Section 2

8. Start Up From the Unit "Test Mode Feature"

8.1. Step Test Mode

Utilizing the sight hole in the lower left-hand corner of the of the control box front panel, verify that the LED on the UCP is on continuously. (The cover panel does not require removal.)

Initiate the test mode by shorting across the "TEST" terminals on the unit's Low Voltage Terminal Board (LTB) for two to three seconds, and then removing the short. The LED on the UCP will blink indicating the unit is in the test mode, and the indoor fan motor (IDM) is turned on (STEP1). The unit may be left in any step for up to one hour to allow for troubleshooting. If left in any one mode, after approximately one hour, the UCP will exit the test mode.

To step into the next mode, short across the "TEST" terminals for 2 to 3 seconds, and remove the short. See test mode table. The UCP will skip the steps marked with *, or **, if they are not a feature or accessory on this unit. Exit the test mode by cycling unit power with the disconnect switch (off & on), or by stepping through the test steps, until the UCP's LED stops flashing.

8.2. Auto Test Mode

This test mode is the most useful during initial system start up. The entire duration of the test will last from 90-270 seconds depending on the unit, and accessories installed.

Initiate the Auto Test Mode by installing a jumper across the "TEST" terminals on the unit's Low Voltage Terminal Board (LTB). The LED on the UCP will begin to blink, indicating the unit is in the test mode. The unit will cycle through the test steps in sequence, one time, changing test steps every 30 seconds. ***Note: power to the unit must be on prior to placing the jumper on TEST 1 & 2.***

The UCP will skip the steps marked with *, or **, if they are not a feature or accessory on this unit. Terminate the Auto Test Mode by removing the jumper from the "TEST" terminals, and cycling the unit power with the disconnect switch (off & on). If the unit is inadvertently left in the Auto Test Mode with the jumper left in place, the UCP will automatically exit the test mode and ignore the jumper.

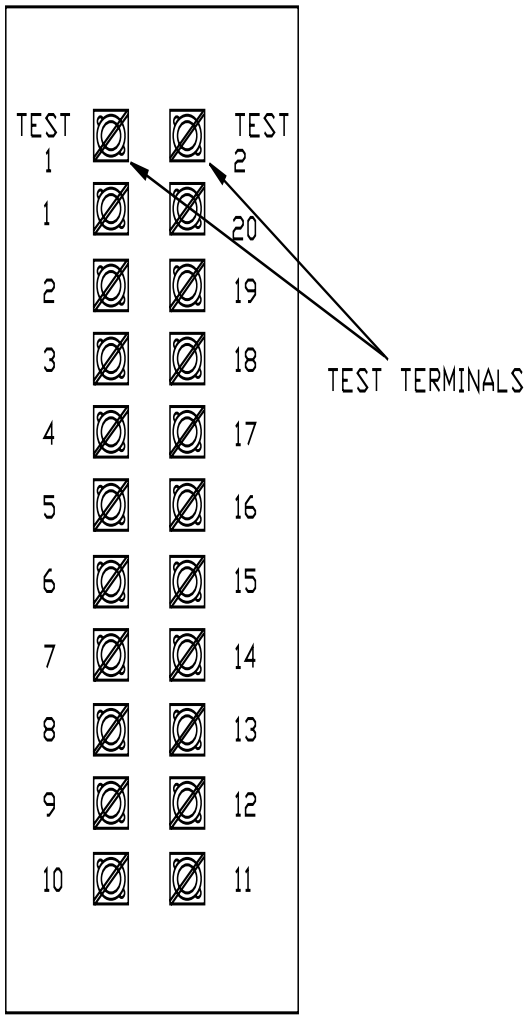
8.3. Resistance Test Mode

This test mode is used to force the unit into a specific test step. A selection of resistors or a decade resistor box (BAYSERV001A) is required. This takes the guess-work out of which test step the unit is in.

Initiate the Resistance Test Mode by installing the proper resistor across the "TEST" terminals on the unit's Low Voltage terminal Board (LTB). The LED on the UCP will begin to blink, indicating the unit is in the test mode, and the system will operate in the desired mode.

Terminate the Resistance Test Mode by removing the resistor from the "TEST" terminals, and cycling the unit power with the disconnect switch (off & on). If the unit is inadvertently left in the Resistance Test Mode, the UCP will automatically exit the test mode after one hour, and ignore the resistor across the "TEST" terminals.

8.4. Test Mode Voyager 3-25



TEST MODE TABLE

STEP	MODE	LED	Ohmx1k
NONE	NORMAL OPERATION	ON	N/A
1	INDOOR FAN ON	BLINK	2.2
2*	ECONOMIZER OPEN	BLINK	3.3
3	COOL 1 (ECON. CLOSE)	BLINK	4.7
4	COOL 2	BLINK	6.8
4	HEAT 1	BLINK	10
6**	HEAT 2	BLINK	15
7**	HEAT 3	BLINK	22
8***	DEFROST	BLINK	33
9***	EMERGENCY HEAT	BLINK	47
NONE	NORMAL OPERATION	ON	N/A

* Economizer is optional. If not installed, this step will be skipped.
** Heat 2 & 3 are a function if the size heaters installed.
*** Heat pump units only.

8.5. Test Mode (3-25 ton):

Electric/Electric Units

Step	Mode	IDM	Econ	CPR1	CPR2	HT1	HT2	ODM1	ODM2
1	Fan On	On	Min	Off	Off	Off	Off	Off	Off
2 *	Econ.	On	Open	Off	Off	Off	Off	Off	Off
3	Cool 1	On	Min	On	Off	Off	Off	On	**
4	Cool 2	On	Min	On	On	Off	Off	On	**
5 *	Heat 1	On	Min	Off	Off	On	Off	Off	Off
6 *	Heat 2	On	Min	Off	Off	On	On	Off	Off

* With Optional Accessory
** "**Off"** If temperature falls below 60° (±2°)F, **"On"** if temperature rises above 65° (±2°)F.
Note: Steps for optional accessories and modes not present in unit will be skipped.

Heat Pump Units

Step	Mode	IDM	Econ	CPR1	CPR2	AUX HT1	AUX HT2	SOV	ODM1	ODM2
1	Fan On	On	Min	Off	Off	Off	Off	Off	Off	Off
2 *	Econ.	On	Open	Off	Off	Off	Off	Off	Off	Off
3	Cool 1	On	Min	On	Off	Off	Off	On	On	**
4	Cool 2	On	Min	On	On	Off	Off	On	On	**
5	Heat 1	On	Min	On	On	Off	Off	Off	On	On
6 *	Heat 2	On	Min	On	On	On	Off	Off	On	On
7 *	Heat 3	On	Min	On	On	On	On	Off	On	On
8	Defrost	On	Min	On	On	On	On	On	Off	Off
9	Em Heat	On	Min	Off	Off	On	On	Off	Off	Off

* With Optional Accessory
** "**Off"** If temperature falls below 60° (±2°)F, **"On"** if temperature rises above 65° (±2°)F.
Note: Steps for optional accessories and modes not present in unit will be skipped.

Gas/Electric Units

Step	Mode	IDM	Econ	CPR1	CPR2	HT1	HT2	ODM1	ODM2
1	Fan On	On	Min	Off	Off	Off	Off	Off	Off
2 *	Econ.	On	Open	Off	Off	Off	Off	Off	Off
3	Cool 1	On	Min	On	Off	Off	Off	On	**
4	Cool 2	On	Min	On	On	Off	Off	On	**
5	Heat 1	On	Min	Off	Off	On	Off	Off	Off
6	Heat 2	On	Min	Off	Off	On	On	Off	Off

* With Optional Accessory
** "**Off"** If temperature falls below 60° (±2°)F, **"On"** if temperature rises above 65° (±2°)F.
Note: Steps for optional accessories and modes not present in unit will be skipped.

8.6. VAV Test Mode Voyager 27.5-50

TEST STEP	MODE	IGV/VFD (Note 7)	FAN	ECON (Note 6)	COMP 1	COMP 2	HEAT 1	HEAT 2	OHMS
1	IGV/VFD TEST	OPEN/100%	OFF	CLOSED	OFF	OFF	OFF	OFF	2.2K
2	IGV/VFD TEST	CLOSED/OFF	OFF	CLOSED	OFF	OFF	OFF	OFF	3.3K
3	MINIMUM VENTILATION	(Note 1) IN CONTROL	ON	MINIMUM POSITION	OFF	OFF	OFF	OFF	4.7K
4	ECONOMIZER	(Note 1) IN CONTROL	ON	OPEN	OFF	OFF	OFF	OFF	6.8K
5	COOL STAGE 1	(Note 1) IN CONTROL	(Note 2) ON	MINIMUM POSITION	(Note 4) ON	OFF	OFF	OFF	10K
6	COOL STAGE 2	(Note 1) IN CONTROL	(Note 2) ON	MINIMUM POSITION	(Note 5) OFF	(Note 4,5) ON	OFF	OFF	15K
7	COOL STAGE 3	(Note 1) IN CONTROL	(Note 2) ON	MINIMUM POSITION	(Note 4) ON	(Note 4) ON	OFF	OFF	22K
8	HEAT STAGE 1	(Note 1) OPEN	(Note 2) ON	CLOSED	OFF	OFF	(Note 3) ON	OFF	33K
9	HEAT STAGE 2	(Note 1) OPEN	(Note 2) ON	CLOSED	OFF	OFF	(Note 3) ON	(Note 3) ON	47K
10	RESET								

8.7. CV Test Mode Voyager 27.5-50

TEST STEP	MODE	FAN	ECON (Note 6)	COMP 1	COMP 2	HEAT 1	HEAT 2	OHMS
1	MINIMUM VENTILATION	ON	MINIMUM POSITION	OFF	OFF	OFF	OFF	4.7K
2	ECONOMIZER TEST OPEN	ON	OPEN	OFF	OFF	OFF	OFF	6.8K
3	COOL STAGE 1	ON	MINIMUM POSITION	(Note 4) ON	OFF	OFF	OFF	10K
4	COOL STAGE 2	ON	MINIMUM POSITION	(Note 5) OFF	(Note 4,5) ON	OFF	OFF	15K
5	COOL STAGE 3	ON	MINIMUM POSITION	(Note 4) ON	(Note 4) ON	OFF	OFF	22K
6	HEAT STAGE 1	ON	CLOSED	OFF	OFF	ON	OFF	33K
7	HEAT STAGE 2	ON	CLOSED	OFF	OFF	ON	ON	47K
8	RESET							

Notes

1 – The IGV will be controlled to the supply pressure set point unless test mode has been running for 6 minutes or Longer then IGV damper will drive to the full open position.

2 – The supply fan will not be allowed to go from an off state to an on state until the IGV are fully closed.

3 – The Heat outputs will not be allowed to come on until the IGV are at the full open position.

