

ZN253 Controller

Technical Instructions

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What is the ZN253 controller?

The ZN253 controller is used for zone control.

Driver and control program

Driver	DRV_ZN ¹
Maximum number of control programs	1
Maximum number of BACnet objects ²	300

¹ To replace a U line controller with a ZN253, use the driver DRV_ZNPLUSU_<latest version>. See the *ZN U Line Emulation Technical Instructions*.

² Depends on available memory.

Specifications

Power	24 Vac $\pm 10\%$, 50–60 Hz, 12 VA 26 Vdc (25 V min, 30 V max)
BACnet port (This port may be labeled CMnet.)	For communication with the controller network using ARC156 or MS/TP (9600 bps–76.8 kbps)
Rnet port	Supports: • Up to 5 ZS sensors • One Wireless Adapter that communicates with up to 5 wireless sensors • One Equipment Touch • Up to 4 RS Standard sensors and one RS Plus, RS Pro, or RS Pro-F sensor. NOTE ZS sensors, a Wireless Adapter, and an Equipment Touch can share the Rnet, but not RS sensors.
LStat port	For LogiStat and LogiStat Plus zone sensors. The LogiStat port uses two universal inputs. NOTE The ZN253 does not support the LogiStat Pro. Use an RS Pro on the Rnet port instead.
Local Access port	For system start-up and troubleshooting
Flow sensor port	Provides flow inputs for a USF or UDF flow sensor.
Inputs	5 inputs configurable for thermistor or dry contact. Inputs 1 and 2 are also configurable for 0–5 Vdc. Inputs 4 and 5 are used when a LogiStat sensor is connected, but are available if an RS room sensor is connected.
Input resolution	10 bit A/D

Input pulse frequency	10 pulses per second. Minimum pulse width (on or off time) required for each pulse is 50 msec.
Digital outputs	2 digital outputs, relay contacts rated at 1 A max. @ 24 Vac/Vdc. Configured normally open.
Analog outputs	3 analog outputs, 0–10 Vdc (5 mA max)
Output resolution	8 bit D/A
Memory	512 kB non-volatile battery-backed RAM, 1 MB Flash memory, 16-bit memory bus
Battery	10-year Lithium CR2032 battery retains the following data for a maximum of 10,000 hours during power outages: control programs, editable properties, schedules, and trends.
Protection	Incoming power and network connections are protected by non-replaceable internal solid-state polyswitches that reset themselves when the condition that causes a fault returns to normal. The power, network, input, and output connections are also protected against transient excess voltage/surge events lasting no more than 10 msec.
BT485 connector	You attach a BT485 (not included) to a controller at the beginning and end of a network segment to add bias and to terminate a network segment.
Status indicators	LED's indicate status of communications, running, errors, power, and digital outputs
Environmental operating range	0 to 130 °F (-17.8 to 54.4 °C), 10–90% relative humidity, non-condensing
Physical	Rugged GE C2950 Cyclopy plastic
Overall dimensions	Width: 5 1/16 in. (12.9 cm) Height: 5 11/16 in. (14.4 cm)
Mounting dimensions	5 9/16" (14.1 cm) between mounting slot centerlines
Weight	0.6 lbs (0.27 kg)
BACnet support	Conforms to the BACnet Advanced Application Controller (B-AAC) Standard Device Profile as defined in ANSI/ASHRAE Standard 135-2012 (BACnet) Annex L, Protocol Revision 9
Listed by	UL-916 (PAZX), cUL-916 (PAZX7), FCC Part 15-Subpart B-Class A, CE

Inputs

The ZN253 has 5 inputs that accept the following signal types.

These inputs...	Support this signal type...	Description
All	Thermistor	Precon type 2 (10 kOhm at 77 °F). Input voltage for IN-4: 1 to 2.52 Vdc Input voltage for all other inputs: 0.33 to 2.52 Vdc
All	Dry contact	A 3.3 Vdc wetting voltage detects contact position, resulting in a 0.3 mA maximum sense current when the contacts are closed.
IN-1, IN-2	0–5 Vdc	The output impedance of a 0–5 Vdc source must not exceed 100 Ohms. The input impedance of the ZN253 is approximately 30 kOhm.
All	Timed local override	A momentary contact switch that overrides a schedule and turns equipment on for a defined period of time. The override time added for each push of the button and the maximum allowable On time are software adjustable.
All	Pulse counter ¹	Pulse counting up to 10 pulses per second. Minimum pulse width (on or off time) required for each pulse is 50 msec.
IN-4, IN-5	LogiStat ²	IN-4: See Thermistor. IN-5: Setpoint adjust. Input voltages should be from 1.4 to 3.4 Vdc.

¹ The ZN253 can perform pulse counting for dry contact or voltage inputs if you assign the input to a Pulse to Analog Input microblock. See *To assign inputs or outputs to points* (page 16).

² A LogiStat sensor connected to the ZN253 uses IN-4 and IN-5. A ZS or RS sensor connected to the **Rnet** port does not use these inputs.

Digital outputs

The ZN253 has 2 digital outputs. You can connect each output to a maximum of 24 Vac/Vdc. Each output is a dry contact rated at 1 A, 24 V maximum and is normally open.

Analog outputs

The ZN253 has 3 analog outputs that support voltage devices from 0-10 Vdc. The controlled device must have a minimum of 2000 Ohms resistance measured from its input to ground and must share the same ground as the controller.

Zone sensors

Automated Logic® wireless sensors

You can connect a Wireless Adapter to ZN253's **Rnet** port. The Wireless Adapter communicates with up to 5 wireless sensors. When using wireless sensors, the Rnet can have:

- Up to 5 wireless and ZS sensors (any combination)
- One Wireless Adapter
- One Equipment Touch

ZS Sensors

You can wire up to 5 ZS sensors to the ZN253's Rnet port.

RS sensors

You can wire RS sensors to the ZN253's **Rnet** port. An Rnet can consist of any of the following combinations of devices wired in a daisy-chain or star configuration:

- 1 RS Plus, RS Pro, or RS Pro-F
- 1–4 RS Standards
- 1–4 RS Standards, and 1 RS Plus, RS Pro, or RS Pro-F

LogiStats

You can wire a LogiStat or LogiStat Plus to the ZN253's **LStat** port.

NOTES

- The ZN253 does not support the LogiStat Pro.
- A LogiStat or LogiStat Plus wired to the ZN253 cannot be used for local access.

