

## BusWorks® NT Series Expandable Remote I/O Modules For Ethernet

Analog and Digital I/O Modules

Modbus/TCP, Ethernet/IP and Profinet

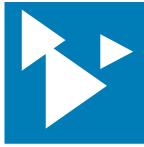
IIoT or Peer-to-Peer Communication

IF/Then/Else Control Logic

*Industrial I/O Solutions You Can Depend On.*



ISO9001  
AS9100  
 MADE IN USA



# Expandable Remote I/O

**Acromag's Busworks® NT Series**  
lets you add expansion I/O  
modules for a high-density,  
cost-efficient remote I/O solution

Base unit NTE Ethernet models handle the network communication and interface up to 16 analog or digital I/O channels for remote monitoring or control applications. NTX Expansion models provide a cost-effective way to add a mix of I/O signal types under a single IP address.

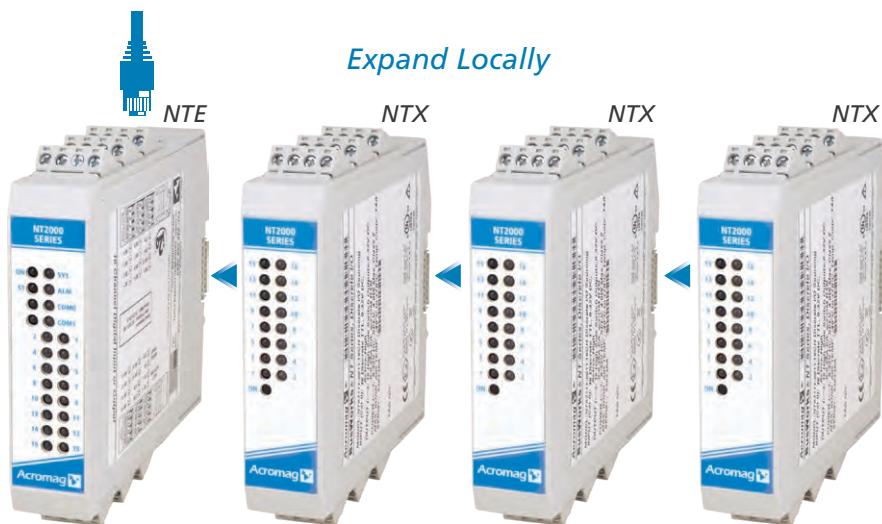
## Multi-protocol support

The NTE Ethernet I/O modules are pre-programmed to support Modbus/TCP, Ethernet/IP and Profinet\* protocols. Just select which is to be used. Modules also support direct i2o® peer-to-peer communication without a controller.

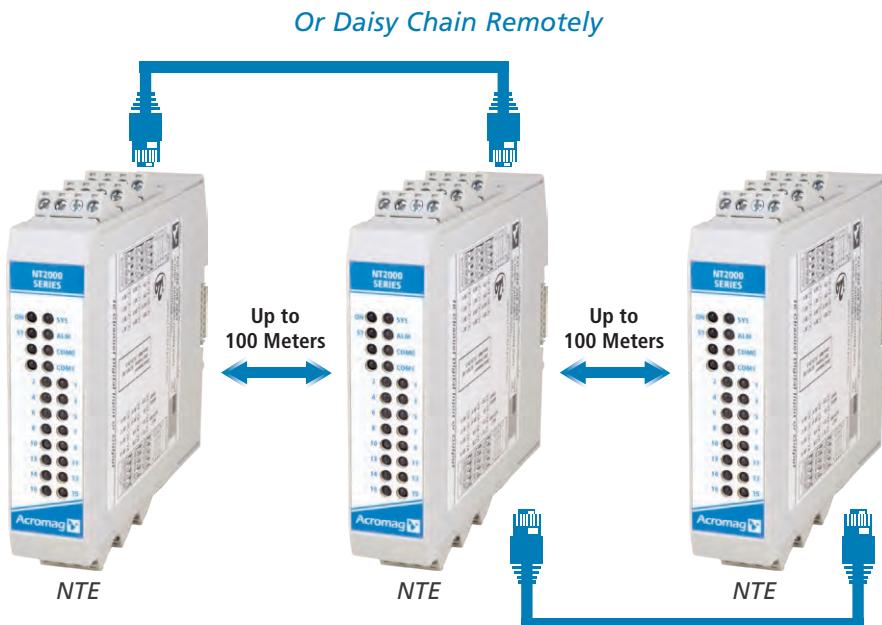
- Integrated I/O expansion bus
- Up to 64 I/O channels per IP address
- Mix analog, digital, and temperature I/O on a base NTE unit
- i2o peer-to-peer or multicast communications
- Rugged design, -40 to 70°C
- Hazardous location approvals

\*coming soon

**Modbus** EtherNet/IP®  
TCP/IP



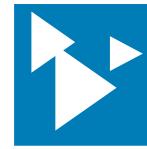
Link up to three NTX expansion I/O modules to an NTE Ethernet I/O module over the integrated DIN rail I/O bus connectors.



Connect NTE Ethernet I/O modules with a daisy-chain topology using the internal dual-port switch to simplify network cabling.

I/O Support	Input Modules	Output Modules
DC Current	8 differential or 16 single-ended channels	8 output channels
DC Voltage	8 differential or 16 single-ended channels	8 output channels
Thermocouple	8 channels of Type J, K, T, R, S, B, E, N, or mV	
RTD/Resistance	4 channels PT100, Cu10, 0-500 ohms.	
Digital I/O	16 channels	16 channels
Relays, Contact Closures	6 channels 120/240V AC	6 normally open 5A relays

# Ethernet-based Configuration



## Easy setup from anywhere with a web browser

NTE Ethernet I/O modules have a built-in web server for convenient configuration without installing any software. Several web pages lead you through the options to set your IP addresses, protocol, and I/O parameters. A diagnostics page lets you monitor I/O values from your PC, tablet, or smartphone.

## Advanced features for IIoT and local control logic functions

The configuration pages will help you quickly setup advanced capabilities such as peer-to-peer communication, conditional logic computation, and alarm output.

- Peer-to-peer communication
- Field-upgradeable firmware
- Counter/timers
- IF/THEN/ELSE logic
- Alarm output\*
- RESTful APIs\*
- OPC-UA server\*
- MQTT support\*

\*coming soon

Slot 0: Analog Current In Board (Single-Ended)

The following options are unique for each channel:

Channel: Channel 1

Current Range: ±20mA

Change Range: ±20mA

The following options are shared for all channels:

Current Filter Selection: Low Filter: 80 ms

Change Filter Selection: High Filter: 480 ms

Burnout Current Enable: Off

ADC Settling Delay: 0 µs

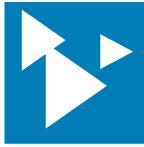
Change Slot 0 Configuration

P2P Config

Slot Number	Starting I/O Channel	# of Channels	Target IP Address	Starting Target Register	Update Time	Change of State	Percent Change
Slot 1: Thermocouple	Channel 4	8	192.168.0.10	00950	0 ms	N/A	10.5%
Slot 0: Digital I/O Board (Sourcing With 10kD Pulldown)	Channel 2	0	0.0.0.0	00000	0 ms	OFF	N/A
Slot 0: Digital I/O Board (Sourcing With 10kD Pulldown)	Channel 2	0	0.0.0.0	00000	0 ms	OFF	N/A
Slot 0: Digital I/O Board (Sourcing With 10kD Pulldown)	Channel 2	0	0.0.0.0	00000	0 ms	OFF	N/A
Slot 0: Digital I/O Board (Sourcing With 10kD Pulldown)	Channel 2	0	0.0.0.0	00000	0 ms	OFF	N/A
Slot 0: Digital I/O Board (Sourcing With 10kD Pulldown)	Channel 2	0	0.0.0.0	00000	0 ms	OFF	N/A
Slot 0: Digital I/O Board (Sourcing With 10kD Pulldown)	Channel 2	0	0.0.0.0	00000	0 ms	OFF	N/A
Slot 0: Digital I/O Board (Sourcing With 10kD Pulldown)	Channel 2	0	0.0.0.0	00000	0 ms	OFF	N/A

Slot 1: Digital I/O Board (Relay)

1 Input	2 Input	3 Input	4 Input	5 Input	6 Input
1 Output	2 Output	3 Output	4 Output	5 Output	6 Output
Counter: 755	Counter: 0	Counter: 555	Counter: 0	Counter: 0	Counter: 0
Reset Counter					



# Common Specifications

## Network Communication

Interface: 10/100Mbps Ethernet.  
Protocols: Modbus TCP/IP, Ethernet/IP, or Profinet and i2o® peer-to-peer / multi-cast.  
IIoT communication: OPC-UA, MQTT, RESTful APIs (pending).  
Connectors: Two shielded 8-pin RJ-45 sockets, 10BaseT/100BaseTX.

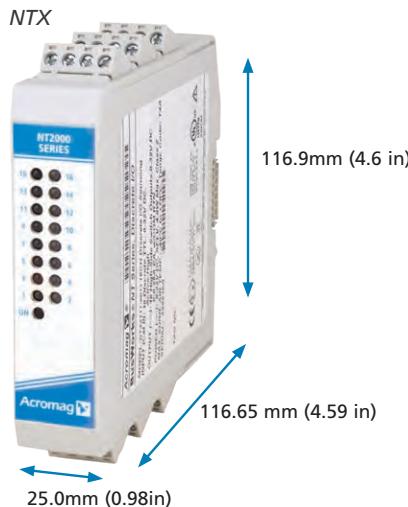
## Approvals and Certifications

CE marked.  
UL/cUL Class I; Div. 2;  
Groups A, B, C, D.  
ATEX/IECEx Zone 2.  
EtherNet/IP, Profinet conformance  
Modbus/TCP (pending).  
Radiated Emissions: BS EN 61000-6-4,  
CISPR 16.  
RFI: BS EN 61000-6-2, IEC 61000-4-3.

## Models: Ethernet I/O Units

NTE2111-1111 .... Dual RJ45 ports, discrete I/O, sinking output, 16-ch  
NTE2121-1111 .... Dual RJ45 ports, discrete I/O, sourcing output, 16-ch  
NTE2131-1111 .... Dual RJ45 ports, discrete I/O, relay output, 6 MR + 6 DI  
NTE2141-1111\* .. Dual RJ45 ports, discrete I/O, 120/240V AC input, 6 DI + 6 DO  
NTE2211-1111 .... Dual RJ45 ports, analog input, differential current, 8 AI + 2 DIO  
NTE2221-1111 .... Dual RJ45 ports, analog input, single-ended current, 16-ch  
NTE2231-1111 .... Dual RJ45 ports, analog input, differential voltage, 8 AI + 2 DIO  
NTE2241-1111 .... Dual RJ45 ports, analog input, single-ended voltage, 16-ch  
NTE2311-1111 .... Dual RJ45 ports, analog output, current, 8-ch  
NTE2321-1111 .... Dual RJ45 ports, analog output, voltage, 8-ch  
NTE2511-1111 .... Dual RJ45 ports, combo I/O, current, 4 AI + 2 AO + 4 DIO  
NTE2512-1111 .... Dual RJ45 ports, combo I/O, current, 4 AI + 4 DIO  
NTE2531-1111 .... Dual RJ45 ports, combo I/O, voltage, 4 AI + 2 AO + 4 DIO  
NTE2532-1111 .... Dual RJ45 ports, combo I/O, voltage, 4 AI + 4 DIO  
NTE2611-1111 .... Dual RJ45 ports, temperature input, 8 thermocouple + 2 DIO  
NTE2621-1111 .... Dual RJ45 ports, temperature input, 4 RTD + 2 DIO

## Dimensions: Units in millimeters (inches)



## Physical

Housing: General purpose plastic enclosure for mounting on 35mm "T-type" DIN rail.  
Case Material: Self-extinguishing polyamide, UL94 V-0 rated, general purpose NEMA Type 1.  
Circuit Board: Military grade fire-retardant epoxy glass (IPC-4101/98).  
I/O Connectors: Removable terminal blocks rated for 12A/250V; AWG #26-12, stranded/solid copper wire.  
Dimensions (W x H x D):  
25.0 x 116.9 mm (0.98 x 4.6 inches).  
NTE: 139.2 mm (5.48 inches).  
NTX: 116.65 mm (4.59 inches).  
Weight:  
NTE models: 0.5 lbs (0.23 Kg).  
NTX models: 0.3 lbs (0.14 Kg).

## Models: Expansion I/O Units

NTX2111-0011 .... Discrete I/O, sinking output, 16-ch  
NTX2121-0011 .... Discrete I/O, sourcing output, 16-ch  
NTX2131-0011 .... Discrete I/O, relay output, 6 MR + 6 DI  
NTX2141-0011\* .. Discrete I/O, 120/240V AC input, 6 DI + 6 DO  
NTX2211-0011 .... Analog input, differential current, 8 AI + 2 DIO  
NTX2221-0011 .... Analog input, single-ended current, 16-ch  
NTX2231-0011 .... Analog input, differential voltage, 8 AI + 2 DIO  
NTX2241-0011 .... Analog input, single-ended voltage, 16-ch  
NTX2311-0011 .... Analog output, current, 8-ch  
NTX2321-0011 .... Analog output, voltage, 8-ch  
NTX2511-0011 .... Combo I/O, current, 4 AI + 2 AO + 4 DIO  
NTX2512-0011 .... Combo I/O, current, 4 AI + 4 DIO  
NTX2531-0011 .... Combo I/O, voltage, 4 AI + 2 AO + 4 DIO  
NTX2532-0011 .... Combo I/O, voltage, 4 AI + 4 DIO  
NTX2611-0011 .... Temperature input, 8 thermocouple + 2 DIO  
NTX2621-0011 .... Temperature input, 4 RTD + 2 DIO

\*coming soon



Visit [Acromag.com/NT](http://Acromag.com/NT)  
for complete information



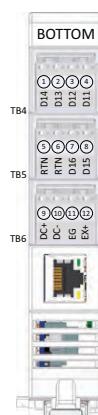
# Ethernet I/O: BusWorks® NT Series

## NT2110 Ethernet Discrete I/O Modules



124  
HOUR  
STOCK ITEM

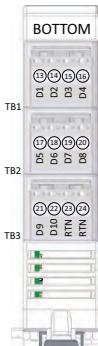
2  
YEAR  
WARRANTY



EtherNet/IP®



NTX2111 MODEL



16 discrete I/O ◆ Active low in / sinking out ◆ Ethernet I/O plus Expansion I/O ◆ Multi-protocol support

The BusWorks® NT2000 series offers a cost-effective, modular solution for Ethernet remote I/O systems. Two module types are available. NTE Ethernet models provide the protocol interface plus I/O signal processing channels. NTX expansion modules add extra I/O channels when mated to any NTE Ethernet communication module.

