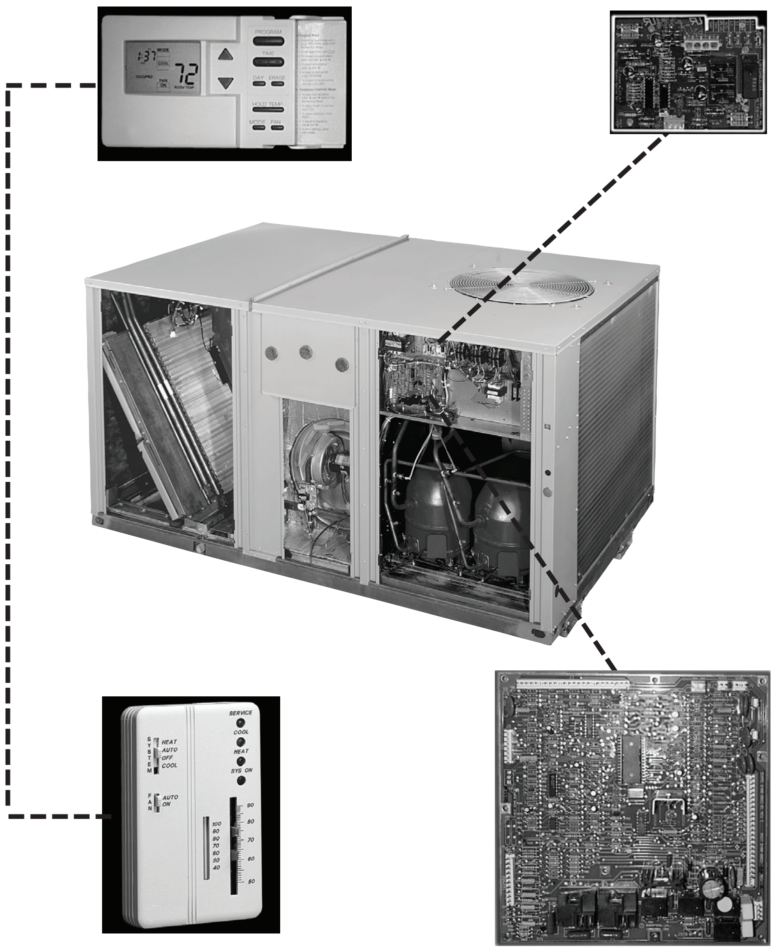
Voyager™ Microcontrols



⚠SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

May 2020

RT-SVD006B-EN

Introduction to Microcontrols

The Voyager Micro was developed with two specific thoughts in mind: comfort and reliability. It provides Proportional/Integral control for superior temperature control and eliminates the need to add time delay relays or anti-short cycle times in the field. The Micro also reduces the number of parts in the control system, which means fewer parts to fail and troubleshoot. In the unlikely event that a problem does occur, the Micro’s on-board diagnostics are there to assist and get you back on line fast. Trane is a pioneer in the application of microprocessor controls in the HVAC industry and has extensive experience in the design of hardware and software.

New Information

This revised edition contains information on the following units:

Voyager I & II

Voyager 3-25 ton cooling only, gas/electric, and 3-20 ton heat pumps. At the factory these are referred to as Voyager I (VI) and Voyager II (VII), which refers to cabinet size. They are grouped together in this manual because the control strategy is mostly the same regardless of tonnage. They differ only in type of heat, number of stages, etc.

Voyager III

Voyager 27.5-50 ton cooling only, gas/electric and electric heat as either constant volume (CV) and variable air volume (VAV) units. At the factory these are referred to as Voyager III (VIII) or Voyager Commercial. Constant volume means that the unit is designed to provide a constant amount of air. Variable air volume means that the unit can provide a modulating quantity of air by means of inlet guide vanes (IGVs) or variable frequency drives (VFDs). Throughout this manual whenever Voyager III controls differ from Voyager I & II, look for “Voyager III Notes”.

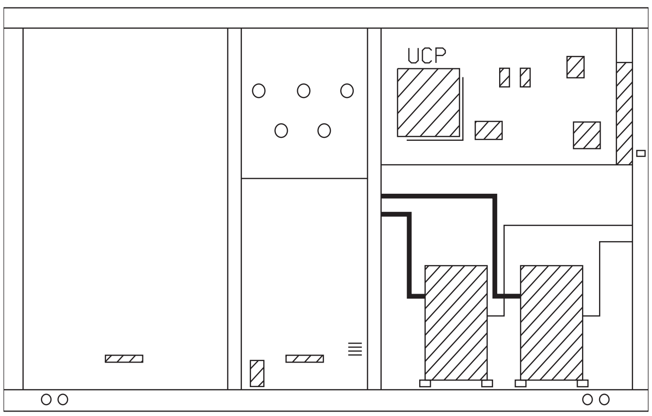
Table of Contents

Unitary Control Processor

The Unitary Control Processor (UCP) includes the following functions:

- Controls decision making processes in place of a thermostat
- Functions as a proportional integral control for superior comfort
- Controls cooling & heating staging and timing
- Contains many other equipment protection and operational enhancement features

Unitary Control Processor as a Decision Making Process.

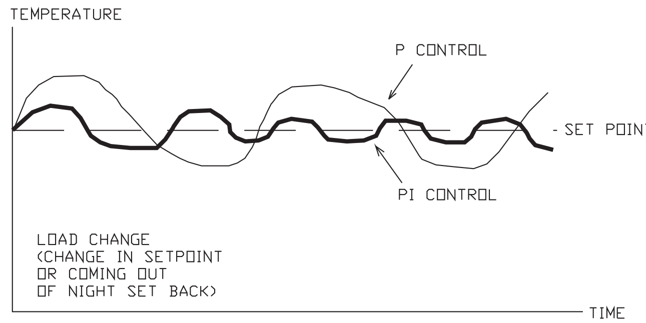


Proportional Integral Control

Proportional Integral Control (PI), located in the UCP enables space temperature control by the following:

- Sets the corrective action proportional to the error of deviation from the set point.
- Sets the rate of corrective action proportional to the error, resulting in the elimination of steady state error.

Proportional Integral Control as a Corrective Action.



Zone Sensor Module

The Zone Sensor Modules (ZSMs) replace a thermostat by providing the operator interface and zone temperature sensor input for the UCP. A Zone Sensor Module (ZSM) is required for each constant volume system, unless a Conventional Thermostat Interface (CTI), or VariTrac II with CCP is being used.

Voyager III Note:

> Variable Air Volume (VAV) units, 27.5-50 ton can use similar controllers, or they can be operated from the VAV panel in the rooftop unit. For more information see “UCP Default Control,” p. 31

ZSMs are available with the following features:

Remote sensing capabilities

Space temperature averaging capabilities

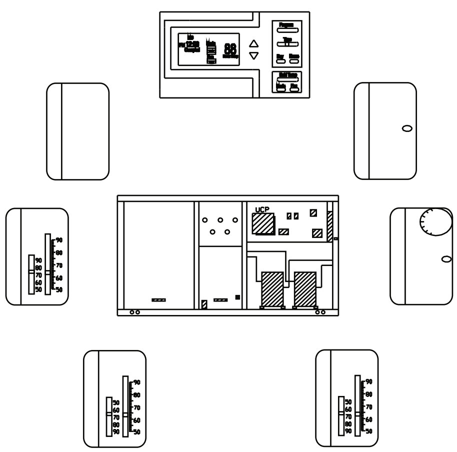
Single or Dual set point

.

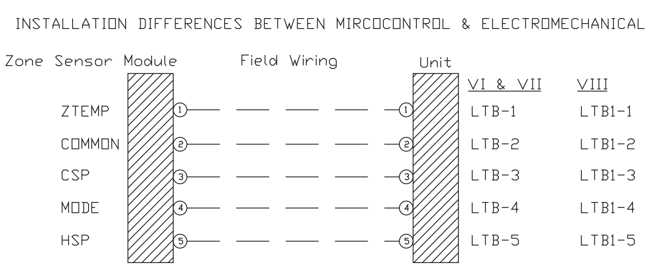
Programmable models

Manual & Auto changeover

Very simple to use



Installation Differences between Microcontrol & Electromechanical



Wiring

There are differences between microelectronic control units and electromechanical units. The most obvious difference is that typical industry terminal designations are not used. In other words, “R-G-Y-W-B” are not used. This is a very big change, but in reality it is a simplification. Terminal designations are now 1-2-3-4-5 etc.

The terminal designations on the Zone Sensor Modules (ZSMs) are identical to the terminal designations on the Low Voltage Terminal Board (LTB). No more wondering what thermostat terminal goes to what unit terminal.

Customer control wiring connections are as simple as: 1 to 1, 2 to 2, 3 to 3, 4 to 4, 5 to 5, and so on.

Voyager III note:

> VAV units use the VAV set point panel for supply air and morning warm-up set points.

Obsolete Zone Sensor Module Descriptions

	Accessory Model #	Zone Sensor Module Description	Required # Conductors	Terminal Description
Heat/Cool				
	BAYSENS006A ASYSTAT661A	Single Set Point Manual Change Over	4	1,2,3,4
	BAYSENS008A ASYSTAT663A	Dual Set Point Manual / Auto Change Over	5	1,2,3,4,5
	BAYSENS010A	Dual Set Point with LEDs Manual / Auto Change Over	10	1,2,3,4,5, 6,7,8,9,10
	BAYSENS019A/020A ASYSTAT666A	Programmable with Night Setback and LCD Indicators	3-7	12,14 7-10 Optional
Heat Pump				
	BAYSENS007A ASYSTAT662A	Single Set Point Manual Change Over	6	1,2,3,4, 6,7
	BAYSENS009A ASYSTAT664A	Dual Set Point Manual / Auto Change Over	7	1,2,3,4,5, 6,7
	BAYSENS011A	Dual Set Point with LEDs Manual / Auto Change Over	10	1,2,3,4,5, 6,7,8,9,10
	BAYSENSO23A ASYSTAT667A	Programmable with Night Setback and LCD Indicators	3-7	7,8,9,10,11, 12,14 7-10 Optional
Heat / Cool Or Heat Pump				
	BAYSENS012A ASYSTAT665A	Programmable with Night Setback	2	11,12
	BAYSENS018A	Programmable with Night Setback and LCDs	6	7,8,9,10, 11,12
	BAYSENS022A	Digital with LCD Temperature Display	3	11,12,14
Tracer / Tracker / ComforTrac ICS				
	BAYSENS013A BAYSENS013B	Override Sensor	2	1,2
	BAYSENS014A BAYSENS014B	Override Sensor with Set Point	3	1,2,3

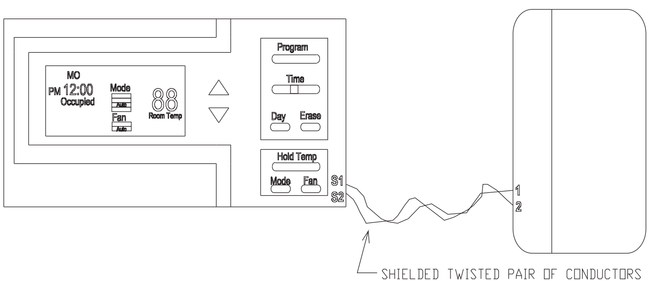
ZSM Current Zone Sensor Module Descriptions

	Accessory Model #	Zone Sensor Module Description	Required # Conductors	Terminal Connections
Heat/Cool				
	BAYSENS006B ASYSTAT661B	Single Set Point Manual Change Over	4	1,2,3,4
	BAYSENS008B ASYSTAT663B	Dual Set Point Manual / Auto Change Over	5	1,2,3,4,5
	BAYSENS010B	Dual Set Point with LEDs Manual / Auto Change Over	10	1,2,3,4,5, 6,7,8,9,10
	BAYSENS017B	Remote sensor	2	1, 2
	BAYSENS019B/020B ASYSTAT666B	Programmable with Night Setback and LCD Indicators	3-7	7,8,9,10, 11,12,14, 7-10 optional
	BAYSENS021A	VAV Remote Panel w/out Night Setback	4-9	1,2,3,4,6,7, 8,9,10 6-10 optional
Heat Pump				
	BAYSENS007B ASYSTAT662B	Single Set Point Manual Change Over	6	1,2,3,4, 6,7
	BAYSENS009B ASYSTAT664B	Dual Set Point Manual / Auto Change Over	7	1,2,3,4,5, 6,7
	BAYSENS011B	Dual Set Point with LEDs Manual / Auto Change Over	10	1,2,3,4,5, 6,7,8,9,10
	BAYSENS017B	Remote sensor	2	1, 2
	BAYSENS019B ASYSTAT666B	Programmable with Night Setback and LCD Indicators	3-7	7,8,9,10, 11,12,14, 7-10 optional
Tracer / Tracker / ComforTrac ICS				
	BAYSENS013C	Override Sensor with Override / Cancel	2	1,2
	BAYSENS014C	Override Sensor with Set Point and Override / Cancel	3	1,2,3

ZSM Control Wiring Tables

Control Wiring Tables

Standard Zone Sensor Module		Conventional Thermostat	
Wire Size	**Maximum Wire Length**	**Wire Size**	**Maximum Wire Length**
22-gauge	150 feet	22-gauge	30 feet
20-gauge	250 feet	20-gauge	50 feet
18-gauge	375 feet	18-gauge	75 feet
16-gauge	600 feet	16-gauge	125 feet
14-gauge	975 feet	14-gauge	200 feet
Zone Sensor Module (ZSM) to Low Voltage Terminal Board (LTB), and Remote Sensor to Zone Sensor Module (ZSM).		Conventional Thermostat Interface (CTI) Installation. Voyager III Note: CTI can be used on constant volume units only. Standard Thermostat to Low Voltage Terminal Board (LTB).	
Wire Type = Standard Thermostat Wire, solid conductor		Wire Type = Standard Thermostat Wire, Solid Conductor.	
Note: Total resistance must not exceed 5 Ohms, or ZSM calibration / accuracy may be affected.		Note: Total resistance must not exceed 1 Ohm; or CTI and low voltage transformer will be over powered.	

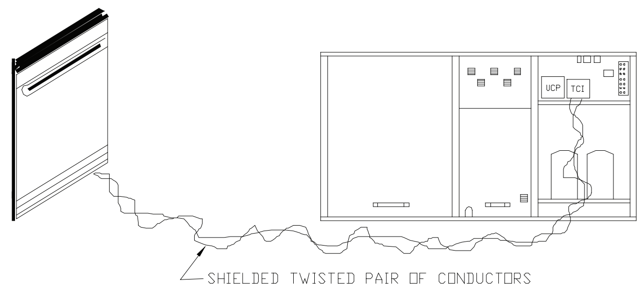


Remote Sensor to Programmable ZSM

Type = Shielded Twisted Pair of Conductors.

Specification = 18-gauge / Belden 8760 or equivalent.

Length = 1,000 feet, or less.



Integrated Comfort System (ICS) Device

Type = Shielded Twisted Pair of Conductors.

Specification = 18-gauge / Belden 8760 or equivalent.

Length = 5,000 feet, or less.

Equipment Protection / Operation Timings And Features

Increased Reliability

- Fewer components (moving electromechanical parts); less likelihood of equipment down time or failure. **Standard**

Proportional Integral (PI) Control

- Proportional - sets corrective action proportional to deviation from set point. Integral - fine-tunes the rate of corrective action proportional to the error (results in superior temperature control). **Standard**

Built In “TEST” Mode

- Aids in quick verification of system and control operation; exercises both hardware and software (no special tools required). **Standard**

On Board Diagnostics

- Assists with equipment troubleshooting if a problem should occur. **Standard**

Low Ambient Start Timer (LAST) Function

- Bypasses low pressure control when a compressor starts, eliminating nuisance compressor lockouts. **Standard**

Anti Short Cycle Timer (ASCT) Function

- Provides a three (3) minute minimum “ON” time and a three (3) minute minimum “OFF” time for compressors; enhances compressor reliability by ensuring proper oil return. **Standard**

Time Delay Relay (TDR) Function

- Provides an incremental staging delay between compressors; minimizes equipment current inrush and consumption by keeping compressors from starting simultaneously. **Standard**

Built In Fan Delay Relay (FDR) Function

- Provides custom indoor fan timing sequences for the different types of equipment, enhancing efficiency and reliability. **Standard**

Built In Evaporator Defrost Control Function

- Provides low ambient cooling down to 0° F. **Standard**
- Built in Froststat for Voyager 27.5-50 ton units - Provides low ambient cooling down to 0°F. **Standard**

Integral Electric Heat Staging

- Stages electric heaters “OFF” and “ON”, eliminating the use of sequencers. **Standard**

Intelligent Fallback

- Built in Default Control provides adaptive operation, which allows the equipment to continue to operate, and provide comfort in the event of certain input failures. Also, allows temporary operation without a Zone Sensor Module (ZSM). **Standard**

Emergency Stop Terminals on Low Voltage Terminal Board (LTB-16 & LTB-17)

- Provides a convenient point to disable the equipment completely and immediately. **Standard**

Lower Installation Cost

- When using a standard Zone Sensor Module (ZSM), control voltage wiring may be run up to five (5) times further than any electromechanical system with no increase in wire gauge. Example: Electromechanical System - 75 feet using 18-gauge wire. Microcontrol System - 375 feet using 18 gauge wire. **Standard**

Alternating Lead/Lag

Note: *Dual Compressor or Dual Circuit Models Only.*

- During periods of part load operation, each compressor cycles alternately as circuit number one, equalizing compressor wear and run time. Enabled by cutting the wire at UCP junction number J1-7. **Standard**

Demand Defrost on 3-7.5 Ton Heat Pumps

- Defrosts only if needed; not based on time like most other systems. Adapts to changing weather conditions and lowers operating costs. **Standard**

Heat Pump on 3-20 Ton Soft Start

- Provides a smooth transition into heating after defrost, minimizing noise and compressor stress associated with switch over. **Standard**

Heat Pump on 3-20 Ton Smart Recovery and Smart Staging

- Inhibits auxiliary heat operation if the space is recovering adequately (0.1° F./minute) with the heat pump alone, providing considerable savings in operating costs. **Standard**

Remote Sensing

- All Zone Sensor Modules (ZSMs) have remote sensing capabilities. **Standard**

Space Temperature Averaging

- All standard ZSMs have space temperature averaging capabilities.

Note: *Requires a minimum of four (4) remote sensors.*

Supply Air Tempering

- A built in feature enabled using a programmable ZSM or ICS device. When in the HEAT mode (and not actively heating), if supply air temperature drops 10° F. below the heating set point, heat is turned on until supply air temperature rises to a point 10° F. above the heating set point. Provides temperate air during the “OFF” cycle, and eliminates cold air dumping from supply ducts. Extremely effective when introducing large quantities of fresh air.

Built In Night Set Back And Unoccupied Functions

- When using a standard dual set point/auto change over ZSM, enable this function by applying a short across terminals LTB-11 and LTB-12. Sets cooling set point up a minimum of 7° F., sets heating set point back a minimum of 7° F., forces outside air damper (if present) minimum position to zero, and forces fan operation to automatic. **Accessory (requires time clock accessory or field supplied/installed switch or contacts)**
- When using a standard single set point/manual change-over ZSM setback/setup will not occur but other unoccupied functions will. **Accessory (requires time clock accessory or field supplied/installed switch or contacts).** See defaults, Section 8.8 for more information.
- **Voyager III Note:** For VAV- mechanical cooling is disabled, outside air damper will close, and the fan stays off except for unoccupied heating mode (if present). IGVs and VAV boxes are forced open during transition from occupied to unoccupied.

Selectable Economizer Dry Bulb Change Over

- Allows the capability of selecting the following dry bulb change over points: 55, 60 or 65° F. **Standard with economizer**

Economizer Preferred Cooling

- Provides fully integrated operation. Will not turn on a compressor with the economizer, if the space is recovering adequately with the economizer alone (0.2° F./minute). Allows the equipment to be utilized in more varied applications. **Standard with economizer**

Morning warm-up Control – (VAV units)

- With a programmable sensor, ICS device or standard VAV set point panel.

Daytime warm-up Control – (VAV units)

- When using morning warm-up, the daytime control is available or can be disabled. **Standard**

Equipment Operation with a Conventional Thermostat Interface (CTI)

When a CTI and a conventional mechanical thermostat are applied to the unit, operation differs. Thermostat logic is different; therefore some features discussed previously are not available. They are as follows:

- The Supply Air Tempering feature is not available. If outdoor air is being introduced through the equipment, discharge air temperature may be cold when not actively heating.
- Proportional Integral (PI) control is not available.
- On Board Diagnostics are only available on the Unitary Control Processor (UCP) at the J7 pins, instead of the Low Voltage Terminal Board (LTB).
- Intelligent Fall Back is not available. If a failure occurs in the device controlling the equipment, operation will cease.
- Heat Pump Smart Recovery and Smart Staging is not available. Heat Pump operation becomes more costly unless the generic control being applied can accomplish this.
- Remote Sensing Capabilities are not available on mechanical thermostats.
- Space Temperature Averaging capabilities are not available on mechanical thermostats.
- Built in Night Set Back and Unoccupied Functions are not available on mechanical thermostats.
- Built in Unoccupied mode is not available on mechanical thermostats.

Note: *Installation can be more costly. In addition to the price of Conventional Thermostat Interface and the thermostat or generic control, the control wiring size must be increased.Troubleshooting becomes more complex, because of the additional hardware (i.e. CTI Module).*

Voyager III Notes:

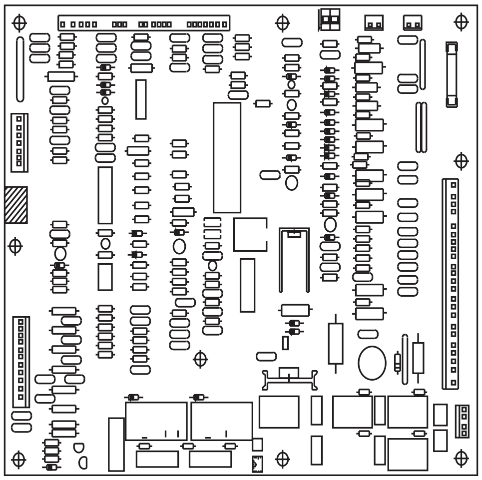
1) Not an option on VAV units.

2) On CV units the unit is limited to 2 stages of cooling.

Microcontrol Component Descriptions and Part Numbers

Unitary Control Processor (UCP)

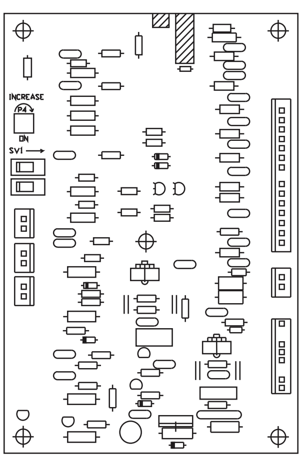
Main board in the unit control box, which is standard in all microcontrol units. The computer and program reside in this board. This is the brain of the control system.



Component Description	Part Number
Unitary Control Processor (UCP) 3-25 tons	MOD-01164
Unitary Control Processor (UCP) 27.5-50 tons	MOD-0405

Unitary Economizer Module (UEM)

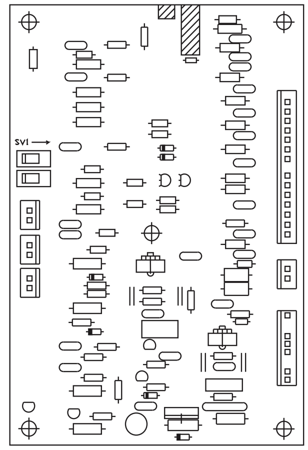
Board located in economizer section on 3-25 ton units, and unit control box on 27.5-50 ton units. Standard in all microcontrol economizers, motorized outside air dampers, and BAYDIAG001A. Allows UCP to directly control the economizer actuator (ECA). This is the hardware interface between the UCP and the economizer actuator (ECA) motor.



Component Description	Part Number
Unitary Economizer Module (UEM)	MOD-0145

Unitary VAV Module (UVM)

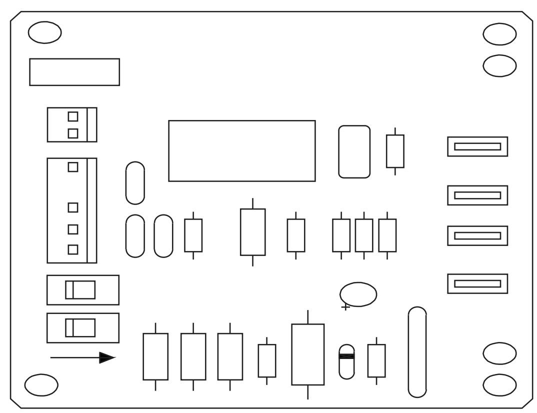
Standard board located in unit control box on 27.5-50 Ton Vav units. Provides a 2 to 10 VDC output to control Inlet Guide Vanes or Variable Frequency Drive.



