

READ AND SAVE THESE INSTRUCTIONS

CARNES®

**CarnesLink External Monitoring for your
Commercial, Industrial, and Residential Carnes Humidifiers
DESIGN SERIES "A"**

INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

CARNES COMPANY 448 S. Main St., P. O. Box 930040, Verona, WI 53593-0040 Phone: (608)845-6411 Fax: (608)845-6504 www.carnes.com

CARNES® Link



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Introduction

Basic Unit Information

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

Unit Serial #:	No. of Humidifiers:	Communication Protocol:
Unit Model #:	Voltage / Phase:	Steam Output lbs./hr.
	_____ V / _____ Phase	_____ lbs./hr.
Customer / Job:	Facility Address:	Sales Rep / Distributor:



CAUTION!

DO NOT INSTALL, USE OR OPERATE THIS EQUIPMENT UNTIL THIS MANUAL HAS BEEN READ AND UNDERSTOOD. 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 — **Water/Steam and Distribution Methods**

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 in turn, creates extremely hot surfaces (cylinder surface, steam hose, steam pipe, condensate hose/pipe, distribution piping) and hot water or visible/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, always proceed with extreme caution. Before any service or maintenance is performed, turn off unit, disconnect electrical service and allow humidifier unit to cool down completely.



WARNING — **De-energize Electrical Supply**

Before any service or maintenance is performed make sure main power supply is disconnected and safety labeled (If Carnes unit is set up with a built-in circuit breaker, turn off circuit breaker and additionally turn off 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. Please note, that electric shocks 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:

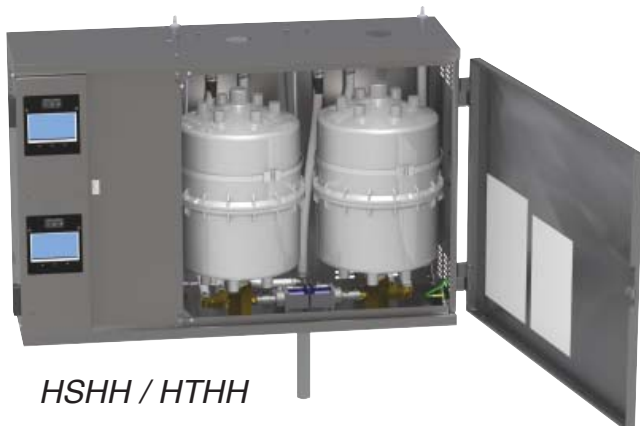
BACnet® is a registered trademark of ASHRAE. Modbus® is a registered trademark of SCHNEIDER ELECTRIC USA, INC. Metasys® is a registered trademark of Johnson Controls, Inc. Siemens® is a registered trademark of Siemens AG. CARNES® is a registered trademark of Carnes Company.

Introduction

“H” Series Humidifier Models

HS — 304 Stainless Steel Cabinet without Circuit Breakers

HT — 304 Stainless Steel Cabinet with Circuit Breakers



HSHH / HTHH



*HSGH / HSAH / HSDH
HTGH / HTAH / HTDH*



HRAB

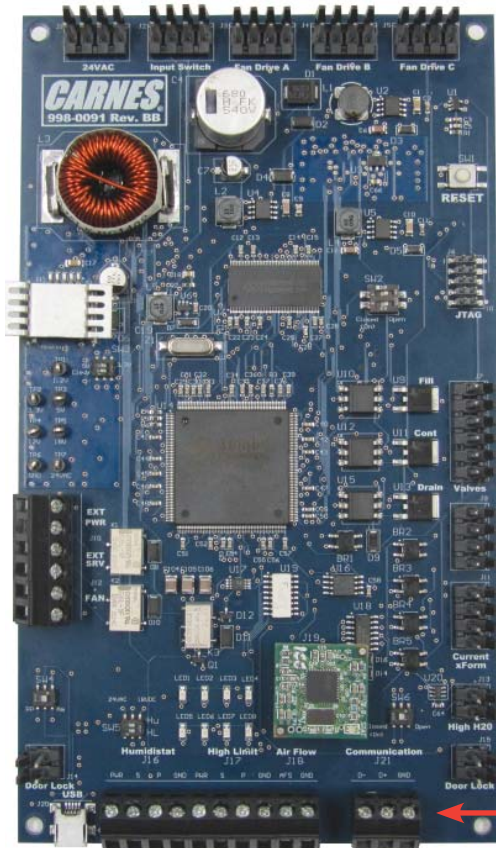
Introduction

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 uses a communication chip that is factory installed on our “True Touchscreen” circuit board, mounted internally inside your Carnes humidifier(s) cabinet. The user friendly interface on the “True Touchscreen” makes setting up CarnesLink easy and convenient. Simply select what communication protocol you are using (*See Table 1*) and update any settings as desired.

Table 1 - Communication Protocol Options

COMMUNICATION PROTOCOL
BACnet® MS/TP
Modbus® RTU
Metasys® N2
Siemens® FLN



Data Communication Wiring Terminals



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. The ground (GND) wire should be wired directly from the unit to the Building Management System and wired prior to wiring 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.

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 noisy environments, at higher baud rates, the type of cable used becomes more critical.

Carnes strongly recommends 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, such as our dual cylinder humidifier units. These connections are made through the Building Management System to terminals D-, D+, and GND on the CarnesLink circuit board's J21 communication connection (shown on page 9, Wiring Diagram).

Installation and Setup

Wiring

Table 2 shows the recommended wire types and maximum lengths to be used to wire the CarnesLink circuit board to the Building Management System.