NT2110 modules offer 16 bidirectional discrete I/O channels for low-side (sinking switch) applications. NTE Ethernet models provide a compact network interface to monitor or control discrete device levels. Appending NTX expansion models can interface up to 64 discrete I/O channels on a single IP address.

Applications include monitoring and control of relays, solenoids, contact closures, TTL logic, and discrete sensors on motors, lamps, valves, doors, etc.

An isolated RS-485 bus links up to three expansion modules to the Ethernet module with connectors that join along the DIN rail. This internal NT bus distributes power and communication between the modules. Users can mix analog, temperature, and discrete I/O modules across the NT bus.

Acromag's i2o® messaging technology allows direct peer-to-peer or multicast communication between remote modules without a master controller.

### Key Features & Benefits

- Configured over Ethernet with web browser
- Expandable I/O capacity, up to 64 I/O channels of mixed signal types on one IP address
- Field-selectable Modbus TCP/IP, EtherNet/IP, or Profinet communication
- i2o peer-to-peer or multicast communication
- Dual RJ45 ports enable daisy chain topology
- Inputs support TTL thresholds and up to 32V
- Open-drain outputs switch up to 32V and 250mA
- Tandem input/output channels allow loop-back monitoring of outputs
- Configurable counters and totalization
- \*OPC-UA, \*MQTT and \*RESTful API IIoT support
- Conditional logic for rule-based I/O operation
- Advanced \*alarm and \*data logging functions
- 1500V isolation between I/O, network, and power
- Thin 25mm housing with pluggable terminals
- Wide temperature operation (-40 to 70°C)
- LED status indicators for visual troubleshooting
- CE compliant. UL/cUL Class 1 Div 2 and ATEX/IECEx Zone 2 approvals

\* Coming soon. Consult factory for availability.

The screenshot shows the Acromag I/O Config software interface. The top navigation bar includes Network, I/O Config, Counters, P2P, Multicast, Calibration, Diagnostics, and Utility. The user is logged in as 'admin'.

**I/O Config** tab (Slot 0: Digital I/O Board (Sinking)):

- Channel: Channel 1
- Current Watchdog Timeout (ms): 0
- Change Watchdog Timeout: 5000
- Change Watchdog State: Off
- Buttons: Change Slot 0 Configuration, Change Slot 0 Configuration

**Counter Config** tab (Slot 0: Digital I/O Board (Sinking)):

- Slot: 0
- Channel: 1
- Counter Enable: Disabled
- Count Direction: Up
- Edge Detection: Negative
- Start-Up Mode: Last Count
- Termination Mode: Stop And Hold
- Alarm Mode: Disabled
- Debounce Enable: Disabled
- Debounce Value: 0
- Pre-Load Value: 0
- Buttons: Change Counter Enable, Change Count Direction, Change Edge Detection, Change Start-Up Mode, Change Termination Mode, Change Alarm Mode, Change Debounce Enable, Change Debounce Value, Change Pre-Load Value

**I/O Config** tab (Slot 1: Digital I/O Board (Sinking)):

- Channel: Channel 1
- Current Watchdog Timeout (ms): 5000
- Change Watchdog Timeout: 5000
- Change Watchdog State: Off
- Buttons: Change Slot 1 Configuration, Change Slot 1 Configuration

**Counter Config** tab (Slot 1: Digital I/O Board (Sinking)):

- Slot: 1
- Channel: 1
- Counter Enable: Disabled
- Count Direction: Up
- Edge Detection: Negative
- Start-Up Mode: Last Count
- Termination Mode: Rollover
- Alarm Mode: Disabled
- Debounce Enable: Disabled
- Debounce Value: 0
- Pre-Load Value: 0
- Buttons: Change Counter Enable, Change Count Direction, Change Edge Detection, Change Start-Up Mode, Change Termination Mode, Change Alarm Mode, Change Debounce Enable, Change Debounce Value, Change Pre-Load Value

Easily configure I/O modules using any web browser.

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# Ethernet I/O: BusWorks® NT Series

## NT2110 Ethernet Discrete I/O Modules

### Performance Specifications

#### ■ Ethernet Interface (NTE models only)

##### Communication

Configurable for Modbus TCP/IP, EtherNet/IP, and Profinet.

10/100Mbps data rate, auto-sensing.

##### IP Address

Default 192.168.0.10. Configurable static IP or DHCP.

#### ■ Discrete Inputs (Active-Low)

##### Input Signal Voltage Range

0 to +32V DC.

##### Input Current

280µA, typical at 32V DC.

##### Input Signal Threshold

TTL compatible w/100mV of hysteresis, typical.

Low-to-High threshold: 1.7VDC, typical.

High-to-Low threshold: 1.6VDC, typical.

TTL logic limit - LOW: 0.8V DC max.

TTL logic limit - HIGH: 2.0VDC min.

##### Input Resistance

100K ohms typical (input only), 10K ohms w/ output pull-ups installed.

##### Input Hysteresis

100mV DC typical.

##### Input Response Time

5ms typical, not including network time.

##### Input Transient Voltage Suppressor

Installed at every I/O point, up to 38V working, 47V breakdown, and 77V clamping.

#### ■ Discrete Outputs (Sinking)

##### Output "OFF" Voltage Range

0 to 32V DC.

##### Output "ON" Current Range

0 to 250mA DC, continuous.

##### Output Rds ON Resistance

0.8 ohms typical, 1.6 ohms maximum.

##### Protections

Thermal overload shutdown.

Over-voltage shutdown.

Over-load shutdown.

Reverse polarity protection shunt.

##### Output "OFF" Leakage Current

0.1uA typical, 50uA max (mosfet only, 25°C, 32V).

Does not include input bias current.

##### Output Response Time

5ms typical. Does not include network time.

#### ■ Counters

##### Input Counter

Inputs (channels 1-8) may operate as up/down event counters for signals up to 85 Hz.

##### Counter Preload Value

Each channel can start from 0 to 4,294,967,295.

##### Counter Debounce

0 to 65,535ms to filter noise or relay chatter.

##### Counter Alarms

Alarms can toggle an output state upon reaching the termination value. Alarm state can auto-reset after the next count or hold/latch until reset.

##### FRAM

4Kb (4096 bits) non-volatile memory stores counter value.

#### ■ General I/O

##### Input Update/Conversion Rate

Fresh data available to the network every 10ms.

##### Response Time from an Ethernet command

Less than 5ms, typical.

##### Excitation

External voltage of 4-32V required between I/O EXC and any RTN. Excitation must source 52mA minimum (at 32V). For 16 channels at 250mA max rated load, excitation must source 4A min.

##### I/O Pull-Ups (Internal)

Each I/O channel has 10KΩ pull-up to EXC to pull the tandem open drain output and input high/OFF.

#### ■ Environmental and Physical

##### Temperature and Humidity

Operating: -40 to +70°C (-40 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 and 250V AC or 354V DC continuous between I/O channels (group), each network port and power circuits.

##### Power Supply

10-32V DC SELV power wired to NTE model only.

Power to NTX models is via NT bus connection.

##### Power Consumption

NTE2111: <=2.0W (input).

NTX2111: <=0.5W max. (each).

##### Dimensions (width x height x depth)

NTE: 25 x 116.9 x 139.2 mm (0.98 x 4.6 x 5.48 inches).

NTX: 25 x 116.9 x 116.65 mm (0.98 x 4.6 x 4.59 inches).

##### Weight

NTE: 0.5 lbs (0.23 kg).

NTX: 0.3 lbs (0.14 kg).

#### ■ Standards and Certifications

Electromagnetic Compatibility (EMC)  
CE marked, per EMC Directive 2004/108/EC.

##### Safety Approvals

UL/cUL: Class I; Div 2; Groups A, B, C, D.  
ATEX/IECEx: Zone 2.

### Ordering Information

#### ■ Models

[Go to on-line ordering page >](#)

NTE2111-1111

Ethernet I/O module with dual RJ45 ports, 16 discrete I/O channels.

NTX2111-0011

Expansion I/O module with 16 discrete I/O channels.

#### ■ Accessories

5035-369

5035-370

Ethernet patch cable, low EMI, double-shielded.  
3 feet (5035-369) or 15 feet (5035-370).

PS5R-VB24

Power supply, 24V DC, 15W output.

See [www.acromag.com](http://www.acromag.com) for other sizes.



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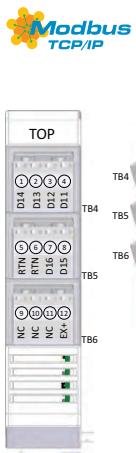
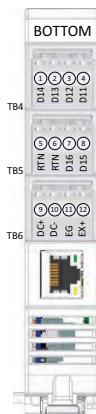
# Ethernet I/O: BusWorks® NT Series

## NT2120 Ethernet Discrete I/O Modules

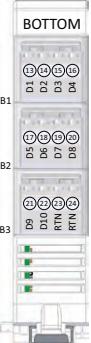


124  
HOUR  
STOCK ITEM

2  
YEAR  
WARRANTY



EtherNet/IP®



16 discrete I/O ◆ Active high in / sourcing out ◆ Ethernet I/O plus Expansion I/O ◆ Multi-protocol support

The BusWorks® NT2000 series offers a cost-effective, modular solution for Ethernet remote I/O systems. Two module types are available. NTE Ethernet models provide the protocol interface plus I/O signal processing channels. NTX expansion modules add extra I/O channels when mated to any NTE Ethernet communication module.

NT2120 modules offer 16 bidirectional discrete I/O channels for high-side (sourcing switch) applications. NTE Ethernet models provide a compact network interface to monitor or control discrete device levels. Appending NTX expansion models can interface up to 64 discrete I/O channels on a single IP address.

Applications include monitoring and control of relays, solenoids, contact closures, TTL logic, and discrete sensors on motors, lamps, valves, doors, etc.

An isolated RS-485 bus links up to three expansion modules to the Ethernet module with connectors that join along the DIN rail. This internal NT bus distributes power and communication between the modules. Users can mix analog, temperature, and discrete I/O modules across the NT bus.

Acromag's i2o® messaging technology allows direct peer-to-peer or multicast communication between remote modules without a master controller.

### Key Features & Benefits

- Configured over Ethernet with web browser
- Expandable I/O capacity, up to 64 I/O channels of mixed signal types on one IP address
- Field-selectable Modbus TCP/IP, EtherNet/IP, or Profinet communication
- i2o peer-to-peer or multicast communication
- Dual RJ45 ports enable daisy chain topology
- Inputs support TTL thresholds and up to 32V
- Open-drain outputs switch up to 32V and 250mA
- Tandem input/output channels allow loop-back monitoring of outputs
- Configurable counters and totalization
- \*OPC-UA, \*MQTT and \*RESTful API IIoT support
- Conditional logic for rule-based I/O operation
- Advanced \*alarm and \*data logging functions
- 1500V isolation between I/O, network, and power
- Thin 25mm housing with pluggable terminals
- Wide temperature operation (-40 to 70°C)
- CE compliant. UL/cUL Class 1 Div 2 and ATEX/IECEx Zone 2 approvals
- LED status indicators for visual troubleshooting

\* Coming soon. Consult factory for availability.

The screenshot shows the Acromag Web Configurator interface. The top navigation bar includes Network, I/O Config, Counters, P2P, Multicast, Calibration, Diagnostics, and Utility. The I/O Config page displays configuration for Slot 0 and Slot 1, both labeled 'Digital I/O Board (Sourcing With 10kΩ Pulldown)'. The Counter Config page shows settings for Slot 0, including Counter Enable, Count Direction, Edge Detection, Start-Up Mode, Termination Mode, Alarm Mode, Debounce Enable, Debounce Value, and Pre-Load Value.

Easily configure I/O modules using any web browser.

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# Ethernet I/O: BusWorks® NT Series

## NT2120 Ethernet Discrete I/O Modules

### Performance Specifications

#### ■ Ethernet Interface (NTE models only)

##### Communication

Configurable for Modbus TCP/IP, EtherNet/IP, and Profinet.

10/100Mbps data rate, auto-sensing.

##### IP Address

Default 192.168.0.10. Configurable static IP or DHCP.

#### ■ Discrete Inputs

##### Input Signal Voltage Range

0 to +32V DC.

##### Input Current

280µA, typical at 32V DC.

##### Input Signal Threshold

TTL compatible w/100mV of hysteresis, typical.

Low-to-High threshold: 1.7VDC, typical.

High-to-Low threshold: 1.6VDC, typical.

TTL logic limit - LOW: 0.8V DC max.

TTL logic limit - HIGH: 2.0VDC min.

##### Input Resistance

100K ohms typical (input only), 10K ohms w/ tandem output using internal pull-downs installed.

##### Input Hysteresis

100mV DC typical.

##### Input Response Time

5ms typical, not including network time.

##### Input Transient Voltage Suppressor

Installed at every I/O point, up to 38V working, 47V breakdown, and 77V clamping.

#### ■ Discrete Outputs

##### Output "ON" Voltage Range

6 to 32V DC.

##### Active Current Limitation

Output limits load current to a shorted load at 0.6A typical, 0.4A-0.9A range.

##### Output "ON" Current Range

0 to 250mA DC, continuous.

##### Output Rds ON Resistance

0.8 ohms typical, 1.6 ohms maximum.

##### Protections

Thermal overload shutdown.

Over-voltage shutdown.

Over-load shutdown.

Reverse polarity protection shunt.

##### Output "OFF" Leakage Current

50µA maximum per channel (mosfet only).

Does not include input bias current.

##### Output Response Time

5ms typical. Does not include network time.

#### ■ Counters

##### Input Counter

Inputs (channels 1-8) may operate as up/down event counters for signals up to 85 Hz.

##### Counter Preload Value

Each channel can start from 0 to 4,294,967,295.

##### Counter Debounce

0 to 65,535ms to filter noise or relay chatter.

##### Counter Alarms

Alarms can toggle an output state upon reaching the termination value. Alarm state can auto-reset after the next count or hold/latch until reset.

##### FRAM

4Kb (4096 bits) non-volatile memory stores counter value.

#### ■ General I/O

##### Input Update/Conversion Rate

Fresh data available to the network every 10ms.

##### Response Time from an Ethernet command

Less than 5ms, typical.

##### Excitation

Excitation voltage of 6-32V required between field EXC and RTN terminals. Excitation must source 52mA minimum (at 32V). For 16 channels at maximum rated load, excitation must source 4A.