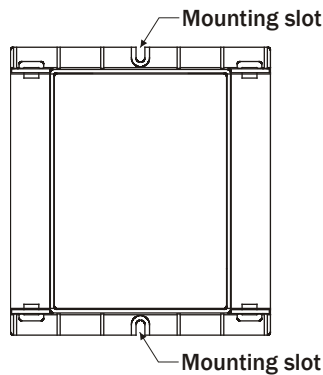
Equipment Touch devices

You can wire an Equipment Touch to the ZN253's Rnet port to view or change the controller's property values, schedule equipment, view trends and alarms, and more, without having to access the system's server. The Rnet can have one Equipment Touch, one Wireless Adapter, and up to 5 ZS sensors. RS sensors cannot share the Rnet with an Equipment Touch.

To mount the ZN253

NOTE You must mount the ZN253 inside the building. The ZN253's warranty will be void if you mount it outside.

Screw the ZN253 into an enclosed panel using the mounting slots shown below. Leave about 2 in. (5 cm) on each side of the controller for wiring.



Wiring for power



WARNING Do not apply line voltage (mains voltage) to the controller's ports and terminals.



CAUTIONS

- The ZN253 is powered by a Class 2 power source. Take appropriate isolation measures when mounting it in a control panel where non-Class 2 circuits are present.
- Automated Logic® controllers can share a power supply as long as you:
 - Maintain the same polarity.
 - Use the power supply only for Automated Logic® controllers.

To wire for power

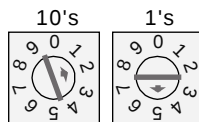
- 1 Remove power from the power supply.
- 2 Pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **24 Vac**.
- 3 Connect the transformer wires to the screw terminal connector.
- 4 Apply power to the power supply.
- 5 Measure the voltage at the ZN253's power input terminals to verify that the voltage is within the operating range of 21.6–26.4 Vac.
- 6 Connect a 4-inch (10.2 cm) wire from **Gnd** to the control panel.
- 7 Insert the screw terminal connector into the ZN253's power terminals.
- 8 Verify that the **Power** LED is on and the **Run** LED is blinking.

To address the ZN253

You must give the ZN253 an address that is unique on the network. You can address the ZN253 before or after you wire it for power.

- 1 If the ZN253 has been wired for power, pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **24 Vac**. The controller reads the address each time you apply power to it.
- 2 Using the rotary switches, set the controller's address to match the **Address** in the controller's properties dialog box in SiteBuilder. Set the **Tens (10's)** switch to the tens digit of the address, and set the **Ones (1's)** switch to the ones digit.

EXAMPLE If the controller's address is 25, point the arrow on the **Tens (10's)** switch to 2 and the arrow on the **Ones (1's)** switch to 5.



Wiring for communications

The ZN253 communicates using BACnet on the following types of network segments:

- ARC156 communicating at 156 kbps
- MS/TP communicating at 9600 bps, 19.2 kbps, 38.4 kbps, or 76.8 kbps

NOTE ARC156 is a unique implementation of the industry standard ARCNET. For a summary of differences between ARCNET and ARC156, see the *ARC156 Wiring Technical Instructions*.

Wiring specifications

For...	Use...	Maximum Length
ARC156 ¹ and MS/TP ²	22 AWG, low-capacitance, twisted, stranded, shielded copper wire	2000 feet (610 meters)

¹ See the *ARC156 Wiring Technical Instructions*.

² See the *MS/TP Networking and Wiring Technical Instructions*.



WARNING Do not apply line voltage (mains voltage) to the controller's ports and terminals.

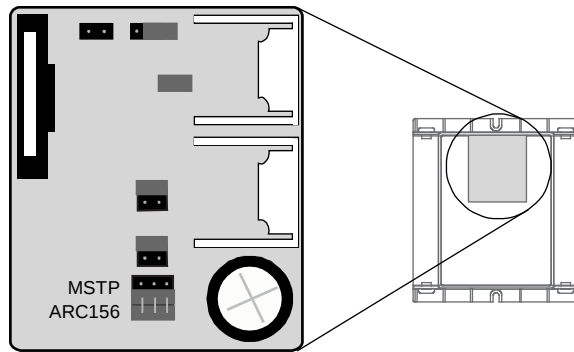
To wire the ZN253 for communications

- 1 Pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **24 Vac**.
- 2 Check the communications wiring for shorts and grounds.
- 3 Connect the communications wiring to the controller's screw terminals labeled **Net +**, **Net -**, and **Shield**.

NOTE Use the same polarity throughout the network segment.

- 4 Set the communication type and baud rate.

For...	Set Communications Selection Jumper to... (See figure below)	Set DIP switches 1 and 2 to...
ARC156	ARC156	N/A. Baud rate will be 156 kbps regardless of the DIP switch settings.
MS/TP	MSTP	The appropriate baud rate. See the MSTP Baud diagram on the controller.



NOTE Use the same baud rate for all controllers on the network segment.

- 5 If the ZN253 is at either end of a network segment, connect a BT485 to the ZN253.
- 6 Insert the power screw terminal connector into the ZN253's power terminals.
- 7 Verify communication with the network by viewing a Module Status report in the WebCTRL® interface.

Wiring inputs and outputs

Wiring specifications

Input wiring

Input	Maximum length	Minimum gauge	Shielding
0–5 Vdc	1000 feet (305 meters)	26 AWG	Shielded
Thermistor Dry contact	1000 feet (305 meters)	22 AWG	Shielded
ZS sensor RS sensor Wireless Adapter for wireless sensors Equipment Touch	See <i>Wiring devices to the ZN253's Rnet port</i> (page 11).		
LogiStat sensor	See <i>Wiring a LogiStat sensor to the ZN253</i> (page 13).		

Output wiring

To size output wiring, consider the following:

- Total loop distance from the power supply to the controller, and then to the controlled device
NOTE Include the total distance of actual wire. For 2-conductor wires, this is twice the cable length.
- Acceptable voltage drop in the wire from the controller to the controlled device
- Resistance (Ohms) of the chosen wire gauge
- Maximum current (Amps) the controlled device requires to operate

To wire inputs and outputs



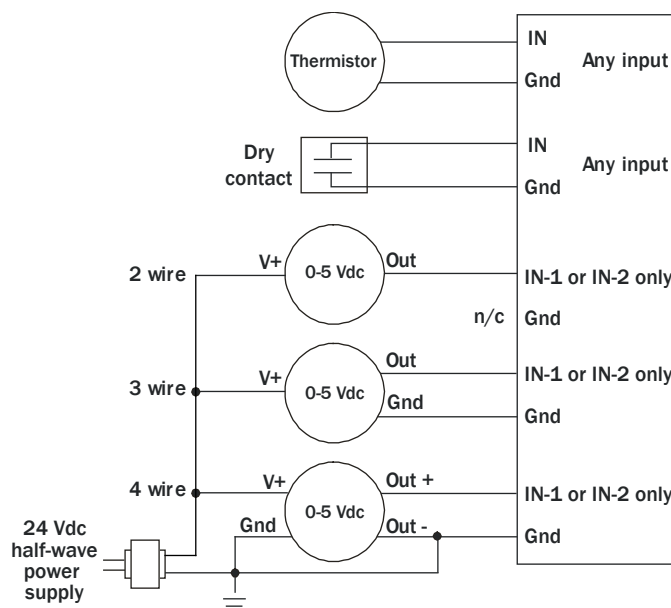
WARNING Do not apply line voltage (mains voltage) to the controller's ports and terminals.

