reliable measurements and dependable operation.

The DB25 port provides a parallel connection to a rack of 8B analog input modules. The 8B modules provide an isolated front-end with signal conditioning of up to 16 sensor signals.

Industrial-grade models add a configurable integrator/totalizer plus superior accuracy and temperature performance compared to the economical commercial-grade version.

Input Ranges

±5V DC via DB25 port connection (default) or ±10V DC

Ethernet Communication

Modbus TCP/IP, 10/100Base-T(X)

Power Requirement

18 to 36V DC, 2.0W

Approvals

CE, UL/cUL (industrial-grade units only)
Zone 2, Class 1, Division 2, ABCD

Key Features & Benefits

- DB25 port provides an easy connection to a rack of 8B signal conditioning modules (4, 8, or 16 ch panels supported)
- Cables available for input from 8B, 7B, 5B, or 3B signal conditioning modules
- High-resolution 16-bit A/D
- Fast scanning of all channels in 8mS
- 3-way isolation and surge suppression
- Configurable integration/totalization function with non-volatile memory
- Dual-format 16/32-bit data registers
- Scaling registers on all channels
- Configurable sample averaging
- Automatic calibration and self-test
- User-adjustable TCP Ports 1-99,999 for advanced network configuration
- Web browser configuration with copy utility for fast setup

Performance Specifications

Accuracy

958EN-4016: Less than 0.05% of range.
958EN-4C16: Less than 0.10% of range.

Input Impedance

4M ohms.

Operating Temperature and Humidity Ranges

958EN-4016: -40 to 70°C (-40 to 158°F).
958EN-4C16: 0 to 55°C (32 to 131°F).
Relative humidity: 5 to 95%, non-condensing.

Isolation

3-way isolation of I/O, power, network circuits.
Peak: 1500V AC, ANSI/ISA-82.01-1988.
Continuous: 250V AC, 354V DC.

Ordering Information

♦ I/O Modules

958EN-4016 {industrial-grade}
16-ch voltage input module with integrator

958EN-4C16 {commercial-grade*}
16-ch voltage input module

* CE approval only, no integrator function

♦ Accessories

Industrial Ethernet Switches
See Page 25.

Hardware Accessories and Power Supplies
See Page 26.

Software Support
See Page 27.

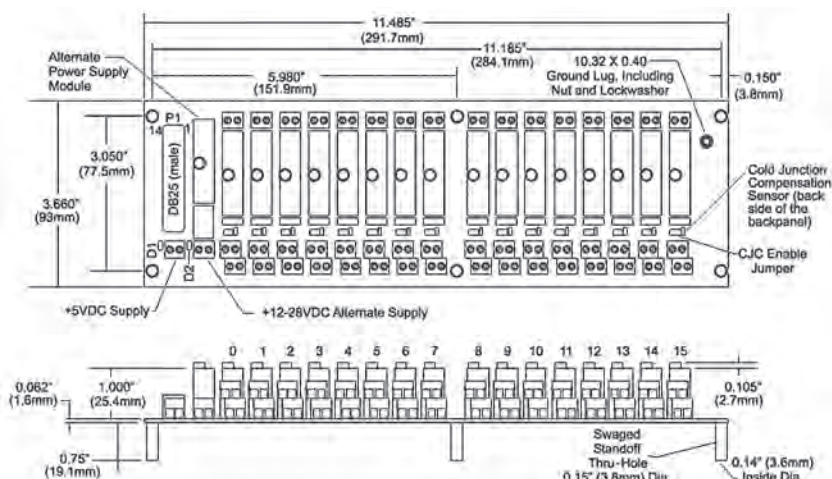
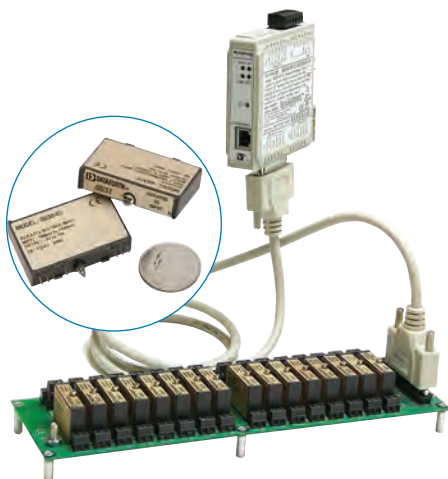
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Ethernet I/O: BusWorks® Series



8B Signal Conditioning Modules



High-density isolation amplifiers ♦ Parallel interface connects to 958EN Ethernet Analog Input Modules

Description

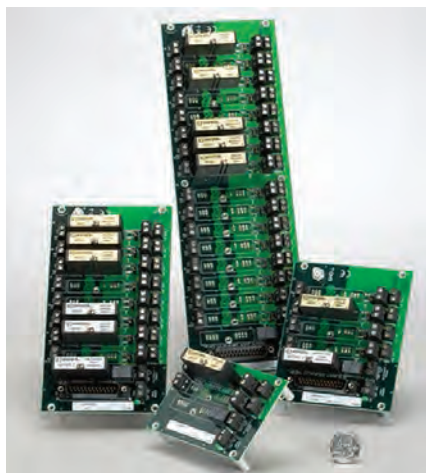
This new line of high-density isolated signal conditioners provides 17 family groups with a total of 102 models that interface to a wide variety of voltage, current, temperature, position, frequency, and strain measuring devices. Housed in a package only one-fifth the size of competing products, the 8B module series offers instrument-class performance with superior specifications for accuracy, linearity, filtering, isolation, output noise and much more.

Key Features & Benefits

- $\pm 0.05\%$ accuracy
- $\pm 0.02\%$ linearity
- 1500Vrms isolation
- 3- to 5-pole low-pass filter
- 120dB CMR
- ANSI/IEEE C37.90.1 transient protection
- Field I/O protection from 30 to 240V AC continuous
- -40°C to 85° operating temperature range
- CE compliant
- UL/cUL listing pending for Class 1, Division 2

Applications

- Systems requiring high channel-to-channel isolation, noise rejection, surge suppression, and amplification
- Designed for front-end signal conditioning or embedded applications:
- DCS, PLC, controllers, data acquisition, remote I/O, recorders, etc.
- On-board embedded OEM applications
- Protects equipment, increases accuracy, and installs/expands easily
- Low-cost, high-density amplifier system



Ordering Information

NOTE: Please refer to Acromag Bulletin #8400-479 or visit www.acromag.com for full ordering information.

♦ Input Modules

- Current input
- Voltage input; 1kHz, 20kHz, or narrow bandwidth
- RTD input; linearized; 2-, 3-, or 4-wire RTD
- Thermocouple input; linearized or non-linearized
- Strain gage input; wide or narrow bandwidth
- Potentiometer input
- Frequency input

♦ Accessories

- 2-, 4-, 8-, and 16-position analog I/O backpanels
- Power supplies
- Interface cables
- 19-Inch metal mounting rack



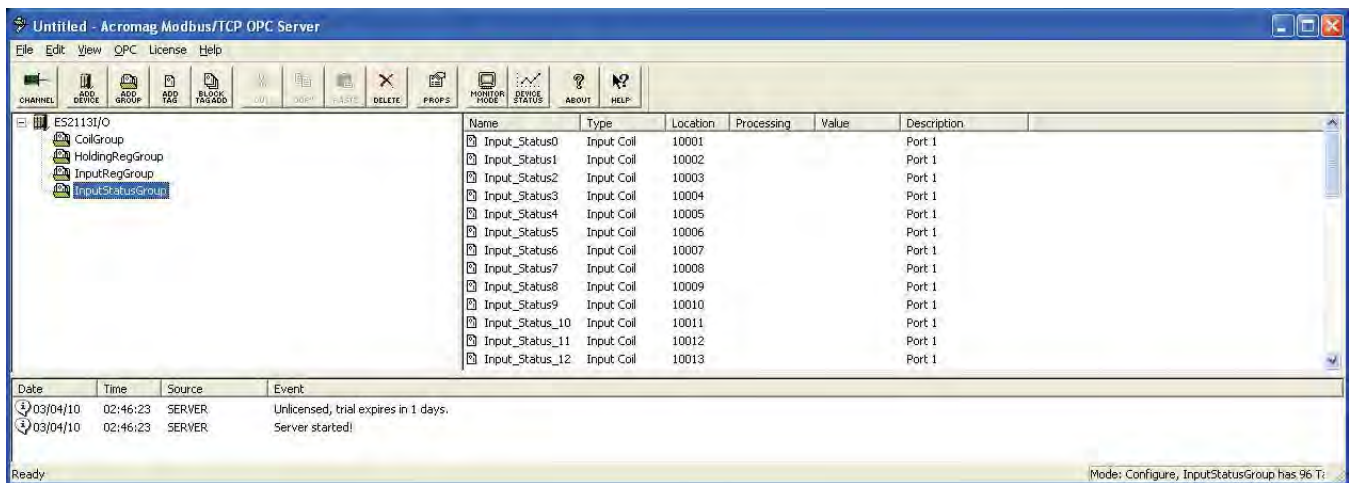
8Bs also connect to EtherStax analog I/O modules (ES2151, ES2152, ES2153, ES2162, ES2172 models)

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Ethernet I/O: Software Support

ACMBTCP-OPC Modbus/TCP Master OPC DA Server



High-performance OPC Server for all Acromag Ethernet I/O ♦ Low-cost server exclusively for Acromag I/O

Description

Acromag's Modbus/TCP Master OPC DA Server delivers high-speed connectivity to all Acromag Modbus TCP/IP slave devices via Ethernet. This server is designed for all local or remote OPC clients such as HMI, SCADA, operator interface and custom-built (Visual Basic®, Visual C++®) applications.

This OPC server offers the most reliable, cost effective and comprehensive features list available in the OPC/HMI market today.

Our unique read/write tag optimization algorithms provide unmatched data transfer speeds between OPC server and hardware devices.

Acromag's OPC server has passed the OPC Foundation's OPC Data Access 3.00 compliance test.

This server includes comprehensive, context-sensitive help systems, Visual Basic OPC client example application with Visual Basic source code, and a pre-built client executable.

Compatible With Leading HMI and SCADA Packages

Acromag's Data Access Server can be used as a data server to any HMI or SCADA package that is OPC compliant. Additionally, the online help system will guide you through the configuration for popular packages from Wonderware, Intellution, Rockwell, GE, and others.

Key Features & Benefits

- Runs on Windows® XP, Vista, 7, 2003 Server, 2008 Server
- Designed exclusively for use with all Acromag Modbus/TCP Ethernet devices
- OPC compliance tested
- Unlimited OPC clients, devices, or items
- Supports OPC custom and automation interfaces such as Visual Basic and C++
- Easy CSV import / export capability
- Modbus packet optimization for fast transactions
- Runs as a stand-alone executable or unattended with no login required
- Device status dialog for easy diagnostics

Free 30-day Trial Version

Download a no-risk demonstration version and try it free for 30 days. Once you see how easy it is and the robust functionality, you can quickly convert the trial version to a full product license.

Ordering Information

ACMBTCP-OPC*

Modbus/TCP Master OPC DA Server.

Only available online at www.acromag.com/OPC

Free 30-day Trial*

Download a no-risk 30-day demonstration version at www.acromag.com/OPC

** NOTE: This software package is only for use with Acromag Ethernet I/O modules. It cannot be used with third-party instrumentation.*



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Ethernet I/O: Software Support

AMXX Series ActiveX / .NET Controls for Modbus I/O



Microsoft
Visual Basic



Microsoft
Visual C++



Easy PC-based communication to Acromag BusWorks and EtherStax I/O ♦ Modbus/TCP or Modbus/RTU

Description

Acromag's AMXX Series software controls provide a fast, easy way to communicate with any Modbus/RTU or Modbus/TCP slave devices connected to your PC's serial or network ports. Within minutes, your Visual Basic, Visual C, .NET, Excel, or other compatible applications will be talking Modbus protocol.

AMRX Modbus/RTU ActiveX Control

The AMRX package is an easy to use ActiveX control that provides a convenient way to communicate to Modbus/RTU slave devices. It also includes a timer for polled data acquisition and a floating point conversion ActiveX control.

AMRN Modbus/RTU Forms Control

AMRN is a simple Windows Forms Control that provides a quick way to communicate with Modbus/RTU slave devices connected to your PC's serial port.

AMTX Modbus/TCP ActiveX Control

AMTX is an easy to use ActiveX control that simplifies communication with Modbus/TCP slave devices connected to your PC's wired or wireless network.

AMTN Modbus/TCP Forms Control

AMTN is an easy to use Windows Forms Control for Modbus/TCP to communication with slave devices connected to your PC's Ethernet port. It can be used on a form or optionally without a form.

Demonstration Programs

Demonstration versions are available. The demos are complete operating ActiveX controls that have a time limit. After 60-90 minutes, communication functions will be disabled. Re-starting the application will initiate another functional demonstration period.

Key Features & Benefits

- Any container application that can embed ActiveX controls can use the AMXX software packages
- At design time, you can access your Modbus device from the software's test property page
- Property page device access makes start-up and troubleshooting a snap – all without writing a single line of code
- Talking to a Modbus slave is as simple as calling a function with the necessary arguments
- The software automatically builds the command, appends a CRC, sends the request over the network, and validates the response
- Your program just reads and writes simple 16-bit data values
- ActiveX controls include a help file and examples for Excel, Visual Basic, C++
- .NET controls include a help file and examples for Visual Basic, C#, and Managed C++



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Ethernet I/O: Software Support

Software Controls Selection Guide

Controls	Protocols		Visual Studio 6.0		Visual Studio 2005/2008/2010			Windows			Compatible Products	
Model	Modbus/RTU (RS-485)	Modbus/TCP (Ethernet)	Visual Basic (VB6)	Visual C++ (VC6)	Visual Basic (.NET)	Visual C++ (.NET)	Visual C# (.NET)	Excel	32-bit	64-bit	900MB	900EN ES2000
AMRX	•		•	•				•	•		•	
AMRN	•				•	•	•		•	•	•	
AMTX		•	•	•				•	•			•
AMTN		•			•	•	•		•	•		•

AMTX Modbus/TCP Master ActiveX Control Properties

Server | Test

ServerIPAddress: 192 . 168 . 1 . 200

ListenPort: 502 (502 recommended)

RcvTimeout: 500 ms

ConnectTimeout: 3000 ms

OK Cancel Apply Help

Ordering Information

AMRX-CD

Modbus/RTU ActiveX Control,
Single Development Site License (on CD-ROM).

AMRN-CD

Modbus/RTU Windows Forms Control,
Single Development Site License (on CD-ROM).

AMTX-CD

Modbus/TCP ActiveX Control,
Single Development Site License (on CD-ROM).

AMTN-CD

Modbus/TCP Windows Forms Control,
Single Development Site License (on CD-ROM).

By purchasing a single development site license you may install the software and develop your application on a single PC and distribute it with your compiled application program royalty free an unlimited number of times. When used in a Microsoft Excel, Word, PowerPoint or other non-compiling end-user application program where full development capabilities are always present, a separate license file must be purchased and installed on each computer that the end-user application program is installed and running on. Please see the EULA included with the demo for complete licensing information.

AMTX Modbus/TCP Master ActiveX Control Properties

Server | Test

Modbus

UnitID: 1 StartReg: 0 NumReg: 16

Access:

- ☐ Input Register(s)
- ☒ Holding Register(s) Read
- ☐ Coil(s) Write
- ☐ Discrete Input(s)

Format:

- ☒ Hex
- ☐ Decimal

Report Slave ID

Read Excp. Stat.

Connect Disconnect

Status: No Error

Data: 000F 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000

OK Cancel Apply Help



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Ethernet I/O: BusWorks® Series



ESW-MBLIB Ethernet Modbus C Library Software



```
Command Prompt - exmbtcpip

Modbus TCP/IP Example 9500-370A

1. Exit this Program
2. Set IP Address: 10.1.1.161
3. Set Register Address: 0
4. Set Register Count: 4
5. Report Slave I.D.
6. Read Output Status
7. Read Input Status
8. Force Single Coil
9. Force Multiple Coils
10. Read Output Registers
11. Read Input Registers
12. Preset Single Register
13. Preset Multiple Registers

Select: 11
00 0002
01 0000
02 0000
03 0000
```

Universal support for five operating systems ♦ C source code provided ♦ Demo program included

Description

Acromag's Modbus C Library software greatly simplifies development of programs to interface with Acromag's BusWorks® and EtherStax® Ethernet I/O products. The library also supports any standard Ethernet Modbus slave device that communicates via Modbus TCP/IP or UDP/IP protocol. This utility is ideal for developers that are unfamiliar with Modbus protocol or the framing of TCP/IP or UDP/IP messages.

The C library makes programming easy and portable by simply linking user code with the provided function calls (below). Most function calls require passing only a few parameters such as the IP address, Modbus register address, and register count.

Example Program

The included example program is menu-driven to help users build Modbus TCP/IP and UDP/IP commands. Menu selections let users configure, read, and write Ethernet I/O slave devices such as Acromag's BusWorks and EtherStax products.

Users may also leverage this demonstration application into a tool for configuration or test by supplying commands and/or data values in the form of a text file. The program will execute each command in the text file as if it had been typed from the console terminal.

Key Features & Benefits

- Library of function routines simplify communication with I/O modules
- Function calls provided for a variety of operating systems
- C source code supplied
- Demonstration program included
- Saves development time
- Ideal for use with Acromag's BusWorks and EtherStax I/O modules
- Compatible with any standard Modbus TCP/IP or UDP/IP device

Codes	Functions
01 (01H)	Read Coil (Output) Status
02 (02H)	Read Input Status
03 (03H)	Read Holding Registers
04 (04H)	Read Input Registers
05 (05H)	Force Single Coil (Output)
06 (06H)	Preset Single Register
15 (0FH)	Force Multiple Coils (Outputs)
16 (10H)	Preset Multiple Registers
17 (11H)	Report Slave ID



Microsoft
Visual C



Linux



VxWorks®



Ordering Information

ESW-MBLIB
Ethernet Modbus C Library Software (CD-ROM)





900EN Series, EIS Series Industrial Ethernet Switches

◆ 5-Port Switch, Unmanaged



900EN-S005 Ethernet Switches

Acromag's five-port Ethernet switch is designed for use in industrial applications. Rugged construction and a variety of security features ensure reliable operation under demanding conditions. Internal intelligence enables "connect and go" operation for fast and easy network installation with auto-negotiation of data rate, flow control, and crossover signal compatibility. No configuration is necessary when the 900EN-S005 is used as a simple switch with Acromag I/O modules. For advanced users, this switch offers numerous control functions that are easily configured through DIP-switch settings or programmed using your computer.

- Five shielded RJ-45 sockets, 8-pin, 10Base-T / 100Base-TX
- 1500V port-to-port isolation
- Redundant power support
- -25 to 70°C operating range
- CE, ATEX marked. UL, cUL listed, Class I; Div. 2; Groups A, B, C, D.

◆ 8-Port Switch, Unmanaged



EIS Series Ethernet Switches

Models

EIS-358: 8-port (Cu), redundancy, unmanaged

EIS-408: 8-port (Cu/fiber), redundancy, managed

EIS series switches are designed for harsh environments. They feature a rugged IP30 aluminum case, 300,000 hour MTBF, and power supply redundancy for dependable networking.

Managed operation

With web-based setup, managed switches ensure easy installation and maintenance. Managed switches also support many powerful Ethernet features such as port VLAN, Quality of Service (QoS), Internet Group Management Protocol (IGMP) Snooping, and failure alarms.

Self-healing redundant ring capability

Some models employ redundancy to provide self-recovery if the primary communication path fails. Redundant ring technology instantly reconfigures to provide an alternate path. The fast recovery time protects mission-critical applications from interruptions and temporary malfunctions.

- Ultra-fast redundant ring technology (<300ms) supports STP, RSTP and proprietary protocols
- -10 to 70°C operating temperature range
- Port-to-port isolation (1200V AC)
- Built-in RFI/EMI and surge/transient protection

◆ 8-Port Switch, Managed, FX



Ordering Information

◆ Switches

For more information please visit www.acromag.com.

900EN-S005

Ethernet switch, 5-port Copper

EIS-358

Ethernet switch with redundancy, 8-port Copper

EIS408FX-M

Ethernet switch with redundancy, 6 Cu / 2 Fiber-optic, multi-mode fiber (up to 2 km).

EIS-408FX-S

Ethernet switch with redundancy, 6 Cu / 2 Fiber-optic, single-mode fiber (up to 30 km).

◆ Accessories

Hardware Accessories and Power Supplies
See Page 26.



MODBUS-RTU: REMOTE I/O

These low-cost multi-channel I/O modules are ideal for remote I/O applications with limited space and those requiring a handful of channels in many locations.



BusWorks® I/O Modules for Modbus-RTU

Acromag's BusWorks 900MB series is a collection of analog and discrete I/O modules with Modbus-RTU network communication. BusWorks modules are ideal for a wide variety of distributed I/O applications including data acquisition, control, process monitoring, and test & measurement.

Analog input modules accept DC current, voltage, or temperature sensor signals and feature local limit alarm capabilities. Analog output modules provide DC current or voltage signals for local displays, recorders, variable frequency drives, valves, and other equipment.

Discrete I/O modules monitor and/or control on/off status of industrial devices.

Windows® configuration software simplifies module setup with easy selection of input/output ranges, alarm setpoints, and other operating parameters.

All 900MB Modbus I/O modules communicate over a high-speed RS-485 network supporting data transfer rates up to 115K baud.

Inputs

- Thermocouple
- RTD/Resistance
- Millivolt
- Frequency
- DC voltage
- DC current
- AC current
- Discrete status

Outputs

- DC voltage
- DC current
- Discrete switches or local limit alarms

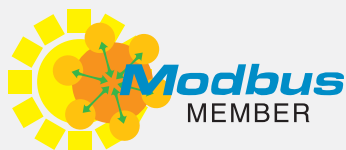
Power

- 10-36V DC
- 24V AC

Approvals

- CE, UL/cUL Class I Div 2 Groups ABCD

For more information, visit our website at www.acromag.com/modbus





Modbus/RS-485



913/914MB Multi-Channel Analog Input Modules

DC Current, DC Voltage or AC Current Input

Limit Alarms or Discrete Outputs

Models

913MB: 4 current input channels
914MB: 4 voltage input channels

Input Ranges

0 to 20mA DC,
±10V DC,
0 to 20A AC (with 5020-350 sensor)

Output

Four output channels:
Open-drain MOSFETs (1A DC loads)
0 to 35V DC

Network Communication

Modbus-RTU high-speed RS-485

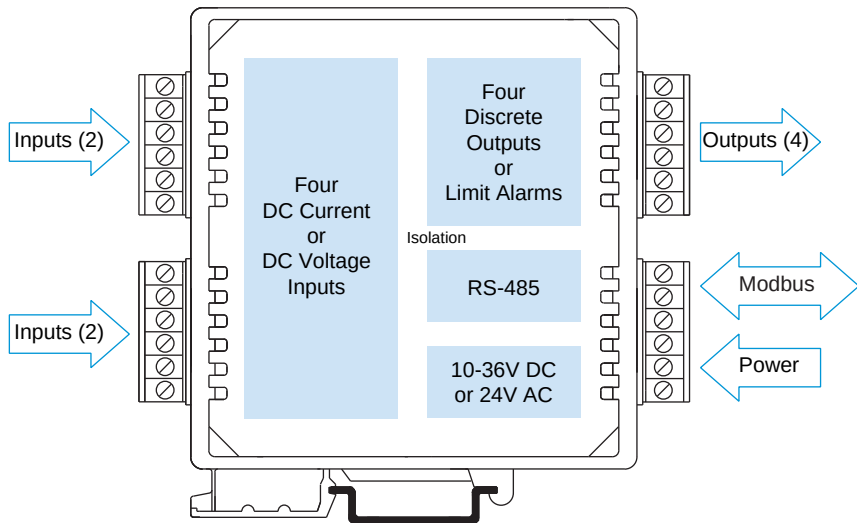
Power Requirement

10 to 36V DC,
24V AC

Approvals

CE marked. UL, cUL listed
Class I; Division 2; Groups A, B, C, D.

DC Current/Voltage Input Module



Description

This signal conditioner is a four-channel analog input module with four discrete outputs. It provides isolation between input, output, power, and network circuits. Network communication adheres to the industry-standard RS-485 Modbus RTU protocol. AC and DC power sources are supported with nonpolarized, diode-coupled terminals.

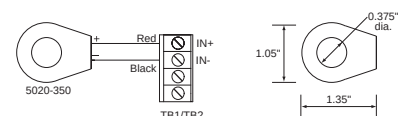
The inputs accommodate wide DC voltage or current ranges. Flexible discrete outputs operate as alarms or on/off controllers. As limit alarms, each discrete output can be configured with high and/or low setpoints exclusively tied to an analog input channel. Alarm trips function without host communication enabling low-cost stand-alone alarms, as well as local backup for the primary control system. Otherwise, on/off control is based on commands issued by the host system.

Combining flexible transmitter functions, mixed signal I/O, alarm support, and a network interface in a single package, makes this instrument extremely powerful. Multi-channel design adds cost-efficiency and allows high-density mounting. Plus, safe, rugged construction makes these modules reliable for use in both control room and distributed field I/O applications. Custom module configurations are also possible (consult factory for details).

Special Features

- Standard Modbus RTU protocol with high-speed RS-485 communication (up to 115K bps)
- 16-bit sigma-delta A/D yields 0.1% of range resolution and accuracy
- Four inputs in a single inch-wide module reduces system costs and saves panel space
- Four discrete outputs enable local limit alarms or host-controlled on/off switching
- Heavy-duty 1A solid-state relays provide dependable on/off control of industrial devices
- Self-calibration lowers maintenance costs by reducing periodic manual calibration checks
- Watchdog timers provide a configurable failsafe output state for use when host I/O communication is lost
- Four-way isolation eliminates potential ground loops between power, input, output, and network circuitry
- Self-diagnostics monitor microcontroller activity to detect operational failures (lock-up) and execute a reset to restore communication

AC Current Sensor Model 5020-350



For 913MB. Order separately (one per channel).



Performance Specifications

General Input

Resolution
0.005% or 1 part in 20,000.

Noise Rejection
Normal mode: 40dB @ 60Hz, typical.
Common mode: 140dB @ 60Hz, typical.

Input Filter Bandwidth
-3dB at 3Hz, typical.

Input Conversion Rate
180ms per channel.

Current Input (913MB)

DC Current Input Ranges
Range user-configured. Range selected applies to all channels.

0 to 1mA, 0 to 20mA, 4 to 20mA,
0 to 11.17mA (for use with 5020-350 AC sensor).

DC Current Input Resistance
49.9 ohms.

DC Current Input Accuracy
±0.1% of input range.

Voltage Input (914MB)

DC Voltage Input Ranges
Range user-configured. Range selected applies to all channels.

±10V, ±5V, ±2.5V, ±1.25V,
±625mV, ±313mV, ±156mV, ±78mV

Input Impedance
110.5K ohms.

DC Voltage Input Accuracy
±0.1% of input range.

Discrete Output

Output Type
Four independent open drain MOSFET switches with a common return that operate as low-side switches.

Output Voltage Range
0 to 35V DC.
External voltage source required.

Output Current Range
0 to 1A DC continuous for each output.

Output OFF Leakage Current
50µA maximum.

Output ON Resistance
0.15 ohms maximum.

Output Response Time
4.1ms typical, from receipt of command to gate transition of the output MOSFET.

Operation

Digital outputs are set to their OFF state following a software or power-on reset. Outputs can optionally be set to user-defined states following a watchdog timeout. Watchdog timeout output control takes precedence over limit alarm control. Alarm control takes precedence over host control.

Communication

Supported Modbus Commands

The command/response protocol for communicating with this module adheres to the Modbus/RTU standard for the following Modbus Functions.

- Read Coil (Output) Status
- Read Holding Registers
- Read Input Registers
- Force Single Coil (Output)
- Preset Single Register
- Force Multiple Coils (Output)
- Preset Multiple Registers
- Report Slave ID
- Reset Slave

LED Indicators

LEDs indicate power, status, and discrete level/alarm.

Power and Isolation

Power Requirements
10 to 36V DC or 22 to 26V AC.

Supply Current

Supply	Current Draw
10V DC	125mA maximum
24V DC	50mA maximum
24V AC	100mA rms maximum

Isolation

1500V AC for 60 seconds or 250V AC continuous.
4-way isolation between input, network, power, and discrete I/O circuits. Inputs are isolated channel-to-channel for common mode voltage to ±4V DC.

Ordering Information

Models

913MB-0900

914MB-0900

DC current (913MB) or voltage (914MB) input module

Accessories

900C-SIP

Configuration Software Interface Package (includes software CD-ROM for Windows, RS-232/485 converter, and RS-485/three-wire cable)

5034-225

USB-to-RS232 adapter. See page 68 for more info.

5020-350

AC current sensor for 913MB. One for each channel. (See page 205)

TBK-B02

Optional terminal block kit, barrier strip style, 4 pcs.

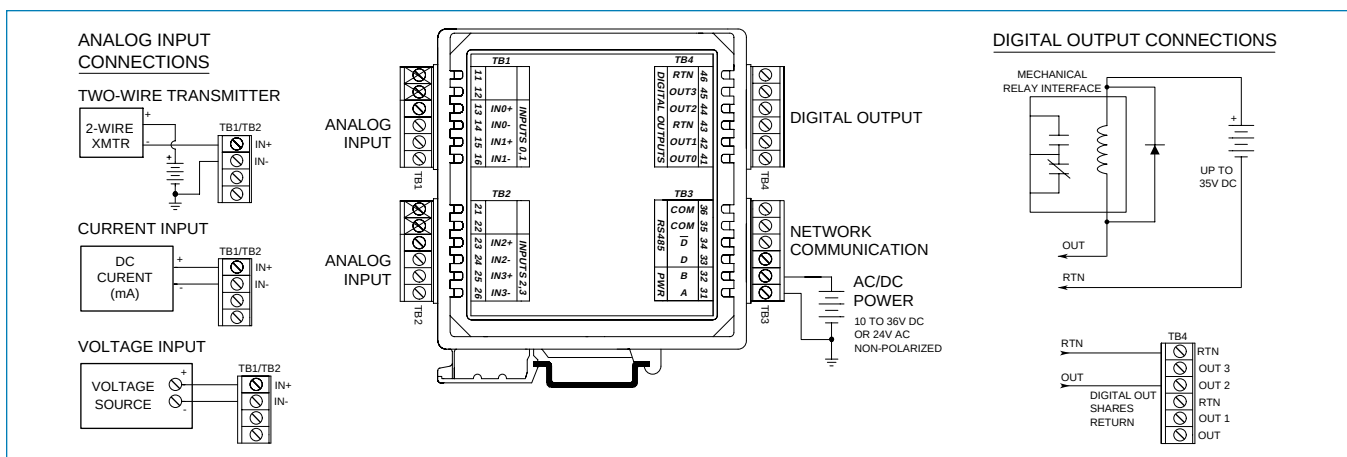
TBK-S02

Optional terminal block kit, spring clamp style, 4 pcs.

PS5R-D24

Power supply (24V DC, 2.1A).
See Power Supplies on Page 199.

For more information on software, network hardware, and mounting accessories, please see Pages 69-71.





Modbus/RS-485



917/918MB Multi-Channel Analog Output Modules

DC Current or DC Voltage Outputs Discrete Outputs

Models

917MB: 4 current output channels

918MB: 4 voltage output channels

Analog Output

917MB: 0 to 20mA, 4 to 20mA, 0 to 1mA DC

918MB: 0 to 10V, 0 to 5V, 0 to 1V DC

Discrete Output

Four output channels:

Open-drain MOSFETs (1A DC loads)

0 to 35V DC

Network Communication

Modbus-RTU high-speed RS-485

Power Requirement

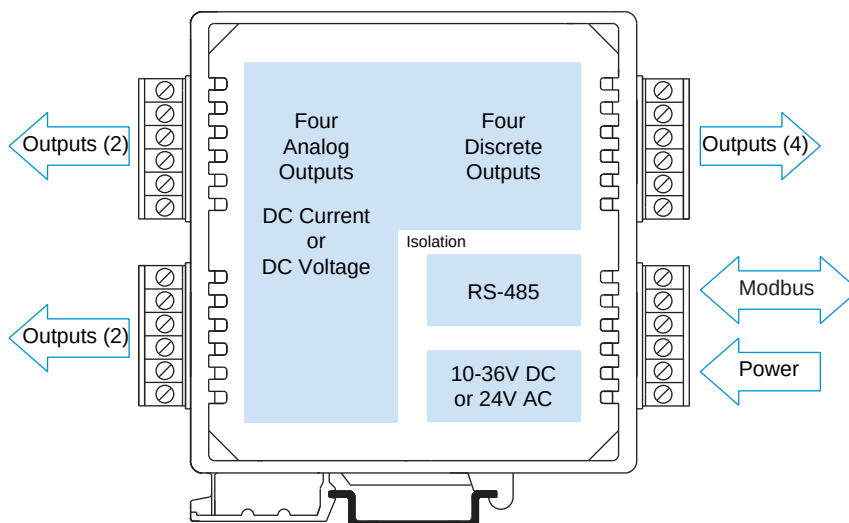
12 to 36V DC (917MB), 10 to 36V DC (918MB),
24V AC

Approvals

CE marked. UL, cUL listed

Class I; Division 2; Groups A, B, C, D.

Analog Output Module



Description

These modules drive four analog output channels and also feature four discrete outputs for on/off control. Isolation separates the output, power, and network circuits. Network communication adheres to the industry-standard RS-485 Modbus RTU protocol. AC and DC power sources are supported with nonpolarized, diode-coupled terminals.

The analog outputs generate a signal based on communication from the host. They accommodate wide DC voltage or current ranges.

Discrete outputs provide simple on/off switching capability (open-drain) for external devices.

Combining analog outputs, on/off controllers, and a network interface in a single package, makes this instrument extremely powerful. Multi-channel design adds cost-efficiency and allows high-density mounting. Plus, safe, rugged construction make it reliable for both control room and distributed field I/O use in a broad range of temperature control applications. Custom module configurations are also possible (consult factory for details).

Special Features

- Standard Modbus RTU protocol with high-speed RS-485 communication (up to 115K bps)
- 12-bit D/A yields 0.1% of span resolution and accuracy
- Four analog outputs in an inch-wide module reduces system costs and saves panel space
- Four discrete outputs enable host-controlled on/off switching
- Heavy-duty 1A solid-state relays provide dependable on/off control of industrial devices
- Self-calibration lowers maintenance costs by reducing periodic manual calibration checks
- Watchdog timers provide a configurable failsafe output state for use when host I/O communication is lost
- Three-way isolation eliminates potential ground loops between power, output, and network circuitry
- Self-diagnostics monitor microcontroller activity to detect operational failures (lock-up) and execute a reset to restore communication



Performance

General Analog Output

Resolution

See current/voltage output specifications for more information.

Ambient Temperature Effect

Better than $\pm 0.001\%$ of output span per $^{\circ}\text{C}$, or $\pm 1.0\mu\text{V}/^{\circ}\text{C}$, whichever is greater.

Ambient Temperature

Operation (917MB): -25°C to 60°C (-13°F to 140°F).

Operation (918MB): -25°C to 70°C (-13°F to 158°F).

Storage: -40°C to $+85^{\circ}\text{C}$ (-40°F to $+185^{\circ}\text{F}$).

* Limit 917MB maximum ambient to 50°C (122°F) when using supply voltages less than 15V DC.

Current Output (917MB)

DC Current Output Ranges

Range user-configured. Range selected applies to all channels.

Output Range	Resolution	Accuracy (% span)
0 to 1mA	0.554%	$\pm 2.0\%$ ($\pm 0.002\text{mA}$)
0 to 20mA	0.028%	$\pm 0.1\%$ ($\pm 0.02\text{mA}$)
4 to 20mA	0.035%	$\pm 0.1\%$ ($\pm 0.02\text{mA}$)

Maximum Output Current

22.5mA DC typical.

Integral Non-Linearity

$\pm 0.1\%$ of span or $\pm 2\text{LSB}$ typical, whichever is larger, for spans equal to or greater than 16mA.

Output Compliance

12V minimum, 12.7V typical.

Output Load Resistance Range

0 to 630 ohms typical.

Response Time

11ms typical into 500 ohms, for measurement to reach 98% of the final value in response to a step command. Actual response time will vary with load.

Voltage Output (918MB)

DC Voltage Output Ranges

Range user-configured. Selection applies to all channels.

Output Range	Resolution	Accuracy (% span)
0 to 1V	0.274%	$\pm 0.6\%$ ($\pm 6\text{mV}$)
0 to 5V	0.055%	$\pm 0.1\%$ ($\pm 5\text{mV}$)
0 to 10V	0.027%	$\pm 0.1\%$ ($\pm 10\text{mV}$)

Maximum Output Voltage

11.255V DC typical.

Integral Non-Linearity

$\pm 0.1\%$ of span or $\pm 2\text{LSB}$ typical, whichever is larger, for spans equal to or greater than 5V.

Output Current

0 to 10mA DC maximum.

Output Impedance

1 ohm.

Output Short Circuit Protection

Included.

Response Time

110 μs rise time typical, 150 μs fall time typical, unloaded, for output to reach 98% of the final value in response to a step command. Time varies with load.

Discrete Output

Output Type

Four independent open drain MOSFET switches with a common return that operate as low-side switches.

Output Voltage Range

0 to 35V DC (up to 1A/channel continuous). External voltage source required.

Output ON Resistance

0.15 ohms maximum.

Operation

Digital outputs are set to their OFF state following a software or power-on reset. Outputs may be set to user-defined states following a watchdog timeout. Watchdog timeout output control takes precedence over limit alarm control. Alarm control takes precedence over host control.

Output Response Time

4.1ms typical, from receipt of command to gate transition of the output MOSFET.

Communication

Supported Modbus Commands

The command/response protocol for communicating with this module adheres to the Modbus/RTU standard for the following Modbus Functions.

Read Coil (Output) Status	Report Slave ID
Read Holding Registers	Reset Slave
Read Input Registers	
Force Single Coil (Output)	
Preset Single Register	
Force Multiple Coils (Output)	
Preset Multiple Registers	

LED Indicators

LEDs indicate power, status, and discrete level/alarm.

Power and Isolation

Power Requirements

10 to 36V DC (918MB), 12 to 36V DC (917MB)
22 to 26V AC.

Supply Current

Supply	Current Draw (917)	Current Draw (918)
10V DC	Not Recommended	100mA maximum
12V DC	275mA maximum	85mA maximum
24V DC	120mA maximum	45mA maximum
24V AC	210mA rms max.	85mA rms max.

Isolation

1500V AC for 60 seconds or 250V AC continuous.
3-way isolation between outputs, network, and power circuits.

Ordering Information

Models

917MB-0900

918MB-0900

DC current (917MB) or voltage (918MB) output module

Accessories

900C-SIP

Configuration Software Interface Package (includes software CD-ROM for Windows, RS-232/485 converter, and RS-485/three-wire cable)

4001-095

USB-to-RS232 adapter. See page 70 for more info.

TBK-B02

Optional terminal block kit, barrier strip style, 4 pcs.

TBK-S02

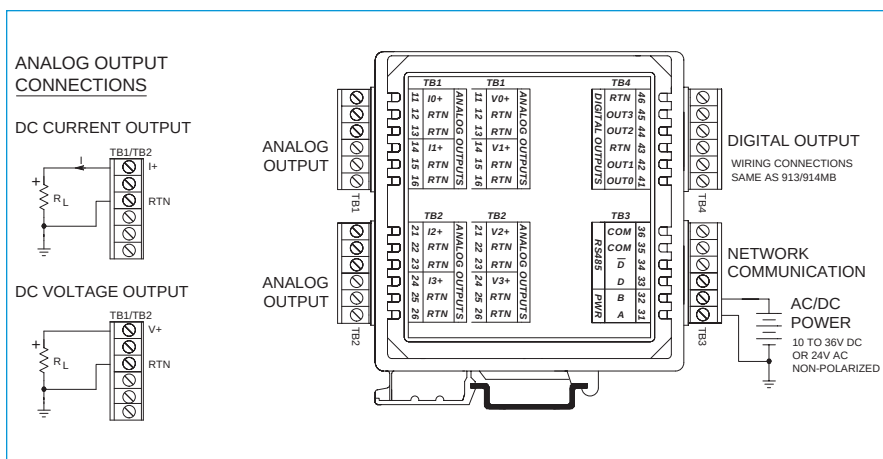
Optional terminal block kit, spring clamp style, 4 pcs.

PSSR-D24

Power supply (24V DC, 2.1A).

See Power Supplies on Page 199.

For more information on software, network hardware, and mounting accessories, please see Pages 69-71.





Modbus/RS-485



924MB Multi-Channel Temperature Control Modules

Thermocouple or Millivolt Input

Limit Alarms or Discrete Outputs

Model

924MB: 4 input channels

Input

Four input channels:
Thermocouple (types J, K, T, R, S, E, B, N),
±100mV DC

Output

Four output channels:
Open-drain MOSFETs (1A DC loads)
0 to 35V DC

Network Communication

Modbus-RTU high-speed RS-485

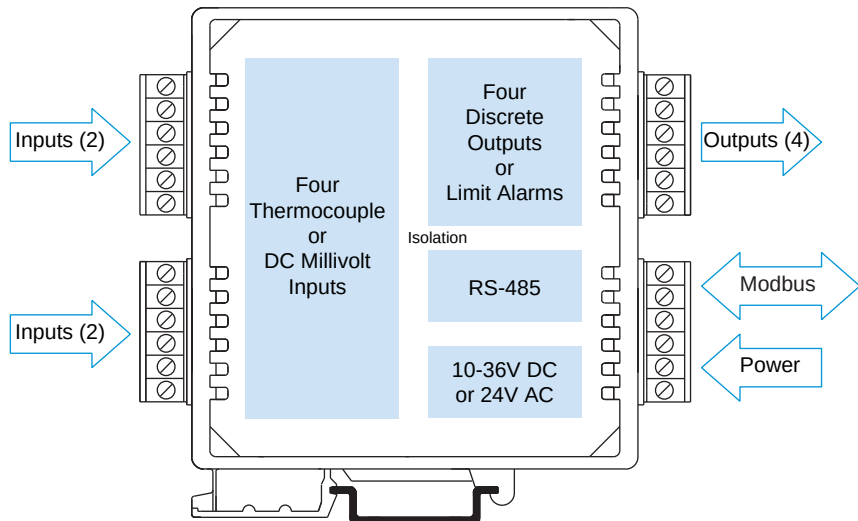
Power Requirement

10 to 36V DC,
24V AC

Approvals

CE marked. UL, cUL listed
Class I; Division 2; Groups A, B, C, D.

Thermocouple/Millivolt Input Module



Description

This signal conditioner is a four-channel analog input module with four discrete outputs. It filters and linearizes thermocouple inputs while providing isolation between input, output, power, and network circuits. Cold junction compensation and upscale/downscale sensor break detection are standard. AC and DC power sources are supported with nonpolarized, diode-coupled terminals.

The programmable inputs accommodate eight thermocouple types plus wide-range millivolt signals. Flexible discrete outputs operate as alarms or on/off controllers. As limit alarms, each discrete output can be configured with high and/or low setpoints exclusively tied to an analog input channel. Alarm trips function without host communication enabling low-cost stand-alone alarms as well as local backup for the primary control system. Otherwise, on/off control is based on commands issued by the host system.

Combining flexible transmitter functions, mixed signal I/O, alarm support, and a network interface in a single package, makes this instrument extremely powerful. Multi-channel design adds cost-efficiency and allows high-density mounting. Plus, safe, rugged construction makes these modules reliable for use in both control room and distributed field I/O applications. Custom module configurations are also possible (consult factory for details).

Special Features

- Standard Modbus RTU protocol with high-speed RS-485 communication (up to 115K bps)
- 16-bit sigma-delta A/D yields 0.1°C resolution and 0.5°C measurement accuracy
- Thermocouple linearization and sensor break detection ensure reliable measurements
- Four discrete outputs enable local temperature limit alarms or host-controlled on/off switching
- Heavy-duty 1A solid-state relays provide dependable on/off control of industrial devices
- Self-calibration lowers maintenance costs by reducing periodic manual calibration checks
- Watchdog timers provide a configurable failsafe output state for use when host I/O communication is lost
- Four-way isolation eliminates potential ground loops between power, input, output and network circuitry
- Self-diagnostics monitor microcontroller activity to detect operational failures (lock-up) and execute a reset to restore communication



Performance

General Input

Resolution

±100mV DC input: 0.1%.
Thermocouple input: 0.1°C (0.18°F).

Ambient Temperature Effect

Better than ±0.005% of input span per °C, or
±1.0uV/°C, whichever is greater.

Noise Rejection

Normal mode: 40dB @ 60Hz, typical.
Common mode: 140dB @ 60Hz, typical.

Input Filter Bandwidth

-3dB at 3Hz, typical.

Input Conversion Rate

90ms per channel.

Thermocouple Input

Thermocouple Input Ranges

Thermocouple type user-configured. Type selected applies to all channels. Signal linearization, cold-junction compensation, and open circuit or lead break detection are included.

TC	°C Range (°F Range)	Accuracy
J	-210 to 760°C (-346 to 1400°F)	±0.5°C
K	-200 to 1372°C (-328 to 2502°F)	±0.5°C
T	-260 to 400°C (-436 to 752°F)	±0.5°C
R	-50 to 1768°C (-58 to 3214°F)	±1.0°C
S	-50 to 1768°C (-58 to 3214°F)	±1.0°C
E	-200 to 1000°C (-328 to 1832°F)	±0.5°C
B	260 to 1820°C (500 to 3308°F)	±1.0°C
N	-230 to 1300°C (-382 to 2372°F)	±1.0°C

Note 1: Accuracy is given with CJC switched off.

Relative inaccuracy with CJC enabled may increase by ±0.5°C.

Thermocouple Break Detection

TC sensor failure can be configured for either upscale or downscale. Selection applies to all channels.

DC Millivolt Input

Millivolt Input Ranges

±100mV DC.

Millivolt Input Accuracy

±0.1% of input range.

Discrete Output

Output Type

Four independent open drain MOSFET switches with a common return that operate as low-side switches.

Output Voltage Range

0 to 35V DC, 1A DC maximum for each output.
External voltage source required.

Output ON Resistance

0.15 ohms maximum.

Operation

Digital outputs are set to their OFF state following a software or power-on reset. Outputs can optionally be set to user-defined states following a watchdog timeout. Watchdog timeout output control takes precedence over limit alarm control. Alarm control takes precedence over host control.

Output Response Time

4.1ms typical, from receipt of command to gate transition of the output MOSFET.

Communication

Supported Modbus Commands

The command/response protocol for communicating with this module adheres to the Modbus/RTU standard for the following Modbus Functions.

Read Coil
Read Holding Registers
Read Input Registers
Force Single Coil
Preset Single Register
Force Multiple Coils
Preset Multiple Registers
Report Slave ID
Reset Slave

LED Indicators

LEDs indicate power, status, and discrete level/alarm.

Power and Isolation

Power Requirements

10 to 36V DC,
22 to 26V AC.

Supply Current

Supply	Current Draw
10V DC	100mA maximum
24V DC	45mA maximum
24V AC	85mA rms maximum

Isolation

1500V AC for 60 seconds or 250V AC continuous.
4-way isolation between input, network, power and discrete I/O circuits. Inputs are isolated channel-to-channel for common mode voltage to ±5V DC.

Ordering Information

924MB-0900

Thermocouple/millivolt input module

900C-SIP

Configuration Software Interface Package
(includes software CD-ROM for Windows, RS-232/485 converter, and RS-485/three-wire cable)

4001-095

USB-to-RS232 adapter. See page 70 for more info.

TBK-B01

Optional terminal block kit, barrier strip style, 2 pcs.
(Does not include terminal block for input wiring.)

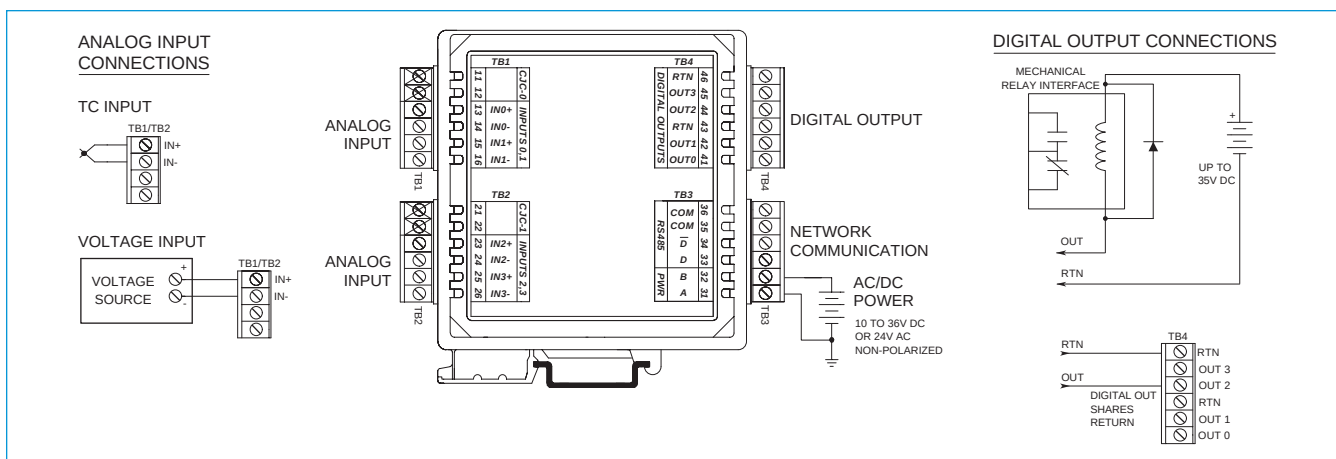
TBK-S02

Optional terminal block kit, spring clamp style, 2 pcs.
(Does not include terminal block for input wiring.)

PS5R-D24

Power supply (24V DC, 2.1A).
See Power Supplies on Page 199.

For more information on software, network hardware, and mounting accessories, please see Pages 69-71.





Modbus/RS-485



932/934MB Multi-Channel Temperature Control Modules

RTD or Resistance Input

Limit Alarms or Discrete Outputs

Models

932MB: 2 input channels, 2 relay outputs

934MB: 4 input channels, 4 relay outputs

Input

RTD (100 ohm Pt, 120 ohm Ni, 10 ohm Cu),
Resistance (0 to 500 ohms)

Output

Solid-state relays, Form A, SPST-NO

Network Communication

Modbus-RTU high-speed RS-485

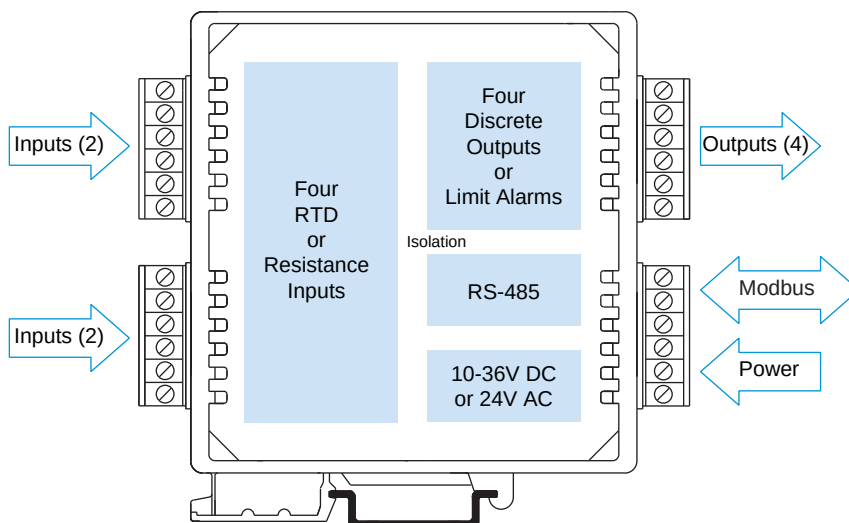
Power Requirement

10 to 36V DC,
24V AC

Approvals

CE marked. UL, cUL listed
Class I; Division 2; Groups A, B, C, D.

RTD/Resistance Input Module



Description

This signal conditioner is a dual or quad-channel analog input module with one discrete/relay output per input channel and a Modbus interface. It filters and linearizes RTD or resistance inputs while providing isolation between input, output, power, and network circuits. Lead wire compensation and upscale/downscale sensor break detection are standard. Low voltage AC and DC power sources are supported with nonpolarized, diode-coupled terminals.

The programmable inputs accommodate four RTD types plus wide-range resistance signals. Flexible discrete outputs operate as alarms or on/off controllers. As limit alarms, each discrete output can be configured with high and/or low setpoints exclusively tied to an analog input channel. Alarm trips function without host communication enabling low-cost stand-alone alarms as well as local backup for the primary control system. Otherwise, on/off control is based on commands issued by the host system.

Combining flexible transmitter functions, mixed signal I/O, alarm support, and a network interface in a single package, makes this instrument extremely powerful. Multi-channel design adds cost-efficiency and allows high-density mounting. Plus, safe, rugged construction makes these modules reliable for use in both control room and distributed field I/O applications. Custom module configurations are also possible (consult factory for details).

Special Features

- Standard Modbus RTU protocol with high-speed RS-485 communication (up to 115K bps)
- 16-bit sigma-delta A/D yields 0.1°C resolution and 0.25°C accuracy (Pt, Ni RTDs)
- RTD linearization and sensor break detection ensure reliable measurements
- Discrete relay outputs enable local temperature limit alarms or host-controlled on/off switching
- Heavy-duty 1A solid-state relays provide dependable on/off control of industrial devices
- Self-calibration lowers maintenance costs by reducing periodic manual calibration checks
- Watchdog timers provide a configurable failsafe output state for use when host I/O communication is lost
- Four-way isolation eliminates potential ground loops between power, input, output and network circuitry
- Self-diagnostics monitor microcontroller activity to detect operational failures (lock-up) and execute a reset to restore communication



Performance

RTD/Resistance Input

Input Ranges

Input type user-configured. Type selected applies to all channels. RTD linearization, lead wire compensation, and open circuit or lead break detection are included.

Input Type	Alpha	Input Range	Accuracy
Pt 100 ohm	1.3850	-200 to 850°C	±0.25°C
Pt 100 ohm	1.3911	-200 to 850°C	±0.25°C
Ni 120 ohm	1.6720	-80 to 320°C	±0.25°C
Cu 10 ohm	1.4272	-200 to 260°C	±1.00°C
Resistance	linear	0 to 500 ohms	±0.05 ohm

Resolution

Input Type	Alpha	Resolution
Pt 100 ohm	1.3850	0.1°C
Pt 100 ohm	1.3911	0.1°C
Ni 120 ohm	1.6720	0.1°C
Cu 10 ohm	1.4272	0.2°C
Resistance	linear	7.8125 milliohms

Ambient Temperature Effect

Better than ±0.005% of input span per °C, or ±1.0uV/°C, whichever is greater.

Noise Rejection

Normal mode: 40dB @ 60Hz, typical.
Common mode: 130dB @ 60Hz, typical.

Input Filter Bandwidth

-3dB at 3Hz, typical.

Input Conversion Rate

300ms per channel typical.

RTD Break Detection

Sensor failure can be configured for either upscale or downscale. Selection applies to all channels.

Excitation Current

1mA DC typical, all types.

Lead-Wire Compensation

Inherent for 3-wire RTD. The maximum lead resistance is 25 ohms per lead (Pt), 20 ohms per lead (Ni), 10 ohms per lead (Cu). All lead wires must be of equal size and length.

Discrete Output

Output Type

Solid-State Relay (SSR), one Form A (SPST-NO) switch per input channel. Outputs share a common return connection at the RTN terminals for low side switching.

Output Voltage Range

0 to 48V DC, 1A DC.

Output ON Resistance

0.4 ohms maximum.

Output Response Time

4.1ms typical, from receipt of command to gate transition of the output MOSFET.

Operation

Digital outputs are set to their OFF state following a software or power-on reset. Outputs can be set to user-defined states following a watchdog timeout.

Communication

Supported Modbus Commands

The command/response protocol for communicating with this module adheres to the Modbus/RTU standard for the following Modbus Functions.

Read Holding Registers	Read Coil
Read Input Registers	Reset Slave
Preset Single Register	Report Slave ID
Force Multiple Coils	Force Single Coil
Preset Multiple Register	

LED Indicators

LEDs indicate power, status, and discrete level/alarm.

Power and Isolation

Power Requirements

10 to 36V DC (56mA max. at 24V DC).
22 to 26V AC (94mA rms max. at 24V AC).

Isolation

1500V AC for 60 seconds or 250V AC continuous. 4-way isolation between input, network, power and discrete I/O circuits. Inputs are isolated channel-to-channel for common mode voltage to ±5V DC.

Ordering Information

932MB-0900

Two channel RTD/Resistance input module

934MB-0900

Four channel RTD/Resistance input module

Accessories

900C-SIP

Configuration Software Interface Package (includes software CD-ROM for Windows, RS-232/485 converter, and RS-485/three-wire cable)

4001-095

USB-to-RS232 adapter. See page 70 for more info.

TBK-B02

Optional terminal block kit, barrier strip style, 4 pcs.

TBK-S02

Optional terminal block kit, spring clamp style, 4 pcs.

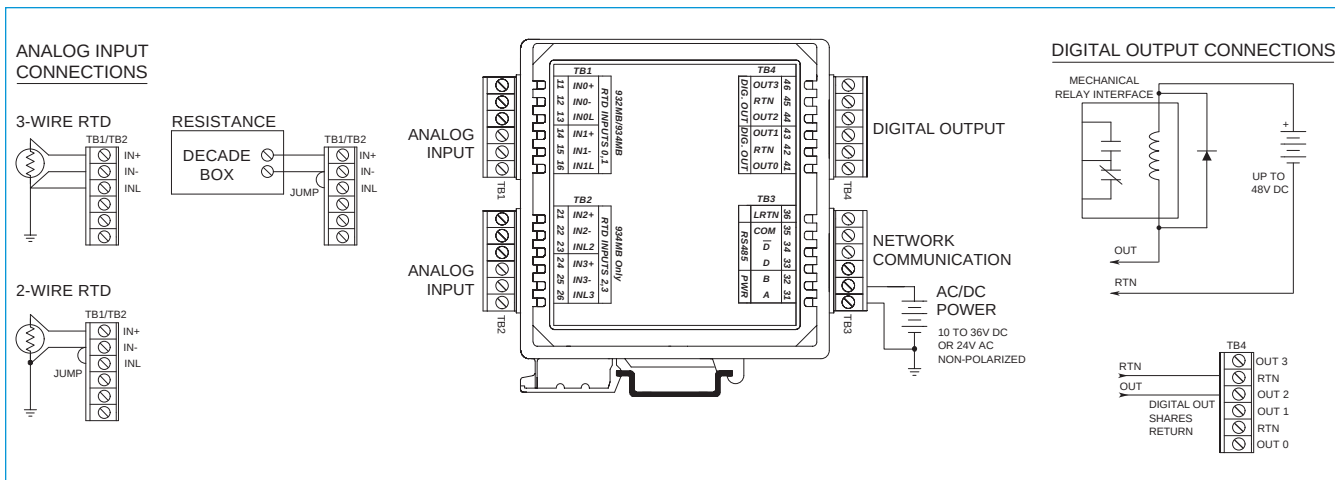
PS5R-D24

Power supply (24V DC, 2.1A).
See Power Supplies on Page 199.

For more information on software, network hardware, and mounting accessories, please see Pages 69-71.



Optional terminal blocks: barrier strip (left) and spring clamp (right). Cage clamp terminal is standard.





Modbus/RS-485



942MB Frequency/ Pulse Counter Modules

Periodic or Pulse Waveform Input

Limit Alarms or Discrete Outputs

Model

942MB: 2 input channels

Input

Two input channels:
0 to 50KHz in three selectable ranges
Amplitudes up to 140V AC or 200V peak
Pulse counter range of 0 to 65535

Output

Two output channels:
Solid-state relays (1A DC loads)
0 to 48V DC

Network Communication

Modbus-RTU high-speed RS-485

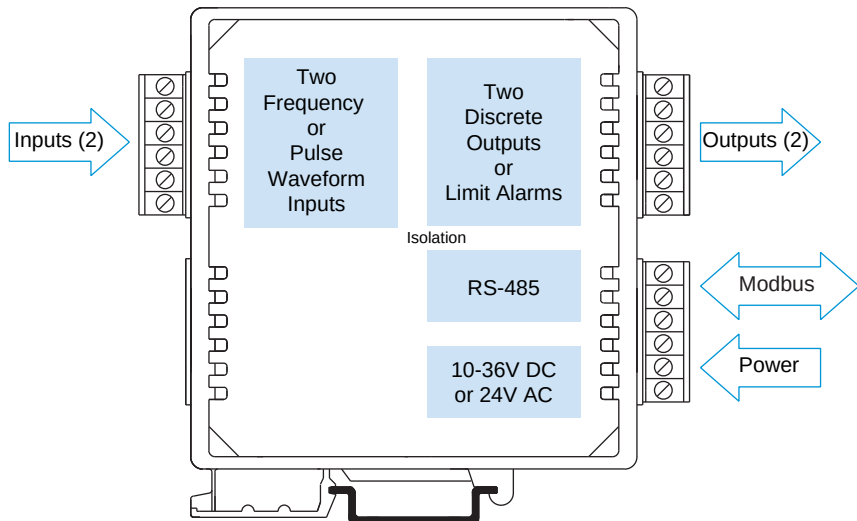
Power Requirement

10 to 36V DC,
24V AC

Approvals

CE marked. UL, cUL listed
Class I; Division 2; Groups A, B, C, D.

Frequency/Counter Module



Description

This signal conditioner is a two-channel analog input module with discrete outputs and Modbus communication. It conditions periodic or pulse waveform inputs and provides solid-state relays for limit alarms or ON/OFF control.

Versatile inputs accommodate many applications using TTL, magnetic pickups, proximity sensors, or a variety of switches (high/low-side transistor, dry contact, open drain, open collector). Bipolar and unipolar waveforms are supported with a selectable input bias that accepts both zero and non-zero crossing signals. Voltage threshold and relative hysteresis are also user selectable.

Inputs may also function as event counters with separate microcontrollers for each channel. The module counts pulses on the positive or negative edge. It can wrap around to zero for continuous counting, latch at a programmed count value (setpoint), or automatically reset itself to zero after reaching a setpoint value. Software controls enable remote resets. A variety of filters help remove noise, jitter, and other mechanical effects to prevent false counts.

The discrete outputs can operate as independent alarms or provide on/off control regulated by the host system. As limit alarms, each output can be set for high and/or low setpoints exclusively tied to an analog input. These low cost modules are ideal for standalone alarms as well as for local backup of the primary control system.

Special Features

- Standard Modbus RTU protocol with high-speed RS-485 communication (up to 115K bps)
- Separate microcontrollers on each channel for pulse counting and period measurement
- Solid-state relay outputs enable local limit alarms or host-controlled on/off switching
- Bipolar and unipolar input signal support
- Programmable pulse counter functions
- Input filtering functions include hysteresis, averaging, debounce, relay time delay, and alarm deadband controls
- 4-way isolation (input, output, power, network)
- Watchdog timers provide a failsafe output
- Self-diagnostics monitor microcontroller activity to detect operational failures (lock-up) and execute a reset to restore communication



Optional terminal blocks: barrier strip (left) and spring clamp (right). Cage clamp terminal is standard.



Performance

Frequency/Counter Input

Input Ranges

Input type user-configured. Applies to both channels.

Input Range	Accuracy	Accuracy over Temp.
0 to 100Hz	±0.04Hz	±0.06Hz
0 to 1000Hz	±0.4Hz	±0.6Hz
0 to 50,000Hz	±10Hz	±15Hz
0 to 65,535 pulses	±1 pulse	±1 pulse

Unipolar Input Configuration

Amplitude: 0 to 3V minimum range,
0 to 200V peak maximum range.

Threshold: Configurable for 1.5V or 5V, typical.

Hysteresis: Configurable for ±25mV (at 1.5V threshold), or ±83mV (at 5.0V threshold), typical.

Bipolar (Zero-Crossing) Input Configuration

Amplitude (0-20KHz): ±50mV minimum (with ±25mV hysteresis), or ±150mV minimum (with ±83mV hysteresis), to ±200V peak maximum.

Amplitude (Above 20KHz): ±100mV minimum (with ±25mV hysteresis), or ±200mV minimum (with ±83mV hysteresis), to ±200V peak maximum.

Threshold: 0mV nominal, 0.01V typical with ±25mV hysteresis; 0.03V typical with ±83mV hysteresis.

Hysteresis: Configurable for ±25mV or ±83mV, typical.

Resolution

0 to 100Hz input range: 0.01Hz

0 to 1000Hz input range: 0.1Hz

0 to 50,000Hz input range: 1Hz

Pulse counter: 1 pulse

Minimum Input Pulse Width

10µs (frequency input); 5mS (pulse input).

Counting Rate

100Hz maximum counting rate

(5mS ON and 5mS OFF for 10mS period or 100Hz).

Input Impedance

35K ohms, typical.

Input Filter Bandwidth

-3dB at 35kHz, typical.

Input Pullup/Pulldown

Software selectable 2.7K ohm input pullup to +5V and a 1K ohm input pulldown to return. The resistors may also be left floating (none).

Input Debounce

0 to 1.375 seconds, configurable in 5mS increments.

Noise Rejection

Common mode: 80dB @ 60Hz, typical with 100 ohm input unbalance.

Discrete Output

Output Type

Solid-State Relay (SSR), one Form A (SPST-NO) switch per input channel. Outputs share a common return connection at the RTN terminals for low-side switching

Output Voltage Range

0 to 48V DC, 1A DC.

Output ON Resistance

0.4 ohms maximum.

Output Response Time

4.1ms typical, from receipt of command to gate transition of the output MOSFET.

Operation

Digital outputs are set to their OFF state following a software or power-on reset. Outputs can be set to user-defined states following a watchdog timeout.

Communication

Supported Modbus Commands

The command/response protocol for communicating with this module adheres to the Modbus/RTU standard for the following Modbus Functions.

Read Holding Registers

Read Input Registers

Preset Single Register

Force Multiple Coils

Preset Multiple Registers

Read Coil

Reset Slave

Report Slave ID

Force Single Coil

LED Indicators

LEDs indicate power, status, and discrete level/alarm.

Power and Isolation

Power Requirements

10 to 36V DC.

22 to 26V AC.

Isolation

1500V AC for 60 seconds or 250V AC continuous.

4-way isolation between input, network, power and discrete I/O circuits. Inputs are isolated channel-to-channel for common mode voltage to ±5V DC.

Ordering Information

942MB-0900

Frequency/counter input module

Accessories

900C-SIP

Configuration Software Interface Package (includes software CD-ROM for Windows, RS-232/485 converter, and RS-485/three-wire cable)

4001-095

USB-to-RS232 adapter. See page 70 for more info.

TBK-B02

Optional terminal block kit, barrier strip style, 4 pcs.

TBK-S02

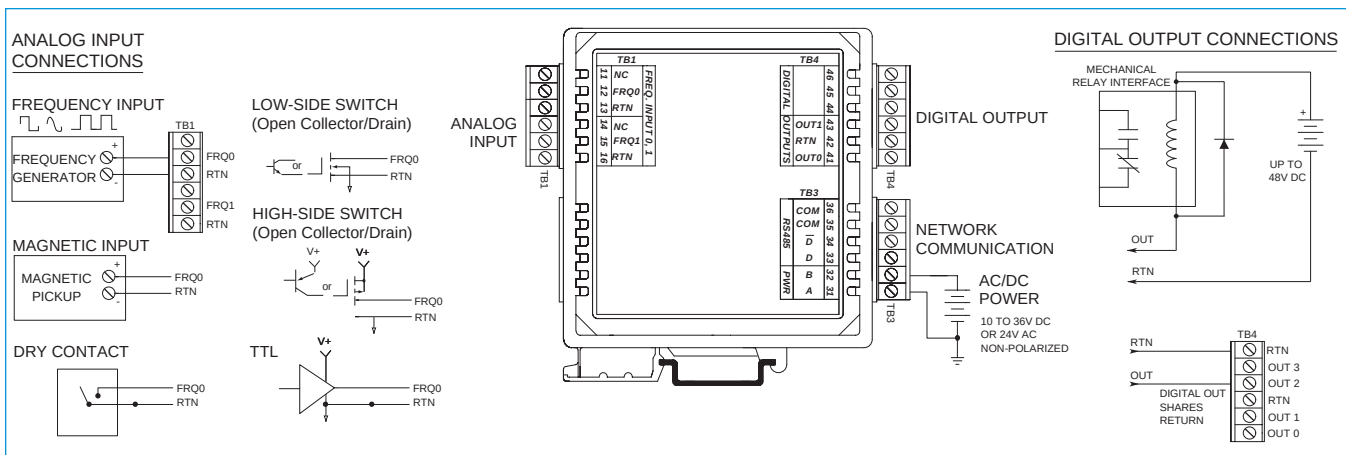
Optional terminal block kit, spring clamp style, 4 pcs.

PS5R-D24

Power supply (24V DC, 2.1A).

See Power Supplies on Page 199.

For more information on software, network hardware, and mounting accessories, please see Pages 69-71.





Modbus/RS-485



901/902/903MB Multi-Channel Discrete I/O Modules

Active-Low Inputs Sinking Outputs (Low-Side Switching)

Models

901MB: 12 input channels
902MB: 12 output channels
903MB: 12 input/output channels

Input

Twelve input channels (901, 903 models only)
0 to 35V DC

Output

Twelve output channels (902, 903 models only)
0 to 35V DC

Network Communication

Modbus-RTU high-speed RS-485

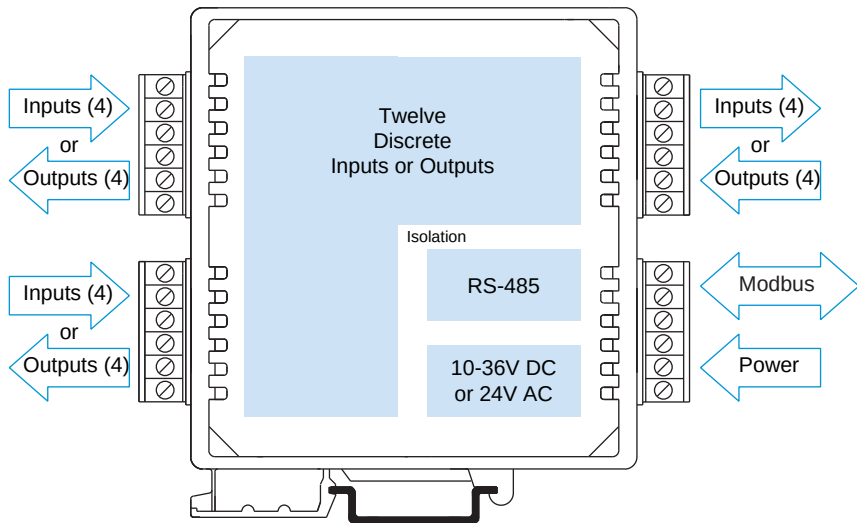
Power Requirement

10 to 36V DC,
24V AC

Approvals

CE marked. UL, cUL listed
Class I; Division 2; Groups A, B, C, D.

High-Density Discrete I/O Module



Description

These modules provide twelve discrete input and/or output channels. Isolation separates the I/O, power, and network circuits. Network communication adheres to the industry-standard RS-485 Modbus RTU protocol. Both AC and DC power sources are supported with wide range, nonpolarized, diode-coupled terminals.

The open-drain outputs are intended for current-sinking or low-side switching applications. The buffered inputs are active-low. These models are the complement of the 904, 905, and 906 units which have open-source, high-side output switches and active-high inputs. Socketed pull-up resistors are easily removed or exchanged to satisfy your application requirements.

The 903MB model has twelve input/output points that may be used as inputs or outputs on a bit-by-bit basis. Outputs may be read back to verify output settings.

Combining flexible I/O types, wide I/O ranges, and a network interface in a single package, makes this instrument extremely powerful. Multi-channel design adds cost-efficiency and allows high-density mounting. Plus, safe, rugged construction makes these modules reliable for use in both control room and distributed field I/O applications. Custom module configurations are also possible (consult factory for details).

Special Features

- Standard Modbus RTU protocol with high-speed RS-485 communication (up to 115K bps)
- Twelve I/O channels in a single inch-wide unit reduces system costs and saves panel space
- High-voltage, high-current, open-drain outputs enable direct (low-side) control of external devices
- High-voltage buffered inputs monitor discrete levels from a variety of industrial devices
- Tandem input/output circuitry (903 models only) connects input buffers with open-drain outputs for convenient loopback monitoring of the output state
- Outputs have built-in over-temperature and over-current shut-down protection, plus active clamping circuits for switching inductive loads
- Watchdog timers provide a configurable failsafe output state for use when host I/O communication is lost
- Three-way isolation eliminates potential ground loops between power, I/O, and network circuitry
- Self-diagnostics monitor microcontroller activity to detect operational failures (lock-up) and execute a reset to restore communication



■ Performance

■ Discrete Inputs (901 & 903 models only)

Input Type

12 active-low, buffered inputs, with a common connection. Inputs include transient suppression devices and series connected 100K ohm resistors, plus diode over-voltage clamps to the internal +5V supply.

Input Signal Voltage Range

0 to 35V DC, maximum.

Input Current

293µA, typical at 35V DC.

Input Signal Threshold

TTL compatible with 100mV of hysteresis, typical. Low-to-High threshold is 1.7VDC, High-to-Low is 1.6VDC, typical. Limited to TTL levels of 0.8VDC (max. LOW level) and 2.0VDC (min. HIGH level).

Input Resistance

100K ohms, typical.

Input Hysteresis

100mV DC, typical.

■ Discrete Outputs (902 & 903 models only)

Output Type

12 independent, open-drain, DMOS MOSFET switches with a common source connection that operate as low-side switches.

Output Voltage Range

0 to 35V DC max. (0 to 500mA/channel continuous). External voltage source required.

Output ON Resistance

0.28 ohms maximum.

Output Response Time

Force Single Coil: Output updates within 250µs of receipt of a command.

Force Multiple Coils: First coil updates in 250µs, followed successively by additional coils every 180µs.

■ General

I/O Pull-ups and Socket

5.6K ohm pull-up resistor SIPs are installed in sockets at each port (four-channels per port).

Excitation (per port)

External excitation voltage for each four-channel port is limited to 35V or less.

Supported Modbus Commands

The command/response protocol for communicating with this module adheres to the Modbus/RTU standard for the following Modbus Functions.

Read Coil (Output) Status
Read Input Status
Read Holding Registers
Force Single Coil (Output)
Preset Single Register
Reset Slave
Force Multiple Coils (Outputs)
Preset Multiple Registers
Report Slave ID

LED Indicators

LEDs indicate power, status, and discrete level.

Power Requirements

10 to 36V DC,
22 to 26V AC.

Supply Current

Supply	Current Draw
10V DC	130mA maximum
24V DC	54mA maximum
24V AC	95mA maximum

Isolation

1500V AC for 60 seconds or 250V AC continuous.
3-way isolation between I/O, network, and power circuits.

■ Ordering Information

Models

901MB-0900

Discrete input module

902MB-0900

Discrete output module

903MB-0900

Discrete input/output module

Accessories

900C-SIP

Configuration Software Interface Package (includes software CD-ROM for Windows, RS-232/485 converter, and RS-485/three-wire cable)

4001-095

USB-to-RS232 adapter. See page 70 for more info.

TBK-B02

Optional terminal block kit, barrier strip style, 4 pcs.

TBK-S02

Optional terminal block kit, spring clamp style, 4 pcs.

P55R-D24

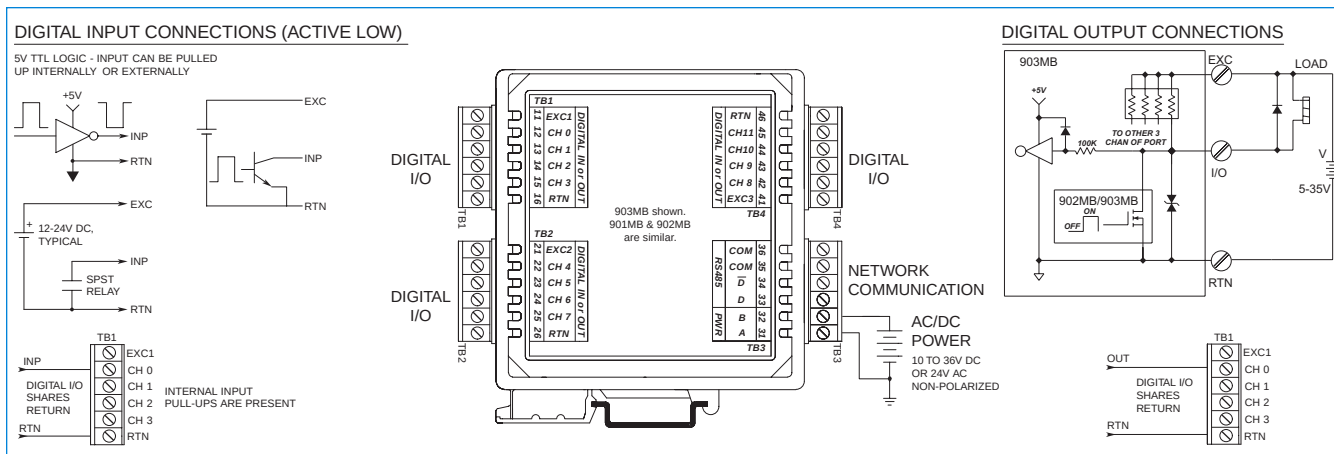
Power supply (24V DC, 2.1A).

See Power Supplies on Page 199.

For more information on software, network hardware, and mounting accessories, please see Pages 69-71.



Optional terminal blocks: barrier strip (left) and spring clamp (right). Cage clamp terminal is standard.





Modbus/RS-485



904/905/906MB Multi-Channel Discrete I/O Modules

Active-High Inputs Sourcing Outputs (High-Side Switching)

Models

904MB: 12 input channels
905MB: 12 output channels
906MB: 12 input/output channels

Input

Twelve input channels (904, 906 models only)
0 to 35V DC

Output

Twelve output channels (905, 906 models only)
6 to 35V DC

Network Communication

Modbus-RTU high-speed RS-485

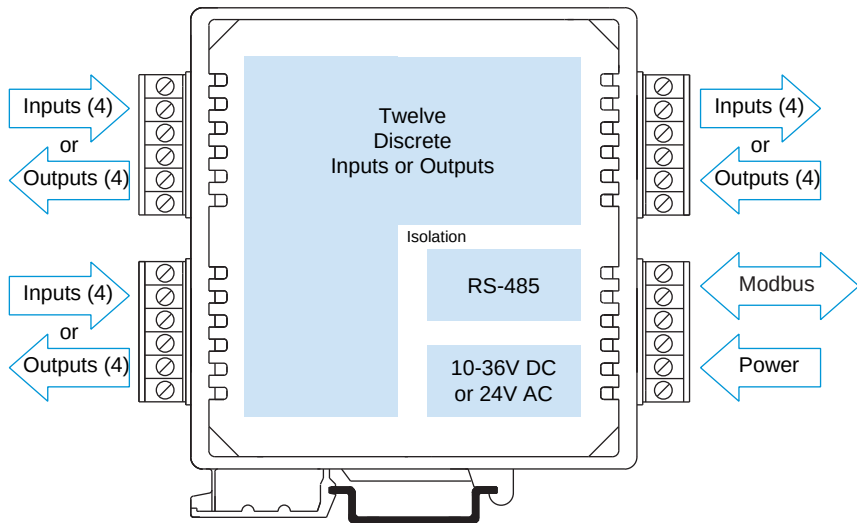
Power Requirement

10 to 36V DC,
24V AC

Approvals

CE marked. UL, cUL listed
Class I; Division 2; Groups A, B, C, D.

High-Density Discrete I/O Module



Description

These modules provide twelve discrete input and/or output channels. Isolation separates the I/O, power, and network circuits. Network communication adheres to the industry-standard RS-485 Modbus RTU protocol. Both AC and DC power sources are supported with wide range, nonpolarized, diode-coupled terminals.

The outputs are intended for current-sourcing or high-side switching applications. The buffered inputs are active-high. These models are the complement of the 901, 902, and 903 units which have low-side output switches and active-low inputs. Socketed pull-down resistors are easily removed or exchanged to satisfy your application requirements.

The 906MB model has twelve input/output points that may be used as inputs or outputs on a bit-by-bit basis. Outputs may be read back to verify output settings.

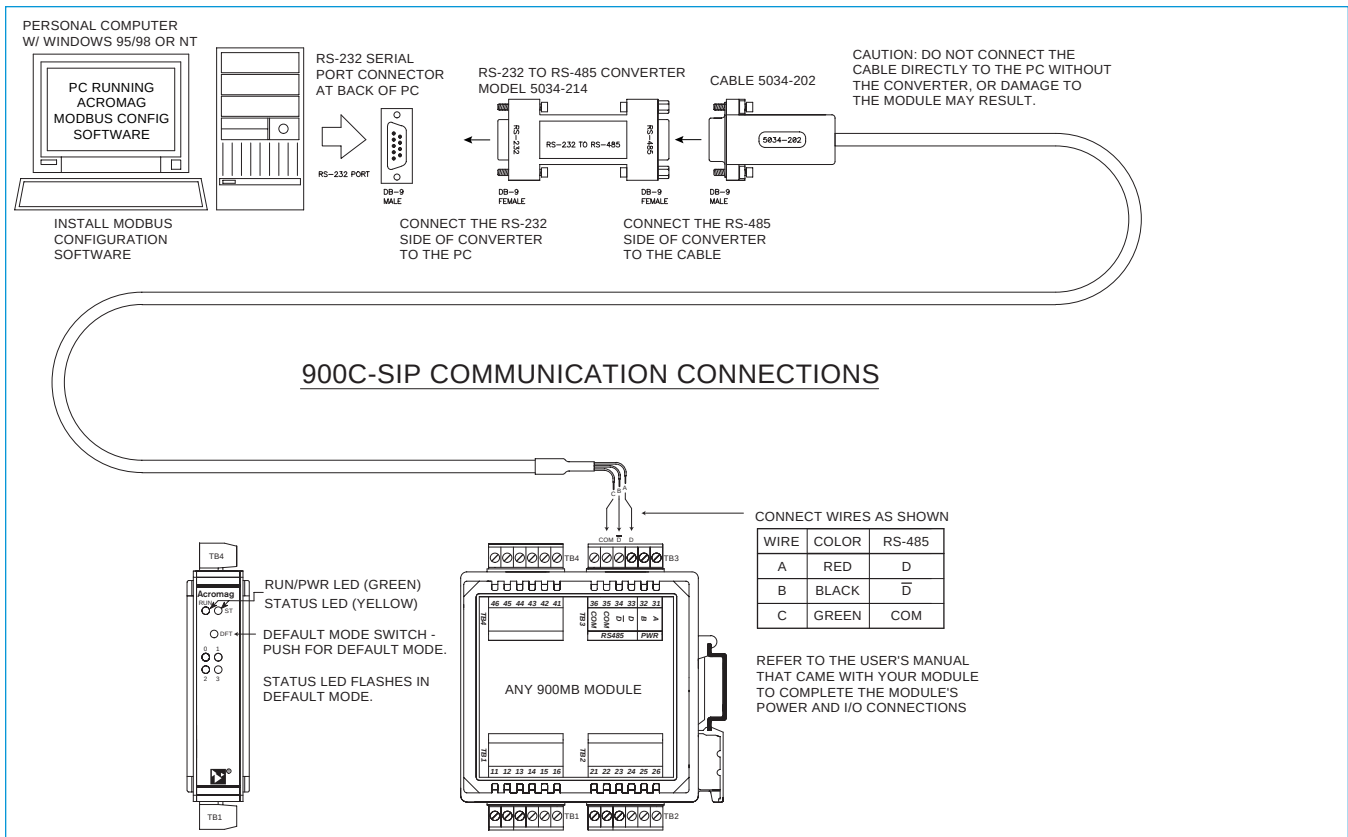
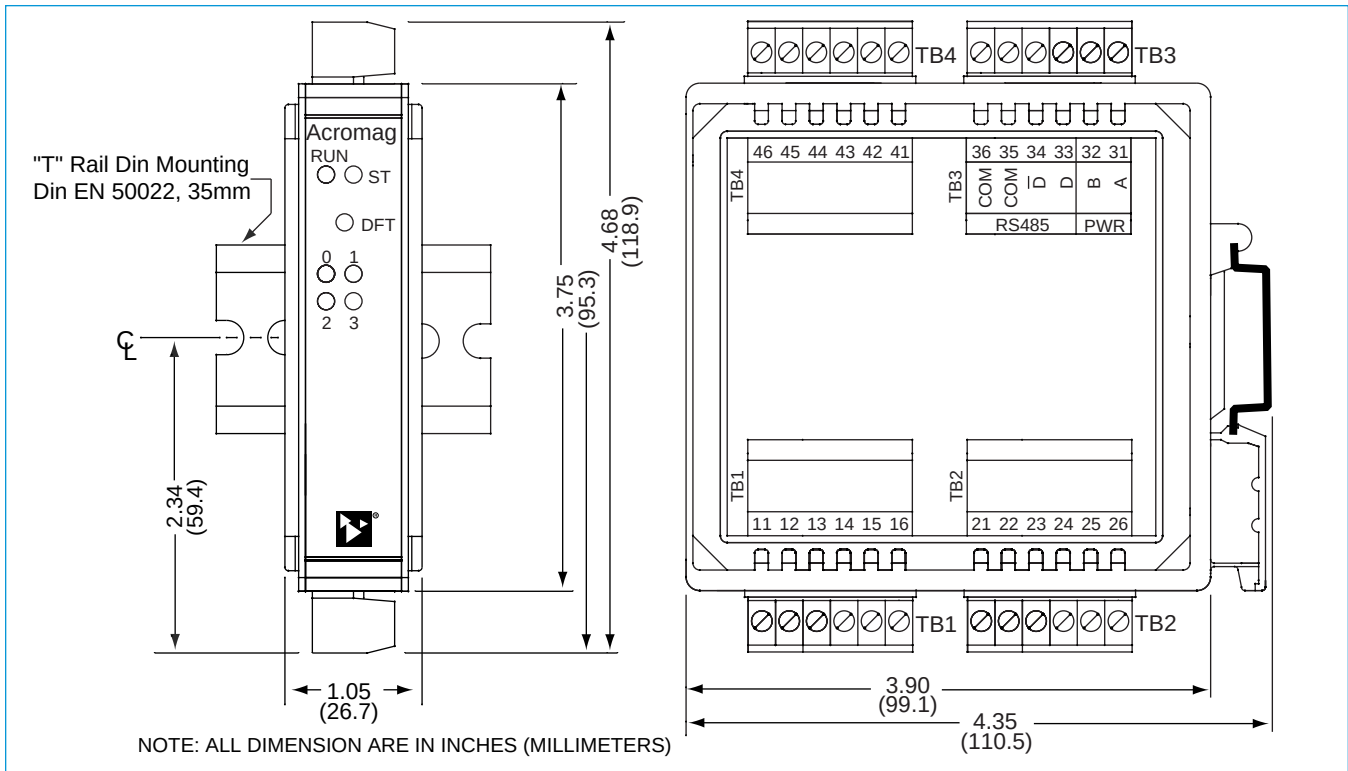
Combining flexible I/O types, wide I/O ranges, and a network interface in a single package, makes this instrument extremely powerful. Multi-channel design adds cost-efficiency and allows high-density mounting. Plus, safe, rugged construction makes these modules reliable for use in both control room and distributed field I/O applications. Custom module configurations are also possible (consult factory for details).

Special Features

- Standard Modbus RTU protocol with high-speed RS-485 communication (up to 115K bps)
- Twelve I/O channels in a single inch-wide unit reduces system costs and saves panel space
- High-voltage, high-current, open-source outputs enable direct (high-side) control of external devices
- High-voltage buffered inputs monitor discrete levels from a variety of industrial devices
- Tandem input/output circuitry (906 models only) connects input buffers with open-source outputs for convenient loopback monitoring of the output state
- Watchdog timers provide a configurable failsafe output state for use when host I/O communication is lost
- Three-way isolation eliminates potential ground loops between power, I/O, and network circuitry
- Self-diagnostics monitor microcontroller activity to detect operational failures (lock-up) and execute a reset to restore communication



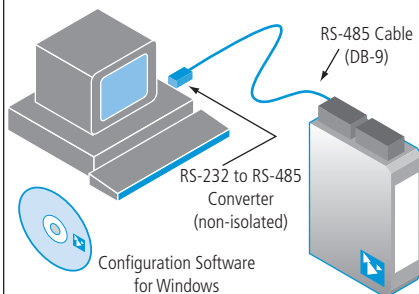
900MB Series Technical Diagrams





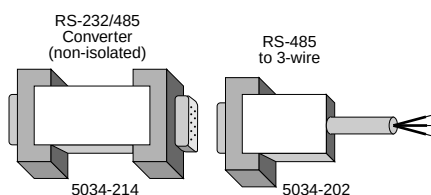
Configuration Kit

Software Interface Package
Model No. 900C-SIP



Software Interface Package

This package includes Windows® Configuration Software, an RS-232-to-485 Serial Port Converter, and an RS-485 Signal Cable. These components provide everything you need to set up a Series 900 I/O module from your desktop PC before installing it on the network.



Ordering Information

- 900C-SIP**
Software Interface Package.
Includes Configuration Software (5034-186), Non-isolated RS-232 to RS-485 Serial Port Converter (5034-214), and RS-485 Cable (5034-202).
Items can also be ordered separately below.
- 5034-186**
Configuration Software for Windows (95/98/2000/ME/NT4/XP) on CD-ROM.
- 5034-214**
Non-isolated RS-232 to RS-485 Serial Port Converter, DB-9F to DB-9F.
- 5034-202**
RS-485 to 3-wire Cable Converter, DB-9M to 3 x 12AWG RS-485 Cable, 8 ft.

Network Power



Universal 50W Power Supply

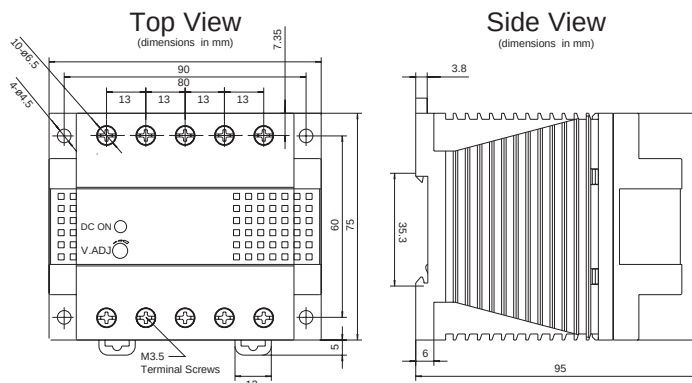
The PS5R-D24 is the ideal power source to drive your network.

Input Power Requirement
Universal power
85 to 264V AC,
105 to 370V DC

Output
24V DC, 2.1A (50W)

Ordering Information

PS5R-D24
Universal Power Supply



Mounting Hardware

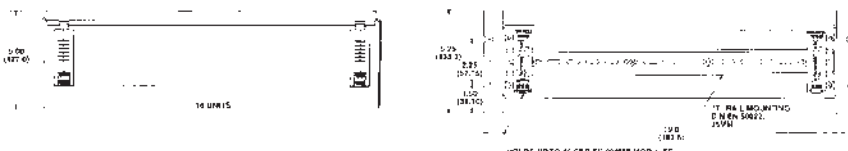


DIN-Rail Mounting

For your convenience, Acromag offers several mounting accessories to simplify your system installation. Our 19" rack-mount kit provides a clean solution for mounting your I/O modules and a power supply. Or you can buy precut DIN rail strips for mounting on any flat surface.

Ordering Information

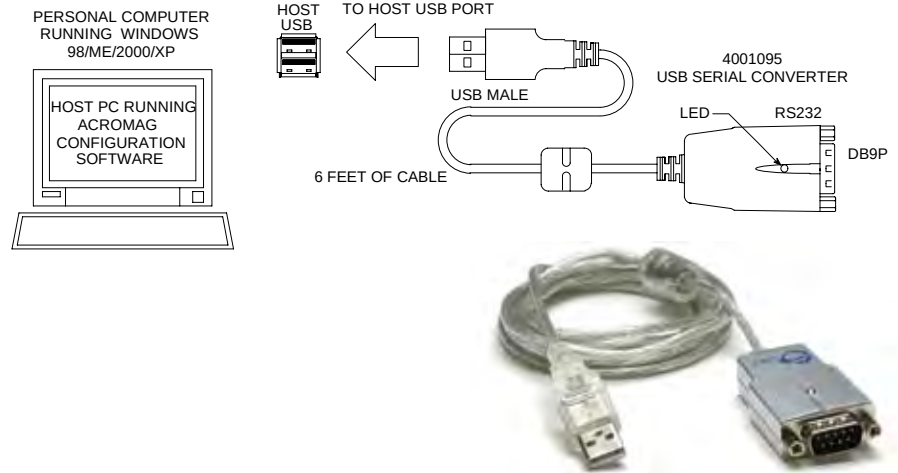
- 20RM-16-DIN**
19" rack-mount kit with DIN rail.
- DIN RAIL 3.0**
DIN RAIL 16.7
DIN rail strip, Type T, 3 inches (75mm) or 16.7 inches (425mm)



Dimensions in inches (mm).



Model 4001-095 USB-to-Serial Adapter



Simplifies configuration of Acromag I/O Modules ♦ Enables configuration via USB port

Description

This device is a USB-to-serial adapter that you can use to communicate with many Acromag I/O products for setup and re-configuration for your application.

Key Features & Benefits

- Connects to I/O modules via USB (other adapters may be necessary)
- Complete RS232 control signals
- Conforms to USB Specification, Version 1.1
- USB-powered
- Cable length, 6 ft., UL approved

Performance Specifications

USB Specification
Version 1.1

Data rate
Up to 115.2Kbps

Environmental Standards
RoHS-compliant

Basic Power Consumption
150mA

PC Requirements

Windows® 7 (32-/64-bit) / Vista (32-/64-bit) / XP (32-/64-bit) / Server 2003 & 2008 (32-/64-bit) / 2000 / ME / 98SE / 98

Ordering Information

NOTE: For more information visit www.acromag.com.

Adapters

4001-095

USB to serial adapter. Includes driver CD and manual.

5030-913

Serial port adapter. DB9S connector to RJ11 jack.

5034-202

RS-485 to 3-wire cable converter and cable, DB-9M to 3 x 12AWG RS-485 cable, 8 ft.

5032-287

RS-232 to 151T transmitter configuration device converter and cable, 6 ft.

5034-214

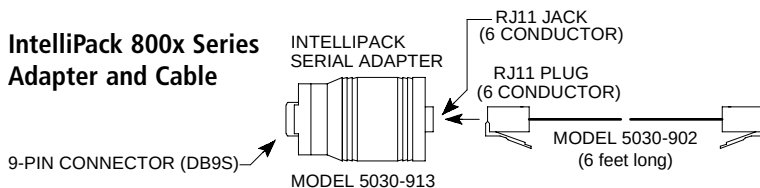
Non-isolated RS-232 to RS-485 Serial Port Converter, DB-9F to DB-9F.

Cables

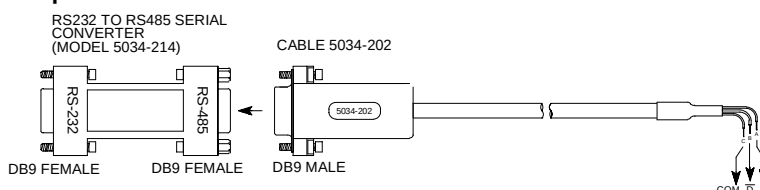
5030-902

Cable. 6 feet long with RJ11 plug at each end.

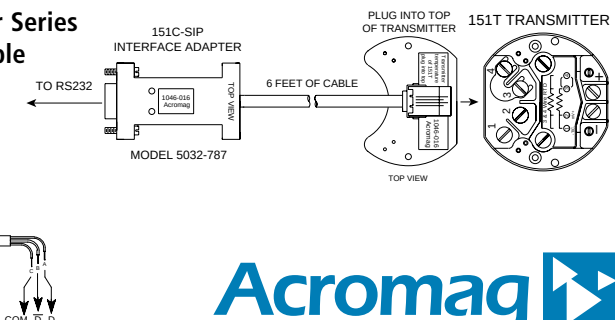
IntelliPack 800x Series Adapter and Cable



900MB Modbus Series Adapter and Cable



151T Transmitter Series Adapter and Cable



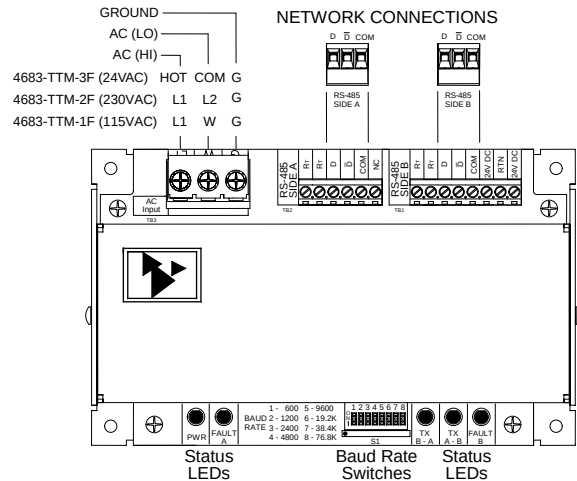
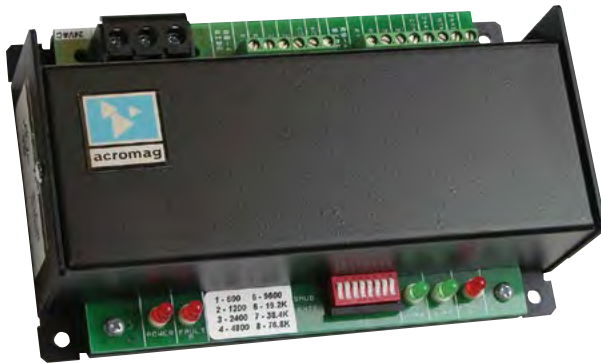
Acromag THE LEADER IN INDUSTRIAL I/O

Tel: 248-295-0880 ■ Fax: 248-624-9234 ■ sales@acromag.com ■ www.acromag.com ■ 30765 S Wixom Rd, Wixom, MI 48393 USA



Network Accessories: 4683 Series

4683-TTM RS-485 to RS-485 Network Repeater



For N2 or BACnet MS/TP bus ♦ Drives up to 32 RS-485 devices ♦ Isolates and boosts signal up to 4000 ft.

Description

Models

4683-TTM-1F: 115V AC Power
4683-TTM-2F: 230V AC Power
4683-TTM-3F: 24V AC Power

Acromag's RS-485 network repeater device allows users to take full advantage of the RS-485 standard's extended communication distances and multi-dropping capabilities. In addition, these devices offer field selectable End-of-Line Network (EOLN) terminations on both the A and B networks.

Operation is transparent to all devices and no handshaking is required. Up to thirty-two RS-485 devices can be driven. Network repeaters are ready to mount on any base plate. Or, for a harsh environment, it can be installed in a NEMA enclosure of your choice. No enclosure is necessary for use in a laboratory or office. Installation requires mounting, connecting power and cables, and setting the baud rate.

Approvals

UL/cUL listed:
Energy management equipment

Key Features & Benefits

- Designed for use with Johnson Controls N2 or BACnet bus
- No handshaking
- No extra control lines
- I/O signal isolation
- Baud rates of 600, 1200, 2400, 4800, 9600, 19.2K, 38.4K, and 76.8K are switch selectable
- Field-selectable end-of-line network terminations on both A and B sides
- Electrical transient protection is provided. This protects the host computer from destructive noise spikes and other transient signals.
- Status LED's indicate transmission direction, RS-485 bus fault conditions, and power applied.
- 24/115/230V AC power available
- No separate transformer required with 24V AC units (4683-TTM-3F)

Operation

Model 4683-TTM-xF network repeaters isolate and boost RS-485 signals allowing communication signals to travel another 4000 ft. Each repeater permits the addition of another 32 unit load to a network.

The repeater has two RS-485 "sides" known as the A and B sides. The A side typically connects to the network towards the host and the B side connects to the extended network. Functionally, the A and B sides are equivalent.

Repeaters receive AC power through a 3-screw terminal strip. Transient signal protection is provided on both RS-485 sides.

When both RS-485 lines are idle, each side is in receive mode. When a '1' to '0' transition is detected (signifying a start bit) on either side, the opposite side's transmitter is enabled. The transmitter stays enabled for one character's time (based on the baud rate switch setting). The received character is then passed through.

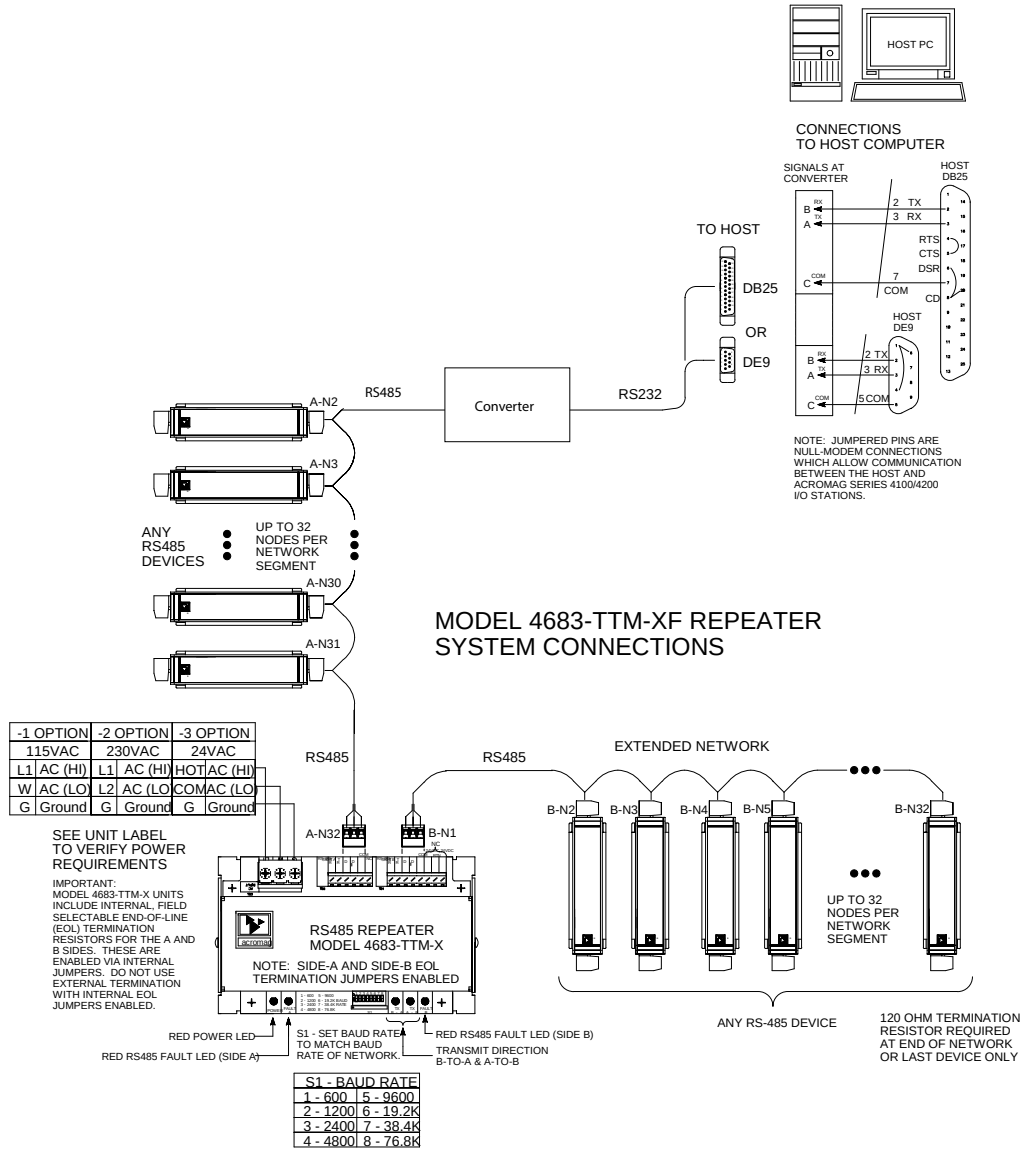


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Network Accessories: 4683 Series

4683-TTM RS-485 to RS-485 Network Repeater



The station configuration drawing is for general illustration purposes only. Johnson Controls system customers should instead refer to the Metasys® Network Technical Manual for N2 Bus Communication, or the MS/TP Communication Bus Technical Bulletin for wiring connections using the 4683-TTM-xF repeater.