##### I/O Pull-Ups (Internal)

Each I/O channel has 10KΩ pull-down to I/O return and will never float.

#### ■ Environmental and Physical

##### Temperature and Humidity

Operating: -40 to +70°C (-40 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 and 250V AC or 354V DC continuous between I/O channels (group), each network port and power circuits.

##### Power Supply

10-32V DC SELV power wired to NTE model only.

Power to NTX models is via NT bus connection.

##### Power Consumption

NTE2121: <=2.0W (input).

NTX2121: <=0.5W max. (each).

##### Dimensions (width x height x depth)

NTE: 25 x 116.9 x 139.2 mm (0.98 x 4.6 x 5.48 inches).

NTX: 25 x 116.9 x 116.65 mm (0.98 x 4.6 x 4.59 inches).

##### Weight

NTE: 0.5 lbs (0.23 kg).

NTX: 0.3 lbs (0.14 kg).

#### ■ Standards and Certifications

Electromagnetic Compatibility (EMC)  
CE marked, per EMC Directive 2004/108/EC.

##### Safety Approvals

UL/cUL: Class I; Div 2; Groups A, B, C, D.  
ATEX/IECEx: Zone 2.

### Ordering Information

#### ■ Models

[Go to on-line ordering page >](#)

NTE2121-1111

Ethernet I/O module with dual RJ45 ports, 16 discrete I/O channels.

NTX2121-0011

Expansion I/O module with 16 discrete I/O channels.

#### ■ Accessories

5035-369

5035-370

Ethernet patch cable, low EMI, double-shielded.  
3 feet (5035-369) or 15 feet (5035-370).

PS5R-VB24

Power supply, 24V DC, 15W output.

See [www.acromag.com](http://www.acromag.com) for other sizes.



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# Ethernet I/O: BusWorks® NT Series

## NT2130 Ethernet Discrete I/O Modules



6 mechanical relay outputs ◆ 6 discrete inputs ◆ Ethernet I/O plus Expansion I/O ◆ Multi-protocol support

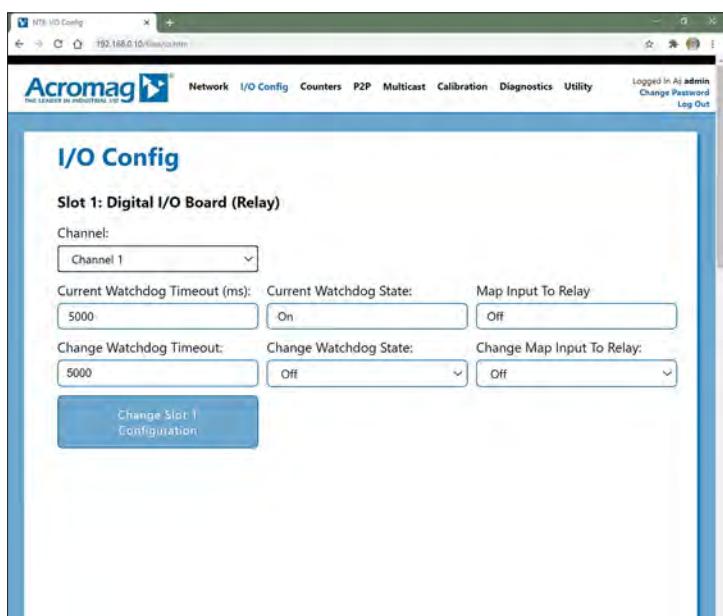
The BusWorks® NT2000 series offers a cost-effective, modular solution for Ethernet remote I/O systems. Two module types are available. NTE Ethernet models provide the protocol interface plus I/O signal processing channels. NTX expansion modules add extra I/O channels when mated to any NTE Ethernet communication module.

NT2130 modules offer six 5A mechanical relays and six discrete inputs. The NTE Ethernet I/O models provide a compact network interface to monitor and control discrete device levels. Appending NTX expansion models can interface up to 24 relays and 24 level sensing inputs on a single IP address.

Applications include on/off monitoring and control of motors, pumps, lights, heaters, fans, etc. or the open/close status of valves, doors, and gates.

An isolated RS-485 bus links up to three expansion modules to the Ethernet module with connectors that join along the DIN rail. This internal NT bus distributes power and communication between the modules. Users can mix analog, temperature, and discrete I/O modules across the NT bus.

Acromag's i2o® messaging technology allows direct peer-to-peer or multicast communication between remote modules without a master controller.



Easily configure I/O modules using any web browser.

### Key Features & Benefits

- Configured over Ethernet with web browser
- Expandable I/O capacity, up to 60 I/O channels of mixed signal types on one IP address
- Field-selectable Modbus TCP/IP, EtherNet/IP, or Profinet communication
- i2o peer-to-peer or multicast communication
- Dual RJ45 ports enable daisy chain topology
- High-power SPST Form A relays switch 30V DC or 240V AC at currents up to 5A
- Active-high Inputs support TTL thresholds and up to 32V DC
- Configurable counter/timers and totalization
- \*OPC-UA, \*MQTT and \*RESTful API IIoT support
- Conditional logic for rule-based I/O operation
- Advanced \*alarm and \*data logging functions
- 1500V isolation between I/O, network, and power
- Thin 25mm housing with pluggable terminals
- Wide temperature operation (-40 to 70°C)
- CE compliant. UL/cUL Class 1 Div 2 and ATEX/IECEx Zone 2 approvals

\* Coming soon. Consult factory for availability.



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# Ethernet I/O: BusWorks® NT Series

## NT2130 Ethernet Discrete I/O Modules

### Performance Specifications

#### ■ Ethernet Interface (NTE models only)

##### Communication

Configurable for Modbus TCP/IP, EtherNet/IP, and Profinet.

10/100Mbps data rate, auto-sensing.

##### IP Address

Default 192.168.0.10. Configurable static IP or DHCP.

#### ■ Discrete Inputs

##### Input Signal Voltage Range

0 to +32V DC.

##### Input Current

280µA, typical at 32V DC.

##### Input Signal Threshold

TTL compatible w/100mV of hysteresis, typical.

Low-to-High threshold: 1.7VDC, typical.

High-to-Low threshold: 1.6VDC, typical.

TTL logic limit - LOW: 0.8V DC max.

TTL logic limit - HIGH: 2.0VDC min.

##### Input Resistance

10KΩ typical (each input has 10KΩ pull-down).

##### Input Pull-Downs (Internal)

Each input has 10KΩ pull-down to I/O return and will never float.

##### Input Hysteresis

100mV DC typical.

##### Input Response Time

5ms typical, not including network time.

##### Input Transient Voltage Suppressor

Installed at every I/O point, up to 38V working, 47V breakdown, and 72V clamping.

#### ■ Mechanical Relay Outputs

##### Configuration

Six isolated 1 FORM A SPST-NO sealed relays.

##### Contact Rating

5A, 250V AC or 30V DC.

##### Maximum Switching Voltage

277VAC/125V DC.

##### Maximum Switching Power

1250VA or 150W.

##### Minimum Switching Load

1mA, 5V DC.

##### Resistance

30 mΩ maximum at 6V DC and 1A.

##### Electrical Life:

Mechanical:  $20 \times 10^6$  operations minimum.

3A:  $100 \times 10^3$  operations minimum.

5A:  $50 \times 10^3$  operations minimum.

Switching frequency: 20 per minute.

##### Contact Material

Gold overlay silver alloy (Ag90 Ni10+Au).

##### Initial Dielectric Strength

Resistance 1000M ohms at 500V DC.

Between open contacts: 750V AC 50/60Hz, 1 min.

Between contacts/coil: 3000V AC 50/60Hz, 1 min.

##### Relay Response (No Relay Time Delay)

Contacts energize bounce-free within 10ms and release bounce-free within 5ms (does not include network time).

#### ■ Counter/Timers

##### Input Counter

Inputs (channels 1-6) may operate as up/down event counters for signals up to 85 Hz.

##### Counter Preload Value

Each channel can start from 0 to 4,294,967,295.

##### Counter Debounce

0 to 65,535ms to filter noise or relay chatter.

##### Counter Alarms

Alarms can toggle an output state upon reaching the termination value. Alarm state can auto-reset after the next count or hold/latch until reset.

##### FRAM

4Kb (4096 bits) non-volatile memory stores counter value plus scaling and totalization information.

#### ■ General I/O

##### Input Update/Conversion Rate

Fresh data available to the network every 10ms.

##### Response Time from an Ethernet command

Less than 5ms, typical.

#### ■ Environmental and Physical

##### Temperature and Humidity

Operating: -40 to +70°C (-40 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 and 250V AC or 354V DC continuous between I/O channels (group), each network port and power circuits.

##### Power Supply

10-32V DC SELV power wired to NTE models only. Power to NTX models is via NT bus connection.

##### Power Consumption

NTE2131: <=2.6W (input).

NTX2131: <=1.0W max. (each).

##### Dimensions (width x height x depth)

NTE: 25 x 116.9 x 139.2 mm (0.98 x 4.6 x 5.48 inches).

NTX: 25 x 116.9 x 116.65 mm (0.98 x 4.6 x 4.59 inches).

##### Weight

NTE: 0.5 lbs (0.23 kg).

NTX: 0.3 lbs (0.14 kg).

#### ■ Standards and Certifications

##### Electromagnetic Compatibility (EMC)

CE marked, per EMC Directive 2004/108/EC.

##### Safety Approvals

UL/cUL: Class I; Div 2; Groups A, B, C, D.

ATEX/IECEx: Zone 2.

### Ordering Information

#### ■ Models

[Go to on-line ordering page >](#)

NTE2131-1111

Ethernet I/O module with dual RJ45 ports, 6 relays, 6 discrete inputs

NTX2131-0011

Expansion I/O module with 6 relays, 6 discrete inputs

#### ■ Accessories

5035-369

5035-370

Ethernet patch cable, low EMI, double-shielded. 3 feet (5035-369) or 15 feet (5035-370).

PS5R-VB24

Power supply, 24V DC, 15W output.

See [www.acromag.com](http://www.acromag.com) for other sizes.



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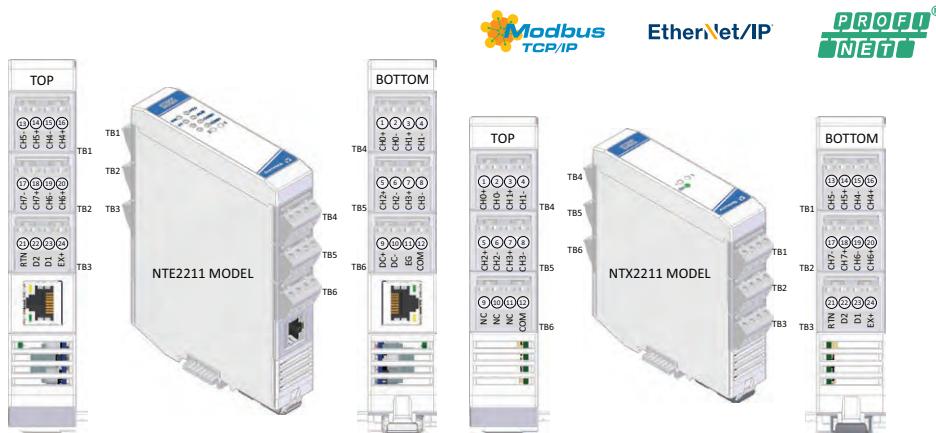
# Ethernet I/O: BusWorks® NT Series

## NT2210 Ethernet Analog I/O Modules



124  
HOUR  
STOCK ITEM

2  
YEAR  
WARRANTY



8 differential current inputs ◆ 2 discrete I/O ◆ Ethernet I/O plus Expansion I/O ◆ Multi-protocol support

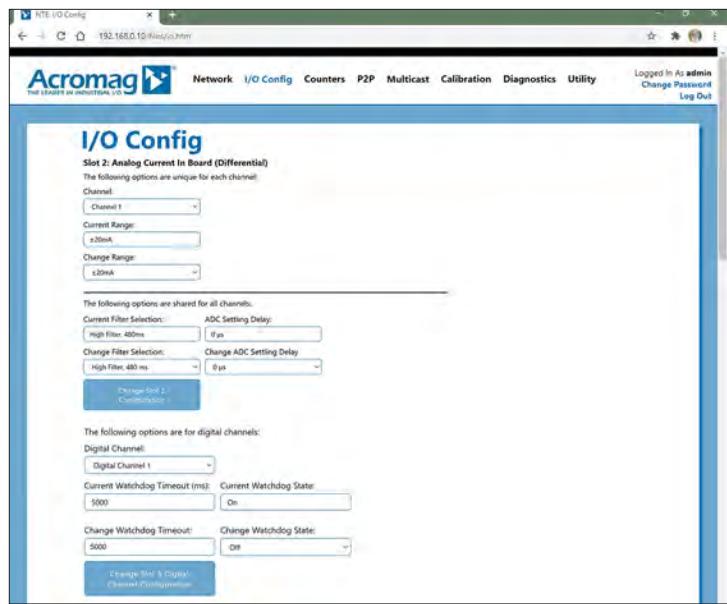
The BusWorks® NT2000 series offers a cost-effective, modular solution for Ethernet remote I/O systems. Two module types are available. NTE Ethernet models provide the protocol interface plus I/O signal processing channels. NTX expansion modules add extra I/O channels when mated to any NTE Ethernet communication module.

NT2210 modules offer 8 current inputs and 2 bidirectional discrete I/O channels. Each input has true differential 16-bit A/D. NTE Ethernet models provide a compact network interface to monitor sensor levels or 4-20mA loops. Appending NTX expansion modules can interface up to 32 differential current inputs on a single IP address.

Applications include collecting pressure, level, flow, temperature, and other data at sensors, transducers, or transmitters. The 4-20mA current loop is the most common process control signal in many industries.

An isolated RS-485 bus links up to three expansion modules to the Ethernet module with connectors that join along the DIN rail. This internal NT bus distributes power and communication between the modules. Users can mix analog, temperature, and discrete I/O modules across the NT bus.

Acromag's i2o® messaging technology allows direct peer-to-peer or multicast communication between remote modules without a master controller.



Easily configure I/O modules using any web browser.

