



Allen-Bradley

ControlNet™ Adapter Module

**(Catalog Numbers 1747-ACN15,
1747-ACNR15)**

User Manual

**Rockwell
Automation**

Introducing the ControlNet Adapter Module

Chapter Objectives

This chapter describes the ControlNet adapter modules (cat. no. 1747-ACN15 and 1747-ACNR15):

- features
- hardware components, including
 - diagnostic indicators
 - network access port (NAP)
 - ControlNet connectors
 - network address switch assemblies

Module Description and Features

The 1747-ACN15 and 1747-ACNR15 adapters control remote 1746 I/O on the ControlNet network. The ControlNet network is a communication architecture that allows the exchange of messages between ControlNet products compliant with the CI specification.

The 1747-ACN15 and 1747-ACNR15 adapters features include:

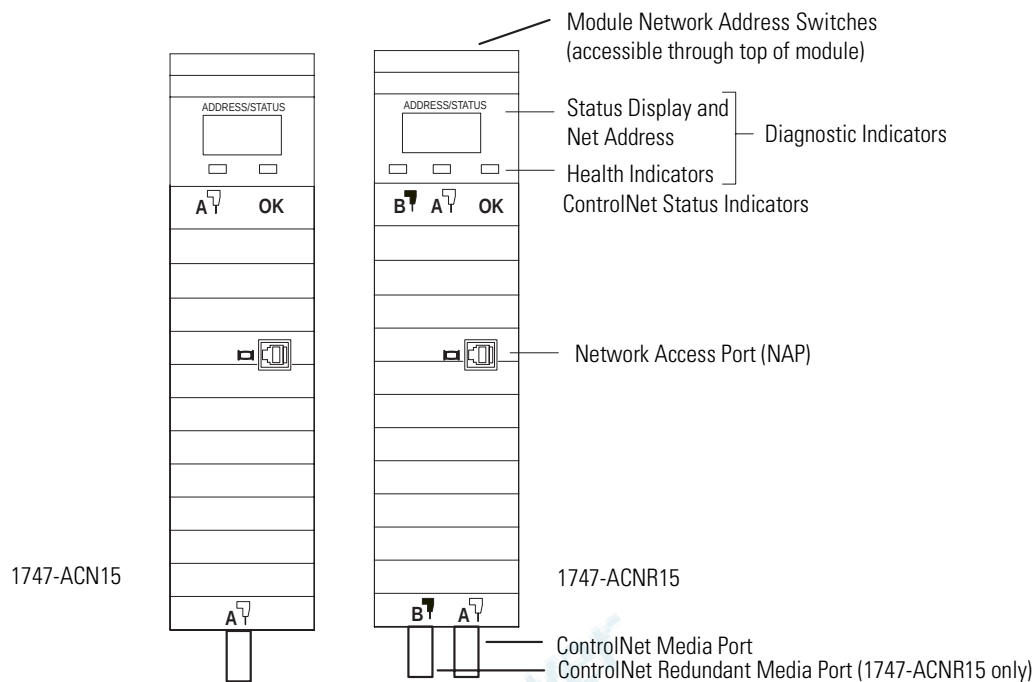
- high-speed data transfer
- diagnostic messages
- local communication network access through the network access port (NAP)
- redundant media (1747-ACNR15 only)

Hardware Components

The adapter module consists of the following major components:

- ControlNet status indicators
- status display
- network access port (NAP)
- ControlNet connectors (one on 1747-ACN15; two on 1747-ACNR15)
- module net address switch assemblies (on top of module)

Figure 1.1 ControlNet Adapter Module



Diagnostic Indicators

Health indicators are located on the front panel of the adapter module, See Figure 1.1. They show both normal operation and error conditions in your remote I/O system.

In addition, an alphanumeric display (net address/status) provides status code indications when an error occurs during initialization or operation.

A complete description of the diagnostic indicators and status display and how to use them for troubleshooting is explained in Chapter 5.

Network Access Port (NAP)

The network access port provides a bidirectional electrical interface for programming, maintenance, and I/O monitoring devices in both redundant and non-redundant connections. See Figure 1.1 connecting programming terminals to the network using the NAP above.

