Important: Read and save these instructions. This guide to be left with equipment owner.

BACnet®, LONWORKS®

Supplemental Installation and Operation Manual

Using BACnet or LonWorks with Nortec humidifiers. Includes installation, operation maintenance and troubleshooting information.

2574199–B | 23 Feb 2016

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Thank you for choosing Nortec.

INSTALLATION DATE (MM/DD/YYYY)

MODEL #
SERIAL #
CYLINDER #

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CAUTION: Servicing

- Disconnect main power before any servicing.
- The plumbing and electrical compartments contain high voltage components and wiring. Access should be limited to authorized personnel only.
- During and following operation of the humidifier, the steam and components in contact with the steam such as the blower pack, steam lines, steam distributors, and condensate lines can become hot and can burn if touched.
- Nortec Humidity Ltd does not accept any liability for installations of humidity equipment installed by unqualified personnel or the use of parts/components/equipment that are not authorized or approved by Nortec Humidity Ltd.

CAUTION: Electrical

- All electrical work should be done according to local and national electrical code.
- Electrical connection to be performed by a licensed electrician.

CAUTION: Installation

- Do not mount Humidifier on hot surfaces.
- Do not mount in area where freezing can occur.
- Do not mount on vibrating surface.
- Do not mount on floor.
- Regardless of selecting on/off or modulating control method, Nortec humidifiers must have a closed circuit across its on/off security loop control terminal to operate. Nortec highly recommends the use of a duct high limit humidistat.

Introduction

Nortec NHEL/EL electrode humidifiers are equipped with the Integrated Controller or 'IC' (touch screen) and can readily connect to BACnet Master Slave Token Passing (BACnet MS/TP) and Internet Protocol (BACnet IP) building management systems (BMS) right out of the box. This document describes how to connect these humidifiers to such a network and defines the parameters that may be monitored. This document also describes the additional options that can be purchased when interfacing with LonWorks or BTL-certified BACnet. Contact the factory for more information on other protocols not listed in this manual.

Requirements

All IC equipped humidifiers are capable of Modbus, BACnet MS/TP and BACnet IP connectivity right out of the box and require no additional hardware to interface with these BMS. For Modbus specific details, consult Nortec Modbus Manual 2560599.

LonWorks and BTL-certified BACnet systems require additional optional hardware – see Options (Lonworks, BTL-certified BACnet) for more details.

Please note: to use the BTL-certified BACnet or Lonworks protocols, the jumper J7 must be **OFF**. When the jumper J7 is on, the controller will enable the native Modbus protocol available on BMS communication port.

Integrated Controller Wiring Connections

Using the correct wiring between the humidifier and the BACnet network is important to ensure reliable communications and reduce the impact of electrical interference.

BACnet MS/TP

For BACnet MSTP networks, the recommended wire type is 18 -24 AWG, shielded twisted pair wire with 120 Ohm characteristic impedance. Ensuring the correct shield terminations is necessary to prevent electrical interference. The wire shield should be terminated at either the humidifier or the BACnet system, but not both. This allows induced current to "drain"; if the shield is terminated at both ends it will function as a conductor and can actually increase electrical interference. To minimize signal loss a wire run should not exceed 2000 feet at 38.4 kbps.

Table 1 BACnet MS/TP Parameters

Signal Type	Polarity		Recommended Cable	Address		Maximum Recommended Distance from NORTEC Humidifier
	A	B		Node ID	Device Instance	
EIA-485, 2-wire	Net -	Net +	18-24 AWG Shielded, Twisted Pair 120 Ω Impedance	79*	1001*	2300 ft at 9.6 kbps 2000 ft at 38.4 kbps

*Default, may vary for multi-unit orders.

BACnet IP

For BACnet IP networks, the recommended wire type is standard Category 5 Ethernet Cable (CAT 5) with RJ-45 terminations (Category 5E and category 6 cable are also acceptable). Refer to the BMS supplier for maximum recommended lengths of CAT5 cable.

Table 2 BACnet IP Parameters

Signal Type	BACnet IP		Recommended Cable	Address		Maximum Recommended Distance from NORTEC Humidifier
	Transmission Mode	Port		Node ID	Device Instance	
LAN Standard	UDP	47808	Category 5 Ethernet Cable (CAT 5 or better) with RJ-45 termination	79*	12*	Depends on cable manufacturer, refer to BMS Supplier for recommendations

*Default, may vary for multi-unit orders.

Wiring connections are made directly to the NHEL/EL Integrated Controller circuit board. Figure 1: Location of Integrated Controller Board shows the location of the IC board inside the NH-EL/EL humidifier.

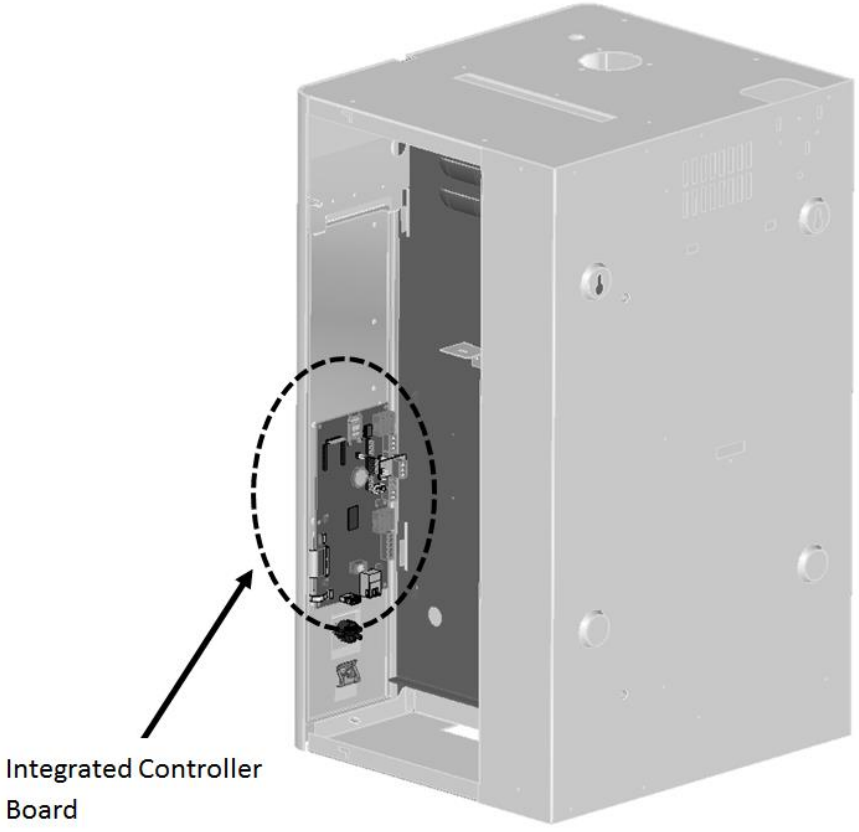

Figure 1: Location of Integrated Controller Board

Figure 2: BACnet MS/TP and IP Connection Location show where the physical connections will be made in order to interface with one of these BMS protocols. For information on Optional protocols, such as Lonworks or BTL-certified BACnet, please see Options (Lonworks, BTL-certified) for details.

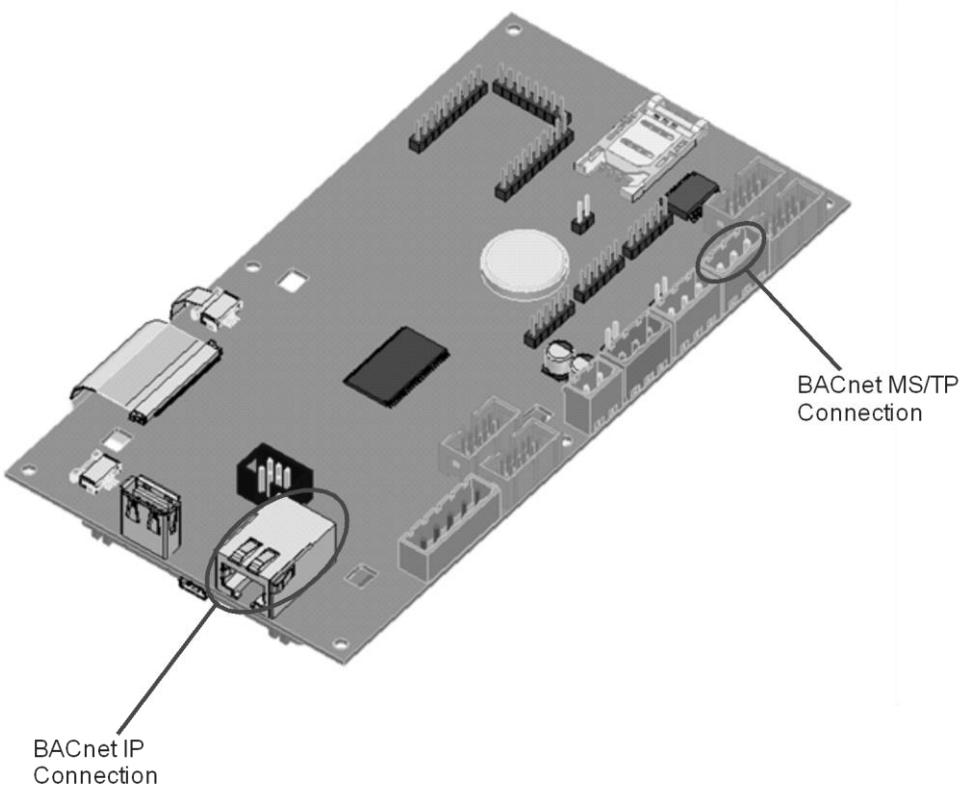

Figure 2: BACnet MS/TP and IP Connection Location

Refer to Figure 3 and Figure 4 for instructions on making wiring connections for each respective protocol.

