DXU3 Universal Air Control - Single Zone
Self-Contained Interoperable Controller Model UCP-1

SUPERSEDES: December 14, 2012  EFFECTIVE: January 11, 2013

Plant ID: 001-4017

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DXU3

The DXU3 Universal Air Control is a stand-alone microprocessor-based controller for single zone DX package units and air handler units with an economizer. The application includes packaged rooftop DX units and air handler units with up to two stages of heating, four stages of cooling, air handler units with analog heating and cooling valves, and a modulated or two-position economizer.

Overview

Digital inputs are provided for fan status, mixed air low limit status, smoke detector, and filter status. Analog inputs are provided for mixed air temperature, return air humidity and supply air temperature. Indoor Air Quality can be defined by the user as analog or digital. Zone temperature can be sensed by a two-wire serial interface to an iWorx® TS300 series thermostat or a 10 K Ohm Precon Type II or Type III Thermistor. The controller incorporates digital outputs in the form of triacs for fan operation, two heating stages, four cooling stages and a two-position economizer. The heating or cooling stage triacs can also be configured to control floating point valves. In addition, analog outputs are provided to control an analog heating and cooling valve as well as a modulated economizer, if required.

The controller is based on LonWorks® networking technology. It can be networked to a higher-level control system for monitoring and control applications.

Features

- Four stages of cooling, or a floating point cooling valve, or a modulated cooling valve
- Two stages of heating, or a floating point heating valve, or a modulated heating valve
- Dehumidification
- Modulated or two-position economizer
- Economizer enabled based on enthalpy or dry bulb calculations
- Runtime accumulation for heating, cooling and fan
- Individual temperature setpoints for occupied/unoccupied heat and cool
- Time proportioned control of the staged outputs to reduce cycling
- Proportional + Integral control of the modulated economizer, modulated heating and cooling
- Thermostat with space temp, setpoint adjust, fan override, occupancy override
- Local backup schedule
- Minimum cycle timer
- Mixed air low limit protection
- Filter status, fan proof, and smoke detection input
- Fan control energized on call for heating or cooling
- IAQ compensation based on IAQ input
- Outside Air Temperature Cutoffs
- Supply Air Temperature cooling limit
- Automatic heat/cool changeover
- Automatic configuration with the LCI
- Alarm/Event reporting
- LonWorks interface to building automation systems

PURPOSE OF THIS GUIDE

The iWorx® DXU3 Application Guide provides application information for the DXU3 Controller.

The reader should understand basic HVAC concepts, intelligent environmental control automation, and basic LonWorks networking and communications. This Application Guide is written for:

- Users who engineer control logic
• Users who set up hardware configuration
• Users who change hardware or control logic
• Technicians and field engineers of Taco Electronic Solutions, Inc.

REPRESENTATIONS AND WARRANTIES

This Document is subject to change from time to time at the sole discretion of Taco Electronic Solutions, Inc. All updates to the Document are available at www.taco-hvac.com. When installing this product, it is the reader’s responsibility to ensure that the latest version of the Document is being used.

iWorx® products shall only be used for the applications identified in the product specifications and for no other purposes. For example, iWorx® products are not intended for use to support fire suppression systems, life support systems, critical care applications, commercial aviation, nuclear facilities or any other applications where product failure could lead to injury to person, loss of life, or catastrophic property damage and should not be used for such purposes.

Taco Electronic Solutions, Inc. will not be responsible for any product or part not installed or operated in conformity with the Document and instructions or which has been subject to accident, disaster, neglect, misuse, misapplication, inadequate operating environment, repair, attempted repair, modification or alteration, or other abuse. For further information, please refer to the last page of this Document for the company’s Limited Warranty Statement, which is also issued with the product or available at www.taco-hvac.com.

APPLICABLE DOCUMENTATION

See the table below for additional documentation that may be applicable to this controller.

<table>
<thead>
<tr>
<th>Description</th>
<th>Audience</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>iWorx® LCI2 Application Guide, Document No. 505-002</td>
<td>Application Engineers</td>
<td>Provides instructions for setting up and using the iWorx® Local Control Interface.</td>
</tr>
<tr>
<td></td>
<td>Installers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Service Personnel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Start-up Technicians</td>
<td></td>
</tr>
<tr>
<td></td>
<td>End user</td>
<td></td>
</tr>
<tr>
<td><a href="http://iWorxWizard.taco-hvac.com">http://iWorxWizard.taco-hvac.com</a></td>
<td>Application Engineers</td>
<td>An on-line configuration and submittal package generator based on user input. Automatically generates bill of materials, sequence of operations, flow diagrams, wiring diagrams, points and specifications.</td>
</tr>
<tr>
<td></td>
<td>Wholesalers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Contractors</td>
<td></td>
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</tbody>
</table>

INSTALLATION INSTRUCTIONS

Precautions

General

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

CAUTION: Risk of explosion if battery is replaced by an incorrect type. Contains lithium type battery; dispose of properly.

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 charge you may have accumulated.
- Use a wrist strap when handling printed circuit boards. The 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 use only. 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 140 °F (60 °C) or fall below 32 °F (0 °C) and relative humidity does not exceed 90%, non-condensing.

**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. 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 in the United States.

**BEFORE INSTALLING**

**About this Document**

The instructions in this document are for the DXU3 controllers which support one DX packaged rooftop unit or an air handling 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.

If the equipment is to be installed outdoors, it must be 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 are connected to the equipment.

**Selecting a Power Source**

This equipment requires a UL recognized Class 2 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 sensor power supplies can use the same power source. If both are using the same power source, the loads must have EMF protection. This protection can be integral to the load, or installed in the 24 VAC wiring across the load’s coil.

To provide necessary RFI and transient protection, the controller’s ground (GND) pin (T40) 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 limits. Excessive noise could also produce inaccurate sensor data. The power source must be capable of operating with this connection to ground.

**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 a mounting location. Enclosure mounting is recommended.
2. Hold the controller on the panel you wish to mount it on. With a marker or pencil mark the mounting locations on the panel.
3. Using a small drill bit pre-drill the mounting holes.
4. Using two #6 pan head screws, mount the controller to the panel.
5. Wire the controller (See Routing Cabling to the Device).
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 (T40) 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 (T38) to the same external point as the ground terminal (T40).

**WIRING INFORMATION**

**WARNING**: Terminals 6, 9, 12, 15, and 18 are connected internally on DXU3 controllers. Disconnect ALL power sources when installing or servicing this equipment to prevent electrical shock or equipment damage.

Figure 2: DXU Wiring Example - Power Sourced
Figure 3: DXU Wiring Example - Power Sinking.

Single Zone Unit with Staged Heating & Cooling and Modulated Economizer;
Triac Outputs Wired as Power-Sinking.

Symbols
- T: 10 K ohm Precon Type III thermistor
- H: 6-10VDC Humidity Sensor
- C: 24VAC pilot relay or contactor coil

Note:
Ensure input switches and output jumpers are in the proper position!
Connecting Input Devices

Return Humidity (RAH)
To connect the Return Humidity sensor to the unit, connect the positive wire from the sensor to RAH (T19) and the other wire to the adjacent common (T18). 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 DXU3.

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

Supply Air Temperature (SAT)
To connect the Supply Air thermistor to the unit, attach one wire from the thermistor to SAT (T16) and the other wire to the adjacent common (T15). The thermistor used must be 10K Precon Type III.
Smoke Detector (SMK)
To connect the smoke detector switch to the digital input, attach one wire of the contact to SMK (T14) and the other wire to the adjacent common (T15). 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 Status (FIL)
To connect the filter switch to the digital input, attach one wire of the contact to FIL (T13) and the other wire to the adjacent common (T12). 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 (T11) and the other wire to the adjacent common (T12). This must be a dry contact normally open switch.

Indoor Air Quality (IAQ)
To connect the IAQ sensor to the digital or analog input, attach one wire of the contact to IAQ (T10) and the other wire to the adjacent common (T9). For a digital sensor, this must be a dry contact, normally closed switch. For an analog sensor, it must be of the 0-10V type.

Return Air Temperature (RAT)
To connect the return air temperature thermistor to the analog input, attach one wire of the sensor to RAT (T8) and the other wire to the adjacent common (T9).

Space Temperature (ST, optional)
To connect a thermistor (Precon II or Precon III) to the analog input, attach one wire of the sensor to ST (T7) and the other wire to the adjacent common (T6). The thermistor can be used if no TS300 series thermostat is being used.

Fan Proof (FNP)
To connect the fan proof switch to the digital input, attach one wire of the contact to FNP (T5) and the other wire to the adjacent common (T6). This must be a dry contact, normally closed switch. If you are not providing a fan proof input, T5 and T6 must be shorted (jumpered) together.

Zone Temp, Room Humidity (Optional)
To connect an iWorx® TS300 series thermostat to the unit, connect the positive wire from the sensor to T3 and the other wire to the adjacent common (T4).

Connecting Output Devices

Modulated Economizer (ECNM)
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 ECNM (T37) and the other wire to COM (T36). See preceding figures for details.

Modulated Heating (HTGM)
The modulated heating output can be set to 0-10 V max through the control logic. Connect the positive wire from the heating output to ECNM (T35) and the other wire to COM (T36). See preceding figures for details.