4 – The condenser fans will operate any time a compressor is ON providing the outdoor air temperatures are within the operating values listed in 10.1.2.

5 – For 27.5 through 35 Ton units, cool stage 2 is not used and cool stage 3 becomes the active sequence.

6 – The exhaust fan will turn on anytime the economizer damper position is equal to or greater than the exhaust fan set point.

7 – The VAV box output will be energized at the start of the test mode to allow time for the boxes to open. It takes 6 minutes for the boxes to drive from the full closed position to the full open position. The timing cannot be changed in the field.

8.8. UCP Default Control

If the UCP loses communication with an ICS device, or if it loses the Zone Sensor Module's Heating and Cooling set point input (slide potentiometers), the UCP will control to the default mode within approximately 15 minutes.

The temperature sensing thermistor in the Zone Sensor Module is the ONLY component required for the Default Mode to operate. (Without knowing the zone temperature, constant volume units will **not** heat or cool.)

Comfort can be provided without a Zone Sensor Module by removing the Outdoor Air Sensor from the machine and connecting it in the room to the wires from LTB-1 and LTB-2. This can also be done on the roof, by connecting the sensor to LTB1-1 and LTB1-2, and dropping it in the return air stream. **Voyager III Note:** A jumper is also required for default operation on 27.5-50 ton VAV units between LTB1-2 and LTB1-4.

8.8.1. Constant Volume 3-50 Ton

Component or Function	Default Operation
Cooling Set point (CSP)	HSP +4° if no CSP from ZSM
Heating Set point (HSP)	CSP -4° if no HSP from ZSM
No CSP *or* HSP from ZSM	74° CSP, 71° HSP
Mode input from ZSM	Auto changeover if no MODE input is provided
Fan input from ZSM	Continuous if no MODE input is provided
Supply air sensor (SAS) (LTB 18/19)	If SAS is disabled, unit will not economize
Economizer minimum position	Normal operation unless disabled at UEM J11 / J12
Night Setback mode*	Unit must have CSP *and* HSP for LTB 11/12 night setback function
Supply Air Tempering	Only used with Programmable ZSM, Tracker or Tracer
Power Exhaust	On when economizer is at 25% + outdoor air opening

Note: Economizer will function normally if using default setpoints as shown above.

*With a single setpoint ZSM (on a cool only unit for example) an HSP can be simulated by putting a resistor from LTB 2-5. See Section 25.3 for appropriate selections.

8.8.2. VAV 27.5-50 Ton

Component or Function	Default Operation
Supply Air Cooling Set point	55° F. if no input
Supply Air Reset Set point	Disabled if no input
Supply Air Reset Amount	Disabled if no input
Supply Air Static Set point	0.5 IWC if no input
Supply Air Static Deadband	0.5 IWC if no input
Morning Warmup (MWU) Set point	MWU disabled if no zone temp input
Daytime warmup (DWU)	DWU disabled if no MWU setpoint input*
Zone temp input (LTB1-1 & LTB1-2)	MWU and DWU disabled if no zone temp input
Mode input (LTB1-2 & LTB1-4)**	Night setback will not work if a jumper is used instead of a ZSM input or 7.68K ohm resistor
LTB1-2 to LTB1-4 Jumper Removed	Unit off, no fan
LTB1-2 to LTB1-4 Jumper Added	Unit *auto changeover, continuous fan*
Power Exhaust Setpoint	25% if no input

** Can also be disabled by cutting wire 110D at UCP J1-3.*
*** If a BAYSENS021B is not used, a 7.68K ohm resistor can be installed at LTB1-2 to LTB1-4 for "Auto" MODE input.*

8.8.2.1 27.5-50 ton VAV Modes of Operation

Unit functions are determined by the inputs on LTB1 as follows. The possible inputs are shown in the top (horizontal) row. The functions available are shown in the vertical columns below each input.

	No Inputs On LTB1	**Jumper LTB1-2 & 4**	**BAYSENS017B w/ LTB1-2 & 4 Jumper**	**BAYSENS021B Or...BAYSENS017B w/ 7.68K resistor between LTB1-2 & 4**	**BAYSENS020B or ICS system (Tracer, Tracker, Summit)**
Occupied Cooling	No	Yes	Yes	Yes	Yes
Daytime Warmup (DWU)	No	No	Yes	Yes	Yes
Morning Warmup (MWU)	No	No	No	Yes	Yes
Indoor blower (occupied mode)	Off	On	On	On	On
Indoor blower (unoccupied mode)	N/A	Off	Off	Auto	Auto
Unoccupied Cooling	N/A	No	No	No	Yes
Unoccupied Heating	N/A	No	No	Yes	Yes
Short across LTB1-11 & 12 creates an unoccupied mode(Night setback)	No	Yes	Yes	Yes	N/A

8.9. Providing Temporary (default) Heating and Cooling

8.9.1. Constant Volume Units 3-50 Ton

Locate the hole in the right corner post of the unit next to the control box. Remove the thermistor sensor (OAS), by reaching around and behind the corner post and slide it out of the rubber grommet. Cut the two (2) splices and remove the sensor. Using two (2) wire nuts, individually cap the wires so they are not shorted. [A part # SEN00339 (10K @77F thermistor) can also be used for this purpose.]
Voyager III Note: The Outside Air Sensor is located near the economizer damper hood

Locate the Low Voltage Terminal Board (LTB) on the right side of the control box, and connect two (2) thermostat wires from down in the room to terminals LTB-1 and LTB-2. Take the sensor removed from the unit down to the room and connect it to the two (2) wires that are connected to terminals LTB-1 and LTB-2 at the unit.

The indoor fan will run continuously, and economizer (if present) will open to the minimum position. The cooling set point will be 74° F, and the heating set point will be 71° F. The system will run in the auto mode and switch between heating and cooling as necessary.

Note: If outdoor sensor is used, this is for temporary operation only. Economizer cooling, condenser fan cycling, and evaporator defrost functions are disabled. Evaporator coil may freeze during low ambient cooling.

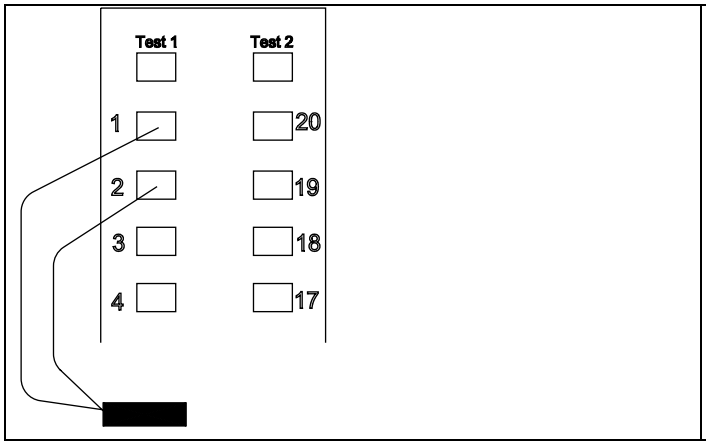
8.9.2. Variable Air Volume Units 27.5-50 Ton

Variable Air Volume applications minimally require a jumper between terminals LTB1-2 and LTB1-4 for "Supply Air" cooling operation.

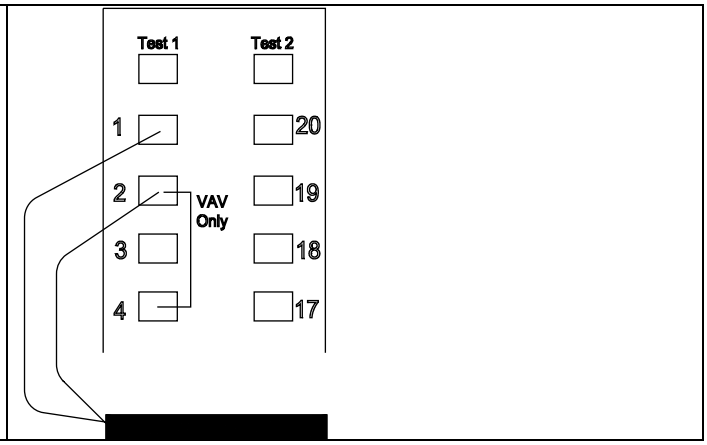
If unoccupied heating is also required, instead of using a jumper, install a 7.68K ohm thermistor between LTB1-2 and LTB1-4. See section 8.8.2.1 for a summary of modes with different inputs.

Note: If outdoor sensor is used, this is for temporary operation only. Economizer cooling, condenser fan cycling, and evaporator defrost functions are disabled. Evaporator coil may freeze during low ambient cooling.

3-50 ton constant volume units



27.5-50 ton VAV units



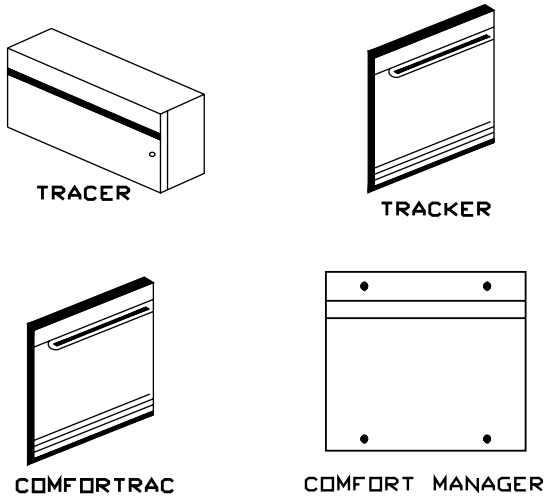
8.10. Tracer / Tracker / VariTrac

The UCP in the microcontrol unit acts as a slave device to an Integrated Comfort System (ICS) device. The ICS device can dictate modes of operation, however it cannot override the inherent equipment protection and efficiency timings which are built into the UCP. The respective modes of operation are identical to those described elsewhere in this manual.

When the microcontrol unit is energized, it will take anywhere from one to two minutes for the UCP to take the ICS device set points. In the mean time the equipment may begin to start up in the stand alone mode. On a typical VariTrac CCP installation, the microcontrol unit will sit idle until it receives its commands from the CCP. If the Voyager stops communicating with the VariTrac CCP, a mechanical ZSM connected to the LTB will provide stand-alone operation until communication is reestablished. If the Voyager stops communicating with a Tracker or Tracer, the Voyager will use its own default set points until communication is reestablished.

For more in depth information on an ICS device, consult the specific ICS device literature.