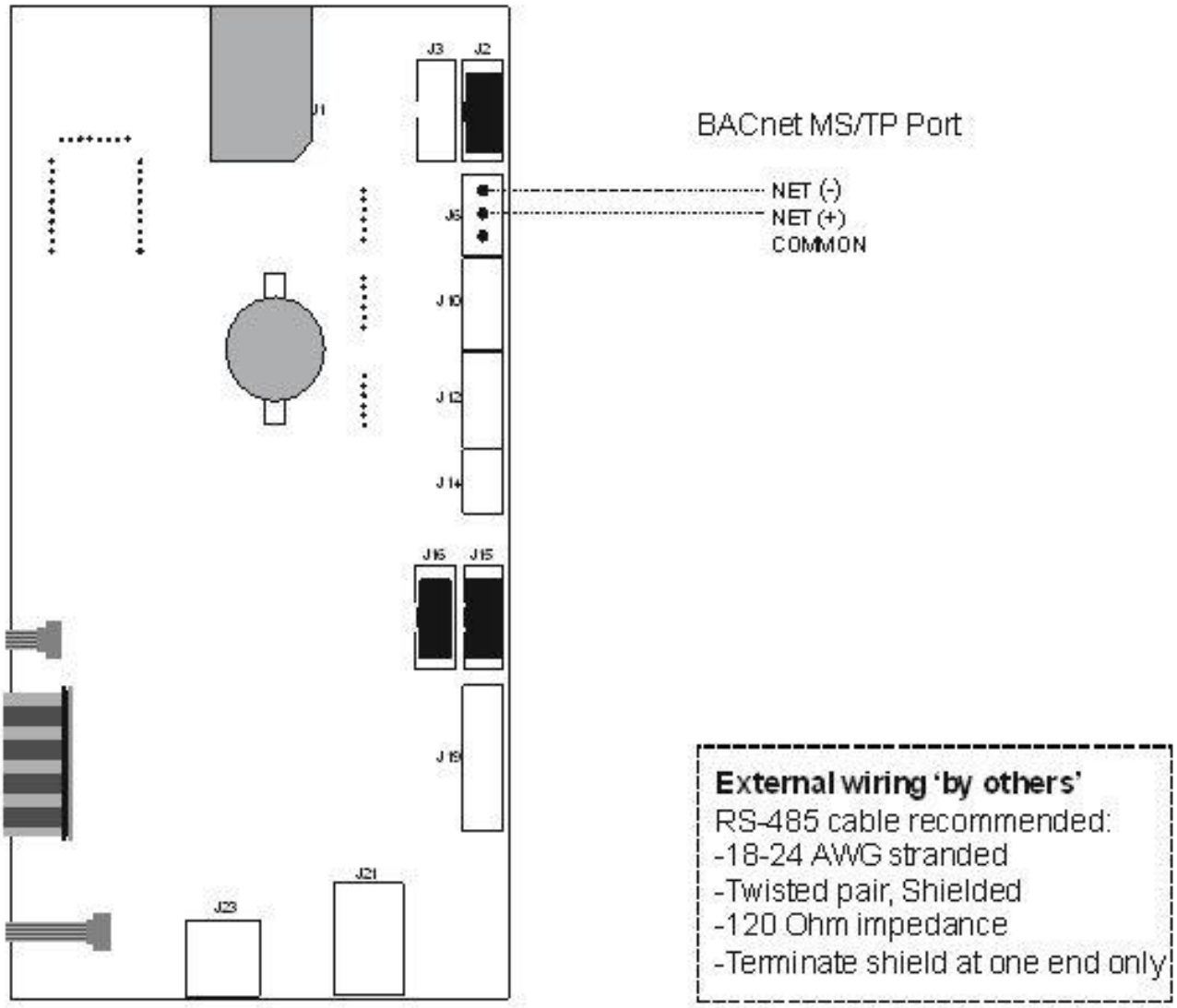

Figure 3: BACnet MS/TP Wiring Diagram

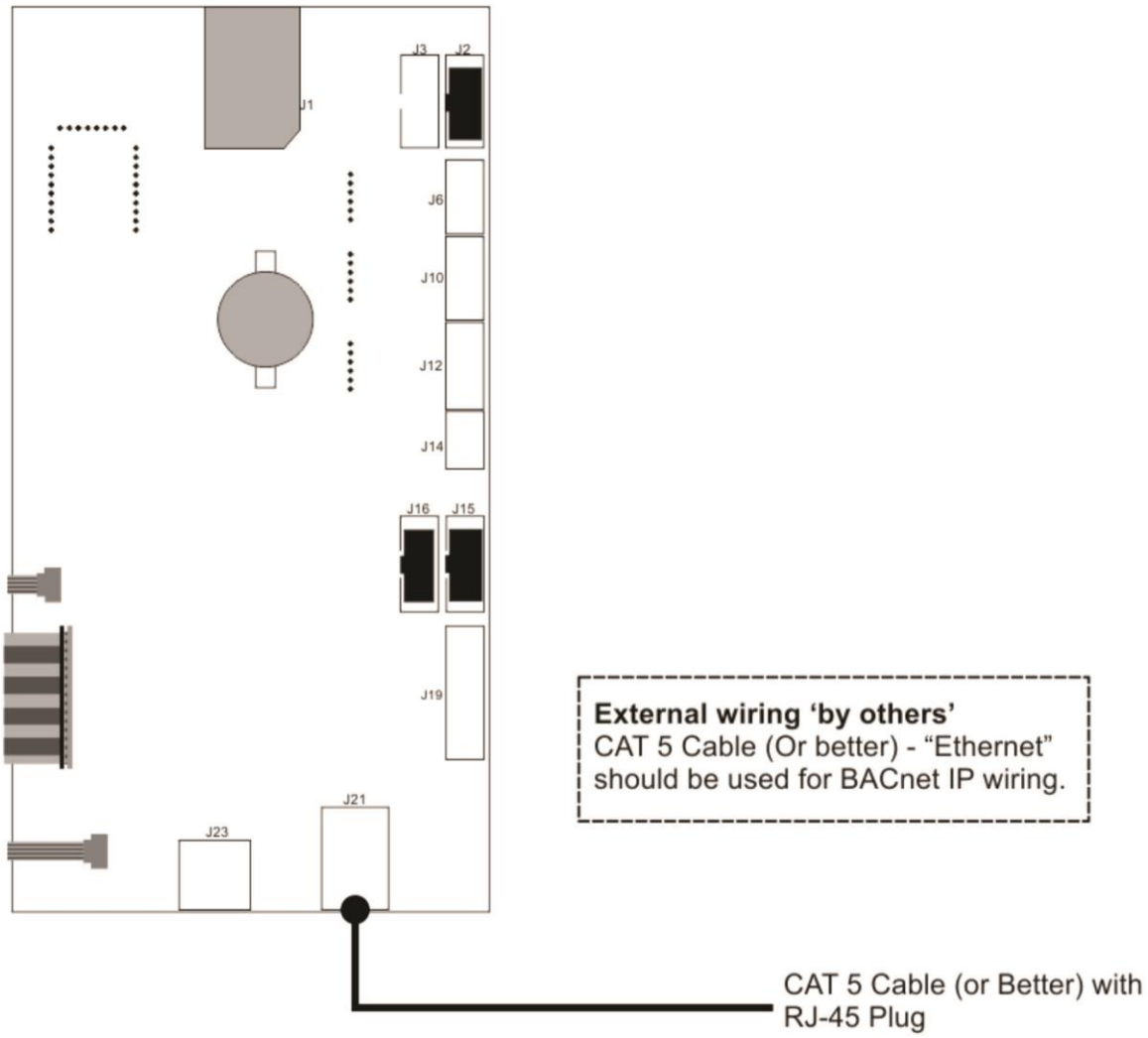

Figure 4: BACnet IP Wiring Diagram

Addressing and Communication

After wiring connections have been completed, the humidifier needs to be setup to operate and communicate through the BACnet interface.