Component Description	Part Number
Unitary VAV Module (UVM)	MOD-0146

Defrost Module (DFM)

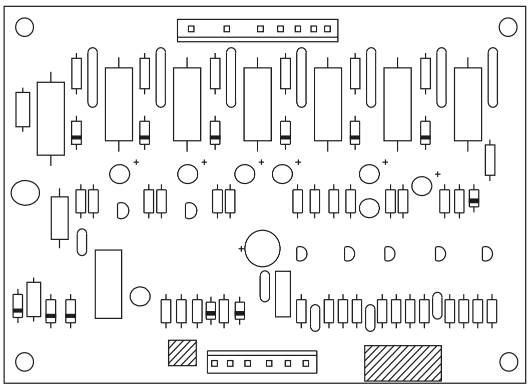
Small board located in the unit control box. Standard in 10-20 ton microcontrol heat pumps only. Provides time / temperature input to the UCP for time / temperature defrost.



Component Description	Part Number
Defrost Module (DFM)	BRD-0742

Conventional Thermostat Interface (CTI)

Accessory (BAYCTHI001C) field or factory installed board, mounted in unit control box to the right of the UCP board. Allows system to be operated by a conventional thermostat or through dry contact closure type controls. The only difference in hardware between VI/VII/VIII is the cable length from the UCP to the CTI. Can only be used on constant volume units.



Component Description	Part Number
Conventional Thermostat Interface (CTI)	BRD-0968

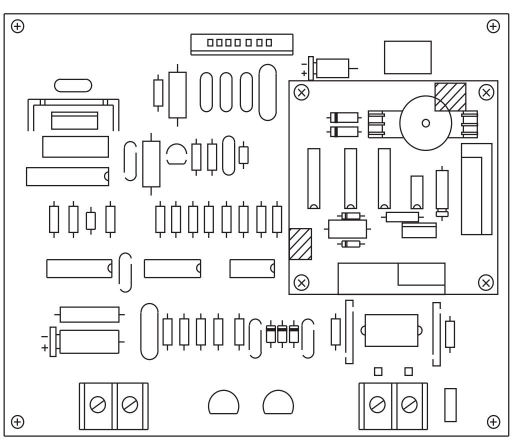
Trane Communications Interface (TCI-3)

Accessory (BAYICSI001B) field or factory installed board, mounted in unit control box to the right of the UCP board. Allows system to communicate with, and be controlled by Tracer, the Tracker "STAT" 4/7/16 series, and VariTrac bypass VAV system.

Voyager III (VAV) Note:

VariTrac can not be used with Voyager III VAV. Used with constant volume units only.

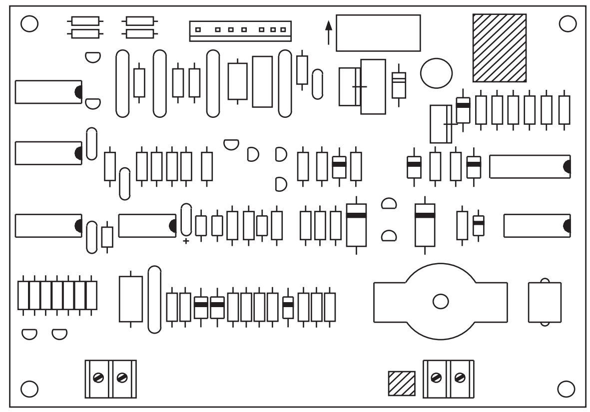
Note: *Obsolete ComforTrac and VariTrac Comfort Manager also require this interface.*



Component Description	Part Number
Trane Communications Interface (TCI-3))	BRD-0917

Obsolete Trane Communications Interface (TCI-1)

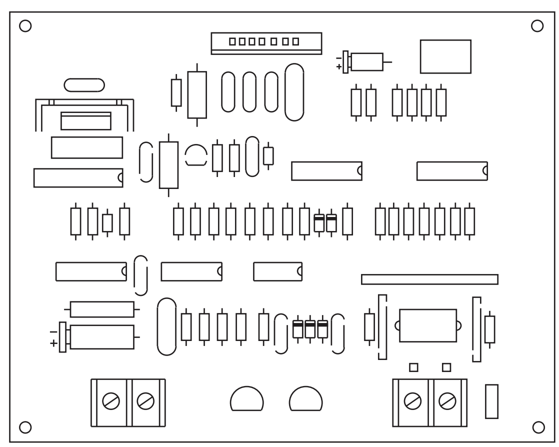
Accessory field installed board, mounted in unit control box to the right of the UCP board. Allows system to communicate with, and be controlled by, Tracer / Tracker / ComforTrac Integrated Comfort System (ICS) Building Management Devices.



For Replacement use TCI-3	Part Number
Trane Communications Interface (TCI-3)	BRD-0917

Obsolete Trane Communications Interface (TCI-2)

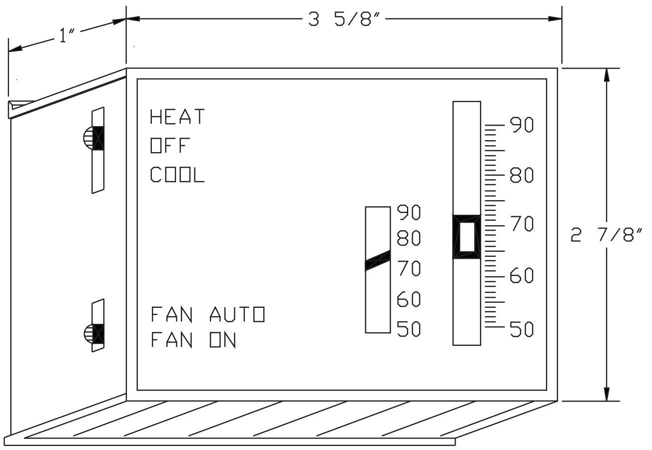
Accessory field installed board, mounted in unit control box to the right of the UCP board. Allows system to communicate with, and be controlled by, VariTrac Comfort Manager zoning system.



For Replacement use TCI-3	Part Number
Trane Communications Interface (TCI-3)	BRD-0917

Obsolete BAYSENS006A/ASYSTAT661A

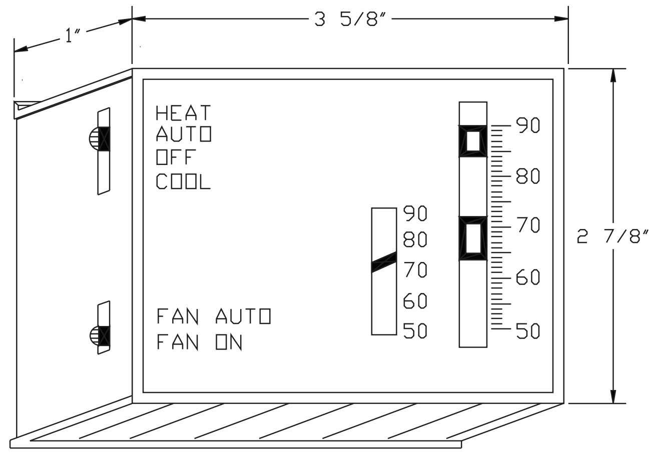
Accessory Heat / Cool Zone Sensor Module (ZSM), single set point, manual change over. Four conductors required. Manufactured by Sunne prior to 12/93.



For Replacement use BAYSENS006B & Wall Plate BAYMTPL004A	Part Number
BAYSENS006B [Sunne part# 62822]	SEN-0410
ASYSTAT661B [Sunne part# 62830]	SEN-0417

Obsolete BAYSENS008A/ASYSTAT663A

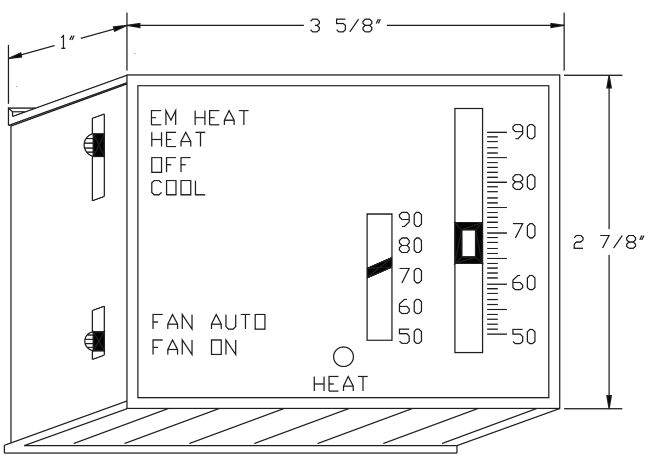
Accessory Heat / Cool Zone Sensor Module (ZSM), dual set point, manual / auto-change over. Five conductors required. Manufactured by Sunne prior to 12/93.



For Replacement use BAYSENS008B & Wall Plate BAYMTPL004A	Part Number
BAYSENS008B [Sunne part# 62826]	SEN-0408
ASYSTAT663B [Sunne part# 62833]	SEN-0419

Obsolete BAYSENS007A/ASYSTAT662A

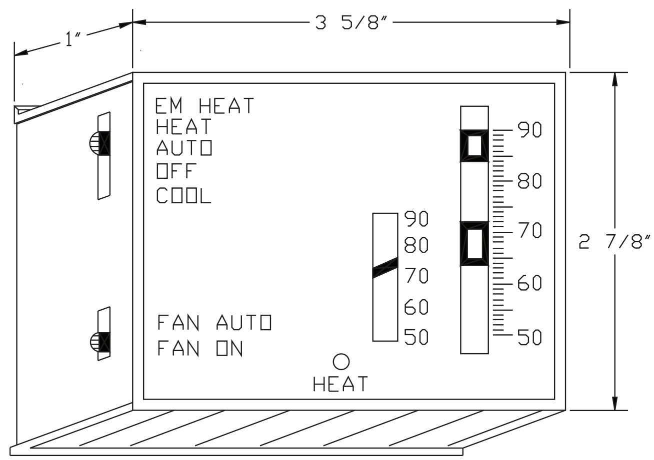
Accessory Heat Pump Zone Sensor Module (ZSM), single set point, manual change over. Six conductors required. Manufactured by Sunne prior to 12/93.



For Replacement use BAYSENS007B & Wall Plate BAYMTPL004A	Part Number
BAYSENS007B [Sunne part# 62821]	SEN-0411
ASYSTAT662B [Sunne part# 62831]	SEN-0418

Obsolete BAYSENS009A/ASYSTAT664A

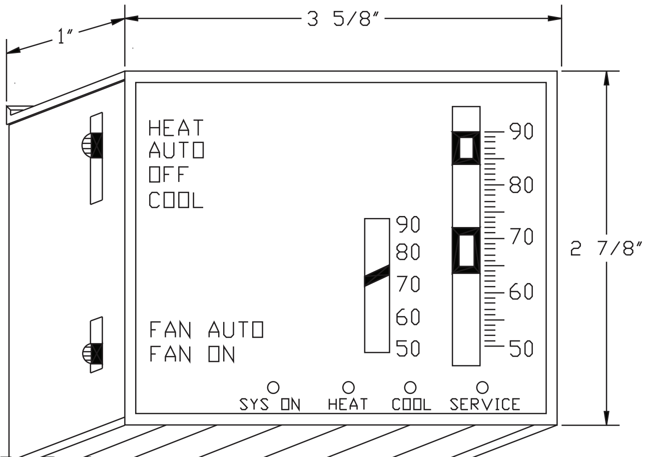
Accessory Heat Pump Zone Sensor Module (ZSM), dual set point, manual / auto-change over. Seven conductors required. Manufactured by Sunne prior to 12/93.



For Replacement use BAYSENS009B & Wall Plate BAYMTPL004A	Part Number
BAYSENS009B [Sunne part# 62825]	SEN-0412
ASYSTAT664B [Sunne part# 62832]	SEN-0420

Obsolete BAYSENS010A

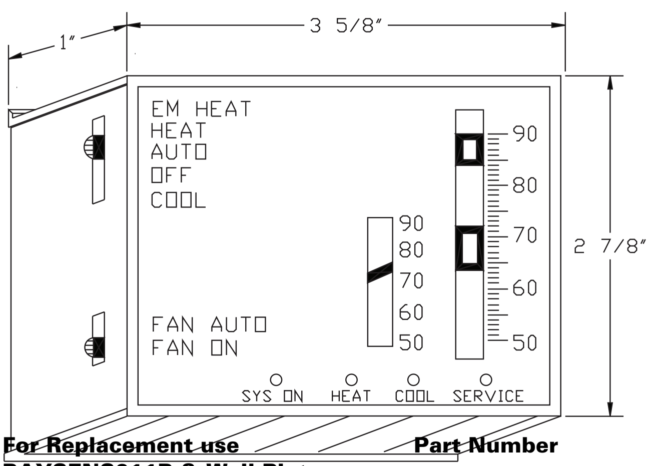
Accessory Heat / Cool Zone Sensor Module (ZSM), dual set point with LEDs, manual / auto-change over. Ten conductors required. Manufactured by Sunne prior to 12/93.



For Replacement use	Part Number
BAYSENS010B & Wall Plate BAYMTPL004A	
BAYSENS010B [Sunne part# 62823]	SEN-0413

Obsolete BAYSENS011A

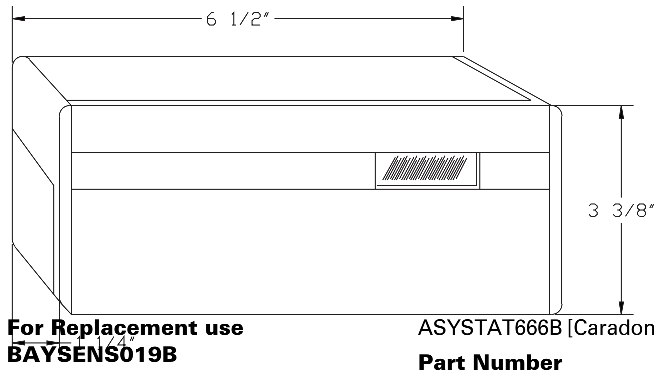
Accessory Heat Pump Zone Sensor Module (ZSM), dual set point with LEDs, manual / auto-change over. Ten conductors required. Manufactured by Sunne prior to 12/93.



For Replacement use	Part Number
BAYSENS011B & Wall Plate BAYMTPL004A	
BAYSENS011B [Sunne part# 62824]	SEN-0414

Obsolete BAYSENS012A/ASYSTAT665A

Accessory Heat / Cool and Heat Pump, programmable night set back Zone Sensor Module (ZSM). Two conductors required. Manufactured by Enerstat/Valera prior to 02/94.

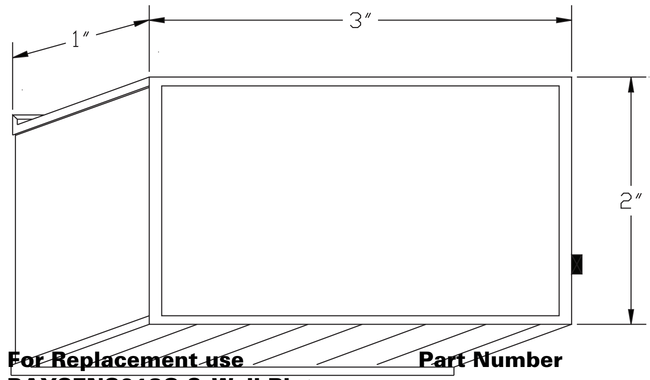


For Replacement use	Part Number
BAYSENS019B	
BAYSENS019B [Caradon part# 91K91]	SEN-0874
ASYSTAT666B [Caradon part# 91K92]	

Note: *Minimum of 3 wires required with a BAYSENS019B*

Obsolete BAYSENS013A

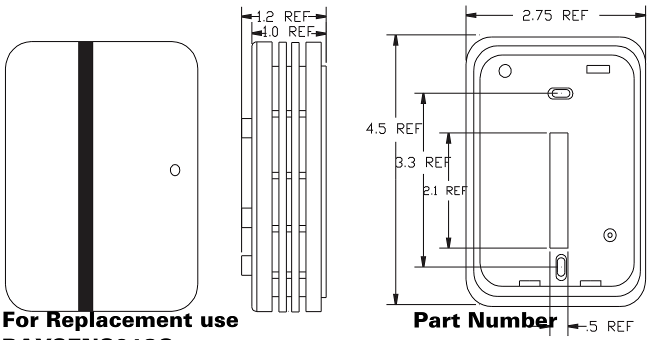
Accessory ICS (Tracer/Tracker/ComforTrac) Zone Sensor Module (ZSM), with override button. Two conductors required. Manufactured by Sunne prior to 12/93.



For Replacement use	Part Number
BAYSENS013C & Wall Plate BAYMTPL004A	
BAYSENS013C [Sunne part# 65464]	SEN-0495

Obsolete BAYSENS013B

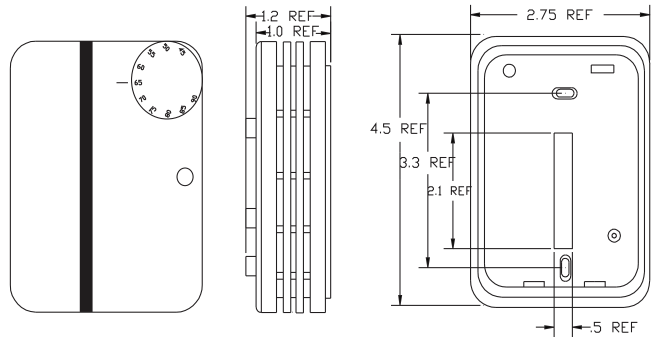
Accessory ICS (Tracer/Tracker/ComforTrac) Zone Sensor Module (ZSM), with override button. Two conductors required. Manufactured by Sunne, prior to 08/95.



For Replacement use BAYSENS013C	Part Number
BAYSENS013C [Sunne part# 65464]	SEN-0495

Obsolete BAYSENS014B

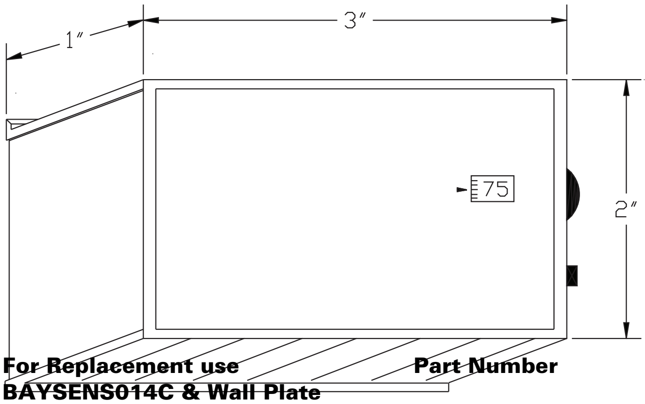
Accessory ICS (Tracer/Tracker/ComforTrac) Zone Sensor Module (ZSM), with override button and set point. Three conductors required. Manufactured by Sunne, prior to 08/95.



For Replacement use BAYSENS014C	Part Number
BAYSENS014C [Sunne part# 65465]	SEN-0496

Obsolete BAYSENS014A

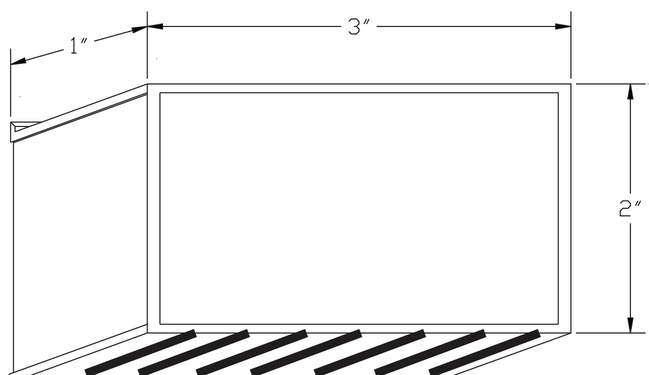
Accessory ICS (Tracer/Tracker/ComforTrac) Zone Sensor Module (ZSM), with override button and set point. Three conductors required. Manufactured by Sunne prior to 12/93.



For Replacement use BAYSENS014C & Wall Plate BAYMTPL004A	Part Number
BAYSENS014C [Sunne part# 65465]	SEN-0496

Obsolete BAYSENS017A

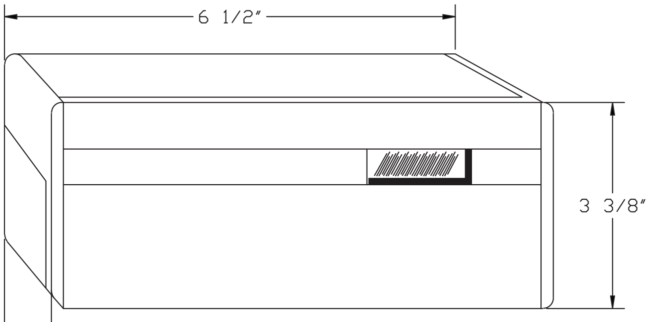
Accessory Zone Sensor Remote, used with BAYSENS006A, 007A, 008A, 009A, 010A or 011A. Two conductors required. Manufactured by Sunne prior to 12/93.



For Replacement use BAYSENS017B & Wall Plate BAYMTPL004A	Part Number
BAYSENS017B [Sunne part# 65464]	SEN-0435
ASYSTAT669A [Sunne part# 65541]	SEN-0493

Obsolete BAYSENS018A

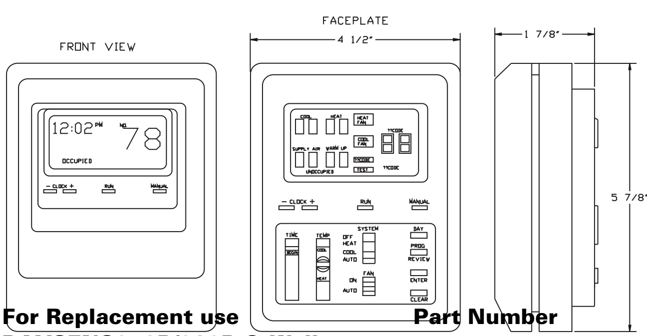
Accessory Heat / Cool and Heat Pump, programmable night set back Zone Sensor Module (ZSM), with LCD status / diagnostic indicators. Six conductors required. Manufactured by Enerstat/Valera prior to 02/94.



For Replacement use BAYSENS019B & Wall Plate BAYMTPL003A	Part Number
BAYSENS019B [Caradon part# 91K91]	SEN-0874
ASYSTAT666B [Caradon part# 91K92]	SEN-0907

Obsolete BAYSENS019A/020A/ ASYSTAT666A

Accessory Heat/Cool, programmable night set back Zone Sensor Module (ZSM), with LCD status / diagnostic indicators. Seven conductors, terminals 11, 12 & 14 required, 7 through 10 optional. Manufactured by Caradon, introduced 03/94.

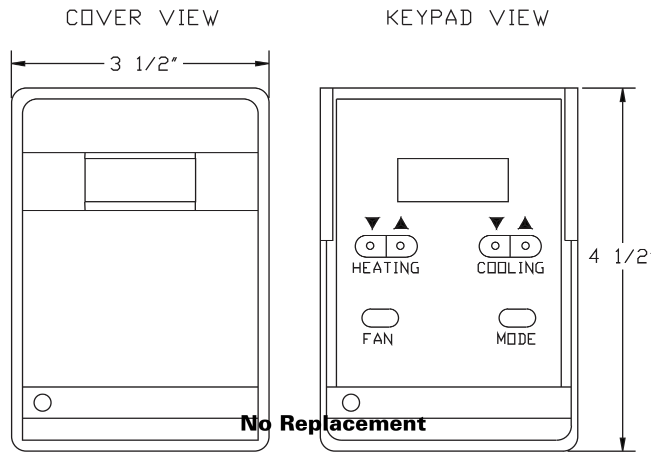


For Replacement use BAYSENS019B/020B & Wall Plate BAYMTPL003A	Part Number
BAYSENS019B [Caradon part# 91K91]	SEN-0874
ASYSTAT666B [Caradon part# 91K92]	SEN-0907
BAYSENS020B [Caradon part# 91K93]	SEN-0874

(VAV only)

Obsolete BAYSENS022A

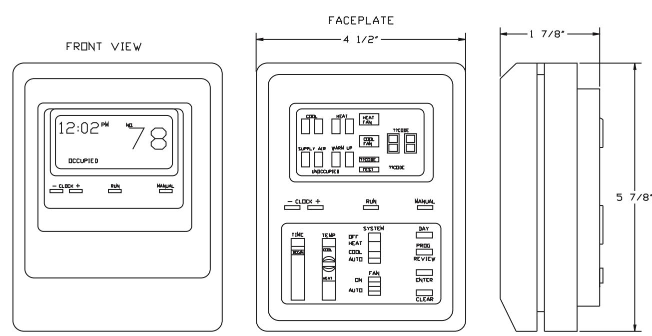
Accessory Heat / Cool and Heat Pump, (non-programmable) digital Zone Sensor Module (ZSM), with LCD display. Three conductors required. Manufactured by Enerstat/Valera, introduced 06/93.



