This unit is equipped with Johnson Controls' digital controller UNT-220. The controller will operate as a "stand-alone" device or can be integrated with a METASYS Facility Management System.

FIELD WIRING CONNECTIONS

In addition to the high voltage connections shown in the unit installation instructions, the following connections are required:

NOTE: The zone thermostat must be ordered through the local Johnson Controls Branch; it is not included with the unit as a factory supplied item. Thermostat selection will depend upon system application.

1. Stand-Alone Operation

For "stand-alone" operation, the connections to a zone thermostat and optional time clock shown in Figure 1 are required.

2. Facility Management System Operation

For networking with a facility management system, the three wire bus connection shown in Figure 2 and an address selection are required.

For specific programming information, contact the local Johnson Controls office/distributor.

SEQUENCE OF OPERATION

All of the following operational sequences are provided on a stand-alone basis not requiring connection to a facility management system for operation except as noted.

The UNT controller is supplied in a unique pre-configured format where different operating sequences are obtained simply by adding the necessary sensors or output devices. In this way, a majority of applications can be addressed without the need for controller configuration in the field.

OPERATING MODES

Occupied Mode
- Indoor fan runs continuously (intermittent indoor fan optional)
- Economizer opens to minimum position
- Occupied heating and cooling set points control system

Unoccupied Mode
- Indoor fan runs only with heating or cooling
- Economizer is closed (economizer operation optional)
- Unoccupied heating and cooling set points control system

Warmup Mode
- Same as Occupied Mode, except economizer is closed
- Used while changing from Unoccupied to Occupied modes

Standby Mode
- Same as Occupied Mode except Standby heating and cooling set points control system
- Used with occupancy sensor in areas intermittently occupied

COOLING OPERATION

When zone temperature is below the cooling set point, all mechanical cooling will be off and the economizer at minimum position. As zone temperature rises above the cooling set point, cooling will be energized.

If free cooling is available, the economizer will open beyond minimum position in direct proportion to how far zone temperature is above the cooling set point. The economizer will modulate over a 3°F span of zone temperature. This means that when zone temperature is 1-1/2°F above the cooling set point, the economizer will be open to 50%. When zone temperature is 3°F above the cooling set point, the economizer will be open 100%. A discharge air temperature sensor will signal the economizer to drive closed at discharge temperatures below 55°F. If the discharge temperature sensor becomes unreliable, the economizer will not open beyond minimum position.

As zone temperature continues to rise above the cooling set point, the first stage of mechanical cooling (Y1) will be energized. A further rise in zone temperature will bring on the second stage of mechanical cooling (Y2) if equipped. A two minute delay between the first and second stage of cooling is factory set in the controller. Each stage of mechanical cooling will also operate with minimum OFF and minimum ON times.

As the zone temperature falls toward the cooling set point, stages of mechanical cooling will be de-energized in reverse order, and then the economizer will close to minimum position.

If free cooling is not available, or there is no economizer installed, stages of mechanical cooling will be energized as zone temperature rises above the cooling set point. The zone temperature at which mechanical cooling is energized will be closer to the cooling set point when free cooling is not available.

HEATING OPERATION

As zone temperature drops below the heating set point, the first stage a heat (W1) will be energized. If zone temperature continues to drop, the second stage of heat (W2) if equipped will be energized after a two minute interstage delay. Stages will be turned off in reverse order as zone temperature rises toward the heating set point. Each stage of heat will operate with minimum OFF and ON times.

HEATING/COOLING LOCKOUT

If an outdoor air enthalpy or temperature sensor is installed in the system, mechanical cooling will be locked-out below 50°F and heating will be locked out above 60°F. These outdoor temperature lockout set points may be changed in the field through a Zone Terminal Unit, METASYS Facility Management System, or laptop PC and HVAC PRO software.
AIRFLOW INTERLOCK

Airflow must be proven before heating, cooling, or economizer can function. Similarly, if airflow is lost at anytime, heating, cooling, and economizer will be de-energized immediately. The indoor fan will also be de-energized after 15 seconds if airflow was lost after having been proven. Once the indoor fan is de-energized due to airflow loss, an Airflow Failure alarm will be initiated, which may be signaled at a Zone Terminal Unit or METASYS Facility Management System.