### Key Features & Benefits

- Configured over Ethernet with web browser
- Expandable I/O capacity, up to 58 I/O channels of mixed signal types on one IP address
- Field-selectable Modbus TCP/IP, EtherNet/IP, or Profinet communication
- i2o peer-to-peer or multicast communication
- Dual RJ45 ports enable daisy chain topology
- Eight current inputs
- Accepts  $\pm 20$ mA, 0/4-20mA, and 0/10-50mA input
- Discrete I/O can monitor and control equipment with TTL or 32V logic levels
- \*OPC-UA, \*MQTT and \*RESTful API IIoT support
- Conditional logic for rule-based I/O operation
- Advanced \*alarm and \*data logging functions
- 1500V isolation between I/O, network, and power
- Thin 25mm housing with pluggable terminals
- Wide temperature operation (-40 to 70°C)
- CE compliant. UL/cUL Class 1 Div 2 and ATEX/IECEx Zone 2 approvals

\* Coming soon. Consult factory for availability.

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# Ethernet I/O: BusWorks® NT Series

## NT2210 Ethernet Analog I/O Modules

### Performance Specifications

#### ■ Ethernet Interface (NTE models only)

##### Communication

Configurable for Modbus TCP/IP, EtherNet/IP, and Profinet.

10/100Mbps data rate, auto-sensing.

##### IP Address

Default 192.168.0.10. Configurable static IP or DHCP.

#### ■ Analog Inputs

##### A/D Converter

Eight input channels differentially multiplexed to a 24-bit sigma-delta ADC through unity-gain differential buffers (only 16-bits are used).

##### Input Current Ranges

±20mA, 0-20mA, 4-20mA, 10-50mA, or 0-50mA. Inputs will float relative to ADC unless connected to COM. Up to five inputs in series can connect to the same 20mA current source.

##### Input Accuracy

Better than ±0.05% of span typical, ±0.1% maximum.

#### ■ Discrete Inputs (Active-Low)

##### Input Signal Voltage Range

0 to +32VDC.

##### Input Current

280µA, typical at 32VDC.

##### Input Signal Threshold

TTL compatible w/100mV of hysteresis, typical. 1.7V DC Low-to-High, 1.6V DC High-to-Low. 0.8V DC TTL LOW limit, 2.0V DC TTL HIGH limit.

##### Input Resistance

100K ohms typical (input only), ~10K ohms with output pull-up.

##### Input Response Time

5ms typical, not including network time.

#### ■ Discrete Outputs (Sinking)

##### Output "OFF" Voltage Range

0 to 32V DC.

##### Output "ON" Current Range

0 to 250mA DC, continuous.

##### Output Rds ON Resistance

0.8 ohms typical, 1.6 ohms maximum.

##### Output Response Time

5ms typical. Does not include network time.

#### ■ General I/O

##### Input Update/Conversion Rate

Fresh data available to the network every 10ms.

##### Response Time from an Ethernet command

Less than 5ms, typical.

##### Excitation

External voltage of 4-32V required between I/O EXC and any RTN. Excitation must source 52mA minimum (at 32V). For 2 channels at 250mA max rated load, excitation must source 0.5A min.

##### I/O Pull-Ups (Internal)

Each I/O channel has 10KΩ pull-up to EXC to pull the tandem open drain output and input high/OFF.

#### ■ Environmental and Physical

##### Temperature and Humidity

Operating: -40 to +70°C (-40 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 and 250V AC or 354V DC continuous between I/O channels (group), each network port and power circuits.

##### Power Supply

10-32V DC SELV power wired to NTE models only.

Power to NTX models is via NT bus connection.

##### Power Consumption

NTE2211: <=1.5W (input).

NTX2211: <=0.5W max. (each).

##### Dimensions (width x height x depth)

NTE: 25 x 116.9 x 139.2 mm (0.98 x 4.6 x 5.48 inches).

NTX: 25 x 116.9 x 116.65 mm (0.98 x 4.6 x 4.59 inches).

##### Weight

NTE: 0.5 lbs (0.23 kg).

NTX: 0.3 lbs (0.14 kg).

#### ■ Standards and Certifications

##### Electromagnetic Compatibility (EMC)

CE marked, per EMC Directive 2004/108/EC.

##### Safety Approvals

UL/cUL: Class I; Div 2; Groups A, B, C, D.

ATEX/IECEx: Zone 2.

### Ordering Information

#### ■ Models

[Go to on-line ordering page >](#)

NTE2211-1111

Ethernet I/O module with dual RJ45 ports, 8 differential current inputs and 2 discrete I/O

NTX2211-0011

Expansion I/O module with 8 differential current inputs and 2 discrete I/O

#### ■ Accessories

5035-369

5035-370

Ethernet patch cable, low EMI, double-shielded. 3 feet (5035-369) or 15 feet (5035-370).

PS5R-VB24

Power supply, 24V DC, 15W output.

See [www.acromag.com](http://www.acromag.com) for other sizes.



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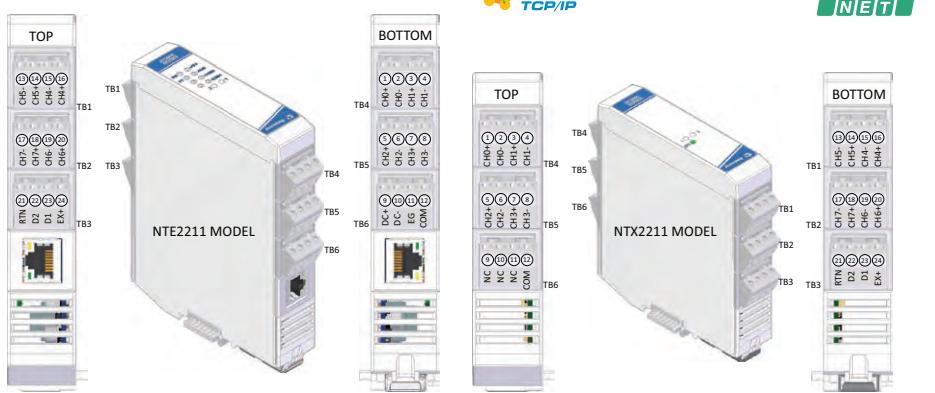
# Ethernet I/O: BusWorks® NT Series

## NT2220 Ethernet Analog I/O Modules



124  
HOUR  
STOCK ITEM

2  
YEAR  
WARRANTY



16 single-ended current inputs ◆ Ethernet I/O plus Expansion I/O ◆ Multi-protocol support

The BusWorks® NT2000 series offers a cost-effective, modular solution for Ethernet remote I/O systems. Two module types are available. NTE Ethernet models provide the protocol interface plus I/O signal processing channels. NTX expansion modules add extra I/O channels when mated to any NTE Ethernet communication module.

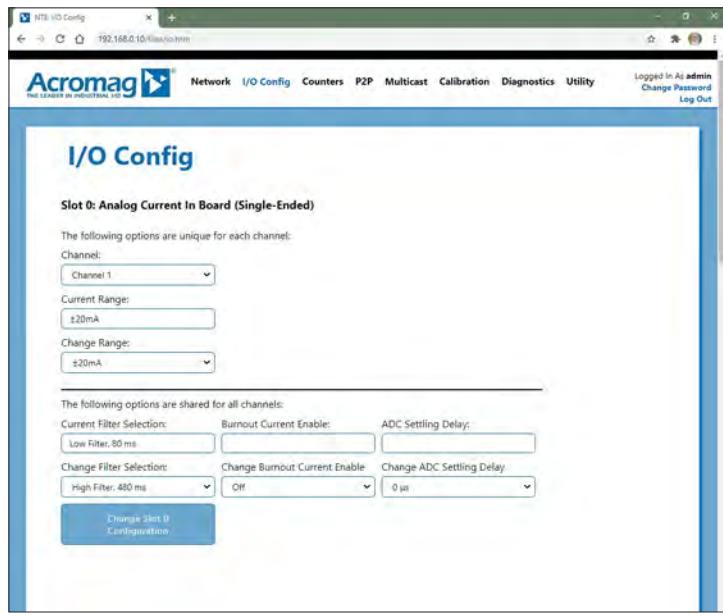
NT2220 modules offer 16 current inputs. Each input supports bipolar and unipolar ranges with 16-bit A/D. NTE Ethernet models provide a compact network interface to monitor sensor levels or 4-20mA loops. Appending NTX expansion models can interface up to 64 current inputs on a single IP address.

Applications include collecting pressure, level, flow, temperature, and other data at sensors, transducers, or transmitters. The 4-20mA current loop is the most common process control signal in many industries.

An isolated RS-485 bus links up to three expansion modules to the Ethernet module with connectors that join along the DIN rail. This internal NT bus distributes power and communication between the modules. Users can mix analog, temperature, and discrete I/O modules across the NT bus.

Acromag's i2o® messaging technology allows direct peer-to-peer or multicast communication between remote modules without a master controller.

Easily configure I/O modules using any web browser.



### Key Features & Benefits

- Configured over Ethernet with web browser
- Expandable I/O capacity, up to 64 I/O channels of mixed signal types on one IP address
- Field-selectable Modbus TCP/IP, EtherNet/IP, or Profinet communication
- i2o peer-to-peer or multicast communication
- Dual RJ45 ports enable daisy chain topology
- 16 single-ended current inputs that share common
- Accepts  $\pm 20$ mA, 0/4-20mA, and 0/10-50mA input
- Measures AC current input with optional sensor
- LED status indicators for visual troubleshooting
- \*OPC-UA, \*MQTT and \*RESTful API IIoT support
- Conditional logic for rule-based I/O operation
- Advanced \*alarm and \*data logging functions
- 1500V isolation between I/O, network, and power
- Thin 25mm housing with pluggable terminals
- Wide temperature operation (-40 to 70°C)
- CE compliant. UL/cUL Class 1 Div 2 and ATEX/IECEx Zone 2 approvals

\* Coming soon. Consult factory for availability.

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# Ethernet I/O: BusWorks® NT Series

## NT2220 Ethernet Analog I/O Modules

### Performance Specifications

#### Ethernet Interface (NTE models only)

##### Communication

Configurable for Modbus TCP/IP, EtherNet/IP, and Profinet.

10/100Mbps data rate, auto-sensing.

##### IP Address

Default 192.168.0.10. Configurable static IP or DHCP.

### Analog Inputs

#### A/D Converter

16 input channels multiplexed to a 24-bit sigma-delta ADC through precision resistors and unity-gain buffers using a 16-bit bipolar conversion scheme.

#### Input Current Ranges

±20mA, 0-20mA, 4-20mA, 0-50mA and 10-50mA. 0-11.17mA range for use with 0-20A AC current sensing toroidal instrument transformer (5020-350).

Input channels are single-ended inputs that share a common return connection.

#### Input Accuracy

Better than ±0.05% of span typical, ±0.1% maximum.

#### Input Measurement Temperature Drift

Better than ±50ppm/°C (±0.0050%/°C).

#### Input Update/Conversion Rate

Response time will vary as filtering is increased. The fastest response time is less than 1ms typical.

#### Input Overvoltage Protection

Bipolar Transient Voltage Suppressors (TVS) with 5.5V clamp level. Inputs also include triple diode over-voltage clamps.

#### Input Impedance

49.9Ω shunt resistor.

#### Input Filter

Normal mode filtering fixed per input type.

### General I/O

#### Input Update/Conversion Rate

Fresh data available to the network every 10ms.

#### Response Time from an Ethernet command

Less than 5ms, typical.

### Environmental and Physical

#### Temperature and Humidity

Operating: -40 to +70°C (-40 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 and 250V AC or 354V DC continuous between I/O channels (group), each network port and power circuits.

#### Power Supply

10-32V DC SELV power wired to NTE model only.

Power to NTX models is via NT bus connection.

#### Power Consumption

NTE2221: <=1.5W (input).

NTX2221: <=0.5W max. (each).

#### Dimensions (width x height x depth)

NTE: 25 x 116.9 x 139.2 mm (0.98 x 4.6 x 5.48 inches).

NTX: 25 x 116.9 x 116.65 mm (0.98 x 4.6 x 4.59 inches).

#### Weight

NTE: 0.5 lbs (0.23 kg).

NTX: 0.3 lbs (0.14 kg).

### Standards and Certifications

#### Electromagnetic Compatibility (EMC)

CE marked, per EMC Directive 2004/108/EC.

#### Safety Approvals

UL/cUL: Class I; Div 2; Groups A, B, C, D.

ATEX/IECEx: Zone 2.

### Ordering Information

#### Models

[Go to on-line ordering page >](#)

NTE2221-1111

Ethernet I/O module with dual RJ45 ports, 16 single-ended current inputs

NTX2221-0011

Expansion I/O module with 16 single-ended current inputs

#### Accessories

5020-350

Toroidal 0 to 20A AC current sensor.

5035-369

5035-370

Ethernet patch cable, low EMI, double-shielded.

3 feet (5035-369) or 15 feet (5035-370).

PS5R-VB24

Power supply, 24V DC, 15W output.

See [www.acromag.com](http://www.acromag.com) for other sizes.



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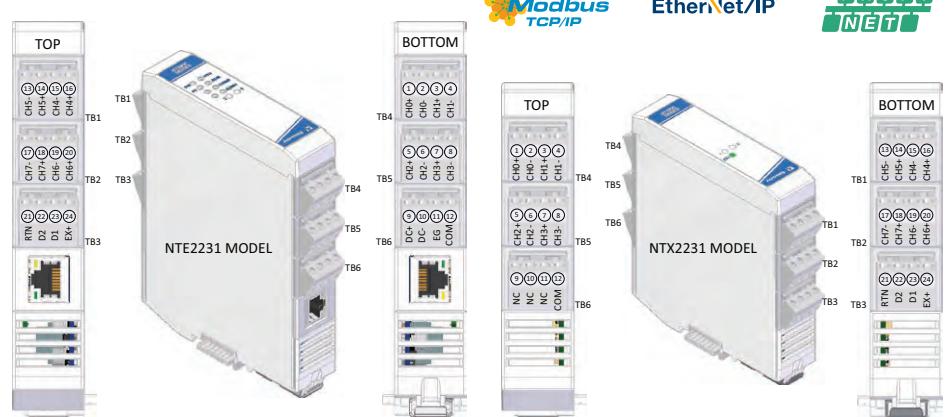
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# Ethernet I/O: BusWorks® NT Series

## NT2230 Ethernet Analog I/O Modules



8 differential voltage inputs ◆ 2 discrete I/O ◆ Ethernet I/O plus Expansion I/O ◆ Multi-protocol support

The BusWorks® NT2000 series offers a cost-effective, modular solution for Ethernet remote I/O systems. Two module types are available. NTE Ethernet models provide the protocol interface plus I/O signal processing channels. NTX expansion modules add extra I/O channels when mated to any NTE Ethernet communication module.

NT2230 modules offer 8 voltage inputs and 2 bidirectional discrete digital I/O channels. Each input has true differential 16-bit A/D. NTE Ethernet models provide a compact network interface to monitor sensor levels or 0-10V devices. Appending NTX expansion models can interface up to 32 differential voltage inputs on a single IP address.