ISO9001
AS9100

MADE IN USA

Acromag

THE LEADER IN INDUSTRIAL I/O

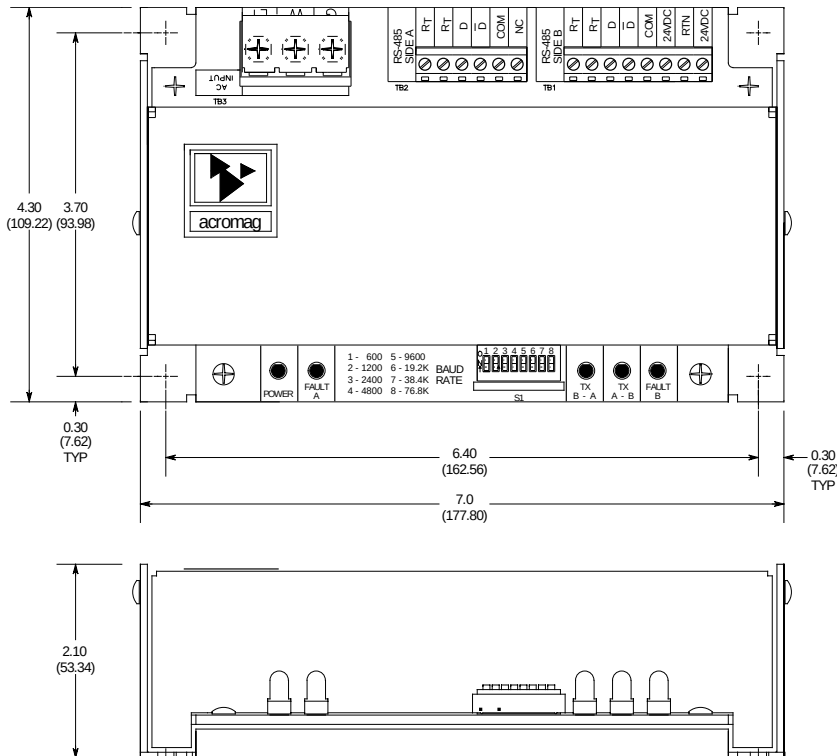
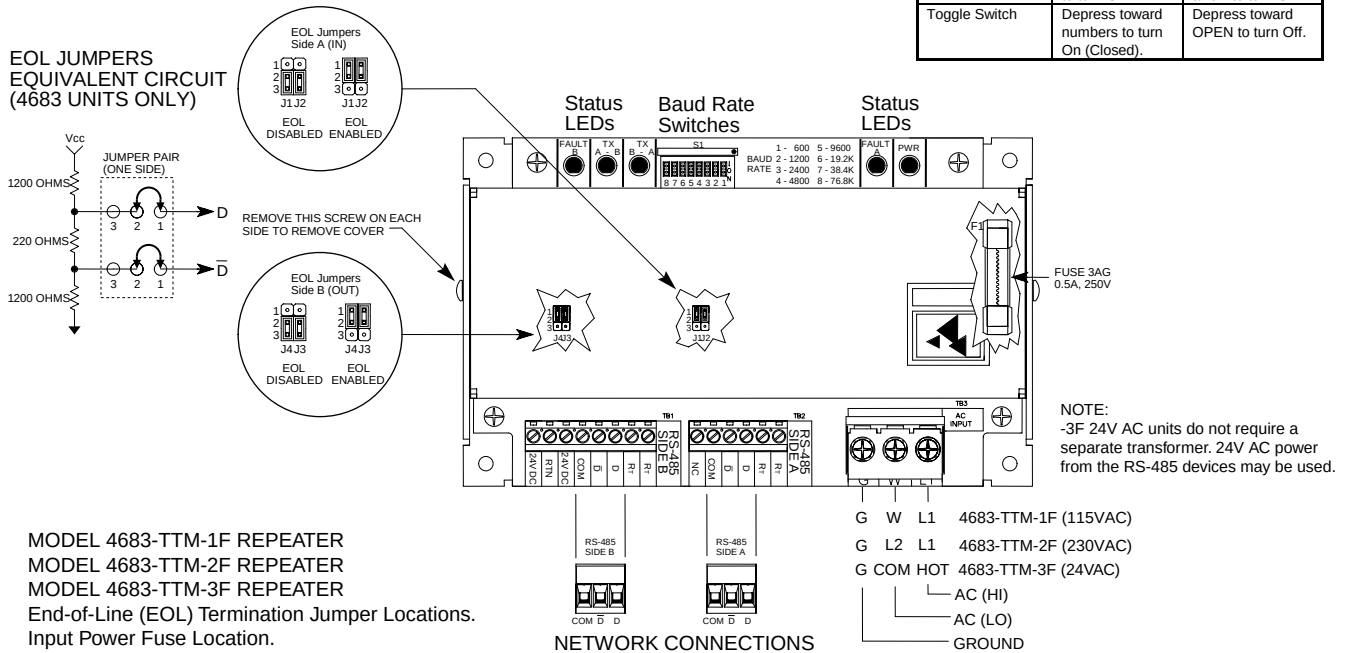
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Network Accessories: 4683 Series

4683-TTM RS-485 to RS-485 Network Repeater

Switch Variation	Switch Operation	
Slide Switch	Slide with arrow to turn ON.	Slide opposite to arrow to turn Off.
Toggle Switch	Depress toward numbers to turn On (Closed).	Depress toward OPEN to turn Off.



ISO9001
AS9100

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Network Accessories: 4683 Series

4683-TTM RS-485 to RS-485 Network Repeater

Performance Specifications

■ Communication Specifications

Baud Rates

Switch settings on unit for 600, 1200, 2400, 4800, 9600, 19.2K, 38.4K, and 76.8K baud rates. Switch must be in the proper baud rate position for proper operation.

RS-485 Bus Loading

One unit load equivalent.

RS-485 Bus Drive

Complete RS-485 compliance for up to 32 unit loads (31 unit loads if a repeater is used).

End-of-Line Termination Network

The EOLN termination network is shown on the right and is individually selected on both the A and B sides by a pair of shorting clips. The A-side is controlled by jumper pair J1, J2 and the B-side is controlled by jumper pair J3 and J4.

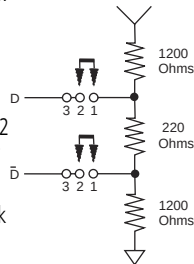
The EOLN termination network is enabled for the A side or B side when the associated pair of jumpers are positioned over pins 1 and 2. Conversely, the EOLN is disabled (out of the circuit) when the pair jumpers are positioned over pins 2 and 3.

Duplex

Half duplex only.

Data Format

Ten bits typical (1 start bit, 8 data bits, and 1 stop bit). Other formats are supported.



■ Specifications

Power Line Fuse

0.5A, 125V, 0.75A, 3AG type.

Isolation

Provides galvanic and opto-coupler isolation between RS-485(A), RS-485(B), AC power, and chassis ground. Common mode voltages are permitted up to 250V rms or 354V DC (withstands a 1500V AC dielectric strength test for 1 min. without breakdown) on a continuous basis. Complies with requirements outlined in ANSI C39.5-1974 for voltage ratings specified.

RFI Resistance

Withstands an RFI field strength of 10V per meter at 27 Mhz, 151 Mhz, and 467 Mhz with no digital effect, per SAMA PMC 33.1.

Line Noise Effects

Field and power line terminals withstand ANSI/IEEE C37.90-1978 Surge Withstanding Capability (SWC) Test with no component failures. Unit is tested to a standardized test waveform that is representative of surges (high-frequency transient electrical interference), observed in actual installations.

Communications Connections

Network repeater - both RS-485 connectors use modular terminal blocks with screw clamps. Wire range 14 to 26 AWG.

Power Wire Connections

Network repeater terminal block. See label on unit for power to be applied to unit.

Shipping Weight

3.0 pounds (1.4 kg) packed per unit.

■ Environmental

Operating temperature

-25 to 70° C (-13 to 158° F)

Storage temperature

-25 to +85° C (-13 to 185° F)

Relative humidity

0 to 95% RH (noncondensing), up to 40° C (104° F).

Power

4683-TTM-1F

115VAC ±10%, 50/60 Hz, 0.05A

4683-TTM-2F

230VAC ±10%, 50/60 Hz, 0.03A

4683-TTM-3F

24VAC ±10%, 50/60 Hz, 0.18A typical

Approvals

UL/cUL listed – energy management equipment.

Ordering Information

Models

4683-TTM-1F

115V AC Power.

4683-TTM-2F

230V AC Power.

4683-TTM-3F

24V AC Power.

Accessories

See www.acromag.com for more information.

ISO9001
AS9100



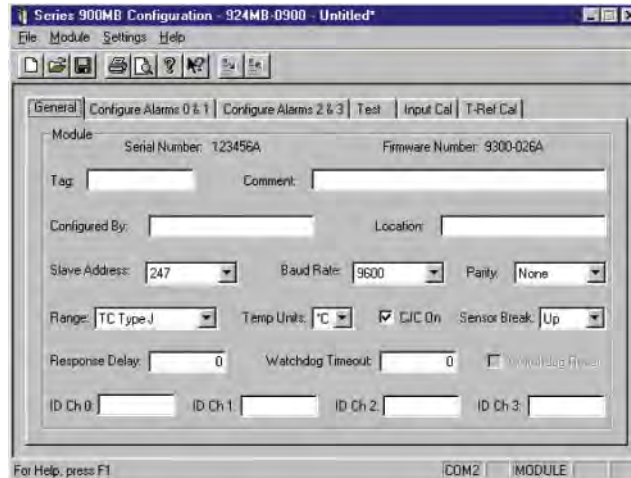
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Series 900MB Modbus RTU I/O

Model 900C-SIP Configuration Software Interface Package



Configuration Software ♦ USB-to-RS232 Adapter ♦ RS232-to-RS485 Adapter ♦ Interface Cable

Description

Acromag's configuration software is the key to the I/O modules' easy-to-use operation. The software employs the friendly Windows® interface with pull-down selection menus and fill-in-the-blank fields to speed you through a few brief configuration screens. No programming is required.

This package includes the Configuration Software, an RS232-to-485 Serial Port Converter, RS485 Signal Cable, and an USB to Serial adapter. These components provide everything you need to set up a Series 900 I/O module from your desktop PC before installing it on the network.

Software Compatibility

Windows XP, Vista, 7.

Ordering Information

NOTE: For more information, visit www.acromag.com.

Models

900C-SIP

Configuration Software Interface Package. Includes user manual, CD, non-isolated RS232-to-RS485 serial port converter (5034-214), RS485 cable (5034-202), and USB adapter (4001-095).

4001-095

USB-to-DB9 serial port (RS232) adapter.

5034-186

Configuration software on CD-ROM.

5034-202

RS485 to 3-wire cable converter and cable, DB-9M to 3 x 12AWG RS485 cable, 8 ft.

5034-214

Non-isolated RS232-to-RS485 serial port converter, RS232 port-powered, DB-9F to DB-9F.

Connection Diagram

See following page.

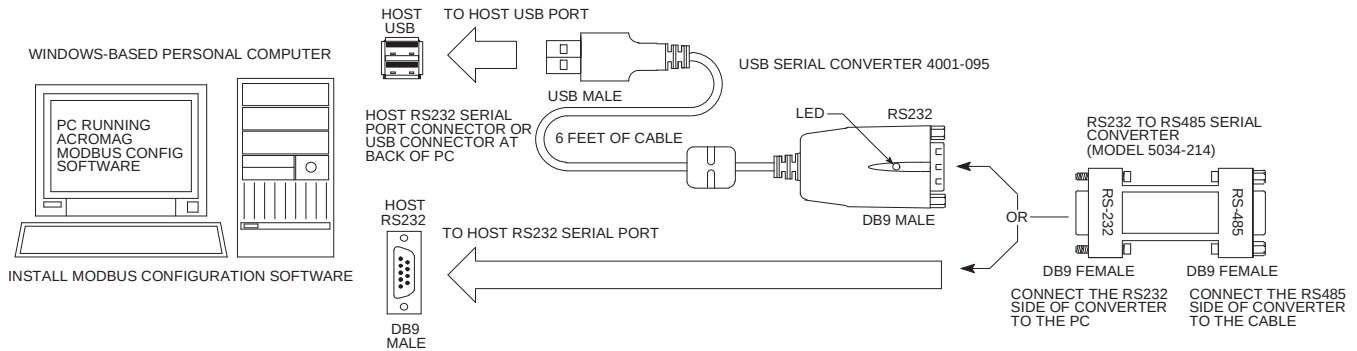
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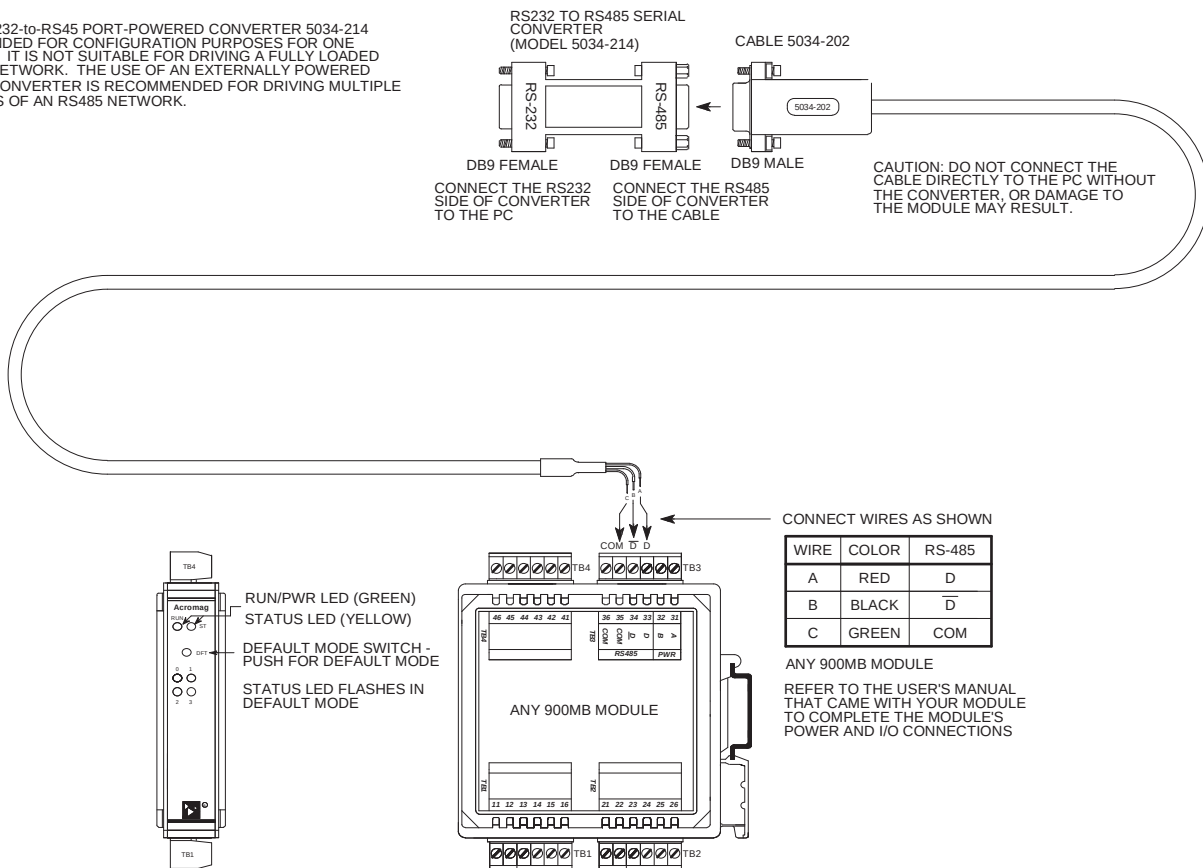


Series 900MB Modbus RTU I/O

900C-SIP COMMUNICATION CONNECTIONS



THE RS232-to-RS485 PORT-POWERED CONVERTER 5034-214 IS INTENDED FOR CONFIGURATION PURPOSES FOR ONE DEVICE. IT IS NOT SUITABLE FOR DRIVING A FULLY LOADED RS485 NETWORK. THE USE OF AN EXTERNALLY POWERED RS485 CONVERTER IS RECOMMENDED FOR DRIVING MULTIPLE DEVICES OF AN RS485 NETWORK.





PROFIBUS-DP: REMOTE I/O

Save up to 50% compared to block and modular I/O systems. Acromag's BusWorks® modules do not require special buscouplers, racks, or power supplies.



BusWorks® I/O Modules for Profibus-DP

Acromag's BusWorks 900PB series is a high-performance line of network-ready analog and discrete I/O modules. They feature universal input/output ranges and an intelligent microcontroller to provide extreme flexibility and powerful monitoring and control capabilities. Select from a variety of analog and discrete I/O models to meet your application requirements.

Each module provides a direct network interface for your I/O signals. Unlike "block I/O" devices that combine large, expensive processor blocks with snap-on I/O terminal blocks, 900PB modules handle the network interface and I/O processing in one, compact multi-channel module. This space-saving approach is very cost-effective for systems that need to add a small quantity of I/O channels at existing control sites or network to new remote sites.

To ensure high performance, modules feature an advanced microcontroller technology. On-board address switches and automatic baud rate detection (up to 12 Mbps) simplify installation. Four-way isolation prevents ground loops and increases noise immunity. Indicator LEDs and self-diagnostics help you quickly catch problems.

Inputs

- Thermocouple
- RTD/resistance
- Millivolt
- DC current/voltage
- AC current
- Discrete level/status

Outputs

- DC voltage
- DC current
- Discrete switches

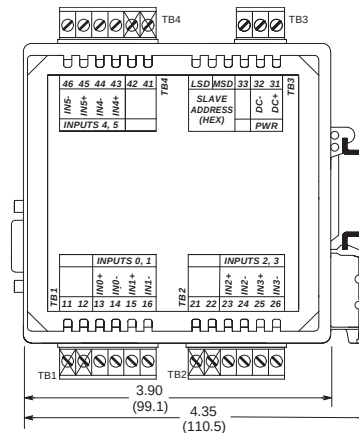
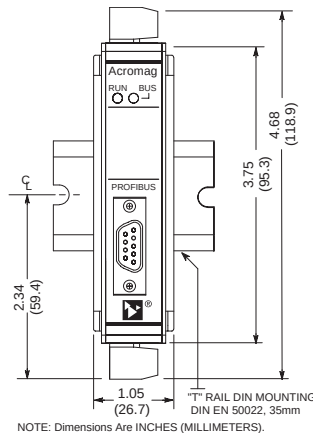
Power

- 12-36V DC

Approvals

- Profibus PNO, CE, UL/cUL Class I Div 2

For more information, visit our website at www.acromag.com/profibus



NOTE: Dimensions Are INCHES (MILLIMETERS).

961PB, 962PB Analog Input:

6-Channel Differential Input: DC Current or DC Voltage Signals

Models

961PB: 6 DC current input channels
962PB: 6 DC voltage input channels

Description

These modules provide an isolated Profibus-DP network interface for six analog input channels. Differential inputs eliminate ground loops and thus the need for isolators in many applications. Multi-range inputs accept signals from a variety of sensor and devices. High-resolution, low noise, A/D converters deliver high accuracy and reliability.

Input Ranges

DC Current (user-selectable ranges)

0 to 1mA, 0 to 11mA, 0 to 20mA, 4 to 20mA
0 to 20 amps AC (with optional AC sensor)

DC Voltage (user-selectable ranges)

±78mV to ±10V DC (eight range options)

Network Communication

Profibus-DP, RS-485 network up to 12Mbaud

Power Requirement

12 to 36V DC supply required

Approvals

Profibus PNO certified.
CE marked. UL, cUL listed.
Class I; Division 2; Groups A, B, C, D.

Special Features

- Standard Profibus-DP network communication with industry-standard ASIC (Siemens SPC3)
- 6-input stand-alone module is very economical
- Differential inputs eliminate ground loops
- Universal inputs support a variety of sensors
- High-resolution 16-bit Σ - Δ A/D converters ensure precise, high accuracy measurements
- Compact packaging with pluggable terminals saves space and simplifies wiring
- Wide operational temperature range permits installation in extreme environments

Performance

General Specifications

See Page 47 for communication and other specs.

Input

Configuration

Input ranges are selectable for a 3-channel group.

Accuracy

Better than $\pm 0.05\%$ of span for nominal input ranges.

Analog to Digital Converter (A/D)

16-bit Σ - Δ converter.

Resolution

0.005% or 1 part in 20000.

Noise Rejection

Normal Mode: Better than 40dB @ 60Hz.
Common Mode: Better than 140dB @ 60Hz.

Input Filter Bandwidth

-3dB at 3Hz, typical.

DC Current Input impedance

24.9 ohms.

DC Voltage Input impedance
Greater than 110.5K ohms.

Environmental

Ambient Temperature

Operating: -25 to 70°C (-13 to 158°F).
Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity

5 to 95%, non-condensing.

Isolation

1500V AC for 60 seconds or 250V AC continuous.
3-way isolation between I/O, network, and power.

Ordering Info

Models

961PB-2006

DC current input module, 6 differential channels

962PB-2006

DC voltage input module, 6 differential channels

NOTE: Modules include GSD files on CD-ROM.

Accessories (see Page 48)

5020-350

AC current sensor. Used with 961PB DC current input models. One sensor per channel is required.
See page 205.

P55R-D24

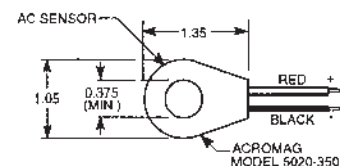
Power supply (24V DC, 2.1A).
See Power Supplies on Page 199.

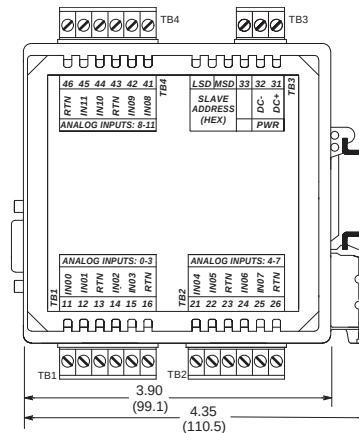
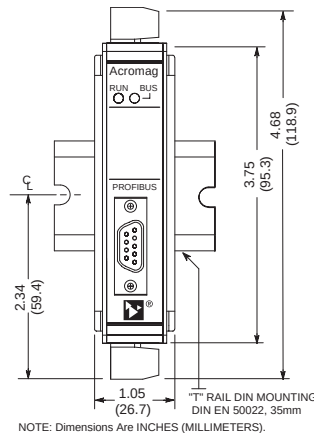
TBK-B03

Optional terminal block kit, barrier strip style, 4 pcs.

TBK-S03

Optional terminal block kit, spring clamp style, 4 pcs.





NOTE: Dimensions Are INCHES (MILLIMETERS).

963/964PB Analog Input:

12-Channel Single-Ended Input: DC Current or DC Voltage Signals

Models

963PB: 12 DC current input channels
964PB: 12 DC voltage input channels

Description

These modules provide an isolated Profibus-DP network interface for twelve analog input channels. Compact design saves space and lowers system costs. Multi-range inputs accept signals from a variety of sensors and devices. High-resolution, low noise, A/D converters deliver high accuracy and reliability.

Input Ranges

DC Current (user-selectable ranges)

0 to 1mA, 0 to 11mA, 0 to 20mA, 4 to 20mA
0 to 20 amps AC (with optional AC sensor)

DC Voltage (user-selectable ranges)

±1V, ±5V, or ±10V DC

Network Communication

Profibus-DP, RS-485 network up to 12Mbaud

Power Requirement

12 to 36V DC supply required

Approvals

Profibus PNO certified.
CE marked. UL, cUL listed.
Class I; Division 2; Groups A, B, C, D.

Special Features

- Standard Profibus-DP network communication with industry-standard ASIC (Siemens SPC3)
- 12-input module has very low cost per channel
- Universal DC inputs support a wide variety of industrial sensors and signals
- High-resolution 16-bit Σ - Δ A/D converters ensure precise, high accuracy measurements
- Compact packaging with pluggable terminals saves space and simplifies wiring
- Wide operational temperature range permits installation in extreme environments

Performance

General Specifications

See Page 47 for communication and other specs.

Input

Configuration

Input ranges are selectable on each terminal block for a group of four input channels (4-channel basis).

Accuracy

Better than $\pm 0.05\%$ of span for nominal input ranges.

Analog to Digital Converter (A/D)

16-bit Σ - Δ converter.

Resolution

0.005% or 1 part in 20000, typical.

Noise Rejection

Normal Mode: Better than 40dB @ 60Hz.
Common Mode: Better than 140dB @ 60Hz.

Input Filter Bandwidth

-3dB at 3Hz, typical.

DC Current Input impedance

49.9 ohms.

DC Voltage Input impedance
Greater than 110.5K ohms.

Environmental

Ambient Temperature

Operating: -25 to 70°C (-13 to 158°F).
Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity

5 to 95%, non-condensing.

Isolation

1500V AC for 60 seconds or 250V AC continuous.
3-way isolation between I/O, network, and power.
Inputs share a common.

Ordering Info

Models

963PB-2012

DC current input module, 12 single-ended channels

964PB-2012

DC voltage input module, 12 single-ended channels

NOTE: Modules include GSD files on CD-ROM.

Accessories

5020-350

AC current sensor. Used with 963PB DC current input models. One sensor per channel is required.
See page 205.

PS5R-D24

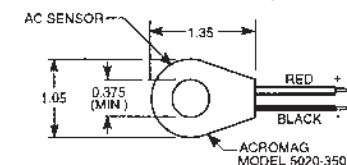
Power supply (24V DC, 2.1A).
See Power Supplies on Page 199.

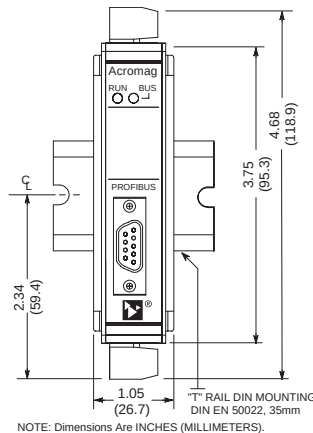
TBK-B03

Optional terminal block kit, barrier strip style, 4 pcs.

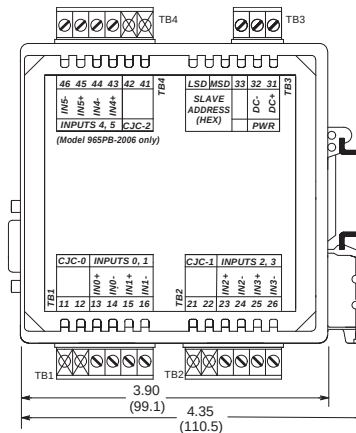
TBK-S03

Optional terminal block kit, spring clamp style, 4 pcs.





NOTE: Dimensions Are INCHES (MILLIMETERS).



965PB Analog Input:

4 or 6-Channel Input: Thermocouple or Millivolt Signals

Description

These modules provide an isolated Profibus-DP network interface for up to six input channels. Differential inputs eliminate ground noise and each terminal block includes a cold junction compensation (CJC) sensor for more precise temperature measurements. Multi-range inputs accept signals from a variety of sensors and devices. High-resolution, low noise, A/D converters deliver high accuracy and reliability.

Input Ranges

Thermocouple (user-selectable type)

Type J, K, T, R, S, E, B, or N

DC Millivolts (user-selectable range)

±100mV or ±1V DC

Network Communication

Profibus-DP, RS-485 network up to 12Mbaud

Power Requirement

12 to 36V DC supply required

Approvals

Profibus PNO certified.

CE marked. UL, cUL listed.

Class I; Division 2; Groups A, B, C, D.

Special Features

- Standard Profibus-DP network communication with industry-standard ASIC (Siemens SPC3)
- 6-input stand-alone module is very economical
- Universal inputs support a variety of sensors
- Built-in CJC sensor on each terminal block produces more precise temperature measurements
- Thermocouple break detection (upscale or downscale) identifies sensor wiring failures
- High-resolution 16-bit Σ - Δ A/D converters ensure precise, high accuracy measurements
- Compact packaging with pluggable terminals saves space and simplifies wiring
- Wide operational temperature range permits installation in extreme environments

Performance

General Specifications

See Page 47 for communication and other specs.

Input

Configuration

Input ranges are selectable for a 3-channel group.

Accuracy

Input	Input Range	Accuracy (typical)
Type J	-210 to 760°C	±0.5°C
Type K	-200 to 1372°C	±0.5°C
Type T	-260 to 400°C	±0.5°C
Type R	-50 to 1768°C	±1.0°C
Type S	-50 to 1768°C	±1.0°C
Type E	-200 to 1000°C	±0.5°C
Type B	260 to 1820°C	±1.0°C
Type N	-230 to -170°C	±1.0°C
Type N	-170 to 1300°C	±0.5°C
Voltage	±100mV or ±1V DC	±0.1% of span

Cold Junction Compensation (CJC) Accuracy
±0.5°C.

Thermocouple Break Detection

Upscale or downscale selection applies to all channels.

Analog to Digital Converter (A/D)

16-bit Σ - Δ converter.

Noise Rejection

Normal Mode: Better than 40dB @ 60Hz.

Common Mode: Better than 140dB @ 60Hz.

Input Filter Bandwidth

-3dB at 3Hz, typical.

Environmental

Ambient Temperature

Operating: -25 to 70°C (-13 to 158°F).

Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity

5 to 95%, non-condensing.

Isolation

1500V AC for 60 seconds or 250V AC continuous.

3-way isolation between I/O, network, and power.

Ordering Info

Models

965PB-2004

4-channel thermocouple/millivolt input module

965PB-2006

6-channel thermocouple/millivolt input module

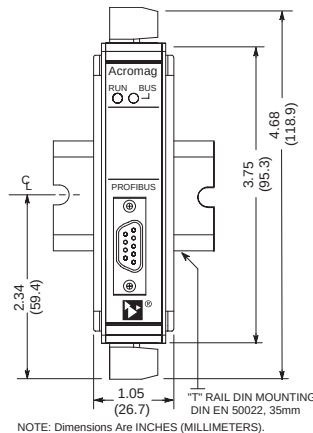
NOTE: Modules include GSD files on CD-ROM.

Accessories (see Page 48)

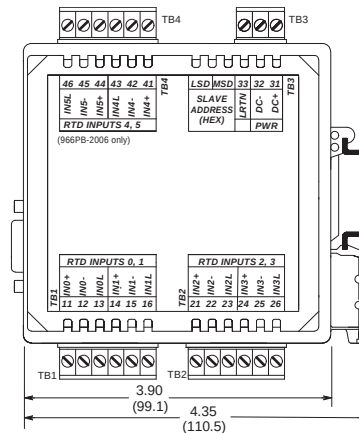
P55R-D24

Power supply (24V DC, 2.1A).

See Power Supplies on Page 199.



NOTE: Dimensions Are INCHES (MILLIMETERS).



966PB Analog Input:

4 or 6-Channel Input: RTD or Resistance Signals

Description

These modules provide an isolated Profibus-DP network interface for up to six input channels. Multi-range inputs accept signals from a variety of sensors and devices. High-resolution, low noise, A/D converters deliver high accuracy and reliability. 3-way isolation further improves the system performance.

Input Ranges

RTD (user-selectable type)

2-wire and 3-wire RTDs are supported.

Platinum 100 ohm ($\alpha = 1.3850$ or 1.3911)

Nickel 120 ohm

Copper 10 ohm

Resistance

0 to 500 ohms

Network Communication

Profibus-DP, RS-485 network up to 12Mbaud

Power Requirement

12 to 36V DC supply required

Approvals

Profibus PNO certified.

CE marked. UL, cUL listed.

Class I; Division 2; Groups A, B, C, D.

Special Features

- Standard Profibus-DP network communication with industry-standard ASIC (Siemens SPC3)
- 6-input stand-alone module has much lower start-up cost than multi-piece block I/O systems
- Versatile RTD or ohmic inputs support a wide variety of industrial sensors and devices
- RTD break detection (upscale or downscale) identifies sensor wiring failures
- High-resolution 16-bit Σ - Δ A/D converters ensure precise, high accuracy measurements
- Compact packaging with pluggable terminals saves space and simplifies wiring
- Wide operational temperature range permits installation in extreme environments

Performance

General Specifications

See Page 47 for communication and other specs.

Input

Configuration

Input ranges are selectable for a 3-channel group.

Accuracy

Input Type	Input Range	Accuracy (typical)
Pt 100 ohm	-200 to 850°C	$\pm 0.25^\circ\text{C}$
Ni 120 ohm	-80 to 320°C	$\pm 0.25^\circ\text{C}$
Cu 10 ohm	-200 to 260°C	$\pm 1.25^\circ\text{C}$
Resistance	0 to 500 ohms	± 0.05 ohms

RTD Break Detection

Upscale or downscale selection applies to all channels.

Analog to Digital Converter (A/D)

16-bit Σ - Δ converter.

Noise Rejection

Normal Mode: Better than 40dB @ 60Hz.

Common Mode: Better than 130dB @ 60Hz.

Input Filter Bandwidth

-3dB at 3Hz, typical.

Excitation Current

1mA DC typical, all RTD types.

Environmental

Ambient Temperature

Operating: -25 to 70°C (-13 to 158°F).

Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity

5 to 95%, non-condensing.

Isolation

1500V AC for 60 seconds or 250V AC continuous.

3-way isolation between I/O, network, and power.

Inputs share a common.

Ordering Info

Models

966PB-2004

4-channel RTD/resistance input module

966PB-2006

6-channel RTD/resistance input module

NOTE: Modules include GSD files on CD-ROM.

Accessories (see Page 48)

PS5R-D24

Power supply (24V DC, 2.1A).

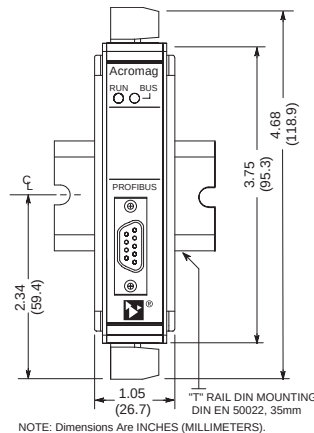
See Power Supplies on Page 199.

TBK-B03

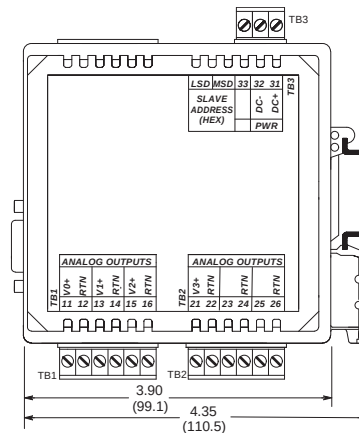
Optional terminal block kit, barrier strip style, 4 pcs.

TBK-S03

Optional terminal block kit, spring clamp style, 4 pcs.



NOTE: Dimensions Are INCHES (MILLIMETERS).



972/973PB Analog Output:

4 or 6-Channel Output: DC Current or DC Voltage Signals

Models

972PB: DC current output channels

973PB: DC voltage output channels

Description

These modules provide up to six channels of analog output. Multi-range outputs support a wide variety of industrial devices. They can drive displays and recorders, control drives, or send analog signals to other systems. High-resolution, low noise, D/A converters deliver high accuracy and reliability. 3-way isolation further improves system performance.

Output Ranges

DC Current (user-selectable ranges)

0 to 1mA, 0 to 20mA, or 4 to 20mA

DC Voltage (user-selectable ranges)

0 to 1V, 0 to 5V, or 0 to 10V DC

Network Communication

Profibus-DP, RS-485 network up to 12Mbaud

Power Requirement

16 to 36V DC supply required

Approvals

Profibus PNO certified.

CE marked. UL, cUL listed.

Class I; Division 2; Groups A, B, C, D.

Special Features

- Standard Profibus-DP network communication with industry-standard ASIC (Siemens SPC3)
- 6-input stand-alone module has much lower start-up cost than multi-piece block I/O systems
- Universal DC outputs support a wide variety of signals and industrial devices
- Three selectable failsafe modes (0%, last-state, or pre-defined) help prevent unsafe conditions
- Compact packaging with pluggable terminals saves space and simplifies wiring
- Wide operational temperature range permits installation in extreme environments

Performance

General Specifications

See Page 47 for communication and other specs.

Configuration

Output ranges are selectable on a channel to channel basis.

Output

Accuracy

Better than $\pm 0.1\%$ of span, typical.

1.6% for 0 to 1mA range. 0.8% for 0 to 1V range.

Digital to Analog Converter (D/A)

12-bit converter.

Current Output Compliance

12V minimum, 13V typical.

Current Output Load Resistance Range

0 to 625 ohms, typical.

Voltage Output Source Current

0 to 10mA DC, maximum.

Environmental

Ambient Temperature

Operating:

972PB-200x models -25 to 60°C (-13 to 158°F).

973PB-200x models: -25 to 70°C (-13 to 140°F).

Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity

5 to 95%, non-condensing.

Isolation

1500V AC for 60 seconds or 250V AC continuous.

3-way isolation between I/O, network, and power.

Outputs share a common.

Ordering Info

Models

972PB-2004

DC current output module, 4 channels

972PB-2006

DC current output module, 6 channels

973PB-2004

DC voltage output module, 4 channels

973PB-2006

DC voltage output module, 6 channels

NOTE: Modules include GSD files on CD-ROM.

Accessories (see Page 48)

PS5R-D24

Power supply (24V DC, 2.1A).

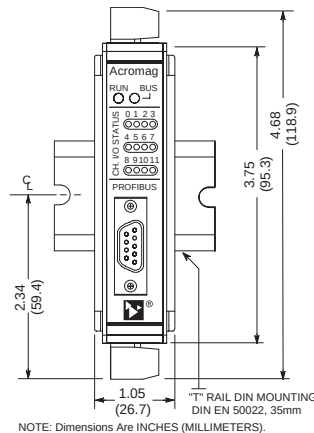
See Power Supplies on Page 199.

TBK-B03

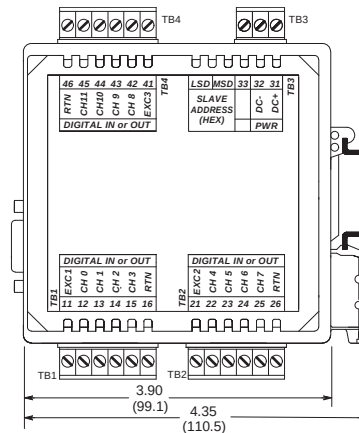
Optional terminal block kit, barrier strip style, 4 pcs.

TBK-S03

Optional terminal block kit, spring clamp style, 4 pcs.



NOTE: Dimensions Are INCHES (MILLIMETERS).



981/982/983PB Discrete I/O:

12-Channel I/O: Active-Low Inputs, Sinking Outputs (Low-Side Switching)

Models

981PB: 12 input channels
982PB: 12 output channels
983PB: 12 input/output channels

Description

These modules provide an isolated Profibus-DP network interface for twelve discrete input and/or output channels. The outputs provide direct on/off, high/low, or open/close control of industrial devices. The inputs sense the status of motors, pumps, valves and other equipment. The 983PB model with tandem I/O provides output level control and status verification in one unit.

Input Range

0 to 35V DC

Output Range

0 to 35V DC

Network Communication

Profibus-DP, RS-485 network up to 12Mbaud

Power Requirement

12 to 36V DC supply required

Approvals

Profibus PNO certified.
CE marked. UL, cUL listed.
Class I; Division 2; Groups A, B, C, D.

Special Features

- Standard Profibus-DP network communication with industry-standard ASIC (Siemens SPC3)
- 12-channel stand-alone module has far lower start-up cost than multi-piece block I/O systems
- 0-35V DC solid-state logic interface can monitor or control a wide variety of devices
- Bidirectional I/O models facilitate loopback monitoring of the output state
- Socketed SIP resistors provide input and output 5.6K ohm pull-ups to the excitation supply
- Three selectable failsafe modes (off, last-state, or pre-defined) help prevent unsafe conditions
- Compact packaging with pluggable terminals saves space and simplifies wiring
- Wide operational temperature range permits installation in extreme environments

Performance

General Specifications

See Page 47 for communication and other specs.

Input (981 & 983 models)

Input Type

Twelve active-low, buffered inputs, with a common connection. Built-in 5.6K ohm pullups to excitation terminal socketed for 4-channel groups.

Input Signal Voltage Range

0 to 35V DC, maximum.

Input Impedance

100K ohms, typical.

Input Signal Threshold

TTL compatible with 100mV of hysteresis, typical.

Output (982 & 983 models)

Output Type

12 independent, open-drain, DMOS MOSFET switches.

Output Voltage Range

0 to 35V DC max. (0 to 500mA/channel continuous).

Output ON Resistance

0.28 ohms maximum.

Environmental

Ambient Temperature

Operating: -25 to 70°C (-13 to 158°F).
Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity

5 to 95%, non-condensing.

Isolation

1500V AC for 60 seconds or 250V AC continuous.
3-way isolation between I/O, network, and power.

Ordering Information

Models

981PB-2012

Discrete input module, 12 channels

982PB-2012

Discrete output module, 12 channels

983PB-2012

Discrete input/output module, 12 channels

NOTE: Modules include GSD files on CD-ROM.

Accessories (see Page 48)

PS5R-D24

Power supply (24V DC, 2.1A).

See Power Supplies on Page 199.

TBK-B03

Optional terminal block kit, barrier strip style, 4 pcs.

TBK-S03

Optional terminal block kit, spring clamp style, 4 pcs.



General Operation and Performance Specifications

The following specifications are common to all 900PB Series I/O modules.

■ Communication

Interface Standard

Isolated, 3-wire RS-485 multi-drop, half-duplex, asynchronous.

Command/Response Protocol

Standard ProfiBus DP (Master/Slave) protocol per European Norm EN50170.

Baud Rate

Supports rates of 9600, 19.2K, 44.45K, 93.75K, 187.5K, 500K, 1.5M, and 12M bits per second, auto-detected.

Communication Distance

Up to 1200 meters without a repeater using Type A wire (<30pF/m).

1200m @ 115Kbps or less

1000m @ 187.5Kbps

400m @ 500Kbps

200m @ 1.5Mbps

100m @ 12Mbps

Address

Set via two rotary hexadecimal switches or via the Set Slave Address command. Valid setting is 0-125.

Address 126 (7EH) is factory default address.

Maximum Message Size

Up to 32 bytes recommended, extendable up to 244 bytes of data/node/message, plus 11 bytes of overhead (data frame).

Network Capacity

Multi-drop up to 31 modules, plus a host, without a repeater. Up to 125 modules plus a host if four repeaters are used (one for every 31 nodes).

■ Environmental

Isolation

I/O channel, power, and network circuits are isolated from each other for common-mode voltages up to 250VAC, or 354V DC off DC power ground, on a continuous basis (will withstand 1500VAC dielectric strength test for one minute without breakdown). Complies with test requirements of ANSI/ISA-82.01-1988 for voltage rating specified.

■ Electromagnetic Compatibility (EMC)

Immunity per European Norm EN50082-1.

Emissions per European Norm EN50081-1.

Electrostatic Discharge (ESD) Immunity

Per EN61000-4-2.

Radiated Field Immunity (RFI)

Per EN61000-4-3 and ENV50204.

Electrical Fast Transient Immunity (EFT)

Per EN61000-4-4.

Conducted RF Immunity (CRFI)

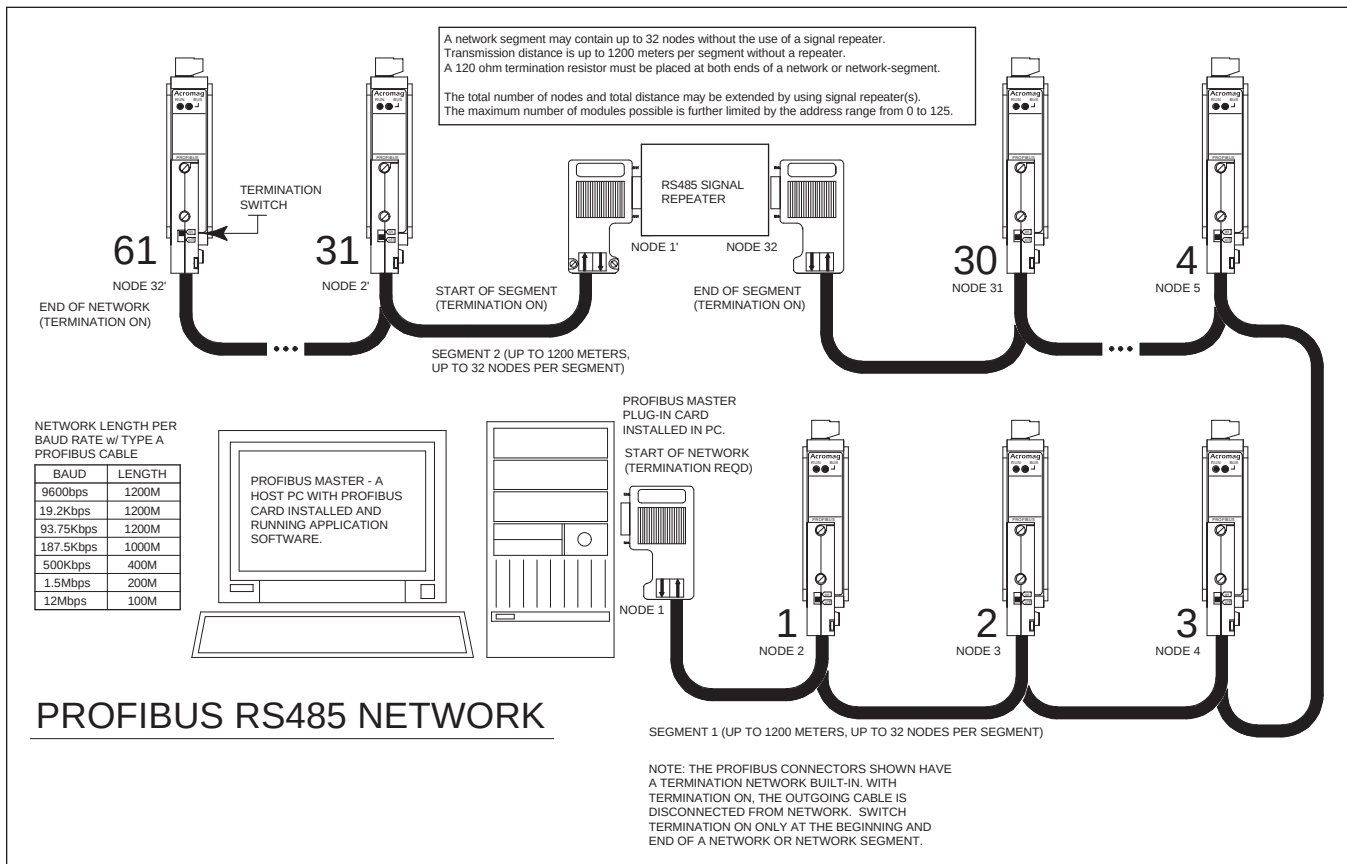
Per EN61000-4-6.

Surge Immunity

Per EN61000-4-5.

Radiated Frequency Emissions

Per EN55022 Class B.





Accessories

Terminal Blocks

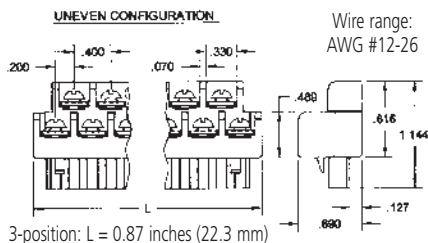
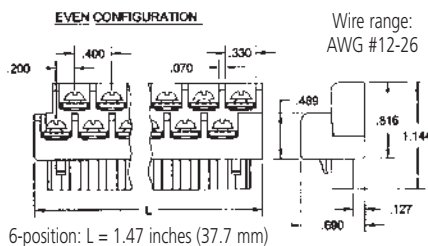


Barrier strip (left) and spring clamp (right).

Ordering Information

See individual I/O modules for compatibility.

Barrier Strip Terminal Blocks

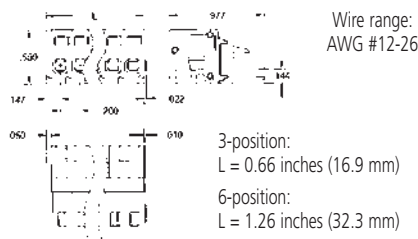


TBK-B01
Terminal block kit,
two 6-position pieces

TBK-B03
Terminal block kit,
one 3-position and
three 6-position pieces

TBK-B02
Terminal block kit,
four 6-position pieces

Spring Clamp Terminal Blocks



TBK-S01
Terminal block kit,
two 6-position pieces

TBK-S03
Terminal block kit,
one 3-position and
three 6-position pieces

TBK-S02
Terminal block kit,
four 6-position pieces

Mounting Hardware



DIN-Rail Mounting

For your convenience, Acromag offers several mounting accessories to simplify your system installation. Our 19" rack-mount kit provides a clean solution for mounting your I/O modules and a power supply. Or you can buy precut DIN rail strips for mounting on any flat surface.

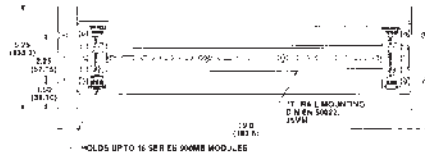
Ordering Information

20RM-16-DIN
19" rack-mount kit with DIN rail.

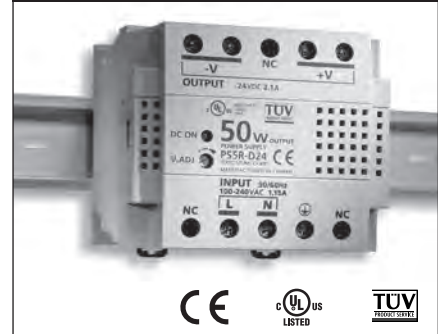
DIN RAIL 3.0

DIN RAIL 16.7

DIN rail strip, Type T, 3 inches (75mm) or 16.7 inches (425mm)



Power Supplies



50W Supply

Input Power Requirement
85 to 264V AC or 105 to 370V DC

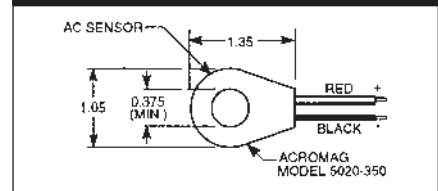
Output
24V DC, 2.1A (50W)

Ordering Information

P55R-D24
Universal 50W power supply

See Power Supplies on Page 199 for other models and more information.

AC Current Sensor



Ordering Information

5020-350
AC current sensor (See page 205)

Isolated Transmitters: 600T Series



600T Series Models by Function Guide

◆ 610T Units (4-wire)



Multi-channel, DC-powered isolated transmitters. Designed For high-density panel installations.

◆ 630T Units (4-wire)



Multi-channel AC/DC powered isolators. Provides excitation supply for 2-wire transmitters.

◆ 650T Units (2-wire)



Multi-channel, output loop-powered transmitters with input isolation. Designed to front-end PLC inputs.

◆ 670T Units (2-wire)



Multi-channel, input loop-powered transmitters with output isolation. Designed to isolate PLC outputs to field devices.

	610T	630T	650T	670T
Functions				
4-20mA isolator			X	X
Isolated signal converter/transmitter	X	X		
Signal splitter		X	X	
Channel Configurations				
Single channel units	X	X	X	X
Dual channel units	X	X	X	X
Quad channel units				X
Splitter (one input, two outputs)		X	X	
Power Configurations				
Input loop-powered				X
Output loop-powered (2-wire transmitter)			X	
AC-powered		X		
DC-powered	X	X		
Inputs				
DC voltage input	X		X	
DC current input	X	X	X	X
Thermocouple/millivolt input			X	
RTD/resistance input			X	
AC current input	X			
Outputs				
DC current	X	X	X	X
DC voltage	X			
Isolation Configurations				
Input from output/power	X		X	
Output from input/power	X			X
3-way (input/output/power)	X	X		

600T Series

Isolated Transmitters

611T, 612T	Page 2
631T, 632T, 633T	4
651T, 652T, 653T	6
654T	8
655T, 656T, 657T	10
657T, 658T	12
670T	14

Technical Documentation

Dimensions diagrams	see individual units
Application notes	Page 16
Accessories	21

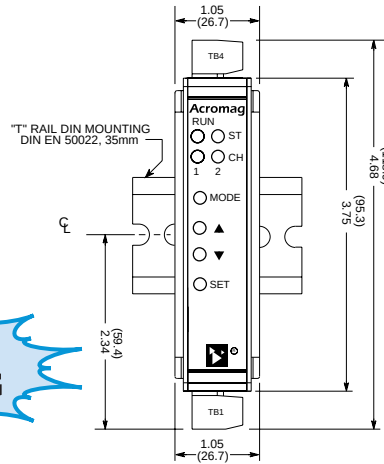
Acromag [®]
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Isolated Transmitters: 600T Series

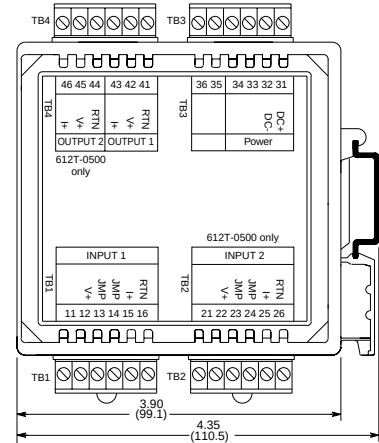
611T, 612T Multi-Channel, Universal DC I/O



**AUTO-CONFIG
SELF-RANGING**



NOTE: ALL DIMENSIONS ARE IN INCHES (MILLIMETERS)



DC current or voltage input ♦ Single/dual-channel DC-powered transmitters

Description

Models

611T: Single I/O channel

612T: Dual I/O channel

These units receive DC current or voltage input signals, provide isolation, and output proportional DC current or voltage signals. With support for universal DC I/O ranges, 610T series transmitters provide a solution for a wide variety of isolation and signal conversion tasks. The single-channel 611T and dual-channel 612T are ideal for panel shops and end-users who require a high-density signal conditioner that can accommodate a broad range of instrumentation applications.

Installation is fast and simple with Acromag's built-in auto-configuration feature. Using your standard calibrator, the 610T's internal microcontroller automatically senses the input source type (voltage or current) and selects the optimum performance range for your zero and full-scale input values. To adjust your output values, simply push the up or down buttons on the front panel until you read the desired output signal on your meter.

Both models provide high-voltage isolation between the input, output and power (3-way). On dual channel units, each channel operates independently, with inputs isolated from each other, to prevent interaction between channels.

For easy troubleshooting, each channel has diagnostic LEDs to identify input over/under range conditions. An additional status LED indicates the unit is operating properly or that the front panel pushbutton lockout feature has been invoked.

Input Ranges

Universal input with automatic configuration

- ±100mA (self-ranging),
- ±100V DC (self-ranging),
- 0 to 20 amps AC (with optional sensor)

Output Ranges

Universal output (user-configured ranges)

- 0 to 20mA (full range capability),
- 0 to 10V DC (full range capability)

Power Requirement

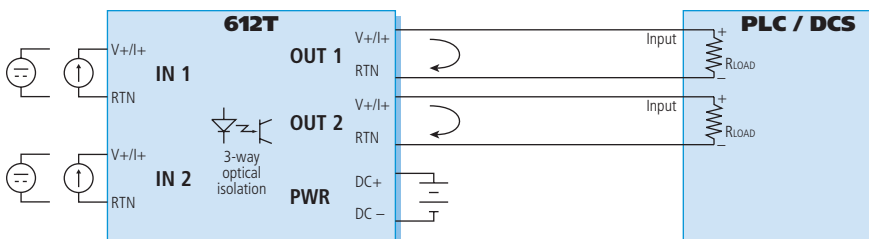
10 to 36V DC

Approvals

CE marked. UL, cUL listed.

Key Features & Benefits

- Universal DC input and output ranges offer flexibility to fit many applications.
- Auto-configuration and self-ranging technologies speed installation without pots, switches, jumpers, or software.
- Optical isolation eliminates ground loops, reduces noise, and blocks transient signals.
- Push-button calibration simplifies field adjustments for faster and easier maintenance.
- Configuration lockout safety feature prevents tampering and accidental changes.
- Reverse-acting output capability enables inverse proportional control signals.
- Each input channel can drive two outputs (a voltage and a current output signal).
- Dual channel model saves space and reduces equipment costs.
- High-resolution Σ - Δ A/D converters deliver superior accuracy for reliable measurements.



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Isolated Transmitters: 600T Series



Performance Specifications

◆ General Input

Analog to Digital Converter (ADC)
16-bit Σ - Δ A/D converter.

Noise Rejection

Normal Mode: Better than 40dB @ 60Hz.
Common Mode: Better than 100dB @ 60Hz.

Input Overvoltage Protection

Bipolar Transient Voltage Suppressors (TVS).

◆ DC Current Input

DC Current Input Range

± 100 mA DC with full range capability.
Minimum recommended span is ± 4 mA.

DC Current Input Impedance

10 ohms.

DC Current Input Accuracy

Better than $\pm 0.1\%$ of output span.

◆ DC Voltage Input

DC Voltage Input Range

± 100 V DC with full range capability.
Minimum recommended span is ± 40 mV.

Input impedance

± 1 V to ± 100 V input: greater than 100K ohms.
 ± 40 mV to ± 1 V input: 1K ohm

DC Voltage Input Accuracy

Better than $\pm 0.1\%$ of output span.

◆ AC Current Input

AC Current Input Range (optional)

An optional external AC current sensor is required to monitor AC current signals (Model 5020-350).

AC Current Range	Primary Turns
0 to 20A AC	1
0 to 10A AC	2
0 to 5A AC	4
0 to 2A AC	10
0 to 1A AC	20

AC Current Input Accuracy

Better than $\pm 0.5\%$ of output span.



Optional terminal blocks: barrier strip (left) and spring clamp (right). Cage clamp terminal is standard.

◆ Output (DC V/mA)

Current Output

Range: 0 to 20mA maximum (user-configured range).
Compliance: 11V DC typical.
Load resistance range: 0 to 550 ohms.

Voltage Output

Ranges: 0 to 10V maximum (user-configured range).
Compliance: 10mA max. with short circuit protection.
Output impedance: 1 ohms.

Accuracy (overall input to output)

Better than $\pm 0.1\%$ of span for nominal output ranges of 0 to 10V or 0 to 20mA.

Ambient Temperature Effect

Better than $\pm 0.018\%$ of output span per $^{\circ}\text{C}$ or $\pm 1\mu\text{V}$, whichever is greater.

Output Response Time (for input step change)

800mS typical to 98% of final output value.

◆ Environmental

Ambient Temperature

Operating: -25 to 70°C (-13 to 158°F).
Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity

5 to 95%, noncondensing.

Power Requirements

611T: 10 to 36V DC. 24V DC @ 55mA.
612T: 10 to 36V DC. 24V DC @ 75mA.

Isolation

3-way (input/output/power). 1500V AC for 60 seconds or 250V AC continuous. Dual channel model includes input-to-input isolation and outputs share a common.

Radiated Field Immunity (RFI)

Complies with EN61000-4-3 Level 3 and EN50082-1.

Electromagnetic Field Immunity (EMI)

Less than $\pm 0.25\%$ of output span effect.

Electrical Fast Transient (EFT)

Complies with EN61000-4-4 Level 3 and EN50082-1.

Surge Withstanding Capability (SWC)

Complies with EN61000-4-5 Level 3 and EN50082-1.

Electrostatic Discharge (ESD)

Complies with EN61000-4-2 Level 3 and EN50082-1.

Radiated Emissions

Meets or exceeds EN50081-1 for Class B equipment.

Approvals

CE marked, UL, cUL listed (USA, Canada).
UL3121 general product safety.

◆ Physical

Enclosure

Case: Self-extinguishing NYLON type 6.6 polyamide thermoplastic UL94 V-2 NEMA Type 1 enclosure.

Connectors (Removable Terminal Blocks)

Wire Range: AWG #12-24.

Printed Circuit Boards

Military grade FR-4 epoxy glass circuit board.

Dimensions

1.05W x 4.68H x 4.35D inches.
26.7W x 118.9H x 110.5D millimeters.

Shipping Weight

1 pound (0.45 Kg) packed.

Ordering Information

◆ Models

611T-0500

Single channel isolated transmitter

612T-0500

Dual channel isolated transmitter
Add "-C" suffix for optional factory configuration.

◆ Accessories (see Page 21)

5020-350

AC current sensor. See Page 20 for details.

PS5R-SD24

Power supply (24V DC, 2.5A).

TBK-B02

Optional terminal block kit, barrier strip style, 4 pcs.

TBK-S02

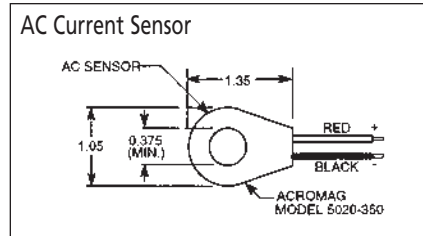
Optional terminal block kit, spring clamp style, 4 pcs.

DIN RAIL 3.0 or DIN RAIL 16.7

DIN rail strip, Type T, 3 in.(75mm) or 16.7 in. (425mm)

20RM-16-DIN

19" rack-mount kit with DIN rail.
Holds sixteen 610T series transmitters.

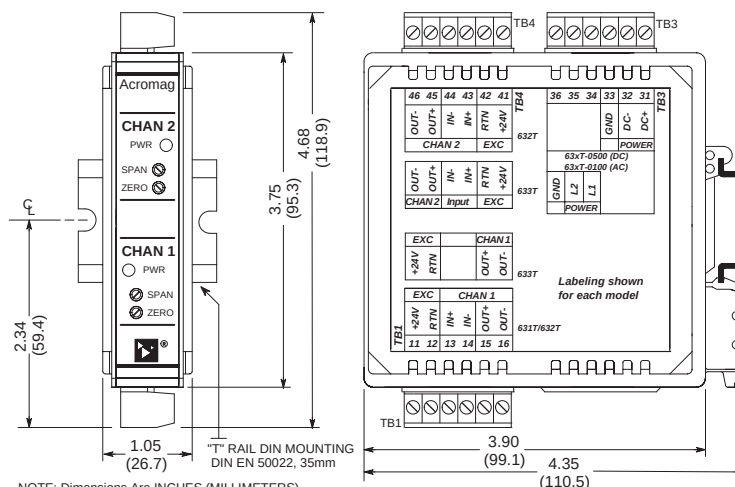


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Isolated Transmitters: 600T Series

631T, 632T, 633T Multi-Channel 4-Wire Isolators



DC current input ♦ Single/dual-channel AC/DC-powered isolators ♦ Signal splitter

Description

Models

631T: Single I/O channel

632T: Dual I/O channel

633T: Single input, dual output (splitter)

These units receive 4-20mA process current inputs and provide isolated 4-20mA output signals. Each channel operates independently and is isolated from the others to prevent interaction between channels. Galvanic isolation eliminates ground loops, reduces noise, and blocks transient signals.

Units are shipped with factory calibration for quick installation. These isolators also automatically compensate for load resistance variations, so re-calibration is rarely necessary. However, adjustable zero and span trim pots are provided to ensure precise calibration for maintenance requirements and long term serviceability.

These isolators generate a 24V input excitation supply suitable for powering one or two 2-wire transmitters. The supply is current limited at each output to prevent any excitation short from pulling down the internal power supply. The internal DC supply improves system performance by isolating loops on a single or dual channel basis. It saves space, complexity, and the expense of installing additional supplies to power your field loops.

Input / Output Ranges

4 to 20mA DC input
4 to 20mA DC output

Power Requirement

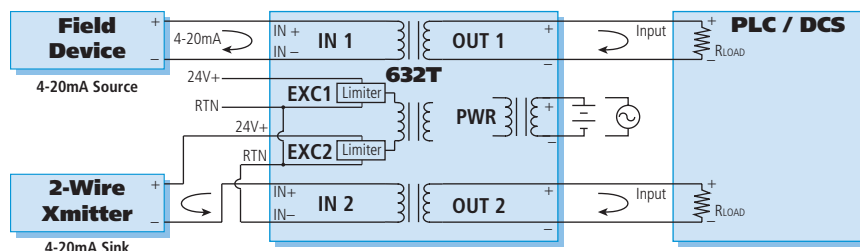
15-36V DC
90-250V AC (125V DC $\pm 10\%$)
Four-wire isolated transmitter

Approvals

CE marked. UL, cUL listed.
Class I, Division 2, Groups A, B, C, D.

Key Features & Benefits

- Two channels in a single unit saves space and reduces costs.
- Signal splitter model (633T) provides two identical isolated outputs from one input signal.
- Built-in isolated excitation supply with short circuit protection can drive up to two field 2-wire process loops.
- Full isolation safely separates each input channel, each output channel, the excitation supply, and power.
- Excellent accuracy and stability ensure reliable operation in hostile environments.
- Low input burden keeps voltage drop to less than 1.5V for full-scale current.
- Supports wide 0 to 1000 ohm load range and no trimming is required if the load varies.
- Current limiting safely limits output to 27mA.
- Pluggable terminals, zero/span trim pots and power LEDs make installation, maintenance, and long term service easy.



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Isolated Transmitters: 600T Series



Performance Specifications

Reference Test Conditions

Input/output current 4 to 20mA; Output load 250 ohms; Power 24V DC or 115V AC; 77°F (25°C).

Input Range

4 to 20mA input (each channel).

Input Burden

Voltage drop (631T, 632T):
Less than 1.5V (75 ohms) at full scale.
Voltage drop (633T):
Less than 3.0V (150 ohms) at full scale.

Input Overvoltage Protection

Bipolar Transient Voltage Suppressors (TVS).

Input Excitation

24V DC $\pm 10\%$, 22mA maximum each. Fully isolated.
Includes independent current limiting at EXC1 and EXC2 near 23mA, each.

Output Range

4-20mA DC output (each channel).

Output Trim Range

Zero and full-scale adjustment to $\pm 4\%$.

Output Limiting

Outputs are limited to 27mA.

Output Load

0 to 1000 ohms (631T).
0 to 950 ohms (632T, 633T).

Output Load Resistance Effect

Less than $\pm 0.01\%$ of output span effect for a ± 100 ohm change in load resistance.

Output Response Time (for input step change)

25mS typical to 98% of final output value.

Accuracy

$\pm 0.05\%$ of output span. Error includes the combined effects of isolator repeatability, hysteresis, terminal point linearity and adjustment resolution.

Temperature Drift

Better than $\pm 50\text{ppm}/^\circ\text{C}$ ($\pm 0.005\%/^\circ\text{C}$) over the ambient temperature range. This specification includes the combined effects of zero and span over temperature.

Calibration

Two 15-turn potentiometers (zero and span) per output channel, accessible from front of the unit.

Bandwidth

-3dB at 50Hz, typical with a 500 ohm load.

Noise Rejection

Common mode: Better than 100dB at 60Hz, typical.
Normal mode: -6dB at 60Hz, typical, 500 ohm load.

LED Indicators

Green, one LED per output channel.
Constant ON indicates power applied.

◆ Environmental

Ambient Temperature

Operating: -25 to 75°C (-13 to 167°F),
[if excitation supplies are used on 632T or 633T
-25 to 60°C (-13 to 140°F)]
Storage: -40 to 85°C (-40 to 185°F)

Relative Humidity

5 to 95%.

Power Requirement

DC-powered units: 15-36V DC SELV.
AC-powered units: 90-250V AC (125V DC $\pm 10\%$)
631T: 1.5 watts without excitation, 2.4 watts with excitation.
632T, 633T: 3.0 watts without excitation, 4.8 watts with excitation.

Isolation

Inputs, outputs, individual channels, power, and excitation supplies are isolated from each other for common-mode voltages up to 250V AC, or 354V DC off ground, on a continuous basis (will withstand 1500V AC dielectric strength test for one minute without breakdown).

Electromagnetic Field Immunity (EMI)

Less than $\pm 0.25\%$ of output span effect under the influence of electromagnetic fields from switching solenoids, commutator motors, and drill motors.

Meets Immunity Standards Per EN50082-1

Electrostatic Discharge (ESD) Immunity
4KV direct contact and 8KV air-discharge to the enclosure port per EN61000-4-2.

Radiated Field Immunity (RFI)

10V/M, 80 to 1000MHz AM and 900MHz keyed carrier, per EN61000-4-3 and ENV50204.

Electrical Fast Transient Immunity (EFT)

2KV to power and 1KV to signal I/O per EN61000-4-4.

Conducted RF Immunity (CRFI)

10Vrms, 150KHz to 80MHz, per EN61000-4-6.

Surge Immunity

0.5KV per EN61000-4-5.

Emissions Per European Norm EN50081-1

Radiated Frequency Emissions
30 to 1000MHz per EN55022 Class B.

Approvals

CE marked, UL & cUL listed.
Hazardous Locations: Class I: Div. 2; Groups A, B, C, D

◆ Physical

Enclosure

Case: Self-extinguishing NYLON type 6.6 polyamide thermoplastic UL94 V-2 NEMA Type 1 enclosure.

Connectors (Removable Terminal Blocks)

Wire Range: AWG #14-22 (AWG #12 stranded only).

Printed Circuit Boards

Military grade FR-4 epoxy glass circuit board.

Dimensions

1.05W x 4.68H x 4.35D inches.
26.7W x 95.3H x 110.5D millimeters.

Ordering Information

◆ Models

631T-0100

Single channel isolator, AC-powered

631T-0500

Single channel isolator, DC-powered

632T-0100

Dual channel isolator, AC-powered

632T-0500

Dual channel isolator, DC-powered

633T-0100

Single input with dual isolated output, AC-powered

633T-0500

Single input with dual isolated output, DC-powered

◆ Accessories (see Page 21)

PSSR-SD24

Power supply (24V DC, 2.5A).

TBK-B02

Optional terminal block kit, barrier strip style, 4 pcs.

TBK-S02

Optional terminal block kit, spring clamp style, 4 pcs.

DIN RAIL 3.0

DIN RAIL 16.7

DIN rail strip, Type T, 3 inches (75mm) or 16.7 inches (425mm)

20RM-16-DIN

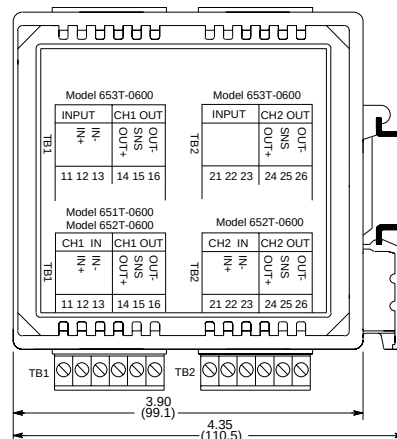
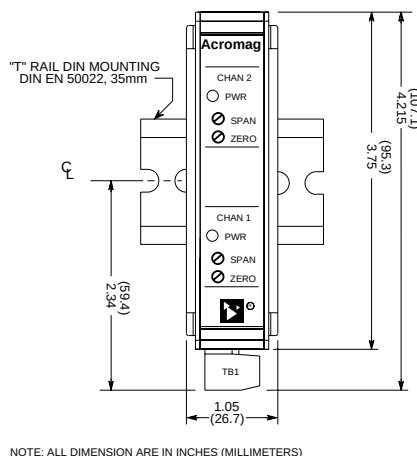
19" rack-mount kit with DIN rail.
Holds sixteen 630T transmitters.

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Tel: 248-295-0880 ■ Fax: 248-624-9234 ■ sales@acromag.com ■ www.acromag.com ■ 30765 S Wixom Rd, Wixom, MI 48393 USA

Isolated Transmitters: 600T Series

651T, 652T, 653T Multi-Channel, Two-Wire Isolators



NOTE: ALL DIMENSION ARE IN INCHES (MILLIMETERS)

DC current input ♦ Single/dual-channel DC-powered isolators ♦ Signal splitter

Description

Models

- 651T: Single I/O channel
- 652T: Dual I/O channel
- 653T: Single input, dual output (splitter)

These units receive 4-20mA process current inputs and provide isolated 4-20mA output signals. Each channel operates independently and is isolated from the others to prevent interaction between channels.

For easy troubleshooting, each unit has LEDs and diagnostic test points. Power LEDs help identify output open loop conditions. The precision 10 ohm sense resistor enables monitoring of the output signal without disturbing field wiring.

Input / Output Ranges

- 4 to 20mA DC input
- 4 to 20mA DC output

Power Requirement

- 12 to 36V DC (loop-powered)
- Two-wire transmitter

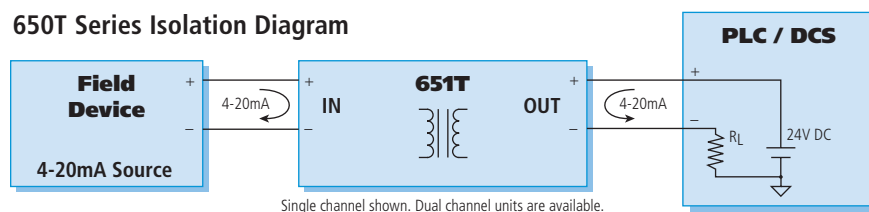
Approvals

CE marked. UL, cUL listed
Class I, Division 2, Groups A, B, C, D.

Key Features & Benefits

- Two channels in a single unit saves space and reduces costs.
- Signal splitter model (653T) provides two identical outputs from one input signal.
- Galvanic isolation eliminates ground loops, reduces noise, and blocks transient signals.
- Independent channels prevent signal interaction and offer spares for later use.
- Power LEDs provide a visual indication of operational process loops.
- Excellent accuracy and stability ensure reliable

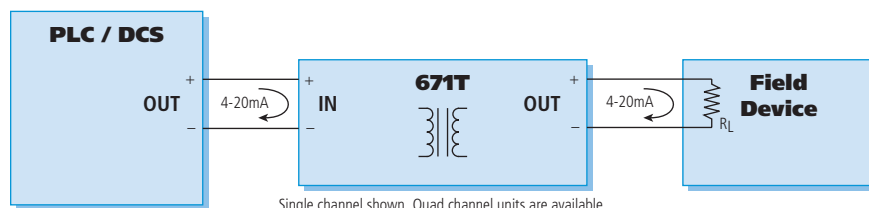
650T Series Isolation Diagram



Single channel shown. Dual channel units are available.

Note: 650T series transmitters are for two-wire transmitter interfaces (sinks current).
For application notes using 650T Transmitters, refer to Page 16.

670T Series Isolation Diagram



Single channel shown. Quad channel units are available.

Note: 670T series transmitters are for output resistive loads only (sources current).
For more information on the 670T Transmitter, refer to Page 14. Application notes are on Page 16.



Isolated Transmitters: 600T Series



Performance Specifications

Reference Test Conditions

Input/Output current: 4 to 20mA; output load 500 ohms; 77°F (25°C).

Input range

4 to 20mA input (each channel).

Input burden

Voltage drop (651T, 652T): Less than 1.5V, typical (75 ohm equivalent).

Voltage drop (653T): Less than 3.0V, typical (150 ohm equivalent).

Output range

4-20mA DC output (each channel).

$RI = (P_{supply} - 12V) / 0.02$

Output compliance

$P_{supply} = 12V + (0.02 \times R_{load})$

Output limiting

Outputs are limited to 36mA.

Output ripple

Less than $\pm 0.1\%$ of the maximum output span.

Accuracy

$\pm 0.1\%$ of output span. Error includes the combined effects of isolator repeatability, hysteresis, terminal point linearity and adjustment resolution.

Ambient temperature effect

Less than $\pm 0.006\%$ of input span per °F ($\pm 0.01\%$ per °C) over the ambient temperature range for reference test conditions. This specification includes the combined effects of zero and span over temperature.

Calibration

Two 15-turn potentiometers (zero and span) per channel, accessible from front of the unit.

Bandwidth

-3dB at 45Hz, typical.

Response time

For a step input, the output reaches 98% of output span in 15mS, typical.

Noise rejection

Common mode: 100dB at 60Hz, typical.

Normal mode: -5dB at 60Hz, 100 ohm source, typical.

Diagnostics

LED power indicator: Off for output open loop detection, power, or load compliance problem.

Field test points: An internal 10 ohm sense resistor provides test points for monitoring the output signal current during field maintenance.

◆ Environmental

Ambient Temperature

Operating: -25 to 70°C (-13 to 158°F).

Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity

5 to 95%.

Power Requirement

12 to 50V DC for each output channel.

Isolation

Inputs, outputs, and individual channels are isolated from each other for common-mode voltages up to 250V AC, or 354V DC off ground, on a continuous basis (will withstand 1500V AC dielectric strength test for one minute without breakdown).

Radiated Field Immunity (RFI)

Complies with EN61000-4-3 Level 3 (10V/m, 30 to 1000MHz) and European Norm EN50082-1.

Electromagnetic Field Immunity (EMI)

Less than $\pm 0.25\%$ of output span effect under the influence of electromagnetic fields from switching solenoids, commutator motors, and drill motors.

Surge Immunity

Complies with EN61000-4-5 Level 3 (2KV) and European Norm EN50082-1.

Electrical Fast Transient (EFT)

Complies with EN61000-4-4 Level 3 (2KV) and European Norm EN50082-1.

Electrostatic Discharge (ESD)

Complies with EN61000-4-2 Level 3 (8KV air, 4KV direct to the enclosure port) and European Norm EN50082-1.

Radiated Emissions

Meets or exceeds European Norm EN50081-1 for Class B equipment.

Approvals

CE marked, UL & cUL listed.

Hazardous Locations: Class I: Div. 2; Groups A, B, C, D

◆ Physical

Enclosure

Case: Self-extinguishing NYLON type 6.6 polyamide thermoplastic UL94 V-2 NEMA Type 1 enclosure.

Connectors (Removable Terminal Blocks)

Wire Range: AWG #14-22 (AWG #12 stranded only).

Printed Circuit Boards

Military grade FR-4 epoxy glass circuit board.

Dimensions

1.05W x 4.68H x 4.35D inches.

26.7W x 95.3H x 110.5D millimeters.

Shipping Weight

1 pound (0.45 Kg) packed.

Ordering Information

◆ Models

651T-0600

Single channel 2-wire transmitter

652T-0600

Dual channel 2-wire transmitter

653T-0600

Single input with dual isolated output transmitter

◆ Accessories (see Page 21)

PS5R-SD24

Power supply (24V DC, 2.5A).

TBK-B01

Optional terminal block kit, barrier strip style, 2 pcs.

TBK-S01

Optional terminal block kit, spring clamp style, 2 pcs.

DIN RAIL 3.0

DIN RAIL 16.7

DIN rail strip, Type T, 3 inches (75mm) or 16.7 inches (425mm)

20RM-16-DIN

19" rack-mount kit with DIN rail.

Holds sixteen 650T transmitters.



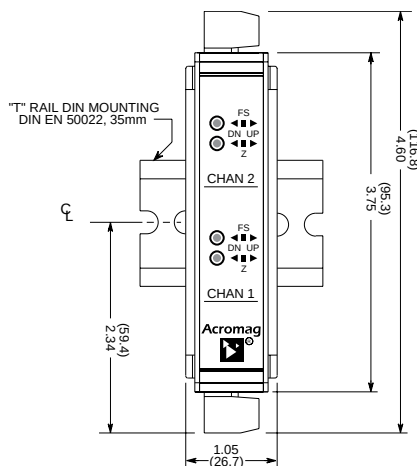
Optional terminal blocks: barrier strip (left) and spring clamp (right). Cage clamp terminal is standard.

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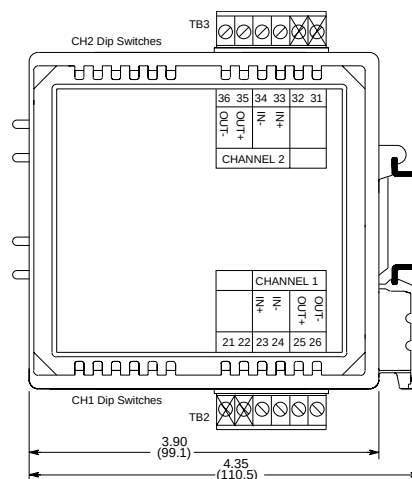


Isolated Transmitters: 600T Series

654T Multi-Channel, Two-Wire Transmitters



NOTE: ALL DIMENSION ARE IN INCHES (MILLIMETERS)



DC voltage input ♦ Dual-channel DC-powered transmitters

Description

Models

654T: Dual DC voltage input channels

These units accept DC voltage input signals, provide isolation, and output proportional DC current signals. With two independent I/O channels in a slim package, the 654T is ideal for panel shops and end-users who require a high-density signal conditioner that can cover a broad range of measurement applications.

Configuration is fast and easy. First, you select the input range for each channel with simple DIP switches. Then, you set your zero/full-scale output values using the noninteractive increase/decrease toggle switches on the front panel to modify the output signal until the desired output value is read on your voltmeter. The switches make it easy to calibrate a normal (proportional) or reverse-acting (inverse) response in seconds. After setting the desired calibration, you can engage the safety lockout feature on the DIP switch to prevent accidental changes and unauthorized tampering.

The 654T provides two independent high-voltage input isolation circuits. Loss of power or a failure on one channel has no effect on the other. The second channel can be used as a built-in spare for reduced downtime should the first channel fail. The spare channel becomes operational by simply moving the wired terminal block over to the vacant channel.

Input Ranges

Bipolar: $\pm 78\text{mV}$ to $\pm 625\text{mV}$ (selectable ranges)
Unipolar: 0–1.25 to 0–10V DC (selectable ranges)

Output Range

4 to 20mA DC

Power Requirement

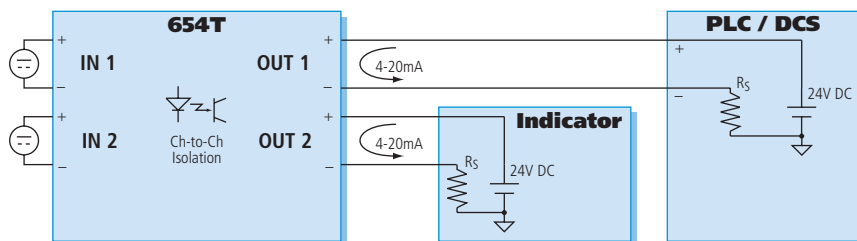
12 to 50V DC (loop-powered)
Two-wire transmitter

Approvals

CE marked, UL, cUL listed
Class I; Division 2; Groups A, B, C, D.

Key Features & Benefits

- DIP switch-configuration simplifies installation without analog pots, jumpers, or software.
- Isolation eliminates ground loops, reduces noise, and blocks transient signals.
- One-step calibration with increase/decrease toggle switches simplifies field adjustments for faster and easier maintenance.
- Automatic self-calibration compensates for temperature effects and component aging to deliver maintenance-free operation.
- Configuration lockout safety feature helps prevent tampering and accidental calibration changes.
- Reverse-acting output capability enables inverse proportional control signals.
- Dual channel model saves space and reduces equipment costs.
- High-resolution 16-bit $\Sigma-\Delta$ A/D converters deliver superior accuracy for more reliable measurements.
- Built-in transient voltage suppressors protect circuitry from electrical interference.



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Isolated Transmitters: 600T Series



Performance Specifications

◆ General Input

Analog to Digital Converter (ADC)

16-bit $\Sigma\text{-}\Delta$ A/D converter.

Noise Rejection

Normal Mode: Better than 40dB @ 60Hz with 100 ohm input unbalance.

Common Mode: Better than 140dB @ 60Hz with 100 ohm input unbalance.

Input Overvoltage Protection

Bipolar Transient Voltage Suppressors (TVS).

◆ DC Voltage Input

Input Range

DIP switch-selectable. See table below.

Input Range	Recommended Minimum Span (10%)
A) $\pm 78\text{mV}$	15mV
B) $\pm 156\text{mV}$	31mV
C) $\pm 313\text{mV}$	62mV
D) $\pm 625\text{mV}$	124mV
E) 0 to 1.25V	125mV
F) 0 to 2.5V	250mV
G) 0 to 5V	500mV
H) 0 to 10V	1000mV

Span adjust: See table above.

Zero adjust: 100% full range.

Input Impedance

110K ohms, typical

◆ Output

Output Range

Range: 4 to 20mA DC, 3.8 to 24mA range typical.

Output Compliance

$R_{LOAD} = (V_{SUPPLY} - 12V) / 0.02A$

600 ohms at 24V DC supply

Output Response Control

Proportional/inverse selectable.

Ambient Temperature Effect

Better than $\pm 0.018\%$ of input span per $^{\circ}\text{C}$ ($\pm 0.01\%$ per $^{\circ}\text{F}$).

Output Resolution

Output resolves to 1 part in 6546 for the nominal 4 to 20mA output span.

Output Response Time (for input step change)

980ms typical to 98% of final output value.

Accuracy (overall input to output)

$\pm 0.1\%$ of output span.

◆ Environmental

Ambient Temperature

Operating: -25 to 75°C (-13 to 167°F).

Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity

5 to 95%, noncondensing.

Power Requirement

12 to 50V DC @ 25mA for each output channel.

Isolation

Inputs, outputs, and individual channels are isolated from each other for common-mode voltages up to 250V AC, or 354V DC off ground, on a continuous basis (will withstand 1500V AC dielectric strength test for one minute without breakdown).

Radiated Field Immunity (RFI)

Designed to comply with EN61000-4-3 Level 3 and EN50082-1.

Electromagnetic Field Immunity (EMI)

Less than $\pm 0.25\%$ of output span effect.

Electrical Fast Transient (EFT)

Complies with EN61000-4-4 Level 3 (2KV) and EN50082-1.

Electrostatic Discharge (ESD)

Complies with EN61000-4-2 Level 3 (8KV air or 4KV direct) and EN50082-1.

Radiated Emissions

Meets or exceeds EN50081-1 for Class B equipment.

Approvals

CE marked, UL & cUL listed.

Hazardous Locations: Class I: Div. 2; Groups A, B, C, D

◆ Physical

Enclosure

Case: Self-extinguishing NYLON type 6.6 polyamide thermoplastic UL94 V-2 NEMA Type 1 enclosure.

Connectors (Removable Terminal Blocks)

Wire Range: AWG #12-24.

Printed Circuit Boards

Military grade FR-4 epoxy glass circuit board.

Dimensions

1.05W x 4.68H x 4.35D inches.

26.7W x 118.9H x 110.5D millimeters.

Shipping Weight

1 pound (0.45 Kg) packed.

Ordering Information

◆ Models

654T-0600

Dual channel DC voltage 2-wire transmitter.

Add "-C" suffix for optional factory configuration.

◆ Accessories (see Page 21)

PS5R-SD24

Power supply (24V DC, 2.5A).

TBK-B01

Optional terminal block kit, barrier strip style, 2 pcs.

TBK-S01

Optional terminal block kit, spring clamp style, 2 pcs.

DIN RAIL 3.0

DIN RAIL 16.7

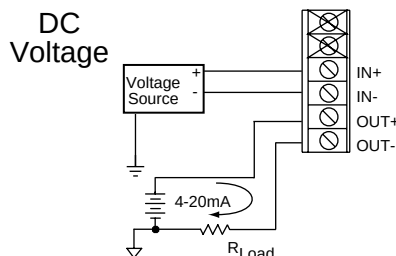
DIN rail strip, Type T, 3 inches (75mm) or 16.7 inches (425mm)

20RM-16-DIN

19" rack-mount kit with DIN rail.

Holds sixteen 650T transmitters.

Input Connections

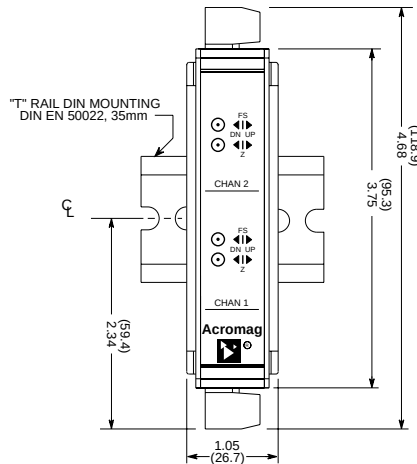


Optional terminal blocks: barrier strip (left) and spring clamp (right). Cage clamp terminal is standard.

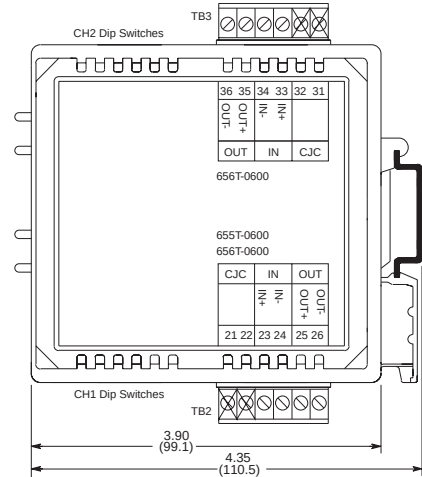
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Isolated Transmitters: 600T Series

655T, 656T Multi-Channel, Two-Wire Transmitters



NOTE: ALL DIMENSION ARE IN INCHES (MILLIMETERS)



Thermocouple and millivolt input ♦ Single/dual channel loop-powered transmitter

Description

Models

655T: Single TC/mV input channel

656T: Dual TC/mV input channel

These units accept universal thermocouple and millivolt input signals, provide isolation, and output proportional DC current signals. The output can also be linearized to the input sensor signal. Single-channel 655T and dual-channel 656T units are ideal for panel shops and end-users who require a high-density signal conditioner that can cover a broad range of temperature measurement applications.

Configuration is fast and easy. First, you select the input type with a simple DIP switch. Then, you set your zero/full-scale output values using a toggle switch on the front panel to increase or decrease the signal until you read the desired output value on your voltmeter. The toggles make it easy to calibrate a normal (proportional) or reverse-acting (inverse) response in seconds. After setting the desired calibration, just press the mode/set toggle and your configuration settings are safely saved to nonvolatile memory.

Both models provide high-voltage input isolation (output and power circuits share a common). On dual channel units, each channel operates independently, with inputs isolated from each other, to prevent interaction between channels.

Input Ranges

TC types: J, K, T, R, S, E, B, N
(DIP switch selection)

DC voltage: $\pm 15.6\text{mV}$ to $\pm 62.5\text{mV}$, 0 to 1V DC

Output Ranges

4 to 20mA DC

Power Requirement

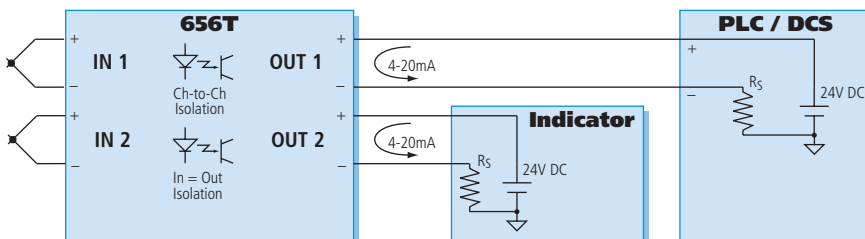
12 to 50V DC (loop-powered)
Two-wire transmitter

Approvals

CE marked. UL, cUL listed
Class I; Division 2; Groups A, B, C, D.

Key Features & Benefits

- Selectable thermocouple input types offer flexibility to fit many applications.
- DIP switch-configuration and self-ranging technologies speed installation without pots, jumpers, or software.
- Linearizer function provides an output that is linear to the temperature or millivolt signal.
- Isolation eliminates ground loops, reduces noise, and blocks transient signals.
- Toggle-switch calibration simplifies field adjustments for faster and easier maintenance.
- Configuration lockout safety feature prevents tampering and accidental changes.
- Reverse-acting output capability enables inverse proportional control signals.
- Dual channel model saves space and reduces equipment costs.
- CJC control only requires a millivolt source to calibrate modules
- High-resolution $\Sigma\text{-}\Delta$ A/D converters deliver superior accuracy for reliable measurements.



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Isolated Transmitters: 600T Series



Performance Specifications

◆ General Input

Analog to Digital Converter (ADC)
16-bit S-D A/D converter.

Noise Rejection

Normal Mode: Better than 40dB @ 60Hz.
Common Mode: Better than 100dB @ 60Hz.

Input Overvoltage Protection

Bipolar Transient Voltage Suppressors (TVS).

◆ Thermocouple Input

Input Ranges (switch-selectable)

TC Type	Temperature Range	Accuracy
J	-210 to 760°C (-346 to 1400°F)	±0.5°C
K	200 to 1372°C (-328 to 2502°F)	±0.5°C
T	-260 to 400°C (-436 to 752°F)	±0.5°C
R	-50 to 1768°C (-58 to 3214°F)	±1.0°C
S	-50 to 1768°C (-58 to 3214°F)	±1.0°C
E	-200 to 1000°C (-328 to 1832°F)	±0.5°C
B	260 to 1820°C (500 to 3308°F)	±1.0°C
N	-230 to 1300°C (-382 to 2372°F)	±0.5°C

Span adjust: Full range. 100°C or 3mV minimum span recommended.

Zero adjust: 0 to 90 % of full range.

Thermocouple Linearization

On/off selectable.

Thermocouple Break Detection

TC sensor failure can be configured for either upscale or downscale.

Cold Junction Compensation (CJC) Control

On/off selectable.

◆ Millivolt Input

Input Range

Ranges: ±15.6, ±31.3, ±62.5mV
0 to 0.125, 0.25, 0.5, 1.0V DC
Span adjust: 10 to 100% of range.
Zero adjust: 0 to 90% of range.

◆ Output

Output Range

Range: 4 to 20mA DC, 3.8 to 22mA range typical.

Output Compliance

$$R_{load} = (V_{supply} - 12V) / 0.02A$$

Output Response Control

Proportional/inverse selectable.

Ambient Temperature Effect

Better than ±0.006% of input span per °C or ±100ppm/°C, whichever is greater.

Output Response Time (for input step change)

700mS typical to 98% of final output value.

◆ Environmental

Ambient Temperature

Operating: -25 to 75°C (-13 to 167°F).
Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity

5 to 95%, noncondensing.

Power Requirement

12 to 50V DC @ 25mA for each output channel.

Isolation

Inputs, outputs, and individual channels are isolated from each other for common-mode voltages up to 250V AC, or 354V DC off ground, on a continuous basis (will withstand 1500V AC dielectric strength test for one minute without breakdown).

Radiated Field Immunity (RFI)

Complies with EN61000-4-3 Level 3 and EN50082-1.

Electromagnetic Field Immunity (EMI)

Less than ±0.25% of output span effect.

Electrical Fast Transient (EFT)

Complies with EN61000-4-4 Level 3 and EN50082-1.

Electrostatic Discharge (ESD)

Complies with EN61000-4-2 Level 3 and EN50082-1.

Radiated Emissions

Meets or exceeds EN50081-1 for Class B equipment.

Approvals

CE marked, UL & cUL listed.

Hazardous Locations: Class I: Div. 2; Groups A, B, C, D.

◆ Physical

Enclosure

Case: Self-extinguishing NYLON type 6.6 polyamide thermoplastic UL94 V-2 NEMA Type 1 enclosure.

Connectors (Removable Terminal Blocks)

Wire Range: AWG #12-24.

Printed Circuit Boards

Military grade FR-4 epoxy glass circuit board.

Dimensions

1.05W x 4.68H x 4.35D inches.
26.7W x 118.9H x 110.5D millimeters.

Shipping Weight

1 pound (0.45 Kg) packed.

Ordering Information

◆ Models

655T-0600

Single channel TC 2-wire transmitter. Full feature set.

656T-0600

Dual channel TC 2-wire transmitter. Full feature set.

Add "-C" suffix for optional factory configuration.

656T-E600

Dual channel TC 2-wire transmitter. Economy version.
TC Type J, K and 0-125mV input ranges only.
No linearization. No inverse output (proportional only).

Accessories (see Page 21)

PS5R-SD24

Power supply (24V DC, 2.5A).

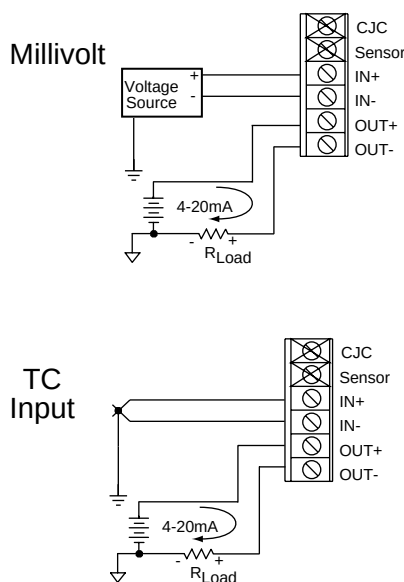
DIN RAIL 3.0

DIN RAIL 16.7

DIN rail strip, Type T,
3 inches (75mm) or 16.7 inches (425mm)

20RM-16 DIN

19" rack-mount kit with DIN rail.
Holds sixteen 650T series transmitters.

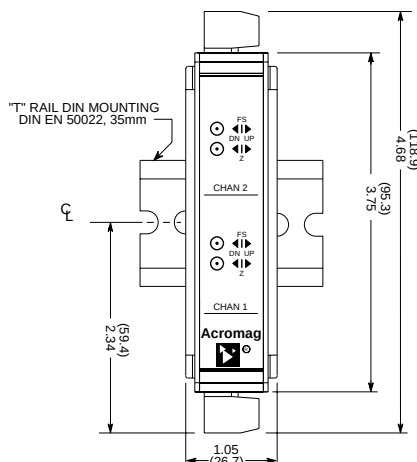


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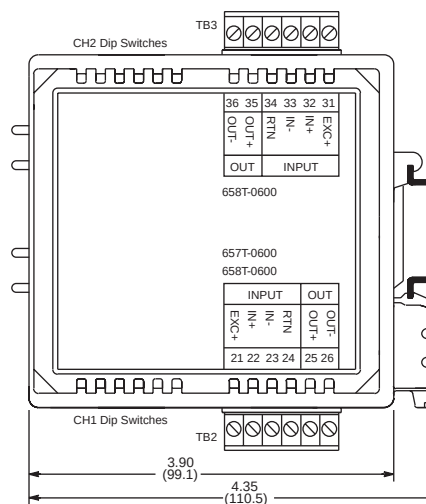


Isolated Transmitters: 600T Series

657T, 658T Multi-Channel, Two-Wire Transmitters



NOTE: ALL DIMENSION ARE IN INCHES (MILLIMETERS)



RTD / resistance input ♦ Single/dual channel loop-powered transmitter

Description

Models

657T: Single RTD input channel

658T: Dual RTD input channels

These units accept universal RTD or resistance input signals and output proportional DC current signals. The output can also be linearized to the input sensor signal. Single-channel 657T and dual-channel 658T units are ideal for panel shops and end-users who require a high-density signal conditioner that can accommodate a broad range of temperature measurement applications.

Configuration is fast and easy. First, you select the input type with a simple DIP switch. Then, you set your zero/full-scale output values using a toggle switch on the front panel to increase or decrease the signal until you read the desired output value on your voltmeter. The toggles make it easy to calibrate a normal (proportional) or reverse-acting (inverse) response in seconds. After completing the calibration, just press the mode/set toggle and your configuration settings are safely saved to nonvolatile memory.

Input Ranges

RTD: 100 ohm Pt, 120 ohm Ni, 10 ohm Cu

Resistance: 0 to 500 ohms

Output Range

4 to 20mA DC

Power Requirement

12 to 50V DC (loop-powered)

Two-wire transmitter

Approvals

CE marked. UL, cUL listed

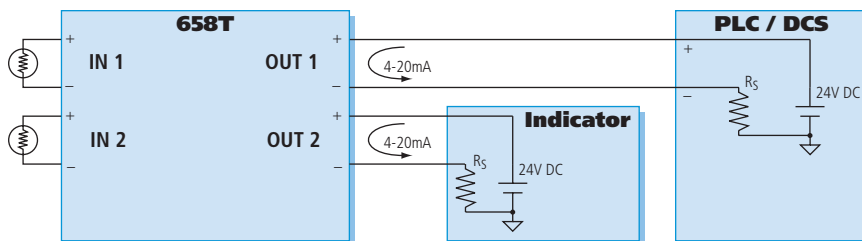
Class I; Division 2; Groups A, B, C, D.



Optional terminal blocks: barrier strip (left) and spring clamp (right). Cage clamp terminal is standard.

Key Features & Benefits

- Selectable RTD input types offer flexibility to fit many applications.
- DIP switch-configuration and self-ranging technologies speed installation without pots, jumpers, or software.
- Toggle-switch calibration simplifies field adjustments for faster and easier maintenance.
- Configuration lockout safety feature prevents tampering and accidental changes.
- Reverse-acting output capability enables inverse proportional control signals.
- Dual channel model saves space and reduces equipment costs.
- High-resolution Σ - Δ A/D converters deliver superior accuracy for reliable measurements.
- Lead break detection supports upscale or downscale failsafe mode.



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Isolated Transmitters: 600T Series



Performance Specifications

◆ General Input

Analog to Digital Converter (ADC)
16-bit S-D A/D converter.

Noise Rejection

Normal Mode: Better than 40dB @ 60Hz.
Common Mode: Better than 100dB @ 60Hz.

Input Overvoltage Protection

Bipolar Transient Voltage Suppressors (TVS).

Input Impedance

400K ohm at 10mV span;
input current, $\pm 25\text{nA}$, typical ($\pm 30\text{nA}$, max.).

◆ RTD Input

RTD Input Ranges

RTD	°C Range (°F Range)	Accuracy
Pt1	-200 to 850°C (-328 to 1562°F)	$\pm 0.25^\circ\text{C}$
Pt2	-200 to 850°C (-328 to 1562°F)	$\pm 0.25^\circ\text{C}$
Ni	-80 to 320°C (-112 to 608°F)	$\pm 0.25^\circ\text{C}$
Cu	200 to 260°C (-328 to 500°F)	$\pm 1.00^\circ\text{C}$

Alpha: Pt1 ($\alpha = 1.3850$), Pt2 ($\alpha = 1.3911$),
Ni $\alpha = 1.6720$, Cu ($\alpha = 1.4272$).

2, 3, or 4-wire configurations supported. Module provides sensor excitation, linearization, lead-wire compensation, and sensor break detection.

RTD Excitation Current

0.5mA DC typical, all types.

RTD Lead-Wire Compensation

25 ohms per lead.

RTD Break Detection

Configurable for either upscale or downscale.

◆ Resistance Input

Resistance Input Range

0 to 500 ohms.

Resistance Accuracy

± 0.05 ohms.

◆ Output

Output Range

Range: 4 to 20mA DC, 3.8 to 22mA range typical.

Output Compliance

$R_{load} = (V_{supply} - 12V) / 0.02A$

Output Response Control

Proportional/inverse selectable.

Ambient Temperature Effect

Better than $\pm 0.006\%$ of input span per $^\circ\text{C}$ or $\pm 100\text{ppm}/^\circ\text{C}$, whichever is greater.

Output Response Time (for input step change)

700mS typical to 98% of final output value.

◆ Environmental

Ambient Temperature

Operating: -25 to 75°C (-13 to 167°F).

Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity

5 to 95%, noncondensing.

Power Requirement

12 to 50V DC @ 25mA for each output channel.

Isolation

Not isolated.

Radiated Field Immunity (RFI)

Complies with EN61000-4-3 Level 3 and EN50082-1.

Electromagnetic Field Immunity (EMI)

Less than $\pm 0.25\%$ of output span effect.

Electrical Fast Transient (EFT)

Complies with EN61000-4-4 Level 3 and EN50082-1.

Electrostatic Discharge (ESD)

Complies with EN61000-4-2 Level 3 and EN50082-1.

Radiated Emissions

Meets or exceeds EN50081-1 for Class B equipment.

Approvals

CE marked, UL & cUL listed.

Hazardous Locations: Class I: Div. 2; Groups A, B, C, D.

◆ Physical

Enclosure

Case: Self-extinguishing NYLON type 6.6 polyamide thermoplastic UL94 V-2 NEMA Type 1 enclosure.

Connectors (Removable Terminal Blocks)

Wire Range: AWG #12-24.

Printed Circuit Boards

Military grade FR-4 epoxy glass circuit board.

Dimensions

1.05W x 4.68H x 4.35D inches.
26.7W x 118.9H x 110.5D millimeters.

Shipping Weight

1 pound (0.45 Kg) packed.

Ordering Information

◆ Models

657T-0600 (add "-C" for factory calibration)
Single channel RTD 2-wire transmitter

658T-0600 (add "-C" for factory calibration)
Dual channel RTD 2-wire transmitter

Add "-C" suffix for optional factory configuration.

◆ Accessories (see Page 21)

P55R-SD24

Power supply (24V DC, 2.5A).

TBK-B01

Optional terminal block kit, barrier strip style, 2 pcs.

TBK-S01

Optional terminal block kit, spring clamp style, 2 pcs.

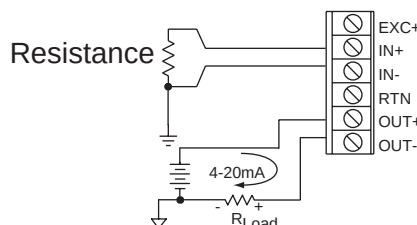
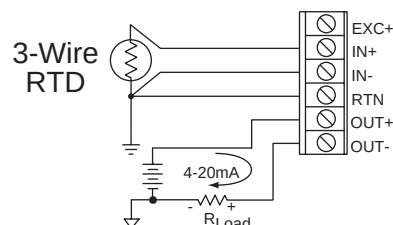
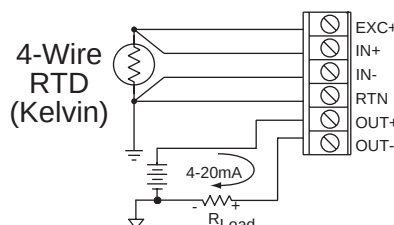
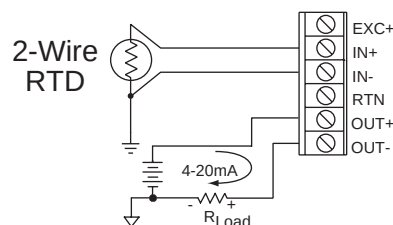
DIN RAIL 3.0

DIN RAIL 16.7

DIN rail strip, Type T, 3 inches (75mm) or
16.7 inches (425mm)

20RM-16-DIN

19" rack-mount kit with DIN rail.
Holds sixteen 650T transmitters.

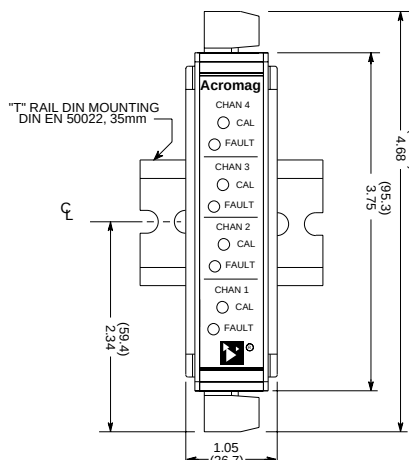


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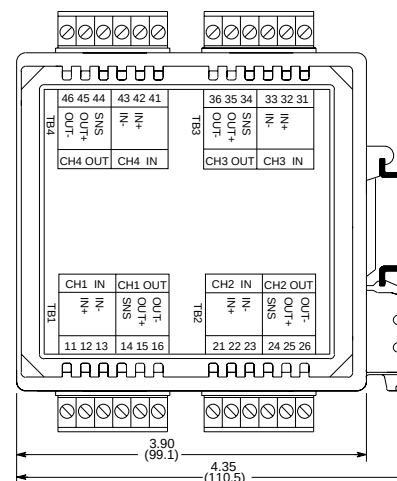


Isolated Transmitters: 600T Series

671T, 672T, 674T Multi-Channel, Two-Wire Isolators



NOTE: ALL DIMENSIONS ARE IN INCHES (MILLIMETERS)



DC current input ♦ Single, dual, or quad I/O loop-powered isolators

Description

Models

671T: Single I/O channel

672T: Dual I/O channel

674T: Quad I/O channel

These units receive 4-20mA process current inputs and provide isolated 4-20mA output signals. Each channel operates independently and is isolated from the others to prevent interaction between channels.