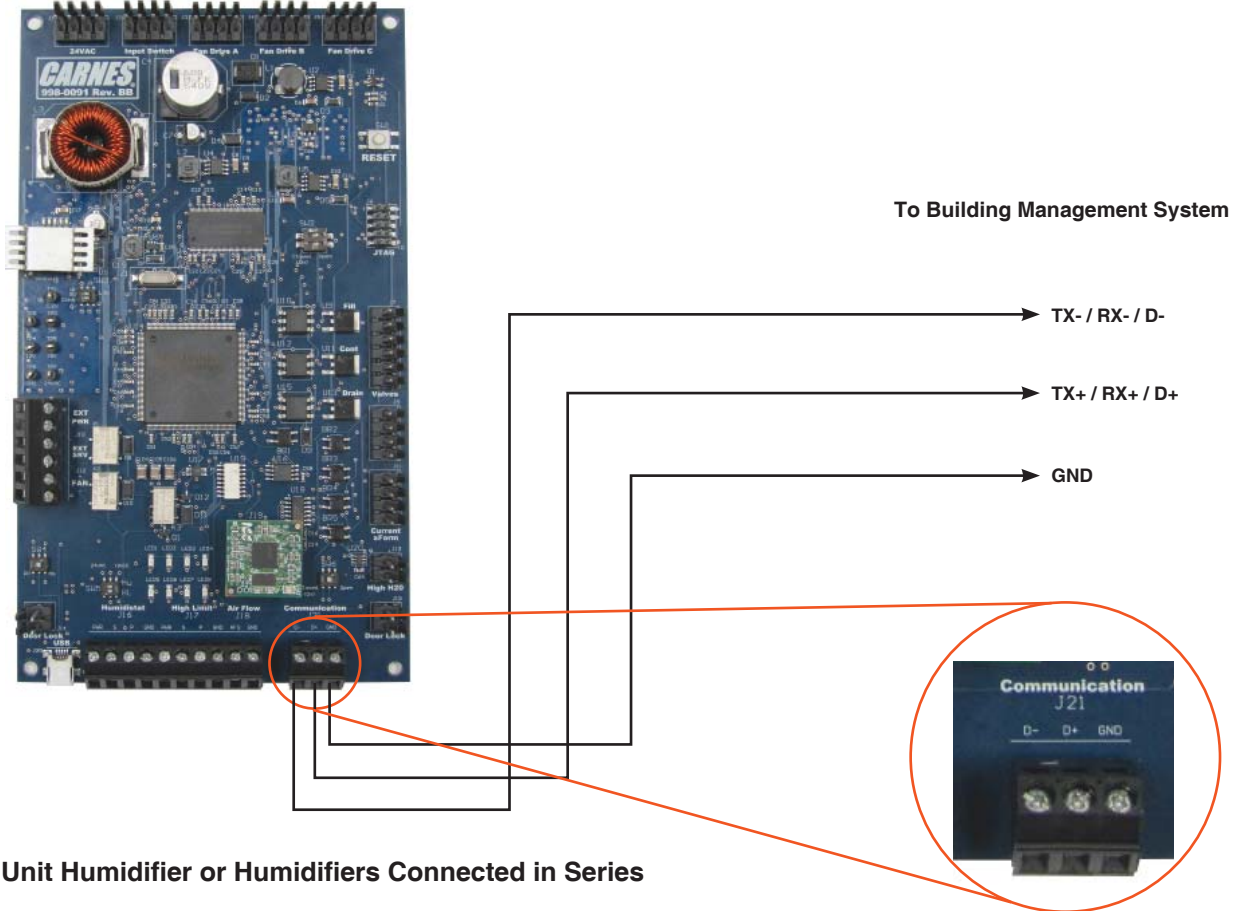
Table 2 - Wire Types and Lengths

Protocol	Signal Type	Recommended Cable	Polarity		Max. Distance of Wire Run
			Data- (D-)	Data+ (D+)	
BACnet® MS/TP	RS-485 Half Duplex	Unterminated Networks 18 to 24 AWG Recommended 120 Ohms (max.)	Net-	Net+	Unterminated 1000 ft. ~300 meters
		Terminated Networks 20 to 22 AWG (for runs up to 1000 ft. ~300 meters) Recommended 120 Ohms (max.)			Terminated 4000 ft. ~1200 meters
Modbus® RTU	RS-485 Half Duplex	Unterminated Networks 18 to 24 AWG Recommended 120 Ohms (max.)	Net-	Net+	Unterminated 1000 ft. ~300 meters
		Terminated Networks 16 to 20 AWG (for runs up to 4000 ft. ~1200 meters) Recommended 120 Ohms (max.)			Terminated 4000 ft. ~1200 meters
Metasys® N2	RS-485 Half Duplex	18 to 24 AWG Recommended Shielded, Twisted Pair 120 Ohms (max.)	TX- RX-	TX+ RX+	2000 ft. ~600 meters
Siemens® FLN	RS-485 Half Duplex	18 to 24 AWG Recommended Shielded, Twisted Pair 120 Ohms (max.)	D-	D+	2000 ft. ~600 meters