BACnet Communication Set-up

The following table demonstrates the default addressing found on the Integrated Controller:

Table 3 BACnet Specific Defaults

	BACnet IP	BACnet MSTP
Default IP addressing	IP Type: DHCP IP: 192.168.168.243 Subnet: 255.255.255.000 Gateway: 192.168.168.101	N/A
Default BACnet Address (MAC address)	79	79
Default BACnet Node ID (Device Instance)	12	1001

Locating the IP addressing in the IC is summarized as follows:
Main Menu > 0335 > Configuration > Comms. Menu > Network Parameters >

Note: By default, the IC will have BACnet disabled. To enable BACnet, select *BACnet IP or BACnet MSTP* under *BACnet Parameters*. Select *the respective protocol* and confirm the selection by pressing the *Check Mark* button. This action is summarized as follows:
Main Menu > 0335 > Configuration > Comms. Menu > BACnet Parameters >

Once BACnet is enabled, addressing can be modified as desired.
Locating the BACnet Address (MAC address) in the IC is summarized as follows:
Main Menu > 0335 > Configuration > Comms. Menu > BACnet Parameters > BACnet MSTP address

Locating the BACnet Node ID (Device Instance) in the IC is summarized as follows:
Main Menu > 0335 > Configuration > Comms. Menu > BACnet Parameters > Node ID

Control Signal Setting

By default the humidifier is configured to operate on a hardwired control signal supplied through the unit terminal strip. This can be changed to allow the humidifier to function entirely through its BACnet interface.
*Note: the Humidifier Security loop will still need to be enabled for humidifier to run.

To adjust this setting:

1 Press the ***Menu*** icon on the lower left corner of the status screen, to access the menu.
2 When prompted for a password, enter 0335 using the number pad. Press the ***Check Mark*** icon to confirm.
3 Select the ***Configuration*** menu.
4 Select the ***Control Settings*** menu. The following settings can be adjusted:

Table 4 Control Signal Parameters

Source	*Analog:* Use hardwired control signal *BACnet/IP:* Write control signal through BACnet/IP interface *BACnet/MS:* Write control signal through BACnet/MS interface
Control Mode	*Demand*: Use a demand control signal *RH P*: Use a sensor value and proportional *RH PI*: Use a sensor value and proportional-integral control band
Control Channels	*Single*: Use a single channel control signal *Dual*: Use a dual channel control signal

Note: Refer to the CONTROLS section of the humidifier's Installation and Operation Manual for more information on the above settings.

5 Press ***Back*** repeatedly to return to the home screen when complete.

This procedure is summarized below:
Main Menu > 0335 > Configuration > Control Settings >

Source: Analog, BACnet/IP, BACnet/MS,
Control Mode: Demand, RH P, or RH PI
Control Channels: Single or Dual

Control Mapping

Table 5 BACnet Object Definition List

Parameter Name	Description	BACnet ID	Format	Range	Unit	R/W	Details
Dinput_A1	Write RH or Demand signal value to control channel 1 for cylinder A	10044	Integer	0 - 100	%	Write	Requires BACnet to be enabled. For most common configurations, this is the primary control signal
Dinput_A2	Write RH or Demand signal value to control channel 2 for cylinder A	10045	Integer	0 - 100	%	Write	Requires BACnet to be enabled.
Dinput_B1	Write RH or Demand signal value to control channel 1 for cylinder B	10046	Integer	0 - 100	%	Write	Requires BACnet to be enabled. Only applies to EL/NH-EL-150 and EL/NH-EL-200 with dual channel control enabled
Dinput_B2	Write RH or Demand signal value to control channel 2 for cylinder B	10047	Integer	0 - 100	%	Write	Requires BACnet to be enabled. Only applies to EL/NH-EL-150 and EL/NH-EL-200 with cylinders dual channel control enabled and cylinders in independent operation mode
Manual_ Capcity_A	Sets a manual capacity limit restriction for cylinder A	10008	Integer	0 - 100	%	Write	Limits output to percentage of total cylinder capacity (for single cylinder) or for cylinder A (EL/NH-EL-150 and EL/NH-EL-200 models only)
Manual_ Capcity_B	Sets a manual capacity limit restriction for cylinder B (if present)	10027	Integer	0 - 100	%	Write	Limits output to percentage capacity for cylinder B (EL/NH-EL-150 and EL/NH-EL-200 models only)
BMS_ Timeout	BMS timeout for Modbus and BACnet	10043	Integer	0 - 300	s	Write	It is recommend to not change the value from the factory default (300)
Remote_ Disable	Remotely disable steam production for the unit	25	Integer	0 or 1	-	Write	0 = Idle/Humidify 1 = Disabled

Parameter Name	Description	BACnet ID	Format	Range	Unit	R/W	Details
SP_Chan_A 1	Writes the desired space setpoint for control channel 1 for cylinder A	10010	Integer	0 - 95	%	Write	Use only when Control Mode (14) is set to RHp or RHpi Use only when sending RH values to Dinput_A1. For most common configurations this is the primary space setpoint.
SP_Chan_A 2	Writes the desired space setpoint for control channel 2 for cylinder A	10013	Integer	10 - 95	%	Write	Use only when sending RH value to Dinput_A2 with dual channel control enabled
SP_Chan_B 1	Writes the desired space setpoint for control channel 1 for cylinder B	10016	Integer	0 - 95	%	Write	Use only with EL/NH-EL-150 and EL/NH-EL-200 models when sending RH value to Dinput_B1 and cylinders are in independent operation mode
SP_Chan_B 2	Writes the desired space setpoint for control channel 2 for cylinder B	10019	Integer	10 - 95	%	Write	Use only with EL/NH-EL-150 and EL/NH-EL-200 models when sending RH value to Dinput_B2 with dual channel control enabled and cylinders are in independent operation mode
Signal_ Source	Selects signal source to control unit	13	Integer	0 - 4	-	Write	0 = Analog 1 = Modbus 2 = BACnet/IP 3 = BACnet/MS 4 = LonWorks
Control_M ode	Selects method to control unit	14	Integer	1 - 3	-	Write	1 = Demand 2 = RH P 3 = RH PI
Control_ Channel	Selects method to control channels	15	Integer	0 - 1	-	Write	0 = Single Channel 1 = Dual Channel
Input_A1	Displays channel 1 demand for cylinder A	10001	Integer	0 - 100	%	Read	Displays channel 1 demand/sensed RH as a percentage of cylinder capacity for cylinder A
Input_A2	Displays channel 2 demand for cylinder A	10002	Integer	0 - 100	%	Read	Displays channel 2 demand/sensed RH as a percentage of cylinder capacity for cylinder A
Input_B1	Displays channel 1 demand for cylinder B	10003	Integer	0 - 100	%	Read	Displays channel 1 demand/sensed RH as a percentage of cylinder capacity for cylinder B (EL/NH-EL-150 and EL/NH-EL-200 models only)

Parameter Name	Description	BACnet ID	Format	Range	Unit	R/W	Details
Input_B2	Displays channel 2 demand for cylinder B	10004	Integer	0 - 100	%	Read	Displays channel 2 demand/sensed RH as a percentage of cylinder capacity for cylinder B (EL/NH-EL-150 and EL/NH-EL-200 models only)
Blower_Pack_A	Reads the status of the blower pack for cylinder A	4	Integer	0 or 1	-	Read	0 = Open 1 = Closed
Blower_Pack_B	Reads the status of the blower pack for cylinder B	6	Integer	0 or 1	-	Read	0 = Open 1 = Closed
Fan_Activate_A	Indicates if air handle or furnace is activated for cylinder A	1	Integer	0 or 1	-	Read	0 = Not Activated 1 = Activated
Fan_Activate_B	Indicates if air handle or furnace is activated for cylinder B	2	Integer	0 or 1	-	Read	0 = Not Activated 1 = Activated
Do_Fault_A	Reads the status of a fault on the unit	69	Integer	0 or 1	-	Read	0 = No Fault 1 = Fault
Do_Service_A	Reads the status of a service request on the unit	67	Integer	0 or 1	-	Read	0 = No Service Required 1 = Service Required
Humidifier_Status_A	Reads the status of the unit for cylinder A	36	Integer	0 - 9	-	Read	0 = Humidifying 1 = Idle 2 = Idle Drain 3 = Keepwarm 4 = Filling 5 = Draining 6 = Disabled 7 = Safety Loop 8 = Warning 9 = Fault 10 = blower pack

Parameter Name	Description	BACnet ID	Format	Range	Unit	R/W	Details
Humidifier_ Status_B	Reads the status of the unit for cylinder B	57	Integer	0 - 9	-	Read	0 = Humidifying 1 = Idle 2 = Idle Drain 3 = Keepwarm 4 = Filling 5 = Draining 6 = Disabled 7 = Safety Loop 8 = Warning 9 = Fault 10 = blower pack
System_ Demand_A	Reads the demand for cylinder A	10057	Integer	0 – 100	%	Read	*Demand Mode:* Summation of Input_A1 and Input_A2 *RH Mode:* PID calculation
System_ Demand_B	Reads the demand for cylinder B	10058	Integer	0 – 100	%	Read	*Demand Mode:* Summation of Input_B1 and Input_B2 *RH Mode:* PID calculation
Safety_Loop_A	Reads the status of the safety loop for cylinder A	3	Integer	0 or 1	-	Read	0 = Open 1 = Closed
Safety_Loop_B	Reads the status of the safety loop for cylinder B	5	Integer	0 or 1	-	Read	0 = Open 1 = Closed
Run_Time_ A	Reads operating time for cylinder A	10060	Integer	0 - 5000	Hrs	Read	Displays the total time cylinder A has been running since last reset
Run_Time_ B	Reads operating time for cylinder B	10079	Integer	0 - 5000	Hrs	Read	Displays the total time cylinder B has been running since last reset
Weighted_ Hours_A	Reads the weighted time for cylinder A	10061	Integer	0 - 5000	Hrs	Read	An equated run time based on Run_Time_A x System_Demand_A
Weighted_ Hours_B	Reads the weighted time for cylinder B	10080	Integer	0 - 5000	Hrs	Read	An equated run time based on Run_Time_B x System_Demand_B

Options (Lonworks, BTL-Certified BACnet)

Nortec offers additional protocol options that may be purchased if required. Both field and factory installed versions are available and include Lonworks and BTL® (BACnet Testing Lab)[1] certified BACnet. See Tables 6 and Table 7 for specific part numbers and details.