No Replacement

Obsolete BAYSENS023A/ASYSTAT667A

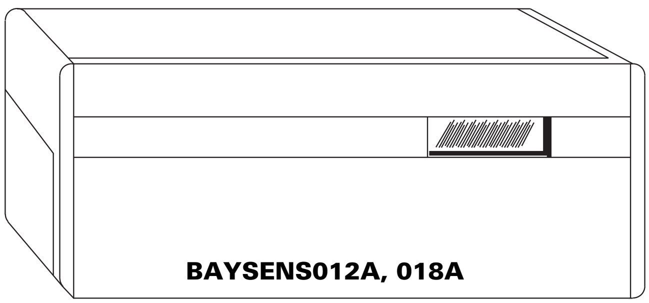
Accessory Heat Pump, programmable night set back Zone Sensor Module (ZSM), with LCD status / diagnostic indicators. Seven conductors, terminals 11, 12 & 14 required, 7 through 10 optional. Manufactured by Caradon, introduced 03/94.



For Replacement use BAYSENS019B & Wall Plate BAYMTPL003A	Part Number
BAYSENS019B [Caradon part# 91K91]	SEN-0874
ASYSTAT666B [Caradon part# 91K92]	SEN-0907

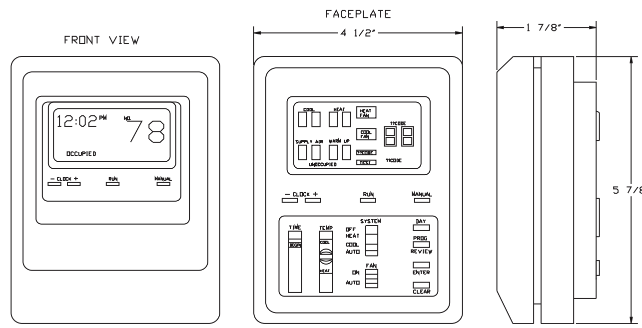
Obsolete Programmable Zone Sensor Modules

The programmable zone sensor module is a night set back device with 7 day programming capabilities, and one occupied / unoccupied period per day. Two wires are required for BAYSENS012A or ASYSTAT665A installation. BAYSENS018A required 6 wires. A microprocessor in the zone sensor communicates with the UCP once every 0.5 seconds.



Obsolete Programmable Zone Sensor Modules

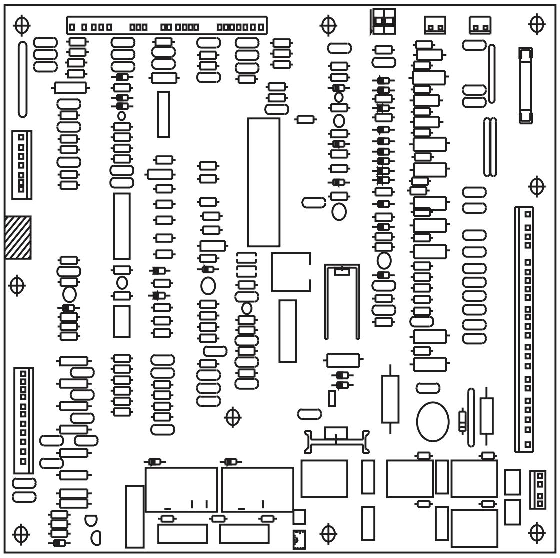
The programmable zone sensor module, is a night set back device with many features. It has 7 day programming capabilities, with two occupied, and two unoccupied periods per day. Three wires are required for BAYSENS019A/023A or ASYSTAT666B basic installation. When remote panel indication is needed, up to seven wires are used to complete installation. Its microprocessor communicates once every 0.5 seconds with the UCP, for rapid response to zone changes.



Microcontrol Accessories and What They Offer

BAYSENS006B/ASYSTAT661B

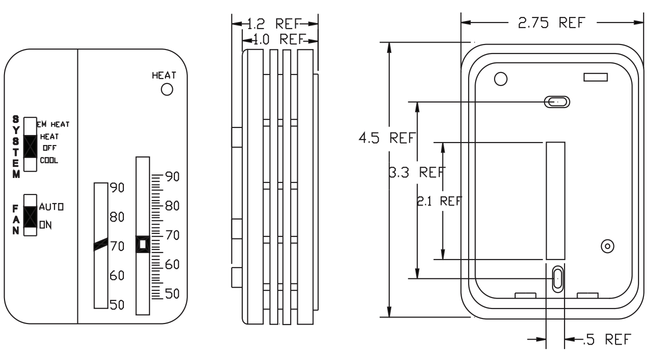
Accessory Heat / Cool Zone Sensor Module (ZSM), single set point, manual change over. Four conductors required. Manufactured by Sunne, introduced 12/93.



Component Description	Part Number
BAYSENS006B [Sunne part# 62822]	SEN-0410
ASYSTAT661B [Sunne part# 62830]	SEN-0417

BAYSENS007B / ASYSTAT662B

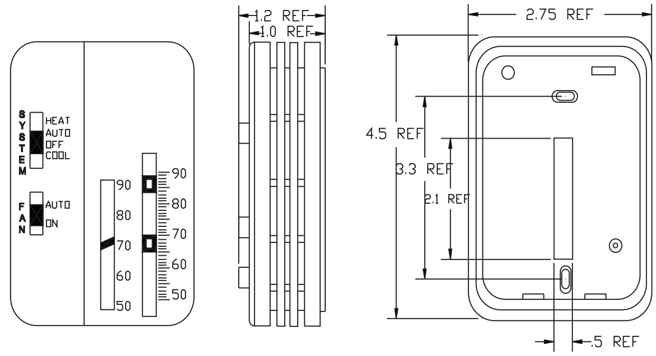
Accessory Heat Pump Zone Sensor Module (ZSM), single set point, manual change over. Six conductors required. Manufactured by Sunne, introduced 12/93.



Component Description	Part Number
BAYSENS007B [Sunne part# 62821]	SEN-0411
ASYSTAT662B [Sunne part# 62831]	SEN-0418

BAYSENS008B / ASYSTAT663B

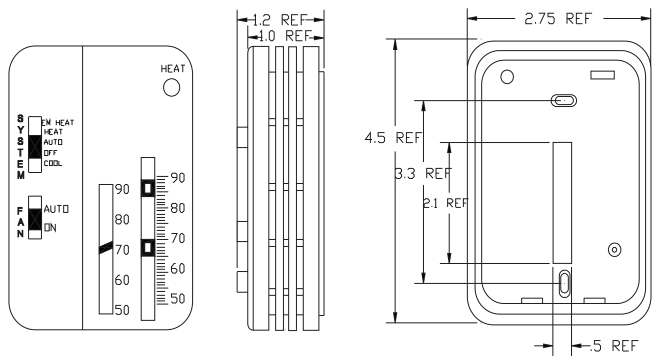
Accessory Heat / Cool Zone Sensor Module (ZSM), dual set point, manual / auto change over. Five conductors required. Manufactured by Sunne, introduced 12/93.



Component Description	Part Number
BAYSENS008B [Sunne part# 62826]	SEN-0408
ASYSTAT663B [Sunne part# 62833]	SEN-0419

BAYSENS009B / ASYSTAT664B

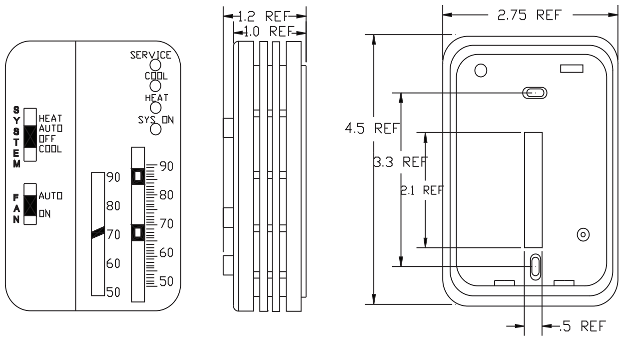
Accessory Heat Pump Zone Sensor Module (ZSM), dual set point, manual / auto change over. Seven conductors required. Manufactured by Sunne, introduced 12/93.



Component Description	Part Number
BAYSENS009B [Sunne part# 62825]	SEN-0412
ASYSTAT664B [Sunne part# 62832]	SEN-0420

BAYSENS010B

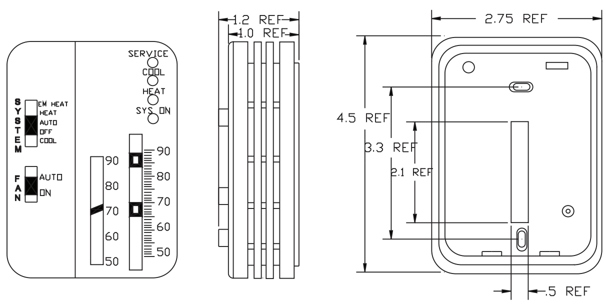
Accessory Heat / Cool Zone Sensor Module (ZSM), dual set point with LEDs, manual / auto change over. Ten conductors required. Manufactured by Sunne, introduced 12/93.



Component Description	Part Number
BAYSENS010B [Sunne part# 62823]	SEN-0413

BAYSENS011B

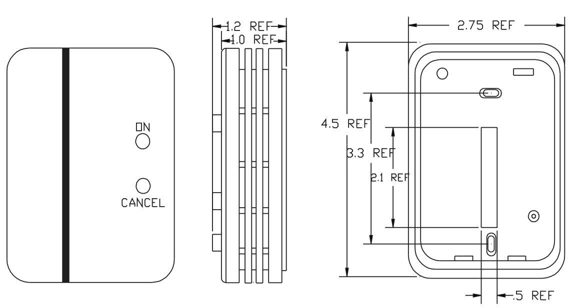
Accessory Heat Pump Zone Sensor Module (ZSM), dual set point with LEDs, manual / auto change over. Ten conductors required. Manufactured by Sunne, introduced 12/93.



Component Description	Part Number
BAYSENS011B [Sunne part# 62824]	SEN-0414

BAYSENS013C

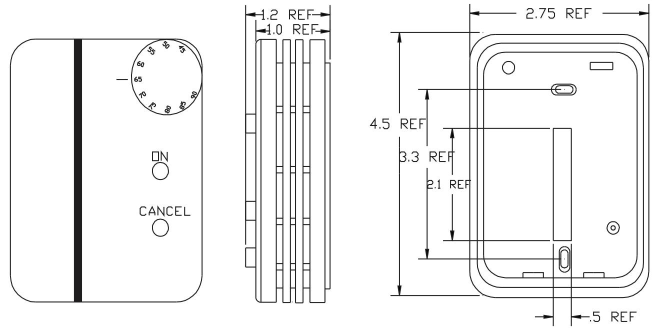
Accessory ICS (Tracer/Tracker/ComforTrac) Zone Sensor Module (ZSM), with override button, and override cancel button. Two conductors required. Manufactured by Sunne, introduced 08/95.



Component Description	Part Number
BAYSENS013C [Sunne part# 65464]	SEN-0495

BAYSENS014C

Accessory ICS (Tracer/Tracker/ComforTrac) Zone Sensor Module (ZSM), with override button, set point, and override cancel button. Three conductors required. Manufactured by Sunne, introduced 08/95.

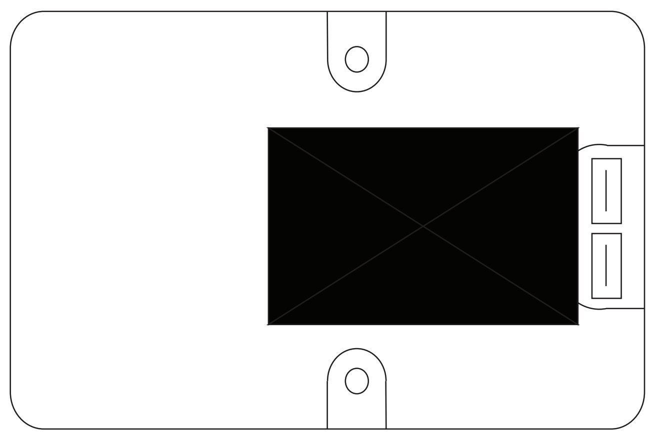


Component Description	Part Number
BAYSENS014C [Sunne part# 65465]	SEN-0496

BAYSENS015A Humidity Sensor (OHS, RHS)

Outdoor Humidity Sensor: Field installed accessory, located below and to the left of economizer actuator motor. Used in reference (BAYENTH003A) and comparative (BAYENTH004A) enthalpy control.

Return Humidity Sensor: Field installed accessory, located inside economizer barometric relief hood. Used in comparative (BAYENTH004A) enthalpy control only. (Honeywell #C7600A1028)



Component Description	Part Number
BAYSENS015A Humidity Sensor (OHS, RHS)	SEN-0277

BAYSENS016A Thermistor Sensor (OAS, SAS, RAS, CTS)

Outdoor Air Sensor: Located in corner post by unit control box on Voyager I and II units. Located in the economizer section on Voyager Commercial units. Comes standard on all microcontrol units.

Supply Air Sensor: Field installed in supply fan housing for Voyager I and II units. Factory installed in supply fan housing for Voyager III units. Comes standard with all microcontrol economizers, or BAYDIAG001A (Generic Input/Output Module) used to gain additional points on ICS jobs when economizers are not used.

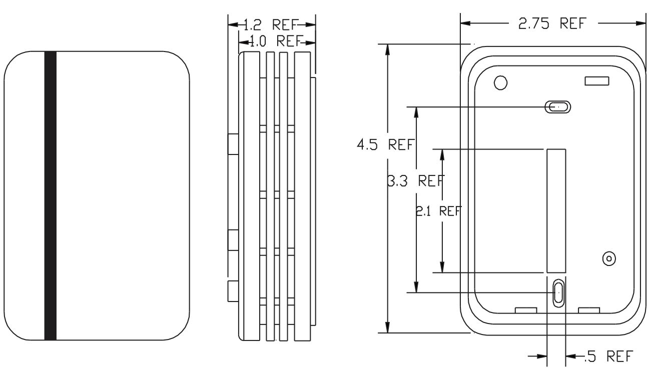
Return Air Sensor: Field installed accessory. Located in barometric relief hood of economizer accessory, used in comparative enthalpy control only (BAYENTH004A accessory).

Coil Temperature Sensor: Located in a 3/8" copper tube well, which is brazed to the lowest circuit entering the outdoor coil (3-7.5 ton heat pumps only).

Component Description	Part Number
Thermistor Sensor (OAS, SAS, RAS)	SEN-0339

BAYSENS017B / ASYSTAT669A

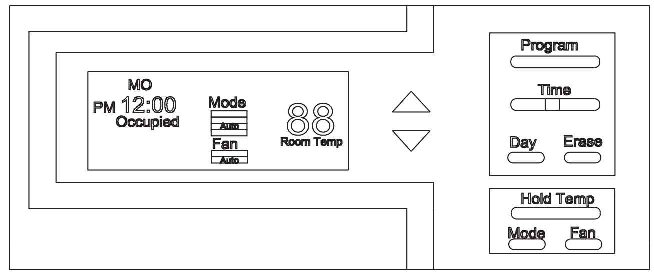
Accessory Zone Sensor Remote, used with all **current** zone sensors. Two conductors required. Manufactured by Sunne, introduced 12/93.



Component Description	Part Number
BAYSENS017B [Sunne part# 62828]	SEN-0435
ASYSTAT669A [Sunne part# 65541]	SEN-0493

BAYSENS019B / ASYSTAT666B (CV 3-50 Ton)

Accessory Heat/Cool, programmable night set back Zone Sensor Module (ZSM), with LCD status / diagnostic indicators. Seven conductors: terminals 11, 12 & 14 required, 7 through 10 optional. Manufactured by Caradon, introduced 06/98.



Component Description

BAYSENS019B [Caradon part# 91K91]

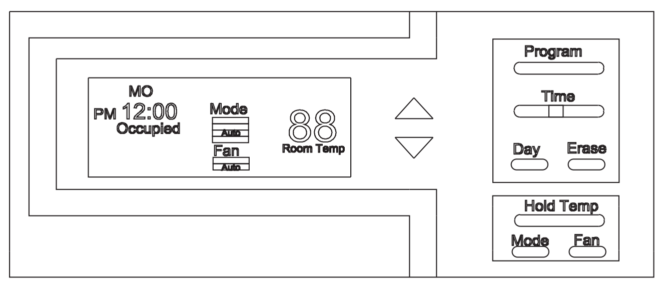
ASYSTAT666B [Caradon part# 91K91]

Part Number

SEN-0874

BAYSENS020B (Voyager III VAV only)

Accessory Heat/Cool, programmable night set back Zone Sensor Module (ZSM) for VAV applications, with LCD status / diagnostic indicators. Seven conductors: terminals 11, 12 & 14 required, 7 through 10 optional. Manufactured by Caradon, introduced 06/98.

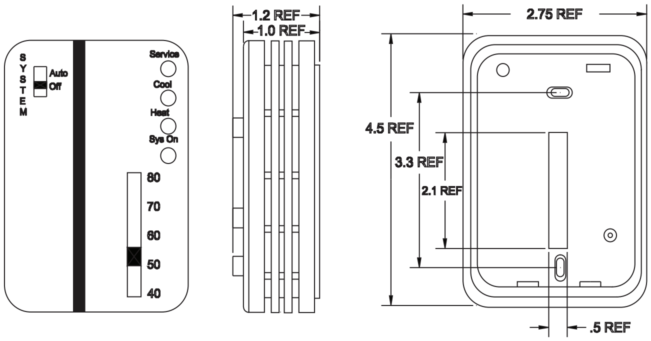


Component Description

BAYSENS020B [Caradon part# 91K93]

BAYSENS021B (Voyager III VAV only)

Accessory Zone Sensor Module (ZSM) for VAV applications, single set point with LEDs, system auto or off. Nine conductors, terminals 1, 2, 4, & 5 required, 6 through 10 optional.

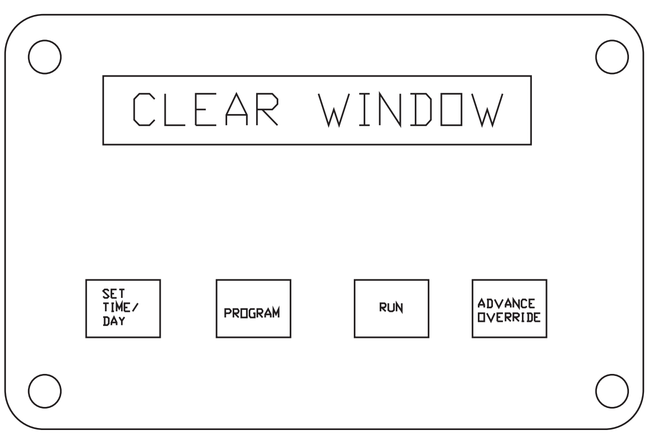


Component Description	Part Number
BAYSENS021A	SEN-0440

Electronic Time Clock

The BAYCLCK001A / ASYSTAT668A has a 16 digit LCD display and provides set up / set back for multiple units (up to four), when used in conjunction with a standard dual setpoint zone sensor module (see YC-EB-1 for sequence of operation details). The electronic time clock is a true 7 day programmable device which offers one occupied and one unoccupied mode per day, and a smart copy feature allows Monday's program to be copied to every other day (upon initial power up).

The time clock contains four separate relays with normally open contacts. Each set of contacts should be wired to terminals LTB-11 and LTB-12. The normally open contacts may be used to power an auxiliary relay and control any generic building device or load. The time clock requires 24 VAC, provided by unit terminals LTB-16 and LTB-20 (or LTB-15 and LTB-16 on equipment produced prior 07/93).



Component Description	Part Number
BAYCLCK001A	TWR-0115
ASYSTAT668A	TWR-0116

High Temperature Sensor

The high temperature sensor accessory (BAYFRST001A) provides high limit cutout with manual reset in ICS device Tracer / Tracker / ComforTrac / VariTrac systems. The sensors are wired to the TB-1 on the Trane Communications Interface (TCI).

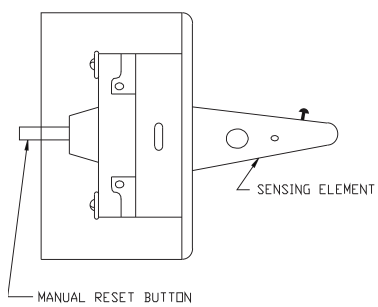
The sensors may be used to detect heat from a fire in air conditioning or ventilation ducts and provide system shut down to contain the fire. Approximately 30 seconds after sensor opens, the associated unit will completely shut down. The sensors come with case and cover, and mount directly to the ductwork. There are two sensors that are included in the accessory. Both sensors are factory set; one opens at 135° F. and should be installed in the return air duct, the other opens at 240° F. and should be installed in the supply duct.

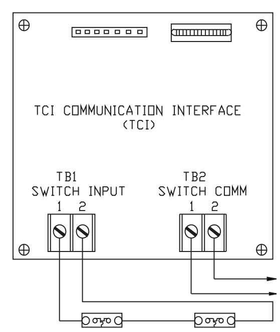
Note: *This accessory can also be applied in Non-ICS applications and wired between terminals LTB-16 and LTB-17 at the low voltage terminal strip. The unit will shut down immediately when the sensor opens.*

To reset a sensor which has opened, push and release the button protruding through the cover. See reset button. The sensor temperature must drop 25° F. below the cut out point before it will reset.

There are no field adjustments that can be made to the sensor; if a problem exists, the sensor must be replaced.

Part Number "CNT-0637" = 135° F. sensor. Part Number "CNT-0638" = 240° F. sensor.





Component Description	Part Number
BAYFRST001A	CNT-0637 & CNT - 0638

Start Up From the Unit “Test Mode Feature”

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.

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.

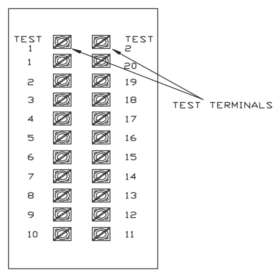
Resistance Test Mode

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.

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.

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.

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								

CV Test Mode Voyager 27.5-50

TEST STEP	MODE	FAN	ECON (Note 6)	COMP 1	COMP 2	HEAT 1	HEAT 2	OMHS
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 in 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.

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.

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.

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.

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

Providing Temporary (default) Heating and Cooling

Constant Volume Unites 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.*

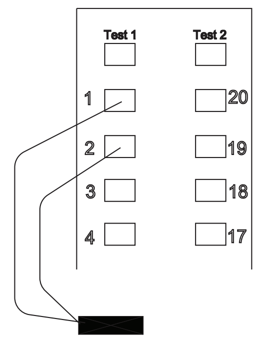
Variable Air Volume Units 27.5-50 Ton

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

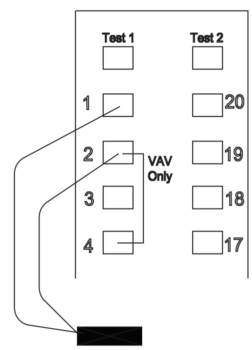
If unoccupied heating is also required, instead of using a jumper, install a 7.68K ohm thermistor between LTB1-2 and LTB1-4. See section 8.8.2.1 for a summary of modes with different inputs.

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



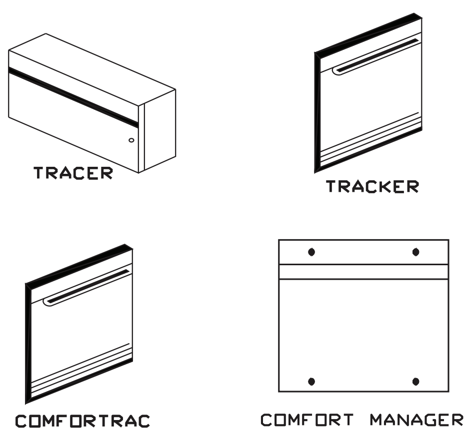
Tracer / Tracker / VariTrac

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

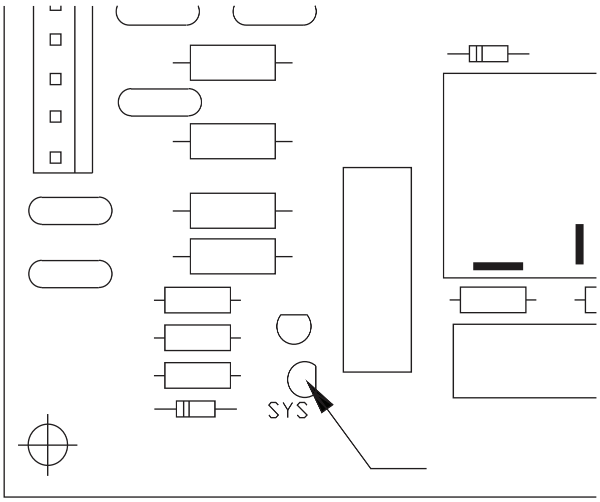


Voyager III note:

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

LED Locations and Status Information

Unitary Control Processor LED

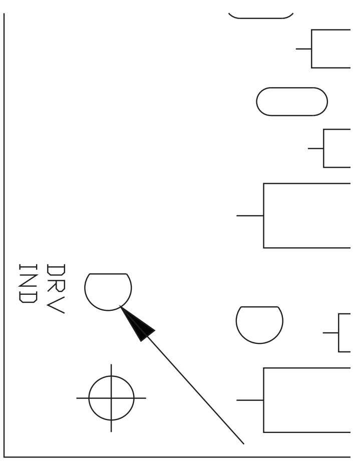


ON-Indicates that the UCP is powered up, also indicates that the software/computer program is intact and functional, and is lit continuously during normal operation.

