

READ AND SAVE THESE INSTRUCTIONS

CARNES®

**CarnesLink External Monitoring for your
Commercial, Industrial, and Residential Carnes Humidifiers**

INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

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CARNES® Link



FORM 16860B
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Important Note:

Do not install, use, or operate this equipment until this manual has been read and understood completely. Read and save these instructions for future use.

CAUTION

Perform all basic safety steps in this humidifier manual before starting unit. Follow all recommendations, instructions, and precautions in this Installation, Operation, and Maintenance Manual to maximize performance, maintain efficiency, and to provide a safe operational environment.

WARNING: HOT SURFACES

The process of humidification, using an electrode style humidifier, creates steam through the boiling process. Temperatures of this boiling water and steam can reach 212°F (100°C). This system creates extremely hot surfaces (cylinder surface, steam hose, steam pipe, condensate hose/pipe, distribution piping) and hot water, visible steam, and non-visible steam. Even discharged condensate water can be extremely hot. Contact with these surfaces, water, or steam can cause personal injury. To avoid severe burns and other injuries, always proceed with extreme caution. Before any service or maintenance is performed on the humidifier, turn off unit, disconnect electrical service, and allow humidifier unit to cool down completely.

WARNING: ELECTRICAL

De-energize Electrical Supply before any service or maintenance is performed. Verify the main power supply is disconnected and safely labeled. If the Carnes humidifier utilizes an individual circuit breaker, turn off the unit circuit breaker and the main power supply breaker. Failure to turn off main power supply could result in fire, electrical shock or both, resulting in damage to property, personal injury or death.

Important Note: Electric shock can and will permanently damage components on the circuit board and CarnesLink communication chip.

Liability:

Carnes does not accept any liability for installations of humidifier equipment installed by unqualified personnel or the use of parts, components, equipment or alterations of Carnes manufactured equipment that is not authorized or approved by Carnes.

Trademarks:

BACnet® is a registered trademark of ASHRAE.

Modbus® is a registered trademark of SCHNEIDER ELECTRIC USA, INC.

Metasys® is a registered trademark of Johnson Controls, Inc.

Siemens® is a registered trademark of Siemens AG.

CARNES® is a registered trademark of Carnes Company.

Introduction

Basic Unit Information

Please fill out the below information and keep with your records.

Unit Serial Number:	Number of Humidifiers:	Communication Protocol:
Unit Model Number:	Voltage / Phase:	Steam Output (Lb/Hr)
	_____ V / _____ Phase	_____ Lb/Hr
Customer / Job:	Facility Address:	Sales Rep / Distributor:



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Introduction

CarnesLink Introduction

CarnesLink offers you the ability to monitor and control your Carnes humidifier(s) (H-Series and newer) by allowing the humidifier(s) to link to your Building Management System (BMS). CarnesLink utilizes a communication module that is factory installed on the main humidifier control board that is mounted inside your Carnes humidifier(s) cabinet. The user friendly interface on the humidifier touchscreen makes setting up CarnesLink easy and convenient. Simply select the communication protocol that is being utilized in your building (*See Table 1*) and update any settings as desired.

The CarnesLink communication control module also utilizes a power isolation block that provides ease of use and reliability to the overall Building Management System. The power isolation block isolates power between the main humidifier control board and the Building Management System, which helps prevent any electrical issues from the main communication wires from leaking into the humidifier control board and vice versa. The power isolation block also provides relay support to the rest of the Building Management System by helping lift up voltages to line level on the communication wires. This can potentially help with reliability of the overall system by preventing voltage drop, especially when longer wire runs are used. The power isolation block helps with ease of use also, by allowing you to terminate end of line units with a simple switch, instead of using an external resistor across the two communication pathways.

Table 1 - Communication Protocol Options and Settings

Protocol	Signal Type	Recommended Cable	Polarity		Max. Distance of Wire Run
			Data- (D-)	Data+ (D+)	
BACnet [®] MS/TP	RS-485 Half Duplex	18 to 24 AWG Shielded Twisted Pair 120-ohms max.	Net-	Net+	Unterminated 1000 ft. (~300 meters)
Modbus [®] RTU					Terminated 4000 ft. (~1200 meters)
Metasys [®] N2			TX- / RX-	TX+ / RX+	2000 ft. (~600 meters)
Siemens [®] FLN			D-	D+	

Installation and Setup

Wiring

BACnet®, Modbus®, Metasys®, and Siemens® communicate by using RS-485 (EIA-485-A), half duplex signal type. Carnes recommends using a shielded twisted pair wire with less than 120-ohms resistance and less than 30 pF per foot capacitance between the humidifier and the Building Management System. Over distances less than 100 feet in electrically quiet environments, the type of cable used is usually not a concern, but when you need to run long distances, in electrically noisy environments, at higher baud rates, the type of cable used becomes more critical.

Carnes strongly advises against running RS-485 network cable adjacent to or in the same conduit with main power wires. Avoid running the RS-485 line near the main power supply going into the humidifier cabinet and never use the same access port on the humidifier for both main power and the RS-485 network cable.

CarnesLink connections must be made between the main humidifier and the Building Management System, and between the main humidifier and any slaves that are present. These connections are made through the Building Management System to terminals D-, D+, GND, and SHD on the CarnesLink power isolation board communication connection (shown in *Figure 1*).

Important Notes:

DO NOT wire the unit to the Building Management System with power being supplied to the unit as this could damage the CarnesLink circuit board. Terminals D- and D+ should be the last connection made when wiring the unit to the Building Management System. First the shield of the cable should be connected to the 'SHD' terminal and if a ground wire is present, it should be wired directly to the 'GND' terminal. Once these connections have been made, it is safe to place the D+ and D- terminals.

Ground loops are always a possibility when wiring two devices together. Always verify that there is no potential between the ground of the humidifier communication GND port and the ground port of the connecting device from the Building Management System.

Table 2 - Wire Types and Lengths

Protocol	Signal Type	Recommended Cable	Polarity		Max. Distance of Wire Run
			Data- (D-)	Data+ (D+)	
BACnet® MS/TP	RS-485 Half Duplex	18 to 24 AWG Shielded Twisted Pair 120-ohms max.	Net-	Net+	Unterminated 1000 ft. (~300 meters)
Modbus® RTU					Terminated 4000 ft. (~1200 meters)
Metasys® N2			Tx- / Rx-	Tx+ / Rx+	2000 ft. (~600 meters)
Siemens® FLN			D-	D+	

Notes for Table 2:

- **Terminated Network:** A terminated network is only ever needed when utilizing BACnet® MS/TP or Modbus® RTU communication protocols. End of line termination is done by placing a 120-ohm resistor across the Tx/Rx terminals of the units at both ends of the network. Proper termination setup can provide the overall network with increased reliability and function by extending the maximum distance of wire run. Most end of line units would require an external 120-ohm resistor placed directly across two communication terminals, but CarnesLink has a built-in terminating resistor that can be turned on or off via the switch located on module (shown in *Figure 1*).
- **Unterminated Network:** An unterminated network does not have a resistance placed across the Tx/Rx wires and it is required when utilizing Metasys® N2 and Siemens® FLN communication protocols.