Applications include collecting pressure, HVAC levels, temperature, and other data at sensors, transducers, or transmitters. The 0-10V signal is very commonly used for automation and environmental controllers.

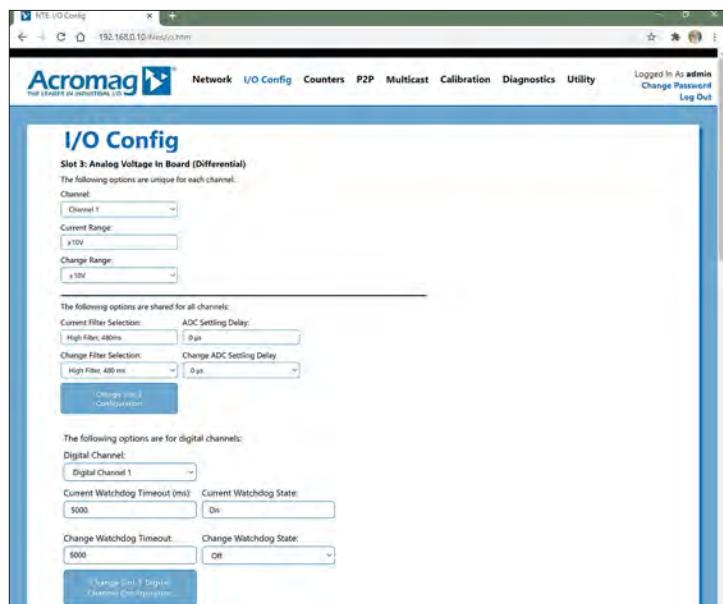
An isolated RS-485 bus links up to three expansion modules to the Ethernet module with connectors that join along the DIN rail. This internal NT bus distributes power and communication between the modules. Users can mix analog, temperature, and discrete I/O modules across the NT bus.

Acromag's i2o® messaging technology allows direct peer-to-peer or multicast communication between remote modules without a master controller.

### Key Features & Benefits

- Configured over Ethernet with web browser
- Expandable I/O capacity, up to 58 I/O channels of mixed signal types on one IP address
- Field-selectable Modbus TCP/IP, EtherNet/IP, or Profinet communication
- i2o peer-to-peer or multicast communication
- Dual RJ45 ports enable daisy chain topology
- Eight voltage inputs with true differential node pairs referenced to input common
- Accepts  $\pm 1/5/10V$  and 0 to  $1/5/10V$  inputs
- Discrete I/O can monitor and control equipment with TTL or 32V logic levels
- \*OPC-UA, \*MQTT and \*RESTful API IIoT support
- Conditional logic for rule-based I/O operation
- Advanced \*alarm and \*data logging functions
- 1500V isolation between I/O, network, and power
- Thin 25mm housing with pluggable terminals
- Wide temperature operation (-40 to 70°C)
- CE compliant. UL/cUL Class 1 Div 2 and ATEX/IECEx Zone 2 approvals.

\* Coming soon. Consult factory for availability.



Easily configure I/O modules using any web browser.



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# Ethernet I/O: BusWorks® NT Series

## NT2230 Ethernet Analog I/O Modules

### Performance Specifications

#### ■ Ethernet Interface (NTE models only)

##### Communication

Configurable for Modbus TCP/IP, EtherNet/IP, and Profenet.

10/100Mbps data rate, auto-sensing.

##### IP Address

Default 192.168.0.10. Configurable static IP or DHCP.

#### ■ Analog Inputs

##### A/D Converter

Eight input channels differentially multiplexed to a 24-bit sigma-delta ADC through unity-gain differential buffers (only 16-bits are used).

##### Input Voltage Ranges

$\pm 1V$ ,  $\pm 5V$ ,  $\pm 10V$ , 0-1V, 0-5V, 0-10V. Inputs are referenced to input common (COM) using resistive dividers at each input node and do not float.

##### Input Accuracy

Better than  $\pm 0.05\%$  of span typical,  $\pm 0.1\%$  maximum.

#### ■ Discrete Inputs (Active-Low)

##### Input Signal Voltage Range

0 to +32V DC.

##### Input Current

280 $\mu$ A, typical at 32V DC.

##### Input Signal Threshold

TTL compatible w/100mV of hysteresis, typical.  
1.7V DC Low-to-High, 1.6V DC High-to-Low.  
0.8V DC TTL LOW limit, 2.0V DC TTL HIGH limit.

##### Input Resistance

100K ohms typical (input only), ~10K ohms with internal pull-ups.

##### Input Response Time

5ms typical, not including network time.

#### ■ Discrete Outputs (Sinking)

##### Output "OFF" Voltage Range

0 to 32V DC.

##### Output "ON" Current Range

0 to 250mA DC, continuous.

##### Output Rds ON Resistance

0.8 ohms typical, 1.6 ohms maximum.

##### Output Response Time

5ms typical. Does not include network time.

#### ■ General I/O

##### Input Update/Conversion Rate

Fresh data available to the network every 10ms.

##### Response Time from an Ethernet command

Less than 5ms, typical.

##### Excitation

External voltage of 4-32V required between I/O EXC and any RTN for DI/O. Excitation must source 52mA minimum (at 32V). For 2 channels at 250mA max rated load, excitation must source 0.5A min.

##### I/O Pull-Ups (Internal)

Each discrete I/O channel has a 10K $\Omega$  pull-up to EXC to pull the tandem open drain output and input high/OFF.

#### ■ Environmental and Physical

##### Temperature and Humidity

Operating: -40 to +70°C (-40 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 and 250V AC or 354V DC continuous between I/O channels (group), each network port and power circuits.

##### Power Supply

10-32V DC SELV power wired to NTE model only.

Power to NTX models is via NT bus connection.

##### Power Consumption

NTE2231: <=1.5W (input).

NTX2231: <=0.5W max. (each).

##### Dimensions (width x height x depth)

NTE: 25 x 116.9 x 139.2 mm (0.98 x 4.6 x 5.48 inches).

NTX: 25 x 116.9 x 116.65 mm (0.98 x 4.6 x 4.59 inches).

##### Weight

NTE: 0.5 lbs (0.23 kg).

NTX: 0.3 lbs (0.14 kg).

#### ■ Standards and Certifications

##### Electromagnetic Compatibility (EMC)

CE marked, per EMC Directive 2004/108/EC.

##### Safety Approvals

UL/cUL: Class I; Div 2; Groups A, B, C, D.

ATEX/IECEx: Zone 2.

### Ordering Information

#### ■ Models

[Go to on-line ordering page >](#)

NTE2231-1111

Ethernet I/O module with dual RJ45 ports, 8 differential voltage inputs and 2 discrete I/O

NTX2231-0011

Expansion I/O module with 8 differential voltage inputs and 2 discrete I/O

#### ■ Accessories

5035-369

5035-370

Ethernet patch cable, low EMI, double-shielded. 3 feet (5035-369) or 15 feet (5035-370).

PS5R-VB24

Power supply, 24V DC, 15W output.

See [www.acromag.com](http://www.acromag.com) for other sizes.



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# Ethernet I/O: BusWorks® NT Series

## NT2240 Ethernet Analog I/O Modules

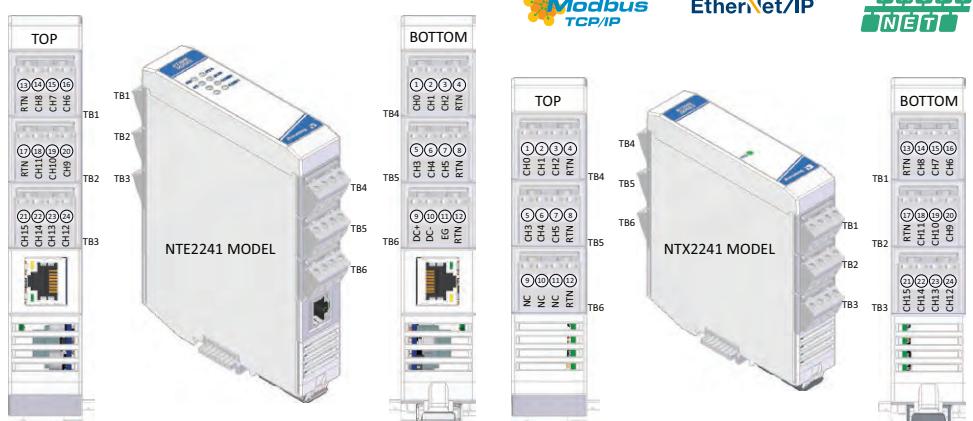


124  
HOUR  
STOCK ITEM

2  
YEAR  
WARRANTY



EtherNet/IP®



16 single-ended voltage inputs ◆ Ethernet I/O plus Expansion I/O ◆ Multi-protocol support

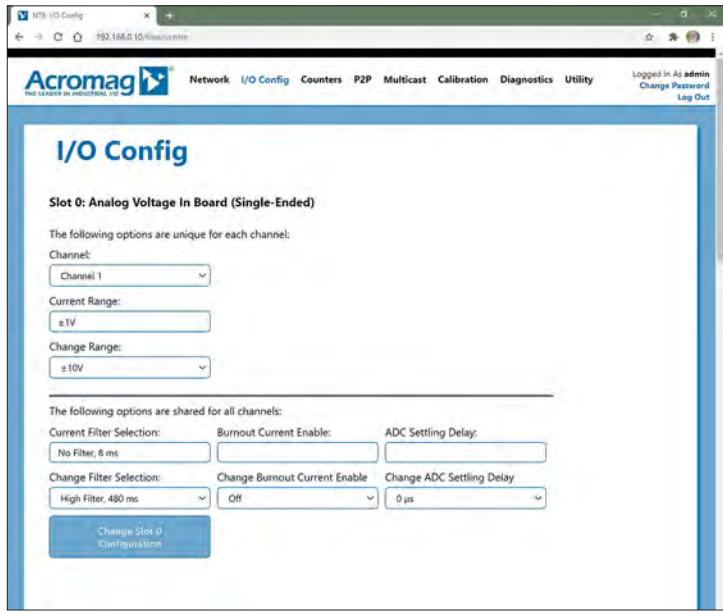
The BusWorks® NT2000 series offers a cost-effective, modular solution for Ethernet remote I/O systems. Two module types are available. NTE Ethernet models provide the protocol interface plus I/O signal processing channels. NTX expansion modules add extra I/O channels when mated to any NTE Ethernet communication module.

NT2240 modules offer 16 voltage inputs. Each input supports bipolar and unipolar ranges with 16-bit A/D. NTE Ethernet models provide a compact network interface to monitor sensor levels or 0-10V devices. Appending NTX expansion models can interface up to 64 voltage inputs on a single IP address.

Applications include collecting pressure, HVAC levels, temperature, and other data at sensors, transducers, or transmitters. The 0-10V signal is very commonly used for automation and environmental controllers.

An isolated RS-485 bus links up to three expansion modules to the Ethernet module with connectors that join along the DIN rail. This internal NT bus distributes power and communication between the modules. Users can mix analog, temperature, and discrete I/O modules across the NT bus.

Acromag's i2o® messaging technology allows direct peer-to-peer or multicast communication between remote modules without a master controller.



Easily configure I/O modules using any web browser.

### Key Features & Benefits

- Configured over Ethernet with web browser
- Expandable I/O capacity, up to 64 I/O channels of mixed signal types on one IP address
- Field-selectable Modbus TCP/IP, EtherNet/IP, or Profinet communication
- i2o peer-to-peer or multicast communication
- Dual RJ45 ports enable daisy chain topology
- 16 single-ended voltage inputs that share common
- Accepts ±1/5/10V and 0 to 1/5/10V inputs
- LED status indicators for visual troubleshooting
- \*OPC-UA, \*MQTT and \*RESTful API IIoT support
- Conditional logic for rule-based I/O operation
- Advanced \*alarm and \*data logging functions
- 1500V isolation between I/O, network, and power
- Thin 25mm housing with pluggable terminals
- Wide temperature operation (-40 to 70°C)
- CE compliant. UL/cUL Class 1 Div 2 and ATEX/IECEx Zone 2 approvals

\* Coming soon. Consult factory for availability.



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# Ethernet I/O: BusWorks® NT Series

## NT2240 Ethernet Analog I/O Modules

### Performance Specifications

#### ■ Ethernet Interface (NTE models only)

##### Communication

Configurable for Modbus TCP/IP and EtherNet/IP, and Profinet.

10/100Mbps data rate, auto-sensing.

##### IP Address

Default 192.168.0.10. Configurable static IP or DHCP.

#### ■ Analog Inputs

##### A/D Converter

16 input channels multiplexed to a 24-bit sigma-delta ADC through resistive dividers using a 16-bit bipolar conversion scheme.

##### Input Voltage Ranges

$\pm 1V$ ,  $\pm 5V$ ,  $\pm 10V$ , 0-1V, 0-5V, 0-10V.

Input channels are single-ended inputs that share a common return connection.

##### Input Accuracy

Better than  $\pm 0.05\%$  of span typical,  $\pm 0.1\%$  maximum.

##### Input Measurement Temperature Drift

Better than  $\pm 50\text{ppm}/^\circ\text{C}$  ( $\pm 0.0050\%/\text{ }^\circ\text{C}$ ).

##### Input Update/Conversion Rate

Response time will vary as filtering is increased. The fastest response time without sample averaging is less than 1ms typical.

##### Input Overvoltage Protection

Bipolar Transient Voltage Suppressors (TVS) with 18V clamp level. Inputs also include triple diode over-voltage clamps.

##### Input Impedance

97.1k $\Omega$  minimum (NT2241 input divider).

##### Input Filter

Normal mode filtering fixed per input type.

#### ■ General I/O

##### Input Update/Conversion Rate

Fresh data available to the network every 10ms.

##### Response Time from an Ethernet command

Less than 5ms, typical.

#### ■ Environmental and Physical

##### Temperature and Humidity

Operating: -40 to  $+70^\circ\text{C}$  (-40 to  $+158^\circ\text{F}$ ).

Storage: -40 to  $+85^\circ\text{C}$  (-40 to  $+185^\circ\text{F}$ ).

Relative Humidity: 5 to 95%, non-condensing.

##### Isolation

1500V AC for 60 seconds and 250V AC or 354V DC continuous between I/O channels (group), each network port and power circuits.

##### Power Supply

10-32V DC SELV power wired to NTE model only.

Power to NTX models is via NT bus connection.

##### Power Consumption

NTE2241:  $<=1.5\text{W}$  (input).