For easy troubleshooting, each unit has LEDs and diagnostic test points. Fault LEDs identify output open loop conditions and load compliance problems. The precision 10 ohm sense resistor enables monitoring of the output signal without disturbing field wiring.

Input / Output Ranges

4 to 20mA DC input

4 to 20mA DC output

Power Requirement

Loop-powered

(power derived from input signal current)

Approvals

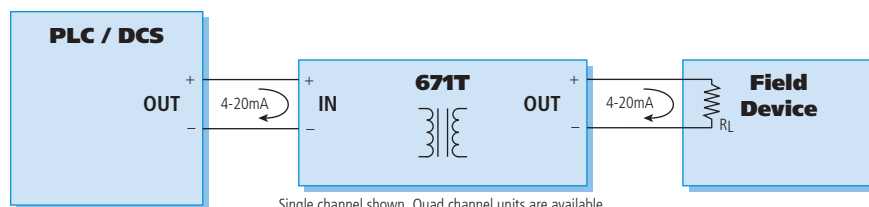
CE marked. UL, cUL listed.

Class I; Division 2; Groups A, B, C, D

Key Features & Benefits

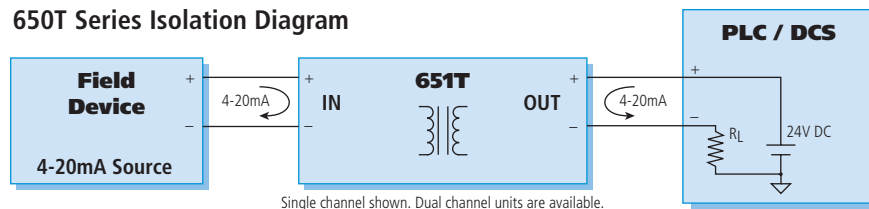
- Multiple channels on a single unit saves space and reduces costs.
- Galvanic isolation eliminates ground loops, reduces noise, and blocks transient signals.
- Independent channels prevent signal interaction and offer spares for later use.
- Fault LEDs provide a clear visual warning of open or failed process loops.
- Single calibration pot per channel enables one-step, precise calibration.

670T Series Isolation Diagram



Note: 670T series transmitters are for output resistive loads only (sources current).
For application notes using 670T Transmitters, refer to Page 16.

650T Series Isolation Diagram



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Isolated Transmitters: 600T Series



Performance Specifications

Reference Test Conditions

Input/Output current: 4 to 20mA; output load 250 ohms; 77°F (25°C).

Input

4 to 20mA input (each channel).

Input burden

The voltage drop is a function of the input current and load resistance and is calculated as follows:

Input Voltage Drop = 4.9V DC + (0.0212A x Rload)

Example:

For Rload = 250 ohms, Vdrop = 10.2V DC

Output

4-20mA DC output (each channel).

Output load

0 to 525 ohms.

Accuracy

Better than $\pm 0.1\%$ of output span. Error includes the combined effects of isolator repeatability, hysteresis, terminal point linearity and adjustment resolution.

Calibration

One 15-turn potentiometer per channel accessible from front of the unit.

Ambient temperature effect

Less than $\pm 0.01\%$ of output span per °F ($\pm 0.018\%$ per °C) over the ambient temperature range for reference test conditions. This specification includes the combined effects of zero and span over temperature.

Output ripple

Less than $\pm 0.1\%$ of the maximum output span.

Bandwidth

-3dB at 2.2Hz, typical.

Response time

For a step input, the output reaches 98% of output span in less than 300ms, typical, into 250 ohms.

Noise rejection

Common mode: 110dB at 60Hz, typical.

Diagnostics

LED fault indicator: Lights for output open loop detection or load compliance problem.

Field test points: An internal 10 ohm sense resistor provides test points for monitoring the output signal current during field maintenance with a voltmeter.

◆ Environmental

Ambient Temperature

Operating: -25 to 70°C (-13 to 158°F).
Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity

5 to 95%.

Power Requirement

Power is derived from the input signal loop. In the event of an open output circuit, the input loop voltage drop is limited below 20V, nominal. Isolator has reverse polarity protection.

Isolation

Inputs, outputs, and individual channels are isolated from each other for common-mode voltages up to 250V AC, or 354V DC off ground, on a continuous basis (will withstand 1500V AC dielectric strength test for one minute without breakdown).

Radiated Field Immunity (RFI)

Designed to comply with EN61000-4-3 Level 3 (10V/m, 80 to 1000MHz AM and 900MHz keyed) and European Norm EN50082-1.

Electromagnetic Field Immunity (EMI)

Less than $\pm 0.25\%$ of output span effect under the influence of electromagnetic fields from switching solenoids, commutator motors, and drill motors.

Electrical Fast Transient (EFT)

Complies with EN61000-4-2 Level 3 (8KV air, 4KV direct to the enclosure port) and European Norm EN50082-1.

Surge Immunity

Complies with EN61000-4-5 Level 3 (2KV) and European Norm EN50082-1.

Electrostatic Discharge (ESD)

Complies with EN61000-4-2 Level 3 (8KV air, 4KV direct to the enclosure port) and European Norm EN50082-1.

Radiated Emissions

Meets or exceeds European Norm EN50081-1 for Class B equipment.

Approvals

CE marked, UL & cUL listed.

Hazardous Locations: Class I: Div. 2; Groups A, B, C, D.

◆ Physical

Enclosure

Case: Self-extinguishing NYLON type 6.6 polyamide thermoplastic UL94 V-2 NEMA Type 1 enclosure.

Connectors (Removable Terminal Blocks)

Wire Range: AWG #14-22 (AWG #12 stranded only).

Printed Circuit Boards

Military grade FR-4 epoxy glass circuit board.

Dimensions

1.05W x 4.68H x 4.35D inches.
26.7W x 118.9H x 110.5D millimeters.

Shipping Weight

1 pound (0.45 Kg) packed.

Ordering Information

◆ Models

671T-0600

Single channel isolated transmitter

672T-0600

Dual channel isolated transmitter

674T-0600

Quad channel isolated transmitter

◆ Accessories (see Page 21)

PS5R-SD24

Power supply (24V DC, 2.5A).

TBK-B01

Optional terminal block kit, barrier strip style, 2 pcs. (For use with 671T and 672T model.s)

TBK-B02

Optional terminal block kit, barrier strip style, 4 pcs. (For use with 674T model.)

TBK-S01

Optional terminal block kit, spring clamp style, 2 pcs. (For use with 671T and 672T model.s)

TBK-S02

Optional terminal block kit, spring clamp style, 4 pcs. (For use with 674T model.)

DIN RAIL 3.0

DIN RAIL 16.7

DIN rail strip, Type T, 3 inches (75mm) or 16.7 inches (425mm)

20RM-16-DIN

19" rack-mount kit with DIN rail.
Holds sixteen 670T transmitters.

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Isolated Transmitters: 600T Series

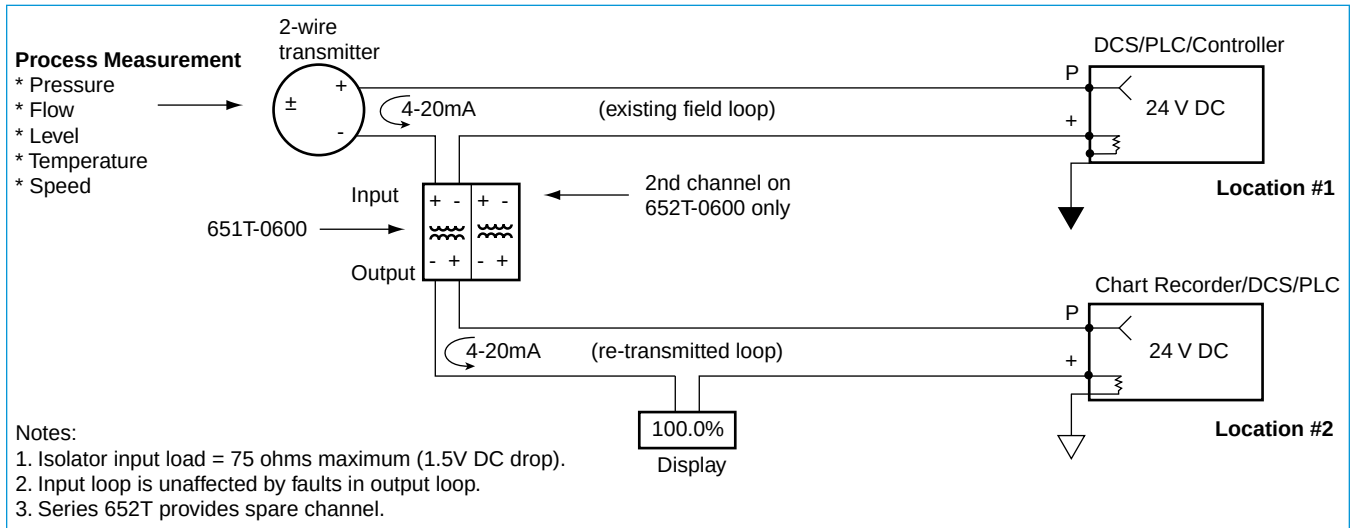
Application Notes

Application 1

Retransmitting a signal from a two-wire loop to a second location.

Solution

Use either a model 651T-0600 (single channel) or 652T-0600 (dual channel) transmitter.

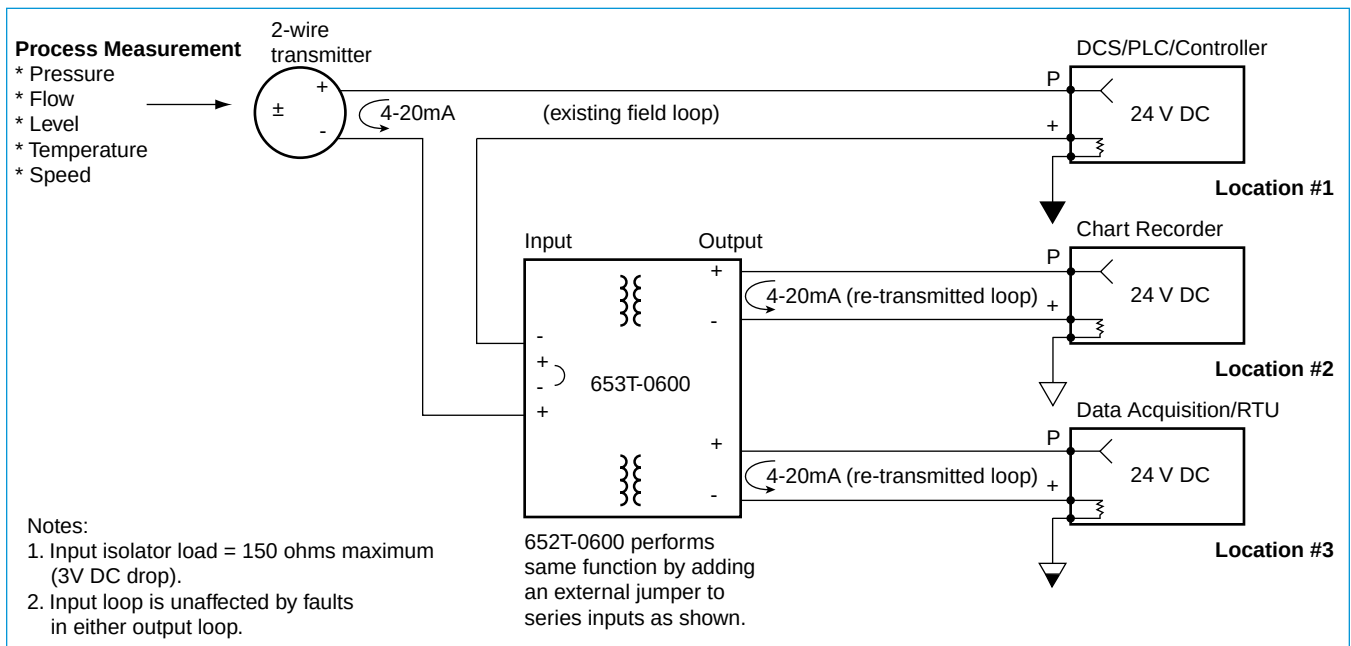


Application 2

Splitting a signal from a two-wire loop: two outputs for different locations.

Solution

Use either a 653T-0600 (single input, dual output) or 652T-0600 (dual input, dual output) unit.



Isolated Transmitters: 600T Series



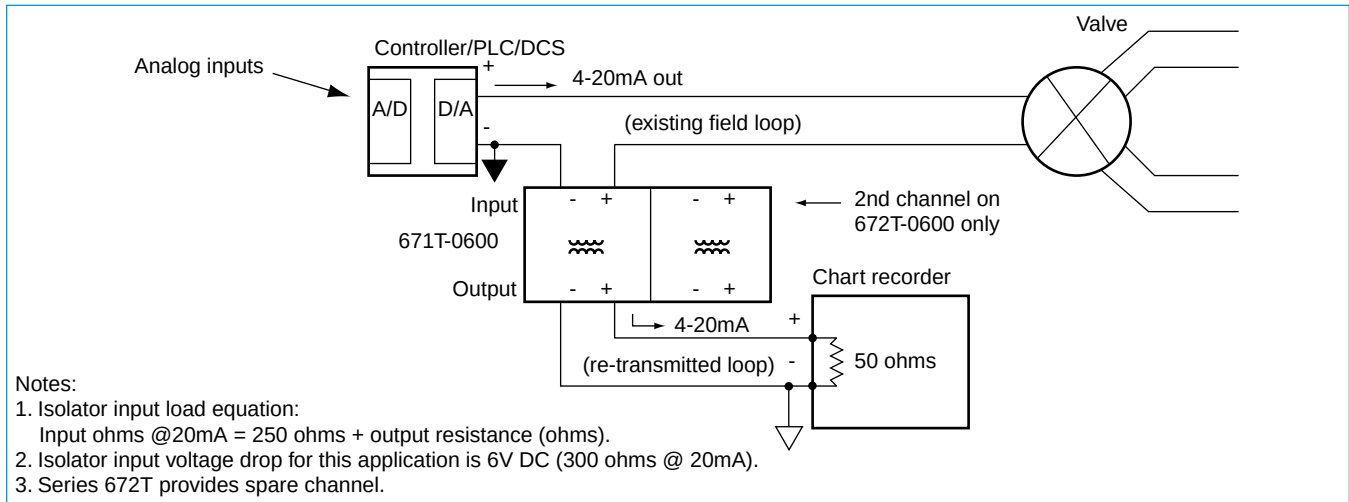
Application Notes

Application 3

Retransmitting a signal output from a controller or a D/A card.

Solution

Use either a model 671T-0600 (single channel) or 672T-0600 (dual channel) transmitter.

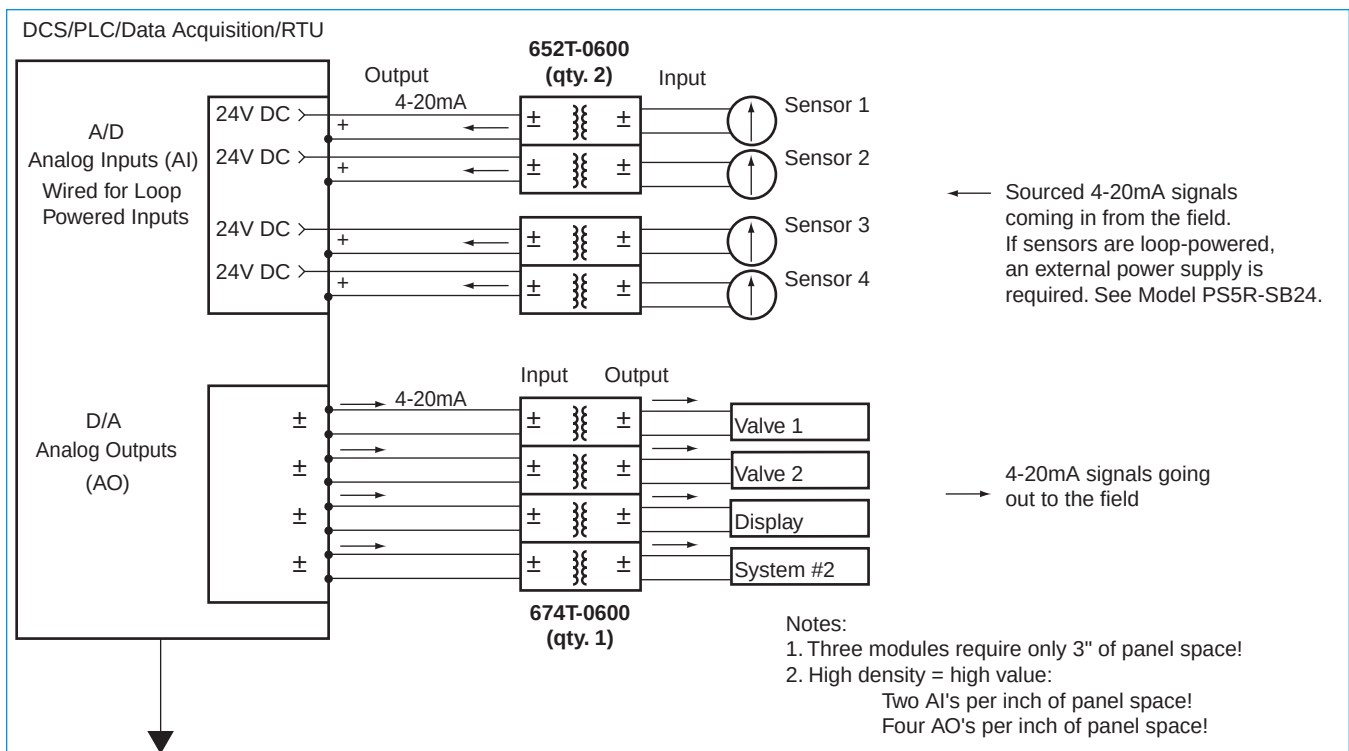


Application 4

Low-cost, channel-to-channel isolation of 4-20mA signals for controllers.

Solution

Use either a 652T-0600 (dual channel) for A/D cards or a 674T-0600 (quad channel) for D/A cards.



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Isolated Transmitters: 600T Series

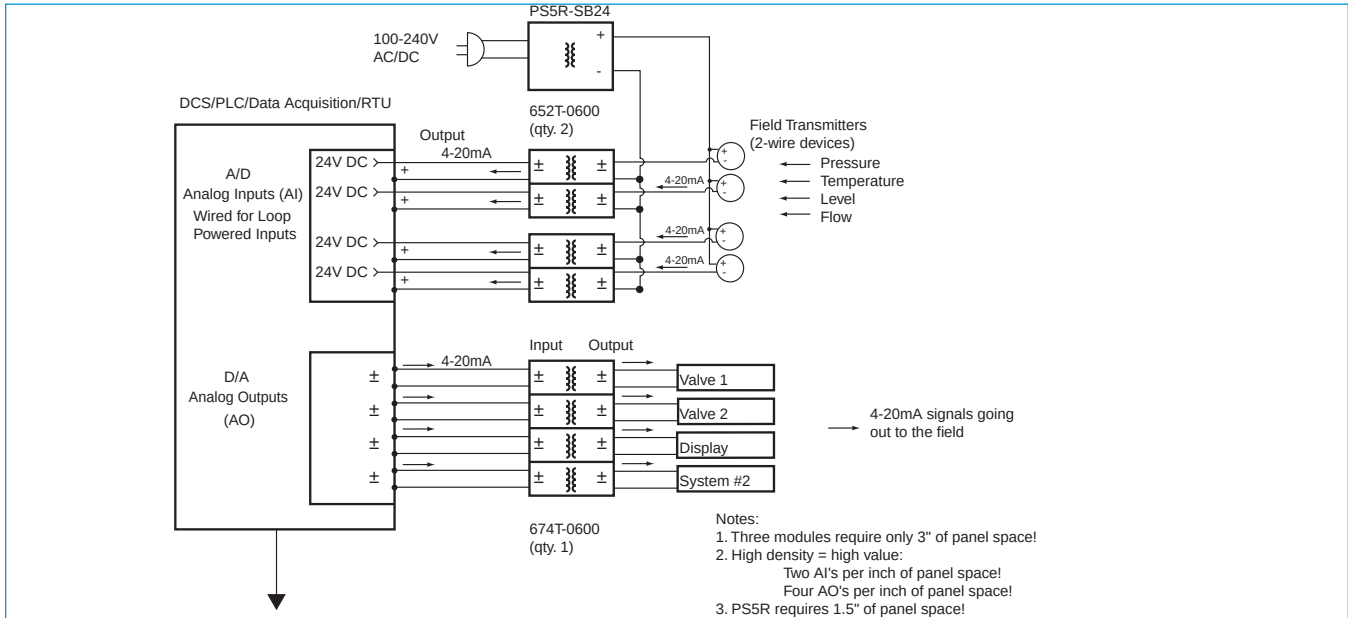
600T Application Notes

Application 5

Powering field transmitters (2-wire) and providing low-cost isolation of 4-20mA signals for controllers.

Solution

Model 652T-0600
Model 674T-0600
Model PSSR-SB24

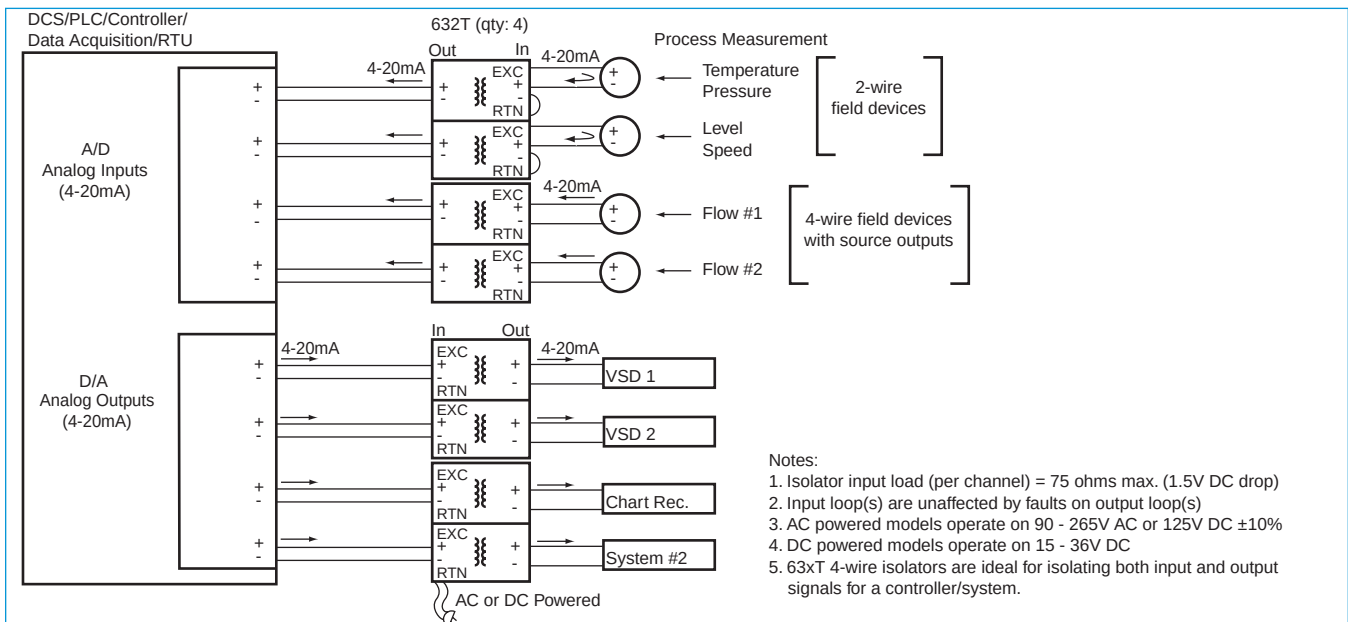


Application 6

Require 4-wire isolators for input and output signals for controller. Built-in excitation supply needed for some field 2-wire devices.

Solution

Model 632T-0100 (dual channel, AC powered) or
Model 632T-0500 (dual channel, DC powered).
Model 631T for single channel 4-wire isolators.



Isolated Transmitters: 600T Series



630T Application Notes

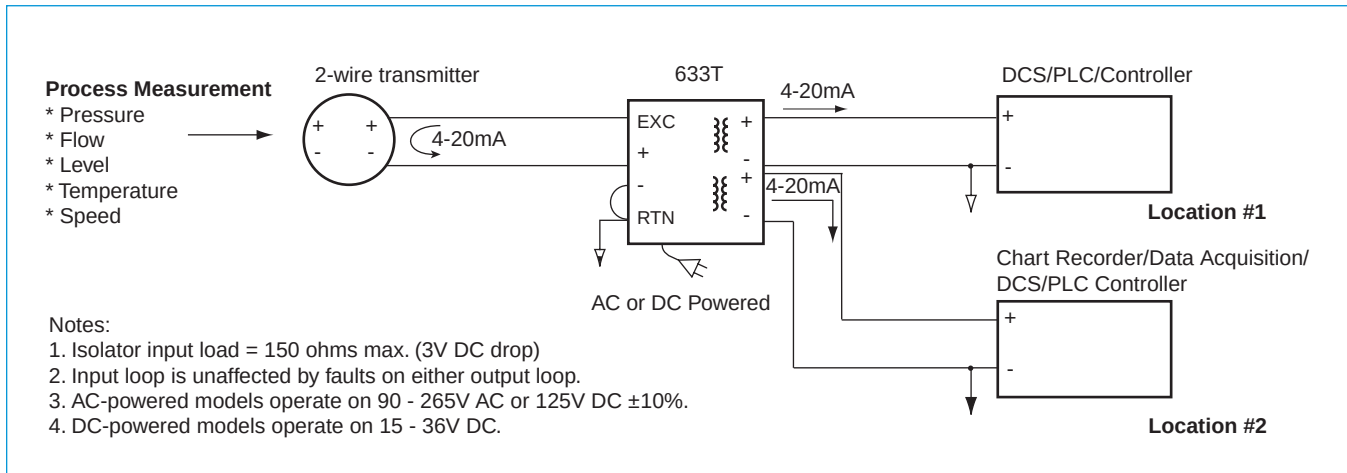
Application 7

Require a 4-wire isolator "splitter" to excite a field device and re-transmit 4-20mA to two locations.

Solution

Model 633T-0100 (AC powered) or
Model 633T-0500 (DC powered).

Use additional 633T units for re-transmitting to more locations. Install inputs in series with primary 4-20mA loop or the re-transmitted loops as required.

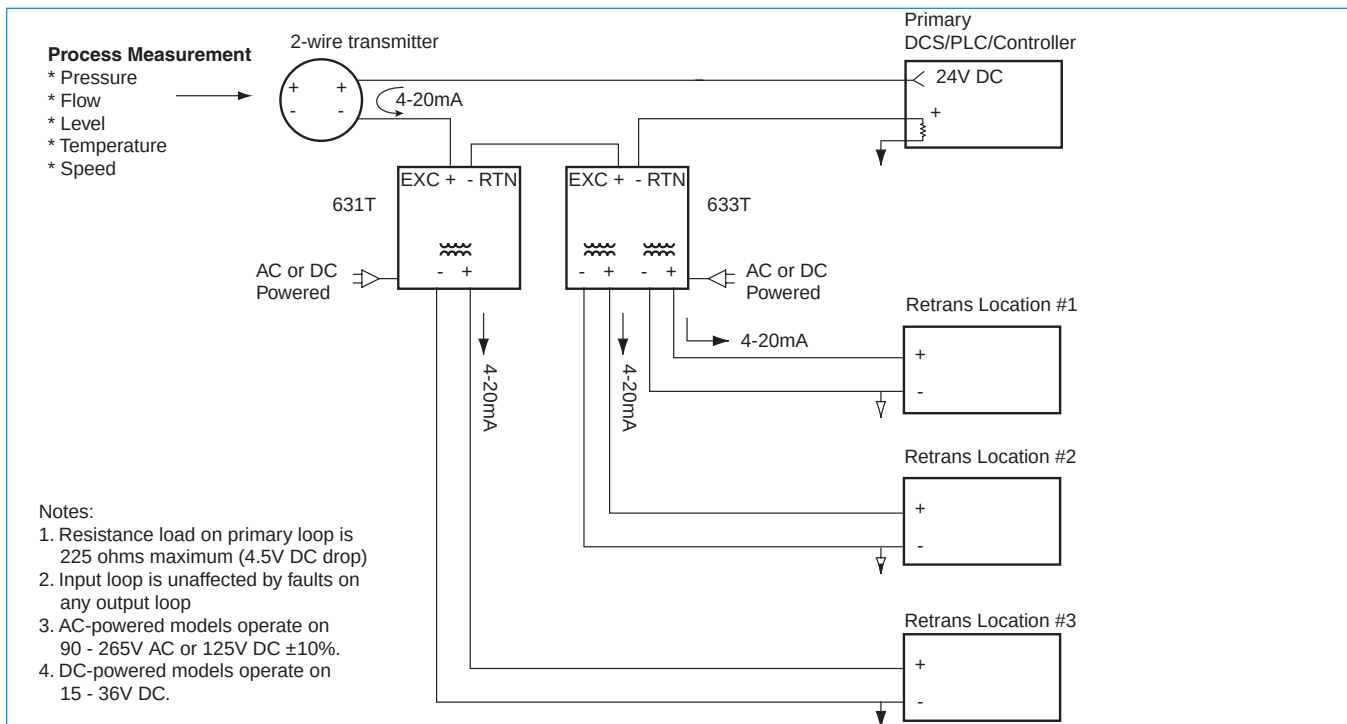


Application 8

Require 4-wire isolators to retransmit a 4-20mA signal to three locations.

Solution

Model 631T-0x00 (splitter) and
Model 631T-0x00 (one channel isolator).
(Where x = 1 or 5 for AC or DC power)



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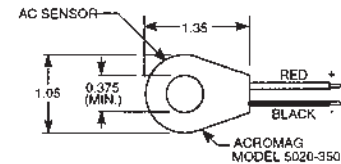


Isolated Transmitters: 600T Series

5020-350 Application Notes

1/24
HOUR
STOCK ITEM

2
YEAR
WARRANTY



Using Acromag's AC current sensor Model 5020-350

Many Acromag instruments with DC current input can be used in conjunction with an external AC Current Sensor to precondition an AC current input signal. This sensor is a highly accurate toroidal instrument transformer that converts an AC current signal to a safe, low-level, DC milliamper signal (0 to 11.17mA).

The transmitters only accept the isolated low-level signal produced by the AC current sensing transformer and cannot be connected directly to the source of AC power without damage or safety risk. The AC Current Sensor is fully insulated and designed for mounting near the source of the AC current. The input AC current range is a simple function of the number of turns placed on the AC Current Sensor (see the table below). The benefits to using an external sensor (external from the transmitter) include the following:

◆ Low losses:

It is not practical to run AC currents over long distances because of significant resistance voltage drops at high currents. The low-level DC milliamper signal output from the AC Current Sensor can be transmitted safely over long distances, allowing the transmitter to be remotely located from the AC power wiring.

◆ Safety:

The AC Current Sensor's output leads can be open or short circuited and these conditions do not affect the AC current loop or cause damage to the sensor. Likewise, the wires connecting the AC Current Sensor to the transmitter can be easily removed from the transmitter's input terminals without concern or hazard.

◆ Ease of Calibration:

The AC current input range can be easily scaled in the field by simply changing the number of primary turns at the sensor, with no additional calibration required. That is, the AC current input span is a simple function of the number of primary turns placed on the AC Current Sensor and sensor/transmitter calibration is not affected by this. Refer to Applications "A" & "B" of the diagrams on the next page.

Sensor Primary Turns	AC Current Input Range	Sensor Output (red/black wires)
1	0 to 20 Amps AC	0 to 11.17mA DC
2	0 to 10 Amps AC	0 to 11.17mA DC
4	0 to 5 Amps AC	0 to 11.17mA DC
10	0 to 2 Amps AC	0 to 11.17mA DC
20	0 to 1 Amps AC	0 to 11.17mA DC

The AC Current Sensor is isolated and can be used in AC circuits up to 250V AC, 50 or 60 Hz. It is designed to be mounted at the source of the AC current to be measured. The transmitter can be located remotely from the AC signal and wired using small gauge wire. The sensor's output wires can be shorted, open-circuited, or removed from the transmitter's input terminals, without hazard to personnel or the AC Current Sensor.

DANGER:

If the AC Current Sensor is used with an AC Current Transformer (C.T.), disconnect power to the C.T., or short the output of the C.T., before removing the wire going through the AC Current Sensor. If this is not done, an open circuited C.T. will generate high voltages (hazardous) and possible C.T. damage.

The output wires of the sensor are polarized: the Red wire is (+) plus and the Black wire is (-) minus. Normally, these output wires are attached to one end of a cable (user supplied) and the other end connects to the transmitter's input. Connect the Current Sensor output leads to the transmitter input by connecting Red (+) to the transmitter's plus (+) terminal, and Black (-) to the transmitter's minus (-) terminal. Proper polarity must be observed.

WARNING:

The input to the module can only come from the AC Current Sensor output wires (red/black). If AC current is directly attached to the transmitter's input terminals, the transmitter will be destroyed and safety compromised.

For most applications, it is recommended that the minus (-) transmitter input terminal be connected to an earth ground. The connections between the AC Current Sensor would be floating if not grounded. Grounding eliminates the risk of high common-mode voltages from showing up on the wires and reduces noise pickup.

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Using Acromag's AC current sensor Model 5020-350

Several Acromag transmitters with DC current input can be used in conjunction with an external AC Current Sensor to precondition an AC current input signal. This sensor is a highly accurate toroidal instrument transformer that converts an AC current signal to a safe, low-level, DC milliamper signal (0 to 11.17mA).

The transmitters only accept the isolated low-level signal produced by the AC current sensing transformer and cannot be connected directly to the source of AC power without damage or safety risk. The AC Current Sensor is fully insulated and designed for mounting near the source of the AC current. The input AC current range is a simple function of the number of turns placed on the AC Current Sensor (see the table below). The benefits to using an external sensor (external from the transmitter) include the following:

■ Low losses:

It is not practical to run AC currents over long distances because of significant resistance voltage drops at high currents. The low-level DC milliamper signal output from the AC Current Sensor can be transmitted safely over long distances, allowing the transmitter to be remotely located from the AC power wiring.

■ Safety:

The AC Current Sensor's output leads can be open or short circuited and these conditions do not affect the AC current loop or cause damage to the sensor. Likewise, the wires connecting the AC Current Sensor to the transmitter can be easily removed from the transmitter's input terminals without concern or hazard.

■ Ease of Calibration:

The AC current input range can be easily scaled in the field by simply changing the number of primary turns at the sensor, with no additional calibration required. That is, the AC current input span is a simple function of the number of primary turns placed on the AC Current Sensor and sensor/transmitter calibration is not affected by this. Refer to Applications "A" & "B" of the diagrams on the next page.



Acromag's Flat Pack transmitters are shown with the AC current sensor toroidal transformer.

Sensor Primary Turns	AC Current Input Range	Sensor Output (red/black wires)
1	0 to 20 Amps AC	0 to 11.17mA DC
2	0 to 10 Amps AC	0 to 11.17mA DC
4	0 to 5 Amps AC	0 to 11.17mA DC
10	0 to 2 Amps AC	0 to 11.17mA DC
20	0 to 1 Amps AC	0 to 11.17mA DC

The AC Current Sensor is isolated and can be used in AC circuits up to 250V AC, 50 or 60 Hz. It is designed to be mounted at the source of the AC current to be measured. The transmitter can be located remotely from the AC signal and wired using small gauge wire. The sensor's output wires can be shorted, open-circuited, or removed from the transmitter's input terminals, without hazard to personnel or the AC Current Sensor.

DANGER:

If the AC Current Sensor is used with an AC Current Transformer (C.T.), disconnect power to the C.T., or short the output of the C.T., before removing the wire going through the AC Current Sensor. If this is not done, an open circuited C.T. will generate high voltages (hazardous) and possible C.T. damage.

The output wires of the sensor are polarized: the Red wire is (+) plus and the Black wire is (-) minus. Normally, these output wires are attached to one end of a cable (user supplied) and the other end connects to the transmitter's input. Connect the Current Sensor output leads to the transmitter input by connecting Red (+) to the transmitter's plus (+) terminal, and Black (-) to the transmitter's minus (-) terminal. Proper polarity must be observed.

WARNING:

The input to the module can only come from the AC Current Sensor output wires (red/black). If AC current is directly attached to the transmitter's input terminals, the transmitter will be destroyed and safety compromised.

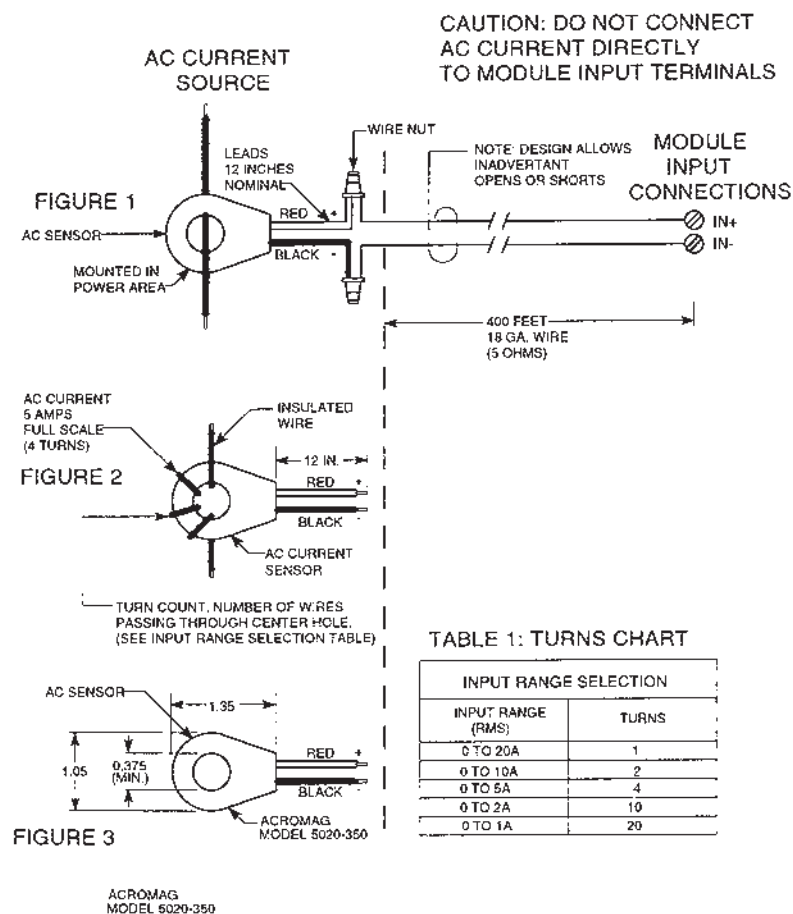
For most applications, it is recommended that the minus (-) transmitter input terminal be connected to an earth ground. The connections between the AC Current Sensor would be floating if not grounded. Grounding eliminates the risk of high common-mode voltages from showing up on the wires and reduces noise pickup.

Supported Products

- IntelliPack Series Transmitters and Alarms
- 610T Series Isolated Transmitters
- ACR Series Isolated Transmitters
- Flat Pack 250T/350T/450T Series Transmitters and 361A/461A Series Alarms
- SmartPack Series LonWorks® I/O Modules



Dimensions and Electrical Connections

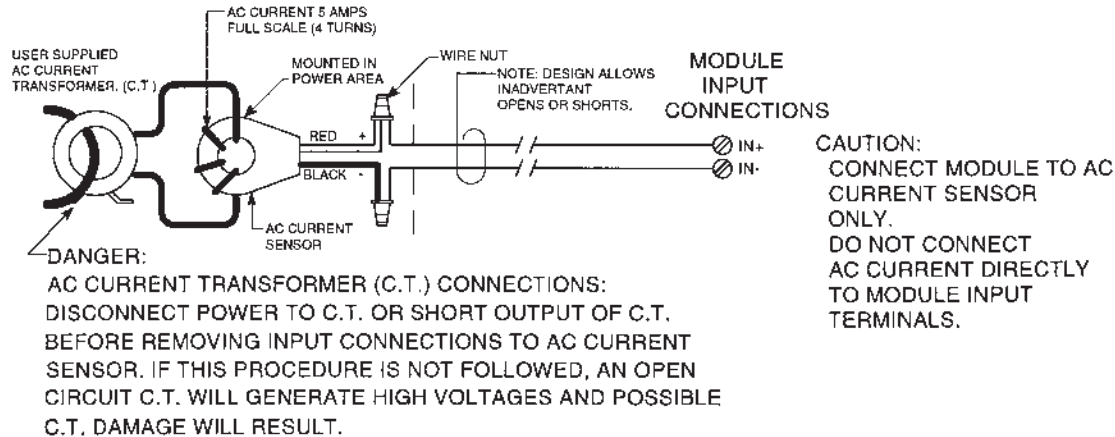


THIS SENSOR IS USED WITH VARIOUS ACROMAG INPUT MODULES - PLEASE REFERENCE THE USER'S MANUAL FOR THE MODULE FOR ADDITIONAL INFORMATION.

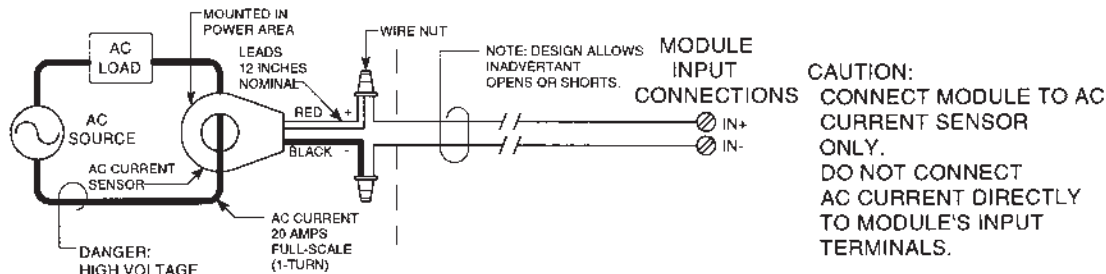


Application Examples

APPLICATION EXAMPLE A: AC CURRENT TRANSFORMER (C.T.)



APPLICATION EXAMPLE B: 115V/230VAC ELECTRICAL CIRCUIT



MODEL 5020-350 AC CURRENT SENSOR ELECTRICAL CONNECTIONS

Isolated Transmitters: 600T Series



Accessories

◆ Terminal Blocks

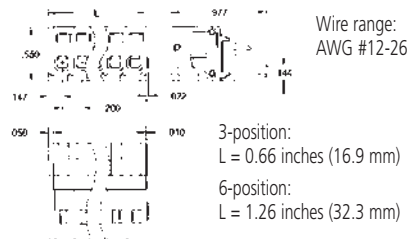
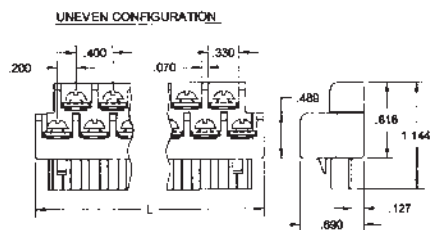


Barrier Strip Terminal Blocks*

Spring Clamp Terminal Blocks*

Ordering Information

* I/O modules ship with cage clamp terminal blocks. Terminal block kits are for replacement purposes. See I/O module information for compatibility



Barrier Strip

TBK-B01
Terminal block kit,
two 6-position pieces

TBK-B02
Terminal block kit, four
6-position pieces

TBK-B03
Terminal block kit, one
3-position and three
6-position pieces

Spring Clamp

TBK-S01
Terminal block kit,
two 6-position pieces

TBK-S02
Terminal block kit,
four 6-position pieces

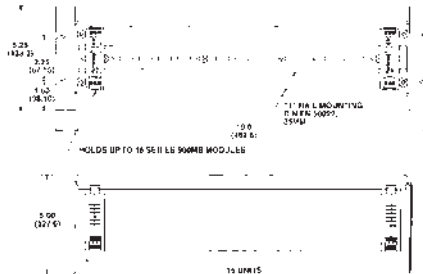
TBK-S03
Terminal block kit,
one 3-position and
three 6-position pieces

◆ Mounting Hardware



Din-Rail Mounting

For your convenience, Acromag offers several mounting accessories to simplify your system installation. Our 19" rack-mount kit provides a clean solution for mounting your I/O modules and a power supply. Or you can buy precut DIN rail strips for mounting on any flat surface.

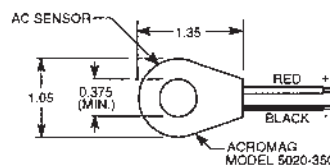


Ordering Information

20RM-16-DIN
19" rack-mount kit with DIN rail.

DIN RAIL 3.0
DIN RAIL 16.7
DIN rail strip, Type T, 3 inches (75mm) or
16.7 inches (425mm)

◆ AC Current Sensor



This external sensor measures a 0-20A AC signal and provides a DC mA output for an Ethernet input module. It enables remote mounting of the I/O module for safe monitoring of the AC signal.

Ordering Information

5020-350
AC current sensor

◆ Power Supplies



60W Universal Slimline Power Supply

Input Power Requirement
85 to 264V AC or 100 to 370V DC

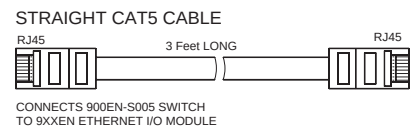
Output
24V DC, 2.5A (60W)

Ordering Information

PS5R-SD24
Universal 60W power supply

Visit www.acromag.com for additional models and more information.

◆ Cables



Ordering Information

5035-355
Ethernet straight cable, CAT5, 3 feet long, shielded
5035-360
Ethernet crossover cable, CAT5E, 5 feet long, shielded

Acromag [®]
THE LEADER IN INDUSTRIAL I/O



Isolated Transmitters



270i Isolators DC Current Input

The 270i accepts a process current input and provides an isolated 4 to 20mA process current output signal. Power is received from the input signal current.

These isolators use transformer isolation to effectively break the electrical path between the transmitted signal and the receiving device. This eliminates ground loops, reduces noise, and helps protect against transients for more accurate and reliable measurements.

This product is also extremely easy to install. All units are factory calibrated for loads up to 600 ohms to eliminate any need for load trim adjustments.

Input Range

- 4 to 20mA DC

Output Range

- 4 to 20mA DC

Power Requirement

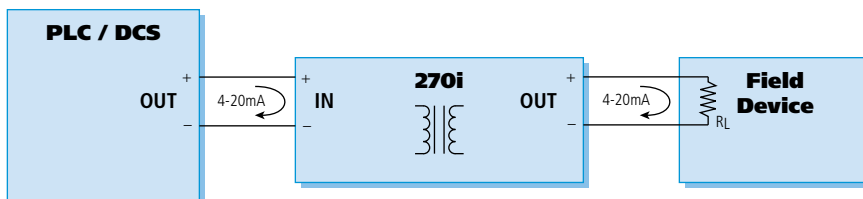
- 12 to 50V DC @ 20mA (loop-powered), power is derived from the input signal current. Loop-burden: 10.8V@250 ohm output load.

Approvals

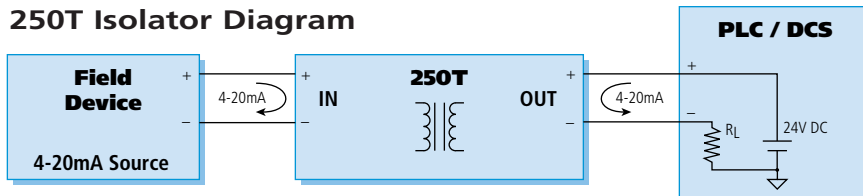
CSA: C22.2 No. 142

Class I; Division 1; Groups A, B, C, D
Class I; Division 2; Groups A, B, C, D
Class II; Division 1; Groups E, F, G

270i Isolator Diagram



250T Isolator Diagram



For more information about the 250T Transmitter, refer to Page 144.

Special Features

- Excellent accuracy and stability ensure reliable measurements in harsh industrial environments.
- 1500V AC peak isolation (250V AC or 354V DC continuous) prevents ground loops.
- RFI and EMI resistance minimize the effects of environmental noise.
- Calibration is independent of the load to eliminate load compensation adjustments
- Zero and span adjustment enable precise calibration.
- Compact, 1-inch wide housing uses less space for easier installation in control panels.
- Input current sense resistor simplifies field diagnostics

Performance

Input

Input Range

4 to 20mA input. Power is derived from the input signal loop. Input current should be limited to less than 50mA to prevent damage to the isolator. In the event of an open output circuit, the input loop voltage drop is limited to 20V, nominal. Isolator has reverse polarity protection.

Zero and span

Zero and span trim adjustments utilize 22-turn potentiometers accessible from front of the unit.

Input voltage drop

The voltage drop is a function of the input current and load resistance and is calculated as follows:

$$\text{Input Voltage Drop} = 5.4V \text{ DC} + (0.0216A \times R_{\text{LOAD}})$$

Example ($R_{\text{LOAD}} = 250 \text{ ohms}$):

$$\text{Input Voltage Drop} =$$

$$5.4V \text{ DC} + (0.0216A \times 250 \text{ ohms}) = 10.8V \text{ DC}.$$

Current sense resistor

A built-in 10 ohm ($\pm 0.1\%$) resistor can monitor input current to the isolator. Wiring to the isolator's input terminals determines if this resistor is included in the current loop. Use of this resistor provides a test signal of 40 to 200mV, representing 4 to 20mA.

Continued on the next page.



Performance (continued)

■ Output

Output Range

4-20mA DC output.

A. For R_{LOAD} from 50 to 600 ohms, connect R_{LOAD} between Output (+) and Output (-) terminals.

B. For R_{LOAD} from 0 to 50 ohms, connect R_{LOAD} between Output (S) and Output (-) terminals. For optimum performance at low values of R_{LOAD}, the isolator has a built-in pad resistor of 50 ohms.

1. Input Voltage Drop (input sense resistor not used):
 $V_{DROP} = 5.4V\ DC + (0.0216A \times (R_{LOAD} + 50\ ohms))$

2. Input Voltage Drop (input sense resistor used)
 $V_{DROP} = 5.6V\ DC + (0.0216A \times (R_{LOAD} + 50\ ohms))$

Accuracy

±0.1% of output span. Error includes the combined effects of isolator repeatability, hysteresis, terminal point linearity and adjustment resolution.

Load resistance effect

Less than ±0.1% of output span as load resistance is changed over entire range. Allows use of isolator, within resistance load range, without the need to recalibrate the isolator for a particular load.

Output ripple

Less than ±0.1% of the maximum output span.

Bandwidth

-3dB at 3Hz, typical.

Response time

For a step input, the output reaches 98% of output span in 180ms, typical.

■ Environmental

Ambient temperature range

Operating: -13 to 185°F (-25 to 85°C).

Storage: -40 to 185°F (-40 to 85°C).

Ambient temperature effect

Less than ±0.006% of output span per °F (±0.01% per °C) over the ambient temperature range for reference test conditions. This specification includes the combined effects of zero and span over temperature.

Isolation

The input and output circuits are isolated from each other for common-mode voltages up to 250V AC, or 354V DC off ground, on a continuous basis (will withstand 1500V AC dielectric strength test for one minute without breakdown).

Noise rejection

Common mode: 110dB at 60Hz, typical.

RFI resistance

Less than ±0.5%, of output span effect.

EMI resistance

Less than ±0.25% of output span effect.

Surge withstand capability (SWC)

Input/Output terminations rated per ANSI/IEEE C37.90-1978. Unit is tested to a standardized test waveform that is representative of surges (high frequency transient electrical interference), observed in actual installations.

■ Ordering Information

Select one option from each column. Example: 270i-20MA-DIN-NCR

Base	Input	Mounting		Approval
270i	-20MA	-DIN	-N4	-NCR
		-ST	-N12	-DT1
		-SM	-XP	

Input Options

-20MA: 4.0 to 20.0mA DC

Mounting Options

Mountings

-DIN: DIN rail G or T mount

-ST: SNAPTRACK mount

-SM: Surface-mount

External housings

-N4: NEMA 4, water-tight, holds two

-N12: NEMA 12, oil-tight, holds two

-XP: Explosion-proof NEMA 4, holds one

Approval Options

-NCR: No certification/approval required.

-DT1†: CSA approval, Div. 2 hazardous locations:

Class I; Div. 2; Groups A, B, C, D.

Ordering Notes

* Unit requires factory calibration. Append "-C" to end of model number. Specify ranges on order.

† Units are shipped separately from any optional enclosures (i.e. units are not installed in any external housing).

Accessories

Power supplies

See Power Supplies on Page 199.

DIN RAIL 3.0

DIN RAIL 16.7

DIN rail strip, Type T, 3 inches (75mm) or 16.7 inches (425mm)

20RM-16-DIN

19" rack-mount kit with DIN rail.

Holds sixteen 270i isolators.



Isolated Transmitters



2
YEAR
WARRANTY

330i and 430i Signal Isolators DC Current Input

Models

330i: DC-powered transmitter series

430i: AC-powered transmitter series

Input Range

- 4 to 20mA DC

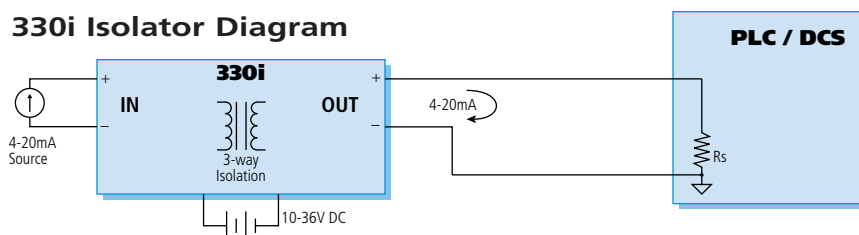
Output Range

- 4 to 20mA DC

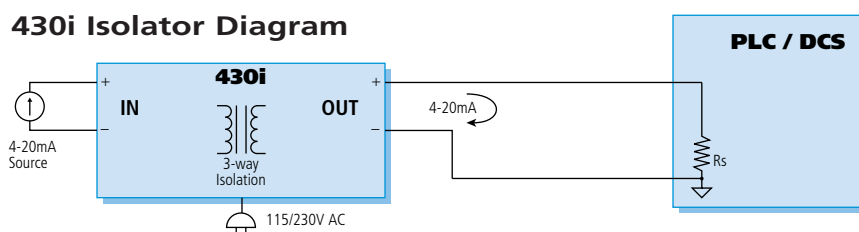
Power Requirements

- 330i: 10 to 36V DC
85mA with 15V supply, 55mA at 24V
- 430i:
115V AC @ 0.040A
230V AC @ 0.020A

330i Isolator Diagram



430i Isolator Diagram



Description

Series 330i and 430i isolators provide 3-way isolation and do not require recalibration for different loads.

Both the 330i and 430i accept a 4 to 20mA process current input and provide a 3-way isolated process current output signal.

These isolators use transformer isolation to effectively break the electrical path between the transmitted signal, receiving device, and power. This eliminates ground loops, reduces noise, and helps protect sensitive instruments from transients for more accurate and reliable measurements.

The 330i and 430i are also extremely easy to use. Advanced circuitry eliminates the need to recalibrate as loads change and allows us to provide factory calibration regardless of the load. And, for highly reliable field operation, they withstand extreme ambient temperatures and have excellent temperature coefficients.

Special Features

- 3-way isolation; input, output, and power circuits are isolated from each other.
- 1500V AC peak isolation (250V AC or 354V DC continuous) prevents ground loops.
- Excellent accuracy and stability ensure reliable measurements in harsh industrial environments
- RFI and EMI resistance minimize the effects of environmental noise
- Factory calibration is provided standard
- Calibration is independent of the load to eliminate load compensation adjustments
- Wide power supply range on 330i handles more applications to reduce inventory stock
- DC power used with 330i carry lower voltages and do not require expensive conduit for safer and easier installation.
- Low input burden (1.3V typical), independent of load, helps prevent overloading of the loop
- High load compliance drives output load resistances up to 1050 ohms independent of supply voltage
- 25mS response time delivers fast updates to monitoring and control systems.
- Zero and span adjustment enable precise calibration.



Performance

Reference test conditions

Input/Output current: 4 to 20mA; output load 250 ohms; 25°C ambient; 15V DC or 115V AC supply.

Input

Input

4 to 20mA DC, with an input drop less than 1.5V DC (75 ohms) at full-scale. IMPORTANT: Input current must not exceed 100mA or damage to the unit may occur.

Zero and span

Zero and span trim adjustments utilize 15-turn potentiometers accessible on front of the unit.

Output

Output

4 to 20mA DC $R_{LOAD} = 0$ to 1050 ohms.

Output limiting

Output current limited to less than 28mA, nominal.

Output ripple

Less than $\pm 0.1\%$ of maximum output span.

Accuracy

Better than $\pm 0.1\%$ of output span. Error includes the combined effects of isolator repeatability, hysteresis, terminal point linearity and adjustment resolution. Does not include sensor error.

Bandwidth

-3dB at 50Hz, typical, with 500 ohm load.

Response time

For a step input, the output reaches 98% of output span in 25ms, typical, with a 500 ohm load. Response time will vary with load resistance.

Power

Power (330i)

10V to 36V DC, current draw is a function of supply voltage (refer to table below)

Supply Voltage	Supply Current at 20mA Output	At Current Limit
10V	135mA	200mA
12V	105mA	145mA
15V	85mA	110mA
24V	55mA	70mA
36V	45mA	50mA

Power (430i)

-1: 115V AC $\pm 10\%$, 50 to 60Hz, 0.040A max.
-2: 230V AC $\pm 10\%$, 50 to 60Hz, 0.020A max.

Power supply effect

330i: Less than $\pm 0.001\%$ of output span per volt for rated supply variations.

430i: Less than $\pm 0.01\%$ of output span for rated supply variations.

Environmental

Ambient temperature range

-13 to 185°F (-25 to 85°C)

Ambient temperature effect

Less than $\pm 0.003\%$ of output span per °F ($\pm 0.005\%$ per °C) over the ambient temperature range for reference test conditions. This specification includes the combined effects of zero and span over temperature.

Isolation

Three-way isolation between input, output, and power circuits for common mode voltages up to 250V AC, or 354V DC off ground, on a continuous basis (withstand 1500V AC dielectric strength test for sixty seconds without breakdown).

Noise rejection

Normal Mode: -6 dB at 60Hz, typical, 500 ohm load.

RFI resistance

Less than $\pm 0.5\%$, of output span with RFI field strengths of up to 10V/meter at frequencies of 27, 151 and 467 MHz.

EMI resistance

Less than $\pm 0.25\%$ of output span effect with switching solenoids or commutator motors.

Surge withstand capability (SWC)

Input/Output terminations rated per ANSI/IEEE C37.90-1978. Unit is tested to a standardized test waveform that is representative of surges (high frequency transient electrical interference), observed in actual installations.

Physical

Construction

Circuit boards: Military grade FR-4 epoxy glass.

Terminals: Compression type, 14 AWG max.

Case: Self-extinguishing NYLON Type 6.6 polyamide thermoplastic UL94V-2, color black. General Purpose, NEMA Type 1 enclosure.

Circuit board coating: Fungus resistant acrylic conformal coat.

Mounting position: Position insensitive.

Ordering Information

Isolators

330i-C1-Y-DIN-NCR

Single-channel isolator unit, DC-powered.

430i-C1-Y-1-DIN-NCR

Single-channel isolator unit, 115V AC-powered.

430i-C1-Y-2-DIN-NCR

Single-channel isolator unit, 230V AC-powered.

Accessories

Power supplies

See Power Supplies on Page 199.

DIN RAIL 3.0

DIN RAIL 16.7

DIN rail strip, Type T, 3 inches (75mm) or 16.7 inches (425mm)

20RM-16-DIN

19" rack-mount kit with DIN rail. Holds ten 330i or 430i transmitters.

350T-N4-WM

NEMA 4 water-tight enclosure, wall-mount. Holds one 330i/430i transmitter.

350T-N12-WM

NEMA 12 oil-tight enclosure, wall-mount. Holds one 330i/430i transmitter.



Isolated Transmitters



340i Isolators DC Current Input

Input Range

- 4 to 20mA DC

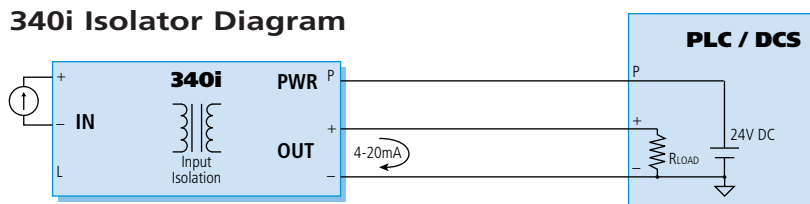
Output Range

- 4 to 20mA DC

Power Requirement

- 10 to 36V DC @ 30mA

340i Isolator Diagram



Description

The 340i accepts a process current input and provides an isolated 4 to 20mA process current output signal.

These isolators use transformer isolation to effectively break the electrical path between the transmitted signal and the receiving device. This eliminates ground loops, reduces noise, and helps protect against transients for more accurate and reliable measurements.

This product is also extremely easy to install. All units are factory calibrated to eliminate any need for load trim adjustments. Also, up to eight isolators at a location can share a single Acromag 35PS power supply for a more convenient and cost-effective solution.

Special Features

- Excellent accuracy and stability ensure reliable measurements in harsh industrial environments.
- 1500V AC peak isolation (250V AC or 354V DC continuous) prevents ground loops.
- Calibration is independent of the load to eliminate load compensation adjustments
- Zero and span adjustment enable precise calibration.
- RFI and EMI resistance minimize the effects of environmental noise.
- Low power consumption helps prevent expensive upgrades to larger power supplies.
- 25mS response time delivers fast updates to monitoring and control systems.
- Compact, 1-inch wide housing uses less space for easier installation in control panels.



■ Performance

Reference test conditions

Input/Output current: 4 to 20mA; output load 250 ohms; 77°F (25°C); 15V DC supply.

■ Input

Input

4 to 20mA DC, input drop less than 1.5V at full-scale. Input current must not exceed 100mA.

Zero and span

The Zero and Span trim adjustments utilize 15-turn potentiometers which are accessible from the front of the unit. Isolator is DIN-rail mounted.

■ Output

Output

4 to 20mA DC.

The output shares a common with the power supply.

NOTE: Voltage output is not available on this unit, use Model 350T on Page 144 if this is a requirement.

Load resistance range equation

$R_{LOAD\ MAX} = (Min.\ VDC\ supply - 5.0V) / 0.02A$

At 10.0V DC supply, $R_{LOAD} = 0$ to 250 ohms

At 15.0V DC supply, $R_{LOAD} = 0$ to 500 ohms

At 24.0V DC supply, $R_{LOAD} = 0$ to 950 ohms

Output limiting

135% of full scale output, nominal.

Output ripple

Less than $\pm 0.1\%$ of maximum output span.

Bandwidth

-3dB at 50Hz, typical, with 500 ohm load.

Response time

For a step input, the output reaches 98% of output span in 25mS, typical, 500 ohm load.

Accuracy

Better than $\pm 0.1\%$ of output span. Error includes the combined effects of isolator repeatability, hysteresis, terminal point linearity and adjustment resolution. Does not include sensor error.

■ Power

Power

10.0V to 36.0V DC, 30mA at full scale, 35mA at limit. The external DC power supply is connected between the output (P) and (-) terminals. The current specified is for rated supply inputs and full scale output. Diode on isolator provides reverse polarity protection. Note: Do not exceed 36V DC peak, to avoid damage to the isolator.

Power supply effect

DC Volts: Less than $\pm 0.001\%$ of output span per volt.

60/120Hz Ripple: Less than $\pm 0.01\%$ of span per volt peak to peak of power supply ripple.

■ Environmental

Ambient temperature range

Operating: -13 to 185°F (-25 to 85°C).

Storage: -40 to 185°F (-40 to 85°C).

Ambient temperature effect

Less than $\pm 0.003\%$ of output span per °F ($\pm 0.005\%$ per °C) over the ambient temperature range for reference test conditions. This specification includes the combined effects of zero and span over temperature.

Isolation

The input circuit is electrically isolated from the output and power circuits, allowing the input to operate at up to 250V AC, or 354V DC off ground, on a continuous basis (will withstand 1500V AC dielectric strength test for one minute without breakdown). Complies with test requirements outlined in ANSI C39.5-1974 for the voltage rating specified.

Noise rejection

Common mode: -6 dB at 60Hz, typical, 500 ohm load.

RFI resistance

Less than $\pm 0.5\%$, of output span with RFI field strengths of up to 10V/meter at frequencies of 27, 151 and 467 MHz.

EMI resistance

Less than $\pm 0.25\%$ of output span effect with switching solenoids or commutator motors.

Surge withstand capability (SWC)

Input/Output terminations rated per ANS/IEEE C37.90-1978. Unit is tested to a standardized test waveform that is representative of surges (high frequency transient electrical interference), observed in actual installations.

■ Physical

Construction

Circuit boards: Military grade FR-4 epoxy glass.

Terminals: Compression type, 14 AWG max.

Case: Self-extinguishing NYLON Type 6.6 polyamide thermoplastic UL94V-2, color black. General Purpose, NEMA Type 1 enclosure.

Circuit board coating: Fungus resistant acrylic conformal coat.

Mounting position: Position insensitive.

■ Ordering Information

Isolator

340i-C1-Y-DIN-NCR

Single-channel 4-20mA isolator.

Accessories

Power supplies

See Power Supplies on Page 199.

DIN RAIL 3.0

DIN RAIL 16.7

DIN rail strip, Type T, 3 inches (75mm) or 16.7 inches (425mm)

20RM-16-DIN

19" rack-mount kit with DIN rail. Holds sixteen 340i transmitters.

350T-N4-WM

NEMA 4 water-tight enclosure, wall-mount. Holds two 340i transmitters.

350T-N12-WM

NEMA 12 oil-tight enclosure, wall-mount. Holds two 340i transmitters.



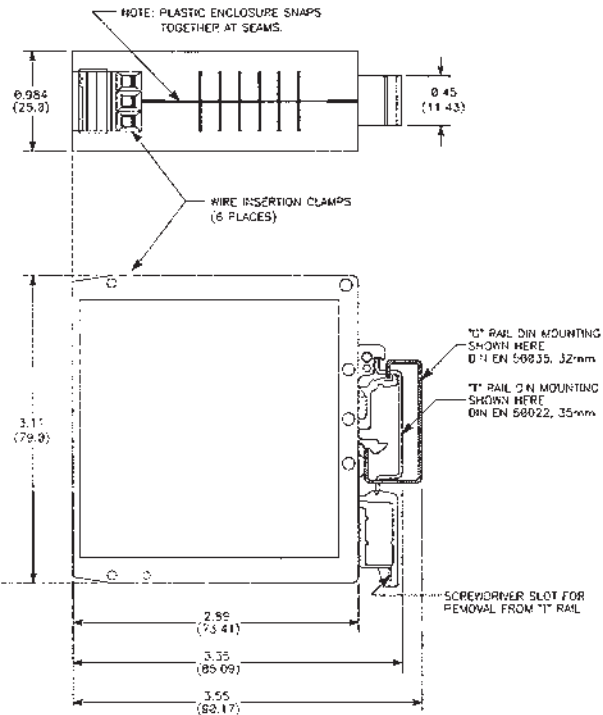
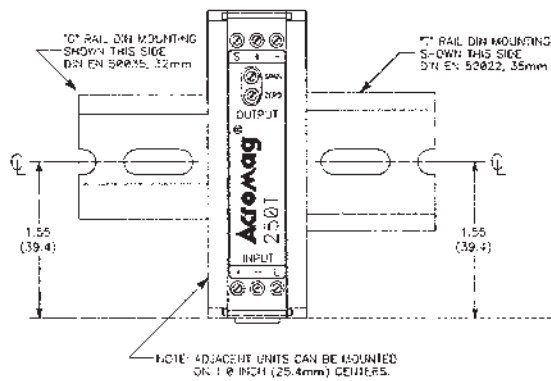
Dimensions

Transmitters: 250T, 350T

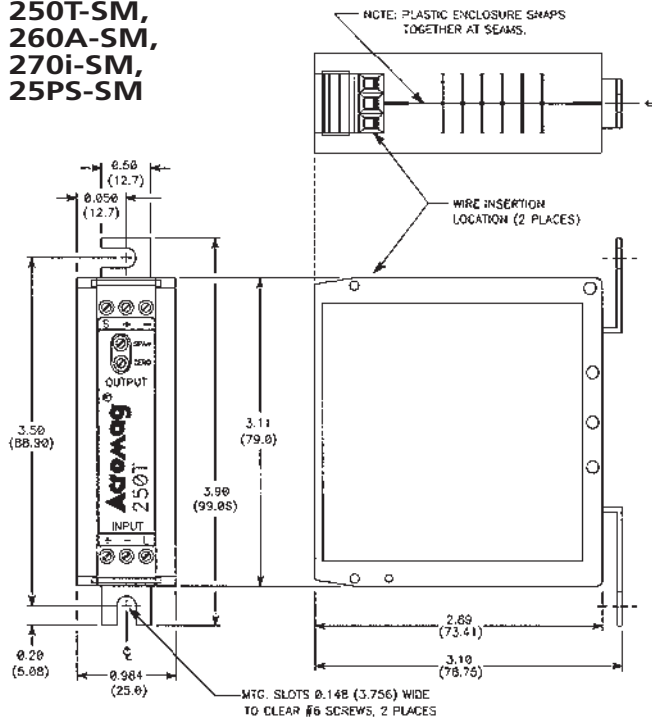
Isolators: 270i, 340i,

Limit Alarms: 260A

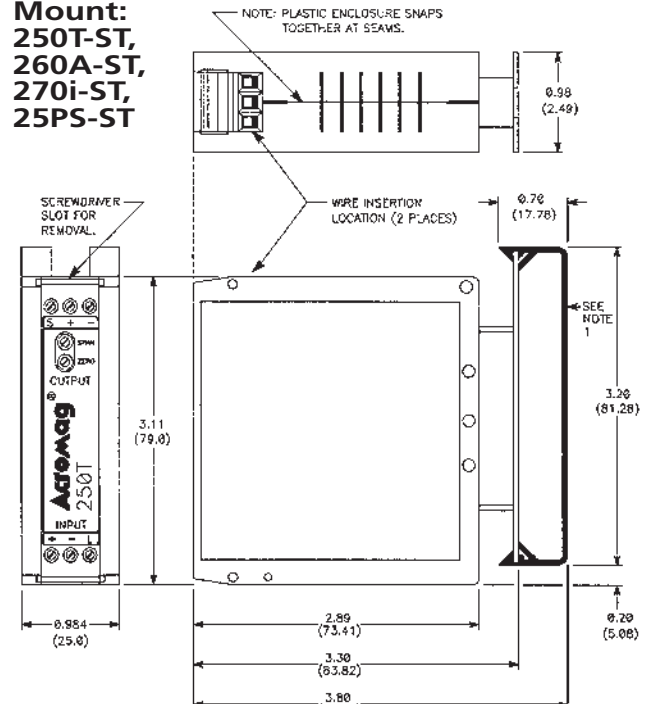
Power Supplies: 25PS, 35PS-2U



Surface Mount:
250T-SM,
260A-SM,
270i-SM,
25PS-SM



Snaptrack Mount:
250T-ST,
260A-ST,
270i-ST,
25PS-ST



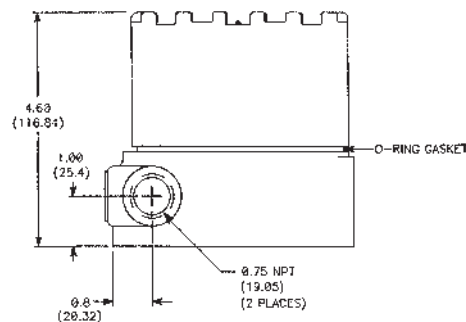
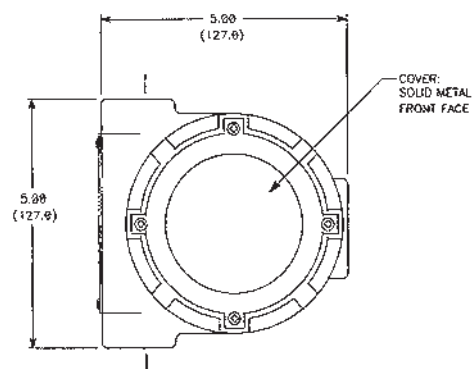
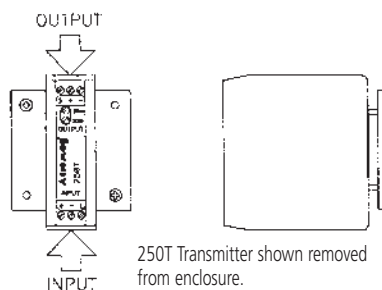
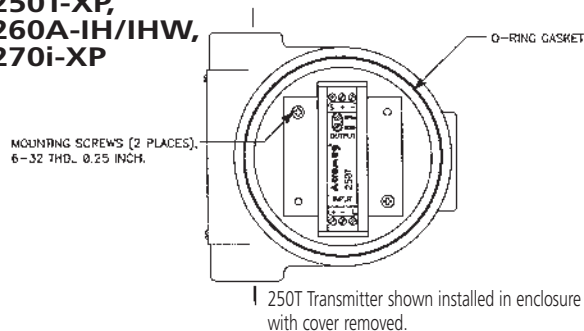
Dimensions are in inches (millimeters).



Dimensions

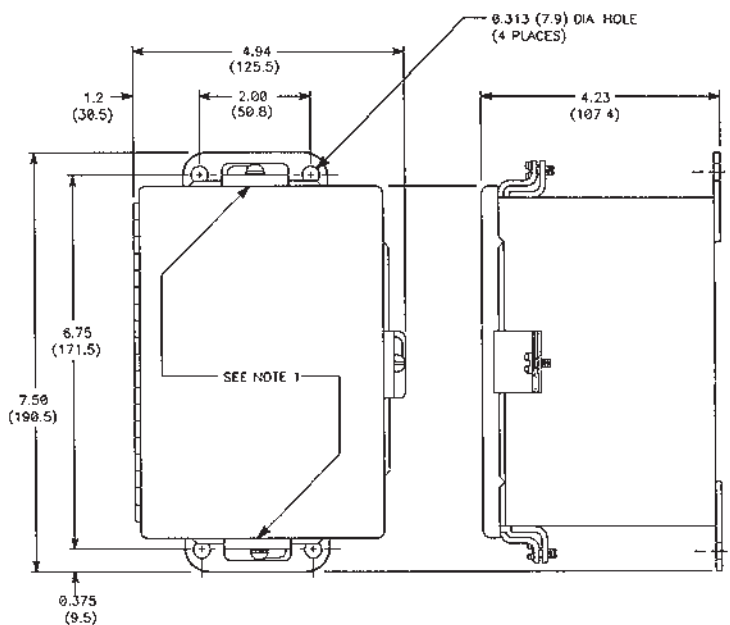
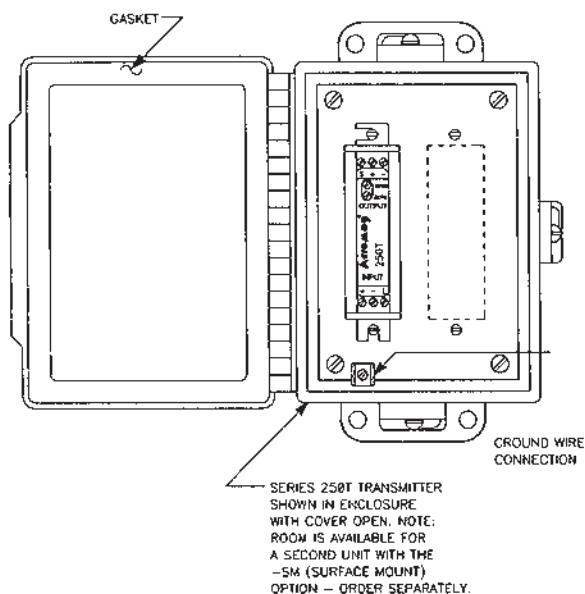
Explosion-Proof and Industrial Housing

**250T-XP,
260A-IH/IHW,
270i-XP**



NEMA-4 and NEMA-12 Enclosures

**250T-N4 / N12, 25PS-N4 / N12
260A-N4 / N12, 270i-N4 / N12**



NOTES:

1. THESE SPECIFIC CLAMPS ON NEMA 4 ENCLOSURES ONLY.
2. CONDUIT MOUNTING HOLES AND FITTINGS ARE CUSTOMER SUPPLIED.

Dimensions are in inches (millimeters).



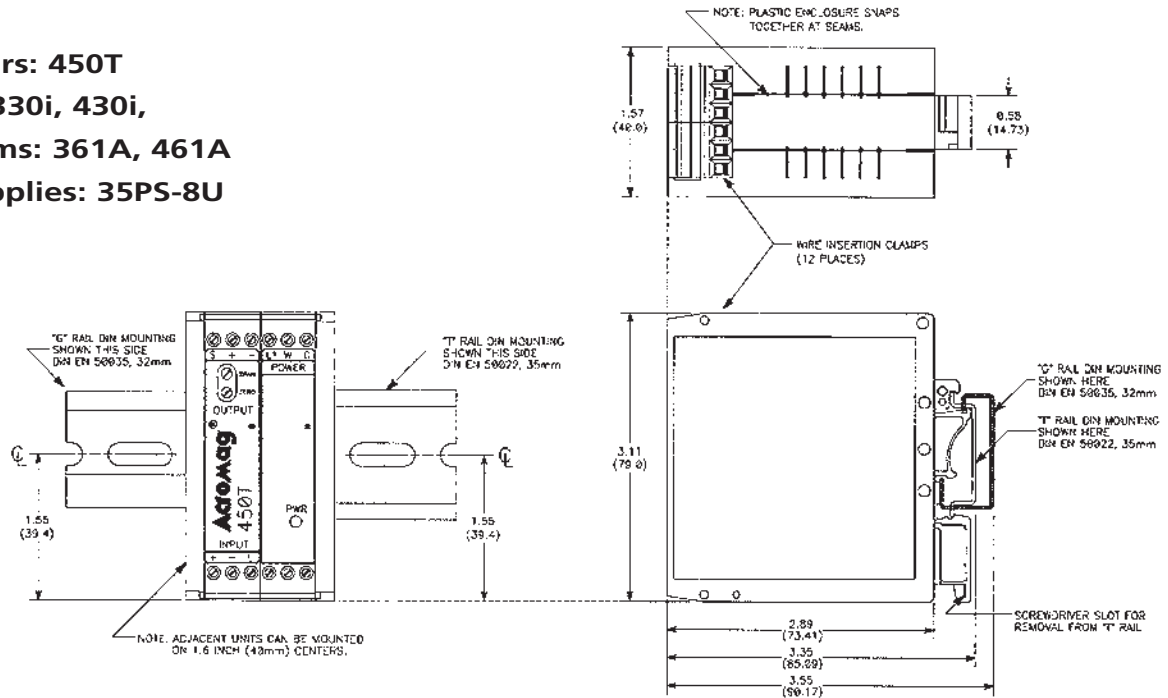
Dimensions

Transmitters: 450T

Isolators: 330i, 430i,

Limit Alarms: 361A, 461A

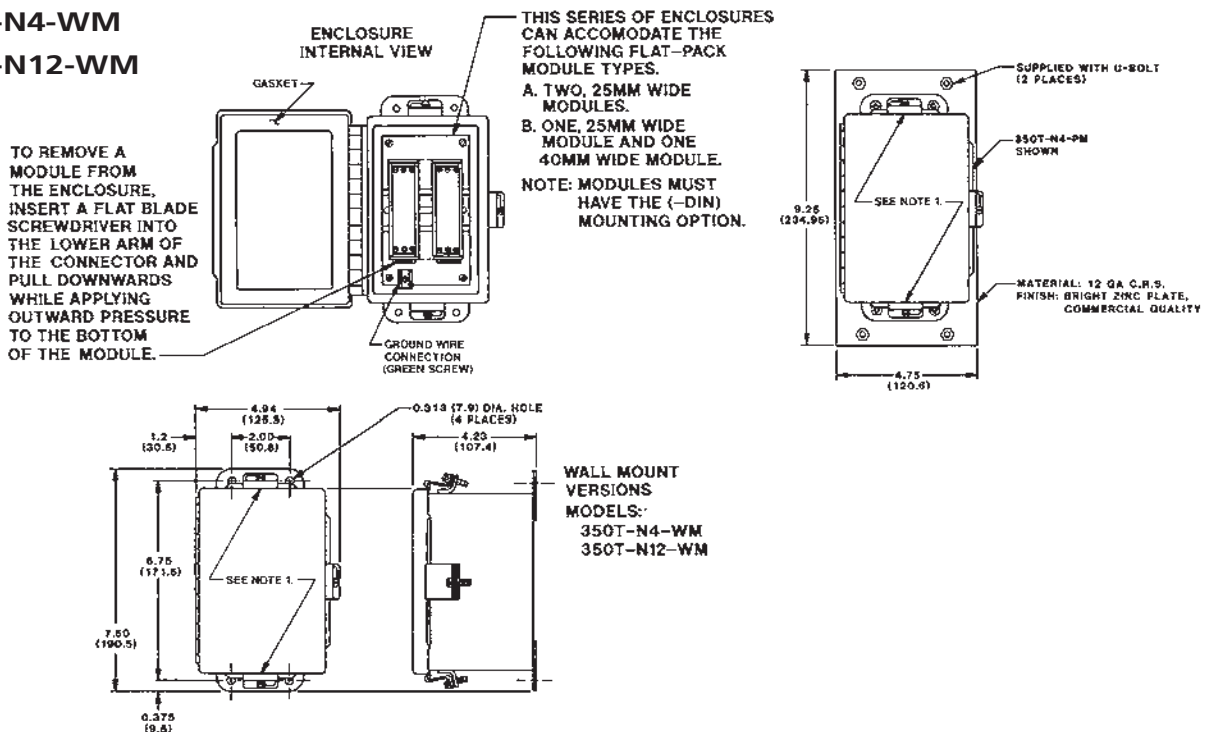
Power Supplies: 35PS-8U



NEMA-4 and NEMA-12 Enclosures

350T-N4-WM

350T-N12-WM



NOTES:

1. THESE SPECIFIC CLAMPS ON NEMA 4 ENCLOSURES ONLY.

2. CONDUIT MOUNTING HOLES AND FITTINGS ARE CUSTOMER SUPPLIED.

3. ALL DIMENSIONS ARE IN INCHES (MILLIMETERS).

Dimensions are in inches (millimeters).

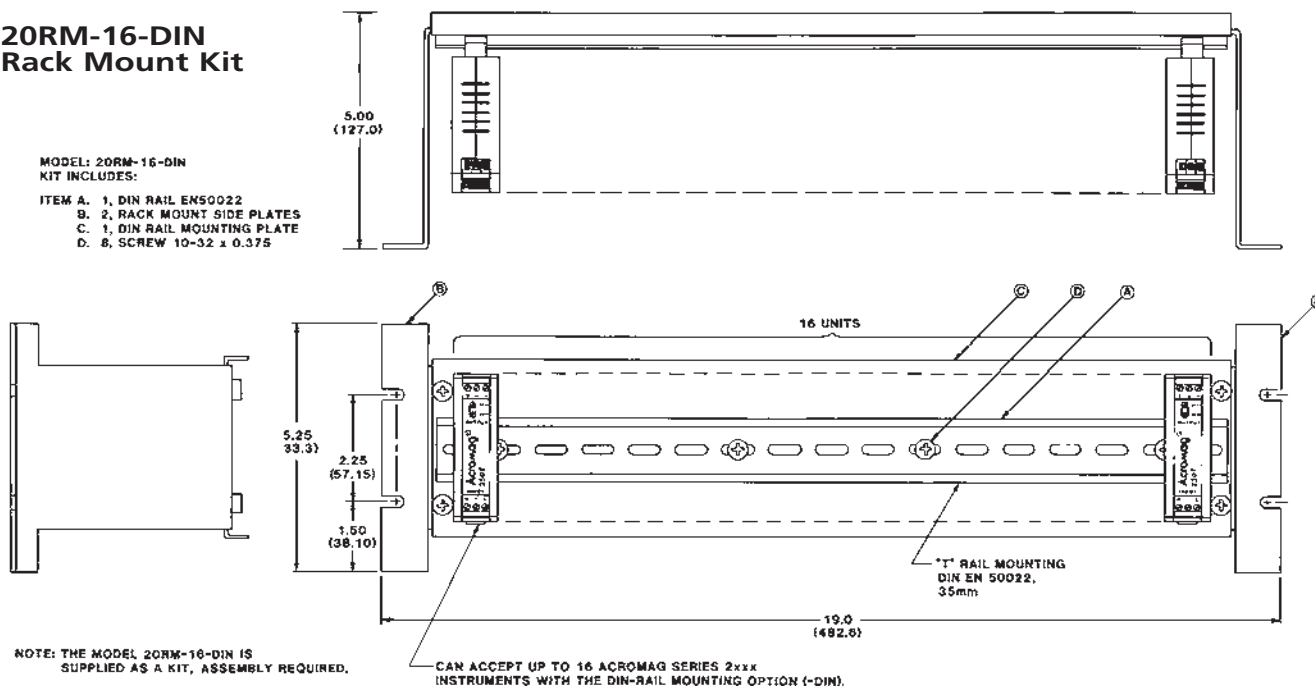


Dimensions

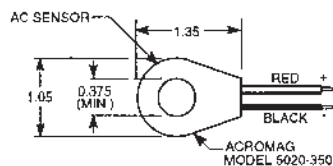
20RM-16-DIN Rack Mount Kit

MODEL: 20RM-16-DIN
KIT INCLUDES:

- ITEM A. 1, DIN RAIL EN50022
- B. 2, RACK MOUNT SIDE PLATES
- C. 1, DIN RAIL MOUNTING PLATE
- D. 8, SCREW 10-32 x 0.375



AC Sensor 5020-350



Dimensions are in inches (millimeters).



Smart Transmitters



151T/155H Units Universal Input (TC, RTD, mV, ohms)

Models

151T: PC-configured transmitter

155H: HART®-configured transmitter

ATW-TLD: Optional plug-in LCD display with two-line text and bar graph readout

Input Ranges

Universal input with PC or HART configuration

- RTD (2, 3, and 4-wire),
100 ohm Pt DIN (alpha = 0.00385),
100 ohm Pt SAMA, (alpha = 0.003923)
10 ohm Cu, 100 ohm Ni, 120 ohm Ni
- Thermocouple: B, C, E, J, K, L, N, R, S, T, U
- Millivolt (-15 to 115mV)
- 4 to 20mA DC (with optional 5 ohm resistor)
- Resistance (0 to 500 ohms)

Output Ranges

- 4 to 20mA (both models)
- HART protocol (155H model only)

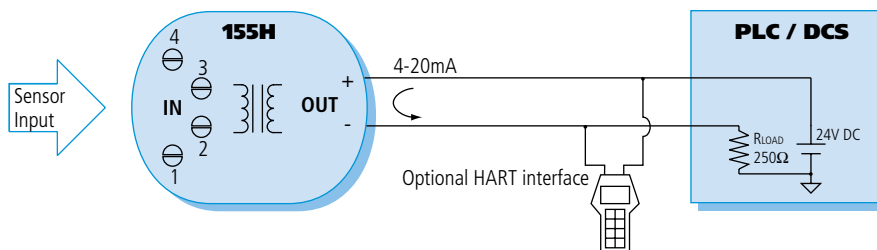
Power Requirement

- Loop-powered (2-wire), 12 to 42V DC

Approvals

- CE marked. CSA:
Class I Division 2 Groups A, B, C, D.

PC or HART®-configured Two-Wire Transmitter



Description

These programmable transmitters convert temperature and other sensor inputs to a proportional process current signal. A HART protocol output is optional.

Acromag's 1500 series transmitters bring the best elements of analog and smart digital technologies together to offer unsurpassed value for temperature measurement applications. They deliver superior accuracy, unrivaled versatility, and are extremely easy to use. Save time. Cut costs. And improve performance.

Two models are available. The 151T model is a standard PC-configurable two-wire transmitter. The 155H is a two-wire transmitter with a HART interface for communication and configuration.

Options include a plug-in LCD display and an explosion-proof enclosure. The two-line display provides a 4½ digit readout in °C or °F, a bar graph, and a text line for tag information. Push-buttons on the display unit allow you to configure the transmitter in the field. The enclosure is ideal for field mounting in hazardous locations. A window maintains visibility for the LCD display.



Special Features

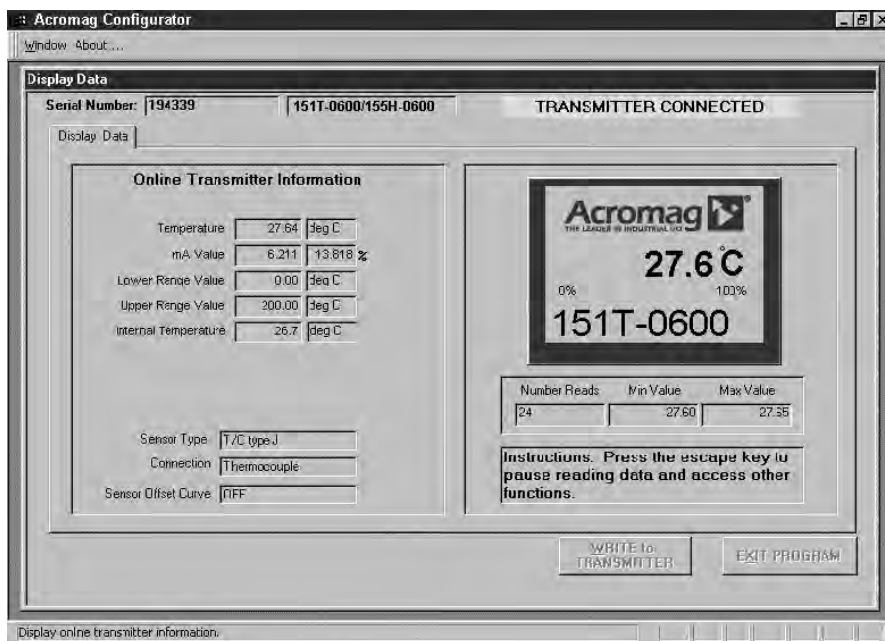
- Microprocessor reduces setup time, improves performance, and performs self-diagnostics.
- Multivariable transmitter accepts a variety of input sensor types to meet most applications and help minimize inventory requirements.
- Multifunction LCD readout displays temperature in °C or °F, a bar graph, the tag name, and diagnostic data.
- Flexible configuration supports setup via a PC with Acromag's software interface package, a standard handheld 275 HART communicator (155H only), or by using pushbuttons on the optional LCD display.
- 22-breakpoint linearizer table helps the user define custom output transfer functions.
- Sensor break detection and reporting functions allow users to specify a failsafe output and post a message on the optional LCD display.
- Automatic cold-junction compensation ensures high accuracy over a wide temperature range.
- Isolation between input/output circuits allows the use of grounded or ungrounded sensors.
- Output ranges can be set in engineering units anywhere within the input sensor range. No minimum/maximum span limitation.



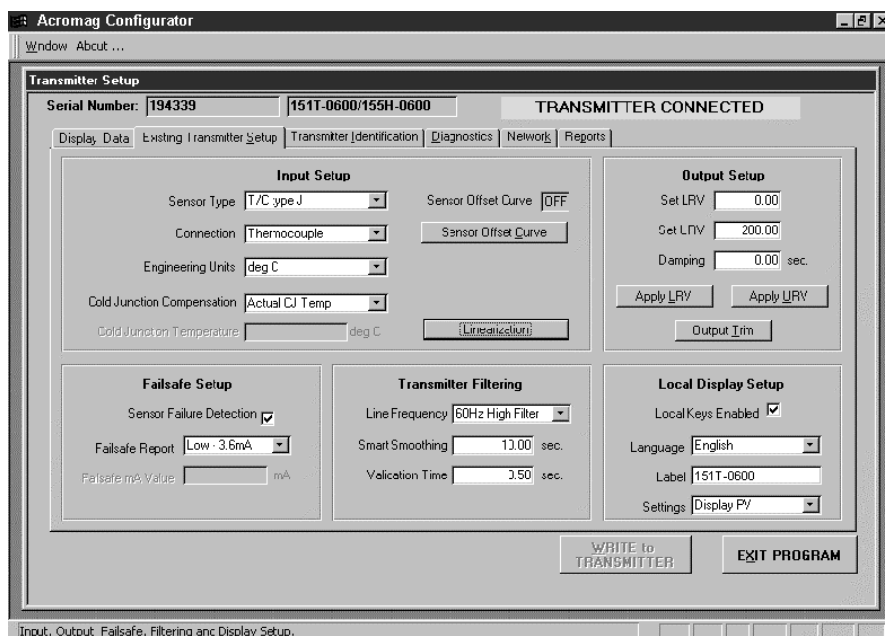
Explosion-proof and NEMA 4X stainless steel industrial enclosures are available.



Model 151T PC Configuration



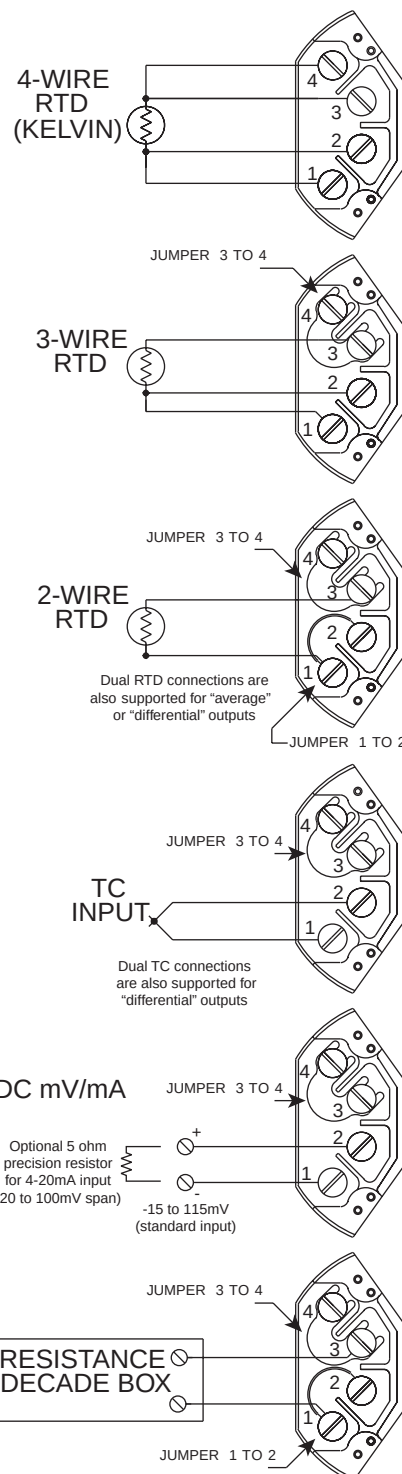
The Display Data screen shows the current status of the transmitter and simulates the readout on the optional LCD display.



Configuring Acromag's 151T and 155H transmitters is easy. The software interface package provides simple pull-down selection menus and fill-in-the-blank fields.

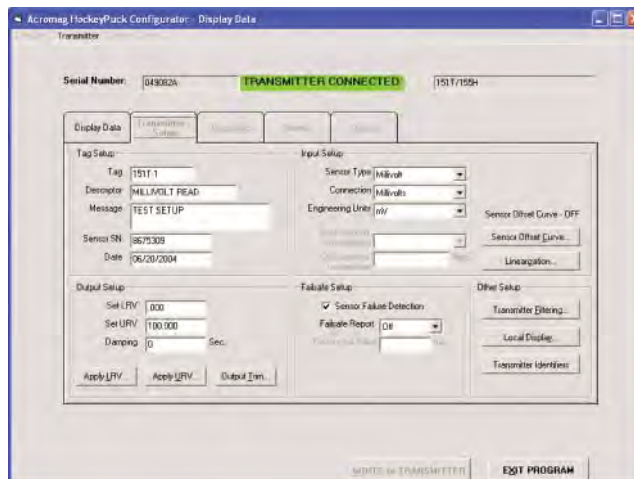
1500 Series Installation

Input Connections



Series 151T, 155H Transmitters

Model 151C-SIP, 155H-SIP Configuration Software Interface Package



Configuration Software ♦ USB-to-RS232 Adapter ♦ RS232 Interface Adapter

Description

Acromag's configuration software is the key to the 151T and 155H transmitters' easy-to-use operation. The software employs the friendly Windows® interface with pull-down selection menus and fill-in-the-blank fields to speed you through a few brief configuration screens. No programming is required.

The software interface package for 151T-0600 transmitters includes a user manual, CD-ROM, transmitter-to-DB9 interface adapter, and DB9-to-USB adapter.

The software interface package for 155H-0600 transmitters includes a user manual, CD-ROM, and transmitter-to-DB9 interface adapter.

Software Compatibility

Windows 98, 2000, ME, NT, XP, Vista, 7.

Ordering Information

NOTE: For more information, visit www.acromag.com.

Models

151C-SIP

Software interface package for 151T-0600. Includes user manual, CD, PC serial port adapter (5032-787), and USB adapter (4001-095).

155H-SIP

Software interface package for 155H-0600. Includes user manual, CD, PC serial port adapter (5032-780), and USB adapter (4001-095).

4001-095

USB-to-DB9 serial port (RS232) adapter.

5032-780

PC serial port (RS232) adapter for 155H-0600 Transmitter-to-DB9 connection.

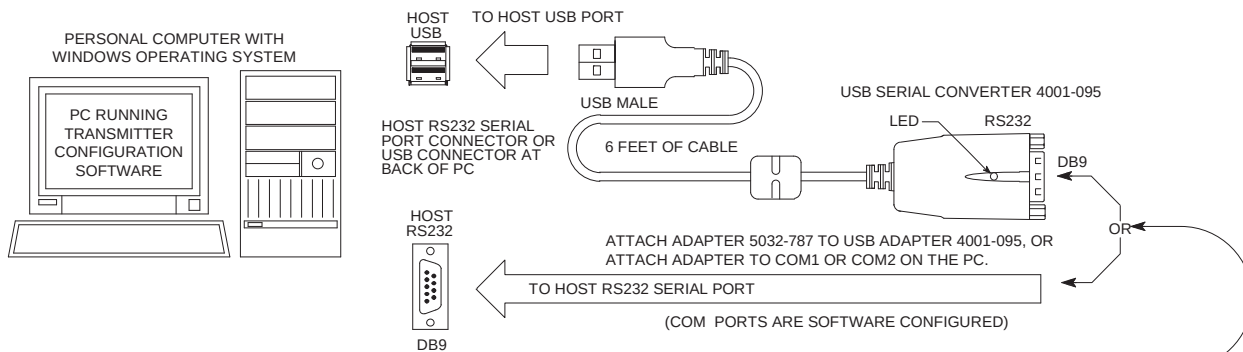
5032-787

PC serial port (RS232) adapter for 151T-0600 Transmitter-to-DB9 connection.

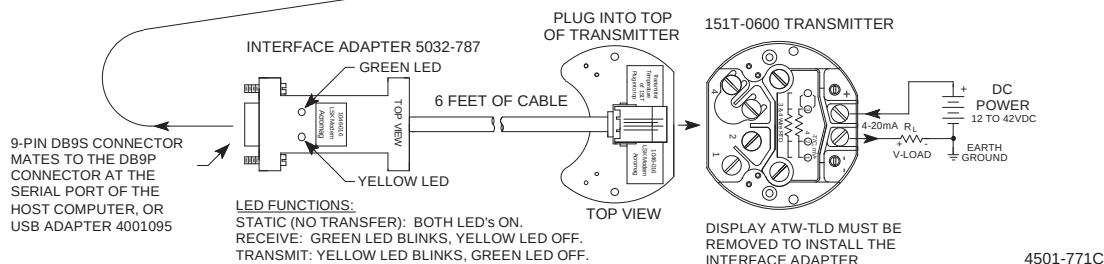
Connection Diagram

See following page.

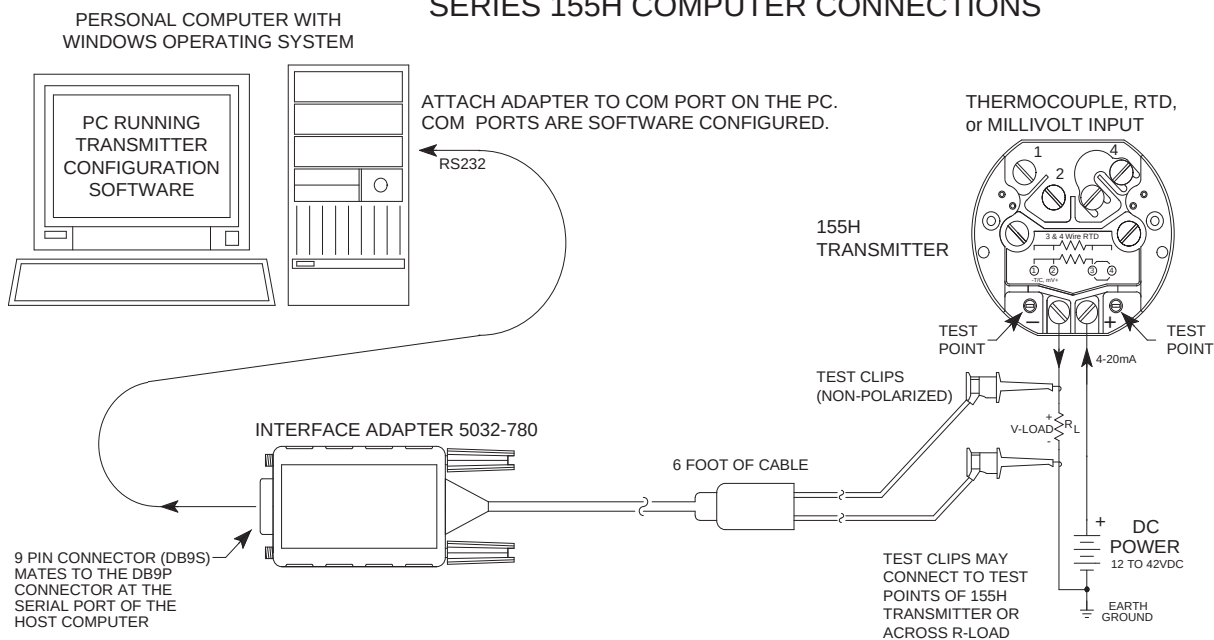
Series 151T, 155H Transmitters



SERIES 151T COMPUTER CONNECTIONS



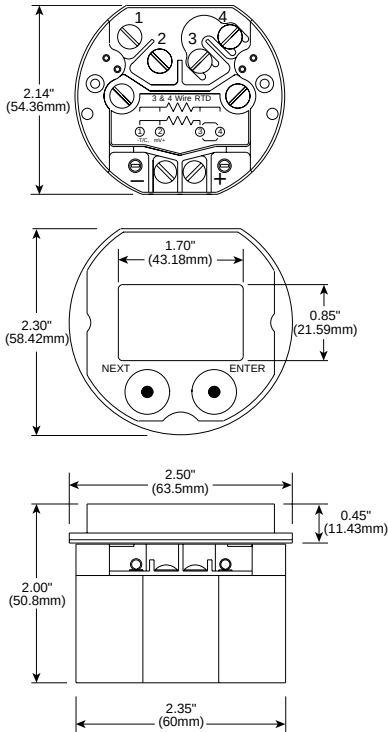
SERIES 155H COMPUTER CONNECTIONS



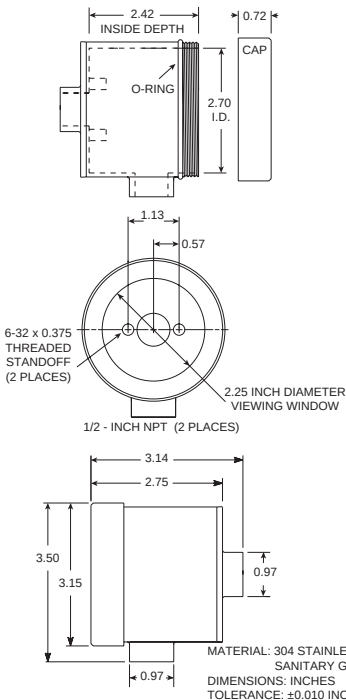


151T/155H Units Installation

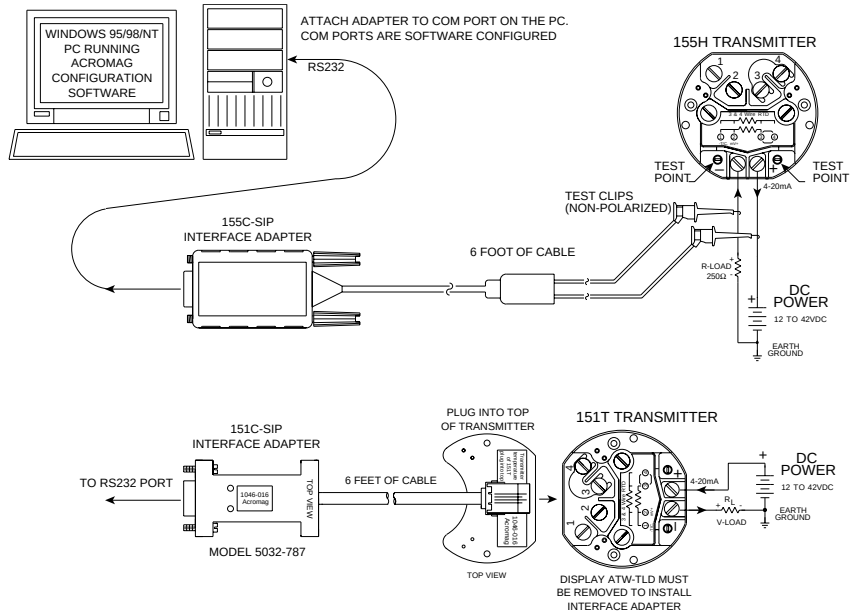
Dimensions



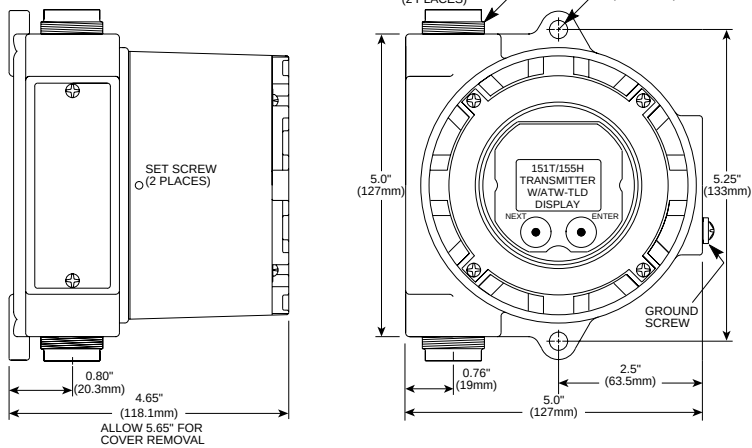
ATW-SSW Dimensions



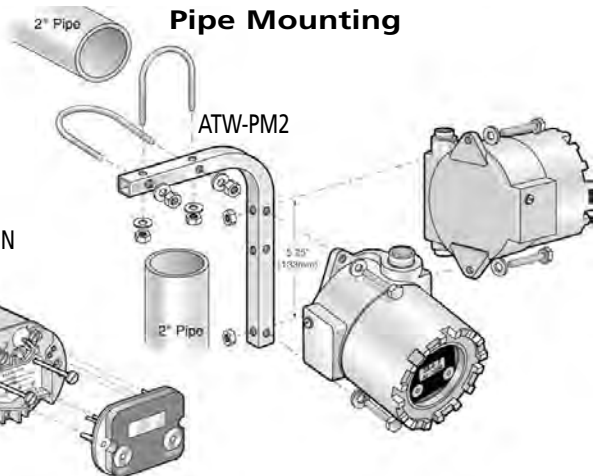
PC Configuration Connections



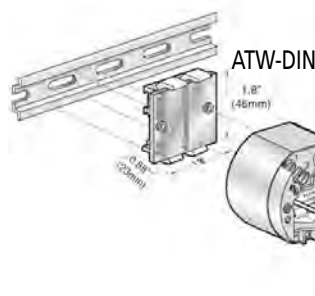
ATW-XPW Dimensions



Pipe Mounting



DIN Rail Mounting





Performance

General Input

Digital Input Accuracy

±0.05% of equivalent millivolt or ohm reading, or the accuracy shown in range tables, whichever is greater.