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.

Unitary Economizer Module LED

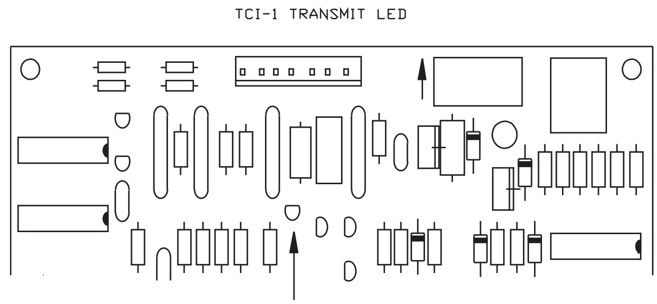


ON-Indicates that the UCP is sending a signal to drive the economizer actuator (ECA) motor open or closed. Lit only when the damper should be opening or closing.

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.

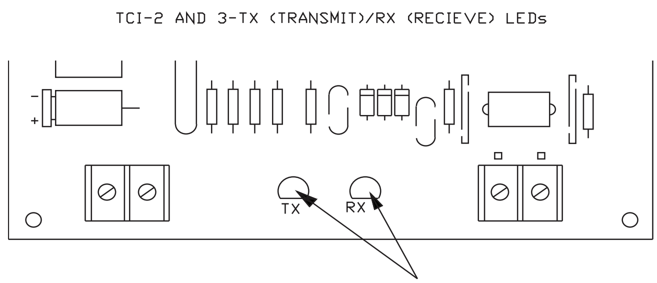
TCI-1 (Obsolete) - LED



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.

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



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.*

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

Cooling Mode

Cooling Staging 3-25 Tons

Stage 1	3 minutes OFF minimum	3 minutes ON minimum		OFF
Stage 2	3 minutes OFF minimum	3 min. delay between stages	3 minutes ON minimum	OFF
Indoor Fan	OFF	ON		OFF
Outdoor Fan 1	OFF	ON		OFF
Outdoor Fan 2	OFF	ON above 65° F.		OFF

0 1 2 3 4 5 6 7 8 9 10 11 12

Time Progress by Minutes

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	CPR1 **			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
			CPR1,2,3	Fan #2		-30
					Fan #3,4	-30

* Single circuit, dual manifold compressors
** First Stage, Number one refrigeration circuit, Stand alone compressor is “On”.
*** First Stage is “Off”, number two refrigeration circuit, manifold compressor pair operating simultaneously is “On”.

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

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 "Cooling Staging 27.5-50 Tons," p. 36
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.

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 "Cooling Staging 27.5-50 Tons," p. 36

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%.

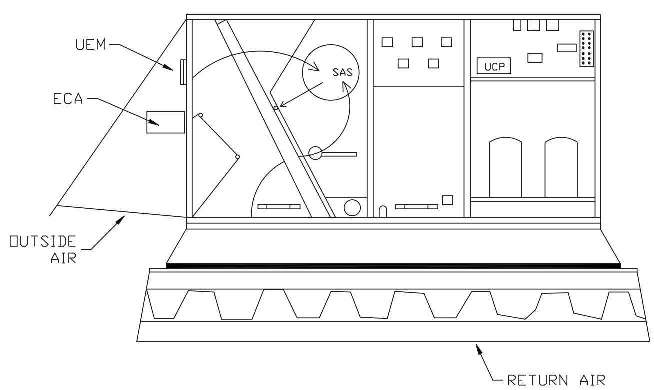
On a call for cooling, providing outdoor air conditions are suitable to economize, the Unitary Control Processor (UCP) will provide 2 functions.

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.

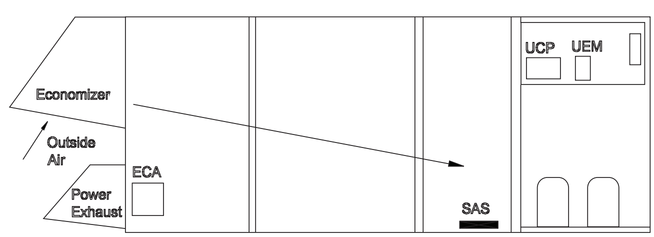
If the supply air temperature is above 55° F., the UCP will open the outside air damper to admit additional outdoor air until the temperature returns to the 50 to 55° F. range. If the supply air temperature is below 50° F, the UCP will close the outside air damper until the temperature returns to the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



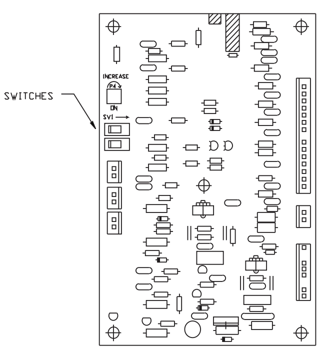
Economizer 27.5-50 tons



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

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.

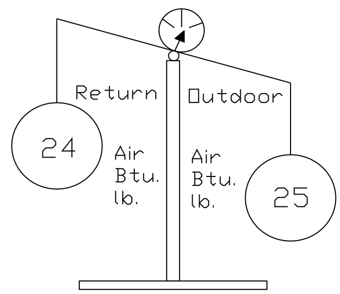
There are 4 field selectable reference enthalpy change over points. The two switches referenced are located on the UEM board, shown above. The switches are factory set at "D", this is the most comfortable, not the most economical setting. If a failure occurs in this switching circuit, the enthalpy change 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

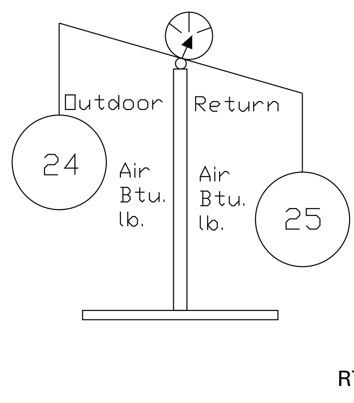
Switch 1	Switch 2	Selected Enthaply Change Over Point	Standard Setting
OFF	OFF	19 Btu/lb dry air D	Factory Default
OFF	ON	22 Btu/lb dry air C	
ON	OFF	25 Btu/lb dry air B	
ON	ON	28 Btu/lb dry air A	

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.

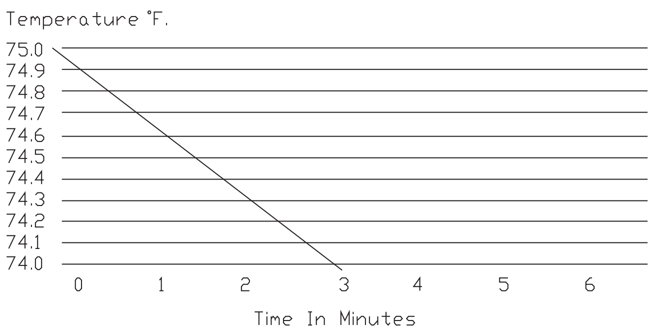


Economizer and Options 3-50 ton Constant Volume Units

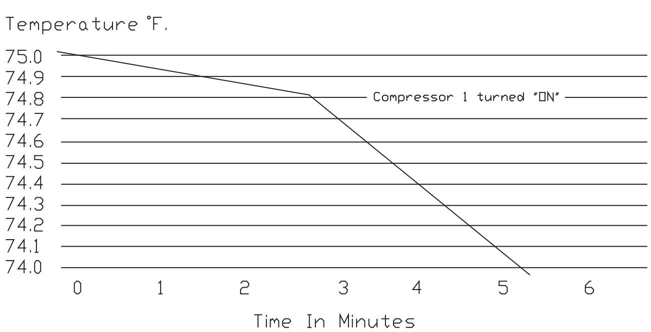
Addition of economizer preferred cooling logic on all equipment produced after 06/93, X13650473 (BRD-0931) UCP. This allows fully integrated economizer operation, where under extreme cooling requirement periods, the compressor(s) can operate in conjunction with the economizer if needed.

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



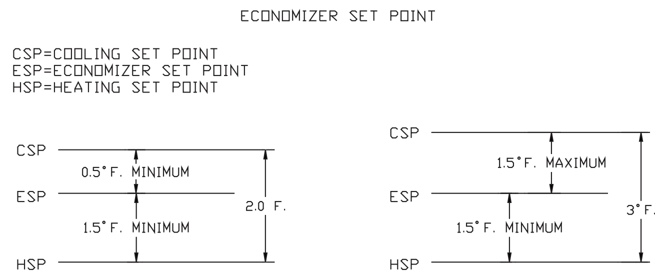
System Where Zone Temperature Recovery is Unsatisfactory



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.

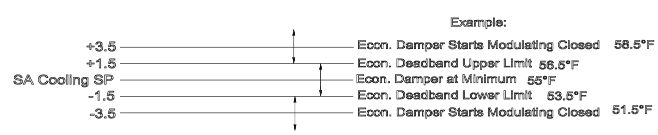
The economizer set point is a variable depending upon how close the heating and cooling set points are in relationship to one another. The economizer set point can be as close as 0.5 F. below the cooling set point, but no further than 1.5° F. below the cooling set point. When the heating and cooling 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.



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.

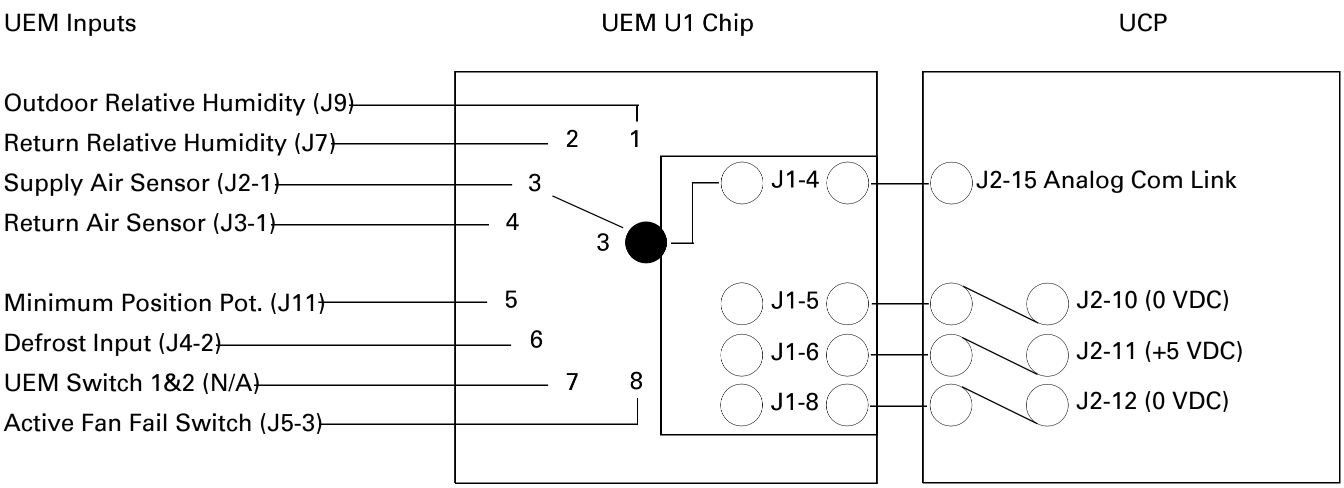


How the Economizer Functions Electrically

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.



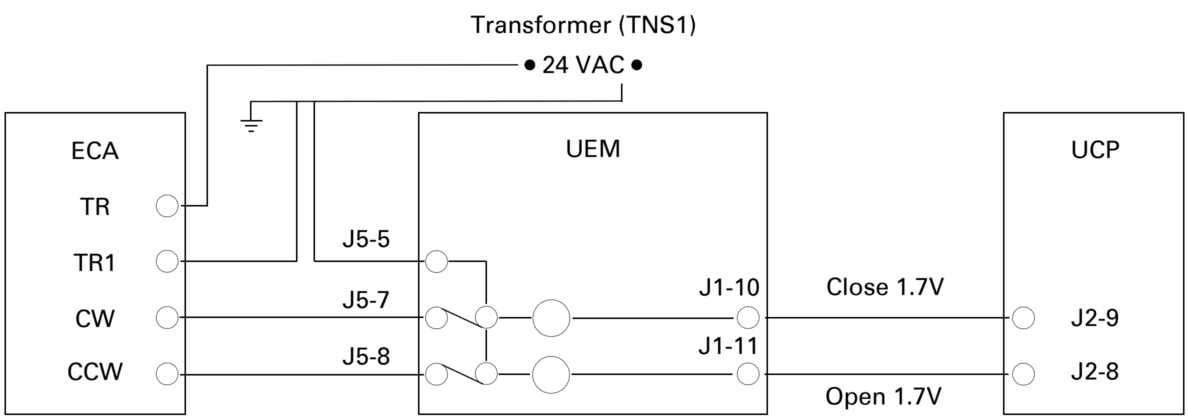
The UCP voltages listed above on J2-10, J2-11, and J2-12 are shown to illustrate how the circuit works. If troubleshooting this circuit, each pin connection measured to ground will have a distinctive pattern in the 0-5VDC range.

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

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.

Power Exhaust

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.*

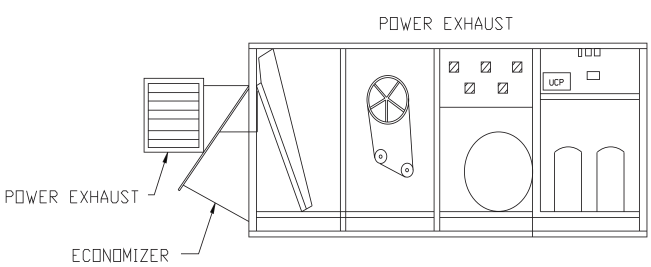
The power exhaust is typically used to help alleviate building pressurization. It should not be substituted for a separate exhaust system when one is needed or required. Pressurization problems will occur on extremely tight buildings with multiple rooftop units with economizers and power exhaust if a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

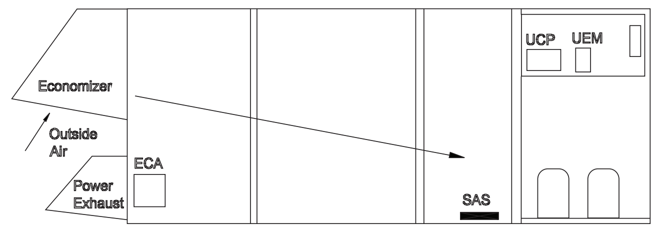
Note: *The Exhaust Fan Contactor (XFC) has a 30 VDC coil.*



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.

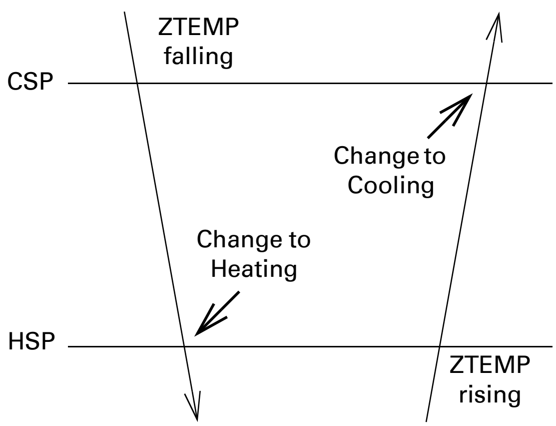
Under normal design conditions, +0.25" w.c. return building static, the power exhaust is capable of exhausting approximately 50% of nominal system airflow. See catalog for specific unit data. The power exhaust set point (outside air damper position at which the power exhaust comes on) can be set from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



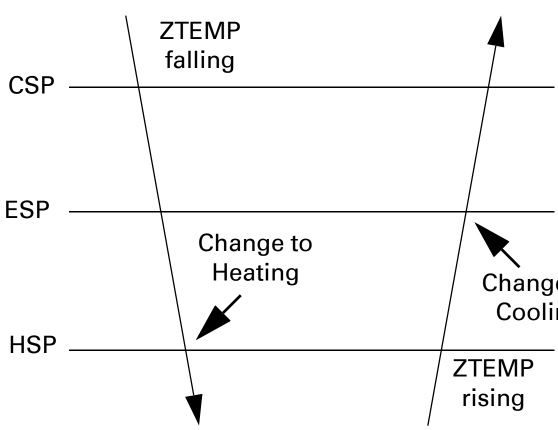
Heating / Cooling Change Over

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.

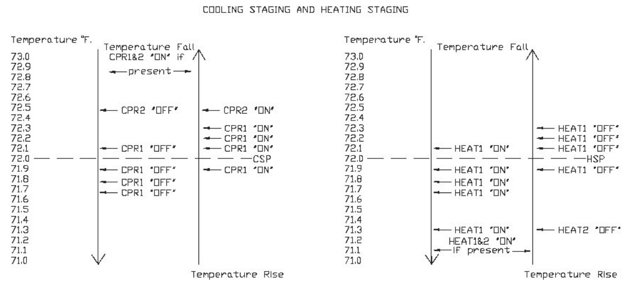


Without Economizer



With Economizer

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.

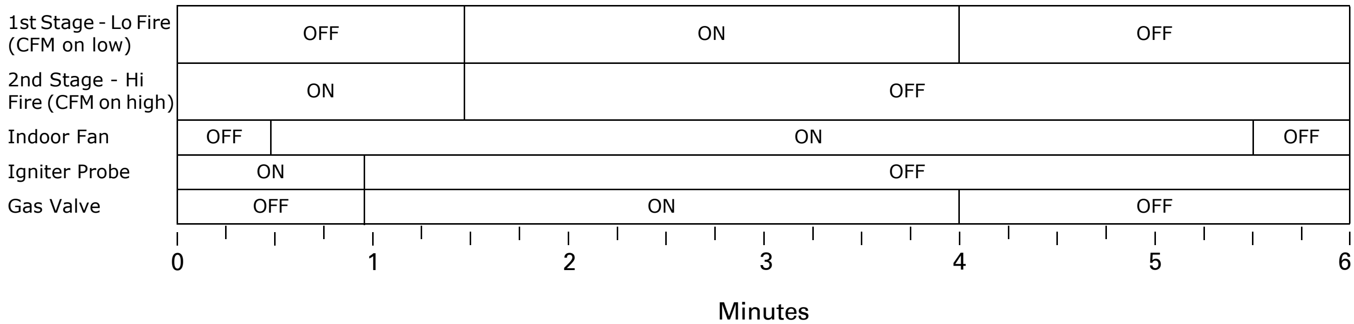
Heating Staging

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.

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

Gas Heat Mode (CV 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.

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).

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.*

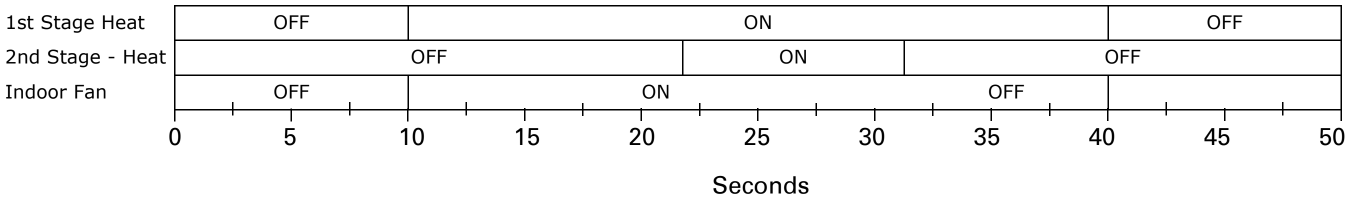
2. Daytime warm-up is activated when the unit is in the occupied mode and the zone temperature falls below the daytime warm-up initiate temperature or the unit is in occupied heat mode.

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).

Electric Heat Start Up From the ZSM or Thermostat

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.

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

5. 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.
6. 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.
7. 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.

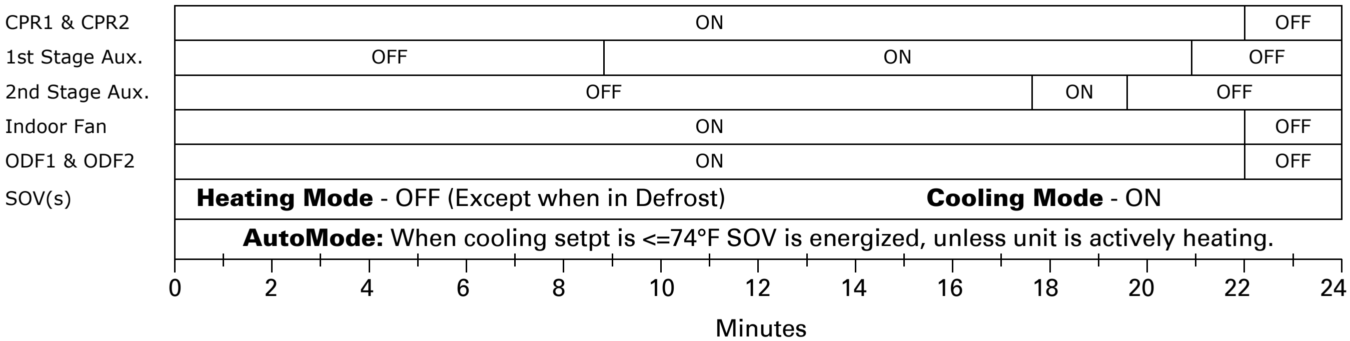
3. Emergency heat mode with heat pumps uses the same timing and logic as described above.

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.

Heat Pump Start Up From the ZSM or Thermostat

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.

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.

Low Ambient Mechanical Cooling Operation

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.*

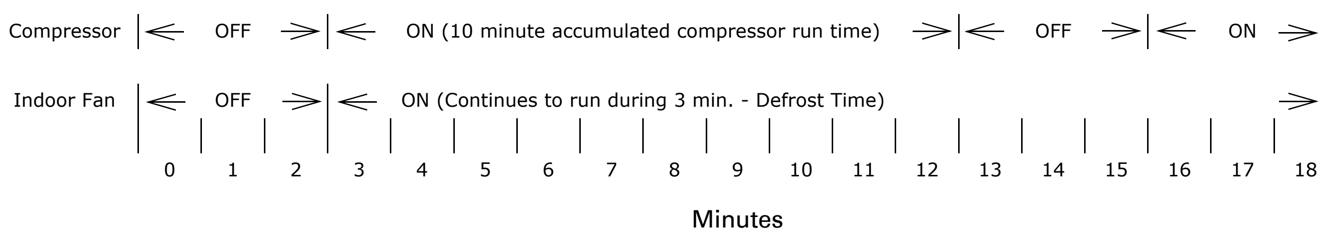
Evaporator Defrost Control Function / Frostat (27.5-50 Ton CV and VAV)

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.*



Heat Pump Defrost Operation

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

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

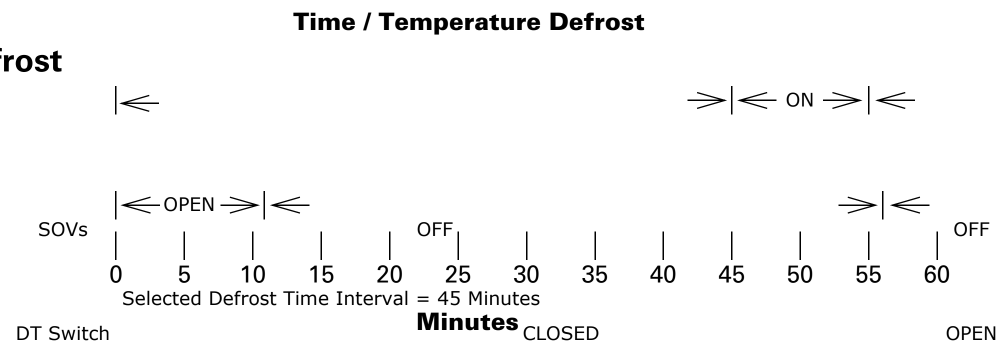
Problem = 16 Consecutive High Delta Ts After Defrost (Tyler Fault C)

Diagnostic = (Simultaneous Heat And Cool Fail At ZSM Or LTB)

Default = 10 Minute Defrost After Each 30 Minutes Of Accumulated Compressor Run Time

Time Temperature Defrost (10-20 ton only)

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



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.