Modulated Cooling (CLGM)
The modulated cooling output can be set to 0-10 V max through the control logic. Connect the positive wire from the cooling output to CLGM (T34) and the other wire to COM (T33). See preceding figures for details.

Cooling Stage 1 or Cooling Floating Point Valve Open (C1)
The cooling stage output must be connected to a 24 VAC pilot relay if the load is greater than 1 Amp. See preceding figures for details. If the load is less than 1 Amp, connect cooling stage 1 to C1 (31) and TC12 (30).
For control of a floating point valve, connect C1 as the valve open signal.
Cooling Stage 2 or Cooling Floating Point Valve Close (C2)
The cooling stage output must be connected to a 24 VAC pilot relay if the load is greater than 1 Amp. See preceding figures for details. If the load is less than 1 Amp, connect cooling stage 2 to C2 (29) and TC12 (30).
For control of a floating point valve, connect C2 as the valve close signal.

Cooling Stage 3 (C3)
The cooling stage output must be connected to a 24 VAC pilot relay if the load is greater than 1 Amp. See preceding figures for details. If the load is less than 1 Amp, connect cooling stage 3 to C3 (T28) and TC34 (T27).

Cooling Stage 4 (C4)
The cooling stage output must be connected to a 24 VAC pilot relay if the load is greater than 1 Amp. See preceding figures for details. If the load is less than 1 Amp, connect cooling stage 4 to C4 (T26) and TC34 (T27).

Heating Stage 1 or Heating Floating Point Valve Open (H1)
The heating stage output must be connected to a 24 VAC pilot relay if the load is greater than 1 Amp. See preceding figures for details. If the load is less than 1 Amp, connect heating stage 1 to H1 (T25) and TC56 (24).
For control of a floating point heating valve, connect H1 (T25) as the valve open signal. TC56 (T24) is the common.

Heating Stage 2 or Heating Floating Point Valve Close (H2)
The heating stage output must be connected to a 24 VAC pilot relay if the load is greater than 1 Amp. See preceding figures for details. If the load is less than 1 Amp, connect heating stage 2 to H1 (T23) and TC56 (T24).
For control of a floating point heating valve, connect H2 (T23) as the valve close signal. TC56 (T24) is the common.

Fan (FAN)
The fan output must be connected to a 24 VAC pilot relay if the load is greater than 1 Amp. See preceding figures for details. If the load is less than 1 Amp, connect the fan to FAN (T22) and TC78 (T21).

Two Position Economizer (ECD)
The two position economizer output must be connected to a 24 VAC pilot relay if the load is greater than 1 Amp. See preceding figures for details. If the load is less than 1 Amp, connect the economizer to ECD (T20) and TC78 (T21).

Other Connections

Network (LON)
Network wiring must be twisted pair. One network wire must be connected to terminal NETA (T1) and the other network wire must be connected to terminal NETB (T2). 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 (T39) and the other output wire from the power supply to the adjacent common terminal (T38).

Ground (GND)
Terminal GND (T40) 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/Room Humidity
• 0-10 Volt

Mixed Air Temp, Return Air Temp, and Supply Air Temp
• Precon Type II or Type III 10K thermistor

Fan Proof
• Dry Contact
• Normally Closed

Filter, Mixed Air Low Limit, and Smoke
• Dry Contact
• Normally Open

Indoor Air Quality
• Dry Contact, Normally Open
• Analog, 0 - 10 Volt

Thermostat Network
• 12 Volt nominal, internally limited to 0.04 A

Outputs

Analog Outputs: Modulated Economizer, Modulated Heating, Modulated Cooling
• 0-10 Volt
• 2K Ohm minimum load
• 8 bit resolution

Triac Outputs: Fan, H1, H2, C1, C2, C3, C4, Two-Position Economizer
• 24 VAC
• 1A @ 50C, 0.5A @ 60C, limited by the Class 2 supply rating

Recommended Sensor Wire

<table>
<thead>
<tr>
<th>Cable Type</th>
<th>Pairs</th>
<th>Details</th>
<th>Taco Catalog No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>18AWG</td>
<td>1</td>
<td>Stranded Twisted Shielded Pair, Plenum</td>
<td>WIR-018</td>
</tr>
</tbody>
</table>

FTT-10A Network

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

<table>
<thead>
<tr>
<th>Cable Type</th>
<th>Pairs</th>
<th>Details</th>
<th>Taco Catalog No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 4 22AWG (0.65mm)</td>
<td>1</td>
<td>Unshielded, Plenum, U.L. Type CMP</td>
<td>WIR-022</td>
</tr>
</tbody>
</table>

Power

Power Requirements
• 24VAC (20VAC to 28VAC), requires an external Class 2 supply

Power Consumption
• 7.2W with no external loads, maximum limited by the Class 2 supply rating

Mechanical

Housing
• Dimensions: 5.55” (141mm) high, 6.54” (166 mm) wide, 1.75” deep (44 mm)
• ABS

Weight
• Controller Weight: 0.70 pounds (0.32 kilograms)
• Shipping Weight: 1.0 pounds (0.46 kilograms)

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: 32 °F to 140 °F (0 °C to 60 °C)
• Humidity: 0 to 90%, non-condensing

Agency Listings

Agency Compliances
• FCC Part 15 Class A
APPLICATION OVERVIEW

Description for the Single Zone DX Unit

The controller maintains the temperature of a space to a user-defined setpoint. The figures below illustrate typical controller applications. The control is achieved by controlling the economizer position and sequencing the heating and cooling stages or modulating heating or cooling valves based on the current space requirements.

Figure 5: Single Zone DXU3 with staged heating and cooling and Modulated Economizer

The controller controls the starting and stopping of the supply air fan. The fan is energized when there is a need for heating or cooling. During the occupied periods, the fan can be configured to run continuously. The fan can be overridden from the local thermostat. If overridden, the fan runs continuously.

The enthalpies of the outside and inside air are calculated periodically. A comparison is performed to determine if "free cooling" is available. If "free cooling" is available, the economizer is enabled. Free cooling can also be enabled based on a dry-bulb comparison of the outdoor air temperature and indoor temperature.

Figure 6: Single Zone DXU3 with staged heating and cooling and Two Position Economizer
The system can use either a two position or modulated economizer. If a two position economizer is employed, it is energized when there is a call for cooling. It is used as the first stage of cooling to take advantage of the energy savings. The two-position economizer output is off when the economizer feature is disabled.

If the modulated economizer is enabled, when “free cooling” is available, the modulated economizer position is calculated by a Proportional + Integral (P+I) control loop. The control is based on the mixed air temperature and setpoint. As the temperature increases above the mixed air setpoint, the economizer valve is modulated open. The economizer is modulated closed as the temperature decreases below the mixed air setpoint. The economizer is modulated to its minimum position when the economizer is disabled. The economizer can optionally be disabled during unoccupied periods. When free cooling is available, mechanical cooling will not be enabled until the economizer is fully open (100%) for three minutes.

Heating is accomplished through control of up to two stages of heating, control of a floating point heating valve or control of one analog valve. Cooling is accomplished through control of up to four stages of cooling, a floating point cooling valve or an analog cooling valve.

The heating and cooling stages are sequenced with a time-proportioned control algorithm to minimize excessive cycling. The sequencing is based on the measured space temperature, space setpoint and the heating and cooling offsets. The heating and cooling offsets define a desired temperature range for occupied operation around the space setpoint. When unoccupied mode is entered, the heating setpoint is set back and the cooling setpoint is set to a user-defined setpoint. The cooling stages are interlocked with the economizer control. If the two position economizer is employed, the stages sequence on after the economizer.

If configured for modulated analog valve, the cooling valve position is calculated by a Proportional + Integral control loop based on the space temperature and the cooling setpoint. As the temperature increases above the cooling setpoint, the cooling valve will be modulated open. The cooling valve will be modulated closed as the temperature decreases below the cooling setpoint. When unoccupied mode is entered, the cooling setpoint is set up.

Figure 7: Single Zone DXU3 with Modulated Heating, Cooling and Economizer
The heating valve position is calculated by a Proportional + Integral control loop based on the space temperature and the heating setpoint. As the temperature decreases below the heating setpoint, the heating valve will be modulated open. The heating valve will be modulated closed as the temperature increases above the heating setpoint. When unoccupied mode is entered, the heating setpoint is set back.

**Figure 8: Single Zone DXU3 with Modulated Heating, Cooling and Two-Position Economizer**

If configured for a floating point valve control, the cooling valve is calculated by a Proportional + Integral control loop based on the space temperature and cooling setpoint. As the temperature increases above the cooling setpoint, the valve will be modulated open. The valve will be modulated closed as the temperature decreases below the cooling setpoint. When unoccupied mode is entered, the cooling setpoint is setup.

If configured for a floating point valve control, the heating valve is calculated by a Proportional + Integral control loop based on the space temperature and heating setpoint. As the temperature decreases below the heating setpoint, the valve will be modulated open. The valve will be modulated closed as the temperature increases above the heating setpoint. When unoccupied mode is entered, the heating setpoint is setup.

Each controller interfaces to a local thermostat. The thermostat includes a space temperature sensor, temperature setpoint adjustment, occupancy override, and a fan auto/on selection (depending on the model). Additionally a 10K Pre-con Type II or Type III Thermistor/ wall sensor can be used.