Ambient Temperature Effect

Self-correcting over full operating temperature range for changes up to 20°C/hour. Error is less than half the reference accuracy plus 0.1°C per 28°C change.

Noise Rejection

Common Mode: Better than 120dB @ 60Hz.

Sensor Break Detection

Failsafe response configurable for upscale (23mA), downscale (3.6mA), or no circuit response.

Linearization

TC and RTD linearization to ±0.05°C. Custom software configuration table supports up to 22 breakpoints.

Input Conversion Rate

7 conversions per second (150mS), typical.

Cold Junction Measurement Accuracy

±0.5°C (±0.9°F).

Input Impedance

Thermocouple/millivolt input: 0.2M ohm.
RTD/resistance input: 1M ohm.

RTD Input Configuration

Supports two, three, and four-wire (Kelvin) RTDs.

RTD Excitation Current

0.3mA nominal.

Input Ranges & Accuracy

Input Type	Input Range	Minimum Span	Accuracy
TC Type B	260 to 1820°C (109 to 3272°F)	100°C (212°F)	±0.8°C (±1.5°F)
TC Type C	0 to 2320°C (32 to 4208°F)	100°C (212°F)	±0.8°C (±1.5°F)
TC Type E	-270 to 1000°C (-454 to 1832°F)	20°C (68°F)	±0.3°C (±0.5°F)
TC Type J	-210 to 1200°C (-346 to 2192°F)	20°C (68°F)	±0.3°C (±0.5°F)
TC Type K	-270 to 1372°C (-454 to 2502°F)	20°C (68°F)	±0.3°C (±0.5°F)
TC Type L	-200 to 900°C (-328 to 1652°F)	20°C (68°F)	±0.3°C (±0.5°F)
TC Type N	270 to 1300°C (518 to 2372°F)	20°C (68°F)	±0.3°C (±0.5°F)
TC Type R	50 to 1768°C (122 to 3214°F)	25°C (77°F)	±0.8°C (±1.5°F)
TC Type S	-50 to 1768°C (-58 to 3214°F)	25°C (77°F)	±0.8°C (±1.5°F)
TC Type T	-270 to 400°C (-454 to 752°F)	20°C (68°F)	±0.3°C (±0.5°F)
TC Type U	-200 to 600°C (-328 to 1112°F)	100°C (212°F)	±0.8°C (±1.5°F)
Millivolt	-15 to 115mV DC	3mV	±0.1mV
DC current (4-20mA)	20 to 100mV DC	Requires 5032-850 precision resistor	
Platinum RTD, 100 ohm, alpha = 385, 392	-200 to 850°C (-328 to 1562°F)	10°C (50°F)	±0.14°C (±0.25°F)
Nickel RTD, 120 ohm	-80 to 320°C (-112 to 608°F)	10°C (50°F)	±0.14°C (±0.25°F)
Nickel RTD, 100 ohm	-60 to 250°C (-76 to 482°F)	10°C (50°F)	±0.14°C (±0.25°F)
Copper RTD, 10 ohm	-70 to 150°C (-94 to 302°F)	100°C (212°F)	±0.14°C (±0.25°F)
Resistance	0 to 500 ohm	n/a	±0.06 ohm

Output

Output Range

4 to 20mA DC.

Output Accuracy

±0.05% of span.

Output Load Compliance

$R_{LOAD} = (V_{SUPPLY} - 12V) / 23mA$.
500 ohm @ 24V DC supply.

Output Response Time (for input step change)

250mS typical to 98% of final output value.

Output Action

Normal or reverse acting.

Damping

Adjustable from 0 to 32 seconds.

Environmental

Ambient Temperature Range (Operating)

Electronics: -40 to 85°C (-40 to 185°F).
Display: -20 to 70°C (-4 to 158°F).

Relative Humidity

5 to 100% non-condensing.

Power Requirements

12 to 42V DC @ 25mA.

Isolation

250V AC (354V DC) continuous isolation between input and output circuits.

Approvals

CE marked.
CSA: Class I; Division 2; Groups A, B, C, D.

EMI/RFI Susceptibility

Less than ±0.5% of reading at 10V/m, 20KHz-1GHz.

Electrical Fast Transient (EFT)

Complies with EN61000-4-4 Level 3 and EN50082-1.

Surge Withstanding Capability (SWC)

Complies with EN61000-4-5 Level 3 and EN50082-1.

Electrostatic Discharge (ESD)

Complies with EN61000-4-2 Level 3 and EN50082-1.

Radiated Emissions

Meets or exceeds EN50081-1 for Class B equipment.

Physical

Enclosure

Sealed Lexan® plastic with waterproof potting.

Connectors

Wire Range: AWG #10-24.

Printed Circuit Boards

Military grade FR-4 epoxy glass circuit board.

Shipping Weight

1 pound (0.45 Kg) packed.

Ordering Information

Models

151T-0600-C

PC-configured transmitter (no HART protocol).
Default calibration TC Type J thermocouple, input: 40 to 200°F, output: 4 to 20mA unless customer specified

155H-0600-C

HART-configured transmitter, calibration same as above

151C-SIP

Software interface package for 151T-0600. Includes user manual, CD-ROM, PC serial port adapter, cable.

155H-SIP

Software interface package for 155H-0600. Includes user manual, CD-ROM, PC serial port adapter, cable.

ATW-TLD

Plug-in LCD display (compatible with 151T and 155H)

Accessories

5032-850: Precision 5 ohm (4 to 20mA sensing) resistor, 0.1%, 0.75W.

5034-225: USB-to-RS232 adapter

ATW-XPW: Explosion-proof housing

ATW-SSW: NEMA4X stainless steel non-corrosive housing

ATW-DIN: DIN-rail mounting adapter

ATW-PM2: 2-inch pipe mount kit for ATW-XPW

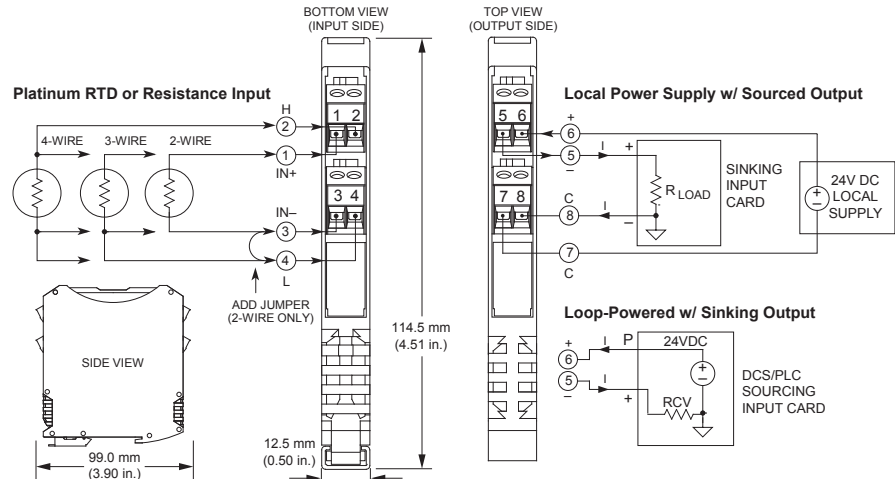
8500-613: Configuration User's Manual for use with hand-held 275 HART communicator.

All trademarks are the property of their owners.



Transmitters: TT230 Series

TT231 RTD/resistance input two-wire/three-wire transmitter



100 ohm Pt RTD or 0-900 ohm input ◆ 4-20mA output (sink/source) ◆ 12-32V DC loop/local power

Description

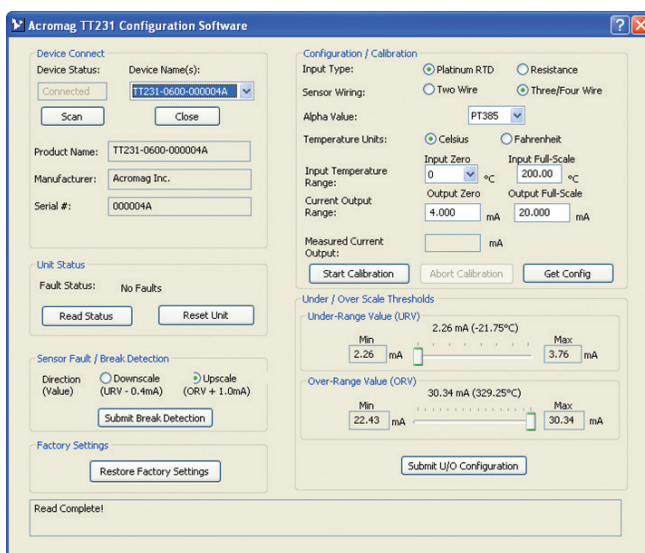
The TT231 model is a space-saving two-wire transmitter that converts a 100 ohm Platinum RTD sensor input to a proportional 4-20mA signal. Power is received from the output loop current or a DC supply when using a three-wire connection. The transmitter provides sensor excitation plus performs linearization, lead-wire compensation, and lead-break detection.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile temperature measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Flexible RTD or linear resistance input ranges (any 100 ohm Pt RTD with 375-393 alpha)
- Space-saving 12.5mm (0.5 inch) unit with pluggable terminals for convenient wiring
- High accuracy, linearity, stability, and reliability
- Advanced analog signal conditioning ASIC eliminates digitization errors
- Low temperature drift (<80ppm/°C)
- Supports sink or source output wiring
- Programmable over/under-range limits
- Selectable upscale or downscale operation for sensor errors and lead-break detection
- NAMUR-compliant output loop current
- Shock (25g) and vibration (4g) resistant
- Mounts on Type T DIN-rail
- Wide ambient operation (-40 to 80°C)
- CE compliant. UL/cUL Class 1 Div 2 Zone 2 approvals



TT230 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com.

Windows XP, Vista, 7, & 8



Tel 248-295-0880 ■ Fax 248-624-9234 ■ sales@acromag.com ■ www.acromag.com ■ 30765 Wixom Rd, Wixom, MI 48393 USA



Transmitters: TT230 Series

TT231 RTD/resistance input two-wire/three-wire transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of their USB-ISOLATOR when configuring a TT230 Series transmitter.

■ USB Interface

USB Connector

USB Mini-B type socket, 5-pin.

USB Data Rate

12Mbps. USB v1.1 and 2.0 compatible.

USB Transient Protection

Transient voltage suppression on power and data lines.

USB Cable Length

5.0 meters maximum.

Driver

Not required. Uses built-in Human Interface Device (HID) USB drivers of the Windows operating system.

■ Input

Default Configuration

100Ω Pt RTD, $\alpha=0.00385 \Omega/\Omega^\circ\text{C}$, 0-200°C input, 4-20mA output, upscale break detection.

Input Configuration

Two-, three- or four-wire sensor input connections.

Input Ranges

100 ohm Platinum RTD, $\alpha = 375-393$, 385 (default), -50 to 850°C (-58 to 1562°F).

0 to 900 ohms linear resistance.

Programs in °C, °F, or ohmic integer values only.

Zero Adjust

RTD 3/4 wire: -50, -17.78, or 0°C (-58, 0, 32°F).

RTD 2 wire: 0°C (32°F) fixed.

RES: 0 or 100 ohms.

Full-Scale Adjust

RTD: up to 850°C (1562°F), 50°C (58°F) span minimum.

Resistance: up to 900 ohms, 8 ohm span minimum.

Excitation Current

0.5mA, nominal, each $\pm$ lead.

Lead-Wire Compensation

25 ohms per lead.

Lead Break (Sensor Burnout) Detection

Configurable for either upscale or downscale.

Input Filter Bandwidth

-3dB at 700Hz, typical, normal mode filter.

■ Output

Output Range

4 to 20mA DC.

Under-scale limit adjustable for 2.1 to 3.6mA, nominal.

Over-scale limit adjustable for 21 to 30mA, nominal.

Output Fault Limits (Sensor Fault)

0.4mA below selected under-scale threshold and

1.0mA above over-scale threshold, typical.

Output Compliance

$R_{LOAD} = (V_{SUPPLY} - 8.6V) / 0.020A$.

$R_{LOAD} = 0$ to 750 ohms @ 24V DC.

Output Accuracy

Better than $\pm 0.1\%$ of span, typical for spans less than 500°C. Includes the effects of repeatability, terminal point conformity, and linearization, but does not include sensor error.

Ambient Temperature Effect

Better than $\pm 0.008\%$ per °C of input span or $\pm 80\text{ppm}/^\circ\text{C}$, typical. Includes the combined effects of zero and span drift over temperature.

Output Response Time (for step input change)

500μs, typical with 250 ohm load (to reach 98% of final output value).

■ Environmental

Operating temperature

-40 to 80°C (-40° to 176°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

9-32V DC SELV (Safety Extra Low Voltage),

30mA max.

Shock and Vibration Immunity

Vibration: 5g, per IEC 60068-2-64.

Shock: 50g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.

RFI: BS EN 61000-6-2, IEC 61000-4-3.

Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.

ESD: BS EN 61000-6-2, IEC 61000-4-2.

EFT: BS EN 61000-6-2, IEC 61000-4-4.

Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals

CE compliant. UL/cUL listing.

Designed for Class I; Division 2; Groups ABCD; Zone 2

■ Physical

General

General-purpose enclosure designed for mounting on 35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.

I/O Connectors

Removable plug-in terminal blocks rated for 12A/250V; AWG #26-12, stranded or solid copper wire.

Dimensions

12.5 x 114.5 x 99.0 mm (0.5 x 4.51 x 3.90 inches).

Shipping Weight

0.22 kg (0.5 pounds) packed.

Ordering Information

Models

TT231-0600

Transmitter, RTD/resistance input.

Services

TT230-Config/Cal

Factory custom configuration/calibration service.

Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

TTC-SIP (recommend one kit per customer)

Software Interface Package for Acromag TT Series transmitters. Includes configuration software CD-ROM (5040-944), isolator (USB-ISOLATOR) and two USB cables (4001-112, 4001-113).

Accessories

See www.acromag.com for more information.

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

ISO9001
AS9100



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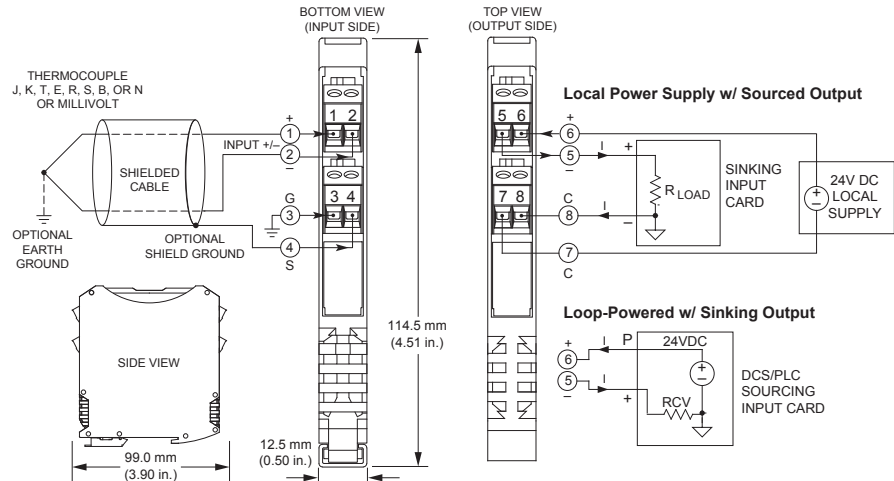


Transmitters: TT230 Series

TT233 Thermocouple/millivolt input two-wire/three-wire transmitter



**USB
Configured**



Universal thermocouple or $\pm 100\text{mV}$ input ♦ 4-20mA output (sink/source) ♦ 12-32V DC loop/local power

Description

The TT233 model is a space-saving two-wire transmitter that isolates and converts a millivolt or thermocouple sensor input to a proportional 4-20mA control signal. Power is received from the output loop current or a DC supply when using a three-wire connection. The transmitter performs thermocouple linearization, cold-junction compensation, and lead-break detection.

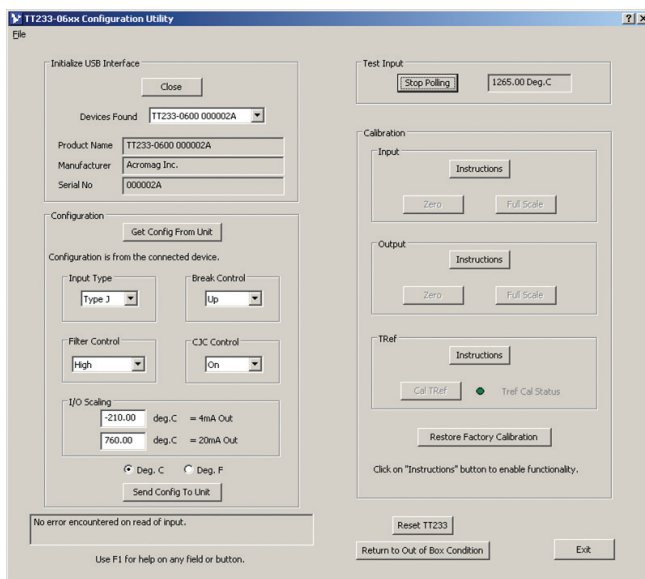
High-voltage isolation separates the input from the output circuit. Isolation protects from surges, reduces noise, and eliminates ground loop errors.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile temperature measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Universal thermocouple or millivolt input (TC Type J, K, T, R, S, E, B, N or $\pm 100\text{mV}$)
- Space-saving 12.5mm (0.5 inch) unit with pluggable terminals for convenient wiring
- High accuracy, linearity, stability, and reliability
- Low temperature drift ($<80\text{ppm}/^\circ\text{C}$)
- User-selectable filtering (none, low, med., high)
- Supports sink or source output wiring
- Supports reverse-acting (inverse) output
- Selectable upscale or downscale operation for sensor errors and lead-break detection
- 1500V input isolation
- NAMUR-compliant output loop current
- Shock (25g) and vibration (4g) resistant
- Mounts on Type T DIN-rail
- Wide ambient operation (-40 to 80°C)
- CE compliant. UL/cUL Class 1 Div 2 Zone 2 approvals



TT230 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com.
Windows XP, Vista, 7, & 8

TT233 Model software allows you to configure transmitters offline, save the file, and download settings into units later, at your convenience.

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Transmitters: TT230 Series

TT233 Thermocouple input two-wire/three-wire transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of their USB-ISOLATOR when configuring a TT230 Series transmitter.

■ USB Interface

USB Connector

USB Mini-B type socket, 5-pin.

USB Data Rate

12Mbps. USB v1.1 and 2.0 compatible.

USB Transient Protection

Transient voltage suppression on power and data lines.

USB Cable Length

5.0 meters maximum.

Driver

Not required. Uses built-in Human Interface Device (HID) USB drivers of the Windows operating system.

■ Input

Default Configuration/Calibration

Input: TC J, -210 to 760°C, high filter, Break: up

Output: 4 to 20mA.

Input Ranges and Accuracy

Input	Range	Accuracy
TC J	-210 to 760°C (-346 to 1400°F)	±0.5°C
TC K	-200 to 1372°C (-328 to 2502°F)	±0.5°C
TC T	-260 to 400°C (-436 to 752°F)	±0.5°C
TC R	-50 to 1768°C (-58 to 3214°F)	±1.0°C
TC S	-50 to 1768°C (-58 to 3214°F)	±1.0°C
TC E	-200 to 1000°C (-328 to 1832°F)	±0.5°C
TC B	260 to 1820°C (500 to 3308°F)	±1.0°C
TC N	-230 to 1300°C (-382 to 2372°F)	±1.0°C
mV	-100 to 100mV	±0.1mV

Error includes the effects of repeatability, terminal point conformity, and linearization. Does not include CJC error.

Thermocouple Reference

(Cold Junction Compensation)

±0.2°C typical, ±0.5°C maximum at 25°C.

Ambient Temperature Effect

Better than ±80ppm/°C (±0.008%/°C).

Zero Scaling Adjust

0 to 95% of range, typical.

Full Scale Adjust

5 to 100% of full scale range, typical.

Lead Break (Sensor Burnout) Detection

Configurable for either upscale (24mA) or downscale (3.3mA) operation.

Input Over-Voltage Protection

Bipolar Transient Voltage Suppressors (TVS), 5.6V clamp level typical.

Resolution

Millivolt input: 0.0025% (1 part in 40,000)
Thermocouple input: 0.1°C.

Input Filter

Selectable digital filtering settings (none, low, medium, high).

Input Filter Bandwidth

Normal mode plus digital filtering within the ADC. Bandwidth (-3dB) varies with digital filter setting from 4Hz without filtering to 0.33Hz with high filtering.

Noise Rejection (Common Mode, High Filter)

155dB @ 60Hz, typical with 100 ohm input unbalance.

■ Output

Output Range

4 to 20mA DC.

Output Compliance

$R_{LOAD} = (V_{SUPPLY} - 11V) / 0.020A$.

$R_{LOAD} = 0$ to 650 ohms @ 24V DC.

Output Response Time (for step input change)

Time to reach 98% of final output value (typical)	
No filtering	104 milliseconds
Low filter	380 milliseconds
Medium filter	760 milliseconds
High filter	960 milliseconds

■ Environmental

Operating temperature

-40 to 80°C (-40° to 176°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

12-32V DC SELV (Safety Extra Low Voltage), 24mA max.

Isolation

1500V AC peak. 250V AC (354V DC) continuous isolation between input and output circuits.

Shock and Vibration Immunity

Vibration: 5g, per IEC 60068-2-64.

Shock: 50g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.

RFI: BS EN 61000-6-2, IEC 61000-4-3.

Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.

ESD: BS EN 61000-6-2, IEC 61000-4-2.

EFT: BS EN 61000-6-2, IEC 61000-4-4.

Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals

CE compliant. UL/cUL listing.

Designed for Class I; Division 2; Groups ABCD; Zone 2.

■ Physical

General

General-purpose enclosure designed for mounting on 35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.

I/O Connectors

Removable plug-in terminal blocks rated for 12A/250V; AWG #26-12, stranded or solid copper wire.

Dimensions

12.5 x 114.5 x 99.0 mm (0.5 x 4.51 x 3.90 inches).

Shipping Weight

0.22 kg (0.5 pounds) packed.

Ordering Information

Models

TT233-0600

Transmitter, thermocouple/millivolt input.

Services

TT230-Config/Cal

Factory custom configuration/calibration service.

Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

TTC-SIP (recommend one kit per customer)

Software Interface Package for Acromag TT Series transmitters. Includes configuration software CD-ROM (5040-944), isolator (USB-ISOLATOR) and two USB cables (4001-112, 4001-113).

Accessories

See www.acromag.com for more information.

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

ISO9001
AS9100

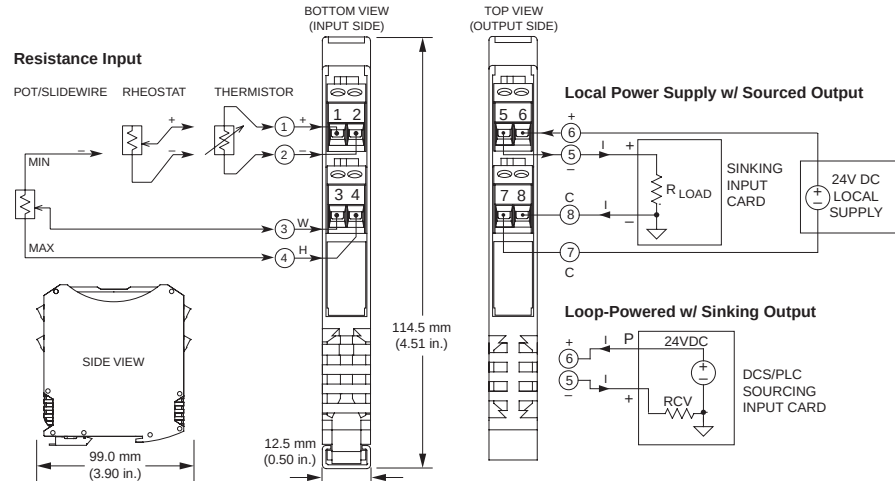


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Transmitters: TT230 Series

TT234 Potentiometer / thermistor input two-wire transmitter



Potentiometer/slidewire, thermistor input ♦ 4-20mA output (sink/source) ♦ 12-32V DC loop/local power

Description

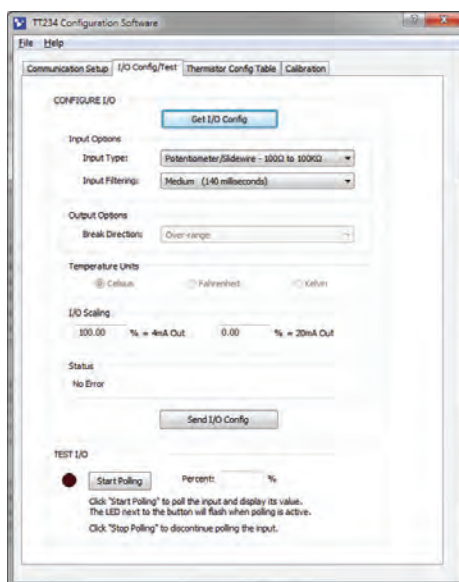
The TT234 model is a space-saving two-wire transmitter that isolates and converts a resistive sensor input to a proportional 4-20mA signal. Power is received from the output loop current or a DC supply when using a three-wire connection. The transmitter provides sensor excitation plus performs linearization, lead-wire compensation, and lead-break detection.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile temperature measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Interfaces 100-100kΩ potentiometer/slidewire and 100-1MΩ NTC thermistor/rheostat inputs
- Customizable thermistor linearization table with preset curves for popular resistances
- 1500V isolation between input/output circuits
- Space-saving 12.5mm (0.5 inch) unit with pluggable terminals for convenient wiring
- High accuracy, linearity, stability, and reliability
- Supports normal or reverse-acting output
- Supports sink or source output wiring
- User-selectable filtering (none, low, med., high)
- Fast response (as low as 11ms)
- Selectable upscale or downscale operation for sensor errors and lead-break detection
- NAMUR-compliant output loop current
- Shock (25g) and vibration (4g) resistant
- Wide ambient operation (-40 to 80°C)
- CE and UL/cUL Class 1 Div 2 Zone 2 approvals



TT230 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com.
 Windows XP, Vista, 7, & 8

The Agility™ Config Tool is downloadable (FREE) at the [Google Play Store](https://www.google.com/search?q=Google+Play+Store).
 For Android Devices only

TT234 Model software allows you to configure transmitters offline, save the file, and download into units later, at your convenience.



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Transmitters: TT230 Series

TT234 Potentiometer / thermistor input two-wire transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of their USB-ISOLATOR when configuring a TT230 Series transmitter.

■ USB Interface

USB Connector

USB Mini-B type socket, 5-pin.

USB Data Rate

12Mbps. USB v1.1 and 2.0 compatible.

USB Transient Protection

Transient voltage suppression on power and data lines.

USB Cable Length

5.0 meters maximum.

Driver

Not required. Uses built-in Human Interface Device (HID) USB drivers of the Windows operating system.

■ Input

Default Configuration

Pot/slidewire, 0% to 100% input, 4-20mA output, downscale break detect, medium filter.

Input Configuration

Two- or three-wire sensor input connections.

User-configurable thermistor linearization table has preset curves for resistances below at 25°C.

Programs in °C, °F, °K, or ohmic integer values only.

Input Ranges

Input Type	Input Range	Accuracy
Potentiometer	0 to 100% (100 to 100KΩ)	< ±0.01% of span
Rheostat	100 to 1MΩ	< ±0.5% of input
Thermistor 2252Ω	-40 to 100°C (-40 to 212°F)	< ±0.05°C (±0.09°F)
Thermistor 2752Ω	-40 to 100°C	< ±0.05°C (±0.09°F)
Thermistor 2795Ω	-40 to 100°C	< ±0.05°C (±0.09°F)
Thermistor 3kΩ	-40 to 100°C	< ±0.05°C (±0.09°F)
Thermistor 5kΩ	-40 to 100°C	< ±0.05°C (±0.09°F)
Thermistor 10kΩ	-40 to 100°C	< ±0.05°C (±0.09°F)
Thermistor 30kΩ	-40 to 100°C	< ±0.05°C (±0.09°F)
Custom thermistor	100 to 1MΩ	< ±0.5% of input

Input Scaling Adjust

Zero: 0 to 95% of range, typical.

Full scale: 5 to 100% of full scale range, typical.

Excitation Voltage

Thermistor/rheostat: 1.25V DC, typical.

Potentiometer: 0.3V DC, limited to 3.35mA, typical.

Lead Break (Sensor Burnout) Detection

Configurable for either upscale or downscale on thermistor or rheostat inputs. Downscale only on potentiometer/slidewire inputs.

■ Output

Output Range

4 to 20mA DC.

Under-range capability 3.5mA.

Over-range capability 24mA.

Output Compliance

$R_{LOAD} = (V_{SUPPLY} - 11V) / 0.020A$.

$R_{LOAD} = 0$ to 650 ohms @ 24V DC.

Output DAC Resolution

16-bit D/A converter

Output Accuracy

Better than ±0.05% of span, typical (±0.1% max.) for nominal input spans. Includes the effects of repeatability, terminal point conformity, and linearization, but does not include sensor error.

Ambient Temperature Effect

Better than ±0.008% per °C of input span or ±80ppm/°C, typical. Includes the combined effects of zero and span drift over temperature.

Output Response Time (for step input change)

No filter: 11ms.

Medium filter: 150ms.

Low filter: 40ms.

High filter: 1200ms.

■ Environmental

Operating temperature

-40 to 80°C (-40° to 176°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

12-32V DC SELV (Safety Extra Low Voltage), 24mA maximum.

Shock and Vibration Immunity

Vibration: 4g, per IEC 60068-2-64.

Shock: 25g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.

RFI: BS EN 61000-6-2, IEC 61000-4-3.

Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.

ESD: BS EN 61000-6-2, IEC 61000-4-2.

EFT: BS EN 61000-6-2, IEC 61000-4-4.

Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals

CE compliant. UL/cUL Class I Div. 2 Zone 2.

■ Physical

General

General-purpose enclosure designed for mounting on 35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.

I/O Connectors

Removable plug-in terminal blocks rated for 12A/250V; AWG #26-12, stranded or solid copper wire.

Dimensions

12.5 x 114.5 x 99.0 mm (0.5 x 4.51 x 3.90 inches).

Shipping Weight

0.22 kg (0.5 pounds) packed.

Ordering Information

Models

TT234-0600

Transmitter, potentiometer/thermistor input

Services

TT230-Config/Cal

Factory custom configuration/calibration service.

Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

TTC-SIP (recommend one kit per customer)

Software Interface Package for Acromag TT Series transmitters. Includes configuration software CD-ROM (5040-944), isolator (USB-ISOLATOR) and two USB cables (4001-112, 4001-113).

Accessories

See www.acromag.com for more information.

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

ISO9001
AS9100



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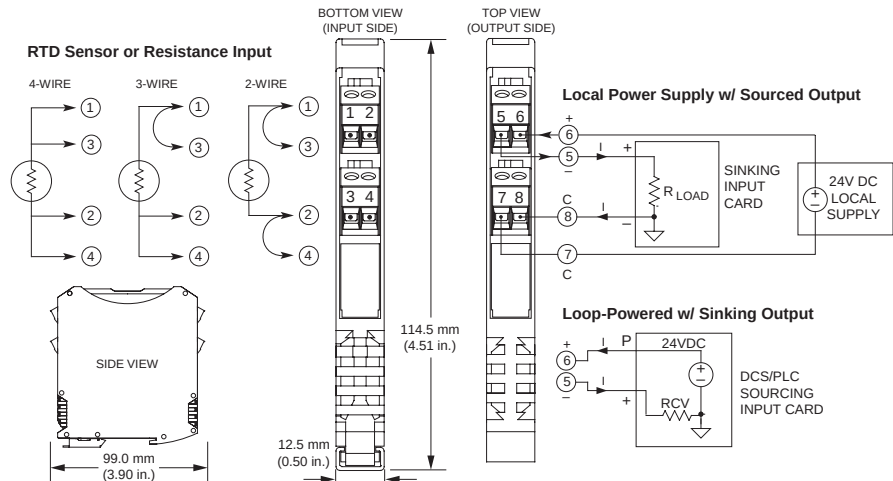


Transmitters: TT230 Series

TT235 Isolated RTD/resistance input two-wire transmitter



**USB
Configured**



RTD (Pt, Ni, Cu) or 0-450 ohm input ♦ 4-20mA output (sink/source) ♦ 12-32V DC loop/local power

Description

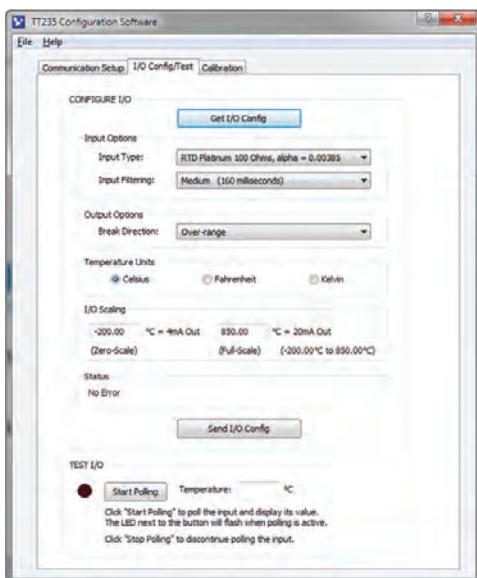
The TT235 model is a space-saving two-wire transmitter that isolates and converts an RTD sensor input to a proportional 4-20mA signal. Power is received from the output loop current or a DC supply when using a three-wire connection. The transmitter provides sensor excitation plus performs linearization, lead-wire compensation, and lead-break detection.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile temperature measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Selectable RTD or linear resistance input type: Pt RTD (100Ω, 200Ω, 500Ω, or 1000Ω), Ni RTD (120Ω), Cu RTD (10Ω), or Resistance (0-450Ω)
- 1500V isolation between input/output circuits
- Space-saving 12.5mm (0.5 inch) unit with pluggable terminals for convenient wiring
- High accuracy, linearity, stability, and reliability
- Supports normal or reverse-acting output
- Supports sink or source output wiring
- User-selectable filtering (none, low, med., high)
- Fast response (as low as 22ms)
- Selectable upscale or downscale operation for sensor errors and lead-break detection
- NAMUR-compliant output loop current
- Shock (25g) and vibration (4g) resistant
- Wide ambient operation (-40 to 80°C)
- CE and UL/cUL Class 1 Div 2 Zone 2 approvals



TT230 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com.
Windows XP, Vista, 7, & 8

The Agility™ Config Tool is downloadable (FREE) at the [Google Play Store](https://play.google.com/store/apps/details?id=com.acromag.agility) for Android Devices only

TT235 Model software allows you to configure transmitters offline, save the file, and download into units later, at your convenience.

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Transmitters: TT230 Series

TT235 Isolated RTD/resistance input two-wire transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of their USB-ISOLATOR when configuring a TT230 Series transmitter.

■ USB Interface

USB Connector

USB Mini-B type socket, 5-pin.

USB Data Rate

12Mbps. USB v1.1 and 2.0 compatible.

USB Transient Protection

Transient voltage suppression on power and data lines.

USB Cable Length

5.0 meters maximum.

Driver

Not required. Uses built-in Human Interface Device (HID) USB drivers of the Windows operating system.

■ Input

Default Configuration

100Ω Pt RTD, $\alpha=0.00385$, -200 to 850°C input, 4-20mA output, upscale break detect, medium filter.

Input Configuration

Two-, three- or four-wire sensor input connections. Programs in °C, °K, °F, or ohmic integer values only.

Input Ranges

Input Type	Input Range	Accuracy ²
RTD, Pt 100Ω	-200 to 850°C (-328 to 1562°F)	±0.2°C, ±0.019%
RTD, Pt 200Ω	-200 to 850°C	±0.3°C, ±0.029%
RTD, Pt 500Ω	-200 to 850°C	±0.5°C, ±0.048%
RTD, Pt 1000Ω	-200 to 850°C	±1.0°C, ±0.095%
RTD, Ni 120Ω (Minco 7-120)	-80 to 320°C (-112 to 608°F)	±0.08°C, ±0.020%
RTD, Cu 10Ω (Minco 16-9)	-200 to 270°C (-328 to 518°F)	±0.5°C, ±0.106%
Resistance (linear) ¹	0 to 450Ω	±0.05Ω, ±0.010%

Note 1: Linear resistance input range approaches but does not include 0Ω and 500Ω. If exactly 0Ω or 500Ω is measured, break detection is triggered.

Note 2: Rated accuracy (in °C and % of span) applies for input spans greater than 5% of input full-scale.

Input Scaling Adjust

Zero: 0 to 95% of range, typical.

Full scale: 5 to 100% of full scale range, typical.

Lead Break (Sensor Burnout) Detection

Configurable for either upscale or downscale.

■ Output

Output Range

4 to 20mA DC.
Under-range capability 3.5mA.
Over-range capability 24mA.

Output Compliance

$R_{LOAD} = (V_{SUPPLY} - 11V) / 0.020A$.
 $R_{LOAD} = 0$ to 650 ohms @ 24V DC.

Output DAC Resolution

16-bit D/A converter

Output Accuracy

Better than ±0.05% of span, typical (±0.1% max.) for nominal input spans. Includes the effects of repeatability, terminal point conformity, and linearization, but does not include sensor error.

Ambient Temperature Effect

Better than ±0.008% per °C of input span or ±80ppm/°C, typical. Includes the combined effects of zero and span drift over temperature.

Output Response Time (for step input change)

No filter: 22ms.
Low filter: 50ms.
Medium filter: 160ms.
High filter: 1210ms.

■ Environmental

Operating temperature

-40 to 80°C (-40° to 176°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

12-32V DC SELV (Safety Extra Low Voltage), 24mA maximum.

Shock and Vibration Immunity

Vibration: 4g, per IEC 60068-2-64.
Shock: 25g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.
RFI: BS EN 61000-6-2, IEC 61000-4-3.
Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.
ESD: BS EN 61000-6-2, IEC 61000-4-2.
EFT: BS EN 61000-6-2, IEC 61000-4-4.
Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals

CE compliant. UL/CUL Class I Div. 2 Zone 2.

■ Physical

General

General-purpose enclosure designed for mounting on 35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.

I/O Connectors

Removable plug-in terminal blocks rated for 12A/250V; AWG #26-12, stranded or solid copper wire.

Dimensions

12.5 x 114.5 x 99.0 mm (0.5 x 4.51 x 3.90 inches).

Shipping Weight

0.22 kg (0.5 pounds) packed.

Ordering Information

Models

TT235-0600

Transmitter, isolated RTD/resistance input.

Services

TT230-Config/Cal

Factory custom configuration/calibration service. Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

TTC-SIP (recommend one kit per customer)

Software Interface Package for Acromag TT Series transmitters. Includes configuration software CD-ROM (5040-944), isolator (USB-ISOLATOR) and two USB cables (4001-112, 4001-113).

Accessories

See www.acromag.com for more information.

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

ISO9001
AS9100



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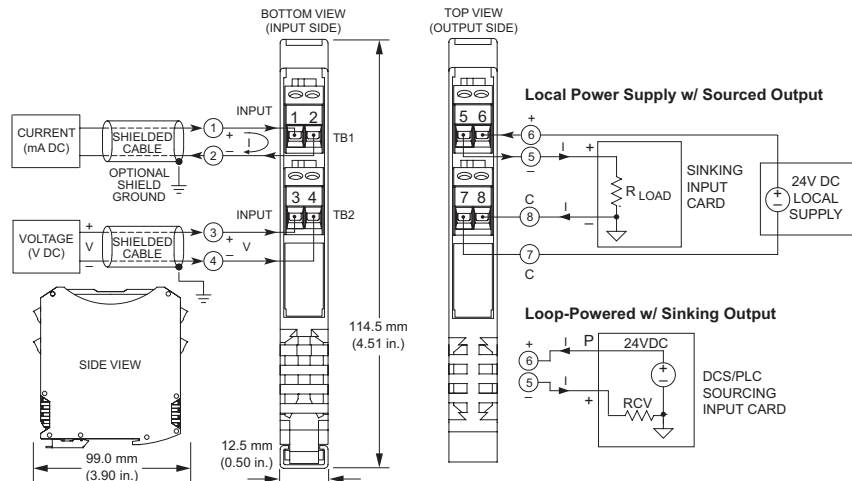


Transmitters: TT230 Series

TT236 Current/millivolt input two-wire/three-wire transmitter



**USB
Configured**



Multi-range $\pm 20\text{mA}$ or $\pm 500\text{mV}$ input ♦ 4-20mA output (sink/source) ♦ 12-32V DC loop/local power

Description

The TT236 model is a space-saving two-wire transmitter that isolates and converts a DC current or low voltage input to a proportional 4-20mA control signal. A single unit supports both voltage and current input for extra flexibility. Power is received from the output loop current or a DC supply when using a three-wire connection.

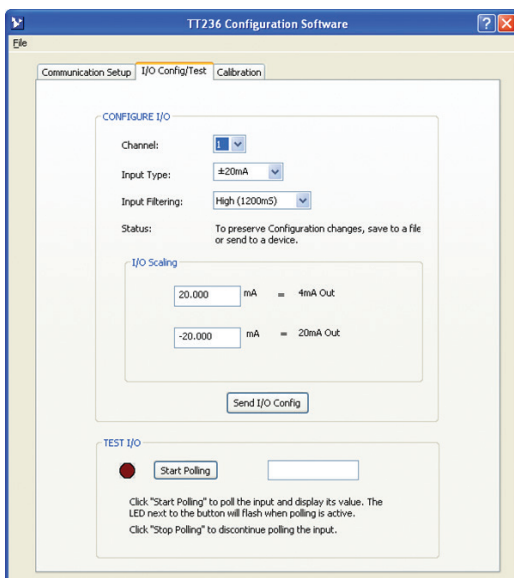
High-voltage isolation separates the input from the output circuit. Isolation protects from surges, reduces noise, and eliminates ground loop errors.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile temperature measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Single unit supports unipolar and bipolar input ranges up to $\pm 20\text{mA}$ or $\pm 500\text{mV}$ DC
- Accepts 0-20A AC input (with external sensor)
- Space-saving 12.5mm (0.5 inch) unit with pluggable terminals for convenient wiring
- High accuracy, linearity, stability, and reliability
- User-selectable filtering (low, medium, high)
- Supports sink or source output wiring
- Supports reverse-acting (inverse) output
- 1500V input isolation
- NAMUR-compliant output loop current
- Shock (25g) and vibration (4g) resistant
- Mounts on Type T DIN-rail
- Wide ambient operation (-40 to 80°C)
- CE compliant. UL/cUL Class 1 Div 2 Zone 2 approvals



TT230 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com. Windows XP, Vista, 7, & 8

The Agility™ Config Tool is downloadable (FREE) at the [Google Play Store](https://play.google.com/store/apps/details?id=com.acromag.agility). For Android Devices only

TT236 Model software allows you to configure transmitters offline, save the file, and download into units later, at your convenience.



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Transmitters: TT230 Series

TT236 Current/millivolt input two-wire/three-wire transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of their USB-ISOLATOR when configuring a TT230 Series transmitter.

■ USB Interface

USB Connector

USB Mini-B type socket, 5-pin.

USB Data Rate

12Mbps. USB v1.1 and 2.0 compatible.

USB Transient Protection

Transient voltage suppression on power and data lines.

USB Cable Length

5.0 meters maximum.

Driver

Not required. Uses built-in Human Interface Device (HID) USB drivers of the Windows operating system.

■ Input

Default Configuration/Calibration

Input: 4 to 20mA, medium filter.

Output: 4 to 20mA.

Input Ranges and Accuracy

Range	Accuracy
±500mV	±0.05% of span
0 to 500mV	±0.05% of span
±20mA	±0.05% of span
0 to 20mA	±0.05% of span
4 to 20mA	±0.05% of span
0 to 11.17mA (for AC sensor)	±0.05% of span
±1mA	±0.05% of span

Error includes the effects of repeatability, terminal point conformity, and linearization.

Ambient Temperature Effect

Better than ±80ppm/°C (±0.008%/°C).

Zero Scaling Adjust

0 to 95% of range, typical.

Full Scale Adjust

5 to 100% of full scale range, typical.

Input Impedance

Current input: 24.9 ohms.

Voltage input: 15M ohms

Input Over-Voltage Protection

Bipolar Transient Voltage Suppressors (TVS), 5.6V clamp level typical.

Input Resolution

Bipolar input: 1 part in 50000 (±25000)

Unipolar input: 1 part in 25000

Input Filter

Selectable digital filtering settings (low, medium, high).

Input Filter Bandwidth

Normal mode plus digital filtering within the ADC. Bandwidth (-3dB) varies with digital filter setting from 4Hz without filtering to 0.33Hz with high filtering.

Noise Rejection (Common Mode, High Filter)

138dB @ 60Hz, typical with 100 ohm input unbalance.

■ Output

Output Range

4 to 20mA DC.

Output Compliance

$R_{LOAD} = (V_{SUPPLY} - 11V) / 0.020A$.

$R_{LOAD} = 0$ to 650 ohms @ 24V DC.

Output Response Time (for step input change)

Time to reach 98% of final output value (typical)	
Low filter	50 milliseconds
Medium filter	150 milliseconds
High filter	1200 milliseconds

■ Environmental

Operating temperature

-40 to 80°C (-40° to 176°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

12-32V DC SELV (Safety Extra Low Voltage), 24mA max.

Isolation

1500V AC peak. 250V AC (354V DC) continuous isolation between input and output circuits.

Shock and Vibration Immunity

Vibration: 5g, per IEC 60068-2-64.

Shock: 50g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.

RFI: BS EN 61000-6-2, IEC 61000-4-3.

Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.

ESD: BS EN 61000-6-2, IEC 61000-4-2.

EFT: BS EN 61000-6-2, IEC 61000-4-4.

Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals

CE compliant. UL/cUL listing.

Designed for Class I; Division 2; Groups ABCD; Zone 2.

■ Physical

General

General-purpose enclosure designed for mounting on 35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.

I/O Connectors

Removable plug-in terminal blocks rated for 12A/250V; AWG #26-12, stranded or solid copper wire.

Dimensions

12.5 x 114.5 x 99.0 mm (0.5 x 4.51 x 3.90 inches).

Shipping Weight

0.22 kg (0.5 pounds) packed.

Ordering Information

Models

TT236-0600

Two-wire transmitter, current/millivolt input.

Services

TT230-Config/Cal

Factory custom configuration/calibration service. Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

TTC-SIP (recommend one kit per customer)

Software Interface Package for Acromag TT Series transmitters. Includes configuration software CD-ROM (5040-944), isolator (USB-ISOLATOR) and two USB cables (4001-112, 4001-113).

Accessories

See www.acromag.com for more information.

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

5020-350

AC current sensor (toroidal transformer); converts 0-20A AC to 0-11.17mA DC.

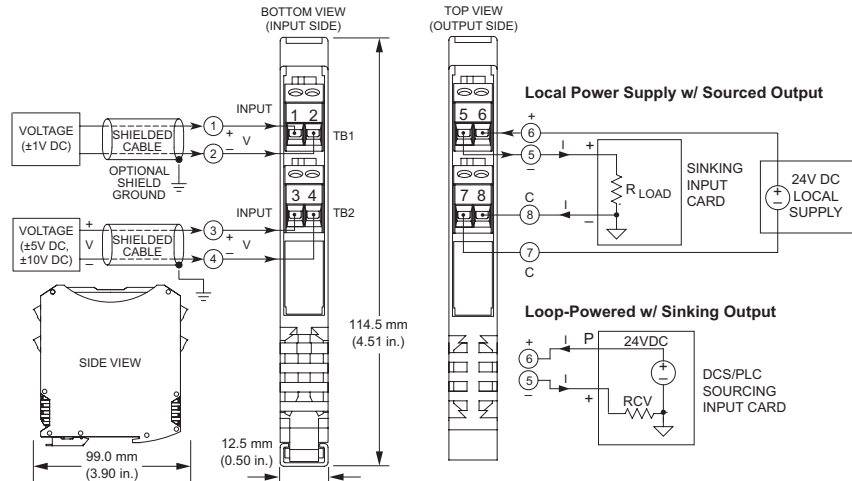
ISO9001
AS9100



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Transmitters: TT230 Series

TT237 Process voltage input two-wire/three-wire transmitter



Multi-range $\pm 1V$, $\pm 5V$, or $\pm 10V$ input ◆ 4-20mA output (sink/source) ◆ 12-32V DC loop/local power

Description

The TT237 model is a space-saving two-wire transmitter that isolates and converts a process level DC voltage input to a proportional 4-20mA control signal. A single unit supports multiple voltage input ranges for extra flexibility. Power is received from the output loop current or a local DC supply when using a three-wire connection.

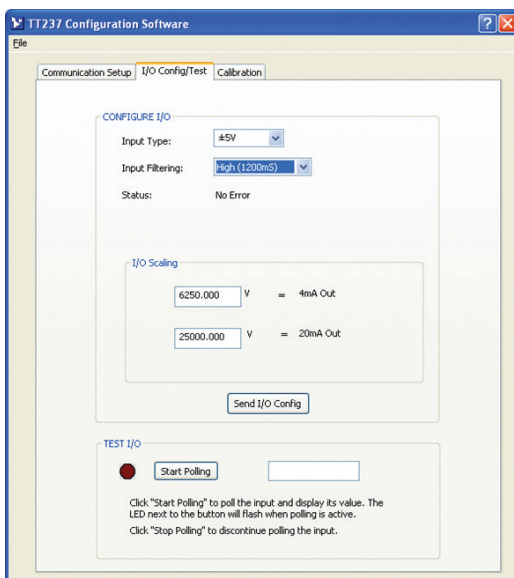
High-voltage isolation separates the input from the output circuit. Isolation protects from surges, reduces noise, and eliminates ground loop errors.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile temperature measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Single unit supports $\pm 1V$, $\pm 5V$, and $\pm 10V$ DC input ranges
- Space-saving 12.5mm (0.5 inch) unit with pluggable terminals for convenient wiring
- High accuracy, linearity, stability, and reliability
- User-selectable filtering (low, medium, high)
- Supports sink or source output wiring
- Supports reverse-acting (inverse) output
- 1500V input isolation
- NAMUR-compliant output loop current
- Shock (25g) and vibration (4g) resistant
- Mounts on Type T DIN-rail
- Wide ambient operation (-40 to $80^{\circ}C$)
- CE compliant. UL/cUL Class 1 Div 2 Zone 2 approvals



TT230 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com Windows XP, Vista, 7, & 8.

The Agility™ Config Tool is downloadable (FREE) at the [Google Play Store](https://play.google.com/store/apps/details?id=com.acromag.agility) For Android Devices only

TT237 Model software allows you to configure transmitters offline, save the file, and download into units later, at your convenience.

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Transmitters: TT230 Series

TT237 Process voltage input two-wire/three-wire transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of their USB-ISOLATOR when configuring a TT230 Series transmitter.

■ USB Interface

USB Connector

USB Mini-B type socket, 5-pin.

USB Data Rate

12Mbps. USB v1.1 and 2.0 compatible.

USB Transient Protection

Transient voltage suppression on power and data lines.

USB Cable Length

5.0 meters maximum.

Driver

Not required. Uses built-in Human Interface Device (HID) USB drivers of the Windows operating system.

■ Input

Default Configuration/Calibration

Input: $\pm 10V$ DC, medium filtering.

Output: 4 to 20mA.

Input Ranges and Accuracy

Range	Accuracy
$\pm 1V$ DC	$\pm 0.05\%$ of span
$\pm 5V$ DC	$\pm 0.05\%$ of span
$\pm 10V$ DC	$\pm 0.05\%$ of span

Error includes the effects of repeatability, terminal point conformity, and linearization.

Ambient Temperature Effect

Better than $\pm 80\text{ppm}/^\circ\text{C}$ ($\pm 0.008\%/^\circ\text{C}$).

Zero Scaling Adjust

0 to 95% of range, typical.

Full Scale Adjust

5 to 100% of full scale range, typical.

Input Impedance

$\pm 1V$ input: 15M ohms.

$\pm 5V$ input: >1M ohms.

$\pm 10V$ input: >1M ohms.

Input Over-Voltage Protection

Bipolar Transient Voltage Suppressors (TVS), 14V working and 18V clamp level typical.

Input Resolution

Bipolar input: 1 part in 50000 (± 25000)

Unipolar input: 1 part in 25000

Input Filter

Selectable digital filtering settings (low, medium, high).

Input Filter Bandwidth

Normal mode plus digital filtering within the ADC. Bandwidth (-3dB) varies with digital filter setting from 4Hz without filtering to 0.33Hz with high filtering.

Noise Rejection (Common Mode, High Filter)

138dB @ 60Hz, typical with 100 ohm input unbalance.

■ Output

Output Range

4 to 20mA DC.

Output Compliance

$R_{LOAD} = (V_{SUPPLY} - 11V) / 0.020A$.

$R_{LOAD} = 0$ to 650 ohms @ 24V DC.

Output Response Time (for step input change)

Time to reach 98% of final output value (typical)	
Low filter	50 milliseconds
Medium filter	150 milliseconds
High filter	1200 milliseconds

■ Environmental

Operating temperature

-40 to 80°C (-40° to 176°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

12-32V DC SELV (Safety Extra Low Voltage), 24mA max.

Isolation

1500V AC peak. 250V AC (354V DC) continuous isolation between input and output circuits.

Shock and Vibration Immunity

Vibration: 5g, per IEC 60068-2-64.

Shock: 50g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.

RFI: BS EN 61000-6-2, IEC 61000-4-3.

Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.

ESD: BS EN 61000-6-2, IEC 61000-4-2.

EFT: BS EN 61000-6-2, IEC 61000-4-4.

Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals

CE compliant. UL/cUL listing.

Designed for Class I; Division 2; Groups ABCD; Zone 2.

■ Physical

General

General-purpose enclosure designed for mounting on 35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.

I/O Connectors

Removable plug-in terminal blocks rated for 12A/250V; AWG #26-12, stranded or solid copper wire.

Dimensions

12.5 x 114.5 x 99.0 mm (0.5 x 4.51 x 3.90 inches).

Shipping Weight

0.22 kg (0.5 pounds) packed.

Ordering Information

Models

TT237-0600

Two-wire transmitter, process voltage input.

Services

TT230-Config/Cal

Factory custom configuration/calibration service. Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

TTC-SIP (recommend one kit per customer)

Software Interface Package for Acromag TT Series transmitters. Includes configuration software CD-ROM (5040-944), isolator (USB-ISOLATOR) and two USB cables (4001-112, 4001-113).

Accessories

See www.acromag.com for more information.

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

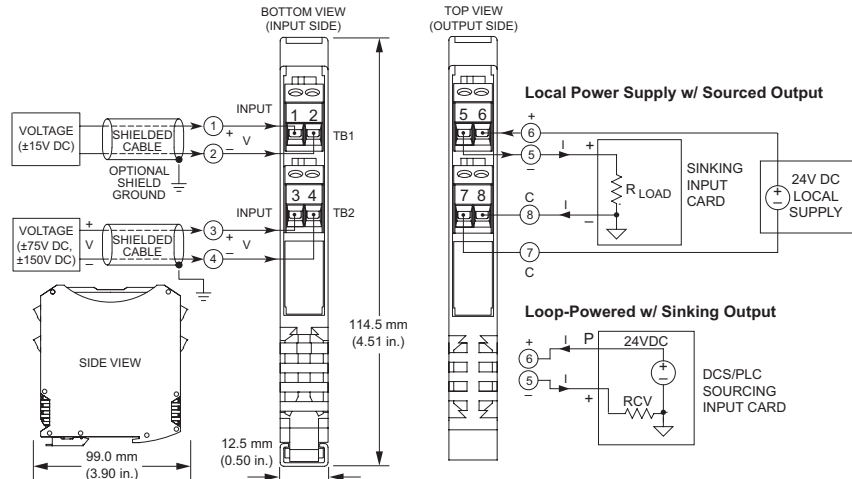
ISO9001
AS9100



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Transmitters: TT230 Series

TT238 High voltage input two-wire/three-wire transmitter



Multi-range $\pm 15V$, $\pm 75V$, or $\pm 150V$ input ◆ 4-20mA output (sink/source) ◆ 12-32V DC loop/local power

Description

The TT238 model is a space-saving two-wire transmitter that isolates and converts a high level DC voltage input to a proportional 4-20mA control signal. A single unit supports multiple voltage input ranges for extra flexibility. Power is received from the output loop current or a local DC supply when using a three-wire connection.

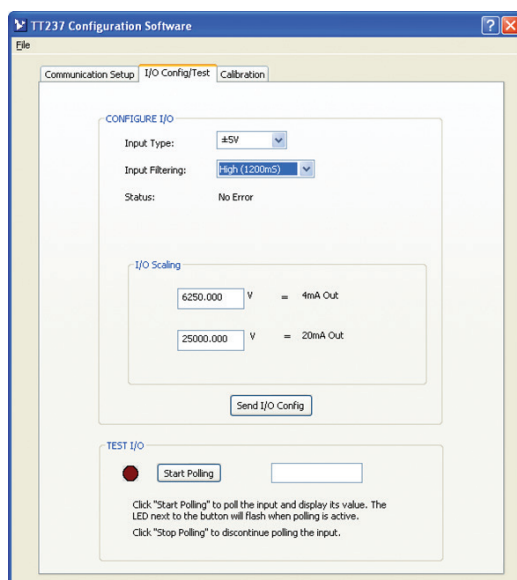
High-voltage isolation separates the input from the output circuit. Isolation protects from surges, reduces noise, and eliminates ground loop errors.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile temperature measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Single unit supports $\pm 15V$, $\pm 75V$, and $\pm 150V$ DC input ranges
- Space-saving 12.5mm (0.5 inch) unit with pluggable terminals for convenient wiring
- High accuracy, linearity, stability, and reliability
- User-selectable filtering (low, medium, high)
- Supports sink or source output wiring
- Supports reverse-acting (inverse) output
- 1500V input isolation
- NAMUR-compliant output loop current
- Shock (25g) and vibration (4g) resistant
- Mounts on Type T DIN-rail
- Wide ambient operation (-40 to $80^{\circ}C$)
- CE compliant. UL/cUL Class 1 Div 2 Zone 2 approvals



TT230 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com.
Windows XP, Vista, 7, & 8

The Agility™ Config Tool is downloadable (FREE) at the [Google Play Store](https://play.google.com/store/apps/details?id=com.acromag.agility).
For Android Devices only

TT238 Model software allows you to configure transmitters offline, save the file, and download into units later, at your convenience.



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Transmitters: TT230 Series

TT238 High voltage input two-wire/three-wire transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of their USB-ISOLATOR when configuring a TT230 Series transmitter.

■ USB Interface

USB Connector

USB Mini-B type socket, 5-pin.

USB Data Rate

12Mbps. USB v1.1 and 2.0 compatible.

USB Transient Protection

Transient voltage suppression on power and data lines.

USB Cable Length

5.0 meters maximum.

Driver

Not required. Uses built-in Human Interface Device (HID) USB drivers of the Windows operating system.

■ Input

Default Configuration/Calibration

Input: $\pm 150V$, medium filtering.

Output: 4 to 20mA.

Input Ranges and Accuracy

Range	Accuracy
$\pm 15V$ DC	$\pm 0.05\%$ of span
$\pm 75V$ DC	$\pm 0.05\%$ of span
$\pm 150V$ DC	$\pm 0.05\%$ of span

Error includes the effects of repeatability, terminal point conformity, and linearization.

Ambient Temperature Effect

Better than $\pm 80\text{ppm}/^{\circ}\text{C}$ ($\pm 0.008\%/^{\circ}\text{C}$).

Zero Scaling Adjust

0 to 95% of range, typical.

Full Scale Adjust

5 to 100% of full scale range, typical.

Input Impedance

Greater than 1M ohms.

Input Over-Voltage Protection

Bipolar Transient Voltage Suppressors (TVS), 220V working typical.

Input Resolution

Bipolar input: 1 part in 50000 (± 25000)

Unipolar input: 1 part in 25000

Input Filter

Selectable digital filtering settings (low, medium, high).

Input Filter Bandwidth

Normal mode plus digital filtering within the ADC. Bandwidth (-3dB) varies with digital filter setting from 4Hz without filtering to 0.33Hz with high filtering.

Noise Rejection (Common Mode, High Filter)

138dB @ 60Hz, typical with 100 ohm input unbalance.

■ Output

Output Range

4 to 20mA DC.

Output Compliance

$R_{LOAD} = (V_{SUPPLY} - 11V) / 0.020A$.

$R_{LOAD} = 0$ to 650 ohms @ 24V DC.

Output Response Time (for step input change)

Time to reach 98% of final output value (typical)	
Low filter	50 milliseconds
Medium filter	150 milliseconds
High filter	1200 milliseconds

■ Environmental

Operating temperature

-40 to 80°C (-40° to 176°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

12-32V DC SELV (Safety Extra Low Voltage), 24mA max.

Isolation

1500V AC peak. 250V AC (354V DC) continuous isolation between input and output circuits.

Shock and Vibration Immunity

Vibration: 5g, per IEC 60068-2-64.

Shock: 50g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.

RFI: BS EN 61000-6-2, IEC 61000-4-3.

Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.

ESD: BS EN 61000-6-2, IEC 61000-4-2.

EFT: BS EN 61000-6-2, IEC 61000-4-4.

Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals

CE compliant. UL/cUL listing.

Designed for Class I; Division 2; Groups ABCD; Zone 2.

■ Physical

General

General-purpose enclosure designed for mounting on 35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.

I/O Connectors

Removable plug-in terminal blocks rated for 12A/250V; AWG #26-12, stranded or solid copper wire.

Dimensions

12.5 x 114.5 x 99.0 mm (0.5 x 4.51 x 3.90 inches).

Shipping Weight

0.22 kg (0.5 pounds) packed.

Ordering Information

Models

TT238-0600

Two-wire transmitter, high voltage input.

Services

TT230-Config/Cal

Factory custom configuration/calibration service. Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

TTC-SIP (recommend one kit per customer)

Software Interface Package for Acromag TT Series transmitters. Includes configuration software CD-ROM (5040-944), isolator (USB-ISOLATOR) and two USB cables (4001-112, 4001-113).

Accessories

See www.acromag.com for more information.

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

ISO9001
AS9100



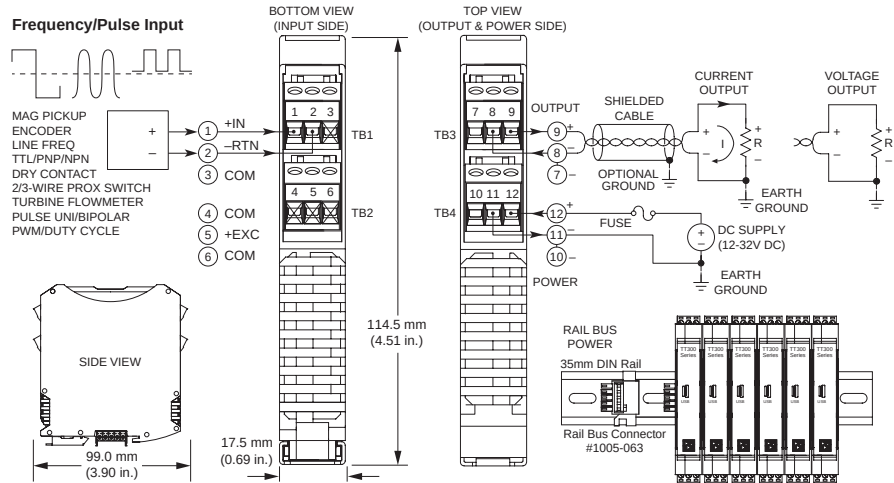
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Transmitters: TT330 Series

TT339 Frequency/pulse/PWM input four-wire transmitter



**USB
Configured**



Multi-range frequency/pulse input ♦ Universal current/voltage output ♦ 12-32V DC local/bus power

Description

The TT339 model is a space-saving four-wire transmitter that isolates and converts frequency, pulse, or pulse-width modulation (PWM) input to a proportional control signal. DC current and voltage output are both supported on a single model. An optional DIN rail bus can deliver primary or redundant power to multiple units without wiring.

High-voltage isolation separates the input from the output circuit. Isolation protects from surges, reduces noise, and eliminates ground loop errors.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile frequency measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.

Amplifier applications include:

- Speed pickup
- Line frequency monitoring
- Turbine flowmeter interface
- PWM sensing/feedback circuits
- Shaft encoder interface

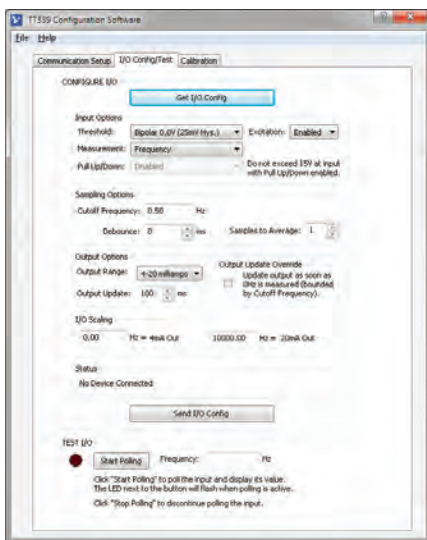
TT330 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com.

Windows® XP, Vista, 7, 8

The Agility™ Config Tool is downloadable (FREE) at the [Google Play Store](https://play.google.com/store/apps/details?id=com.acromag.agility)
For Android Devices only

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Measures frequency or duty cycle and interfaces many input types up to 100KHz
- Accepts input amplitudes up to 120VRMS ($\pm 170V$ DC, unipolar or bipolar)
- Adjustable 0Hz cut-off, sample averaging, debounce, and output update time
- Universal output connections support ranges up to $\pm 21mA$ or $\pm 10.5V$ DC without rewiring
- Supports normal or reverse-acting output
- Fast response time and high accuracy
- Space-saving 17.5mm (0.7 inch) unit with pluggable terminals for convenient wiring
- Redundant power ready (rail/local)
- 1500V isolation, 3-way (power, input, output)
- Shock (25g) and vibration (4g) resistant
- Mounts on Type T DIN-rail
- Wide ambient operation (-40 to 80°C)
- CE Compliant and UL/cUL Class 1 Div 2 Zone 2 approvals



TT339 Model software allows you to configure transmitters offline, save the file, and download into units later, at your convenience.

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Transmitters: TT330 Series

TT339 Frequency/pulse/PWM input four-wire transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of their USB-ISOLATOR when configuring a TT330 Series transmitter.

■ USB Interface

USB Connector

USB Mini-B type socket, 5-pin.

USB Data Rate

12Mbps. USB v1.1 and 2.0 compatible.

USB Transient Protection

Transient voltage suppression on power and data lines.

USB Cable Length

5.0 meters maximum.

Driver

Not required. Uses built-in Human Interface Device (HID) USB drivers of the Windows operating system.

■ Input

Default Configuration/Calibration

$\pm 5.0V$ Square Wave; Input Threshold = Bipolar $0.0V$; Hysteresis $\pm 25mV$; Pull Up/Down = Disabled; Excitation = Enabled; $0Hz$ Cutoff = $0.5Hz$; Sample Average = 1; Output Range = $4-20mA$; I/O Scaling = $0Hz$ to $10KHz$; Normal Acting; Output Update = $100ms$.

Frequency Input

Configurable for any range from $0Hz$ to $100KHz$. Accepts unipolar (non-zero crossing) or bipolar (zero crossing) input signals. $0.5Hz$ minimum span. $1\mu s$ minimum pulse width.

Duty Cycle Input

Carrier frequency range: Any range from 0 to $20KHz$. Duty cycle range: 1 to 99% , depending on freq. range.

Input Scaling Adjust

Zero: Adjustable over 0 to 99% of full-scale input. Full scale: Adjustable over $0.5Hz$ to $100KHz$. Cut-off frequency: Adjustable over $0.01Hz$ to $100KHz$.

Unipolar Signal Configuration:

Amplitude: 0 to $3V$ DC min., 0 to $170V$ DC max.

Thresholds: Configurable for $1.6V$ DC ($\pm 25mV$ hysteresis) or $5V$ DC ($\pm 83mV$ hysteresis), typical.

Bipolar Signal Configuration:

Amplitude: ± 50 to $\pm 200mV$ min. (depending on range and hysteresis), $120V_{RMS}$ max. ($\pm 170V$ DC).

Thresholds: $0mV$ nominal (± 25 or $\pm 83mV$ hysteresis).

Input Pull-up/Pull-down (Internal)

Software-selectable $2.7K\Omega$ input pull-up to $+5V$ and a $1K\Omega$ input pull-down to $-FRN$, or disabled. $15V$ DC maximum input when used.

Input Excitation Supply

$+5V$ DC, current limited to $+20mA$ typical.

Input Filter Bandwidth

$-3dB$ at $35KHz$, typical.

Input Impedance

$37.2K$ ohms, typical.

Noise Rejection

Normal mode @ $60Hz$: Not applicable.
Common mode @ $60Hz$: $90dB$.

■ Output

Output Range

Range	Over-Range	Resolution
$\pm 10V$	$\pm 10.5V$	1 part in 62558
$\pm 5V$	$\pm 5.25V$	1 part in 31278
0 to $10V$	-0.5527 to $+10.5V$	1 part in 59293
0 to $5V$	-0.27634 to $+5.25V$	1 part in 60414
$\pm 20mA$	$\pm 21mA$	1 part in 62400
0 to $20mA$	-1.1054 to $+21mA$	1 part in 58732
4 to $20mA$	-1.1054 to $+21mA$	1 part in 46984

Output Load

Voltage output: 1000 ohms minimum.

Current output: 525 ohms maximum.

Output Update

Software configurable from 10 to $5000ms$. Determines rate at which output signal updates, unless optionally overridden by the $0Hz$ cutoff setting.

Output Accuracy

Better than $\pm 0.05\%$ of span, typical ($\pm 0.1\%$ max.) for nominal input spans. Includes the effects of repeatability, terminal point conformity, and linearization, but does not include sensor error.

Output Ripple

Less than $\pm 0.1\%$ of output span.

Output Ambient Temperature Drift

Better than $\pm 40ppm/^{\circ}C$ ($\pm 0.0040\%/^{\circ}C$).

■ Environmental

Operating temperature

-40 to $80^{\circ}C$ (-40° to $176^{\circ}F$).

Storage temperature

-40 to $85^{\circ}C$ (-40 to $185^{\circ}F$).

Relative humidity

5 to 95% non-condensing.

Power Requirement

$12-32V$ DC SELV (Safety Extra Low Voltage), $24mA$ max.

Isolation

$1500V$ AC peak. $250V$ AC ($354V$ DC) continuous isolation between input, output, and power (3-way).

Shock and Vibration Immunity

Vibration: $4g$, per IEC 60068-2-64.

Shock: $25g$, per IEC 60068-2-27

Approvals

CE compliant. UL/cUL Class I Div. 2 Zone 2.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.

RFI: BS EN 61000-6-2, IEC 61000-4-3.

Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.

ESD: BS EN 61000-6-2, IEC 61000-4-2.

EFT: BS EN 61000-6-2, IEC 61000-4-4.

Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

■ Physical

General

General-purpose enclosure designed for mounting on $35mm$ "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.

I/O Connectors

Removable plug-in terminal blocks rated for $12A/250V$; AWG #26-12, stranded or solid copper wire.

Dimensions

$17.5 \times 114.5 \times 99.0$ mm ($0.7 \times 4.51 \times 3.90$ inches).

Shipping Weight

0.22 kg (0.5 pounds) packed.

Ordering Information

Models

TT339-0700

Transmitter, isolated frequency/pulse/PWM input

Services

TT330-Config/Cal

Factory custom configuration/calibration service. Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

TTC-SIP (recommend one kit per customer)

Software Interface Package for Acromag TT Series transmitters. Includes configuration software CD-ROM (5040-944), isolator (USB-ISOLATOR) and two USB cables (4001-112, 4001-113).

Accessories

See www.acromag.com for more information.

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

TTBUS-KIT

DIN rail bus power connector and left/right terminal blocks. One kit supports multiple transmitters.

ISO9001
AS9100



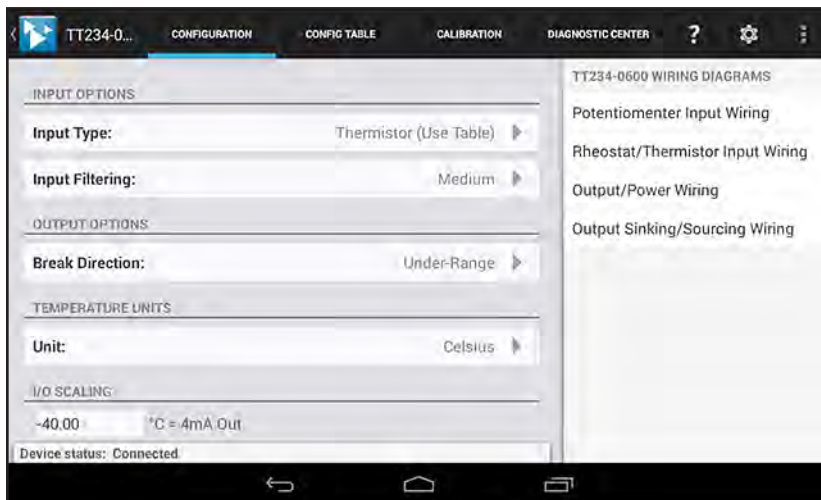
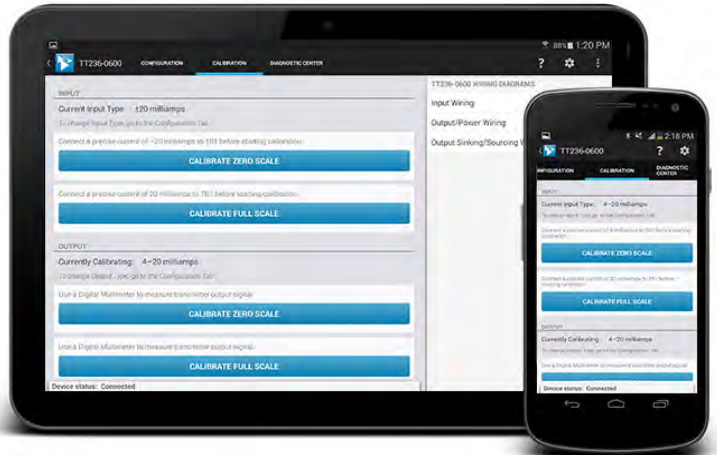
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Transmitters: TT Series

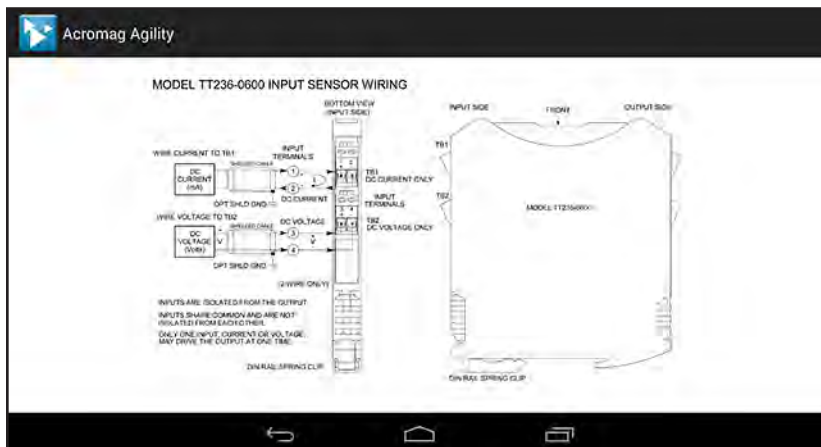
Acromag Agility™ Config Tool Mobile Application

The Agility™ Config Tool is a mobile application that allows easy setup and configuration of Acromag TT Series transmitters via a tethered mobile device.

This free app is available for Android devices at the Google Play store at [Acromag Agility™ Config Tool](#).



With a couple of taps, quickly configure input, output, unit and scaling options.



Quick and easy access to the wiring diagram, even offline without internet access.

Key Features & Benefits

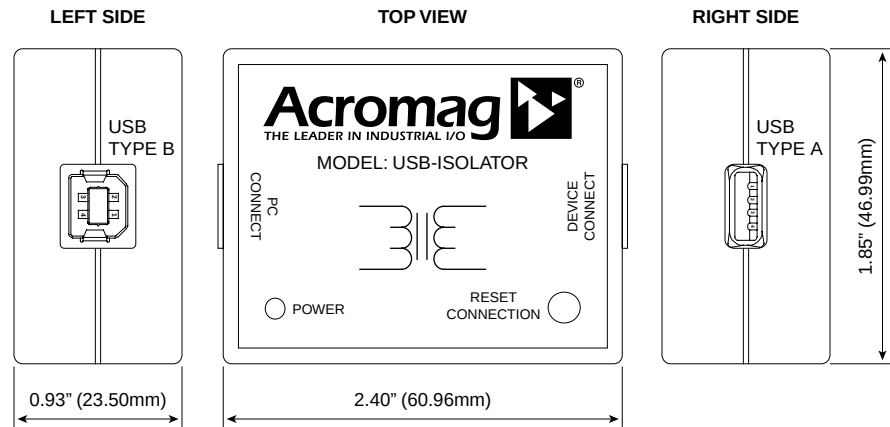
- Connects to Acromag TT Series transmitters (except models TT231 and TT233)
- Requires the use of USB OTG Cable (Acromag part #: 5028-565) and USB A to Mini B Cable (Acromag part #: 4001-113)
- Configures and calibrates TT Series products via phone or tablet running Android 4.0 ICS (Ice Cream Sandwich) or later.
- View wiring diagrams, even without an internet connection
- Perform quick and easy field diagnostics and troubleshooting
- Ideal for field technicians



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USB-ISOLATOR USB-to-USB Isolator



USB-powered, USB 2.0 and 1.1 compatible ♦ 1500V AC / 2100V DC isolation ♦ No drivers required

Description

This compact, industrial-grade isolator provides a high-voltage isolation barrier between a computer and a connected USB device. The isolation protects equipment from electrical surges and transient voltage spikes. It also eliminates ground loop currents flowing between the PC and peripherals which can cause damage and inaccurate measurements. Additionally, isolation minimizes conducted noise from static discharge, magnetic fields, and radio frequency interference.

Acromag's USB isolator is very easy to use. The isolator inserts in-line with the USB connection and operates transparently. No special software drivers are required. The unit receives power from the PC's USB port and isolates that power to the connected device. High noise immunity and low radiated emissions ensure reliable data transfer in sensitive applications.

A number of high-performance features help provide convenient and dependable operation. The green LED indicates that power is being received and blinks if the connected device draws too much current. An internal jumper lets you switch from Full Speed (12 Mbps) to Low Speed (1.5 Mbps) communication. The reset button offers a simple way to reinitialize a connected device without breaking the cable connection. High-retention USB sockets keep cables securely attached under shock and vibration.

Key Features & Benefits

- Isolates and protects a USB peripheral from a USB host
- Electrical isolation up to 1500V AC / 2100V DC
- Common mode filtering on all data lines
- Built-in surge/transient suppression up to 8kV on all ports
- Self-powered through the USB port
- Supports USB 2.0 full speed (12 Mbps) and USB 1.1 low speed (1.5 Mbps) data rates with jumper-selection
- LED for power indication and diagnostics
- Reset button to reinitialize and re-enumerate peripheral devices
- Output short circuit protection with auto-retry
- No software or configuration required (transparent operation)
- Uses standard high-retention USB Type A/B cable connections (includes 1m cable)
- Compact size and rugged design for harsh environments
- Wide ambient temperature operation -40 to 70°C (-40 to 158°F)
- CE, FCC, UL/cUL approvals

Ordering Information

Models

USB-ISOLATOR

USB isolator, includes USB cable (Part # 4001-112) for isolator-to-PC connection

TTC-SIP

CD-ROM (Part #5040-944), USB isolator and two USB cables (Part # 4001-112, 4001-113) for configuration of Acromag TT Series transmitters

Accessories

4001-112

USB cable, 1 meter, with Type A to Type B plugs

4001-113

USB cable, 1 meter, with Type A to Mini-B plugs





USB-ISOLATOR USB-to-USB Isolator

Performance Specifications

■ USB Port Interface

Standards

USB 1.1 and 2.0 compatible, full speed (12Mbps, default) and low speed (1.5Mbps) data rates supported. For low speed data rates, an internal jumper is provided for user setting. Connection is transparent, no software or configuration is required. Isolator will not be enumerated in the device manager.

■ Physical

Dimensions

2.40" Length x 1.85" Wide x 0.925" High
(60.96mm x 46.99mm x 23.495mm).

Connectors

Standard high retention USB A/B connectors with minimum withdrawal force of 15 Newtons. 1 meter A/B cable included.

PC Connector

USB Type B receptacle

Device Connector

USB Type A receptacle

LED Indicator

Green LED indicates isolator receiving 5V power from the USB computer bus. Flashing indicates short circuit/ retries on peripheral side.

Reset Button

Resets the connection to the USB peripheral device for reinitialization and re-enumeration.

Enclosure Material

ABS Resin, UL94 rated, IP30 plastic case.

■ Environmental

Operating temperature

-40 to 70°C (-40° to 158°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power

PC Connect Side: Standard USB bus power (5V DC).

Device Connect Side: 5V DC / 120mA with full power connection from PC. Includes over-current protection with auto-retry.

Isolation

1500V AC / 2100V DC peak isolation.

250V AC continuous safety isolation.

Agency Approvals:

CE and FCC compliant. UL/cUL Class 1 Div. 2 Zone 2.

Radiated Field Immunity (RFI)

Designed to comply with IEC1000-4-3 Level 3 and EN50082-1.

Electromagnetic Compatibility (EMC)

Minimum immunity per EN61000-6-2:2001

Electrostatic Discharge (ESD) Immunity

Per IEC61000-4-2.

Radiated Field Immunity (RFI)

Per IEC61000-4-3.

Electrical Fast Transient Immunity (EFT)

Per IEC61000-4-4. Complies with IEC1000-4-4 Level 3 and EN50082-1.

Surge Immunity

Complies with IEC1000-4-5 Level 3 and EN50082-1.

Per IEC61000-4-5.

Conducted RF Immunity (CRFI)

Per IEC61000-4-6.

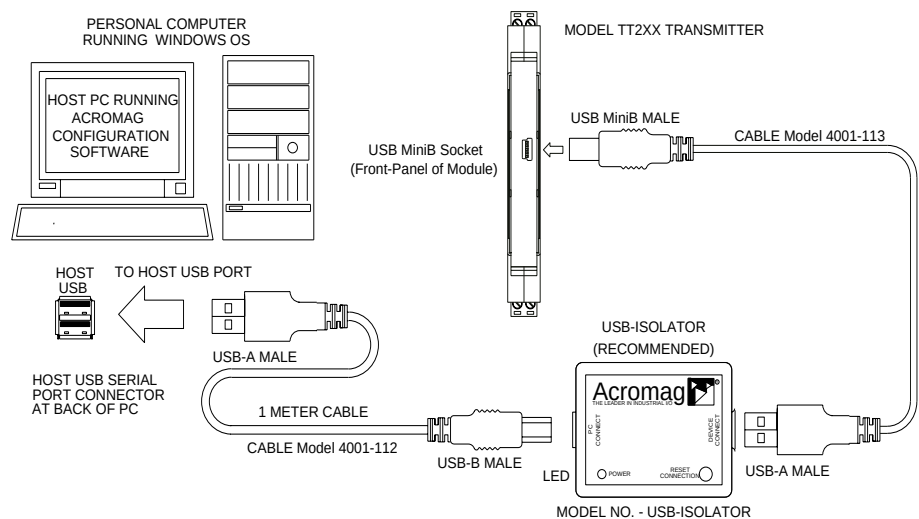
Emissions

Per EN61000-6-4:2001.

Radiated Frequency Emissions

Per CISPR11 Class A. Meets or exceeds EN50081-1 for Class B equipment.

TT SERIES USB TRANSMITTER CONNECTIONS



ISO9001
AS9100

MADE IN USA

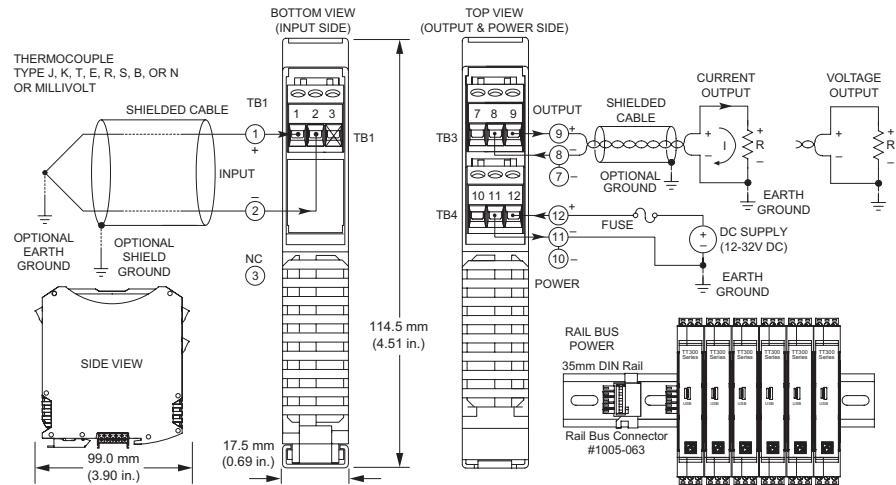
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Transmitters: TT330 Series

TT333 Thermocouple/millivolt input four-wire transmitter



Universal thermocouple/millivolt input ♦ Universal current/voltage output ♦ 12-32V DC local/bus power

Description

The TT333 model is a space-saving four-wire transmitter that isolates and converts a millivolt or thermocouple sensor input to a proportional control signal. DC current and voltage output are both supported on a single model. An optional DIN rail bus can deliver primary or redundant power to multiple units without wiring.

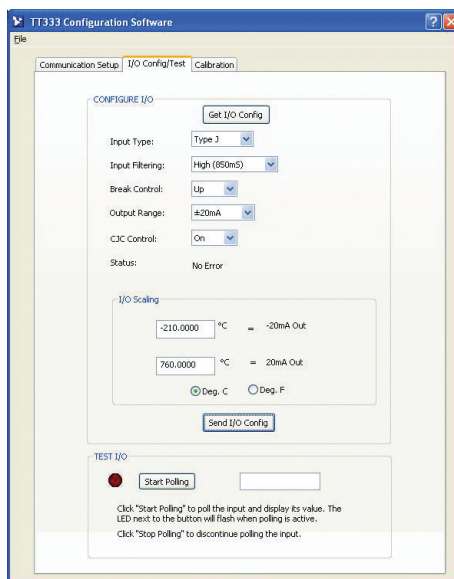
High-voltage isolation separates the input from the output circuit. Isolation protects from surges, reduces noise, and eliminates ground loop errors.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile temperature measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Universal thermocouple or millivolt input (TC Type J, K, T, R, S, E, B, N or $\pm 100\text{mV}$)
- Universal output connections support ranges up to $\pm 21\text{mA}$ or $\pm 10.5\text{V DC}$ without rewiring
- Space-saving 17.5mm (0.7 inch) unit with pluggable terminals for convenient wiring
- High accuracy, linearity, stability, and reliability
- User-selectable filtering (none, low, med., high)
- Adjustable response times (15ms to 850ms)
- Supports reverse-acting (inverse) output
- Selectable upscale or downscale operation for sensor faults and lead-break detection
- Bus power, local power, or both
- Redundant power ready (rail/local)
- 1500V isolation, 3-way (power, input, output)
- Shock (25g) and vibration (4g) resistant
- Wide ambient operation (-40 to 80°C)
- CE compliant. UL/cUL Class 1 Div 2 Zone 2 approvals



TT330 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com.

Windows® XP, Vista, 7, and 8

The Agility™ Config Tool is downloadable (FREE) at the [Google Play Store](https://play.google.com/store/apps/details?id=com.acromag.agility) For Android Devices only

TT333 Model software allows you to configure transmitters offline, save the file, and download into units later, at your convenience.

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Transmitters: TT330 Series

TT333 Thermocouple/millivolt input four-wire transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of their USB-ISOLATOR when configuring a TT330 Series transmitter.

■ USB Interface

USB Connector

Type: USB Mini-B type socket, 5-pin.
Data rate: 12Mbps. USB v1.1 and 2.0 compatible.
Maximum cable length: 5.0 meters.

USB Transient Protection

Transient voltage suppression on power and data lines.

Driver

Not required. Uses Windows HID drivers.

■ Input

Default Configuration/Calibration

Input: TC J, -210 to 760°C, med. filter, break: up
Output: 4 to 20mA.

Input Ranges and Accuracy

Input	Range	Accuracy
TC J	-210 to 760°C (-346 to 1400°F)	±0.5°C
TC K	-200 to 1372°C (-328 to 2502°F)	±0.5°C
TC T	-260 to 400°C (-436 to 752°F)	±0.5°C
TC R	-50 to 1768°C (-58 to 3214°F)	±1.0°C
TC S	-50 to 1768°C (-58 to 3214°F)	±1.0°C
TC E	-200 to 1000°C (-328 to 1832°F)	±0.5°C
TC B	260 to 1820°C (500 to 3308°F)	±1.0°C
TC N	-230 to 1300°C (-382 to 2372°F)	±1.0°C
mV	-100 to 100mV	±0.1mV

Error includes the effects of repeatability, terminal point conformity, and linearization (but not CJC error).

Thermocouple Reference

(Cold Junction Compensation)

±0.2°C typical, ±0.5°C maximum at 25°C.

Ambient Temperature Effect

Better than ±80ppm/°C (±0.008%/°C).

Scaling Adjust

Zero: 0 to 95% of range, typical.

Full scale: 5 to 100% of full scale range, typical.

Lead Break (Sensor Burnout) Detection

Upscale/downscale ±5% full scale range typical.

Input Over-Voltage Protection

Bipolar Transient Voltage Suppressors (TVS),
5.6V clamp level typical.

Input Resolution

Millivolt input: 0.0025% (1 part in 40,000)
Thermocouple input: 0.1°C.

Input Impedance

Current input: 24.9 ohms.

Voltage input: 15M ohms

Input Filter

Selectable digital filtering settings (none, low, medium, and high)

Noise Rejection

Normal mode @ 60Hz:

>0.5dB (no filter), >80dB (high filter)

Common mode @ 60Hz:

>100dB (no filter), >130dB (high filter)

■ Output

Output Range

Range	Over-Range	Resolution
±10V	±10.5V	1 part in 62415
±5V	±5.25V	1 part in 31208
0 to 10V	-0.5527 to +10.5V	1 part in 59240
0 to 5V	-0.27634 to +5.25V	1 part in 60262
±20mA	±21mA	1 part in 62259
0 to 20mA	-1.1054 to 21mA	1 part in 58596
4 to 20mA	-1.1054 to 21mA	1 part in 46877

Output Load

Voltage output: 1K ohms minimum.

Current output: 0-550 ohms.

Output Response Time (for step input change)

Time to reach 98% of final output value (typical)	
No filter	15 milliseconds
Low filter	40 milliseconds
Medium filter	120 milliseconds
High filter	850 milliseconds

Output Ripple

Less than ±0.1% of output span.

Output Ambient Temperature Drift

Better than ±80ppm/°C (±0.0080%/°C).

■ Environmental

Operating temperature

-40 to 80°C (-40° to 176°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

12-32V DC SELV (Safety Extra Low Voltage),
24mA max.

Isolation

1500V AC peak. 250V AC (354V DC) continuous
isolation between input, output, and power (3-way).

Shock and Vibration Immunity

Vibration: 5g, per IEC 60068-2-64.

Shock: 50g, per IEC 60068-2-27

Approvals

CE compliant. UL/cUL listing.

Designed for Class I; Division 2; Groups ABCD; Zone 2.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.

RFI: BS EN 61000-6-2, IEC 61000-4-3.

Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.

ESD: BS EN 61000-6-2, IEC 61000-4-2.

EFT: BS EN 61000-6-2, IEC 61000-4-4.

Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

■ Physical

General

General-purpose enclosure designed for mounting on
35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color
light gray. General-purpose NEMA Type 1 enclosure.

I/O Connectors

Removable plug-in terminal blocks rated for 12A/250V;
AWG #26-12, stranded or solid copper wire.

Dimensions

17.5 x 114.5 x 99.0 mm (0.7 x 4.51 x 3.90 inches).

Shipping Weight

0.22 kg (0.5 pounds) packed.

Ordering Information

Models

TT333-0700

Four-wire transmitter, thermocouple/millivolt input.

Services

TT330-Config/Cal

Factory custom configuration/calibration service.
Specify input type, input/output zero and full-scale
values, filtering, and sensor fault settings on order.

Software

TTC-SIP (recommend one kit per customer)

Software Interface Package for Acromag TT Series
transmitters. Includes configuration software CD-ROM
(5040-944), isolator (USB-ISOLATOR) and two USB
cables (4001-112, 4001-113).

Accessories

See www.acromag.com for more information.

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

TTBUS-KIT

DIN rail bus power connector and left/right terminal
blocks. One kit supports multiple transmitters.

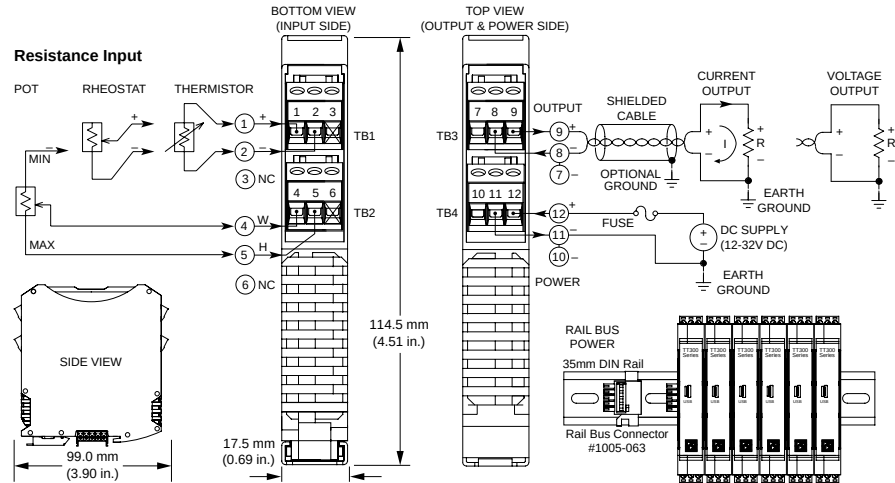
ISO9001
AS9100



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Transmitters: TT330 Series

TT334 Potentiometer / thermistor input four-wire transmitter



Pot/slidewire, thermistor input ♦ Universal current/voltage output ♦ 12-32V DC local/bus power

Description

The TT334 model is a space-saving four-wire transmitter that isolates and converts a resistive sensor input to a proportional control signal. DC current and voltage output are both supported on a single model. An optional DIN rail bus can deliver primary or redundant power to multiple units without wiring.

High-voltage isolation separates the input from the output circuit. Isolation protects from surges, reduces noise, and eliminates ground loop errors.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile temperature measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Interfaces 100-100kΩ potentiometer/slidewire and 100-1MΩ NTC thermistor/rheostat inputs
- Customizable thermistor linearization table with preset curves for popular resistances
- Universal output connections support ranges up to ±21mA or ±10.5V DC without rewiring
- Pluggable terminals for convenient wiring
- High accuracy, linearity, stability, and reliability
- User-selectable filtering (none, low, med., high)
- Fast response (as low as 21ms)
- Supports normal or reverse-acting output
- Selectable upscale or downscale operation for sensor faults and lead-break detection
- Bus power, local power, or both for redundant power supplies
- 1500V isolation, 3-way (power, input, output)
- Shock (25g) and vibration (4g) resistant
- Wide ambient operation (-40 to 80°C)
- CE and UL/cUL Class 1 Div 2 Zone 2 approvals



TT330 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com.

Windows® XP, Vista, 7, and 8

TT334 Model software allows you to configure transmitters offline, save the file, and download into units later, at your convenience.

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Transmitters: TT330 Series

TT334 Potentiometer / thermistor input four-wire transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of their USB-ISOLATOR when configuring a TT330 Series transmitter.

■ USB Interface

USB Connector

Type: USB Mini-B type socket, 5-pin.
Data rate: 12Mbps. USB v1.1 and 2.0 compatible.
Maximum cable length: 5.0 meters.

USB Transient Protection

Transient voltage suppression on power and data lines.

Driver

Not required. Uses Windows HID drivers.

■ Input

Default Configuration

Pot/slidewire, 0% to 100% input, 4-20mA output, downscale break detect, medium filter.

Input Configuration

Two- or three-wire sensor input connections.

User-configurable thermistor linearization table has preset curves for resistances below at 25°C.

Programs in °C, °F, °K, or ohmic integer values only.

Input Ranges

Input Type	Input Range	Accuracy
Potentiometer	0 to 100% (100 to 100KΩ)	< ±0.01% of span
Rheostat	100 to 1MΩ	< ±0.5% of input
Thermistor 2252Ω	-40 to 100°C (-40 to 212°F)	< ±0.05°C (±0.09°F)
Thermistor 2752Ω	-40 to 100°C	< ±0.05°C (±0.09°F)
Thermistor 2795Ω	-40 to 100°C	< ±0.05°C (±0.09°F)
Thermistor 3kΩ	-40 to 100°C	< ±0.05°C (±0.09°F)
Thermistor 5kΩ	-40 to 100°C	< ±0.05°C (±0.09°F)
Thermistor 10kΩ	-40 to 100°C	< ±0.05°C (±0.09°F)
Thermistor 30kΩ	-40 to 100°C	< ±0.05°C (±0.09°F)
Custom thermistor	100 to 1MΩ	< ±0.5% of input

Input Scaling Adjust

Zero: 0 to 95% of range, typical.

Full scale: 5 to 100% of full scale range, typical.

Lead Break (Sensor Burnout) Detection

Configurable for either upscale or downscale on thermistor or rheostat inputs. Downscale only on potentiometer/slidewire inputs.

Excitation Voltage

Thermistor/rheostat: 1.25V DC, typical.

Potentiometer: 0.3V DC, limited to 3.35mA, typical.

■ Output

Output Range

Range	Over-Range	Resolution
±10V	±10.5V	1 part in 62558
±5V	±5.25V	1 part in 31278
0 to 10V	-0.5527 to +10.5V	1 part in 59293
0 to 5V	-0.27634 to +5.25V	1 part in 60414
±20mA	±21mA	1 part in 62400
0 to 20mA	-1.1054 to 21mA	1 part in 58732
4 to 20mA	-1.1054 to 21mA	1 part in 46984

Output Accuracy

Better than ±0.05% of span, typical (±0.1% max.) for nominal input spans. Includes the effects of repeatability, terminal point conformity, and linearization, but does not include sensor error.

Output Load

Voltage output: 1K ohms minimum.

Current output: 0-525 ohms.

Output Response Time (for step input change)

No filter: 21ms. Medium filter: 150ms.

Low filter: 40ms. High filter: 1200ms.

Output Ambient Temperature Drift

Better than ±80ppm/°C (±0.0080%/°C).

■ Environmental

Operating temperature

-40 to 80°C (-40° to 176°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

12-32V DC SELV (Safety Extra Low Voltage), 1.3W max.

Isolation

1500V AC peak. 250V AC (354V DC) continuous isolation between input, output, and power (3-way).

Shock and Vibration Immunity

Vibration: 4g, per IEC 60068-2-64.

Shock: 25g, per IEC 60068-2-27

Approvals

CE compliant. UL/cUL Class I Div. 2 Zone 2..

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.

RFI: BS EN 61000-6-2, IEC 61000-4-3.

Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.

ESD: BS EN 61000-6-2, IEC 61000-4-2.

EFT: BS EN 61000-6-2, IEC 61000-4-4.

Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

■ Physical

General

General-purpose enclosure designed for mounting on 35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.

I/O Connectors

Removable plug-in terminal blocks rated for 12A/250V; AWG #26-12, stranded or solid copper wire.

Dimensions

17.5 x 114.5 x 99.0 mm (0.7 x 4.51 x 3.90 inches).

Shipping Weight

0.22 kg (0.5 pounds) packed.

Ordering Information

Models

TT334-0700

Four-wire transmitter, potentiometer/thermistor input

Services

TT330-Config/Cal

Factory custom configuration/calibration service.

Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

TTC-SIP (*recommend one kit per customer*)

Software Interface Package for Acromag TT Series transmitters. Includes configuration software CD-ROM (5040-944), isolator (USB-ISOLATOR) and two USB cables (4001-112, 4001-113).

Accessories

See www.acromag.com for more information.

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

TTBUS-KIT

DIN rail bus power connector and left/right terminal blocks. One kit supports multiple transmitters.

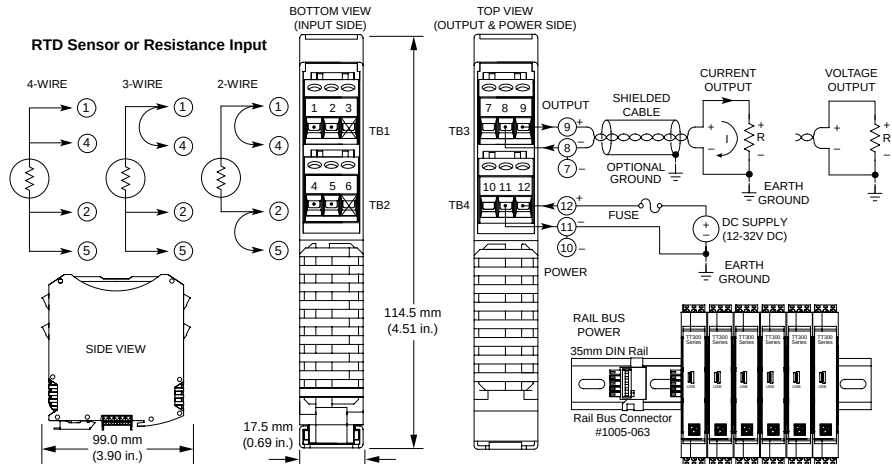
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Transmitters: TT330 Series

TT335 Isolated RTD/resistance input four-wire transmitter



RTD (Pt, Ni, Cu) or 0-450 ohm input ♦ Universal current/voltage output ♦ 12-32V DC local/bus power

Description

The TT335 model is a space-saving four-wire transmitter that isolates and converts an RTD sensor input to a proportional control signal. DC current and voltage output are both supported on a single model. An optional DIN rail bus can deliver primary or redundant power to multiple units without wiring.

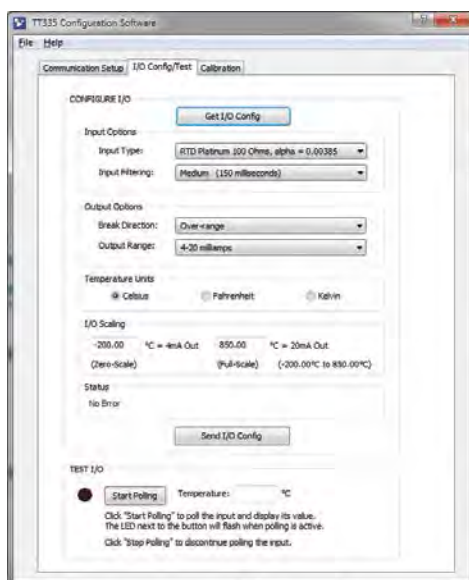
High-voltage isolation separates the input from the output circuit. Isolation protects from surges, reduces noise, and eliminates ground loop errors.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile temperature measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Selectable RTD or linear resistance input type: Pt RTD (100Ω, 200Ω, 500Ω, or 1000Ω), Ni RTD (120Ω), Cu RTD (10Ω), or Resistance (0-450Ω)
- Universal output connections support ranges up to ±21mA or ±10.5V DC without rewiring
- Pluggable terminals for convenient wiring
- High accuracy, linearity, stability, and reliability
- User-selectable filtering (none, low, med., high)
- Fast response (as low as 32ms)
- Supports normal or reverse-acting output
- Selectable upscale or downscale operation for sensor faults and lead-break detection
- Bus power, local power, or both for redundant power supplies
- 1500V isolation, 3-way (power, input, output)
- Shock (25g) and vibration (4g) resistant
- Wide ambient operation (-40 to 80°C)
- CE and UL/cUL Class 1 Div 2 Zone 2 approvals



TT330 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com.

