



iWorX DXU Series Installation Instructions

DXU-1, DXU-2

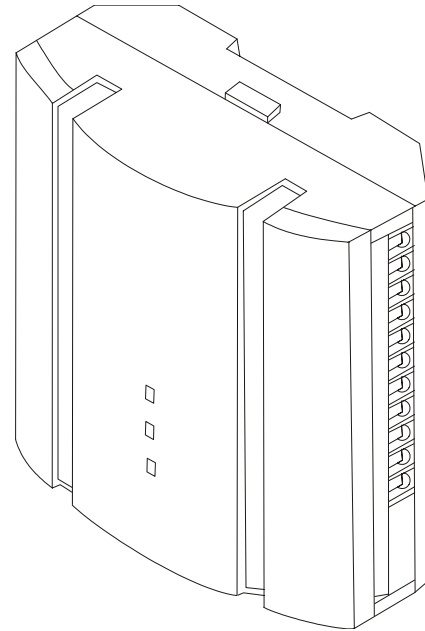
The iWorX DXU-1 and DXU-2 are self-contained controllers for single zone commercial rooftop HVAC units. The DXU-1 controls a packaged rooftop DX unit with up to two stages of cooling and two stages of heating. The DXU-2 controls a packaged rooftop DX unit with up to four stages of cooling, and controls either two stages of heating or a floating point heating valve. The DXU-2 also controls a modulated or two-position economizer. Individual temperature setpoints are provided for occupied and unoccupied heat and cool cycles.

Application

DXU Series controllers support a digital thermostat module. Basic to each unit is a removable electronics module with LED indicators. Coupled to this module is a DIN rail or panel-mount base module with wiring terminal blocks.

They function in standalone mode or as part of a LonWORKS[®] Network using the integral FTT-10 Free Topology communications transceiver. This network interface enables the controllers to be integrated with a building automation system.

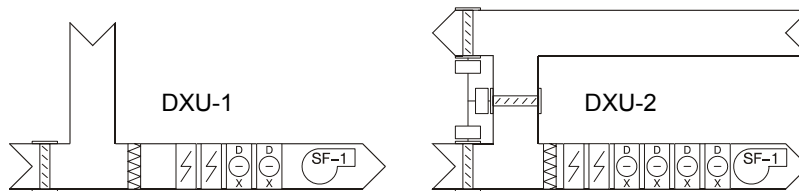
The controllers also monitor smoke, air filter, mixed air low limit, and fan status.



Applicable Documentation

Description	Audience	Purpose
iWorX LCI User's Guide	<ul style="list-style-type: none"> - Application Engineers - Installers - Service Personnel - Start-up Technicians - End user 	Provides instructions for setting up and using the iWorX Local Control Interface
DXU-1, DXU-2 Application Manuals	<ul style="list-style-type: none"> - Application Engineers - Wholesalers - Contractors 	Provides specific application information about the DXU-1 and DXU-2, including sequence of operation and configuration information.
Additional Documentation	<i>LonWorks FTT-10A Free Topology Transceiver User's Guide</i> , published by Echelon Corporation. It provides specifications and user instructions for the FTT-10A Free Topology Transceiver.	

Typical Use



Innovex Technologies
511 Braddock Avenue
Turtle Creek, PA 15145
www.innovextechnologies.com

iWorX is a trademark of Innovex Technologies
LON, LonWORKS, & LonMARK are trademarks of Echelon Corporation

Precautions

General



This symbol is intended to alert the user to the presence of important installation and maintenance (servicing) instructions in the literature accompanying the equipment.



Warning: Electrical shock hazard. Disconnect **ALL** power sources when installing or servicing this equipment to prevent electrical shock or equipment damage.

Make all wiring connections in accordance with these instructions and in accordance with pertinent national and local electrical codes. Use only copper conductors that are suitable for 167 °F (75 °C).

Static Electricity

Static charges produce voltages that can damage this equipment. Follow these static electricity precautions when handling this equipment.

- Work in a static free area.
- Touch a known, securely grounded object to discharge any static charge you may have accumulated.
- Use a wrist strap when handling printed circuit boards. The wrist strap must be secured to earth ground.

Location

Avoid locations where corrosive fumes, excessive moisture, vibration or explosive vapors are present.

Avoid electrical noise interference. Do not install near large contactors, electrical machinery, or welding equipment.