Installation and Setup

Wiring Diagram

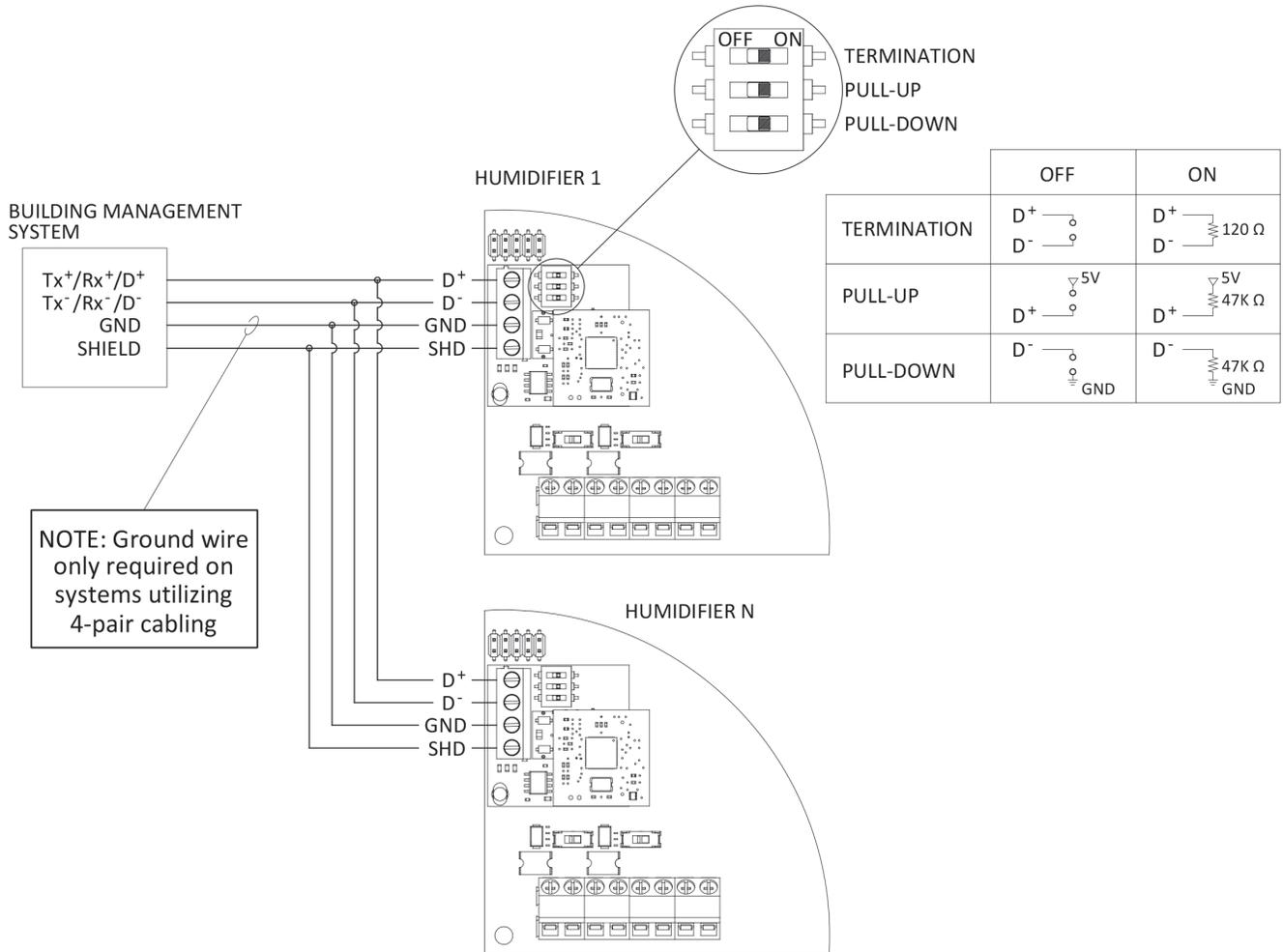


Figure 1: BMS and CarnesLink Wiring Diagram

Installation and Setup

Configuration

Introduction

This section provides a step by step procedure to configuring the humidifier to run with a desired data communication protocol.

Configuration Procedure

When configuring the data communication protocol, first the communication protocol setup page will need to be located.



Figure 2: Home Screen

Select settings on the home page of the humidifier's user interface. Once in the settings menu, go to the fourth page by clicking the right arrow until you see the 'Communication Setup' button.

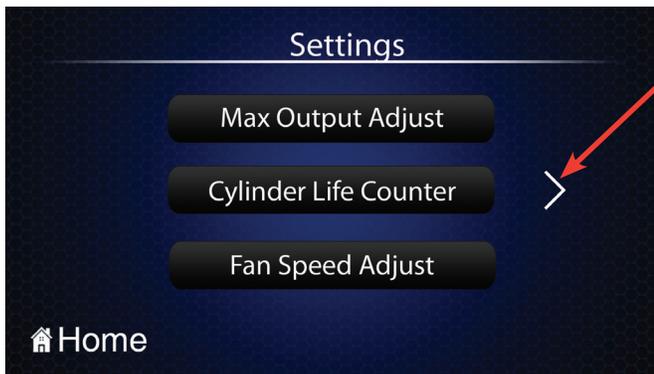


Figure 3: Page 1 of Settings Screen



Figure 4: Page 3 of Settings Screen

Once in the Communication Setup page, the selection for the desired protocol can be made by pressing the top button, which will either have a pre-set protocol shown or a 'Select Protocol' button shown. If your desired communication protocol is not shown, you will need to press the button and choose the protocol that matches your needs.



Figure 5: Communication Protocol Setup Screen with No Protocol Selected

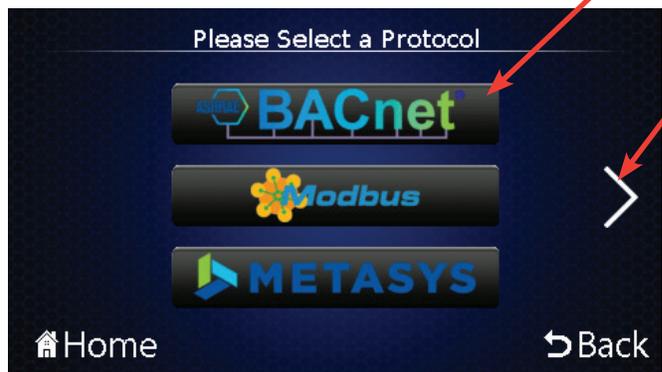


Figure 6: Protocol Selection Screen

Installation and Setup

Configuration

Once a protocol has been selected, new button(s) will appear on the 'Communication Setup' page which will allow you to change the settings to meet requirements of the Building Management System.