Windows® XP, Vista, 7, and 8

TT335 Model software allows you to configure transmitters offline, save the file, and download into units later, at your convenience.

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Transmitters: TT330 Series

TT335 Isolated RTD/resistance input four-wire transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of their USB-ISOLATOR when configuring a TT330 Series transmitter.

■ USB Interface

USB Connector

Type: USB Mini-B type socket, 5-pin.
Data rate: 12Mbps. USB v1.1 and 2.0 compatible.
Maximum cable length: 5.0 meters.

USB Transient Protection

Transient voltage suppression on power and data lines.

Driver

Not required. Uses Windows HID drivers.

■ Input

Default Configuration

100Ω Pt RTD, $\alpha=0.00385$, -200 to 850°C input, 4-20mA output, upscale break detect, medium filter.

Input Configuration

Two-, three- or four-wire sensor input connections.
Programs in °C, °K, °F, or ohmic integer values only.

Input Ranges

Input Type	Input Range	Accuracy ²
RTD, Pt 100Ω	-200 to 850°C (-328 to 1562°F)	±0.2°C, ±0.019%
RTD, Pt 200Ω	-200 to 850°C	±0.3°C, ±0.029%
RTD, Pt 500Ω	-200 to 850°C	±0.5°C, ±0.048%
RTD, Pt 1000Ω	-200 to 850°C	±1.0°C, ±0.095%
RTD, Ni 120Ω (Minco 7-120)	-80 to 320°C (-112 to 608°F)	±0.08°C, ±0.020%
RTD, Cu 10Ω (Minco 16-9)	-200 to 270°C (-328 to 518°F)	±0.5°C, ±0.106%
Resistance (linear) ¹	0 to 450Ω	±0.05Ω, ±0.010%

Note 1: Linear resistance input range approaches but does not include 0Ω and 500Ω. If exactly 0Ω or 500Ω is measured, break detection is triggered.

Note 2: Rated accuracy (in °C and % of span) applies for input spans greater than 5% of input full-scale.

Input Scaling Adjust

Zero: 0 to 95% of range, typical.
Full scale: 5 to 100% of full scale range, typical.

Lead Break (Sensor Burnout) Detection

Configurable for either upscale or downscale.

■ Output

Output Range

Range	Over-Range	Resolution
±10V	±10.5V	1 part in 62558
±5V	±5.25V	1 part in 31278
0 to 10V	-0.5527 to +10.5V	1 part in 59293
0 to 5V	-0.27634 to +5.25V	1 part in 60414
±20mA	±21mA	1 part in 62400
0 to 20mA	-1.1054 to 21mA	1 part in 58732
4 to 20mA	-1.1054 to 21mA	1 part in 46984

Output Accuracy

Better than ±0.05% of span, typical (±0.1% max.) for nominal input spans. Includes the effects of repeatability, terminal point conformity, and linearization, but does not include sensor error.

Output Load

Voltage output: 1K ohms minimum.
Current output: 0-525 ohms.

Output Response Time (for step input change)

No filter: 32ms.
Low filter: 50ms.
Medium filter: 160ms.
High filter: 1210ms.

Output Ambient Temperature Drift

Better than ±80ppm/°C (±0.0080%/°C).

■ Environmental

Operating temperature

-40 to 80°C (-40° to 176°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

12-32V DC SELV (Safety Extra Low Voltage), 1.3W max.

Isolation

1500V AC peak. 250V AC (354V DC) continuous isolation between input, output, and power (3-way).

Shock and Vibration Immunity

Vibration: 4g, per IEC 60068-2-64.
Shock: 25g, per IEC 60068-2-27

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.
RFI: BS EN 61000-6-2, IEC 61000-4-3.
Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.
ESD: BS EN 61000-6-2, IEC 61000-4-2.
EFT: BS EN 61000-6-2, IEC 61000-4-4.
Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals

CE compliant. UL/cUL Class I Div. 2 Zone 2.

■ Physical

General

General-purpose enclosure designed for mounting on 35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.

I/O Connectors

Removable plug-in terminal blocks rated for 12A/250V; AWG #26-12, stranded or solid copper wire.

Dimensions

17.5 x 114.5 x 99.0 mm (0.7 x 4.51 x 3.90 inches).

Shipping Weight

0.22 kg (0.5 pounds) packed.

Ordering Information

Models

TT335-0700

Four-wire transmitter, isolated RTD/resistance input

Services

TT330-Config/Cal

Factory custom configuration/calibration service. Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

TTC-SIP (recommend one kit per customer)

Software Interface Package for Acromag TT Series transmitters. Includes configuration software CD-ROM (5040-944), isolator (USB-ISOLATOR) and two USB cables (4001-112, 4001-113).

Accessories

See www.acromag.com for more information.

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

TTBUS-KIT

DIN rail bus power connector and left/right terminal blocks. One kit supports multiple transmitters.

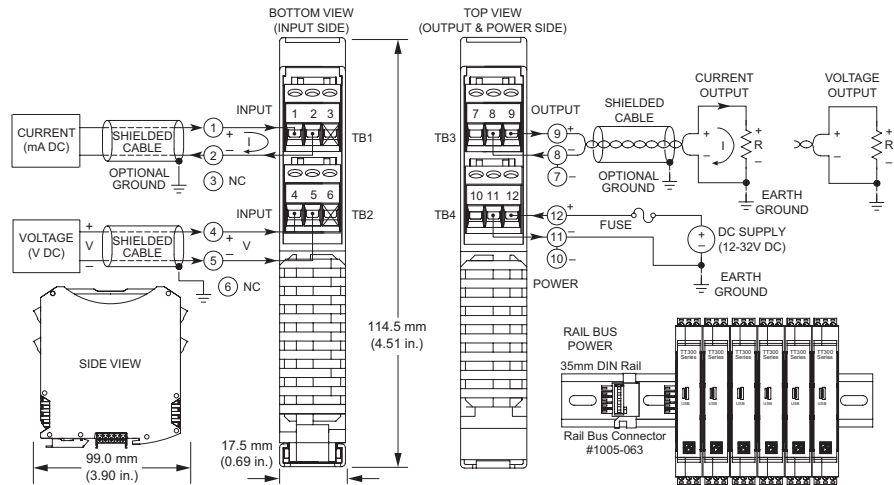
ISO9001
AS9100



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Transmitters: TT330 Series

TT336 Current/millivolt input four-wire transmitter



Multi-range $\pm 20\text{mA}$ or $\pm 500\text{mV}$ input ♦ Universal current/voltage output ♦ 12-32V DC local/bus power

Description

The TT336 model is a space-saving four-wire transmitter that isolates and converts a DC current or low voltage input to a proportional control signal. DC current and voltage output are both supported on a single model. An optional DIN rail bus can deliver primary or redundant power to multiple units without wiring.

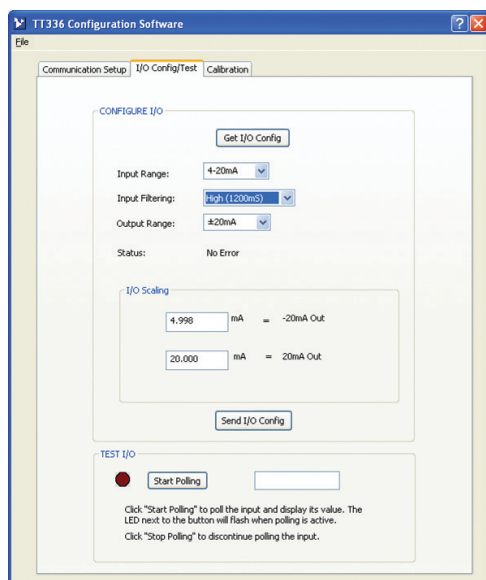
High-voltage isolation separates the input from the output circuit. Isolation protects from surges, reduces noise, and eliminates ground loop errors.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile temperature measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Single unit supports unipolar and bipolar input ranges up to $\pm 20\text{mA}$ or $\pm 500\text{mV}$ DC
- Compatible with 0-20A AC sensor input
- Universal output connections support ranges up to $\pm 21\text{mA}$ or $\pm 10.5\text{V}$ DC without rewiring
- Space-saving 17.5mm (0.7 inch) unit with pluggable terminals for convenient wiring
- High accuracy, linearity, stability, and reliability
- User-selectable filtering (none, low, med., high)
- Adjustable response times (10ms to 1200ms)
- Supports reverse-acting (inverse) output
- Bus power, local power, or both
- Redundant power ready (rail/local)
- 1500V input isolation, 3-way (power, input, output)
- Shock (25g) and vibration (4g) resistant
- Mounts on Type T DIN-rail
- Wide ambient operation (-40 to 80°C)
- CE compliant. UL/cUL Class 1 Div 2 Zone 2 approvals



TT330 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com.

Windows® XP, Vista, 7, and 8

The Agility™ Config Tool is downloadable (FREE) at the [Google Play Store](https://play.google.com/store/apps/details?id=com.acromag.agility). For Android Devices only

TT336 Model software allows you to configure transmitters offline, save the file, and download into units later, at your convenience.

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Transmitters: TT330 Series

TT336 Current/millivolt input four-wire transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of their USB-ISOLATOR when configuring a TT330 Series transmitter.

■ USB Interface

USB Connector

USB Mini-B type socket, 5-pin.

USB Data Rate

12Mbps. USB v1.1 and 2.0 compatible.

USB Transient Protection

Transient voltage suppression on power and data lines.

USB Cable Length

5.0 meters maximum.

Driver

Not required. Uses built-in Human Interface Device (HID) USB drivers of the Windows operating system.

■ Input

Default Configuration/Calibration

Input: 4 to 20mA, medium filter.

Output: 4 to 20mA.

Input Ranges and Accuracy

Range	Accuracy
±500mV	±0.05% of span
0 to 500mV	±0.05% of span
±20mA	±0.05% of span
0 to 20mA	±0.05% of span
4 to 20mA	±0.05% of span
0 to 11.17mA (for AC sensor)	±0.05% of span
±1mA	±0.05% of span

Error includes the effects of repeatability, terminal point conformity, and linearization.

Ambient Temperature Effect

Better than ±80ppm/°C (±0.008%/°C).

Zero Scaling Adjust

0 to 95% of range, typical.

Full Scale Adjust

5 to 100% of full scale range, typical.

Input Over-Voltage Protection

Bipolar Transient Voltage Suppressors (TVS), 5.6V clamp level typical.

Input Resolution

Bipolar input: 1 part in 50000 (±25000)
Unipolar input: 1 part in 25000

Input Impedance

Current input: 24.9 ohms.
Voltage input: 15M ohms

Input Filter

Selectable digital filtering settings (none, low, medium, and high).

Noise Rejection

Normal mode @ 60Hz:
>4dB (no filter), >80dB (high filter)
Common mode @ 60Hz:
>90dB (no filter), >120dB (high filter)

■ Output

Output Range

Range	Over-Range	Resolution
±10V	±10.5V	1 part in 62415
±5V	±5V	1 part in 31208
0 to 10V	-0.5527 to +10.5V	1 part in 59240
0 to 5V	-0.27634 to +5.25V	1 part in 60262
±20mA	±21mA	1 part in 62259
0 to 20mA	-1.1054 to 21mA	1 part in 59596
4 to 20mA	-1.1054 to 21mA	1 part in 46877

Output Load

Voltage output: 1K ohms minimum.
Current output: 0-550 ohms.

Output Response Time (for step input change)

Time to reach 98% of final output value (typical)		
	TB1 (±20mA)	TB2 (±500mV)
No filter	10 milliseconds	15 milliseconds
Low filter	34 milliseconds	45 milliseconds
Medium filter	136 milliseconds	120 milliseconds
High filter	1168 milliseconds	1072 milliseconds

Output Ripple

Less than ±0.1% of output span.

Output Ambient Temperature Drift

Better than ±80ppm/°C (±0.008%/°C).

■ Environmental

Operating temperature

-40 to 80°C (-40° to 176°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

12-32V DC SELV (Safety Extra Low Voltage), 24mA max.

Isolation

1500V AC peak. 250V AC (354V DC) continuous isolation between input, output, and power (3-way).

Shock and Vibration Immunity

Vibration: 5g, per IEC 60068-2-64.
Shock: 50g, per IEC 60068-2-27

Approvals

CE compliant. UL/cUL listing.
Designed for Class I; Division 2; Groups ABCD; Zone 2.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.
RFI: BS EN 61000-6-2, IEC 61000-4-3.
Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.
ESD: BS EN 61000-6-2, IEC 61000-4-2.
EFT: BS EN 61000-6-2, IEC 61000-4-4.
Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

■ Physical

General

General-purpose enclosure designed for mounting on 35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.

I/O Connectors

Removable plug-in terminal blocks rated for 12A/250V; AWG #26-12, stranded or solid copper wire.

Dimensions

17.5 x 114.5 x 99.0 mm (0.7 x 4.51 x 3.90 inches).

Shipping Weight

0.22 kg (0.5 pounds) packed.

Ordering Information

Models

TT336-0700

Four-wire transmitter, current/millivolt input.

Services

TT330-Config/Cal

Factory custom configuration/calibration service. Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

TTC-SIP (recommend one kit per customer)

Software Interface Package for Acromag TT Series transmitters. Includes configuration software CD-ROM (5040-944), isolator (USB-ISOLATOR) and two USB cables (4001-112, 4001-113).

Accessories

See www.acromag.com for more information.

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

TTBUS-KIT

DIN rail bus power connector and left/right terminal blocks. One kit supports multiple transmitters.

5020-350

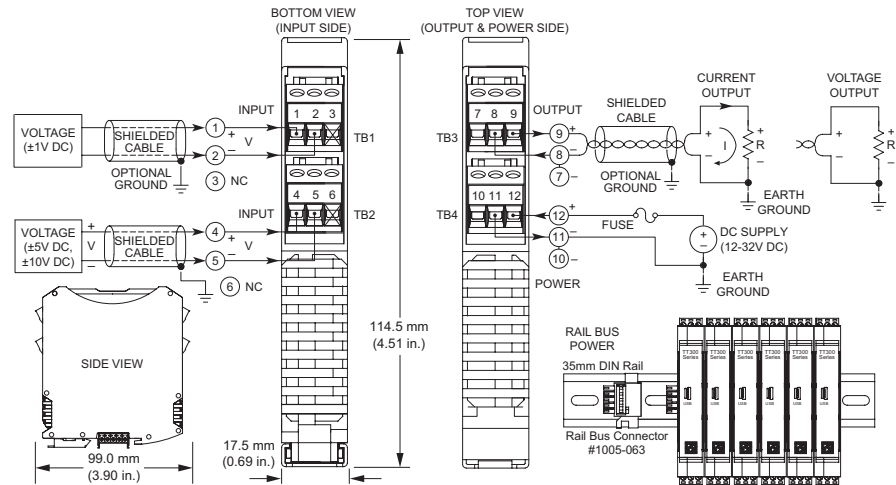
AC current sensor (toroidal transformer); converts 0-20A AC to 0-11.17mA DC.



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Transmitters: TT330 Series

TT337 Process voltage input four-wire transmitter



Multi-range $\pm 1V$, $\pm 5V$, or $\pm 10V$ input ◆ Universal current/voltage output ◆ 12-32V DC local/bus power

Description

The TT337 model is a space-saving four-wire transmitter that isolates and converts a process level DC voltage input to a proportional control signal. DC current and voltage output are both supported on a single model. An optional DIN rail bus can deliver primary or redundant power to multiple units without wiring.

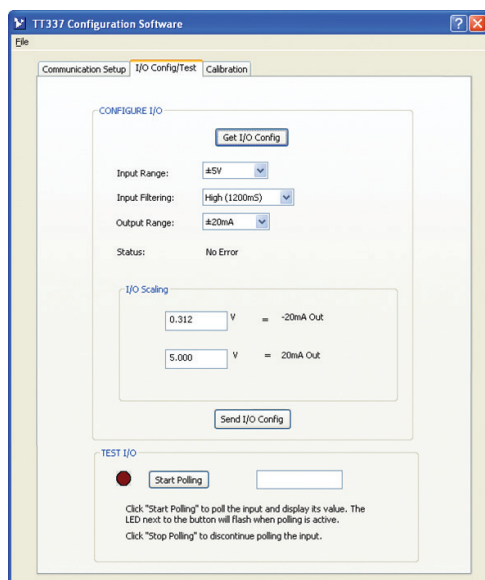
High-voltage isolation separates the input from the output circuit. Isolation protects from surges, reduces noise, and eliminates ground loop errors.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile temperature measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Single unit supports $\pm 1V$, $\pm 5V$, and $\pm 10V$ DC input ranges
- Universal output connections support ranges up to $\pm 21mA$ or $\pm 10.5V$ DC without rewiring
- Space-saving 17.5mm (0.7 inch) unit with pluggable terminals for convenient wiring
- High accuracy, linearity, stability, and reliability
- User-selectable filtering (none, low, med., high)
- Adjustable response times (12ms to 1200ms)
- Supports reverse-acting (inverse) output
- Bus power, local power, or both
- Redundant ready power
- 1500V input isolation
- Shock (25g) and vibration (4g) resistant
- Mounts on Type T DIN-rail
- Wide ambient operation (-40 to $80^{\circ}C$)
- CE compliant. UL/cUL Class 1 Div 2 Zone 2 approvals



TT330 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com.

Windows® XP, Vista, 7, and 8

The Agility™ Config Tool is downloadable (FREE) at the [Google Play Store](https://play.google.com/store/apps/details?id=com.acromag.agility). For Android Devices only

TT337 Model software allows you to configure transmitters offline, save the file, and download into units later, at your convenience.

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Transmitters: TT330 Series

TT337 Process voltage input four-wire transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of their USB-ISOLATOR when configuring a TT330 Series transmitter.

■ USB Interface

USB Connector

USB Mini-B type socket, 5-pin.

USB Data Rate

12Mbps. USB v1.1 and 2.0 compatible.

USB Transient Protection

Transient voltage suppression on power and data lines.

USB Cable Length

5.0 meters maximum.

Driver

Not required. Uses built-in Human Interface Device (HID) USB drivers of the Windows operating system.

■ Input

Default Configuration/Calibration

Input: $\pm 10V$, medium filter.

Output: 4 to 20mA.

Input Ranges and Accuracy

Range	Accuracy
$\pm 1V$ DC	$\pm 0.05\%$ of span
$\pm 5V$ DC	$\pm 0.05\%$ of span
$\pm 10V$ DC	$\pm 0.05\%$ of span

Error includes the effects of repeatability, terminal point conformity, and linearization.

Ambient Temperature Effect

Better than $\pm 80\text{ppm}/^\circ\text{C}$ ($\pm 0.008\%/^\circ\text{C}$).

Zero Scaling Adjust

0 to 95% of range, typical.

Full Scale Adjust

5 to 100% of full scale range, typical.

Input Over-Voltage Protection

Bipolar Transient Voltage Suppressors (TVS), 14V working and 18V clamp level typical.

Input Resolution

Bipolar input: 1 part in 50000 (± 25000)

Unipolar input: 1 part in 25000

Input Impedance

$\pm 1V$ input: 15M ohms.

$\pm 5V$ input: $>1M$ ohms.

$\pm 10V$ input: $>1M$ ohms.

Input Filter

Selectable digital filtering settings (none, low, medium, and high).

Noise Rejection

Normal mode @ 60Hz:

$>1\text{dB}$ (no filter), $>80\text{dB}$ (high filter)

Common mode @ 60Hz:

$>80\text{dB}$ (no filter), $>120\text{dB}$ (high filter)

■ Output

Output Range

Range	Over-Range	Resolution
$\pm 10V$	$\pm 10.5V$	1 part in 62415
$\pm 5V$	$\pm 5V$	1 part in 31208
0 to 10V	-0.5527 to +10.5V	1 part in 59293
0 to 5V	-0.27634 to +5.25V	1 part in 59293
$\pm 20\text{mA}$	$\pm 21\text{mA}$	1 part in 62415
0 to 20mA	-1.1054 to 21mA	1 part in 59293
4 to 20mA	-1.1054 to 21mA	1 part in 47434

Output Load

Voltage output: 1K ohms minimum.

Current output: 0-550 ohms.

Output Response Time (for step input change)

Time to reach 98% of final output value (typical)		
	TB1 ($\pm 1V$)	TB2 ($\pm 5V$, $\pm 10V$)
No filter	12 milliseconds	78 milliseconds
Low filter	28 milliseconds	98 milliseconds
Medium filter	115 milliseconds	208 milliseconds
High filter	1116 milliseconds	1164 milliseconds

Output Ripple

Less than $\pm 0.1\%$ of output span.

Output Ambient Temperature Drift

Better than $\pm 80\text{ppm}/^\circ\text{C}$ ($\pm 0.0080\%/^\circ\text{C}$).

■ Environmental

Operating temperature

-40 to 80°C (-40° to 176°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

12-32V DC SELV (Safety Extra Low Voltage), 24mA max.

Isolation

1500V AC peak. 250V AC (354V DC) continuous isolation between input, output, and power (3-way).

Shock and Vibration Immunity

Vibration: 5g, per IEC 60068-2-64.

Shock: 50g, per IEC 60068-2-27

Approvals

CE compliant. UL/cUL listing.

Designed for Class I; Division 2; Groups ABCD; Zone 2.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.

RFI: BS EN 61000-6-2, IEC 61000-4-3.

Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.

ESD: BS EN 61000-6-2, IEC 61000-4-2.

EFT: BS EN 61000-6-2, IEC 61000-4-4.

Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

■ Physical

General

General-purpose enclosure designed for mounting on 35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.

I/O Connectors

Removable plug-in terminal blocks rated for 12A/250V; AWG #26-12, stranded or solid copper wire.

Dimensions

17.5 x 114.5 x 99.0 mm (0.7 x 4.51 x 3.90 inches).

Shipping Weight

0.22 kg (0.5 pounds) packed.

Ordering Information

Models

TT337-0700

Four-wire transmitter, process voltage input.

Services

TT330-Config/Cal

Factory custom configuration/calibration service.

Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

TTC-SIP (recommend one kit per customer)

Software Interface Package for Acromag TT Series transmitters. Includes configuration software CD-ROM (5040-944), isolator (USB-ISOLATOR) and two USB cables (4001-112, 4001-113).

Accessories

See www.acromag.com for more information.

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

TTBUS-KIT

DIN rail bus power connector and left/right terminal blocks. One kit supports multiple transmitters.

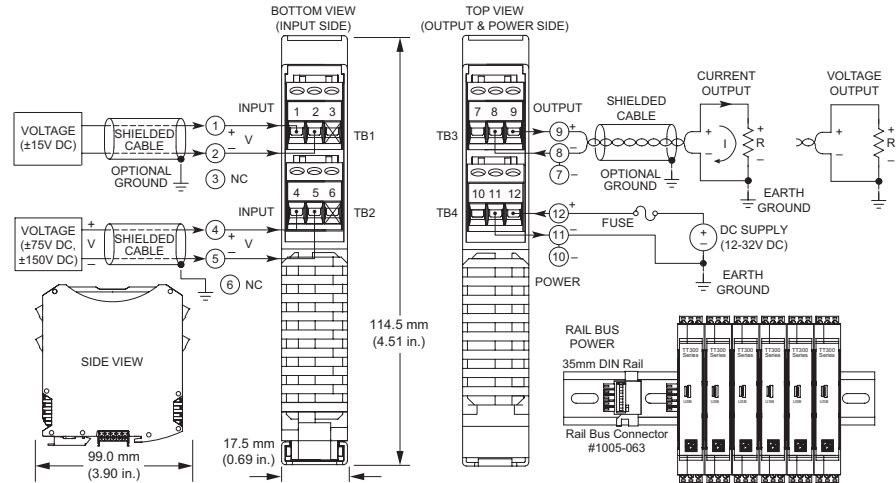
ISO9001
AS9100



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Transmitters: TT330 Series

TT338 High voltage input four-wire transmitter



Multi-range ± 15 , ± 75 , or ± 150 V input ♦ Universal current/voltage output ♦ 12-32V DC local/bus power

Description

The TT338 model is a space-saving four-wire transmitter that isolates and converts a high level DC voltage input to a proportional control signal. DC current and voltage output are both supported on a single model. An optional DIN rail bus can deliver primary or redundant power to multiple units without wiring.

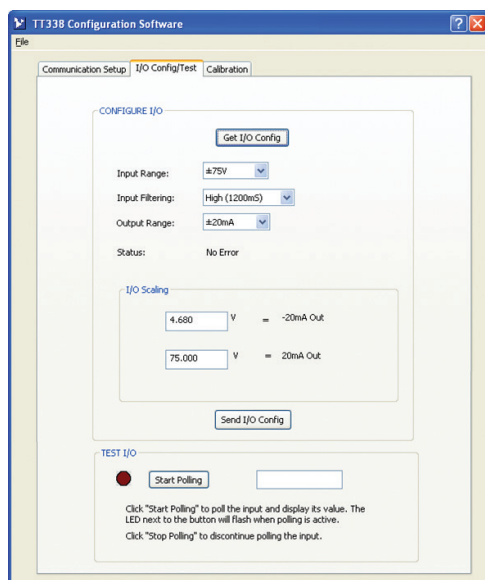
High-voltage isolation separates the input from the output circuit. Isolation protects from surges, reduces noise, and eliminates ground loop errors.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile temperature measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Single unit supports ± 15 V, ± 75 V, and ± 150 V DC input ranges
- Universal output connections support ranges up to ± 21 mA or ± 10.5 V DC without rewiring
- Space-saving 17.5mm (0.7 inch) unit with pluggable terminals for convenient wiring
- High accuracy, linearity, stability, and reliability
- User-selectable filtering (none, low, med., high)
- Adjustable response times (50ms to 1200ms)
- Supports reverse-acting (inverse) output
- Bus power, local power, or both
- Redundant ready power
- 1500V input isolation
- Shock (25g) and vibration (4g) resistant
- Mounts on Type T DIN-rail
- Wide ambient operation (-40 to 80°C)
- CE compliant. UL/cUL Class 1 Div 2 Zone 2 approvals



TT330 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com.

Windows® XP, Vista, 7, and 8

The Agility™ Config Tool is downloadable (FREE) at the [Google Play Store](https://play.google.com/store/apps/details?id=com.acromag.agility). For Android Devices only

TT338 Model software allows you to configure transmitters offline, save the file, and download into units later, at your convenience.

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Transmitters: TT330 Series

TT338 High voltage input four-wire transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of their USB-ISOLATOR when configuring a TT330 Series transmitter.

■ USB Interface

USB Connector

USB Mini-B type socket, 5-pin.

USB Data Rate

12Mbps. USB v1.1 and 2.0 compatible.

USB Transient Protection

Transient voltage suppression on power and data lines.

USB Cable Length

5.0 meters maximum.

Driver

Not required. Uses built-in Human Interface Device (HID) USB drivers of the Windows operating system.

■ Input

Default Configuration/Calibration

Input: $\pm 15V$, medium filter.

Output: 4 to 20mA.

Input Ranges and Accuracy

Range	Accuracy
$\pm 15V$ DC	$\pm 0.05\%$ of span
$\pm 75V$ DC	$\pm 0.05\%$ of span
$\pm 150V$ DC	$\pm 0.05\%$ of span

Error includes the effects of repeatability, terminal point conformity, and linearization.

Ambient Temperature Effect

Better than $\pm 80\text{ppm}/^\circ\text{C}$ ($\pm 0.008\%/^\circ\text{C}$).

Zero Scaling Adjust

0 to 95% of range, typical.

Full Scale Adjust

5 to 100% of full scale range, typical.

Input Over-Voltage Protection

Bipolar Transient Voltage Suppressors (TVS), 220V working typical.

Input Resolution

Bipolar input: 1 part in 50000 (± 25000)

Unipolar input: 1 part in 25000

Input Impedance

Greater than 1M ohms.

Input Filter

Selectable digital filtering settings (none, low, medium, and high).

Noise Rejection

Normal mode @ 60Hz:

>15dB (no filter), >80dB (high filter)

Common mode @ 60Hz:

>70B (no filter), >120dB (high filter)

■ Output

Output Range

Range	Over-Range	Resolution
$\pm 10V$	$\pm 10.5V$	1 part in 62415
± 5	$\pm 5V$	1 part in 31208
0 to 10V	-0.5527 to +10.5V	1 part in 59293
0 to 5V	-0.27634 to +5.25V	1 part in 59293
$\pm 20mA$	$\pm 21mA$	1 part in 62415
0 to 20mA	-1.1054 to 21mA	1 part in 59293
4 to 20mA	-1.1054 to 21mA	1 part in 47434

Output Load

Voltage output: 1K ohms minimum.

Current output: 0-525 ohms.

Output Response Time (for step input change)

Time to reach 98% of final output value (typical)		
	TB1 ($\pm 15V$)	TB2 ($\pm 75V, \pm 150V$)
No filter	49 milliseconds	49 milliseconds
Low filter	69 milliseconds	68 milliseconds
Medium filter	175 milliseconds	152 milliseconds
High filter	1164 milliseconds	944 milliseconds

Output Ripple

Less than $\pm 0.1\%$ of output span.

Output Ambient Temperature Drift

Better than $\pm 80\text{ppm}/^\circ\text{C}$ ($\pm 0.008\%/^\circ\text{C}$).

■ Environmental

Operating temperature

-40 to 80°C (-40° to 176°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

12-32V DC SELV (Safety Extra Low Voltage), 24mA max.

Isolation

1500V AC peak. 250V AC (354V DC) continuous isolation between input, output, and power (3-way).

Shock and Vibration Immunity

Vibration: 5g, per IEC 60068-2-64.

Shock: 50g, per IEC 60068-2-27

Approvals

CE compliant. UL/CUL listing.

Designed for Class I; Division 2; Groups ABCD; Zone 2.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.

RFI: BS EN 61000-6-2, IEC 61000-4-3.

Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.

ESD: BS EN 61000-6-2, IEC 61000-4-2.

EFT: BS EN 61000-6-2, IEC 61000-4-4.

Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

■ Physical

General

General-purpose enclosure designed for mounting on 35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.

I/O Connectors

Removable plug-in terminal blocks rated for 12A/250V; AWG #26-12, stranded or solid copper wire.

Dimensions

17.5 x 114.5 x 99.0 mm (0.7 x 4.51 x 3.90 inches).

Shipping Weight

0.22 kg (0.5 pounds) packed.

Ordering Information

Models

TT338-0700

Four-wire transmitter, high voltage input.

Services

TT330-Config/Cal

Factory custom configuration/calibration service.

Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

TTC-SIP (recommend one kit per customer)

Software Interface Package for Acromag TT Series transmitters. Includes configuration software CD-ROM (5040-944), isolator (USB-ISOLATOR) and two USB cables (4001-112, 4001-113).

Accessories

See www.acromag.com for more information.

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

TTBUS-KIT

DIN rail bus power connector and left/right terminal blocks. One kit supports multiple transmitters.

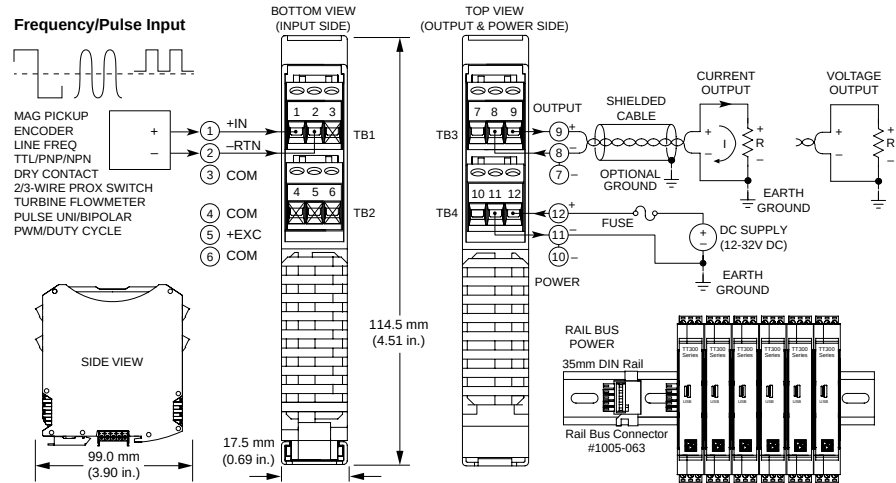
ISO9001
AS9100



Tel 248-295-0880 ■ Fax 248-624-9234 ■ sales@acromag.com ■ www.acromag.com ■ 30765 Wixom Rd, Wixom, MI 48393 USA

Transmitters: TT330 Series

TT339 Frequency/pulse/PWM input four-wire transmitter



Multi-range frequency/pulse input ♦ Universal current/voltage output ♦ 12-32V DC local/bus power

Description

The TT339 model is a space-saving four-wire transmitter that isolates and converts frequency, pulse, or pulse-width modulation (PWM) input to a proportional control signal. DC current and voltage output are both supported on a single model. An optional DIN rail bus can deliver primary or redundant power to multiple units without wiring.

High-voltage isolation separates the input from the output circuit. Isolation protects from surges, reduces noise, and eliminates ground loop errors.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile frequency measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.

Amplifier applications include:

- Speed pickup
- Line frequency monitoring
- Turbine flowmeter interface
- PWM sensing/feedback circuits
- Shaft encoder interface

TT330 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com.

Windows® XP, Vista, 7, 8

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Measures frequency or duty cycle and interfaces many input types up to 100KHz
- Accepts input amplitudes up to 120VRMS ($\pm 170V$ DC, unipolar or bipolar)
- Adjustable 0Hz cut-off, sample averaging, debounce, and output update time
- Universal output connections support ranges up to $\pm 21mA$ or $\pm 10.5V$ DC without rewiring
- Supports normal or reverse-acting output
- Fast response time and high accuracy
- Space-saving 17.5mm (0.7 inch) unit with pluggable terminals for convenient wiring
- Redundant power ready (rail/local)
- 1500V isolation, 3-way (power, input, output)
- Shock (25g) and vibration (4g) resistant
- Mounts on Type T DIN-rail
- Wide ambient operation (-40 to 80°C)
- CE Compliant and UL/cUL Class 1 Div 2 Zone 2 approvals



TT339 Model software allows you to configure transmitters offline, save the file, and download into units later, at your convenience.



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Transmitters: TT330 Series

TT339 Frequency/pulse/PWM input four-wire transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of their USB-ISOLATOR when configuring a TT330 Series transmitter.

■ USB Interface

USB Connector

USB Mini-B type socket, 5-pin.

USB Data Rate

12Mbps. USB v1.1 and 2.0 compatible.

USB Transient Protection

Transient voltage suppression on power and data lines.

USB Cable Length

5.0 meters maximum.

Driver

Not required. Uses built-in Human Interface Device (HID) USB drivers of the Windows operating system.

■ Input

Default Configuration/Calibration

±5.0V Square Wave; Input Threshold = Bipolar 0.0V; Hysteresis ±25mV; Pull Up/Down = Disabled; Excitation = Enabled; 0Hz Cutoff = 0.5Hz; Sample Average = 1; Output Range = 4-20mA; I/O Scaling = 0Hz to 10KHz, Normal Acting; Output Update = 100ms.

Frequency Input

Configurable for any range from 0Hz to 100KHz. Accepts unipolar (non-zero crossing) or bipolar (zero crossing) input signals. 0.5Hz minimum span. 1µs minimum pulse width.

Duty Cycle Input

Carrier frequency range: Any range from 0 to 20KHz. Duty cycle range: 1 to 99%, depending on freq. range.

Input Scaling Adjust

Zero: Adjustable over 0 to 99% of full-scale input. Full scale: Adjustable over 0.5Hz to 100KHz. Cut-off frequency: Adjustable over 0.01Hz to 100KHz.

Unipolar Signal Configuration:

Amplitude: 0 to 3V DC min., 0 to 170V DC max.

Thresholds: Configurable for 1.6V DC (±25mV hysteresis) or 5V DC (±83mV hysteresis), typical.

Bipolar Signal Configuration:

Amplitude: ±50 to ±200mV min. (depending on range and hysteresis), 120VRMS max. (±170V DC).

Thresholds: 0mV nominal (±25 or ±83mV hysteresis).

Input Pull-up/Pull-down (Internal)

Software-selectable 2.7KΩ input pull-up to +5V and a 1KΩ input pull-down to -FRN, or disabled. 15V DC maximum input when used.

Input Excitation Supply

+5V DC, current limited to +20mA typical.

Input Filter Bandwidth

-3dB at 35KHz, typical.

Input Impedance

37.2K ohms, typical.

Noise Rejection

Normal mode @ 60Hz: Not applicable.
Common mode @ 60Hz: 90dB.

■ Output

Output Range

Range	Over-Range	Resolution
±10V	±10.5V	1 part in 62558
±5V	±5.25V	1 part in 31278
0 to 10V	-0.5527 to +10.5V	1 part in 59293
0 to 5V	-0.27634 to +5.25V	1 part in 60414
±20mA	±21mA	1 part in 62400
0 to 20mA	-1.1054 to +21mA	1 part in 58732
4 to 20mA	-1.1054 to +21mA	1 part in 46984

Output Load

Voltage output: 1000 ohms minimum.

Current output: 525 ohms maximum.

Output Update

Software configurable from 10 to 5000ms. Determines rate at which output signal updates, unless optionally overridden by the 0Hz cutoff setting.

Output Accuracy

Better than ±0.05% of span, typical (±0.1% max.) for nominal input spans. Includes the effects of repeatability, terminal point conformity, and linearization, but does not include sensor error.

Output Ripple

Less than ±0.1% of output span.

Output Ambient Temperature Drift

Better than ±40ppm/°C (±0.0040%/°C).

■ Environmental

Operating temperature

-40 to 80°C (-40° to 176°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

12-32V DC SELV (Safety Extra Low Voltage), 24mA max.

Isolation

1500V AC peak. 250V AC (354V DC) continuous isolation between input, output, and power (3-way).

Shock and Vibration Immunity

Vibration: 4g, per IEC 60068-2-64.

Shock: 25g, per IEC 60068-2-27

Approvals

CE compliant. UL/cUL Class I Div. 2 Zone 2.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.

RFI: BS EN 61000-6-2, IEC 61000-4-3.

Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.

ESD: BS EN 61000-6-2, IEC 61000-4-2.

EFT: BS EN 61000-6-2, IEC 61000-4-4.

Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

■ Physical

General

General-purpose enclosure designed for mounting on 35mm "T-type" DIN rail.

Case Material

Self-extinguishing polyamide, UL94 V-0 rated, color light gray. General-purpose NEMA Type 1 enclosure.

I/O Connectors

Removable plug-in terminal blocks rated for 12A/250V; AWG #26-12, stranded or solid copper wire.

Dimensions

17.5 x 114.5 x 99.0 mm (0.7 x 4.51 x 3.90 inches).

Shipping Weight

0.22 kg (0.5 pounds) packed.

Ordering Information

Models

TT339-0700

Transmitter, isolated frequency/pulse/PWM input

Services

TT330-Config/Cal

Factory custom configuration/calibration service. Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

TTC-SIP (recommend one kit per customer)

Software Interface Package for Acromag TT Series transmitters. Includes configuration software CD-ROM (5040-944), isolator (USB-ISOLATOR) and two USB cables (4001-112, 4001-113).

Accessories

See www.acromag.com for more information.

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

TTBUS-KIT

DIN rail bus power connector and left/right terminal blocks. One kit supports multiple transmitters.

ISO9001
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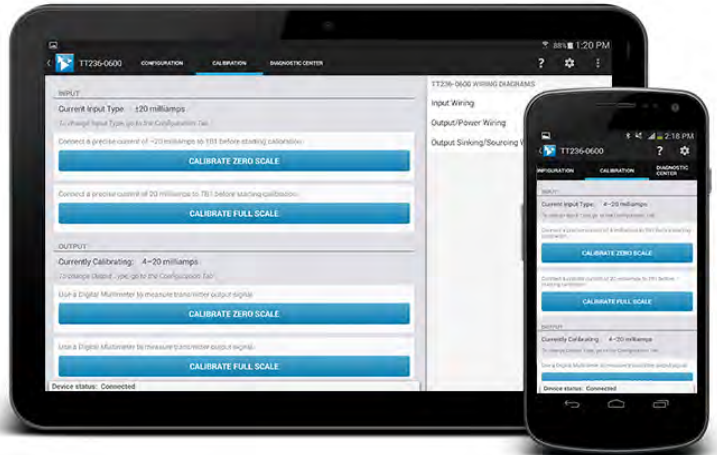
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Transmitters: TT Series

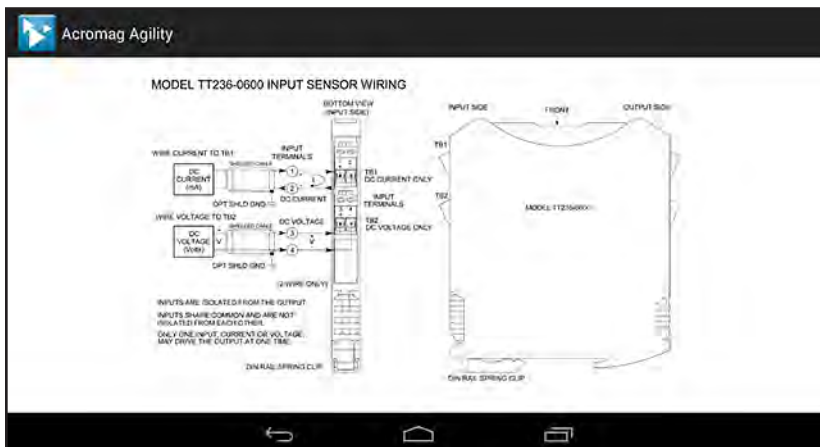
Acromag Agility™ Config Tool Mobile Application

The Agility™ Config Tool is a mobile application that allows easy setup and configuration of Acromag TT Series transmitters via a tethered mobile device.

This free app is available for Android devices at the Google Play store at [Acromag Agility™ Config Tool](#).



With a couple of taps, quickly configure input, output, unit and scaling options.



Quick and easy access to the wiring diagram, even offline without internet access.

Key Features & Benefits

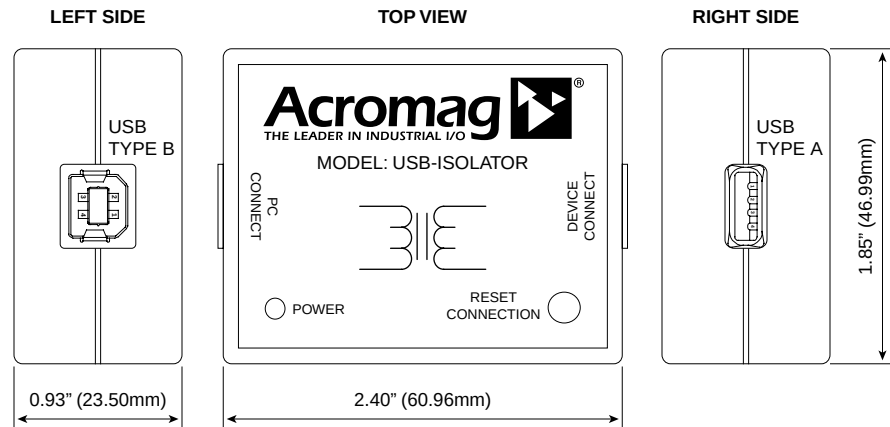
- Connects to Acromag TT Series transmitters (except models TT231 and TT233)
- Requires the use of USB OTG Cable (Acromag part #: 5028-565) and USB A to Mini B Cable (Acromag part #: 4001-113)
- Configures and calibrates TT Series products via phone or tablet running Android 4.0 ICS (Ice Cream Sandwich) or later.
- View wiring diagrams, even without an internet connection
- Perform quick and easy field diagnostics and troubleshooting
- Ideal for field technicians



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USB-ISOLATOR USB-to-USB Isolator



USB-powered, USB 2.0 and 1.1 compatible ♦ 1500V AC / 2100V DC isolation ♦ No drivers required

Description

This compact, industrial-grade isolator provides a high-voltage isolation barrier between a computer and a connected USB device. The isolation protects equipment from electrical surges and transient voltage spikes. It also eliminates ground loop currents flowing between the PC and peripherals which can cause damage and inaccurate measurements. Additionally, isolation minimizes conducted noise from static discharge, magnetic fields, and radio frequency interference.

Acromag's USB isolator is very easy to use. The isolator inserts in-line with the USB connection and operates transparently. No special software drivers are required. The unit receives power from the PC's USB port and isolates that power to the connected device. High noise immunity and low radiated emissions ensure reliable data transfer in sensitive applications.

A number of high-performance features help provide convenient and dependable operation. The green LED indicates that power is being received and blinks if the connected device draws too much current. An internal jumper lets you switch from Full Speed (12 Mbps) to Low Speed (1.5 Mbps) communication. The reset button offers a simple way to reinitialize a connected device without breaking the cable connection. High-retention USB sockets keep cables securely attached under shock and vibration.

Key Features & Benefits

- Isolates and protects a USB peripheral from a USB host
- Electrical isolation up to 1500V AC / 2100V DC
- Common mode filtering on all data lines
- Built-in surge/transient suppression up to 8kV on all ports
- Self-powered through the USB port
- Supports USB 2.0 full speed (12 Mbps) and USB 1.1 low speed (1.5 Mbps) data rates with jumper-selection
- LED for power indication and diagnostics
- Reset button to reinitialize and re-enumerate peripheral devices
- Output short circuit protection with auto-retry
- No software or configuration required (transparent operation)
- Uses standard high-retention USB Type A/B cable connections (includes 1m cable)
- Compact size and rugged design for harsh environments
- Wide ambient temperature operation -40 to 70°C (-40 to 158°F)
- CE, FCC, UL/cUL approvals

Ordering Information

Models

USB-ISOLATOR

USB isolator, includes USB cable (Part # 4001-112) for isolator-to-PC connection

TTC-SIP

CD-ROM (Part #5040-944), USB isolator and two USB cables (Part # 4001-112, 4001-113) for configuration of Acromag TT Series transmitters

Accessories

4001-112

USB cable, 1 meter, with Type A to Type B plugs

4001-113

USB cable, 1 meter, with Type A to Mini-B plugs





USB-ISOLATOR USB-to-USB Isolator

Performance Specifications

■ USB Port Interface

Standards

USB 1.1 and 2.0 compatible, full speed (12Mbps, default) and low speed (1.5Mbps) data rates supported. For low speed data rates, an internal jumper is provided for user setting. Connection is transparent, no software or configuration is required. Isolator will not be enumerated in the device manager.

■ Physical

Dimensions

2.40" Length x 1.85" Wide x 0.925" High
(60.96mm x 46.99mm x 23.495mm).

Connectors

Standard high retention USB A/B connectors with minimum withdrawal force of 15 Newtons. 1 meter A/B cable included.

PC Connector

USB Type B receptacle

Device Connector

USB Type A receptacle

LED Indicator

Green LED indicates isolator receiving 5V power from the USB computer bus. Flashing indicates short circuit/ retries on peripheral side.

Reset Button

Resets the connection to the USB peripheral device for reinitialization and re-enumeration.

Enclosure Material

ABS Resin, UL94 rated, IP30 plastic case.

■ Environmental

Operating temperature

-40 to 70°C (-40° to 158°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power

PC Connect Side: Standard USB bus power (5V DC).

Device Connect Side: 5V DC / 120mA with full power connection from PC. Includes over-current protection with auto-retry.

Isolation

1500V AC / 2100V DC peak isolation.

250V AC continuous safety isolation.

Agency Approvals:

CE and FCC compliant. UL/cUL Class 1 Div. 2 Zone 2.

Radiated Field Immunity (RFI)

Designed to comply with IEC1000-4-3 Level 3 and EN50082-1.

Electromagnetic Compatibility (EMC)

Minimum immunity per EN61000-6-2:2001

Electrostatic Discharge (ESD) Immunity

Per IEC61000-4-2.

Radiated Field Immunity (RFI)

Per IEC61000-4-3.

Electrical Fast Transient Immunity (EFT)

Per IEC61000-4-4. Complies with IEC1000-4-4 Level 3 and EN50082-1.

Surge Immunity

Complies with IEC1000-4-5 Level 3 and EN50082-1.

Per IEC61000-4-5.

Conducted RF Immunity (CRFI)

Per IEC61000-4-6.

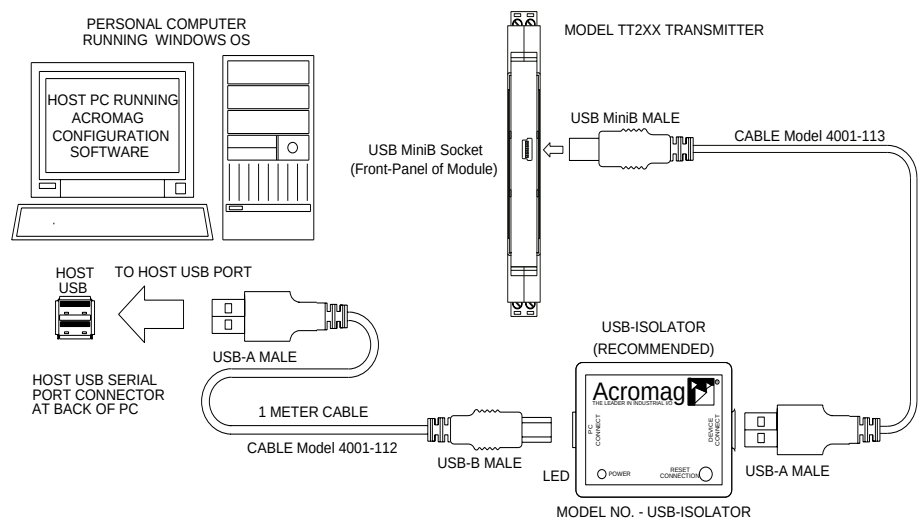
Emissions

Per EN61000-6-4:2001.

Radiated Frequency Emissions

Per CISPR11 Class A. Meets or exceeds EN50081-1 for Class B equipment.

TT SERIES USB TRANSMITTER CONNECTIONS



ISO9001
AS9100

MADE IN USA

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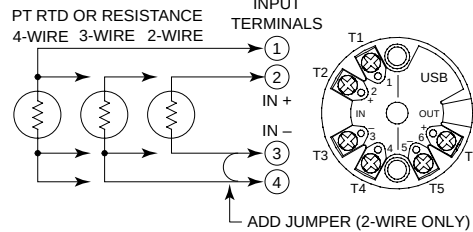
Transmitters: ST130 Series

ST131 RTD input head-mount transmitter

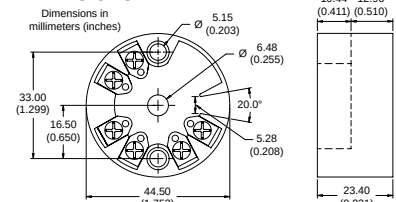


USB
Configured

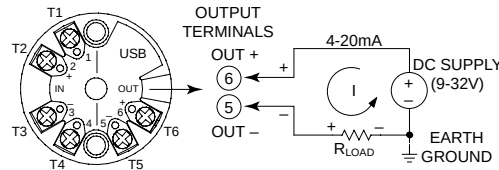
INPUT CONNECTIONS



DIMENSIONS



OUTPUT CONNECTIONS



100 ohm Pt RTD or 0-900 ohm input ◆ 4-20mA output ◆ Loop-powered, 9-32V DC

Description

The ST131 is a low-cost two-wire transmitter that converts a 100 ohm Platinum RTD sensor input to a proportional 4-20mA signal. Power is received from the output loop current. The transmitter provides sensor excitation and includes linearization, lead-wire compensation, and lead-break detection functions. Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile temperature transmitter for RTD and resistance elements. These transmitters are designed to withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Flexible RTD or linear resistance input ranges
- Supports any 100 ohm Pt RTD (375-393 alpha)
- High accuracy and linearity
- Advanced analog signal conditioning ASIC eliminates digitization errors
- Low temperature drift
- Fast response time (< 500µs)
- Programmable over/under-range limits
- Selectable upscale or downscale operation for sensor errors and lead-break detection
- NAMUR NE43 compliant fault response
- Reverse polarity protected with non-polarized output
- Mounts in DIN Form B sensor heads
- Optional DIN rail adapter
- Wide ambient operation (-40 to 80°C)
- Hardened for harsh environments
- CE Compliant. UL/cUL Class 1 Div 2 Zone 2 approvals. ATEX Certified.



ST130 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com.

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Transmitters: ST130 Series

ST131 RTD input head-mount transmitter

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of the USB-ISOLATOR when configuring an ST130 transmitter.

■ USB Interface

USB Connector

USB Mini-B type socket, 5-pin.

USB Data Rate

12Mbps. USB v1.1 and 2.0 compatible.

USB Transient Protection

Transient voltage suppression on power and data lines.

USB Cable Length

5.0 meters maximum.

Driver

Not required. Uses built-in Human Interface Device (HID) USB drivers of the Windows operating system.

■ Input

Input Configuration

Two-, three- or four-wire sensor input connections.

Input Ranges

100 ohm Platinum RTD, $\alpha = 375-393$, 385 (default), -50 to 900°C (-58 to 1652°F).

0 to 900 ohms linear resistance.

Programs in °C or ohmic integers only.

Zero Adjust

RTD 3/4 wire: -50, -17.78, or 0°C (-58, 0, 32°F).

RTD 2 wire: 0°C (32°F) fixed.

RES: 0 or 100 ohms.

Full-Scale Adjust

RTD: up to 900°C (1652°F), 50°C (58°F) span minimum.

Resistance: up to 900 ohms, 8 ohm span minimum.

Excitation Current

0.5mA, nominal.

Lead-Wire Compensation

25 ohms per lead.

Lead Break (Sensor Burnout) Detection

Configurable for either upscale or downscale.

■ Output

Output Range

4 to 20mA DC.

Under-scale limit adjustable for 2.1 to 3.6mA, nominal.

Over-scale limit adjustable for 21 to 30mA, nominal.

Output Fault Limits (Sensor Fault)

0.4mA below selected under-scale threshold and

1.0mA above over-scale threshold, typical.

Output Compliance

$R_{LOAD} = (V_{SUPPLY} - 9V) / 0.02A$.

$R_{LOAD} = 0$ to 750 ohms @ 24V DC.

Output Accuracy

Better than $\pm 0.1\%$ of span, typical for spans less than 500°C. Includes the effects of repeatability, terminal point conformity, and linearization, but does not include sensor error.

Ambient Temperature Effect

Better than $\pm 0.010\%$ per °C of input span or $\pm 80\text{ppm}/^\circ\text{C}$, typical. Includes the combined effects of zero and span drift over temperature.

Output Response Time

500 μs , typical with 250 ohm load.

■ Environmental

Operating temperature

-40 to 80°C (-40° to 176°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

9-32V DC SELV (Safety Extra Low Voltage), 28mA max.

Isolation

Not isolated.

Shock and Vibration Immunity

Vibration: 5g, per IEC 60068-2-64.

Shock: 50g, per IEC 60068-2-27.

Radiated Emissions

BS EN 61000-6-4, CISPR 16.

Radiated Field Immunity (RFI)

BS EN 61000-6-2, IEC 61000-4-3.

Conducted RF Immunity (CRFI)

BS EN 61000-6-2, IEC 61000-4-6.

Electrostatic Discharge (ESD)

BS EN 61000-6-2, IEC 61000-4-2.

Electrical Fast Transient (EFT)

BS EN 61000-6-2, IEC 61000-4-4.

Surge Immunity

BS EN 61000-6-2, IEC 61000-4-5.

Approvals

CE compliant. UL/cUL listings. ATEX Certified.

Designed for Class I; Division 2; Groups ABCD; Zone 2.

Ⓢ II 3 G Ex nA IIC T4 Gc -40°C $\leq$ Ta $\leq$ +80°C

■ Physical

General

General purpose enclosure with potted circuit designed for mounting in DIN Form B connection heads.

DIN-Rail Mounting

Using optional ST130-DIN adapter, unit can mount to 35x15mm, T-type or G-type DIN rails.

Case Material

Self-extinguishing polycarbonate ABS plastic, UL94 V-0 rated base material. USB dust cap material is Santoprene, 251-70W232.

Printed Circuit Board

Military grade fire-retardant epoxy glass per IPC-4101/98 with humi-seal conformal coating.

I/O Connectors

Barrier strip type, captive screw terminals.

Wire range: AWG #14-28 solid or stranded.

Dimensions

Diameter = 44.5mm (1.752 inches),

Height = 23.4mm (0.921 inches).

Conforms to DIN 43 729 Form B size requirements.

Shipping Weight

0.5 pounds (0.22 Kg) packed.

Ordering Information

Models

ST131-0600

Transmitter, 100 ohm Pt RTD input, CE Compliant.

Default calibration: Pt385 RTD, 3-wire, 0-200°C input, 4-20mA output, upscale fault detect.

ST131-0610

Same as ST131-0600 plus UL/cUL Class 1 Div 2 Zone 2 approval and ATEX Certified.

If mounting screws are required, order one ST130-MTG with each unit.

Services

ST13x-Config/Cal

Factory custom configuration/calibration service.

Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

ST13C-SIP

Software Interface Package. Includes configuration software (ST130-CONFIG), isolator (USB-Isolator) and two USB cables (Part # 4001-112, 4001-113) for Acromag ST130 Series head-mount transmitters.

One (1) kit recommended per customer.

Accessories

Connection Head Enclosures

See Bulletin 8400-630 or www.acromag.com for info.

ST130-DIN

DIN-rail adapter.

ST130-MTG

Replacement mounting kit (screws and relief springs) for installing ST130 transmitter in a DIN Form B connection head.

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).



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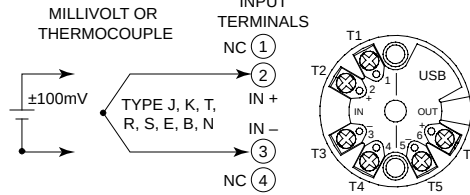
Transmitters: ST130 Series

ST132 Thermocouple/millivolt input head-mount transmitter

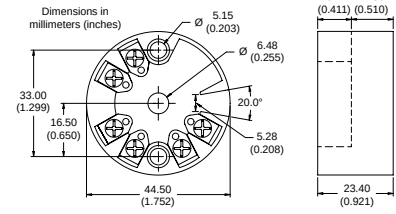


**USB
Configured**

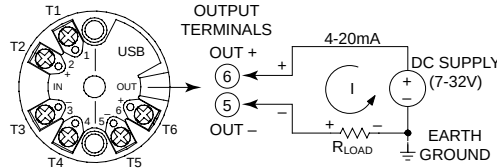
INPUT CONNECTIONS



DIMENSIONS



OUTPUT CONNECTIONS



Universal thermocouple (8 types) or $\pm 100\text{mV}$ input ♦ 4-20mA output ♦ Loop-powered, 7-32V DC

Description

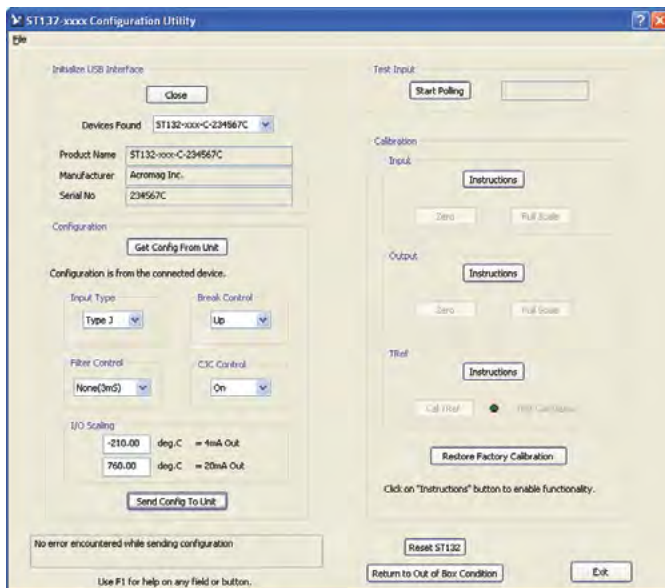
The ST132 is a low-cost two-wire transmitter that converts a millivolt or thermocouple sensor input to a proportional 4-20mA control signal. Power is received from the output loop current. The transmitter performs signal linearization, cold-junction compensation, and lead-break detection functions.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile temperature measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Flexible thermocouple or millivolt input ranges (TC Type J, K, T, R, S, E, B, N or $\pm 100\text{mV}$)
- 24-bit A/D microcontroller
- High accuracy, linearity, stability, and reliability
- Low temperature drift ($<75\text{ppm}/^\circ\text{C}$)
- Fast response time (as low as 8ms)
- Supports reverse-acting (inverse) output
- Selectable upscale or downscale operation for sensor errors and lead-break detection
- Non-polarized output/power connection
- Mounts in DIN Form B sensor heads
- Shock (50g) and vibration (5g) resistant
- Optional DIN rail adapter
- Wide ambient operation (-40 to 80°C)
- Hardened for harsh environments
- CE compliant. UL/cUL Class 1 Div 2 Zone 2 approvals. ATEX Certified.



ST130 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com.

ST132 software allows you to configure transmitters offline, save the file, and download settings into units later, at your convenience.



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Transmitters: ST130 Series

ST132 Thermocouple input head-mount transmitter with USB-configuration

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of the USB-ISOLATOR when configuring an ST130 transmitter.

■ USB Interface

USB Connector

USB Mini-B type socket, 5-pin.

USB Data Rate

12Mbps. USB v1.1 and 2.0 compatible.

USB Transient Protection

Transient voltage suppression on power and data lines.

USB Cable Length

5.0 meters maximum.

Driver

Not required. Uses built-in Human Interface Device (HID) USB drivers of the Windows operating system.

■ Input

Default Configuration/Calibration

Input: TC J, -17.78 to 60°C, upscale break, high filter.

Output: 4 to 20mA.

Input Ranges and Accuracy

Input	Range	Accuracy
TC J	-210 to 760°C (-346 to 1400°F)	±0.5°C
TC K	-200 to 1372°C (-328 to 2502°F)	±0.5°C
TC T	-260 to 400°C (-436 to 752°F)	±0.5°C
TC R	-50 to 1768°C (-58 to 3214°F)	±1.0°C
TC S	-50 to 1768°C (-58 to 3214°F)	±1.0°C
TC E	-200 to 1000°C (-328 to 1832°F)	±0.5°C
TC B	260 to 1820°C (500 to 3308°F)	±1.0°C
TC N	-230 to 1300°C (-382 to 2372°F)	±1.0°C
mV	-100 to 100mV	±0.1mV

Error includes the effects of repeatability, terminal point conformity, and linearization at 25°C operating ambient temperature.

Thermocouple Reference

(Cold Junction Compensation)

±0.1°C typical, ±0.3°C maximum at 25°C.

Ambient Temperature Effect

Better than ±75ppm/°C (±0.0075%/°C).

Zero Scaling Adjust

0 to 95% of range, typical.

Full Scale Adjust

5 to 100% of full scale range, typical.

Lead Break (Sensor Burnout) Detection

Configurable for either upscale or downscale.

Thermocouple Input Bias Current

±250nA typical (TC break).

Input Over-Voltage Protection

Bipolar Transient Voltage Suppressors (TVS), 5.6V clamp level typical.

Input Filter Bandwidth

-3dB at 55Hz, typical, normal mode filter.

Resolution

Millivolt input: 0.005% (1 part in 20,000)
Thermocouple input: 0.1°C.

Input Filter

Normal mode filtering, plus selectable digital filtering settings (none, low, medium, high) optimized and fixed per input range within the A/D converter.

Noise Rejection (Normal Mode)

75dB @ 60Hz, typical with 100 ohm input unbalance.

■ Output

Output Range

4 to 20mA DC.

Output Compliance

$R_{LOAD} = (V_{SUPPLY} - 7V) / 0.02A$.

$R_{LOAD} = 0$ to 850 ohms @ 24V DC.

Output Response Time (for step input change)

Time to reach 98% of final output value ranges from 8ms (with no filtering) to 800ms (with high filtering).

■ Environmental

Operating temperature

-40 to 80°C (-40° to 176°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

7-32V DC SELV (Safety Extra Low Voltage), 25mA max.

Isolation

Not isolated.

Shock and Vibration Immunity

Vibration: 5g, per IEC 60068-2-64.

Shock: 50g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.

RFI: BS EN 61000-6-2, IEC 61000-4-3.

Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.

ESD: BS EN 61000-6-2, IEC 61000-4-2.

EFT: BS EN 61000-6-2, IEC 61000-4-4.

Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals

CE compliant. UL/cUL listings. ATEX Certified.

Designed for Class I; Division 2; Groups ABCD; Zone 2.

Ⓢ II 3 G Ex nA IIC T4 Gc -40°C ≤ Ta ≤ +80°C

■ Physical

General

General purpose enclosure with potted circuit designed for mounting in DIN Form B connection heads.

Case Material

Self-extinguishing polycarbonate ABS plastic, UL94 V-0 rated base material. USB dust cap material is Santoprene, 251-70W232.

I/O Connectors

Barrier strip type, captive screw terminals.

Wire range: AWG #14-28 solid or stranded.

Shipping Weight

0.5 pounds (0.22 Kg) packed.

Ordering Information

Models

ST132-0600

Transmitter, thermocouple/millivolt input, CE approval.

ST132-0610

Same as ST132-0600 plus UL/cUL Class 1 Division 2 Zone 2 approval and ATEX Certified.

If mounting screws are required, order one ST130-MTG with each unit.

Services

ST13x-Config/Cal

Factory custom configuration/calibration service.

Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

ST13C-SIP (recommend one kit per customer)

Software Interface Package. Includes configuration software (ST130-CONFIG), isolator (USB-ISOLATOR) and two USB cables (Part # 4001-112, 4001-113) for Acromag ST130 Series head-mount transmitters.

Accessories

Connection Head Enclosures

See Bulletin 8400-630 or www.acromag.com for info.

ST130-DIN

DIN-rail adapter (Type G or T).

ST130-MTG

Replacement mounting kit (screws and relief springs) for installing ST130 transmitter in a DIN Form B connection head.

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

ISO9001
AS9100



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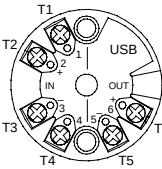
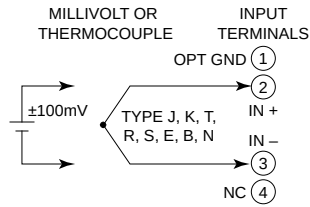
Transmitters: ST130 Series

ST133 Isolated thermocouple/mV input head-mount transmitter

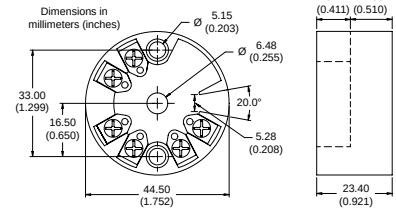


**USB
Configured**

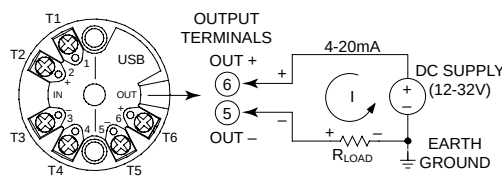
INPUT CONNECTIONS



DIMENSIONS



OUTPUT CONNECTIONS



Thermocouple (8 types) or ±100mV input ♦ 4-20mA output ♦ 1500V isolation ♦ Loop-powered

Description

The ST133 is a low-cost two-wire transmitter that isolates and converts a millivolt or thermocouple sensor input to a proportional 4-20mA control signal. Power is received from the output loop current. The transmitter performs signal linearization, cold-junction compensation, and lead-break detection functions.

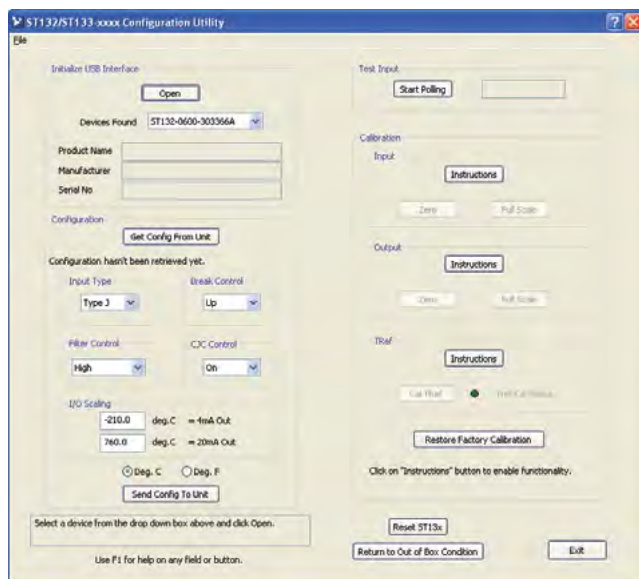
High-voltage isolation separates the input from the output circuit. Isolation protects from surges, reduces noise, and eliminates ground loop errors.

Setup and calibration are fast and easy with a convenient USB connection to your PC and Acromag's Windows configuration software.

Advanced signal processing capabilities, variable range input, and convenient USB programming make this instrument a very versatile temperature measurement device. These transmitters can withstand harsh industrial environments and operate reliably across a wide temperature range with very low drift. They feature RFI, EMI, ESD, EFT, and surge protection plus low radiated emissions.

Key Features & Benefits

- Easy setup and digital calibration via USB with Windows configuration software
- Flexible thermocouple or millivolt input ranges (TC Type J, K, T, R, S, E, B, N or ±100mV)
- 1500V input isolation
- 24-bit A/D microcontroller
- High accuracy, linearity, stability, and reliability
- Low temperature drift (<75ppm/°C)
- User selectable filtering (none, low, med. high)
- Fast response time (as low as 90ms)
- Supports reverse-acting (inverse) output
- Selectable upscale or downscale operation for sensor errors and lead-break detection
- Non-polarized output/power connection
- Mounts in DIN Form B sensor heads
- Shock (50g) and vibration (5g) resistant
- Optional DIN rail adapter
- Wide ambient operation (-40 to 80°C)
- Hardened for harsh environments
- CE compliant. UL/cUL Class 1 Div 2 Zone 2 approvals. ATEX Certified.



ST130 Series Transmitter Configuration Software is downloadable (FREE) from www.acromag.com.

ST133 software allows you to configure transmitters offline, save the file, and download settings into units later, at your convenience.

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Transmitters: ST130 Series

ST133 Isolated thermocouple input head-mount transmitter with USB-configuration

Performance Specifications

IMPORTANT: To prevent damage or errors from grounded PCs and surges, Acromag strongly recommends use of the USB-ISOLATOR when configuring an ST130 transmitter.

■ USB Interface

USB Connector

USB Mini-B type socket, 5-pin.

USB Data Rate

12Mbps. USB v1.1 and 2.0 compatible.

USB Transient Protection

Transient voltage suppression on power and data lines.

USB Cable Length

5.0 meters maximum.

Driver

Not required. Uses built-in Human Interface Device (HID) USB drivers of the Windows operating system.

■ Input

Default Configuration/Calibration

Input: TC J, -210 to 760°C, upscale fault, high filter.

Output: 4 to 20mA.

Input Ranges and Accuracy

Input	Range	Accuracy
TC J	-210 to 760°C (-346 to 1400°F)	±0.5°C
TC K	-200 to 1372°C (-328 to 2502°F)	±0.5°C
TC T	-260 to 400°C (-436 to 752°F)	±0.5°C
TC R	-50 to 1768°C (-58 to 3214°F)	±1.0°C
TC S	-50 to 1768°C (-58 to 3214°F)	±1.0°C
TC E	-200 to 1000°C (-328 to 1832°F)	±0.5°C
TC B	260 to 1820°C (500 to 3308°F)	±1.0°C
TC N	-230 to 1300°C (-382 to 2372°F)	±1.0°C
mV	-100 to 100mV	±0.1mV

Error includes the effects of repeatability, terminal point conformity, and linearization at 25°C operating ambient temperature.

Thermocouple Reference

(Cold Junction Compensation)

±0.1°C typical, ±0.3°C maximum at 25°C.

Ambient Temperature Effect

Better than ±75ppm/°C (±0.0075%/°C).

Zero Scaling Adjust

0 to 95% of range, typical.

Full Scale Adjust

5 to 100% of full scale range, typical.

Lead Break (Sensor Burnout) Detection

Configurable for either upscale (24mA) or downscale (3.3mA) operation.

Thermocouple Input Bias Current

±250nA typical (TC break).

Input Over-Voltage Protection

Bipolar Transient Voltage Suppressors (TVS), 5.6V clamp level typical.

Resolution

Millivolt input: 0.0025% (1 part in 40,000)

Thermocouple input: 0.1°C.

Input Filter

Normal mode filtering, plus selectable digital filtering settings (none, low, medium, high) optimized and fixed per input range within the A/D converter.

Noise Rejection (Normal Mode)

75dB @ 60Hz, typical with 100 ohm input unbalance.

■ Output

Output Range

4 to 20mA DC.

Output Compliance

$R_{LOAD} = (V_{SUPPLY} - 12V) / 0.024A$.

$R_{LOAD} = 0$ to 500 ohms @ 24V DC.

Output Response Time (for step input change)

Time to reach 98% of final output value (typical)	
No filtering	90 to 125ms
Low filter	240 to 420ms
Medium filter	550 to 1020ms
High filter	900 to 1500ms

■ Environmental

Operating temperature

-40 to 80°C (-40° to 176°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power Requirement

12-32V DC SELV (Safety Extra Low Voltage), 24mA max.

Isolation

1500V AC peak. 250V AC (354V DC) continuous isolation between input and output circuits.

Shock and Vibration Immunity

Vibration: 5g, per IEC 60068-2-64.

Shock: 50g, per IEC 60068-2-27.

Electromagnetic Compatibility (EMC) Compliance

Radiated Emissions: BS EN 61000-6-4, CISPR 16.

RFI: BS EN 61000-6-2, IEC 61000-4-3.

Conducted RFI: BS EN 61000-6-2, IEC 61000-4-6.

ESD: BS EN 61000-6-2, IEC 61000-4-2.

EFT: BS EN 61000-6-2, IEC 61000-4-4.

Surge Immunity: BS EN 61000-6-2, IEC 61000-4-5.

Approvals

CE compliant. UL/cUL listings. ATEX Certified.

Designed for Class I; Division 2; Groups ABCD; Zone 2.

Ⓢ II 3 G Ex nA IIC T4 Gc -40°C ≤ Ta ≤ +80°C

■ Physical

General

General purpose enclosure with potted circuit designed for mounting in DIN Form B connection heads.

Case Material

Self-extinguishing polycarbonate ABS plastic, UL94

V-0 rated base material. USB dust cap material is

Santoprene, 251-70W232.

I/O Connectors

Barrier strip type, captive screw terminals.

Wire range: AWG #14-28 solid or stranded.

Shipping Weight

0.5 pounds (0.22 Kg) packed.

Ordering Information

Models

ST133-1600

Transmitter, thermocouple/millivolt input, CE approval.

ST133-1610

Same as ST133-1600 plus UL/cUL Class 1 Division 2

Zone 2 approval and ATEX Certified.

If mounting screws are required, order one ST130-MTG with each unit.

Services

ST13x-Config/Cal

Factory custom configuration/calibration service.

Specify input type, input/output zero and full-scale values, filtering, and sensor fault settings on order.

Software

ST13C-SIP (recommend one kit per customer)

Software Interface Package. Includes configuration software (ST130-CONFIG), isolator (USB-ISOLATOR) and two USB cables (Part # 4001-112, 4001-113) for Acromag ST130 Series head-mount transmitters.

Accessories

Connection Head Enclosures

See Bulletin 8400-630 or www.acromag.com for info.

ST130-DIN

DIN-rail adapter (Type G or T).

USB-ISOLATOR

USB-to-USB isolator, includes USB cable (4001-112).

ISO9001
AS9100



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Transmitters: ST130 Series

Mounting Accessories Enclosures, adapters, mounting kits



4001-115K Aluminum
Explosion-Proof,
NEMA-4 rated



4001-116K Stainless
Steel Explosion-Proof,
NEMA-4X rated



4001-117K Aluminum
General-Purpose,
NEMA-4X rated



4001-119K Cast Iron
General-Purpose,
NEMA-4X rated

Simplifies mounting of ST130 Series transmitters ♦ Ideal for mounting in the field or in a control room

Description

For your convenience, Acromag offers a variety of head-mount enclosures and other mounting accessories to simplify your system installation.

Ordering Information

NOTE: For more information visit www.acromag.com.

Mounting Accessories

ST130-MTG

Replacement mounting Kit – Includes two (2) M4 mounting screws, (2) 6-32 mounting screws, and (2) two relief springs for mounting an ST130 transmitter in a DIN Form B connection head.

4001-115K

Explosion-Proof Aluminum Connection Head – FM/FMC, Class I, Division 1, Groups A, B, C, D, T6; Class II, III, Division 1, Groups E, F, G, T6; NEMA 4 rated. Includes M4 mounting screws and springs.

4001-116K

Explosion-Proof Stainless Steel Connection Head – FM/FMC, Class I, Division 1, Groups A, B, C, D, T6; Class II, Division 1, Groups E, F, G, T6; Class III, NEMA 4X rated. Includes M4 mtg screws and springs.

4001-117K

General-Purpose Aluminum Connection Head – NEMA 4X and IP68 rated. Includes M4 mounting screws and springs.

4001-119K

General-Purpose Cast Iron Connection Head – NEMA 4X rated. Includes M4 mtg screws and springs.

ST130-DIN

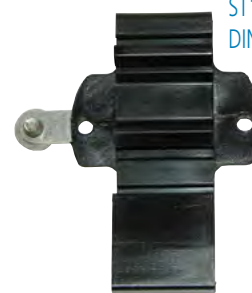
Series ST DIN Rail Adapter – Includes a DIN rail bracket with mounting screws that connects a ST130 transmitter to a 35mm T-type or G-type DIN rail. Includes M4 mounting screws and springs.

ST130-MTG
Mounting Kit



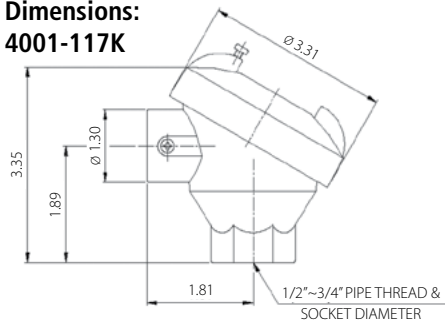
Required to mount ST130 transmitter in connection head enclosure.

ST130-DIN
DIN-rail Adapter

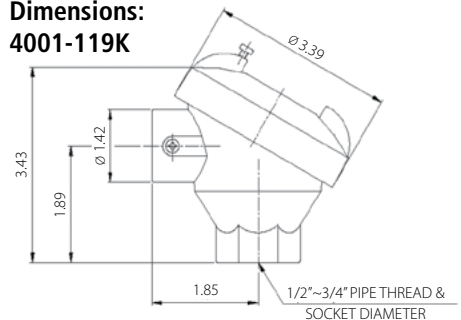


Includes ST130-MTG

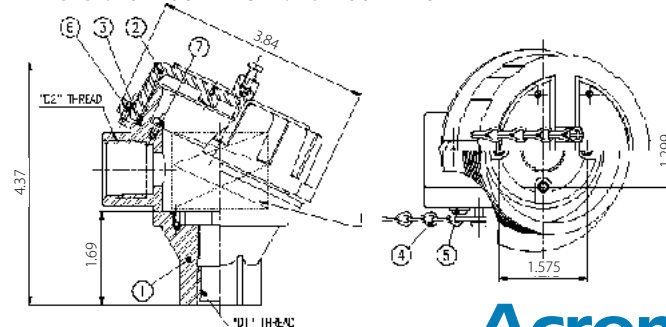
Dimensions: 4001-117K



Dimensions: 4001-119K



Dimensions: 4001-115K and 4001-116K



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IntelliPack®: 800 Series



800 Series Models by Function Guide

◆ 800T Intelligent Transmitters



IntelliPack transmitter units convert sensor inputs to isolated process current or voltage output signals.

◆ 800A Intelligent Alarms



Alarm units monitor sensor inputs and provide relay actuation if conditions exceed user-defined limits.

◆ 800M Math/Computation



IntelliPack math modules perform complex mathematical computations.

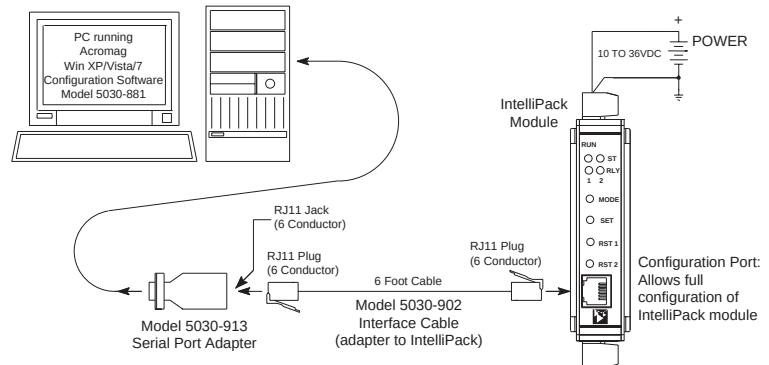
	801T	811T	841T	851T	801A	811/812A	822A	832A	892/894M	895/896M
PRIMARY FUNCTIONS										
Isolated transmitter	X	X	X	X					X	X
Single channel alarm	X	X	X	X	X	X				
Dual channel alarm						X	X	X		
Dual channel math/computation									X	X
Quad channel math/computation									X	
POWER CONFIGURATION										
DC-powered	X	X	X	X	X	X	X	X	X	X
INPUTS										
DC voltage/current input		X				X			X	X
DC millivolt input	X			X	X		X			
Thermocouple input	X				X		X			
RTD input	X				X			X		
Resistance input	X				X			X		
Frequency input			X							
AC current input (requires external sensor)		X				X			X	X
Strain gauge/load cell				X						
OUTPUTS										
DC current	X	X	X	X					X	
DC voltage	X	X	X	X					X	
Frequency/pulse/pulse-width modulation										X
SPDT or SPST relay	X	X	X	X	X	X	X	X		X
DPDT relay					X	X				

IntelliPack®: 800 Series

IntelliPack 800 Series Signal Conditioners



Configuration Diagram



After the initial software configuration, a PC is no longer required. Field calibration is easily handled with the IntelliPack's push-buttons, status LEDs and a standard field calibrator.

Intelligent Transmitters ♦ Intelligent Alarms ♦ Intelligent Math Modules

IntelliPack® Intelligent Transmitters, Alarms, and Math Modules

The IntelliPack series is a high-performance line of multi-function I/O modules. IntelliPack units feature universal input/output ranges and an intelligent microcontroller to provide extreme flexibility and powerful signal conditioning capabilities.

Since each IntelliPack module supports many I/O configurations, you can handle a broad range of applications with only a few models. Now you can reduce your spare inventory stock and still remain covered in an emergency.

Windows® XP®/Vista/7 software helps you quickly configure IntelliPacks for your application. With just a few mouse clicks, you can select your desired input/output ranges and other operating parameters from a list of available options. And if your operating requirements change, a simple reconfiguration lets you adapt in a hurry with minimal downtime.

Once configured, IntelliPacks are very easy to adjust in the field with standard calibrators (no PC required). Front panel push buttons simplify changes to setpoints, deadbands, and zero/full-scale values. LEDs clearly indicate the status and mode of operation.

Key Features & Benefits

- **Universal I/O ranges** cover a wide range of applications to reduce stock inventories.
- **Windows XP/Vista/7 software** configuration simplifies IntelliPack module setup.
- **Push button field calibration** makes routine maintenance easy without a PC.
- **Internal microcontroller** provides intelligent signal processing capabilities.
- **Quick-disconnect terminals** facilitate installation and removal of I/O modules.
- **Field diagnostics** enhanced with software minimize downtime.

Transmitters

IntelliPack transmitter units convert sensor inputs to isolated process current or voltage output signals. Each unit accepts a variety of input and output ranges to support a broad range of applications. An optional relay output enables local alarms. Plus, the internal microcontroller can perform many signal processing and transfer functions.

Input

- Thermocouple/RTD/ohms/DC millivolts
- DC voltage/current
- Frequency/pulse counter
- AC current

Output

- Universal DC voltage/current
- SPDT relay

Functions

All functions are standard

- Signal linearizer
- Square root computation
- Signal average computation
- Pulse counting
- Limit alarm

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Alarms

IntelliPack alarm units monitor sensor inputs and provide relay actuation if conditions exceed user-defined limits. An internal microcontroller provides signal processing and logic functions, normally found only in expensive controllers, for a variety of intelligent alarm functions. Dual relay units support two different alarm functions at the same time.

Inputs

- Thermocouple/RTD/ohms/DC millivolts
- DC voltage/current
- AC current

Outputs

- One DPDT relay or two SPDT relays

Functions

All functions are standard on every alarm unit.

- Limit and window (band-pass) alarm
- Deviation alarm
- Rate-of-change alarm
- On/off controller
- Peak/valley signal detection

Math Modules

IntelliPack math modules perform a variety of complex mathematical computations on up to four input signals and provide a DC or frequency output signal that represents the calculated result. Typical applications include calculating sums, deltas, averages, flow rates, volumes, and tracking minimum/maximum values. Equations are entered using a freeform format, the same as in most popular spreadsheet programs.

Input and Output Ranges

- Universal DC voltage/current
- Frequency, pulse, PWM outputs

Functions

- Add, subtract, multiply, divide
- Square root, exponential, logarithmic
- Absolute value, minimum/maximum
- High/low selector, track and hold
- Trigonometric (sine, cosine, tangent)
- Conditional arguments (if, then, and, or)

Fast Installation

- Step 1** Run configuration software offline to select desired operating parameters.
- Step 2** Print configuration or save to disk.
- Step 3** Connect PC to IntelliPack and download configuration data.
- Step 4** Disconnect PC and install IntelliPack module in the field.
- Step 5** Optional. Calibrate in field using push-buttons on front panel.

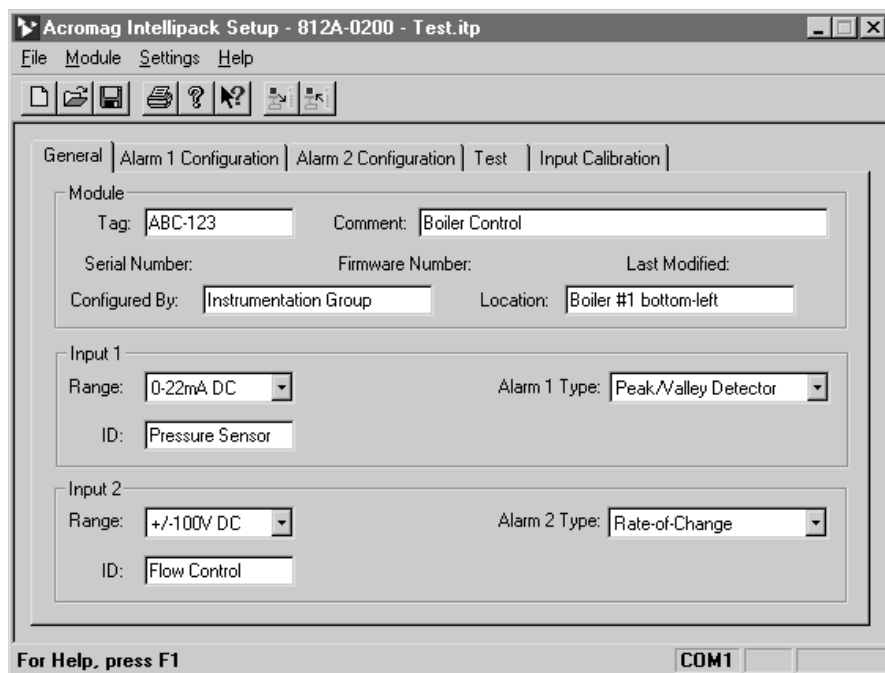
Easy Software Configuration

Acromag's configuration software is the key to the IntelliPack's easy-to-use operation. The software employs the friendly Windows XP/Vista/7 interface with pull-down selection menus and fill-in-the-blank fields to speed you through a few brief configuration screens. No programming is required.

An adapter plugs into the serial port of your computer. It serves as an isolated interface between the IntelliPack and the PC. A cable with RJ11 phone-style plugs at each end links the adapter to the IntelliPack's serial port. The software, adapter, and cable are sold as a kit (Model 800C-SIP) for easy ordering.

Once connected, the software reads the IntelliPack's non-volatile memory to determine the unit type and loads the appropriate configuration form with several property pages. As you select the input range and alarm function on the general property page, the other pages are dynamically customized to speed you through the procedure. After you select the operating parameters, the configuration is downloaded and stored in the IntelliPack's memory. The configuration is also saved to a file for subsequent downloading to other modules or for quick modifications. This capability saves you valuable downtime and archives your settings.

After you complete the configuration, the software provides a detailed printout to document your application.



Typical software configuration screen. Data is uploaded from the IntelliPack module.



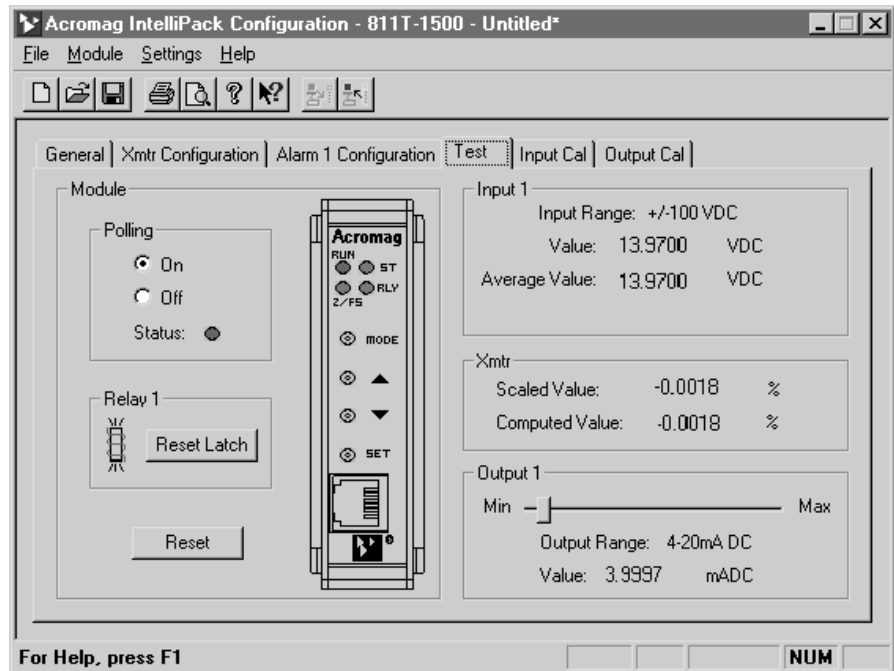
IntelliPack®: 800 Series

Software Diagnostics

The configuration software also shows you the current status of your IntelliPack module. A test screen (shown at right) indicates the current input signal value and the averaged value. The status of the relay and output signal are also displayed.

You can override the output for 10 seconds to verify the system is responding properly. The screen's IntelliPack diagram has representative LEDs to help you detect any bulb failures and verify proper operation.

On alarm modules, you can reset latched relays in software by clicking the screen's reset button with your mouse.



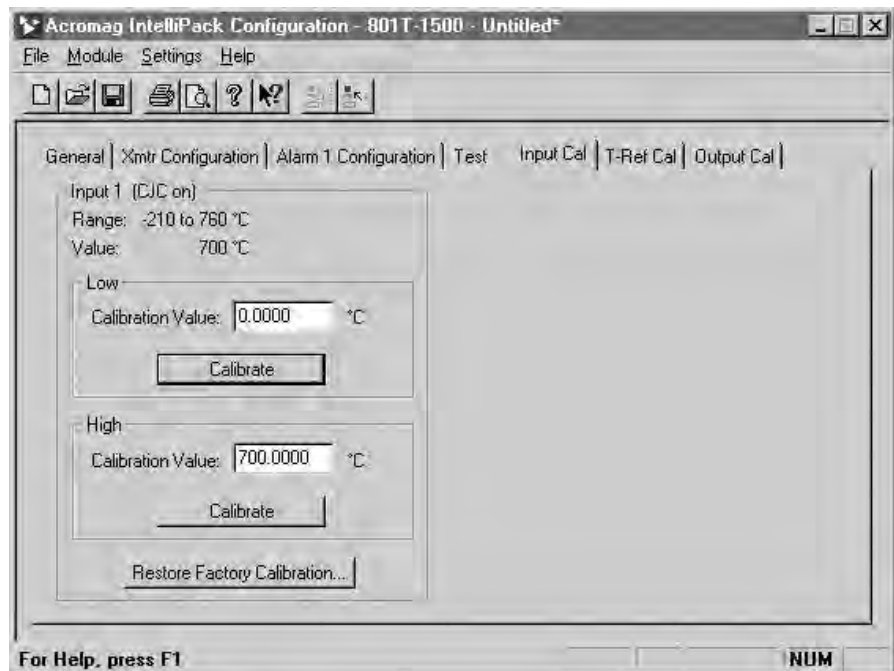
Quickly test or monitor your IntelliPack module with a software screen that displays all current values.

Software Calibration

The IntelliPack's configuration software makes calibrating your transmitters and alarms very easy. You can upload your IntelliPack's current calibration and quickly verify the settings or make changes on the input, output and thermocouple reference junction calibration property sheets.

The output calibration window has a slider control that you can drag with your mouse. This slider allows you to adjust the output current or voltage signal independent of the input signal.

If a unit is miscalibrated or you make a mistake, you can instantly restore the factory calibration settings. The original values are displayed on the screen.



Easily set calibration values by simply typing in the values or restore original factory settings instantly.

IntelliPack®: 800 Series



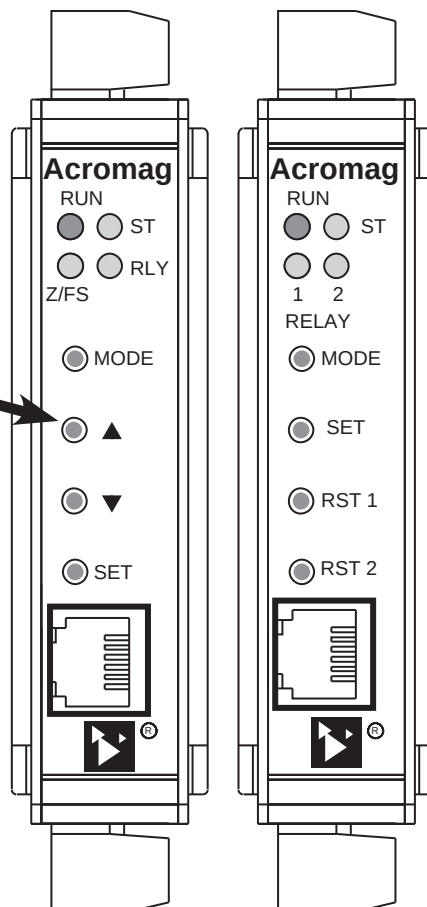
Simple Push-Button Field Configuration

After the initial software configuration, key functions may be reprogrammed in the field without a PC. Push-buttons let you adjust the IntelliPack's setpoint, deadband, zero, and full scale signal values with conventional field calibrators. LEDs indicate the mode and guide you through a few short steps. Latched relays may also be reset in the field.

With IntelliPacks, zero and span adjustments are one-step operations. Unlike many potentiometer-based instruments, IntelliPack zero/span adjustments are independent and non-interactive. The internal microprocessor holds the zero setting constant while the span is adjusted for precise calibration in a single iteration.

Transmitter

Alarm



The following tables describe push-button and LED functions for alarm and transmitter module types.

Push-Buttons (Alarms)

Mode: Push to enter field configuration mode.

Set: Accepts input data during field calibration.

RST 1: Resets a latched alarm for relay 1.

RST 2: Resets a latched alarm for relay 2.

Push-Buttons (Transmitters)

Mode: Push to enter field configuration mode.

Set: Accepts input data during field calibration.

▲: Calibrates (increases) the output signal.

▼: Calibrates (decreases) the output signal.

LED Indicators (Alarms)

Run (Green) - Indicates power applied.

Flashes when performing diagnostics.

ST (Yellow) - Status LED flashes to indicate input is out of range or a sensor break has been detected.

Relay 1 Alarm (Yellow) - Constant ON indicates alarm condition for relay 1.

Relay 2 Alarm (Yellow) - Constant ON indicates alarm condition for relay 2.

LED Indicators (Transmitters)

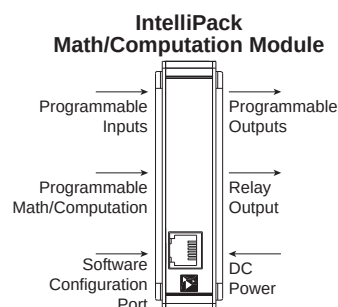
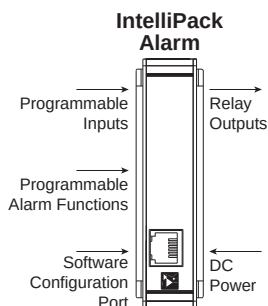
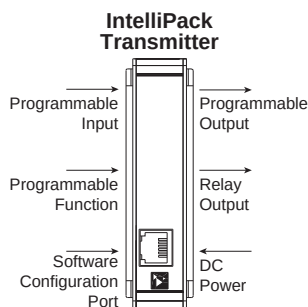
Run (Green) - Indicates power applied.

Flashes when performing diagnostics.

ST (Yellow) - Status LED flashes to indicate input is out of range or a sensor break has been detected.

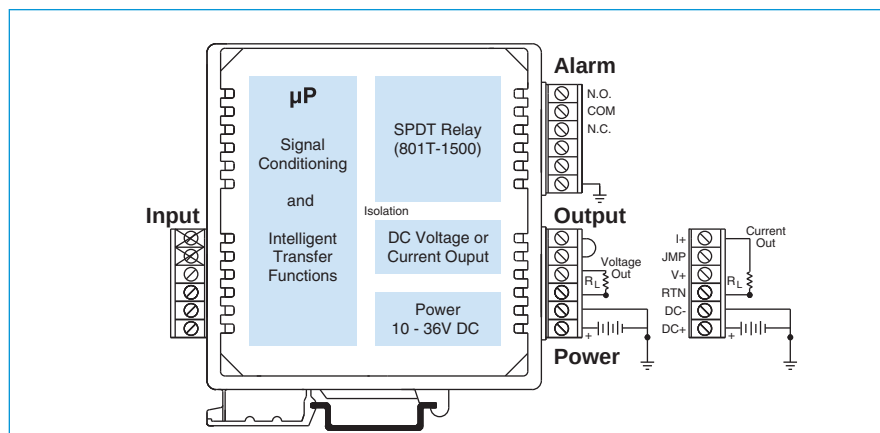
Z/FS (Yellow) - Lights or flashes to indicate the input zero or full-scale value is being calibrated.

RLY (Yellow) - Lights to indicate alarm condition or relay setpoint adjustments are being made. Flashes for deadband adjustments.





Transmitter w/alarm



801T Transmitters

Thermocouple, RTD, Millivolt, and Resistance Input

Models

801T-0500: Universal temperature transmitter

801T-1500: Transmitter with limit alarm

Input Ranges

TC types: J, K, T, R, S, E, B, N

Millivolt: $\pm 15.625\text{mV}$ to $\pm 1.0\text{V}$ DC

RTD: 100 ohm Pt, 120 ohm Ni, 10 ohm Cu

Resistance: 0 to 500 ohms

Output Ranges

0 to 1mA, 0 to 20mA, 4 to 20mA DC

0 to 5V, 0 to 10V DC

Limit Alarm

SPDT electro-mechanical relay (-1500 unit only)

Power Requirement

10 to 36V DC

Approvals

CE marked. UL, cUL listed.

Description

These transmitters isolate and convert sensor inputs to noise-free, proportional DC current or voltage output signals. An optional relay output adds a local limit alarm function.

Each unit offers a selection of input and output ranges, as well as several signal conditioning options. This flexibility enables a single IntelliPack to handle a broad range of applications. As your needs change, you can easily reconfigure the unit for different ranges or functions.

Setup is very easy. IntelliPack modules are quickly configured with the user-friendly Windows software program. Field adjustments are simple with the module's front-panel push-buttons and status LEDs. Once configured, IntelliPacks operate independent of any host computer.

Special Features

- High-resolution Sigma-Delta A/D converter delivers high accuracy with low noise.
- Advanced microcontroller provides intelligent signal processing power for linearization, averaging, and square root computations.
- Windows XP/Vista/7 software configuration speeds setup and replacement.
- Multi-purpose inputs and outputs reduce spare stock requirements.
- Relay output option provides local limit alarm capability.

Performance

General Input

Analog to Digital Converter (ADC)
16-bit $\Sigma\text{-}\Delta$ A/D converter.

Resolution

$\pm 0.005\%$ of span or 0.1°C .

Ambient Temperature Effect

Better than $\pm 0.005\%$ of input span per $^\circ\text{C}$ or $\pm 1\mu\text{V}$, whichever is greater.

Noise Rejection

Normal Mode: Better than 40dB @ 60Hz.

Common Mode: Better than 130dB @ 60Hz.

Input Response Time (for input step change)

Less than 200ms typical
to 98% of final output value.

Input Overvoltage Protection

Bipolar Transient Voltage Suppressors (TVS).

Thermocouple Input

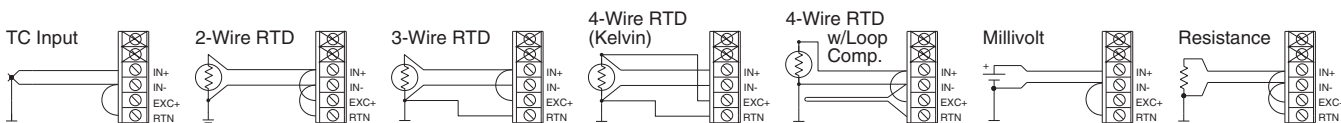
Thermocouple Input Ranges

Thermocouple type user configured. Signal linearization, cold-junction compensation, and open circuit or lead break detection are included.

TC	$^\circ\text{C}$ Range ($^\circ\text{F}$ Range)	Accuracy
J	-210 to 760°C (-346 to 1400°F)	$\pm 0.5^\circ\text{C}$
K	-200 to 1372°C (-328 to 2502°F)	$\pm 0.5^\circ\text{C}$
T	-260 to 400°C (-436 to 752°F)	$\pm 0.5^\circ\text{C}$
R	-50 to 1768°C (-58 to 3214°F)	$\pm 1.0^\circ\text{C}$
S	-50 to 1768°C (-58 to 3214°F)	$\pm 1.0^\circ\text{C}$
E	-200 to 1000°C (-328 to 1832°F)	$\pm 0.5^\circ\text{C}$
B	260 to 1820°C (500 to 3308°F)	$\pm 1.0^\circ\text{C}$
N	-230 to 1300°C (-382 to 2372°F)	$\pm 1.0^\circ\text{C}$

Thermocouple Break Detection

TC sensor failure can be configured for either upscale or downscale.





■ RTD Input

RTD Input Ranges

100 ohm Platinum, 120 ohm Nickel, or 10 ohm Copper; user-configured.

RTD	°C Range (°F Range)	Accuracy
Pt ¹	-200 to 850°C (-328 to 1562°F)	±0.25°C
Pt ²	-200 to 850°C (-328 to 1562°F)	±0.25°C
Ni	-80 to 320°C (-112 to 608°F)	±0.25°C
Cu	-200 to 260°C (-328 to 500°F)	±1.00°C

Alpha: Pt1 (a = 1.3850), Pt2 (a = 1.3911), Ni (a = 1.6720), Cu (a = 1.4272).

2, 3, or 4-wire configurations supported. Module provides sensor excitation, linearization, lead-wire compensation, and sensor break detection.

RTD Excitation Current

1mA DC typical, all types.

RTD Lead-Wire Compensation

25 ohms per lead.

RTD Break Detection

RTD sensor failure can be configured for either upscale or downscale.

■ Millivolt Input

DC Millivolt/Voltage Input Ranges

±1.0V	±125mV	±31.25mV
±500mV	±62.5mV	±15.625mV
±250mV		

Millivolt Accuracy

Better than ±0.05% of input span.

■ Resistance Input

Resistance Input Range

0 to 500 ohms.

Resistance Accuracy

±0.05 ohms.

■ Output (DC V/mA)

D/A Converter

16-bit Σ-Δ.

Current Output

Ranges: 0-1mA, 0-20mA, 4-20mA.

Compliance: 10V minimum (500 ohm load).

Accuracy: 0.025% of span.

Voltage Output

Ranges: 0-5V, 0-10V.

Compliance: 10mA maximum with short circuit protection. 1 ohm output impedance.

Accuracy: 0.025% of span.

Accuracy (overall input to output)

0.075% of span.

■ Output (Relay)

Relay

One SPDT electro-mechanical relay.

Relay Ratings (CSA ratings)

25V DC @ 5A.

120/240V AC @ 5A.

Relay Time Delay

Adjustable alarm delay of up to 25 seconds.

Contact Material

Silver-cadmium oxide (AgCdO).

Expected Mechanical Life

20 million operations.

■ Environmental

Ambient Temperature

Operating: -25 to 70°C (-13 to 158°F).

Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity

5 to 95%.

Power Requirements

10 to 36V DC. 75mA @ 24V. 120mA @ 15V.

Isolation (optical)

4-way (input/output/relay/power).

1500V AC for 60 seconds or 250V AC continuous.

Radiated Field Immunity (RFI)

EN61000-4-3, EN50082-1.

Electromagnetic Field Immunity (EMI)

Less than ±0.25% of output span effect under the influence of electromagnetic fields from switching solenoids, commutator motors, and drill motors.

Electrical Fast Transient (EFT)

EN61000-4-4, EN50082-1.

Surge Withstanding Capability (SWC)

EN61000-4-5, EN50082-1.