This equipment is suitable for indoor or outdoor use. Preferably, or as required by National Electrical Code, the unit is intended to be installed within an electrical control enclosure. Operate where ambient temperatures do not exceed 185 °F (85 °C) or fall below -40 °F (-40 °C) and relative humidity does not exceed 90%, non-condensing.

For Installation in the United States

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. This equipment can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment to a power source different from that to which the receiver is connected.
- Consult the equipment supplier or an experienced radio/TV technician for help.

You are cautioned that any changes or modifications to this equipment not expressly approved in these instructions could void your authority to operate this equipment.

For Installation in the European Community

This equipment meets the requirements of the European Community Directives for Electromagnetic Compatibility (EMC Directive 89/336/EE).

Before Installing

About this Document

The instructions in this document are for the DXU-1 and DXU-2 controllers which support one DX packaged rooftop unit.

Inspecting the Equipment

Inspect the shipping carton for damage. If damaged, notify the carrier immediately. Inspect the equipment for damage. Return damaged equipment to the supplier.

What is Not Included with this Equipment

- A power source for the equipment electronics and peripheral devices.
- Tools necessary to install, troubleshoot and service the equipment.
- The screws or DIN rail needed to mount the device.
- Peripheral devices, such as sensors, actuators, etc.
- Cabling, cabling raceway, and fittings necessary to connect this equipment to the power source, FTT-10A network and peripheral devices.

Equipment Location



Abide by all warnings regarding equipment location provided earlier in this document.

Optimally, the equipment should be installed within a secure enclosure.

The equipment must be installed indoors unless contained within a protective enclosure. The enclosure must maintain internal temperature and humidity within the ranges specified for this equipment.

The equipment must be installed within 500 feet of all input peripherals (smoke detectors, sensors, etc.) that will be connected to the equipment. It must be within 200 feet of any directly-connected thermostats.

Selecting a Power Source

This equipment requires a UL recognized or CE marked (as appropriate) external power source (not supplied) to operate. The controller power input requires a voltage of 24 Volts AC.

To calculate power source current requirements, add the power consumption of all peripheral devices to that of the controller.

The controller and triac output loads can use the same power source. The loads must have EMF protection. This protection can be integral to the load, or installed across the load's coil.

To provide necessary RFI and transient protection, the controller's ground (GND) pin (T28) must be connected to earth ground or the earth ground of the packaged unit's enclosure ground. Failure to properly ground the controller may cause it to exceed FCC & CE limits. Excessive noise could also produce inaccurate sensor data. The power source must be capable of operating with the connection to ground described in "Grounding the Device" on page 4.

Installation

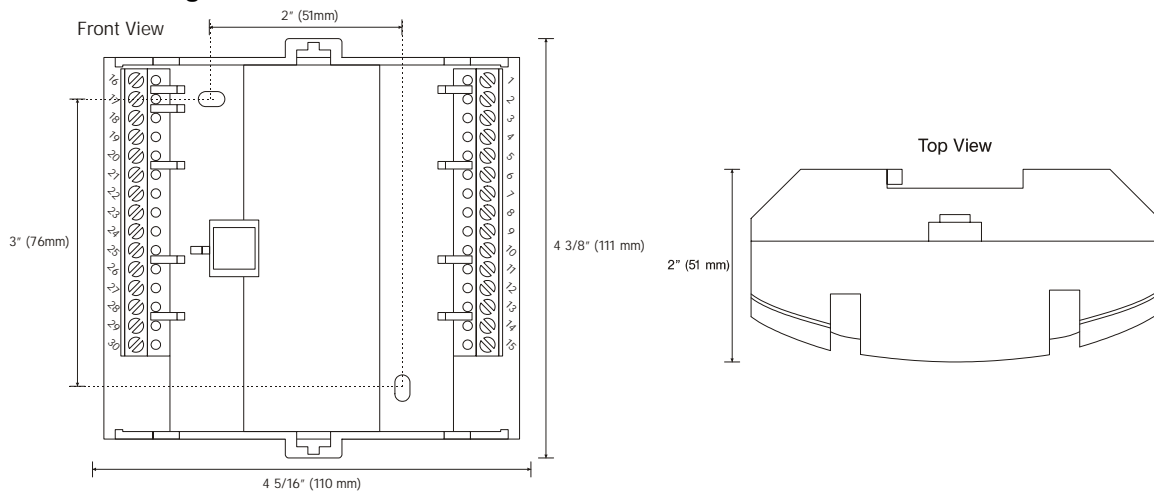


Warning: Electrical shock hazard. To prevent electrical shock or equipment damage, disconnect **ALL** power sources to controllers and loads before installing or servicing this equipment or modifying any wiring.