The controller operates in one of two states: occupied or unoccupied. The LCI determines the active operating mode. The controller maintains the comfort level to a user-defined setpoint during the occupied period. The controller uses setup and setback values during the unoccupied period to maintain the space temperature. An optional backup schedule is provided for cases when the LCI is not available.

A digital input is provided to monitor the status of the supply air fan. If the fan is energized and no air flow is detected after 30 seconds, the controller turns off all stages of heating and cooling along with the supply air fan. The controller returns to normal operation after it is reset. An alarm is reported to the LCI when this condition exists.

The controller monitors a digital input to determine the presence of smoke. When the input indicates smoke, the controller immediately turns off the supply air fan and all stages of heating and cooling. The controller returns to normal operation after it is reset. An alarm is reported to the LCI when smoke is detected.

A digital input is provided on the controller to monitor the status of the air filter. An external pressure switch is wired to the input to determine when the filter becomes dirty. An alarm is reported to the LCI when this condition exists.
Mixed air low limit protection is provided through a digital input. If a low limit condition exists, the controller turns off all stages of heating and cooling along with the supply air fan. An alarm is reported to the LCI when this condition exists. If configured for either analog or floating point valve the valve will open 100% to prevent freezing of the coils. The controller returns to normal operation after it is reset. Following the reset, there is a 10 minute delay before the mixed air low limit is checked again.

An indoor air quality input is provided. If an indoor air quality alarm is indicated, the supply air fan is energized and the economizer is overridden to supply fresh air to the space.

The controller monitors the runtime of the cooling stages, heating stages, and fan. When any of the runtimes exceeds a programmable limit, a maintenance alarm is reported to the LCI.

When the space temperature exceeds a programmable limit, a high limit alarm is reported to the LCI. When the space temperature drops below a programmable limit, a low limit alarm is reported to the LCI. When the space temperature returns to the proper range, a return to normal alarm is reported to the LCI.

When the return Air Humidity or Zone Humidity rises above the humidity setpoint, dehumidification is enabled by enabling the cooling stages, if modulated cooling is enabled, the cooling output goes to 100%. Dehumidification is disabled, when return air humidity drops below the setpoint by 3%.

SEQUENCE OF OPERATION

This section describes the detailed sequence of operation for the controller control algorithms.

Setpoints

The heating and cooling setpoint for both occupied and unoccupied periods are programmable values. The space setpoint is a programmed value. The heating setpoint, and cooling setpoint are calculated from the space setpoint and heating and cooling offsets and the current operating mode (i.e. occupied or unoccupied).

The space setpoint is displayed in the thermostat and the LCI’s controllers list.

The zero energy band is calculated as follows:

**Occupied Mode**

\[ Zeb_{Occ} = (SpaceSetpoint - HeatOffset) - (SpaceSetpoint + CoolOffset) \]

**Unoccupied Mode**

\[ CalcHeatSp = UnoccupiedHeatSp \]

\[ CalcCoolSp = UnoccupiedCoolSp \]

**Figure 9: Space Setpoint Calculation.**

The effective setpoint is a calculated value based on the space setpoint and the thermostat’s setpoint adjust limit value. The setpoint adjust limit is used to increase or decrease the space setpoint from the local thermostat. The setpoint adjust limit value limited to plus or minus the programmed setpoint adjustment.
The setpoint adjust limit also affects the calculated heating and calculated cooling setpoints by an equal amount. The setpoint adjust limit only applies in the occupied mode of operation. It has no affect in the unoccupied mode. Note that the actual programmed setpoint, heating and cooling offsets are not changed. The thermostat’s setpoint adjust limit is simply added to the programmed setpoints to derive the calculated values.

**Occupied Mode**

\[
\text{CalcCoolingSp} = \text{SpaceSp} + \text{CoolOffset} \pm \text{UserAdjust} \\
\text{CalcHeatingSp} = \text{SpaceSp} - \text{HeatOffset} \pm \text{UserAdjust} \\
\text{EffectiveSp} = \text{SpaceSp} \pm \text{SpOffset}
\]

**Unoccupied Mode**

\[
\text{CalcCoolingSp} = \text{UnoccupiedCoolingSp} \\
\text{CalcHeatingSp} = \text{UnoccupiedHeatingSp} \\
\text{EffectiveSp} = \text{SpaceSp}
\]
Figure 10: Setpoint Adjustment

- Heating Offset
  70°F (21.1°C)
  Space Setpoint
  71°F (21.7°C)

- Cooling Offset
  72°F (22.2°C)

Thermostat Offset = 0°F (0.0°C)

- Heating Offset
  72°F (22.2°C)
  Space Setpoint
  73°F (22.8°C)

- Cooling Offset
  74°F (23.3°C)

Thermostat Offset = 2°F (1.1°C)

- Heating Offset
  68°F (20.0°C)
  Space Setpoint
  69°F (20.6°C)

- Cooling Offset
  70°F (21.1°C)

Thermostat Offset = -2°F (-1.1°C)
**Heating Sequence**

The controller provides support for either two stages of heating or one floating point or 0 - 10V modulating heating valve. You can specify which type of heat you are using through configuration parameters.

**Heating Stages**

The controller sequences the heating stages based on the space temperature and the calculated heating setpoint. When the space temperature drops below the heating setpoint minus the heating control band for a predefined time-period, a stage is turned on. If the space temperature remains below this value for an additional time-period, the next available stage is turned on. This cycle continues until all available stages have been energized.

After the space temperature has risen above the heating setpoint for a predefined period of time, the last energized stage is turned off. (Note that the last stage that was turned on is the first one to be turned off.) If the space temperature remains above the heating setpoint for an additional time-period, the next previous stage is turned off. This cycle continues until all stages have been de-energized.

When the space temperature rises above the space setpoint, all of the heating stages turn off.

During unoccupied periods, the heating setpoint is adjusted downwards using a separate unoccupied heating setpoint.

**Figure 11: Heat Sequence - Occupied Mode**

**Figure 12: Heat Sequence – Unoccupied Mode**
Heating Valve Control

Heating with Floating Point Control

The heating stage outputs can be configured for floating point control of a heating valve. Floating point control is enabled when Heating Stages are set to zero and the Heating Valve Travel Time is non-zero. The H1 output is the valve open signal and the H2 output is the valve close signal.

After a reset, the floating point valve is calibrated by closing the valve for a period of the travel time. This ensures that the valve is fully closed. When the valve is at its calculated 0% or 100% position, the valve is over-driven for 30 seconds to ensure that the valve is fully closed or open.

The floating point control is similar to the heating modulated algorithm. If the space temperature is below the heating setpoint, the valve is driven open. When the space temperature is above the heating setpoint, the valve is driven close. There is a +/- 1 °F (0.55 °C) deadband around the setpoint to prevent the valve from dithering. During mixed air low limit alarms, the heating valve is driven to 100%.

During unoccupied periods, the heating setpoint is adjusted downwards using a separate unoccupied heating setpoint.

Heating with Modulated Heating Valve

The calculated heating loop setpoint is derived from the heating setpoint and the loop proportional gain.

\[
\text{CalcHeatingLoopSp} = \frac{\text{CalcHeatingSp} - \frac{1}{2(K_p)}}{K_p} 
\]

The heating valve is modulated by a Proportional + Integral (P+I) control loop based on the heating loop setpoint and the space temperature. The P+I control loop will modulate the valve to maintain a constant space temperature. As the temperature decreases below the heating loop setpoint, the heating valve will be modulated open. The heating valve will be modulated closed as the temperature increases above the heating loop setpoint. When unoccupied mode is entered, the heating loop setpoint is set back through a separate unoccupied heating setpoint.

To prevent the integral component from becoming too large, there is anti-wind up reset protection. This protection clamps the integral value when all of the components add up to more than 100% or less than 0%. The following equations are used for P+I control:

\[
K_p = \text{Proportional Gain} \\
K_i = \text{Integral Gain} \\
\text{Error} = \text{HeatingLoopSp} - \text{SpaceTemp} \\
I = I + (K_i \times \text{Error}) \\
\text{HeatPosition} = (K_p \times \text{Error}) + I
\]

Cooling Sequence

The controller provides support for either four compressor stages of cooling or one floating point or 0-10V modulating cooling valve. You can specify which type of cooling you are using through configuration parameters.
Cooling Stages

The controller sequences the cooling compressor stages based on the space temperature and the calculated cooling setpoint. When the space temperature rises above the cooling setpoint plus the cooling control band for a predefined time-period, a stage is turned on. If the space temperature remains above this value for an additional time-period, the next stage is turned on. This cycle continues until all stages have been energized.

After the space temperature has dropped below the cooling setpoint for a predefined time-period, the last-energized stage is turned off. (Note that the last stage that was turned on is the first one to be turned off.) If the space temperature remains below the cooling setpoint for an additional time-period, the next previous stage is turned off. This cycle continues until all stages have been de-energized.

When the space temperature drops below the space setpoint, all of the cooling stages turn off.

During unoccupied periods, the cooling setpoint is adjusted upwards using a separate unoccupied cooling setpoint.

Figure 13: Cooling Sequence - Occupied Mode

Figure 14: Cooling Sequence – Unoccupied Mode

Cooling with Floating Point Control

The cooling outputs can be configured for floating point control of a cooling valve. Floating point control is enabled when Cooling Stages are set to zero and the Cooling Valve Travel Time is non-zero. The Cooling Stage 1 output is the valve open signal and the Cooling Stage 2 output is the valve close signal.

