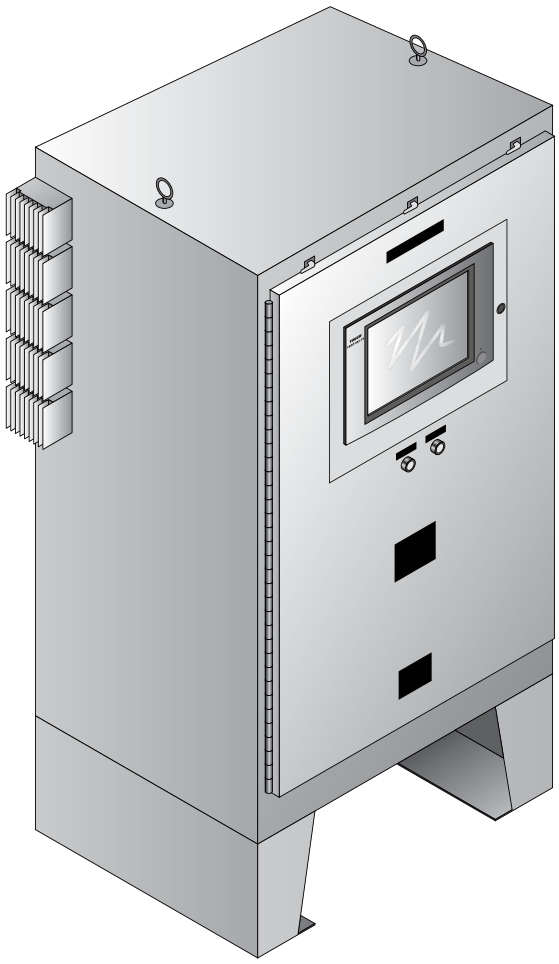
PENTAIR

Raychem NGC-40 CONTROL SYSTEM

INSTALLATION MANUAL



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SECTION 1 – OVERVIEW

1.1 INTRODUCTION

The Raychem NGC-40 is a fully functional, self-contained control and monitoring system used with electric heat-tracing systems. It is designed for installation requiring minimal wiring on site. This manual provides information pertaining to the installation, operation, testing, adjustment, and maintenance of all components of the Raychem NGC-40 Control System. For information about how to program the Raychem NGC-40 Control System, see the Raychem NGC-40 Control System with DTS User Guide (H58269).

A typical Raychem NGC-40 Control System consists of at least a one Power and Termination module (NGC 40 PTM), one Bridge module (NGC-40-BRIDGE), one or more Heat-Trace Controllers (NGC-40-HTC or HTC3) and one IO module (NGC-40-IO). Additional IO modules (NGC-40-IO) are optional and may be used. The system is intended to provide configuration and component flexibility so that it may be optimized for a customer's specific needs.

The information in this document coincides with the specific releases of firmware (listed in the table below) for the Heat-Trace Controllers (NGC-40-HTC or HTC3) and Bridge module (NGC-40-BRIDGE) components. As Pentair Thermal Management releases new firmware to significantly modify or enhance any of these components, new documentation will accompany these releases. To ensure that the correct documentation is being used for your particular version of the NGC-40-HTC/HTC3 and NGC-40-BRIDGE, compare the firmware version number of each component against the number listed in the table below. As subsequent changes are made, supplements to this document will be included in manuals shipped after the firmware is released. Supplements will make specific reference to the operation or functional change.

Copies of this manual and updates may be downloaded from the Literature section of www.pentairthermal.com.

Component	Version number
NGC-40-HTC	4.x
NGC-40-HTC3	4.x
NGC-40-IO	3.x
NGC-40-BRIDGE	5.x

IMPORTANT WARNINGS AND NOTES

The following icons are used extensively throughout this manual to alert you to important warnings ⚠ that affect safety and to important notes that affect the proper operation of the unit. Be sure to read and follow them carefully.

SECTION 2 – INSTALLATION AND WIRING

2.1 INTRODUCTION

⚠ WARNING:

Electrical Hazard! Ensure all personnel involved in installation, servicing, and programming are qualified and familiar with electrical equipment, its ratings, safe electrical practices and national and local electrical codes. Multiple voltages and signal levels may be present during the installation, operation, and servicing of this product. Do not power the NGC-40 until the safety provisions specified in this manual have been observed.

This section includes information regarding the initial inspection, preparation for use, and wiring instructions for the components of the Raychem NGC-40 Control System.

2.2 INITIAL INSPECTION

Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, it should be kept until the contents of the shipment have been verified for completeness and the equipment has been checked mechanically and electrically. Procedures for installing the Raychem NGC-40 Control System are given in this section. If the shipment is incomplete, mechanically damaged, defective in any way, or does not pass the electrical performance tests, notify the nearest Pentair Thermal Management representative. If the shipping container is damaged, or the cushioning material shows signs of stress, notify the carrier as well as your Pentair Thermal Management representative. Keep the shipping materials for the carrier's inspection.

2.3 OPERATING ENVIRONMENT

There are three types of enclosures available with the Raychem NGC-40 panel, as shown below.

Enclosure Type	Area Classification	Usage
TYPE-12	Nonhazardous (Unclassified) Locations	Indoors
TYPE-4/3R	Nonhazardous (Unclassified) Locations	Outdoors, painted steel
TYPE-4/3R with Z purge option	Hazardous Locations • Class I, Division 2, Groups A, B, C, D • Class I, Zone 2, Group IIC	Outdoors, painted steel with mechanical relays
TYPE-4X	Hazardous Locations • Class I, Division 2, Groups A, B, C, D • Class I, Zone 2, Group IIC	Outdoors, stainless steel with solid-state relays

⚠ WARNING:

Shock Hazard. Some wiring configurations will use more than one power source. All power sources must be de-energized prior to performing any maintenance on a module or its heating circuit. The operating environment should be within the limitations specified for the Raychem NGC-40 components as outlined in Appendix A.

2.4 INSTALLATION LOCATION

The wide ambient operating temperature range of the Raychem NGC-40 Control System permits installation in almost any convenient location. Considerations should include: expected atmospheric conditions (weather), accessibility for maintenance and testing, the location of existing conduits, and hazardous location rating. Ambient temperature conditions may affect load current ratings.

⚠ WARNING:

Fire Hazard. Always be sure that the intended location is classified as an area that the product is approved for use in as defined by Article 500 of the National Electrical Code and/or Part I, Section 18 of the Canadian Electrical Code.

2.5 MOUNTING PROCEDURES

Each Raychem NGC-40 panel includes a set of "As Built" drawings that have been engineered, designed, and drafted based upon the model number and any special requirements that were requested when ordering. The "As Built" drawings include an elevation/layout (with bill of materials) and schematics. If these drawings are not included, contact your Pentair Thermal Management Representative and request the "As Built" drawings for your panel. Upon request, an electronic copy of these drawings can be provided.

For mounting the panel, locate the elevation and layout drawing which includes a bill of materials. The enclosure mounting information will be provided on the "As Built" drawings.

2.6 WIRING PROCEDURES

Refer to the "As Built" drawings for wiring of incoming/outgoing power and incoming RTD connections. The Raychem NGC-40 panel can be purchased with, or without, a distribution panel board.

2.6.1 INCOMING POWER WITH DISTRIBUTION SYSTEM

Main Circuit Breaker

Locate the main circuit breaker in the panel by using the supplied elevation/layout drawing, and connect per the associated schematic drawings. Depending upon the size and type of main circuit breaker and voltage loss calculations, use the appropriate size and number of wires to connect directly to the main circuit breaker, and panel board neutral and ground bus in the panel.

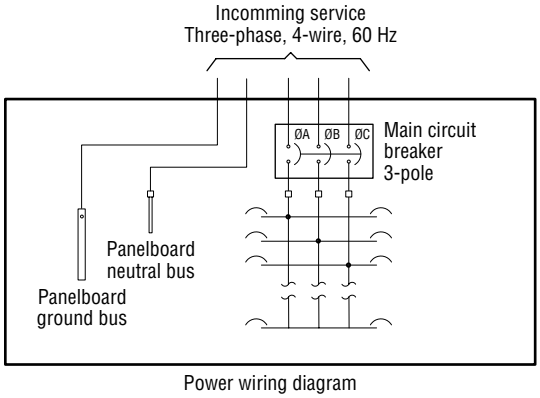


Fig. 2.1 Main circuit breaker wiring

Branch Circuit Breakers

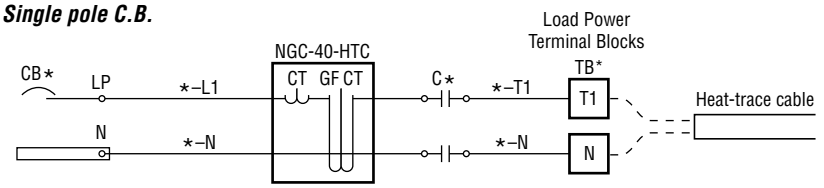
The branch circuit breakers are pre-wired to the contactors or solid- state relays in the panel, so no further incoming power wiring is required.

2.6.2 OUTGOING POWER WITH DISTRIBUTION SYSTEM

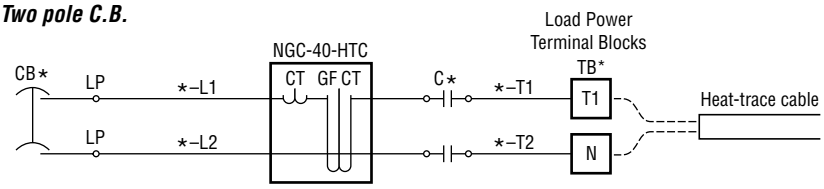
Load Power Terminal Blocks

Locate the outgoing heater terminal blocks using the supplied elevation/layout drawing, and connect per the associated schematic drawings. Depending upon the size of the branch circuit breaker and voltage loss calculations, use the appropriate size and number of wires to connect from the panel's Load Power Terminal Blocks to the heat-trace power junction box.

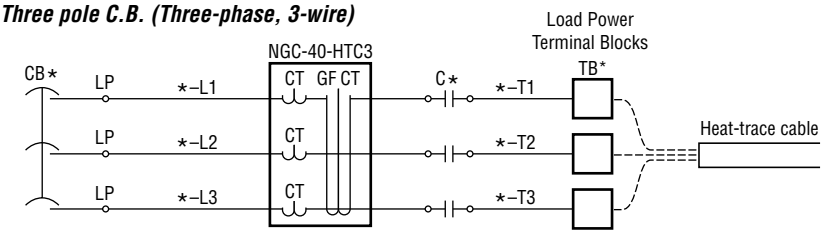
Single pole C.B.



Two pole C.B.



Three pole C.B. (Three-phase, 3-wire)



Three pole C.B. (Three-phase, 4-wire)

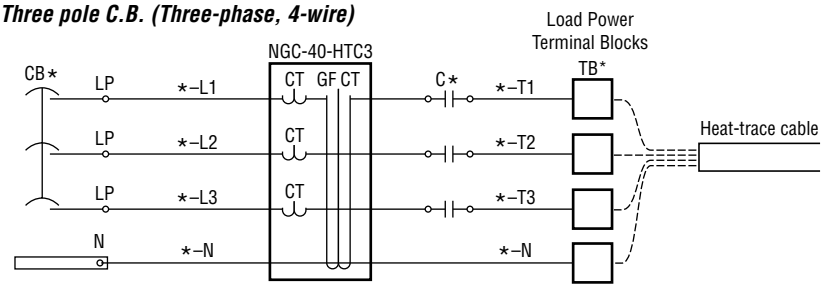


Fig. 2.2 Heat-trace power wiring diagram

2.6.3 INCOMING/OUTGOING POWER WITHOUT DISTRIBUTION PANEL BOARD

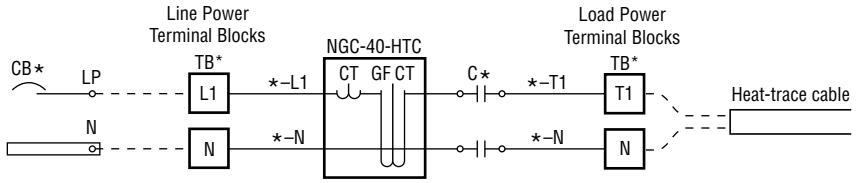
Line Power Terminal Blocks

Locate the incoming power terminal blocks in the panel using the supplied elevation/layout drawings and connect per the associated schematic drawing. Depending upon size and type of the remotely located branch circuit breakers, use the appropriate size and number of wires to connect directly to the Line Power Terminal Blocks.