NTX2241:  $<=0.5\text{W}$  max. (each).

##### Dimensions (width x height x depth)

NTE: 25 x 116.9 x 139.2 mm (0.98 x 4.6 x 5.48 inches).

NTX: 25 x 116.9 x 116.65 mm (0.98 x 4.6 x 4.59 inches).

##### Weight

NTE: 0.5 lbs (0.23 kg).

NTX: 0.3 lbs (0.14 kg).

#### ■ Standards and Certifications

##### Electromagnetic Compatibility (EMC)

CE marked, per EMC Directive 2004/108/EC.

##### Safety Approvals

UL/cUL: Class I; Div 2; Groups A, B, C, D.

ATEX/IECEx: Zone 2.

### Ordering Information

#### ■ Models

[Go to on-line ordering page >](#)

NTE2241-1111

Ethernet I/O module with dual RJ45 ports, 16 single-ended voltage inputs

NTX2241-0011

Expansion I/O module with 16 single-ended voltage inputs

#### ■ Accessories

5035-369

5035-370

Ethernet patch cable, low EMI, double-shielded. 3 feet (5035-369) or 15 feet (5035-370).

PS5R-VB24

Power supply, 24V DC, 15W output.

See [www.acromag.com](http://www.acromag.com) for other sizes.



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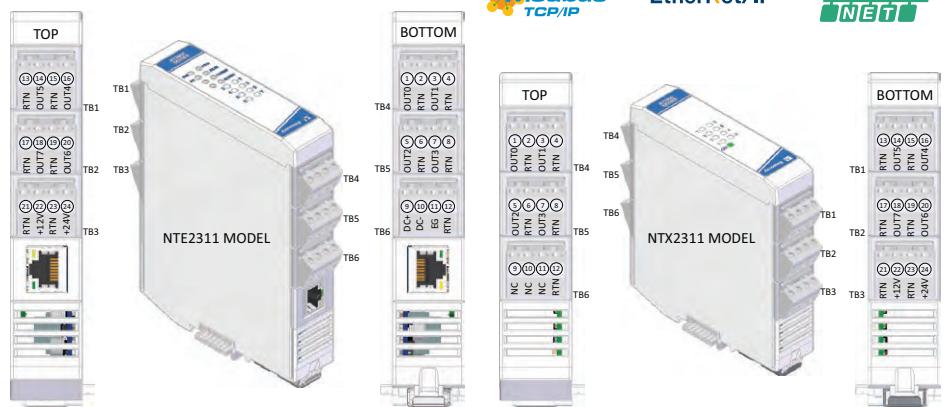
# Ethernet I/O: BusWorks® NT Series

## NT2310 Ethernet Analog Output Modules



124  
HOUR  
STOCK ITEM

2  
YEAR  
WARRANTY



8 process current outputs ◆ Ethernet I/O plus Expansion I/O ◆ Multi-protocol support

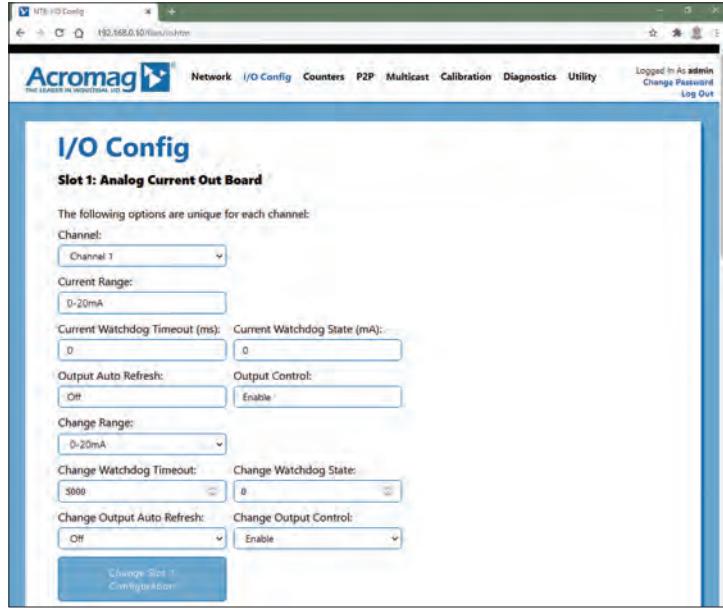
The BusWorks® NT2000 series offers a cost-effective, modular solution for Ethernet remote I/O systems. Two module types are available. NTE Ethernet models provide the protocol interface plus I/O signal processing channels. NTX expansion modules add extra I/O channels when mated to any NTE Ethernet communication module.

NT2310 modules offer 8 current outputs. Each output is driven by a 16-bit DAC. NTE Ethernet models provide a compact network interface to control 4-20mA loops. Appending NTX expansion models can interface up to 32 current outputs at a single IP address.

Applications include controlling analog actuator levels and driving recorders, displays, or other instruments. The outputs can control valves, pumps, and motors to regulate flow, level, or temperature.

An isolated RS-485 bus links up to three expansion modules to the Ethernet module with connectors that join along the DIN rail. This internal NT bus distributes power and communication between the modules. Users can mix analog, temperature, and discrete I/O modules across the NT bus.

Acromag's i2o® messaging technology allows direct peer-to-peer or multicast communication between remote modules without a master controller.



## Key Features & Benefits

- Configured over Ethernet with web browser
- Expandable I/O capacity, up to 56 I/O channels of mixed signal types at one IP address
- Field-selectable Modbus TCP/IP, EtherNet/IP, or Profinet communication
- i2o peer-to-peer or multicast communication
- Dual RJ45 ports enable daisy chain topology
- Eight current outputs with 16-bit D/A resolution
- Selectable 0-20mA or 4-20mA output range
- LED status indicators for visual troubleshooting
- \*OPC-UA, \*MQTT and \*RESTful API IIoT support
- Conditional logic for rule-based I/O operation
- Advanced \*alarm and \*data logging functions
- 1500V isolation between I/O, network, and power
- Thin 25mm housing with pluggable terminals
- Wide temperature operation (-40 to 70°C)
- CE compliant. UL/cUL Class 1 Div 2 and ATEX/IECEx Zone 2 approvals (pending)

\* Coming soon. Consult factory for availability.

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# Ethernet I/O: BusWorks® NT Series

## NT2310 Ethernet Analog Output Modules

### Performance Specifications

#### ■ Ethernet Interface (NTE models only)

##### Communication

Configurable for Modbus TCP/IP and EtherNet/IP, and Profinet.

10/100Mbps data rate, auto-sensing.

##### IP Address

Default 192.168.0.10. Configurable static IP or DHCP.

#### ■ Analog Outputs

##### A/D Converter

Eight current output channels driven by an octal 16-bit voltage DAC. Outputs share a return.

##### Output Current Ranges

Select 0-20mA or 4-20mA DC. Maximum current is 22.6mA.

##### Output Accuracy

Factory calibrated to better than  $\pm 0.1\%$  of span. Manual calibration of current outputs can improve accuracy to better than  $\pm 0.05\%$ .

##### Output Temperature Drift

Better than  $\pm 60\text{ppm}/^\circ\text{C}$  ( $\pm 0.0060\%/\text{C}$ ).

##### Output Load Resistance Range

0-600 ohms.

##### Output Excitation

Two separate excitation inputs, one for 12V power sources (10-15V) and one for 24V power (20-28V). Both excitation sources are diode-coupled allowing redundant excitation supplies.

##### Output Compliance

12.5V typical (with a 15V internal excitation rail). Output can typically drive 20mA full-scale into 625 ohms, or 22.6mA maximum into 550 ohms.

##### Output Update Rate

Outputs update when written and are continuously refreshed every 5 seconds.

#### ■ General I/O

##### Input Update/Conversion Rate

Fresh data available to the network every 10ms. Dependent on number of samples with averaging.

##### Response Time from an Ethernet command

Less than 5ms, typical.

#### ■ Environmental and Physical

##### Temperature and Humidity

Operating: -40 to  $+70^\circ\text{C}$  (-40 to  $+158^\circ\text{F}$ ).

Storage: -40 to  $+85^\circ\text{C}$  (-40 to  $+185^\circ\text{F}$ ).

Relative Humidity: 5 to 95%, non-condensing.

##### Isolation

1500VAC HIPOT for 60 seconds with 250VAC/354VDC continuous isolation between output channels/excitation (as a group), network (each port), and input power.

##### Power Supply

10-32V DC SELV power wired to NTE model only.

Power to NTX models is via NT bus connection.

##### Power Consumption

NTE2311: 1.091W typical, 1.20W maximum.

NTX2311: 0.092W maximum (each).

##### Dimensions (width x height x depth)

NTE: 25 x 116.9 x 139.2 mm (0.98 x 4.6 x 5.48 inches).

NTX: 25 x 116.9 x 116.65 mm (0.98 x 4.6 x 4.59 inches).

##### Weight

NTE: 0.5 lbs (0.23 kg).

NTX: 0.3 lbs (0.14 kg).

#### ■ Standards and Certifications

##### Electromagnetic Compatibility (EMC)

CE marked, per EMC Directive 2004/108/EC.

##### Safety Approvals

UL/cUL: Class I; Div 2; Groups A, B, C, D (pending).

ATEX/IECEx: Zone 2 (pending).

### Ordering Information

#### ■ Models

[Go to on-line ordering page >](#)

NTE2311-1111

Ethernet I/O module with dual RJ45 ports, 8 current outputs.

NTX2311-0011

Expansion I/O module with 8 current outputs.

#### ■ Accessories

5035-369

5035-370

Ethernet patch cable, low EMI, double-shielded. 3 feet (5035-369) or 15 feet (5035-370).

PS5R-VB24

Power supply, 24V DC, 15W output.

See [www.acromag.com](http://www.acromag.com) for other sizes.



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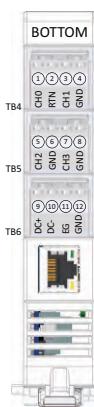


# Ethernet I/O: BusWorks® NT Series

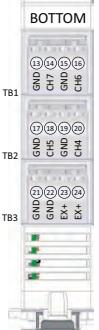
## NT2320 Ethernet Analog Output Modules



124  
HOUR  
STOCK ITEM



EtherNet/IP®



8 process voltage outputs ◆ Ethernet I/O plus Expansion I/O ◆ Multi-protocol support

The BusWorks® NT2000 series offers a cost-effective, modular solution for Ethernet remote I/O systems. Two module types are available. NTE Ethernet models provide the protocol interface plus I/O signal processing channels. NTX expansion modules add extra I/O channels when mated to any NTE Ethernet communication module.

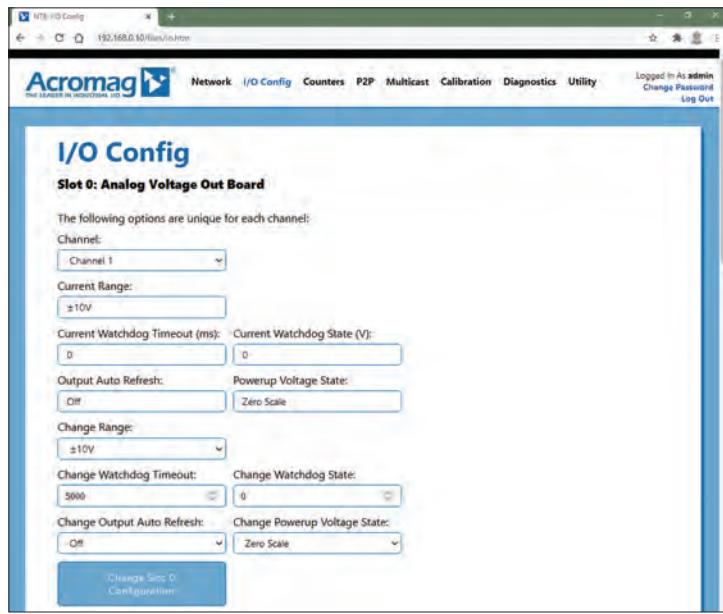
NT2320 modules offer 8 voltage outputs. Each output is driven by a 16-bit DAC. NTE Ethernet models provide a compact network interface to control voltage signal levels. Appending NTX expansion models can interface up to 32 voltage outputs at a single IP address.

Applications include controlling analog actuator levels and driving recorders, displays, or other process instruments. Voltage outputs can control generator power, drive speed, or valve positioning.

An isolated RS-485 bus links up to three expansion modules to the Ethernet module with connectors that join along the DIN rail. This internal NT bus distributes power and communication between the modules. Users can mix analog, temperature, and discrete I/O modules across the NT bus.

Acromag's i2o® messaging technology allows direct peer-to-peer or multicast communication between remote modules without a master controller.

Easily configure I/O modules using any web browser.



## Key Features & Benefits

- Configured over Ethernet with web browser
- Expandable I/O capacity, up to 56 I/O channels of mixed signal types at one IP address
- Field-selectable Modbus TCP/IP, EtherNet/IP, or \*Profinet communication
- i2o peer-to-peer or multicast communication
- Dual RJ45 ports enable daisy chain topology
- Eight voltage outputs with 16-bit D/A resolution
- Selectable ±5V, ±10V, 0-5V, 0-10V output range
- LED status indicators for visual troubleshooting
- \*OPC-UA, \*MQTT and \*RESTful API IIoT support
- Conditional logic for rule-based I/O operation
- Advanced \*alarm and \*data logging functions
- 1500V isolation between I/O, network, and power
- Thin 25mm housing with pluggable terminals
- Wide temperature operation (-40 to 70°C)
- CE compliant. Hazardous approvals pending.

\* Coming soon. Consult factory for availability.

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# Ethernet I/O: BusWorks® NT Series

## NT2320 Ethernet Analog Output Modules

### Performance Specifications

#### ■ Ethernet Interface (NTE models only)

##### Communication

Configurable for Modbus TCP/IP, EtherNet/IP, and Profinet.

10/100Mbps data rate, auto-sensing.

##### IP Address

Default 192.168.0.10. Configurable static IP or DHCP.

#### ■ Analog Outputs

##### D/A Converter

Eight DC voltage outputs driven by individual D/A converters. Outputs share a return.

##### Output Voltage Ranges

Select  $\pm$ 10V,  $\pm$ 5V, 0-10V, or 0-5V.

##### Output Accuracy

Factory calibrated to better than  $\pm$ 0.1% of span. Manual calibration of voltage outputs can improve accuracy to better than  $\pm$ 0.05%.

##### Output Temperature Drift

Better than  $\pm$ 50ppm/ $^{\circ}$ C ( $\pm$ 0.0050%/ $^{\circ}$ C).