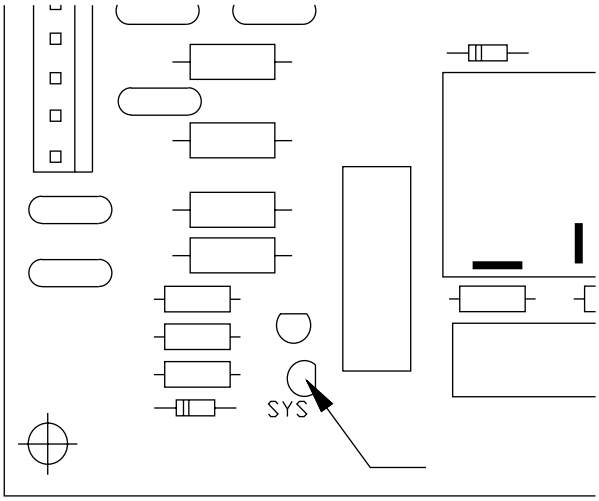
Tracer/Tracker/ComforTrac/Comfort Manager



Voyager III note: Tracker and VariTrac can not be used with 27.5-50 ton VAV units. It only works with constant volume units.

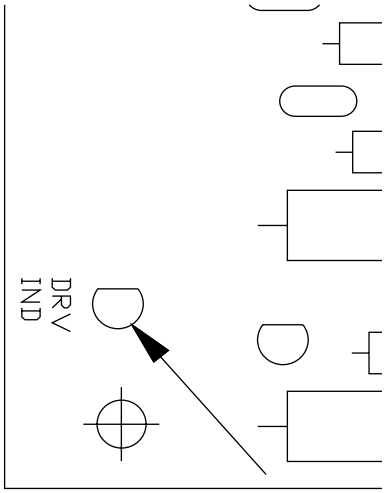
9. LED Locations and Status Information

9.1. Unitary Control Processor LED



ON-Indicates that the UCP is powered up, also indicates that the software/computer program is intact and functional, and is lit continuously during normal operation.
BLINKING-Indicates that the UCP is in the TEST mode.
OFF-Indicates that no power is going to the UCP, or that the software/computer program has failed.

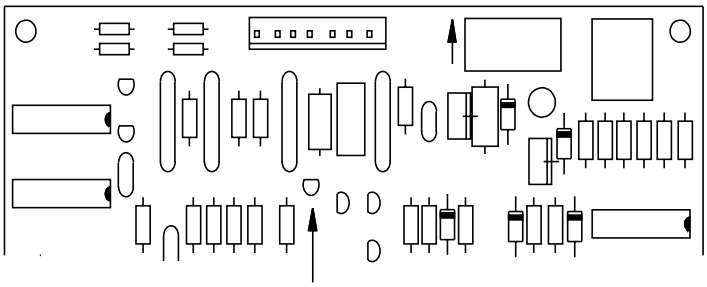
9.2. Unitary Economizer Module LED



ON-Indicates that the UCP is sending a signal to drive the economizer actuator (ECA) motor open or closed. Lit only when the damper should be opening or closing.
Note: During economizer calibration, typically at initial power up, the UCP will close the damper and over drive for approximately 1 to 1.5 minutes. The LED on the UEM will be lit, but the damper will not be moving.
OFF-Indicates UCP is "not" sending a signal to drive the economizer actuator motor open or closed. The damper should not be moving.

9.3. TCI-1 (Obsolete) - LED

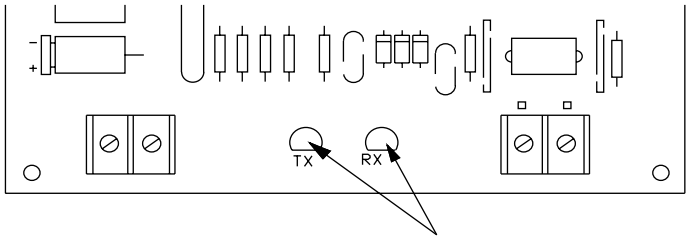
TCI-1 TRANSMIT LED



ON-Indicates that communication is taking place between the UCP and ICS device, ICS device is transmitting data to the UCP, LED is not continuously lit but actually blinking at a nearly imperceptible rate.
OFF-Indicates communication is "not" presently taking place.

9.4. TCI-2 (Obsolete) and 3 (Current) - LED

TCI-2 AND 3-TX (TRANSMIT)/RX (RECIEVE) LEDs



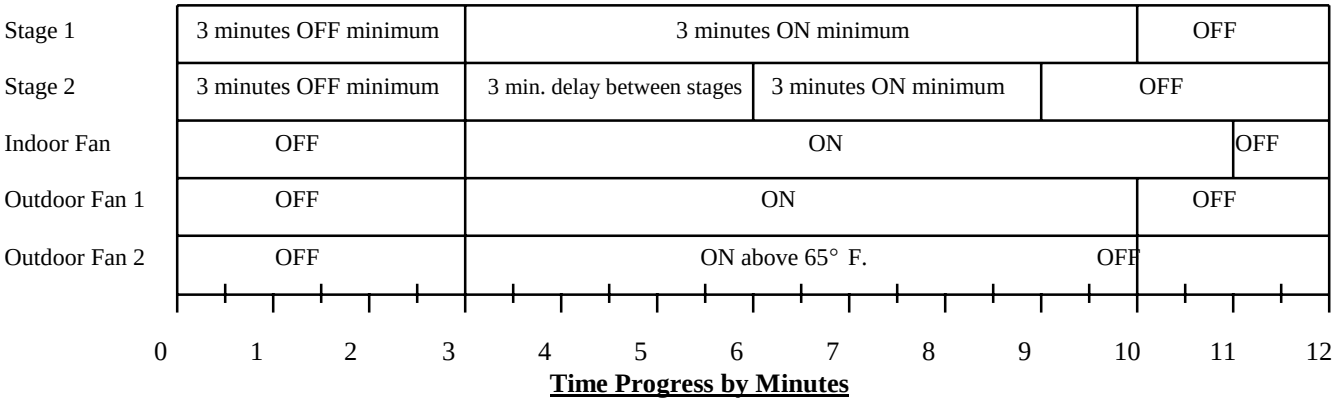
TX (TRANSMIT) RED LED
ON-Indicates ICS Device is transmitting data to the UCP. LED is not continuously lit but will sometimes blink at a nearly imperceptible rate.
OFF- Indicates UCP is "not" receiving data from the ICS device.

RX (RECEIVE) GREEN LED
ON-Indicates ICS Device is receiving data from the UCP. LED is not continuously lit but will sometimes blink at a nearly imperceptible rate.
OFF-Indicates UCP is "not" receiving data from the ICS device.
Note: The frequency at which communication takes place is a function of the ICS Device; refer to ICS device literature.

10. Cooling Start Up From the Zone Sensor Module (ZSM) Or Thermostat

10.1. Cooling Mode

10.1.1. Cooling Staging 3-25 Tons



10.1.2. Cooling Staging 27.5-50 Tons

Unit Size Tons	Stage 1	Stage 2	Stage 3	Condenser Fan Output A	Condenser Fan Output B	OA Temp. Fans "OFF"
27.5-30	CPR1 *			Fan #2		70
					Fan #3	90
		CPR1, 2	NA	Fan#2		-10
					Fan #3	60
35	CPR1 *			Fan #2		65
					Fan #3	85
		CPR1, 2	NA	Fan#2		-20
					Fan #3	55
40	CPR 1 **			Fan #2		50
					Fan # 3,4	70
		CPR 2, 3***		Fan #2		20
			CPR1,2,3		Fan #3,4	60
				Fan #2		-30
					Fan #3,4	50
50	CPR1 **			Fan #2		20
					Fan #3,4	60
		CPR 2,3 ***		Fan #2		-10
					Fan #3,4	55
			CPR 1,2,3	Fan #2		-30
					Fan #3,4	-30

* Single circuit, dual manifolded compressors

** First Stage, Number one refrigeration circuit, Stand alone compressor is "On".

*** First Stage is "Off", number two refrigeration circuit, manifolded compressor pair operating simultaneously is "On".

Note: Condenser fan # 1 is always on when any compressor is running.

10.1.3. Cooling Mode Voyager 3-50 Tons (Constant Volume):

Note: At power up the UCP self tests for 20 seconds before beginning compressor timing.

1. Each compressor will be off for a minimum of 3 minutes before beginning a cycle, and will run for a minimum of 3 minutes before ending a cycle. See exceptions below.

2. There will be a minimum of 3 minutes delay between compressor stages turning ON.

3. On 40-50 ton constant volume units 3 stages of mechanical cooling are possible by alternating compressor operation as shown in table 10.1.2.

4. When the fan switch is in the auto position, the indoor fan continues to operate for 60 seconds after the completion of a cooling cycle, to increase efficiency by removing residual cooling from the evaporator coil.

5. At power up the economizer goes through a calibration cycle. It will drive open for 5 seconds and then drive closed for 90 seconds, verifying damper is fully closed.

6. If a CTI and a thermostat are being used, and an economizer is present, the economizer calibration sequence must be complete before the fan will come on.

3-25 ton Exception to three minute off time: When outside temperature rises to 65° F on 2 condenser fan units, the compressor stops along with fan number one for 7 seconds and then restarts with both fans running.

27.5-50 ton Exception to three minute off time: The compressors will turn off for 7 seconds as the outdoor temperature goes up and additional condenser fans or compressor stages are required as shown in table 10.1.2.

Lead/Lag: When lead/lag is enabled on 2 compressor units, the first compressor to come on will alternate at the end of each compressor cycle.

10.1.4. Cooling Mode for Voyager 27.5-50 Tons (VAV):

VAV compressor staging is the same as constant volume units. Compressors stage on or off in response to changes in the supply air temperature. The indoor blower is on all the time, and IGVs or VFD controls amount of airflow.

27.5-50 ton Exception to three minute off time: The compressors will turn off for 7 seconds as the outdoor temperature goes up and additional condenser fans or compressor stages are required as shown in table 10.1.2.

10.2. Economizer Operation 3-50 Ton Units

The typical components of the microcontrol 0 to 100% fully modulating economizer include the following:

- Actuator motor (ECA)
- Unitary Economizer Module (UEM),
- Unitary Control Processor (UCP),
- Supply Air (temperature) Sensor (SAS).
- Minimum Position Potentiometer 0-50%.