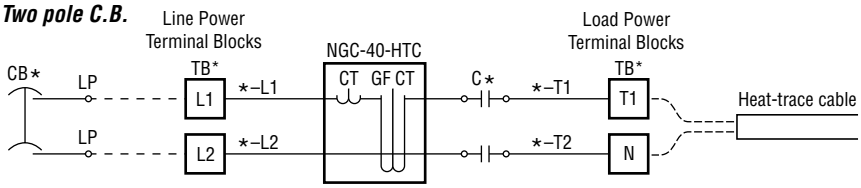
Load Power Terminal Blocks

Locate the outgoing power terminal blocks in the panel using the supplied elevation/layout drawings and connect per the associated schematic drawing. Depending upon size and type of the remotely located branch circuit breakers, use the appropriate size and number of wires to connect from the Load Power Terminal Blocks to the heater's power connection box.

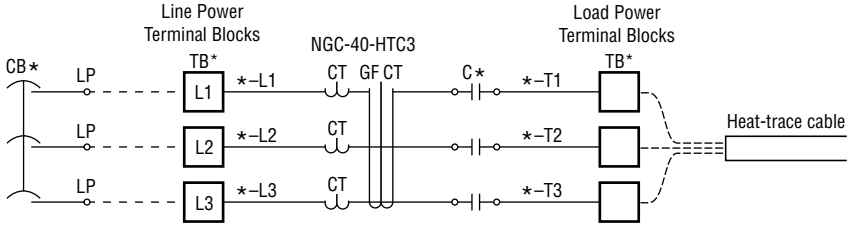
Single pole C.B.



Two pole C.B.



Three pole C.B. (Three-phase, 3-wire)



Three pole C.B. (Three-phase, 4-wire)

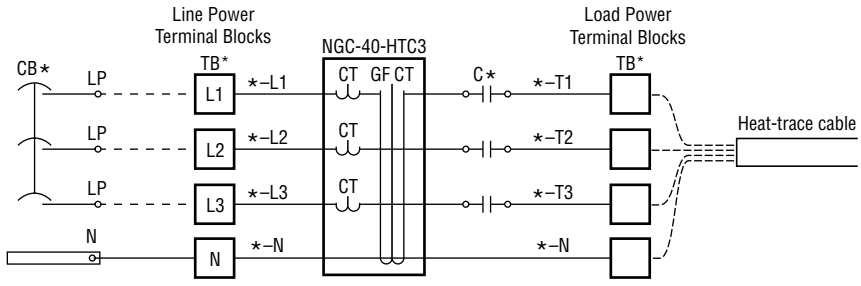


Fig. 2.3 Load power terminal block configurations

2.6.4 INCOMING RTD WIRING

Nonhazardous and Hazardous Location Installations Wired to Terminal Block in Panel

Each Raychem NGC-40-HTC/HTC3 module has one RTD input. The RTD wiring from the NGC 40-HTC/HTC3 have been pre-wired to RTD terminals. The field RTD wiring (3-wire with shield) will be terminated by the installer at the RTD terminal blocks. Refer to the "As Built" Drawings for the RTD Termination Schedule. Refer to Section 3.1 for additional NGC-40-HTC/HTC3 wiring information.

RTD Connections - North American Installation Technique

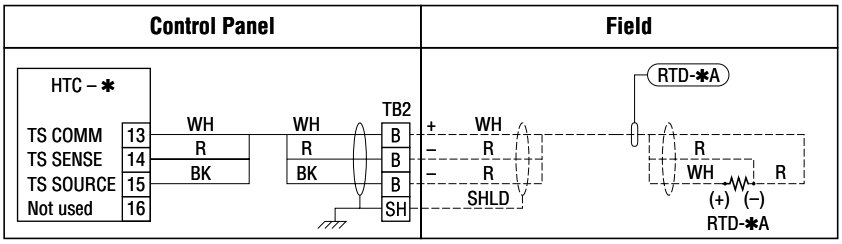


Fig. 2.4 Typical RTD installation from the NGC-40-HTC/HTC3 module in a North American style panel

RTD Connections - European Installation Technique

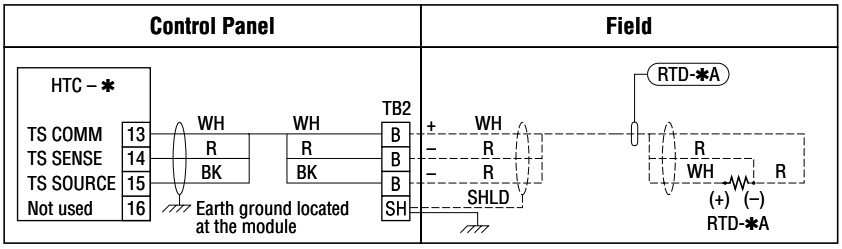


Fig. 2.5 Typical RTD installation from the NGC-40-HTC/HTC3 module in an European style panel

Optional RTD inputs via the NGC-40-IO module

One NGC 40 IO module is mandatory. The digital output of this module is used for activating the Common Alarm Light on the Raychem NGC 40 panel door. Additional NGC 40 IO modules are optional components that may or may not be included in a panel depending on its design. If used, each Raychem NGC-40-IO module provides up to four additional RTD inputs. The RTD wiring from the NGC-40-IO have been pre-wired to RTD terminals. The field RTD wiring (3-wire with shield) will be terminated by the installer at the RTD terminal blocks. Refer to the "As Built" Drawings for the RTD Termination Schedule. Refer to Section 3.3 for additional NGC-40-IO wiring information.

RTD Connections - North American Installation Technique

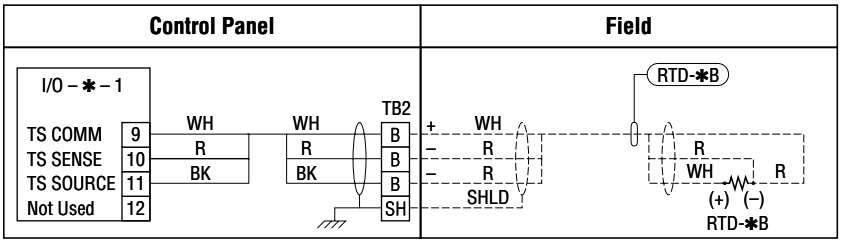


Fig. 2.6 Typical RTD installation from the NGC-40-IO module in a North American style panel

RTD Connections - European Installation Technique

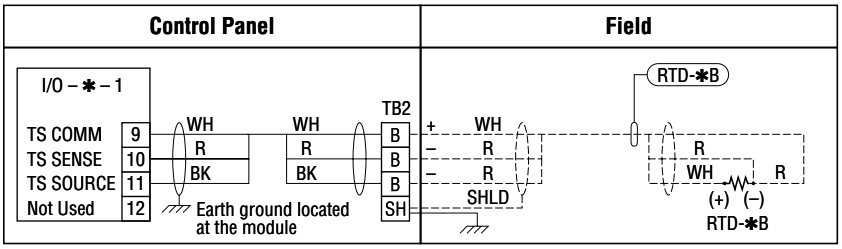


Fig. 2.7 Typical RTD installation from the NGC-40-IO module in a North American style panel

2.6.5 NGC-40-BRIDGE SWITCH SETTINGS

User Interface – Configuration Switch

A slide switch is provided on the front of the module to allow the user to set the RS-232 (COM 3) into a known state, as shown in the following table:

Bridge module settings	Switch position	
	SET (Configuration) mode	RUN (Normal operating) mode
Local RS-232 (COM 3) parameters		
Modbus address	1	Settings based on the user parameters of the Bridge
(The default user parameters are the same as those in the SET mode)		
Protocol	RTU	
Data rate	9600 baud	
Data bits	8	
Stop bits	2	
Parity	none	
Tx delay	0 ms	

If the present user parameters of the communications port of an NGC-40-BRIDGE are not known, the NGC-40-BRIDGE can be placed in the SET mode by its Configuration Switch and the Raychem Supervisor or any other device that needs to communicate with the NGC-40-BRIDGE, can then be used to establish communications. The user parameters (including those of the communications port) can then be read.

While in the SET mode, modifications to the NGC-40-BRIDGE user parameters of the communications port will be saved but will not take effect until the Configurations Switch is moved to the RUN mode.

The parameters of the two RS-485 ports (COM 1 and COM 2) and the ethernet port are not affected by the position of the Configuration Switch.

For firmware upgrades only: When in SET mode, the NGC-40-BRIDGE 10/100 LAN (Ethernet) port settings are those defined by the Boot loader.

In the RUN mode, these port settings are defined by the user parameters of the Bridge (the default user parameters are the same as those in the table above).

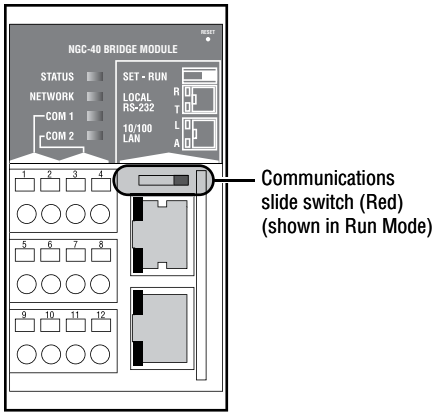


Fig. 2.8 Communication Slide Switch

2.6.6 OPTIONAL RMM2 CONNECTION

When using the field mounted RMM2 for RTD input, it must be connected to the COM2 In as shown below.

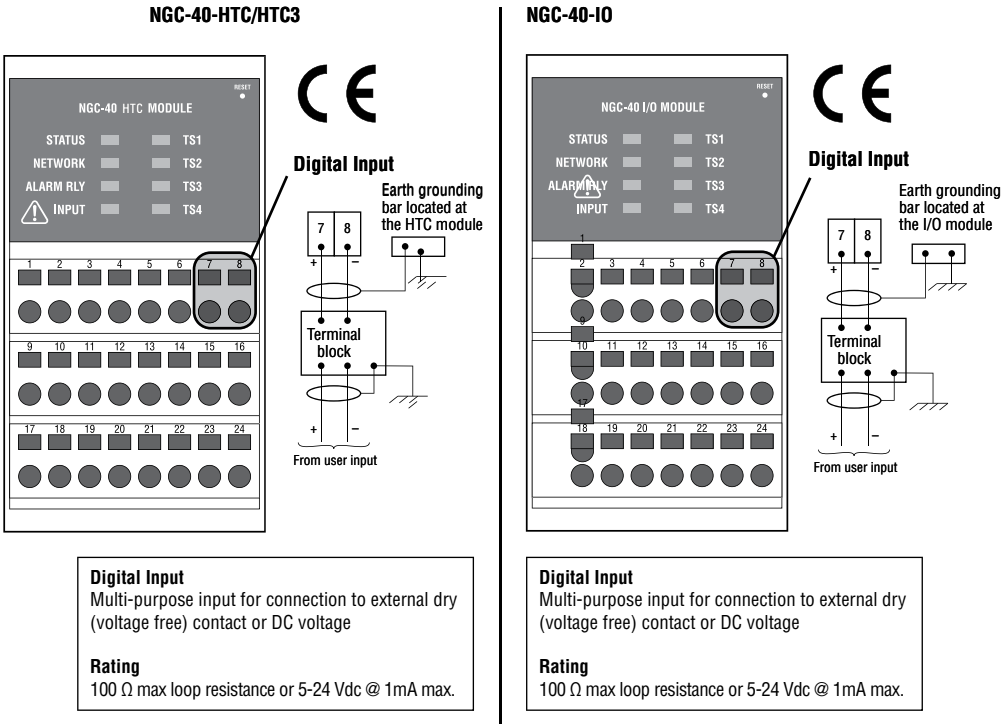


Fig. 2.9 RMM2 Connection

2.6.7 OPTIONAL TOUCH 1500R CONNECTIONS

When using the Touch 1500R (Remote User Interface Terminal) with the NGC-40 system, the user must connect main power to the Touch 1500R and communication cable from the NGC-40-BRIDGE to the Touch 1500R.

Fig. 2.10 Touch 1500R

Connecting Main Power to the Touch 1500R

Use only copper conductors for field wiring. A close-up of the power connection terminals is shown below. This connection energizes the Raychem TOUCH 1500 electronics only; it does not provide power to the heat tracing or contactor coils.

IMPORTANT: If the Raychem TOUCH 1500R controller has a different source of power than the heat tracing, it may be worthwhile to install an uninterruptible power supply (UPS) so the unit can continue to control and/or monitor the heat tracing in the event of a localized power failure.

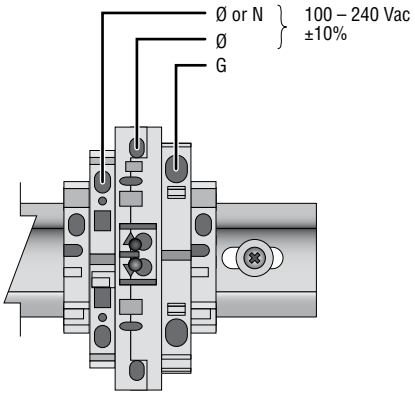


Fig. 2.11 Touch 1500R Main Power Terminal Block

Connecting RS-485 Field Port Communication

The NGC-40-BRIDGE communicates with the TOUCH 1500R over an RS-485 network, which can have a total cable length of no more than 1200 m (4000 ft), as required.