Installing Your ControlNet Adapter Module

Chapter Objectives

This chapter describes the procedures for installing your ControlNet adapter module. These include:

- European Directive compliance
- determining power requirements
- setting the network address switches
- setting the I/O chassis switches
- installing the adapter module in the chassis
- connecting programming terminals to the network via the network access port (NAP)
- powerup sequence

Compliance to European Union Directives

For general installation guidelines, see SLC 500 System Installation Recommendations on page B-6. If this product has the CE mark it is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives.

EMC Directive

This product is tested to meet Council Directive 89/336/EEC Electromagnetic Compatibility (EMC) and the following standards, in whole or in part, documented in a technical construction file:

- EN 50081-2
EMC - Generic Emission Standard, Part 2 - Industrial Environment
- EN 50082-2
EMC - Generic Immunity Standard, Part 2 - Industrial Environment

This product is intended for use in an industrial environment.

Low Voltage Directive

This product is tested to meet Council Directive 73/23/EEC Low Voltage, by applying the safety requirements of EN 61131-2 Programmable Controllers, Part 2 - Equipment Requirements and Tests.

For specific information required by EN 61131-2, see the appropriate sections in this publication, as well as the following Allen-Bradley publications:

- *Industrial Automation Wiring and Grounding Guidelines For Noise Immunity*, publication 1770-4.1
- *Automation Systems Catalog*, publication B111

Determining Power Requirements

The ControlNet adapter module requires a maximum backplane current of 900 mA at 5V dc. Remember to add this amount to other current requirements for your I/O chassis.

Setting the Network Address Switches

The switches on the top of the adapter module determine the network address of the adapter. The two switches are:

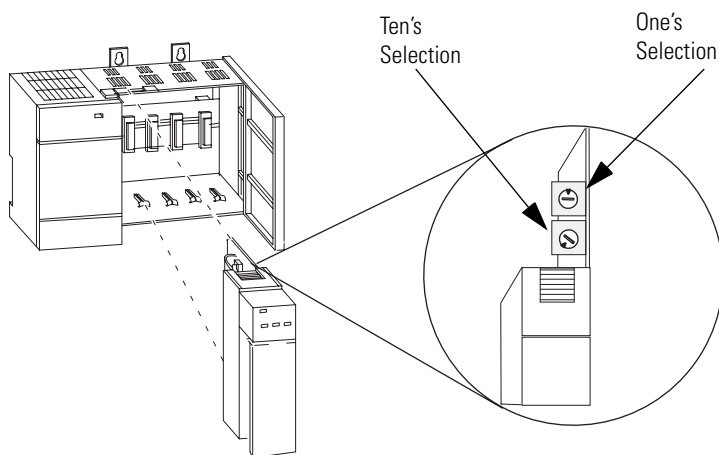
- the ten's switch
- the one's switch

The combination of these switches allows selection of network addresses from 01 to 99.

NOTE

00 is an invalid number.

Figure 2.1 Setting the Network Address



Installing the Adapter Module in the Chassis

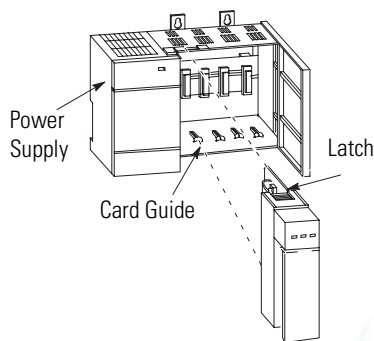
Once you've set the appropriate switch assemblies for your adapter module, follow these procedures for installation.

Refer to the *Industrial Controller Wiring and Grounding Guidelines*, Publication 1770-4.1 for proper grounding and wiring methods to use when installing your module.

ATTENTION



Remove system power before removing or installing your module in the I/O chassis. Failure to observe this warning could damage module circuitry and injure people.



1. Remove power from the I/O chassis before inserting (or removing) the module.
2. Align the circuit board with the chassis card guide in the left slot.
3. Slide the module into the chassis until the top and bottom latches are latched. To remove the module, press the releases at the top and bottom of the module and slide it out.
4. Press firmly and evenly to seat the module in its backplane connectors.