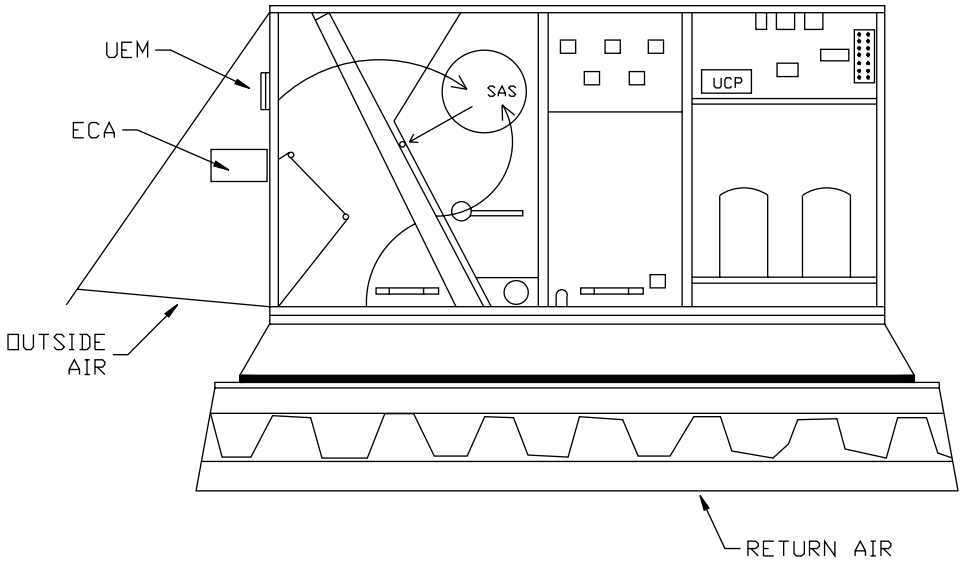
On a call for cooling, providing outdoor air conditions are suitable to economize, the Unitary Control Processor (UCP) will provide 2 functions.

1. The UCP will sub-cool the zone to a point between 0.5 and 1.5° F. below the physical zone sensor module's (or ICS device) cooling set point.
2. The UCP will maintain a 50 to 55° F. supply air temperature.

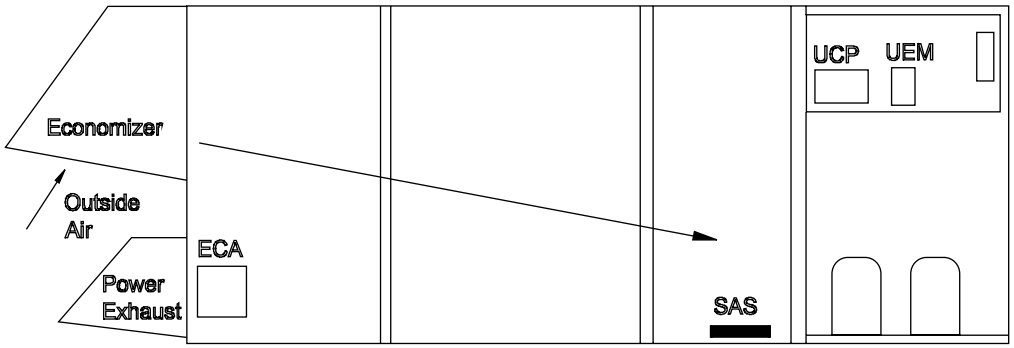
If the supply air temperature is above 55° F., the UCP will open the outside air damper to admit additional outdoor air until the temperature returns to the 50 to 55° F. range. If the supply air temperature is below 50° F, the UCP will close the outside air damper until the temperature returns to the 50 to 55° F. range.

Note: Except during MWU or while economizing, any time the fan is on, the economizer will be at minimum position. When the fan shuts off the outside air damper closes.

Economizer 3-25 tons



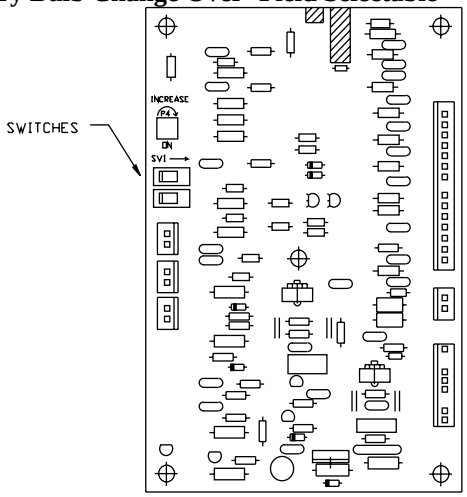
Economizer 27.5-50 tons



10.3. Dry Bulb Change Over - Field Selectable

The dry bulb change-over point is the outdoor temperature at which the equipment will change over, on a temperature fall, from mechanical to economizer cooling. Like wise, the system will change back over, from economizer cooling to mechanical cooling, if the outside air temperature rises above the selected change over temperature. There are 3 selectable dry bulb change over points. The two switches referenced are located on the UEM board. Selecting the proper dry bulb change over point is typically relative to the geographic location of the job site. For example, we may select a 65° F. change over point for an arid climate like Arizona or California, and a 55° F. change over point for a more humid climate like Georgia or Virginia. The lower the humidity, the more comfortable the zone will be (typically 50% relative humidity or less). The lower the change over point, the more comfortable the customer will be (depending on climate). The higher the change over point, the more economical the operation will be.

Dry Bulb Change Over- Field Selectable



Normal Operation

Switch 1	Switch 2	°F. Dry Bulb Temp.
OFF	OFF	60 Factory
OFF	ON	55
ON	OFF	65
ON	ON	Not Used

With CTI

If suitable to economize:
Y1 = Economizer
Y2 = 1st Stage

If not suitable to economize:
Y1 = 1st Stage
Y2 = 2nd Stage & 3rd Stage

10.4. Single Enthalpy "Reference" Change Over - Field Selectable

Reference enthalpy is accomplished by using the **BAYENTH003A accessory**, consisting of an Outdoor Humidity Sensor (OHS). Similar to traditional enthalpy control, it is selectable to one of 4 enthalpies. If the outdoor enthalpy is greater than 1/2 Btu/LB dry air above the selected enthalpy, the economizer will not operate and will not open past minimum position. The economizer will not operate at outdoor temperatures above 75° F., the humidity sensor maximum operating limit.

If the outdoor enthalpy is less than 1/2 Btu/LB dry air below the selected enthalpy, the microcontrol equipment will change over, from mechanical to economizer cooling utilizing outdoor air. Mechanical cooling will operate if the outdoor enthalpy rises 1/2 Btu/LB dry air above the selected enthalpy.

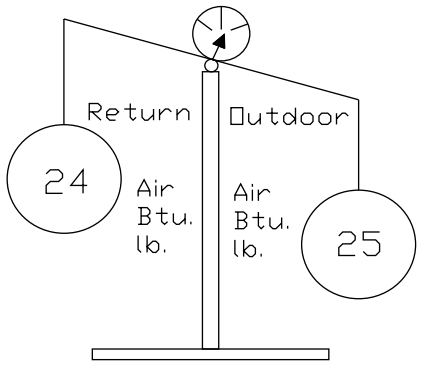
There are 4 field selectable reference enthalpy change over points. The two switches referenced are located on the UEM board, shown above. The switches are factory set at “D”, this is the most comfortable, not the most economical setting. If a failure occurs in this switching circuit, the enthalpy change over point will default to setting “C”. If the Outdoor Humidity Sensor (OHS) or Unitary Economizer Module's (UEM's) input for this sensor were to fail, the economizer will operate using Dry Bulb Change Over.

SINGLE ENTHALPHY "REFENCE" CHANGE OVER-FIELD SELECTABLE

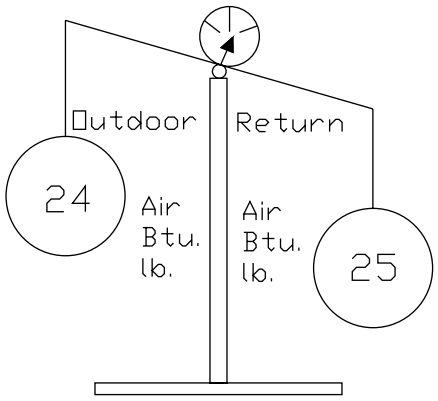
Switch 1	Switch 2	Selected Enthaply Change Over Point	Standard Setting
OFF	OFF	19 Btu/lb dry air D	Factory Default
OFF	ON	22 Btu/lb dry air C	
ON	OFF	25 Btu/lb dry air B	
ON	ON	28 Btu/lb dry air A	

10.5. Differential Enthalpy "Comparative" Change Over

Comparative enthalpy is accomplished by using the BAYENTH004A accessory, consisting of an Outdoor Humidity Sensor (OHS), Return Humidity Sensor (RHS) and Return Air (temperature) Sensor (RAS). Similar to differential enthalpy control used in electromechanical equipment. If the outdoor enthalpy is greater than 1/2 Btu/LB dry air above the return air enthalpy, the unit will not economize. The economizer will not operate at outdoor temperatures above 75° F., the humidity sensor maximum operating limit.



If the outdoor enthalpy is less than 1/2 Btu/LB dry air below the return air enthalpy, the unit will economize. Mechanical cooling will operate if the outdoor enthalpy rises 1/2 Btu/LB dry air above the return air enthalpy. If the Return Air Sensor (RAS) or the Return Humidity sensor (RHS) were to fail, the economizer will operate using Reference Enthalpy. If the Outdoor Humidity Sensor (OHS) were to fail, the economizer will operate using Dry Bulb Change Over.

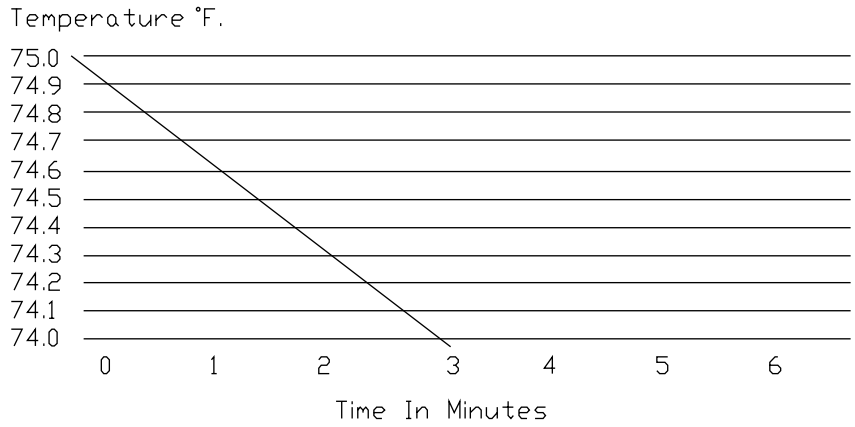


10.6. Economizer and Options 3-50 ton Constant Volume Units

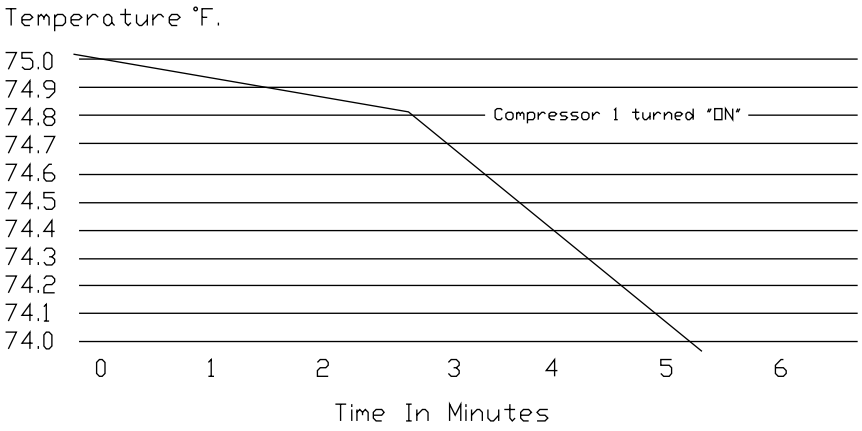
Addition of economizer preferred cooling logic on all equipment produced after 06/93, X13650473 (BRD-0931) UCP. This allows fully integrated economizer operation, where under extreme cooling requirement periods, the compressor(s) can operate in conjunction with the economizer if needed.