Electrostatic Discharge (ESD)

EN61000-4-2, EN50082-1.

Radiated Emissions

EN50081-1 for Class B equipment.

Approvals

CE, UL listed (USA, Canada).

UL3121 - general product safety.

■ Configuration

Software Configuration

Units are fully programmable via the Windows

XP/Vista, 7 IntelliPack Configuration

Program. Configuration downloads from PC through

EIA232 serial port using Acromag 800C-SIP kit.

Field Configuration

Output, zero/full-scale, relay setpoint and deadband are configurable via push-buttons and a standard calibrator.

LED Indicators

LEDs indicate power, status, calibration, and alarm.

■ Physical

Enclosure

Case: Self-extinguishing NYLON type 6.6 polyamide thermoplastic UL94 V-2 NEMA Type 1 enclosure.

Connectors (Removable Terminal Blocks)

Wire Range: AWG #14-22 (AWG #12 stranded only).

Printed Circuit Boards

Military grade FR-4 epoxy glass circuit board.

Dimensions

1.05W x 4.68H x 4.35D inches.

26.7W x 118.9H x 110.5D millimeters.

Shipping Weight

1 pound (0.45 Kg) packed.

■ Ordering Information

IMPORTANT: All IntelliPacks require initial software configuration (order 800C-SIP). See Note 1 below.

801T-0500

IntelliPack transmitter (TC/RTD/mV/resistance input).

801T-1500

Same as above, plus an SPDT relay output.

800C-SIP

Software Interface Package.

Only one kit is required for all IntelliPack models.

See diagram on Page 83 for included parts.

5034-225

USB-to-RS232 adapter. See page 121 for more info.

PS5R-D24

Power supply (24V DC, 2.1A).

See Power Supplies on Page 199.

TBK-B01

Optional terminal block kit, barrier strip style, 2 pcs.

(Does not include terminal block for input wiring.)

TBK-S01

Optional terminal block kit, spring clamp style, 2 pcs.

(Does not include terminal block for input wiring.)

NOTE 1: To order factory configuration, call Acromag for a configuration form which must accompany your order. Also, append "-C" to model number (example: 801T-1500-C). 800C-SIP kit is still recommended.



Optional terminal blocks: barrier strip (left) and spring clamp (right). Cage clamp terminal is standard.



Transmitter w/alarm



811T Transmitters

DC Current, DC Voltage, and AC Current Input

Models

811T-0500: Universal DC input transmitter

811T-1500: Transmitter with limit alarm

Input Ranges

DC Current: 0 to 22mA

DC Voltage: $\pm 100V$ DC

AC Current: 0 to 20A AC (with external sensor)

Output Ranges

0 to 1mA, 0 to 20mA, 4 to 20mA DC

0 to 5V, 0 to 10V DC

Limit Alarm

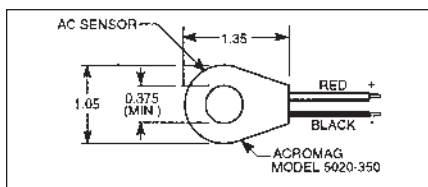
SPDT electro-mechanical relay (-1500 unit only)

Power Requirement

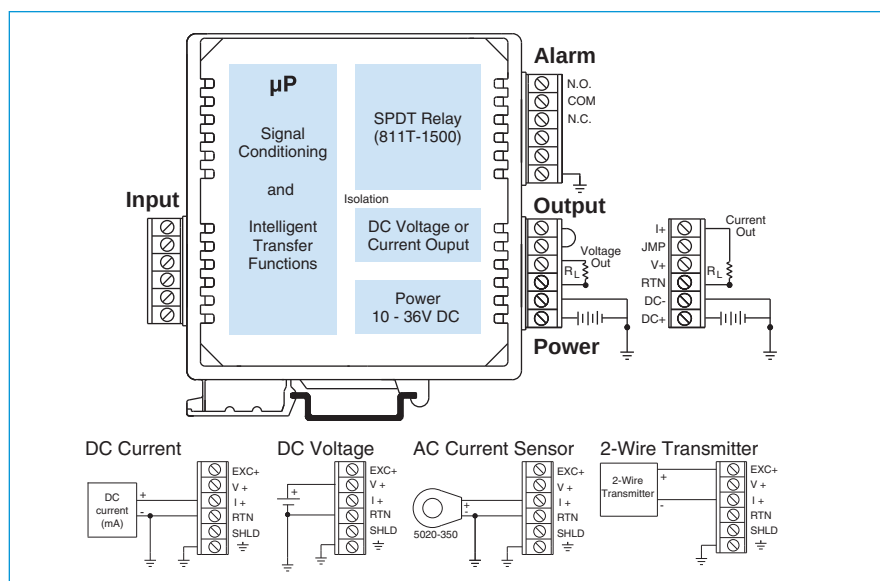
10 to 36V DC

Approvals

CE marked. UL, cUL listed.



AC Current Sensor Model 5020-350 (ordered separately)



Description

These transmitters isolate and convert sensor inputs to noise-free, proportional DC current or voltage output signals. An optional relay output adds a local limit alarm function.

Each unit offers a selection of input and output ranges, as well as several signal conditioning options. This flexibility enables a single IntelliPack to handle a broad range of applications. As your needs change, you can easily reconfigure the unit for different ranges or functions.

Setup is very easy. IntelliPack modules are quickly configured with the user-friendly Windows software program. Field adjustments are simple with the module's front-panel push-buttons and status LEDs. Once configured, IntelliPacks operate independent of any host computer.

Special Features

- High-resolution Sigma-Delta A/D converter delivers high accuracy with low noise.
- Advanced microcontroller provides intelligent signal processing power for linearization, averaging, and square root computations.
- Windows XP/Vista/7 software configuration speeds setup and replacement.
- Multi-purpose inputs and outputs reduce spare stock requirements.
- Relay output option provides local limit alarm capability.

Performance

General Input

Analogue to Digital Converter (ADC)
16-bit Σ - Δ A/D converter.

Ambient Temperature Effect

Better than $\pm 0.005\%$ of input span per $^{\circ}C$ or $\pm 1\mu V$, whichever is greater.

Noise Rejection

Normal Mode: Better than 40dB @ 60Hz.
Common Mode: Better than 100dB @ 60Hz.

Input Response Time (for input step change)

Less than 100ms typical
to 98% of final output value.

Input Overvoltage Protection

Bipolar Transient Voltage Suppressors (TVS).

DC Current Input

DC Current Input Range (100% rangeable)

Input Ranges	Resolution
0 to 22mA DC	757nA
0 to 5mA DC	189nA

DC Current Input Impedance

24.9 ohms.

Excitation Supply (for 2-wire instruments)

+15V DC at 24mA maximum.

DC Current Input Accuracy

Better than $\pm 0.05\%$ of input span.

continued on next page



■ DC Voltage Input

DC Voltage Input Ranges (100% rangeable)

Input Ranges	Resolution
±100V DC	3.77mV
±50V DC	1.88mV
±25V DC	942µV
±12V DC	471µV
±6V DC	236µV
±3V DC	118µV

Input impedance

Greater than 500K ohms.

DC Voltage Input Accuracy

Better than ±0.05% of input span.

■ AC Current Input

AC Current Input Range (optional)

An optional external AC current sensor is required to monitor AC current signals (Model 5020-350).

AC Current Range	Primary Turns
0 to 20A AC	1
0 to 10A AC	2
0 to 5A AC	4
0 to 2A AC	10
0 to 1A AC	20

AC Current Input Accuracy

Better than ±0.05% of input span.

■ Output (DC V/mA)

D/A Converter

16-bit Σ-Δ.

Current Output

Ranges: 0-1mA, 0-20mA, 4-20mA.

Compliance: 10V minimum (500Ω load).

Accuracy: 0.025% of span.

Voltage Output

Ranges: 0-5V, 0-10V.

Compliance: 10mA maximum with short circuit protection. 1Ω output impedance.

Accuracy: 0.025% of span.

Accuracy (overall input to output)

0.075% of span.

■ Output (Relay)

Relay

One SPDT electro-mechanical relay.

Relay Ratings (CSA ratings)

25V DC @ 5A.

120/240V AC @ 5A.

Relay Time Delay

Adjustable alarm delay of up to 25 seconds.

Contact Material

Silver-cadmium oxide (AgCdO).

Expected Mechanical Life

20 million operations.

■ Environmental

Ambient Temperature

Operating: -25 to 70°C (-13 to 158°F).

Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity

5 to 95%.

Power Requirements

10 to 36V DC. 110mA @ 24V. 170mA @ 15V.

Isolation (optical)

4-way (input/output/relay/power).

1500V AC for 60 seconds or 250V AC continuous.

Radiated Field Immunity (RFI)

EN61000-4-3, EN50082-1.

Electromagnetic Field Immunity (EMI)

Less than ±0.25% of output span effect under the influence of electromagnetic fields from switching solenoids, commutator motors, and drill motors.

Electrical Fast Transient (EFT)

EN61000-4-4, EN50082-1.

Surge Withstanding Capability (SWC)

EN61000-4-5, EN50082-1.

Electrostatic Discharge (ESD)

EN61000-4-2, EN50082-1.

Radiated Emissions

EN50081-1 for Class B equipment.

Approvals

CE, UL listed (USA, Canada).

UL1321 - general product safety.

■ Configuration

Software Configuration

Units are fully programmable via the Windows

XP/Vista/7 IntelliPack Configuration

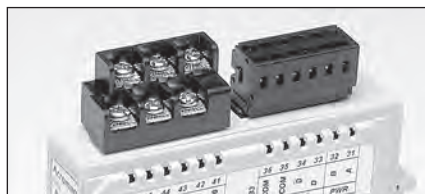
Program. Configuration downloads from PC through EIA232 serial port using Acromag 800C-SIP kit.

Field Configuration

Output, zero/full-scale, relay setpoint and deadband are configurable via push-buttons and a standard calibrator.

LED Indicators

LEDs indicate power, status, calibration, and alarm.



Optional terminal blocks: barrier strip (left) and spring clamp (right). Cage clamp terminal is standard.

■ Physical

Enclosure

Case: Self-extinguishing NYLON type 6.6 polyamide thermoplastic UL94 V-2 NEMA Type 1 enclosure.

Connectors (Removable Terminal Blocks)

Wire Range: AWG #14-22 (AWG #12 stranded only).

Printed Circuit Boards

Military grade FR-4 epoxy glass circuit board.

Dimensions

1.05W x 4.68H x 4.35D inches.

26.7W x 118.9H x 110.5D millimeters.

Shipping Weight

1 pound (0.45 Kg) packed.

■ Ordering Information

IMPORTANT: All IntelliPacks require initial software configuration (order 800C-SIP).

See Note 1 below.

811T-0500

IntelliPack transmitter unit (DC voltage/current input).

811T-1500

Same as above, plus an SPDT relay output.

5020-350

AC current sensor. Required for AC current inputs.

See Page 205 for more information.

800C-SIP

Software Interface Package.

Only one kit is required for all IntelliPack models.

See diagram on Page 83 for included parts.

5034-225

USB-to-RS232 adapter. See page 121 for more info.

PS5R-D24

Power supply (24V DC, 2.1A).

See Power Supplies on Page 199.

TBK-B01

Optional terminal block kit, barrier strip style, 2 pcs. (For use with 811T-0500 model.)

TBK-B02

Optional terminal block kit, barrier strip style, 4 pcs. (For use with 811T-1500 model with alarm.)

TBK-S01

Optional terminal block kit, spring clamp style, 2 pcs. (For use with 811T-0500 model.)

TBK-S02

Optional terminal block kit, spring clamp style, 4 pcs. (For use with 811T-1500 model with alarm.)

NOTE 1: To order factory configuration, call Acromag for a configuration form which must accompany your order. Also, append "-C" to model number (example: 811T-1500-C). 800C-SIP kit is still recommended.



Transmitter w/alarm



841T Transmitters

Frequency, Pulse Counter Input

Models

841T-0500: Frequency input transmitter

841T-1500: Transmitter with limit alarm

Input Ranges

Sensor types: TTL, dry contact, open collector NPN/PNP, NAMUR, magnetic pickups, proximity

Frequency: 0 to 100Hz, 0 to 1KHz, 0 to 50KHz

Pulse: 0 to 65535 pulses

Output Ranges

0 to 1mA, 0 to 20mA, 4 to 20mA DC

0 to 5V, 0 to 10V DC

Limit Alarm

SPDT electro-mechanical relay (-1500 unit only)

Power Requirement

10 to 36V DC

Approvals

CE marked. UL, cUL listed.

Description

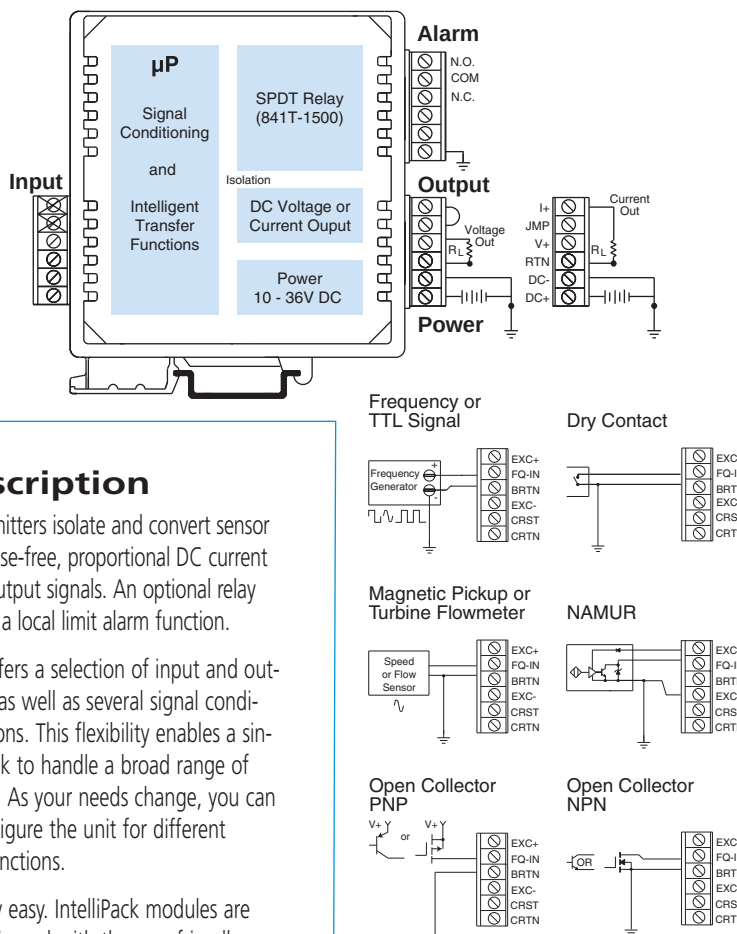
These transmitters isolate and convert sensor inputs to noise-free, proportional DC current or voltage output signals. An optional relay output adds a local limit alarm function.

Each unit offers a selection of input and output ranges, as well as several signal conditioning options. This flexibility enables a single IntelliPack to handle a broad range of applications. As your needs change, you can easily reconfigure the unit for different ranges or functions.

Setup is very easy. IntelliPack modules are quickly configured with the user-friendly Windows software program. Field adjustments are simple with the module's front-panel push-buttons and status LEDs. Once configured, IntelliPacks operate independent of any host computer.

Special Features

- High-resolution Sigma-Delta A/D converter delivers high accuracy with low noise.
- Advanced microcontroller provides intelligent signal processing power for linearization, averaging, and square root computations.
- Windows XP/Vista/7 software configuration speeds setup and replacement.
- Multi-purpose inputs and outputs reduce spare stock requirements.
- Relay output option provides local limit alarm capability.



Performance

General Input

Resolution

Input Range	Resolution
0 to 100Hz	0.01Hz
0 to 1000Hz	0.1Hz
0 to 50,000Hz	1Hz
0 to 65,535 pulses	1 pulse

Noise Rejection

Common Mode: Better than 80dB @ 60Hz.

Input Response Time (for input step change)
-3dB @ 35KHz.

Input Overvoltage Protection

Bipolar Transient Voltage Suppressors (TVS).

Continued on next page.



■ Performance

■ Frequency Input

Input Types

TTL, dry contact, open collector NPN/PNP, NAMUR, magnetic pickups, proximity sensors.

Frequency Ranges

0 to 100Hz
0 to 1000Hz
0 to 50,000Hz.

Pulse Counter Input Range

0 to 65535 pulses.

Minimum Input Pulse Width

Frequency inputs: 10µs.
Pulse counting inputs: 5ms.

Voltage Ranges

Unipolar: 0 to 100V DC.
Bipolar: ±50mV to ±100V peak.

Zero/Full Scale Adjustment

Zero and span: 100% full range adjustment.
Pulse counting: Up to 65535 spans within range.

Input Threshold/Hysteresis

Bipolar:
Threshold: 0.01V, typical.
Hysteresis: ±25mV or ±83mV.

Unipolar:

Threshold: 1.5V or 5V.
Hysteresis: ±25mV or ±83mV

Input Debounce (Event Counter)

0 to 1000ms (configurable in 5ms increments).

Frequency Excitation Supply

Selectable, +8.2V or +12V @ 15mA.

Input Impedance

35K ohms, typical.

Accuracy

Input Range	Accuracy
0 to 100Hz	±0.04Hz
0 to 1000Hz	±0.4Hz
0 to 50,000Hz	±10Hz
0 to 65,535 pulses	±1 pulse

■ Output (DC V/mA)

D/A Converter

16-bit Σ-Δ.

Current Output

Ranges: 0-1mA, 0-20mA, 4-20mA.
Compliance: 10V minimum (500Ω load).
Accuracy: 0.025% of span.

Voltage Output

Ranges: 0-5V, 0-10V.
Compliance: 10mA maximum with short circuit protection. 1 ohm output impedance.
Accuracy: 0.025% of span.

Accuracy (overall input to output)

0.075% of span.

■ Output (Relay)

Relay

One SPDT electro-mechanical relay.

Relay Ratings (CSA ratings)

25V DC @ 5A.
120/240V AC @ 5A.

Relay Time Delay

Adjustable alarm delay of up to 25 seconds.

Contact Material

Silver-cadmium oxide (AgCdO).

Expected Mechanical Life

20 million operations.

■ Environmental

Ambient Temperature

Operating: -25 to 70°C (-13 to 158°F).
Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity

5 to 95%.

Power Requirements

10 to 36V DC. 100mA @ 24V. 160mA @ 15V.

Isolation (optical)

4-way (input/output/relay/power).
1500V AC for 60 seconds or 250V AC continuous.

Radiated Field Immunity (RFI)

EN61000-4-3, EN50082-1.

Electromagnetic Field Immunity (EMI)

Less than ±0.25% of output span effect under the influence of electromagnetic fields from switching solenoids, commutator motors, and drill motors.

Electrical Fast Transient (EFT)

EN61000-4-4, EN50082-1.

Surge Withstanding Capability (SWC)

EN61000-4-5, EN50082-1.

Electrostatic Discharge (ESD)

EN61000-4-2, EN50082-1.

Radiated Emissions

EN50081-1 for Class B equipment.

Approvals

CE, UL listed (USA, Canada).
UL3121 - general product safety.

■ Configuration

Software Configuration

Units are fully programmable via the Windows XP/Vista/7 IntelliPack Configuration Program. Configuration downloads from PC through EIA232 serial port using Acromag 800C-SIP kit.

Field Configuration

Output, zero/full-scale, relay setpoint and deadband are configurable via push-buttons and a standard calibrator.

LED Indicators

LEDs indicate power, status, calibration, and alarm.

■ Physical

Enclosure

Case: Thermoplastic UL94 V-2 NEMA Type 1 enclosure.

Connectors (Removable Terminal Blocks)

Wire Range: AWG #14-22 (AWG #12 stranded only).

Printed Circuit Boards

Military grade FR-4 epoxy glass circuit board.

Dimensions and Shipping Weight

1.05W x 4.68H x 4.35D in. (26.7 x 118.9 x 110.5 mm)
1 pound (0.45 Kg) packed.

■ Ordering Information

IMPORTANT: All IntelliPacks require initial software configuration (order 800C-SIP).
See Note 1 below.

841T-0500

IntelliPack transmitter unit (freq/pulse counter input).

841T-1500

Same as above, plus an SPDT relay output.

800C-SIP

Software Interface Package.
Only one kit is required for all IntelliPack models.
See diagram on Page 83 for included parts.

5034-225

USB-to-RS232 adapter. See page 121 for more info.

PS5R-D24

Power supply (24V DC, 2.1A).
See Power Supplies on Page 199.

TBK-B01

Optional terminal block kit, barrier strip style, 2 pcs.
(For use with 841T-0500 model.)

TBK-B02

Optional terminal block kit, barrier strip style, 4 pcs.
(For use with 841T-1500 model with alarm.)

TBK-S01

Optional terminal block kit, spring clamp style, 2 pcs.
(For use with 841T-0500 model.)

TBK-S02

Optional terminal block kit, spring clamp style, 4 pcs.
(For use with 841T-1500 model with alarm.)

NOTE 1: To order factory configuration, call Acromag for a configuration form which must accompany your order. Also, append "-C" to model number (example: 841T-1500-C). 800C-SIP kit is still recommended.



Optional terminal blocks: barrier strip (left) and spring clamp (right). Cage clamp terminal is standard.



Bridge Interface



851T Transmitters

Strain Gauge, Load Cell Input

Input

Sensor types

Load cells (4- or 6-wire configurations),
Strain gauges (full-, half-, or quarter-bridge),
Millivolt

Bridge/gauge resistance

Supports 85 ohms or greater with 10V excitation

Input sensitivity

Accepts load cell and strain gauge rated outputs
up to 10mV/V DC

Internal excitation

Adjustable from 4 to 11V DC, 120mA max.

Output

Universal output

0 to 20mA (user-configured ranges),
0 to 10V DC (user-configured ranges),

Relay Output (optional)

5A SPDT dry contact relay

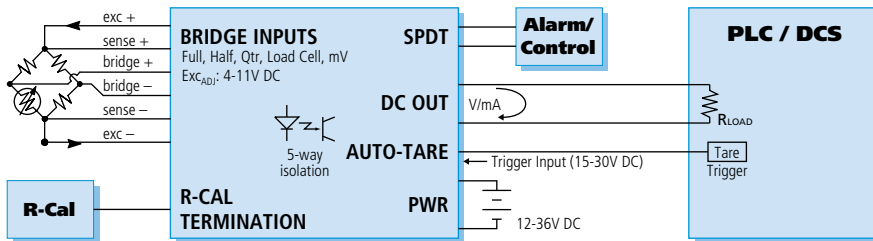
Power Requirement

12 to 36V DC

Approvals

CE marked. UL, cUL listed.

Strain Gauge / Load Cell Transmitter with Alarm



Description

IntelliPack strain gauge and load cell transmitters offer many powerful features beyond the limited capabilities found in typical bridge amplifiers. 851T models accept signals from sensors wired in a Wheatstone bridge configuration. Common uses include measurement of force, weight, level, torque, acceleration, pressure, and vibration.

The transmitter's input circuit allows true 6-wire bridge measurement and includes an adjustable bridge excitation supply (4 to 11V DC) with a remote sense feature. Sense wires ensure the programmed excitation voltage is applied at the sensor and enable lead-wire compensation. The differential input performs true ratiometric conversions for extremely stable measurements that remain accurate over time and temperature. Plus, lead break detection is inherent in the device.

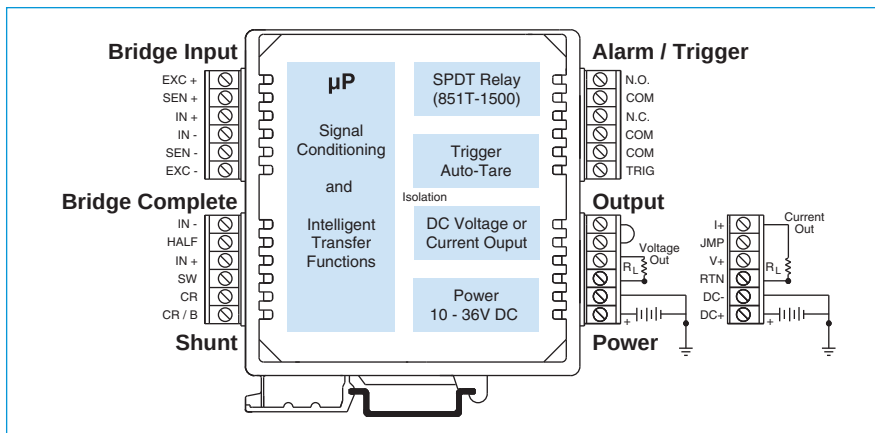
IntelliPack configuration software simplifies setup for use with basic load cells, millivolt inputs, or seven bridge sensor formats. Internal bridge completion resistors are supplied for half and quarter bridges. The software also downloads sensor parameters such as gauge factor and Poisson's ratio into the transmitter for internal calculation of complex equations to determine sensor strain (ϵ). The strain is then converted to a representative process signal output.

Screw terminals enable a remote "auto-tare" function to compensate for non-zero dead weights and other sensor offsets (e.g. container weight or bridge imbalances). Alternatively, these same screw terminals may be used to reset latched relay alarms.

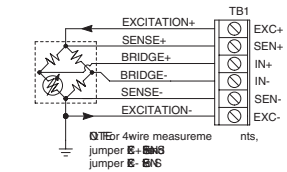
All these powerful features combined with Acromag's user-friendly configuration software, make the 851T a versatile device that's easy to use and maintain. Plus, a rugged, compact design makes it ideal for use out in the field, on the plant floor, or inside a laboratory.

Special Features

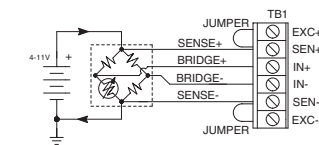
- Intelligent signal processing functions perform math computations for custom output:
 - strain (ϵ) calculations
 - signal linearization (25 breakpoints)
 - average signal computation
- Relay output option provides local limit alarm capability in addition to the DC output
- Adjustable bridge excitation supports a wide variety of sensor types
- An internal bridge completion function (half-to-full and quarter-to-full) accommodates a broad range of applications
- Remote auto-tare function compensates for extraneous loads and corrects for imbalances in the input bridge
- High-resolution Sigma-Delta A/D converter delivers high accuracy with low noise.
- Windows XP/Vista/7 software configuration speeds setup and replacement.



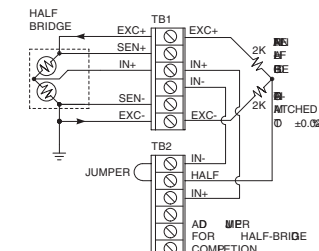
FULL-BRIDGE INPUT (INTERNAL EXCITATION)



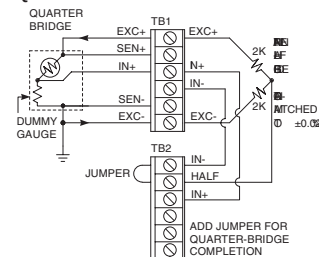
FULL-BRIDGE INPUT (EXTERNAL EXCITATION)



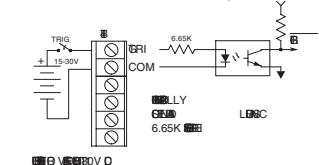
HALF-BRIDGE INPUT



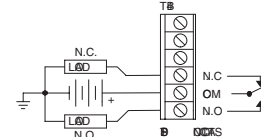
QUARTER-BRIDGE INPUT



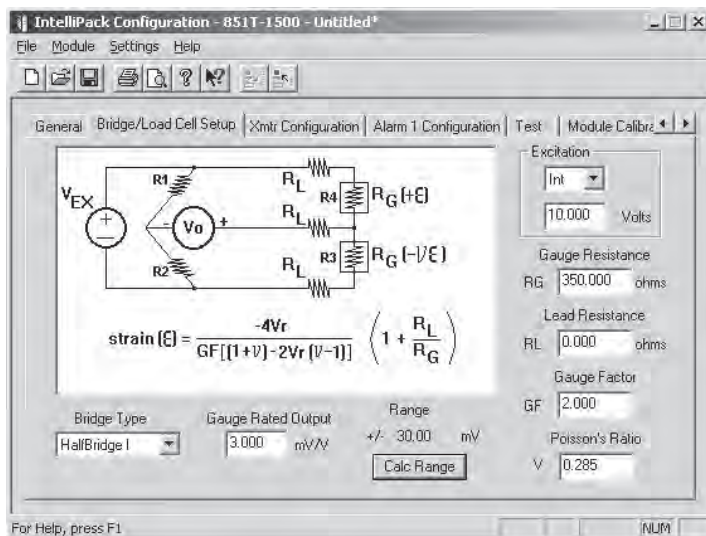
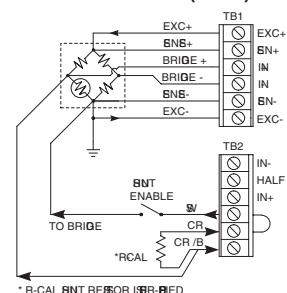
DIGITAL INPUT "TRIGGER" (AUTO-TARE/RELAY RESET)



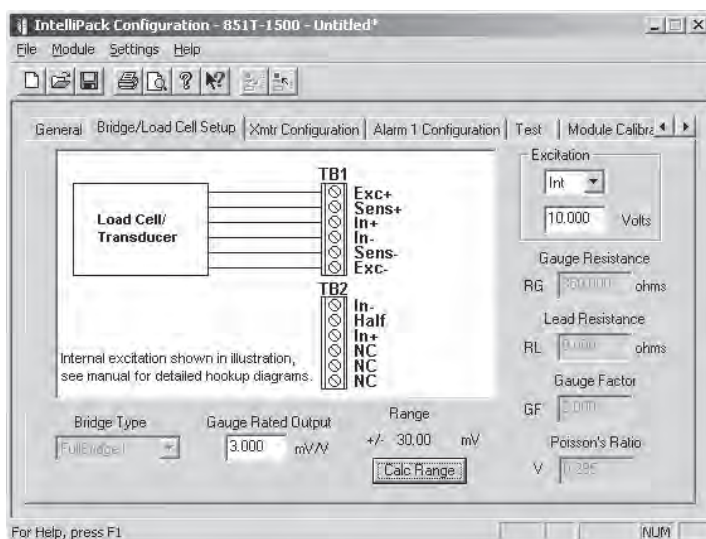
RELAY OUTPUT



SHUNT CALIBRATION (R-CAL)



Complex strain (ϵ) calculations are easily configured and computed for full, half, and quarter-bridge sensors.



The configuration software makes it easy to set up the transmitter for use with basic load cell sensor devices. Common input sources include pressure transducers, torque converters, and vibration sensors.



851T Transmitters

■ Performance

■ General Input

Analog to Digital Converter (ADC)

16-bit Σ - Δ A/D converter.

Resolution

$\pm 0.01\%$ of span.

Input Reference Test Conditions

120 ohm full bridge; Excitation = 10V; Rated Output = 3mV/V; Range = ± 30 mV; Ambient Temperature = 25°C; Power Supply = 24V DC; Alarm Delay = 100ms.

Accuracy (overall input to output)

Better than $\pm 0.1\%$ of span, typical.
This value does not include sensor errors.

Ambient Temperature Effect

Better than $\pm 0.01\%$ of input span per °C (± 100 ppm/°C), or ± 1.0 uV/°C, whichever is greater.

Response Time (for input step change)

250ms to 98% of final output value (into 500 ohms).

Input Overvoltage Protection

Bipolar Transient Voltage Suppressors (TVS).

■ Bridge Input

Input Types

Select from basic load cell, two quarter-bridge options, two half-bridge options, three full-bridge options, or millivolts.

Input Span/Range

Bipolar input range is determined from the $\pm$ product of the gauge's rated output and the nominal excitation selection (2mV/V x 10V = ± 20 mV range).

Input Over-range

The actual input range is $\pm 150\%$ typical of the range obtained via the $\pm$ product of the gauge's rated output and the nominal excitation applied.

Input Sensitivity

Accepts gauge rated outputs up to 10mV/V. The range of your input signal is the product of the excitation voltage and your gauge's rated output.

Input Impedance

± 1 N at 1M ohms min.; ± 5 EN at 29.09K ohms, typical.

Input Lead Resistance

Module has sufficient overdrive to guarantee 10V bridge excitation with 5 ohms/lead and 100mA of internal excitation current. Larger lead resistances may limit the maximum achievable bridge excitation.

Input Lead Break Detection

Sensor failure detection is upscale only.

Input Bridge Excitation (Internal)

Adjustable from 4V to 11V, 120mA maximum. Internal excitation may be turned OFF for external excitation supply connection.

Input Bridge Excitation (External)

4V to 11V. The internal excitation must be turned OFF for connection to an external excitation supply.

■ Digital (Trigger) Input

Input Type

"Active High" input.
15-30V DC (6.65K ohms).
See connection diagram.

Operation (Tare/Alarm Modes)

The trigger function is set for "Auto-Tare" mode by default. This input can also be configured to reset latched alarms via the Configuration Software.

■ Output (DC V/mA)

D/A Converter

16-bit Σ - Δ .

Current Output

Ranges: 0-1mA, 0-20mA, 4-20mA.
Compliance: 10V minimum (500 ohm load).

Voltage Output

Ranges: 0-5V, 0-10V.
Compliance: 10mA maximum with short circuit protection. 1 ohm output impedance.

■ Output (Relay)

Relay

One SPDT, Form C, dry contact relay.

Relay Ratings (CSA ratings)

25V DC @ 5A, resistive load.
120/240V AC @ 5A, resistive load.

Relay Time Delay

Adjustable alarm delay of up to 25 seconds.

Relay Response (No Relay Time Delay)

Relay contacts switch within 580ms typical, for an input step change from 10% of span on one side of an alarm point to 5% of span on the other side of the alarm point.

Initial Dielectric Strength

1000V AC rms between open contacts.

Contact Material

Silver-cadmium oxide (AgCdO).

Expected Mechanical Life

20 million operations.

Performance specifications continued on next page.



■ Environmental

Ambient Temperature

Operating: -25 to 70°C (-13 to 158°F).
Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity

5 to 95%.

Power Requirements

12 to 36V DC. 11V DC minimum.
175mA @ 24V. 290mA @ 15V.

Isolation (optical)

5-way (input/output/relays/trigger/power).
Input, analog output, trigger, and power circuits are isolated from each other for up to 1500V AC for 60 seconds or 250V AC continuous. Optional relay outputs are isolated from other circuits up to 150V AC, or 150V DC.

Radiated Field Immunity (RFI)

EN61000-4-3, EN50082-1.

Electromagnetic Field Immunity (EMI)

Less than $\pm 0.25\%$ of output span effect under the influence of electromagnetic fields from switching solenoids, commutator motors, and drill motors.

Electrical Fast Transient (EFT)

EN61000-4-4, EN50082-1.

Surge Withstanding Capability (SWC)

EN61000-4-5, EN50082-1.

Electrostatic Discharge (ESD)

EN61000-4-2, EN50082-1.

Radiated Emissions

EN50081-1 for Class B equipment.

Approvals

CE, UL listed (USA, Canada).
UL3121 - general product safety.

■ Configuration

Software Configuration

Units are fully programmable via the Windows XP/Vista/7 IntelliPack Configuration Program. Configuration downloads from PC through EIA232 serial port using Acromag 800C-SIP kit.

Field Configuration

Output, zero/full-scale, relay setpoint and deadband are configurable via push-buttons and a standard calibrator.

LED Indicators

LEDs indicate power, status, calibration, and alarm.

■ Physical

Enclosure

Case: Self-extinguishing NYLON type 6.6 polyamide thermoplastic UL94 V-2 NEMA Type 1 enclosure.

Connectors (Removable Terminal Blocks)

Wire Range: AWG #14-22 (AWG #12 stranded only).

Printed Circuit Boards

Military grade FR-4 epoxy glass circuit board.

Dimensions

1.05W x 4.68H x 4.35D inches.
26.7W x 118.9H x 110.5D millimeters.

Shipping Weight

1 pound (0.45 Kg) packed.

■ Ordering Information

IMPORTANT: All IntelliPacks require initial software configuration (order 800C-SIP).
See Note 1 below.

851T-0500

IntelliPack transmitter unit, strain gauge input

851T-1500

Same as above, plus an SPDT relay output.

800C-SIP

Software Interface Package.

Only one kit is required for all IntelliPack models.
See diagram on Page 83 for included parts.

5034-225

USB-to-RS232 adapter. See page 121 for more info.

PS5R-D24

Power supply (24V DC, 2.1A).
See Power Supplies on Page 199.

TBK-B02

Optional terminal block kit, barrier strip style, 4 pcs.

TBK-S02

Optional terminal block kit, spring clamp style, 4 pcs.

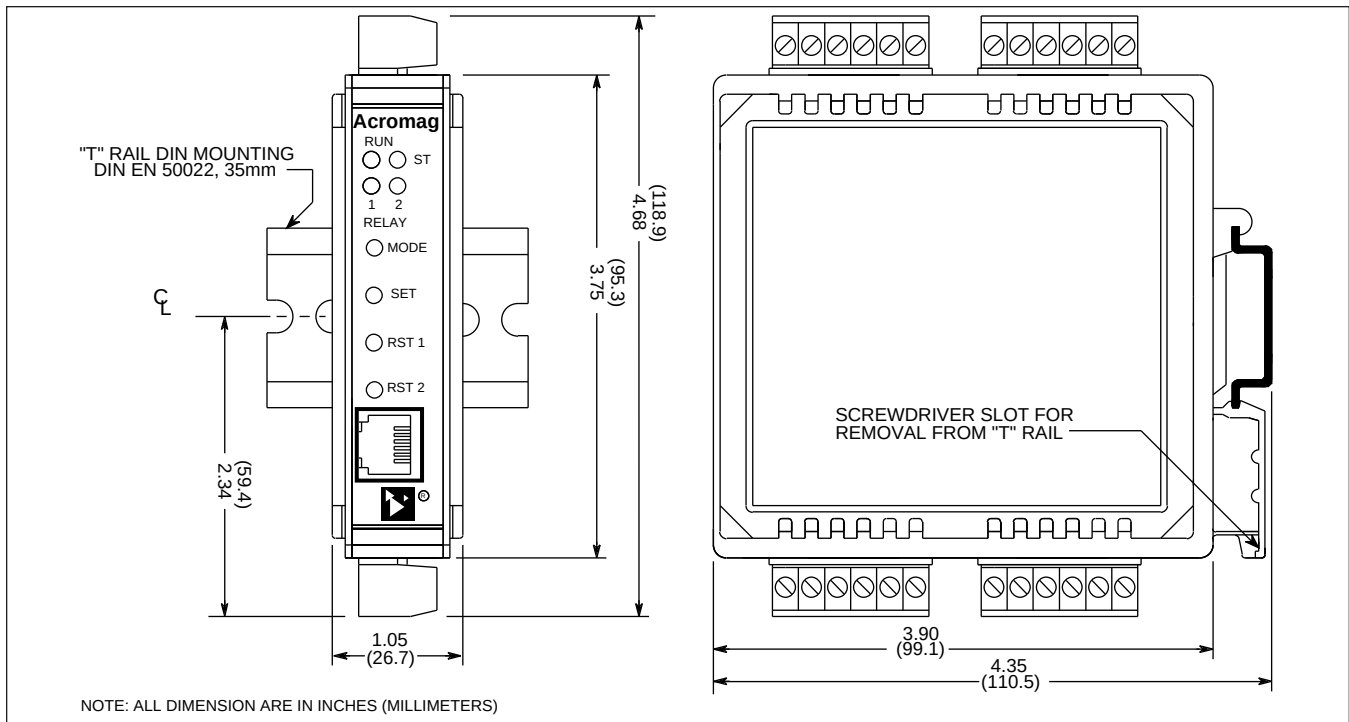
NOTE 1: To order factory configuration, call Acromag for a configuration form which must accompany your order. Also, append "-C" to model number (example: 851T-1500-C). 800C-SIP kit is still recommended.



Optional terminal blocks: barrier strip (left) and spring clamp (right). Cage clamp terminal is standard.



Dimensions





Accessories

Terminal Blocks

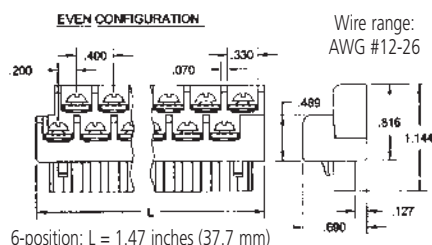


Barrier strip (left) and spring clamp (right).

Ordering Information

See individual I/O modules for compatibility.

Barrier Strip Terminal Blocks

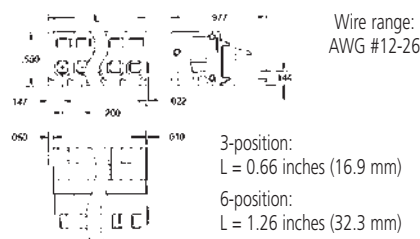


TBK-B01
Terminal block kit,
two 6-position pieces

TBK-B02
Terminal block kit,
four 6-position pieces

TBK-B03
Terminal block kit,
one 3-position and
three 6-position pieces

Spring Clamp Terminal Blocks



TBK-S01
Terminal block kit,
two 6-position pieces

TBK-S02
Terminal block kit,
four 6-position pieces

TBK-S03
Terminal block kit,
one 3-position and
three 6-position pieces

Mounting Hardware



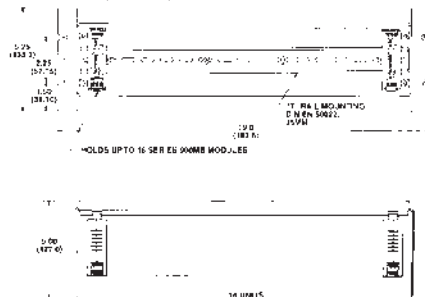
DIN-Rail Mounting

For your convenience, Acromag offers several mounting accessories to simplify your system installation. Our 19" rack-mount kit provides a clean solution for mounting your I/O modules and a power supply. Or you can buy precut DIN rail strips for mounting on any flat surface.

Ordering Information

20RM-16-DIN
19" rack-mount kit with DIN rail.

DIN RAIL 3.0
DIN RAIL 16.7
DIN rail strip, Type T, 3 inches (75mm) or
16.7 inches (425mm)



Power Supplies



50W Supply

Input Power Requirement
85 to 264V AC or 105 to 370V DC

Output
24V DC, 2.1A (50W)

Ordering Information

P55R-D24
Universal 50W power supply

See Power Supplies on Page 199 for other models and more information.

USB / RS232 Adapter

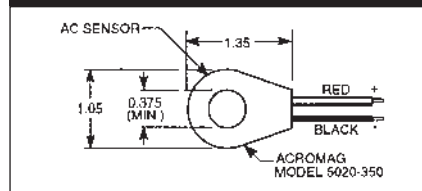


Length: 3.15 in (8.0 cm)
Height: 0.80 in (2.03 cm)
Width: 1.75 in (4.44 cm)
Weight: 1.6 oz (45.36 g)

Ordering Information

5034-225
USB-to-RS232 adapter

AC Current Sensor



Ordering Information

5020-350
AC current sensor (See page 205)



Isolated Transmitters



AC Voltage and AC Current Input

These models convert sensor inputs to proportional process current or voltage output signals.

AC voltage transmitters accept direct voltage inputs. Current models include an external AC current sensor. This toroidal sensor outputs a safe DC milliamp signal which transmits accurately over long distances. Input span is a function of the primary turns placed on the sensor.

Input Ranges

- AC voltage, 50/60Hz
0 to 150V AC
- AC current, 0 to 20A

Output Ranges

- DC current: 4 to 20mA
- DC voltage: 0 to 5V or 0 to 10V

Power Requirements

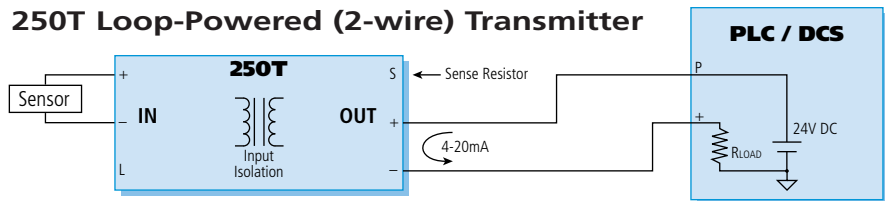
- 250T: 12 to 50V DC @ 20mA (loop-powered)
- 350T: DC voltage source (see table below)

Output range	Power
4 to 20mA	10 to 36V DC @ 30mA
0 to 5V	10 to 36V DC @ 9mA
0 to 10V	12.5 to 36V DC @ 9mA

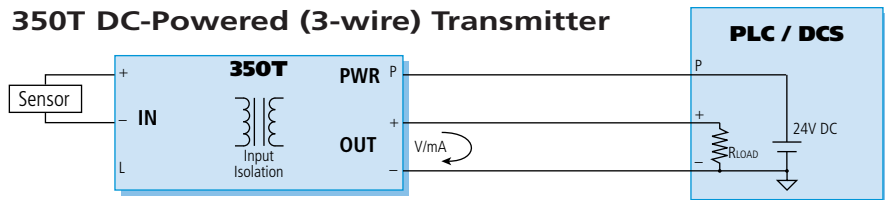
- 450T: 115V or 230V AC, $\pm 10\%$, 50 to 60Hz

Output range	Power
4 to 20mA	115V AC @ 0.050A
4 to 20mA	230V AC @ 0.025A
0 to 5V, 0 to 10V	115V AC @ 0.020A
0 to 5V, 0 to 10V	230V AC @ 0.010A

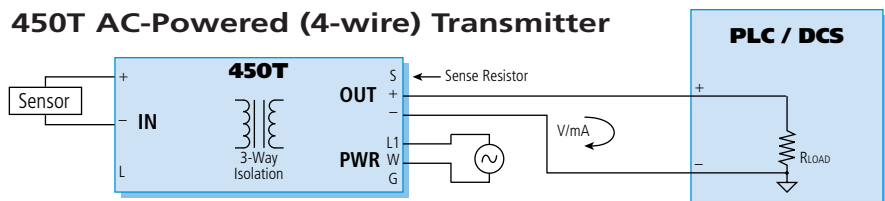
250T Loop-Powered (2-wire) Transmitter



350T DC-Powered (3-wire) Transmitter



450T AC-Powered (4-wire) Transmitter



Special Features

- Excellent accuracy and stability ensure reliable measurements in harsh industrial environments.
- External AC current sensor with DC mA output enables remote mounting of transmitter (for safe monitoring of the AC signal)
- AC current range is a function of sensor primary turns for easy rescaling in field
- Factory-calibrated AC current transmitter does not need recalibration
- RFI and EMI resistance minimize the effects of environmental noise.
- Compact, 1-inch wide housing uses less space.
- Low power consumption. (350T as low as 9mA).
- 1500V AC peak isolation (250V AC or 354V DC continuous) prevents ground loops.

250T models:

Input isolated from output/power.

350T models:

Input isolated from output and power.
Output and power share a common.

450T models:

3-way isolation. Input, output, and power circuits are isolated from each other.

Performance

Ambient Temperature Range

Operating: -13 to 185°F (-25 to 85°C).
Storage: -40 to 185°F (-40 to 85°C).

Accuracy

$\pm 0.5\%$ of calibrated span. Includes repeatability, hysteresis, terminal point linearity, and adjustment resolution.

Ambient Temperature Effect

Less than $\pm 0.01\%$ of output span per °F ($\pm 0.018\%$ per °C). (Specification includes the combined effects of zero and span over temperature).

Noise Resistance

RFI: Less than $\pm 0.5\%$ of output span effect.
EMI: Less than $\pm 0.25\%$ of output span effect.

Noise Rejection

Common Mode (-VAC): 120dB at 60Hz, 100 ohm unbalance.
Common Mode (-CACX): 120dB at 60Hz, 1 ohm unbalance.
Normal Mode: Not Applicable.

Response Time

Output reaches 98% of output span in 300mS.

Bandwidth

-3dB at 3 Hz, typical.

Output Compliance

250T: $R_{LOAD} (max.) = (V_{SUPPLY} - 12V) / 20mA$.
350T: $R_{LOAD} (max.) = (V_{SUPPLY} - 2.5V) / 20mA$.
450T: $R_{LOAD} = 600 \text{ ohms}$.



Ordering Information

Select one option from each column. Example: 450T-VAC-V5-2-DIN-NCR-C

To order factory calibration, append "-C" to end of model number. Specify ranges on order.

Base	Input	Mounting	Approval
250T	-VAC -CACX	-DIN -N4 -ST -N12 -SM -XP	-NCR

Note:
All 250Ts have 4 to 20mA output and are loop-powered.

Base	Input	Output	Mounting	Approval
350T	-VAC -CACX	-Y -V0 -V5	-DIN	-NCR

Note:
All 350Ts accept 10 to 36V DC power supply.

Base	Input	Output	Power	Mounting	Approval
450T	-VAC -CACX	-Y -V0 -V5	-1 -2	-DIN	-NCR

Input Options

-VAC: AC Voltage,
0 to 150V AC range,
Span adjust: 60 to 150V AC
Zero adjust: 0 to 90VAC
Input impedance 100k ohms
Input burden is 0.3 volt-amps

-CACX*: AC Current

AC Current Sensor (5020-350): One sensor is supplied with each transmitter. The sensor is a high-accuracy toroidal instrument transformer. See Page 205 for more information.

AC Input Range	Primary Turns	Sensor Output
0 to 20 Amps AC	1	0 to 11.17 mA DC
0 to 10 Amps AC	2	0 to 11.17 mA DC
0 to 5 Amps AC	4	0 to 11.17 mA DC
0 to 1 Amps AC	20	0 to 11.17 mA DC

Input Burden: A function of the wire gauge resistance used for the primary turns.

Input Overload: The AC Current Sensor withstands overloads as follows: 20 times full-scale for 0.01 second., 10 times full-scale for 0.1 second., and 5 times full-scale for 1.0 second.

AC Current Sensor to Transmitter Wiring Distance: 400 feet maximum for 18 AWG wire gauge. Other wire gauges can be used as long as the resistance of both wires is less than 5.0 ohms.

Output Options (350T, 450T only)

-Y: 4 to 20mA DC.
-V0: 0 to 10V DC into 10K ohms or greater
-V5: 0 to 5V DC into 5K ohms or greater

Power Options (450T only)

-1: 115V AC power
-2: 230V AC power

Mounting Options

Mountings

-DIN: DIN rail G or T mount
-ST: SNAPTRACK mount [250T only]
-SM: Surface-mount [250T only]

External housings

-N4: NEMA 4, water-tight [250T only], holds two
-N12: NEMA 12, oil-tight [250T only], holds two
-XP: Explosion-proof NEMA 4 [250T only], holds one

Approval Options

-NCR: No certification/approval required.

Ordering Notes

* Unit is factory calibrated for fixed range (adjustable by windings of sensor). Custom factory calibration '-C' option is not available with this input.

Accessories

Power supplies

See Power Supplies on Page 199.

5020-350

AC current sensor. (See page 205)

DIN RAIL 3.0

DIN RAIL 16.7

DIN rail strip, Type T, 3 inches (75mm) or 16.7 inches (425mm)

20RM-16-DIN

19" rack-mount kit with DIN rail. Holds sixteen 250T/350Ts or ten 450T transmitters.

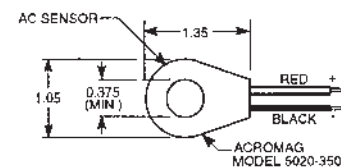
350T-N4-WM

NEMA 4 water-tight enclosure, wall-mount. Holds two 350Ts or one 450T transmitter.

350T-N12-WM

NEMA 12 oil-tight enclosure, wall-mount. Holds two 350Ts or one 450T transmitter.

AC Current Sensor





Isolated Transmitters



DC Millivolts Input

These models convert sensor inputs to proportional process current or voltage output signals.

Models

250T: Loop-powered transmitter series

350T: DC-powered transmitter series

450T: AC-powered transmitter series

Input Ranges

- Millivolt: -25 to 250mV
narrow span: 3 to 5mV, custom calibration

Output Ranges

- DC current: 4 to 20mA
- DC voltage: 0 to 5V or 0 to 10V

Power Requirements

- 250T: 12 to 50V DC @ 20mA (loop-powered)

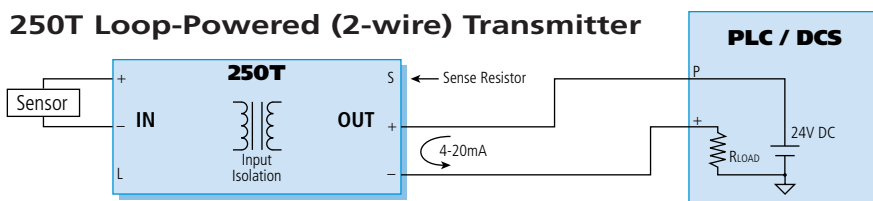
- 350T: DC voltage source (see table below)

Output range	Power
4 to 20mA	10 to 36V DC @ 30mA
0 to 5V	10 to 36V DC @ 9mA
0 to 10V	12.5 to 36V DC @ 9mA

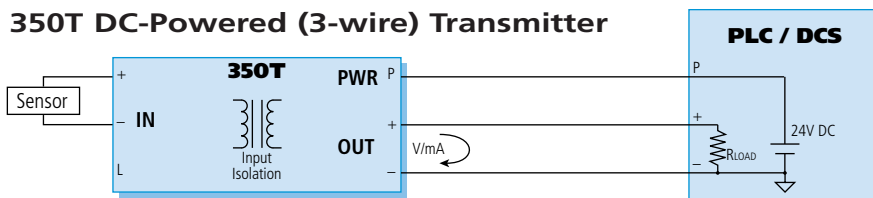
- 450T: 115V or 230V AC, $\pm 10\%$, 50 to 60Hz

Output range	Power
4 to 20mA	115V AC @ 0.050A
4 to 20mA	230V AC @ 0.025A
0 to 5V, 0 to 10V	115V AC @ 0.020A
0 to 5V, 0 to 10V	230V AC @ 0.010A

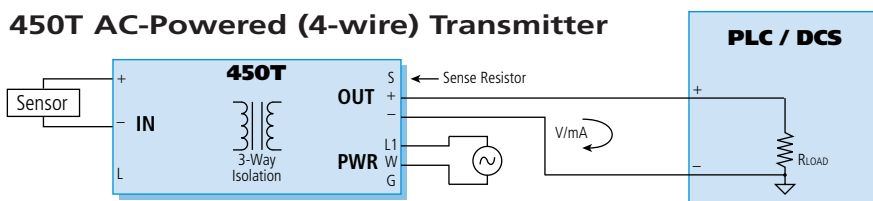
250T Loop-Powered (2-wire) Transmitter



350T DC-Powered (3-wire) Transmitter



450T AC-Powered (4-wire) Transmitter



Special Features

- Excellent accuracy and stability ensure reliable measurements in harsh industrial environments.
- RFI and EMI resistance minimize the effects of environmental noise.
- 90% span adjustment enables precise application calibration.
- 1500V AC peak isolation (250V AC or 354V DC continuous) prevents ground loops.

250T models:

Input isolated from output/power.

350T models:

Input isolated from output and power.
Output and power share a common.

450T models:

3-way isolation. Input, output, and power circuits are isolated from each other.

- Compact, 1-inch wide housing uses less space for easier installation in control panels.
- Low power consumption. 350T units operate on currents as low as 9mA to help prevent expensive upgrades to larger power supplies.

Performance

Ambient Temperature Range

Operating: -13 to 185°F (-25 to 85°C).
Storage: -40 to 185°F (-40 to 85°C).

Accuracy

$\pm 0.1\%$ of calibrated span or $\pm 0.01\text{mV}$, whichever is greater. Includes repeatability, hysteresis, terminal point linearity, and adjustment resolution.

Ambient Temperature Effect

Less than $\pm 0.01\%$ of output span per °F ($\pm 0.018\%$ per °C). $\pm 0.025\%$ of output span per °F ($\pm 0.045\%$ per °C) for narrow span units. (Specification includes the combined effects of zero and span over temperature).

Noise Resistance

RFI: Less than $\pm 0.5\%$ of output span effect.
EMI: Less than $\pm 0.25\%$ of output span effect.

Noise Rejection

Common Mode: 130dB at 60Hz, 100 ohm unbalance.
Normal Mode: 30dB at 60Hz, 100 ohm source.

Response Time

Output reaches 98% of output span in 300ms.

Bandwidth

-3dB at 3 Hz, typical.

Output Compliance

250T: $R_{LOAD} (\text{max.}) = (V_{SUPPLY} - 12V) / 20\text{mA}$.
350T: $R_{LOAD} (\text{max.}) = (V_{SUPPLY} - 2.5V) / 20\text{mA}$.
450T: $R_{LOAD} = 600 \text{ ohms}$.

Input Impedance

1.0M ohm at 10mV span, typical; input current, $\pm 10\text{nA}$, typical.



Ordering Information

Select one option from each column. Example: 450T-MV1-Y-1-DIN-NCR-C

To order factory calibration, append "-C" to end of model number. Specify ranges on order.

Base	Input	Mounting		Approval
250T	-MV1	-DIN	-N4	-NCR
	-MV2	-ST	-N12	-DT1
	-MV3	-SM	-XP	

Note:
All 250Ts have 4 to 20mA output and are loop-powered.

Base	Input	Output	Mounting	Approval
350T	-MV1	-Y	-DIN	-NCR
	-MV2	-V0		
	-MV3	-V5		

Note:
All 350Ts accept 10 to 36V DC power supply.

Base	Input	Output	Power	Mounting	Approval
450T	-MV1	-Y	-1	-DIN	-NCR
	-MV2	-V0	-2		
	-MV3	-V5			

Input Options

-MV1: Millivolt.

Span adjust: 5 to 55mV DC

Zero adjust: -5 to 25mV DC

-MV2: Millivolt.

Span adjust: 25 to 250mV DC

Zero adjust: -25 to 125mV DC

-MV3*: Millivolt, narrow span.

Span adjust: 3 to 5mV DC

Zero adjust: -5 to 25mV DC

Specify calibration range on order.

Output Options (350T, 450T only)

-Y: 4 to 20mA DC.

-V0: 0 to 10V DC into 10K ohms or greater

-V5: 0 to 5V DC into 5K ohms or greater

Power Options (450T only)

-1: 115V AC power

-2: 230V AC power

Mounting Options

Mountings

-DIN: DIN rail G or T mount

-ST: SNAPTRACK mount [250T only]

-SM: Surface-mount [250T only]

External housings

-N4: NEMA 4, water-tight [250T only], holds two

-N12: NEMA 12, oil-tight [250T only], holds two

-XP: Explosion-proof NEMA 4 [250T only], holds one

Approval Options

-NCR: No certification/approval required.

-DT1: CSA approval, Div. 2 hazardous locations:

Class I; Div. 2; Groups A, B, C, D [250T only].

Ordering Notes

* Unit requires factory calibration. Append "-C" to end of model number. Specify ranges on order.

† Units are shipped separately from any optional enclosures (i.e. units are not installed in any external housing).

Accessories

Power supplies

See Power Supplies on Page 199.

DIN RAIL 3.0

DIN RAIL 16.7

DIN rail strip, Type T, 3 inches (75mm) or 16.7 inches (425mm)

20RM-16-DIN

19" rack-mount kit with DIN rail. Holds sixteen 250T/350Ts or ten 450T transmitters.

350T-N4-WM

NEMA 4 water-tight enclosure, wall-mount.

Holds two 350Ts or one 450T transmitter.

350T-N12-WM

NEMA 12 oil-tight enclosure, wall-mount.

Holds two 350Ts or one 450T transmitter.



Isolated Transmitters



Frequency Input

These transmitters accept periodic or pulse wave-form signals such as those originating from tachometers, magnetic transducers, and turbine flow meters, and provide a proportional process current or voltage output signal.

Models

250T: Loop-powered transmitter series

350T: DC-powered transmitter series

450T: AC-powered transmitter series

Input Ranges

- Frequency, span ranges 0 to 25.6KHz, field-selectable, direct coupled inputs, $\pm 25\text{mV}$ to 150V RMS

Output Ranges

- DC current: 4 to 20mA
- DC voltage: 0 to 5V or 0 to 10V

Power Requirements

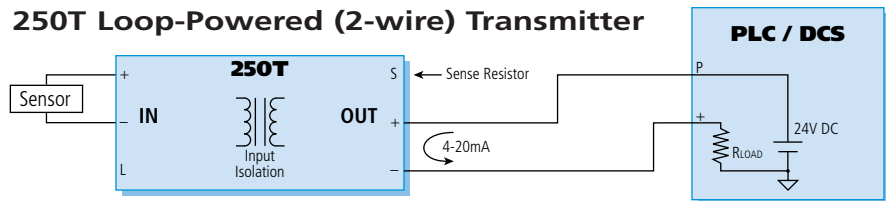
- 250T: 12 to 50V DC @ 20mA (loop-powered)
- 350T: DC voltage source (see table below)

Output range	Power
4 to 20mA	10 to 36V DC @ 30mA
0 to 5V	10 to 36V DC @ 9mA
0 to 10V	12.5 to 36V DC @ 9mA

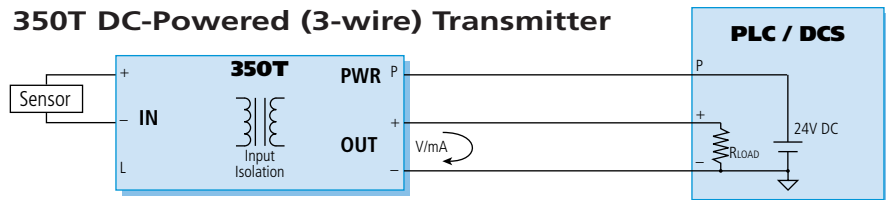
- 450T: 115V or 230V AC, $\pm 10\%$, 50 to 60Hz

Output range	Power
4 to 20mA	115V AC @ 0.050A
4 to 20mA	230V AC @ 0.025A
0 to 5V, 0 to 10V	115V AC @ 0.020A
0 to 5V, 0 to 10V	230V AC @ 0.010A

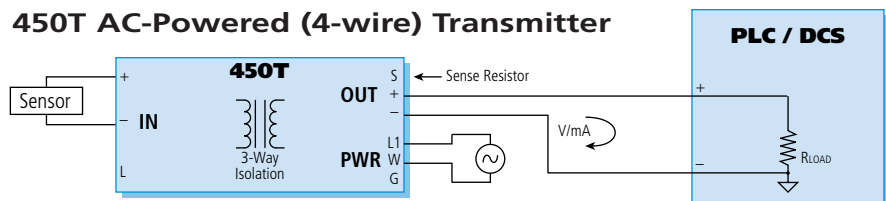
250T Loop-Powered (2-wire) Transmitter



350T DC-Powered (3-wire) Transmitter



450T AC-Powered (4-wire) Transmitter



Special Features

- Excellent accuracy and stability ensure reliable measurements in harsh industrial environments.
- RFI and EMI resistance minimize the effects of environmental noise.
- 90% span adjustment enables precise application calibration.
- Quartz crystal time-base design improves temperature performance
- Field-selectable time constants optimize output response time and ripple characteristics
- Selectable threshold circuits accept unipolar/bipolar inputs (0V bipolar, 1.5V unipolar)
- Excitation/pull-up circuit adds flexibility
- 1500V AC peak isolation (250V AC or 354V DC continuous) prevents ground loops.

250T models:

Input isolated from output/power.

350T models:

Input isolated from output and power. Output and power share a common.

450T models:

3-way isolation. Input, output, and power circuits are isolated from each other.

Performance

Ambient Temperature Range

Operating: -13 to 185°F (-25 to 85°C).

Storage: -40 to 185°F (-40 to 85°C).

Accuracy

$\pm 0.1\%$ of calibrated span. Includes repeatability, hysteresis, terminal point linearity, and adjustment resolution.

Ambient Temperature Effect

Less than $\pm 0.01\%$ of output span per $^{\circ}\text{F}$ ($\pm 0.018\%$ per $^{\circ}\text{C}$). (Specification includes the combined effects of zero and span over temperature).

Noise Resistance

RFI: Less than $\pm 0.5\%$ of output span effect.

EMI: Less than $\pm 0.25\%$ of output span effect.

Noise Rejection

Common Mode: 115dB at 60Hz, 100 ohm unbalance.

Normal Mode: Not applicable.

Response Time

Time for output to reach 98% of output span depends on jumper-selectable frequency range.

Range 1: 8.0 sec response time (98%).

Range 2: 5.0 sec response time (98%).

Range 3: 0.4 sec response time (98%).

Bandwidth

-3dB at 25,600Hz, typical.

Output Compliance

250T: $R_{LOAD}(\text{max.}) = (V_{SUPPLY} - 12V) / 20\text{mA}$.

350T: $R_{LOAD}(\text{max.}) = (V_{SUPPLY} - 2.5V) / 20\text{mA}$.

450T: $R_{LOAD} = 600$ ohms.



Ordering Information

Select one option from each column. Example: 450T-V4-V0-2-DIN-NCR-C

To order factory calibration, append "-C" to end of model number. Specify ranges on order.

Base	Input	Mounting		Approval
250T	-FQ1	-DIN	-N4	-NCR
		-ST	-N12	-DT1
		-SM	-XP	

Note:
All 250Ts have 4 to 20mA output and are loop-powered.

Base	Input	Output	Mounting	Approval
350T	-FQ1	-Y	-DIN	-NCR
		-V0		
		-V5		

Note:
All 350Ts accept 10 to 36V DC power supply.

Base	Input	Output	Power	Mounting	Approval
450T	-FQ1	-Y	-1	-DIN	-NCR
		-V0	-2		
		-V5			

Input Options

-FQ1: Frequency, range 0 to 25.6KHz

Span adjust: 50 to 100% of range selected below.

Zero adjust: 0 to 20% of span.

Jumper-selectable ranges:

Range A: 25 to 50 Hz span.

Range B: 50 to 100 Hz span.

Range C: 100 to 200 Hz span.

Range D: 200 to 400 Hz span.

Range E: 400 to 800 Hz span.

Range F: 800 to 1,600 Hz span.

Range G: 1,600 to 3,200 Hz span.

Range H: 3,200 to 6,400 Hz span.

Range I: 6,400 to 12,800 Hz span.

Range J: 12,800 to 25,600 Hz span.

Input Circuit Open Response

Down-scale drive standard.

Bipolar Input Configuration

Threshold: 0.0V DC.

Input Amplitude: ± 25 mV to 150V RMS.

Hysteresis: Fixed: ± 25 mV, nominal. Switching points are -25mV and +25mV (nominal), or 0.0V ± 0.025 V.

Unipolar Input Configuration

Threshold: 1.5V DC. Attenuator resistors may be installed to further reduce sensitivity, consult factory.

Hysteresis: Fixed: ± 25 mV, nominal. Switching points are +1.525V and +1.475V (nominal), or +1.5V ± 0.025 V.

Input Amplitude: 0 to 2V to 150V RMS.

Unipolar Excitation Supply: For contact closure or open collector transistor switching circuits. Nominal excitation/pull-up is 5V DC through 15K ohms (0.333mA, nominal).

Minimum Pulse Width

The minimum pulse width required is 10 μ S.

Output Options (350T, 450T only)

-Y: 4 to 20mA DC.

-V0: 0 to 10V DC into 10K ohms or greater

-V5: 0 to 5V DC into 5K ohms or greater

Power Options (450T only)

-1: 115V AC power

-2: 230V AC power

Mounting Options

Mountings

-DIN: DIN rail G or T mount

-ST: SNAPTRACK mount [250T only]

-SM: Surface-mount [250T only]

External housings

-N4: NEMA 4, water-tight [250T only], holds two

-N12: NEMA 12, oil-tight [250T only], holds two

-XP: Explosion-proof NEMA 4 [250T only], holds one

Approval Options

CE marked [250T only].

-NCR: No certification/approval required.

-DT1[†]: CSA approval, Div. 2 hazardous locations: Class I; Div. 2; Groups A, B, C, D [250T only].

Ordering Notes

* Unit requires factory calibration. Append "-C" to end of model number. Specify ranges on order.

† Units are shipped separately from any optional enclosures (i.e. units are not installed in any external housing).

Accessories

Power supplies

See Power Supplies on Page 199.

DIN RAIL 3.0

DIN RAIL 16.7

DIN rail strip, Type T, 3 inches (75mm) or 16.7 inches (425mm)

20RM-16-DIN

19" rack-mount kit with DIN rail. Holds sixteen 250T/350Ts or ten 450T transmitters.

350T-N4-WM

NEMA 4 water-tight enclosure, wall-mount. Holds two 350Ts or one 450T transmitter.

350T-N12-WM

NEMA 12 oil-tight enclosure, wall-mount. Holds two 350Ts or one 450T transmitter.



Isolated Transmitters



Potentiometer/Slidewire Input

These models convert sensor inputs to proportional process current or voltage output signals.

Models

250T: Loop-powered transmitter series

350T: DC-powered transmitter series

450T: AC-powered transmitter series

Input Ranges

- Resistance, 100 to 10,000 ohm three-wire pot/slidewire

Output Ranges

- DC current: 4 to 20mA
- DC voltage: 0 to 5V or 0 to 10V

Power Requirements

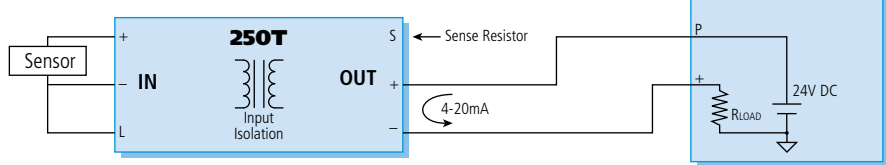
- 250T: 12 to 50V DC @ 20mA (loop-powered)
- 350T: DC voltage source (see table below)

Output range	Power
4 to 20mA	10 to 36V DC @ 30mA
0 to 5V	10 to 36V DC @ 9mA
0 to 10V	12.5 to 36V DC @ 9mA

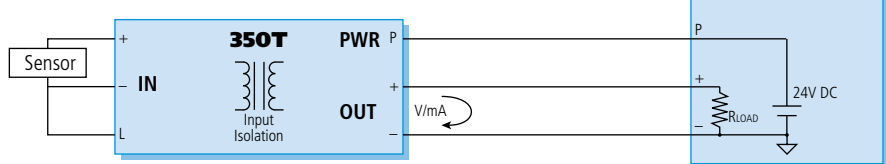
- 450T: 115V or 230V AC, $\pm 10\%$, 50 to 60Hz

Output range	Power
4 to 20mA	115V AC @ 0.050A
4 to 20mA	230V AC @ 0.025A
0 to 5V, 0 to 10V	115V AC @ 0.020A
0 to 5V, 0 to 10V	230V AC @ 0.010A

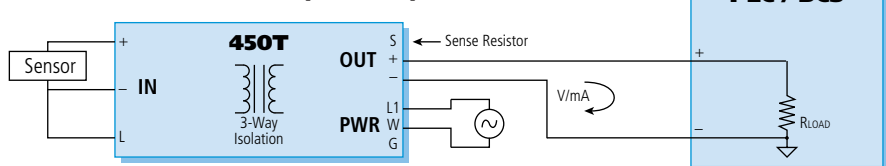
250T Loop-Powered (2-wire) Transmitter



350T DC-Powered (3-wire) Transmitter



450T AC-Powered (4-wire) Transmitter



Special Features

- Excellent accuracy and stability ensure reliable measurements in harsh industrial environments.
- RFI and EMI resistance minimize the effects of environmental noise.
- 75% span adjustment enables precise application calibration.
- Compact, 1-inch wide housing uses less space for easier installation in control panels.
- Low power consumption. 350T units operate on currents as low as 9mA to help prevent expensive upgrades to larger power supplies.
- 1500V AC peak isolation (250V AC or 354V DC continuous) prevents ground loops.

250T models:

Input isolated from output/power.

350T models:

Input isolated from output and power. Output and power share a common.

450T models:

3-way isolation. Input, output, and power circuits are isolated from each other.

Performance

Ambient Temperature Range

Operating: -13 to 185°F (-25 to 85°C).
Storage: -40 to 185°F (-40 to 85°C).

Accuracy

$\pm 0.1\%$ of calibrated span. Includes repeatability, hysteresis, terminal point linearity, and adjustment resolution.

Ambient Temperature Effect

Less than $\pm 0.01\%$ of output span per °F ($\pm 0.018\%$ per °C). (Specification includes the combined effects of zero and span over temperature).

Noise Resistance

RFI: Less than $\pm 0.5\%$ of output span effect.
EMI: Less than $\pm 0.25\%$ of output span effect.

Noise Rejection

Common Mode: 120dB at 60Hz, 100 ohm unbalance.
Normal Mode: 26dB at 60Hz, 100 ohm source.

Response Time

Output reaches 98% of output span in 300mS.

Bandwidth

-3dB at 3 Hz, typical.

Output Compliance

250T: $R_{LOAD} (max.) = (V_{SUPPLY} - 12V) / 20mA$.
350T: $R_{LOAD} (max.) = (V_{SUPPLY} - 2.5V) / 20mA$.
450T: $R_{LOAD} = 600 \text{ ohms}$.



Ordering Information

Select one option from each column. Example: 450T-P-V0-2-DIN-NCR

NOTE: Factory calibration is not available. Zero and full scale values vary for each application.

Base	Input	Mounting		Approval
250T	-P	-DIN	-N4	-NCR
		-ST	-N12	
		-SM	-XP	

Note:
All 250Ts have 4 to 20mA output and are loop-powered.

Base	Input	Output	Mounting	Approval
350T	-P	-Y	-DIN	-NCR
		-V0		
		-V5		

Note:
All 350Ts accept 10 to 36V DC power supply.

Base	Input	Output	Power	Mounting	Approval
450T	-P	-Y	-1	-DIN	-NCR
		-V0	-2		
		-V5			

Accessories

Power supplies

See Power Supplies on Page 199.

DIN RAIL 3.0

DIN RAIL 16.7

DIN rail strip, Type T, 3 inches (75mm) or 16.7 inches (425mm)

20RM-16-DIN

19" rack-mount kit with DIN rail. Holds sixteen 250T/350Ts or ten 450T transmitters.

350T-N4-WM

NEMA 4 water-tight enclosure, wall-mount. Holds two 350Ts or one 450T transmitter.

350T-N12-WM

NEMA 12 oil-tight enclosure, wall-mount. Holds two 350Ts or one 450T transmitter.

Input Options

-P: Potentiometer/Slidewire Input

100 to 10,000 ohms

Span adjust: 25 to 100% of slidewire resistance

Zero adjust: 0 to 75% of slidewire resistance

Excitation: 0.2V DC (current limited to 3.0mA).

Output Options (350T, 450T only)

-Y: 4 to 20mA DC.

-V0: 0 to 10V DC into 10K ohms or greater

-V5: 0 to 5V DC into 5K ohms or greater

Power Options (450T only)

-1: 115V AC power

-2: 230V AC power

Mounting Options

Mountings

-DIN: DIN rail G or T mount

-ST: SNAPTRACK mount [250T only]

-SM: Surface-mount [250T only]

External housings

-N4: NEMA 4, water-tight [250T only], holds two

-N12: NEMA 12, oil-tight [250T only], holds two

-XP: Explosion-proof NEMA 4 [250T only], holds one

Approval Options

-NCR: No certification/approval required.



Isolated Transmitters



RTD Input

These models convert sensor inputs to proportional process current or voltage output signals.

Models

250T: Loop-powered transmitter series

350T: DC-powered transmitter series

450T: AC-powered transmitter series

Input Ranges

- 100 ohm Pt RTD (2, 3, or 4-wire), Pt-385/392
- 10 ohm Cu RTD (2, 3, or 4-wire)

Output Ranges

- DC current: 4 to 20mA
- DC voltage: 0 to 5V or 0 to 10V

Power Requirements

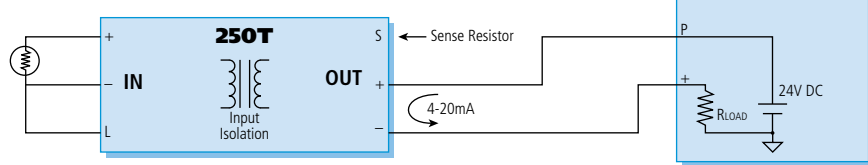
- 250T: 12 to 50V DC @ 20mA (loop-powered)
- 350T: DC voltage source (see table below)

Output range	Power
4 to 20mA	10 to 36V DC @ 30mA
0 to 5V	10 to 36V DC @ 9mA
0 to 10V	12.5 to 36V DC @ 9mA

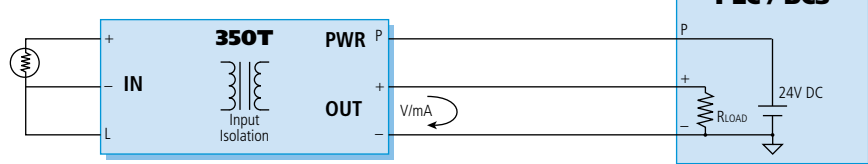
- 450T: 115V or 230V AC, $\pm 10\%$, 50 to 60Hz

Output range	Power
4 to 20mA	115V AC @ 0.050A
4 to 20mA	230V AC @ 0.025A
0 to 5V, 0 to 10V	115V AC @ 0.020A
0 to 5V, 0 to 10V	230V AC @ 0.010A

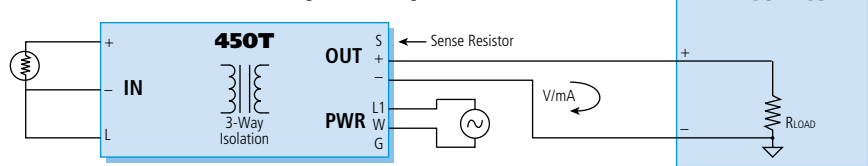
250T Loop-Powered (2-wire) Transmitter



350T DC-Powered (3-wire) Transmitter



450T AC-Powered (4-wire) Transmitter



Special Features

- Excellent accuracy and stability ensure reliable measurements in harsh industrial environments.
- RTD signal linearization improves accuracy and reduces drift.
- RTD break detection indicates open RTD failures with upscale operation.
- RTD lead wire compensation eliminates the effect of the wire's resistance.
- RFI and EMI resistance minimize the effects of environmental noise.
- 75% span adjustment enables precise application calibration.
- Low power consumption (350T as low as 9mA).
- 1500V AC peak isolation (250V AC or 354V DC continuous) prevents ground loops.

250T models:

Input isolated from output/power.

350T models:

Input isolated from output and power.
Output and power share a common.

450T models:

3-way isolation. Input, output, and power circuits are isolated from each other.

Performance

Ambient Temperature Range

Operating: -13 to 185°F (-25 to 85°C).

Storage: -40 to 185°F (-40 to 85°C).

Accuracy

$\pm 0.1\%$ of calibrated span or ± 0.25 mV, whichever is greater. Includes repeatability, hysteresis, terminal point linearity, and adjustment resolution.

Ambient Temperature Effect

-RBPx: $\pm 0.01\%$ of output span per °F ($\pm 0.018\%$ / °C).

-RBCx: $\pm 0.025\%$ of output span per °F ($\pm 0.045\%$ / °C).

(Specification includes the combined effects of zero and span over temperature).

Noise Resistance

RFI: Less than $\pm 0.5\%$ of output span effect.

EMI: Less than $\pm 0.25\%$ of output span effect.

Noise Rejection

Common Mode: 120dB at 60Hz, 100 ohm unbalance.

Normal Mode: 26dB at 60Hz, 100 ohm source, 20dB at 60Hz, 10 ohm source.

Response Time

Output reaches 98% of output span in 350ms.

Bandwidth

-3dB at 3 Hz, typical.

Output Compliance

250T: $R_{LOAD} (max.) = (V_{SUPPLY} - 12V) / 20mA$.

350T: $R_{LOAD} (max.) = (V_{SUPPLY} - 2.5V) / 20mA$.

450T: $R_{LOAD} = 600$ ohms.



Ordering Information

Select one option from each column. Example: 450T-RBP2-V0-2-DIN-NCR-C
To order factory calibration, append "-C" to end of model number. Specify ranges on order.

Base	Input	Mounting	Approval
250T	-RBP1 -RBC1	-DIN -N4	-NCR
	-RBP2 -RBC2	-ST -N12	-DT1
	-RBP3	-SM -XP	

Note:
All 250Ts have 4 to 20mA output and are loop-powered.

Base	Input	Output	Mounting	Approval
350T	-RBP1 -RBC1	-Y	-DIN	-NCR
	-RBP2 -RBC2	-V0		
	-RBP3	-V5		

Note:
All 350Ts accept 10 to 36V DC power supply.

Base	Input	Output	Power	Mounting	Approval
450T	-RBP1 -RBC1	-Y	-1	-DIN	-NCR
	-RBP2 -RBC2	-V0	-2		
	-RBP3	-V5			

Input Options

Platinum RTD input

- RBP1: Platinum RTD, 100 ohm
Span adjust: 25 to 100°C (45 to 180°F)
Zero adjust: -150 to 150°C (-238 to 302°F),
Accuracy: $\pm 0.1\%$
- RBP2: Platinum RTD, 100 ohm
Span adjust: 50 to 200°C (90 to 360°F)
Zero adjust: -150 to 150°C (-238 to 302°F),
Accuracy: $\pm 0.1\%$
- RBP3: Platinum RTD, 100 ohm
Span adjust: 200 to 800°C (360 to 1440°F)
Zero adjust: -150 to 150°C (-238 to 302°F),
Accuracy: $\pm 0.3\%$

Copper RTD input

- RBC1: 10 ohm Copper RTD
Span: 50 to 100°C (90 to 180°F)
Zero: -50 to 50°C (-58 to 122°F)
Accuracy: $\pm 0.25\%$
- RBC2: 10 ohm Copper RTD
Span: 100 to 200°C (180 to 360°F)
Zero: -50 to 50°C (-58 to 122°F)
Accuracy: $\pm 0.25\%$

Maximum Excitation Current

- Platinum RTD: 1.0mA (0.5mA for -RBP3)
- Copper RTD: 1.5mA.

Lead Wire Compensation

- A. 100 ohm, Pt RTD: Zero shift is less than 0.01%/ohm of lead resistance, for up to 10 ohms/leg, with a total maximum shift of 0.1%.
- B. 10 ohm Cu RTD: Zero shift is less than 0.05%/ohm of lead resistance, for up to 10 ohms/leg, with a total maximum shift of 0.5%.

Output Options (350T, 450T only)

- Y: 4 to 20mA DC.
- V0: 0 to 10V DC into 10K ohms or greater
- V5: 0 to 5V DC into 5K ohms or greater

Power Options (450T only)

- 1: 115V AC power
- 2: 230V AC power

Mounting Options

Mountings

- DIN: DIN rail G or T mount
- ST: SNAPTRACK mount [250T only]
- SM: Surface-mount [250T only]

External housings

- N4: NEMA 4, water-tight [250T only], holds two
- N12: NEMA 12, oil-tight [250T only], holds two
- XP: Explosion-proof NEMA 4 [250T only], holds one

Approval Options

- NCR: No certification/approval required.
- DT1†: CSA approval, Div. 2 hazardous locations:
Class I; Div. 2; Groups A, B, C, D [250T only].

Ordering Notes

† Units are shipped separately from any optional enclosures (i.e. units are not installed in any external housing).

Accessories

Power supplies

See Power Supplies on Page 199.

DIN RAIL 3.0

DIN RAIL 16.7

DIN rail strip, Type T, 3 inches (75mm) or 16.7 inches (425mm)

20RM-16-DIN

19" rack-mount kit with DIN rail. Holds sixteen 250T/350Ts or ten 450T transmitters.

350T-N4-WM

NEMA 4 water-tight enclosure, wall-mount. Holds two 350Ts or one 450T transmitter.

350T-N12-WM

NEMA 12 oil-tight enclosure, wall-mount. Holds two 350Ts or one 450T transmitter.



Isolated Transmitters



Thermocouple Input

These models convert sensor inputs to proportional process current or voltage output signals.

Models

250T: Loop-powered transmitter series

350T: DC-powered transmitter series

450T: AC-powered transmitter series

Input Ranges

- Thermocouple types J, K, T, R, S, E, B
- Linearized thermocouple (custom ranges)

Output Ranges

- DC current: 4 to 20mA
- DC voltage: 0 to 5V or 0 to 10V

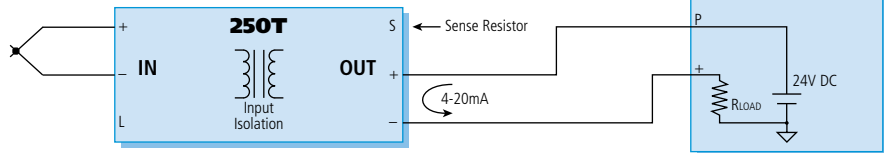
Power Requirements

- 250T: 12 to 50V DC @ 20mA (loop-powered)
- 350T: DC voltage source (see table below)
- 450T: 115V or 230V AC, $\pm 10\%$, 50 to 60Hz

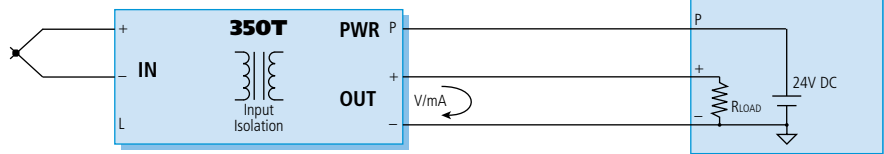
Output range	Power
4 to 20mA	10 to 36V DC @ 30mA
0 to 5V	10 to 36V DC @ 9mA
0 to 10V	12.5 to 36V DC @ 9mA

Output range	Power
4 to 20mA	115V AC @ 0.050A
4 to 20mA	230V AC @ 0.025A
0 to 5V, 0 to 10V	115V AC @ 0.020A
0 to 5V, 0 to 10V	230V AC @ 0.010A

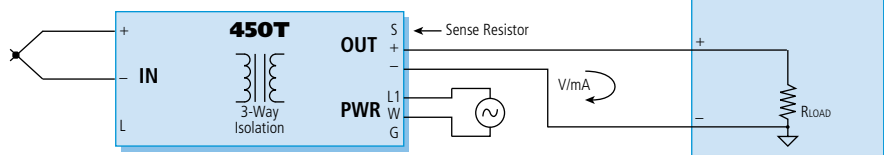
250T Loop-Powered (2-wire) Transmitter



350T DC-Powered (3-wire) Transmitter



450T AC-Powered (4-wire) Transmitter



Special Features

- Excellent accuracy and stability ensure reliable measurements in harsh industrial environments.
- Field-selectable input types reduce stocking requirements.
- Thermocouple reference junction compensation reduces drift and corrects nonlinearity.
- TC linearizer (5-slope) improves accuracy.
- TC break detection indicates open circuit failures with selectable up/downscale operation.
- RFI and EMI resistance minimize the effects of environmental noise.
- 75% span adjustment enables precise application calibration.
- 1500V AC peak isolation (250V AC or 354V DC continuous) prevents ground loops.

250T models:

Input isolated from output/power.

350T models:

Input isolated from output and power.
Output and power share a common.

450T models:

3-way isolation. Input, output, and power circuits are isolated from each other.

Performance

Ambient Temperature Range

Operating: -13 to 185°F (-25 to 85°C).
Storage: -40 to 185°F (-40 to 85°C).

Accuracy

$\pm 0.1\%$ of calibrated span or $\pm 0.01\text{mV}$, whichever is greater. Includes repeatability, hysteresis, terminal point linearity, and adjustment resolution.

Ambient Temperature Effect

Less than $\pm 0.01\%$ of output span per °F ($\pm 0.018\%$ per °C). $\pm 0.025\%$ of output span per °F ($\pm 0.045\%$ per °C) for narrow span units. (Specification includes the combined effects of zero and span over temperature).

Noise Resistance

RFI: Less than $\pm 0.5\%$ of output span effect.
EMI: Less than $\pm 0.25\%$ of output span effect.

Noise Rejection

Common Mode: 130dB at 60Hz, 100 ohm unbalance.
Normal Mode: 30dB at 60Hz, 100 ohm source.

Response Time

Output reaches 98% of output span in 300ms.

Bandwidth

-3dB at 3 Hz, typical.

Output Compliance

250T: $R_{LOAD} (\text{max.}) = (V_{SUPPLY} - 12V) / 20\text{mA}$.
350T: $R_{LOAD} (\text{max.}) = (V_{SUPPLY} - 2.5V) / 20\text{mA}$.
450T: $R_{LOAD} = 600 \text{ ohms}$.

Linearization (-xLxx) Option

5-segment TC linearizer provides minimum 10 to 1 improvement $\pm 0.1\%$ in the linearity curve.



Ordering Information

Select one option from each column. Example: 450T-TC3-Y-1-DIN-NCR-C
To order factory calibration, append "-C" to end of model number. Specify ranges on order.

Base	Input	Mounting	Approval
250T	-TC 1 -RL00*	-DIN -N4	-NCR
	-TC3* -SL00*	-ST -N12	-DT1
	-JL00* -EL00*	-SM -XP	
	-KL00* -BL00*		
	-TL00*		

Note:
All 250Ts have 4 to 20mA output and are loop-powered.

Base	Input	Output	Mounting	Approval
350T	-TC 1 -RL00*	-Y	-DIN	-NCR
	-TC3* -SL00*	-V0		
	-JL00* -EL00*	-V5		
	-KL00* -BL00*			
	-TL00*			

Note:
All 350Ts accept 10 to 36V DC power supply.

Base	Input	Output	Power	Mounting	Approval
450T	-TC 1 -RL00*	-Y	-1	-DIN	-NCR
	-TC3* -SL00*	-V0	-2		
	-JL00* -EL00*	-V5			
	-KL00* -BL00*				
	-TL00*				

Input Options

Nonlinearized Input Options (output linear to millivolts)

-TC 1: Thermocouple;
Field-selectable for J,K,T,R,S,E,B

Type J:

Span: 100 to 760°C (180 to 1368°F)
Zero: -100 to 450°C (-148 to 842°F)

Type K:

Span: 100 to 1200°C (180 to 2160°F)
Zero: -100 to 600°C (-148 to 1112°F)

Type T:

Span: 150 to 400°C (270 to 720°F)
Zero: -150 to 300°C (-238 to 572°F)

Type E:

Span: 100 to 700°C (180 to 1260°F)
Zero: -100 to 350°C (-148 to 662°F)

Type R:

Span: 550 to 1750°C (990 to 3150°F)
Zero: 0 to 1200°C (32 to 2192°F)

Type S:

Span: 550 to 1750°C (990 to 3150°F)
Zero: 0 to 1200°C (32 to 2192°F)

Type B:

Span: 1000 to 1820°C (1800 to 3276°F)
Zero: 0 to 1000°C (32 to 2192°F)

-TC3*: Narrow span TC, Field selectable J,K,T,R,S,E,B;
(spans from 3 to 5mV); . Specify ranges on order.

Linearized Input Options

(output linear to temperature for spans over 5mV
consult factory for spans under 5mV)

-JL00*: Linearized TC for Type J
Specify ranges on order.

-KL00*: Linearized TC for Type K
Specify ranges on order.

-TL00*: Linearized TC for Type T
Specify ranges on order.

-RL00*: Linearized TC for Type R
Specify ranges on order.

-SL00*: Linearized TC for Type S
Specify ranges on order.

-EL00*: Linearized TC for Type E
Specify ranges on order.

-BL00*: Linearized TC for Type B
Specify ranges on order.

Input Impedance

Without TC Break Detection: 1.0M ohm at 10mV span, typical; input current, ± 10 nA, typical.

With TC Break Detection: 400K ohm at 10mV span; input current, ± 25 nA, typical (± 30 nA, max.).

Output Options (350T, 450T only)

-Y: 4 to 20mA DC.

-V0: 0 to 10V DC into 10K ohms or greater

-V5: 0 to 5V DC into 5K ohms or greater

Power Options (450T only)

-1: 115V AC power

-2: 230V AC power

Mounting Options

Mountings

-DIN: DIN rail G or T mount

-ST: SNAPTRACK mount [250T only]

-SM: Surface-mount [250T only]

External housings

-N4: NEMA 4, water-tight [250T only], holds two

-N12: NEMA 12, oil-tight [250T only], holds two

-XP: Explosion-proof NEMA 4 [250T only], holds one

Approval Options

-NCR: No certification/approval required.

-DT1: CSA approval, Div. 2 hazardous locations:
Class I; Div. 2; Groups A, B, C, D [250T only].

Ordering Notes

* Unit requires factory calibration. Append "-C" to end of model number. Specify ranges on order.

† Units are shipped separately from any optional enclosures (i.e. units are not installed in any external housing).

Accessories

Power supplies

See Power Supplies on Page 199.

DIN RAIL 3.0

DIN RAIL 16.7

DIN rail strip, Type T, 3 inches (75mm) or 16.7 inches (425mm)

20RM-16-DIN

19" rack-mount kit with DIN rail. Holds sixteen 250T/350Ts or ten 450T transmitters.

350T-N4-WM

NEMA 4 water-tight enclosure, wall-mount. Holds two 350Ts or one 450T transmitter.

350T-N12-WM

NEMA 12 oil-tight enclosure, wall-mount. Holds two 350Ts or one 450T transmitter.



Isolated Transmitters



DC Voltage and DC Current Input

These models convert sensor inputs to proportional process current or voltage output signals.

Models

250T: Loop-powered transmitter series

350T: DC-powered transmitter series

450T: AC-powered transmitter series

Input Ranges

- DC voltage, $\pm 100\text{mV}$ to $\pm 100.0\text{V DC}$
- DC current, 0 to 20mA (10 ohm input load)

Output Ranges

- DC current: 4 to 20mA
- DC voltage: 0 to 5V or 0 to 10V

Power Requirements

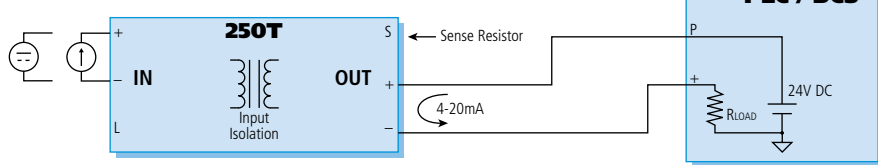
- 250T: 12 to 50V DC @ 20mA (loop-powered)
- 350T: DC voltage source (see table below)

Output range	Power
4 to 20mA	10 to 36V DC @ 30mA
0 to 5V	10 to 36V DC @ 9mA
0 to 10V	12.5 to 36V DC @ 9mA

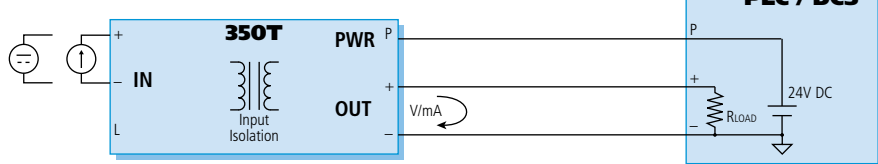
- 450T: 115V or 230V AC, $\pm 10\%$, 50 to 60Hz

Output range	Power
4 to 20mA	115V AC @ 0.050A
4 to 20mA	230V AC @ 0.025A
0 to 5V, 0 to 10V	115V AC @ 0.020A
0 to 5V, 0 to 10V	230V AC @ 0.010A

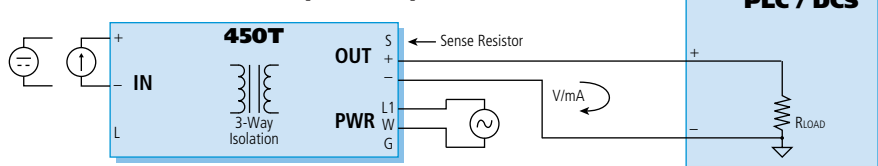
250T Loop-Powered (2-wire) Transmitter



350T DC-Powered (3-wire) Transmitter



450T AC-Powered (4-wire) Transmitter



Special Features

- Excellent accuracy and stability ensure reliable measurements in harsh industrial environments.
- RFI and EMI resistance minimize the effects of environmental noise.
- 90% span adjustment enables precise application calibration.
- Compact, 1-inch wide housing uses less space for easier installation in control panels.
- Low power consumption. 350T units operate on currents as low as 9mA to help prevent expensive upgrades to larger power supplies.
- 1500V AC peak isolation (250V AC or 354V DC continuous) prevents ground loops.

250T models:

Input isolated from output/power.

350T models:

Input isolated from output and power. Output and power share a common.

450T models:

3-way isolation. Input, output, and power circuits are isolated from each other.

Performance

Ambient Temperature Range

Operating: -13 to 185°F (-25 to 85°C).
Storage: -40 to 185°F (-40 to 85°C).

Accuracy

$\pm 0.1\%$ of calibrated span or ± 0.25 mV, whichever is greater. Includes repeatability, hysteresis, terminal point linearity, and adjustment resolution.

Ambient Temperature Effect

Less than $\pm 0.01\%$ of output span per $^{\circ}\text{F}$ ($\pm 0.018\%$ per $^{\circ}\text{C}$). (Specification includes the combined effects of zero and span over temperature).

Noise Resistance

RFI: Less than $\pm 0.5\%$ of output span effect.
EMI: Less than $\pm 0.25\%$ of output span effect.

Noise Rejection

Common Mode: 120dB at 60Hz, 100 ohm unbalance.
Normal Mode: 30dB at 60Hz, 100 ohm source.

Response Time

Output reaches 98% of output span in 300mS.

Bandwidth

-3dB at 3 Hz, typical.

Output Compliance

250T: $R_{LOAD}(\text{max.}) = (V_{SUPPLY} - 12\text{V}) / 20\text{mA}$.
350T: $R_{LOAD}(\text{max.}) = (V_{SUPPLY} - 2.5\text{V}) / 20\text{mA}$.
450T: $R_{LOAD} = 600$ ohms.



Ordering Information

Select one option from each column. Example: 450T-V4-V0-2-DIN-NCR-C
To order factory calibration, append "-C" to end of model number. Specify ranges on order.

Base	Input		Mounting		Approval
250T	-C1	-V4	-DIN	-N4	-NCR
	-V1	-V5	-ST	-N12	-DT1
	-V2	-V6	-SM	-XP	
	-V3				

Note:
All 250Ts have 4 to 20mA output and are loop-powered.

Base	Input		Output	Mounting	Approval
350T	-C1	-V4	-Y	-DIN	-NCR
	-V1	-V5	-V0		
	-V2	-V6	-V5		
	-V3				

Note:
All 350Ts accept 10 to 36V DC power supply.

Base	Input		Output	Power	Mounting	Approval
450T	-C1	-V4	-Y	-1	-DIN	-NCR
	-V1	-V5	-V0	-2		
	-V2	-V6	-V5			
	-V3					

Input Options

- C1: Current range 0 to 20mA
Span adjust: 4.0 to 20.0mA DC
Zero adjust: 0.0 to 16.0mA DC
Input impedance: 10 ohms.
- V1: Voltage range 0 to 1V DC
Span adjust: 0.1 to 1.0V DC
Zero adjust: 0 to 25% of input span
Input impedance: 40M ohms at 0.4V span.
- V2: Voltage range 0 to 10V DC
Span adjust: 1.0 to 10.0V DC
Zero adjust: 0 to 25% of input span
Input impedance: 100K ohms.
- V3: Voltage range 0 to 100V DC
Span adjust: 10.0 to 100.0V DC
Zero adjust: 0 to 25% of input span
Input impedance: 500K ohms.
- V4: Voltage range ± 1 V DC
Span adjust: ± 0.1 to ± 1.0 V DC
Zero adjust: symmetrical around 0V
Input impedance: 80M ohms at 0.8V span.
- V5: Voltage range ± 10 V DC
Span adjust: ± 1.0 to ± 10.0 V DC
Zero adjust: symmetrical around 0V
Input impedance: 100K ohms.
- V6: Voltage range ± 100 V DC
Span adjust: ± 10.0 to ± 100.0 V DC
Zero adjust: symmetrical around 0V
Input impedance: 500K ohms.

Output Options (350T, 450T only)

- Y: 4 to 20mA DC.
- V0: 0 to 10V DC into 10K ohms or greater
- V5: 0 to 5V DC into 5K ohms or greater

Power Options (450T only)

- 1: 115V AC power
- 2: 230V AC power

Mounting Options

Mountings

- DIN: DIN rail G or T mount
- ST: SNAPTRACK mount [250T only]
- SM: Surface-mount [250T only]

External housings

- N4: NEMA 4, water-tight [250T only], holds two
- N12: NEMA 12, oil-tight [250T only], holds two
- XP: Explosion-proof NEMA 4 [250T only], holds one

Approval Options

- NCR: No certification/approval required.

- DT1†: CSA approval, Div. 2 hazardous locations:
Class I; Div. 2; Groups A, B, C, D [250T only].

Ordering Notes

- * Unit requires factory calibration. Append "-C" to end of model number. Specify ranges on order.
- † Units are shipped separately from any optional enclosures (i.e. units are not installed in any external housing).

Accessories

Power supplies

See Power Supplies on Page 199.

DIN RAIL 3.0

DIN RAIL 16.7

DIN rail strip, Type T, 3 inches (75mm) or 16.7 inches (425mm)

20RM-16-DIN

19" rack-mount kit with DIN rail. Holds sixteen 250T/350Ts or ten 450T transmitters.

350T-N4-WM

NEMA 4 water-tight enclosure, wall-mount. Holds two 350Ts or one 450T transmitter.

350T-N12-WM

NEMA 12 oil-tight enclosure, wall-mount. Holds two 350Ts or one 450T transmitter.



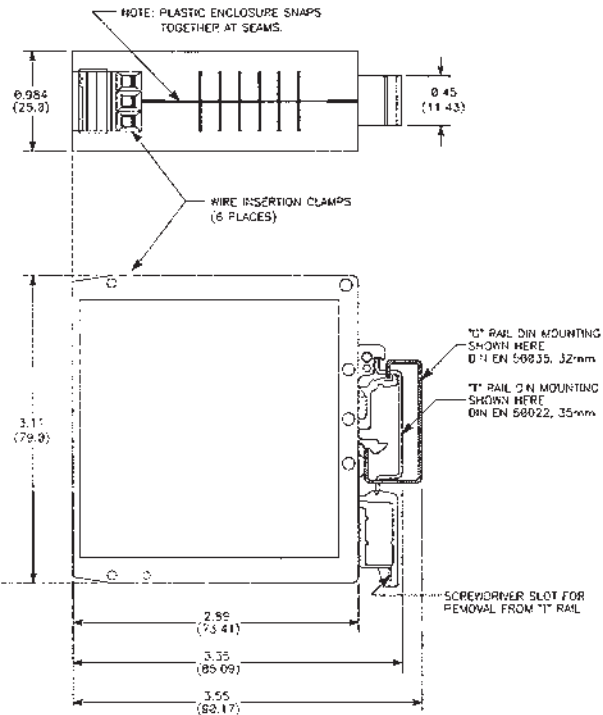
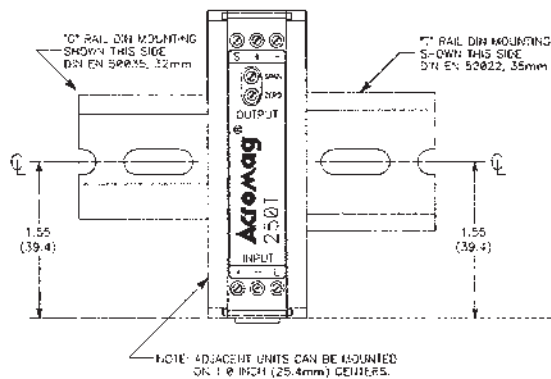
Dimensions

Transmitters: 250T, 350T

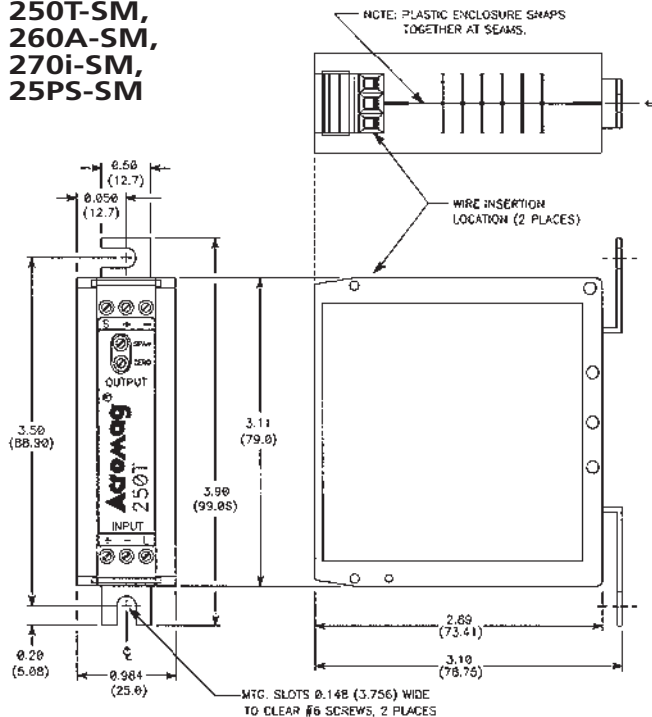
Isolators: 270i, 340i,

Limit Alarms: 260A

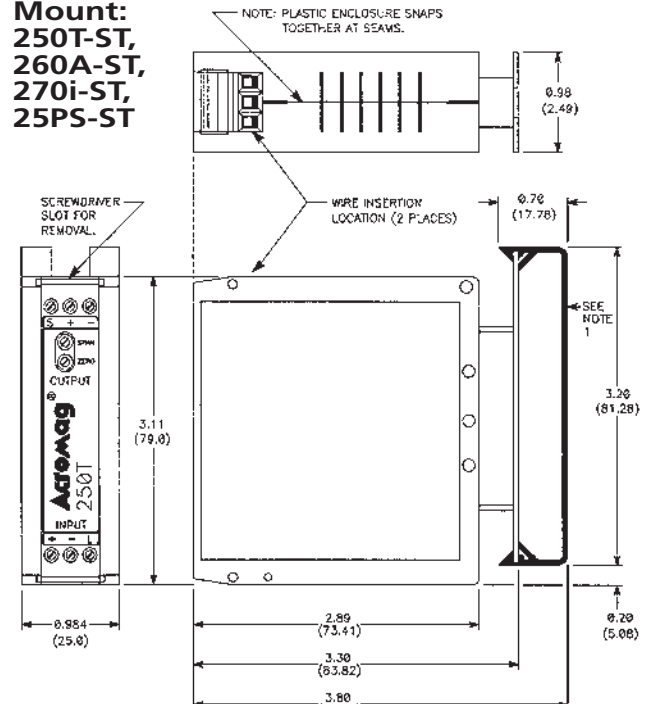
Power Supplies: 25PS, 35PS-2U



Surface Mount:
250T-SM,
260A-SM,
270i-SM,
25PS-SM



Snaptrack Mount:
250T-ST,
260A-ST,
270i-ST,
25PS-ST



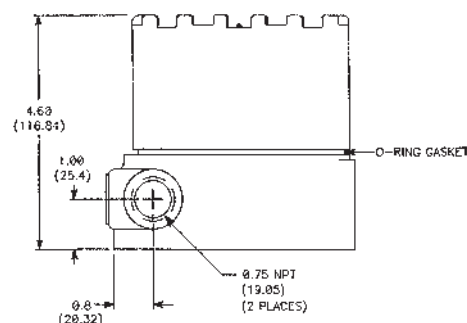
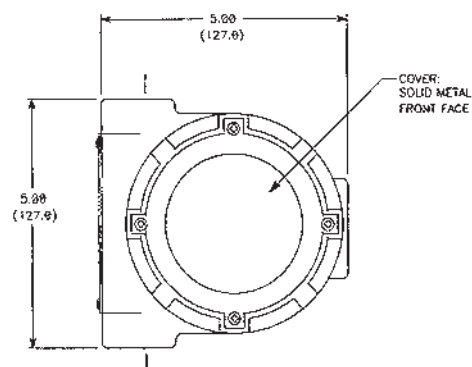
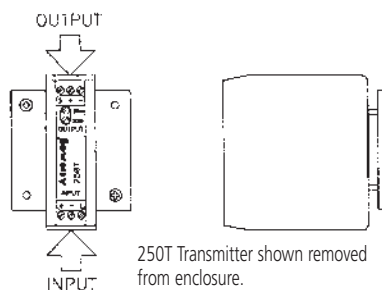
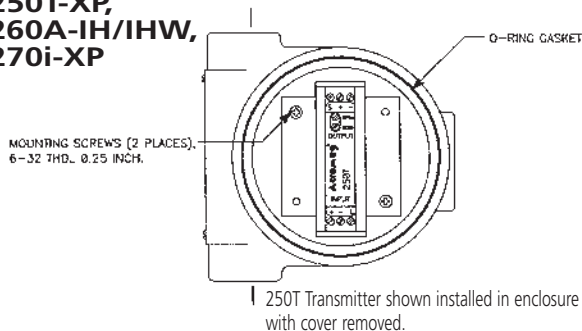
Dimensions are in inches (millimeters).