Table 6. Optional Factory Installed Part Numbers

Part Number	Kit Name	Kit Description
2574194	Lonworks, NH-EL	Factory installed option for Echelon's LonWorks protocol
2574193	BACnet MSTP, BTL-certified, NH-EL	Factory installed option for BTL approved protocol for BACnet MSTP
2574192	BACnet IP, BTL-certified, NH-EL	Factory installed option for BTL approved protocol for BACnet IP
-	Lonworks, EL	Factory installed option for Echelon's LonWorks protocol. Configured with humidifier through Nortec Help software.
-	BACnet MSTP, BTL-certified, EL	Factory installed option for BTL approved protocol for BACnet MSTP. Configured with humidifier through Nortec Help software.
-	BACnet IP, BTL-certified, EL	Factory installed option for BTL approved protocol for BACnet IP. Configured with humidifier through Nortec Help software.

[1] BTL is a registered trademark of BACnet International (BI)

Table 7. Optional Field Install Part Numbers

Part Number	Kit Name	Kit Description
2574197	Lonworks, NH-EL , Retrofit	Field install option for Echelon's LonWorks protocol
2574196	BACnet MSTP, BTL , NH-EL Retrofit	Field install option for BTL approved protocol for BACnet MSTP
2574195	BACnet IP, BTL, NH-EL Retrofit	Field install option for BTL approved protocol for BACnet IP

Field Retrofit Installation

The kits consist of a single interface card that is mounted on the rear side of the integrated controller. Care should be taken with installation the optional unit in the field. Users will need to install the interface card onto the pins as shown in Figure 5: Mounting Location and figure 6: Pin Alignment. Figure 8: BACnet Specific Port and Figure 9: LonWorks specific port display the location of each port for the respective protocol.

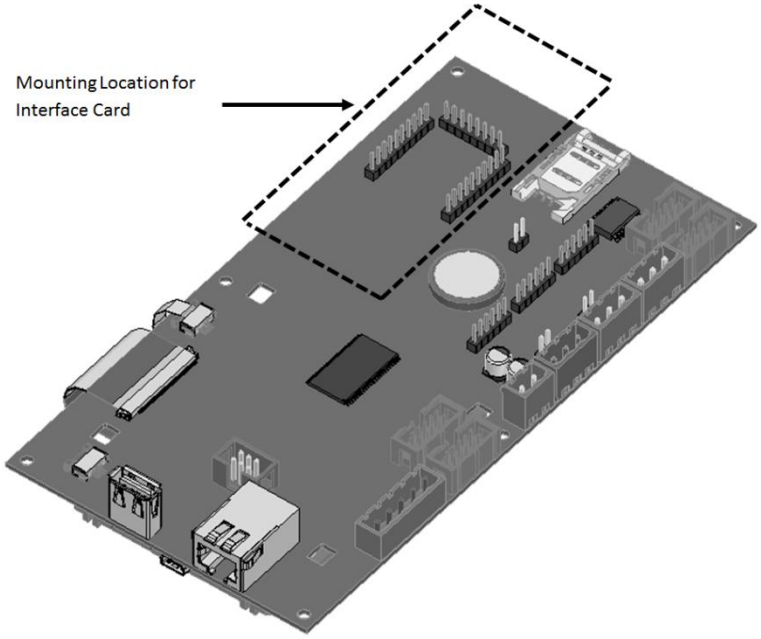

Figure 5: Mounting Location

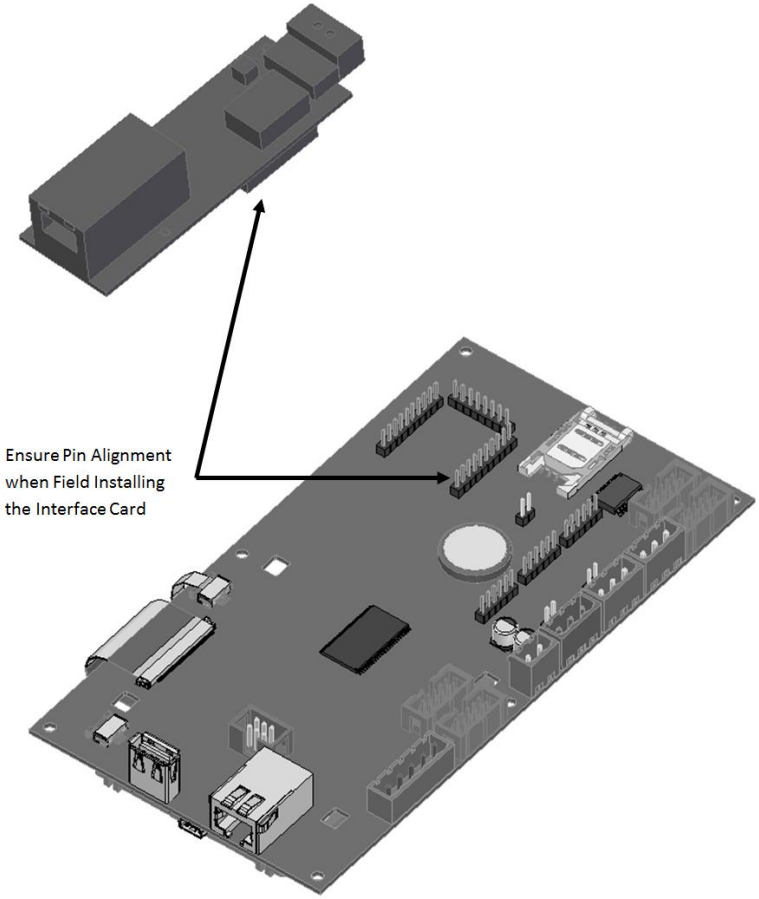

Figure 6: Pin Alignment

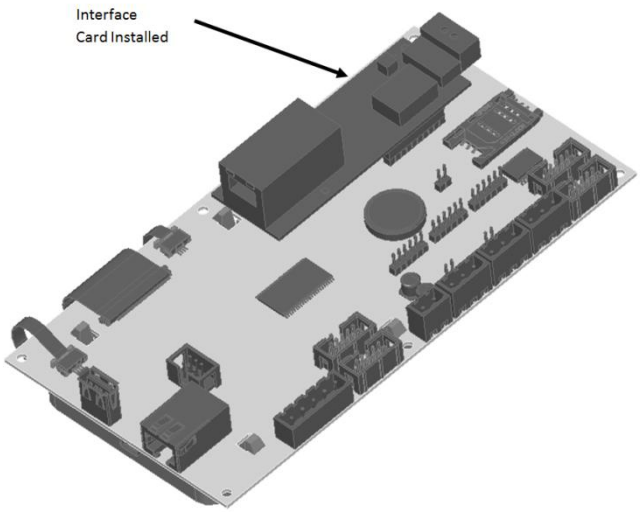

Figure 7: Installation complete

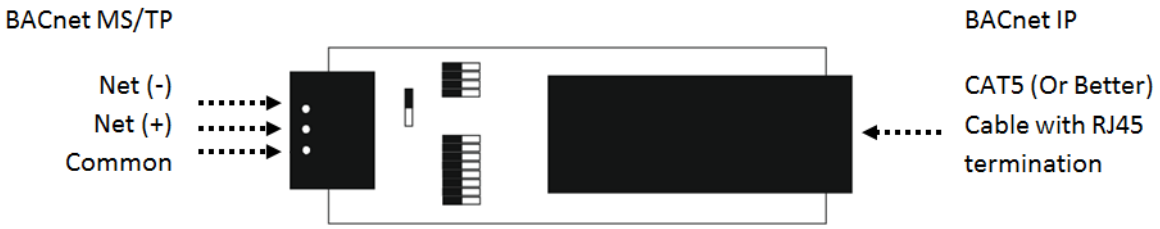

Figure 8: BACnet Specific Ports

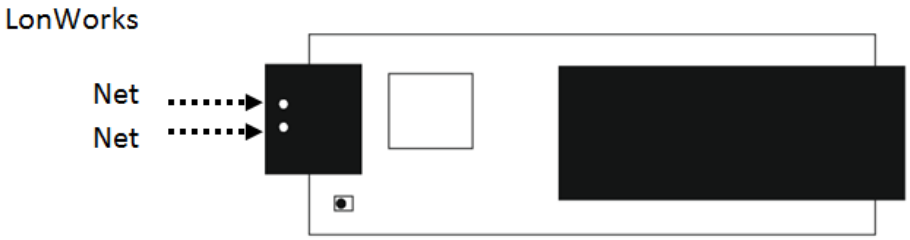

Figure 9: LonWorks Specific Port

Addressing and Communication

After wiring connections have been completed, the humidifier needs to be setup to operate and communicate through the interface. The initial step is to configure the Control settings to ensure the humidifier points to the installed option.