A 3 minute delay evaluates and verifies the Zone Temperature is dropping. A compressor will not be turned on if the zone is recovering at a rate of 12° F./hour (0.2° F./minute). Compressor 1 will be turned "ON" to assist the economizer, providing the outside air damper has driven 100% open, and the zone temperature (after 3 minutes) is not dropping at a rate of 12° F./hour (0.2° F./minute).

System Where Zone Temperature Recovery Is Satisfactory



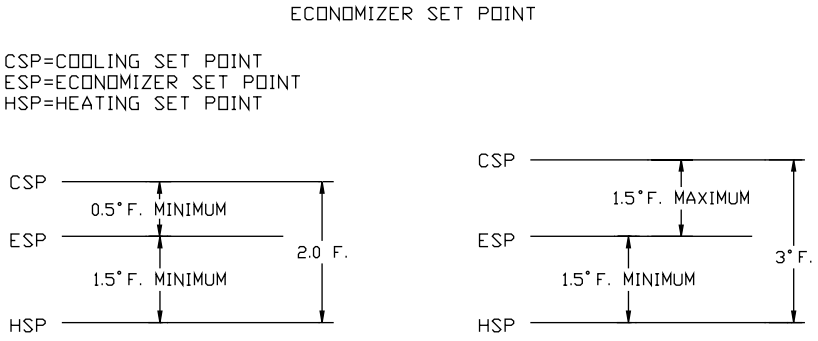
System Where Zone Temperature Recovery Is Unsatisfactory



10.7. Economizer Set Point- Constant Volume (3-50 tons)

The economizer set point is a minimum of 1.5° F. above the heating set point; the control algorithm will not let it be any closer. The economizer set point is also a maximum of 1.5° F. below the cooling set point; the control algorithm will not let it be any farther. The cooling and heating set points can be as close together as 2° F. and as far apart as 40° F. The economizer set point changes as the cooling and heating set point changes.

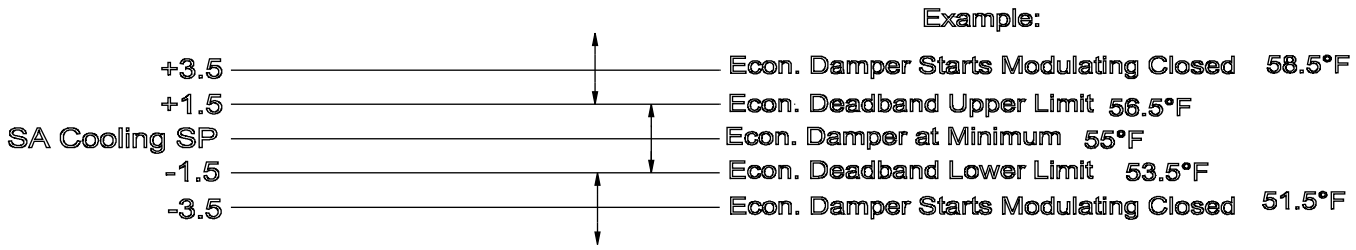
The economizer set point is a variable depending upon how close the heating and cooling set points are in relationship to one another. The economizer set point can be as close as 0.5° F. below the cooling set point, but no further than 1.5° F. below the cooling set point. When the heating and cooling set points are only 2° F. apart, the 1.5° F. minimum above the heating set point forces the economizer set point to 0.5° F. below the cooling set point. When the set points are 3° F. apart or farther, the economizer set point is at its maximum of 1.5° F. below the cooling set point.



10.8. Economizer Set Point- Variable Air Volume (27.5-50 tons)

The following is dependent upon economizer and compressor deadbands and set points for VAV units. See example below:

1. If suitable to economize and the outside air temperature is less than the Economizer Deadband Lower Limit (EDBLL) (which means <53.5° F from example below), then Mechanical cooling is disabled. If outside air temperature is greater than or equal to EDBLL (which means > or = 53.5° F from example below), Mechanical cooling is enabled.
2. If outside air temperature is greater than EDBLL (53.5° F) and the supply air temperature is greater than the Economizer Deadband Upper Limit (EDBUL) (which is 56.5 ° F from example below), the economizer damper will modulate to 100%.
3. After the economizer reaches 100% and conditions are still suitable to economize, 1 compressor is turned on.
4. If this is still not reaching supply air (SA) cooling set point (55° F) and it is still suitable to economize, then additional mechanical cooling is enabled.

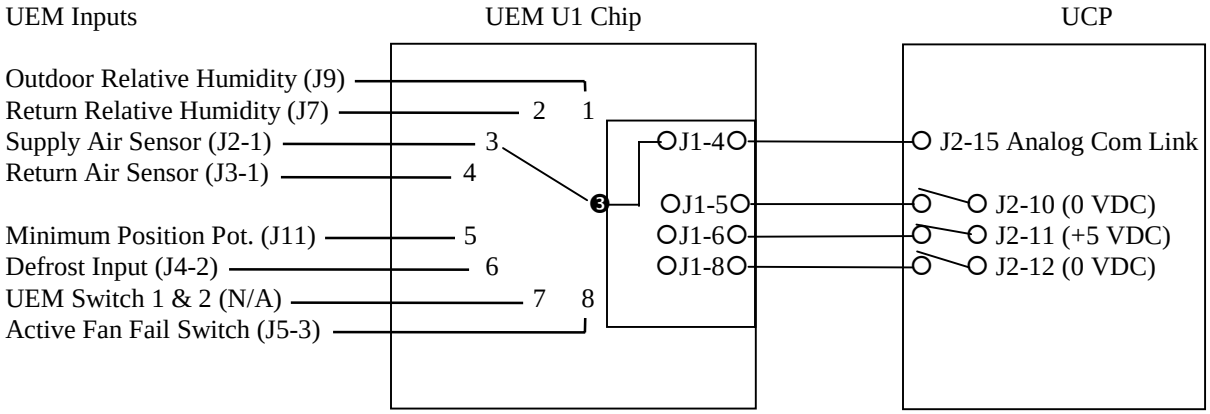


10.9. How the Economizer Functions Electrically

10.9.1. How The UCP Receives Information To Make Control Decisions

The UCP has only 1 analog input that goes out to the UEM, however the UEM has 8 different inputs going to it that the UCP must read. This information gets back to the UCP in a unique manner, via the U1 chip on the UEM, by using logic gate technology. For simplicity, the UCP outputs on terminals J2-10, J2-11, and J2-12 can be viewed as single pole single throw (SPST) switches.

By changing the position of the switches, and coming up with different combinations, the UCP is capable of toggling the U1 chip and reading all 8 UEM inputs through 1 UCP input. These 3 "switches" are capable of making up 8 different combinations. Each combination then in turn completes a circuit, allowing the UCP to read all 8 UEM inputs through 1 wire, one at a time. As the switches at the UCP change state from "OFF" (Logic Level Low 0VDC) to "ON" (Logic Level Hi +5VDC) and back, the U1 chip of the UEM changes position and makes contact with each UEM input as the UCP tells it to.



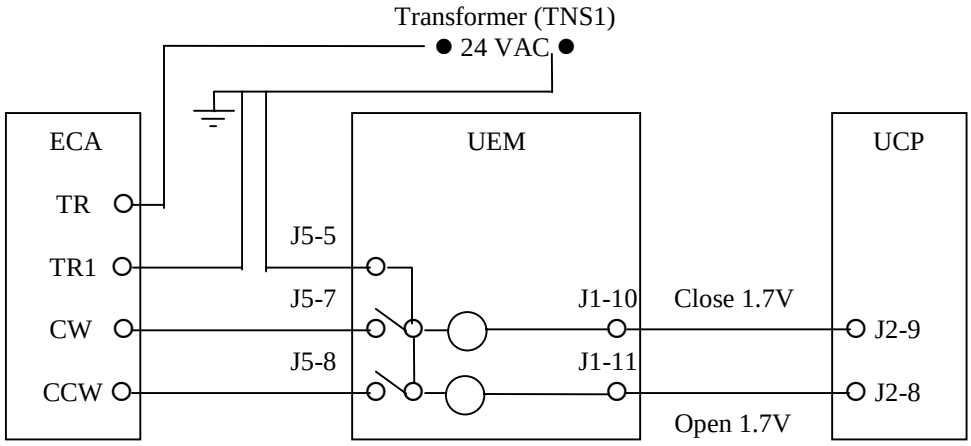
The UCP voltages listed above on J2-10, J2-11, and J2-12 are shown to illustrate how the circuit works. If troubleshooting this circuit, each pin connection measured to ground will have a distinctive pattern in the 0-5VDC range.

The UCP voltage on J2-15 should pulse from approximately 0-5VDC.

10.9.2. How the UCP Causes Changes To Occur

The UCP processes the information it receives through the UEM to make control related decisions, like whether to economize or not, or whether to drive the damper motor (modulate) open or closed to lower or raise the supply air temperature.

To drive the damper motor open, the UCP sends 5 volts DC out through terminal J2-8, the 5 volts DC enters the UEM at terminal J1-11, where it energizes an electronic device (similar to a relay) to complete an electrical circuit. This makes a connection between the UEM terminal J5-8 and the common side of the control power transformer, to drive the damper motor open. To drive the damper motor closed, the UCP sends 5 volts DC out through terminal J2-9, the 5 volts DC enters the UEM at terminal J1-10, where it energizes an electronic device (similar to a relay) to complete an electrical circuit. This makes a connection between the UEM terminal J5-7 and the common side of the control power transformer, to drive the damper motor closed.



On UEM pin terminal J1-10, 5VDC is present at all times except while a UCP drive close command is given. During the drive command period, the voltage drops to 1.7VDC.

On UEM pin terminal J1-11, 5VDC is present at all times except while a UCP drive open command is given. During the drive command period, the voltage drops to 1.7VDC.