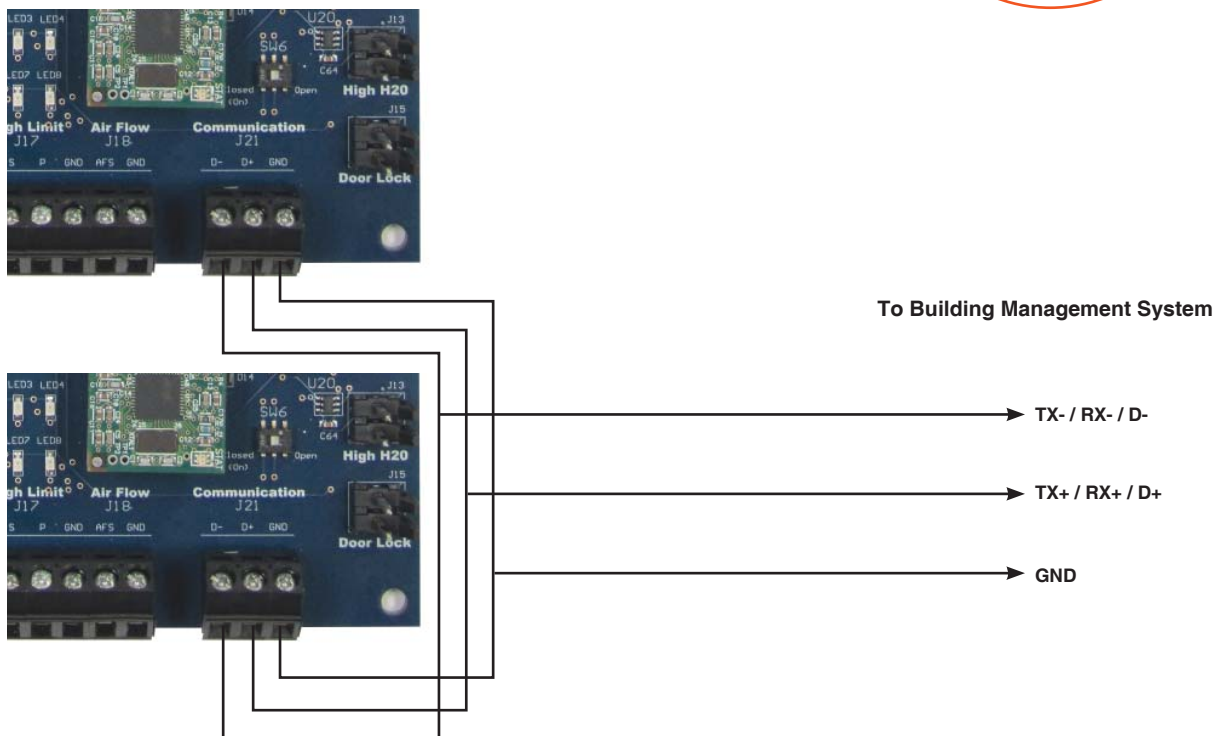
Installation and Setup

Wiring Diagram (BMS to CarnesLink)

Single Humidifier



Dual Unit Humidifier or Humidifiers Connected in Series



Installation and Setup

Configuration

Introduction

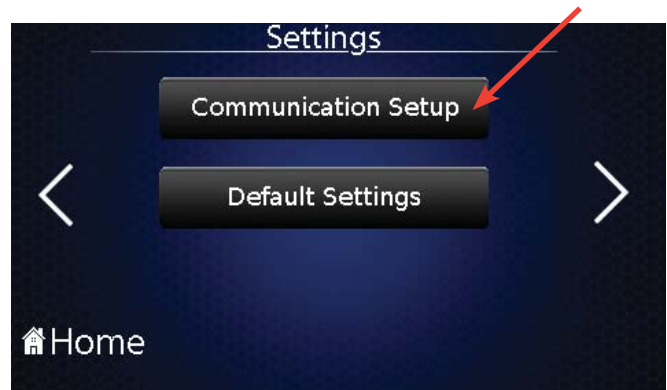
This section provides a step by step procedure to configuring the humidifier to run with a desired data communication protocol.

Configuration Procedure

When configuring the data communication protocol, first the *Communication Protocol Setup* page will need to be located.



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



Once on the *Communication Protocol Setup* page, the selection for the desired protocol can be made by selecting the 'Select Protocol' button and choosing which protocol that fits your Building Management System needs.



Once a protocol has been selected, a new button will appear allowing for the changing of the settings tied to the selected protocol. To change these settings the 'Protocol Settings' button can be selected and will lead to a new page showing each setting that can be modified for the selected protocol.

Installation and Setup

Configuration



Address, Baud Rate, and Parity are settings that can be adjusted for all protocols. BACnet® has an additional adjustable setting that can be found on the second page and is labeled ‘Device Instance’. Each of these 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 1 stop bit, and device instance is set to 869.

Address can be selected and then the desired address for the humidifier can be entered. The range that the address has to be within is shown on the screen and varies based on protocol.

Baud Rate can be selected to match your Building Management System’s baud rate to allow for communication. There are 4 changeable digits in the 6 digit displayed value, the following X’s indicate what values can be changed: XXXX00 Bd. For example, if you wish for 38400 Bd, please enter 038400.

Parity can also be selected based on your management system’s communication. Generally this will be (0) No parity and 1 stop bit but can be changed based on protocol (currently Modbus® is the only protocol supported that can support a Parity value other than 0).

Device Instance can be selected on the second page only when BACnet® is selected. Device instance is used to set a unique identifier for this humidifier unit. The editable seven digit value has a set range from 0 to 4194302. When entering the desired value, ensure that 0’s are included prior to your number. For example, if you desire to have a value of 1234, please enter 0001234.

If you are having trouble, make sure that the protocol selected is enabled on the main page of *Communication Protocol Setup*; otherwise please visit troubleshooting documentation found in this manual.