OPERATION WITH TIME CLOCKS

The UNT controller may be used with conventional time clocks to signal occupied and unoccupied modes. Binary input BI-1 on the UNT is factory set to accept a contact closure, which will change the system to its occupied mode. One time clock may control several rooftops; however, an isolated relay is needed for each UNT. A simple night/day switch may also be wired to BI-1 as a manual changeover.

POWER FAIL RESTART

A delay time is factory set in each UNT before any heating or cooling will be energized after a power loss. This delay is intended to reduce the peak electrical demand which may otherwise occur after a power loss when every load is energized immediately. The delay time is factory set at one minute for every UNT; however maximum benefits can be obtained by giving each UNT a different power fail restart delay time. Delay times may be adjusted through a METASYS Facility Management System or laptop PC and HVAC PRO software.

SYSTEM DIAGNOSTICS

Several types of advanced system diagnostics are built into York METASYS rooftop controls. Some diagnostic features require that a given option be added to the system.

- **Sensor Alarms** - If any sensor connected to the UNT controller becomes unreliable, ie. open/shorted/out of normal range, then that sensor’s input will be ignored. An alarm condition will also be indicated through a METASYS Facility Management System, Zone Terminal Unit, or laptop PC with HVAC PRO software.

  For example, if the discharge air temperature sensor becomes disconnected, the economizer will not be allowed to open beyond minimum position and a sensor alarm will be indicated.

  - The system will continue to function, even with several sensor inputs unreliable. The zone temperature sensor, however, must be operating properly for any heating or cooling to be energized.

- **Economizer Alarm** - On units equipped with a Johnson Controls digital economizer, an alarm will be indicated if the actuator’s commanded position and actual position do not match. This may be an indication that the outdoor air dampers are binding or that the economizer actuator has failed. The economizer’s actual position and commanded position may also be monitored independently for service.

  - **Dirty Filter Alarm** - If a dirty filter switch is installed, it will indicate the need to change air filters on the unit. This is done by sensing the difference in air pressure on either side of the filters. When the pressure difference rises to the switch’s set point, its contacts will close sending an alarm.

  - **Heating/Cooling Alarms** - The UNT controller will monitor discharge temperature whenever stages of heating or cooling are energized. If the discharge temperature does not drop by at least 2F for cooling or rise by 2F for heating within 5 minutes of each stage being turned on, an alarm will be sent.

    - **Cooling Limits Alarm** - The UNT controller will monitor the status of cooling limits through the unit terminal strip’s “X” terminal. This “X” terminal indicates whenever a cooling limit on the rooftop unit has opened.

### DEFAULT VALUES FOR HEATING AND COOLING SET POINTS

<table>
<thead>
<tr>
<th>PARAMETERS</th>
<th>OCCUPIED MODE</th>
<th>STANDBY MODE</th>
<th>UNOCCUPIED MODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling Setpoint</td>
<td>72.0</td>
<td>74.0</td>
<td>80.0</td>
</tr>
<tr>
<td>Cooling Deadband</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Alt. Cool Deadband</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Econ. Prop. Band</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Cooling Prop. Band</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Cool Integration Time</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Heating Setpoint</td>
<td>68.0</td>
<td>66.0</td>
<td>62.0</td>
</tr>
<tr>
<td>Heating Prop. Band</td>
<td>-3.0</td>
<td>-3.0</td>
<td>-3.0</td>
</tr>
<tr>
<td>Heat Integration Time</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>
START-UP INSTRUCTIONS

- Upon initial power-up of units equipped with METAT-SYS "Unit" control option, the unit will be in an UNOCCUPIED mode, which corresponds to the following operation:

  a) Economizer remains closed to outside air.

  b) Indoor fan operates intermittently with a call for heating or cooling.

  c) UNOCCUPIED setpoints of 85°F for cooling and 55°F for heating will control the unit.