11. Power Exhaust

11.1. Power Exhaust 3-25 Ton Units:

The power exhaust can be installed on 6.25-25 ton (and 5 ton High Efficiency) downflow units to the economizer accessory or to the return ductwork on 3-25 ton for horizontal units. **Note:** Make sure the power exhaust is braced properly.

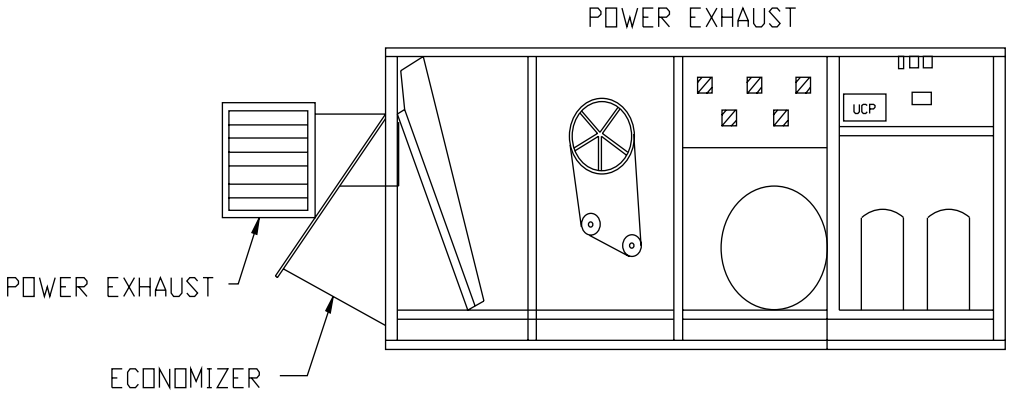
The power exhaust is typically used to help alleviate building pressurization. It should not be substituted for a separate exhaust system when one is needed or required. Pressurization problems will occur on extremely tight buildings with multiple rooftop units with economizers and power exhaust if a separate exhaust system is not installed.

Under normal design conditions, +0.25" w.c. return building static, the power exhaust is capable of exhausting approximately 30% of nominal system air flow. See catalog for specific unit data. Performance will vary as system design deviates from typical conditions. The more negative the return static, the less air it is capable of exhausting.

The power exhaust fan motor is energized when the damper is at a position greater than 25% of the actuator stroke. If minimum position is above 25%, after a 22.5 second delay for damper to reach 25% on the way to minimum position, power exhaust will operate each time the indoor fan is energized. If minimum position is below 25%, power exhaust will operate only when the unit is economizing and the damper is open more than 25%.

When power exhaust is used, wait until calibration is complete. Power exhaust may not come on if unit is put in test mode before calibration is complete.

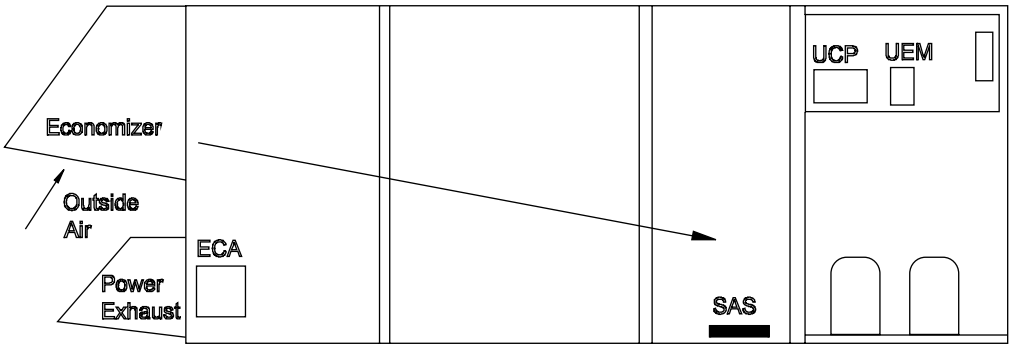
Note: The Exhaust Fan Contactor (XFC) has a 30 VDC coil.



11.2. Power Exhaust 27.5-50 Ton Units:

The 27.5 – 50 ton power exhaust fan is started whenever the position of the economizer dampers meets or exceeds the power exhaust set point when the supply fan is running. The set point panel is located in the return air section. This power exhaust can be adjusted from low to high speed or medium if 1 fan is wired for low & 1 for high speed.

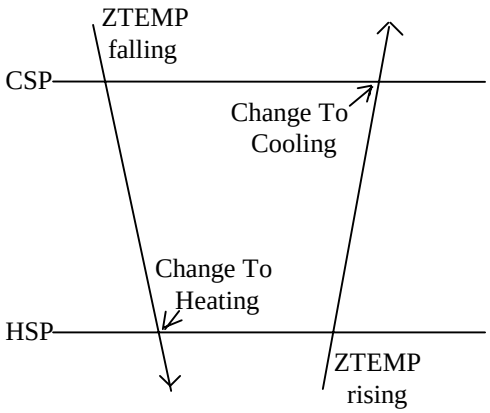
Under normal design conditions, +0.25" w.c. return building static, the power exhaust is capable of exhausting approximately 50% of nominal system airflow. See catalog for specific unit data. The power exhaust set point (outside air damper position at which the power exhaust comes on) can be set from 0-100%.



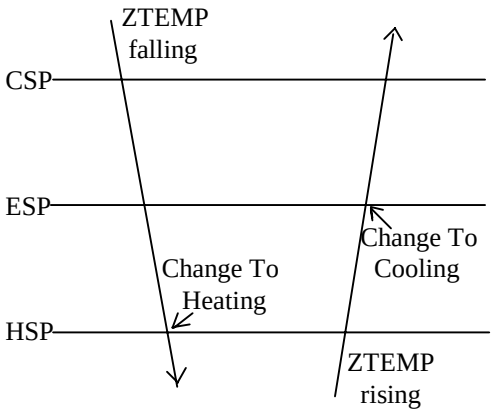
12. Heating / Cooling Change Over

The change over from heating to cooling is accomplished in two different ways. The first drawing below illustrates change over in a system without an economizer, and second drawing illustrates change over in a system with an economizer. Change over from cooling to heating is accomplished in the same manner for both economizer and economizer less systems.

If the unit is in the cooling mode and the zone temperature is falling, the unit will change to the heating mode when the zone temperature is equal to or less than the heating set point. For systems without economizers, if the unit is in the heating mode, and the zone temperature is rising, the unit will change to the cooling mode when the zone temperature is equal to or greater than the cooling set point. For systems with economizers, if the unit is in the heating mode, and the zone temperature is rising, the unit will change to the cooling mode when the zone temperature is equal to or greater than the economizer set point.

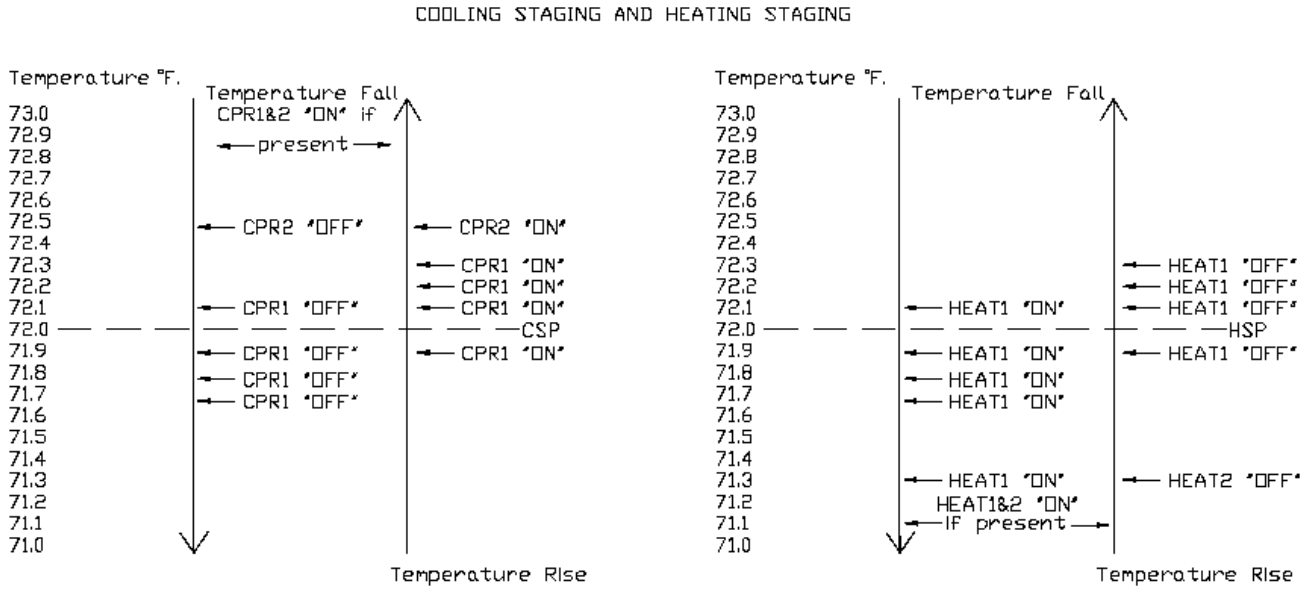


Without Economizer



With Economizer

12.1. Cooling and Heating Staging (Constant Volume Only)



Cooling and Heating Staging are a process of the UCP Proportional Integral control algorithm. Calculations are based on how far away from set point the zone is, and how long it has been this far away. The variables of relative distance from set point and time cannot give way to numbers that are predetermined, but they can provide us with some fairly accurate general rules.

Cooling Staging

If the zone temperature is more than 0.5° F. above the Cooling Set Point, compressors one and two (if present), will typically be operating. See "Temperature Fall" above. As the zone temperature drops, when it is 0.5° F. or less above set point, compressor two (if present) will turn off after its 3 minute minimum on time has been met. Compressor one continues to run, and will turn off somewhere between 0.1° F. above set point and 0.3° F. below set point.

As the zone temperature begins to warm, and the temperature rise is slow (typically less than 0.25° F. (minute), compressor one will typically turn on at set point, or 0.1° F. below set point. See "Temperature Rise" above. If the zone temperature rises at a faster rate (typically between 0.25-0.5° F. (minute), compressor one will typically turn on between 0.2-0.3° F. above set point. Compressor two (if present) will typically turn on approximately 0.5° F. above set point, regardless of how fast the temperature rises.