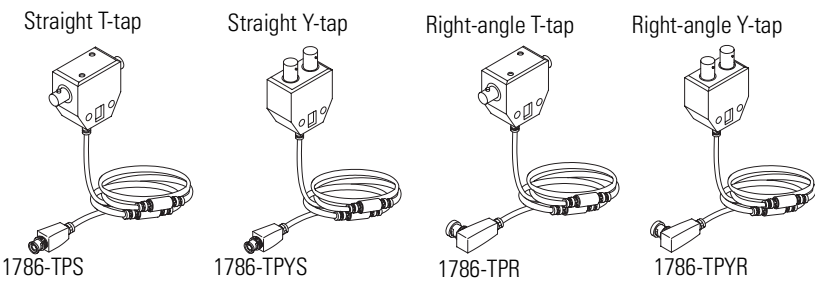
ATTENTION



Do not force the module into the backplane connector. If you cannot seat the module with firm pressure, check the alignment. Forcing the module can damage the backplane connector or the module.

Connecting Your Adapter to the ControlNet Network

You connect your 1747-ACN15 or -ACNR15 adapter module to a ControlNet network via taps. These taps are available:



IMPORTANT Taps contain passive electronics and must be purchased from Allen-Bradley for the network to function properly.

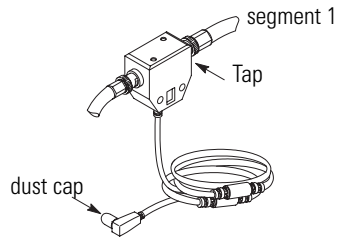
1. Remove the tap's dust cap (located on the straight or right angle connector).

If your node supports:	Connect the tap's straight or right angle connector:
Non-redundant media	to the channel A connector on the 1747-ACN15 or 1747-ACNR15 (channel B on the 1747-ACNR is not used) ⁽¹⁾
Redundant media	• from trunkline A to channel A on the 1747-ACNR15 • from trunkline B to channel B on the 1747-ACNR15

⁽¹⁾ While both channels are active, Allen-Bradley recommends using channel A for non-redundant media.

ATTENTION Do not allow any metal portions of the tap to contact any conductive material. If you disconnect the tap from the adapter, place the dust cap back on the straight or right angle connector to prevent the connector from accidentally contacting a metallic grounded surface.



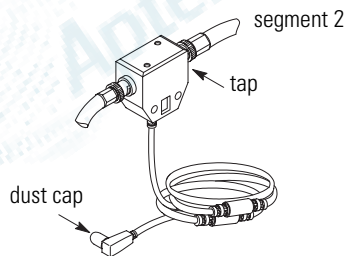


2. Remove and discard the dust caps from the adapter BNC jacks.
3. Connect this tap's straight or right angle connector to the BNC connector on the adapter.

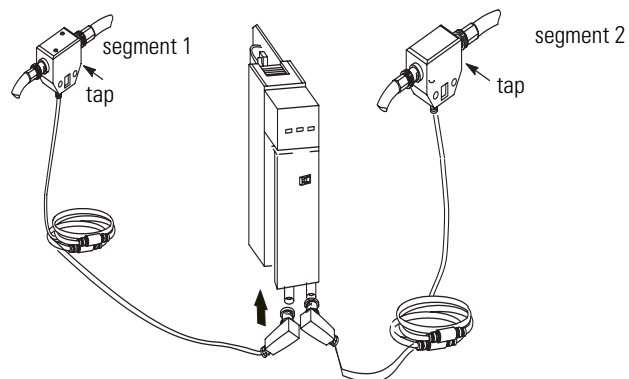
IMPORTANT

To prevent inadvertent reversal of the tap connections (resulting in incorrect LED displays and troubleshooting), check the tap drop cable for a label indicating the attached segment before making your connection.

4. For redundant adapters (1747-ACNR15), remove (and save) the dust cap located on the straight or right angle connector of the designated tap on the second segment (segment 2).



5. Connect this tap's straight or right angle connector to the BNC connector on the adapter.

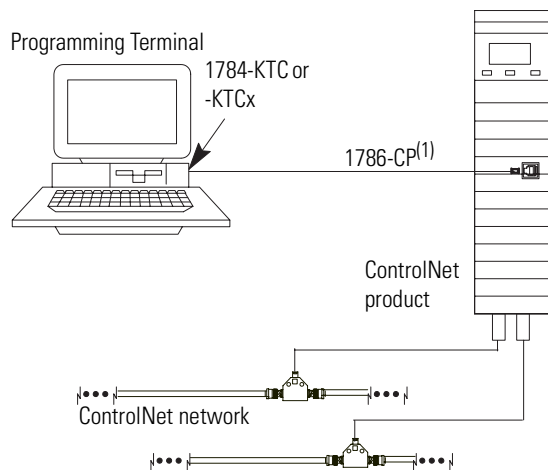


After terminating your segments, connect the node to the network.