- 1 Verify that the ZN253's power and communications connections work properly.
- 2 Pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **24 Vac**.

3 Connect the input wiring to the screw terminals on the ZN253.

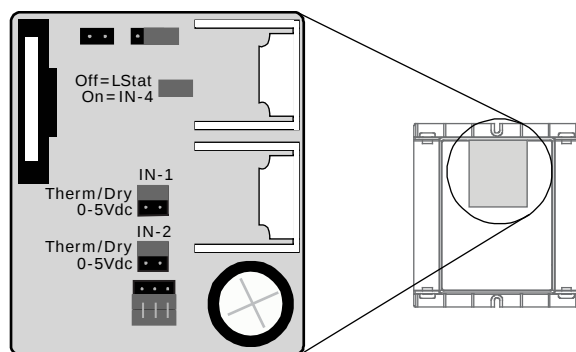
NOTES

- Connect the shield wire to the **GND** terminal with the ground wire.
- **IN-4** and **IN-5** share the **GND** terminal above **IN-4**.

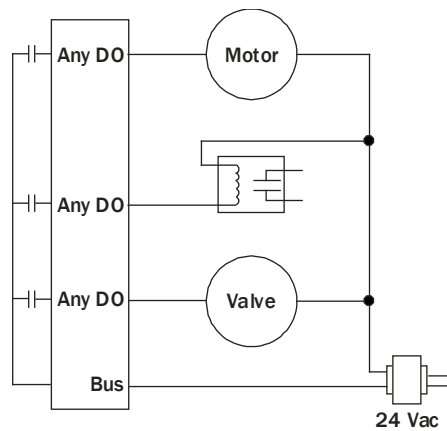


4 Set the appropriate jumpers on the ZN253.

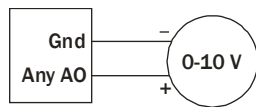
To use...	For...	
IN-1 or IN-2	Thermistor Dry contact 0-5 Vdc	Set jumpers IN-1 or IN-2 to the type of signal the input will receive. See figure below.
IN-4 or IN-5	Thermistor Dry contact	Verify the LStat/IN-4 jumper is on. See figure below.
IN-4 and IN-5	LogiStat	See <i>To wire a LogiStat sensor</i> (page 14).



- 5** Connect the digital output wiring to the screw terminals on the ZN253 and to the controlled device.



- 6** Connect the analog output wiring to the screw terminals on the ZN253 and to the controlled device.



- 7** Insert the power screw terminal connector into the ZN253's power terminals.

Wiring devices to the ZN253's Rnet port

You can wire the following devices to the ZN253's Rnet port in a daisy-chain or star configuration:

- *ZS or RS sensors* (page 11)
- *Wireless Adapter* (page 12) that communicates with wireless sensors
- *Equipment Touch* (page 13)

NOTE ZS sensors, a Wireless Adapter, and an Equipment Touch can share the same Rnet, but not RS sensors.

The Rnet communicates at a rate of 115 kbps.

Rnet wiring specifications

NOTE Use the specified type of wire and cable for maximum signal integrity.

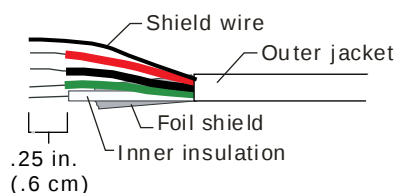
Description	4 conductor, shielded or unshielded, CMP, plenum rated cable
Conductor	22 AWG (7x0096) bare copper
Maximum length	500 feet (152 meters)
Insulation	Low-smoke PVC (or equivalent)
Color Code	Black, white, green, red
Shielding	If shielded, Aluminum/Mylar shield (100% coverage) with TC drain wire
UL temperature rating	32–167 °F (0–75 °C)
Voltage	300 Vac, power limited
Listing	UL: NEC CL2P, or better

To wire a ZS or an RS sensor to the ZN253

For complete sensor installation instructions, including ZS sensor power requirements, see:

- *ZS Sensors Technical Instructions*
- *RS Sensors Technical Instructions*

- 1 Remove power from the ZN253.
- 2 Partially cut, then bend and pull off the outer jacket of the Rnet cable(s). Do not nick the inner insulation.

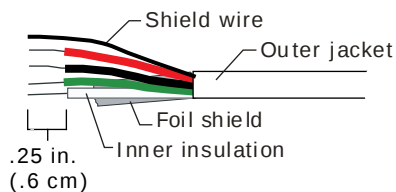


- 3 Strip about .25 inch (.6 cm) of the inner insulation from each wire.
- 4 Wire each terminal on the ZN253's **Rnet** port to the terminal of the same name on the sensor.
NOTE If using shielded wire, connect the shield wire and the ground wire to the **Gnd** terminal.
- 5 Apply power to the ZN253.

To wire a Wireless Adapter to the ZN253

NOTES

- The Wireless Adapter requires a 24 Vac power supply. It is not powered by the Rnet.
 - If the Wireless Adapter will be:
 - Daisy-chained on the Rnet with ZS sensors or an Equipment Touch, use the standard 4-conductor Rnet cable.
 - The only device on the Rnet, you can use a 3-conductor cable instead of the standard 4-conductor Rnet cable.
 - For complete Wireless Adapter installation instructions, see the *Wireless Sensors Technical Instructions*.
- 1 Remove power from the ZN253.
 - 2 Partially cut, then bend and pull off the outer jacket of the Rnet cable(s). Do not nick the inner insulation.



- 3 Strip about .25 inch (.6 cm) of the inner insulation from each wire.
- 4 Wire the ZN253's **Rnet+**, **Rnet-**, and **Gnd** terminals to the terminals of the same name on the Wireless Adapter's Rnet connector.



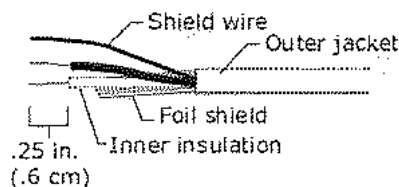
- NOTE** If using shielded wire, connect the shield wire and the ground wire to the **Gnd** terminal.
- 5 Apply power to the ZN253.