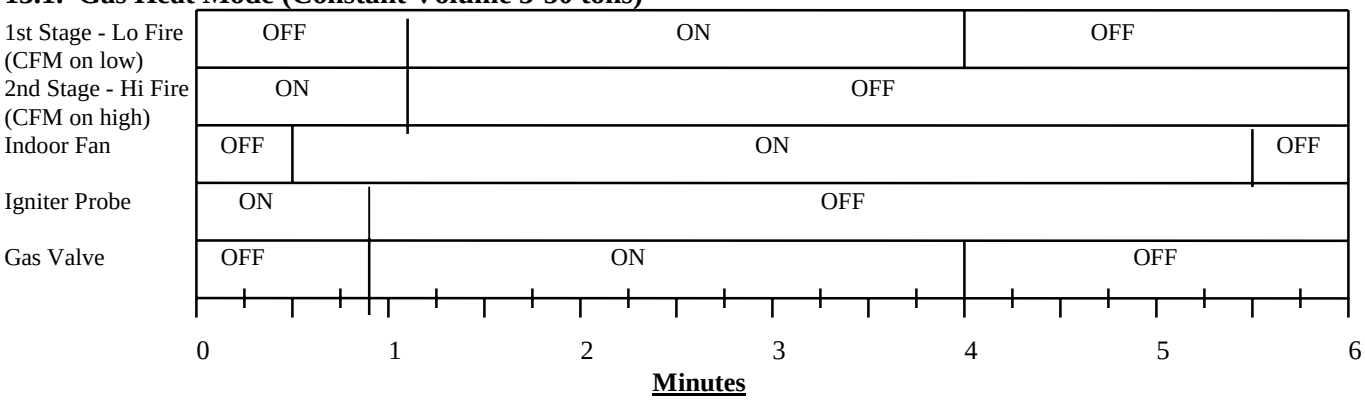
Heating Staging

If the zone temperature is more than 0.3° F. above the Heating Set Point, all heat should be off, providing all timing requirements have been met. As the zone temperature drops, when it is between 0.1-0.3° F. below set point, stage 1 heat will be turned on. See "Temperature Fall" above. If the zone temperature continues to fall, stage 2 heat (if present) will be turned on approximately 0.75° . below set point.

As the zone begins to warm and the temperature rises, stage 2 heat (if present) is turned off approximately 0.75° F. below set point. See "Temperature Fall" above. If the zone temperature continues to rise, when it is between 0.1-0.3° F. above set point, stage 1 heat will be turned off.

13. Gas Heat Start Up From the Zone Sensor Module or a Thermostat

13.1. Gas Heat Mode (Constant Volume 3-50 tons)



If the zone temperature is more than 0.3° F. above the Heating Set Point, all heat should be off, providing all timing requirements have been met. As the zone temperature drops, when it is between 0.1- 0.3° F. below set point, stage 1 heat will be turned on. If the zone temperature continues to fall, stage 2 heat (if present) will be turned on approximately 0.75° F. below set point.

The graph above illustrates the gas heating mode start up sequence. The various operating components are down the left side, and time progresses left to right across the graph.

13.1.1. Gas Heating Mode Voyager 3-50 Tons (Constant Volume):

1. The heat cycle will start in 2nd Stage - Hi Fire for 1 minute, after which time it will go to 1st Stage - Low Fire. If 2nd Stage - Hi Fire is required, it will stage up again to 2nd Stage - Hi Fire.
2. A 7 second trial for ignition occurs 30-45 seconds (depending on ignition control version) into the heat cycle. Lock out occurs after 3 unsuccessful trials.
3. 30-45 seconds after the heating cycle is initiated, the indoor fan will be turned ON, allowing time for the heat exchanger to warm up, so that cold air is not blown onto the occupants of the space.
4. The indoor fan operates for 90 seconds after each heat cycle when the fan switch is in the auto position, to remove any residual heat left in the heat exchanger.
5. If a CTI and thermostat are used, the heat cycle can be initiated and terminated as rapidly as every 5 seconds.

Note:
1. At power up the UCP self tests for 20 seconds before beginning heating timing.
2. If a CTI and a thermostat are being used, and an economizer is present, the economizer calibration sequence must be complete before the heating cycle can begin or the fan can be turned on by the fan switch at the thermostat.
3. A 4 minute minimum ON time existed for the gas heat cycle on original UCP (9/90).(Voyager 3-25 tons)
4. The 4 minute minimum ON time could be defeated in X13650508 software (06/94) (Voyager 3-25 tons).
5. The 4 minute minimum ON time was removed in X13650564 software (Voyager 3-25 tons).

13.1.2. Gas Heating Mode Voyager 27.5-50 Tons (VAV):

Morning warm-up:

1. Morning Warm-up (MWU) is enabled when the unit has a zone temperature input on LTB1-1 and LTB1-2, when enabled in the options menu of the BAYSENS020B, or by enabling through ICS.
2. After MWU is activated the system will ensure that all variable air volume (VAV) boxes have been signaled to be open for at least 6 minutes. After this 6 minutes, the inlet guide vanes (IGVs) or variable frequency drives (VFDs) will be driven to full airflow. ***The VAV unit runs at 100% airflow while heating.***
3. Then, all stages of gas heat are energized and the economizer damper is driven fully closed.
4. Heat stages will cycle off as MWU set point is approached.
5. Upon reaching MWU set point the unit will change over to cooling operation and the VAV dampers will modulate as required.

Notes:
1. The unit is shipped from the factory with a VAV panel, which has a MWU set point potentiometer.
2. MWU is activated whenever the unit switches from unoccupied to occupied, and the zone temperature is at least 1.5° F below the MWU set point.
3. MWU can be disabled by use of Tracer, programmable sensor (BAYSENS020B), or by removing the zone temperature input on LTB1-1.
4. On BAYSENS020B the MWU setpoint is called the “warm-up” setpoint.

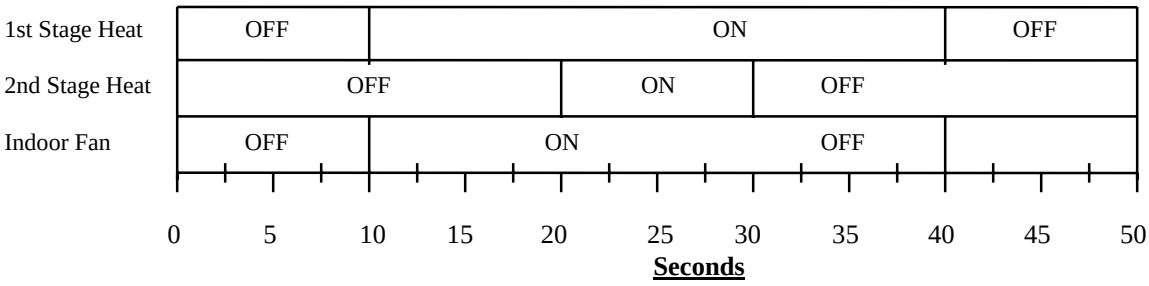
Daytime warm-up:

1. Daytime Warm-up (DWU) is enabled when the unit has a zone temperature input on LTB1-1 and LTB1-2, when enabled in the options menu of the BAYSENS020B, or by enabling through ICS.
2. After DWU is activated the system will ensure that all variable air volume (VAV) boxes have been signaled to be open for at least 6 minutes. After this 6 minutes, the inlet guide vanes (IGVs) or variable frequency drives (VFDs) will be driven to full airflow. ***The VAV unit runs at 100% airflow while heating***
3. Then, all stages of gas or electric heat are energized and the economizer damper is driven to minimum position.
4. When the zone temperature reaches the MWU set point, the unit automatically switches over to cooling mode, and will not heat again unless the zone temperature falls to 3° F below the MWU set point.

Notes:
1. Daytime warm-up set point is 3° F. below the MWU set point set at the VAV panel, programmable zone sensor, or ICS device.
2. Daytime warm-up is activated when the unit is in the occupied mode and the zone temperature falls below the daytime warm-up initiate temperature or the unit is in occupied heat mode.
3. The unit will ignore the VAV panel MWU set point if Tracer or programmable sensor (BAYSENS020B) is being used. If communication is lost, the unit will use the VAV panel input.
4. DWU can be deactivated via Tracer, programmable sensor (BAYSENS020B), or by removing the “DWU enable” input on the UCP at J1-3. (See low voltage wiring at unit).

14. Electric Heat Start Up From the ZSM or Thermostat

14.1. Electric / Electric Heat Mode (Constant Volume 3-50 tons)



The graph above illustrates electric heating mode start up sequence. The various operating components are down the left side, and time progresses left to right across the graph.

14.1.1. Electric Heating Mode Voyager 3-50 Tons (CV):

1. There is 10 second delay before starting the first stage of electric heat, and a 10 second delay between stages. Minimum on and off times are 10 seconds.
2. The indoor fan will start one second before first stage electric heat is energized. When heat cycle ends, indoor fan is turned off at the same time as electric heat.
3. If a CTI and thermostat are used, the heat can be turned on and off as rapidly as every 5 seconds.

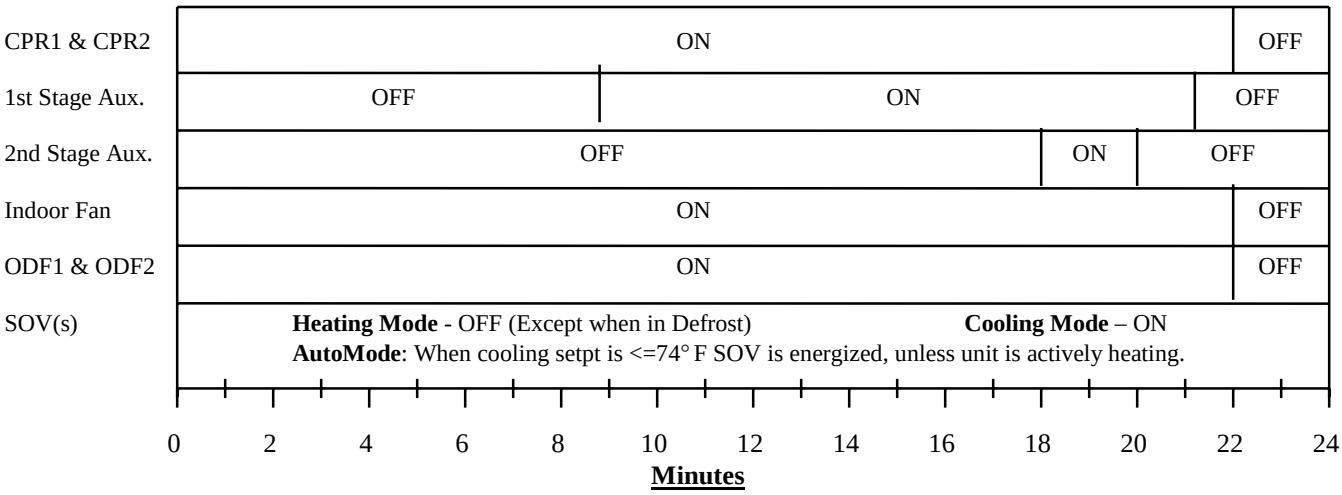
Notes: 1. At power up the UCP self tests for 20 seconds before beginning heating timing.
2. If a CTI and a thermostat are being used, and an economizer is present, the economizer calibration sequence must be complete before the heating cycle can begin or the fan can be turned on by the fan switch at the thermostat.
3. Emergency heat mode with heat pumps uses the same timing and logic as described above.