Installation and Setup

Startup Checklist

Wiring Connection:

- Verify that there is no ground potential between devices to avoid ground loop current
- Main humidifier unit wired to BMS system using RS-485 (Twisted Pair)
- Wired to the correct Data (-/+) terminals and grounded directly to the BMS system
- Shields should be connected to the BMS end only
- Controls wired directly to humidifier

Startup Procedure:

- Perform “H” series humidifier unit startup check
- Ensure that power is supplied to the humidifier and the CarnesLink circuit board shows a green light
- Complete the “Communication Protocol Setup” under the Settings Page

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, specifically for the “H” Series models. CarnesLink uses the BACnet® Master Slave/Token Passing (MS/TP) protocol.

This document assumes the user/installer is familiar with BACnet® and BACnet® terminology.

BACnet® 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 4800 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 communication. RS-485 is a 3 wire conductor that will be used with the following connections: Data positive, Data negative, and Ground. The ground will be used 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® Event Notifications.

Important facts about BACnet® MS/TP

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**Objects**

A complete list of all BACnet® objects for CarnesLink are listed in the following section. There are a total of 26 BACnet® objects that are exposed to the network consisting of the following types:

Analog Inputs (x5)

Analog inputs are read-only integer values used for observing BACnet® values.

Analog Values (x6)

Analog values are read and write integer values used for observing BACnet® values.

Binary Inputs (x8)

Binary inputs are read only binary values of either 0 or 1; each binary value is described in the BACnet® data table.

Binary Values (x4)

Binary values are read and write binary values of either 0 or 1; each binary value is described in the BACnet® data table.

Multistate Values (x3)

Multistate values are read and write integer enumerations, each enumeration value is described in the BACnet® data 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

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	No Parity (1 Stop Bit)

BACnet® Data

BACnet® Value	Name	Read/Write	Object Type	Description
0	Status	Read	Multi-state Input	Status 1 - Off/Disabled 2 - On/Humidifying 3 - Service Required (See Service Required, BACnet® value 12, for more information) 4 - Filling 5 - Draining 6 - High Water 7 - Idle 8 - Insufficient Control
1	Air Flow	Read	Binary Input	Air Flow 0 - No Air Flow Detected 1 - Air Flow Detected
2	Contactors	Read	Binary Input	Contactors 0 - Off 1 - On
3	Control Setpoint	Read	Analog Input	Control Setpoint 0 - Max Setpoint
4	Ctrl Humidistat	Read	Binary Input	Control Humidistat 0 - No Demand for humidity from the Control Humidistat 1 - Demand for humidity from the Control Humidistat
5	Door Interlock	Read	Binary Input	Door Interlock 0 - Open Door 1 - Closed Door
6	Drain Valve	Read	Binary Input	Drain Valve 0 - Closed Valve 1 - Open Valve

BACnet® MS/TP

Object Table

BACnet® Data Continued

BACnet® Value	Name	Read/Write	Object Type	Description
7	Fill Valve	Read	Binary Input	Fill Valve 0 - Closed Valve 1 - Open Valve
8	High Water	Read	Binary Input	High Water 0 - High Water not detected 1 - High Water detected
9	HiLmt Humidistat	Read	Binary Input	High Limit Humidistat 0 - No demand for humidity from the High Limit Humidistat 1 - Demand for humidity from the High Limit Humidistat
10	Output	Read	Analog Input	Steam Output 0 - 150 Value displays the output of the humidifier in Kg/Hr or Lb/Hr depending on output units, BACnet® value 21.
11	Reduced Setpoint	Read	Analog Input	Reduced Setpoint 0 - Max Setpoint Limited output value that is active when the maximum output is reduced by repeated high water sensor activations.
12	Service Required	Read	Multi-state Input	Service Required 1 - No Service Needed 2 - Drain Switch Activated 3 - Mild Reduced Setpoint (Setpoint >60% max.) 4 - Extreme Reduced Setpoint (Setpoint <60% max.) 5 - Shutdown Due to High Water Timeout 6 - Shutdown Due to Setpoint Timeout 7 - Over 130% Output 8 - Drain Switch Activated But Closed with Timeout 9 - Cylinder Nearing End of Life 10 - Blower Box Fan A is not operating correctly 11 - Blower Box Fan B is not operating correctly 12 - Blower Box Fan C is not operating correctly 99 - Board Communication Error
13	Communication Ind	Read	Analog Input	Communication Index Used to determine if BACnet® communications is active. Unused by the end user.
14	Cylinder Life	Read	Analog Input	Cylinder Life 0 - 99999 Hours Counts the cylinder life in hours.
16	72 Hour Drain	Read/Write	Binary Value	72 Hour Drain 0 - Off 1 - On

BACnet® MS/TP

Object Table

BACnet® Data Continued

BACnet® Value	Name	Read/Write	Object Type	Description
17	Auto Dim Display	Read/Write	Binary Value	Auto Dim Display 0 - Off 1 - On
18	Drain Pulse	Read/Write	Binary Value	Drain Pulse 0 - Off 1 - On
19	Fan Speed	Read/Write	Analog Value	Fan Speed 0 - 100% Controls fans on mounted or remote blower box
20	Max Setpoint	Read/Write	Analog Value	Max Setpoint 0 - 100 Allowed to be 20% of the maximum output up to the maximum output. I.E., if the unit is a 100 pound unit, this value can be from 20 to 100.
21	Output Units	Read/Write	Binary Value	Steam Output Units 0 - Lb/Hr 1 - Kg/Hr
22	Corr Drain Lngth	Read/Write	Analog Value	Corrective Drain Length 20 - 100% in multiples of 10%
24	Boil Down Timer	Read/Write	Analog Value	Boil Down Timer 0 - 255 Seconds
26	Hi Water Timeout	Read/Write	Analog Value	High Water Timeout 0 - 168 Hours
28	Setpoint Timeout	Read/Write	Analog Value	Setpoint Timeout 30 - 255 Minutes
30	Off / On / Drain	Read/Write	Multi-state Value	Off / On / Drain Switch Position 1 - Off 2 - On 3 - Drain

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, specifically for the “H” Series models. CarnesLink uses the Modbus® Remote Terminal Unit (RTU) serial level communication protocol.