Control Signal Setting

By default the humidifier is configured to operate on a hardwired control signal supplied through the unit terminal strip. This can be changed to allow the humidifier to function entirely through its Optional interface.

To adjust this setting:

1. Press the ***Menu*** icon on the lower left corner of the screen, to access the menu.
2. When prompted for a password, enter 0335 using the number pad. Press the ***Check Mark*** icon to confirm.
3. Select the ***Configuration*** menu.
4. Select the ***Control Settings*** menu. The following settings can be adjusted:

Table 8 BTL/Lonworks Control Signal Parameters

Source	*Analog:* Use hardwired control signal Modbus: Write control signal through BTL-certified BACnet Option LonWorks: Write control signal through LonWorks Option
Control Mode	*Demand*: Use a demand control signal *RH P*: Use a sensor value and proportional *RH PI*: Use a sensor value and proportional-integral control band
Control Channels	*Single*: Use a single channel control signal *Dual*: Use a dual channel control signal

Note: Refer to the CONTROL SETTING section of the humidifier's Installation and Operation Manual for more information on the above settings.

5. Press ***Back*** repeatedly to return to the home screen when complete.

This procedure is summarized below:
Main Menu > 0335 > Configuration > Control Settings >

Source: Analog, Modbus, LonWorks
Control Mode: Demand, RH P, or RH PI
Control Channels: Single or Dual

Controller Set-up

The BACnet BTL or LonWorks options utilize an additional hardware component. Protocol configuration is completed at the factory, prior to final testing. It may be necessary to configure the address parameters in the field.

BACnet IP systems will require a static IP address to communicate on the network.
BACnet MS/TP systems require both a device instance and a baud rate to be set.
LonWorks systems automatically detect network address parameters and do not require configuration.

BTL-Certified BACnet specific : Changing Unit Addressing

The BTL-certified BACnet options utilize an additional hardware component for translation. For address changes in either BACnet MS/TP or BACnet IP, the device instance and BACnet MAC address can be modified easily using the dip switches shown in Figure 10: Dip Switches on BTL-certified BACnet.

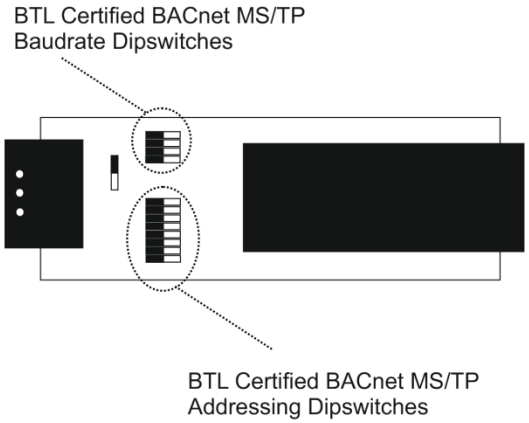

Figure 10: Dip Switches on BTL-Certified BACnet

These switches allow you to set a binary value between 1 and 127 inclusive. The methodology for converting numbers to binary is presented in Appendix A. To set the device instance to a value outside of this range, a specific web browser tool may be used to make IP and address modifications in the field, Contact Nortec Technical Services for further detail.

Take care when adjusting switches to ensure the settings are entered as intended. Common settings are tabulated in Appendix A. After an address change has been made, the humidifier must be power cycled for the change to take effect.

Changing Baud Rate (BACnet MSTP Only)

The baud rate for communications can also be changed through the respective dip switches.

By adjusting the settings according to Appendix A, the baud rate can be changed. For best results it is recommended to set the baud rate to Auto (BACnet MSTP only), 9600, 19200, or 38400. Communication performance varies with building automation system manufacturer and some experimentation with other

baud rates may be required to obtain the best performance. The Auto setting is currently only supported for BACnet MSTP networks.

BACnet Pics and Bibs

The Protocol Implementation Conformance Statement or "PICS" describes the BACnet capabilities of a particular BACnet implementation. It is a written document, created by the manufacturer of a device, which identifies the particular options specified by BACnet that are implemented in the device.

BACnet Interoperability Building Blocks (BIBBs) describe a list of services a BACnet device provides. The main areas that the building blocks are concerned with include: data sharing, trends, schedules, device and system management. BIBBs help specify the interoperability capabilities of a BACnet device. See Appendix C for PICS and BIBBs profiles.

LonWorks Variables

LonWorks uses the identical set of variables/points as BACnet. For a detailed list of the variables, please see Appendix B.

To facilitate the integration of a LonWorks unit within a network, it may be desirable to obtain an External Interface File (XIF). Files of type .xif are used to convey the resources, specific objects and data types which a LonWorks device possesses. The .xif file allows a network integrator to simulate the presence of a networked humidifier even if it is not yet physically connected to the network. In fact, if the integrator has the .xif files of all network devices, a complete system could be simulated and configured off-line. Once the configuration is done, the integrator's software tool can be connected to the actual system and the configuration information can be downloaded.

The XIF file can be retrieved directly from the Optional Interface Card. A Windows based laptop and an Ethernet cable (CAT 5 or better) are required for this process. This process requires the "Remote User Interface" software tool from Fieldserver. It is available by visiting http://fieldserver.com/techsupport/utility/utility.php and downloading the "Utility" software:

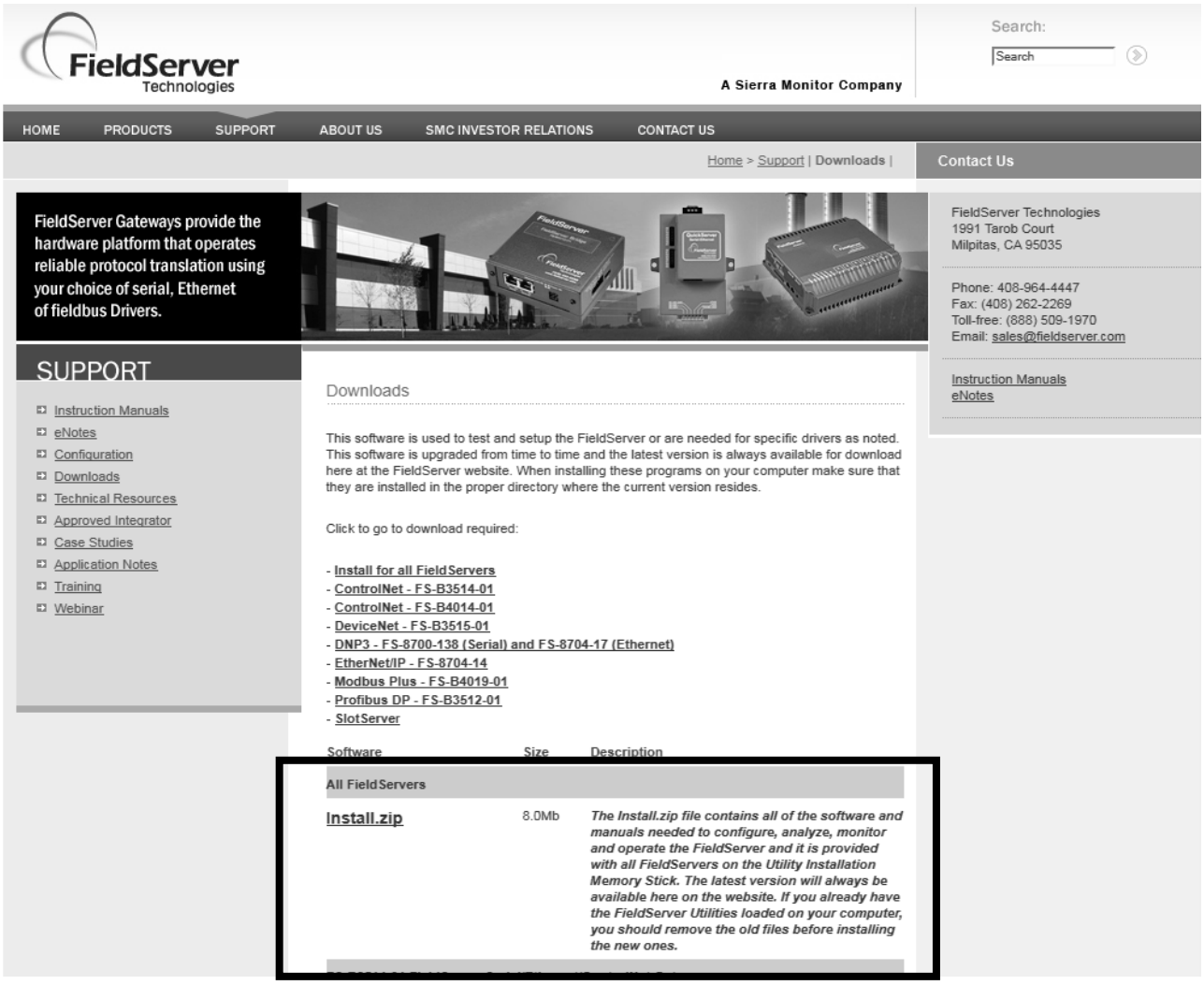

Figure 11 Software Retrieval

Once this software has been installed, use the following procedure:

1. Locate desired humidifier. Ensure unit is powered on and remove the panel on the Front side of the humidifier. Locate the Integrated Controller Board inside of the unit.