Mounting the Device

1. Select mounting location. Enclosure mounting is recommended.
2. Squeeze the controller at the top and bottom to release the cover tabs, and gently separate the controller base (back) from the electronics module (front).
3. Do one of the following:
 - a. Using two #6 pan head screws, mount base of controller to a panel.
 - b. Snap controller base on a 35 mm DIN mounting rail (not provided). Multiple units can be mounted on the same DIN mounting rail.
4. Wire controller base (See Routing Cabling to the Device).
5. After wiring:
 - a. Line up terminal pins with the correct sockets on the terminal blocks.
 - b. Insert cover tabs into brackets on the base of the controller.
 - c. Push gently until the cover snaps into place.

Figure 1: Mounting Dimensions.



Routing Cabling to the Device



Cabling used to connect the power source and cabling used to connect the FTT-10A network must remain separated within the control enclosure and wiring conduit.

Grounding the Device



The ground terminal (T28) must be securely connected to earth ground. Failure to properly ground this equipment will result in improper operation. Improper grounding may also increase the risk of electrical shock and may increase the possibility of interference with radio/TV reception.



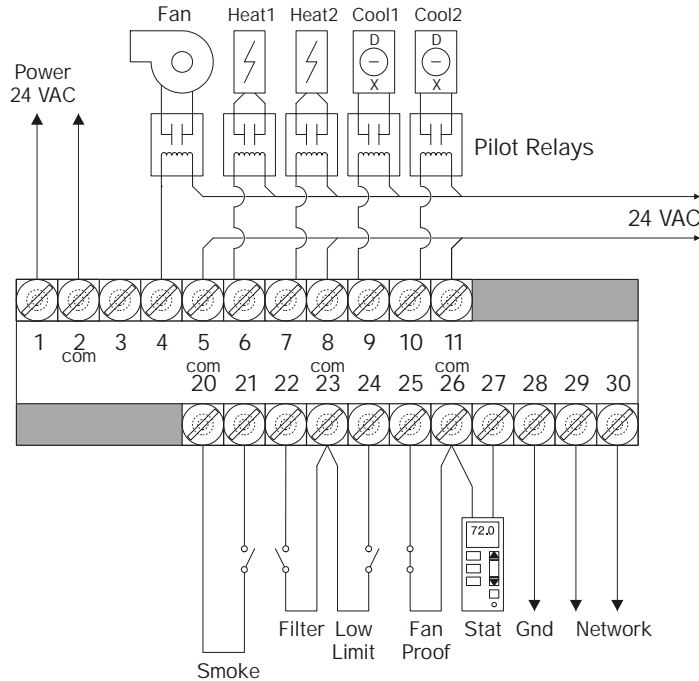
For best performance, connect the power supply common terminal (T2) to the same external point as the ground terminal (T28).

Wiring Information



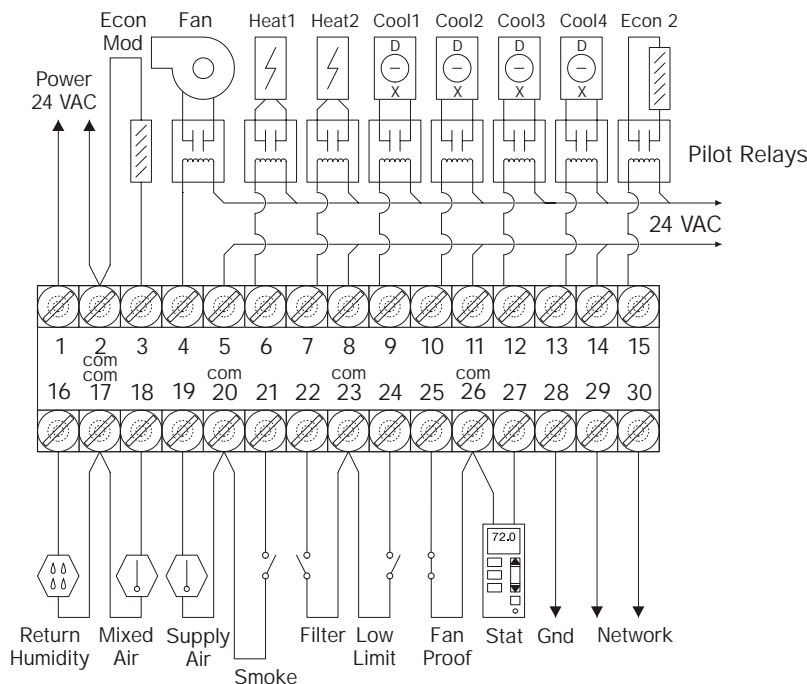
WARNING: Terminals 2, 20, 23, and 26 are connected internally on DXU-1 controllers. Disconnect **ALL** power sources when installing or servicing this equipment to prevent electrical shock or equipment damage.