After a reset, the floating point valve is calibrated by closing the valve for a period of the travel time. This ensures that the valve is fully closed. When the valve is at its calculated 0% or 100% position, the valve is over-driven for 30 seconds to ensure that the valve is fully closed or open.
The floating point control is similar to the cooling modulated algorithm. If the space temperature is above the cooling setpoint, the valve is driven open. When the space temperature is below the cooling setpoint, the valve is driven close. There is a +/- 1 °F (0.55 °C) deadband around the setpoint to prevent the valve from dithering. During mixed air low limit alarms, the cooling valve is driven to 100%.

During unoccupied periods, the cooling setpoint is adjusted upwards using a separate unoccupied cooling setpoint.

**Cooling with Modulated Cooling Valve**

The *calculated cooling loop setpoint* is derived from the calculated cooling setpoint and the loop proportional gain.

\[
\text{CalcCoolingLoopSp} = \text{CalcCoolingSp} + \frac{1}{2(K_p)}
\]

The cooling valve is modulated by Proportional + Integral (P+I) control loop based on the cooling loop setpoint and space temperature. The P+I control loop will modulate the valve to maintain a constant space temperature. As the temperature increases above the cooling loop setpoint, the cooling valve will be modulated open. The cooling valve will be modulated closed as the temperature decreases below the cooling loop setpoint. When unoccupied mode is entered, the cooling setpoint is adjusted upwards through a separate unoccupied cooling setpoint.

To prevent the integral component from becoming too large, there is anti-wind up reset protection. This protection clamps the integral value when all of the components add up to more than 100% or less than 0%. The following equations are used for P+I control:

\[
K_p = \text{ProportionalGain} \\
K_i = \text{IntegralGain} \\
\text{Error} = \text{CoolingSetpoint} - \text{SpaceTemp} \\
I = I + (K_i \times \text{Error}) \\
\text{CoolPosition} = (K_p \times \text{Error}) + I
\]
Economizer Operation

The controller provides support for either a two-position or a modulated economizer. You can specify which type of economizer operates through a configuration parameter. The economizer is enabled based on the availability of "free cooling" from the outdoor air. Free cooling can be determined by dry bulb or enthalpy comparisons. In order to provide maximum energy savings, the cooling stages are interlocked with the economizer.

Dry Bulb Comparisons

Free cooling can be determined based on a comparison of outdoor air temperature and indoor air temperature. When the outdoor air temperature is a programmable amount below the indoor air temperature, free cooling is enabled. When the outdoor air temperature rises above the indoor temperature, free cooling is disabled.

Enthalpy Comparison

An enthalpy calculation is performed periodically to determine if “free cooling” is available from the outside air. The outside enthalpy is calculated based on the outside air temperature and humidity. The outside temperature and humidity are measured by an external device (such as an ASM) on the network and sent to the controller. The same calculation is performed on the inside air based on the space temperature and return air humidity. The inside enthalpy minus the outside enthalpy must be greater than the Free Cooling Setpoint in order for the economizer to be used for free cooling. Optionally, an ASM can measure the indoor air humidity globally. In this case, a return air humidity sensor would not be required at each DXU3.

Two-position Economizer Control

If configured, the two-position economizer is enabled when there is “free cooling” available as determined by the enthalpy or drybulb calculations. When the economizer is enabled, the economizer triac output is energized. When the economizer is disabled, the economizer output is de-energized. A configuration parameter is available to optionally disable the economizer during unoccupied periods.

Modulated Economizer Control

If present, the modulated economizer is enabled when there is “free cooling” available as determined by the enthalpy or dry bulb calculations. A configuration parameter is available to optionally disable the economizer during unoccupied periods.

Figure 15: Economizer Control.

When the economizer is enabled, a Proportional + Integral (P+I) control loop modulates the economizer output position to maintain a constant mixed air temperature.

The Proportional + Integral (P+I) control loop is based on the mixed air temperature setpoint and economizer setpoint. As the temperature increases above the economizer setpoint, the economizer is modulated open. The economizer is modulated closed as the temperature decreases below the economizer setpoint.
To prevent the integral component from becoming too large, there is anti-wind up reset protection. This protection clamps the integral value when all of the components add up to more than 100% or less than 0%. The following equations are used for P+I control:

\[ K_p = \text{ProportionalGain} \]
\[ K_i = \text{IntegralGain} \]
\[ \text{Error} = \text{EconSp} - \text{MixedAirTemp} \]
\[ I = I + (K_i \times \text{Error}) \]
\[ \text{EconPosition} = (K_p \times \text{Error}) + I \]

When the economizer is disabled, it modulates to the minimum position. A configuration parameter is available to optionally disable the economizer during unoccupied periods.

**Cutoff Temperatures**

The cutoff temperatures can be set for heating, cooling and for the economizer to suppress mechanical equipment from activating if the Outside Air Temperature is above or below a cutoff setpoint.

Heating will be suspended when the Outside Air Temperature (OAT) rises above \( \text{Max OAT Heat} \) and resumes when the OAT falls 5 °F below the setting. Cooling is suspended when the OAT falls below \( \text{Min OAT Cool} \) and will resume when OAT rises 5 °F above the setting. The Economizer will close the Dampers to the MinAirPosition, whenever the OAT is outside the \( \text{Max OAT Econ} \) and \( \text{Min OAT Econ} \) Temperature limits.

The Supply Air Temperature (SAT) will be monitored and compared to the \( \text{SAT Cooling Limit} \). Should the SAT fall below the \( \text{SAT Cooling Limit} \), additional cooling will not be enabled. If the SAT rises above the \( \text{SAT Cooling Limit} \) additional cooling will be enabled as needed.

**Dehumidification**

If the \( \text{Setpoint} \) is set to zero, dehumidification is disabled.

When the humidity is above the \( \text{Setpoint} \) dehumidification begins and stops when the humidity drops below \( \text{Setpoint} - 3\% \).

Dehumidification stops when the Space Temperature drops below the Heating Setpoint minus Shutoff offset. Dehumidification is disabled when the unit is in Heating mode.

During Dehumidification, the operating mode is displayed as Dehumid. The cooling outputs stage on, and the stage timer is enforced, or modulating output or floating point valve will be set to 100%.

**Analog Outputs**

All modulated outputs support normal and reverse actuation. Making the analog output's minimum voltage scaling parameter less than the maximum enables normal actuation. Making the analog outputs maximum scaling parameter less than the minimum enables reverse actuation.

**Fan Operation**

During occupied periods, you can set the fan to always run or to cycle off when the space temperature is within the zero energy band. The zero energy band is defined as the temperature range between the cooling and heating setpoints. The fan is interlocked with the cooling and heating stages. If there is a call for heating or cooling, the fan energizes. During the unoccupied period, the fan always cycles off when the space temperature is within the zero energy band.

Depending on the model of thermostat, you may be able to override the fan from the local thermostat. When the fan selection is set to \( \text{Auto} \), the fan operates as described above. If the fan selection is set to \( \text{On} \), the fan is constantly on.
**Fan Proof**

When there is a call for heating or cooling, the fan output is energized. A fan status input is provided for monitoring the operation of the fan. When the fan is initially turned on, there is a 30 second delay before the fan status is checked. If at any time after the delay, the fan status indicates the fan is not running, a fan failure condition is generated. The heating and cooling stages are interlocked with the fan. When a fan failure condition exists, the heating stages, cooling stages and the fan immediately turn off. The condition returns to normal when the fan signal returns.

**Note:** If you are not providing a fan status switch, the input must be jumpered to the adjacent common. After a fan failure, the controller’s status LED goes solid red. To return the controller to normal operation after the failure condition is resolved, you must reset the controller by removing and reapplying power or by using the controller reset feature on the LCI. (See *iWorx® LCI2 Application Guide* for details.)

**Smoke Detection**

A smoke detector input is provided. If the smoke detector indicates smoke is present, all of the stages and the fan turn off. The controller returns to normal operation after a reset.

**Mixed Air Low Limit Detection**

An input is provided for a mixed air low limit detection device. If a low limit condition is detected, all of the stages and the fan turn off. The controller returns to normal operation after a neuron reset. (After the DXU3 switches from unoccupied mode to occupied mode, there is a ten minute delay before it reports Mixed Air Low Limit alarms.) If heating is configured as modulated or floating point the heating valve opens to 100%

**Filter Status**

The filter status input is monitored to determine if the filter is operating properly. The input is used to indicate that maintenance is required on the filter. The controller application is not shutdown due to a filter alarm.

**Indoor Air Quality**

An indoor air quality input is provided. If an indoor air quality alarm is indicated, the supply air fan is energized and the economizer is overridden to supply fresh air to the space.

The source of an indoor air quality signal can be a digital sensor providing an on/off signal or a configurable analog sensor. Setup of the analog sensor requires the IAQ sensor settings to be populated. A Min, Max, Setpoint and an Offset can be specified. When an indoor air condition is sensed by the controller, the economizer is opened to 100%.