To wire an Equipment Touch to the ZN253

NOTES

- The Equipment Touch requires a 24 Vac power supply. It is not powered by the Rnet.
- If the Equipment Touch will be:
 - Daisy-chained on the Rnet with ZS sensors or a Wireless Adapter, use the standard 4-conductor Rnet wiring and follow the wiring instructions *To wire a ZS or an RS sensor to the ZN253* (page 11).
 - The only device on the Rnet, you can use a 2-conductor cable instead of the standard 4-conductor Rnet cable and follow the instructions below.
- For complete Equipment Touch installation instructions including wiring diagrams, see the *Equipment Touch Installation and Setup Guide*.

- 1 Remove power from the ZN253.
- 2 Partially cut, then bend and pull off the outer jacket of the cable. Do not nick the inner insulation.



- 3 Strip about .25 inch (.6 cm) of the inner insulation from each wire.
- 4 Wire the ZN253's **Rnet+** and **Rnet-** terminals to the terminals of the same name on the Equipment Touch's connector.
NOTE If using shielded wire, connect the shield wire and the ground wire to the **Gnd** terminal.
- 5 Apply power to the ZN253.

Wiring a LogiStat sensor to the ZN253

You can wire a LogiStat or LogiStat Plus to the ZN253's **Lstat** port

For complete sensor installation instructions, see the *LogiStat Sensors Technical Instructions*.

LogiStat wiring specifications

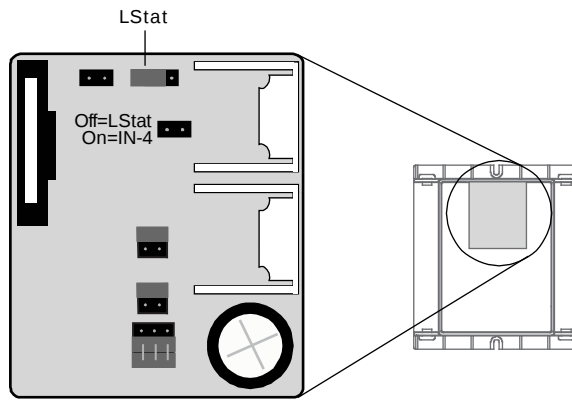
Use 22 AWG, unshielded wire, maximum length 100 feet (30 meters).

To wire a LogiStat sensor

- 1 Pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **24 Vac**.
- 2 To connect the LogiStat sensor to the ZN253's **LStat** port.

Wire this terminal on the LStat port...	To this terminal on the LogiStat sensor
Gnd	Gnd
IN-4	Temp
IN-5	SW
LED	LS5v

- 3 Remove the jumper from **LStat/IN-4** (J12 on the circuit board).



- 4 Set the **LStat/Rnet** jumper to **LStat**.
- 5 Insert the power screw terminal connector into the ZN253's power terminals.

Downloading the ZN253

Download the following items to the ZN253's battery-backed memory:

Item	Notes
Control program	Must be in WebCTRLx.x\webroot\<system_name>\programs.
DRV_ZN driver	Must be in WebCTRLx.x\webroot\<system_name>\drivers. NOTE To verify that you have the driver's latest version, go to http://accounts.automatedlogic.com/download , then select Drivers > ExecB . Compare the latest version to the ZN253's driver in SiteBuilder.
Editable properties	
Schedules	

If you change any of the above items or the ZN253's address after the initial download, you must download again. The first download takes longer than subsequent downloads.



CAUTIONS

- The ZN253 will lose stored data when you download.
- Equipment controlled by the ZN253 will shut down and restart when you download.

To download from the WebCTRL® interface

If your network is complete, you can download from any network browser. If not complete, connect a laptop with a local copy of the system database to the ZN253's local access port. See *To communicate through the local access port* (page 24).

- 1 On the WebCTRL® **Network**  tree, select the controller.
- 2 Click **Downloads**.
- 3 Do one of the following:
 - If the controller is in the Downloads list, go to step 4.
 - If the controller is not in the list:
 - a. Click **Add**.
 - b. In the pop-up, select the controller.
 - c. Select **All Content**.
 - d. Click **Add**.
 - e. Click **Close**.
- 4 Select the controller in the Downloads list.
- 5 Click **Start**.

NOTES

- If the download fails, locate and resolve the problem, then retry the download.
- You can also download a controller from the **Devices** page.

To assign inputs or outputs to points

To use an input or output, you must assign it to its corresponding point in the control program.

- 1 In the WebCTRL® **Geographic**  tree, select the equipment controlled by the ZN253.
- 2 On the **Properties** page, select the **I/O Points** tab.
- 3 In each point's **Num** field, type the number of the controller's corresponding input or output. For example, if you use DO1 on the ZN253 for the point **Fan S/S**, type 1 in the **Num** field for **Fan S/S**.

NOTES

- **Exp** (expander number) is 00 for the ZN253.
 - Do not assign the same output number to more than one point.
- 4 Enter the appropriate values for each input and output in the remaining columns. See *Input values*, *Output values*, *Resolution values* and *Offset/Polarity values* below.
NOTE You can also enter these values in the EIKON® LogicBuilder application.
 - 5 If you have not performed the initial download to the ZN253, you must download now so you can verify inputs and outputs.
 - 6 To verify each input's operation, force each sensor to a known value, then compare it to the **Value** shown on the **Properties** page on the **I/O Points** tab.
 - 7 To verify each output's operation, lock each output to a known condition on the **I/O Points** tab, then verify that the equipment operates correctly.

Input values

Input	I/O Type	Sensor/Actuator Type	Min/Max
Analog (BAI)			
0-5 Vdc	0-5 Volt	Linear Full Range	Engineering values associated with 0 Vdc (Min) and 5 Vdc (Max) ¹
Thermistor	Thermistor	Select your Thermistor type or set up and select a Non-Linear, Custom Table ²	N/A
Pulse to Analog (BPTA) ³			
Pulse Counter	Counter Input	N/A	N/A
Digital (Binary) (BBI)			
Dry Contact	Dry Contact	N/A	N/A

¹ The sensor reads a value and sends a corresponding signal (Volt, mA, or psi) to the ZN253's physical input. The Analog Input microblock uses the **Min** and **Max** values to linearly translate the signal into the engineering value used in subsequent control logic. For example, set **Min** to 0 and **Max** to 10 for a 4-20 mA sensor that measures velocity from 0.0 to 10.0 inches/second so that when the input reads 4 mA, the microblock outputs a value of 0. Similarly, when the input reads 8 mA, the microblock outputs a value of 2.5.