14.1.2. Electric Heating Mode Voyager 27.5-50 Tons (VAV):

Refer back to Gas Heat (see 13.1.2) for VAV Morning Warm-up & VAV Daytime Warm-up Control. The control timings and sequences are the same for gas heating or electric heating.

15. Heat Pump Start Up From the ZSM or Thermostat

15.1. Heat Pump Heating Mode (3-20 tons) WC Units



The graph above illustrates heat pump heating mode start up sequence. The various operating components are down the left side, and time progresses left to right across the graph.

15.1.1. Heat Pump Heating Mode Voyager 3-20 Tons (CV):

1. On 2 compressor units, both compressors operate as first stage heating. There is a one second delay between starting compressors.
2. There is a 9 minute delay before auxillary heat comes on, and an additional 9 minutes between stages.
3. As the zone temperature approaches set point, auxiliary heat stages will cycle off. See the "Smart Recovery" section (page 67) for more information.
4. At end of heating cycle, fan shuts off immediately if the mode input is AUTO.

Notes:
1. At power up the UCP self tests for 20 seconds before beginning compressor timing.
2. Each compressor will be off for a minimum of 3 minutes before beginning a cycle, and will run for a minimum of minutes before ending a cycle.
3. If a CTI and a thermostat are being used, and an economizer is present, the economizer calibration sequence must be complete before the fan can be turned on by the fan switch at the thermostat.

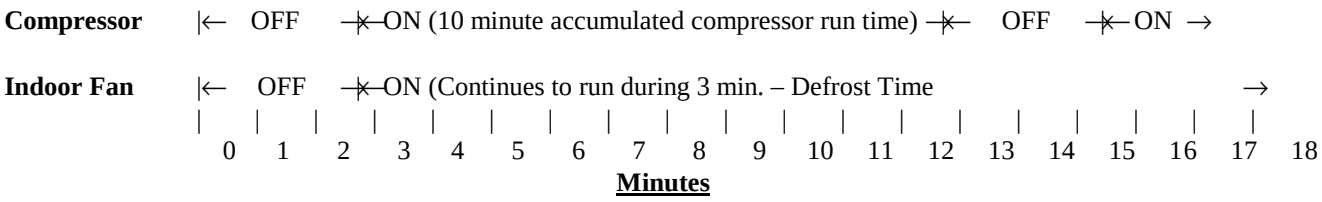
16. Low Ambient Mechanical Cooling Operation

16.1. Evaporator Defrost Control (EDC) Function (3-25 Tons only)

The Evaporator Defrost Control (EDC) function provides low ambient cooling, standard, down to 0° F. At this temperature, the equipment can provide approximately 60% of the mechanical cooling capacity. During low ambient operation compressor run time is counted and accumulated by the UCP. Low ambient operation is defined as 55° F. for single condenser fan units (3 through 10 ton), and 40° F. for dual condenser fan units (12 1/2 through 25 ton). Dual condenser fan units provide condenser fan cycling.

When accumulated compressor run time reaches approximately 10 minutes, an evaporator defrost cycle is initiated. An evaporator defrost cycle lasts for 3 minutes; this matches the compressor 3 minute minimum OFF time. When an evaporator defrost cycle occurs, the compressors are turned off and the indoor fan motor continues to run. After completing an evaporator defrost cycle the unit returns to normal operation, and the compressor run time counter is reset to zero.

Note: Economizer operation is not affected by an evaporator defrost cycle.



16.2. Evaporator Defrost Control Function / Frostat (27.5-50 Ton CV and VAV)

The Frostat input is a normally closed temperature switch.

Upon sensing a continuous open state on the frostat input for 5 seconds nominal the following will occur:

1. Both compressors are to be turned off after they have been operating for a minimum of 3 minutes continuous operation.
2. Supply fan will be forced ON until frostat input has been in a continuously closed state for 5 seconds nominal or 60 seconds after the call for cooling is satisfied, whichever is longer.

Note: Frostat opens at 35° F. plus or minus 5° F.

17. Heat Pump Defrost Operation

17.1. Demand Defrost (3-7.5 Ton only)

Demand Defrost is used on 3-7 1/2 Ton Heat Pumps. The UCP logic supports both Demand and Time / Temperature defrost. The UCP determines defrost operation by configuration wires built into each unit wiring harness. It is similar to Tyler Demand Defrost operation, however defrost is allowed below 6° F. outdoor temperatures if needed. After 30 minutes of run time under defrost permit conditions the UCP will initiate a defrost cycle. Data gathered during this cycle will be used to calculate clean coil delta T and defrost initiate value.

Upon termination of this cycle, the UCP monitors outdoor temperature (ODT) and coil temperature (CT) and calculates delta T (ODT-CT), this value is stored in memory and the UCP calculates a defrost initiate value. The UCP is continually comparing delta T to the defrost initiate value. To permit defrost, outdoor temperature must be below 52° F., coil temperature must be below 33° F. and delta T must exceed calculated value. After delta T reaches current initiate value, a defrost cycle will begin.

Defrost Termination is calculated in the following manner:
Defrost Termination Temperature (DTT) = Outdoor Temperature (ODT) + 47° F. or, DTT = ODT + 47° F.
The DTT will typically be between 57° F. and 72° F

17.2. Demand Defrost Failures, Diagnostics, and Defaults

The following is a complete listing of the failures or operating problems, and defaults for stand alone system operation with Zone Sensor Modules (ZSM's). An ICS device Tracer / Tracker / ComforTrac will directly indicate any of the items below, immediately after the first occurrence.

Problem = Coil Temperature Sensor (CTS) Failure (see section 29.0 to test)
Diagnostic = (Simultaneous Heat And Cool Fail At ZSM Or LTB)
Default = 10 Minute Defrost After Each 30 Minutes Of Accumulated Compressor Run Time

Problem = Outdoor Air Sensor (OAS) Failure (see section 27.5 to test the sensor)
Diagnostic = (Simultaneous Heat And Cool Fail At ZSM Or LTB)
Default = 10 Minute Defrost After Each 30 Minutes Of Accumulated Compressor Run Time

Problem = Mode Switch In Emergency Heat Position
Diagnostic = (Heat Fail At ZSM Or LTB)
Default = Mechanical (Compressor) Heating Disabled, Auxiliary Heat Only

Problem = Low Delta T For 2 Hours (Tyler Fault A)
Diagnostic = (Simultaneous Heat And Cool Fail At ZSM Or LTB)
Default = 10 Minute Defrost After Each 30 Minutes Of Accumulated Compressor Run Time

Problem = 10 Consecutive Defrosts Terminated By Time (Tyler Fault B)
Diagnostic = (Simultaneous Heat And Cool Fail At ZSM Or LTB)
Default = 10 Minute Defrost After Each 30 Minutes Of Accumulated Compressor Run Time

Problem = 16 Consecutive High Delta Ts After Defrost (Tyler Fault C)
Diagnostic = (Simultaneous Heat And Cool Fail At ZSM Or LTB)
Default = 10 Minute Defrost After Each 30 Minutes Of Accumulated Compressor Run Time

17.3. Time Temperature Defrost (10-20 Ton only)

Time / Temperature Defrost

Switch 1	Switch 2	Defrost Time
OFF	OFF	70 Min.
ON	OFF	90 Min.
OFF	ON	60 Min
ON	ON	45 Min.

SOVs: |← OFF →| ON →| OFF

Selected Defrost Time Interval = 45 Minutes

DT Switch: |← OPEN →| CLOSED →| OPEN

0 5 10 15 20 25 30 35 40 45 50 55 60

Minutes

Time / Temperature Defrost uses the Defrost Module (DFM), which is located in the control box, used in 10-20 ton heat pump units only. It provides input to the UCP for Time / Temperature defrost.

The defrost interval is field selectable to one of four settings, see above. After the compressor(s) have accumulated the run time selected on the Defrost Module (DFM), and the Defrost Temperature Switch (DT) closes, the UCP initiates outdoor coil defrost. If the unit changes over to the cooling mode, then back, the timing starts over.

The defrost cycle ends when the DT changes to the "open" state, or after approximately 10 minutes of defrost, or high pressure control on either compressor opens.

17.4. Time / Temperature Defrost Failures, Diagnostics, and Defaults

If the defrost temperature switch (DT) sticks or stays closed, a 10 minute default defrost cycle will be initiated by the UCP after the selected accumulated compressor run time.

If the UCP stops communicating with the defrost module the unit will defrost every 70 minutes of run time (in the heating mode) for 10 minutes, even if the DT is open.

A failure of this type will cause the HEAT and COOL LEDs to blink at the Zone Sensor Module (if applicable) once per second. This will also indicate a simultaneous HEAT and COOL failure at the low voltage terminal board LTB. As long as the on board relay on the Defrost Module and its controlling circuitry remain intact to energize the Switch Over Valve(s) SOV(s), defrost will still occur.

17.5. Soft Start Heat Pump 3-20 Ton

DT Switch: |← CLOSED →| OPEN (Defrost cycle terminating) →

↓5 second Soft Start delay ↓

SOV(s): |← ON →| OFF →

Outdoor Fan(s): |← OFF →| ON →

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

Seconds

The UCP has a built in “Soft Start” feature which is utilized in heat pump operation only. When a Heat Pump defrost cycle is terminating, the outdoor fan(s) are turned on for 5 seconds before de-energizing the switch over valve(s). "Soft Start" provides a smooth transition back to mechanical heating operation, and minimizes noise associated with switch over valve operation. This feature also improves compressor reliability, by greatly reducing stress on compressors associated with high pressure differential during defrost.

17.6. Smart Recovery

The UCP has built in Heat Pump "Smart Recovery", if the heat produced by the compressor(s) is making a recovery toward set point at a rate of at least 6° F./hour (0.1° F./minute), the electric heat is not turned on. A nine minute stage up delay allows time for recovery to begin. Every nine minutes after the mechanical heating cycle starts, the UCP checks the zone temperature to see if it is rising at least 6° F./hour (0.1° F./minute). If it is, auxiliary electric heat is not turned on, and the UCP continues the nine minute monitoring process.

If the zone temperature is not rising at a rate of at least 6° F./hour (0.1° F./minute), the UCP will energize the first stage of auxiliary electric heat (if installed). The UCP continues the nine minute monitoring process, if the zone temperature is still not rising at least 6° F./hour (0.1° F./minute), the second stage of auxiliary electric heat is energized (if installed). If after the next nine minute interval the zone temperature is rising sufficiently, the UCP will de-energize the second stage of auxiliary electric heat, and continue to stage down in reverse order.