The controller has a temperature reset function for IAQ alarm operation. The temperature reset function allows the space temperature to rise above or drop below the calculated control setpoints by a configurable amount. This feature allows time for indoor air quality to improve. During IAQ Alarm operation, if the space temperature rises above or drops below the temperature reset limit, the controller will resume normal economizer control to maintain a comfort space temperature. Once the space temperature is brought within the calculated setpoints and an IAQ Alarm condition still exists, the controller will resume the IAQ mode of operation.

The controller has an alarm delay function that configures how long it will wait before signaling an IAQ Alarm condition.

**Thermostat**

The space temperature value, setpoint adjustment, humidity (depending on the thermostat model), fan auto/on status (depending on the thermostat model), and occupancy override request are monitored by the thermostat and sent to the controller.

The controller automatically detects a failure of the thermostat. When the thermostat fails, the cooling stages, heating stages, economizer, and fan are turned off and control is disabled.

**NOTE:** unless another host controller overrides the space temperature through the LCI, the thermostat must be connected. The status LED on the controller turns solid red if the thermostat is not connected and no other controller is providing temperature data. Once the controller begins receiving temperature data the status LED will turn green indicating normal operation.
**Extended Occupancy Time accumulation**

When the space is overridden to the occupied mode of operation via the space thermostat, the amount of extended occupancy is accumulated. The extended occupancy time is accumulated in minutes and can be viewed from the LCI under the “Thermostat Settings”.

The extended occupancy time is backed up to non-volatile memory at midnight. The user can clear the accumulated extended occupancy from the LCI.

**Real Time Clock (RTC)**

The RTC will be set or synced by the LCI each day at midnight. The controller will utilize the RTC in conjunction with its local backup schedule during periods when the LCI is not available.

**Local Backup Schedule**

The LCI normally determines the operating mode. You can define a local backup schedule for situations when the LCI is not available. When the controller detects that the LCI is not available (after 10 minutes without communication), it resorts to the local backup schedule that you have configured. If the local backup schedule is disabled, the controller defaults to the occupied mode.

You configure the occupied and unoccupied times that are used in determining the current operating mode of the controller when it is running a backup schedule. By default, both the unoccupied and occupied time are set to zero, which disables the local backup schedule. This causes the controller to default to the occupied mode of operation if it cannot communicate with the LCI.

**Runtime Accumulations**

The total runtime is accumulated for the heating, cooling, and fan outputs. The runtimes can be used to indicate that maintenance is required on the equipment controlled by these outputs. The runtime can be reset by an operator or maintenance person once servicing has been performed.

**Alarms and Events**

The controller detects certain alarm conditions and sends them to the LCI. Before this can occur, you must use the LCI to configure the controller.

**Digital Input Alarms**

The controller monitors the status of the digital inputs and generates alarms for the following events:

- Fan failure (Fan Failed Alarm)
- Smoke detect (Smoke Detected Alarm)
- Mixed air low limit condition (Low Limit Alarm)
- Dirty filter (Dirty Filter Alarm)
- Indoor Air Quality (Indoor Air Quality Alarm)

**Thermostat Failure**

The controller automatically detects the presence of the local thermostat and monitors its status. If the thermostat fails to communicate with the controller, a Thermostat Failed Alarm is generated and the controller’s status LED turns red. If the space temperature is overridden by a host controller, this alarm is disabled.

**Maintenance Alarm**

The controller provides programmable Runtime Limits for generating runtime Maintenance Alarms. When any of the cooling, heating, or fan runtime limits are exceeded, a Maintenance Alarm is sent to the LCI.

**Space Temperature Alarms**

The controller generates high and low limit alarms for the space temperature. You can configure a programmable space temperature alarm limit offset. The temperature limits are calculated based on the control setpoints, alarm limit offset, and control band.

\[ \text{HighLimit} = \text{CalcCoolingSp} + \text{AlarmLimitOffset} + \text{CoolBand} \]
When the measured space temperature exceeds the high limit, a high limit alarm (Space Temperature High Limit Alarm) is generated. When the space temperature drops below the low limit, a low limit alarm is generated (Space Temperature Low Limit Alarm). A return to normal alarm is generated when the space temperature is between the high and low limit (Space Temperature Return to Normal).

When the controller switches between the unoccupied and occupied modes of operation, no space temperature alarms are reported for 30 minutes following the switch. This helps eliminate nuisance alarms.

**Communication with Associated Devices**

The controller is capable of communicating and sharing information with other controllers on the network.

**Communication with a BZU**

The communication between a DXU3 and a BZU is configured by the LCI2. The individual controller screen for the BZU displays a *Members* button which can be pressed to create an association between a DXU3 and a BZU. This can only be a one-to-one association, where the BZU acts as the master and the DXU3 acts as a slave.

During the association process, the BZU receives a notice from the DXU3. Once associated, the BZU starts exchanging messages with the DXU3.

When communication gets lost between the DXU3 and the BZU, the BZU attempts to contact the DXU3 every 5 minutes. During this time, the DXU3 reacts as if the Stat doesn't respond.

**Communication with a CCU**

The communication between a CCU and a DXU is configured by the LCI2. The individual Controller Screen for the CCU displays a *Members* button which can be pressed to create an association.

Please refer to the *iWorX LCI Application Manual* for a detailed description of how to associate DXU and CCU-type controllers.

\[
\text{LowLimit} = \text{CalcHeatingSp} - \text{AlarmLimitOffset} - \text{HeatBand}
\]
CONTROLLER IDENTIFICATION

Once the DXU3 is properly installed and recognized by the Local Control Interface (LCI2), the LCI2 can be used to configure the settings of the controller. This section describes the commands available on the LCI2 for configuration of the DXU3, and the meanings and suggested values for controller parameters. For more information on using the LCI2, see the *iWorx® LCI2 Application Guide*.

Network Inputs

The DXU3 allows a network manager to write to Network Input Variables for the purpose of overriding the configuration, operation and outputs of the DXU3. The variables are listed below and in Table 1 on page 30.

Values written to NVIs have absolute priority over any other controller operation.

- *nviSpaceTemp* overrides the space temperature as obtained from the thermostat, sensor, or ASM module and is used by the controller for temperature control. Writing to this variable will also be reflected in the controller's output of the space temperature as displayed on the LCI.

- *nviSetpoint* overrides the setpoint as obtained from the thermostat, the LCI or from a pre-configured schedule. Writing to this variable will also be reflected in the controller's output of the effective setpoint as displayed on the LCI.

- *nviOccCmd* overrides the occupancy as obtained from the thermostat. Writing to this variable will also be reflected in the controller's output of the occupancy mode. Note that this is NOT the occupancy sensor. The occupancy sensor hardware input (OCC) will still be displayed on the LCI based on its configuration.

- *nviResetRuntime* is a command to reset the fan, heating and cooling runtimes. If the value sent is 0, then no reset occurs; if the value sent is 1, then the runtimes are reset.

- *nviSysTime* is a time stamp to set the date and time. Writing to this variable will change the time on the device and will affect all time-related functions such as schedules.

- *nviOutOverride* is a structure (defined in Table 2 on page 31) that overrides the hardware digital and analog outputs on the DXU3. These values allow the network controller to directly control the analog and digital outputs of the board. Additionally, the two floating setpoint outputs may be set directly.

  **NOTE:** the DXU3 makes no attempt to interpret the outputs; assigning meaningless outputs (such as setting a digital output in both the digOut array and the fpOut array, or assigning a value to H1 but leaving H2 as 0xFF) will have unpredictable results.

Table 1: Network Variable Inputs (NVIs)

<table>
<thead>
<tr>
<th>Internal Variable Name</th>
<th>Format</th>
<th>Range</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>nviSpaceTemp</td>
<td>SNVT_temp_p</td>
<td>-29 to 230°F (-33 to 210°C)</td>
<td>Space temperature</td>
</tr>
<tr>
<td>nviSetpoint</td>
<td>SNVT_temp_p</td>
<td>-29 to 230°F (-33 to 210°C)</td>
<td>Setpoint</td>
</tr>
<tr>
<td>nviOccCmd</td>
<td>SNVT_occupancy</td>
<td>0=Occupied 1=Unoccupied 2=Bypass 3=Standby -1=Nul</td>
<td>Occupancy Command</td>
</tr>
<tr>
<td>nviResetRuntime</td>
<td>SNVT_lev_disc</td>
<td>0=no reset 1=reset runtimes</td>
<td>Resets fan, heating, and cooling runtimes</td>
</tr>
<tr>
<td>nviSysTime</td>
<td>SNVT_time_stamp</td>
<td>Date/Time</td>
<td>System time</td>
</tr>
<tr>
<td>nviOutOverride</td>
<td>See Table 2</td>
<td>Structure</td>
<td>Output override</td>
</tr>
</tbody>
</table>
Table 2: Output Override Structure (NVI)

<table>
<thead>
<tr>
<th>Setting</th>
<th>Type/Range</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
</table>
| digOut[8]| Unsigned Byte: 0xFF = no override | 0xFF    | digOut[0] = TO1 (pin 31) C1  
digOut[1] = TO2 (pin 29) C2  
digOut[2] = TO3 (pin 28) C3  
digOut[3] = TO4 (pin 26) C4  
digOut[4] = TO5 (pin 25) H1  
digOut[5] = TO6 (pin 23) H2  
digOut[6] = TO7 (pin 22) FAN  
digOut[7] = TO8 (pin 20) ECD |
| aOut[4]  | SNVT_lev_percent: 32767 = no override | 32767   | aOut[0] = AO 0 (pin 37) ECNM  
aOut[1] = AO 1 (pin 35) HTGM  
aOut[2] = AO 2 (pin 34) CLGM  
aOut[3] = AO 3 (pin 32) unassigned |
fpOut[1] = unassigned  
fpOut[2] = unassigned  
fpOut[3] = unassigned |