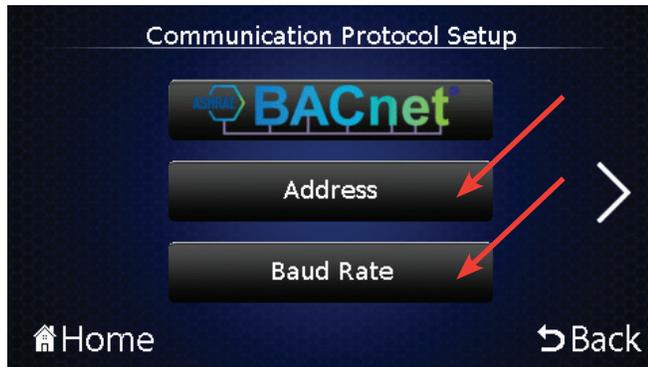


Figure 7: Communication Protocol Setup Screen with BACnet MS/TP Protocol Selected

Address, baud rate, parity, and device instance are all settings that can be adjusted, depending on the communication protocol that is selected. Some protocols do not allow the user to change certain settings because they are static values. Each of the settings has a default value as follows: Address is set to 86, baud rate is set to 9600 Bd, parity is set to (0) 'No Parity and Stop Bit', and device instance is set to 869.

Address: The address is a user-adjustable value to specify an individual unit on a network. Each protocol has different ranges for the address value, and each unit on the network needs to have a different address. Same addresses on the same network can cause communication issues because the controller will not know which one to communicate to.

Baud Rate: The rate at which information is transferred in a communication channel, in this case number of bits per second. The baud rate of the Building Management System and the humidifier need to be identical for communication to function properly.

Parity: The parity value is based on the parity selection (none, odd, or even) and number of stop bits. The stop bit is the number of bits ending a string of binary code in the communication signal. Modbus® is the only protocol that allows for differing parity values.

Device Instance: The device instance value is BACnet® specific and it is used to identify specific units on the network. Device instance is similar to address except that the range is much larger, allowing for a more defined location, and the device instance can not cause communication issues with the unit.

Introduction

This document provides a User's Guide for using CarnesLink. This product provides a BACnet[®] network interface between BACnet[®] client devices and the humidifier as a BACnet[®] MS/TP server device. CarnesLink uses the BACnet[®] Master Slave/Token Passing (MS/TP) protocol.

Important Note: This document assumes the user/installer is familiar with BACnet[®] and BACnet[®] terminology.

Requirements

Performance

CarnesLink uses a standard BACnet[®] MS/TP protocol communication structure that uses messages based on a client server model. Each BACnet[®] confirmed service request is answered as quickly as possible without using a response delay. Support for all baud rates between 9600 and 115200 baud in increments of 100 is allowed, along with the ability to customize address and device instance to better adapt to your building management needs. Due to protocol restrictions, parity is fixed at (0) no parity with one stop bit.

Support for MS/TP

BACnet[®] MS/TP uses standard tinned copper RS-485 (also known as EIA485) conductor as the physical layer for serial network communication. RS-485 is a 3-wire conductor that will be used with the following connections: Data Positive (D+), Data Negative (D-), and Shield (SHD). Rarely, but in some cases, it is required that a 4-wire conductor be used to properly ground the master to the slave, and in this case an extra ground (GND) wire is utilized. The shield will be utilized as a reference for the data transmission and receiving of the twisted pair data lines.

Object Support (In General)

CarnesLink supports a table-based fixed list of BACnet[®] visible values which appear as live values of various BACnet[®] standard object types, in addition to a device object.

Alarms

Although CarnesLink supports the ability to indicate various alarm conditions through value changes in properties of several of its objects, it does not generate any BACnet[®] specific event notifications.

Important Facts

The Building Management System cannot have more than one client device on a communication line. Only one server can communicate with the client device at a time. Server devices cannot communicate with other server devices and client devices cannot communicate with other client devices.

BACnet[®] MS/TP**Object Descriptions**

A complete list of all BACnet[®] objects for CarnesLink are listed in the following section. There are a total of 28 BACnet[®] objects that are exposed to the network consisting of the following types:

Analog Inputs (x7)

Analog inputs are read-only integer values used for observing BACnet[®] values. Each analog input is described in detail in the BACnet[®] object table.

Analog Values (x7)

Analog values are read and write integer values used for observing and controlling BACnet[®] values. Each analog value is described in detail in the BACnet[®] object table.

Binary Inputs (x6)

Binary inputs are read-only binary values of either 0 or 1 and are used for observing BACnet[®] values. Each binary input is described in detail in the BACnet[®] object table.

Binary Values (x5)

Binary values are read and write binary values of 0 or 1 and are used for observing and controlling BACnet[®] values. Each binary value is described in detail in the BACnet[®] object table.

Multi-state Values (x3)

Multi-state values are read and write integer enumerations used for observing and controlling BACnet[®] values. Each multi-state value is described in detail in the BACnet[®] object table.

The following tables list all of the BACnet[®] properties supported for each object type. All objects seen over BACnet[®] have real-time values that the humidifier has for the described value. All object types, names, and BACnet[®] value locations are non-editable. Only read/write values can be edited over BACnet[®] from the Building Management System and no read-only value can be changed by any other means except by the humidifier.

BACnet® MS/TP

Object Table

Table 3 - BACnet® Main Information

Index	Description	Value
1	Default Initial Instance ID	869
2	Device Display Name	Carnes Humid
3	BACnet® Vendor ID	869
4	Vendor Name	Carnes Company
5	Device Setup	BACnet® MS/TP Server
6	Model Name	Humidifier
7	Default Address	86
8	Default Baud Rate	9600
9	Parity	(0) No Parity, 1 Stop Bit

Table 4 - BACnet® Object Information

BACnet® Instance	Name	Read/Write	Object Type	Description
0	Status	Read	Multi-state Input	Status 0 - Off/Disabled 1 - Manual Drain 2 - Short Drain 3 - Long Drain 4 - Pulse Drain 5 - Standby 6 - Steady State 7 - Fill 8 - Drain
1	Service Required	Read	Multi-state Input	Service Required 0 - No Service Required 1 - Reduce Setpoint Active (Unit Off) 2 - Reduce Setpoint Timeout (Unit Off) 3 - High Water Timeout (Unit Off) 4 - State Timeout (Unit Off) 5 - Exceeded Max Current (Unit Off) 6 - Persistent Boil Down Issues (Unit Off) 7 - Board Communication Error (Unit Off)
2	Off / On / Drain	Read/Write	Multi-state Input	Off / On / Drain Switch Position 1 - Off 2 - On 3 - Drain
0	Air Flow	Read	Binary Input	Air Flow 0 - No Air Flow Detected 1 - Air Flow Detected
1	Contactors	Read	Binary Input	Contactors 0 - Off 1 - On