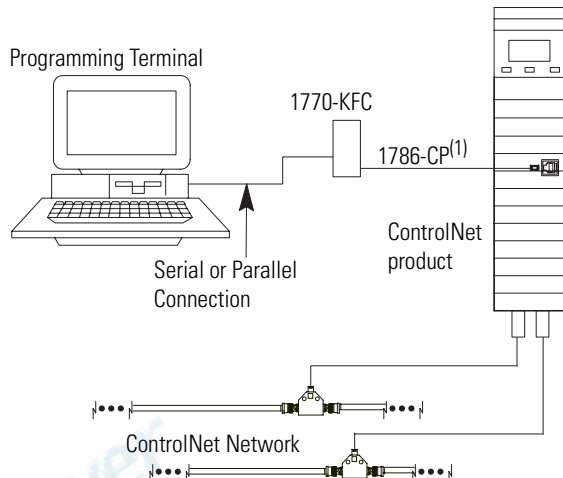
Connecting Programming Terminals to the Network via the NAP

You can connect programming terminals to the ControlNet network by connecting to the network access port (NAP). Two methods are shown below.

Using 1784-KTC or -KTCx Communication Card and NAP



Using 1770-KFC Communication Interface and NAP



(1) The 1786-CP cable can be plugged into any ControlNet product's NAP to provide programming capability on the ControlNet network. A programming terminal connected through this cable is counted as a node and must have a unique address.

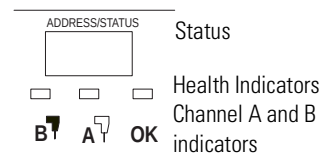
ATTENTION



Use the 1786-CP cable when connecting a programming terminal to the network through NAPs. Using a commercially available RJ-style cable could result in possible network failures.

Powerup Sequence

There are three health indicators on the module. The LED on the right (labeled “OK”) is the generic module health indicator. The LED in the middle (labeled “A”) is the health indicator of cable A. On the 1747-ACNR15, the LED on the left (labeled “B”) is the health indicator for cable B. In addition, the alphanumeric display can display module status. The following describes the normal power-up sequence for the adapter module. (Refer to Troubleshooting With the Status Indicators and Status Display on page 5-1 and ControlNet Status Indicators on page 5-3 for explanation of the LED’s and alphanumeric display.)



1. Apply power to the chassis - notice that all three health indicators should be off and the status window indicates “POST” (Power On Self Test).
2. After “POST”, the status window displays the sequence “0000”, “1111”, “2222”, through “9999”. During this time, the A and B LEDs are off and the OK LED toggles between red and green; this happens so fast, the OK LED appears amber.
3. The series and revision levels are then displayed in the status window. A series A revision level B module would display “A/B”. During this time, the A and B LEDs are off and the OK LED toggles between red and green; this happens so fast, the OK LED appears amber.
4. After the operating system is loaded and initialized, the status window and the LEDs indicate the status of the module and its connections to the cable(s). If the module address is not zero and a valid ControlNet connection is made to either channel A or B, the status window toggles between “ACTV” (Active) and the module node address (“A#02”, node address number 2). If there are no active connectors, the status window displays “IDLE”.
5. If there is a hardware problem of any kind, the health LED turns red and the status window toggles between “FATL” and up to four alphanumeric characters. The “FATL” indicates that there was a fatal error and the characters indicate what the error is.

For detailed information on planning and installing your ControlNet system, refer to Related Publication on page P-1.