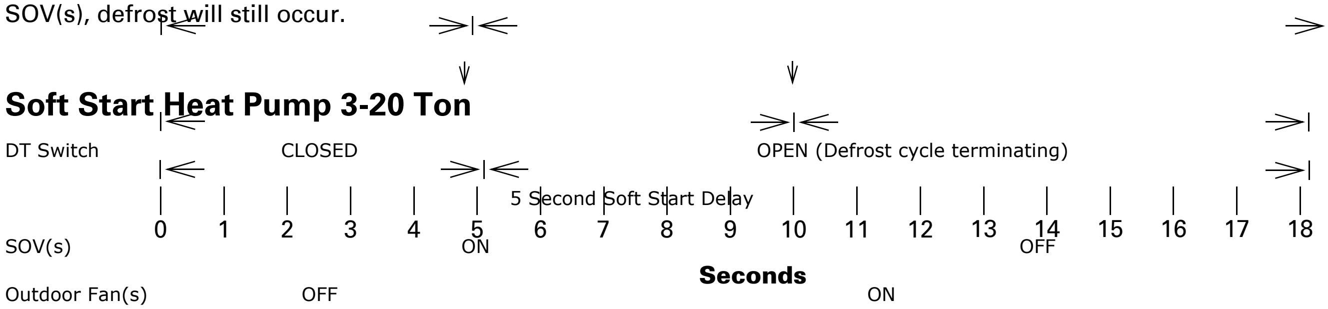
Time / Temperature Defrost Failures, Diagnostics, and Defaults

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.

Soft Start Heat Pump 3-20 Ton

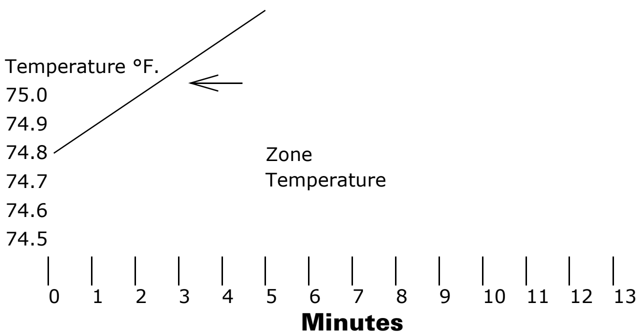


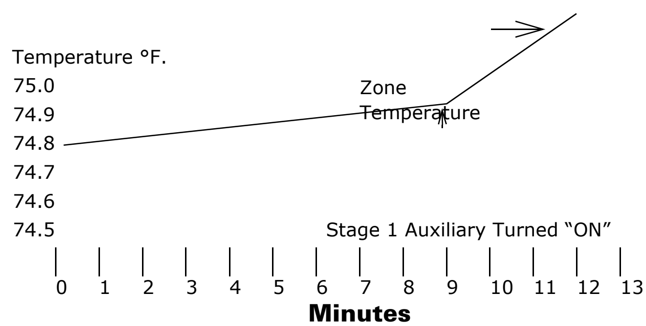
The UCP has a built in “Soft Start” feature which is utilized in heat pump operation only. When a Heat Pump defrost cycle is terminating, the outdoor fan(s) are turned on for 5 seconds before de-energizing the switch over valve(s). "Soft Start" provides a smooth transition back to mechanical heating 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.

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.





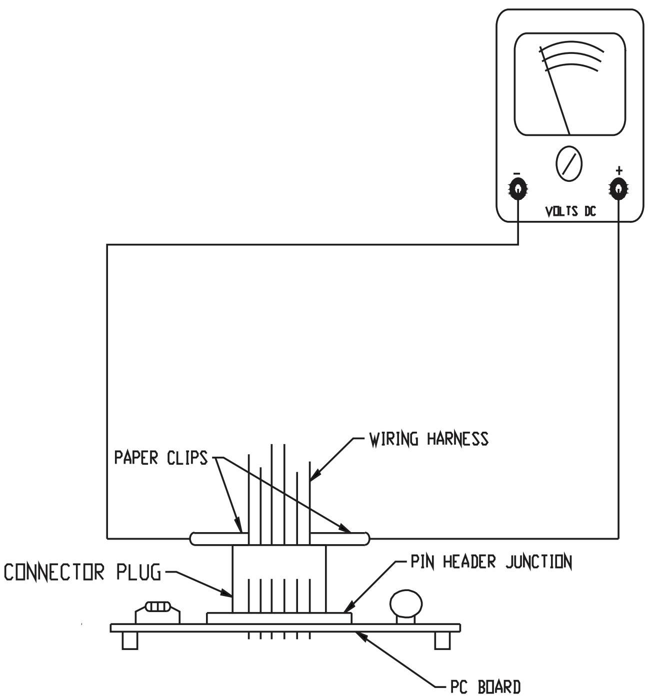
Electrical Measurements

With Plugs Connected

While trouble shooting the microcontrol units, there will be times when it is necessary to make electrical measurements with the system powered up and operating. There are several different methods of accomplishing. Electronic meter lead accessory kits are commercially available for this purpose, and make the servicer’s job easier.

An alternative to this is to utilize two small paper clips, with one end straightened. These are small enough to be slid into the connector along side the wire, and make contact with the internal terminal, without causing any damage. A multimeter can now be connected to the two paper clips, allowing the electrical measurements to be made.

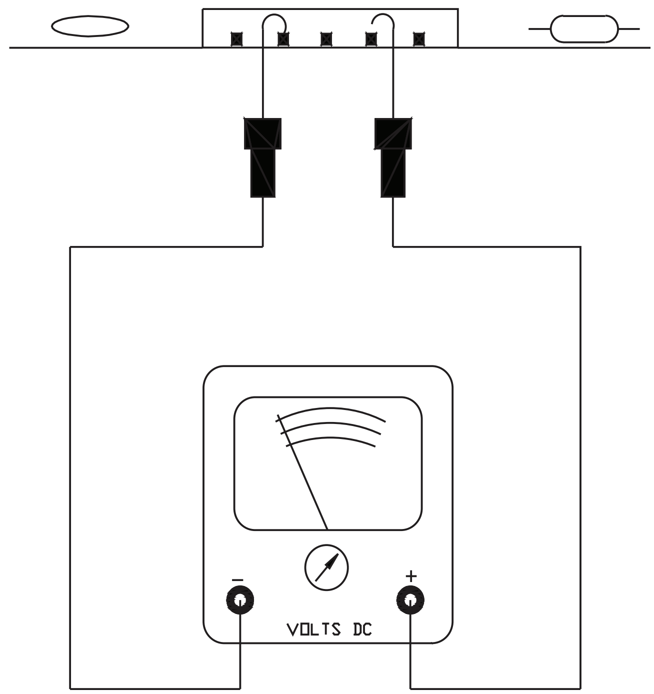
Note: *Do not puncture the wire insulation with meter leads to make electrical measurements.*



With Plugs Disconnected

While trouble shooting the microcontrol units, there will be times when it is necessary to make board level electrical measurements. The proper test clip leads are the "Mini Grabber / Plunger Type" test clips. These leads must be capable of grabbing a 0.045" square terminal, with a center to center terminal distance of 0.156".

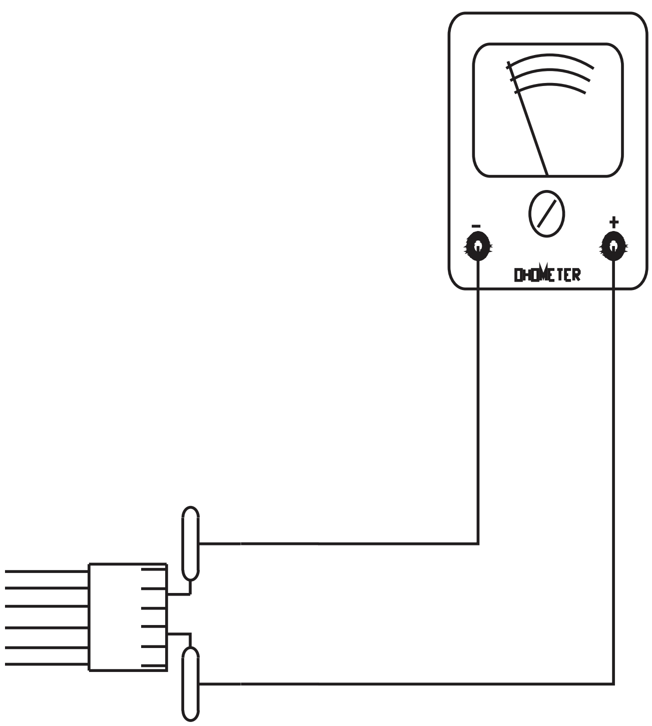
The Mini Grabber/Plunger Type test clips can effectively be clipped to the UCP board terminals. Do not attempt to utilize alligator test clips, or any general purpose test clips to accomplish this type of measurement. Test clips other than Mini Grabbers do not have the proper clearance capabilities, and short circuits will occur, resulting in P.C. board failures.



At Disconnected Plug Ends

While trouble shooting the microcontrol units, there will be times when it is necessary to make electrical measurements, and test the terminal integrity at the disconnected plug ends. Electronic meter lead accessory kits are available for this purpose.

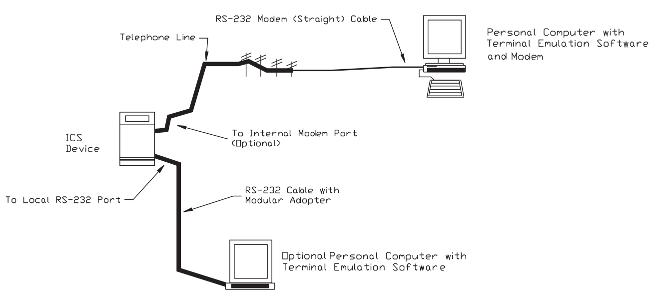
An alternative to these kits is to utilize two small paper clips, with one end straightened. Paper clips are small enough that they can be slid into the plug end of the connector, and make contact with the internal terminal, without causing any damage. If the internal terminal grips the paper clip, without the clip falling out, the terminal is usually okay. A multimeter can now be connected to the two paper clips, allowing the electrical measurements to be made. Do not force the probe end of a standard meter lead into the plug end of the connector to make electrical measurements. This will damage the terminals, causing loss of contact, and leave you with more problems than you had originally.



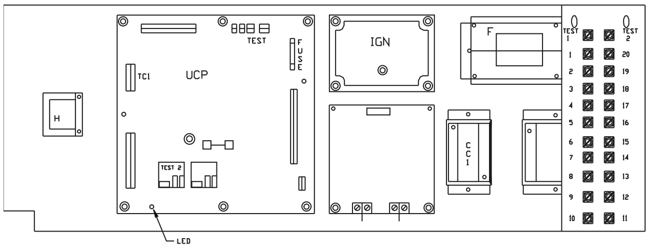
Trouble Shooting from an Integrated Comfort System (ICS) Device

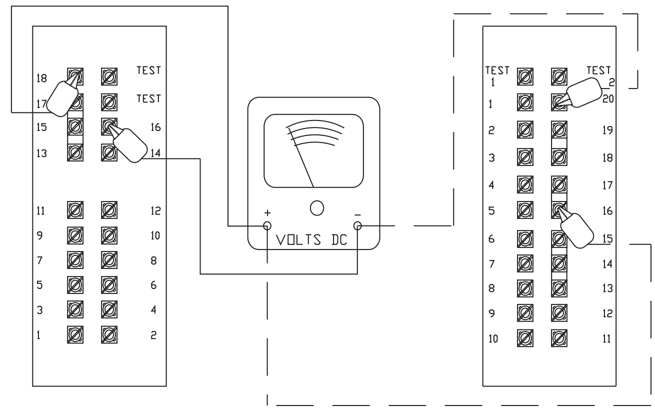
An ICS device like: Tracer, Tracker and VariTrac CCP (CV only), are effective tools of locating the source of a problem. There are 46 or more Binary and Analog values, some standard and some accessory achieved, on a microcontrol unit that can be accessed on site or remotely. This allows diversity in being able to diagnose and trouble shoot, or checking system status on several pieces of equipment from just one location.

Several of the values will alarm the ICS device in the event of a failure, and through custom alarming, those that do not may be enabled to do so. Trend logs can be set up to monitor most of these points at regular intervals, so that suspect problem occurrences can be captured and viewed, without having to continuously monitor system status. If a modem is installed in the ICS device, countless hours of manpower can be saved in travel, trouble shooting can begin immediately after an alarm or telephone call is received. Consult the respective ICS device Installation / Operation / Programming (IOP) manual for information on programming and set up.



Recommended Steps for Trouble Shooting





Prior to 6/93 Since 6/93

1. Do Not kill unit power with disconnect switch, or diagnostic & failure status information will be lost.
2. Utilizing the hole in the lower left hand corner of the control box dead front panel, verify that the LED on the UCP is burning continuously. If LED is lit, go to Step 4.
3. If LED is not lit, verify presence of 24 VAC between LTB-16 and LTB-20 (Note: LTB-16 and LTB-18 before 06/93). If 24 VAC is present, proceed to Step 4. If 24 VAC is not present, test unit primary voltage, test transformer (TNS1) and fuse or internal circuit breaker, test fuse (F1) in upper right hand corner of UCP. Proceed to Step 4 if necessary.
4. Utilizing the Failure Status Diagnostics at the end of this section, test the following: System status, Heating status, and Cooling status. If a Heating failure, a Cooling failure, or both are indicated, follow instructions in Failure Status Diagnostics section. If a System failure is indicated, proceed to Step 5. If no failures are indicated, proceed to Step 6.
5. If a System failure is indicated, re-check Steps 2 and 3. If the LED is not lit in Step 2, and 24 VAC is present in Step 3, the UCP has failed. Replace UCP.
6. If no failures are indicated, place the system in the test mode, utilizing the Test Mode Feature in Section 2. This procedure will allow you to test all of the UCPs on board outputs, and all of the off board controls (relays, contactors, etc.) that the UCP outputs energize, for each respective mode. Proceed to Step 7.
7. Step the system through all of the available modes, and verify operation of all outputs, controls, and modes. If a problem in operation is noted in any mode, you may leave the system in that mode for up to one hour while troubleshooting. refer to sequence of operations for each mode, to assist in verifying proper operation. Make repairs if necessary, and proceed to Steps 8, and 9.
8. If no abnormal operating conditions appear in the test mode, exit by cycling unit power at the service disconnect. This verifies that all of the UCPs on board outputs, and all of the controls the UCPs outputs energize are operational.
9. Refer to Individual Component Test Procedures in Section 4, if other microelectronic components are suspect.

Trouble Shooting Chart "Problem Descriptions and Causes"

Always verify the unit is operating in the proper "MODE" when troubleshooting.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
A. 3-25 Ton - Unit will not operate in the TEST MODE - no fan, cool or heat.	1. No power to the Unit. 2. No power to the UCP. 3. UCP fuse (F1) is defective.	1. Check line voltage to the unit. 2. Check for 24 VAC from bottom of F1 fuse to system. 3. Check for 24 VAC from top of F1 fuse to system ground. If 24 VAC is not present, fuse is bad.
B. Goes into TEST MODE, runs for 15-40 seconds, then stops:	1. Unit has entered AFF mode 2. A TCI is installed and its High-Temp input is open w/DIP sw.#1 ON. 3. Heat pump only - fan runs 15 sec & stops 4. Goes into TEST MODE (UCP's LED blinks) but still won't run.	1. See "System Failure Status Diagnostics with LED Indicators," p. 62 Check IDM, belt. (Nothing runs) 2. Close input or turn switch to OFF if not used. (Nothing runs) 3. Polarized plugs not configured correctly - see "The polarized plugs are not configured properly on Heat Pump (3-20 ton):," p. 96 (Nothing runs) 4. Each output - cool 1 & 2, heat - is locked out. Troubleshoot each circuit individually. (Only fan runs)
C. 27.5 - 50 Ton - Unit will not operate in the TEST MODE No fan, cool or heat	1. See test 1-3 in "A" above 2. Auto Stop input is open	1. See above 2. Close Auto Stop input; after 5 seconds system will run
D. Goes into TEST MODE, runs for 40 seconds, then stops.	1. FFS failed to close after 40 seconds. 2. A TCI is installed and its High Temp input is open w/DIP sw.#1 ON.	1. See "System Failure Status Diagnostics with LED Indicators," p. 62 Check belt, IDM 2. Close input or turn switch to OFF if not used. For additional troubleshooting information on V3 see IOM.
E. Unit will not heat or cool but the fan switch operates.	1. ZSM is defective. 2. Problem in ZSM wiring.	1. Refer to Zone Sensor Module troubleshooting, "Testing Programmable Zone Sensor Module (ZSMs)," p. 70, "Testing Unitary Economizer Module (UEM)," p. 76 2. Verify wiring connections between LTB and ZSM.
F. Unit heats and cools, but will not control to setpoint.	1. ZSM is defective. 2. Unit is over/undersized. 3. ZSM location poor.	1. Refer to Zone Sensor Module Troubleshooting, "Testing Programmable Zone Sensor Module (ZSMs)," p. 70, "Testing Unitary Economizer Module (UEM)," p. 76 2. Look at p. 104 for more information. 3. Look at p. 104 for more information.
G. CPR1 will not operate, ODM runs.	1. Compressor failure. 2. CC1 contator or wiring failure.	1. Test compressor - replace if necessary. 2. Check wires, terminals and CC1. Replace if necessary.
H. CPR1 operates, ODM1 will not operate.	1. ODM has failed. 2. ODM capacitor(s) has failed.	1. Check wires, terminals and CC1. Repair / replace if necessary. 2. Repair connection / replace as needed.
I. CPR1 & ODM1 operates, but ODM2 will not.	1. OAS is out of range. 2. ODM / capacitor has failed.	1. Test Outdoor Air Sensor - see p. 79 2. Repair / replace as needed.
J. CPR1 and ODM1 will not operate, even in the TEST MODE, but fan runs OK.	1. CC1 Circuit open. 2. LPC1 circuit open. 3. UCP is defective	1. Check wiring, terminals and applicable controls (CCB1, HPC1, & WTL1) see "UCP "Snubber Circuits"," p. 122 2. Verify 24 VAC input at J2-2 - voltage should always be present. 3. Cycle power off, then on, & try TEST MODE again. If compressor runs, it was in a Cool Fail mode. See "Heat Failure Status Diagnostics with LED Indicators," p. 62 If compressor still will not run, UCP must be replaced.
K. ODM 3 and/or 4 will not cycle.	1. OAS 2. ODM3 and/or 4 capacitor has failed. 3. Wiring, terminal, or CC2 contactor failure. 4. ODM3 and/or 4 has failed.	1. Perform OAS Resistance/Temperature check. Replace if necessary. 2. Check ODM capacitor, replace if necessary. 3. Check wires, terminals, and CC2. Repair or replace if necessary. 4. Check ODM, replace if necessary.

	5. UCP is defective. 6. ODF2 has failed.	5. Replace UCP module 6. Check for proper voltage and contact closure. ODF2 relay has a 24 VDC holding coil. If voltage is present, replace relay.
L. CPR2 and 3 (if applicable) will not operate.	1. No power to CC2 and/or 3 coil. Cool Failure Possible. 2. CC2 and/or 3 coil defective. Cool Failure Indicated. 3. CC2 and/or 3 contacts defective. 4. UCP is defective.	1. Check wiring, terminals and applicable controls (CCB2, CCB3, HPC2, LPC2, WTL2, WTL3) 2. Verify integrity of CC2 and/or 3 coil windings. If open or shorted replace CC2 and/or CC3. 3. If 24 VAC is present at CC2 and/or 3 coil, replace relay. 4. 24 VAC is not present at CC2 and/or 3 coil. Reset the Cool Failure by cycling the service disconnect. Place the unit into Cool Stage 2 Mode, step 4 for constant Volume or step 6 for variable air volume, to ensure CPR2 and 3 Compressor operation. Check input devices in #1 & #2 above, if no controls have opened, and CC2 and/or 3 will not close, replace UCP.
M. Indoor motor (IDM) will not operate.	1. IDM has failed. 2. Wiring, terminal, or contactor failure. 3. ZSM is defective. 4. UCP is defective. 5. Supply Fan Proving (SFP) switch has opened.	1. Check IDM, replace if necessary. 2. Check wiring, terminals and F contactor. Repair or replace terminals, or fan contactor F. 3. Place unit in test mode. If the fan operates in the test mode, test ZSM using the appropriate test. 4. Check the UCP fan output. Locate P2 connector, which is connected to J2 on the UCP. Find wire 64A (Black) and measure voltage to ground. If 24 VAC is not present on a call for fan, replace the UCP. 5. Check SFP and belts, repair or replace if necessary.
N. No Heat (YC's CFM will not run, IP warms up, GV is energized,	1. CFM has failed. 2. CFM capacitor has failed. 3. Wiring, or terminal failure. 4. Heat relay H has failed. 5. TNS2 and/or 3 has failed. (460/575 V units only)	1. Check CFM, replace if necessary. 2. Disconnect BROWN wires from capacitor, test, and replace if necessary. 3. Check wiring, and terminals. Repair, or replace if necessary. 4. Check for line voltage between terminals 1 & 3 on heat relay. If voltage is present, contacts are open. Check for 24 VAC at H coil, replace H if 24 VAC is present. 5. Check for 230 VAC at TNS2 and/or 3 secondary, between Y1 and Y2. If 230 VAC is not present, replace TNS2 and/or 3.
O. No Heat (YC's only) CFM runs, GV energizes, IP does not warm up.	1. TNS2 and/or 3 has failed. 2. Wiring or terminal failure. 3. IGN has failed. 4. IP has failed.	1. Check for 115 VAC at TNS2 and/or 3 secondary, between X1 and X2. If 115 VAC is not present, replace TNS2 an/or 3. 2. Check wiring, and terminals. Repair, or replace if necessary. 3. Verify presence of 115 VAC at IGN L1 and L2. Check for 115 VAC between terminals PPM4-1 and PPM4-2, and PPM5-1 and PPM5-2 (if applicable) in the gas section. If 115 VAC is present for IP warm up, IGN is OK. If 115 VAC is not present, replace IGN. 4. With 115 VAC applied to IP, warm up should take place. Cold resistance of IP should be a minimum of 50 Ohms. Nominal current should be 2.5 to 3.0 Amps.
P. No Heat (YC's only) GV does not energize, CFM runs, IP warms up	1. Wiring or terminal failure. 2. IGN has failed 3. GV has failed.	1. Verify presence of 24 VAC between IGN PWR terminal to ground, if not present, check wiring and terminals. Repair or replace if necessary. 2. Verify presence of 24 VAC between IGN VALVE terminal to ground, if not present replace IGN. 3. Measure voltage between TH and TR on the gas valve (GV). If 24 VAC is present and the GV will not open, replace the GV.
Q. Low Heat Capacity Intermittant Heat. (YC's only) CFM runs in LO or HI speed only, or may not operate at all in one speed or the other.	1. CFM has failed. 2. UCP is defective.	1. Check CFM, test LO and HI speed windings. 2. Check UCP K5 relay. Check for K5 coil voltage at solder joints CR16 above K5 on the UCP. Nominal voltage at the coil is 28 VDC. If 28 VDC is present, COM. & N.O. contacts should be closed, energizing CFM HI speed windings. If 28

		VDC is not present, LO speed should be energized through K5 COM. & N.C. contacts. If voltage contradicts operation, UCP has failed.
R. No Heat (YC's only) "Fan" selection switch on the ZSM is in the "AUTO" position and the fan runs continuously.	1. TCO2 has opened. Heat Failure Indicated.	1. System Status Failure Diagnostic Place the unit in the Heating Test Mode, steps 6 & 7 for constant volume or step 8 & 9 for variable air volume and check the complete heating system for failure. Make necessary repairs or adjustments to the unit.
S. No Heat (TE's only) Electric heat will not operate.	1. Heater contactor(s) have failed.	1. Check for 24 VAC at AH, BH,CH, and DH contactor coils. If 24 VAC is present on a call for heat, and the contacts do not close, the contactor has failed.
	2. Heater element temperature limit(s) is open.	2. Check line voltage between the element temperature limit terminals located in heat section. If line voltage is present, the limit is open. Repair heating unit, or replace limit(s) as needed.
	3. Wiring or terminal failure.	3. Check for wiring, or terminal failure in control and power circuit. Repair or replace if necessary.
	4. Heater Element(s) has failed.	4. Check element and circuit integrity. Repair or replace as necessary. Replace open elements.
	5. UCP is defective.	5. Check UCP heat outputs. "First stage", locate P1 connector, connected to J1 on the UCP. Locate wire 65E at terminal P1-22, measure between 65E and ground. If 24 VAC is present, repeat #3 above. If 24 VAC is not present, the UCP has failed. "Second stage", Check UCP K5 relay. Measure from the common terminal on the relay to ground, 24 VAC should be present, if not repeat #3 above. If present, measure from the N.O. terminal on the relay to ground. If 24 VAC is not present, the UCP has failed.
T. Evaporator coil freezes up during low ambient operation.	1. System low on refrigerant charge.	1. Leak check, repair, evacuate, and recharge system as necessary.
	2. System low on air flow.	2. Check return air for obstruction or dirty filters. Check fan wheels, motors, and belts.
	3. Outdoor Air Sensor (OAS) has Failed.	3. Check OAS at connector P1 by disconnecting P1 from J1 on the UCP. Check resistance between P1-15 and P1-16, refer to the Resistance versus Temperature chart. Replace sensor if necessary.
	4. Frostat has Failed	4. Check Frostat Switch