BACnet® MS/TP

Object Table

Table 4 - BACnet® Object Information Continued

BACnet® Instance	Name	Read/Write	Object Type	Description
2	Door Interlock	Read	Binary Input	Door Interlock 0 - Open Door 1 - Closed Door
3	Drain Valve	Read	Binary Input	Drain Valve 0 - Closed Valve 1 - Open Valve
4	Fill Valve	Read	Binary Input	Fill Valve 0 - Closed Valve 1 - Open Valve
5	High Water	Read	Binary Input	High Water 0 - No High Water Detected 1 - High Water Detected
0	Control Setpoint	Read	Analog Input	Control Setpoint Value displays the controlled setpoint of the humidifier in Lb/Hr.
1	Ctrl Humidistat	Read	Analog Input	Control Humidistat Value displays the humidistat demand in %.
2	HiLmt Humidistat	Read	Binary Input	High Limit Humidistat Value displays the high limit humidistat demand in fr%.
3	Output	Read	Analog Input	Steam Output Value displays the steam output of the humidifier in Lb/Hr.
4	Reduced Setpoint	Read	Analog Input	Reduced Setpoint Value displays the reduced setpoint of the humidifier in Lb/Hr. If reduced setpoint is the same as max setpoint, then there are no issues with the unit that are resulting in a reduced setpoint.
5	Communication Ind	Read	Analog Input	Communication Index Used to determine if BACnet® communications is active. Unused by the end user.
6	Cylinder Life	Read	Analog Input	Cylinder Life Value displays the cylinder life in hours.
0	72 Hour Drain	Read/Write	Binary Value	72 Hour Drain 0 - Off 1 - On
1	Auto Dim Display	Read/Write	Binary Value	Automatically Dim Display 0 - Off 1 - On
2	Drain Pulse	Read/Write	Binary Value	Drain Pulse 0 - Off 1 - On

BACnet® MS/TP

Object Table

Table 4 - BACnet® Object Information Continued

BACnet® Instance	Name	Read/Write	Object Type	Description
3	Output Units	Read/Write	Binary Value	Output Units 0 - Lb/Hr 1 - Kg/Hr
4	Humidistat Sel	Read/Write	Binary Value	Humidistat Type Selection 0 - Common Humidistat 1 - 0-10V Modulating Humidity Sensor
0	Fan Speed	Read/Write	Analog Value	Fan Speed Controls fan speed of mounted or remote blower box. If unit does not have attached fans, ignore this setting.
1	Max Setpoint	Read/Write	Analog Value	Max Setpoint Controls the maximum output of the unit. This value has a range of 20% - 100% of the rated maximum steam output of the unit.
2	Corr Drain Lngth	Read/Write	Analog Value	Corrective Drain Length Controls the drain percentage of the unit when the boil down time value has not been met. This value has a range of 20% - 100%.
3	Boil Down Timer	Read/Write	Analog Value	Boil Down Timer Controls the boil down time value, in seconds, of the unit, which will affect how often the unit performs a corrective drain. This value has a range of 0 - 255 seconds.
4	High Water T/O	Read/Write	Analog Value	High Water Timeout Controls how long the unit can function properly when high water overflow is being continuously sensed. This value has a range of 0 - 168 hours.
5	Setpoint Timeout	Read/Write	Analog Value	Setpoint Timeout Controls how long the unit will function with a reduced setpoint. This value has a range of 30 - 255 minutes.
6	Hum Setpoint	Read/Write	Analog Value	Humidity Setpoint Controls the humidity setpoint of the system if a humidity sensor is utilized over a common humidistat. This value has a range of 0 - 100%RH.

Introduction

This document provides a User's Guide for using CarnesLink. This product provides a Modbus[®] network interface between Modbus[®] RTU master device and the humidifier as a Modbus[®] RTU slave device. CarnesLink uses the Modbus[®] Remote Terminal Unit (RTU) serial level communication protocol.

Important Note: This document assumes the user/installer is familiar with Modbus[®] and Modbus[®] terminology.

Requirements

Performance

CarnesLink uses a standard Modbus[®] RTU protocol communication structure. Each Modbus[®] communication request from the master device is answered as quickly as possible from the humidifier slave device without using a response delay. Support for all baud rates between 4800 and 115200 baud in increments of 100 is allowed, along with the ability to customize parity and address to better adapt to your building management needs.

Support for RTU

Modbus[®] RTU uses standard tinned copper RS-485 (also known as EIA485) conductor as the physical layer for serial network communication. RS-485 is a 3-wire conductor that will be used with the following connections: Data Positive (D+), Data Negative (D-), and Shield (SHD). Rarely, but in some cases, it is required that a 4-wire conductor be used to properly ground the master to the slave, and in this case an extra Ground (GND) wire is utilized. The shield will be utilized as a reference for the data transmission and receiving of the twisted pair data lines.

Object Support (In General)

CarnesLink supports a table-based fixed list of Modbus[®] visible values based on Modbus[®] address locations which appear as live values of various Modbus[®] standard object types.

Important Facts

The Building Management System cannot have more than one master device on a communication line. Only one slave can communicate with the master device at a time. Slave devices cannot communicate with other slave devices and master devices cannot communicate with other master devices.

A complete list of all Modbus[®] objects for CarnesLink are listed in the following section. There are a total of 28 Modbus[®] objects that are exposed to the network per CarnesLink consisting of the following types:

Inputs Register (x15)

Input register values are read-only integers that can only be viewed via Modbus[®] RTU. Each input register is described in detail in the Modbus[®] RTU object table.

Holding Register (x13)

Holding register values are read/write values that can be both viewed and edited via Modbus[®] RTU. Each holding register is described in detail in the Modbus[®] RTU object table.

The following tables list all of the Modbus[®] properties supported for each object type. All objects seen over Modbus[®] have real-time values that the humidifier has for the described value. All object types, names and Modbus[®] value locations are non-editable. Only read/write values can be edited over Modbus[®] from the Building Management System and no read-only value can be changed by any other means except by the humidifier.