##### Output Excitation

Required for output operation 0.8W max.

##### Output Update Rate

Outputs update when written and are continuously refreshed every 5 seconds.

#### ■ General I/O

##### Input Update/Conversion Rate

Fresh data available to the network every 10ms. Dependent on number of samples with averaging.

##### Response Time from an Ethernet command

Less than 5ms, typical.

#### ■ Environmental and Physical

##### Temperature and Humidity

Operating: -40 to  $+70^{\circ}$ C (-40 to  $+158^{\circ}$ F).

Storage: -40 to  $+85^{\circ}$ C (-40 to  $+185^{\circ}$ F).

Relative Humidity: 5 to 95%, non-condensing.

##### Isolation

1500V AC for 60 seconds and 250V AC or 354V DC continuous between I/O channels (group), each network port and power circuits.

##### Power Supply

10-32V DC SELV power wired to NTE model only.

Power to NTX models is via NT bus connection.

Excitation Voltage: +12V DC to +24V DC

##### Power Consumption

NTE2321: 1.23 W typical, 1.35 maximum.

NTX2321: 1.44 W typical, 1.54 W maximum.

##### Dimensions (width x height x depth)

NTE: 25 x 116.9 x 139.2 mm (0.98 x 4.6 x 5.48 inches).

NTX: 25 x 116.9 x 116.65 mm (0.98 x 4.6 x 4.59 inches).

##### Weight

NTE: 0.5 lbs (0.23 kg).

NTX: 0.3 lbs (0.14 kg).

#### ■ Standards and Certifications

##### Electromagnetic Compatibility (EMC)

CE marked, per EMC Directive 2004/108/EC.

##### Safety Approvals

Hazardous approvals pending.

### Ordering Information

#### ■ Models

[Go to on-line ordering page >](#)

NTE2321-1111

Ethernet I/O module with dual RJ45 ports, 8 voltage outputs.

NTX2321-0011

Expansion I/O module with 8 voltage outputs.

#### ■ Accessories

5035-369

5035-370

Ethernet patch cable, low EMI, double-shielded. 3 feet (5035-369) or 15 feet (5035-370).

PS5R-VB24

Power supply, 24V DC, 15W output.

See [www.acromag.com](http://www.acromag.com) for other sizes.



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# Ethernet I/O: BusWorks® NT Series

## NT2510/2530 Ethernet Multi-Function I/O Modules



EtherNet/IP®



4 analog inputs ◆ 2 analog outputs ◆ 4 discrete I/O ◆ Ethernet I/O plus Expansion I/O ◆ Multi-protocol support

The BusWorks® NT2000 series offers a cost-effective, modular solution for Ethernet remote I/O systems. Two module types are available. NTE Ethernet models provide the protocol interface plus I/O signal processing channels. NTX expansion modules can add extra I/O channels when mated to any NTE Ethernet communication module.

NT2510 modules offer 4 current inputs, 2 current outputs, and 4 discrete I/O channels. NT2530 models have voltage input. NTE Ethernet models provide a network interface to monitor and control I/O signals. Appending NTX expansion models can interface up to 24 analog and 16 discrete I/O on a single IP address.

Applications include monitoring and controlling analog signals representing temperature, pressure, level, and flow. Discrete I/O sense and control levels on motors, lamps, valves, and other equipment.

An isolated RS-485 bus links up to three expansion modules to the Ethernet module with connectors that join along the DIN rail. This internal NT bus distributes power and communication between the modules. Users can mix analog, temperature, and discrete I/O modules across the NT bus.

Acromag's i2o® messaging technology allows direct peer-to-peer multicast communication between remote modules without a master controller.

Easily configure I/O modules using any web browser.

## Key Features & Benefits

- Configured over Ethernet with web browser
- Expandable I/O capacity, up to 58 I/O channels of mixed signal types on one IP address
- Field-selectable Modbus TCP/IP, Ethernet/IP, or Profinet communication
- i2o peer-to-peer or multicast communication
- Dual RJ45 ports enable daisy chain topology
- Four differential analog inputs  
current ranges: 0/4-20mA, ±20mA, 0/10-50mA  
voltage ranges: 0-1/5/10V, ±1/5/10V
- Two process current 0/4-20mA outputs (optional)
- Four tandem discrete I/O for TTL or 32V input
- \*OPC-UA, \*MQTT and \*RESTful API IIoT support
- Conditional logic for rule-based I/O operation
- Advanced \*alarm and \*data logging functions
- 1500V isolation from I/O to network and power
- Thin 25mm housing with pluggable terminals
- Wide temperature operation (-40 to 70°C)
- CE compliant. Hazardous approval pending.
- \* Coming soon. Consult factory for availability.

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# Ethernet I/O: BusWorks® NT Series

## NT2510/2530 Ethernet Multi-Function I/O Modules

### Performance Specifications

#### ■ Ethernet Interface (NTE models only)

##### Communication

Configurable for Modbus TCP/IP and EtherNet/IP, and Profinet.

10/100Mbps data rate, auto-sensing.

##### IP Address

Default 192.168.0.10. Configurable static IP or DHCP.

#### ■ Analog Inputs

##### A/D Converter

Four input channels differentially multiplexed to a 24-bit sigma-delta ADC through unity-gain differential buffers (only 16-bits are used).

##### Input Current Ranges (NT2510 models)

±20mA, 0-20mA, 4-20mA, 0-50mA, or 10-50mA.

##### Input Voltage Ranges (NT2530 models)

±1V, ±5V, ±10V, 0-1V, 0-5V, 0-10V.

##### Input Accuracy

Better than ±0.05% of span typical, ±0.1% maximum.

#### ■ Analog Outputs

##### NT2511, 2531 models only

##### D/A Converter

Two current output channels driven by a 16-bit DAC.

##### Output Current Ranges

0-20mA, 4-20mA.

##### Output Accuracy

Factory calibrated to better than ±0.1% of span. Manual calibration can be better than ±0.05%.

##### Output Excitation

Two excitation inputs for 12V and 24V sources.

#### ■ Discrete Inputs (Active-high)

##### Input Signal Voltage Range

0 to 32VDC.

##### Input Signal Threshold

TTL compatible w/100mV of hysteresis, typical.

Low-to-High threshold: 1.7VDC, typical.

High-to-Low threshold: 1.6VDC, typical.

TTL logic limit - LOW: 0.8V DC max.

TTL logic limit - HIGH: 2.0VDC min.

##### Tandem I/O Channels

Inputs support loop-back monitoring of output state.

#### ■ Discrete Outputs (Sourcing)

##### Output "ON" Voltage Range

TTC (6V) to 32V DC.

##### Output "ON" Current Range

0 to 300mA DC, continuous.

#### ■ General I/O

##### Input Update/Conversion Rate

Fresh data available to the network every 10mS. Dependent on number of samples with averaging.

##### Response Time from an Ethernet command

Less than 5mS, typical.

#### ■ Environmental and Physical

##### Temperature and Humidity

Operating: -40 to +70°C (-40 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 and 250V AC or 354V DC continuous between I/O channels (group), each network port and power circuits. Note, network isolation is <1500V.

##### Power Supply

10-32V DC SELV power wired to NTE models only. Power to NTX models is via NT bus connection.

##### Dimensions (width x height x depth)

NTE: 25 x 116.9 x 139.2 mm (0.98 x 4.6 x 5.48 inches).

NTX: 25 x 116.9 x 116.65 mm (0.98 x 4.6 x 4.59 inches).

##### Weight

NTE: 0.5 lbs (0.23 kg).

NTX: 0.3 lbs (0.14 kg).

#### ■ Standards and Certifications

##### Electromagnetic Compatibility (EMC)

CE marked, per EMC Directive 2004/108/EC.

##### Safety Approvals

UL/cUL: Class I; Div 2; Groups A, B, C, D (pending).

ATEX/IECEx: Zone 2 (pending).

### Ordering Information

#### ■ Models

[Go to on-line ordering page >](#)

##### NTE2511-1111

Ethernet I/O module with dual RJ45 ports, 4 current inputs, 2 current outputs, 4 discrete I/O

##### NTX2511-0011

Expansion I/O module with 4 current inputs, 2 current outputs, 4 discrete I/O

##### NTE2512-1111

Ethernet I/O module with dual RJ45 ports, 4 current inputs, 4 discrete I/O

##### NTX2512-0011

Expansion I/O module with 4 current inputs, 4 discrete I/O

##### NTE2531-1111

Ethernet I/O module with dual RJ45 ports, 4 voltage inputs, 2 current outputs, 4 discrete I/O

##### NTX2531-0011

Expansion I/O module with 4 voltage inputs, 2 current outputs, 4 discrete I/O

##### NTE2532-1111

Ethernet I/O module with dual RJ45 ports, 4 voltage inputs, 4 discrete I/O

##### NTX2532-0011

Expansion I/O module with 4 voltage inputs, 4 discrete I/O

#### ■ Accessories

##### 5020-350

Toroidal 0 to 20A AC current sensor. 0-11, 17mA output.

##### 5035-369

##### 5035-370

Ethernet patch cable, low EMI, double-shielded. 3 feet (5035-369) or 15 feet (5035-370).

##### PS5R-VB24

Power supply, 24V DC, 15W output.

See [www.acromag.com](http://www.acromag.com) for other sizes.



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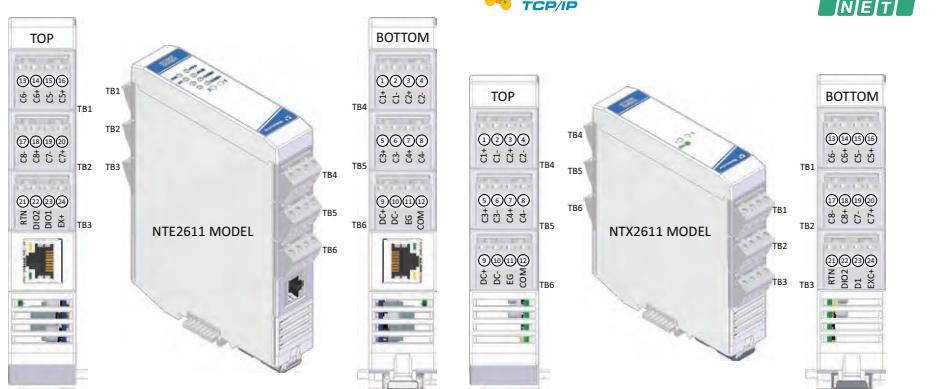
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# Ethernet I/O: BusWorks® NT Series

## NT2610 Ethernet Temperature Input Modules



8 thermocouple / mV inputs ◆ 2 discrete I/O ◆ Ethernet I/O plus Expansion I/O ◆ Multi-protocol support

The BusWorks® NT2000 series offers a cost-effective, modular solution for Ethernet remote I/O systems. Two module types are available. NTE Ethernet models provide the protocol interface plus eight I/O signal processing channels. NTX expansion modules add eight more I/O channels when mated to any NTE Ethernet communication module.

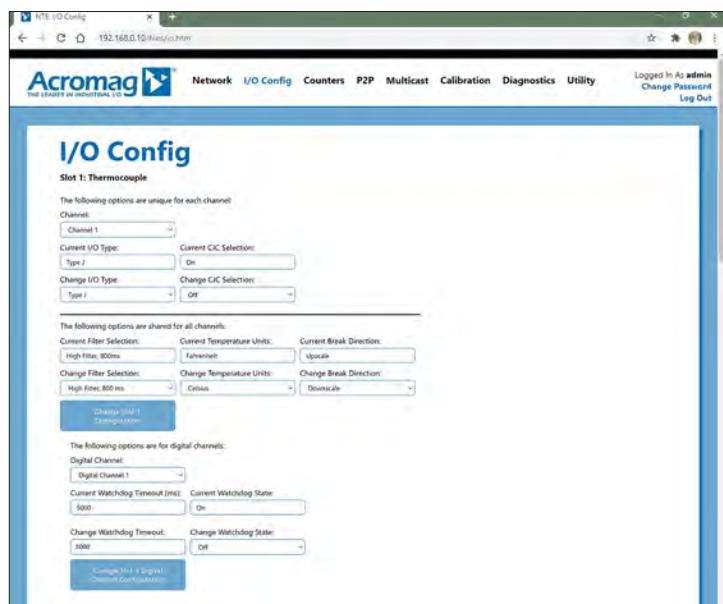
NT2610 modules offer 8 thermocouple/millivolt inputs and 2 bidirectional discrete digital I/O channels. Each input can support a variety of sensor types. NTE Ethernet models provide a network interface to monitor temperature levels. Appending NTX expansion modules can interface up to 32 TC/mV sensor inputs at a single IP address.

Applications include monitoring temperatures in tanks, pipes, motors, heaters, chillers, and many industrial processes. Many pressure, weight, flow, and chemical sensors also provide a millivolt output.

An isolated RS-485 bus links up to three expansion modules to the Ethernet module with bus connectors that join units along the DIN rail. This internal NT bus distributes power and communication between the modules. Users can mix analog, temperature, and discrete I/O modules across the NT bus.

Acromag's i2o® messaging technology allows direct peer-to-peer or multicast communication between remote modules without a master controller.

Easily configure I/O modules using any web browser.



### Key Features & Benefits

- Configured over Ethernet using a web browser
- Expandable I/O capacity, up to 58 I/O channels at one IP address
- Field-selectable Modbus TCP/IP, EtherNet/IP, or Profinet communication
- i2o peer-to-peer or multicast communication
- Dual RJ45 ports enable daisy chain topology
- Eight differential thermocouple/millivolt inputs
- Accepts TC types J, K, T, R, S, B, E, or N and millivolt ranges of  $\pm 100\text{mV}$  or  $\pm 500\text{mV}$
- Discrete I/O can monitor and control equipment with TTL or 32V logic levels
- \*OPC-UA, \*MQTT and \*RESTful API IIoT support
- Conditional logic for rule-based I/O operation
- Advanced \*alarm and \*data logging functions
- 1500V isolation between I/O, network, and power
- Thin 25mm housing with pluggable terminals
- Wide temperature operation (-40 to 70°C)
- CE compliant. UL/cUL Class 1 Div 2 and ATEX/IECEx Zone 2 approvals

\* Coming soon. Consult factory for availability.



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# Ethernet I/O: BusWorks® NT Series

## NT2610 Ethernet Temperature Input Modules

### Performance Specifications

#### ■ Ethernet Interface (NTE models only)

##### Communication

Configurable for Modbus TCP/IP and EtherNet/IP, and Profinet.

10/100Mbps data rate, auto-sensing.

##### IP Address

Default 192.168.0.10. Configurable static IP or DHCP.