Component Failure and Response Chart

COMPONENT	FAILURE RESPONSE	NORMAL RANGE	DIAGNOSTIC
(OAS) Outdoor Air Sensor	1. Economizer in minimum position. Will not modulate.	^-55 to 175 F ^680K to 1.2K	*NONE* Check at UCP connector P1, between P1-15 & P1-16.
	2. ODM3 will not cycle off (runs continuously)	^-55 to 175 F 680K to 1.2K	*NONE* Check at UCP connector for CV or check at UVM for VAV
(RAS) Return Air Sensor	1. Economizer operates using Reference Enthalpy	0 to 209 F 90K to 7.1K	*NONE* Check at UEM connector P13, between P13-1 & P13-2.
(SAS) Supply Air Sensor	1. Economizer in minimum position, will not modulate.	0 to 209 F 90K to 7.1K	CV *NONE* VAV Cool Fail
(OHS) Outdoor Humidity Sensor	1. Uses Dry Bulb operation and economizes if below 60 F DB.	4 to 20 mA 90 to 10% RH Honeywell C7600A.	*NONE* Check at UEM J9(-) and J10(+) by measuring current draw.
(RHS) Return Humidity Sensor	1. Economizer operates using Referance Enthalpy.	4 to 20 mA 90 to 10% RH Honeywell C7600A.	*NONE* Check at UEM J7(-) and J8(+) by measuring current draw.
Minimum position Potentiometer	1. Economizer modulates but minimum posiotion stays at zero.	UEM onboard potentiometer range 50 to 200 Ohms.	*NONE* Check resistance at UEM J11 and J12 50 to 200 Ohms.
Cooling Setpoint (CSP) for CV ZSM slide potentiometer	1. Uses HSP and CSP CSP= HSP + 4 F or use UCP Default Mode.	100 to 900 Ohms Use ZSM Test Procedures.	*NONE* Check at terminals 2 and 3 on ZSM
Heating Setpoint (HSP) for CV ZSM slide potentiometer	1. Uses CSP and HSP HSP= CSP - 4 F.	100 to 900 Ohms Use ZSM Test Procedures.	*NONE* Check at terminals 2 and 5 on ZSM.
HSP and CSP for CV are both lost.	1. Cannot control at ZSM, unit using UCP Default Mode	100 to 900 Ohms approx. Use ZSM Test Procedures.	Cool Failure Output at LTB1-8 to LTB1-6 "COOL" LED Blinks at ZSM

NONE = No LED indication

COMPONENT	FAILURE RESPONSE	NORMAL RANGE	DIAGNOSTIC
(ZTEMP) Zone Temperature Sensor CV or VAV during Unoccupied mode.	1. No Heating or Cooling ZTS "Fan" selection switch operates IDM during Unoccupied Mode	-40 TO 150 F 346K to 2.1K	CV Cool Failure Output at LTB1-8 to LTB1-6 "COOL" LED Blinks at ZSM
(TCO1 or TC03) High Limit Cutout	Heat goes off	Normally Closed Temperature varies by unit.	*NONE*
(TCO2) Fan Failure Limit	Heat goes off, IDM runs continuously.	Normally Closed Open 135 F Reset 105 F.	Heat Failure Output at LTB1-7 to LTB1-6 "HEAT" LED Blinks at ZSM.
(LPC1) Low Pressure Control	Compressor CPR1 will not operate.	Open 7 PSIG Close 22 PSIG.	Possible Cool Failure at J2-2 to Ground, 0 VAC. "COOL" LED Blinks at ZSM.
(LPC2) Low Pressure Control Dual Circuits Only	Compressor CPR2 will not operate.	Open 7 PSIG Close 22 PSIG.	Possible Cool Failure at J2-3 to Ground, 0 VAC. "COOL" LED blinks at ZSM.
(CCB1)	Compressor CPR1 will not operate.	Normally Closed range varies by unit.	Cool Failure Output at LTB1-8 to LTB1-6 "COOL" LED blinks at ZSM.
(CCB2 or CCB3) Compressor Overload	Compressor CPR2 or CPR3 will not operate.	Normally Closed range varies by unit	Cool Failure Output at LTB1-8 to LTB1-6 "COOL" LED blinks at ZSM.
(HPC1) High Pressure Control	Compressor CPR1 will not operate.	Open 425 psig Close 325 psig	Cool Failure Output at LTB1-8 to LTB1-6 "COOL" LED blinks at ZSM.
(HPC2) High Pressure Control	Compressor CPR2 or CPR3 will not operate.	Open 425 psig Close 325 psig	Cool Failure Output at LTB1-8 to LTB1-6 "COOL" LED blinks at ZSM.
(WTL1) Winding Temperature Limit	Compressor CPR1 will not operate.	Normally Closed	Cool Failure Output at LTB1-8 to LTB1-6 "COOL" LED blinks at ZSM.
(WTL2 or WTL3) Winding Temperature Limit	Compressor CPR2 or CPR3 will not operate.	Normally Closed	Cool Failure Output at LTB1-8 to LTB1-6 "COOL" LED blinks at ZSM.
(CC1) Compressor Contactor 24 VAC coil	Compressor CPR1 will not operate.	Varies by unit	Cool Failure Output at LTB1-8 to LTB1-6 "COOL" LED blinks at ZSM.
(CC2 or CC3) Compressor Contactor 24 VAC coil	Compressor CPR2 or CPR3 will not operate.	Varies by unit	Cool Failure Output at LTB1-8 to LTB1-6 "COOL" LED blinks at ZSM.

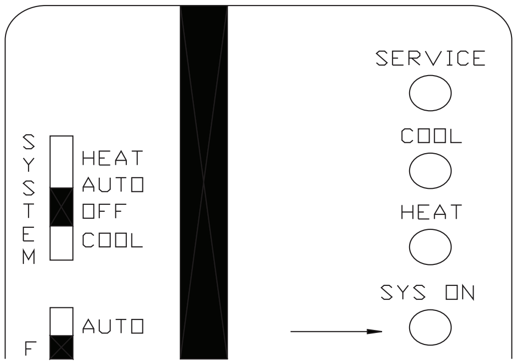
NONE = No LED indication

COMPONENT	FAILURE RESPONSE	NORMAL RANGE	DIAGNOSTIC
(CFS) Clogged Filter Switch (Any Generic Normally Open Switch)	This input is for "indication only and does not effect the normal operation of the unit.	"Normal operation = 0 VAC measured between terminals J5-1 and Ground.	SERVICE LED comes on, 24 VAC measured between UCP J5-1 and Ground
Supply Fan Proving Switch	Unit will not operate in any mode.	0.05" W.G. Normally Closed	Service Failure Output at LTB-6 to LTB-10 "SERVICE" LED blinks at ZSM
Static Pressure Transducer VAV	IGV will not open	0.25 - 4 VDC between J8 and J9 on VAV	Heat and Cool Failure Output at LTB-7 to LTB-6 & LTB-8 to LTB-6 "HEAT" and "COOL" LED's blink at ZSM
MWU (VAV)	Cannot control from unit Disable MWU & DWU	0 - 1000 ohms Approx.	*NONE*
Reset Setpoint (VAV)	Cannot control from unit Disable Reset	0 - 1000 ohms Approx.	*NONE*
Reset Amount (VAV)	Cannot control from unit Disable Reset	50 - 750 ohms Approx.	*NONE*
SA Press Setpoint (VAV	Cannot control from unit Uses Default	80 - 780 ohms Approx	*NONE*
SA Press Deband (VAV)	Cannot control from unit Uses Default	0 - 1000 ohms Approx.	*NONE*
XFSP	Cannot control from unit Uses Default of 25%	100 - 900 ohms Approx.	*NONE*

NONE = No LED indication

Failure Status Diagnostics

System Failure Status Diagnostics with LED Indicators



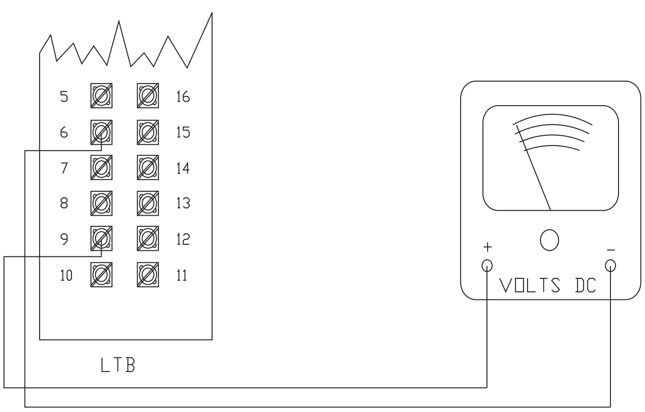
ON - Indicates that the UCP is powered up, also indicates that the software/computer program is intact and functional, and is lit continuously during normal operation.

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. See "Recommended Steps for Trouble Shooting," p. 55.

System Failure Status Diagnostics without LED Indicators

System ON = Measure DC volts between terminals LTB-6 & LTB-9

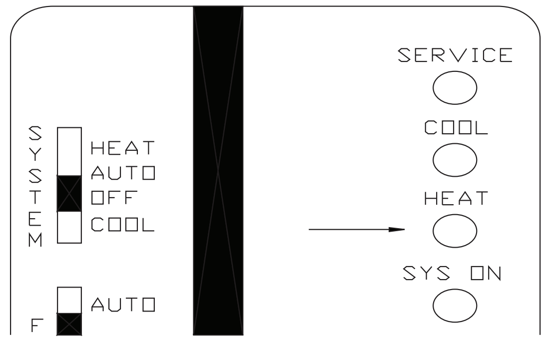


Normal Operation = Approximately 32 VDC.

System Failure = Less than 1 VDC, approximately 0.75 VDC. Indicates that no power is going to the UCP, or that the software/computer program has failed. See "Recommended Steps for Trouble Shooting," p. 55.

Heat Failure Status Diagnostics with LED Indicators

Test Mode = Alternates between 32 VDC & 0.75 VDC. 23.3. Heat Failure Status Diagnostics with LED Indicators.



ON - Indicates unit is in the heat mode, and actively heating.

BLINKING - Indicates a Heating Failure has occurred.

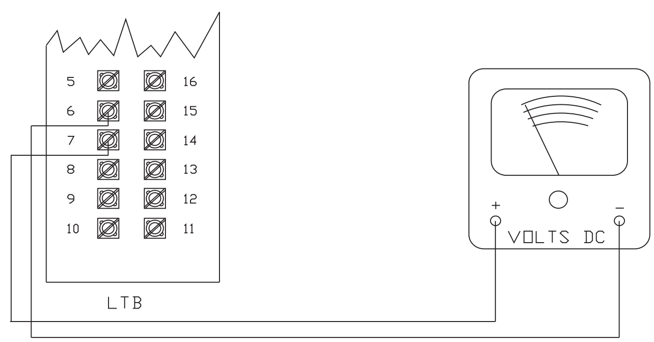
OFF - Indicates that the unit is "not" actively heating.

Heating Failure Causes:

1. TCO2 has opened (YCs only) / TC03 (V3 27.5-50 tons).
2. ZSM mode switch is in Emergency Heat position (WCs only).

Heat Failure Status Diagnostics without LED Indicators

HEAT = Measure DC volts between terminals LTB-6 & LTB-7.



Heat Operating = Approximately 32 VDC.

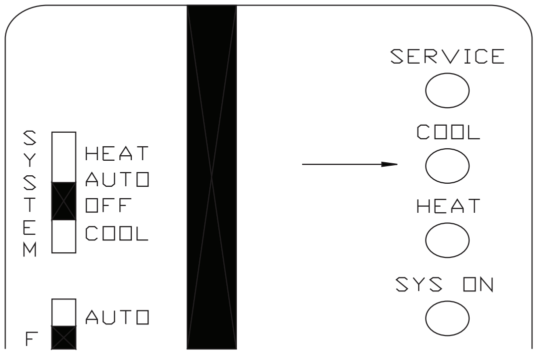
Heat Off = Less than 1 VDC, approximately 0.75 VDC.

Heating Failure = Alternates between 32 VDC & 0.75 VDC.

Heating Failure Causes

1. TCO2 has opened (YCs only) / TCO3 (V3 27.5-50 Ton).
2. ZSM mode switch is in Emergency Heat position (WCs only).

Cool Failure Status Diagnostics with LED Indicators



ON - Indicates unit is in the cool mode, and actively cooling, economizer or mechanical cooling.

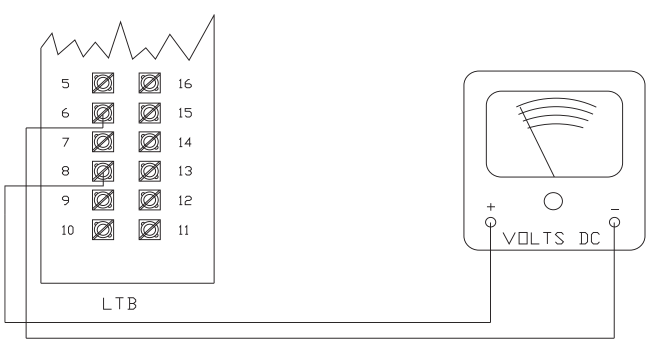
BLINKING - Indicates a cooling failure has occurred.

OFF - Indicates that the unit is "not" actively cooling.

1. Cooling and heating set point (slide pots) on ZSM have failed. See "Testing Zone Sensor Module (ZSM)," p. 68.
2. Zone temperature thermistor ZTEMP on ZSM failed. See "Testing Zone Sensor Module (ZSM)," p. 68.
3. CC1 or CC2 24 VAC control circuit has opened, Check CC1 & CC2 coils, and any applicable control(s) (CCB1, CCB2,COL1, COL2, DTL1, DTL2, HPC1, HPC2, WTL1, WTL2).
4. CPR1 or CPR2 DISABLE circuit (LPC) opened, during 3 minute minimum ON time, on 4 consecutive compressor starts.
5. Open circuit on programmable sensor terminal 12 at LTB.

Cool Failure Status Diagnostics without LED Indicators

COOL = Measure DC volts between terminals LTB-6 & LTB-8.



Cool Operating = Approximately 32 VDC.

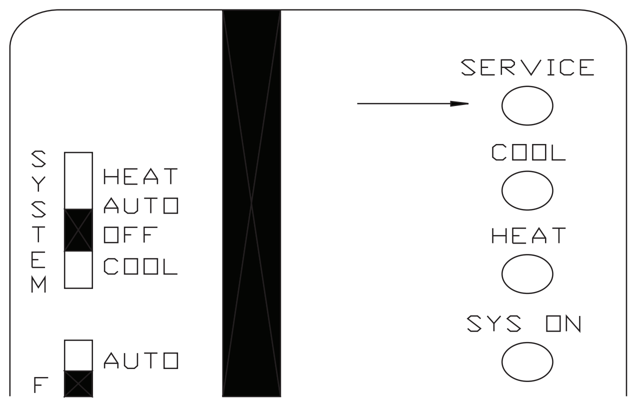
Cool Off = Less than 1 VDC, approximately 0.75 VDC.

Cooling Failure = Alternates between 32 VDC & 0.75 VDC.

Cooling Failure Causes:

1. Cooling and heating set point (slide pots) on ZSM have failed. See "Testing Zone Sensor Module (ZSM)," p. 68.
2. Zone temperature thermistor ZTEMP on ZSM failed. See "Testing Zone Sensor Module (ZSM)," p. 68.
3. CC1 or CC2 24 VAC control circuit has opened, check CC1 & CC2 coils, and any of the controls below applying to this unit (COL1, COL2, HPC1, HPC2, DTL1, DTL2, WTL1, WTL2).
4. CPR1 or CPR2 DISABLE circuit (LPC) opened, during 3 minute minimum ON time, on 4 consecutive compressor starts.
5. Open circuit on programmable sensor terminal 12 at LTB.

Service Failure Status Diagnostics with LED Indicators



ON - Indicates Clogged Filter (CFS) or Fan Failure (FFS) (3-25 ton only), indication only.

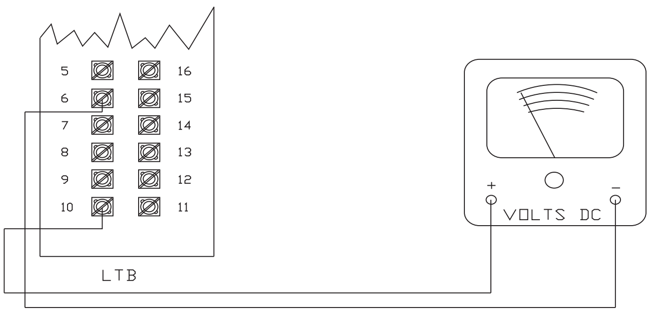
BLINKING - Indicates Active Fan Failure (AFF) (3-25) or Fan Failure (FFS) (27.5-50 ton only), unit shuts down.

OFF - Neither of the above have occurred, or not being used.

Note: *SERVICE LED can be used as a generic indicator. Field modifications are necessary.*

Service Failure Status Diagnostics without LED Indicators

SERVICE = Measure DC volts between terminals LTB-6 & LTB-10.



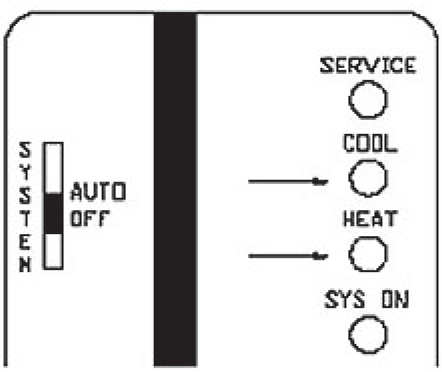
Clogged Filter (CFS)/Fan Failure (FFS) (3-25 only) = Approximately 32 VDC. Indication only.

Normal Operation = Less than 1 VDC, approximately 0.75 VDC.

Active Fan Failure (AFF) (3-25), Fan Failure (FFS) (27.5-50) = Alternates between 32VDC & 0.75VDC. Unit will not run.

Note: *SERVICE LED can be used as a generic indicator. Field modifications are necessary.*

Heat Pump/External Auto Stop Status Diagnostic with LED Indicators



SIMULTANEOUS BLINKING –

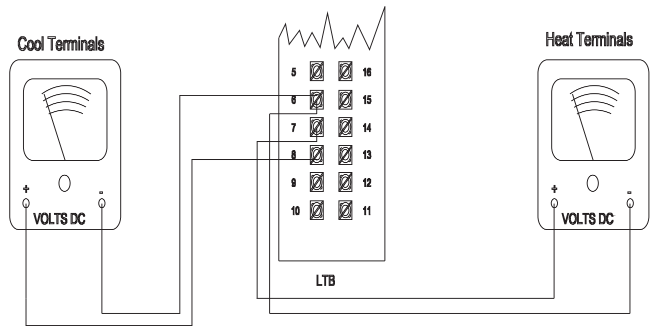
3 - 7.5 ton heat pump – See Demand Defrost troubleshooting section 17.2

10 – 20 ton heat pump – See Defrost Module troubleshooting section 17.4

27.5 - 50 ton (all) - External Auto Stop (LTB1-16 &17) has opened

Heat Pump / External Auto Stop Status Diagnostic without LED Indicators

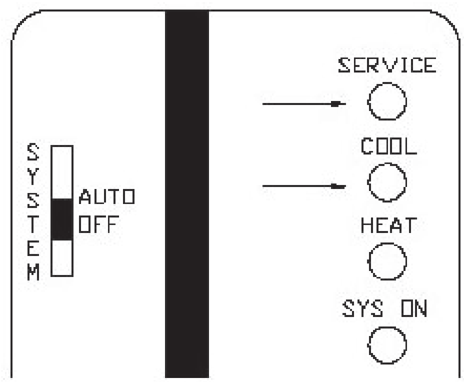
Measure DC volts between terminals LTB-6 & LTB-7 and terminals LTB-6 & LTB-8.



LTB-6 & LTB-8 Failure = Alternates between 32 VDC & 0.75 VDC.

LTB-6 & LTB-7 Failure = Alternates between 32 VDC & 0.75 VDC.

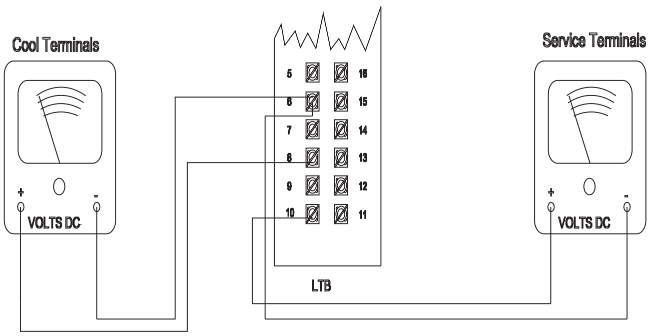
Static Pressure Transducer Status Diagnostic with LED Indicators



SIMULTANEOUS BLINKING - Static Pressure Transducer Failure (27.5-50 ton VAV only)

Static Pressure Transducer Status Diagnostic without LED Indicators

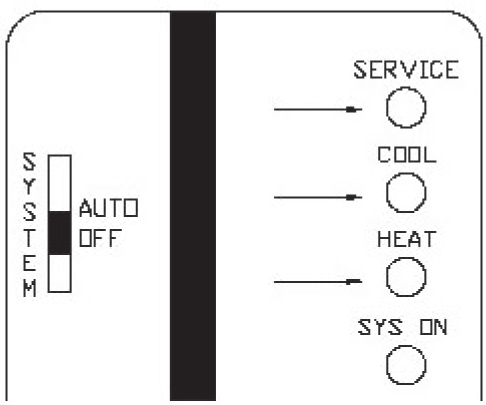
Static Pressure Transducer = Measure DC volts between terminals LTB-6 & LTB-10 and terminals LTB-6 & LTB-8.



LTB-6 & LTB-10 Failure = Alternates between 32 VDC & 0.75 VDC.

LTB-6 & LTB-8 Failure = Alternates between 32 VDC & 0.75 VDC.

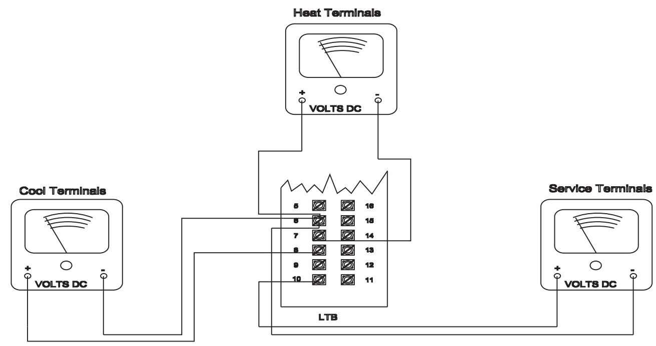
Supply Air High Limit Duct Static Status Diagnostic with LED Indicators



SIMULTANEOUS BLINKING - Supply Air High Limit Duct Static Trip. Manual Reset. (27.5-50 ton VAV only)

Supply Air High Limit Duct Static Status Diagnostic without LED Indicators

Supply Air High Limit Duct Static = Measure DC volts between terminals LTB-6 & LTB-10, terminal LTB-6 & LTB-7, and terminals LTB-6 & LTB-8.



LTB-6 & LTB-10 Failure = Alternates between 32 VDC & 0.75 VDC.

LTB-6 & LTB-8 Failure = Alternates between 32 VDC & 0.75 VDC.

LTB-6 & LTB-7 Failure = Alternates between 32 VDC & 0.75 VDC.

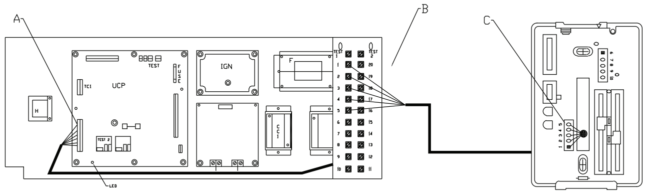
Testing the Unitary Control Processor (UCP)

Test Mode Functions Properly but Erratic Normal Operation

A situation arises where the equipment functions properly in the Test mode, yet fails to operate properly (or at all) during normal operation (not in the Test mode). If the equipment operates properly in the Test mode and not during normal operation, an input problem is present. The equipment will function properly during normal operation as long as it is provided with valid inputs. Check for diagnostics at the Zone Sensor Module (ZSM) or Low Voltage Terminal Board (LTB). If any diagnostics are present, locate and resolve the problem.

Note: *Note: Always check for diagnostics prior to initiating the Test mode, or all diagnostics will be lost.*

The Test mode bypasses (ignores) all inputs (even the ZSM), the Test mode will function without a Zone Sensor Module present, simulating normal operation. This verifies most of the UCP software, hardware, and all off board components are functional.



A Problem Exists Somewhere between Point "A" And Point "C".

Constant Volume 3-50 Ton

The Zone Sensor Module (ZSM) is the primary input, which actually consists of four separate inputs. The four separate inputs are: Cooling Set Point (CSP), Heating Set Point (HSP), Mode, and Zone Temperature (ZTEMP). The Zone Temperature (ZTEMP) is the most critical input, the equipment cannot operate without this input.