² You can set up a *custom translation table* (page 23) on the driver's **Custom Translation Tables** pages in the WebCTRL® interface.

³ The control program must have one Pulse to Analog Input microblock for each pulse counting input.

Output values

Output	I/O Type	Sensor/Actuator Type	Min/Max
Analog (BAO)			
0-10 Vdc	Electrical 0-10 Volt	Linear Full Range	Engineering values associated with 0 Vdc (Min) and 10 Vdc (Max) ¹
2-10 Vdc	Electrical 0-10 Volt	Linear w/Offset, 2-10 Volts	Engineering values associated with 2 Vdc (Min) and 10 Vdc (Max) ¹
Digital (Binary) (BBO)			
Relay	Relay/Triac Output	N/A	N/A

¹ The Analog Output microblock uses the **Min** and **Max** values to linearly translate its EIKON® LogicBuilder wire value into a physical output signal (Volt, mA, or psi) sent from the ZN253 to an actuator. For example, set **Min** to 0 and **Max** to 100 for an Analog Output microblock that receives a 0 to 100% open signal from a PID microblock and that controls a 0-10 Vdc actuator so that when the PID signal is 100%, the ZN253 output is 10 Vdc. Similarly, when the PID signal is 50%, the ZN253 output is 5 Vdc.

Resolution values

Resolution is not particular to a type of input or output, but the driver handles analog and digital (binary) inputs and outputs differently. To set these values appropriately, you should understand how the driver uses them.

Resolution	Notes
Analog Input (BAI)	The driver truncates the microblock's present value according to the resolution. EXAMPLE If the calculated present value is 13.789 and you set the Resolution to 0.1, the control program uses 13.7 for any calculations downstream from the microblock.
Analog Output (BAO)	The driver truncates the wire input value to the microblock before performing any scaling calculations. EXAMPLE If the wire input value is 13.789 and you set the Resolution to 0.1, the microblock uses 13.7 for any scaling calculations.
Digital Inputs and Outputs	N/A

Offset/Polarity values

Offset/Polarity is not particular to a type of input or output, but the driver handles analog and digital (binary) inputs and outputs differently. To set these values appropriately, you should understand how the driver uses them.

Offset/Polarity	Notes
Analog Input (BAI)	Offset value (positive or negative) adds a fine adjustment to a sensor reading after all scaling for calibration. EXAMPLE If a sensor reads 74.9°F when the actual measured value is 73.6°F, enter an Offset of -1.3 to calibrate the sensor to the measured value.
Analog Output (BAO)	You can use the Offset value (positive or negative) to calibrate an output, but you generally do not need to. If used, the driver adds the offset value to the wire input value before performing any scaling calculations to determine the ZN253's output.
Digital (Binary) Input (BBI)	Polarity determines the microblock's present value when no signal is received from the equipment. When no signal is received from the equipment, if Polarity is set to: normal —present value is off reversed —present value is on
Digital (Binary) Output (BBO)	Polarity determines the ZN253's output based on the control program's signal to the microblock. When the control program's signal to the microblock is on , if Polarity is set to: normal —output is on reversed —output is off NOTE Regardless of Polarity , the output will be off if the ZN253 loses power.

Using a flow sensor

In a single duct system, the ZN253 controls airflow in the zone using a USF flow sensor and an actuator. In a dual duct system, the ZN253 controls airflow in the zone using a UDF flow sensor and two actuators. Each actuator is connected to 2 digital outputs or 1 analog output.

To connect duct tubes to the flow sensor

USF

- 1 Connect the duct's total pressure tube to the USF's **High** connector.
- 2 Connect the duct's static pressure tube to the USF's **Low** connector.

UDF

Follow the procedure for a USF, but connect one duct's tubes to the UDF's **Flow #1** connectors and the other duct's tubes to the UDF's **Flow #2** connectors.

To wire the flow sensor to the ZN253

Use the cable included with the flow sensor (Automated Logic® part #235012) or a 20 AWG, 4-conductor cable, maximum length 4 feet (1.22 meters).

- 1 Turn off the controller's power.
- 2 Do one of the following:
 - If using the cable included with the flow sensor, connect one end of the cable to the flow sensor's 4-pin connector and the other end of the cable to the controller's 4-pin flow sensor connector.
 - If using a different cable:

To this terminal on the flow sensor...	Wire this terminal on the controller...
1	Flow 2
2	GND
3	+10V
4	Flow 1

To set up the Airflow Control microblock

The ZN253's control program must include one Airflow Control microblock for a single duct system or two of the microblocks for a dual duct system. Each Airflow Control microblock's **Damper Pos** output must have one Floating Motor microblock or an Analog Output microblock connected to it.

You must set up the Airflow Control microblock for each flow sensor.

For a single duct system

- 1 In the WebCTRL® interface on the control program's **Logic** page, select the Airflow Control microblock.
- 2 On the **Details** tab in the **Flow Sensor** field under **Hardware Configuration**, select **External flow sensor**.
- 3 In the **Damper Actuator** field, select **External actuator**.
- 4 In the **Input Number** field, type 1.
- 5 In the **I/O Type** field, select **Flow Input**.
- 6 At the bottom of the **Details** tab, click the plus sign (+) to the left of **Flow Input (AI) Configuration**.
- 7 In the **Sensor Type** field under **Calibration**, select **No Translation**.

For a dual duct system

- 1 In the WebCTRL® interface on the control program's **Logic** page, select the Airflow Control microblock for Flow #1.
- 2 On the **Details** tab in the **Flow Sensor** field under **Hardware Configuration**, select **External flow sensor**.
- 3 In the **Damper Actuator** field, select **External actuator**.
- 4 In the **Input Number** field, type 1.
- 5 In the **I/O Type** field, select **Flow Input**.

- 6 At the bottom of the **Details** tab, click the plus sign (+) to the left of **Flow Input (AI) Configuration**.
- 7 In the **Sensor Type** field under **Calibration**, select **No Translation**.
- 8 On the **Logic** page, select the Airflow Control microblock for Flow #2.
- 9 Repeat steps 2 through 6 for Flow #2, typing 2 in step 3.

NOTE When performing test and balance, follow the steps under **Test and Balance** on the Airflow Control microblock's **Properties** page **Details** tab.

To set up the driver

After you download the driver and control program to the ZN253, you may want to change the driver's properties in the WebCTRL® interface to suit your application.

- 1 On the WebCTRL® **Network**  tree, click  to the left of your ZN253.
- 2 Click  to the left of **Driver** to see its children.
- 3 Make changes as needed on the **Properties** page for **Driver** and any of its children.