Figure 2: DXU-1 Terminal Connections



WARNING: Terminals 2, 17, 20, 23, and 26 are connected internally on DXU-2 controllers. Disconnect **ALL** power sources when installing or servicing this equipment to prevent electrical shock or equipment damage.

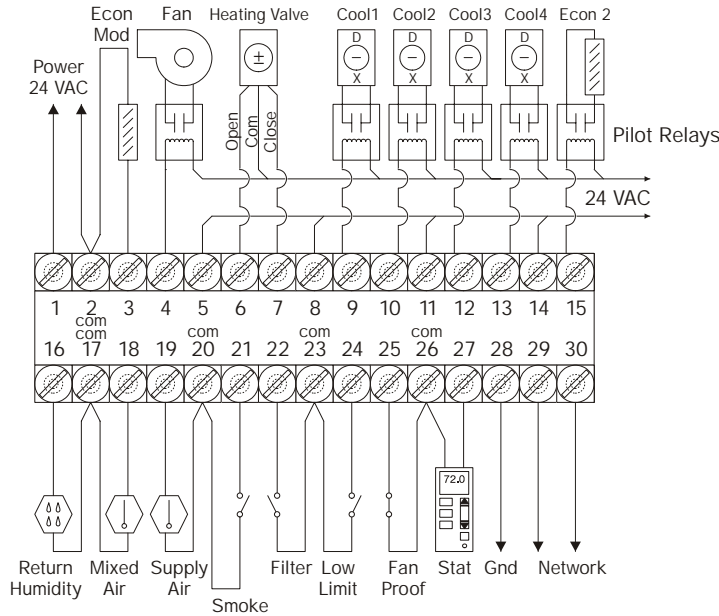
Figure 3: Terminal Connections for a DXU-2 with Two Heating Stages





WARNING: Terminals 2, 17, 20, 23, and 26 are connected internally on DXU-2 controllers. Disconnect **ALL** power sources when installing or servicing this equipment to prevent electrical shock or equipment damage.

Figure 4: Terminal Connections for a DXU-2 with a Modulated Heating Valve



Connecting Input Devices

Smoke Detector (SMK)

To connect the smoke detector switch to the digital input, attach one wire of the contact to SMK (T21) and the other wire to the adjacent common (T20). This must be a dry contact normally open switch. This input is for indication only. A separate smoke detector should be wired into a fire alarm system if the generation of a fire alarm is required.

Filter (FIL)

To connect the filter switch to the digital input, attach one wire of the contact to FIL (T22) and the other wire to the adjacent common (T23). This must be a dry contact normally open switch.

Mixed Air Low Limit (MLL)

To connect the mixed air low limit switch to the digital input, attach one wire of the contact to MLL (T24) and the other wire to the adjacent common (T23). This must be a dry contact normally open switch.

Fan Proof (FNP)

To connect the fan proof switch to the digital input, attach one wire of the contact to FNP (T25) and the other wire to the adjacent common (T26). This must be a dry contact, normally closed switch. If you are not providing a fan proof input, T25 and T26 must be shorted (jumpered) together.

Thermostat (STAT)

Connect one wire of a Innovex Technologies digital thermostat module (DTM) to the STAT (T27) terminal. Connect the other wire to the adjacent common (T26). The wiring is polarity independent.

Return Humidity (RAH) (DXU-2) (Optional)

To connect the Return Humidity sensor to the unit, connect the positive wire from the sensor to RAH (T16) and the other wire to the adjacent common (T17). The sensor must be of the 0-10 Volt type.

If global indoor air humidity readings are being provided over the network, it is not necessary to attach a return air humidity sensor directly to the DXU. See the *iWorX DXU-2 Application Manual* for more information.

Mixed Air (MAT) (DXU-2)

To connect the Mixed Air thermistor to the unit, attach one wire from the thermistor to MAT (T18) and the other wire to the adjacent common (T17). The thermistor used must be 10K Precon Type III.