The RS-485 communicating cable shall be a shielded, two conductor (twisted pair) cable.

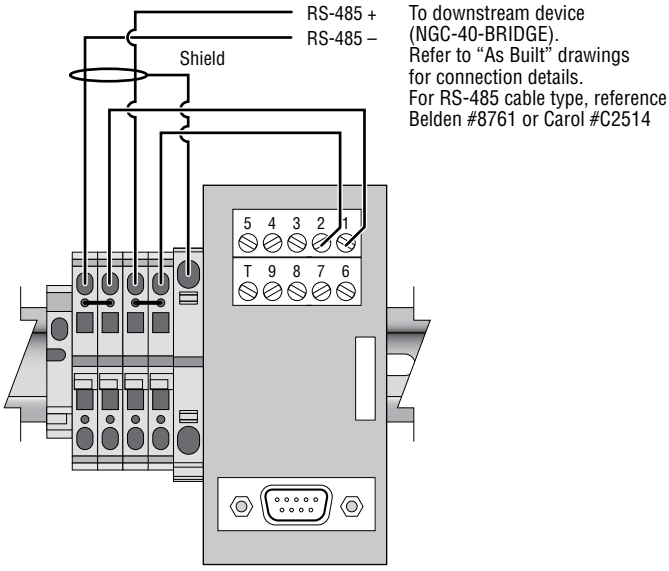


Fig. 2.12 Touch 1500R RS-485 Terminal Block

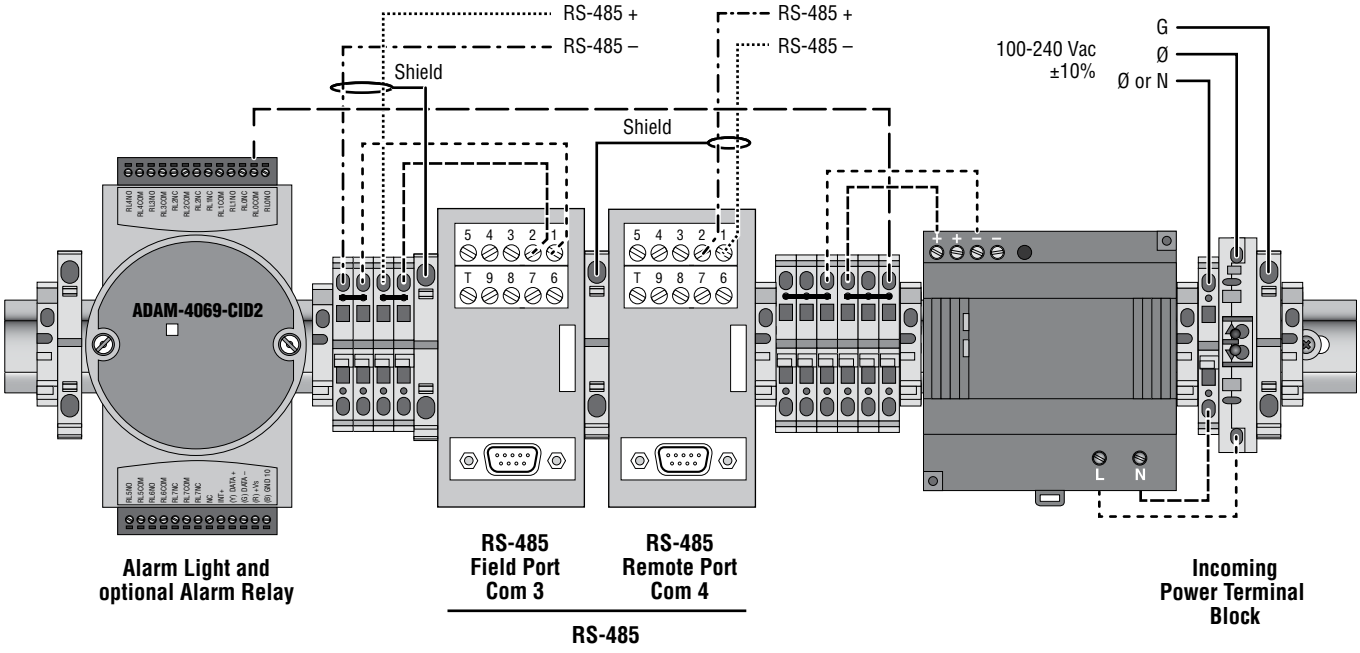


Fig. 2.13 Touch 1500R Wiring Diagram

2.6.8 OPTIONAL DIGITAL INPUTS

Both the Raychem NGC-40-HTC/HTC3 and the Raychem NGC-40-IO modules have a digital input which is programmable and may be used for various functions such as forcing outputs on and off. The field wiring for these connections will be wired directly to the module as shown below.

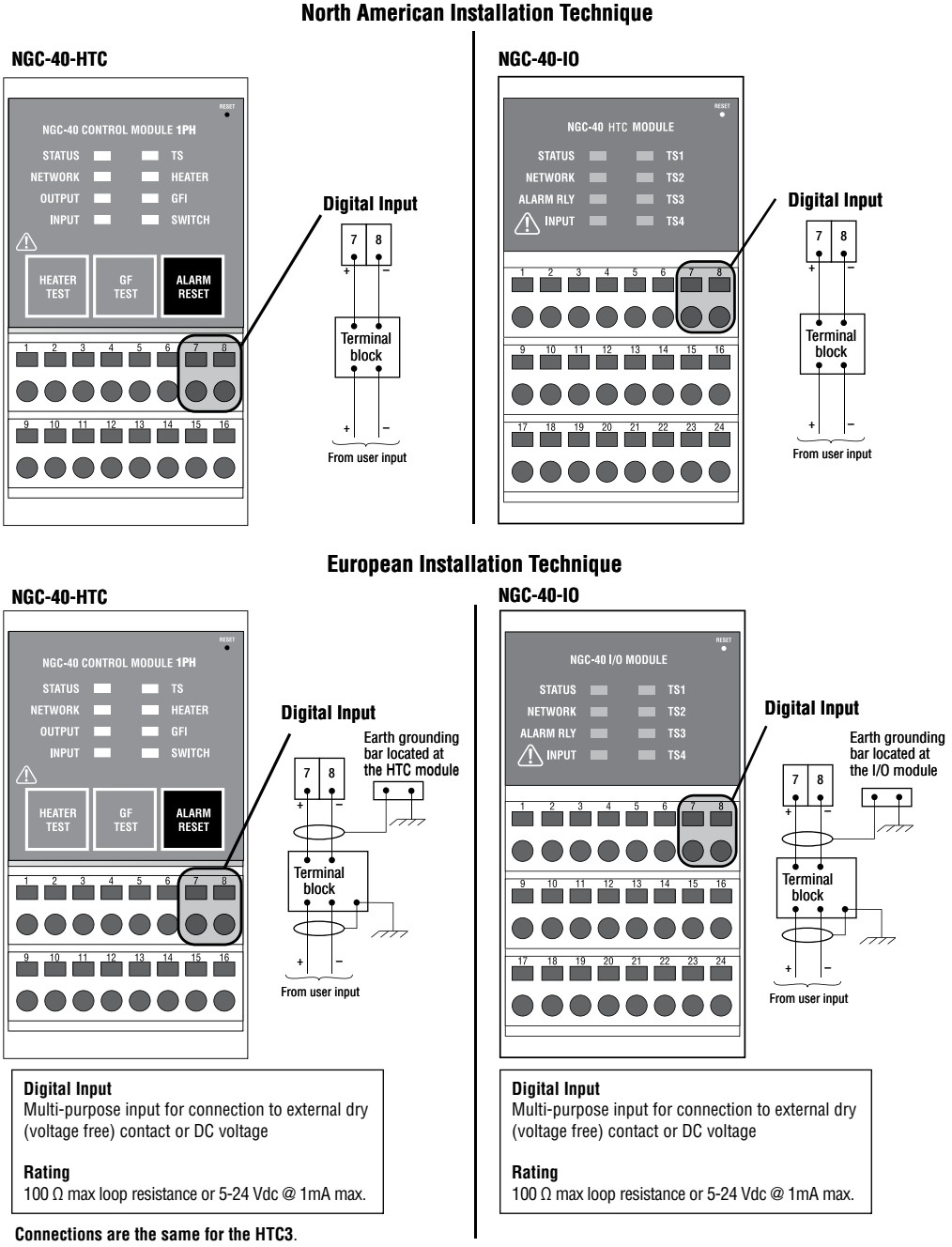


Fig. 2.14 Digital Inputs

2.6.9 OPTIONAL ALARM RELAY

Both the Raychem NGC-40-HTC/HTC3 and the Raychem NGC-40-IO modules have an alarm relay which can be used to control an external annunciator. The field wiring for these connections will be wired directly to the module as shown below.

⚠ WARNING: Shock Hazard. Disconnect from live voltage prior to accessing terminals.

- Multi-purpose. Alarm relay energized in normal state.
- The alarm relay is configured as Fail Safe
- The alarm relay connections provide a form C dry contact:

  250 V / 3A 50/60 Hz (CE)

  277 V / 3A 50/60 Hz (cCSAus)
- The NO (normally open) contact is open in non-energized condition. When energized, it closes during normal conditions and will open upon an alarm condition or power failure.
- The NC (normally closed) contact is closed in non-energized condition. When energized, it opens during normal conditions and will close upon an alarm condition or power failure.
- Relay contact rated

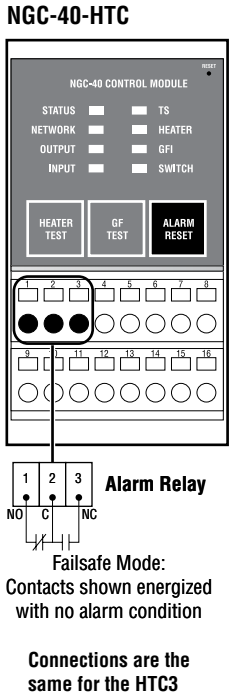


Fig. 2.15 NGC-40-HTC/HTC3 Alarm Relay

⚠ WARNING: Shock Hazard. Disconnect from live voltage prior to accessing terminals

- The common alarm provides a form C contact:

  250 V / 3A 50/60 Hz (CE)

  277 V / 3A 50/60 Hz (c-CSA-us)
- The alarm relay is configured as Fail Safe.
- The NO (normally open) contact is open in non-energized condition. When energized, it closes during normal conditions and will open upon an alarm condition or power failure.
- The NC (normally closed) contact is closed in non-energized condition. When energized, it opens during normal conditions and will close upon an alarm condition or power failure.
- Relay contact rated

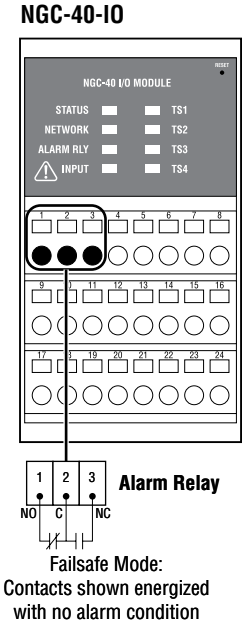


Fig. 2.16 NGC-40-IO Alarm Relay

2.6.10 CONNECTING TO REM PC W/ Raychem SUPERVISOR OR CUSTOMER DCS SYSTEM

The Raychem NGC-40-BRIDGE must communicate with a host computer using Raychem Supervisor in order to load set point information and monitor the HTCs through the NGC 40 BRIDGE's external communication ports. The NGC-40-BRIDGE provides ports for RS 232, RS 485, and Ethernet communications. The RS-485, RS-232 and Ethernet ports could also communicate with a distributed control system (DCS).

RS-232 Serial Connection

The RS-232- port can be used as a direct connection to a single PC located within 50 ft of the panel. For an RS-232 connection, a 3 ft long RJ-11 to 9 pin female D-connector (NGC part number 10332-005) has been provided with the NGC-40 panel. Plug the RJ-11 connector into the RS-232 connector on the NGC-40-BRIDGE and the other end into the 9-pin connector on the user's computer.