Inputs

The inputs are displayed on the LCI’s input screen. These values cannot be changed.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Range</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside Temp</td>
<td>-29 to 230 °F (-33.9 to 110 °C)</td>
<td>The outside air temperature communicated through the LCI from the ASM controller.</td>
</tr>
<tr>
<td>In Enthalpy</td>
<td>0.0 to 60.0 BTU/lb. (0.0 to 139.6 kjoule/kg)</td>
<td>Calculated inside air enthalpy.</td>
</tr>
<tr>
<td>Out Enthalpy</td>
<td>2.0 to 60.0 BTU/lb. (3.0 to 139.6 kjoule/kg)</td>
<td>Calculated outside air enthalpy.</td>
</tr>
<tr>
<td>Space Temperature</td>
<td>-29 to 90 °F (-33.9 to 32.2 °C)</td>
<td>The space temperature reported by the SLink or thermistor.</td>
</tr>
<tr>
<td>Occ Ext Time Rem</td>
<td>0-1000 min</td>
<td>Number of minutes remaining in extended occupancy.</td>
</tr>
<tr>
<td>Smoke Detector</td>
<td>Normal, Smoke</td>
<td>Status of the smoke detector.</td>
</tr>
<tr>
<td>Fan Status</td>
<td>Off, On</td>
<td>Status of the fan proof switch.</td>
</tr>
<tr>
<td>Low Limit</td>
<td>Normal, Low limit</td>
<td>Status of the low limit switch.</td>
</tr>
<tr>
<td>Filter Status</td>
<td>Normal, Dirty</td>
<td>Status of the filter status switch.</td>
</tr>
<tr>
<td>Indoor Air Qual.</td>
<td>Normal, Alarm</td>
<td>Status of the indoor air quality sensor when defined as “Digital”.</td>
</tr>
<tr>
<td>Occupancy Mode</td>
<td>Occupied, Unocc, Bypass</td>
<td>Occupancy mode of controller.</td>
</tr>
<tr>
<td>Supply Air Temp</td>
<td>-29 to 230 °F (-33.9 to 110 °C)</td>
<td>Temperature of the supply air duct.</td>
</tr>
<tr>
<td>Return Air Temp</td>
<td>-29 to 230 °F (-33.9 to 110 °C)</td>
<td>Temperature of the return air duct.</td>
</tr>
<tr>
<td>Mixed Air Temp</td>
<td>-29 to 230 °F (-33.9 to 110 °C)</td>
<td>Temperature of the mixed air plenum.</td>
</tr>
<tr>
<td>Return/Zone Humidity</td>
<td>0.00 to 100.00%</td>
<td>Humidity of the return air duct or space.</td>
</tr>
<tr>
<td>IAQ</td>
<td>0 to 4000 ppm</td>
<td>Reading of the indoor air quality sensor when defined as “Analog.”</td>
</tr>
</tbody>
</table>
Outputs

The outputs are displayed on the LCI’s output screen. These values cannot be changed.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Range</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode</td>
<td>Heat, Cool, Off, Fan, Free Cooling, Dehumid, Shut Down</td>
<td>Operating mode</td>
</tr>
<tr>
<td>Heat Output</td>
<td>0.00% to 100.00%</td>
<td>Current state of the heating output.</td>
</tr>
<tr>
<td>Cool Output</td>
<td>0.00% to 100.00%</td>
<td>Current state of the cooling output.</td>
</tr>
<tr>
<td>Economizer Output</td>
<td>0.00% or 100.00%</td>
<td>Current state of the economizer output.</td>
</tr>
<tr>
<td>Fan Output</td>
<td>0.00% or 100.00%</td>
<td>Current state of the fan output.</td>
</tr>
<tr>
<td>In Alarm?</td>
<td>Yes, No</td>
<td>Alarm indication.</td>
</tr>
</tbody>
</table>

Configuration

This section describes the settings that can be modified.

All Settings

Displays all of the DXU3’s setpoints and editable settings and provides access to edit all DXU3 parameters from a single screen, some of the parameters are structures and will be described in individual tables below this table.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Range</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermostat</td>
<td>Structure</td>
<td></td>
<td>Thermostat Settings</td>
</tr>
<tr>
<td>Setpoints</td>
<td>Structure</td>
<td></td>
<td>Setpoint Settings</td>
</tr>
<tr>
<td>Staged Cooling</td>
<td>Structure</td>
<td></td>
<td>Staged Cooling Settings</td>
</tr>
<tr>
<td>Modulated Cooling</td>
<td>Structure</td>
<td></td>
<td>Modulated Cooling Settings</td>
</tr>
<tr>
<td>Floating SP Cooling</td>
<td>Structure</td>
<td></td>
<td>Floating Point Valve Cooling Settings</td>
</tr>
<tr>
<td>Staged Heating</td>
<td>Structure</td>
<td></td>
<td>Staged Heating Settings</td>
</tr>
<tr>
<td>Modulated Heating</td>
<td>Structure</td>
<td></td>
<td>Modulated Heating Settings</td>
</tr>
<tr>
<td>Floating SP Heating</td>
<td>Structure</td>
<td></td>
<td>Floating Point Valve Heating Settings</td>
</tr>
<tr>
<td>Fan Type</td>
<td>Auto, On</td>
<td>Auto</td>
<td>Set to “On” to enable continuous operation during occupied mode. Otherwise, fan switches on and off automatically according to the control algorithm.</td>
</tr>
<tr>
<td>Economizer</td>
<td>Structure</td>
<td></td>
<td>Economizer settings</td>
</tr>
<tr>
<td>Free Cooling</td>
<td>Structure</td>
<td></td>
<td>Free Cooling settings</td>
</tr>
<tr>
<td>Dehumidification</td>
<td>Structure</td>
<td></td>
<td>Dehumidification Settings</td>
</tr>
<tr>
<td>Runtime Limits</td>
<td>Structure</td>
<td></td>
<td>Runtime Limit Settings</td>
</tr>
<tr>
<td>Backup Occ Time</td>
<td>Structure</td>
<td></td>
<td>Hour and minute to begin occupied period for the local backup schedule</td>
</tr>
<tr>
<td>Backup Unocc Time</td>
<td>Structure</td>
<td></td>
<td>Hour and minute to begin unoccupied period for the local backup schedule</td>
</tr>
<tr>
<td>IAQ Mode</td>
<td>Digital, Analog</td>
<td>Digital</td>
<td>Type of IAQ Sensor</td>
</tr>
<tr>
<td>IAQ Settings</td>
<td>Structure</td>
<td></td>
<td>Setting for the IAQ Alarm</td>
</tr>
<tr>
<td>IAQ Sensor</td>
<td>Structure</td>
<td></td>
<td>Settings for the IAQ analog Sensor</td>
</tr>
<tr>
<td>Cutoff Temps</td>
<td>Structure</td>
<td></td>
<td>Provides entries for cutoff temperatures for heating, cooling and economizer functions</td>
</tr>
</tbody>
</table>
Thermostat
Displays all of the thermostat settings and provides access to edit these parameters from a single screen.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Range</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>PreconIII, PreconII, SLink, Not used</td>
<td>SLink</td>
<td>Type of Thermostat used</td>
</tr>
<tr>
<td>Occupancy Extension</td>
<td>0 to 1000 min</td>
<td>60 min</td>
<td>Allowable occupancy extension time.</td>
</tr>
<tr>
<td>Alarm Temp Offset</td>
<td>0 to 10.0 °F (0 to 5.6 °C)</td>
<td>5 °F (2.8 °C)</td>
<td>Degrees below the heating setpoint or above the cooling setpoint to trigger a low limit or high limit alarm. Zero disables the alarm.</td>
</tr>
<tr>
<td>Temperature offset</td>
<td>-10.0 to 10.0 °F (-5.6 to 5.6 °C)</td>
<td>0 °F (0 °C)</td>
<td>Degrees to be added or subtracted from the actual zone temperature. This setting is used as a means to calibrate the actual temperature reading of a Precon II or III thermistor.</td>
</tr>
<tr>
<td>Accumulated Ext Occ.</td>
<td>0 - 1000 min</td>
<td>0 min</td>
<td>Accumulated occupancy extension time.</td>
</tr>
</tbody>
</table>

Setpoint
Displays all of the setpoints and provides access to edit these parameters from a single screen.