Knowing how the Test mode operates, an input problem could be any one of the following:

1. The ZSM has failed.
2. The ZSM is mis-wired, check field low voltage wiring and rewire properly if necessary.
3. The ZSM field wiring has conductor(s) open, shorted to each other, or grounded to conduit etc. Check field wiring with an ohmmeter, repair or replace as necessary.
4. Induced AC voltage on ZSM field wiring. If the ZSM is installed in conduit with line voltage wiring it must be removed. Disconnect wires at both ends (at the unit and the sensor), check for AC voltage from each conductor to ground. if more than 6 volts AC is present, locate problem source and isolate from control wiring.
5. Factory wiring error between the Low Voltage Terminal Board (LTB) and the J7 plug on the Unitary Control Processor (UCP). Remove LTB, check and verify unit wiring against schematic wiring diagram, correct if necessary.

Variable Air Volume (VAV) 27.5-50 Ton

VAV units minimally require a jumper across LTB1-2 & 4 for supply air cooling operation, occupied mode only. If occupied heat (DWU) is required, a BAYSENS021B may be used. If unoccupied or MWU heating is desired, a short across LTB1-11 & 12 will put the unit in an unoccupied mode as long as the BAYSENS021B is used. A BAYSENS020B programmable ZSM provides all needed inputs for heating and cooling, occupied and unoccupied modes.

Forcing Condenser Fan Cycling (12.5-25 Ton Only)

Condenser fan cycling on dual condenser fan units (12.5-25 Tons), can be tested by taking control of the Outdoor Air Sensor (OAS).

Note: *If an economizer is installed, it must be disconnected at the polarized plugs prior to performing this test.*

Electrically remove the Outdoor Air Sensor (OAS) from the circuit, by cutting the wires at the splices in the lower right hand corner of the control box. Insert a 1/4-watt resistive value in place of the OAS to simulate a low ambient condition (33K-75K Ohms). This will simulate an outdoor air temperature between 5° F. and 32° F. Place the unit in the cooling mode, and set the cooling set point to 50° F. Outdoor Motor two (ODM2) will be cycled off, based on the outdoor ambient temperature seen by the UCP, after controlling the Outdoor Air Sensor (OAS) input. ODM2 will be "OFF" when the Outdoor Air temperature falls below 60° (+/- 2°F)., and "ON" if the temperature rises above 65° (+/- 2°F).

Forcing Condenser Fan Cycling (27.5-50 Ton)

Condenser fan cycling on multiple condenser fan units (27.5-50 Tons), can be tested by taking control of the Outdoor Air Sensor (OAS).

Note: *If an economizer is installed, it must be electrically disconnected prior to performing this test.*

Electrically remove the Outdoor Air Sensor (OAS) from the circuit. Using a decade box or similar tool, simulate a low ambient condition to simulate the desired outdoor air temperature. Place the unit in the cooling mode, and set the cooling set point to 50° F. Reference 10.1.2. for Condenser Fan On and Off Temperatures.

Forcing Evaporator Defrost Control (EDC) Cycle (3-25 Ton)

The Evaporator Defrost Control (EDC) can also be tested by taking control of the OAS.

Note: *If an economizer is installed, it must be disconnected at the polarized plugs prior to performing this test.*

Electrically remove the Outdoor Air Sensor (OAS) from the circuit, by cutting the wires, at the splices in the lower right hand corner of the control box. Insert a 1/4 watt resistive value in place of the OAS to simulate a low ambient condition (33K-75K Ohms). This will simulate an outdoor air temperature between 5° F. and 32° F. Place the unit in the cooling mode, and set the cooling set point to 50° F. Evaporator Defrost Control (EDC) will now be activated, and the compressor run time counter will begin counting and accumulating compressor run time. On 12 1/2 through 25 ton units, Outdoor Motor two (ODM2) will be turned “OFF” since the UCP is sensing a low ambient condition. After approximately 10 minutes, a defrost cycle will be initiated.

Forcing Economizer Operation

The function of economizer operation can also be tested by taking control the Outdoor Air Sensor (OAS).

Note: *Do not disconnect the economizer for this test.*

Electrically remove the Outdoor Air Sensor (OAS) from the circuit. Insert a 1/4 watt resistive value in place of the OAS to simulate a low ambient condition (33K-75K Ohms). This will simulate an outdoor air temperature between 5° F. and 32° F. Place the unit in the cooling mode, and set the cooling set point to 50° F. Compressor(s) may run during extended test periods. If it is warm outside, the outside air damper will probably be fully open, and a 50-55° F. supply air temperature will be attempted to be maintained.

If a power exhaust accessory is present, it will be energized whenever the economizer damper is at a position greater than 25% of the actuator stroke (3-25 ton).

Voyager III Notes:

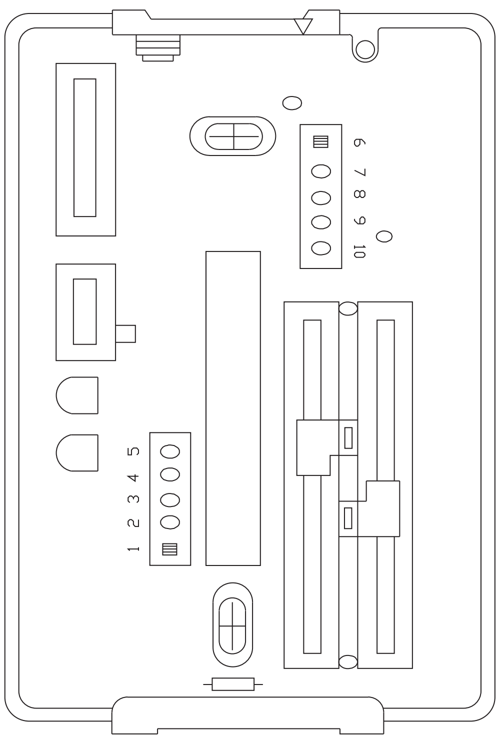
The power exhaust set point determines at which point the power exhaust fan(s) are energized (0-100%).

Testing Zone Sensor Module (ZSM)

Note: *These first 4 tests are not for programmable models, and are conducted with the ZSM electrically removed from the system, unless otherwise noted.*

ZSM Terminal Identification

Terminal #	Terminal I.D.	Terminal #	Terminal I.D.
1	ZTEMP	6	LED COMMON
2	SIGNAL COMMON	7	HEAT LED
3	CSP	8	COOL LED
4	MODE	9	SYS ON LED
5	HSP	10	SERVICE LED



VIEW WITH COVER REMOVED

Test 1: UCP Zone Temperature Input Test

Voltages are measured with power applied to the equipment and the ZSM wired into the circuit. Voltages may be measured at the Low Voltage Terminal Board (LTB) on the unit, or at the ZSM in the space.

Zone Temperature (ZTEMP) is measured between terminals 1 & 2 at the ZSM (LTB-1 & LTB-2 at the unit).

The resistance values (OHMs) are measured with the ZSM disconnected and isolated from the Unitary Control Processor (UCP). The resistance may be measured at the ZSM, or the unit LTB, with the J7 plug disconnected on the UCP. The electrical values below, directly correspond with a zone temperature, that is interpreted by the UCP.

ZTEMP °F	OHMs Rx1K	Volts DC +/-5%	ZTEMP °F	OHMs Rx1K	Volts DC +/-5%
50	19.96	3.125	71	11.60	2.461
51	19.43	3.105	72	11.31	2.441
52	18.92	3.066	73	11.03	2.402
53	18.42	3.027	74	10.76	2.363
54	17.94	3.008	75	10.50	2.344
55	17.47	2.969	76	10.25	2.305
56	17.02	2.930	77	10.00	2.285
57	16.58	2.910	78	9.759	2.246
58	16.15	2.871	79	9.525	2.227
59	15.74	2.852	80	9.297	2.188
60	15.33	2.813	81	9.076	2.168
61	14.94	2.773	82	8.860	2.129
62	14.56	2.754	83	8.650	2.109
63	14.19	2.715	84	8.446	2.070
64	13.83	2.676	85	8.247	2.051
65	13.49	2.656	86	8.054	2.012
66	13.15	2.617	87	7.866	1.992
67	12.82	2.598	88	7.682	1.953
68	12.50	2.559	89	7.504	1.934
69	12.19	2.520	90	7.330	1.914
70	11.89	2.500			

Test 2: UCP Cooling and Heating Set point Input Test

Voltages are measured with power applied to the equipment and the ZSM wired into the circuit. Voltages may be measured at the Low Voltage Terminal Board (LTB) on the unit, or at the ZSM in the space.

Cooling Set point (CSP) is measured between terminals 2 and 3 at the ZSM (LTB-2 & LTB-3 at the unit), and Heating set point (HSP) is measured between terminals 2 and 5 at the ZSM (LTB-2 & LTB-5 at the unit).

The resistance values (OHMs) are measured with the ZSM disconnected and isolated from the Unitary Control Processor (UCP). The resistance may be measured at the ZSM, or the unit LTB, with the J7 plug disconnected from the UCP. The electrical values below, directly correspond with a set point temperature, that is interpreted by the UCP.

Voyager III Note:

For VAV set point panel inputs see section 32.7.

CSP or HSP °F	OHMs Rx1	Volts DC +/-5%	CSP or HSP °F	OHMs Rx1	Volts DC +/-5%
50	889	2.34	71	481	1.61
51	870	2.31	72	461	1.57
52	850	2.29	73	442	1.52
53	831	2.26	74	422	1.47
54	812	2.23	75	403	1.42
55	792	2.20	76	383	1.37
56	773	2.17	77	364	1.32
57	753	2.14	78	344	1.27
58	734	2.10	79	325	1.22
59	714	2.07	80	305	1.16
60	695	2.04	81	286	1.10
61	675	2.00	82	266	1.04
62	656	1.97	83	247	0.98
63	636	1.93	84	227	0.92
64	617	1.90	85	208	0.85
65	597	1.86	86	188	0.78
66	578	1.82	87	169	0.72
67	558	1.78	88	150	0.64
68	539	1.74	89	130	0.57
69	519	1.70	90	111	0.49
70	500	1.65			

Test 3: UCP Mode Input Test

Voltages are measured with power applied to the equipment and the ZSM wired into the circuit. Voltages may be measured at the Low Voltage Terminal Board (LTB) on the unit, or at the ZSM in the space.

MODE is measured between terminals 2 and 4 at the ZSM (LTB-2 & LTB-4 at the unit).

The resistance values (OHMs) are measured with the ZSM disconnected and isolated from the Unitary Control Processor (UCP). The resistance may be measured at the ZSM, or the unit LTB, with the J7 plug disconnected from the UCP. The electrical values below, directly correspond with a MODE that is interpreted by the UCP.

Constant Volume 3-50 Ton

System Switch	Fan Switch	OHMs Rx1K	Volts DC +5%
Short to Common		0	0.00
OFF	AUTO	2.32	0.565
COOL	AUTO	4.87	1.056
AUTO	AUTO	7.68	1.484
OFF	ON	10.77	1.859
COOL	ON	13.32	2.113
AUTO	ON	16.13	2.349
HEAT	AUTO	19.48	2.585
HEAT	ON	27.93	3.028
EM HEAT	AUTO	35.00	3.289
EM HEAT	ON	43.45	3.524
Open Circuit		8	5.000

Variable Air Volume 27.5-50 Ton

System Switch	OHMs Rx1K	Volts DC+5%
AUTO	7.68	1.484
OFF	2.32	0.565

Voyager III Notes:

On VAV units the fan runs continuously in the occupied mode.

Test 4: LED Indicator Test

If an LED fails it will have no effect on system operation. Replacing the ZSM is optional.

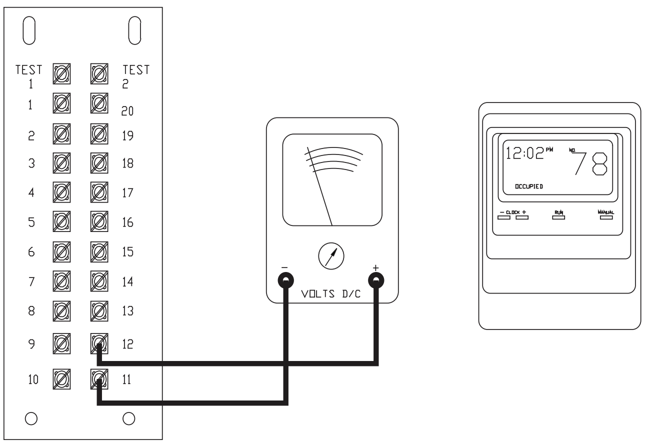
Method 1: Test LEDs with ZSM connected and wired to the unit. Test voltages at LED terminals on ZSM. A measurement of 32 VDC, across an un-lit LED, means the LED has failed.

Method 2: Test the LED with an analog ohmmeter. Connect ohmmeter across LED in one direction, then reverse the leads for the opposite direction. The LED should have at least 100 times more resistance in reverse direction, as compared with the forward direction.

If high resistance is indicated in both directions, the LED is open. If low resistance is indicated in both directions, the LED is shorted.

Testing Programmable Zone Sensor Module (ZSMs)

This section applies to BAYSENS012A, 018A, 019A/B, 020A/B, 023A; ASYSTAT666A, 667A except as indicated.



1. Disconnect wires from LTB-11 (-) and LTB-12 (+), measure voltage between LTB-11 (-) and LTB-12 (+) , should be approximately 32 VDC. If no voltage is measured check wiring between UCP and LTB.

Note: *24 VAC should be present between LTB-14 (LTB 15 on units built prior to 6/93) and LTB-11.*

2. Re-connect wires to terminals LTB-11 (-) and LTB-12 (+), measure voltage again between LTB-11 (-) and LTB-12 (+). Voltage should flash high and low every 0.5 seconds. The voltage on the low end will measure approximately 22 VDC, while the voltage on the high end will measure approximately 22 to 42 VDC.
3. Verify all modes of operation by running the unit through the Test Mode.
4. After verifying proper unit operation, exit the test mode. Turn the fan on continuously at the ZSM, by pressing the button with the fan symbol, or turning the fan switch "ON" (whichever is applicable). If the fan comes on and runs continuously the ZSM is good. If you are not able to turn the fan on, the ZSM is possibly defective and may need replacing. See notes below and specific information for the sensor (following pages) before condemning.

Note: BAYSENS019B*: This sensor will not communicate if it is set to the wrong baud rate. The baud rate may need to changed to 1024 if being used on a unit built prior to 1/96 See section 26.2*

Note: BAYSENS019A, BAYSENS020A, BAYSENS023A, or ASYSTAT666A or ASYSTAT667A*: Prior to condemning the ZSM, it should be re-initialized by activating its self-test feature. The self-test is initiated by pressing the "RUN", "MANUAL" and "DAY" buttons simultaneously. The ZSM program will be cleared and the sensor will have to be re-programmed. Upon completion of the test, a "P" for pass or "F" for fail will appear in the upper left-hand corner of the display, along with the software version number. Press the "CLEAR" button and the sensor will test all of the LED's and LCD pixels, at the conclusion of the LED/LCD test press "CLEAR" again. The sensor may now be re-programmed.*

BAYSENS012A, 018A DIP switch & set-up

Dip switch #1 controls the selection of 12 hour or 24-hour clock display. When switch #1 is "OFF" 12-hour clock is displayed, when "ON" 24 hour clock is displayed.

Dip switch #2 controls the selection of Fahrenheit or Centigrade temperature display. When switch #2 is "OFF", temperature is displayed in degrees Fahrenheit, when "ON" Centigrade is displayed.

Dip switch #3 enables the Computed Recovery feature, when enabled by turning zone sensor dip switch #3 "ON", this allows the zone to be at the occupied temperature at the selected occupied time. As opposed to being in the process of recovering from night set back.

Dip switch #4 enables Unoccupied Functions, activated by turning zone sensor dip switch #4 "ON", this forces the economizer minimum position to zero during the unoccupied mode.

Dip switch #5 selects Warm Up, or ("Unoccupied functions terminate at 2° F. from occupied temperature set point") enabled by turning dip switch #5 "ON". When changing from unoccupied to occupied mode, this keeps the outside air damper closed until the zone temperature is within 2° F. of the occupied set point.

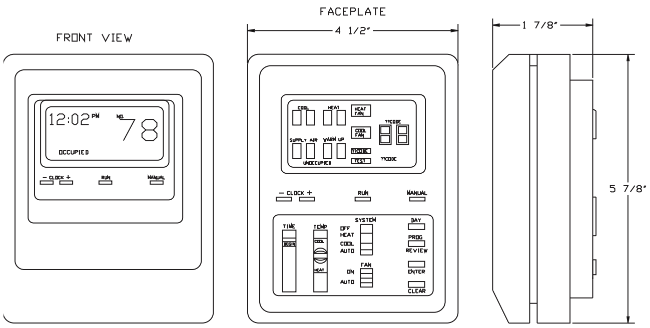
Dip switch #6 controls the Smart Fan option, when switch #6 is turned "ON" the fan mode is forced to the AUTO mode when the equipment is in the unoccupied heating or cooling mode.

Dip switch #7 cons the sensor for Heat Pump or Heat/Cool operation. When switch #7 is turned "ON", the sensor is configured for Heat/Cool operation, when turned "OFF" Emergency Heat operation is enabled.

Dip switch #8 enables and disables key pad lock out. When switch #8 is turned "OFF" the key pad operates normally, when turned "ON" the programming functions are disabled. Reference publication THER-IN-43 for programming and / or additional information.

Note: Note for BAYSENS012A*: This ZSM requires 2 wires from the sensor to the unit. The replacement, BAYSENS019B, requires a minimum of 3 wires.*

BAYSENSO19A/023A
DIP Switches & Setup



Zone Temperature Calibration: Set SYSTEM switch to “OFF”, press ENTER & CLEAR simultaneously until the FIELD CAL icon appears, press “+” & “-” until displayed temperature agrees with calibration instrument. Once calibration is complete, move the SYSTEM switch to the desired position to exit the calibration mode.

Zone Temperature Lockout: If the RUN button is pressed once the room temperature will not be displayed. To display the room temperature press RUN again.

Key Pad Lockout: Locks out the programming functions by pressing and holding the “+” & “-” buttons simultaneously until the display blanks and returns to normal. To unlock the key pad, repeat the procedure.

Adjustable Check Filter Interval (from 10 hours to 59 weeks): This is done by moving the SYSTEM switch to “OFF”, then press and continue to hold the CLEAR button, next move the FAN switch to “ON” and then back to AUTO (the CHECK FILTER icon and “0000” hours will appear. Adjust the interval by pressing the “+” or “-” buttons, once completed release the CLEAR button and move the SYSTEM and FAN switches to the desired positions.

Intelligent Copy: Allows the program to be copied from one day to another during the initial programming.

Dip switch #1 enables Morning Warm-up; when turned “ON” this will keep the outside air damper closed until zone temperature is within 2° F. of the occupied heating set point.

Dip switch #2 overrides Minimum Position; when turned “ON” the outside air damper is closed during the unoccupied mode.

Dip switch #3 selects Fahrenheit or Celsius temperature display; when turned “OFF” Fahrenheit is displayed.

Dip switch #4 enables Supply Air Tempering; when turned “ON” supply air temperature is maintained within +10o F. of the heating set point, when in heat mode and not actively heating.

Dip switch #5 selects internal or remote zone temperature sensing; when turned “OFF” internal sensor is used.

Dip switch #6 selects 12 or 24 hour time, when turned “OFF” 12 hour time is displayed.

Dip switch #7 enables the Smart Fan option; when turned “ON” the fan mode is forced to the AUTO mode when the equipment is in the unoccupied heating or cooling mode.

Dip switch #8 enables Intelligent Temperature Recovery; when turned “ON” the zone will be at occupied temperature at the occupied time, instead of being in the process of recovering from night set back.

Dip switch #9 is for configuration. Reference installer’s guide for specific instructions (SENS-IN-1, 2, or 3).

Programmable Troubleshooting Chart for BAYSENS019A/020A/023A

Problem	Probable Cause
Display does not come on.	Check for power at terminals LTB-11 and LTB-14 (24 VAC).Make sure sensor is properly mounted to sub-base.
No communications with unit.	Check position of dip switch 9. This selects unit type. Test voltage between LTB-11 and LTB-12 (range = 22 - 42 VDC).
Displayed zone temperature is different from actual temperature.	Follow instructions for zone temperature calibration. Be sure sensor has had time to adapt from extreme temperatures.
Displayed zone temperature is 0° F. (0° C.) and a COOL FAIL is present.	Check position of dip switch 5. This selects local or remote sensor. If remote sensor is installed, check wiring for an open circuit condition between terminals S1 & S2. If local sensing is selected, the onboard thermistor is open, replace zone sensor module.
Displayed zone temperature is 99° F. (38° C.) and a COOL FAIL is present.	Check position of dip switch 5. This selects local or remote sensor. If remote sensor is installed, check wiring for a short circuit condition between terminals S1 & S2. If local sensing is selected, the onboard thermistor is shorted, replace zone sensor module.
Zone temperature is not displayed.	Zone temperature lockout is enabled. Press RUN button to display temperature.
Unit won't respond to switches & slides.	Keypad lockout is enabled. See installation instructions to disable.
Clock must be reset after power outage.	The BAYSENS019A/020A requires 3 hours to fully charge the clock's backup energy supply (super capacitor). If the sensor was removed from the sub-base, the clock and day must be reset
RUN and MANUAL LEDs are flashing, or are not lit. (BAYSENS019A/020A only)	If the optional status indicators are wired, the RUN LED will be "OFF" when unit power is "OFF", or when the unit is in the TEST mode. The MANUAL LED will flash when the zone sensor is in temporary override, and is "OFF" when the zone sensor is in program run mode.
Clock flashes "0:00" at initial power up.	Check position of dip switch 6, which selects 12 Hour or 24 Hour time display.
FAN switch is in "ON" position but fan off.	Check position of dip switch 7. This selects Smart Fan option, this problem would is indicate the system is in the unoccupied mode.
System is operating before programmed start time (Constant Volume and Heat Pump units only).	Check position of dip switch 8 which selects computed recovery.

BAYSENS019B Options Menu

Note: *To access the options menu; simultaneously depress and hold the Mode and Program buttons for 4 seconds.*

1. **Morning Warm-up:** This option (when enabled) will activate the heat and close the outside air damper if the zone temperature is below Heating Set Point, whenever the system is switched from unoccupied to occupied mode.
2. **Economizer Minimum Position Override:** This option (when enabled) will override the minimum position in unoccupied mode and close the economizer damper.
3. **Temperature Scale:** This option changes temperature scale from degrees F to degrees C.
4. **Supply Air Tempering:** When in the heating mode but not actively heating, if the Supply Air Temperature reaches 10 degrees below the Heating Set Point; heat will be enabled, until the Supply Air Temperature reaches 10 degrees above the Heating Set Point. Then, heat will be off.
5. **Time Clock:** An option for 12 hour or 24 hour time.
6. **Smart Fan:** When enabled puts the fan in Auto Mode during unoccupied periods regardless of the fan switch position.
7. **Intelligent Temperature Recovery:** This option (when enabled) automatically turns on the unit so that occupied set points are reached by the start of the occupied period.
8. **Programmable Days/Weeks:** This option allows the user to select the days of the week for programming.
9. **Programmable Periods/Day:** This option allows the user to choose the number of events per day.
10. **Programmable Fan Operation:** This option (when enabled) allows the user to program the fan mode for each event/period.

Note: *This overrides Smart Fan Option 6.*

11. **Remote Sensor:** This option should be enabled whenever using an optional remote sensor.
12. **Check Filter Interval:** This option allows the user to set an interval to check the filters on a regular schedule. (Check: filter icon will alarm after the set amount of run hours, reset the alarm fan timer by pressing ERASE key)
13. **Display Zone Temperature:** This option allows the user to display the current zone temperature.
14. **Keypad Lockout:** This option allows the user to enable the keypad lockout function. (Lockout keypad by pressing "+" and "-" keys simultaneously for 4 seconds)
15. **Initial Time Setting in Temporary Override:** This option allows the user to have a preset time when initial override is started.
16. **Buzzer Option:** This option enables the buzzer alarm for the different settings. (Settings: Check Filter, System Failures)
17. **Zone Temperature Calibration:** This option allows the user to calibrate the zone temperature with any offsets. (Hold the +/- key for 2 seconds to change temperature setting.)

Note: *Each time the key is pressed, the temperature changes 0.1 degree. The key must be pressed 10 times for a full degree change.*

18. Baud Rate: This option is the communication speed.

Note: *For units/UCP's built before 1/96 change this option to 0.*

19. **CV or HP Operation:** Changes the sensor to a Heat Pump sensor. (CV =Gas or Electric. HP =Heat Pump.)
20. **Default Cooling Set point:** If the program is erased or not programmed, the unit will default to this set point.
21. **Default Heating Set point:** If the program is erased or not programmed, the unit will default to this set point.
22. **Minimum Cooling Set point:** This option limits the Cooling Set point to this minimum setting.
23. **Maximum Heating Set point:** This option limits the Heating Set point to this maximum setting.