2. Connect one end of the CAT5 cable into the Ethernet port on the Optional Interface Card directly.

3. Connect other end of CAT5 cable to the Ethernet port on the laptop.

4. Run the "Remote User Interface" utility by double clicking the shortcut on your desktop (or *Start>Programs>Fieldserver Utilities>Remote User Interface*)

5. The program should automatically recognize connected humidifier and bring you to the "Main Menu". If it does not, contact Nortec Technical Services at the number on the back cover of this manual.

6. Type "u" for upload.

7. Type "o" for other. (A warning will appear, press any key to continue.)

8. Type “r” for remote.

9. Enter “fserver.xif”’ and hit the ‘enter’ key.

10. Type “u” to initiate upload from the humidifier to the laptop.

11. The .xif file will be saved in the folder “Configuration File Folder” located at *Start>Programs>Fieldserver Utilities>Configuration File Folder.*

12. Type ‘q’ twice to exit out of the program

13. Locate file in Configuration File Folder and change name to corresponding humidifier, (ex, “fserverH1.xif” for Humidifier 1)

14. Repeat this procedure for humidifiers changing the name of the .xif once saved to correspond with the tag of the appropriate humidifier.

Troubleshooting

Table 9 General Troubleshooting

Problem	Resolutions
Cannot see/change set object/parameter from BMS	Check control type. Demand type controls use internal algorithms to generate a signal telling the humidifier to operate at a certain output percentage. These of controls do not report the detected humidity level or set point to the humidifier. As a result the set point and space humidity levels cannot be monitored through the humidifier when using demand controls. Sensor ("transducer") type controls report a sensed humidity value to the humidifier. The set point is configured at the humidifier and the humidifier uses internal algorithms to determine the output percentage. Since the humidifier knows both the set point and humidity level, these values may be monitored through the humidifier.
Cannot establish communication.	Check communication parameters. Nortec humidifiers are capable of BACnet MSTP and IP communication. LonWorks and BTL-certified BACnet based systems require an interface card to translate the information, See Options for respective part numbers. Verify Hardware connections from BMS to humidifier as per the installation chapter. Confirm that the protocol has been activated in the humidifier software: main menu>0335>configuration>Comms menu> BACnet MSTP Specific: Check baud rate . Modifying bps may be necessary for some BMS networks. Ensure BACnet Workstation/BAS can handle BACnet slave devices
Cannot read data from object/parameter	Carefully ensure that addresses are mapped correctly. A single incorrect address may cause loss of communication or faults for an entire chain of humidifiers. Check data type, some network controllers default to integer or binary values depending on variable type.

Problem	**Resolutions**
Only some objects/parameters report data.	Check the baud rate being used on the BMS network. Use of faster baud rates may assist. Check the polling rate being used. High polling rates can interrupt responses from the previous poll of data causing incomplete data transfer. A recommended polling rate is once per minute.
Humidifier will not respond to set point/sensor values/ demand values written over BACnet/LonWorks.	Check that humidifier is configured for automation system. Refer to the "Control Signal Settings" section for your humidifier model. If the setting is "Analog" the humidifier will look for a control signal on the low voltage terminal strip only.
Humidifier will not respond to hardwired controls.	Check that humidifier is configured for "Analog" control. Refer to the "Control Signal Settings" section for your humidifier model. If the setting is "BACnet" or other, the humidifier will look for a control value to be written over that medium.
Intermittent Communications	Check wire type and run length. Wire type should be 18 – 24 AWG, shielded twisted pair wire with 120 ohm characteristic impedance. Chains should generally not exceed 2000 feet total length. Look for wire runs in close proximity to equipment generating significant electrical noise (such as VFD's, medical equipment, X-ray machinery, servers, etc). Check that wire shield is terminated at one end only. Terminations at both ends cause shield to conduct electricity and can generate noise. Confirm correct polarity of conductors at each device. This problem can be the result of Net+ and Net- terminals being crossed. Check BACnet Device Instance, LonWorks addressing for conflicts with any device. Each device on the network must have a unique address. Devices (humidifiers or otherwise) cannot share addresses.
Invalid data	Check BACnet/LonWorks addresses for conflicts. Each device on the network must have a unique address. Devices (humidifiers or otherwise) cannot share addresses.

Problem	**Resolutions**
More variables or additional information is required from the humidifier.	Contact Nortec Technical Services for additional support.
BACnet MSTP: Cannot pass data to controller. Humidifier does not pass token	Isolate chain and try only Humidifier. Embedded BACnet MSTP functions as a slave device and cannot be setup as a Master. Ensure BACnet Workstation/BAS can handle BACnet slave devices. If not possible, consider the BTL option for BACnet MSTP if problem persists. BTL option for BACnet MSTP will function as a Master device.

APPENDIX A

Table 10 Converting Numbers to Binary

Switch	A8	A7	A6	A5	A4	A3	A2	A1
Setting	Off	On	Off	Off	On	On	On	Off
Binary	0	1	0	0	1	1	1	0
Exponential Meaning	2^7 x 0	2^6 x 1	2^5 x 0	2^4 x 0	2^3 x 1	2^2 x 1	2^1 x 1	2^0 x 0
Simplified Meaning	128 x 0	64 x 1	32 x 0	16 x 0	8 x 1	4 x 1	2 x 1	1 x 0
Numerical Meaning	0	64	0	0	8	4	2	0
Result	64 + 8 + 4 + 2 = **78**							

Table 11 Common Settings for Addressing - BTL BACnet MSTP

Value	A8	A7	A6	A5	A4	A3	A2	A1
0 (Auto)*	Off	Off	Off	Off	Off	Off	Off	Off
1	Off	Off	Off	Off	Off	Off	Off	On
10	Off	Off	Off	Off	On	Off	On	Off
25	Off	Off	Off	On	On	Off	Off	On
40	Off	Off	On	Off	On	Off	Off	Off
50	Off	Off	On	On	Off	Off	On	Off
75	Off	On	Off	Off	On	Off	On	On
78	Off	On	Off	Off	On	On	On	Off
100	Off	On	On	Off	Off	Off	On	Off
125	Off	On	On	On	On	On	Off	On
127	Off	On	On	On	On	On	On	On

*** Auto uses the value in the configuration file.**

Table 12 Common Settings – Baud rate BTL BACnet MS/TP

Setting	B4	B3	B2	B1
Auto*	Off	Off	Off	Off
110	Off	Off	Off	On
300	Off	Off	On	Off
600	Off	Off	On	On
1200	Off	On	Off	Off
2400	Off	On	Off	On
4800	Off	On	On	Off
9600	Off	On	On	On
19200	On	Off	Off	Off
20833	On	Off	Off	On
28800	On	Off	On	Off
38400	On	Off	On	On
57600	On	On	Off	Off
76800	On	On	Off	On
115200	On	On	On	Off

*** Auto baud is only supported for BACnet MSTP**

APPENDIX B

Table 13 Parameters

Parameter Name	Description	SNVT #	SNVT	Range	NV Index	R/W	Details
nviDRHDem_A1	Write RH or Demand signal value to control channel 1 for cylinder A	81	Lev_percent	0 - 100	23	W	Requires LonWorks to be enabled. For most common configurations, this is the primary control signal
nviDRHDem_A2	Write RH or Demand signal value to control channel 2 for cylinder A	81	Lev_percent	0 - 100	24	W	Requires LonWorks to be enabled.
nviDRHDem_B1	Write RH or Demand signal value to control channel 1 for cylinder B	81	Lev_percent	0 - 100	33	W	Requires LonWorks to be enabled. Only applies to EL/NH-EL-150 and EL/NH-EL-200 with dual channel control enabled
nviDRHDem_B2	Write RH or Demand signal value to control channel 2 for cylinder B	81	Lev_percent	0 - 100	34	W	Requires LonWorks to be enabled. Only applies to EL/NH-EL-150 and EL/NH-EL-200 with cylinders dual channel control enabled and cylinders in independent operation mode
nviManCapacity_A	Sets a manual capacity limit restriction for cylinder A	81	Lev_percent	0 - 100	15	W	Limits output to percentage of total cylinder capacity (for single cylinder) or for cylinder A (EL/NH-EL-150 and EL/NH-EL-200 models only)
nviManCapacity_B	Sets a manual capacity limit restriction for cylinder B (if present)	81	Lev_percent	0 - 100	30	W	Limits output to percentage capacity for cylinder B (EL/NH-EL-150 and EL/NH-EL-200 models only)
nviBMStimeout	BMS timeout for Modbus and BACnet	107	SNVT_time_sec	0 - 300	5	W	It is recommend to not change the value from the factory default (300)
nviDisable	Remotely disable steam production for the unit	95	Switch	0 or 1	44	W	0 = Idle/Humidify 1 = Disabled
nviSetPoint_A1	Writes the desired space setpoint for control channel 1 for cylinder A	81	Lev_percent	0 - 95	21	W	Use only when sending RH values to Dinput_A1. Use only when nviCtrlMode (3) is set to RHp or RHpi For most common configurations this is the primary space setpoint