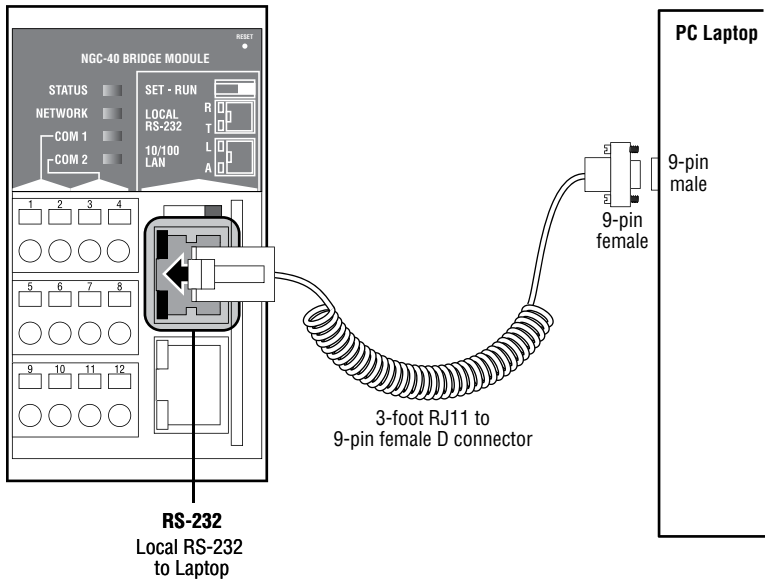


Fig. 2.17 RS-232 Serial Connection

RS-485 Serial Connection

Use the RS-485 port when multiple NGC-40-BRIDGE modules are to be connected to a host computer. If the connection is longer than 1,220 m (4,000 ft), a repeater is required. An RS-485 to RS-232 or an RS-485 to USB converter may be required to make the connection to the user's PC.

Connection Diagram - North American Installation Tech-nique

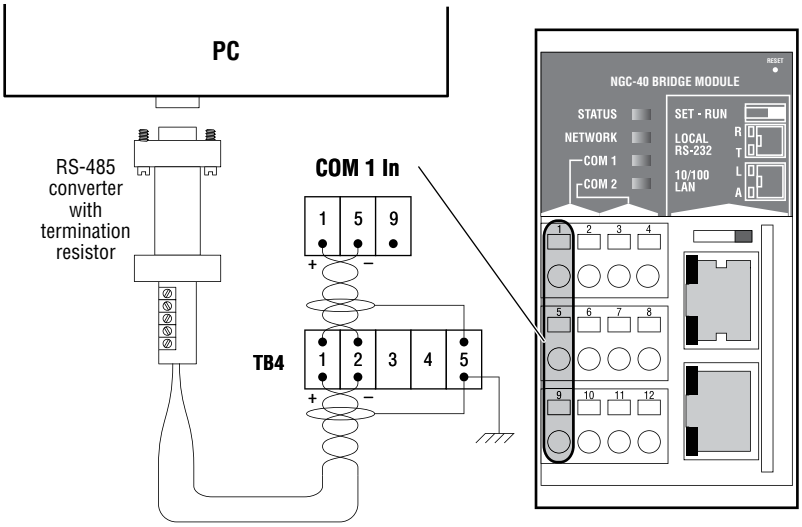


Fig. 2.18 North American RS-485 Serial Connection - COM1

Connection Diagram - European Installation Technique

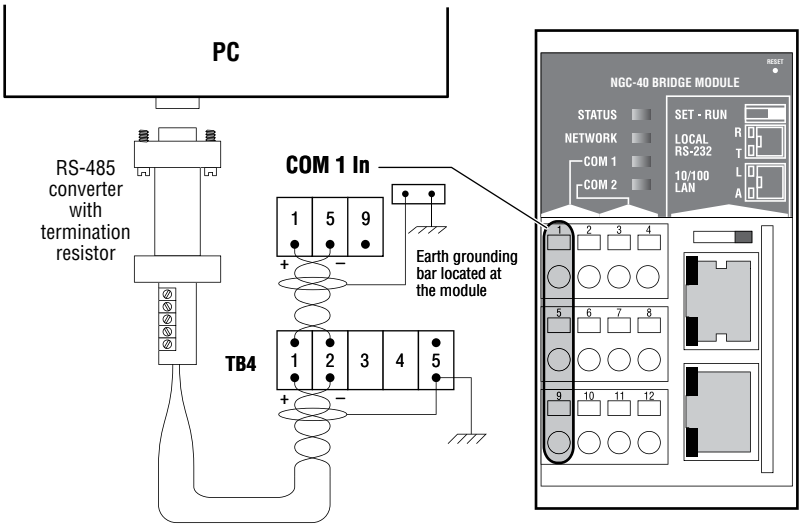


Fig. 2.19 European RS-485 Serial Connection - COM1

Ethernet Connection

The Ethernet port can be used to connect multiple NGC-40-BRIDGE modules to a host computer by connecting to the user's LAN system.

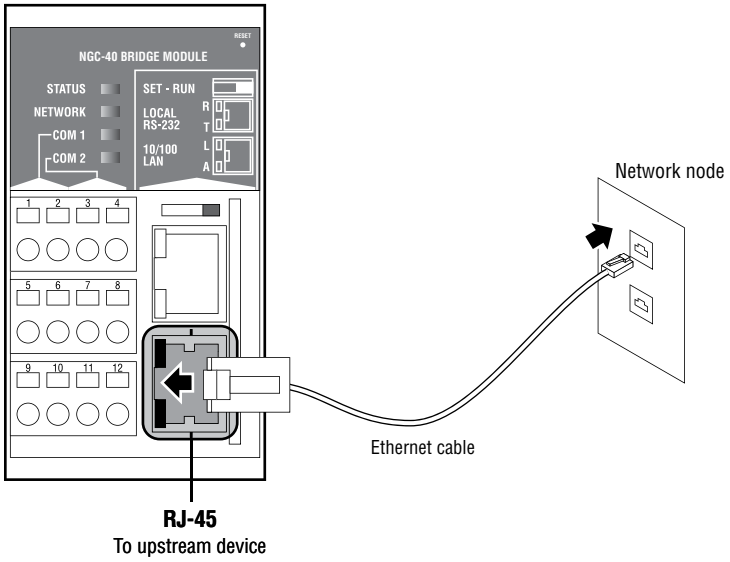


Fig. 2.20 Ethernet Connection

2.6.11 CONNECTING MULTIPLE NGC-40 PANELS (BRIDGES) USING RS-485 (COM 1)

A termination resistor is required at the beginning and the end of the RS-485 communication network. In each panel a termination resistor has been provided on COM 1 (Out). If multiple panels are connected together on an RS-485 network, the COM 1 (Out) termination resistor needs to be removed from all panels except for the last panel.

CONNECTION DIAGRAM - NORTH AMERICAN INSTALLATION TECH-NIQUE

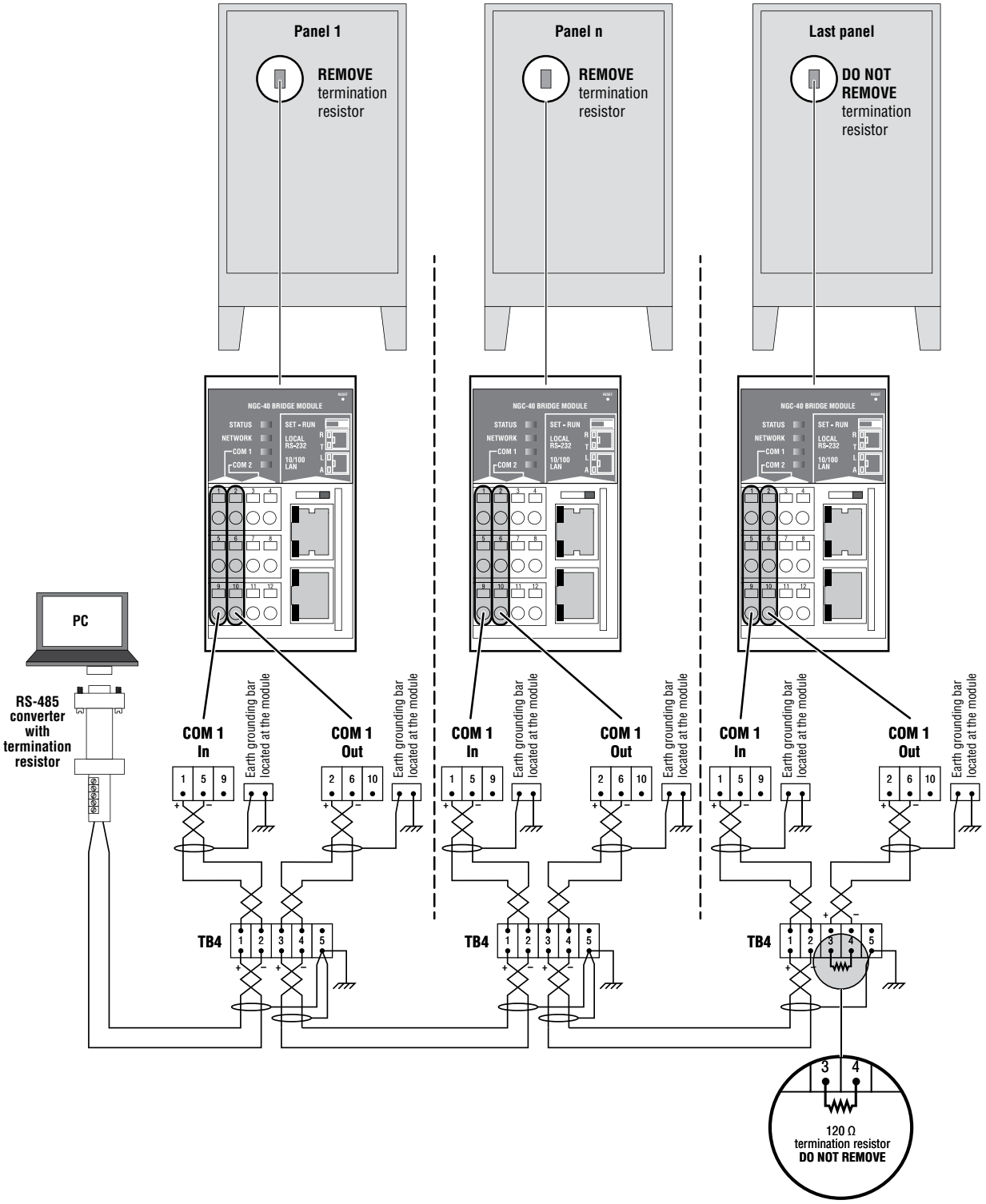


Fig. 2.21 North American termination resistor layout

CONNECTION DIA-GRAM - EUROPEAN INSTALLATION TECHNIQUE

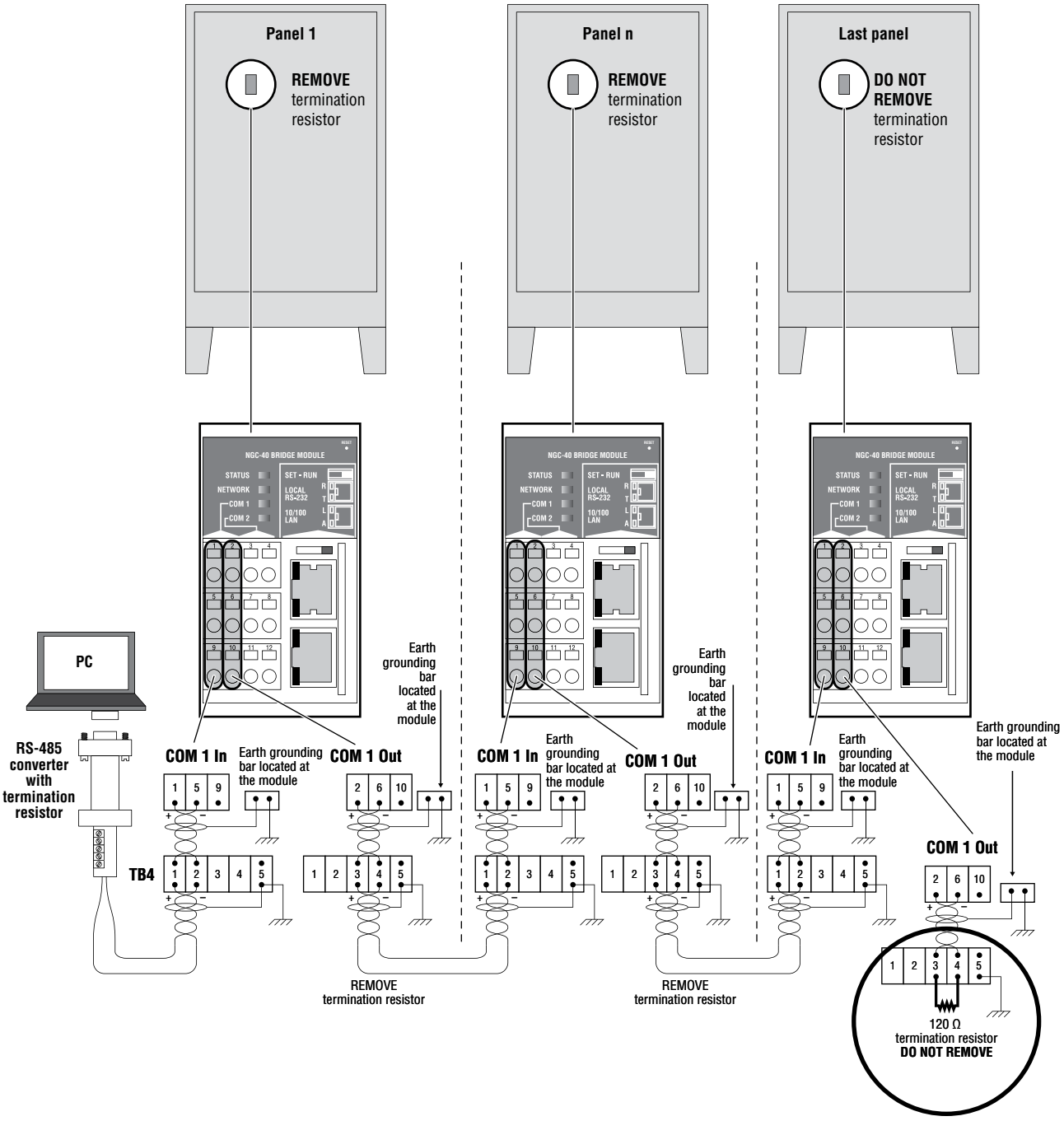
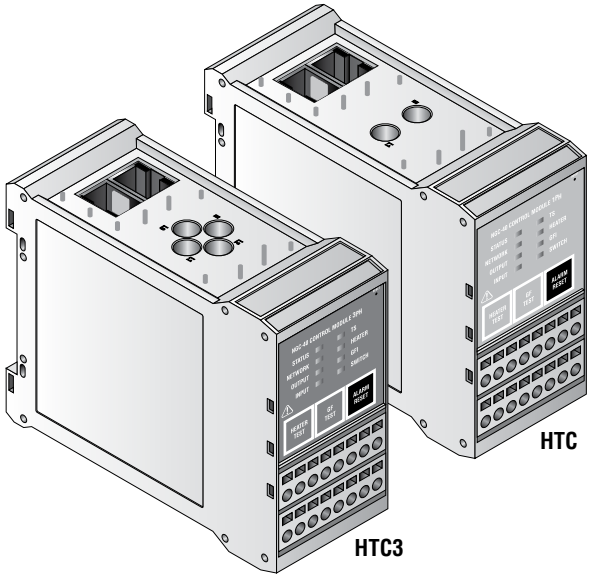