Planning to Use Your ControlNet Adapter Module

Chapter Objectives

This chapter explains how the adapter operates on ControlNet and provides information to assist in configuring your system. This includes:

- compatible 1746 and 1747 I/O modules
- overview of adapter operation
- software requirements
- rack and module connections
- optimizing SLC ControlNet Adapter connections
- module keying
- output operation during Fault and Idle modes
- understanding ControlNet I/O
- scheduled Data-Transfer connections on a ControlNet network

Compatible 1746 and 1747 I/O Modules

The majority of 1746 and 1747 discrete, analog and specialty modules are compatible with the 1747-ACN15 and 1747-ACNR15 adapters. Exceptions include any modules that require G file configuration. These include:

- 1747-SN Remote I/O Scanner module
- 1747-BSN Back-Up Remote I/O Scanner module
- 1746-QV Open Loop Velocity Control module
- 1203-SM1 Scanport module (Class 4 operation) (This module is compatible when configured for class 1 operation.)
- 1747-SCNR ControlNet Scanner module (G files not required, however, this module is not supported by the 1747-ACN15/ACNR15)

A small number of 1746 modules are currently not supported by the adapter due to lack of an EDS (electronic data sheet) file. These modules will be supported once EDS development is completed. A complete list of compatible 1746 and 1747 modules can be found on the Allen-Bradley Technical Support Knowledge Base at:

<http://www.ab.com/support/kbhome.html>

NOTE

The electronic keying option offered by RSNetWorx for rack connections applies to the 1747-ACN15 and -ACNR15 modules only.

Missing or misplaced modules are not detected if the module in question is configured within a rack connection. Critical I/O modules that need to be detected when missing or misplaced must be configured with individual module connections.

Output Operation During Fault and Idle Modes

RSNetworx allows configuration to characterize each module connection activity during certain operational states.

During idle mode and fault modes, outputs are configured for one of the following operation states:

Output Action
Reset outputs to off
Hold last state
Write Safe State data to outputs

Understanding ControlNet I/O

The ControlNet system is designed to:

- provide high-speed, repeatable, deterministic I/O transmission
- allow control and message information to co-exist on the same physical media
- make sure that I/O data transfers are not affected by
 - programming-terminal message activity
 - inter-processor message activity on the network

Scheduled Data-Transfer Connections on a ControlNet Network

Scheduled data transfer on a ControlNet processor:

- is continuous
- is asynchronous to the ladder-logic program scan
- occurs at the actual rate displayed in the Actual Packet Interval field on the RSNetWorx ControlNet I/O mapping (monitor) screen

Troubleshooting

Chapter Objectives

In this chapter, you will learn how to use the indicators on the module frontplate for troubleshooting the module. This includes:

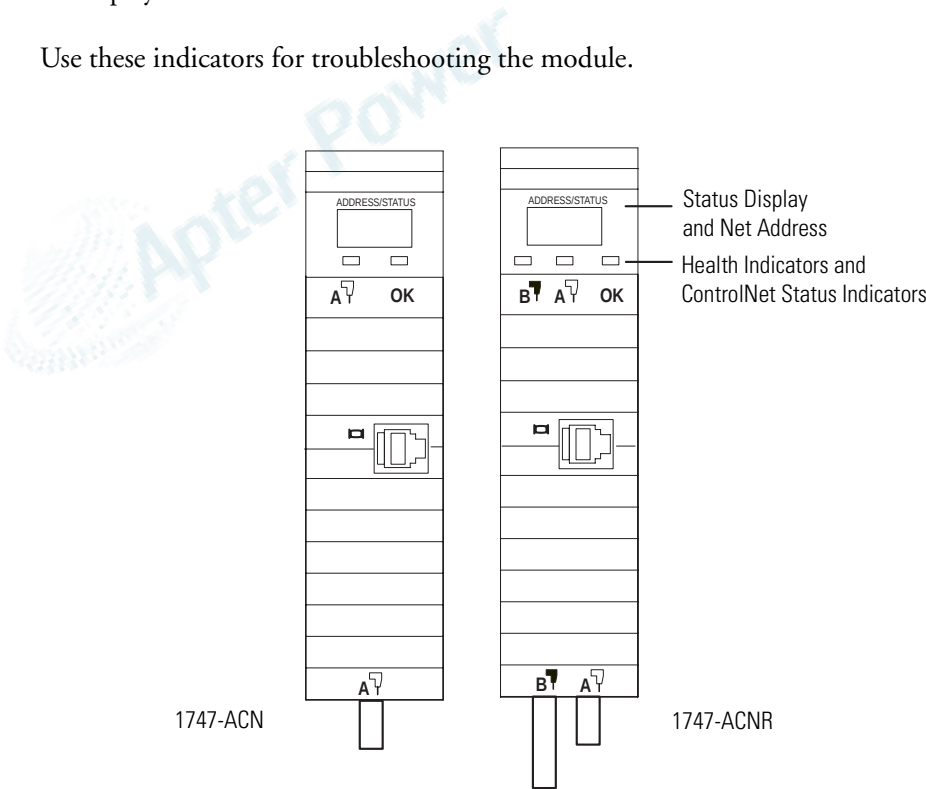
- troubleshooting with the status indicators and status display, including:
 - health indicators and display mnemonics
 - ControlNet status indicators

Troubleshooting With the Status Indicators and Status Display

The module has indicators on the front plate, as shown below. These indicators consist of:

- health indicators
- status indicators
- display of status and address

Use these indicators for troubleshooting the module.