Supply Air (SAT) (DXU-2)

To connect the Supply Air thermistor to the unit, attach one wire from the thermistor to SAT (T19) and the other wire to the adjacent common (T20). The thermistor used must be 10K Precon Type III.

Connecting Output Devices**Heating Outputs (H1, H2)**

The heating stage outputs must be connected to 24 VAC pilot relays if the load is greater than 1 Amp. See Figure 2 or Figure 3 on page 5 for details. For control of a floating point heating valve (DXU-2), connect H1 (T6) as the valve open signal, and H2 (T7) as the valve close signal. See Figure 4 on page 6 for details.

Fan (FAN)

The fan output must be connected to 24 VAC pilot relays if the load is greater than 1 Amp. See Figure 2 or Figure 3 on page 5, or Figure 4 on page 6 for details. If the load is less than 1 Amp, connect the fan to FAN (T4) and COM (T2).

Cooling Outputs (C1, C2) (DXU-1)

The cooling stage outputs must be connected to 24 VAC pilot relays if the load is greater than 1 Amp. See Figure 2 or Figure 3 on page 5, or Figure 4 on page 6 for details. If the load is less than 1 Amp, connect cooling stage 1 to C1 (T9) and COM3 (T8), and cooling stage 2 to C2 (T10) and COM4 (T11).

Cooling Outputs (C1, C2, C3, C4) (DXU-2)

The cooling stage outputs must be connected to 24 VAC pilot relays if the load is greater than 1 Amp. See Figure 2 or Figure 3 on page 5, or Figure 4 on page 6 for details. If the load is less than 1 Amp, connect cooling stage 1 to C1 (T9) and COM3 (T8), cooling stage 2 to C2 (T10) and COM4 (T11), cooling stage 3 to C3 (T12) and COM4 (T11), and cooling stage 4 to C4 (T13) and COM5 (T14).

Two Position Economizer (ECD) (DXU-2)

The two position economizer output must be connected to 24 VAC pilot relays if the load is greater than 1 Amp. See Figure 2 or Figure 3 on page 5, or Figure 4 on page 6 for details. If the load is less than 1 Amp, connect the economizer to ECD (T15) and COM5 (T14).

Modulated Economizer (ECA) (DXU-2)

The modulated economizer output can be set to 0-10 V max through the control logic. Connect the positive wire from the damper actuator to ECA (T3) and the other wire to COM1 (T2). See Figure 3 on page 5 or Figure 4 on page 6 for details.

Other Connections**Network (LON)**

Network wiring must be twisted pair. One network wire must be connected to one LON (T29) terminal and the other network wire must be connected to the other LON (T30) terminal. Polarity is not an issue since an FTT-10A network is used for communications.

Power (PWR)

Connect one output wire from a 24 VAC power supply to PWR (T1) and the other output wire from the power supply to the adjacent common terminal (T2).

Ground (GND, COM1)



Terminals COM1 (T2) and GND (T28) must be connected to earth ground. Failure to properly ground this equipment will result in improper operation. Improper grounding may also increase the risk of electrical shock, and may increase the possibility of interference with radio and TV reception.

Specifications

Electrical

Inputs

- Cabling: twisted shielded pair, 18 AWG recommended—500 feet max. (152 meters)
- Resolution: 10 bit

Return Humidity (DXU-2)

- 0-10 Volt

Mixed Air and Supply Air (DXU-2)

- Precon Type III 10K thermistor

Fan Proof

- Dry Contact
- Normally Closed

Filter, Mixed Air Low Limit, and Smoke

- Dry Contact
- Normally Open

Thermostat Network

- 12 Volt nominal, internally limited to 0.04 A

Outputs

C1, C2, Fan, H1, H2 (DXU-1)

C1, C2, C3, C4, Fan, H1, H2 Economizer DO (DXU-2)

- 24 Volts AC
- 1 A rms

Economizer AO (DXU-2)

- 0-10 Volt
- 2K Ohm minimum load
- 8 bit resolution

FTT-10A Network

- Speed: 78KBPS
- Cabling: Maximum node-to-node distance: 1312 feet (400 meters)
- Maximum total distance: 1640 feet (500 meters)

Table 1: Network Wire Specifications

Cable Type	Pairs	Details	Connect Air Catalog No.
Level 4 22AWG (0.65mm)	1	Unshielded, Plenum, U.L. Type CMP	W221P-2001
Level 4 22AWG (0.65mm)	1	Unshielded, Non-Plenum, U.L. Type CM	W221P-1002

For detailed specifications, refer to the FTT-10A Free-Topology Transceiver User's Guide published by Echelon Corporation. For information on ordering Connect Air items, contact Connect Air International; 4240 B Street; Auburn, WA 98001 <www.connect-air.com>.