This document assumes the user/installer is familiar with Modbus® and Modbus® terminology.

Modbus® 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 communication. RS-485 is a 3 wire conductor that will be used with the following connections: Data positive, Data negative, and Ground. The ground will be used 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 about Modbus® RTU

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.

Modbus® RTU

Objects

A complete list of all Modbus® objects for CarnesLink are listed in the following section. There are a total of 26 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®.

Holding Register (x11)

Holding register values are read/write values that can be both viewed and edited via Modbus®.

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

Modbus® Main Information

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

Modbus® Data

Modbus® Value	Name	Read/Write	Object Type	Description
49	Status	Read	Input Register	Status 0 - Off/Disabled 1 - On/Humidifying 2 - Service Required (See Service Required, Modbus® value 12, for more information) 3 - Filling 4 - Draining 5 - High Water 6 - Idle 7 - Insufficient Control
50	Air Flow	Read	Input Register	Air Flow 0 - No air flow detected 1 - Air flow detected
51	Contactors	Read	Input Register	Contactors 0 - Off 1 - On
52	Control Setpoint	Read	Input Register	Control Setpoint 0 - Max Setpoint
53	Control Humidistat	Read	Input Register	Control Humidistat 0 - No demand for humidity from the Control Humidistat 1 - Demand for humidity from the Control Humidistat
54	Door Interlock	Read	Input Register	Door Interlock 0 - Open Door 1 - Closed Door
55	Drain Valve	Read	Input Register	Drain Valve 0 - Closed Valve 1 - Open Valve
56	Fill Valve	Read	Input Register	Fill Valve 0 - Closed Valve 1 - Open Valve

Modbus® RTU

Object Table

Modbus® Data Continued

Modbus® Value	Name	Read/Write	Object Type	Description
57	High Water	Read	Input Register	High Water 0 - High Water not detected 1 - High Water detected
58	High Limit Humidistat	Read	Input Register	High Limit Humidistat 0 - No demand for humidity from the High Limit Humidistat 1 - Demand for humidity from the High Limit Humidistat
59	Output	Read	Input Register	Steam Output 0 - 150 Value displays the output of the humidifier in Kg/Hr or Lb/Hr depending on Output Units, Modbus® value 21.
60	Reduced Setpoint	Read	Input Register	Reduced Setpoint 0 - Max Setpoint Limited output value that is active when the maximum output is reduced by repeated high water sensor activations.
61	Service Required	Read	Input Register	Service Required 0 - No Service Needed 1 - Drain Switch Activated 2 - Mild Reduced Setpoint (Setpoint >60% max.) 3 - Extreme Reduced Setpoint (Setpoint <60% max.) 4 - Shutdown Due to High-Water Timeout 5 - Shutdown Due to Setpoint Timeout 6 - Over 130% Output 7 - Drain Switch Activated But Closed w/Timeout 8 - Cylinder Nearing End of Life 9 - Blower Box Fan A is not operating correctly 10 - Blower Box Fan B is not operating correctly 11 - Blower Box Fan C is not operating correctly 99 - Board Communication Error
62	Communication Ind	Read	Input Register	Communication Index Used to determine if Modbus® communications is active. Unused by the end user.
63	Cylinder Life	Read	Input Register	Cylinder Life 0 - 99999 Hours Counts the cylinder life in hours.
64	72 Hour Drain	Read/Write	Holding Register	72 Hour Drain 0 - Off 1 - On

Modbus® RTU

Object Table

Modbus® Data Continued

Modbus® Value	Name	Read/Write	Object Type	Description
65	Auto Dim Display	Read/Write	Holding Register	Auto Dim Display 0 - Off 1 - On
66	Drain Pulse	Read/Write	Holding Register	Drain Pulse 0 - Off 1 - On
67	Fan Speed	Read/Write	Holding Register	Fan Speed 0 - 100% Controls fans on mounted or remote blower box
68	Max Setpoint	Read/Write	Holding Register	Max Setpoint 0 - 100 Allowed to be 20% of the maximum output up to the maximum output. I.E., if the unit is a 100 pound unit, this value can be from 20 to 100.
69	Output Units	Read/Write	Holding Register	Steam Output Units 0 - Lb/Hr 1 - Kg/Hr
70	Corrective Drain Length	Read/Write	Holding Register	Corrective Drain Length 20 - 100% in multiples of 10%
71	Boil Down Timer	Read/Write	Holding Register	Boil Down Timer 0 - 255 Seconds
72	High Water Timeout	Read/Write	Holding Register	High Water Timeout 0 - 168 Hours
73	Setpoint Timeout	Read/Write	Holding Register	30 - 255 Minutes
74	Off / On / Drain	Read/Write	Holding Register	Off / On / Drain Switch Position 0 - Off 1 - On 2 - Drain

Introduction

This document provides a User's Guide for using CarnesLink. This product provides a Metasys® network interface between Metasys® N2 master devices and the humidifier as a Metasys® N2 Slave device, specifically for the “H” Series models. CarnesLink uses the Metasys® N2 serial level communication protocol to communicate with Building Management Systems.