Fig. 2.22 European termination resistor layout

SECTION 3 – RAYCHEM NGC-40 COMPONENTS AND OPERATION

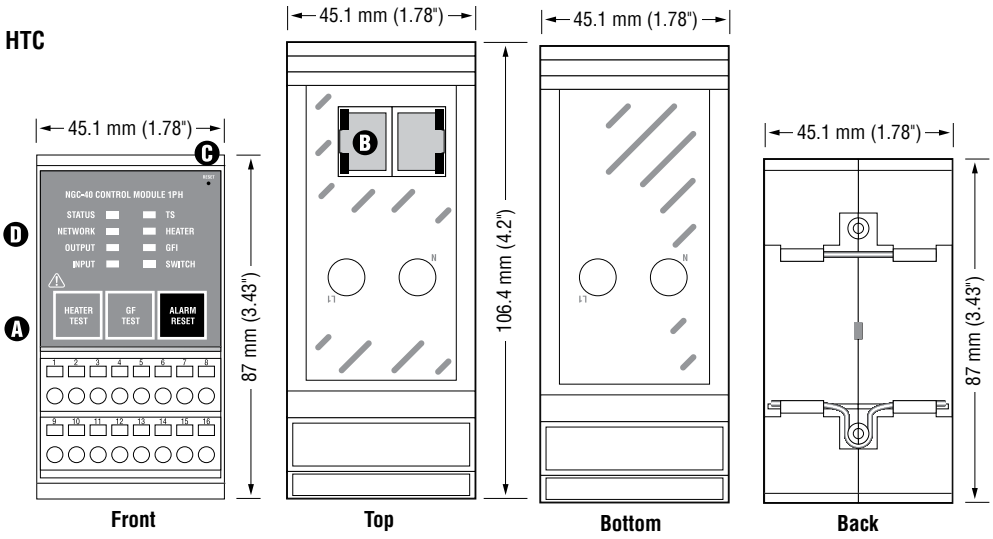
The Raychem NGC-40 heat-trace system is comprised of a number of modular components, allowing the ultimate in design flexibility. This section describes the NGC-40 control and monitoring components (excluding the optional distribution section).

3.1 NGC-40-HTC AND HTC3

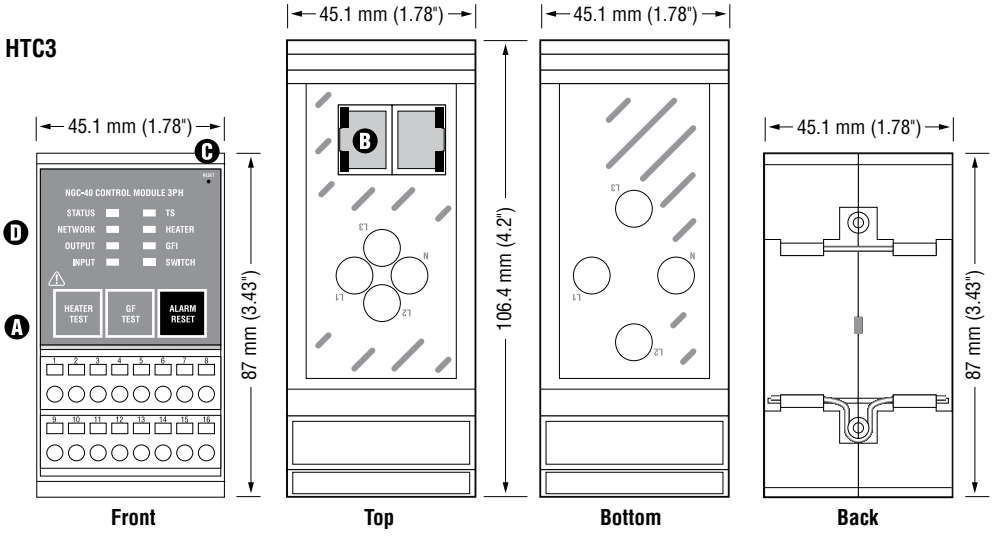


The NGC-40-HTC (for single-phase heaters) and NGC-40-HTC3 (for three-phase heaters) modules are used to control either a solid-state relay or contactor within the NGC-40 control and monitoring system. This module also has one alarm output and one digital input. The alarm output can be used to control an external annunciator. The digital input is programmable and may be used for various functions such as forcing outputs on and off. Other features of this module include ground-fault and line current sensing for both HTC and HTC3. The front panel of the HTC module has LED indicators for various status conditions. The front panel also provides a ground-fault and heater test button.

HTC



HTC3



A. Wiring Terminals					
1 ⚠	Alarm relay N.O.	7	Digital In +	13	TS COM (Wht)
2 ⚠	Alarm relay COM	8	Digital In –	14	TS Sense (Red)
3 ⚠	Alarm relay N.C.	9 ⚠	Line In	15	Not used
4	Not used	10 ⚠	Line Out	16	Not used
5	SSR Out +	11 ⚠	Coil Out		
6	SSR Out –	12	Not Used		

⚠ WARNING:

Shock Hazard. Disconnect from live voltage prior to accessing terminals

B. CAN/BUS MODULE POWER

C. RESET

D. STATUS LEDs

STATUS:	Indicates status of HTC/HTC3 module
Off	No power
Green	Normal operation, no internal faults
Yellow	In Factory mode
Red	HTC/HTC3 operating status
Flash R	Internal Fault:
Flash R/G	Factory status
Flash R/Y	Internal fault detected

INPUT:	Shows status of digital input
Off	Input is inactive (open)
Green	Input is active (shorted)
Flash R	Ext. input source failure
OUTPUT:	Shows status of contactor or SSR
Off	Output off
Green	Follows output state

TS:	Indicates the temperature alarm status
Off	No alarm
Red	High or low temperature alarm
Flash R	Temperature sensor failure
GFI:	Indicates ground-fault status
Off	No alarm
Red	High or low ground-fault alarm
Flash R	Ground-fault trip alarm

NETWORK:	Indicates CAN network activity
Off	No network activity
Green	Flicker on receipt of network data
Yellow	Flicker on transmission of network data
Flash R	Network communication failure

HEATER:	Indicates the heater's alarm status
Off	No alarm
Red	High or low current or resistance alarm
Flash R	Overcurrent trip alarm

SWITCH:	Indicates contactor/ SSR switch status
Off	No alarm
Red	Contactor cycle count alarm
Flash R	Switch failed shorted on

General

Approvals and Certifications	**Hazardous Locations** Class I, Div. 2, Groups A,B,C,D T4 Class I, Zone 2, AEx nC IIC T4 IP20 Ex nL nC IIC T4 X –40°C ≤ Ta ≤ +65°C **Conforms to:** FM Class Number 3600 (11/98) FM Class Number 3611 (10/99) ANSI/UL STD. 60079-15-2009 UL STD. 61010-1 **Certified to:** CAN/CSA STD. C22.2 No. 213-M1987 (R2004) CAN/CSA STD. C22.2 No. 61010-1:2004 EN 61010-1 (2001) CAN/CSA STD. E60079-15:02 (R2006)
Supply voltage	24 Vdc, ± 10%
Internal power consumption	< 2.4 W per NGC-40-HTC/HTC3 module
Ambient operating temperature	–40ºC to 65ºC (–40ºF to 149ºF)
Ambient storage temperature	–40ºC to 75ºC (–40ºF to 167ºF)
Environment	PD2, CAT III
Max. altitude	2,000 m (6,562 ft)
Humidity	5 – 90% noncondensing
Mounting	Din Rail – 35 mm

Electromagnetic Compatibility

Emissions	EN 61000-6-3 Emission standard for residential, commercial and light industrial environments
Immunity	EN 61000-6-2 Immunity standard for industrial environments

Temperature Sensors

Type	100 W, platinum RTD, 3-wire, a = 0.00385 ohms/ohm/ºC Can be extended with a 3-conductor shielded cable of 20 W maximum per conductor 100 W, Ni-Fe, 2-wire Can be extended with a 2-wire shielded cable of 20 WΩmaximum per conductor
Quantity	One per NGC-40-HTC/HTC3 module

Current Sensors (internal to the module)

Quantity per NGC-40-HTC/HTC3	1 for ground-fault measurements
Quantity per NGC-40-HTC	1 for single-phase line current measurements
Quantity per NGC-40-HTC3	3 for three-phase line current measurements
Maximum Line to Line Voltage	1000 Vac

Alarm Relay

Dry contact relay (voltage free)	Relay contact rated 250 V / 3 A 50/60 Hz (CE) and 277 V / 3 A 50/60 Hz (cCSAus). Alarm relay is programmable. N0 and NC contacts available.

Contactor Output Relay

	Relay contact rated 250 V / 3 A 50/60 Hz (CE) and 277 V / 3 A 50/60 Hz (cCSAus).

Digital Input

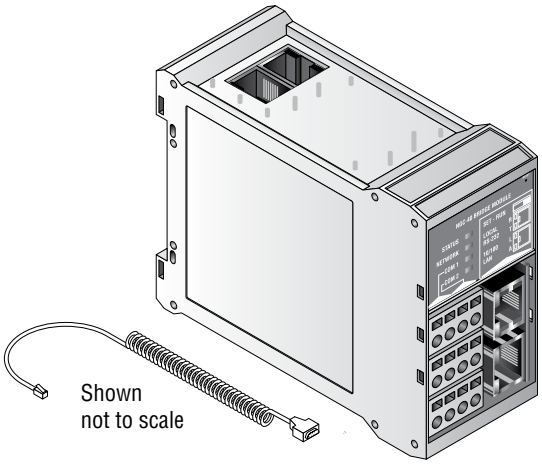
Multi-purpose input	Multi-purpose input for connection to external dry (voltage-free) contact or DC voltage. May be user programmable for: not used / force off / force on functions. It can be configured to be active open or active closed.

CAN Networking Port

Type	2-wire isolated CAN-based peer to peer network. Isolated to 24 Vdc – verified by 500 Vrms dielectric withstand test
Quantity	One input standard per control point
Connection	Two 8-pin RJ-45 connectors (both may be used for Input or Output connections)
Protocol	Proprietary NGC-40
Cable length	10 m (33 ft) maximum

Quantity	Up to 80 HTC/HTC3 and IO modules per network segment
Address	Unique, factory assigned
Connection terminals	
Wiring terminals	Cage clamp, 0.5 to 2.5 mm2 (24 to 12 AWG)
Housing	
Size	45.1 mm (1.78 in) wide x 87 mm (3.43 in) high x 106.4 mm (4.2 in) deep
Line Current Sensors	
Max current	60 A
Accuracy	± 2% of reading
Ground-Fault Sensor	
Range	Range 10 – 250 mA
Accuracy	± 2% of range
Outputs	
SSR output	12 Vdc @ 45 mA max per output

3.2 NGC-40-BRIDGE



The NGC-40-BRIDGE module provides the interface between a panel's internal CAN-based network and upstream devices. Multiple communications ports are supported, allowing serial and Ethernet connections to be used with external devices.