RECOMMENDATION:

A Zone Terminal Unit (P/N AS-ZTU100-0) or laptop PC with HVACPRO software is recommended to perform a complete system start-up procedure. If one of these accessories is not available, follow the basic procedure below.

1) If a zone sensor is installed, unplug it at the three plug cable interface (AS-CBLCON-1).

   a) Economizer will open to 15% minimum position after airflow is proven.

   b) Indoor fan operates continuously.

   c) OCCUPIED setpoints of 72°F for cooling and 68°F for heating will control the unit.

2) After a short delay, the indoor fan should turn ON.

3) If the Indoor fan continues running for more than two minutes, the fan proving switch is functioning.

4) Check that the economizer actuator has opened the outdoor air dampers to a minimum position of 15%.

5) With the indoor fan running, verify mechanical unit operation by jumpering the unit terminal strip. Jumper R to Y1 for cooling stage #1. Then add a second jumper form R to Y2 for cooling stage #2. Remove these jumpers, then add a jumper form R to W1 for stage #1 of heating and R to W2 for heating stage #2. remove all unit terminal strip jumpers.

7) If automatic unit operation is desired before connection to a METASYS network, first determine which mode is required.

   a) For a continuous OCCUPIED mode, leave the jumper installed during step 2) and plug-in the zone sensor.

      This mode would be typical for a building that is occupied, but does not have a METASYS Facility Management System installed.

   b) For a continuous UNOCCUPIED mode, remove the jumper installed during step 2) and plug-in the zone sensor.

      This mode would be typical for a building which is unoccupied or being finished.
<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSE</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indoor fan does not run.</td>
<td>Fan failure.</td>
<td>Jumper R to G, if fan runs remove jumper and proceed to next cause.</td>
</tr>
<tr>
<td></td>
<td>Unit not in OCCUPIED mode.</td>
<td>Jumper BI-1 to 24VAC for continuous occupied mode.</td>
</tr>
<tr>
<td></td>
<td>Fan off due to airflow loss.</td>
<td>Check air proving switch. Restart by breaking and making unit power.</td>
</tr>
<tr>
<td>Economizer does not open in min. position.</td>
<td>Indoor fan not proven.</td>
<td>See above.</td>
</tr>
<tr>
<td></td>
<td>Actuator or linkage.</td>
<td>Remove actuator cover &amp; check for 24VAC across T1 and T2. Then jumper &quot;CW&quot; to &quot;COM&quot;. Actuator should fully open outdoor dampers. Remove jumper.</td>
</tr>
<tr>
<td></td>
<td>Wiring problem.</td>
<td>Check that wire from Zone Bus on UNT controller is connected to &quot;BUS&quot; terminal on actuator.</td>
</tr>
<tr>
<td>Heating or cooling will not turn on automatically</td>
<td>Zone sensor not connected.</td>
<td>Be sure zone sensor is properly connected with an 8 pin plug to the UNT or CBLCON interface.</td>
</tr>
<tr>
<td></td>
<td>Zone temperature not above/below setpoint.</td>
<td>Simulate a load at the sensor with ice or a bag of hot water.</td>
</tr>
<tr>
<td></td>
<td>Heating or cooling lockout from outdoor temperature.</td>
<td>To check system, temporarily remove wire AI-5 at UNT, if present. Be sure to reconnect wire when complete.</td>
</tr>
<tr>
<td></td>
<td>Delay timers active.</td>
<td>Wait until time delays have expired, approximately 5 minutes.</td>
</tr>
</tbody>
</table>
Figure 1 - "Stand Alone" Operation Connection
Figure 2 - METASYS Facility Management Connection