This document assumes the user/installer is familiar with Metasys® and Metasys® terminology.

Metasys® 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. Due to protocol restrictions, Baud rate is fixed at 9600 baud and Parity is fixed at (0) no parity with one stop bit.

Support for N2

Metasys® N2 uses standard tinned copper RS-485 (also known as EIA485) conductor as the physical layer for serial communication. RS-485 is a 3 wire conductor that will be used with the following connections: Data positive, Data negative, and Ground. The ground will be used 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® value locations which appear as live values of various Metasys® standard object types.

Important facts about Metasys® N2

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.

A complete list of all Metasys® objects for CarnesLink are listed in the following section. There are a total of 26 Metasys® 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 Metasys® values.

Analog Outputs (x7)

Analog values are read and write integer values used for observing Metasys® values.

Binary Inputs (x8)

Binary inputs are read only binary values of either 0 or 1; each binary value is described in the Metasys® data table.

Binary Outputs (x4)

Binary values are read and write binary values of either 0 or 1; each binary value is described in the Metasys® data table.

The following tables list all of the Metasys® properties supported for each object type. All objects seen over Metasys® have real-time values that the humidifier has for the described value. All object types, names, and Metasys® value locations are non-editable. Only Read/Write values can be edited over Metasys® 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

Metasys® Main Information

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

Metasys® Data

Metasys® Value	Name	Read/Write	Object Type	Description
192	Status	Read	Analog Input	Status 0 - Off/Disabled 1 - On/Humidifying 2 - Service Required (See Service Required, Metasys® value 12, for more info.) 3 - Filling 4 - Draining 5 - High Water 6 - Idle 7 - Insufficient Control
193	Air Flow	Read	Binary Input	Air Flow 0 - No Air Flow Detected 1 - Air Flow Detected
194	Contactors	Read	Binary Input	Contactors 0 - Off 1 - On
195	Control Setpoint	Read	Analog Input	Control Setpoint 0 - Max Setpoint
196	Control Humidistat	Read	Binary Input	Control Humidistat 0 - No demand for humidity from the Control Humidistat 1 - Demand for humidity from the Control Humidistat
197	Door Interlock	Read	Binary Input	Door Interlock 0 - Open Door 1 - Closed Door
198	Drain Valve	Read	Binary Input	Drain Valve 0 - Closed Valve 1 - Open Valve

Metasys® N2

Object Table

Metasys® Data Continued

Metasys® Value	Name	Read/Write	Object Type	Description
199	Fill Valve	Read	Binary Input	Fill Valve 0 - Closed Valve 1 - Open Valve
200	High Water	Read	Binary Input	High Water 0 - High Water not detected 1 - High Water detected
201	High Limit Humidistat	Read	Binary Input	High Limit Humidistat 0 - No demand for humidity from the High Limit Humidistat 1 - Demand for humidity from the High Limit Humidistat
202	Output	Read	Analog Input	Steam Output 0 - 150 Value displays the output of the humidifier in Kg/Hr or Lb/Hr depending on Output Units, Metasys® value 21.
203	Reduced Setpoint	Read	Analog Input	Reduced Setpoint Value 0 - Max Setpoint Limited output value that is active when the maximum output is reduced by repeated high water sensor activations.
204	Service Required	Read	Analog Input	Service Required 0 - No Service Needed 1 - Drain Switch Activated 2 - Mild Reduced Setpoint (Setpoint >60% max.) 3 - Extreme Reduced Setpoint (Setpoint <60% max.) 4 - Shutdown Due to High-Water Timeout 5 - Shutdown Due to Setpoint Timeout 6 - Over 130% Output 7 - Drain Switch Activated But Closed w/Timeout 8 - Cylinder Nearing End of Life 9 - Blower Box Fan A is not operating correctly 10 - Blower Box Fan B is not operating correctly 11 - Blower Box Fan C is not operating correctly 99 - Board Communication Error
205	Communication Ind	Read	Analog Input	Communication Index Used to determine if Metasys® communications is active. Unused by the end user.
206	Cylinder Life	Read	Analog Input	Cylinder Life 0 - 99999 Hours Counts the cylinder life in hours.
208	72 Hour Drain	Read/Write	Binary Output	72 Hour Drain 0 - Off 1 - On

Metasys® MS/TP

Object Table

Metasys® Data Continued

Metasys® Value	Name	Read/Write	Object Type	Description
209	Auto Dim Display	Read/Write	Binary Output	Auto Dim Display 0 - Off 1 - On
210	Drain Pulse	Read/Write	Binary Output	Drain Pulse 0 - Off 1 - On
211	Fan Speed	Read/Write	Analog Output	Fan Speed 0 - 100% Controls fans on mounted or remote blower box
212	Max Setpoint	Read/Write	Analog Output	Max Setpoint 0 - 100 Allowed to be 20% of the maximum output up to the maximum output. I.E., if the unit is a 100 pound unit, this value can be from 20 to 100.
213	Output Units	Read/Write	Binary Output	Steam Output Units 0 - Lb/Hr 1 - Kg/Hr
214	Corrective Drain Length	Read/Write	Analog Output	Corrective Drain Length 20 - 100% in multiples of 10%
216	Boil Down Timer	Read/Write	Analog Output	Boil Down Timer 0 - 255 Seconds
218	Hi Water Timeout	Read/Write	Analog Output	High Water Timeout 0 - 168 Hours
220	Setpoint Timeout	Read/Write	Analog Output	Setpoint Timeout 30 - 255 Minutes
222	Off / On / Drain	Read/Write	Analog Output	Off / On / Drain Switch Position 1 - Off 2 - On 3 - Drain

Introduction

This document provides a User's Guide for using CarnesLink. This product provides a Siemens® network interface between Siemens® FLN master devices and the humidifier as a Siemens® FLN slave device, specifically for the “H” Series models. CarnesLink uses Siemens® Floor Level Network (FLN) (also known as P1) serial level protocol to communicate using supported Siemens® Commands.