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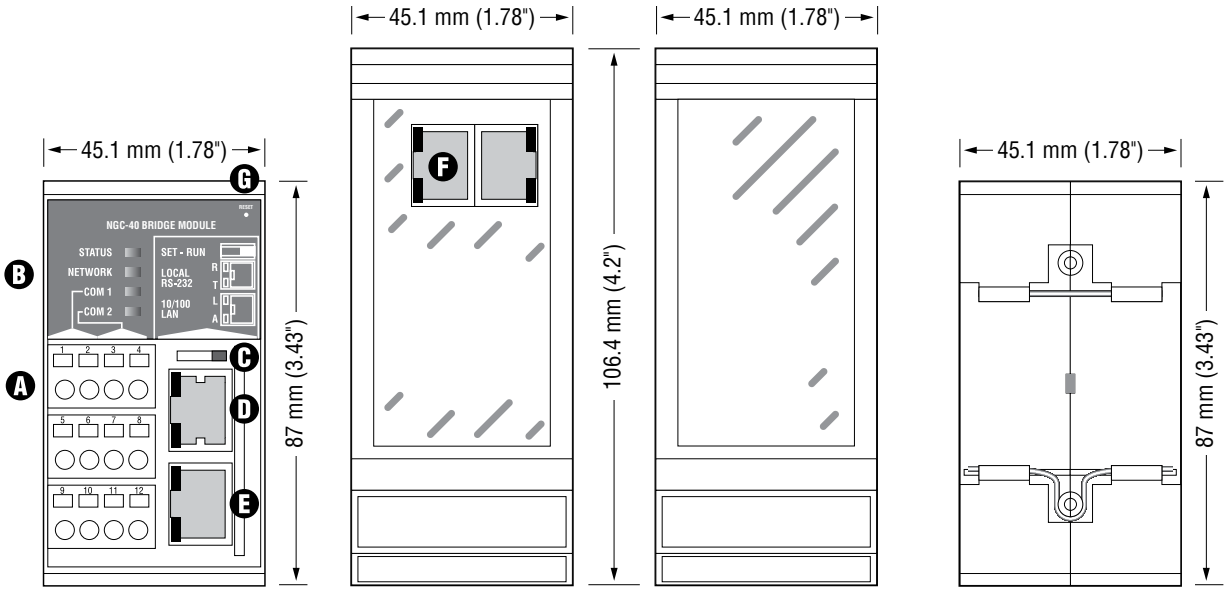
Refer to Appendix A for licensing information.



A. WIRING TERMINALS - RS-485 PORTS

1	COM 1 + in	4	COM 2 + out	7	COM 2 – in
2	COM 1 + out	5	COM 1 – in	8	COM 2 – out
3	COM 2 + in	6	COM 1 – out	9	Not used

B. STATUS LEDs

STATUS: Indicates status of the module

Off	No power
Green	OK/Normal
Yellow	(flashing) Configuration mode
Red	(flashing) Internal fault

NETWORK: Indicates CAN network activity

Off	No link detected
Green	Link OK, receive data packets
Yellow	Transmit data packets
Red	(flashing) Network error

COM: Indicates COM1 & 2 (RS-485) activity

Off	No activity
Green	(flashing) Receipt of data packet
Yellow	(flashing) Transmit of data packet

C. COMMUNICATION SLIDE SWITCH

D. RS-232 PORT

STATUS: Indicates status of RS-232 port

Top LED

Off	No activity
Green	(flashing) Receipt of data packet

Bottom LED

Off	No activity
Yellow	(flashing) Transmit of data packet

E. ETHERNET PORT

STATUS: Indicates status of the LAN

Top LED

Off	No LAN detected
Green	ON, LAN detected

Bottom LED

Off	No LAN activity
Yellow	(flashing) LAN activity (data packet

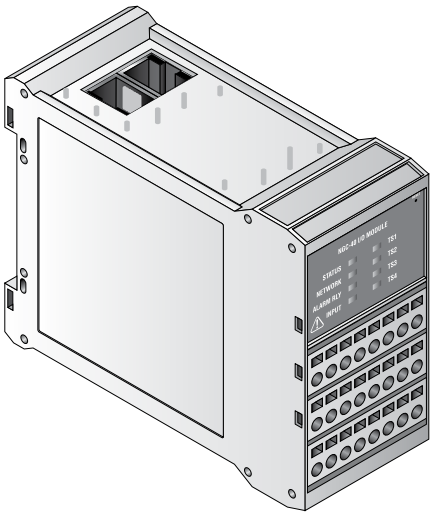
F. CAN BUS / MODULE POWER

G. RESET BUTTON

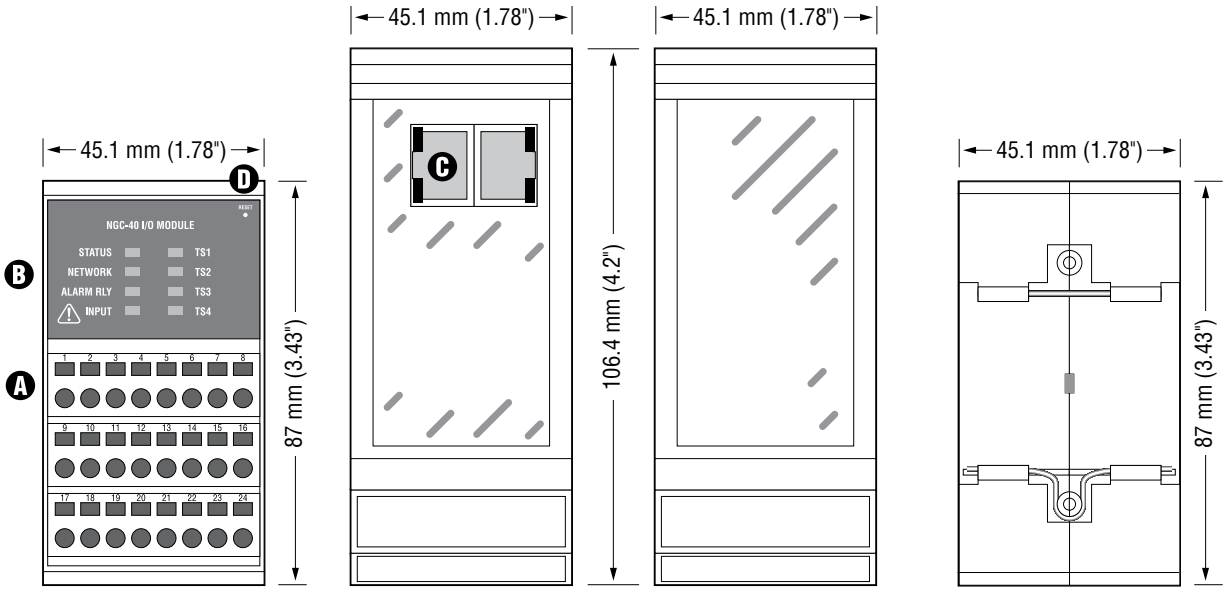
General	
Approvals and Certifications	
Supply voltage	24 Vdc, ± 10%
Internal power consumption	< 3.6 W per NGC-40-BRIDGE
Ambient operating temperature	–40°C to 65°C (–40°F to 149°F)
Ambient storage temperature	–40°C to 75°C (–40°F to 167°F)
Environment	PD2, CAT III
Max. altitude	2,000 m
Humidity	5 – 90% noncondensing
Mounting	Din Rail – 35 mm
Electromagnetic Compatibility	
Emissions	EN 61000-6-3
	Emission standard for residential, commercial and light industrial environments
Immunity	EN 61000-6-2
	Immunity standard for industrial environments
Communications COM1, COM2	
Type	2-wire RS-485
Cable	One shielded twisted pair
Length	1,200 m (4,000 ft) maximum
Quantity	Up to 255 devices per port
Data rate	9600, 19.2K, 38.4K, 57.6K, 115.2K baud
Data bits	7 or 8
Parity	None, even, odd
Stop bits	0, 1, 2
Tx delay	0 – 5 sec.
Protocol	Modbus RTU or ASCII
Connection terminals	Wago cage clamp terminals
Communications COM1, COM2	
Type	RS-232
Cable	Custom TTC# 10332-005
Length	15 m (50 ft) maximum
Data rate	9600, 19.2K, 38.4K, 57.6K, 115.2K baud
Data bits	7 or 8
Parity	None, even, odd
Stop bits	0, 1, 2
Tx delay	0 – 5 sec.
Protocol	Modbus RTU or ASCII
Connection terminals	RJ-11
CAN Networking Port	
Type	2-wire isolated CAN-based peer-peer network. Isolated to 300 V.
Connection	Two 8-pin RJ-45 connectors (both may be used for Input or Output connections)
Protocol	Proprietary NGC-40
Topology	Daisy chain
Length	10 m (33 ft) maximum

Quantity	Up to 80 CAN nodes per network segment
Address	Unique, factory assigned
Ethernet	
Type	10/100 BaseT Ethernet network
Length	100 m (328 ft)
Data rates	10 or 100 MB/s
Protocol	Modbus/TCP
Connection terminals	Shielded 8-pin RJ-45 connector on front of module
Programming and Setting	
LED indicators	
Alarm conditions	RESET, Configuration lost, CAN communications fail
Configuration switch	SET/RUN slide switch on front of module
Connection terminals	
Wiring terminals	Cage clamp, 0.5 to 2.5 mm2 (24 to 12 AWG)
CAN networking and module power	Two RJ-45s, one each IN and OUT. Provides CAN bus signals and +24 Vdc power.
Housing	
Size	45.1 mm (1.78 in) wide x 87 mm (3.43 in) high x 106.4 mm (4.2 in) deep

3.3 NGC-40-IO



The NGC-40-IO provides up to four additional RTD inputs. These additional RTD inputs can be assigned to any NGC-40-HTC/HTC3. The NGC-40-IO also has one digital input and one alarm relay.



A. WIRING TERMINALS - RS-485 PORTS

1-3 ⚠	Alarm relay	9-12	TS1 (RTD1)	21-24	TS4 (RTD4)
4-6	Not used	13-16	TS2 (RTD2)		
7-8	Digital input	17-20	TS3 (RTD3)		

⚠ WARNING:

Shock Hazard. Disconnect from live voltage prior to accessing terminals

B. STATUS LEDs

STATUS: Indicates status of IO module

Off	No power
Green	OK/Normal
Yellow	Configuration mode
Red	Internal fault

ALARM RELAY

Off	No alarm
Red	Alarm condition

TS1 FAIL to TS4 FAIL

Off	Normal, no fault
Red	TS fail (open, shorted, out of range)

NETWORK: Indicates CAN network activity

Off	No link detected
Green	Link OK, receive data packets
Yellow	Transmit data packets

INPUT: Shows status of digital input

Off	Input is inactive (open)
Green	Input is active (shorted)

GFI: Indicates ground-fault status

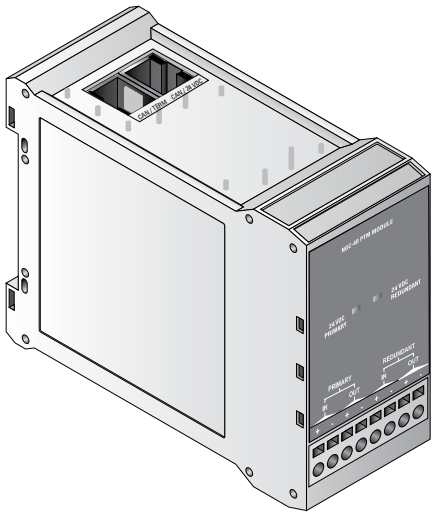
Off	No alarm
Red	High or low ground-fault alarm
Flash R	Ground-fault trip alarm