Dimensions

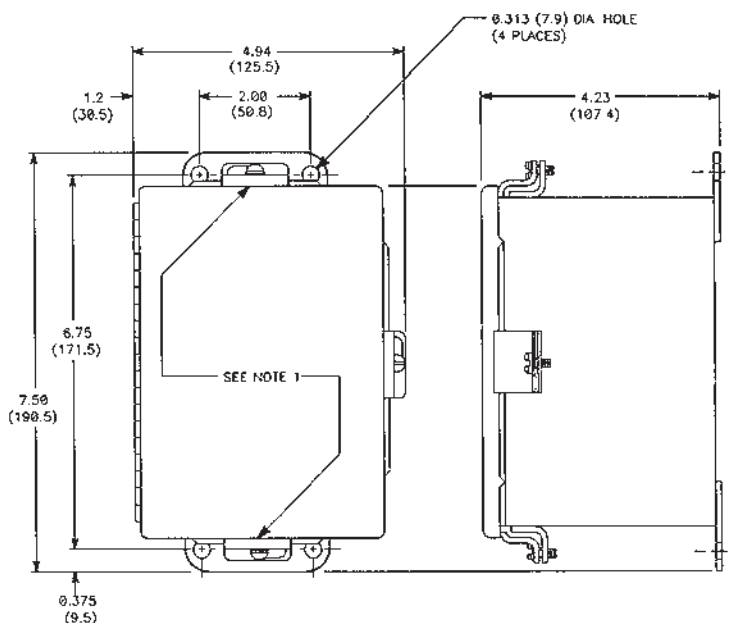
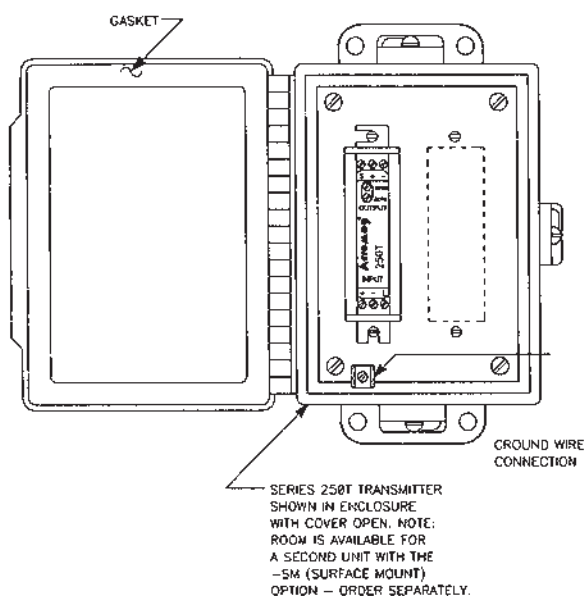
Explosion-Proof and Industrial Housing

**250T-XP,
260A-IH/IHW,
270i-XP**



NEMA-4 and NEMA-12 Enclosures

**250T-N4 / N12, 25PS-N4 / N12
260A-N4 / N12, 270i-N4 / N12**



NOTES:

1. THESE SPECIFIC CLAMPS ON NEMA 4 ENCLOSURES ONLY.
2. CONDUIT MOUNTING HOLES AND FITTINGS ARE CUSTOMER SUPPLIED.

Dimensions are in inches (millimeters).



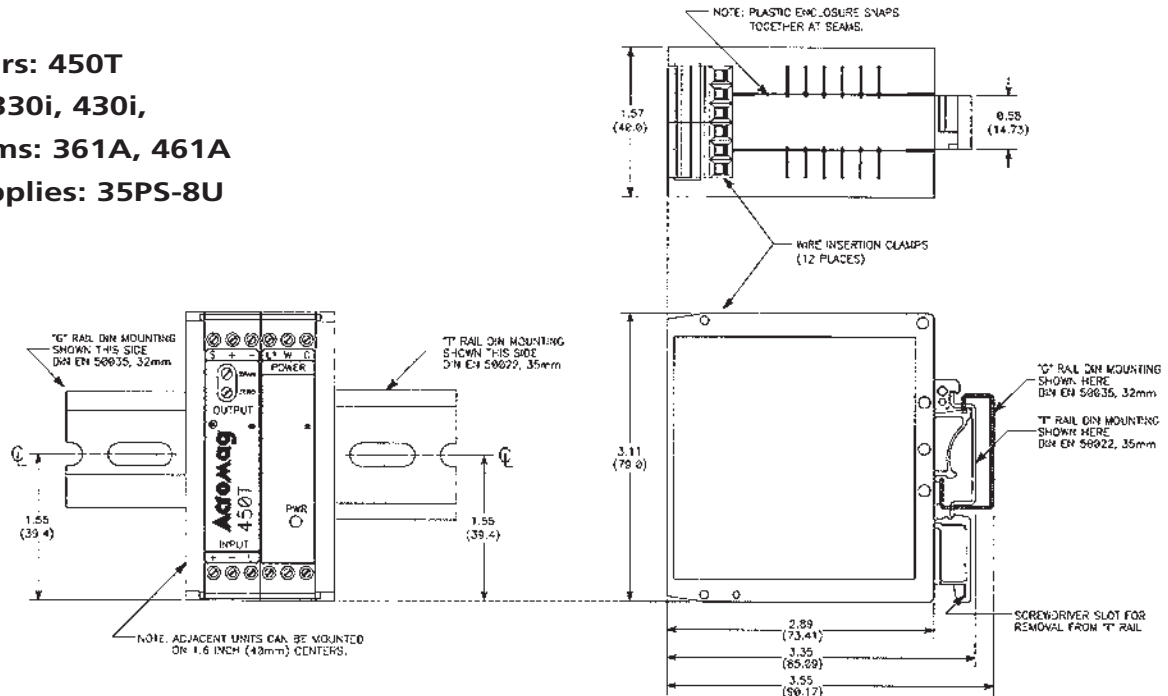
Dimensions

Transmitters: 450T

Isolators: 330i, 430i,

Limit Alarms: 361A, 461A

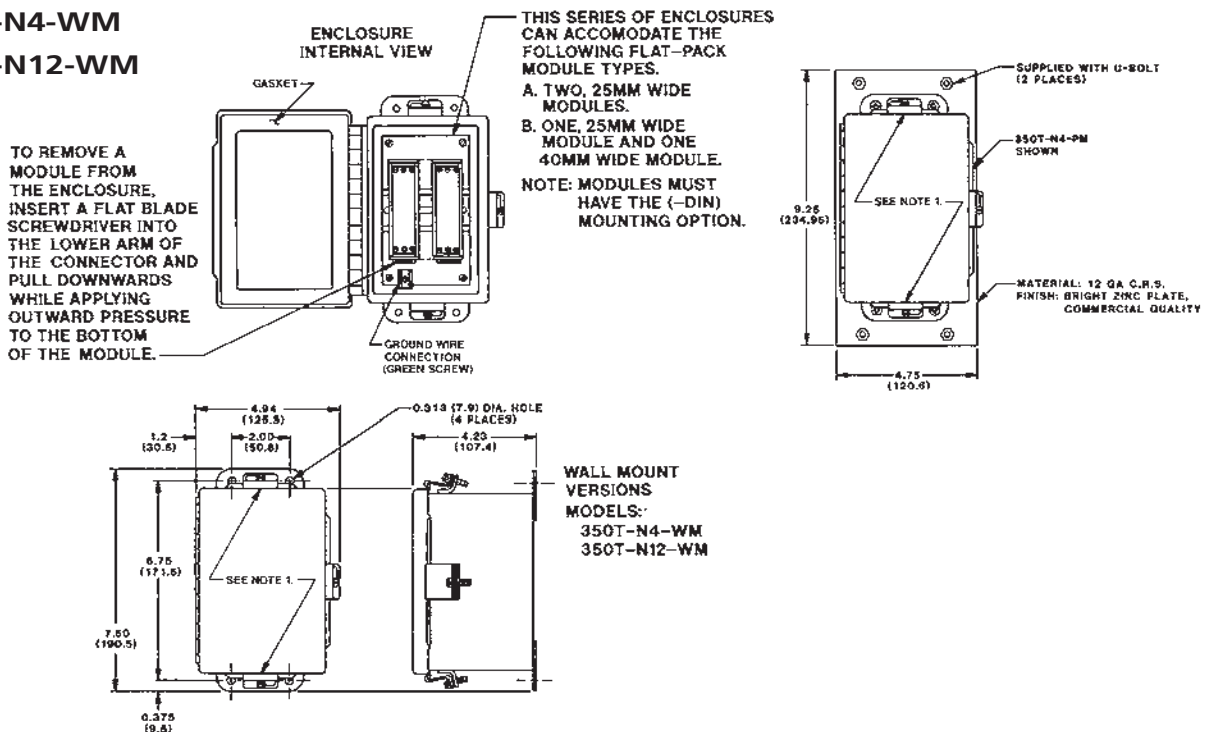
Power Supplies: 35PS-8U



NEMA-4 and NEMA-12 Enclosures

350T-N4-WM

350T-N12-WM



NOTES:

1. THESE SPECIFIC CLAMPS ON NEMA 4 ENCLOSURES ONLY.

2. CONDUIT MOUNTING HOLES AND FITTINGS ARE CUSTOMER SUPPLIED.

3. ALL DIMENSIONS ARE IN INCHES (MILLIMETERS).

Dimensions are in inches (millimeters).

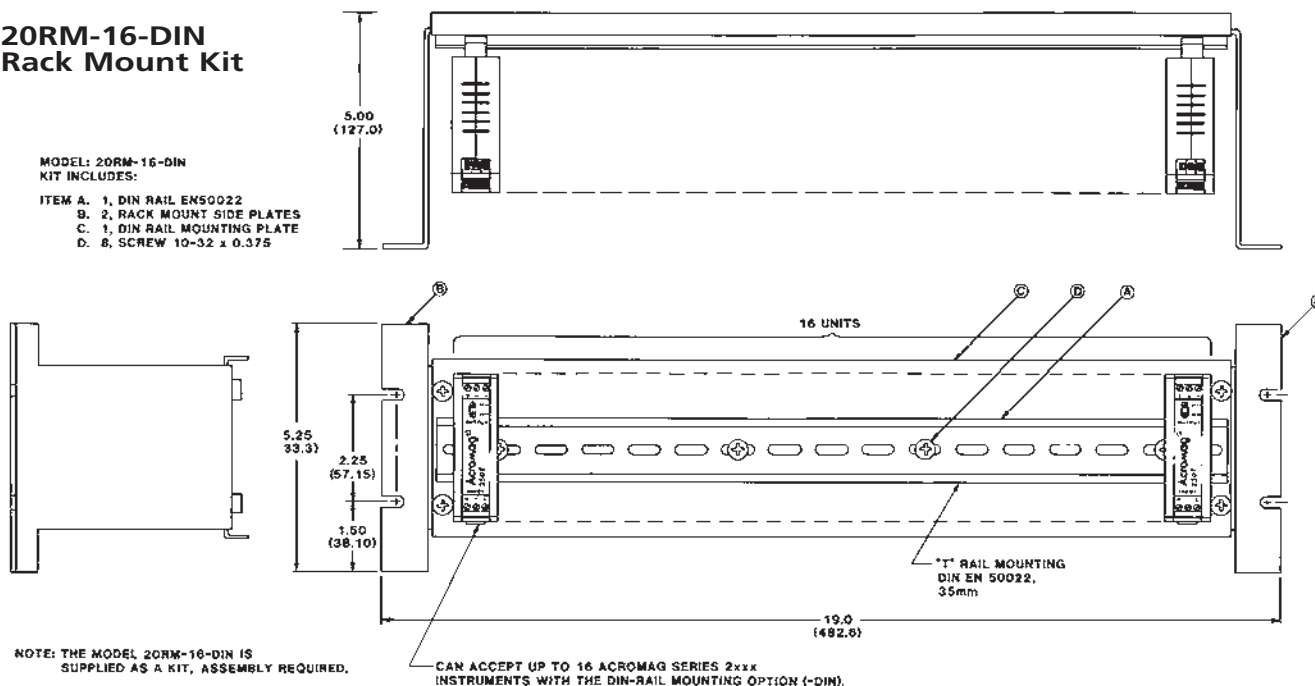


Dimensions

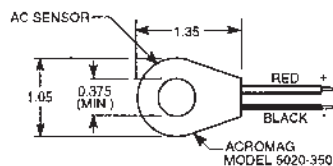
20RM-16-DIN Rack Mount Kit

MODEL: 20RM-16-DIN
KIT INCLUDES:

- ITEM A. 1, DIN RAIL EN50022
- B. 2, RACK MOUNT SIDE PLATES
- C. 1, DIN RAIL MOUNTING PLATE
- D. 8, SCREW 10-32 x 0.375



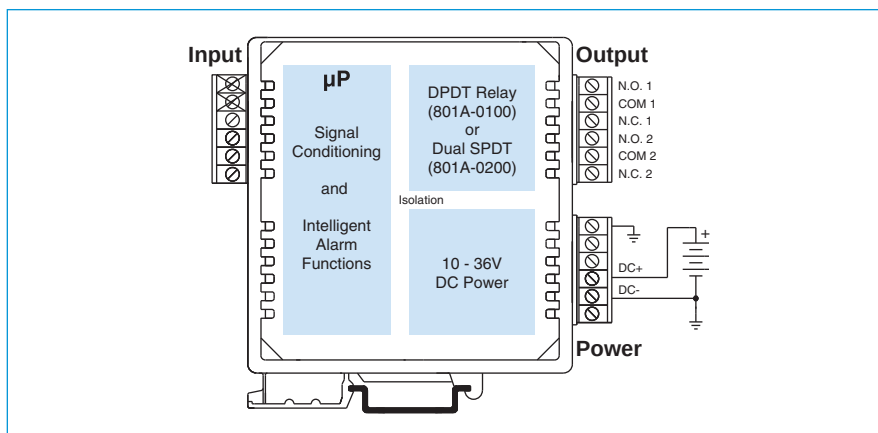
AC Sensor 5020-350



Dimensions are in inches (millimeters).



Intelligent Alarms



801A Alarms

Thermocouple, RTD, and Millivolt Input

Models

801A-0100: Alarm with one DPDT relay

801A-0200: Alarm with two SPDT relays

Input Ranges

TC types: J, K, T, R, S, E, B, N

Millivolt: $\pm 15.625\text{mV}$ to $\pm 1.0\text{V DC}$

RTD: 100 ohm Pt, 120 ohm Ni, 10 ohm Cu

Resistance: 0 to 500 ohms

Alarm Outputs

Single DPDT electro-mechanical 5A relay (-0100),

Dual SPDT electro-mechanical 5A relays (-0200)

Power Requirement

10 to 36V DC

Approvals

CE marked. UL, cUL listed.

Description

IntelliPack alarms compare inputs against user-defined limit setpoints to control built-in relays.

Each unit offers a selection of input ranges and alarm functions to handle a broad range of applications. As your needs change, you can easily reconfigure the unit for different ranges or functions. Alarm functions available on all models include on/off controller, limit alarm, window alarm, deviation alarm, rate-of-change alarm, and peak/valley detection.

Setup is very easy. IntelliPack alarms are configured through a user-friendly Windows XP/Vista/7 program. Field adjustments and recalibration are quickly performed with front-panel push-buttons and status LEDs. Once configured, IntelliPacks operate independent of any host computer.

Special Features

- Integrated microcontroller performs intelligent signal processing for advanced alarm functions.
- Windows XP/Vista/7 software configuration speeds setup and replacement.
- Push-button reprogrammability facilitates changes in the field without a host PC.
- Multi-purpose inputs accept numerous ranges to reduce spare stock requirements.
- High-resolution Sigma-Delta A/D converter delivers high accuracy with low noise.

- Input excitation supply on each input provides power for a two-wire transmitter.

- Dual alarm operation lets you perform two alarm functions at the same time.

Performance

General Input

Analog to Digital (A/D) Converter

16-bit $\Sigma\text{-}\Delta$ A/D converter.

Resolution

$\pm 0.005\%$ of span or $0.1^\circ\text{C}/\text{LSB}$. ADC typically yields resolutions finer than $0.1^\circ\text{C}/\text{LSB}$.

Ambient Temperature Effect

Better than $\pm 0.005\%$ of input span per $^\circ\text{C}$ or $\pm 1\mu\text{V}$, whichever is greater.

Noise Rejection

Normal Mode: Better than 40dB @ 60Hz.

Common Mode: Better than 130dB @ 60Hz.

Input Filter

Normal mode filtering, plus digital filtering optimized and fixed per input range within $\Sigma\text{-}\Delta$ ADC.

Input Response Time

Less than 200mS to 98% of final value for a step change in the input. A software programmable delay can be implemented for filtering transients.

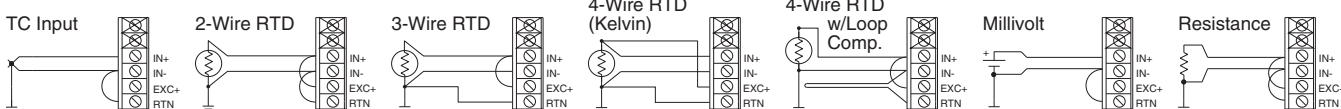
Relay Time Delay

Adjustable alarm delay of up to 25 seconds.

Input Overvoltage Protection

Bipolar Transient Voltage Suppressors (TVS).

Continued on next page.





■ DC Millivolt Input

DC Millivolt/Voltage Input Ranges

±1.0V	±125mV	±31.25mV
±500mV	±62.5mV	±15.625mV
±250mV		

Millivolt Accuracy

Better than ±0.05% of input span.

■ Thermocouple Input

Thermocouple Input Ranges

Thermocouple type user configured. Signal linearization, cold-junction compensation, and open circuit or lead break detection are included.

TC	°C Range (°F Range)	Accuracy
J	-210 to 760°C (-346 to 1400°F)	±0.5°C
K	-200 to 1372°C (-328 to 2502°F)	±0.5°C
T	-260 to 400°C (-436 to 752°F)	±0.5°C
R	-50 to 1768°C (-58 to 3214°F)	±1.0°C
S	-50 to 1768°C (-58 to 3214°F)	±1.0°C
E	-200 to 1000°C (-328 to 1832°F)	±0.5°C
B	260 to 1820°C (500 to 3308°F)	±1.0°C
N	-230 to 1300°C (-382 to 2372°F)	±0.5°C

■ RTD Input

RTD Input Ranges

100Ω Pt, 120Ω Ni, or 10Ω Cu; user-configured.

RTD	°C Range (°F Range)	Accuracy
Pt ¹	-200 to 850°C (-328 to 1562°F)	±0.25°C
Pt ²	-200 to 850°C (-328 to 1562°F)	±0.25°C
Ni	-80 to 320°C (-112 to 608°F)	±0.25°C
Cu	-200 to 260°C (-328 to 500°F)	±1.00°C

Alpha: Pt¹ ($\alpha = 1.3850$), Pt² ($\alpha = 1.3911$), Ni ($\alpha = 1.6720$), Cu ($\alpha = 1.4272$).

2, 3, or 4-wire configurations supported. Module provides sensor excitation, linearization, lead-wire compensation, and sensor break detection.

RTD Excitation Current

1mA DC typical, all types.

RTD Lead-Wire Compensation

25 ohms per lead.

RTD Break Detection

Configurable for either upscale or downscale.

■ Resistance Input

Resistance Input Range

0 to 500 ohms.

Resistance Accuracy

±0.05 ohms.

■ Output

Relay (801A-0100 models)

One DPDT electro-mechanical relay.
Contact material Silver Nickel (AgNi 90/10).

Relays (801A-0200 models)

Two independent SPDT electro-mechanical relays.
Contact material Silver-Cadmium Oxide (AgCdO).

Relay Ratings (CSA ratings)

25V DC @ 5A. 120/240V AC @ 5A.

Expected Mechanical Life

20 million operations.

■ Environmental

Ambient Temperature

Operating: -25 to 70°C (-13 to 158°F).
Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity

5 to 95%.

Power Requirements

10 to 36V DC. 55mA @ 24V. 75mA @ 15V.

Isolation

3-way (input/output/power).
1500V AC for 60 seconds or 250V AC continuous.

Radiated Field Immunity (RFI)

EN61000-4-3, EN50082-1.

Electromagnetic Field Immunity (EMI)

No relay trips will occur beyond ±0.25% of input span from setpoint under the influence of electromagnetic fields from switching solenoids, commutator motors, and drill motors.

Electrical Fast Transient (EFT)

EN61000-4-4, EN50082-1.

Surge Withstanding Capability (SWC)

EN61000-4-5, EN50082-1.

Electrostatic Discharge (ESD)

EN61000-4-2, EN50082-1.

Radiated Emissions

EN50081-1 for Class B equipment.

Approvals

CE marked, UL, cUL listed (USA, Canada).
UL3121 - general product safety.

■ Configuration

Software Configuration

Units are fully programmable via the Windows XP/Vista/7 IntelliPack Configuration Program. Configuration downloads from PC through EIA232 serial port using Acromag 800C-SIP kit.

Field Configuration

Setpoint and deadband are configurable via push-buttons and a standard calibrator.

LED Indicators

LEDs indicate power, status, and alarm.

■ Physical

Enclosure

Case: Self-extinguishing NYLON type 6.6 polyamide thermoplastic UL94 V-2, color beige; general purpose NEMA Type 1 enclosure.

Connectors (Removable terminal blocks)

Wire Range: AWG #14-22 (AWG #12 stranded only).

Printed Circuit Boards

Military grade FR-4 epoxy glass circuit board.

Dimensions

1.05W x 4.68H x 4.35D inches.
26.7W x 118.9H x 110.5D millimeters.

Shipping Weight

1 pound (0.45 Kg) packed.

■ Ordering Information

IMPORTANT: All IntelliPacks require initial software configuration (order 800C-SIP). See Note 1 below.

801A-0100

IntelliPack alarm unit.
One TC/RTD/millivolt input, one DPDT relay.

801A-0200

Same as above except two SPDT relays.

800C-SIP

Software Interface Package.
Only one kit is required for all IntelliPack models. See diagram on Page 83 for included parts.

5034-225

USB-to-RS232 adapter. See page 121 for more info.

PS5R-D24

Power supply (24V DC, 2.1A).
See Power Supplies on Page 199.

TBK-B01

Optional terminal block kit, barrier strip style, 2 pcs. (Does not include terminal block for input wiring.)

TBK-S01

Optional terminal block kit, spring clamp style, 2 pcs. (Does not include terminal block for input wiring.)

NOTE 1: To order factory configuration, call Acromag for a configuration form which must accompany your order. Also, append "-C" to model number (example: 801A-0200-C). 800C-SIP kit is still recommended.



Optional terminal blocks: barrier strip (left) and spring clamp (right). Cage clamp terminal is standard.



Intelligent Alarms



811A Alarm, 812A Dual Alarm

DC Current, DC Voltage, and AC Current Input

Models

- 811A-0100: Alarm with one DPDT relay
- 811A-0200: Alarm with two SPDT relays
- 812A-0200: Dual alarm with two SPDT relays

Input Ranges

- DC Current: 0 to 22mA
- DC Voltage: $\pm 100V$ DC
- AC Current: 0 to 20A AC (with AC current sensor)

Alarm Outputs

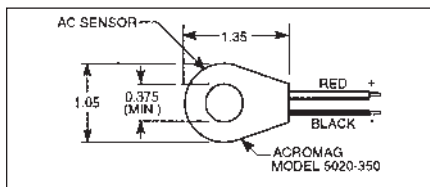
- Single DPDT electro-mechanical 5A relay (-0100),
- Dual SPDT electro-mechanical 5A relays (-0200)

Power Requirement

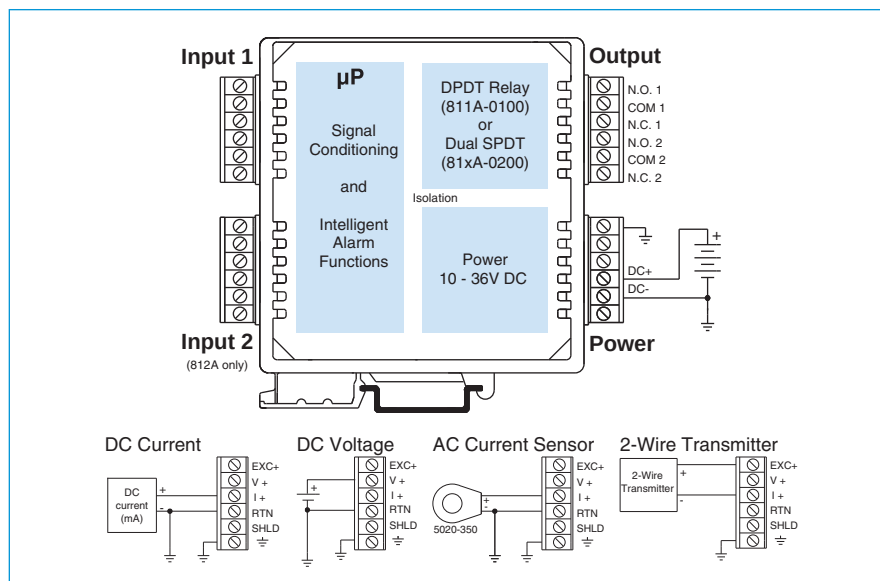
10 to 36V DC

Approvals

CE marked. UL, cUL listed.



AC Current Sensor Model 5020-350
(ordered separately)



Description

IntelliPack alarms compare inputs against user-defined limit setpoints to control built-in relays.

Each unit offers a selection of input ranges and alarm functions to handle a broad range of applications. As your needs change, you can easily reconfigure the unit for different ranges or functions. Alarm functions available on all models include on/off controller, limit alarm, window alarm, deviation alarm, rate-of-change alarm, and peak/valley detection.

Setup is very easy. IntelliPack alarms are configured through a user-friendly Windows XP/Vista/7 program. Field adjustments and recalibration are quickly performed with front-panel push-buttons and status LEDs. Once configured, IntelliPacks operate independent of any host computer.

Special Features

- Integrated microcontroller performs intelligent signal processing for advanced alarm functions.
- Windows XP/Vista/7 software configuration speeds setup and replacement.
- Push-button reprogrammability facilitates changes in the field without a host PC.
- Multi-purpose inputs accept numerous ranges to reduce spare stock requirements.
- High-resolution Sigma-Delta A/D converter delivers high accuracy with low noise.

- Input excitation supply on each input provides power for a two-wire transmitter.

- Dual alarm operation lets you perform two alarm functions at the same time.

Performance

General Input

Analog to Digital (A/D) Converter
16-bit $\Sigma-\Delta$ A/D converter.

Ambient Temperature Effect

Better than $\pm 0.005\%$ of input span per $^{\circ}C$ or $\pm 1\mu V$, whichever is greater.

Noise Rejection

Normal Mode: Better than 40dB @ 60Hz.

Common Mode: Better than 100dB @ 60Hz.

Input Filter

Normal mode filtering, plus digital filtering optimized and fixed per input range within $\Sigma-\Delta$ ADC.

Input Response Time

Less than 100ms to 98% of final value for a step change in the input. A software programmable delay can be implemented for filtering transients.

Relay Time Delay

Adjustable alarm delay of up to 25 seconds.

Input Overvoltage Protection

Bipolar Transient Voltage Suppressors (TVS).

Accuracy (DC Voltage/Current Inputs)

Better than $\pm 0.05\%$ of input span.

Continued on next page.



■ DC Current Input

DC Current Input Range

Input Ranges	Resolution
0 to 5mA DC	189nA/LSB
0 to 22mA DC	757nA/LSB

DC Current Input Impedance

24.9 ohms.

Excitation Supply (for 2-wire instruments)

+15V DC, 24mA maximum.

■ DC voltage Input

DC Voltage Input Ranges

Input Ranges	Resolution
±100V DC	3.77mV
±50V DC	1.88mV
±25V DC	942µV
±12V DC	471µV
±6V DC	236µV
±3V DC	118µV

Input impedance

Greater than 500K ohms.

■ AC Current Input

AC Current Input Range (optional)

An optional external AC current sensor is required to monitor AC current signals (Model 5020-350).

AC Current Range	Primary Turns
0 to 20A AC	1
0 to 10A AC	2
0 to 5A AC	4
0 to 2A AC	10
0 to 1A AC	20

■ Output

Relay (811A-0100 model)

One DPDT electro-mechanical relay.
Contact material Silver Nickel (AgNi 90/10).

Relays (811A-0200, 812A-0200 models)

Two independent SPDT electro-mechanical relays.
Contact material Silver-Cadmium Oxide (AgCdO).

Relay Ratings (CSA ratings)

25V DC @ 5A.
120/240V AC @ 5A.

Expected Mechanical Life

20 million operations.

■ Environmental

Ambient Temperature

Operating: -25 to 70°C (-13 to 158°F).
Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity

5 to 95%.

Power Requirements

811A:
10 to 36V DC. 70mA @ 24V. 110mA @ 15V.
812A:
10 to 36V DC. 110mA @ 24V. 155mA @ 15V.

Isolation

3-way (input/output/power).
1500V AC for 60 seconds or 250V AC continuous.
Inputs share a common on 812A Model.

Radiated Field Immunity (RFI)

EN61000-4-3, EN50082-1.

Electromagnetic Field Immunity (EMI)

No relay trips will occur beyond ±0.25% of input span from setpoint under the influence of electromagnetic fields from switching solenoids, commutator motors, and drill motors.

Electrical Fast Transient (EFT)

EN61000-4-4, EN50082-1.

Surge Withstanding Capability (SWC)

EN61000-4-5, EN50082-1.

Electrostatic Discharge (ESD)

EN61000-4-2, EN50082-1.

Radiated Emissions

EN50081-1 for Class B equipment.

Approvals

CE marked, UL, cUL listed (USA, Canada).
UL3121 - general product safety.

■ Configuration

Software Configuration

Units are fully programmable via the Windows XP/Vista/7 IntelliPack Configuration Program. Configuration downloads from PC through EIA232 serial port using Acromag 800C-SIP kit.

Field Configuration

Setpoint and deadband are configurable via push-buttons and a standard calibrator.

LED Indicators

LEDs indicate power, status, and alarm.

■ Physical

Enclosure

Case: Self-extinguishing NYLON type 6.6 polyamide thermoplastic UL94 V-2, color beige; general purpose NEMA Type 1 enclosure.

Connectors (Removable terminal blocks)

Wire Range: AWG #14-22 (AWG #12 stranded only).

Printed Circuit Boards

Military grade FR-4 epoxy glass circuit board.

Dimensions

1.05W x 4.68H x 4.35D inches.
26.7W x 118.9H x 110.5D millimeters.

Shipping Weight

1 pound (0.45 Kg) packed.

■ Ordering Information

IMPORTANT: All IntelliPacks require initial software configuration (order 800C-SIP). See Note 1 below.

811A-0100

IntelliPack alarm unit.
One DC voltage/current input, one DPDT relay.

811A-0200

Same as above except two SPDT relays.

812A-0200

IntelliPack alarm unit.
Two DC voltage/current inputs, two SPDT relays.

5020-350

AC current sensor. Required for AC current inputs. See page 205 for more information.

800C-SIP

Software Interface Package.
Only one kit is required for all IntelliPack models. See diagram on Page 83 for included parts.

5034-225

USB-to-RS232 adapter. See page 121 for more info.

PS5R-D24

Power supply (24V DC, 2.1A).
See Power Supplies on Page 199.

TBK-B02

Optional terminal block kit, barrier strip style, 4 pcs.

TBK-S02

Optional terminal block kit, spring clamp style, 4 pcs.

NOTE 1: To order factory configuration, call Acromag for a configuration form which must accompany your order. Also, append "-C" to model number (example: 811A-0200-C). 800C-SIP kit is still recommended.



Optional terminal blocks: barrier strip (left) and spring clamp (right). Cage clamp terminal is standard.



Intelligent Alarms



822A Dual Alarm

Thermocouple and Millivolt Input

Models

822A-0200:

Dual input alarm with two SPDT relays

Input Ranges

TC types: J, K, T, R, S, E, B, N

Millivolt: $\pm 15.625\text{mV}$ to $\pm 1.0\text{V DC}$

Alarm Outputs

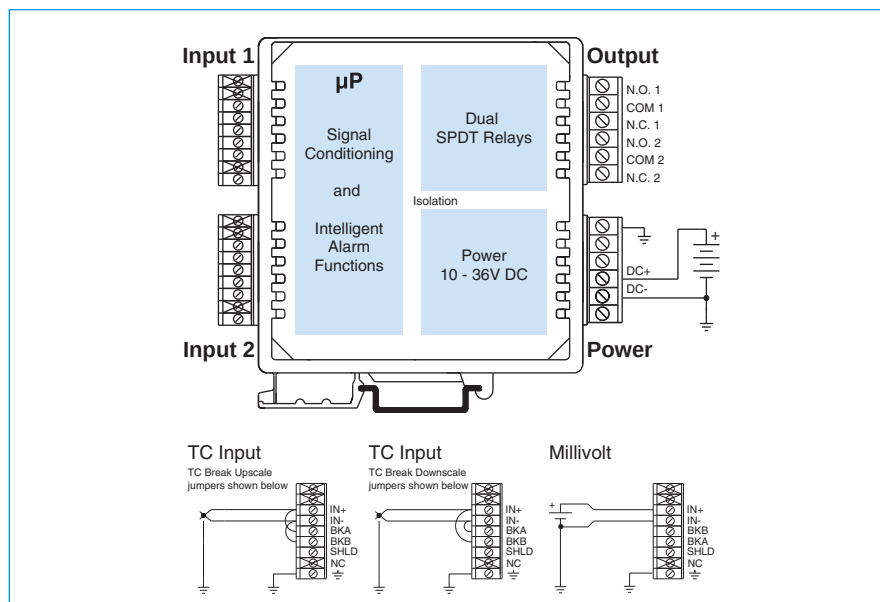
Dual SPDT electro-mechanical 5A relays

Power Requirement

10 to 36V DC

Approvals

CE marked. UL, cUL listed.



Description

IntelliPack alarms compare inputs against user-defined limit setpoints to control built-in relays.

Each unit offers a selection of input ranges and alarm functions to handle a broad range of applications. As your needs change, you can easily reconfigure the unit for different ranges or functions. Alarm functions available on all models include on/off controller, limit alarm, window alarm, deviation alarm, rate-of-change alarm, and peak/valley detection.

Setup is very easy. IntelliPack alarms are configured through a user-friendly Windows 95/98/ME/NT/XP/2000 program. Field adjustments and recalibration are quickly performed with front-panel push-buttons and status LEDs. Once configured, IntelliPacks operate independent of any host computer.

Special Features

- Integrated microcontroller performs intelligent signal processing for advanced alarm functions.
- Windows XP/Vista/7 software configuration speeds setup and replacement.
- Push-button reprogrammability facilitates changes in the field without a host PC.
- Multi-purpose inputs accept numerous ranges to reduce spare stock requirements.
- High-resolution Sigma-Delta A/D converter delivers high accuracy with low noise.
- Input excitation supply on each input provides power for a two-wire transmitter.
- Dual alarm operation lets you perform two alarm functions at the same time.



■ Performance

■ General Input

Analog to Digital (A/D) Converter
16-bit Σ - Δ A/D converter.

Resolution
 $\pm 0.005\%$ of span or $0.1^\circ\text{C}/\text{LSB}$. ADC typically yields resolutions finer than $0.1^\circ\text{C}/\text{LSB}$.

Ambient Temperature Effect
Better than $\pm 0.005\%$ of input span per $^\circ\text{C}$ or $\pm 1\mu\text{V}$, whichever is greater.

Noise Rejection
Normal Mode: Better than 40dB @ 60Hz.
Common Mode: Better than 130dB @ 60Hz.

Input Filter
Normal mode filtering, plus digital filtering optimized and fixed per input range within Σ - Δ ADC.

Input Response Time
Less than 500mS to 98% of final value for a step change in the input. A software programmable delay can be implemented for filtering transients.

Relay Time Delay
Adjustable alarm delay of up to 25 seconds.

Input Overvoltage Protection
Bipolar Transient Voltage Suppressors (TVS).

■ Thermocouple Input

Thermocouple Input Ranges
Thermocouple type user configured. Signal linearization, cold-junction compensation, and open circuit or lead break detection are included.

TC	$^\circ\text{C}$ Range ($^\circ\text{F}$ Range)	Accuracy
J	-210 to 760°C (-346 to 1400°F)	$\pm 0.5^\circ\text{C}$
K	-200 to 1372°C (-328 to 2502°F)	$\pm 0.5^\circ\text{C}$
T	-260 to 400°C (-436 to 752°F)	$\pm 0.5^\circ\text{C}$
R	-50 to 1768°C (-58 to 3214°F)	$\pm 1.0^\circ\text{C}$
S	-50 to 1768°C (-58 to 3214°F)	$\pm 1.0^\circ\text{C}$
E	-200 to 1000°C (-328 to 1832°F)	$\pm 0.5^\circ\text{C}$
B	260 to 1820°C (500 to 3308°F)	$\pm 1.0^\circ\text{C}$
N	-230 to 1300°C (-382 to 2372°F)	$\pm 0.5^\circ\text{C}$

Thermocouple Break Detection
Upscale or downscale.

■ DC Millivolt Input

DC Millivolt/Voltage Input Ranges

$\pm 1.0\text{V}$	$\pm 125\text{mV}$	$\pm 31.25\text{mV}$
$\pm 500\text{mV}$	$\pm 62.5\text{mV}$	$\pm 15.625\text{mV}$
$\pm 250\text{mV}$		

Millivolt Accuracy
Better than $\pm 0.05\%$ of input span.

■ Output

Relays
Two independent SPDT electro-mechanical relays.
Contact material Silver-Cadmium Oxide (AgCdO).

Relay Ratings (CSA ratings)
25V DC @ 5A.
120/240V AC @ 5A.

Expected Mechanical Life
20 million operations.

■ Environmental

Ambient Temperature
Operating: -25 to 70°C (-13 to 158°F).
Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity
5 to 95%.

Power Requirements
10 to 36V DC. 60mA @ 24V. 90mA @ 15V.

Isolation
3-way (input/output/power).
1500V AC for 60 seconds or 250V AC continuous.
Inputs are isolated (up to 48V) from each other.

Radiated Field Immunity (RFI)
EN61000-4-3, EN50082-1.

Electromagnetic Field Immunity (EMI)
No relay trips will occur beyond $\pm 0.25\%$ of input span from setpoint under the influence of electromagnetic fields from switching solenoids, commutator motors, and drill motors.

Electrical Fast Transient (EFT)
EN61000-4-4, EN50082-1.

Surge Withstanding Capability (SWC)
EN61000-4-5, EN50082-1.

Electrostatic Discharge (ESD)
EN61000-4-2, EN50082-1.

Radiated Emissions
EN50081-1 for Class B equipment.

Approvals
CE marked, UL, cUL listed (USA, Canada).
UL3121 - general product safety.

■ Configuration

Software Configuration
Units are fully programmable via the Windows XP/Vista/7 IntelliPack Configuration Program. Configuration downloads from PC through EIA232 serial port using Acromag 800C-SIP kit.

Field Configuration
Setpoint and deadband are configurable via push-buttons and a standard calibrator.

LED Indicators
LEDs indicate power, status, and alarm.

■ Physical

Enclosure
Case: Self-extinguishing NYLON type 6.6 polyamide thermoplastic UL94 V-2, color beige; general purpose NEMA Type 1 enclosure.

Connectors (Removable terminal blocks)
Wire Range: AWG #14-22 (AWG #12 stranded only).

Printed Circuit Boards
Military grade FR-4 epoxy glass circuit board.

Dimensions
1.05W x 4.68H x 4.35D inches.
26.7W x 118.9H x 110.5D millimeters.

Shipping Weight
1 pound (0.45 Kg) packed.

■ Ordering Information

IMPORTANT: All IntelliPacks require initial software configuration (order 800C-SIP). See Note 1 below.

822A-0200
IntelliPack alarm unit.
Two thermocouple/millivolt inputs, two SPDT relays.

800C-SIP
Software Interface Package.
Only one kit is required for all IntelliPack models.
See diagram on Page 83 for included parts.

503A-225
USB-to-RS232 adapter. See page 121 for more info.

P55R-D24
Power supply (24V DC, 2.1A).
See Power Supplies on Page 199.

TBK-B01
Optional terminal block kit, barrier strip style, 2 pcs.
(Does not include terminal block for input wiring.)

TBK-S01
Optional terminal block kit, spring clamp style, 2 pcs.
(Does not include terminal block for input wiring.)

NOTE 1: To order factory configuration, call Acromag for a configuration form which must accompany your order. Also, append "-C" to model number (example: 822A-0200-C). 800C-SIP kit is still recommended.



Optional terminal blocks: barrier strip (left) and spring clamp (right). Cage clamp terminal is standard.



Intelligent Alarms



832A Dual Alarm

RTD and Resistance Input

Models

832A-0200:

Dual input alarm with two SPDT relays

Input Ranges

RTD: 100 ohm Pt, 120 ohm Ni, 10 ohm Cu

Resistance: 0 to 500 ohms

Alarm Outputs

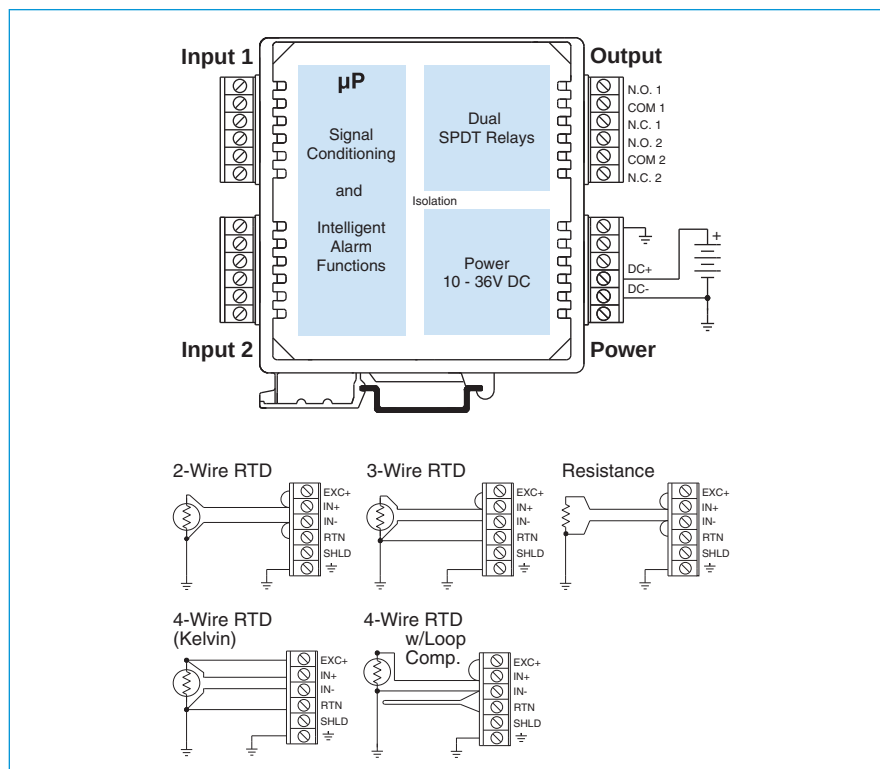
Dual SPDT electro-mechanical 5A relays

Power Requirement

10 to 36V DC

Approvals

CE marked. UL, cUL listed.



Description

IntelliPack alarms compare inputs against user-defined limit setpoints to control built-in relays.

Each unit offers a selection of input ranges and alarm functions to handle a broad range of applications. As your needs change, you can easily reconfigure the unit for different ranges or functions. Alarm functions available on all models include on/off controller, limit alarm, window alarm, deviation alarm, rate-of-change alarm, and peak/valley detection.

Setup is very easy. IntelliPack alarms are configured through a user-friendly Windows XP/Vista/7 program. Field adjustments and recalibration are quickly performed with front-panel push-buttons and status LEDs. Once configured, IntelliPacks operate independent of any host computer.

Special Features

- Integrated microcontroller performs intelligent signal processing for advanced alarm functions.
- Windows XP/Vista/7 software configuration speeds setup and replacement.
- Push-button reprogrammability facilitates changes in the field without a host PC.
- Multi-purpose inputs accept numerous ranges to reduce spare stock requirements.
- High-resolution Sigma-Delta A/D converter delivers high accuracy with low noise.
- Input excitation supply on each input provides power for a two-wire transmitter.
- Dual alarm operation lets you perform two alarm functions at the same time.



■ Performance

■ General Input

Analog to Digital (A/D) Converter
16-bit Σ - Δ A/D converter.

Resolution
0.1°C/LSB. ADC typically yields resolutions finer than 0.1°C/LSB.

Ambient Temperature Effect
Better than $\pm 0.005\%$ of input span per °C or $\pm 1\mu\text{V}$, whichever is greater.

Noise Rejection
Normal Mode: Better than 40dB @ 60Hz.
Common Mode: Better than 130dB @ 60Hz.

Input Filter
Normal mode filtering, plus digital filtering optimized and fixed per input range within Σ - Δ ADC.

Input Response Time
Less than 300mS to 98% of final value for a step change in the input. A software programmable delay can be implemented for filtering transients.

Relay Time Delay
Adjustable alarm delay of up to 25 seconds.

Input Overvoltage Protection
Bipolar Transient Voltage Suppressors (TVS).

■ Resistance Input

Resistance Input Range
0 to 500 ohms.

Resistance Accuracy
 ± 0.05 ohms.

■ RTD Input

RTD Input Ranges
100 ohm Platinum, 120 ohm Nickel, or 10 ohm Copper; user-configured.

RTD	°C Range (°F Range)	Accuracy
Pt ¹	-200 to 850°C (-328 to 1562°F)	$\pm 0.25^\circ\text{C}$
Pt ²	-200 to 850°C (-328 to 1562°F)	$\pm 0.25^\circ\text{C}$
Ni	-80 to 320°C (-112 to 608°F)	$\pm 0.25^\circ\text{C}$
Cu	-200 to 260°C (-328 to 500°F)	$\pm 1.00^\circ\text{C}$

Alpha: Pt¹ ($\alpha = 1.3850$), Pt² ($\alpha = 1.3911$), Ni ($\alpha = 1.6720$), Cu ($\alpha = 1.4272$).

2, 3, or 4-wire configurations supported. Module provides sensor excitation, linearization, lead-wire compensation, and sensor break detection.

RTD Excitation Current
1mA DC typical, all types.

RTD Lead-Wire Compensation
25 ohms per lead.

RTD Break Detection
RTD sensor failure can be configured for either upscale or downscale.

■ Output

Relays
Two independent SPDT electro-mechanical relays.
Contact material Silver-Cadmium Oxide (AgCdO).

Relay Ratings (CSA ratings)
25V DC @ 5A.
120/240V AC @ 5A.

Expected Mechanical Life
20 million operations.

■ Environmental

Ambient Temperature
Operating: -25 to 70°C (-13 to 158°F).
Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity
5 to 95%.

Power Requirements
10 to 36V DC. 55mA @ 24V. 80mA @ 15V.

Isolation
3-way (input/output/power).
1500V AC for 60 seconds or 250V AC continuous.
Inputs share a common.

Radiated Field Immunity (RFI)
EN61000-4-3, EN50082-1.

Electromagnetic Field Immunity (EMI)
No relay trips will occur beyond $\pm 0.25\%$ of input span from setpoint under the influence of electromagnetic fields from switching solenoids, commutator motors, and drill motors.

Electrical Fast Transient (EFT)
EN61000-4-4, EN50082-1.

Surge Withstanding Capability (SWC)
EN61000-4-5, EN50082-1.

Electrostatic Discharge (ESD)
EN61000-4-2, EN50082-1.

Radiated Emissions
EN50081-1 for Class B equipment.

Approvals
CE marked, UL, cUL listed (USA, Canada).
UL3121 - general product safety.

■ Configuration

Software Configuration
Units are fully programmable via the Windows XP/Vista/7 IntelliPack Configuration Program. Configuration downloads from PC through EIA232 serial port using Acromag 800C-SIP kit.

Field Configuration
Setpoint and deadband are configurable via push-buttons and a standard calibrator.

LED Indicators
LEDs indicate power, status, and alarm.

■ Physical

Enclosure
Case: Self-extinguishing NYLON type 6.6 polyamide thermoplastic UL94 V-2, color beige; general purpose NEMA Type 1 enclosure.

Connectors (Removable terminal blocks)
Wire Range: AWG #14-22 (AWG #12 stranded only).

Printed Circuit Boards
Military grade FR-4 epoxy glass circuit board.

Dimensions
1.05W x 4.68H x 4.35D inches.
26.7W x 118.9H x 110.5D millimeters.

Shipping Weight
1 pound (0.45 Kg) packed.

■ Ordering Information

IMPORTANT: All IntelliPacks require initial software configuration (order 800C-SIP). See Note 1 below.

832A-0200
IntelliPack alarm unit.
Two RTD/resistance inputs, two SPDT relays.

800C-SIP
Software Interface Package.
Only one kit is required for all IntelliPack models.
See diagram on Page 83 for included parts.

5034-225
USB-to-RS232 adapter. See page 121 for more info.

P55R-D24
Power supply (24V DC, 2.1A).
See Power Supplies on Page 199.

TBK-B02
Optional terminal block kit, barrier strip style, 4 pcs.

TBK-S02
Optional terminal block kit, spring clamp style, 4 pcs.

NOTE 1: To order factory configuration, call Acromag for a configuration form which must accompany your order. Also, append "-C" to model number (example: 832A-0200-C). 800C-SIP kit is still recommended.



Optional terminal blocks: barrier strip (left) and spring clamp (right). Cage clamp terminal is standard.



Relay Trips



260A Series Fail-safe Limit Alarms

The 260A accepts a 4 to 20mA input signal and provides a dry contact relay output if the input exceeds a user-defined setpoint limit. Power is received from the input loop.

These alarm relays are ideal for local failsafe alarming with existing process transmitters. They are easily installed on a process loop because they do not require an additional power supply and feature a very low voltage burden. A long list of features allows the 260A to adapt to most applications.

Input

4 to 20mA DC

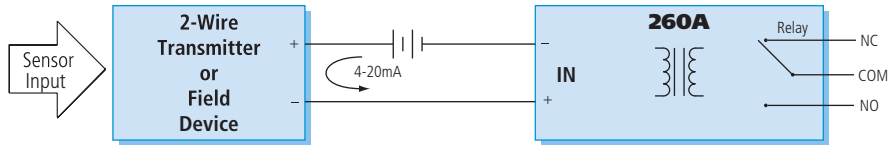
Output

2A SPDT dry contact relay

Power Requirement

4.5V DC (loop-powered)

260A Loop-Powered Limit Alarm



Special Features

- Excellent accuracy and stability ensure reliable measurements in harsh industrial environments.
- RFI and EMI resistance minimize the effects of environmental noise.
- Loop-power design and low 4.5V DC voltage drop enable easy installation.
- Hi/low failsafe option trips alarms above or below setpoint.
- Automatic or manual reset option permits latching alarms.
- Adjustable setpoint (4 to 24mA) handles more applications.
- LED gives visual indication of alarm status.
- Six deadband levels (DIP switch select) offer further flexibility.
- 50mS response time delivers fast alarm notification.
- Compact, 1-inch wide housing uses less space for easier installation.

Performance

Reference test conditions

Input: 4 to 20mA; Setpoint at 20mA (1.0VDC); Failsafe High Alarm; Deadband 0.5%; Ambient 77°F (25°C).

Input

Input

4 to 20mA input. Power to operate the loop-alarm is derived from the input signal loop. Input current should be limited to 50mA or less to prevent damage to the alarm. Alarm input is reverse polarity protected.

Input Impedance

225 ohms at 20mA (input voltage drop: 4.5V DC) typical.

Setpoint adjust

The alarm setpoint is adjustable from 0 to 125% of input current span, readable as 0V DC (0mA) to 1.2V DC (24mA) at terminals. Resolution is 0.1% of span, continuous, on 22-turn potentiometer. The setpoint voltage represents the true trip-point to within ±0.5% of span. By monitoring the input current and adjusting the setpoint pot, the setpoint may be set to within 0.1%.

Deadband adjust (hysteresis)

Field selectable deadband: 0.5, 1, 2, 4, 8 and 16 percent of span, set via an internal DIP switch.

Continued on the next page.



Performance

Continued from the previous page.

Output/Relays

Output

Single-Pole, Double Throw (SPDT), Form C, dry contact relay. Isolated contacts rated at 2A (3A max.), 28V DC or 120V AC resistive.

Relay

Contact material: Fine silver.

Breakdown: 500V AC across contact gaps.

Life: 1 Million operations at 1 amp, 28V DC.

Operation: failsafe, coil normally energized, de-energizes on alarm.

Alarm LED

The LED will be ON if the setpoint is exceeded (relay not energized).

Alarm action

Failsafe high or low alarm. Can be field configured to trip on increasing signal (Failsafe HI Alarm), or decreasing signal (Failsafe LOW Alarm), via an internal DIP switch (S2). Set S2 to C2 position for High Alarm, or the C1 position for Low Alarm. Relay is normally energized and becomes de-energized on alarm or signal failure.

Alarm latch

Automatic Reset (Non-Latching or Latching). Latch action enabled via internal DIP switch. In the Non-Latching mode, the alarm will reset to its non-alarm state as soon as the signal is outside of the selected deadband. In the Latched mode, the alarm will reset when the local Reset button is pushed. Latch action can be locked out by pushing down and turning the Reset button 1/4-turn to lock it in its depressed state, or via the on-board DIP switch.

Accuracy

Repeatable within $\pm 0.1\%$ of input span for constant conditions (25°C).

Response time

The relay contacts switch from closed to open within 50mS for a step input change from 10% of span on one side of the alarm point, to 5% of span on the other side of the alarm point, for high or low alarms.

Minimum time between events: 100mSec.

Ordering Information

Select one option from each column. Example: 260A-20MA-SN-DIN-NCR-C

To order factory calibration, append "-C" to end of model number. Specify ranges on order.

Base	Input	Output	Mounting	Approval
260A	-20MA	-SN	-DIN -N4 -ST -N12 -SM -IH -IHW	-NCR

See Ordering Notes for model number descriptions.

Environmental

Ambient temperature range

-13 to 167°F (-25 to 75°C).

Ambient temperature effect

Less than $\pm 0.01\%$ of output span per °F ($\pm 0.018\%$ per °C) over the ambient temperature range for reference test conditions.

Isolation

The output contacts are isolated from the input/power circuits for common-mode voltages up to 250V AC, or 354V DC off ground, on a continuous basis (will withstand 1500V AC dielectric strength test for one minute without breakdown). This complies with test requirements outlined in ANSI C39.5-1974 for the voltage rating specified.

Noise rejection

Normal mode: 10dB at 60 Hz, typical.

RFI resistance

Unit will not trip, under influence of RFI, when input is $\pm 0.5\%$ of input span from setpoint voltage, with RFI field strengths of up to 10V/meter at frequencies of 27, 151 and 467 MHz.

EMI resistance

Unit will not trip when input is $\pm 0.25\%$ of input span from setpoint voltage with switching solenoids or commutator motors.

Surge withstand capability (SWC)

Input/Output terminations rated per ANSI/IEEE C37.90-1978. Unit is tested to a standardized test waveform that is representative of surges (high frequency transient electrical interference), observed in actual installations.

Physical

Construction

Circuit board: Military grade FR-4 epoxy glass circuit board

Terminals: Compression type, 14 AWG max.

DIP switch contacts: Gold flash over Nickel contacts.

Printed circuit board coating: Fungus resistant acrylic conformal coat.

Mounting position: Position insensitive.

Ordering Notes

Input Option

-20MA: 4 to 20mA

Output Option

-SN: SPDT dry contact relay

Mounting options

Mountings

-DIN: DIN rail G or T mount

-ST: SNAPTRACK mount

-SM: Surface-mount

External housings

-N4: NEMA 4, water-tight, holds two

-N12: NEMA 12, oil-tight, holds two

-IH: Rugged pipe mount housing, water-tight

-IHW: Same as -IH above with window

Approval Options

-NCR: No certification required

Ordering Notes

† Units are shipped separately from any optional enclosures (i.e. units are not installed in any external housing).

†† Units shipped installed in external enclosure.

Accessories

Power supplies

See Power Supplies on Page 199.

DIN RAIL 3.0

DIN RAIL 16.7

DIN rail strip, Type T, 3 inches (75mm) or 16.7 inches (425mm)

20RM-16-DIN

19" rack-mount kit with DIN rail. Holds sixteen 260A alarms.



Relay Trips



361A and 461A Limit Alarms

These alarms accept DC voltage/current input signals and provide relay output if the input exceeds user-defined setpoint limits.

Numerous options and features make these alarms easy to use and well-suited for a wide range of limit monitoring and on/off controller applications. Three-way isolation eliminates ground loops to simplify installation. And for easier use in the field, these alarms withstand extreme temperatures and have accessible setpoint voltage test points. Other features include alarm/power status LEDs and independent setpoint and deadband adjustment pots.

Models

361A: DC-powered

461A: AC-powered

Input Ranges

- 0 to 20mA DC
- 0 to 1V, 0 to 5V, 0 to 10V, 0 to 50V, 0 to 100V DC
- 0 to 20A AC (with external AC current sensor)

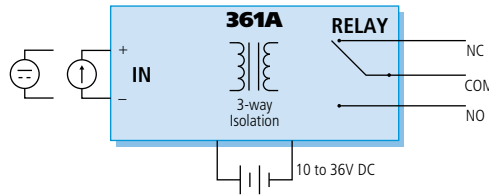
Output

- Electromechanical SPDT dry contact sealed relays; CSA rated for 5A

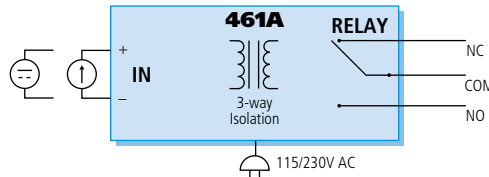
Power Requirements

- 361A: 10 to 36V DC (0.9W max.)
- 461A: 115V AC (0.0320A) or 230V AC (0.016A)

361A DC-Powered Limit Alarm



461A AC-Powered Limit Alarm



Special Features

- 100% adjustable setpoint via 15-turn pot handles more applications and provides better resolution.
- 100% adjustable deadband via 15-turn pot prevents false trips and eliminates alarm chatter.
- Setpoint test points are accessible on front of unit for quick verification with digital voltmeter probe.
- Dual relays offer the flexibility of high/low, high/high, or low/low alarm setpoint operation.
- Three-way isolation eliminates ground loops.
- Jumper-selectable DC voltage or current input reduces inventory stock.
- Jumper-selectable failsafe operation enables alarm actuation on power loss in critical applications.
- Wide power supply range (361A) handles more applications to reduce inventory stock.
- DC power units (361A only) carry lower voltages and do not require expensive conduit for safer and easier installation.
- Diode-coupled power (361A only) supports the use of redundant power supplies for critical applications.
- Excellent accuracy, stability and no loose internal wiring ensure reliable alarm trips.

Performance

Input

Input

-V1: 0 to 1V DC.

1M ohm input impedance or 0 to 20mA DC via 50 ohm internal resistor.

-V5: 0 to 5V DC.

1M ohm input impedance or 0 to 20mA DC via 250 ohm internal resistor.

-V0: 0 to 10V DC. 100K ohm input impedance.

-V50: 0 to 50V DC. 500K ohm input impedance.

-V100: 0 to 100V DC. 1M ohm input impedance.

AC current sensor (5020-350)

Used with -V1 input option only.

Input range is function of turns placed on sensor.

1 turn = 0 to 20A AC; 2 turns = 0 to 10A;

4 turns = 0 to 5A; 10 turns = 0 to 2A.

Setpoint adjust

0 to 115% of input span via 15-turn potentiometer.

Resolution better than 0.1% of span, continuous.

Deadband adjust (hysteresis)

1 to 100% of input span for each channel via 15-turn potentiometer(s). Adjustments are independent on dual alarm models.

Automatic reset (non-latching alarms)

The alarm resets to its non-alarm state as soon as input signal is outside of the selected deadband. If the deadband is set to its extreme (100%), then the alarm is effectively latching and will not reset till the input signal is at or below 0%.

Repeatability

Repeatable to better than $\pm 0.1\%$ of input span

Continued on the next page.



Performance

Continued from the previous page.

Output/Relays

Output

-SMRN: Single alarm.

One SPDT dry-contact sealed relay.

-DMRN: Dual Alarm, two SPDT relays.

Electrical Life - CSA Ratings:

25V DC, 5A, 100,000 operations, resistive.

48V DC, 0.8A, 100,000 operations, resistive.

120V AC, 5A, 30,000 operations, resistive.

240V AC, 5A, 30,000 operations, resistive.

Contact Material: Silver-cadmium oxide.

Breakdown Voltage: Between open contacts:

1000VAC rms. Between contacts and coil: 1500VAC rms, 50-60 Hz for one minute.

Mechanical Life: 20 million operations.

Response time

Fixed delay of 100mS (nominal). Relay transfers $\leq 100\text{mS}$, typical, after input signal exceeds setpoint. Relay transfers within 50mS after input passes dead-band, as it returns to normal range.

Power

Power requirement (361A)

10V to 36V DC.

Current draw is a function of supply voltage.

Currents specified are maximum values with the relay(s) energized.

Supply Voltage	Mechanical Relay Output	
	Single	Dual
10V	65mA	100mA
12V	50mA	75mA
15V	40mA	60mA
24V	30mA	40mA
36V	25mA	30mA

Power requirement (461A)

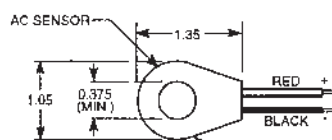
-1: 115V AC $\pm 10\%$, 50 to 60Hz, 0.032A.

-2: 230V AC $\pm 10\%$, 50 to 60Hz, 0.032A.

Power supply effect (461A)

Trip-point varies less than $\pm 0.05\%$ of input span.

AC Current Sensor



Ordering Information

Select one option from each column. Example: 461A-V5-DMRN-1-DIN-NCR-C

To order factory calibration, append "-C" to end of model number. Specify ranges on order.

Base	Input		Output	Mounting	Approval
361A	-V1	-V50	-SMRN	-DIN	-NCR
	-V5	-V100	-DMRN		
	-V0				

Note:
All 361As accept
10 to 36V DC
power supply.

Base	Input		Output	Power	Mounting	Approval
461A	-V1	-V50	-SMRN	-1	-DIN	-NCR
	-V5	-V100	-DMRN	-2		
	-V0					

See Ordering Notes for model number descriptions.

Environmental

Ambient temperature range

-13°F to 167°F (-25°C to 75°C).

Ambient temperature effect

Less than $\pm 0.01\%$ of output span per °F ($\pm 0.018\%$ per °C) over the ambient range.

Isolation

Three way; input, contacts, and power are isolated from each other for common mode voltages up to 250V AC, or 354V DC, continuous (withstands 1500V AC for sixty seconds without breakdown).

Noise rejection

Common mode: Better than 100dB at 60 Hz, 250ohm unbalance, typical.

Normal mode: 26dB at 60 Hz, 250ohm source, typical.

RFI resistance

Unit will not trip under influence of RFI when input is $\pm 0.5\%$ of input span from setpoint voltage for RFI field strengths of up to 10V/meter, at frequencies of 27MHz, 151MHz, and 467MHz.

EMI resistance

Unit will not trip when input is $\pm 0.25\%$ of input span from setpoint voltage with switching solenoids or commutator motors.

Surge withstand capability (SWC)

Meets ANSI/IEEE C37.90-1978.

Physical

Construction

Circuit boards: Military grade FR-4 epoxy glass circuit board, 0.063 inches thick.

Coating: Fungus resistant acrylic conformal coat.

Terminals: Compression type, wire 14 AWG max.

Case: Self-extinguishing NYLON Type 6.6 polyamide thermoplastic, UL94 V-2. NEMA 1 enclosure.

Test points (setpoint): Accepts 0.080" dia. probe.

Mounting position: Position insensitive.

Ordering Notes

Input Options

-V1: 0 to 1V DC, 0 to 20mA DC, or 0 to 20A AC with AC current sensor

-V5: 0 to 5V DC or 0 to 20mA DC

-V0: 0 to 10V DC

-V50: 0 to 50V DC

-V100: 0 to 100V DC

Output Options

-SMRN: One SPDT relay, single setpoint alarm

-DMRN: Two SPDT relays, dual setpoint alarm

Power Options

-1: 115V AC power

-2: 230V AC power

Mounting Option

-DIN: DIN rail G or T mount

Approval Option

-NCR: No certification/approval required.

Accessories

Power supplies

See Power Supplies on Page 199.

5020-350

AC current sensor. (See page 205)

DIN RAIL 3.0 or DIN RAIL 16.7

DIN rail strip, Type T, 3 inches (75mm) or 16.7 inches (425mm)

20RM-16-DIN

19" rack-mount kit with DIN rail. Holds ten alarms.

350T-N4-WM

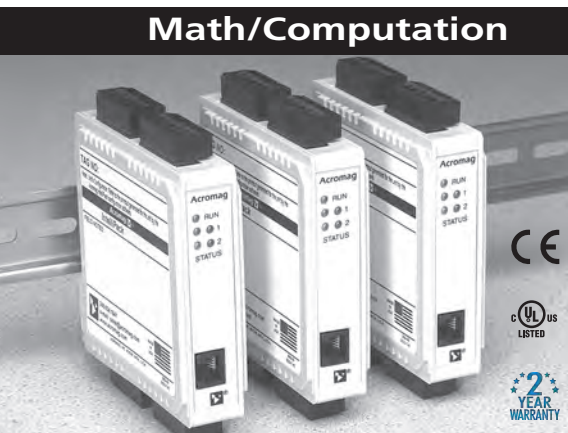
NEMA 4 water-tight enclosure, wall-mount. Holds one 361A or 461A alarm.

350T-N12-WM

NEMA 12 oil-tight enclosure, wall-mount. Holds one 361A or 461A alarm.



Math/Computation



890M Units

Model Types

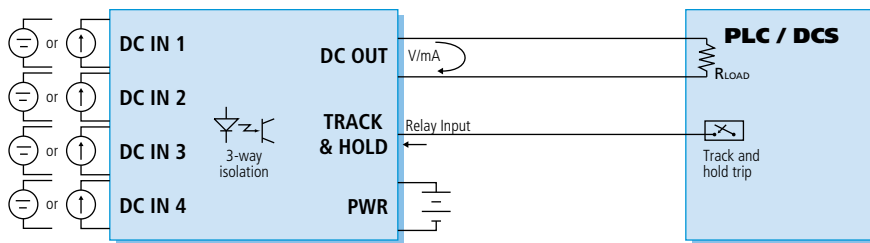
- **892M:** Dual DC voltage/current input with universal DC voltage/current output
- **894M:** Quad DC voltage/current input with universal DC voltage/current output
- **895M:** Single DC voltage/current input with frequency/pulse output
- **896M:** Dual DC voltage/current input with frequency/pulse output

Functions

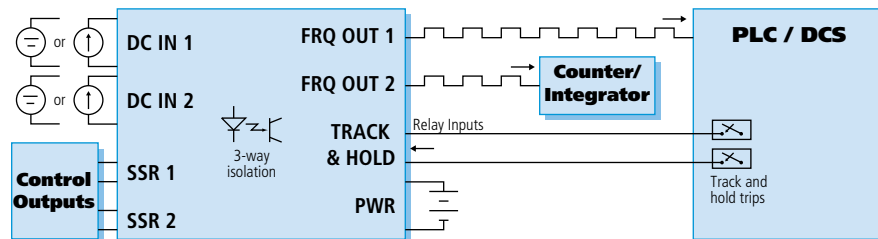
32-bit floating point math processing ensures precise computing for highly accurate output.

- Add, subtract, multiply, divide
- Square root
- Exponential (e^n) and power (X^n)
- Logarithmic (natural and base 10)
- Sine, cosine, tangent, and inverse
- Absolute value
- Minimum/maximum
- Conditional arguments (if, then, else, and, or, >, <, <>, =, <=, >=)
- Input scaling
- High/low signal selector or discriminator
- Track and hold

DC to DC Conversion: 892/894M Math Modules



DC to Frequency Conversion: 895/896M Math Modules



Description

IntelliPack math modules perform complex mathematical computations and convert DC input signals to scaled DC or frequency outputs. They are ideal for isolating and interfacing analog signals to a PLC or controller as a voltage, current, or a pulsed input. Typical applications include calculating a sum, delta's, average, flow rate, volume, weight, power, and other scaled or computed variables.

Math modules are available with either DC voltage/current output or frequency/pulse-width modulated output. The frequency output models also provide two solid-state relays for control or alarm functions. Each output (DC, frequency, and relay channels) is controlled by a unique, user-defined equation. On relay output channels, zero/nonzero equation results and true/false conditions control the on/off state.

Frequency output models are ideal for integrator/totalizer applications. They support ultra-low frequency pulses as slow as 10 cph. And, adjustable zero dropout levels apply a minimum input threshold to filter noise and unwanted pulses.

The math/computation equations are entered into the IntelliPack configuration software in a freeform format, the same as in most popular spreadsheet programs. A simulator screen provides instant feedback to test equations and see the output response before actual installation.

Special Features

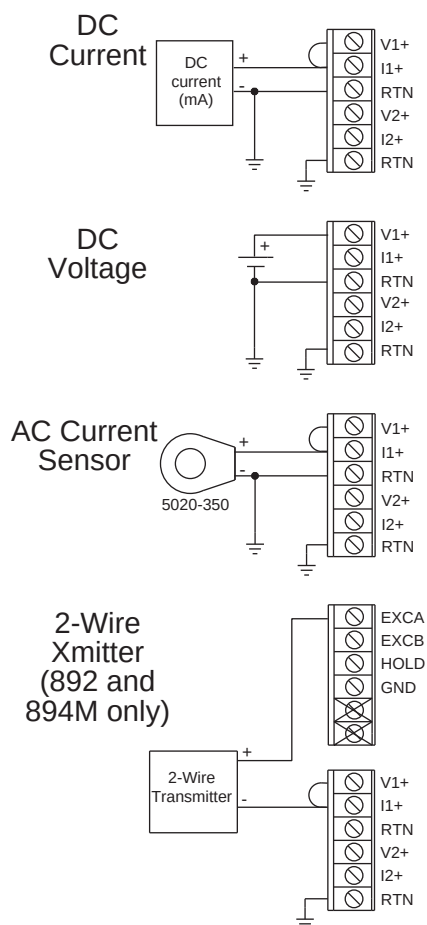
- Universal DC analog I/O ranges provide flexibility for changing application requirements.
- Individual channel input/output scaling displays signal values in engineering units.
- Track and hold function enables easy identification of critical events and their corresponding signal values.
- 200-character equation fields (50-char. max. on 895/896M) support complex transfer functions.
- Software simulation feature allows off-line testing of equations to quickly check output signal response for a variety of conditions.
- Excitation supply for two 2-wire transmitters provides 15V DC @ 48mA to eliminate need for additional power supplies. 892/894M only.
- Diagnostic LEDs provide quick, visual indication of an out-of-range input value.

Frequency output models (895/896M) only

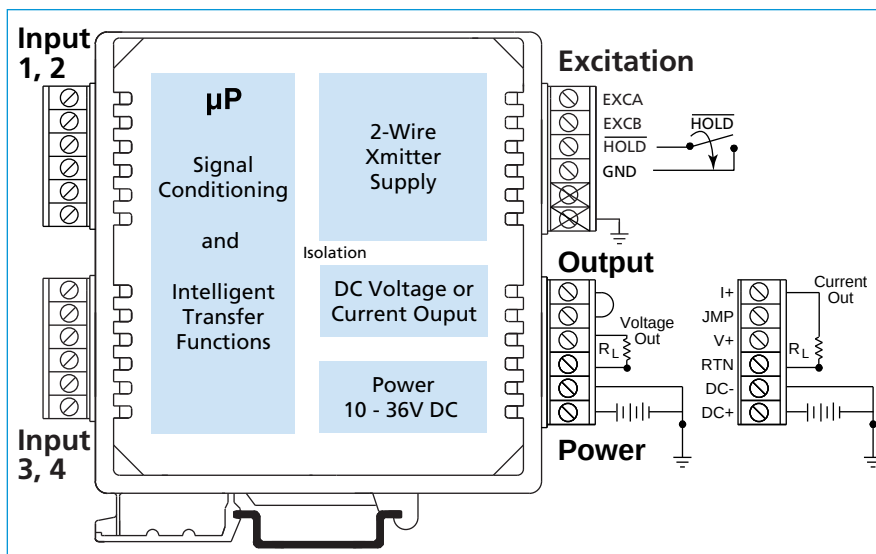
- Pulse output supports integrator and totalizer applications using an external counter to calculate flow, volume, weight, power, etc.
- Pulse-width modulation capability allows the user to vary the output signal's pulse width on a user-defined carrier frequency.
- Solid-state relays provide on/off control or local alarms with failsafe/ nonfailsafe capability.



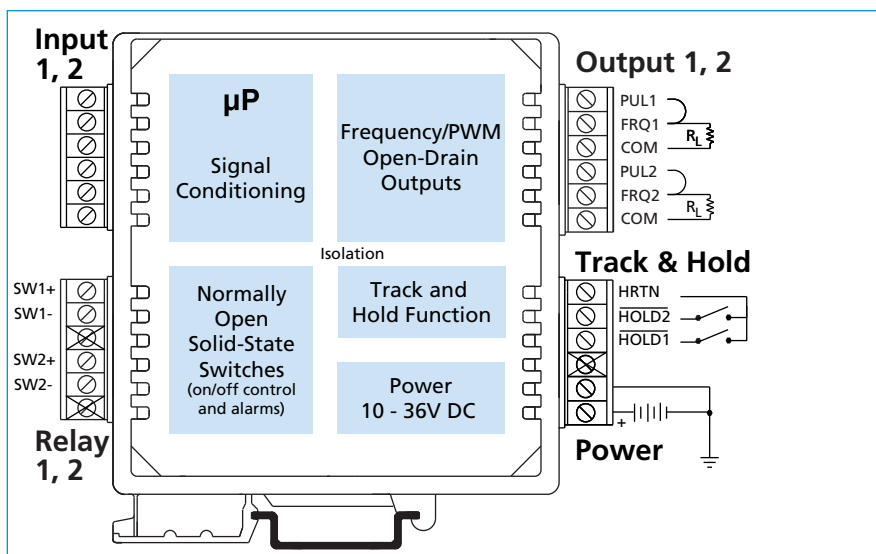
Input Connections



892/894M DC Output Math Module



895/896M Frequency Output Math Module



IntelliPack Features

- Advanced microcontroller has integrated, downloadable flash memory and EEPROM for intelligent signal processing.
- Windows 95/98/ME/NT/XP/2000 software configuration speeds setup and replacement.
- Plug-in terminal blocks make module installation and removal easy.
- Built-in self-diagnostic routines operate upon power-up and during operation for easy maintenance and troubleshooting.
- 3-way optical isolation separates inputs, outputs, and power from each other.
- EMC compliant. Ruggedized circuitry meets directives to provide increased transient immunity and low emissions.
- Wide ambient temperature range ensures reliable performance from -25 to 70°C.
- Wide DC supply range has diode-coupled reverse polarity protection.



892/894M DC Output Math Modules

Application Example

A typical application involves calculating the composite flow rate of several flows. The 894M easily sums up to four inputs and provides the total as an output scaled in engineering units.

Configuration Procedures

- 1) Enter optional tag identifiers and other desired application information.
- 2) Select your input ranges from the pull-down menus and identify the sources.
- 3) Select the output range and either normal or reverse acting (proportional/inverse) mode.

IntelliPack Configuration - 894M-0500 - Untitled*

File Module Settings Help

General Xmtr Configuration Test Input 1-2 Calibration Input 3-4 Calibration Output Calibration

Module

Tag: Tank #2A Comment: Flow into Tank #2A

Serial Number: Firmware Number: 9300-016A Last Modified: 10/12/98 3:31 PM

Configured By: RMG Location: Building #2

Input 1 Range: 4-20mA DC ID: H2O

Input 2 Range: 4-20mA DC ID: HCL

Input 3-4 Range: 4-20mA DC ID (3): NaOH ID (4): CO2

Output 1 Range: 0-10V DC Mode: Normal Acting

IntelliPack Configuration - 894M-0500 - Untitled*

File Module Settings Help

General Xmtr Configuration Test Input 1-2 Calibration Input 3-4 Calibration Output Calibration

Scaling:

I/O	Equation Symbol	Zero Signal Value	Zero Engr. Units Value	Full Scale Signal Value	Full Scale Engr. Units Value	Engr. Units
Input 1	A	4.0 mADC	0	20.0 mADC	1000	GPM
Input 2	B	4.0 mADC	0	20.0 mADC	500	GPM
Input 3	C	4.0 mADC	0	20.0 mADC	250	GPM
Input 4	D	4.0 mADC	0	20.0 mADC	100	GPM
Output 1		0.0 VDC	0	10.0 VDC	1850	GPM

Equation: Output 1 = A+B+C+D

Show Simulator

IntelliPack Configuration Software makes it very easy to set up your input and output ranges and other operational parameters.

- 4) Enter the zero/full scale values in engineering units for input variables A, B, C and D.
- 5) Enter the output scaling parameters, also in engineering units.
- 6) Enter your equation (up to 200-characters) in the equation field to define the output.
- 7) Use the I/O equation simulator (shown below) to verify the expected results for various field conditions.

The IntelliPack math module's configuration property sheet simplifies the entry of equations.

Simulator

Simulated Inputs

Min Max

I/O	Signal Value	Engr. Units Value
Input 1 (A)	12.0000 mADC	500 GPM
Input 2 (B)	12.0000 mADC	250 GPM
Input 3 (C)	12.0000 mADC	125 GPM
Input 4 (D)	12.0000 mADC	50 GPM
Output 1	5.0000 VDC	925 GPM

The pop-up simulator sheet helps you test equations in software with slider bars to simulate input conditions.



895/896M Frequency Output Math Modules

Application Example

Both models are designed for integrator/totalizer applications. The 896M is ideal for demand metering applications. With one high speed pulse output and one low speed output to a pulse counter, you can measure the sum, flow, rate, and total volume.

Configuration Procedures

- 1) Enter optional tag identifiers and application information.
- 2) Select input ranges and zero dropout values from pull-down lists and identify the device.
- 3) Select output ranges from the pull-down menu and set the duty cycle (on-time).

IntelliPack Configuration Software makes it very easy to set up your input and output ranges and other operational parameters.

I/O	Eqn Sym	Zero Signal Value	Zero Engr Units Value	Full Scale Signal Value	Full Scale Engr Units Value	Initial EU Value	Engr Units
Input 1	A	4.0 mADC	0	20.0 mADC	100		gpm
Output 1	B	0.0 Hz	0	1100.0 Hz	1100	0	gpm
Cont 1	C	Open	0	Closed	<>0	0	
Input 2	D	4.0 mADC	0	20.0 mADC	1000		gpm
Output 2	E	0.0 CPH	0	660.0 CPH	1100	0	gpm
Cont 2	F	Open	0	Closed	<>0	0	

Equation:
 Output 1 (B) = A+D
 Cont 1 (C) = IF(A<0) THEN(0) ELSE(1)
 Output 2 (E) = A+D
 Cont 2 (F) = IF(D<0) THEN(0) ELSE(1)

The IntelliPack math module's configuration property sheet simplifies the entry of equations.

- 4) Enter the scaling parameters in engineering units for input variables A and D.
- 5) Enter the frequency scaling parameters for outputs B and E.
- 6) Enter the initial start-up conditions for outputs B, C, E, and F in engineering units.
- 7) Enter up to four 50-character equations in the scroll-down fields to define each output.
- 8) Use the I/O equation simulator (shown below) to verify the expected results for various field conditions.

I/O	Eqn Sym	Signal Value	Engr. Units Value
Input 1	A	12.0000 mADC	50.000 gpm
Output 1	B	550.00 Hz	550.00 gpm
Cont 1	C	Closed	1.0000
Input 2	D	12.0000 mADC	500.00 gpm
Output 2	E	330.00 CPH	550.00 gpm
Cont 2	F	Closed	1.0000

The pop-up simulator sheet helps you test equations in software with slider bars to simulate input conditions.



Real Time Monitoring

892/894M DC Output Math Modules

Models

892M-0500: Two input channels

894M-0500: Four input channels

Input Ranges

0 to 1mA, 0 to 20mA, or 4 to 20mA DC

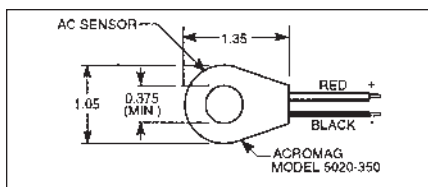
0 to 5V or 0 to 10V DC

0 to 20A AC (with AC current sensor)

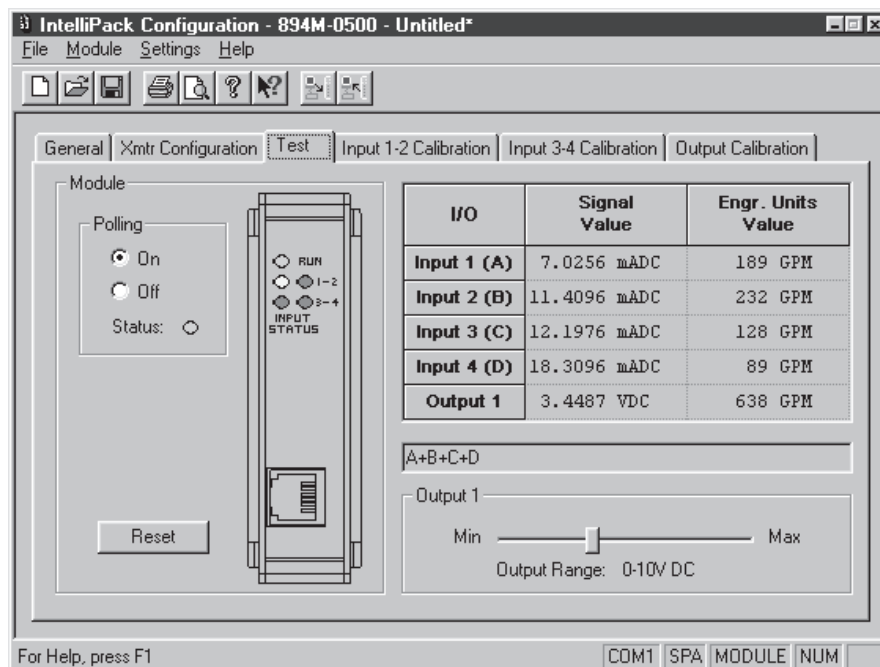
Output Ranges

0 to 1mA, 0 to 20mA, or 4 to 20mA DC,

0 to 5V or 0 to 10V DC



AC Current Sensor Model 5020-350
(ordered separately)



The test property sheet displays run-time input/output values for easy troubleshooting and diagnostics.

Arithmetic Functions

Function	Equation
Addition	$A+B+C+D$
Subtraction	$A - B+C - D$
Multiplication	$4*A - 2*B+3*C - 6*D$
Division	$(A/4+B/2 - 3*C)/8$
Square Root	$\text{SQRT}(A - B+C - D)$
Absolute Value	$\text{ABS}(A - B+C - D)$
Exponential	$\text{EXP}(2*A) = e^{2A}$
Power	$\text{POWER}(A, B) = A^B$
Natural Log	$\text{LN}(A+B)$
Log Base 10	$\text{LOG}_{10}(A/B)$
SIN, COS, TAN, ASIN, ACOS, ATAN	$\text{SIN}(A - B)$ $\text{ACOS}(A*B)$
Minimum	$\text{MIN}(A/2, B/4, 3*C, D)$
Maximum	$\text{MAX}((A - B)/4, C+D)$

Conditional

Function	Equation
If, Then, Else,	$\text{IF}(A>B) \text{ THEN } (2*C)$
And, Or	
>, <, <=	$\text{IF}(\text{OR}(A=B, B>=C))$
=, >=, <=	$\text{THEN } (D)$

Track & Hold Function

A digital input on the math module accepts a logic level signal from PLCs and other devices to hold the output constant at the last known value.



Real Time Monitoring

895/896M Frequency Output Math Modules

Models

895M-0800: Single I/O channel

896M-0800: Dual I/O channels

Input Ranges

0 to 1mA, 0 to 20mA, or 4 to 20mA DC

0 to 5V or 0 to 10V DC

0 to 20A AC (with AC current sensor)

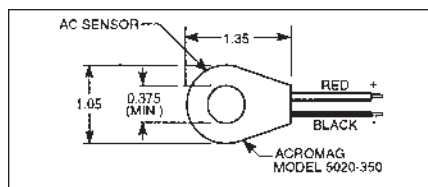
Output Ranges

0 to 36,000 pulse counts per hour,

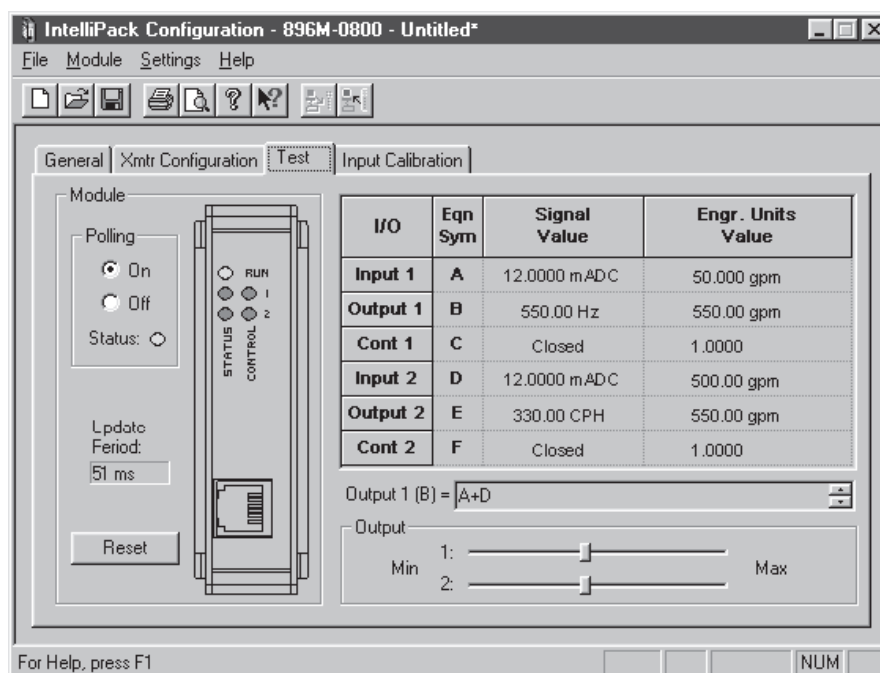
0 to 10KHz Open-drain MOSFETs (60V DC @ 1A),

Solid-state relays (60V DC @ 500mA)

High-voltage open-drain outputs interface to a variety of discrete level devices and to TTL level systems with the use of internal 5V pull-ups.



AC Current Sensor Model 5020-350 (ordered separately)



The test property sheet continuously displays polled information and input/output signal values for easy troubleshooting and diagnostic checkout.

Arithmetic Functions

Function

Addition

Subtraction

Multiplication

Division

Square Root

Absolute Value

Exponential

Power

Natural Log

Log Base 10

SIN, COS, TAN,
ASIN, ACOS, ATAN

Minimum

Maximum

Equation

$A + D$

$A - D$

$4 * A - 6 * D$

$(A/4 + D/2) / 8$

$SQRT(A + D)$

$ABS(A - D)$

$EXP(2 * A) = e^{2A}$

$POWER(A, D) = A^D$

$LN(A + D)$

$LOG10(A/D)$

$SIN(A - D)$
 $ACOS(A * D)$

$MIN(A/2, 3 * D)$

$MAX((A - D)/4, A + D)$

Conditional

Function

If, Then, Else,
And, Or
>, <, <=,
=, >=, <=

Equation

$IF(A > D) THEN (2 * B)$

$IF(OR(A = D, D <= 4 * A) THEN (E/2)$

Track & Hold Function

Discrete inputs on the math module accept logic level signals from PLCs and other devices to hold the associated output constant at the last known value. This function is helpful in determining conditions at the time of a critical event.



■ 892/894M Performance Specs

■ General

Analog to Digital Converter (ADC)
16-bit Σ - Δ A/D converter.

Ambient Temperature Effect

Better than $\pm 0.005\%$ of input span per $^{\circ}\text{C}$ or $\pm 1\mu\text{V}$, whichever is greater.

Noise Rejection

Normal Mode: 40dB @ 60Hz, 100 ohm unbalance.
Common Mode: 100dB @ 60Hz, 100 ohm unbalance.
(49.9 ohm unbalance for process current inputs).

Response Time (for input step change)

800mS typical to 98% of final output value.

Input Overvoltage Protection

Bipolar Transient Voltage Suppressors (TVS).

■ DC Current Input

DC Current Input Ranges

Input Ranges	Resolution
0 to 1mA DC	0.0370%
0 to 20mA DC	0.0025%
4 to 20mA DC	0.0025%

DC Current Input Impedance

49.9 ohms.

DC Current Input Accuracy

Better than 0.05% of input span, typical.
Better than 0.3% of input span typ. for 0-1mA range.

■ DC Voltage Input

DC Voltage Input Ranges

Input Ranges	Resolution
0 to 5V DC	0.0030%
0 to 10V DC	0.0025%

Input impedance

Greater than 500K ohms.

DC Voltage Input Accuracy

Better than 0.05% of input span, typical.

■ Output (DC V/mA)

D/A Converter

16-bit Σ - Δ .

Current Output

Ranges: 0-1mA, 0-20mA, 4-20mA.
Compliance: 10V minimum (500 Ω load).
Accuracy: 0.025% of span (0-1mA: 0.3% of span).

Voltage Output

Ranges: 0-5V, 0-10V.
Compliance: 10mA maximum with short circuit protection. 1 ohm output impedance.
Accuracy: 0.025% of span.

Accuracy (overall input to output)

Better than 0.075% of span, typical.
Better than 0.5% of span for 0-1mA, typical

■ Environmental

Ambient Temperature

Operating: -25 to 70 $^{\circ}\text{C}$ (-13 to 158 $^{\circ}\text{F}$).
Storage: -40 to 85 $^{\circ}\text{C}$ (-40 to 185 $^{\circ}\text{F}$).

Relative Humidity

5 to 95%.

Power Requirements

10 to 36V DC. 120mA @ 24V. 200mA @ 15V.

Isolation (optical)

3-way (input/output/power).
Input circuits share a common.
1500V AC peak or 250V AC (354V DC) continuous.

Radiated Field Immunity (RFI)

EN61000-4-3, EN50082-1.

Electromagnetic Field Immunity (EMI)

Less than $\pm 0.25\%$ of output span effect under the influence of electromagnetic fields from switching solenoids, commutator motors, and drill motors.

Electrical Fast Transient (EFT)

EN61000-4-4, EN50082-1.

Surge Withstanding Capability (SWC)

EN61000-4-5, EN50082-1.

Electrostatic Discharge (ESD)

EN61000-4-2, EN50082-1.

Radiated Emissions

EN50081-1 for Class B equipment.

Approvals

CE marked.
UL listed
cUL listed
Hazardous Loc.: Class I; Division 2; Groups A, B, C, D.

■ Configuration

Software Configuration

Units are fully programmable via the Windows XP/Vista/7 IntelliPack Configuration Program. Configuration downloads from PC through EIA232 serial port using Acromag 800C-SIP kit.

LED Indicators

LEDs indicate power and status.

■ Physical

Enclosure

Case: Self-extinguishing NYLON type 6.6 polyamide thermoplastic UL94 V-2 NEMA Type 1 enclosure.

Connectors (Removable Terminal Blocks)

Wire Range: AWG #14-22 (AWG #12 stranded only).

Printed Circuit Boards

Military grade FR-4 epoxy glass circuit board.

Dimensions

1.05W x 4.68H x 4.35D inches.
26.7W x 118.9H x 110.5D millimeters.

Shipping Weight

1 pound (0.45 Kg) packed.

■ Ordering Information

IMPORTANT: All IntelliPack units require initial software configuration (order 800C-SIP). See Note 1 below.

892M-0500

Dual input computation module with single output.

894M-0500

Quad input computation module with single output.

5020-350

AC current sensor. Required for AC inputs.. See Page 205 for more information.

800C-SIP

Software Interface Package.
Only one kit is required for all IntelliPack models. See diagram on Page 83 for included parts.

5034-225

USB-to-RS232 adapter. See page 121 for more info.

PS5R-D24

Power supply (24V DC, 2.1A). See Power Supplies on Page 199.

TBK-B02

Optional terminal block kit, barrier strip style, 4 pcs.

TBK-S02

Optional terminal block kit, spring clamp style, 4 pcs.

NOTE 1: To order factory configuration, call Acromag for a configuration form which must accompany your order. Also, append "-C" to model number (example: 892M-0500-C). 800C-SIP kit is still recommended.



Optional terminal blocks: barrier strip (left) and spring clamp (right). Cage clamp terminal is standard.



■ 895/896M Performance Specs

■ General

Analog to Digital Converter (ADC)

16-bit Σ - Δ A/D converter.

Input Accuracy

Better than $\pm 0.05\%$ of input span.

Input Zero Dropout Threshold

0 to 10% of input span, user-defined.

Ambient Temperature Effect

Better than $\pm 0.005\%$ of input span per $^{\circ}\text{C}$ or $\pm 1\mu\text{V}$, whichever is greater.

Noise Rejection

Normal Mode: Better than 40dB @ 60Hz.

Common Mode: Better than 100dB @ 60Hz.

Input Overvoltage Protection

Bipolar Transient Voltage Suppressors (TVS).

Input Scaling

Input signal endpoints are scaled using IntelliPack Configuration Software.

Response Time (for input step change)

70ms typical to 98% of final output value.

■ DC Current Inputs

DC Current Input Ranges

0 to 1mA, 0 to 20mA, 4 to 20mA DC.

DC Current Input Impedance

49.9 ohms.

■ DC Voltage Inputs

DC Voltage Input Ranges

0 to 5V, 0 to 10V DC.

DC Voltage Input impedance

Greater than 500K ohms.

■ Frequency Output

Output Type

Open-drain MOSFETs, 60V DC @ 1A DC.

On resistance: 0.2 ohms.

Frequency Range

0 to 10KHz (100% scalable) or

0 to 36,000 counts per hour (CPH).

Output Scaling

Output signal endpoints are scaled using IntelliPack Configuration Software. Output frequency is limited from a minimum span of 0-10Hz to a maximum span of 0-10KHz or from 0-10CPH to 0-36000 CPH.

Output Pullups

470 ohms to 5V via pullup terminals.

60V DC with external pullup resistor.

Output Duty Cycle

User-defined on-time from 0 to 100% of frequency range.

■ Relay Control Outputs

Solid-State Relay

Form A normally-open switch.

Maximum current: 500mA DC.

Maximum off-state voltage: 60V DC.

Maximum on-state resistance: 0.7 ohms.

■ Environmental

Ambient Temperature

Operating: -25 to 70°C (-13 to 158°F).

Storage: -40 to 85°C (-40 to 185°F).

Relative Humidity

5 to 95%.

Power Requirements

10 to 36V DC. 55mA @ 24V.

Isolation (optical)

4-way (input/output/relays/power).

Input circuits share a common.

1500V AC peak or 250V AC (354V DC) continuous.

Radiated Field Immunity (RFI)

EN61000-4-3, EN50082-1.

Electromagnetic Field Immunity (EMI)

Less than $\pm 0.25\%$ of output span effect under the influence of electromagnetic fields from switching solenoids, commutator motors, and drill motors.

Electrical Fast Transient (EFT)

EN61000-4-4, EN50082-1.

Surge Withstanding Capability (SWC)

EN61000-4-5, EN50082-1.

Electrostatic Discharge (ESD)

EN61000-4-2, EN50082-1.

Radiated Emissions

EN50081-1 for Class B equipment.

Approvals

CE, UL listed (USA, Canada).

UL3121 - general product safety.

■ Configuration

Software Configuration

Units are fully programmable via the Windows

XP/Vista/7 IntelliPack Configuration

Program. Configuration downloads from PC through

EIA232 serial port using Acromag 800C-SIP kit.

LED Indicators

LEDs indicate power, status, and relay.

■ Physical

Enclosure

Case: Self-extinguishing NYLON type 6.6 polyamide thermoplastic UL94 V-2 NEMA Type 1 enclosure.

Connectors (Removable Terminal Blocks)

Wire Range: AWG #14-24.

Printed Circuit Boards

Military grade FR-4 epoxy glass circuit board.

Dimensions

1.05W x 4.68H x 4.35D inches.

26.7W x 118.9H x 110.5D millimeters.

Shipping Weight

1 pound (0.45 Kg) packed.

■ Ordering Information

IMPORTANT: All IntelliPack units require initial software configuration (order 800C-SIP). See Note 1 below.

895M-0800

Single channel math module with one frequency output and one control/relay output.

896M-0800

Dual channel math module with two frequency outputs and two control/relay outputs.

5020-350

AC current sensor. Required for AC inputs..

See Page 205 for more information.

800C-SIP

Software Interface Package.

Only one kit is required for all IntelliPack models.

See diagram on Page 83 for included parts.

5034-225

USB-to-RS232 adapter. See page 121 for more info.

PS5R-D24

Power supply (24V DC, 2.1A).

See Power Supplies on Page 199.

TBK-802

Optional terminal block kit, barrier strip style, 4 pcs.

TBK-502

Optional terminal block kit, spring clamp style, 4 pcs.

NOTE 1: To order factory configuration, call Acromag for a configuration form which must accompany your order. Also, append "-C" to model number (example: 892M-0500-C). 800C-SIP kit is still recommended.



Optional terminal blocks: barrier strip (left) and spring clamp (right). Cage clamp terminal is standard.



NEMA-4X, IP65



APM765 Panel Meter

Description

The APM765 displays data collected from process current, DC voltage and temperature inputs. Several output options convert the display into a transmitter with proportional 4-20mA output or a serial communication interface. A relay output option adds limit alarm and pump control capabilities.

Process inputs can be scaled with or without applying an input for virtually any engineering units. Temperature inputs can be programmed to display in degrees Fahrenheit or Celsius.

Inputs

4-20mA DC, ± 20 mA DC, ± 10 V DC,
Type J, K, T, E thermocouples,
100 ohm platinum RTDs

Outputs (optional)

4-20mA (sink/source)
Dual SPDT (Form C) 3A relays
RS-232, RS-422/485 serial communication

Power Requirements

Standard unit: 85-265V AC or 90-265V DC
Optional: 12-24V AC or 12-36V DC

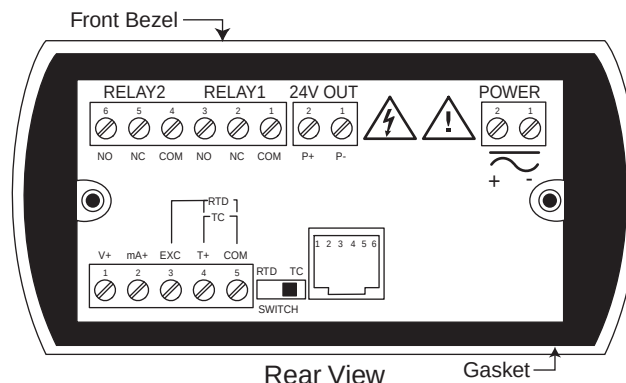
Operating Temperature

0 to 65°C

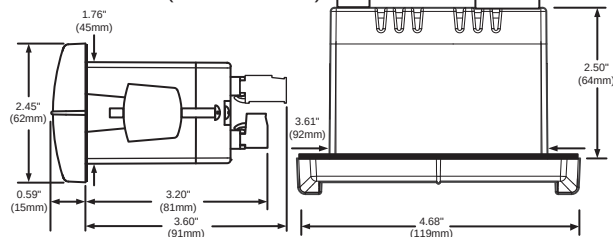
Approvals

CE marked. UL, cUL listed.

Meter with Relays Option



Panel cutout required:
1.772" x 3.622" (45mm x 92mm)



Special Features

- Universal input (TC, RTD, mA, V DC)
- Sunlight-readable display (adjustable intensity)
- Push-button or PC programmable
- Dual relay option for limit alarms or pump control (with alternation)
- Isolated 4-20mA output options (sink/source)
- Single/dual 24V DC isolated power options
- Modbus RTU communication option
- Data acquisition and logging capabilities with MeterView software
- Universal power supply 90-265 VAC/VDC
- Shallow depth package (3.6" behind panel)

Easy Setup

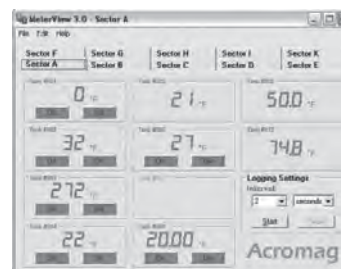
The APM765 is very easy to set up and program using the simple four-button configuration interface. There is only one switch on the entire meter – no jumpers – and never any need to open the case. The meter is also programmable using a PC and the MeterView software. A copy function quickly clones setups from other units.

Applications

- Process & temperature monitoring
- High & low alarms
- Latching or non-latching relays
- Pump alternation control
- Time delay & fail-safe relays
- Minimum & maximum readings

Data Logging

Software provides a convenient way to collect data generated by the APM765's serial output. Users can select the logging time interval and the engineering units for display on the computer screen. Data is written to a file that can be imported into spreadsheets or other applications.





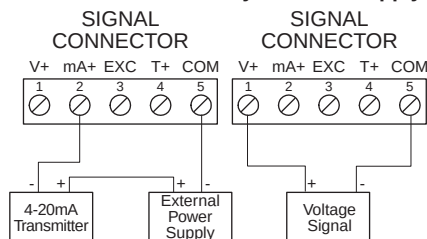
DC Process and Temperature Inputs

The APM765 is factory calibrated to accept 4-20 mA, ± 10 VDC, Type J, K, T, E thermocouples and 100 ohm platinum RTDs. Process inputs can be scaled with or without applying an input for virtually any engineering units. Temperature inputs can be programmed to display in degrees Fahrenheit or Celsius and a type K thermocouple can display up to 2300°F.

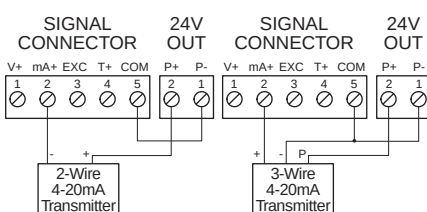
Current/Voltage Input

Setting up the meter to accept a current or voltage input is very easy. All setup steps are performed by pushbuttons or through software so there are no switches or jumpers to adjust.

Transmitter Powered by External Supply



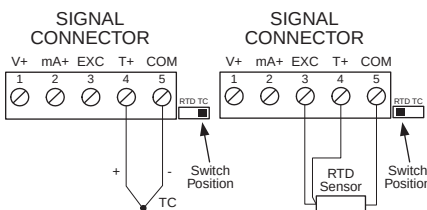
Transmitters Powered by Internal Supply (Optional)



Thermocouple/RTD Input

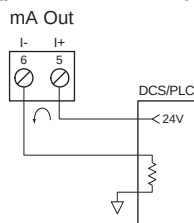
Setting up the APM765 to accept thermocouple or RTD input is simply a matter of setting a switch at the rear of the case and selecting the input type from the menu.

Meters accept J, K, T, or E type thermocouples as well as two, three, or four-wire 100 ohm platinum RTDs.