Modbus® RTU

Object Table

Table 4 - Modbus® Main Information

Index	Description	Value
1	Device Setup	Modbus® RTU Slave
2	Default Address	86
3	Default Baud Rate	9600
4	Default Parity	(0) No Parity, 1 Stop Bit

Table 5 - Modbus® Object Information

Modbus® RTU Value	Name	Read/Write	Object Type	Description
1	Status	Read	Input Register	Status 0 - Off/Disabled 1 - Manual Drain 2 - Short Drain 3 - Long Drain 4 - Pulse Drain 5 - Standby 6 - Steady State 7 - Fill 8 - Drain
2	Service Required	Read	Input Register	Service Required 0 - No Service Required 1 - Reduce Setpoint Active (Unit Off) 2 - Reduce Setpoint Timeout (Unit Off) 3 - High Water Timeout (Unit Off) 4 - State Timeout (Unit Off) 5 - Exceeded Max Current (Unit Off) 6 - Persistent Boil Down Issues (Unit Off) 7 - Board Communication Error (Unit Off)
3	Air Flow	Read	Input Register	Air Flow 0 - No Air Flow Detected 1 - Air Flow Detected
4	Contactors	Read	Input Register	Contactors 0 - Off 1 - On
5	Door Interlock	Read	Input Register	Door Interlock 0 - Open Door 1 - Closed Door
6	Drain Valve	Read	Input Register	Drain Valve 0 - Closed Valve 1 - Open Valve
7	Fill Valve	Read	Input Register	Fill Valve 0 - Closed Valve 1 - Open Valve

Modbus[®] RTU

Object Table

Table 5 - Modbus[®] Object Information Continued

Modbus [®] RTU Value	Name	Read/Write	Object Type	Description
8	High Water	Read	Input Register	High Water 0 - No High Water Detected 1 - High Water Detected
9	Control Setpoint	Read	Input Register	Control Setpoint Value displays the controlled setpoint of the humidifier in Lb/Hr.
10	Control Humidistat	Read	Input Register	Control Humidistat Value displays the humidistat demand in %.
11	High Limit Humidistat	Read	Input Register	High Limit Humidistat Value displays the high limit humidistat demand in fr%.
12	Output	Read	Input Register	Steam Output Value displays the steam output of the humidifier in Lb/Hr.
13	Reduced Setpoint	Read	Input Register	Reduced Setpoint Value displays the reduced setpoint of the humidifier in Lb/Hr. If reduced setpoint is the same as max setpoint, then there is no issues with the unit that are resulting in a reduced setpoint.
14	Communication Index	Read	Input Register	Communication Index Used to determine if Modbus [®] communications is active. Unused by the end user.
15	Cylinder Life	Read	Input Register	Cylinder Life Value displays the cylinder life in hours.
1	Off / On / Drain	Read/Write	Holding Register	Off/On/Drain Switch Position 1 - Off 2 - On 3 - Drain
2	72 Hour Drain	Read/Write	Holding Register	72 Hour Drain 0 - Off 1 - On
3	Auto Dim Display	Read/Write	Holding Register	Automatically Dim Display 1 - Off 2 - On
4	Drain Pulse	Read/Write	Holding Register	Drain Pulse 0 - Off 1 - On
5	Output Units	Read/Write	Holding Register	Output Units 0 - Lb/Hr 1 - Kg/Hr

Modbus[®] RTU

Object Table

Table 5 - Modbus[®] Object Information Continued

Modbus [®] RTU Value	Name	Read/Write	Object Type	Description
6	Humistat Select	Read/Write	Holding Register	Humidistat Type Selection 0 - Common Humidistat 1 - 0-10V Modulating Humidity Sensor
7	Fan Speed	Read/Write	Holding Register	Fan Speed Controls fan speed of mounted or remote blower box. If unit does not have attached fans, ignore this setting.
8	Max Setpoint	Read/Write	Holding Register	Max Setpoint Controls the maximum output of the unit. This value has a range of 20% - 100% of the rated maximum steam output of the unit.
9	Corrective Drain Length	Read/Write	Holding Register	Corrective Drain Length Controls the drain percentage of the unit when the boil down time value has not been met. This value has a range of 20% - 100%.
10	Boil Down Timer	Read/Write	Holding Register	Boil Down Timer Controls the boil down time value, in seconds, of the unit, which will affect how often the unit performs a corrective drain. This value has a range of 0 - 255 seconds.
11	High Water Timeout	Read/Write	Holding Register	High Water Timeout Controls how long the unit can function properly when high water overflow is being continuously sensed. This value has a range of 0 - 168 hours.
12	Setpoint Timeout	Read/Write	Holding Register	Setpoint Timeout Controls how long the unit will function with a reduced setpoint. This value has a range of 30 - 255 minutes.
13	Humidity Setpoint	Read/Write	Holding Register	Humidity Setpoint Controls the humidity setpoint of the system if a humidity sensor is utilized over a common humidistat. This value has a range of 0 - 100%RH.

Introduction

This document provides a User's Guide for using CarnesLink. This product provides a Metasys[®] network interface between Metasys[®] N2 master device and the humidifier as a Metasys[®] N2 slave device. CarnesLink uses the Metasys[®] N2 serial level communication protocol.

Important Note: This document assumes the user/installer is familiar with Metasys[®] and Metasys[®] terminology.

Requirements

Performance

CarnesLink uses a standard Metasys[®] N2 protocol communication structure. Each Metasys[®] communication request from the master device is answered as quickly as possible from the humidifier slave device without using a response delay. Support for customizing the address value to adapt to your building management needs is allowed.

Support for N2

Metasys[®] N2 uses standard tinned copper RS-485 (also known as EIA485) conductor as the physical layer for serial network communication. RS-485 is a 3-wire conductor that will be used with the following connections: Data Positive (D+), Data Negative (D-), and Shield (SHD). Rarely, but in some cases, it is required that a 4-wire conductor be used to properly ground the master to the slave, and in this case an extra Ground (GND) wire is utilized. The shield will be utilized as a reference for the data transmission and receiving of the twisted pair data lines.

Object Support (In General)

CarnesLink supports a table-based fixed list of Metasys[®] visible parameters based on Metasys[®] address locations which appear as live values of various Metasys[®] standard object types.

Important Facts

The Building Management System cannot have more than one master device on a communication line. Only one slave device can communicate with the master device at a time. Slave devices cannot communicate with other slave devices and master devices cannot communicate with other master devices.

A complete list of all Metasys[®] objects for CarnesLink are listed in the following section. There are a total of 28 Metasys[®] objects that are exposed to the network per CarnesLink consisting of the following types:

Analog Inputs (x9)

Analog inputs are read-only integer values used for observing Metasys[®] N2 values. Each analog input is described in detail in the Metasys[®] N2 object table.

Analog Outputs (x8)

Analog values are read and write integer values used for observing and controlling Metasys[®] N2 values. Each analog value is described in detail in the Metasys[®] N2 object table.

Binary Inputs (x6)

Binary inputs are read-only binary values of either 0 or 1 and are used for observing Metasys[®] N2 values. Each binary input is described in detail in the Metasys[®] N2 object table.

Binary Outputs (x5)

Binary values are read and write binary values of 0 or 1 and are used for observing and controlling Metasys[®] N2 values. Each binary value is described in detail in the Metasys[®] N2 object table.