C. CAN BUS / MODULE POWER

D. RESET BUTTON

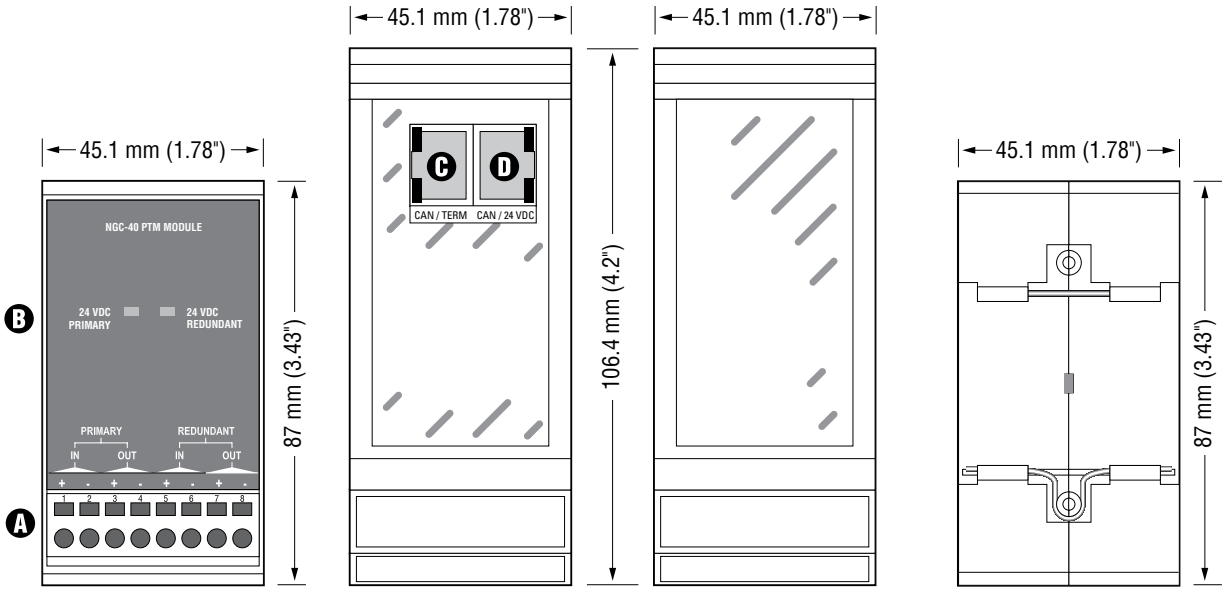
General	
Approvals and Certifications	
Supply voltage	24 Vdc, ± 10%
Internal power consumption	< 2.4 W per NGC-40-IO
Ambient operating temperature	–40ºC to 65ºC (–40ºF to 149ºF)
Ambient storage temperature	–40ºC to 75ºC (–40ºF to 167ºF)
Environment	PD2, CAT III
Max. altitude	2,000 m (6,562 ft)
Humidity	5 – 90% noncondensing
Mounting	Din Rail – 35 mm
Electromagnetic Compatibility	
Emissions	EN 61000-6-3 Emission standard for residential, commercial and light industrial environments
Immunity	EN 61000-6-2 Immunity standard for industrial environments
Temperature Sensors	
Type	100 W, platinum RTD, 3-wire, a = 0.00385 ohms/ohm/ºC Can be extended with a 3-conductor shielded cable of 20 W maximum per conductor 100 W, Ni-Fe, 2-wire Can be extended with a 2-wire shielded cable of 20 W maximum per conductor
Quantity	Up to four wired directly to each NGC-40-IO module
Alarm Relay	
Dry contact relay (voltage free)	Relay contact rated 250 V / 3 A 50/60 Hz (CE) and 277 V / 3 A 50/60 Hz (cCSAus). Output is user programmable to flash. N0 and NC contacts available.
Digital Input	
Multi-purpose input	Multi-purpose input for connection to external dry (voltage-free) contact or DC voltage. May be user programmable for: not used / force off / force on functions. It can be configured to be active open or active closed.
Max. input voltage	24 Vdc
CAN Networking Port	
Type	2-wire isolated CAN-based peer to peer network. Isolated to 300 V.
Connection	Two 8-pin RJ-45 connectors (both may be used for Input or Output connections
Protocol	Proprietary NGC-40
Topology	Daisy chain
Length	10 m (33 ft) maximum
Quantity	Quantity Up to 80 HTC/HTC3 and IO modules per network segment
Address	Unique, factory assigned
Connection terminals	
Wiring terminals	Cage clamp, 0.5 to 2.5 mm2 (24 to 12 AWG)
CAN networking and module power	Two RJ-45s, one each IN and OUT. Provides CAN bus signals and +24 Vdc power.
Housing	
Size	45.1 mm (1.78 in) wide x 87 mm (3.43 in) high x 106.4 mm (4.2 in) deep

3.4 NGC-40-PTM



The NGC-40-PTM accepts a primary and redundant power supply input, accepts the CAN bus inputs, and provides for termination of the CAN bus. Each NGC-40-PTM can provide power for a maximum of 10 NGC-40 modules.

NGC-40-PTM Components



Front **Top** **Bottom** **Back**

A. WIRING TERMINALS - RS-485 PORTS					
1	Primary 24 Vdc In (+)	4	Primary 24 Vdc Out (–)	7	Redundant 24 Vdc Out (+)
2	Primary 24 Vdc In (–)	5	Redundant 24 Vdc In (+)	8	Redundant 24 Vdc Out (–)
3	Primary 24 Vdc Out (+)	6	Redundant 24 Vdc In (–)		

B. STATUS LEDs			
STATUS:	24 Vdc Primary	**24 Vdc Redundant**	
Off	No power	**Off**	**No power**
Green	Power on	**Green**	**Power on**

C. CAN/TERM

D. CAN/24 VDC

NGC-40-PTM Specifications

General

Approvals and Certifications	
Supply voltage	24 Vdc, ± 10%
Internal power consumption	1 W per NGC-40-PTM
Output current	1.5 Amps @ 24 V
Ambient operating temperature	–40ºC to 65ºC (–40ºF to 149ºF)
Ambient storage temperature	–40ºC to 75ºC (–40ºF to 167ºF)
Environment	PD2, CAT III
Max. altitude	2,000 m (6,562 ft)
Humidity	5 – 90% noncondensing
Mounting	Din Rail – 35 mm

Electromagnetic Compatibility

Emissions	Residential/Commercial (Class B) Environment

CAN Networking Port

Type	2-wire isolated CAN-based peer to peer network. Isolated to 300 V.
Connection	Two 8-pin RJ-45 connectors (both may be used for Input or Output connections)
Topology	Daisy chain
Length	10 m (33 ft) maximum
Quantity	Up to 10 CAN nodes per PTM module

Connection terminals

Wiring terminals	Cage clamp, 0.5 to 2.5 mm2 (24 to 12 AWG)
CAN networking and module power	Two RJ-45s, one each IN and OUT. Provides CAN bus signals and 24 Vdc power.

Housing

Size	45.1 mm (1.78 in) wide x 87 mm (3.43 in) high x 106.4 mm (4.2 in) deep

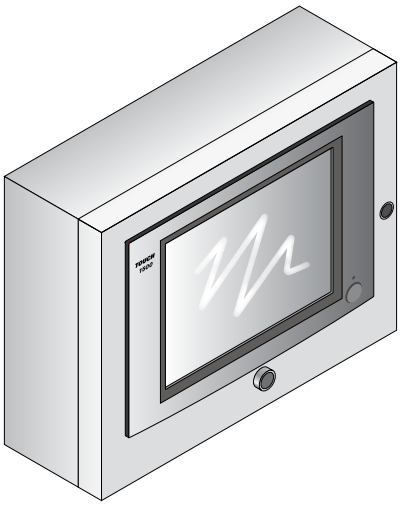
System Power Supply Requirements

Output voltage	24 Vdc ±10%
Approval	NRTL approved device for use in nonhazardous or hazardous locations as appropriate
Overcurrent protection	Must have an automatic disconnect upon a single fault condition

Number of modules per power supply	Min. steady-state current rating (A)	Min. inrush current rating (A)	Min. size wire (AWG)
1 – 5	0.550	0.550	18
6 – 10	1.050	1.050	18
11 – 20	2.050	2.050	18

3.5 TOUCH 1500 AND TOUCH 1500R TOUCH SCREENS

TOUCH 1500 installed in a panel



TOUCH 1500 **TOUCH 1500R**

The Touch 1500 and Touch 1500R are panel mounted touch screen displays used in conjunction with Raychem NGC-40 and NGC-20 (Europe only) control and monitoring devices and are approved for nonhazardous indoor locations. The TOUCH 1500 is rated IP 65 (NEMA 4) and is intended to be mounted on the door of an NGC-40 panel containing NGC-40 modules. The Touch 1500R comes in an IP 65 (NEMA 4) wall-mounted enclosure and is intended to be mounted remotely from the NGC-40 panel containing the NGC-40 modules.

General	
Touch 1500 Approvals / Certifications	
Touch 1500R Approvals and Certifications	
Area of use	Nonhazardous, Indoors (IP65, TYPE 4)
Supply Voltage Touch 1500	120-240 VAC ± 10% 50/60 Hz 96 VA
Supply Voltage Touch 1500R	120-240 VAC ± 10% 50/60 Hz 96 VA
Current rating	Steady state 1.8 A
	Surge current 16 A
Operating temperature	0°C to 50°C (32°F to 122°F) w/o space heater, –30°C to 50°C (–22°F to 122°F) using space heater and screen cover
Storage temperature	–20°C to 60°C (–4°F to 140°F)
Dimensions	449.9 mm W X 315.6 mm H X 141.7 mm D
	(17.74 in. W X 12.44 in. H X 5.58 in. D)
Alarm Outputs	
Relay output	One Form C relay rated at 3 A @ 250 Vac.
	Relay is used as a common alarm.
LCD Display	
Display	LCD is a 15-in XGA, color TFT transflective device with integral CCFL backlight
Touch Screen	4-wire resistive touch screen interface for user entry
Network Connection	
Local/Remote Port	* RS-232/RS-485 ports may be used to communicate with host computers DTS (Raychem Supervisor Software) or DCS
Local RS-232	A non-isolated, 9 pin D sub male
Remote RS-485	2-wire isolated, 9 pin D sub male
Data rate	9600 to 57600 baud
Maximum cable length	For RS-485 not to exceed 1200 m (4000 ft). Cable to be shielded twisted pair.
Field Port	RS-485, 2-wire isolated. Used to communicate with external devices, such as NGC-40-BRIDGE. Maximum cable length not to exceed 1200 m (4000 ft). Cable to be shielded twisted pair.
Signals	2-wire isolated, 9 pin D sub male
Data rate	To 9600 baud
LAN	10/100 Base-T Ethernet port with Link and Activity Status LEDs (X2)
USB Ports	USB 2.0 Host port Type A receptacle (X4)