<table>
<thead>
<tr>
<th>Settings</th>
<th>Range</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setpoint</td>
<td>50 to 95 °F (10 to 35 °C)</td>
<td>71.0°F (21.2 °C)</td>
<td>Setpoint for occupied time periods.</td>
</tr>
<tr>
<td>Cooling Offset</td>
<td>0 to 10.0 °F (0 to 5.6 °C)</td>
<td>1 °F (0.6 °C)</td>
<td>This value is used to calculate the cooling SP by adding to the SP.</td>
</tr>
<tr>
<td>Heating Offset</td>
<td>0 to 10.0 °F (0 to 5.6 °C)</td>
<td>1 °F (0.6 °C)</td>
<td>This value is used to calculate the heating SP by subtracting from the SP.</td>
</tr>
<tr>
<td>SP Adjust Limit</td>
<td>0 to 10.0 °F (0 to 5.6 °C)</td>
<td>2 °F (1.2 °C)</td>
<td>Maximum setpoint adjustment for occupied time periods.</td>
</tr>
<tr>
<td>Unocc Cooling</td>
<td>50 to 95 °F (10 to 35 °C)</td>
<td>82.0°F (27.7 °C)</td>
<td>Cooling setpoint for unoccupied time periods.</td>
</tr>
<tr>
<td>Unocc Heating</td>
<td>50 to 95 °F (10 to 35 °C)</td>
<td>60.0°F (15.5 °C)</td>
<td>Heating setpoint for unoccupied time periods</td>
</tr>
</tbody>
</table>

Staged Heating/Cooling
The following parameter structure displays the heating and cooling parameters used by the controller for staged heating or cooling. Select the parameter to modify and then use the keypad to enter in the desired value.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Range</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stages</td>
<td>0 to 4 (cooling)</td>
<td>4</td>
<td>Number of stages controlled. Set to zero to disable heating or cooling.</td>
</tr>
<tr>
<td></td>
<td>0 to 2 (heating)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Control Band</td>
<td>0 to 10 °F (0 to 5.6 °C)</td>
<td>1.0 °F (0.6 °C)</td>
<td>Value used to modify the calculated heating and cooling setpoints to form the temperature range in which local heating or cooling is enabled.</td>
</tr>
<tr>
<td>Stage Time</td>
<td>0 to 255 min</td>
<td>5 min</td>
<td>The rate at which stages are sequenced.</td>
</tr>
</tbody>
</table>
Modulated Heating/Cooling
The following parameter structure displays the heating and cooling parameters used by the controller for modulated heating or cooling. Select the parameter to modify and then use the keypad to enter in the desired value.

<table>
<thead>
<tr>
<th>Setpoint</th>
<th>Range</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kp</td>
<td>0.00 to 100.00% (per °F)</td>
<td>5.00%</td>
<td>Proportional gain of the cooling P+I control loop.</td>
</tr>
<tr>
<td>Ki</td>
<td>0.00 to 100.00%</td>
<td>0.05%</td>
<td>Integral gain of the cooling P+I control loop.</td>
</tr>
<tr>
<td>Min AO Voltage</td>
<td>0.0 to 10.0 V</td>
<td>0.0 V</td>
<td>Minimum output voltage for modulated heating or cooling.</td>
</tr>
<tr>
<td>Max AO Voltage</td>
<td>0.0 to 10.0 V</td>
<td>0.0 V</td>
<td>Maximum output voltage for modulated heating or cooling. If set to 0, Modulation is disabled.</td>
</tr>
</tbody>
</table>

Floating SP Heating/Cooling
The following parameter structure displays the heating and cooling parameters used by the controller for floating point heating or cooling. Select the parameter to modify and then use the keypad to enter in the desired value.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Range</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kp</td>
<td>0.00 to 100.00% (per °F)</td>
<td>5.00%</td>
<td>Proportional gain of the floating point valve’s P+I control loop.</td>
</tr>
<tr>
<td>Ki</td>
<td>0.00 to 100.00%</td>
<td>0.05%</td>
<td>Integral gain of the floating point valve’s P+I control loop.</td>
</tr>
<tr>
<td>Travel Time</td>
<td>0 to 600 sec</td>
<td>0 sec</td>
<td>Total time it takes for the floating point valve to travel from fully closed to fully open. If set to 0, floating point valve is disabled.</td>
</tr>
<tr>
<td>Deadband</td>
<td>0.00 to 100.00%</td>
<td>10%</td>
<td>The desired setpoint must be this far or greater from the actual position before modulating the actuator.</td>
</tr>
</tbody>
</table>

Economizer
Displays DXU3 setpoints that specifically relate to economizer operation.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Range</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economizer Type</td>
<td>Disabled, 2 St Unocc On, 2 St Unocc Off, Mod Unocc. On, Mod Unocc. Off</td>
<td>Disabled</td>
<td>If using an economizer, set this field to a value that describes the type of economizer and whether it should be enabled during unoccupied periods. Attempts to set Type to “2 St Unocc On” or “2 St Unocc Off” will be ignored.</td>
</tr>
<tr>
<td>Setpoint</td>
<td>40.00 to 70.00 °F (4.44 to 21.11 °C)</td>
<td>55.00 °F (12.78 °C)</td>
<td>Setpoint used for controlling the economizer.</td>
</tr>
<tr>
<td>Min Fresh Air</td>
<td>0.00 to 100.00%</td>
<td>10.0%</td>
<td>Minimum fresh air position for the modulated economizer.</td>
</tr>
<tr>
<td>Kp</td>
<td>0.00 to 100.00% (per °F)</td>
<td>5.00%</td>
<td>Proportional gain of the economizer’s P+I control loop.</td>
</tr>
</tbody>
</table>
### Free Cooling

Displays all of the free cooling settings and provides access to edit these parameters from a single screen.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Range</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ki</td>
<td>0.00 to 100.00%</td>
<td>0.05%</td>
<td>Integral gain of the economizer’s P+I control loop.</td>
</tr>
<tr>
<td>Min AO Voltage</td>
<td>0.0 to 10.0 V</td>
<td>0.0 V</td>
<td>Minimum output voltage for the modulated economizer.</td>
</tr>
<tr>
<td>Max AO Voltage</td>
<td>0.0 to 10.0 V</td>
<td>10.0 V</td>
<td>Maximum output voltage for the modulated economizer.</td>
</tr>
</tbody>
</table>

### Dehumidification

Displays all of the dehumidification settings and provides access to edit these parameters from a single screen.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Range</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Rtn Air Humidity, Global Humidity, Dry Bulb Temp</td>
<td>Rtn Air Humidity</td>
<td>Type of free cooling comparison to perform.</td>
</tr>
<tr>
<td>Enthalpy offset</td>
<td>0.0 to 60.0 BTU/lb. (0.0 to 139.6 kjoule/kg)</td>
<td>5.0 BTU/lb. (11.6 kjoule/kg)</td>
<td>Difference between inside enthalpy and outside enthalpy that enables or disables the economizer.</td>
</tr>
<tr>
<td>Dry bulb offset</td>
<td>0.0 to 20.0 °F (0.0 to 11.1 °C)</td>
<td>5 °F (2.78 °C)</td>
<td>Difference between zone temperature and outside temperature that enables or disables the economizer.</td>
</tr>
</tbody>
</table>

### Runtimes and Limits

Displays all of the runtimes and limits settings and provides access to edit these parameters from a single screen.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Range</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling</td>
<td>0 to 65535 hours</td>
<td>1000 hours</td>
<td>Runtime limit for cooling after which a maintenance alarm is generated.</td>
</tr>
<tr>
<td>Heating</td>
<td>0 to 65535 hours</td>
<td>1000 hours</td>
<td>Runtime limit for heating after which a maintenance alarm is generated.</td>
</tr>
<tr>
<td>Fan</td>
<td>0 to 65535 hours</td>
<td>1000 hours</td>
<td>Runtime limit for fan after which a maintenance alarm is generated.</td>
</tr>
</tbody>
</table>
### Backup Occ Time / Backup Unocc Time for Weekdays

The Backup times for Unoccupied and occupied mode is stored in the controller. The controller uses these times when no network interface to the LCI2 can be found.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Range</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours</td>
<td>0-23</td>
<td>0</td>
<td>Hour to start occupied/unoccupied mode.</td>
</tr>
<tr>
<td>Minutes</td>
<td>0-59</td>
<td>0</td>
<td>Minute to start occupied/unoccupied mode</td>
</tr>
</tbody>
</table>

### IAQ Settings

Displays all of the IAQ settings and provides access to edit these parameters from a single screen.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Range</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAQ Delay Time</td>
<td>0 - 1000 min</td>
<td>5 min</td>
<td>Time the Alarm will be delayed.</td>
</tr>
<tr>
<td>Temp Reset Limit</td>
<td>0 to 15 °F</td>
<td>5 °F</td>
<td>Temperature Reset Limit to ensure comfort temperature during IAQ Alarm conditions.</td>
</tr>
<tr>
<td>Deadband</td>
<td>0 - 400 ppm</td>
<td>0 ppm</td>
<td>Deadband to allow the IAQ to recover from Alarm condition.</td>
</tr>
</tbody>
</table>

### IAQ Sensor

Displays all of the IAQ Sensor settings and provides access to edit these parameters from a single screen.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Range</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
<td>0-4000 ppm</td>
<td>0 ppm</td>
<td>Minimum ppm Sensor setting.</td>
</tr>
<tr>
<td>Max</td>
<td>0-4000 ppm</td>
<td>0 ppm</td>
<td>Maximum ppm Sensor setting.</td>
</tr>
<tr>
<td>Setpoint</td>
<td>0-4000 ppm</td>
<td>0 ppm</td>
<td>Setpoint.</td>
</tr>
<tr>
<td>Offset</td>
<td>0-4000 ppm</td>
<td>0 ppm</td>
<td>Offset to the Sensor reading.</td>
</tr>
</tbody>
</table>