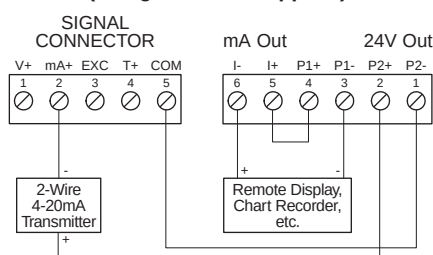


Isolated 4-20mA Output

Standard 4-20 mA Sinking Output (powered externally)

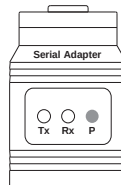


Sourced 4-20 mA Output and Input Signal Powered by Panel Meter (using dual 24V supplies)



Serial or Modbus Output

The APM765 can be used as a data acquisition device, with the added benefit of a digital display, by connecting an optional RS-232 or RS-422/485 serial communication adapter.



Acromag offers MeterView software for simple data acquisition and to program the meter.

Serial Communications

METER ADDRESS

Modbus protocol: 1 - 247 (default 247).

BAUD RATE

300 - 19,200 bps (default 2400).

TRANSMIT TIME DELAY

Programmable between 0 and 199mS or Transmitter always on for RS422 communication (default 10mS).

DATA

8 bit (1 start bit, 1 stop bit).

PARITY

None, even, or odd (default even).

BYTE-TO-BYTE TIMEOUT

0.01 - 2.54 seconds (default 0.01 seconds).

TURN AROUND DELAY

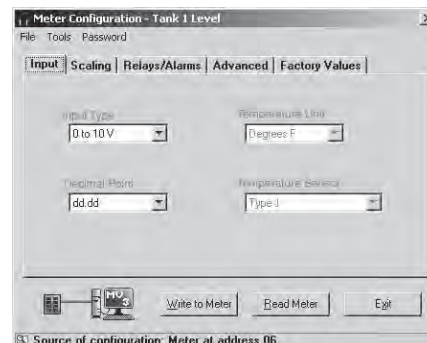
Less than 2mS (fixed).

MeterView Software

MeterView software enables PC programming of the APM765 and sets up data logger operation.

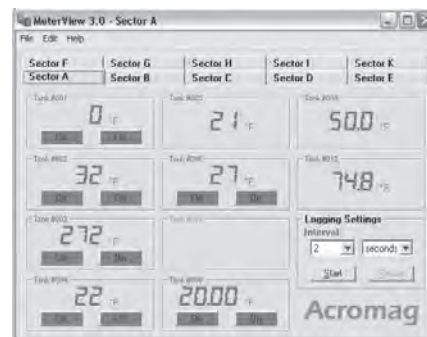
Remote Programming

MeterView software allows all setup parameters to be programmed from a PC and saved to a file for reporting or programming other meters.



Data Acquisition

MeterView software provides a convenient way to collect the data generated from the serial output of up to 100 panel meters. The user can select the logging time interval and the engineering units that will be displayed on the computer screen. Data is written to a file that could then be imported into a spreadsheet or other application.



Sample File Generated by MeterView

PD765 Log File

Name: C:\MV3\Logfile.htm

Created: 2/26/2004 5:34:12 PM

Serial Port: COM 1

Connection speed: 2400 Baud

Logging rate: 1 update every 10 seconds

Date & Time	Tag Number	Address	Display	Units	Relay 1	Relay 2
2/26/2004 5:34:12 PM	Tank 1 Level	06	17.70	Feet	P1 On	P2 Off
2/26/2004 5:34:12 PM	Tank 2 Level	07	18.18	Feet	P3 Off	P4 Off
2/26/2004 5:34:12 PM	Tank 3 Level	08	20.54	Feet	P5 On	P6 Off
2/26/2004 5:34:12 PM	Tank 1 Temp	09	74	°F	Off	Off
2/26/2004 5:34:12 PM	Tank 2 Temp	10	72	°F	Off	Off
2/26/2004 5:34:12 PM	Tank 3 Temp	11	72	°F	Off	Off
2/26/2004 5:34:22 PM	Tank 1 Level	06	17.58	Feet	P1 On	P2 Off
2/26/2004 5:34:22 PM	Tank 2 Level	07	18.04	Feet	P3 Off	P4 Off
2/26/2004 5:34:22 PM	Tank 3 Level	08	19.79	Feet	P5 Off	P6 Off
2/26/2004 5:34:22 PM	Tank 1 Temp	09	74	°F	Off	Off
2/26/2004 5:34:22 PM	Tank 2 Temp	10	72	°F	Off	Off
2/26/2004 5:34:22 PM	Tank 3 Temp	11	72	°F	Off	Off
2/26/2004 5:34:32 PM	Tank 1 Level	06	16.47	Feet	P1 On	P2 Off
2/26/2004 5:34:32 PM	Tank 2 Level	07	16.87	Feet	P3 Off	P4 Off
2/26/2004 5:34:32 PM	Tank 3 Level	08	17.10	Feet	P5 Off	P6 Off
2/26/2004 5:34:32 PM	Tank 1 Temp	09	74	°F	Off	Off



Performance Specifications

Specifications apply to operation at 25°C.

General

DISPLAY

0.56" (14.2 mm) red LEDs. Four digits (-1999 to 9999).

DISPLAY INTENSITY

Eight user-selectable intensity levels.

FRONT PANEL

NEMA 4X, IP65. Panel gasket provided.

PROGRAMMING METHODS

Four front panel push buttons, PC and MeterView software, or cloning with Copy feature.

NOISE FILTER

Programmable between 2 - 199 (0 will disable filter).

DISPLAY UPDATE RATE

1.8-2.5/sec for TC input or 3.7-5/sec for process/RTD.

OVERRANGE AND UNDERRANGE

Display flashes 9999 (over) or -1999 (under).

MAX/MIN DISPLAY

Stored until reset by user or meter is turned off.

NON-VOLATILE MEMORY

All programmed settings are stored in nonvolatile memory for a minimum of ten years if power is lost.

POWER

AC: 85-265 VAC, 50/60 Hz, 20 VA.

DC: 90-265 VDC, 20 W.

Option: 12-36 VDC or 12-24 VAC.

REQUIRED FUSE

UL Recognized, 5A max, slow blow (up to six meters may share one fuse).

NORMAL MODE REJECTION

64 dB at 50/60 Hz.

ISOLATION

Input or output to power line: 4kV.

Input or output to P1 or P2: 500V.

Input to output: 500V.

P1 to P2: 500V.

ENVIRONMENTAL

Operating range: 0 to 65°C (32 to 149°F).

Storage range: -40 to 85°C (-40 to 185°F).

Relative humidity: 0 to 90% non-condensing.

CONNECTIONS

Power & Signal: removable screw terminal blocks accept 12 to 26 AWG. Serial: RJ11 header, standard on all meters.

ENCLOSURE

1/8 DIN, high impact plastic, 94V-0, color: gray.

WEIGHT

8 oz (2.27 g) (no options).

WARRANTY

3 years parts and labor.

Process Inputs

INPUTS

Field selectable: ± 20 mA DC and ± 10 VDC

ACCURACY

$\pm 0.05\%$ of calibrated span ± 1 count, square root: 10-100% F.S.

LOW-FLOW CUTOFF

0 to 9999 (0 disables cutoff function).

DECIMAL POINT

Up to three decimal places: d.ddd, dd.dd, ddd.d, or dddd.

CALIBRATION

Internal or external signal or with PC.

CALIBRATION RANGE

User Programmable over entire range of meter.

INPUT IMPEDANCE

Voltage range: greater than 1M ohms.

Current range: 50-100 ohms.

INPUT OVERLOAD

Protected by automatically resettable fuse.

TEMPERATURE DRIFT

± 50 PPM/°C.

TRANSMITTER SUPPLY

Isolated, one or two transmitter supplies (optional)

P1 (-1 option): 24 VDC $\pm 10\%$ @ 200mA max.

P1/P2 (-2 option)

P1: 24 VDC $\pm 10\%$ @ 200mA.

P2: 24 VDC $\pm 10\%$ @ 40mA.

Temperature Inputs

INPUTS

Factory calibrated, field selectable: type J, K, T, or E thermocouples and 100 ohm. platinum RTD (0.00385 or 0.00392 curve).

RESOLUTION

1°; type T, 1° or 0.1°.

ACCURACY

Type	Temperature Range	Accuracy
J	-58 to 1382°F (-50 to 750°C)	$\pm 2^\circ\text{F}$ ($\pm 1^\circ\text{C}$)
K	-58 to 2300°F (-50 to 1260°C)	$\pm 2^\circ\text{F}$ ($\pm 1^\circ\text{C}$)
T	-292 to 700°F (-180 to 371°C)	$\pm 2^\circ\text{F}$ ($\pm 1^\circ\text{C}$)
E	-58 to 1578°F (-50 to 870°C)	$\pm 2^\circ\text{F}$ ($\pm 1^\circ\text{C}$)
RTD	-328 to 1382°F (-200 to 750°C)	$\pm 1^\circ\text{F}$ ($\pm 1^\circ\text{C}$)

COLD JUNCTION REFERENCE

Automatic.

TEMPERATURE DRIFT

$\pm 2^\circ\text{C}$ maximum; 0 to 65°C ambient temperature.

OFFSET ADJUSTMENT

Programmable to $\pm 19.9^\circ$. This allows the user to apply an offset value to the temperature being displayed.

INPUT IMPEDANCE

Greater than 100k ohms.

SENSOR BREAK

All relays and alarm status LEDs go to alarm state.

Analog output may go to pre-programmed state.

Display will flash.

Relays

RATING

2 SPDT (form C); rated 3 amps @ 30 VDC or 3 amps @ 250 VAC resistive load; 1/14 HP @ 125/250 VAC for inductive loads.

DEADBAND

0-100% of full scale, user selectable.

HIGH OR LOW ALARM

User may program any alarm for high or low.

RELAY OPERATION

1. Automatic (non-latching).
2. Latching.
3. Pump alternation control.

RELAY RESET

User selectable via front panel buttons or PC.

1. Automatic reset only (non-latching).
2. Automatic + manual reset any time (non-latching).
3. Manual reset only, at any time (latching).
4. Manual reset only after alarm condition has cleared (latching).

Automatic reset: Resets when input passes reset point.

Manual reset: Front panel ACK button.

TIME DELAY

0 to 199 seconds, on and off delays; programmable.

FAIL-SAFE OPERATION

Programmable, independent for each relay. Relay coils are energized in normal condition. In case of alarm or power failure, relays will go to de-energized state.

AUTO INITIALIZATION

When power is applied to the meter, relays will reflect the state of the input to the meter.

Isolated 4-20mA Output

OUTPUT RANGE

1.00 to 23.00mA typical. Scalable for 0.00 to 23.99mA.

Factory calibrated for 4-20 mA.

ACCURACY

$\pm 0.1\%$ F.S. ± 0.004 mA.

TEMPERATURE DRIFT

50 PPM/°C from 0 to 65°C ambient.

Note: Analog output drift is separate from input drift.

OUTPUT LOOP RESISTANCE

Power Supply	Minimum	Maximum
24 VDC	10 ohms	700 ohms
35 VDC (external)	100 ohms	1200 ohms

OUTPUT MAXIMUM LOAD

$R_{LOAD} (max) = (V_{SUPPLY} - 10V) / 0.020A$

EXTERNAL POWER RANGE

10-35 VDC.



Ordering Information

Panel Meters

Please select models from the table below.

Model No.	Power: 85-265V AC or 90-265V DC	Power: 12-36V DC or 12-24V AC	24V DC Supply	Dual 24V DC Supplies	Two Relays	4-20mA Output	Modbus Interface
APM765-6R0-00	•						•
APM765-6R0-10	•		•				•
APM765-6R2-00	•				•		•
APM765-6R2-10	•		•		•		•
APM765-6R3-00	•					•	•
APM765-6R3-10	•		•			•	•
APM765-6R3-20	•			•		•	•
APM765-7R0-00		•					•
APM765-7R2-00		•			•		•
APM765-7R3-00		•				•	•

Accessories

APMA2801

NEMA 4X plastic enclosure, holds one APM765 meter

APMA6845

Pipe-mount kit (2-inch pipe) for use with APMA2801.

APMA7232

RS-232 serial adapter, APMA7420 included

APMA7420

Standard modular cable, 7ft. (2.1m).

APMA7422

RS-422/485 serial adapter, APM7420 included

APMA7503-1, APMA7503-2, APMA7503-3

MeterView software with 1 meter license (-1 model), 10 meter license (-2), or 100 meter license (-3).

Field Enclosures

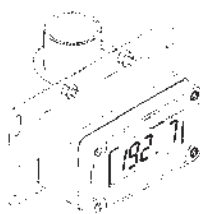
Low-Cost Plastic NEMA 4X Enclosure

The APMA2801 is a low-cost, compact, plastic NEMA 4X enclosure that will house one meter.

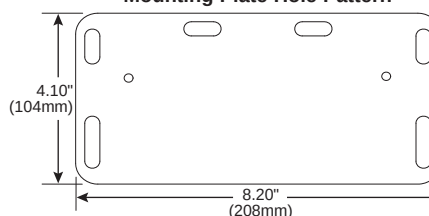


Pipe Mount Kit

The APMA6845 kit mounts a panel meter inside an APMA2801 NEMA 4X enclosure to a 2-inch pipe.



Mounting Plate Hole Pattern



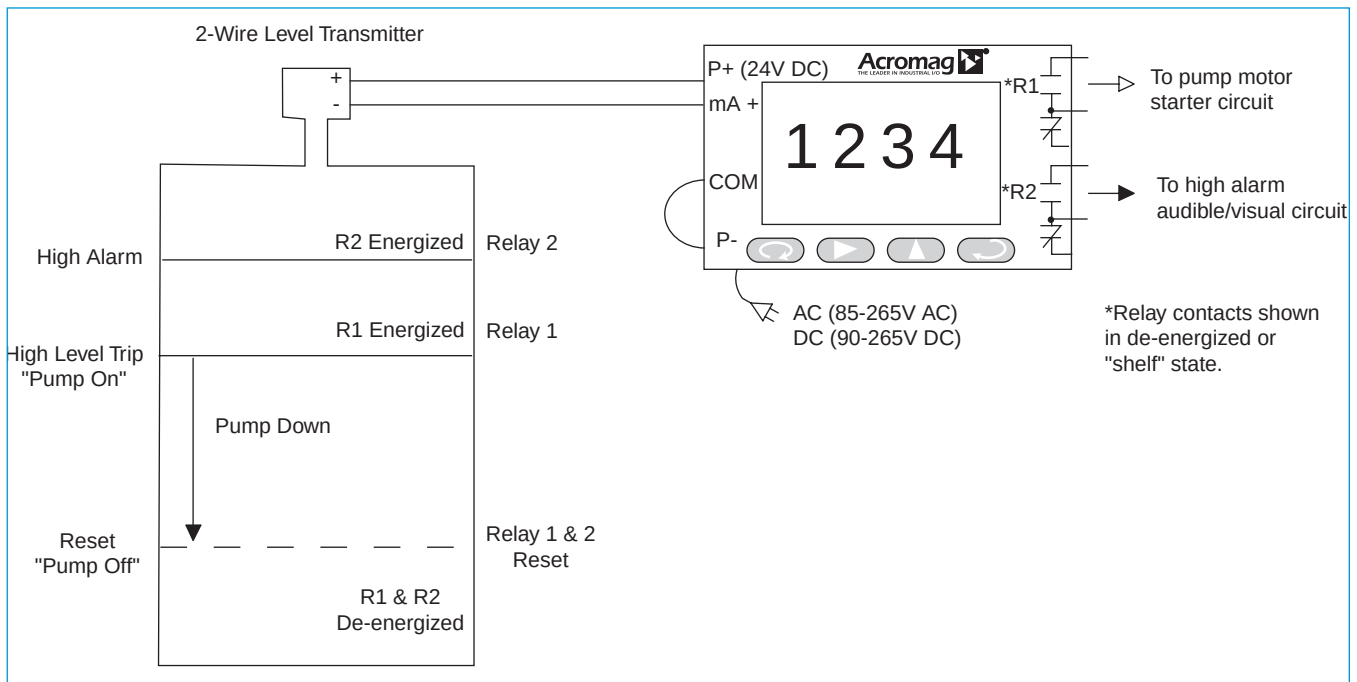


Application #1: Pump down with high alarm

Problem: Need to excite a 2-wire, 4-20mA continuous level sensor, and provide two relay outputs. One relay for pump down and one relay for high alarm with automatic or manual reset.

Solution

Model APM765-6R2-10 panel meter



APM Configuration & Set-up Example

Input: 4-20mA

Dec. Point: As needed (d.ddd, dd.dd, ddd.d, or dddd)

Relay 1 Action: Automatic reset

Relay 1 Setpoint: As needed (e.g.; 16mA)

Relay 1 Reset: As needed (e.g.; 8mA)

Relay 2 Action: Auto-manual reset

Relay 2 Setpoint: As needed (e.g.; 18mA)

Relay 2 Reset: As needed or same as relay 1

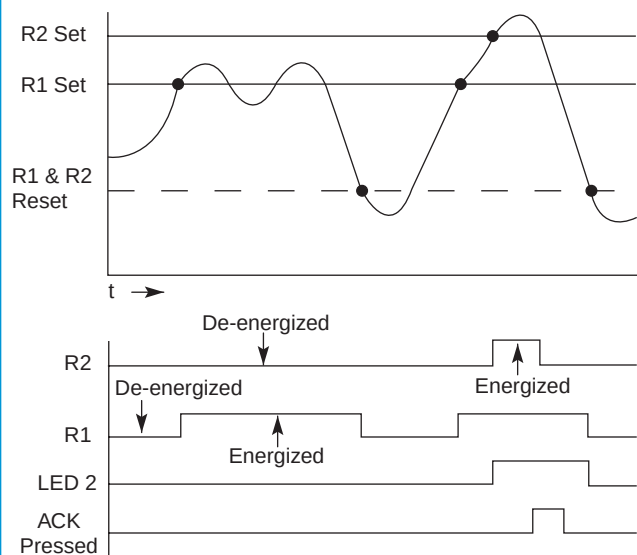
Failsafe Operation: None

Time Delay: None

Display Scale 1: 4mA = 0% (or as needed)

Display Scale 2: 20mA = 100% (or as needed)

Relay Operation Timing Diagrams





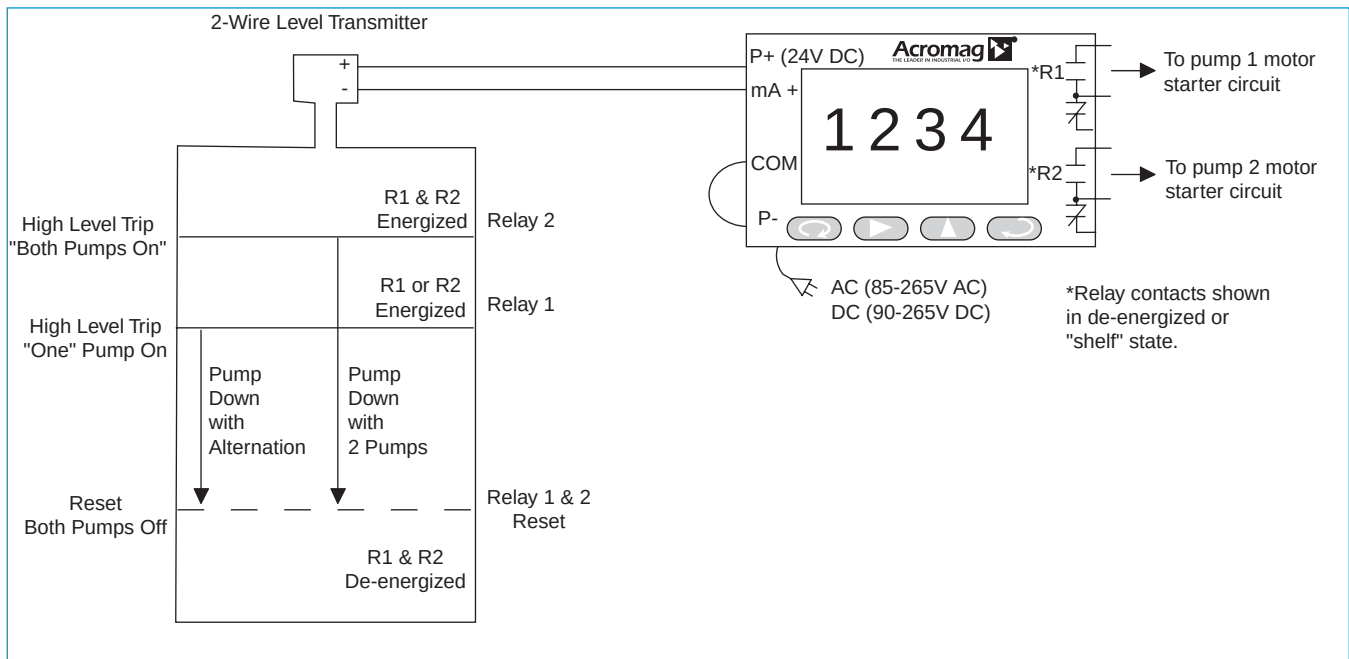
Application #2: Pump down with duplex pump control

Problem: Need to excite a 2-wire, 4-20mA continuous level sensor, and provide two relay outputs for duplex pump control with alternation. Both pumps must be turned on if one can't handle the duty.

Solution

Model APM765-6R2-10 panel meter

For extra high/low alarm relays with built-in silence circuit (manual reset and acknowledge), use additional APM765-6R2-00 and wire in series with 4-20mA loop.



APM Configuration & Set-up Example

Input: 4-20mA

Dec. Point: As needed (d.ddd, dd.dd, ddd.d, or dddd)

Relay 1 Action: Alternate

Relay 1 Setpoint: As needed (e.g.; 16mA)

Relay 1 Reset: As needed (e.g.; 8mA)

Relay 2 Action: Alternate

Relay 2 Setpoint: Above relay 1 (e.g.; 18mA)

Relay 2 Reset: Same as relay 1

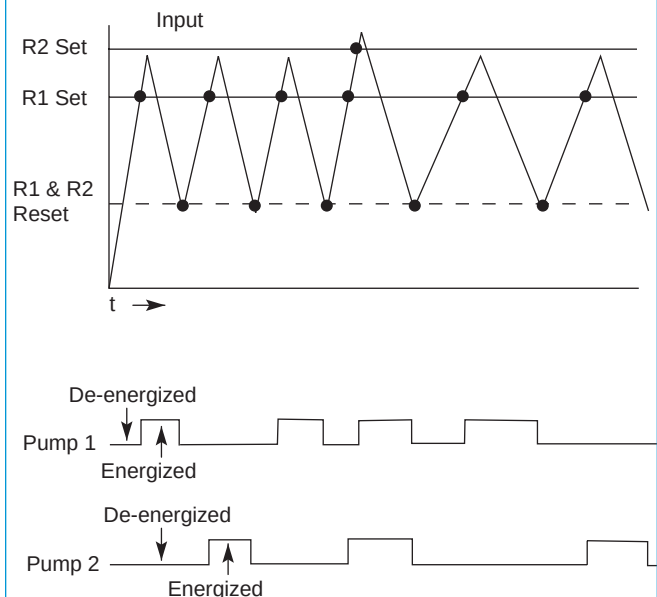
Failsafe Operation: None

Time Delay: None

Display Scale 1: 4mA = 0% (or as needed)

Display Scale 2: 20mA = 100% (or as needed)

Relay Operation Timing Diagrams



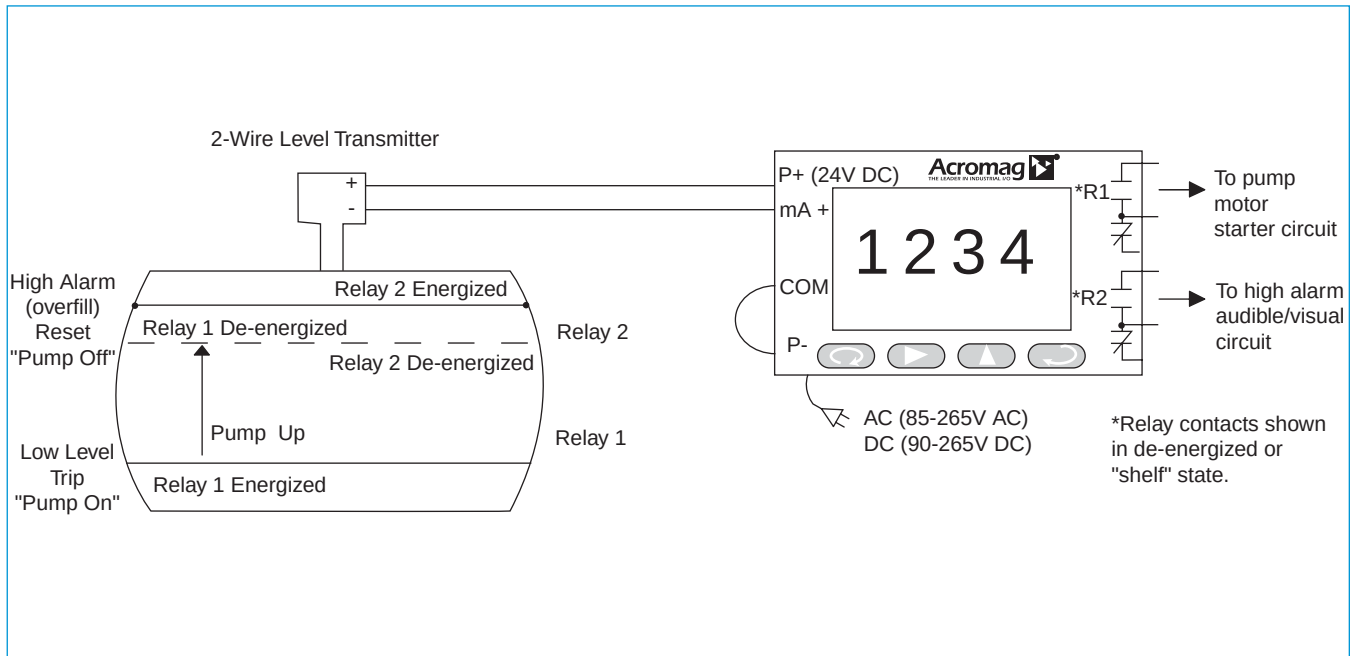


Application #3: Pump Up with overflow alarm

Problem: Need to excite a 2-wire, 4-20mA continuous level sensor, and provide two relay outputs. One relay is for pump control (filling) and the other relay is for high alarm (overflow) with automatic or manual reset.

Solution

Model APM765-6R2-10 panel meter



APM Configuration & Set-up Example

Input: 4-20mA

Dec. Point: As needed (d.ddd, dd.dd, ddd.d, or dddd)

Relay 1 Action: Automatic

Relay 1 Setpoint: As needed (e.g.; 6mA)

Relay 1 Reset: As needed (e.g.; 16mA)

Relay 2 Action: Auto manual

Relay 2 Setpoint: As needed (e.g.; 18mA)

Relay 2 Reset: As needed (e.g.; 16mA)

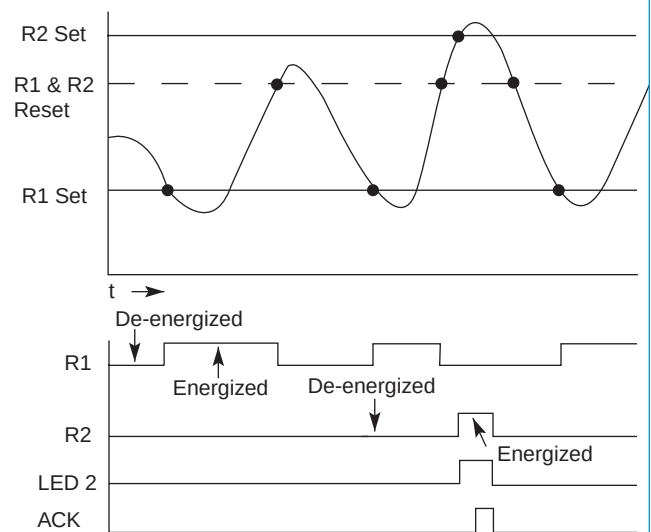
Failsafe Operation: None

Time Delay: None

Display Scale 1: 4mA = 0% (or as needed)

Display Scale 2: 20mA = 100% (or as needed)

Relay Operation Timing Diagrams



8B

8B Isolated Analog Signal Conditioners



8B Modules

This new line of high-density isolated analog signal conditioners provides 17 family groups with a total of 102 models that interface to a wide variety of voltage, current, temperature, position, frequency, and strain measuring devices. Housed in a package only one-fifth the size of competing products, the 8B module series offers fully functional instrument-class performance with superior specifications such as 0.05% accuracy, 0.02% linearity, 3- to 5-pole filtering, 1500Vrms isolation, low output noise and much more.

Custom Signal Conditioning

Custom modules are available: consult factory for minimum quantity and pricing details on custom input ranges, output ranges, bandwidth, and other key parameters.



8B modules are an ideal front-end for Acromag Ethernet I/O modules.

◆ Features

- 0.05% Accuracy
- 0.02% Linearity
- 1500Vrms Isolation
- 3- to 5-Pole Low-Pass Filter
- 120dB CMR
- ANSI/IEEE C37.90.1 Transient Protection
- Field I/O Protection from 30 to 240VAC Continuous
- -40 C to 85 C Operating Temperature Range
- CE Compliant
- UL Listing Pending

◆ Applications

- Systems Requiring High Channel-to-Channel Isolation, Noise Rejection, Surge Suppression, and Amplification
- Designed for "Front-End" Signal Conditioning or Embedded Applications:
 - DCS, PLC, Controllers, Data Acquisition, Remote I/O, Recorders, etc.
 - Acromag EtherStax® Analog I/O Modules
 - Acromag BusWorks® Analog I/O Modules
 - Acromag VME, Industry Pack, PCI, and CompactPCI Analog I/O Modules
 - "On-Board" Embedded OEM Applications
- Protects Equipment, Increases Accuracy, and Installs/Expands Easily
- Low-Cost, High-Density Amplifier System

Isolated Analog Signal Conditioners

VOLTAGE INPUT MODULES, 3Hz BANDWIDTH Page 6

MODEL	INPUT RANGE	OUTPUT RANGE
8B30-01	±10mV	±5V
8B30-02	±50mV	±5V
8B30-03	±100mV	±5V
8B31-01	±1V	±5V
8B31-02	±5V	±5V
8B31-03	±10V	±5V
8B31-04	±1V	0 to +5V
8B31-05	±5V	0 to +5V
8B31-06	±10V	0 to +5V
8B31-07	±20V	±5V
8B31-08	±20V	0 to +5V
8B31-09	±40V	±5V
8B31-10	±40V	0 to +5V
8B31-12	±60V	±5V
8B31-13	±60V	0 to +5V

CURRENT INPUT MODULES, 3Hz Page 8

MODEL	INPUT RANGE	OUTPUT RANGE
8B32-01	4 to 20mA	0 to +5V
8B32-02	0 to 20mA	0 to +5V

ISOLATED TRUE RMS INPUT MODULES Page 10

MODEL	INPUT RANGE	OUTPUT RANGE
9B33-01	0mV to 100mV	0V to +5V
9B33-02	0V to 1 V	0V to +5V
9B33-03	0V to 10V	0V to +5V
9B33-04	0V to 100V	0V to +5V
9B33-05	0V to 300V	0V to +5V
9B33-06	0A to 1A	0V to +5V

LINEARIZED 2- OR 3-WIRE RTD MODULES (0 to +5V OUTPUT, 3Hz BW) Page 12

MODEL	TYPE	INPUT RANGE
8B34-01	100Ω Pt	-100°C to +100°C (-148°F to +212°F)
8B34-02	100Ω Pt	0°C to +100°C (+32°F to +212°F)
8B34-03	100Ω Pt	0°C to +200°C (+32°F to +392°F)
8B34-04	100Ω Pt	0°C to +600°C (+32°F to +1112°F)

LINEARIZED 4-WIRE RTD MODULES (0 to +5V OUTPUT, 3Hz BW) Page 14

MODEL	TYPE	INPUT RANGE
8B35-01	100Ω Pt	-100°C to +100°C (-148°F to +212°F)
8B35-02	100Ω Pt	0°C to +100°C (+32°F to +212°F)
8B35-03	100Ω Pt	0°C to +200°C (+32°F to +392°F)
8B35-04	100Ω Pt	0°C to +600°C (+32°F to +1112°F)

POTENTIOMETER INPUT MODULES (0 to +5V OUTPUT, 3Hz BW) Page 16

MODEL	INPUT RANGE	OUTPUT RANGE
8B36-01	0 to 100Ω	0 to +5V
8B36-02	0 to 500Ω	0 to +5V
8B36-03	0 to 1kΩ	0 to +5V
8B36-04	0 to 10kΩ	0 to +5V

THERMOCOUPLE INPUT MODULES (0 to +5V OUTPUT, 3Hz BW) Page 18

MODEL	TYPE	INPUT RANGE
8B37J	J	-100°C to +760°C (-148°F to +1400°F)
8B37K	K	-100°C to +1350°C (-148°F to +2462°F)
8B37T	T	-100°C to +400°C (-148°F to +752°F)
8B37R	R	0°C to +1750°C (+32°F to +3182°F)
8B37S	S	0°C to +1750°C (+32°F to +3182°F)

STRAIN GAGE INPUT MODULES Page 20

MODEL	INPUT RANGE	EXCITATION VOLTAGE	SENS	OUTPUT RANGE	BW
8B38-01	±10mV	+3.333V	3mV/V	±5V	3kHz
8B38-02	±30mV	+10.0V	3mV/V	±5V	3kHz
8B38-05	±20mV	+10.0V	2mV/V	±5V	3kHz
8B38-31	±10mV	+3.333V	3mV/V	±5V	3Hz
8B38-32	±30mV	+10.0V	3mV/V	±5V	3Hz
8B38-35	±20mV	+10.0V	2mV/V	±5V	3Hz

CURRENT OUTPUT MODULES, 100Hz BANDWIDTH Page 22

MODEL	INPUT RANGE	OUTPUT RANGE
8B39-01	0 to +5V	4 to 20mA
8B39-02	±5V	4 to 20mA
8B39-03	0 to +5V	0 to 20mA
8B39-04	±5V	0 to 20mA
8B39-07	±5V	-20 to 20mA

VOLTAGE INPUT MODULES, 1kHz BANDWIDTH Page 24

MODEL	INPUT RANGE	OUTPUT RANGE
8B40-01	±10mV	±5V
8B40-02	±50mV	±5V
8B40-03	±100mV	±5V
8B41-01	±1V	±5V
8B41-02	±5V	±5V
8B41-03	±10V	±5V
8B41-04	±1V	0 to +5V
8B41-05	±5V	0 to +5V
8B41-06	±10V	0 to +5V
8B41-07	±20V	±5V
8B41-08	±20V	0 to +5V
8B41-09	±40V	±5V
8B41-10	±40V	0 to +5V
8B41-12	±60V	±5V
8B41-13	±60V	0 to +5V

► 8B Selection Guide (Continued)

2-WIRE TRANSMITTER INTERFACE MODULES Page 26

MODEL	INPUT RANGE	OUTPUT RANGE
8B42-01	4 to 20mA	0 to +5V
8B42-02	4 to 20mA	+1 to +5V

FREQUENCY INPUT MODULES Page 28

MODEL	INPUT RANGE	OUTPUT RANGE
8B45-01	0 to 500Hz	0 to +5V
8B45-02	0 to 1kHz	0 to +5V
8B45-03	0 to 2.5kHz	0 to +5V
8B45-04	0 to 5kHz	0 to +5V
8B45-05	0 to 10kHz	0 to +5V
8B45-06	0 to 25kHz	0 to +5V
8B45-07	0 to 50kHz	0 to +5V
8B45-08	0 to 100kHz	0 to +5V

LINEARIZED THERMOCOUPLE INPUT MODULES (0 to +5V OUTPUT, 3Hz BW) Page 30

MODEL	TYPE	INPUT RANGE
8B47J-01	J	0°C to +760°C (+32°F to +1400°F)
8B47J-02	J	-100°C to +300°C (-148°F to +572°F)
8B47J-03	J	0°C to +500°C (+32°F to +932°F)
8B47J-12	J	-100°C to +760°C (-148°F to +1400°F)
8B47K-04	K	0°C to +1000°C (+32°F to +1832°F)
8B47K-05	K	0°C to +500°C (+32°F to +932°F)
8B47K-13	K	-100°C to +1350°C (-148°F to +2462°F)
8B47K-14	K	0°C to +1200°C (+32°F to +2192°F)
8B47T-06	T	-100°C to +400°C (-148°F to +752°F)
8B47T-07	T	0°C to +200°C (+32°F to +392°F)

VOLTAGE OUTPUT MODULES, 100Hz BANDWIDTH Page 32

MODEL	INPUT RANGE	OUTPUT RANGE
8B49-01	0 to +5V	-5V to +5V
8B49-02	±5V	-5V to +5V
8B49-03	±5V	0 to +5V
8B49-04	0 to +10V	-10V to +10V
8B49-05	±10V	-10V to +10V
8B49-06	±10V	0 to +10V
8B49-07	±5V	-10V to +10V

VOLTAGE INPUT MODULES, 20kHz BANDWIDTH Page 34

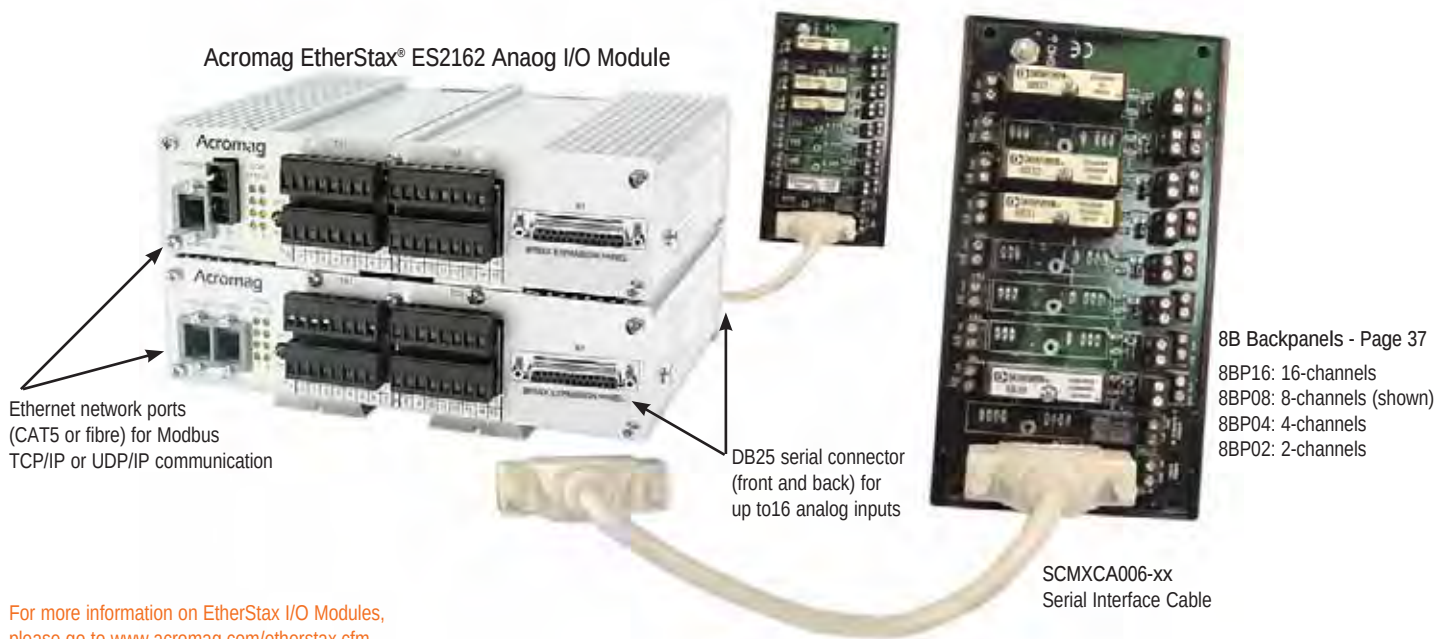
MODEL	INPUT RANGE	OUTPUT RANGE
8B50-01	±20mV	±5V
8B50-02	±50mV	±5V
8B50-03	±100mV	±5V
8B51-01	±1V	±5V
8B51-02	±5V	±5V
8B51-03	±10V	±5V
8B51-04	±1V	0 to +5V
8B51-05	±5V	0 to +5V
8B51-06	±10V	0 to +5V
8B51-07	±20V	±5V
8B51-08	±20V	0 to +5V
8B51-09	±40V	±5V
8B51-10	±40V	0 to +5V
8B51-12	±60V	±5V
8B51-13	±60V	0 to +5V

ACCESSORIES Start on Page 37

MODEL	DESCRIPTION
8BP02	Standard 2-channel backpanel
8BP02-1	8BP02 without cold junction compensation sensor
8BP02-2	8BP02 with DIN rail mounting option
8BP02-3	8BP02-1 with DIN rail mounting option
8BP04	Standard 4-channel backpanel
8BP04-1	8BP04 without cold junction compensation sensor
8BP04-2	8BP04 with DIN rail mounting option
8BP04-3	8BP04-1 with DIN rail mounting option
8BP08	Standard 8-channel backpanel
8BP08-1	8BP08 without cold junction compensation sensor
8BP08-2	8BP08 with DIN rail mounting option
8BP08-3	8BP08-1 with DIN rail mounting option
8BP16	Standard 16-channel backpanel
8BP16-1	8BP16 without cold junction compensation sensor
8BP16-2	8BP16 with DIN rail mounting option
8BP16-3	8BP16-1 with DIN rail mounting option
8BPWR-2	Power Supply Module
SCMXPRT-001	Power supply, 1A, 5VDC, 120VAC
SCMXPRE-001	Power supply, 1A, 5VDC, 220VAC
SCMXPRT-003	Power supply, 3A, 5VDC, 120VAC
SCMXPRE-003	Power supply, 3A, 5VDC, 220VAC
PWR-4505	Power supply, 5A, 5VDC, 85-264VAC
SCMXCA006-xx	System interface cable for backpanels
4001-111	System interface cable for backpanels
8BXIF	DB25 to screw terminal interface board
SCMXRK-002	19-inch metal rack for mounting backpanels
SCMXRAIL1-XX	DIN EN50022-35x7.5 (slotted steel), length -XX in meters
SCMXRAIL2-XX	DIN EN50035-G32 (slotted steel), length -XX in meters
SCMXRAIL3-XX	DIN EN50022-35x15 (slotted steel), length -XX in meters

Isolated Analog Signal Conditioners

◆ Connecting to Acromag Ethernet I/O Modules



Acromag BusWorks® 964EN
Analog Input Module

Acromag BusWorks® 973EN
Analog Output Module

Modbus and Profibus
BusWorks I/O Modules
are also available

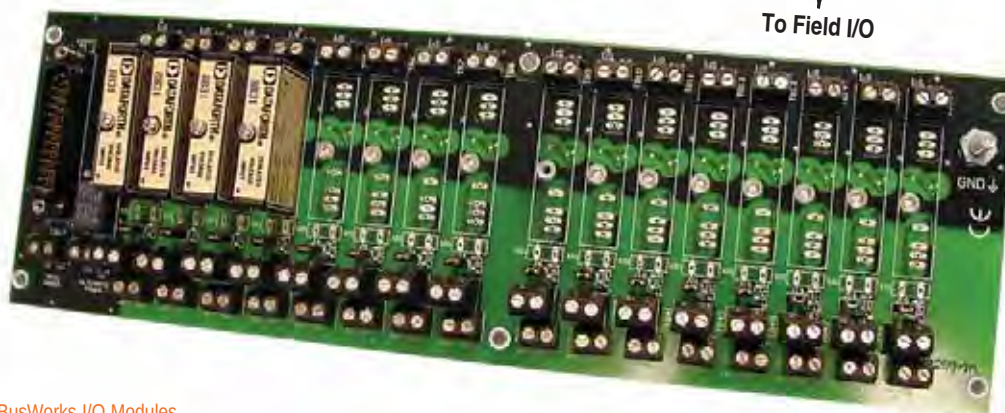
Ethernet network port
for Ethernet/IP or Modbus
TCP/IP communication

To Remote I/O

Up to 12 analog voltage signals per unit

Up to 6 analog voltage signals per unit

To Field I/O



8B Backpanels - Page 37
8BP16: 16-channels
8BP08: 8-channels (shown)
8BP04: 4-channels
8BP02: 2-channels

For more information on BusWorks I/O Modules, please go to www.acromag.com/900EN.cfm.

Power Supplies: PS5R-S Series

PS5R-S Slim Line Universal Power Supplies



Universal Input Power ♦ 10W to 240W Power Range ♦ Compact Design ♦ Worldwide Approvals

Description

Models

PS5R-SB05: 10W power supply, 22.5mm wide
 PS5R-SB12: 15W power supply, 22.5mm wide
 PS5R-SB24: 15W power supply, 22.5mm wide
 PS5R-SC12: 30W power supply, 36mm wide
 PS5R-SC24: 30W power supply, 36mm wide
 PS5R-SD24: 60W power supply, 36mm wide
 PS5R-SE24: 90W power supply, 46mm wide
 PS5R-SF24: 120W power supply, 50mm wide
 PS5R-SG24: 240W power supply, 80mm wide

Input Power Requirement

Universal Input

85 to 264V AC
 100 to 370V DC (10W to 90W units)
 100 to 350V DC (120W and 240W units)

Output

5V DC, 12V DC, or 24V DC

PS5R-S Slim Line models give you all the power of a traditional power supply in only half the space. They feature universal voltage inputs and all the convenient features you've come to expect. Use them in tight spaces or save valuable DIN rail space while still filling your requirements for power. With nine models available, it's easy to find the one that's right for your application!

The PS5R-S Slim Line series has worldwide approvals. It is UL508 listed and approved for Class I Div 2 hazardous locations. The 10W, 15W, 30W and 60W models are also NEC Class 2 rated, while the 120W and 240W even comply with SEMI F47 sag immunity requirements.

For accessibility and convenience, the PS5R-S series has spring-up screw terminals, fused inputs and overload protection. They are DIN Rail or direct surface mountable. No derating means you save money, space and time. You get the power you need; the way you need it.



Finger-safe spring-up screw terminals

Key Features & Benefits

- Lightweight and compact size
- Universal Input (85-264V AC / 100-370V DC)
- Worldwide approvals: CE, UL/cUL, TÜV
 - UL 1604, Class 1, Div 2, Groups ABCD hazardous locations (all units)
 - UL 508 (all units)
 - UL 1310, NEC Class 2 (10W – 60W only)
 - EN50178:1997
 - LVD: EN60950:2000
 - EMC: Directive EN61204-3:2000 (EMI: Class B, EMS: Industrial)
- Power factor correction (EN61000-3-2) (60W to 240W only)
- Meets SEMI F47 sag immunity (120W and 240W only)
- Over-current protection, auto reset
- Over-voltage protection, shut down
- Output voltage adjust (+ / -10%)
- Unique spring-up finger-safe terminals, IP20
- DIN rail or surface mount

Acromag 
 THE LEADER IN INDUSTRIAL I/O

Tel: 248-295-0880 ■ Fax: 248-624-9234 ■ sales@acromag.com ■ www.acromag.com ■ 30765 S Wixom Rd, Wixom, MI 48393 USA



Power Supplies: PS5R-S Series

Easy-to-use

Fast and Easy Installation

IDEC power supplies can quickly snap onto a DIN rail with built-in DIN rail clips that require no additional brackets. They can also be directly mounted on a panel, which means installation is a snap.

IP20 Finger-safe, Spring-up Screw Terminals

Don't worry about losing screws or getting an inadvertent shock from a terminal. The terminals are captive spring-up screws, which makes using them as easy as pushing a screw down and tightening it. They are shock and vibration resistant, and work with ring lugs, fork connectors or stripped wire connections. The terminals are rated IP20 (when tightened) meaning they are recessed to keep fingers and objects from touching the input contacts.

Universal AC/DC Inputs

The power inputs have a range of 85-264V AC to 100-350V DC, and automatically adjust to the correct input power. This makes PS5R-S power supplies suitable for use anywhere in the world.

Output Voltage Adjustment

The output voltage can be easily adjusted within $\pm 10\%$ of the rated voltage.

DC Low Indicator

(15W, 120W & 240W only)

The indicator turns on when the output voltage drops below 80% of the rated value. This assists in troubleshooting power supply problems.

DC ON Indicator

The indicator turns on when the unit is powered up. This is a convenient way to know when the power supply is receiving power.

Reliable Operation

High-performance Output

With very low output ripples of less than 1% peak to peak, the 120W and 240W power supplies are some of the best in the industry. The 240W power supply also has the convenience of two output terminals.

Power Factor Correction (EN61000-3-2)

(60W, 90W, 120W & 240W only)

Power factor correction has also been included to minimize harmonic distortion, resulting in a longer operating life and increased reliability.

Overload Protection

All PS5R-S power supplies are designed with over-current and over-voltage protection to eliminate power supply or equipment damage. With over-current protection, the output voltage automatically drops to zero due to excessive current. When the load returns to a normal level, normal output voltage is restored. With over-voltage protection, the power shuts down when an over-voltage occurs. Only a manual reset can turn the power back on.

Long Life Expectancy

PS5R-S power supplies are very reliable, with a life expectancy of 70,000 hrs. (minimum) or longer, depending on usage.

Ventilation Grill

Provides cooling for the power supply and prevents small objects from falling into the power supply circuitry.

Safety Approvals

SEMI F47

(for 120W & 240W only)

The semiconductor industry requires SEMI F47 approved equipment for use in semiconductor fabrication machinery. The EAC Corp. is a third party agency and a global leader in conducting voltage sag testing on semiconductor equipment. They certified the 120W and 240W to the SEMI F47 standard.

Class I, Div. 2, Groups ABCD

(Ansi/ISA-12.12.01-2011)

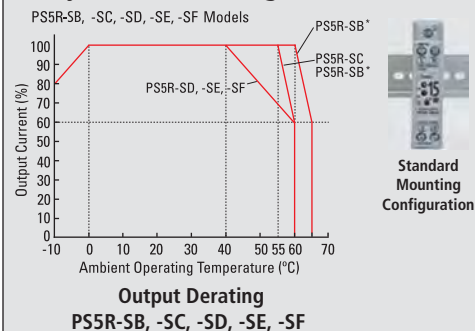
All PS5R-S Slim Line power supplies are approved for use in Class I, Div. 2 environments. They can be used in hazardous locations where flammable liquids, gases, and vapors exist or are normally confined within closed containers.

NEC Class 2 (UL 1310) The 10W, 15W, 30W and 60W PS5R-S Slim Line power supplies are listed according to UL1310, making them compliant to the NEC (National Electric Code) Class 2 rating. For UL1310, the output of the power supplies must be less than 100V AC (under all conditions), have electric shock protection and meet the National Fire Protection Association standards.

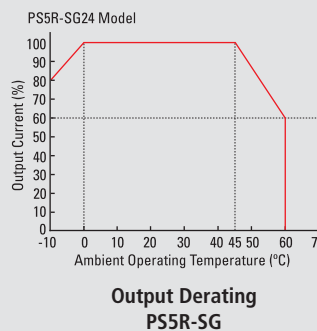
SELV (Safety Extra Low Voltage)

All PS5R-S power supplies are SELV compliant. For safety purposes, regulatory agencies defined the highest voltage a person can sustain, without causing any injury, at approximately 30V AC or 42.4V DC.

Safety Charts - Derating Curves



* Use lower derating curve for -SB units when using non-standard (rotated) mounting configurations.



All Slim Line power supplies are listed to UL508, which allows operation at 100% capacity inside a panel. This eliminates the need to use oversize power supplies or utilize two power supplies derated at 50% of their rated output.

The charts above show that the PS5R-S 10W and 15W (at 60°C), 30W/60W/90W (at 55°C), 120W (at 40°C), and 240W (at 45°C) meet the ambient temperature required by UL508 and EN60950 standards to operate at an output current of 100%. The output current starts to derate beyond the required temperature.



Power Supplies: PS5R-S Series

Performance Specifications

Input

Input Voltage (single-phase, 2-wire)

85 to 264V AC, 105 to 370V DC (10W - 90W units)
85 to 264V AC, 105 to 350V DC (120W, 240W units).

Input Current (maximum)

PS5R-SB05, PS5R-SB12, PS5R-SB24:
0.45A at 100V AC, 0.3A at 200V AC.

PS5R-SC12, PS5R-SC24:

0.9A at 100V AC, 0.6A at 200V AC.

PS5R-SD24:

1.7A at 100V AC, 1.0A at 200V AC.

PS5R-SE24:

2.3A at 100V AC, 1.4A at 200V AC.

PS5R-SF24:

1.8A at 100V AC, 1.0A at 200V AC.

PS5R-SG24:

3.5A at 100V AC, 1.7A at 200V AC.

Internal Fuse Rating

PS5R-SB05, PS5R-SB12, PS5R-SB24: 2A.

PS5R-SC12, PS5R-SC24, PS5R-SD24: 3.15A.

PS5R-SE24, PS5R-SF24: 4A.

PS5R-SG24: 6.3A.

Inrush Current (cold start)

50A maximum (at 200V AC).

Leakage Current (at no load)

PS5R-SB05, PS5R-SB12, PS5R-SB24 :
132V AC: 0.38mA max.; 264V AC: 0.75mA max.

PS5R-SC12, PS5R-SC24, PS5R-SD24, PS5R-SE24:
0.75mA maximum.

PS5R-SF24, PS5R-SG24:

1mA maximum.

Typical Efficiency

PS5R-SB05, PS5R-SB12, PS5R-SB24:
69% at 5V DC, 75% at 12VDC, 79% at 24V DC.

PS5R-SC12, PS5R-SC24:

78% at 12V DC, 80% at 24V DC.

PS5R-SD24: 83% at 24V DC.

PS5R-SE24: 82% at 24V DC.

PSR5-SF24, PS5R-SG24: 84% at 24V DC.

Output

Output Voltage and Current Ratings

See derating curve charts on previous page.

PS5R-SB05, PS5R-SB12, PS5R-SB24:

2.0A at 5V DC, 1.2A at 12V DC, 0.65A at 24V DC.

PS5R-SC12, PS5R-SC24:

2.5A at 12V DC, 1.3A at 24V DC.

PS5R-SD24: 2.5A at 24V DC.

PS5R-SE24: 3.75A at 24V DC.

PSR5-SF24: 5A at 24V DC.

PS5R-SG24: 10A at 24V DC.

Voltage Adjustment

±10% (V. ADJ control on front).

Output Holding Time

20ms minimum (at rated input and output).

Starting Time

PS5R-SB05, PS5R-SB12, PS5R-SB24: 200ms maximum.

PSR5-SF24: 650ms maximum.

PS5R-SG24: 500ms maximum.

Rise Time

All units except PSR5-SF24, PS5R-SG24:
100ms maximum (at rated input and output).

PSR5-SF24, PS5R-SG24: 200ms maximum.

Line Regulation

0.4% maximum

Load Regulation

All units except PS5R-SG24: 1.5% maximum.

PS5R-SG24: 0.8% maximum.

Temperature Regulation

0.05% °C maximum.

Ripple Voltage

All units except PSR5-SF24, PS5R-SG24:
2% peak-to-peak maximum (including noise).

PSR5-SF24, PS5R-SG24:

1% peak-to-peak maximum (including noise).

Over-current Protection

PS5R-SB05, PS5R-SB12, PS5R-SB24:
105% or more, auto reset

PS5R-SC12, PS5R-SC24, PS5R-SD24:
105% or more, auto reset

PS5R-SE24: 105 to 130%, auto reset

PS5R-SF24, PS5R-SG24: 103 to 110%, auto reset

Over-voltage Protection

120% minimum shutdown.

Environmental

Dielectric Strength

Between input and ground: 2000V AC, 1 minute.

Between input and output: 3000V AC, 1 minute.

Between output and ground: 500V AC, 1 minute.

Insulation Resistance

100M ohms min. between input and output terminals.

Operating Temperature

See derating curve charts on previous page.

PS5R-SB05, PS5R-SB12, PS5R-SB24:

-10 to 65°C (14 to 149°F)

All other units: -10 to 60°C (14 to 140°F)

Storage Temperature

-25 to 75°C (-13 to 167°F)

Operating Humidity

20 to 90% relative humidity (no condensation)

Vibration Resistance

10 to 55Hz frequency, 0.375mm amplitude.

Shock Resistance

300m/S², (30G) 3 times each in 6 axes.

Physical

Dimensions and Weight

See dimension diagrams on next page.

Terminal Screw

M3.5 Phillips head screw (screw terminal type).

IP Protection

IP20 finger-safe.

LED Indicators

Operation: Green.

Voltage low: Amber (10W, 15W, 120W, 240W only).

Approvals

EMC: EN61204-3 (EMI: Class B, EMS: Industrial),
c-UL (CSA 22.2 No. 14), ANSI/ISA-12.12.01-2011,
UL508, LVD: EN60950, EN50178

Ordering Information

Models

PS5R-SB05

Power supply, 10W, 2.0A at 5V DC

PS5R-SB12

Power supply, 15W, 1.2A at 12V DC

PS5R-SB24

Power supply, 15W, 0.65A at 24V DC

PS5R-SC12

Power supply, 30W, 2.5A at 12V DC

PS5R-SC24

Power supply, 30W, 1.3A at 24V DC

PS5R-SD24

Power supply, 60W, 2.5A at 24V DC

PS5R-SE24

Power supply, 90W, 3.75A at 24V DC

PS5R-SF24

Power supply, 120W, 5A at 24V DC

PS5R-SG24

Power supply, 240W, 10A at 24V DC

Accessories

PS9Z-5R1B

Panel mounting bracket for model PS5R-SB

PS9Z-5R2B

Panel mounting bracket for model PS5R-SB
(flat side mounting)

PS9Z-5R1C

Panel mounting bracket for models PS5R-SB, PS5R-SD

PS9Z-5R1G

Panel mounting bracket for models PS5R-SF, PS5R-SG

BNL5

Din rail end stop, small

BNL6

Din rail end stop, medium

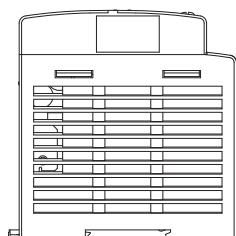
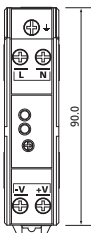


Power Supplies: PS5R-S Series

Dimensions

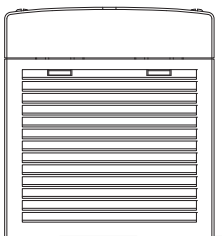
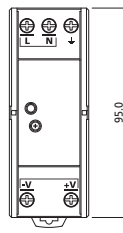
PS5R-SB

Height 90mm (3.54")
Width 22.5mm (0.89")
Depth 95mm (3.74")
Weight 0.16kg (0.35lb.)



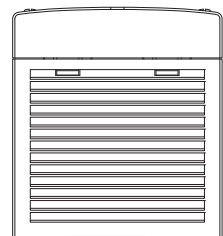
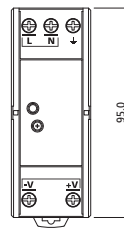
PS5R-SC

Height 95.0mm (3.74")
Width 36.0mm (1.42")
Depth 108.0mm (4.25")
Weight 0.25kg (0.55lb.)



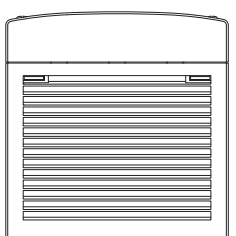
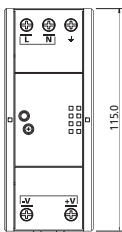
PS5R-SD

Height 95.0mm (3.74")
Width 36.0mm (1.42")
Depth 108.0mm (4.25")
Weight 0.29kg (0.63lb.)



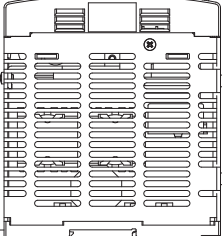
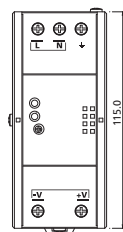
PS5R-SE

Height 115.0mm (4.53")
Width 46.0mm (1.81")
Depth 121.0mm (4.77")
Weight 0.44kg (0.97lb.)



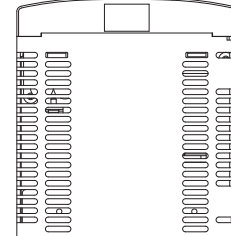
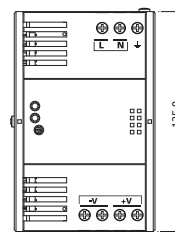
PS5R-SF

Height 115.0mm (4.53")
Width 50.0mm (1.97")
Depth 129.0mm (5.08")
Weight 0.63kg (1.39lb.)



PS5R-SG

Height 125.0mm (4.92")
Width 80.0mm (3.15")
Depth 149.5mm (5.89")
Weight 1.00kg (2.20lb.)





Model 4001-096 USB-to-Ethernet Adapter



Acromag Ethernet I/O Module



To PC's USB port

Simplifies configuration of Acromag Ethernet I/O Modules ♦ Prevents disruption of existing LANs

Description

This device is a USB-to-Ethernet adapter that you can use to communicate with any Acromag Ethernet I/O product for the purpose of setup and re-configuration for your application. It is recommended for initial communication with Acromag Ethernet devices so that you do not have to disrupt your existing network connection.

Small and light, the adapter connects to the USB port of your PC and provides an Ethernet jack to connect to your Ethernet I/O modules. The adapter gets its power through the USB connection, so no power cord is necessary. It's compatible with USB 1.0, 1.1, and 2.0 ports.

Key Features & Benefits

- Connects to 10/100 Ethernet networks via USB
- Compact and rugged for greater portability
- Powered via USB—no external power needed
- One Type-A male USB connector compatible with USB 1.0, 1.1 and 2.0 ports
- One RJ-45 network port connects to any 10/100 Mbps network
- Plug-and-Play compatible with Windows 98SE, ME, 2000, XP

Performance Specifications

Standards

USB 1.0, 1.1, 2.0 IEEE 802.3, IEEE 802.3u

Ports

One Type-A Male Connector, One RJ-45 Port

LEDs Link/Activity

Cabling

Type Cat 5 Ethernet Cable

Dimensions

7.96" x 1.00" x 0.69" (202.3 x 25.35 x 17.65 mm)

Weight

0.8 oz (23 kg)

Power

3.3V low power consumption

Certification

FCC Class B, CE Class B, UL

Operating Temp.

32 to 158°F (0 to 70°C)

Storage Temp.

32 to 158°F (0 to 70°C)

Operating Humidity

10 to 90% non-condensing

Storage Humidity

10 to 90% non-condensing

Ordering Information

NOTE: For more information visit www.acromag.com.

Adapter

4001-096#

USB Ethernet Adapter

Package Contents

- One USB Ethernet Adapter
- One Driver Installation CD
- One Quick Installation Guide
- One User Guide included on Installation CD
- One Acromag Ethernet I/O Instruction Sheet
- One IP Address Batch Configuration CD

Cables

See following page for diagrams.

5035-355

Category 5e STP patch cable, 3 foot long, single-shielded with drain wire, RJ45 plug at both ends

5035-360

Category 5e STP crossover cable, 5 foot long, single-shielded with a drain wire, RJ45 plug at both ends

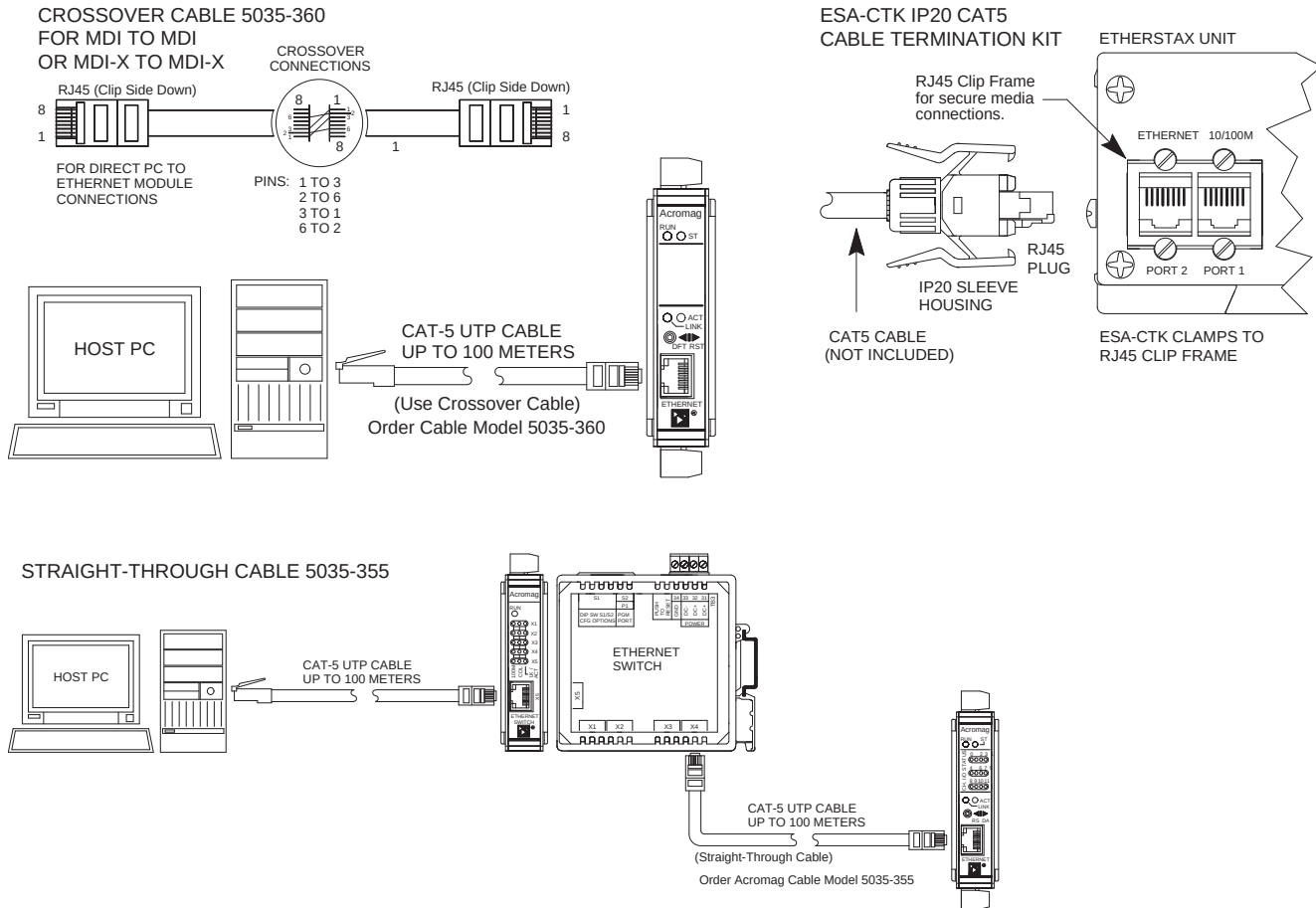
ESA-CTK

Cable termination kit for EtherStax units, accommodates IP20 clip-type plug connectors for secure connections.

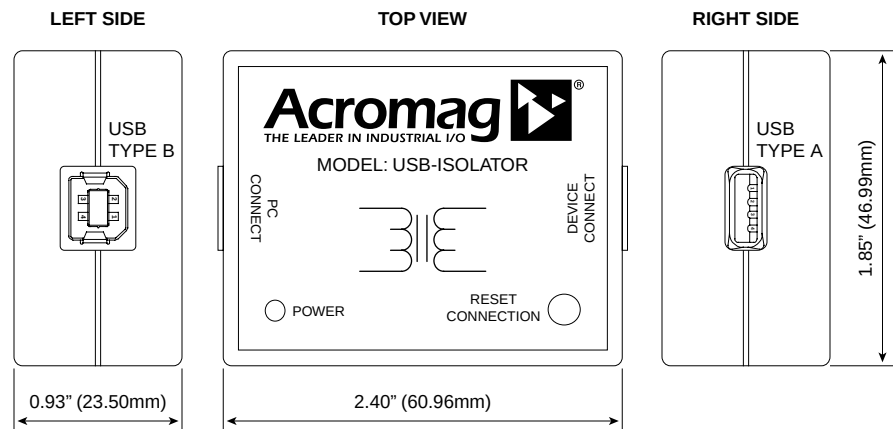


Accessories

Diagrams



USB-ISOLATOR USB-to-USB Isolator



USB-powered, USB 2.0 and 1.1 compatible ♦ 1500V AC / 2100V DC isolation ♦ No drivers required

Description

This compact, industrial-grade isolator provides a high-voltage isolation barrier between a computer and a connected USB device. The isolation protects equipment from electrical surges and transient voltage spikes. It also eliminates ground loop currents flowing between the PC and peripherals which can cause damage and inaccurate measurements. Additionally, isolation minimizes conducted noise from static discharge, magnetic fields, and radio frequency interference.

Acromag's USB isolator is very easy to use. The isolator inserts in-line with the USB connection and operates transparently. No special software drivers are required. The unit receives power from the PC's USB port and isolates that power to the connected device. High noise immunity and low radiated emissions ensure reliable data transfer in sensitive applications.

A number of high-performance features help provide convenient and dependable operation. The green LED indicates that power is being received and blinks if the connected device draws too much current. An internal jumper lets you switch from Full Speed (12 Mbps) to Low Speed (1.5 Mbps) communication. The reset button offers a simple way to reinitialize a connected device without breaking the cable connection. High-retention USB sockets keep cables securely attached under shock and vibration.

Key Features & Benefits

- Isolates and protects a USB peripheral from a USB host
- Electrical isolation up to 1500V AC / 2100V DC
- Common mode filtering on all data lines
- Built-in surge/transient suppression up to 8kV on all ports
- Self-powered through the USB port
- Supports USB 2.0 full speed (12 Mbps) and USB 1.1 low speed (1.5 Mbps) data rates with jumper-selection
- LED for power indication and diagnostics
- Reset button to reinitialize and re-enumerate peripheral devices
- Output short circuit protection with auto-retry
- No software or configuration required (transparent operation)
- Uses standard high-retention USB Type A/B cable connections (includes 1m cable)
- Compact size and rugged design for harsh environments
- Wide ambient temperature operation -40 to 70°C (-40 to 158°F)
- CE, FCC, UL/cUL approvals

Ordering Information

Models

USB-ISOLATOR

USB isolator, includes USB cable (Part # 4001-112) for isolator-to-PC connection

ST13C-SIP

USB isolator and two USB cables (Part # 4001-112, 4001-113) for configuration of Acromag ST130 Series head-mount transmitters

Accessories

4001-112

USB cable, 1 meter, with Type A to Type B plugs

4001-113

USB cable, 1 meter, with Type A to Mini-B plugs





USB-ISOLATOR USB-to-USB Isolator

Performance Specifications

■ USB Port Interface

Standards

USB 1.1 and 2.0 compatible, full speed (12Mbps, default) and low speed (1.5Mbps) data rates supported. For low speed data rates, an internal jumper is provided for user setting. Connection is transparent, no software or configuration is required. Isolator will not be enumerated in the device manager.

■ Physical

Dimensions

2.40" Length x 1.85" Wide x 0.925" High
(60.96mm x 46.99mm x 23.495mm).

Connectors

Standard high retention USB A/B connectors with minimum withdrawal force of 15 Newtons. 1 meter A/B cable included.

PC Connector

USB Type B receptacle

Device Connector

USB Type A receptacle

LED Indicator

Green LED indicates isolator receiving 5V power from the USB computer bus. Flashing indicates short circuit/ retries on peripheral side.

Reset Button

Resets the connection to the USB peripheral device for reinitialization and re-enumeration.

Enclosure Material

ABS Resin, UL94 rated, IP30 plastic case.

■ Environmental

Operating temperature

-40 to 70°C (-40° to 158°F).

Storage temperature

-40 to 85°C (-40 to 185°F).

Relative humidity

5 to 95% non-condensing.

Power

PC Connect Side: Standard USB bus power (5V DC).

Device Connect Side: 5V DC / 120mA with full power connection from PC. Includes over-current protection with auto-retry.

Isolation

1500V AC / 2100V DC peak isolation.

250V AC continuous safety isolation.

Agency Approvals:

CE and FCC compliant. UL/cUL Class 1 Div. 2 Zone 2.

Radiated Field Immunity (RFI)

Designed to comply with IEC1000-4-3 Level 3 and EN50082-1.

Electromagnetic Compatibility (EMC)

Minimum immunity per EN61000-6-2:2001

Electrostatic Discharge (ESD) Immunity

Per IEC61000-4-2.

Radiated Field Immunity (RFI)

Per IEC61000-4-3.

Electrical Fast Transient Immunity (EFT)

Per IEC61000-4-4. Complies with IEC1000-4-4 Level 3 and EN50082-1.

Surge Immunity

Complies with IEC1000-4-5 Level 3 and EN50082-1.

Per IEC61000-4-5.

Conducted RF Immunity (CRFI)

Per IEC61000-4-6.

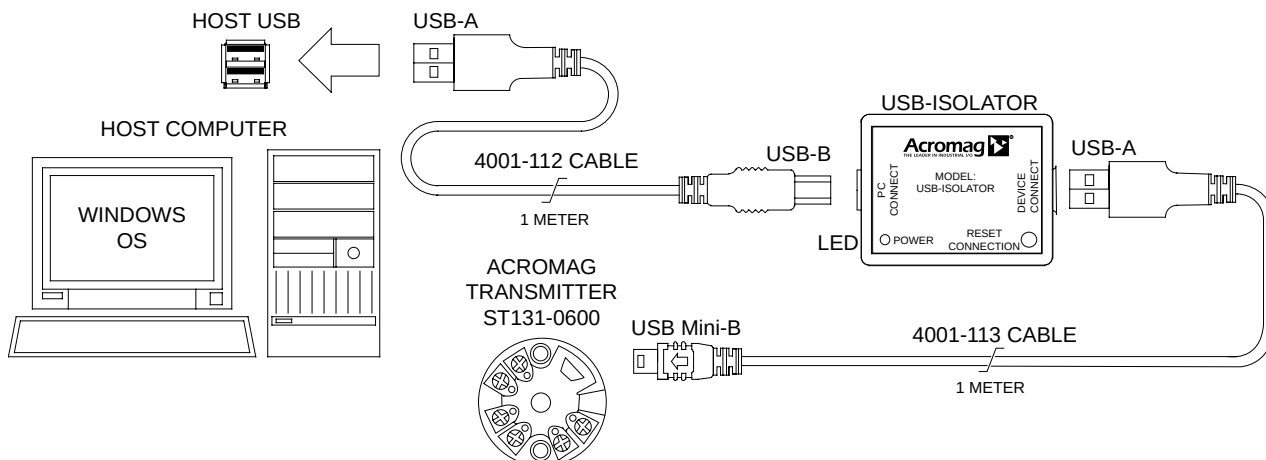
Emissions

Per EN61000-6-4:2001.

Radiated Frequency Emissions

Per CISPR11 Class A. Meets or exceeds EN50081-1 for Class B equipment.

EXAMPLE USB CONNECTION DRAWING

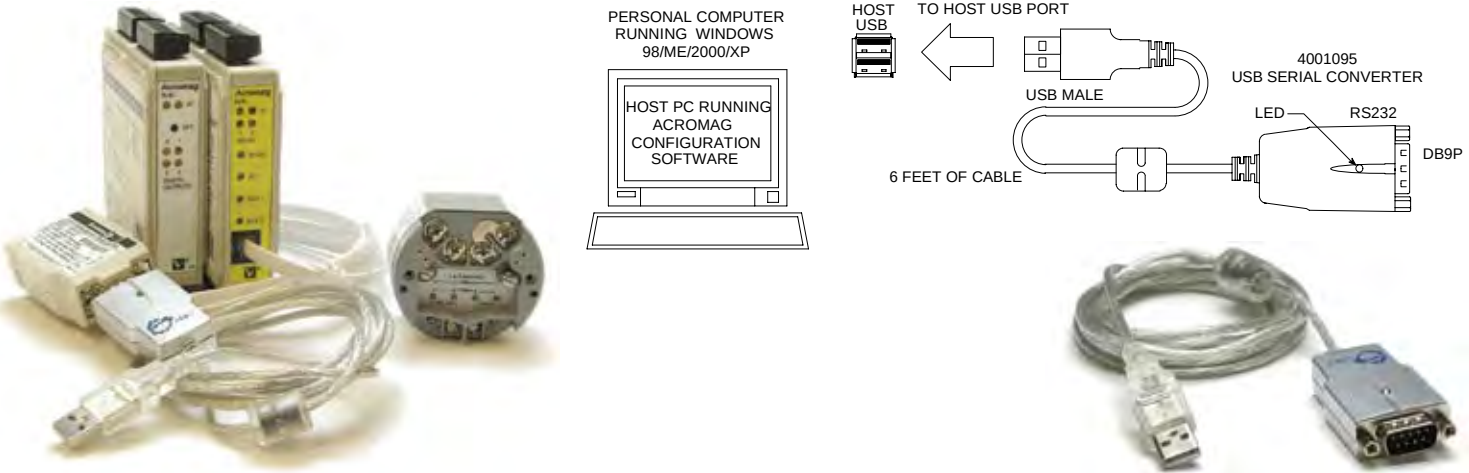


ISO9001
AS9100
MADE IN USA

Acromag
THE LEADER IN INDUSTRIAL I/O

Tel 248-295-0880 ■ Fax 248-624-9234 ■ sales@acromag.com ■ www.acromag.com ■ 30765 Wixom Rd, Wixom, MI 48393 USA

Model 4001-095 USB-to-Serial Adapter



Simplifies configuration of Acromag I/O Modules ♦ Enables configuration via USB port

Description

This device is a USB-to-serial adapter that you can use to communicate with many Acromag I/O products for setup and re-configuration for your application.

Key Features & Benefits

- Connects to I/O modules via USB (other adapters may be necessary)
- Complete RS232 control signals
- Conforms to USB Specification, Version 1.1
- USB-powered
- Cable length, 6 ft., UL approved

Performance Specifications

USB Specification
Version 1.1

Data rate
Up to 115.2Kbps

Environmental Standards
RoHS-compliant

Basic Power Consumption
150mA

PC Requirements
Windows® 7 (32-/64-bit) / Vista (32-/64-bit) / XP (32-/64-bit) / Server 2003 & 2008 (32-/64-bit) / 2000 / ME / 98SE / 98

Ordering Information

NOTE: For more information visit www.acromag.com.

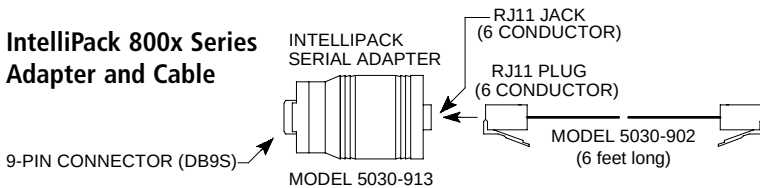
Adapters

- 4001-095**
USB to serial adapter. Includes driver CD and manual.
- 5030-913**
Serial port adapter. DB9S connector to RJ11 jack.
- 5034-202**
RS-485 to 3-wire cable converter and cable, DB-9M to 3 x 12AWG RS-485 cable, 8 ft.
- 5032-287**
RS-232 to 151T transmitter configuration device converter and cable, 6 ft.
- 5034-214**
Non-isolated RS-232 to RS-485 Serial Port Converter, DB-9F to DB-9F.

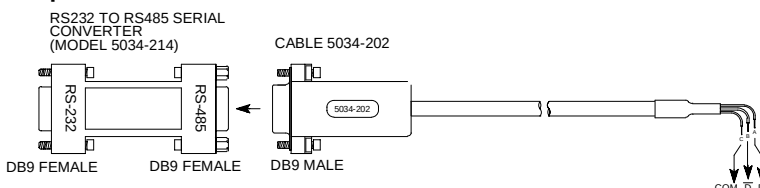
Cables

- 5030-902**
Cable. 6 feet long with RJ11 plug at each end.

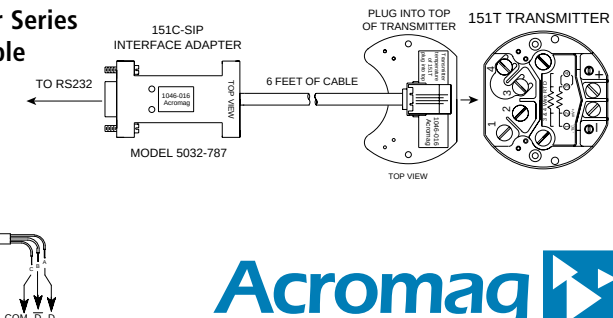
IntelliPack 800x Series Adapter and Cable



900MB Modbus Series Adapter and Cable



151T Transmitter Series Adapter and Cable



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Accessories

Enclosures Explosion-proof and NEMA-rated housings



Industrial housings ♦ Explosion-proof, NEMA-4 water-tight, NEMA-4X stainless steel, NEMA-12 oil-tight

Description

For your convenience, Acromag offers a variety of mounting enclosures to simplify your system installation. Select from units for field-mount, pipe-mount, and wall-mount applications. Consult the factory about agency approvals and certifications.

Ordering Information

NOTE: For more information visit www.acromag.com.

Mounting Accessories

350T-N4-WM
NEMA-4 water-tight enclosure
350T-N12-WM
NEMA-12 oil-tight enclosure

ATW-XPW

Explosion-proof enclosure, for 151T or 155H transmitters

ATW-SSW

NEMA-4X stainless steel non-corrosive enclosure, for 151T or 155H transmitters

ATW-DIN

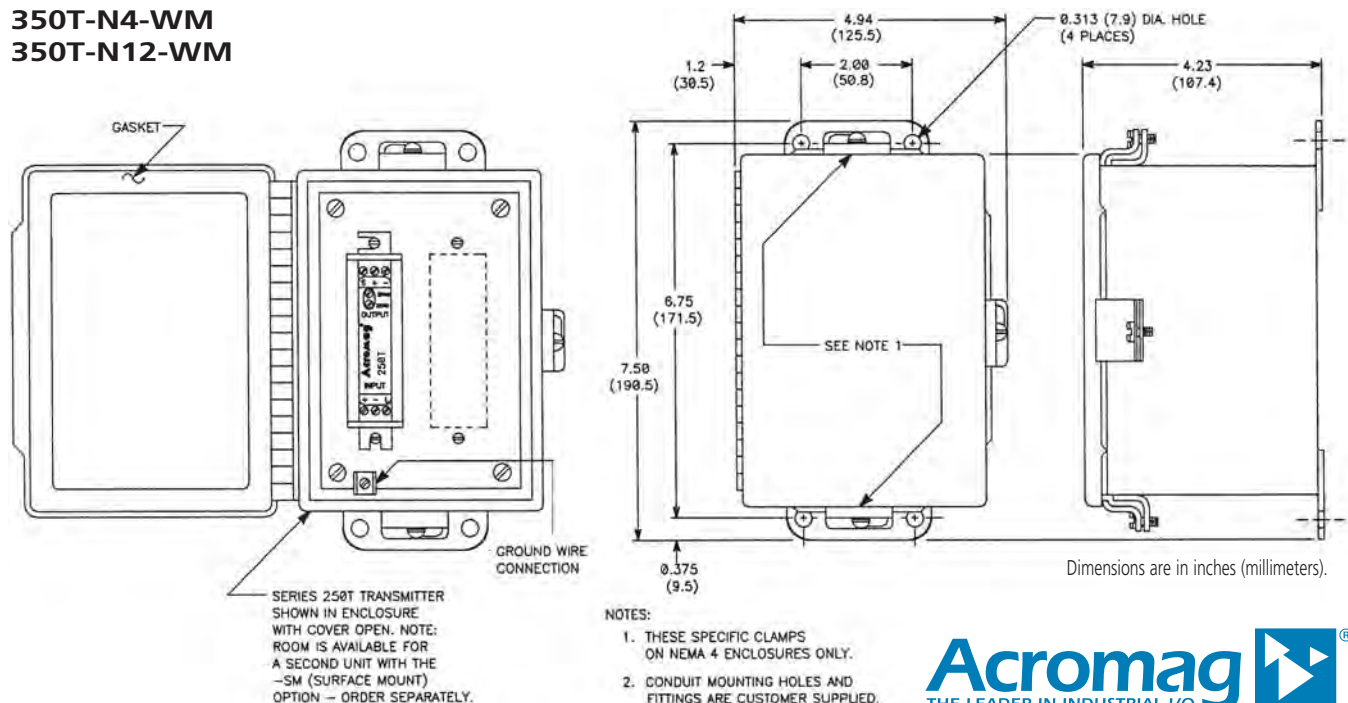
DIN-rail adapter for ATW-XPW

ATW-PM2

2-inch pipe-mount adapter for ATW-XPW

NEMA-4 and NEMA-12 Enclosures

350T-N4-WM 350T-N12-WM



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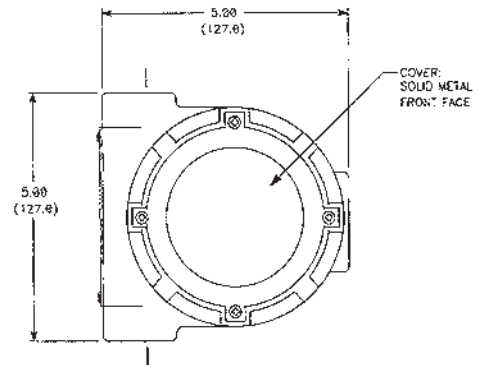
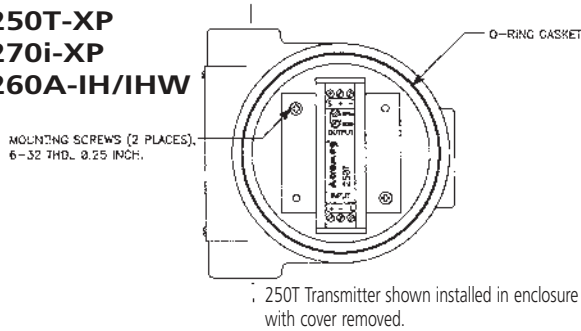
Tel: 248-295-0880 ■ Fax: 248-624-9234 ■ sales@acromag.com ■ www.acromag.com ■ 30765 S Wixom Rd, Wixom, MI 48393 USA



Dimensions

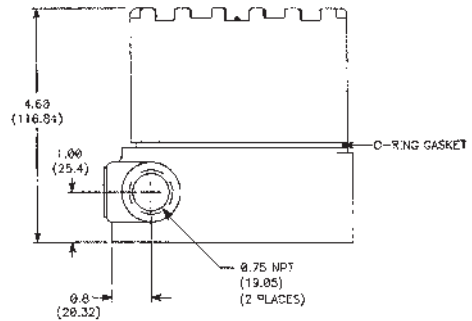
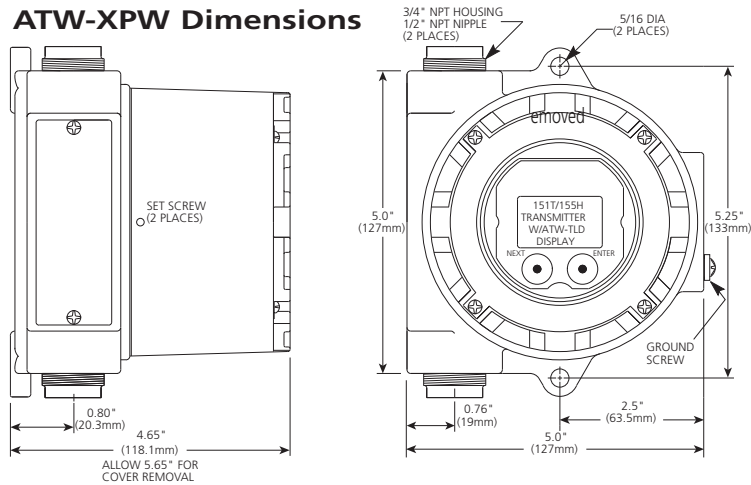
Explosion-Proof and Industrial Housing

**250T-XP
270i-XP
260A-IH/IHW**

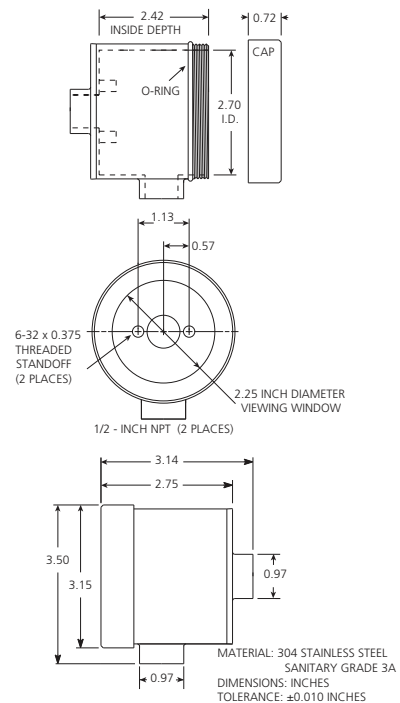


The above housings must be ordered in combination with a Flat Pack transmitter, isolator, or alarm. Please consult factory for ordering information..

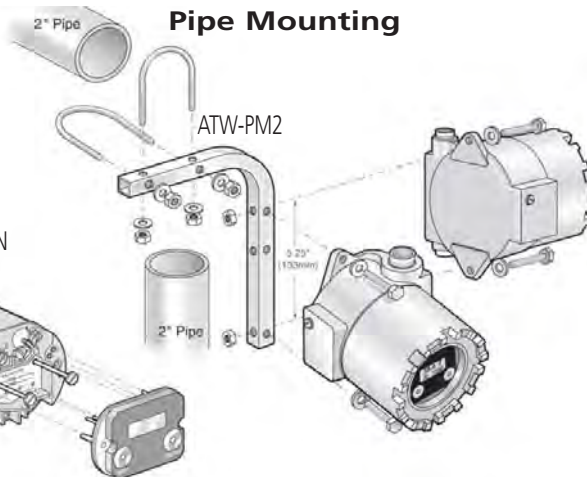
ATW-XPW Dimensions



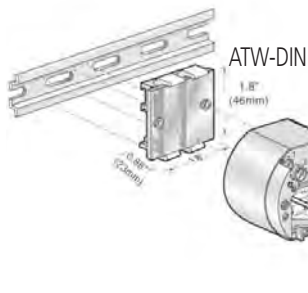
ATW-SSW Dimensions



Pipe Mounting



DIN Rail Mounting



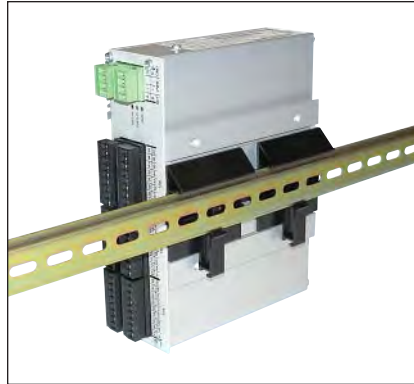
Dimensions are in inches (millimeters).

Ethernet I/O: EtherStax® Series

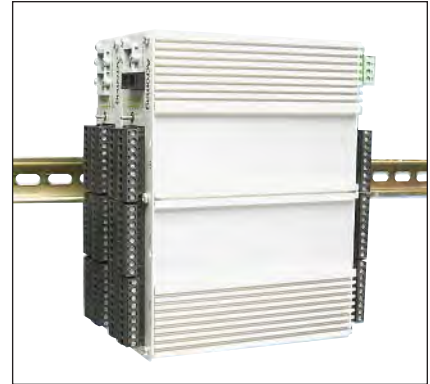
Mounting Mounting kits, DIN rail strips and accessories



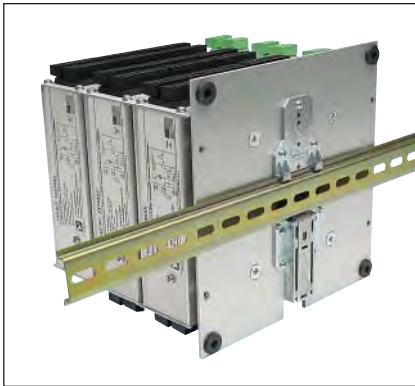
Interlocked units without mounting kit.



ESA-DIN-VMK kit (vertical terminals).



ESA-DIN-VMK supports two stacked units.



ESA-DIN-HMK kit (horizontal terminals).



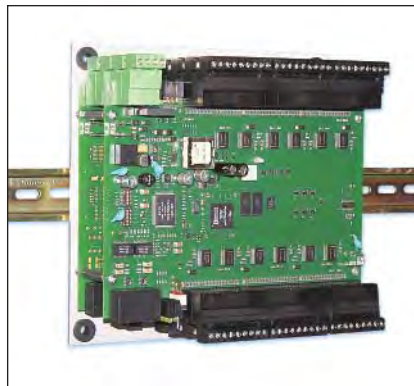
ESA-DIN-HMK supports three stacked units.



ESA-SMK surface/machine mounting kit.



ESA-OMK open board stacking kit. One kit supplies standoffs to stack two units.



Units stacked with ESA-OMK kit can mount on a DIN rail with ESA-DIN-HMK kit plate.

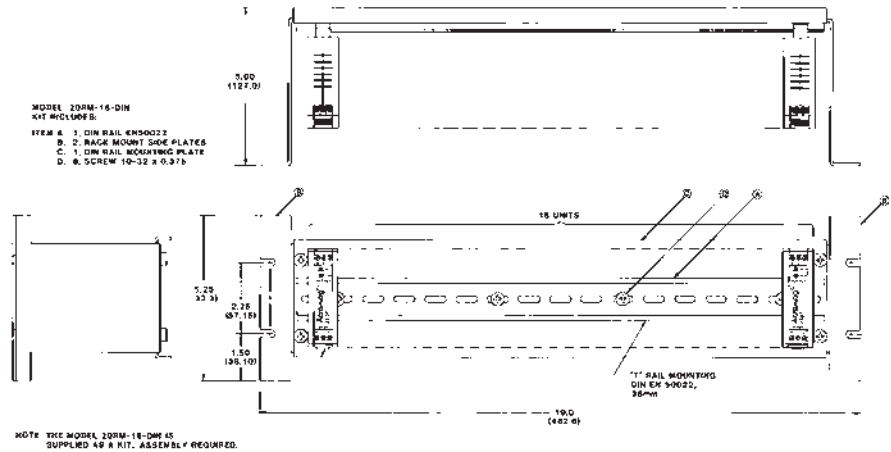


Side-by-side 19-inch rack mounting with ESA-DIN-HMK kit on a DIN rail.

Mounting Mounting kits, DIN rail strips and accessories



Model 20RM-16-DIN
19" Rack Mount Kit



Simplifies mounting of Acromag I/O Modules ♦ Ideal for mounting in test stands and instrument racks

Description

For your convenience, Acromag offers several mounting accessories to simplify your system installation. Our 19" rack-mount kit provides a clean solution for mounting your I/O modules and a power supply. Or, you can buy pre-cut DIN rail strips for mounting on any flat surface.

Ordering Information

NOTE: For more information visit www.acromag.com.

Mounting Accessories

1025-673

Retro-fit mounting bracket for 150T-XJSM explosion-proof housing (enables Flat Pack 250T mounting)

20RM-16-DIN

19" rack-mount kit with DIN rail

DIN RAIL 3.0

DIN rail strip, Type T, 3 inches (75mm)

DIN RAIL 16.7

DIN rail strip, Type T, 16.7 inches (425mm)

ESA-DIN-HMK

DIN rail horizontal mounting unit, holds three EtherStax units.

ESA-DIN-VMK

DIN rail vertical mounting kit, holds two EtherStax units.

ESA-OMK

Open circuit board EtherStax mounting kit, stacks two units.

ESA-SMK

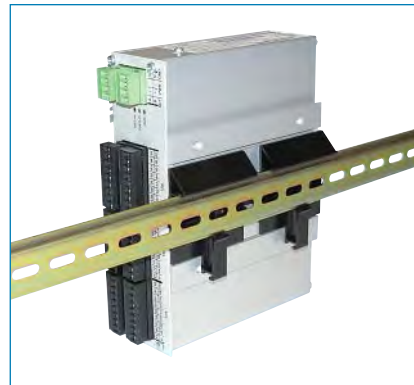
Surface mounting EtherStax kit, mounts up to three units.



ESA-DIN-HMK kit (horizontal terminals).



ESA-SMK surface/machine mounting kit.



ESA-DIN-VMK kit (vertical terminals).



ESA-OMK open board stacking kit. One kit supplies standoffs to stack two units.

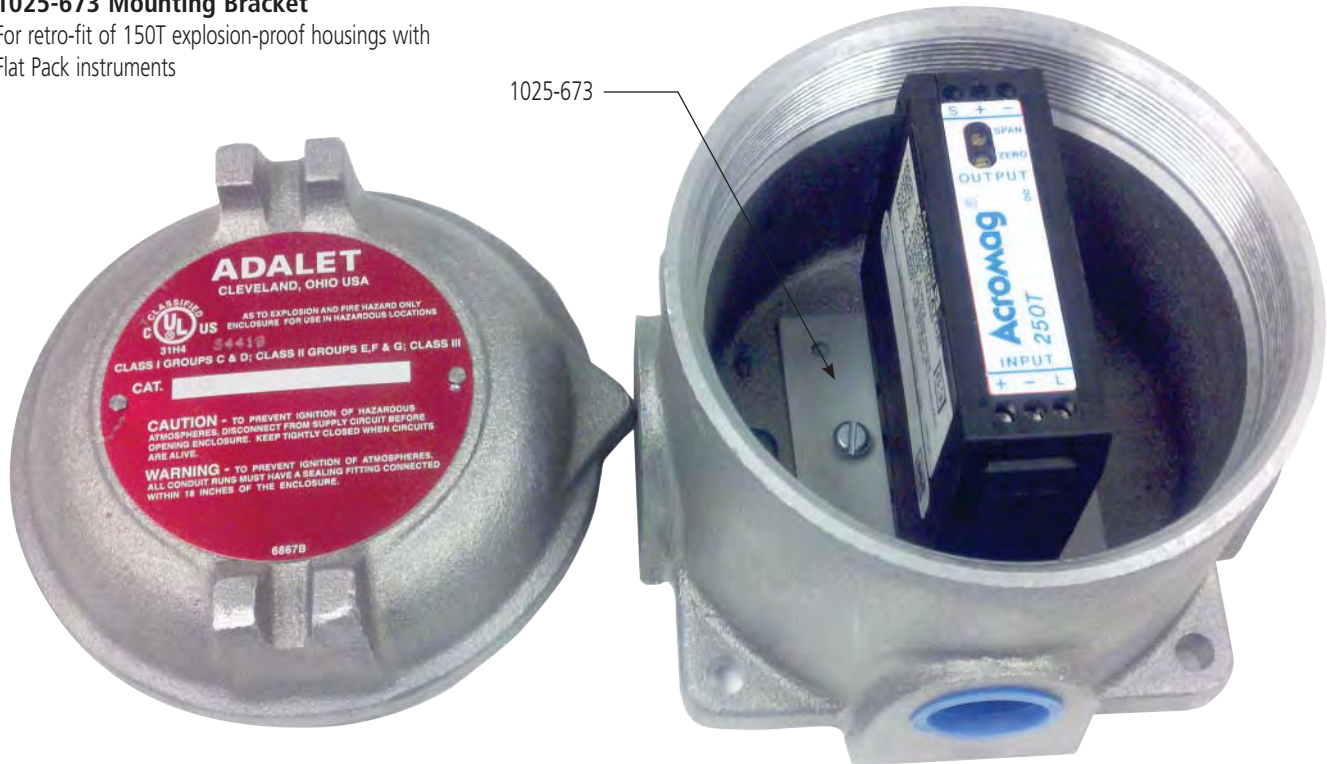


Accessories

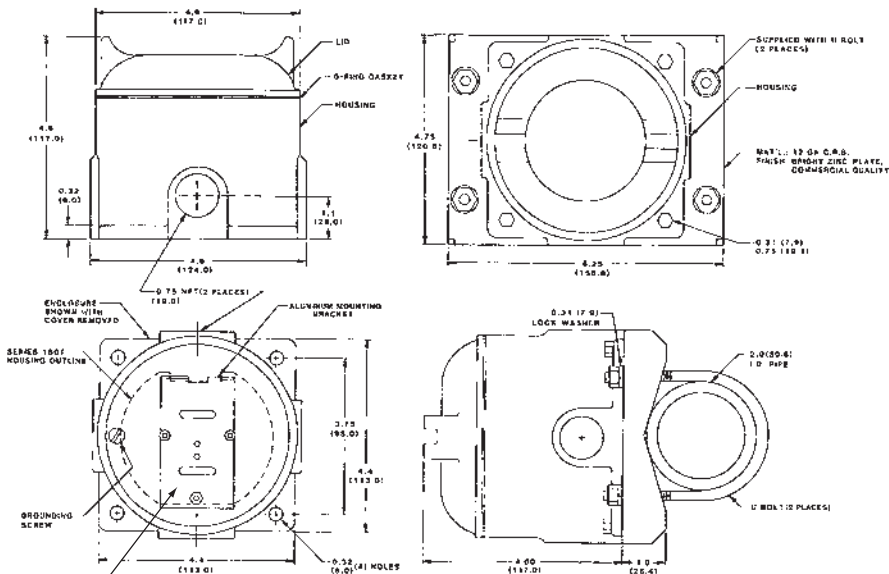
Mounting Mounting kits, DIN rail strips and accessories

1025-673 Mounting Bracket

For retro-fit of 150T explosion-proof housings with Flat Pack instruments



150T-XJSM-WM, 150T-XJSM-PM (retired products), Explosion-Proof Housing Wall-Mount, Pipe-Mount



Replace original bracket with Part #1025-673 for mounting of Flat Pack 250T transmitters

ISO9001
AS9100



Acromag ®
THE LEADER IN INDUSTRIAL I/O

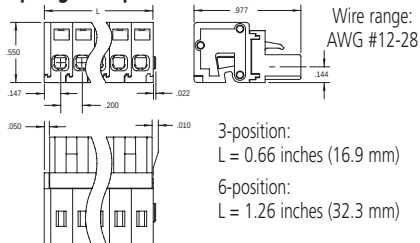
Tel 248-295-0880 ■ Fax 248-624-9234 ■ sales@acromag.com ■ www.acromag.com ■ 30765 Wixom Rd, Wixom, MI 48393 USA



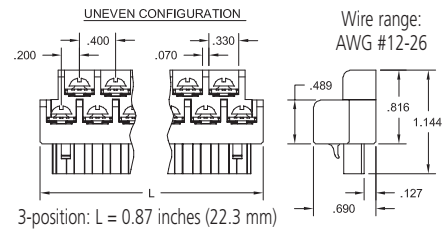
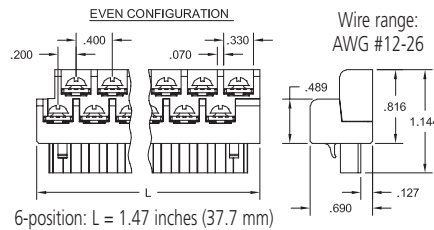
Terminal Blocks Optional Pluggable Wiring Terminals



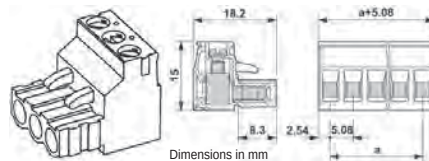
Spring Clamp Terminal Blocks



Barrier Strip Terminal Blocks



Standard Cage Clamp Terminal Blocks



Simplifies wiring connections on Acromag I/O Modules ♦ Barrier strip or spring clamp terminal block kits

Description

These optional terminal blocks provide safe and secure wiring connections. Large captive screw terminals or spring clamps enable fast, easy connections. Pluggable terminals are removable for simple disconnection of the module without disturbing the wiring.

Optional terminal blocks are compatible with Acromag's "white box" modules including BusWorks 900 Series, IntelliPack 800 Series, and isolated transmitters 600 Series.

Barrier Strip



Spring Clamp



Standard Cage Clamp



Performance Specifications

Barrier Strip Terminal Blocks

Wire Range: 12-26 AWG
Safety Ratings: UL, CSA, CE, TUV.
Current/Voltage Rating: 15A, 300V.
Pin Spacing: 5.08mm (0.2").
Housing Material: PPO, UL 94 V-0, Black.
Contacts: Tin-Lead Plated Phosphor Bronze.
Screw: M3, Nickel Plated Steel.
Insulation Resistance: $\geq 10^5$ Megohms.
Dielectric Withstand: <3000V.

Spring Clamp Terminal Blocks

Wire Range: 12-28 AWG.
Safety Ratings: UL, CSA, CE, TUV.
Current/Voltage Rating: 15A, 300V.
Pin Spacing: 5.08mm (0.2")
Housing Material: PPO, UL 94 V-0, Black.
Contacts: Tin-Lead Plated Phosphor Bronze.
Spring Clamp: Stainless Steel.
Insulation Resistance: $\geq 10^5$ Megohms.
Dielectric Withstand: <3000V.

Acromag Standard Cage Clamp Terminal Blocks

Wire Range: 12-24 AWG.
Current/Voltage Rating: 12A, 300V (UL).
Pin Spacing: 5.08mm (0.2").
Housing Material: UL 94 V-0.
Terminal: Brass, nickel plated.
Wire Protector with Contact: Copper alloy tin plating.
Screw: M3, steel, nickel over copper plating.
Contact Resistance: ≤ 10 milliohms per circuit.

Ordering Information

NOTE: For more information visit www.acromag.com.

Terminal Blocks

Refer to I/O module data sheets for compatibility.

TBK-B01

Terminal Block Kit, barrier strip style, includes two 6-position terminal blocks. Kit does not include thermocouple terminal blocks.

TBK-B02

Terminal Block Kit, barrier strip style, includes four 6-position terminal blocks.

TBK-B03

Terminal Block Kit, barrier strip style, includes one 3-position and three 6-position terminal blocks.

TBK-S01

Terminal Block Kit, spring clamp style, includes two 6-position terminal blocks. Kits do not include thermocouple terminal blocks.

TBK-S02

Terminal Block Kit, spring clamp style, includes four 6-position terminal blocks.

TBK-S03

Terminal Block Kit, spring clamp style, includes one 3-position and three 6-position terminal blocks.

DEPENDABLE VALUE.

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 **ISO9001
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