The following tables list all of the Metasys[®] N2 properties supported for each object type. All objects seen over Metasys[®] N2 have real-time values that the humidifier has for the described value. All object types, names, and Metasys[®] N2 value locations are non-editable. Only read/write values can be edited over Metasys[®] N2 from the Building Management System and no read-only value can be changed by any other means except by the humidifier.

Metasys® N2

Object Table

Table 6 - Metasys® N2 Main Information

Index	Description	Value
1	Device Setup	Metasys® N2 Slave
2	Default Address	86
3	Default Baud Rate	9600
4	Default Parity	(1) No Parity, 1 Stop Bit

Table 7 - Metasys® N2 Object Information

Metasys® N2 Value	Name	Read/Write	Object Type	Description
1	Air Flow	Read	Binary Input	Air Flow 0 - No Air Flow Detected 1 - Air Flow Detected
2	Contactator	Read	Binary Input	Contactator 0 - Off 1 - On
3	Door Interlock	Read	Binary Input	Door Interlock 0 - Open Door 1 - Closed Door
4	Drain Valve	Read	Binary Input	Drain Valve 0 - Closed Valve 1 - Open Valve
5	Fill Valve	Read	Binary Input	Fill Valve 0 - Closed Valve 1 - Open Valve
6	High Water	Read	Binary Input	High Water 0 - No High Water Detected 1 - High Water Detected
1	Status	Read	Analog Input	Status 0 - Off/Disabled 1 - Manual Drain 2 - Short Drain 3 - Long Drain 4 - Pulse Drain 5 - Standby 6 - Steady State 7 - Fill 8 - Drain

Metasys® N2

Object Table

Table 7 - Metasys® N2 Object Information Continued

Metasys® N2 Value	Name	Read/Write	Object Type	Description
2	Service Required	Read	Analog Input	Service Required 0 - No Service Needed 1 - Reduced Setpoint Active (Unit Off) 2 - Reduced Setpoint Timeout (Unit Off) 3 - High Water Timeout (Unit Off) 4 - State Timeout (Unit Off) 5 - Exceeded Max Current (Unit Off) 6 - Persistent Boil Down Issues (Unit Off) 7 - Board Communication Error (Unit Off)
3	Control Setpoint	Read	Analog Input	Control Setpoint Value displays the controlled setpoint of the humidifier in Lb/Hr.
4	Control Humidistat	Read	Analog Input	Control Humidistat Value displays the humidistat demand in %.
5	High Limit Humidistat	Read	Analog Input	High Limit Humidistat Value displays the high limit humidistat demand in fr%.
6	Output	Read	Analog Input	Steam Output Value displays the steam output of the humidifier in Lb/Hr.
7	Reduced Setpoint	Read	Analog Input	Reduced Setpoint Value Value displays the reduced setpoint of the humidifier in Lb/Hr. If reduced setpoint is the same as max setpoint, then there are no issues with the unit that are resulting in a reduced setpoint.
8	Communication Index	Read	Analog Input	Communication Index Used to determine if Metasys® communications is active. Unused by the end user.
9	Cylinder Life	Read	Analog Input	Cylinder Life Value displays the cylinder life in hours.
1	72 Hour Drain	Read/Write	Binary Output	72 Hour Drain 0 - Off 1 - On
2	Auto Dim Display	Read/Write	Binary Output	Automatically Dim Display 0 - Off 1 - On
3	Drain Pulse	Read/Write	Binary Output	Drain Pulse 0 - Off 1 - On
4	Output Units	Read/Write	Binary Output	Output Units 0 - Lb/Hr 1 - Kg/Hr

Metasys® MS/TP

Object Table

Table 7 - Metasys® N2 Object Information Continued

Metasys® N2 Value	Name	Read/Write	Object Type	Description
5	Humidistat Select	Read/Write	Binary Output	Humidistat Type Selection 0 - Common Humidistat 1 - 0-10V Modulating Humidity Sensor
1	Off / On / Drain	Read/Write	Analog Output	Off / On / Drain Switch Position 1 - Off 2 - On 3 - Drain
2	Fan Speed	Read/Write	Analog Output	Fan Speed Controls fan speed of mounted or remote blower box. If unit does not have attached fans, ignore this setting.
3	Max Setpoint	Read/Write	Analog Output	Max Setpoint Controls the maximum output of the unit. This value has a range of 20% - 100% of the rated maximum steam output of the unit.
4	Corr Drain Length	Read/Write	Analog Output	Corrective Drain Length Controls the drain percentage of the unit when the boil down time value has not been met. This value has a range of 20% - 100%.
5	Boil Down Timer	Read/Write	Analog Output	Boil Down Timer Controls the boil down time value, in seconds, of the unit, which will affect how often the unit performs a corrective drain. This value has a range of 0 - 255 seconds.
6	Hi Water Timeout	Read/Write	Analog Output	High Water Timeout Controls how long the unit can function properly when high water overflow is being continuously sensed. This value has a range of 0 - 168 hours.
7	Setpoint Timeout	Read/Write	Analog Output	Setpoint Timeout Controls how long the unit will function with a reduced setpoint. This value has a range of 30 - 255 minutes.
8	Hum Setpoint	Read/Write	Analog Output	Humidity Setpoint Controls the humidity setpoint of the system if a humidity sensor is utilized over a common humidistat. This value has a range of 0 - 100%RH.

Introduction

This document provides a User's Guide for using CarnesLink. This product provides a Siemens[®] network interface between Siemens[®] FLN master device and the humidifier as a Siemens[®] FLN slave device. CarnesLink uses the Siemens[®] Floor Level Network (FLN) serial level communication protocol.

Important Note: This document assumes the user/installer is familiar with Siemens[®] and Siemens[®] terminology.

Requirements

Performance

CarnesLink uses a standard Siemens[®] FLN protocol communication structure. Each Siemens[®] communication request from the master device is answered as quickly as possible from the humidifier slave device without using a response delay. Support for all baud rates between 2400 and 115200 baud in increments of 100 is allowed, along with the ability to customize the address to better adapt to your building management needs.

Support for FLN

Siemens[®] FLN uses standard tinned copper RS-485 (also known as EIA485) conductor as the physical layer for serial network communication. RS-485 is a 3-wire conductor that will be used with the following connections: Data Positive (D+), Data Negative (D-), and Shield (SHD). Rarely, but in some cases, it is required that a 4-wire conductor be used to properly ground the master to the slave, and in this case an extra Ground (GND) wire is utilized. The shield will be utilized as a reference for the data transmission and receiving of the twisted pair data lines.

Object Support (In General)

CarnesLink supports a table-based fixed list of Siemens[®] visible values based on Siemens[®] FLN address locations which appear as live values of various Siemens[®] FLN standard object types.