Driver

On the **Driver** page, you can change the following properties:

- Module clock synchronization and failure. See table below.
- Network Input microblock communication properties.

Module Clock	
Clock Fail Date and Time	Date and time the control program uses when controller's real-time clock is invalid.  TIP Use an occupied date and time (such as a Tuesday at 10 a.m.) so the equipment does not operate in unoccupied mode if the controller loses power during occupancy.
Time Synch Sensitivity (seconds)	When the controller receives a time sync request, if the difference between the controller's time and the time sync's time is greater than this field's value, the controller's time is immediately changed. If the difference is less than this field's value, the controller's time is slowly adjusted until the time is correct.
Network Microblocks	
Number of poll retries before Network Input Microblocks Indicate failure	The maximum number of retries after the initial attempt that a Network microblock will attempt to communicate with its target device. If unsuccessful, the point will transition to an idle state for 30 seconds before attempting to communicate again. Change this field only if directed by Technical Support.

Periodic rebinding interval	If a microblock uses a wildcard in its address, this timer determines how often the microblock will attempt to find the nearest instance of its target. For example, if an outside air temperature address uses a wildcard, a VAV application will look for the outside air temperature on the same network segment or on the nearest device containing that object.
BACnet COV Throttling	
Enable COV Throttling	Under normal circumstances, COV Throttling should be enabled to prevent excessive network traffic if an object's COV Increment is set too low. See EXCEPTION below. When enabled, if an object generates excessive COV broadcasts (5 updates in 3 seconds), the driver automatically throttles the broadcasts to 1 per second. Also, if the object's value updates excessively for 30 seconds, an alarm is sent to the WebCTRL® application listing <u>all</u> objects that are updating excessively. A Return-to-normal alarm is sent only after <u>all</u> objects have stopped updating excessively. EXCEPTION: In rare circumstances, such as process control, a subscribing object may require COV updates more frequently than once per second. For these situations, clear this checkbox, but make sure that your network can support the increased traffic. You will also need to disable the Excessive COV alarms under the driver's Common Alarms.
Trend Sampling	
Collect a daily midnight sample for all points in this controller that are sampling on COV	For values that change infrequently, select to verify at midnight daily that the point is still able to communicate trend values.
TouchScreen Control	
TouchScreen Schedule Edit Enable	Check this field to allow a user to edit this controller's schedules from an Equipment Touch's Schedules screen.

Device

On the **Device** page, you can change the following properties:

- BACnet device object properties for the ZN253
- ZN253 network communication

Configuration	NOTE The three APDU fields refer to all networks over which the ZN253 communicates.
Max Masters and Max Info Frames	Apply only if the ZN253 is on an MS/TP network.

Notification Classes

Alarms in the WebCTRL® application use Notification Class #1. A BACnet alarm's Notification Class defines:

- Alarm priority for Alarm, Fault, and Return to Normal states
- Options for BACnet alarm acknowledgment
- Where alarms should be sent (recipients)

Priorities	NOTE BACnet defines the following Network message priorities for Alarms and Events.										
	<table> <tr> <th>Priority range</th><th>Network message priority</th></tr> <tr> <td>00–63</td><td>Life Safety</td></tr> <tr> <td>64–127</td><td>Critical Equipment</td></tr> <tr> <td>128–191</td><td>Urgent</td></tr> <tr> <td>192–255</td><td>Normal</td></tr> </table>	Priority range	Network message priority	00–63	Life Safety	64–127	Critical Equipment	128–191	Urgent	192–255	Normal
Priority range	Network message priority										
00–63	Life Safety										
64–127	Critical Equipment										
128–191	Urgent										
192–255	Normal										
Priority of Off-Normal	BACnet priority for Alarms.										
Priority of Fault	BACnet priority for Fault messages.										
Priority of Normal	BACnet priority for Return-to-normal messages.										
Ack Required for Off-Normal, Fault, and Normal	Specifies whether alarms associated with this Notification Class require a BACnet Acknowledgment for Off-Normal, Fault, or Normal alarms.  TIP You can require operator acknowledgment for an Alarm or Return-to-normal message (stored in the WebCTRL® database). In the WebCTRL® interface on the Alarm > Enable/Disable tab, change the acknowledgment settings for an alarm source or an alarm category.										
Recipient List											
Recipients	The first row in this list is the WebCTRL® application. Do not delete this row. Click Add if you want other BACnet devices to receive alarms associated with this Notification Class.										
Recipient Description	Name that appears in the Recipients table.										
Recipient Type	Use Address (static binding) for either of the following: • Third-party BACnet device recipients that do not support dynamic binding • When you want alarms to be broadcast (you must uncheck Issue Confirmed Notifications). This use is rare.										
Days and times	The days and times during which the recipient will receive alarms.										
Recipient Device Object Identifier	Type the Device Instance from SiteBuilder (or from the network administrator for third-party devices) in the # field.										
Process Identifier	Change for third-party devices that use a BACnet Process Identifier other than 1. The WebCTRL® application processes alarms for any 32-bit Process Identifier.										
Issue Confirmed Notifications	Select to have a device continue sending an alarm message until it receives delivery confirmation from the recipient.										
Transitions to Send	Uncheck the types of alarms you do not want the recipient to get.										

Calendars

Calendars are provided in the driver for BACnet compatibility only. Instead, use the **Schedules** feature in the WebCTRL® interface.

Common Alarms

On these pages, you can enable/disable, change BACnet alarm properties, or set delays for the following BACnet alarms:

- Module Halted
- All Programs Stopped
- Duplicate Address
- Locked I/O
- Control Program
- Program Stopped
- Excessive COV

NOTE To set up alarm actions for controller generated alarms, see *Setting up alarm actions* in WebCTRL® Help.

Module Generated Alarm	
Description	Short message shown on the Alarms page or in an alarm action when this type of alarm is generated.
Events	
Alarm Category and Alarm Template	See <i>Customizing alarms</i> in WebCTRL® Help.
Enable	Clear these checkboxes to disable Alarm or Return to normal messages of this type from this controller.
Notification Class	Do not change this field.

Custom Translation Tables

You can set up a translation table that an analog input will use to translate the raw data from a non-linear sensor to the engineering units you want it to output on the wire. In the **Network**  tree, select **Custom Translation Table #1, #2, or #3**. The **Properties** page has instructions. For the input to use the translation table, navigate to the input in the **Geographic**  tree, select the **Details** tab, then set **Sensor Type (Scaling Method)** to **Non-Linear, Custom Table #__**.