The following tables describe problems that may occur, probable causes, and recommended courses of action.

Health Indicators and Display Mnemonics

OK LED	Display	Description	Probable Cause	Recommended Action
Off	None	Module is not communicating.	Power supply fault.	Check power supply, and seat adapter firmly in chassis.
	None	Module is not communicating.	Defective adapter.	Contact Allen-Bradley service.
	POST	Adapter is running Power On Self Test.	None	None
Amber	0000 through 9999	Adapter is running Power On Self Test.	None	None
	A/A	Adapter is displaying Series and Revision level.	None	None
	INIT	Adapter is loading and initializing operating system.	None	Adapter requires ControlNet configuration.
Solid Red	FATL Number Number	Module is not communicating.	The Adapter has either failed a hardware test, or gone into a state from which it cannot recover. The numbers following the FATL describe the problem in detail.	Document the numbers. Power cycle the adapter. Contact Allen-Bradley service.
Flashing Red	A#00 ERR	Module is not communicating.	The node address switches are set to 00 which is not valid.	Power the adapter off, remove the adapter from the chassis, change the node address switch to something other than 00, replace the adapter in the chassis, and apply power.
	DUP NODE	Module is not communicating.	The adapter has detected a duplicated node address on the network.	Correct the duplicate node address problem.
Flashing Green	IDLE			
	NET ERR	Module is not communicating.	The adapter has detected a cable fault and is attempting to recover. The adapter is sending the three "NET ERR" packets.	None, check cable if problem persists.
Solid Green	ACTV A#XX	Module is working properly.	None	None
	BOOT A#XX	Module is on network, but not supporting any connections.	The main code in the module has failed, or the main code is being updated.	Update the main code with the latest Series and Revision code.
	CODE UPDT	Firmware update mode.	Adapter firmware is being updated via ControlFlash update utility.	None

ControlNet Status Indicators

The following table explains module status when indicators are:

- steady - indicator is on continuously in the defined state.
- alternating - the two indicators alternate between the two defined states at the same time (applies to both indicators viewed together). The two indicators are always in opposite states, out of phase.
- flashing - the indicator alternates between the two defined states (applies to each indicator viewed independent of the other). If both indicators are flashing, they must flash together, in phase.

 A  B	Cause	Action
Off	No power	None or power up
Steady red	Faulted unit	Cycle power If fault persists, contact Allen-Bradley representative or distributor.
Alternating red/green	Self-test	None
Alternating red/off	Incorrect node configuration	Check network address and other ControlNet configuration parameters
Off	Channel disabled	Program network for redundant media, if required
Steady green	Normal operation	None
Flashing green/off	Temporary errors	None; unit will self-correct
	Listen only	Cycle power
Flashing red/off	Media fault	Check media for broken cables, loose connectors, missing terminators, etc.
	No other nodes present on network	Add other nodes to the network
Flashing red/green	Incorrect network configuration	Cycle power or reset unit If fault persists, contact Allen-Bradley representative or distributor.

Specifications

Description	Specification
Module Location	1746 I/O chassis, leftmost slot
Interconnect Cable	Quad shield RG-6 coaxial cable - Refer to the <i>ControlNet Cable System Manual</i> , publication 1786-6.2 for more information.
Power Dissipation	5 Watts
Thermal Dissipation	17.06 BTU/hr
Backplane Current	0.9A at 5V dc
Environmental Conditions: - Operational Temperature - Storage Temperature - Relative Humidity	+0°C to +60°C (+32°F to +140°F) -40°C to +85°C (-40°F to +185°F) 5% to 95% (without condensation)
Agency Certification (when product or packaging is marked)	- CSA certified - CSA Class I, Division 2 Groups A, B, C, D certified - UL listed - CE compliant for all applicable directives