#### ■ Analog Inputs

##### A/D Converter

Eight TC/mV input channels differentially multiplexed to a 24-bit sigma-delta ADC (only 16-bits are used).

##### Input Sensor Ranges

Thermocouple types J, K, T, R, S, E, B, N.

Millivolt ranges of  $\pm 100\text{mV}$  or  $\pm 500\text{mV}$  DC.

##### Input Accuracy

Better than  $\pm 0.05\%$  of span typical,  $\pm 0.1\%$  maximum.

Thermocouple accuracy is  $\pm 0.5^\circ\text{C}$  or  $\pm 1.0^\circ\text{C}$  typical depending on type and temperature range.

##### Break Detection

Configurable for upscale or downscale open sensor or lead break detection.

##### Linearization (T/C Inputs)

Within  $\pm 0.25^\circ\text{C}$  of the NIST tables.

##### Thermocouple CJC Accuracy

-20 to  $+50^\circ\text{C}$ :  $\pm 0.5^\circ\text{C}$  maximum.

-40 to  $+70^\circ\text{C}$ :  $\pm 1.0^\circ\text{C}$  maximum.

##### Temperature Measurement Drift

$\pm 80\text{ppm}$ ,  $\pm 0.0080\%$ .

#### ■ Discrete Inputs (Active-Low)

##### Input Signal Voltage Range

0 to  $+32\text{V}$  DC.

##### Input Current

$280\mu\text{A}$ , typical at  $32\text{V}$  DC.

##### Input Signal Threshold

TTL compatible w/ $100\text{mV}$  of hysteresis, typical.

$1.7\text{V}$  DC Low-to-High,  $1.6\text{V}$  DC High-to-Low.

$0.8\text{V}$  DC TTL LOW limit,  $2.0\text{V}$  DC TTL HIGH limit.

##### Input Resistance

100K ohms typical (input only),  $\sim 10\text{K}$  ohms w/ tandem output using internal pull-ups.

##### Input Response Time

5ms typical, not including network time.

#### ■ Discrete Outputs (Sinking)

Output "OFF" Voltage Range  
0 to  $32\text{V}$  DC.

Output "ON" Current Range  
0 to  $250\text{mA}$  DC, continuous.

Output Rds ON Resistance  
0.8 ohms typical, 1.6 ohms maximum.

Output Response Time  
10ms typical. Does not include network time.

#### ■ General I/O

Input Update/Conversion Rate  
Fresh data available to the network every 10ms.

Response Time from an Ethernet command  
Less than 5ms, typical.

##### Excitation

External voltage of 4-32V required between I/O EXC and any RTN for DI/O. Excitation must source  $500\text{mA}$  minimum (at 32V). For both channels at  $250\text{mA}$  max. rated load.

##### I/O Pull-Ups (Internal)

Each discrete I/O channel has  $10\text{K}\Omega$  pull-up to EXC to pull the tandem open drain output and input high/OFF.

#### ■ Environmental and Physical

##### Temperature and Humidity

Operating: -40 to  $+70^\circ\text{C}$  (-40 to  $+158^\circ\text{F}$ ).

Storage: -40 to  $+85^\circ\text{C}$  (-40 to  $+185^\circ\text{F}$ ).

Relative Humidity: 5 to 95%, non-condensing.

##### Isolation

1500V AC for 60 seconds and 250V AC or 354V DC continuous between I/O channels (group), each network port and power circuits.

##### Power Supply

10-32V DC SELV power wired to NTE model only.

Power to NTX models is via its NT bus connection.

##### Power Consumption

NTE2611:  $<=1.5\text{W}$  (input).

NTX2611:  $<=0.5\text{W}$  max. (each).

##### Dimensions (width x height x depth)

NTE: 25 x 116.9 x 139.2 mm (0.98 x 4.6 x 5.48 inches).

NTX: 25 x 116.9 x 116.65 mm (0.98 x 4.6 x 4.59 inches).

##### Weight

NTE: 0.5 lbs (0.23 kg).

NTX: 0.3 lbs (0.14 kg).

#### ■ Standards and Certifications

##### Electromagnetic Compatibility (EMC)

CE marked, per EMC Directive 2004/108/EC.

##### Safety Approvals

UL/cUL: Class I; Div 2; Groups A, B, C, D.

ATEX/IECEx: Zone 2.

### Ordering Information

#### ■ Models

[Go to on-line ordering page >](#)

NTE2611-1111

Ethernet I/O module with dual RJ45 ports, 8 thermocouple/mV inputs and 2 discrete I/O

NTX2611-0011

Expansion I/O module with 8 thermocouple/mV inputs and 2 discrete I/O

#### ■ Accessories

5035-369

5035-370

Ethernet patch cable, low EMI, double-shielded. 3 feet (5035-369) or 15 feet (5035-370).

PS5R-VB24

Power supply, 24V DC, 15W output.

See [www.acromag.com](http://www.acromag.com) for other sizes.



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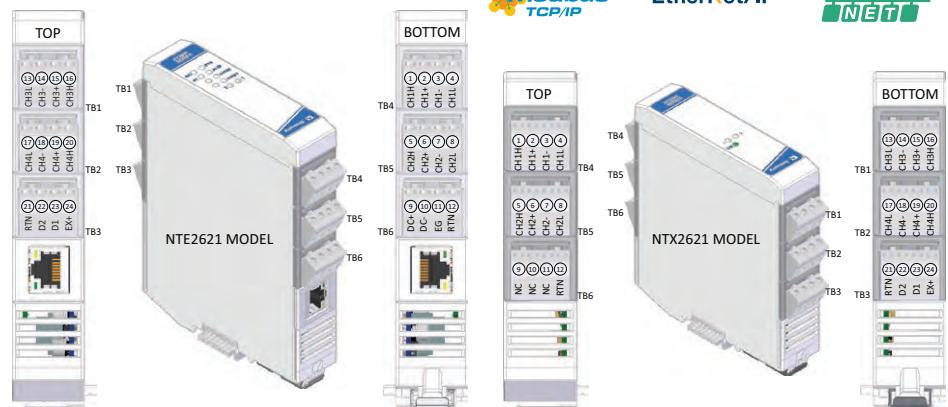
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# Ethernet I/O: BusWorks® NT Series

## NT2620 Ethernet Temperature Input Modules



4 RTD/resistance inputs ◆ 2 discrete I/O ◆ Ethernet I/O plus Expansion I/O ◆ Multi-protocol support

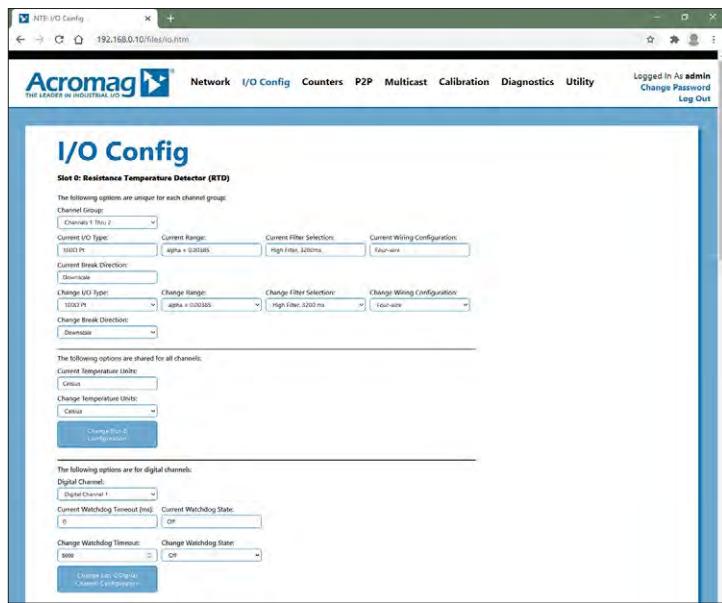
The BusWorks® NT2000 series offers a cost-effective, modular solution for Ethernet remote I/O systems. Two module types are available. NTE Ethernet models provide the protocol interface plus I/O signal processing channels. NTX expansion modules add extra I/O channels when mated to any NTE Ethernet communication module.

NT2620 modules offer 4 RTD/resistance inputs and 2 bidirectional discrete digital I/O channels. Each input can support RTD or resistance sensor types. NTE Ethernet models provide a network interface to monitor temperature levels. Appending NTX expansion modules can interface up to 16 RTD sensor inputs at a single IP address.

Applications include monitoring temperatures in tanks, pipes, motors, heaters, chillers, and many industrial processes. Resistive sensors include slidewires and potentiometers.

An isolated RS-485 bus links up to three expansion modules to the Ethernet module with bus connectors that join units along the DIN rail. This internal NT bus distributes power and communication between the modules. Users can mix analog, temperature, and discrete I/O modules across the NT bus.

Acromag's i2o® messaging technology allows direct peer-to-peer or multicast communication between remote modules without a master controller.



Easily configure I/O modules using any web browser.

### Key Features & Benefits

- Configured over Ethernet using a web browser
- Expandable I/O capacity, up to 54 I/O channels at one IP address
- Field-selectable Modbus TCP/IP, EtherNet/IP, or Profinet communication
- i2o peer-to-peer or multicast communication
- Dual RJ45 ports enable daisy chain topology
- Four RTD or linear resistance inputs
- Accepts Pt, Ni, and Cu RTDs with 2, 3, or 4 wires and 0 to 4500 ohm linear ranges
- Discrete I/O can monitor and control equipment with TTL or 32V logic levels
- \*OPC-UA, \*MQTT and \*RESTful API IIoT support
- Conditional logic for rule-based I/O operation
- Advanced \*alarm and \*data logging functions
- 1500V isolation between I/O, network, and power
- Thin 25mm housing with pluggable terminals
- Wide temperature operation (-40 to 70°C)
- CE compliant. Hazardous approvals pending
- \* Coming soon. Consult factory for availability.



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# Ethernet I/O: BusWorks® NT Series

## NT2620 Ethernet Temperature Input Modules

### Performance Specifications

#### ■ Ethernet Interface (NTE models only)

##### Communication

Configurable for Modbus TCP/IP and EtherNet/IP, and Profinet.

10/100Mbps data rate, auto-sensing.

##### IP Address

Default 192.168.0.10. Configurable static IP or DHCP.

#### ■ Analog Inputs

##### A/D Converter

Four input channels differentially multiplexed to a 24-bit sigma-delta ADC through unity-gain differential buffers (only 16-bits are used).

##### Input Accuracy

Input Type	Input Range	Accuracy (Typical)
PT 100 ohm	-200°C to +850° C	±0.25°C
PT 200 ohm	-200°C to +850° C	±0.30°C
PT 500 ohm	-200°C to +850° C	±0.50°C
PT1000 ohm	-200°C to +850° C	±1.00°C
Ni 120 ohm	-80°C to +320°C	±0.08°C
Cu 10 ohm	-200°C to +270°C	±1.00°C
Resistance	0 to 25 ohm	±0.05 ohm
	0 to 450 ohm	±0.10 ohm
	0 to 900 ohm	±0.90 ohm
	0 to 2250 ohm	±2.25 ohm
	0 to 4500 ohm	±4.50 ohm

##### Break Detection

Configurable for upscale or downscale open sensor or lead break detection.

##### Linearization (RTD Inputs)

Within ±0.25°C of the NIST tables.

##### Temperature Measurement Drift

Better than ±75ppm/°C (±0.0075%/°C).

#### ■ Discrete Inputs (Active-Low)

##### Input Signal Voltage Range

0 to +32V DC.

##### Input Current

280µA, typical at 32V DC.

##### Input Signal Threshold

TTL compatible w/100mV of hysteresis, typical.

1.7V DC Low-to-High, 1.6V DC High-to-Low.

0.8V DC TTL LOW limit, 2.0V DC TTL HIGH limit.

##### Input Resistance

200K ohms typical (input only), ~10K ohms w/ tandem output using internal pull-ups.

##### Input Response Time

5ms typical, not including network time.

#### ■ Discrete Outputs (Sinking)

##### Output "OFF" Voltage Range

0 to 32V DC.

##### Output "ON" Current Range

0 to 300mA DC, continuous.

##### Output Rds ON Resistance

0.8 ohms typical, 1.6 ohms maximum.

##### Output Response Time

10ms typical. Does not include network time.

#### ■ General I/O

##### Input Update/Conversion Rate

Fresh data available to the network every 10ms.

##### Response Time from an Ethernet command

Less than 5ms, typical.

##### Excitation

External voltage of 4-32V required between I/O EXC and any RTN for D/I/O. Excitation must source 600mA at EXC level 4V to 32V. For both channels at 250mA max. rated load.

##### I/O Pull-Ups (Internal)

Each discrete I/O channel has 10KΩ pull-up to EXC to pull the tandem open drain output and input high/Off.

#### ■ Environmental and Physical

##### Temperature and Humidity

Operating: -40 to +70°C (-40 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 and 250V AC or 354V DC continuous between I/O channels (group), each network port and power circuits.

##### Power Supply

10-32V DC SELV power wired to NTE model only. Power to NTX models is via its NT bus connection.

##### Power Consumption

NTE2621: <=1.36W (input).

NTX2621: <=0.142W max. (each).

##### Dimensions (width x height x depth)

NTE: 25 x 116.9 x 139.2 mm (0.98 x 4.6 x 5.48 inches).

NTX: 25 x 116.9 x 116.65 mm (0.98 x 4.6 x 4.59 inches).

##### Weight

NTE: 0.5 lbs (0.23 kg).

NTX: 0.3 lbs (0.14 kg).

#### ■ Standards and Certifications

##### Electromagnetic Compatibility (EMC)

CE marked, per EMC Directive 2004/108/EC.

##### Safety Approvals

Hazardous approvals pending.

### Ordering Information

#### ■ Models

[Go to on-line ordering page >](#)

##### NTE2621-1111

Ethernet I/O module with dual RJ45 ports, 4 RTD/resistance inputs and 2 discrete sinking I/O.

##### NTX2621-0011

Expansion I/O module with 4 RTD/resistance inputs and 2 discrete sinking I/O.

#### ■ Accessories

##### 5035-369

##### 5035-370

Ethernet patch cable, low EMI, double-shielded. 3 feet (5035-369) or 15 feet (5035-370).

##### PS5R-VB24

Power supply, 24V DC, 15W output.

See [www.acromag.com](http://www.acromag.com) for other sizes.

##### Break Detection

Configurable for upscale or downscale open sensor or lead break detection.

##### Linearization (RTD Inputs)

Within ±0.25°C of the NIST tables.

##### Temperature Measurement Drift

Better than ±75ppm/°C (±0.0075%/°C).



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