Switch and Jumper Positions

The **Switch and Jumper Positions** page shows the current physical settings on the ZN253.

To communicate through the Local Access port

Using a computer and a USB Link Kit, you can communicate locally with the ZN253 to download or to troubleshoot.

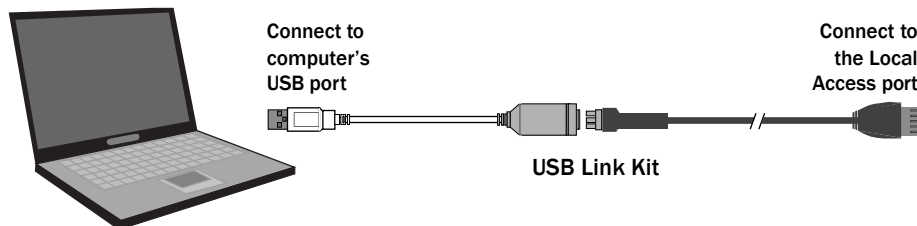
PREREQUISITES

- A computer with a USB port
- A USB Link Kit. See the *USB Link Kit Technical Instructions*.
NOTE The USB Link Kit driver is installed with a WebCTRL® v5 or later system. But if needed, you can get the latest driver from <http://www.silabs.com/products/mcu/Pages/USBtoUARTBridgeVCPDrivers.aspx>. Install the driver before you connect the USB Link Kit to your computer.
- v1.70 or later controller driver



CAUTION If multiple controllers share power but polarity was not maintained when they were wired, the difference between the controller's ground and the computer's AC power ground could damage the USB Link Kit and the controller. If you are not sure of the wiring polarity, use a USB isolator between the computer and the USB Link Kit. Purchase a USB isolator online from a third-party manufacturer.

Connect the USB Link Kit to the computer and to the controller's Local Access port.



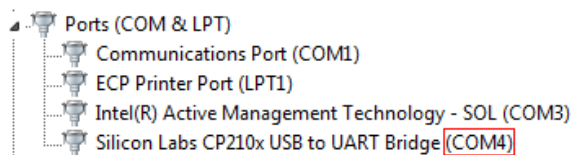
NOTE If using a USB isolator, plug the isolator into your computer's USB port, and then plug the USB Link Kit cable into the isolator.

To set up a Local Access connection in the WebCTRL® interface

For the WebCTRL® application to communicate with the Local Access port, you must do the following:

- 1 On the **System Configuration**  tree, select **Connections**.
- 2 On the **Configure** tab, click **Add**.
- 3 From the **Type** drop-down list, select **BACnet Local Access**.
- 4 Optional: Edit the **Description**.

- 5 Type the computer's **Port** number that the USB cable is connected to.
NOTE To find the port number, plug the USB cable into the computer's USB port, then select **Start > Control Panel > System > Device Manager > Ports (Com & LPT)**. The COM port number is beside **Silicon Labs CP210x USB to UART Bridge**.



- 6 Set the **Baud** rate to 115200.
- 7 Click **Accept**.
- 8 On the **View** tab, click the button next to the BACnet/IP network, then select **BACnet Local Access**.
- 9 Click **Accept**.
- 10 On the **Configure** tab, select **BACnet Local Access**, then click **Start**.
NOTE If an error message appears, make sure the COM port you selected is not in use. For example, PuTTY may be open and is holding the port open.
- 11 On the **Network**  tree, select the controller that you are connected to.
- 12 Click , then select **Manual Command**.
- 13 Type `rnet` here in the dialog box, then click **OK**.
- 14 On the **Properties** page, click **Module Status**. If a Modstat report appears, the WebCTRL® application is communicating with the controller.

Troubleshooting

If you have problems mounting, wiring, or addressing the ZN253, contact ALC Technical Support.

LED's

The LED's on the ZN253 show the status of certain functions.

If this LED is on...	Status is...
Power	The ZN253 has power
Rx	The ZN253 is receiving data from the network segment
Tx	The ZN253 is transmitting data over the network segment
DO#	The digital output is active

The **Run** and **Error** LED's indicate controller and network status.

If Run LED shows...	And Error LED shows...	Status is...
2 flashes per second	Off	Normal
2 flashes per second	2 flashes, alternating with Run LED	Five minute auto-restart delay after system error
2 flashes per second	3 flashes, then off	The controller has just been formatted
2 flashes per second	4 flashes, then pause	Two or more devices on this network have the same network address
2 flashes per second	1 flash per second	The controller is alone on the network
2 flashes per second	On	Obtain a Module Status Report (Modstat) to determine which of the following occurred: • Exec halted after frequent system errors • Control programs halted
5 flashes per second	On	Exec start-up aborted, Boot is running
5 flashes per second	Off	Firmware transfer in progress, Boot is running
7 flashes per second	7 flashes per second, alternating with Run LED	Ten second recovery period after brownout
14 flashes per second	14 flashes per second, alternating with Run LED	Brownout
On	On	Failure. Try the following solutions: • Turn the ZN253 off, then on. • Format the ZN253. • Download the ZN253. • Replace the ZN253.

NOTE If you resolve the issue but the **Error** LED does not turn off, cycle power to the controller.

Possible delay before control program starts

When you first apply power to the ZN253, it waits for up to 3 minutes to receive a time/date broadcast from its BACnet router. The ZN253 begins to run the control program only after it receives the time/date or when the 3 minute waiting period expires. If the ZN253 does not receive a time/date broadcast, it keeps the default setting of 6/12/2002 10:00:00 (am).

To format the controller

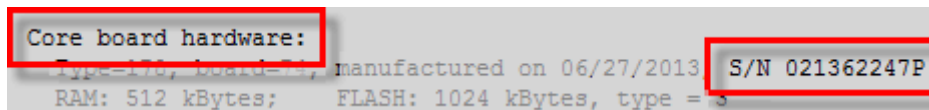
If you cannot communicate with a controller after downloading it, as a last resort, you can manually format the controller to erase its memory.

- 1 Pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **24 Vac**.
- 2  Make sure the address switches are not set to 0, 0.
- 3 Short the **Format** jumper's pins and maintain the short for steps 3 and 4.
- 4 Insert the power screw terminal connector into the ZN253's power terminals.
- 5 Continue to short the jumper until the **Error** LED flashes three times in sync with the **Run** LED.
- 6 Remove the short.
- 7 Download the ZN253.

To get the ZN253's serial number

If you need the ZN253's serial number when troubleshooting, the number is on:

- a sticker on the back of the main controller board
- a Module Status report (Modstat) under **Core** (or **Main**) **board hardware**



To obtain a modstat in the WebCTRL® interface:

- 1 Select the ZN253 in the **Network**  tree.
- 2 On the **Properties** page, click **Module Status**.