This document assumes the user/installer is familiar with Siemens® and Siemens® terminology.

Siemens® Requirements**Performance**

CarnesLink uses a standard Siemens® FLN protocol communication structure. Each Siemens® communication command from the master device is answered as quickly as possible from the humidifier slave device without using a response delay. We recognize that everyone's system can be different and allow for support of all Baud Rates between 2400 and 115200 baud in increments of 100, along with the ability to customize Address 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 FLN

Siemens® FLN uses standard tinned copper RS-485 (also known as EIA485) conductor as the physical layer for serial communication. RS-485 is a 3 wire conductor that will be used with the following connections: Data positive, Data negative, and Ground. The ground will be used 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 parameters based on Siemens® point number locations which appear as live values of various Siemens® standard object types.

Important facts about Siemens® FLN

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

Objects

A complete list of all Siemens® objects for CarnesLink are listed in the following section. There are a total of 31 Siemens® objects that are exposed to the network consisting of the following types:

LAI: Logical Analog Inputs (x7)

Analog inputs are read-only integer values used for observing Siemens® values.

LAO: Logical Analog Outputs (x11)

Analog values are read and write integer values used for observing Siemens® values.

LDI: Logical Digital Inputs (x8)

Binary inputs are read only binary values of either 0 or 1; each binary value is described in the Siemens® data table.

LDO: Logical Digital Outputs (x5)

Binary values are read and write binary values of either 0 or 1; each binary value is described in the Siemens® data table.

The following tables list all of the Siemens® properties supported for each object type. All objects seen over Siemens® have real-time values that the humidifier has for the described value. All object types, names, and Siemens® point number locations are non-editable. Only Read/Write values can be edited over Siemens® 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

Siemens® 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	Parity	No Parity (1 Stop Bit)

Siemens® Data

Point Number	Name	Read/Write	Object Type	Description
1	CTRL ADDRESS	Read/Write	LAO	Controller Address Default to 86 . The address value of the humidifier corresponds to the location of the device on the communication line. This can be changed on the device under settings -> Communication Setup -> Protocol Settings -> Address
2	APPLICATION	Read/Write	LAO	Application Default to 869 . Defines the unique application number for the application.
3	STATUS	Read	LAI	Status 0 - Off/Disabled 1 - On/Humidifying 2 - Service Required (See Service Required, point number 12, for more information) 3 - Filling 4 - Draining 5 - High Water 6 - Idle 7 - Insufficient Control
4	AIR FLOW	Read	LDI	Air Flow 0 - No air flow detected 1 - Air flow detected
5	CONTACTOR	Read	LDI	Contactors 0 - Off 1 - On
6	CONTROL SETPT	Read	LAI	Control Setpoint 0 - Max Setpoint
7	CTRL HUMIDISTAT	Read	LDI	Control Humidistat 0 - No Demand for Humidity from the Control Humidistat 1 - Demand for Humidity from the Control Humidistat

Siemens® FLN

Object Table

Siemens® Data Continued

Point Number	Name	Read/Write	Object Type	Description
8	DOOR INTRLOCK	Read	LDI	Door Interlock 0 - Open Door 1 - Closed Door
9	DRAIN VALVE	Read	LDI	Drain Valve 0 - Closed Valve 1 - Open Valve
10	FILL VALVE	Read	LDI	Fill Valve 0 - Closed Valve 1 - Open Valve
11	HIGH WATER	Read	LDI	High Water 0 - High Water not detected 1 - High Water detected
12	HILMT HMSTAT	Read	LDI	High Limit Humidistat 0 - No demand for humidity from the High Limit Humidistat 1 - Demand for humidity from the High Limit Humidistat
13	OUTPUT	Read	LAI	Steam Output 0 - 150 Value displays the output of the humidifier in Kg/Hr or Lb/Hr depending on Output Units, point number 21.
14	REDUCE SETPT	Read	LAI	Reduced Setpoint 0 - Max Setpoint Reduced setpoint is a limited output value that is active when the maximum output is reduced by repeated high water sensor activations.
15	SERVICE REQD	Read	LAI	Service Required 0 - No Service Needed 1 - Drain Switch Activated 2 - Mild Reduced Setpoint (Setpoint >60% max.) 3 - Extreme Reduced Setpoint (Setpoint <60% max.) 4 - Shutdown Due to High-Water Timeout 5 - Shutdown Due to Setpoint Timeout 6 - Over 130% Output 7 - Drain Switch Activated But Closed w/Timeout 8 - Cylinder Nearing End of Life 9 - Blower Box Fan A is not operating correctly 10 - Blower Box Fan B is not operating correctly 11 - Blower Box Fan C is not operating correctly 99 - Board Communication Error
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 0 - 99999 Hours Counts the cylinder life in hours.
18	72 HR DRAIN	Read/Write	LDO	72 Hour Drain 0 - Off 1 - On