### Cutoff Temps

Displays all of the OAT cutoff settings and provides access to edit these parameters from a single screen.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Range</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max OAT Heat</td>
<td>-7.6 to 122 °F</td>
<td>-4 °F</td>
<td>Outside Air Temperature above which mechanical heating is disabled.</td>
</tr>
<tr>
<td></td>
<td>(-22 to 50 °C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min OAT Cool</td>
<td>-7.6 to 122 °F</td>
<td>-4 °F</td>
<td>Outside Air Temperature below which mechanical cooling is disabled.</td>
</tr>
<tr>
<td></td>
<td>(-22 to 50 °C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max OAT Econ</td>
<td>-7.6 to 122 °F</td>
<td>-4 °F</td>
<td>Outside Air Temperature above which economizer is at Min Air position.</td>
</tr>
<tr>
<td></td>
<td>(-22 to 50 °C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min OAT Econ</td>
<td>-7.6 to 122 °F</td>
<td>-4 °F</td>
<td>Outside Air Temperature below which economizer is at Min Air position.</td>
</tr>
<tr>
<td></td>
<td>(-22 to 50 °C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAT Cooling Limit</td>
<td>45 to 75 °F</td>
<td>55 °F</td>
<td>Supply air temperature below which additional cooling will not be enabled.</td>
</tr>
<tr>
<td></td>
<td>(7.2 to 23.9 °C)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: A value of -4 °F disables this cutoff temperature setting. All other values within the range are valid cutoff temperatures.
## Alarms

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Range</th>
<th>Alarm Trigger</th>
<th>Alarm Reset</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan Failure</td>
<td>Normal, Alarm</td>
<td>Occurs when the fan input detects that the fan is not running after a 30-second grace period after the fan has been activated.</td>
<td>The cause of the emergency condition must be resolved.</td>
</tr>
<tr>
<td>Smoke</td>
<td>Normal, Alarm</td>
<td>Occurs when the smoke alarm input detects the presence of smoke.</td>
<td>The cause of the emergency condition must be resolved.</td>
</tr>
<tr>
<td>Mixed Air Low Limit</td>
<td>Normal, Alarm</td>
<td>Occurs when the mixed air temperature drops below the Low Limit that has been set, indicating a freeze condition.</td>
<td>The cause of the emergency condition must be resolved.</td>
</tr>
<tr>
<td>Filter</td>
<td>Normal, Alarm</td>
<td>Occurs when the Filter Alarm input detects that the filter needs to be replaced.</td>
<td>Automatic when the dirty filter is replaced.</td>
</tr>
<tr>
<td>IAQ</td>
<td>Normal, Alarm</td>
<td>Occurs when the IAQ sensor detects inadequate indoor air quality.</td>
<td>Automatic when air quality returns within normal parameters.</td>
</tr>
<tr>
<td>Thermostat Failure</td>
<td>Normal, Alarm</td>
<td>Occurs when no signal from the thermostat can be detected.</td>
<td>Automatic when communication with the thermostat is restored.</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Normal, Alarm</td>
<td>Occurs when the fan, heating, or cooling operating hours have exceeded their Runtime limit.</td>
<td>To clear the alarm, a user must enter a new value for the alarm limit or reset the accumulated times to zero.</td>
</tr>
<tr>
<td>Space Temp</td>
<td>Normal, Alarm</td>
<td>Occurs when the space temperature exceeds the specified high limit or drops below the specified low limit.</td>
<td>Automatic when space temperature returns within its normal range.</td>
</tr>
</tbody>
</table>
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 left to right on the unit.

<table>
<thead>
<tr>
<th>LED</th>
<th>Indication</th>
</tr>
</thead>
</table>
| Status| – Solid green when running and configured by an LCI (networking)  
– Flashing green when running and NOT configured by an LCI (stand-alone)  
– Solid red when a fault condition exists (control shut down)  
– Blinking Red - the controller has a device failure  
– Solid Amber - The controller has not received a LCI ping message in over 10 minutes and is part of a network. |
| 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 |
| Service| – Illuminated when the service pin is depressed or when a controller gets configured by the LCI. |

Figure 16: DXU3 Controller LEDs

Troubleshooting Tips

This section provides useful tips on troubleshooting the iWorx® DXU3 controller.
## Table 3: Troubleshooting Tips

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controller is not running and Status LED is not illuminated.</td>
<td>No power to controller. Verify the voltage on the controller’s power connector (24 VAC).</td>
</tr>
<tr>
<td>Fan cycles on for 30 seconds and then turns off.</td>
<td>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.</td>
</tr>
<tr>
<td>The fan will not cycle on after the input has been jumpered or the air flow sensor connected.</td>
<td>If the fan was previously in a fan fault condition, the controller must be reset before proper operation can be restored.</td>
</tr>
<tr>
<td>How do I reset the controller?</td>
<td>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.</td>
</tr>
<tr>
<td>The fan will not cycle on.</td>
<td>There are several reasons the fan may not cycle on, and all should be checked.</td>
</tr>
<tr>
<td></td>
<td>– Are all digital inputs on the controller (except for the fan status input) normally open and wired accordingly?</td>
</tr>
<tr>
<td></td>
<td>– Is the controller in an occupied mode?</td>
</tr>
<tr>
<td></td>
<td>– Has the controller been overridden by the LCI?</td>
</tr>
<tr>
<td></td>
<td>– Is the smoke detector or mixed air low limit indicator (freeze stat) tripped? If so, correct the problem and the controller will automatically start; a reset is necessary.</td>
</tr>
<tr>
<td></td>
<td>– Is the thermostat connected?</td>
</tr>
<tr>
<td>The fan and heat/cool pilot relays will not come on even though the LCI indicates it is on.</td>
<td>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.</td>
</tr>
<tr>
<td>The 10K thermistor reading is at its maximum or minimum.</td>
<td>The input is either shorted or open.</td>
</tr>
<tr>
<td>The economizer damper fails to open.</td>
<td>– Was the LCI used to select an economizer type other than ‘None’?</td>
</tr>
<tr>
<td></td>
<td>– Is the difference between indoor and outdoor enthalpy greater than the economizer setpoint?</td>
</tr>
<tr>
<td></td>
<td>– If “global humidity” is selected, make sure that the ASM is reading a valid humidity and providing it to the network.</td>
</tr>
<tr>
<td></td>
<td>– Is the OAT above or below the economizer lockout (also cutoff)?</td>
</tr>
<tr>
<td>The Heat or Cool outputs will not come on even though the space requires conditioned air.</td>
<td>Is the OAT above the Max OAT Heat setting (lockout) or below the Min OAT Cool setting?</td>
</tr>
<tr>
<td>There is an IAQ alarm but the economizer damper is not at 100%.</td>
<td>The space temperature is most likely above or below the space temp +/- IAQ Temp Reset.</td>
</tr>
<tr>
<td>Dehumidification is not being enabled.</td>
<td>– Dehumidification will not be enabled during the heating mode.</td>
</tr>
<tr>
<td></td>
<td>– Is the controller occupied and is the Space Temperature above the setpoint minus the shutoff offset. Dehumidification will operate during unoccupied mode if the type is configured as always enabled.</td>
</tr>
</tbody>
</table>

### Getting Help

Components within iWorx® DXU3 controller cannot be field repaired. If there is a problem with a controller, follow the steps below before contacting your local TES representative or TES technical service.

1. Make sure controllers are connected and communicating to desired devices.
2. Record precise hardware setup indicating the following:
   - Version numbers of applications software.
   - Controller firmware version number.
   - A complete description of difficulties encountered.
NOTES:

LIMITED WARRANTY STATEMENT

Taco Electronic Solutions, Inc. (TES) will repair or replace without charge (at the company’s option) any product or part which is proven defective under normal use within one (1) year from the date of start-up or one (1) year and six (6) months from date of shipment (whichever occurs first).

In order to obtain service under this warranty, it is the responsibility of the purchaser to promptly notify the local TES stocking distributor or TES in writing and promptly deliver the subject product or part, delivery prepaid, to the stocking distributor. For assistance on warranty returns, the purchaser may either contact the local TES stocking distributor or TES. If the subject product or part contains no defect as covered in this warranty, the purchaser will be billed for parts and labor charges in effect at time of factory examination and repair.

Any TES product or part not installed or operated in conformity with TES instructions or which has been subject to accident, disaster, neglect, misuse, misapplication, inadequate operating environment, repair, attempted repair, modification or alteration, or other abuse, will not be covered by this warranty.

TES products are not intended for use to support fire suppression systems, life support systems, critical care applications, commercial aviation, nuclear facilities or any other applications where product failure could lead to injury to person, loss of life, or catastrophic property damage and should not be sold for such purposes.

If in doubt as to whether a particular product is suitable for use with a TES product or part, or for any application restrictions, consult the applicable TES instruction sheets or in the U.S. contact TES at 401-942-8000 and in Canada contact Taco (Canada) Limited at 905-564-9422.

TES reserves the right to provide replacement products and parts which are substantially similar in design and functionally equivalent to the defective product or part. TES reserves the right to make changes in details of design, construction, or arrangement of materials of its products without notification.

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