Recovering from a power outage

The ZN253 has a 10-year Lithium CR2032 battery that retains the following data for a maximum of 10,000 hours during power outages.

- Control programs
- Editable properties
- Trends
- Schedules

If the above data is lost after power returns, replace the battery and then download the ZN253. See instructions below.

To replace the ZN253's battery

If the ZN253 experiences a power outage and the control program stops functioning, replace the battery.

- 1 Verify that the ZN253's power is on.
- 2 Remove the battery from the controller, making note of the battery's polarity.
- 3 Insert the new battery into the controller, matching the polarity of the battery you removed.
- 4 Download the ZN253.

To take the ZN253 out of service

If needed for troubleshooting or start-up, you can prevent the WebCTRL® application from communicating with the ZN253.

- 1 On the WebCTRL® **Network**  tree, select the ZN253.
- 2 On the **Properties** page, check **Out of Service**.
- 3 Click **Accept**.

Compliance

FCC Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.



CAUTION Changes or modifications not expressly approved by the responsible party for compliance could void the user's authority to operate the equipment.

CE Compliance

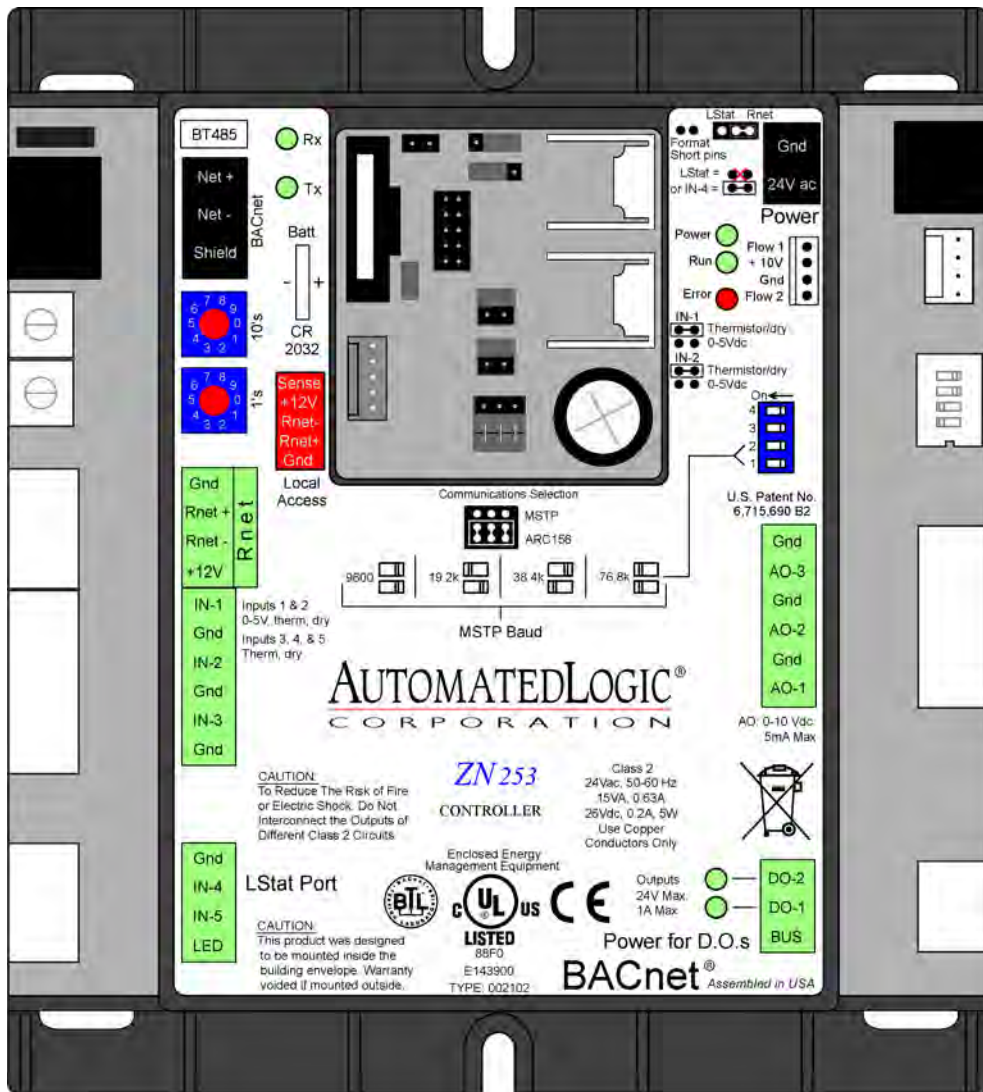


WARNING This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

BACnet Compliance

Compliance of listed products to requirements of ASHRAE Standard 135 is the responsibility of BACnet International. BTL® is a registered trademark of BACnet International.

Appendix - ZN253 coverplate



Document revision history

Important changes to this document are listed below. Minor changes such as typographical or formatting errors are not listed.

Date	Topic	Change description	Code*
2/7/17	Specifications	Added wireless sensors to the Rnet port specification.	X-D
	Zone sensors	Added wireless sensors to this topic.	
	Equipment Touch	Added Wireless Adapter to this topic.	
	Wiring inputs and outputs > Wiring specifications	Added Wireless Adapter to this topic.	
	Wiring devices to the Rnet port	Added Wireless Adapter to this topic.	
	To wire a Wireless Adapter to the ZN253	New topic.	
9/27/16	To set up a Local Access connection in the WebCTRL interface	Updated WebCTRL menu button in step 12.	A-D
	Appendix - ZN253 coverplate	Updated coverplate	A-D
4/20/15	Entire document	New look, no content changes	A-D
11/14/14	BACnet Compliance	Changed BACnet Manufacturers Association to BACnet International	X-D-CP-MW
10/7/14	Driver	Added the Network Microblock fields	A-TS-RB-F
9/4/14	LED's	Changed the Status description for when the Run LED shows 2 flashes per second and the Error LED is On. Also added a note below the table regarding cycling power to turn off Error LED.	A-TS-JM-F-BK
5/13/14	Specifications	Rnet Port: Added Equipment Touch and removed note about BACview® devices	A-D-CP-O-TC
	Equipment Touch devices	New topic	
	Wiring zone sensors to the ZN253	Changed to "Wiring devices to the ZN253's Rnet port"	
	To wire an Equipment Touch to the ZN253	New topic	
	Wiring a LogiStat sensor to the ZN253	New topic	
	To set up the driver > Driver	Added new driver property: TouchScreen Schedule Edit Enable	

* For internal use only