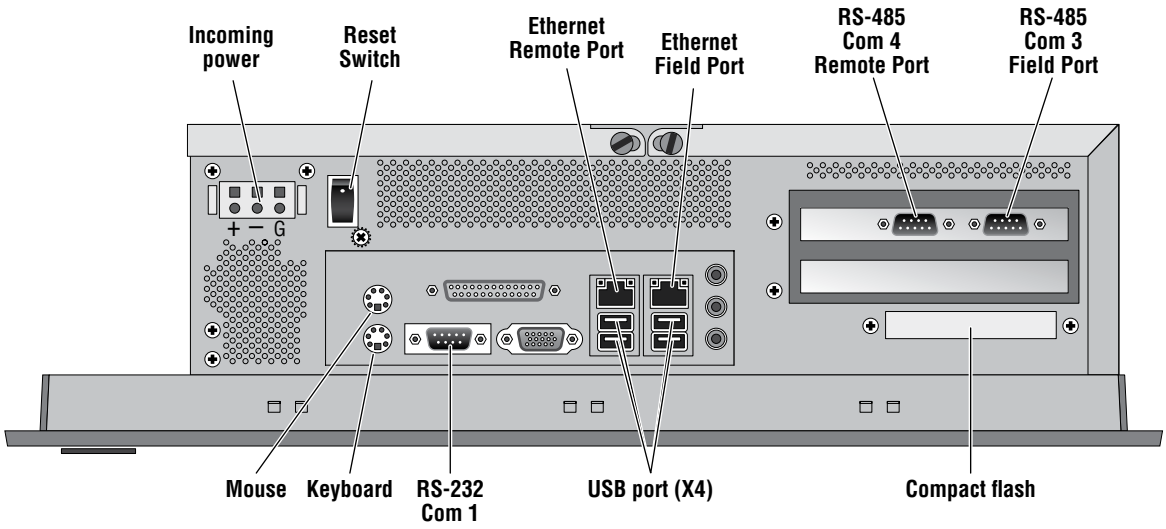


Fig. 2.23 Touch 1500 Connection Diagram

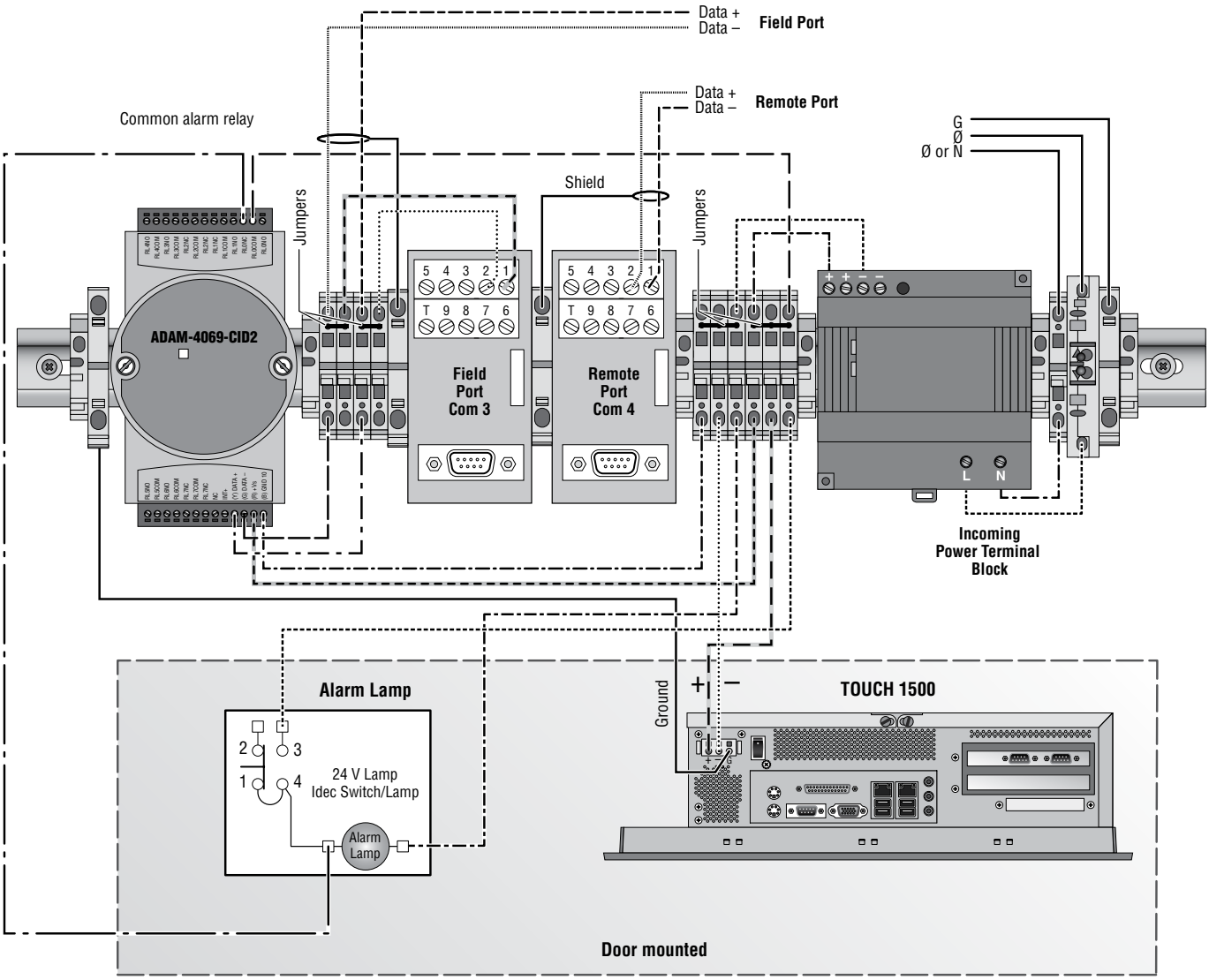


Fig. 2.24 Touch 1500 Overview of Wiring

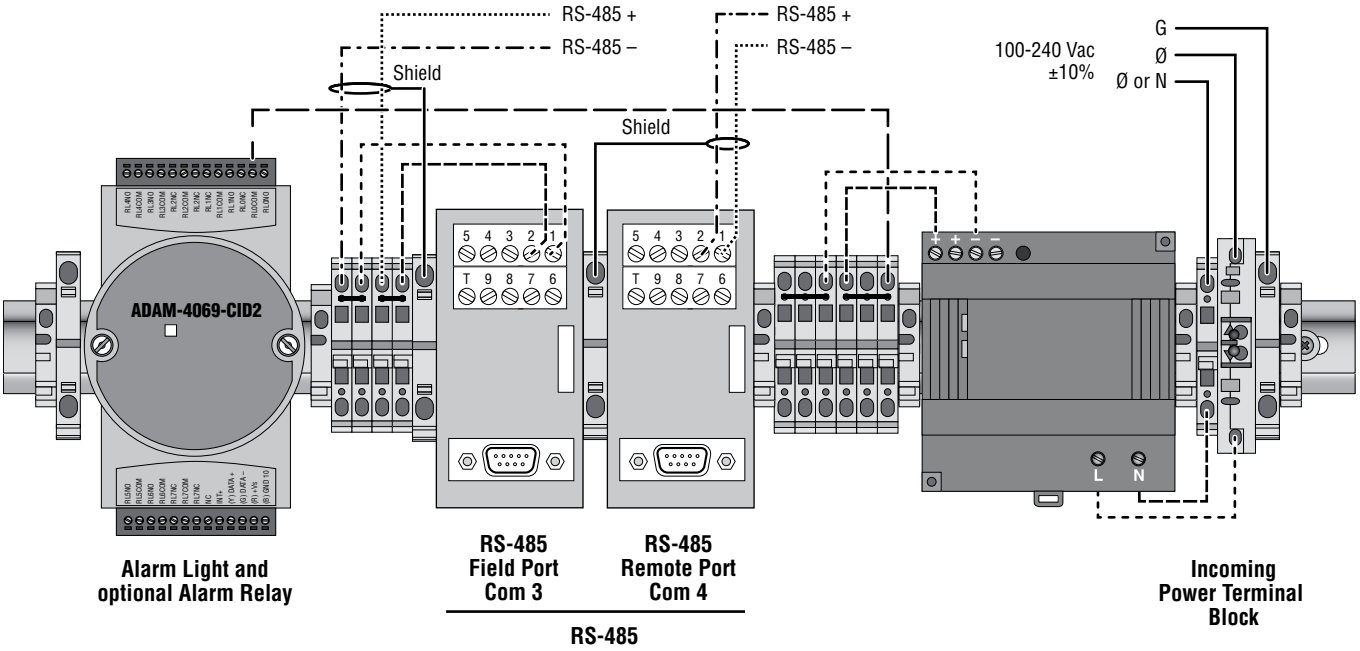


Fig. 2.25 Touch 1500R Overview of Wiring

3.6 TOUCH 1500-HAZ

Touch 1500-HAZ-CPU and Touch 1500-HAZ-TS installed in a panel

The Touch 1500-HAZ is a panel mounted touch screen display and computer used in conjunction with Raychem NGC-40 and NGC-20 (Europe only) control and monitoring devices. The Touch 1500-HAZ display is rated NEMA 4X (IP65) and can be mounted indoors or outdoors in a hazardous location. For outdoor installation, a space heater will be required in the panel for low ambient conditions.

General

Touch 1500-HAZ	
Approvals and Certifications	
Hazardous Locations	
Class 1, Division 2 Groups A, B, C, D	
Area of use	Nonhazardous or hazardous locations, indoor or outdoor (Type 4X, IP66)
Supply Voltage - Touch 1500-HAZ-CPU:	10 – 36 Vdc
Supply Voltage - Touch 1500-HAZ-TS:	19 – 30 Vdc
Current rating - Touch 1500-HAZ-CPU:	2 A @ 24 Vdc
Current rating - Touch 1500-HAZ-TS:	2.62 A @ 24 Vdc
Operating temp (CE)* - Touch 1500-HAZ-CPU:	-20°C to 60°C (-4°F to 140°F)
Operating temp (CE)* - Touch 1500-HAZ-TS:	-20°C to 60°C (-4°F to 140°F)
Operating temp (UL)* - Touch 1500-HAZ-CPU:	-10°C to 60°C (14°F to 140°F)
Operating temp (UL)* - Touch 1500-HAZ-TS:	0°C to 50°C (32°F to 122°F)
Storage temperature	–30°C to 80°C (–22°F to 176°F)
Dimensions (W x D x H)	85.5 mm x 139 mm x 152 mm (3.4 in x 5.5 in x 6 in)
Touch 1500-HAZ-CPU:	422 mm x 68 mm x 338 mm (16.61 in x 2.68 in x 13.31 in)
Touch 1500-HAZ-TS:	

Alarm Outputs

Relay output	One Form C relay rated at 12 A @ 250 Vac. Relay is used as a common alarm.

Network Connection

Remote Port	RS-485 port may be used to communicate with host computers DTS (Raychem Supervisor Software) or DCS
RS-485	A non-insulated 9 pin D sub male
Data rate	To 9600 to 57000 baud
Maximum cable length	For RS-485 not to exceed 1200 m (4000 ft). Cable to be shielded twisted pair.
Field Port	RS-485, 2-wire isolated. Used to communicate with external devices, such as NGC-40-BRIDGE. Maximum cable length not to exceed 1200 m (4000 ft). Cable to be shielded twisted pair.
RS-485	A non-insulated 9 pin D sub male
Data rate	To 9600 baud
Maximum cable length	For RS-485 not to exceed 1200 m (4000 ft). Cable to be shielded twisted pair
LAN	10/100 Base-T Ethernet port with Link and Activity Status LEDs (X3)
USB Ports	USB 2.0 host ports (X4)

Alarm Outputs

Display	LCD is a 15-in XGA, color TFT transflective device with integral LED backlighting.
Touch Screen	5-wire resistive touch screen interface with enhanced ITO film for user entry.

*__IMPORTANT:__ Temperature ratings are without space heaters

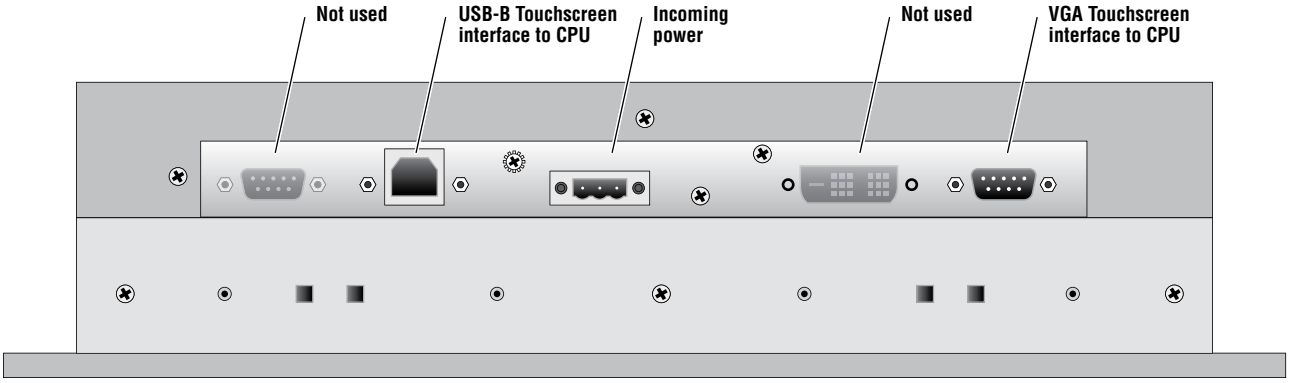


Fig. 2.26 Touch 1500-HAZ-TS Port Diagram

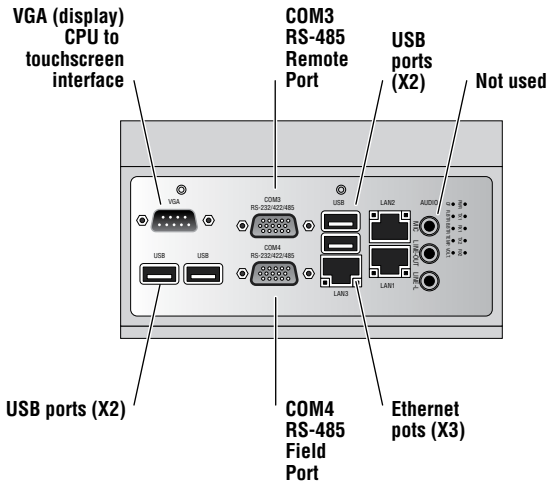


Fig. 2.27 Touch 1500-HAZ-CPU Port Diagram (Back View)

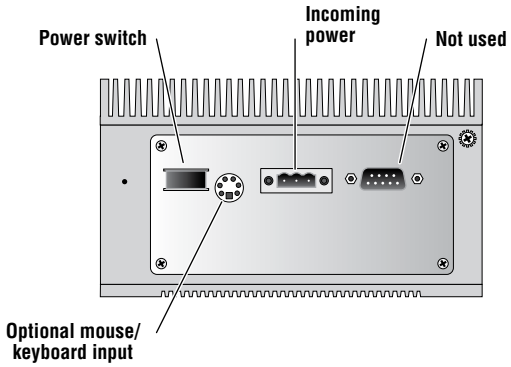


Fig. 2.28 Touch 1500-HAZ-CPU Port Diagram (Side View)

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For example, on rare occasions, there may be a special need to encourage the widest possible use of a certain library, so that it becomes a de-facto standard. To achieve this, non-free programs must be allowed to use the library. A more frequent case is that a free library does the same job as widely used non-free libraries. In this case, there is little to gain by limiting the free library to free software only, so we use the Lesser General Public License.

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For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

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