Parameter Name	Description	SNVT #	SNVT	Range	NV Index	R/W	Details
nviSetPoint_A2	Writes the desired space setpoint for control channel 2 for cylinder A	81	Lev_percent	10 - 95	22	W	Use only when sending RH value to Dinput_A2 with dual channel control enabled
nviSetPoint_B1	Writes the desired space setpoint for control channel 1 for cylinder B	81	Lev_percent	0 - 95	36	W	Use only withEL/ NH-EL-150 and EL/NH-EL-200 models when sending RH value to Dinput_B1 and cylinders are in independent operation mode
nviSetPoint_B2	Writes the desired space setpoint for control channel 2 for cylinder B	81	Lev_percent	10 - 95	37	W	Use only with EL/NH-EL-150 and EL/NH-EL-200 models when sending RH value to Dinput_B2 with dual channel control enabled and cylinders are in independent operation mode
nviSigSource	Selects signal source to control unit	81	Lev_percent	0 - 4	2	W	0 = Analog 1 = Modbus 2 = BACnet/IP 3 = BACnet/MS 4 = LonWorks
nviCtrlMode	Selects method to control unit	81	Lev_percent	1 - 3	3	W	1 = Demand 2 = RH P 3 = RH PI
nviCtrlChannel	Selects method to control channels	81	Lev_percent	0 - 1	4	W	0 = Single Channel 1 = Dual Channel
nvoRHDem_A1	Displays channel 1 demand for cylinder A	81	Lev_percent	0 - 100	12	R	Displays channel 1 demand/sensed RH as a percentage of cylinder capacity for cylinder A
nvoRHDem_A2	Displays channel 2 demand for cylinder A	81	Lev_percent	0 - 100	13	R	Displays channel 2 demand/sensed RH as a percentage of cylinder capacity for cylinder A
nvoRHDem_B1	Displays channel 1 demand for cylinder B	81	Lev_percent	0 - 100	27	R	Displays channel 1 demand/sensed RH as a percentage of cylinder capacity for cylinder B (EL/NH-EL-150 and EL/NH-EL-200 models only)
nvoRHDem_B2	Displays channel 2 demand for cylinder B	81	Lev_percent	0 - 100	28	R	Displays channel 2 demand/sensed RH as a percentage of cylinder capacity for cylinder B (EL/NH-EL-150 and EL/NH-EL-200 models only)
nvoBlowerAct_A	Reads the status of the blower pack for cylinder A	95	Switch	0 or 1	46	R	0 = Open 1 = Closed

Parameter Name	Description	SNVT #	SNVT	Range	NV Index	R/W	Details
nvoBlowerAct_B	Reads the status of the blower pack for cylinder B	95	Switch	0 or 1	49	R	0 = Open 1 = Closed
nvoFanAct_A	Indicates if air handle or furnace is activated for cylinder A	95	Switch	0 or 1	47	R	0 = Not Activated 1 = Activated
nvoFanAct_B	Indicates if air handle or furnace is activated for cylinder B	95	Switch	0 or 1	50	R	0 = Not Activated 1 = Activated
nvoFault	Reads the status of a fault on the unit	95	Switch	0 or 1	42	R	0 = No Fault 1 = Fault
nvoService	Reads the status of a service request on the unit	95	Switch	0 or 1	41	R	0 = No Service Required 1 = Service Required
nvoStatusCylA	Reads the status of the unit for cylinder A	81	Lev_percent	0 - 9	1	R	0 = Humidifying 1 = Idle 2 = Idle Drain 3 = Keepwarm 4 = Filling 5 = Draining 6 = Disabled 7 = Safety Loop 8 = Warning 9 = Fault 10 = blower pack
nvoStatusCylB	Reads the status of the unit for cylinder B	95	Switch	0 - 9	N/A	R	0 = Humidifying 1 = Idle 2 = Idle Drain 3 = Keepwarm 4 = Filling 5 = Draining 6 = Disabled 7 = Safety Loop 8 = Warning 9 = Fault 10 = blower pack
nvoSysDem_A	Reads the demand for cylinder A	81	Lev_percent	0 – 100	14	R	*Demand Mode:* Summation of Input_A1 and Input_A2 *RH Mode:* PID calculation

Parameter Name	Description	SNVT #	SNVT	Range	NV Index	R/W	Details
nvoSysDem_B	Reads the demand for cylinder B	81	Lev_percent	0 – 100	29	R	*Demand Mode:* Summation of Input_B1 and Input_B2 *RH Mode:* PID calculation
nvoSecurity_A	Reads the status of the safety loop for cylinder A	95	Switch	0 or 1	45	R	0 = Open 1 = Closed
nvoSecurity_B	Reads the status of the safety loop for cylinder B	95	Switch	0 or 1	48	R	0 = Open 1 = Closed
nvoHourOpt_A	Reads operating time for cylinder A	124	SNVT_time_hour	0 - 5000	10	R	Displays the total time (hrs) cylinder A has been running since last reset
nvoHourOpt_B	Reads operating time for cylinder B	124	SNVT_time_hour	0 - 5000	25	R	Displays the total time (hrs) cylinder B has been running since last reset
nvoHourWeight_A	Reads the weighted time for cylinder A	124	SNVT_time_hour	0 - 5000	11	R	An equated run time (hrs) based on Run_Time_A x System_Demand_A
nvoHourWeight_B	Reads the weighted time for cylinder B	124	SNVT_time_hour	0 - 5000	26	R	An equated run time (hrs) based on Run_Time_B x System_Demand_B

Appendix C

Protocol Implementation Conformance Statement for BACnet/IP

Basic Information

Document Revision:	1.00
Issue Date:	February 25, 2015
Vendor Name:	Nortec
Product Name:	Integrated Controller
Firmware Revision:	2.8.4.2 - 2.9.4.4
BACnet Protocol Revision:	Version 1, Revision 10
Product Description:	The products are humidifiers. The products support BACnet slave mode, over MS/TP and BACnet IP.

BACnet Standardized Device Profile

☒B-SS	BACnet Smart Sensor
☒B-SA	BACnet Smart Actuator

BACnet Interoperability Building Blocks Supported

☒DS-RP-B	Data Sharing, Read Property, B	Execute
☒DS-WP-B	Data Sharing, Write Property, B	Execute
☒DS-COV-B	Data Sharing, Change of Value, B	Execute
☒DM-DOB-B	Who-Has, B	Execute
☒DM-DDB-B	Who-Is, B	Execute

Standard Object Types

- Analog Input, Analog Output, Analog Value
- Multi State input, Multi State output, Multi State Value
- Device

The following conditions apply to all object types

- Objects may be neither dynamically created nor deleted.
- No proprietary properties are implemented.
- No properties may be written unless required by the BACnet specification.
- No properties have range restrictions beyond those in the BACnet specification.

Data Link Layer Options

- BACnet IP

Segmentation Capability

Segmentation is not supported.

Device Address Binding

Static address binding is not supported.

Network Options

No networking options are supported.

Character Sets Supported

☒ ANSI X3.4

Protocol Implementation Conformance Statement for BACnet MS/TP

Basic Information

Document Revision:	1.04
Issue Date:	March 3, 2015
Vendor Name:	Nortec
Product Name:	Integrated Controller
Firmware Revision:	2.8.4.2 - 2.9.4.4
BACnet Protocol Revision:	Version 1, Revision 10
Product Description:	The products are humidifiers. The products support BACnet slave mode, over MS/TP and BACnet IP.

BACnet Standardized Device Profile

☒B-SS	BACnet Smart Sensor
☒B-SA	BACnet Smart Actuator

BACnet Interoperability Building Blocks Supported

☒DS-RP-B	Data Sharing, Read Property, B	Execute
☒DS-WP-B	Data Sharing, Write Property, B	Execute
☒DS-COV-B	Data Sharing, Change of Value, B	Execute

Standard Object Types

- Analog Input, Analog Output, Analog Value
- Multi State input, Multi State output, Multi State Value
- Device

The following conditions apply to all object types

- Objects may be neither dynamically created nor deleted.
- No proprietary properties are implemented.
- No properties may be written unless required by the BACnet specification.
- No properties have range restrictions beyond those in the BACnet specification.

Data Link Layer Options

- MS/TP slave, baud rate : 9600, 19200, 38400, 115200

Segmentation Capability

Segmentation is not supported.

Device Address Binding

Static address binding is not supported.

Network Options

No networking options are supported.