Power

Power Requirements

- 24VAC power (requires an external supply)

Power Consumption

- With no external loads: 15 VA

Mechanical

Housing

- Dimensions: 4 3/8" high, 4 5/16" wide, 2" deep (111 mm high, 110 mm wide, 51 mm deep)
- ABS Polycarbonate

Electronics

- Processor: 3150 Neuron 10 MHz
- Flash: 48 Kilobytes
- SRAM: 8 Kilobytes
- Termination: 0.197" (5.0 mm) Pluggable Terminal Blocks, 14-22 AWG

Environmental

- Temperature: -40 °F to 185 °F (-40 °C to 85 °C)
- Humidity: 0 to 95 percent, non-condensing

Agency Listings

- UL916

Agency Compliances

- FCC Part 15 Class A
- CE

Troubleshooting

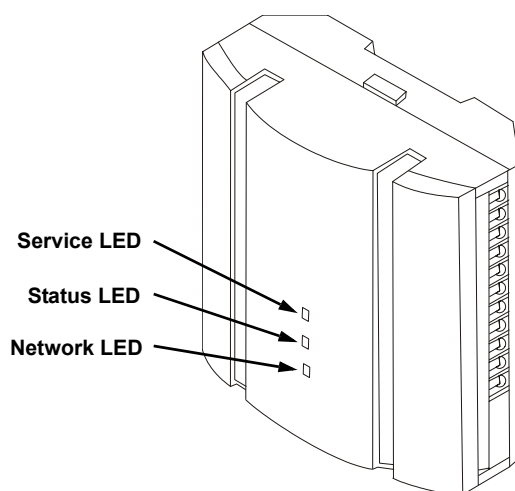
Diagnostic LEDs

The controller has 3 LED indicators. These indicators can aid in troubleshooting equipment operation problems. The following table lists the functions of the controller's LEDs in the order they appear from top to bottom on the unit.

Table 2: Controller LED Indicators.

LED	Indication
Service	– Illuminated when the service pin is pushed
Status	– Solid green when running and configured by an LCI – Flashing green when running and NOT configured by an LCI – Solid red when a fault condition exists
Network	– Yellow while the controller is transmitting data onto the FTT-10A network – Green when there is network activity – Off when there is no network activity

Figure 5: DXU Series Controller LEDs



Troubleshooting Tips

Controller is not running and Status LED is not illuminated.

No power to controller. Verify the voltage on the controller's power connector (24 VAC).

Fan cycles on for 30 seconds and then turns off.

The controller requires the fan status input to be shorted, normally closed, for proper operation. Ensure that your air flow sensor is working and properly wired to the controller. If you are not using an air flow sensor you must place a jumper between the fan status input and the adjacent common terminal.

The fan will not cycle on after the input has been jumpered or the air flow sensor connected.

If the fan was previously in a fan fault condition, the controller must be reset before proper operation can be restored.

How do I reset the controller?

The controller can be reset by the LCI, or you can cycle power to the controller. Refer to the LCI documentation for more information on resetting the controller using the LCI.

The fan will not cycle on.

There are several reasons the fan may not cycle on, and all should be checked.

1. Are all digital inputs on the controller (except for the fan status input) normally open and wired accordingly?
2. Is the controller in an occupied mode?
3. Has the controller been overridden by the LCI?
4. Is the smoke detector or mixed air low limit indicator (freeze stat) tripped? If so, correct the problem and the controller will automatically start; no reset is necessary.
5. Is the thermostat connected?

The fan and heat/cool pilot relays will not come on even though the LCI indicates it is on.

Ensure that the controller and output pilot relay have been powered with 24 VAC and the output has been correctly wired to the coil of the pilot relay. Also ensure that the pilot relay has a 24 VAC coil.

The 10K thermistor reading is at its maximum or minimum.

The input is either shorted or open.

The economizer damper fails to open. (DXU-2 only)

1. Was the LCI used to select an economizer type other than 'None'?
2. Is the difference between indoor and outdoor enthalpy greater than the economizer setpoint?
3. If "global humidity" is selected, make sure that the ASM is reading a valid humidity and providing it to the network.