Siemens® FLN

Object Table

Siemens® Data Continued

Point Number	Name	Read/Write	Object Type	Description
19	AUTODIM DISP	Read/Write	LDO	Auto Dim Display 0 - Off 1 - On
20	OVRD TIME	Read/Write	LAO	Default to 1 Hour. One of the five mandatory FLN points required for compatibility with Siemens® control systems. It has no functionality with the humidifier.
21	DRAIN PULSE	Read/Write	LDO	Drain Pulse 0 - Off 1 - On
22	FAN SPEED	Read/Write	LAO	Fan Speed 0 - 100% Controls fans on mounted or remote blower box
23	MAX SETPOINT	Read/Write	LAO	Max Setpoint 0 - 100 Allowed to be 20% of maximum of the output up to the max. If the unit is a 100 pound unit, this value can be from 20 to 100.
24	OUTPUT UNITS	Read/Write	LDO	Steam Output Units 0 - Lb/Hr 1 - Kg/Hr
25	CORR DRAIN	Read/Write	LAO	Corrective Drain Length 20 - 100% in multiples of 10%
26	BOIL DOWN	Read/Write	LAO	Boil Down Timer 0 - 255 Seconds
27	HI WATER TO	Read/Write	LAO	High Water Timeout 0 - 168 Hours
28	SETPOINT TO	Read/Write	LAO	Setpoint Timeout 30 - 255 Minutes
29	DAY.NGT	Read/Write	LDO	Signifies day or night 0 - Day 1 - Night One of the five mandatory FLN points required for compatibility with Siemens® control systems. It has no functionality with the humidifier.
30	OFF.ON.DRAIN	Read/Write	LAO	Off / On / Drain Switch Position 0 - Off 1 - On 2 - Drain
99	ERROR STATUS	Read/Write	LAO	Error Status One of the five mandatory FLN points required for compatibility with Siemens® control systems. It has no functionality with the humidifier. For error status, please refer to point number 3, STATUS, and point number 15, SERVICE REQD.

General Information

Troubleshooting

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 -).
	Hitting 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.	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 working. Please verify address setup.
		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 are polarity sensitive and must be connected the same way on every device. (i.e. + to + and - to -).

General Information

Troubleshooting

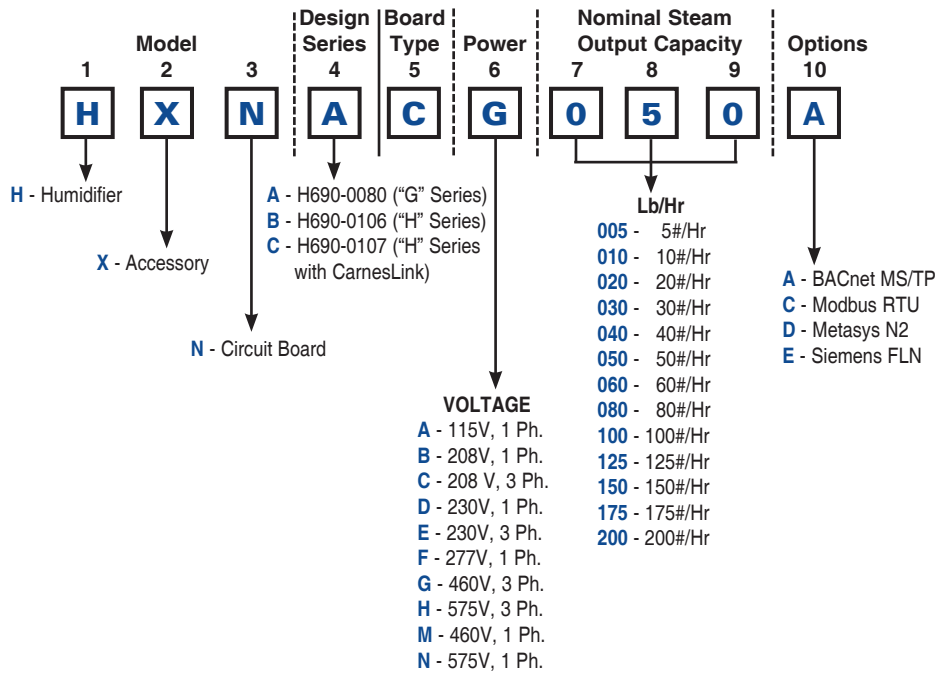
SYMPTOM	CAUSE	ACTION
On the data communication settings page, a message is displayed “Unable to setup protocol. Please contact Carnes Co.”	Missing green chip on circuit board, green chip is loosely connected or green chip has failed.	Attempt to turn off the communication protocol on communication protocol setup and turn it back on.
		While the unit is turned off, try removing and replacing the green communication chip. Be careful not to bend pins, misalign the connectors, or turn the chip upside down.
		Attempt to reset the chip by clicking the ‘Select Protocol’ button on the communication protocol setup page and then selecting on the second page ‘Reset Configuration’.
		Ensure that there is no “board communication failure” service required message. Also, ensure there is no noticeable damage to component U18 or the surrounding components near/under the green chip. If these cases do not exist, a new green chip will be needed.
Green chip’s LED on the humidifier’s circuit board is flashing red.	Communication configuration related issue.	Attempt to turn off the communication protocol on the communication protocol setup page and turn it back on.
		Attempt to reset the chip by clicking the ‘Select Protocol’ button on the communication protocol setup page and then selecting on the second page ‘Reset Configuration’.
No green lights on circuit board with the touchscreen being unresponsive and white.	Green chip improperly installed. The chip was installed one pin too low and ignoring the top two pin mounts.	Remove power from the circuit board. Remove green chip. Properly insert green chip into mount with LED in the bottom right corner. 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
Communication Chip (Only)	H999-6120
Circuit Board (w/ Communication Chip)	SEE TABLE 3

Table 3 - Circuit Board



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.