Important Facts

The Building Management System cannot have more than one master device on a single communication line. Only one slave device can communicate with the master device at a time. Slave devices cannot communicate with other slave devices and master devices cannot communicate with other master devices.

Siemens[®] FLN**Object Descriptions**

A complete list of all Siemens[®] objects for CarnesLink are listed in the following section. There is a total of 28 Siemens[®] objects that are exposed to the network consisting of the following types:

LAI: Logical Analog Inputs (x9)

Analog inputs are read-only integer values used for observing Siemens[®] FLN values. Each analog input is described in detail in the Siemens[®] FLN object table.

LAO: Logical Analog Outputs (x8)

Analog values are read and write integer values used for observing and controlling Siemens[®] FLN values. Each analog value is described in detail in the Siemens[®] FLN object table.

LDI: Logical Digital Inputs (x6)

Binary inputs are read-only binary values of either 0 or 1 and are used for observing Siemens[®] FLN values. Each binary input is described in detail in the Siemens[®] FLN object table.

LDO: Logical Digital Outputs (x5)

Binary values are read and write binary values of 0 or 1 and are used for observing and controlling Siemens[®] FLN values.

The following tables list all of the Siemens[®] FLN properties supported for each object type. All objects seen over Siemens[®] FLN have real-time values that the humidifier has for the described value. All object types, names, and Siemens[®] FLN value locations are non-editable. Only read/write values can be edited over Siemens[®] FLN from the Building Management System and no read-only value can be changed by any other means except by the humidifier.

Siemens® MS/TP

Object Table

Table 8 - Siemens® FLN Main Information

Index	Description	Value
1	Device Setup	Siemens® FLN Slave
2	Application	869
3	Revision String	1869
4	Revision Number	1
5	Description	HUMIDIFIER
6	Default Address	86
7	Default Baud Rate	9600
8	Default Parity	(1) No Parity, 1 Stop Bit

Table 9 - Siemens® FLN Object Information

Siemens® FLN Value	Name	Read/Write	Object Type	Description
3	AIR FLOW	Read	LDI	Air Flow 0 - No Air Flow Detected 1 - Air Flow Detected
4	CONTACTOR	Read	LDI	Contactors 0 - Off 1 - On
5	DOOR INTERLOCK	Read	LDI	Door Interlock 0 - Open Door 1 - Closed Door
6	DRAIN VALVE	Read	LDI	Drain Valve 0 - Closed Valve 1 - Open Valve
7	FILL VALVE	Read	LDI	Fill Valve 0 - Closed Valve 1 - Open Valve
8	HIGH WATER	Read	LDI	High Water 0 - No High Water Detected 1 - High Water Detected
9	STATUS	Read	LAI	Status 0 - Off/Disabled 1 - Manual Drain 2 - Short Drain 3 - Long Drain 4 - Pulse Drain 5 - Standby 6 - Steady State 7 - Fill 8 - Drain

Siemens[®] FLN

Object Table

Table 9 - Siemens[®] FLN Object Information Continued

Siemens [®] FLN Value	Name	Read/Write	Object Type	Description
10	SERVICE REQD	Read	LAI	Service Required 0 - No Service Required 1 - Reduced Setpoint Active (Unit Off) 2 - Reduced Setpoint Timeout (Unit Off) 3 - High Water Timeout (Unit Off) 4 - State Timeout (Unit Off) 5 - Exceeded Max Current (Unit Off) 6 - Persistent Boil Down Issues (Unit Off) 7 - Board Communication Error (Unit Off)
11	CNTL SETPT	Read	LAI	Control Setpoint Value displays the controlled setpoint of the humidifier in Lb/Hr.
12	CNTL HMSTAT	Read	LAI	Control Humidistat Value displays the humidistat demand in %.
13	HILMT HMSTAT	Read	LAI	High Limit Humidistat Value displays the high limit humidistat demand in fr%.
14	OUTPUT	Read	LAI	Steam Output Value displays the steam output of the humidifier in Lb/Hr.
15	REDUCE SETPT	Read	LAI	Reduced Setpoint Value displays the reduced setpoint of the humidifier in Lb/Hr. If reduced setpoint is the same as max setpoint, then there are no issues with the unit that are resulting in a reduced setpoint.
16	COMMIND	Read	LAI	Communication Index Used to determine if Siemens [®] communications is active. Unused by the end user.
17	CYLINDER LIFE	Read	LAI	Cylinder Life Value displays the cylinder life in hours.
18	72 HR DRAIN	Read/Write	LDO	72 Hour Drain 0 - Off 1 - On
19	AUTODIM DISP	Read/Write	LDO	Automatically Dim Display 0 - Off 1 - On

Siemens[®] FLN

Object Table

Table 9 - Siemens[®] FLN Object Information Continued

Siemens [®] FLN Value	Name	Read/Write	Object Type	Description
21	DRAIN PULSE	Read/Write	LDO	Drain Pulse 0 - Off 1 - On
22	OUTPUT UNITS	Read/Write	LDO	Steam Output Units 0 - Lb/Hr 1 - Kg/Hr
23	HUMSTAT SEL	Read/Write	LDO	Humidistat Type Selection 0 - Common Humidistat 1 - 0-10V Modulating Humidity Sensor
24	OFF.ON.DRAIN	Read/Write	LAO	Off / On / Drain Switch Position 1 - Off 2 - On 3 - Drain
25	FAN SPEED	Read/Write	LAO	Fan Speed Controls fans speed of mounted or remote blower box. If unit does not have attached fans, ignore this setting.
26	MAX SETPOINT	Read/Write	LAO	Maximum Setpoint Controls the maximum output of the unit. This value has a range of 20% - 100% of the rated maximum steam output of the unit.
27	CORR DRAIN	Read/Write	LAO	Corrective Drain Length Controls the drain percentage of the unit when the boil down time value has not been met. This value has a range of 20% - 100%.
28	BOIL DOWN	Read/Write	LAO	Boil Down Timer Controls the boil down time value, in seconds, of the unit, which will affect how often the unit performs a corrective drain. This value has a range of 0 - 255 seconds.
30	HI WATER TO	Read/Write	LAO	High Water Timeout Controls how long the unit can function properly when the high water overflow is being continuously sensed. This value has a range of 0 - 168 hours.
31	SETPOINT TO	Read/Write	LAO	Setpoint Timeout Controls how long the unit will function with a reduced setpoint. This value has a range of 30 - 255 minutes.
32	HUM SETPOINT	Read/Write	LAO	Humidity Setpoint Controls the humidity setpoint of the system if a humidity sensor is utilized over a common humidistat. This value has a range of 0 - 100%RH.