Character Sets Supported

☒ ANSI X3.4

Protocol Implementation Conformance Statement for Modbus

Configuration

Baud rate: 9600, 19200, 38400, 115200
Modbus Address: 10 (Default)
Parity: Even

Base Option Parameters

Parameter Name	Modbus Start Address
Fan_activate_a	30009
Fan_activate_b	30019
Safety_loop_a	30007
Blower_pack_a	30008
Safety_loop_b	30017
Blower_pack_b	30018
Source	40014
Control_mode_ch1	40015
Control_channels	40016
Remote_disable	40001
Service_a	30024
Error_a	30025
Enable_a	30002
Enable_b	30012
Service_a	30024

Base Numerical Parameters

Parameter Name	Modbus Start Address
Input_a1	30004
Input_a2	30005
Input_b1	30014
Input_b2	30015
Ic_date	40504
Manual_capacity_a	40002
Sp_chan_a1	40003
Sp_chan_a2	40004
Sp_chan_b1	40008
Sp_chan_b2	40009
Manual_capacity_b	40007
Modbus_addr	40012
Bms_timeout	40013
Dinput_a1	40005
Dinput_a2	40006
Dinput_b1	40010
Dinput_b2	40011
System_demand_a	30006
System_demand_b	30016
Run_time_a	30010

Weighted_hours_a	30011
Run_time_b	30020
Weighted_hours_b	30021
Days_until_serv_a	30012
Days_until_insp_a	30013
Days_until_serv_b	30022
Days_until_insp_b	30023
No_pin	40600

Application Option Parameters

Parameter Name	Modbus Start Address
Humidifier_status_a	30003
Humidifier_status_b	30026

Protocol Implementation Conformance Statement for BACnet BTL Certified

1.1 ProtoCessor-ASP-485

1.1.1 BACnet Standarized Device Profile (Annex L) – [Note: ProtoCessor is a gateway device]

X	BACnet Smart Sensor (B-SS)
X	BACnet Smart Actuator (B-SA)
X	BACnet Application Specific Controller (B-ASC)

1.1.2 BACnet Interoperability Building Blocks Supported (Annex K):

X	K.1.2 BIBB - Data Sharing - ReadProperty-B (DS-RP-B)
X	K.1.4 BIBB - Data Sharing - ReadPropertyMultiple-B (DS-RPM-B)
X	K.1.8 BIBB - Data Sharing - WriteProperty-B (DS-WP-B)
X	K.5.2 BIBB - Device Management - Dynamic Device Binding-B (DM-DDB-B)

1.1.3 Segmentation Capability:

None

1.1.4 Standard Object Types Supported

X	Device Object
X	Analog Input
X	Analog Output
X	Analog Value
X	Binary Input
X	Binary Output
X	Binary Value
X	Multi State Input
X	Multi State Output
X	Multi State Value

1.1.5 Unsupported Properties and Restrictions

1. Does not support BACnet CreateObject
2. Does not support BACnet DeleteObject
3. Does not support any optional properties
4. No additional writeable properties exist
5. No proprietary properties exist
6. No range restrictions exist

1.1.6 Data Link Layer Options:

[X]	MS/TP master (Clause 9), baud rate up to 76.8 Kbps
[X]	MS/TP slave (Clause 9), baud rate up to 76.8 Kbps

1.1.7 Device Address Binding:

Not supported

1.1.8 Networking Options:

Not supported.

1.1.9 Character Sets Supported:

Where support for multiple character sets is indicated, this does not imply that they can all be supported simultaneously.

[X]	ANSI X3.4.	[ ]	ISO 10646 (ICS-4)
[ ]	ISO 10646 (UCS-2).	[ ]	ISO 8859-1
[ ]	IBM/Microsoft DBCS	[ ]	JIS C

1.2 ProtoCessor-FFP-485, ProtoCessor FFP-ETH, ProtoNode

1.2.1 BACnet Standarized Device Profile (Annex L) – [Note: ProtoCessor is a gateway device]

X	BACnet Smart Sensor (B-SS)
X	BACnet Smart Actuator (B-SA)
X	BACnet Application Specific Controller (B-ASC)

1.2.2 BACnet Interoperability Building Blocks Supported (Annex K):

X	K.1.1 BIBB - Data Sharing - ReadProperty-A (DS-RP-A)	
X	K.1.2 BIBB - Data Sharing - ReadProperty-B (DS-RP-B)	
X	K.1.3 BIBB - Data Sharing - ReadPropertyMultiple-A (DS-RPM-A)	
X	K.1.4 BIBB - Data Sharing - ReadPropertyMultiple-B (DS-RPM-B)	
X	K.1.7 BIBB - Data Sharing - WriteProperty-A (DS-WP-A)	
X	K.1.8 BIBB - Data Sharing - WriteProperty-B (DS-WP-B)	
X	K.1.12 BIBB - Data Sharing - COV-B (DS-COV-B)	Unsupported for BACnet/MSTP on FFP-485
X	K.2.2 BIBB - Alarm and Event-Notification Internal-B (AE-N-I-B)	Unsupported for BACnet/MSTP on FFP-485
X	K.2.5 BIBB - Alarm and Event-ACK-B (AE-ACK-B)	Unsupported for BACnet/MSTP on FFP-485
X	K.2.11 BIBB - Alarm and Event-Information-B (AE-INFO-B)	Unsupported for BACnet/MSTP on FFP-485
X	K.5.1 BIBB - Device Management - Dynamic Device Binding-A (DM-DDB-A)	
X	K.5.2 BIBB - Device Management - Dynamic Device Binding-B (DM-DDB-B)	
X	K.5.3 BIBB - Device Management - Dynamic Device Binding-A (DM-DOB-A)	
X	K.5.4 BIBB - Device Management - Dynamic Device Binding-B (DM-DOB-B)	

1.2.3 Segmentation Capability:

None

1.2.4 Standard Object Types Supported

X	Device Object	
X	Analog Input	
X	Analog Output	
X	Analog Value	
X	Binary Input	
X	Binary Output	
X	Binary Value	
X	Multi State Input	
X	Multi State Output	
X	Multi State Value	
X	Notification Class Object	Unsupported for BACnet/MSTP on FFP-485

1.2.5 Unsupported Properties and Restrictions

1. Does not support BACnet CreateObject
2. Does not support BACnet DeleteObject
3. Does not support any optional properties
4. No additional writeable properties exist
5. No proprietary properties exist
6. No range restrictions exist
7. Client Driver can only read Present Value property

1.2.6 Data Link Layer Options:

[X]	BACnet IP, (Annex J)
[X]	Point-to-Point, EIA 232 (Clause 10), baud rate up to 57.6 Kbps
[X]	ISO 8802-3, Ethernet (Clause 7)
[X]	MS/TP master (Clause 9), baud rate up to 76.8 Kbps
[X]	MS/TP slave (Clause 9), baud rate up to 76.8 Kbps

1.2.7 Device Address Binding:

Not supported

1.2.8 Networking Options:

Not Supported.

1.2.9 Character Sets Supported:

Where support for multiple character sets is indicated, this does not imply that they can all be supported simultaneously.

[X]	ANSI X3.4.	[ ]	ISO 10646 (ICS-4)
[ ]	ISO 10646 (UCS-2).	[ ]	ISO 8859-1
[ ]	IBM/Microsoft DBCS	[ ]	JIS C

Warranty

Nortec Humidity Inc. and/or Nortec Humidity Ltd. (hereinafter collectively referred to as THE COMPANY), warrant for a period of two years after installation or 30 months from manufacturer's ship date, whichever date is earlier, that THE COMPANY's manufactured and assembled products, not otherwise expressly warranted (with the exception of the cylinder), are free from defects in material and workmanship. No warranty is made against corrosion, deterioration, or suitability of substituted materials used as a result of compliance with government regulations.

THE COMPANY's obligations and liabilities under this warranty are limited to furnishing replacement parts to the customer, F.O.B. THE COMPANY's factory, providing the defective part(s) is returned freight prepaid by the customer. Parts used for repairs are warranted for the balance of the term of the warranty on the original humidifier or 90 days, whichever is longer.

The warranties set forth herein are in lieu of all other warranties expressed or implied by law. No liability whatsoever shall be attached to THE COMPANY until said products have been paid for in full and then said liability shall be limited to the original purchase price for the product. Any further warranty must be in writing, signed by an officer of THE COMPANY.

THE COMPANY's limited warranty on accessories, not of the companies manufacture, such as controls, humidistats, pumps, etc. is limited to the warranty of the original equipment manufacturer from date of original shipment of humidifier.

THE COMPANY makes no warranty and assumes no liability unless the equipment is installed in strict accordance with a copy of the catalog and installation manual in effect at the date of purchase and by a contractor approved by THE COMPANY to install such equipment.

THE COMPANY makes no warranty and assumes no liability whatsoever for consequential damage or damage resulting directly from misapplication, incorrect sizing or lack of proper maintenance of the equipment.

THE COMPANY makes no warranty and assumes no liability whatsoever for damage resulting from freezing of the humidifier, supply lines, drain lines, or steam distribution systems.

THE COMPANY retains the right to change the design, specification and performance criteria of its products without notice or obligation.

U.S.A.
2700 90th St.
Sturtevant, WI 53177

835 Commerce Park Dr.
Ogdensburg, NY 13669-2209

CANADA
2740 Fenton Road
Ottawa, Ontario K1T 3T7

TEL: 1.866.NORTEC1
FAX: 613.822.7964

EMAIL: nortec@humidity.com
WEBSITE: www.humidity.com

nortec