General Information

Troubleshooting

Table 10 - Troubleshooting Guide

SYMPTOM	CAUSE	ACTION
Humidifier will not communicate with the network.	Data communication settings are not properly setup.	A unique address is required for each device on the network. Duplicate addresses will cause some or all of the devices on the network to stop communicating properly. Please verify address setup.
		Verify that communication settings are correctly calibrated to your network; verify address, baud rate, parity (and device instance for BACnet [®] devices only).
	RS-485 cable is not properly connected.	The RS-485 network cable connections require ground to be connected to ensure proper ground reference and to avoid ground loop potentials. If ground is not connected, damage to the circuit board may occur.
		The RS-485 network cable connections are polarity sensitive and must be connected the same way on every device. (i.e. + to + and - to -).
	You have potentially hit the limits of building management system.	The maximum number of devices allowed on a RS-485 network segment without a repeater is 32. Adding more than 32 devices to a single segment may reduce the transceiver output voltage to a level that is too low to be distinguished from background noise on the cable.
		RS-485 cable impedance should be considered based on baud rate used. Maximum impedance values exist for each baud rate used which can be directly caused by the length of cable.
Network communications are disrupted when the humidifier is connected.	The data communication settings are not properly configured.	A unique address is required for each device on the network. Duplicate addresses will cause some or all of the devices on the network to stop working. Please verify address setup.
		Verify that communication settings are correctly calibrated to your network; verify address, baud rate, parity (and device instance for BACnet [®] devices only).
		With a Modbus [®] setup, ensure parity is properly configured to match the building management system's expected parity.
	RS-485 cable is not properly connected.	The RS-485 network cable connections require ground to be connected to ensure proper ground reference and to avoid ground loop potentials. If ground is not connected damage to the circuit board may occur.
		The RS-485 network cable connections require ground to be connected to ensure proper ground reference and to avoid ground loop potentials. If ground is not connected damage to the circuit board may occur.
		The RS-485 network cable connections require ground to be connected to ensure proper ground reference and to avoid ground loop potentials. If ground is not connected damage to the circuit board may occur.

General Information

Troubleshooting

Table 10 - Troubleshooting Guide Continued

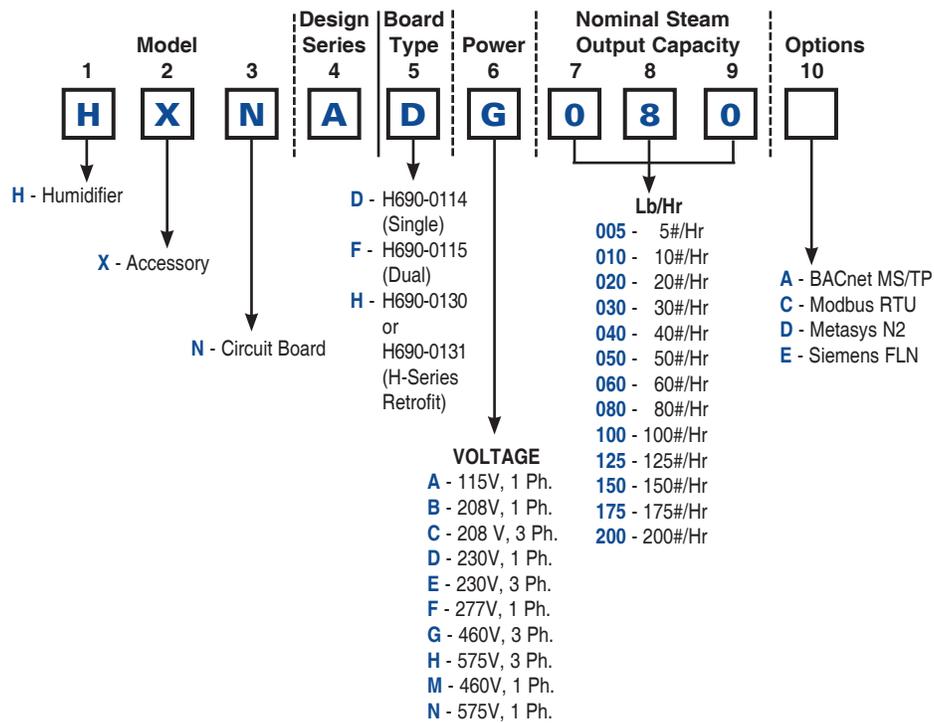
SYMPTOM	CAUSE	ACTION
On the data communication settings page, a message is displayed “External Communication Hardware Not Installed...”	Missing CarnesLink module on the circuit board, CarnesLink module is loosely connected or CarnesLink module has failed.	Attempt to turn off the communication protocol on communication protocol setup and turn it back on.
		Attempt to reset the chip by cycling power off and on to the unit.
		Ensure that there is no “board communication failure” service required message. Also, ensure there is no noticeable damage to the CarnesLink module or the surrounding components near/under the CarnesLink module. If these cases do not exist, a new CarnesLink module or humidifier control board will be needed.
The CarnesLink module LED is flashing red.	Communication configuration related issue.	Attempt to reset the chip by cycling power off and on to the unit.
		Attempt to turn off the communication protocol on the communication protocol setup page and turn it back on.
The touchscreen is unresponsive and white.	CarnesLink module or picoport is improperly installed.	Remove power from the circuit board. Remove the CarnesLink module. Ensure the green chip is properly mounted on the CarnesLink module with the LED in the bottom right corner. Reinstall the CarnesLink module on the main humidifier control board and ensure all pins are properly connected.
Other communication related issue.	Building management system related issue.	Please contact your controls contractor for support with your building management system.

General Information

Replacement Parts

Description	Part Number
CarnesLink Module (Power Isolation and PicoPort)	H690-0108
Communication Chip (PicoPort)	H999-6120
Circuit Board and CarnesLink Module	See Figure 8

Figure 8 - Circuit Board Ordering System



Warranty

Seller warrants products manufactured by it and supplied hereunder to be free from defects in materials and workmanship under normal use and proper maintenance for a period of twelve months from date of shipment. If within such period any such products shall be proved to Seller's reasonable satisfaction to be defective, such products shall be repaired or replaced at Seller's option. Seller's obligation and Buyer's exclusive remedy hereunder shall be limited to such repair and replacement and shall be conditioned upon Seller's receiving written notice of any alleged defects no later than 10 days after its discovery within the warranty period and, at Seller's option, the return of such products to Seller, f.o.b. its factory, when such return is feasible. Seller reserves the right to satisfy its warranty obligation in full by reimbursing Buyer for all payments it makes hereunder, and Buyer shall thereupon return the products to Seller. Seller shall have the right to remedy such defects.

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS AND IMPLIED WARRANTIES (EXCEPT TO TITLE) INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, PERFORMANCE, OR OTHERWISE, and in no event shall the Seller be liable for claims (based upon breach of express or implied warranty, negligence, product liability, or otherwise) for any other damages, whether direct, immediate, incidental, foreseeable, consequential, or special.