BAYSENS020B Options Menu

Note: *To access the options menu; simultaneously depress and hold the Mode and Program buttons for 4 seconds.*

1. **Morning Warm-up:** This option (when enabled) will activate the heat if the zone temperature is 3° below Warm-Up set point whenever the system changes from unoccupied to occupied mode.
2. **Economizer Minimum Position Override:** This is an option (when enabled) that will override the minimum position in the unoccupied mode and close the economizer damper.
3. **Temperature Scale:** This is an option that changes temperature scale from degrees F to degrees C.
4. **Heat Installed:** Set to yes if Electric or Gas Heat is installed.
5. **Time Clock:** This is an option for 12 hour or 24 hour time.
6. **Modulated Heat:** Not used. Leave setting to "0".
7. **Daytime Warm-up:** This option (when enabled) will activate heat during occupied mode whenever zone temperature drops 3° below Warm-Up set point.

8. **Programmable Days/Weeks:** This option allows the user to select the days of the week for programming.
9. **Programmable Periods/Day:** This option allows the user to choose the number of events per day.
10. **Remote Sensor:** This option should be enabled whenever using an optional remote sensor.
11. **Check Filter Interval:** This option allows the user to set an interval to check the filters on a regular schedule. (Check filter icon, on the sensor, will alarm after the set amount of run hours. Reset *the alarm and timer by pressing ERASE key*)
12. **Display Zone Temperature:** This option allows the user to display the current zone temperature.
13. **Keypad Lockout:** This option allows the user to enable the keypad lockout function. (Lockout keypad by pressing + and - keys simultaneously for 4 seconds)
14. **Default Time Setting in Temporary Override:** This option sets the default override time in hours.
15. **Buzzer Option:** This option enables the buzzer alarm for different settings. (Settings: Key press only, Check Filter, System Failures)
16. **Zone Temperature Calibration:** This option allows the user to calibrate the zone temperature with any offsets. (Hold the +/- key for 2 sec. to change temperature setting.)

Note: *Each time the key is pressed, the temperature changes 0.1 degree. The key must be pressed 10 times for a full degree change.*

17. **Default Unoccupied Cooling Set point:** If the unoccupied cooling setpoint is erased or not programmed, the unit will default to this setpoint.
18. **Default Unoccupied Heating Set point:** If the unoccupied heating set point is erased or not programmed, the unit will default to this set point.
19. **Default Supply Air Cooling Setpoint:** If the occupied supply air set point is erased or not programmed, the unit will default to this set point.
20. **Default Supply Air Heat:** This option does not apply to Voyager.
21. **Default Warm-up Setpoint:** If the warm-up set point is erased or not programmed, the unit will default to this set point.
22. **Minimum Unoccupied Cooling Set point:** This option limits the unoccupied Cooling Set Point.
23. **Maximum Unoccupied Heating Set point:** This option limits the unoccupied Heating Set Point.
24. **Minimum Supply Air Cool:** This option limits the Supply Air Cooling Setpoint to a minimum setting.
25. **Maximum Supply Air Heat:** This option does not apply to Voyager.
26. **Maximum Warm-up Setpoint:** This option limits Warm-Up Setpoint to a maximum setting.

Occupied Cooling note: The unit provides cooling capacity in order to maintain the desired supply air setpoint.

Unoccupied Cooling note: The unit will operate in a constant volume (CV) mode while cooling, providing cooling capacity in order to maintain the *unoccupied zone temperature* setpoint.

Heating note: The unit will operate in a constant volume (CV) mode during heating, providing 100% airflow. The occupied setpoint, also called Daytime Warmup Setpoint, is 3 degrees below the “Warm-Up” setpoint.

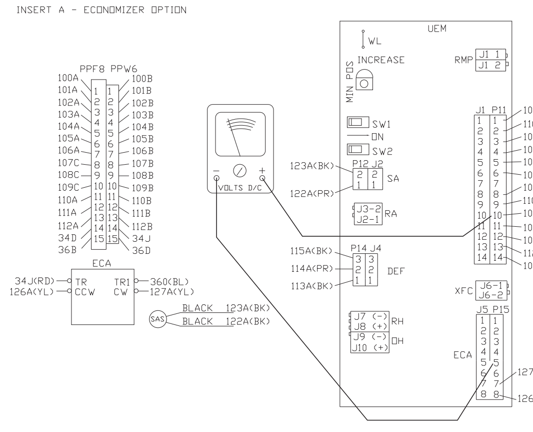
Programmable Troubleshooting Chart for BAYSENS019B/020B

TROUBLESHOOTING GUIDE

Problem	Solution
Display does not come on.	Check for power at terminals 11 and 14 (nominal 24 VAC). Be sure that the terminal block is properly mounted on its pins.
No communications to UCM.	1. Check for voltage between terminals 11 and 12 (range is 22-42 Vdc). Check wiring to UCM if voltage is not present.
Displays COOL FAIL	No communication between terminals 11 and 12. Verify changing voltage.
Displayed zone temperature reads Sh and a COOL FAIL is displayed solid.	1. Check option 11 to see if remote sensor is installed. If remote sensor is installed, check the wiring from terminals S1 and S2 to the remote sensor for a short circuit condition.
	2. If option 11 has 0 value, then a local sensor is selected and the on-board thermistor is shorted and then sensor should be replaced.
Displayed zone temperature oP and a COOL FAIL is displayed solid.	1. Check option 11 to see if remote sensor is installed. If remote sensor is installed, check the wiring from terminals S1 and S2 to the remote sensor for an open circuit condition.
	2. If option 11 has 0 value, then a local sensor is selected and the on-board thermistor is open and the sensor should be replaced.
Zone temperature is not displayed.	Display zone temperature option has been accessed and locked out. Check option 13. The option value should be 1.
ZSM is not responding to pushbuttons.	The ZSM is in keypad lockout mode.
The clock requires reprogramming after a short power interruption.	Replace the battery.
Fan switch is ON position but fan is not running.	Check option 6 in the Option Menu. Smart fan overrides the last part of an unoccupied period.
System is operating before programmed start time.	Check option 7 in the Option Menu. Computed recovery overrides the last part of an unoccupied period to obtain the occupied settings in time.
Buzzer indicates System failure or service required.	Press ERASE to acknowledge buzzer until noon the next day.

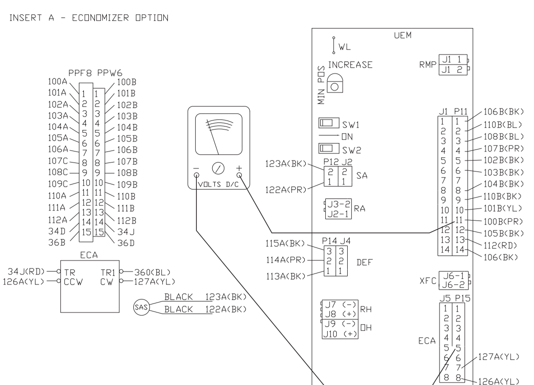
Testing Unitary Economizer Module (UEM)

This series of tests will allow you to diagnose, and determine where, and if a problem exists in the system economizer operation. **Test 1** determines if the problem is in the UCP communicating with the UEM. **Test 2** will determine if the problem is in the UEM or ECA. **Test 3** is for the UEMs minimum position potentiometer. **Test 4** tests sensor inputs and exhaust fan output. **Test 5** shows how to test the sensors. Conduct tests in numerical order until the problem is found.



Test 1: Verifying UCP Communication with UEM

1. Using the Test Mode, step the unit into the economizer mode. Verify that the ECA drives fully open (approximately 90 seconds). The LED on the UEM burns continuously when the ECA drives open or closed.
2. If the ECA is not driving the dampers in Step 1, measure the DC voltage output from the UCP between the UEM connectors J1-11 and J5-5. The voltage measured while the ECA is driving open should be approximately 1.7 VDC. When the 90 seconds have elapsed, and the dampers should be fully open, the voltage will change to approximately 5.0 VDC.



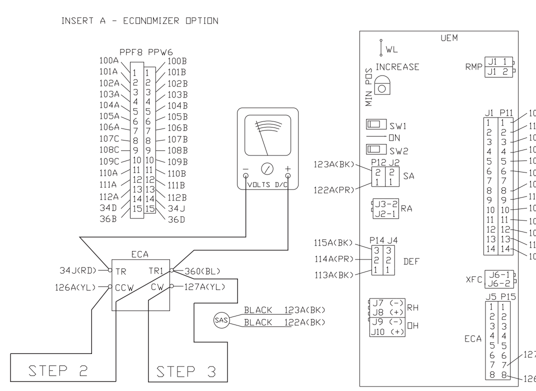
3. Using the Test Mode, step the unit into the Cool 1 mode. The ECA should drive fully closed (approximately 90 seconds), then open to the preset minimum position. The LED on the UEM is on continuously when the ECA drives.
4. If the ECA is not driving the dampers in Step 3, measure the DC voltage output from the UCP between UEM connectors J1-10 and J5-5. The voltage measured while the ECA is driving closed should be approximately 1.7 VDC. When the 90 seconds have elapsed, and the dampers should be fully closed, the voltage will change to approximately 5.0 VDC.

If the voltages in Test 1 are present, the UCP is operating properly. If the ECA will not drive, the problem is in the UEM or ECA, continue to Test 2. If voltages are not present a wire, terminal, or UCP failure has occurred.

Test 2: Verifying That The ECA Is Functional

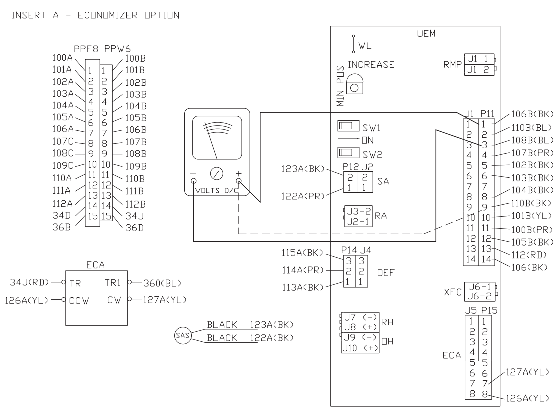
1. With power applied to the system, in any mode, verify presence of 24 VAC between ECA terminals TR and TR1. If 24 VAC is not present, a wiring or terminal problem is present.
2. Jumper terminal TR1 to terminal CCW, the ECA should begin to drive open. The dampers should be in the fully open position after approximately 90 seconds. Remove jumper from CCW terminal.
3. Jumper terminal TR1 to terminal CW, the ECA should begin to drive closed. The dampers should be in the fully closed position after approximately 90 seconds. Remove jumper from both terminals.

If after completing Test 1, and the ECA functions in Test 2, the UEM has failed. Replace UEM. If 24 VAC is present in Step 1, and ECA did not drive as specified in Steps 2 and 3, the ECA is defective. Replace ECA.



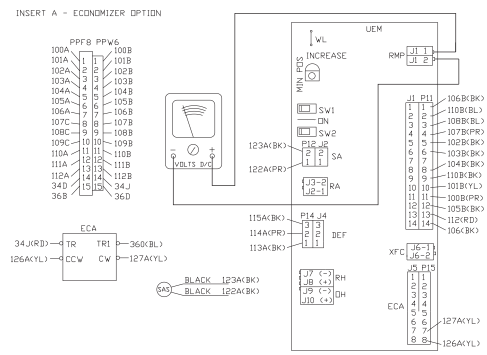
Test 3: Testing the UEM Minimum Position Potentiometer

1. With power applied to the system, in any mode, verify the presence of 5.0 VDC at the following two points. Voltage is measured at connector J1 on the UEM. Measure between J1-1 and J1-3, then measure between J1-3 and J1-9. If 5.0 (+ 0.25) VDC is not present at these two points, a wire, terminal, or UCP failure has occurred. Check integrity of wiring and terminals, repair or replace if necessary. If no wiring problems are present, replace UCP.



2. After verifying the voltage presence in Step 1, turn the minimum position potentiometer fully counter clockwise. Measure the DC voltage between UEM terminals J11(+) and J12(-), should be approximately 0.47 VDC. If 5VDC is measured at these pins, the potentiometer is open or the WL resistor has been cut.
3. Turn the minimum position potentiometer one half turn clock wise, so that the screw driver slot is straight up and down. Measured voltage should be approximately 1.18 VDC.
4. Turn the minimum position potentiometer fully clockwise. Measured voltage should be approximately 1.70 VDC.

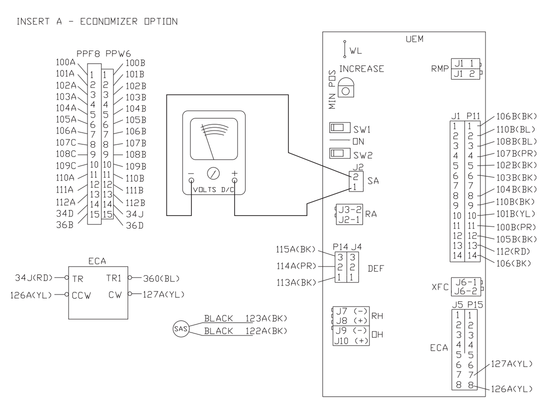
If correct voltages are measured in Steps 1, 2, 3, and 4, UCP, UEM potentiometer and circuitry are good. If correct voltage is measured in Step 1, and not in Steps 2 through 4, replace UEM. Continue to Test 4 if necessary.



Test 4: Testing Sensor Inputs and Exhaust Fan Output

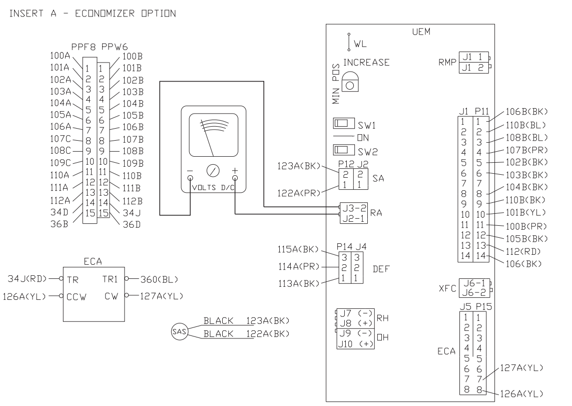
1. **Step 1:** With power applied to the system, turn the ZSM mode switch OFF, and the ZSM fan switch ON. Verify the DC voltages in the following steps.
2. **Step 2: Testing Supply Air Sensor Input**. Remove connector J2 on UEM, marked SA on the side of the UEM board. Measure voltage between pins J2-1 and J2-2, voltage should measure 5.0 (+ 0.25) VDC.

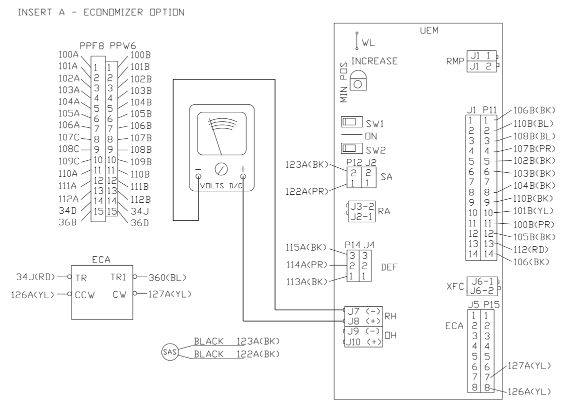
If correct voltages are measured in Tests 1 through 3, and voltage in Test 4, Step 2 is out of range, replace UEM.



3. **Testing Return Air Sensor Input**. Remove connector J3 on UEM (if installed), marked RA on the side of the UEM board. Measure voltage between pins J3-1 and J3-2. Voltage should measure 5.0 (+ 0.25) VDC.

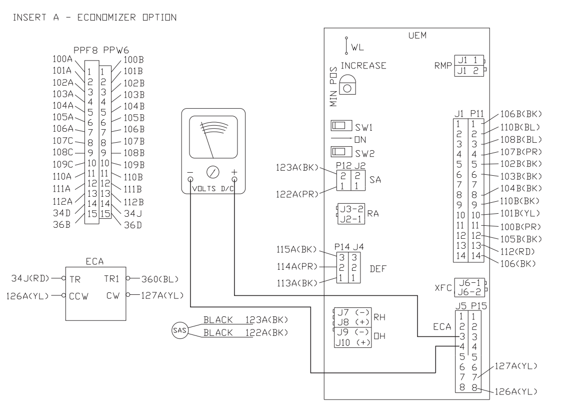
If correct voltages are measured in Tests 1 through 3, and voltage in Test 4, Step 3 is out of range, replace UEM.





4. **Testing Active Fan Failure Input**. Remove connector J5 on UEM, marked ECA on the side of the UEM board. Measure voltage between pins J5-3 and J5-4. Voltage should measure 5.0 (+ 0.25) VDC.

If correct voltages are measured in Tests 1 through 3, and voltage in Test 4, Step 4 is out of range, replace UEM.

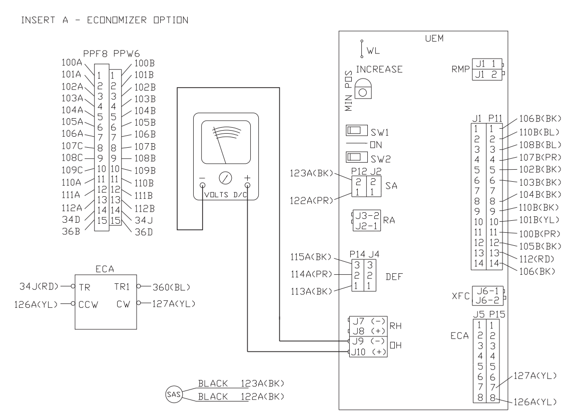


5. **Testing Return Humidity Sensor Input**. Remove wires (if installed) from terminals J7 (-) and J8 (+) on UEM, marked RH on the side of the UEM board. Measure voltage at terminals J7 (-) and J8 (+). Voltage should measure approximately 20 VDC.

If correct voltages are measured in Tests 1 through 3, and voltage in Test 4, Step 5 is out of range, replace UEM.

6. **Testing Outdoor Humidity Sensor Input**. Remove wires (if installed) from terminals J9 (-) and J10 (+) on UEM, marked OH on the side of the UEM board. Measure voltage between terminals J9 (-) and J10 (+). Voltage should measure approximately 20 VDC.

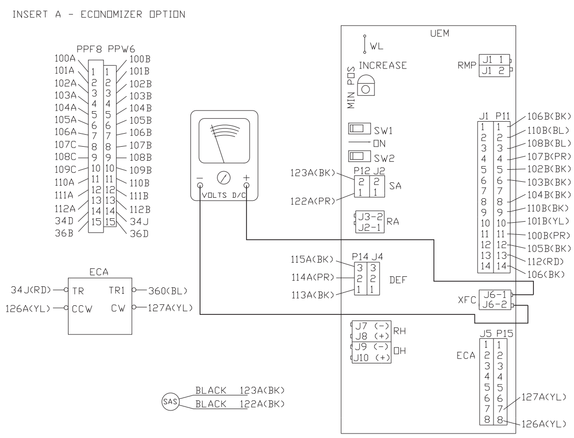
If correct voltages are measured in Tests 1 through 3, and voltage in Test 4, Step 6 is out of range, replace UEM.



7. **Testing Exhaust Fan Contactor Output.** Remove connector (if installed) from J6 on UEM, marked XFC on the side of the UEM board. With the indoor blower running, turn minimum position potentiometer fully counter clock wise. Measure DC voltage between J6-1 and J6-2, should be 0 VDC. Turn minimum position

potentiometer fully clock wise. After about 25 seconds, voltage should measure approximately 30 VDC.

If after completing tests 1 through 4, if any of the voltages specified in Test 4 were not present or were out of range, the UEM has failed. Replace UEM.



Test 5: Testing the Sensors

1. **Test UCP Outdoor Air Sensor Input.** The voltages listed below are measured with power applied to the unit and the Outdoor Air Sensor (OAS) wired into the circuit. Voltages may be measured at the Unitary Control Processor (UCP), or at the connectors nearest the sensor. The OAS is measured between UCP terminals J1-15 & J1-16.

The resistance values (OHMs) are measured with the sensor disconnected and isolated from the UCP. The resistance may be measured at the connectors nearest the sensor, or in the respective plug near the printed circuit board. The electrical values measured, directly correspond with an outdoor temperature, that is interpreted by the UCP.

Voyager III VAV Note:

This test is done at the UVM on terminals J2-1 and J2-2, instead of the UCP board.

TEMP °F	OHMs Rx1K	Volts DC +/-5%	TEMP °F	OHMs Rx1K	Volts DC +/-5%	TEMP °F	OHMs Rx1K	Volts DC +/-5%
-40	346.1	4.648	-39	333.5	4.468	-38	321.5	4.629
-37	310.0	4.609	-36	298.9	4.609	-35	288.3	4.590
-34	278.1	4.570	-33	268.3	4.570	-32	258.9	4.551
-31	249.9	4.531	-30	241.1	4.531	-29	232.7	4.512
-28	224.6	4.492	-27	216.8	4.473	-26	209.4	4.453
-25	202.2	4.434	-24	195.2	4.434	-23	188.6	4.414
-22	182.3	4.395	-21	176.0	4.375	-20	170.1	4.355
-19	164.4	4.336	-18	158.9	4.316	-17	153.6	4.297
-16	148.5	4.277	-15	143.5	4.258	-14	138.8	4.219
-13	134.2	4.199	-12	129.8	4.180	-11	125.5	4.160
-10	121.4	4.141	-9	117.4	4.121	-8	113.6	4.082
-7	109.9	4.063	-6	106.4	4.043	-5	103.0	4.023
-4	99.66	3.984	-3	96.48	3.965	-2	93.40	3.945
-1	90.43	3.906	0	87.56	3.887	1	84.80	3.848
2	82.13	3.828	3	79.50	3.789	4	77.06	3.770
5	74.65	3.730	6	72.33	3.711	7	70.09	3.672
8	67.92	3.652	9	65.82	3.613	10	63.80	3.594
11	61.85	3.555	12	59.96	3.516	13	58.13	3.496
14	56.37	3.457	15	54.66	3.418	16	53.01	3.398
17	51.41	3.359	18	49.87	3.320	19	48.38	3.281
20	46.94	3.262	21	45.54	3.223	22	44.19	3.184
23	42.88	3.145	24	41.62	3.125	25	40.40	3.086
26	39.21	3.047	27	38.07	3.008	28	36.96	2.969
29	35.89	2.930	30	34.85	2.910	31	33.84	2.871
32	32.87	2.832	33	31.94	2.793	34	31.04	2.754

35	30.18	2.734	36	29.33	2.695	37	28.52	2.656
38	27.73	2.617	39	26.97	2.578	40	26.22	2.559
41	25.51	2.520	42	24.81	2.480	43	24.14	2.441
44	23.48	2.422	45	22.85	2.383	46	22.23	2.344
47	21.64	2.305	48	21.06	2.285	49	20.50	2.246
50	19.96	2.207	51	19.43	2.188	52	18.92	2.148
53	18.42	2.109	54	17.94	2.090	55	17.47	2.051
56	17.02	2.012	57	16.58	1.992	58	16.15	1.953
59	15.74	1.934	60	15.33	1.895	61	14.94	1.855
62	14.56	1.836	63	14.19	1.797	64	13.83	1.777
65	13.49	1.738	66	13.15	1.719	67	12.82	1.680
68	12.50	1.660	69	12.19	1.641	70	11.89	1.602
71	11.60	1.582	72	11.31	1.543	73	11.03	1.523
TEMP °F	**OHMs Rx1K**	**Volts DC +/-5%**	**TEMP °F**	**OHMs Rx1K**	**Volts DC +/-5%**	**TEMP °F**	**OHMs Rx1K**	**Volts DC +/-5%**
74	10.76	1.504	75	10.50	1.465	76	10.25	1.445
77	10.00	1.426	78	9.759	1.406	79	9.525	1.367
80	9.297	1.348	81	9.076	1.328	82	8.860	1.309
83	8.650	1.289	84	8.446	1.250	85	8.247	1.230
86	8.054	1.211	87	7.866	1.191	88	7.682	1.172
89	7.504	1.152	90	7.330	1.133	91	7.161	1.113
92	6.996	1.094	93	6.836	1.074	94	6.680	1.055
95	6.528	1.035	96	6.380	1.016	97	6.235	0.996
98	6.095	0.977	99	5.958	0.957	100	5.824	0.938
101	5.694	0.918	102	5.567	0.898	103	5.444	0.898
104	5.323	0.879	105	5.206	0.859	106	5.091	0.840
107	4.980	0.820	108	4.871	0.801	109	4.765	0.801
110	4.662	0.781	111	4.561	0.762	112	4.462	0.762
113	4.366	0.742	114	4.273	0.723	115	4.181	0.703
116	4.092	0.703	117	4.005	0.684	118	3.921	0.664
119	3.838	0.664	120	3.757	0.645	121	3.678	0.645
122	3.601	0.625	123	3.526	0.605	124	3.453	0.605
125	3.381	0.586	126	3.312	0.586	127	3.244	0.566
128	3.177	0.566	129	3.112	0.547	130	3.049	0.547
131	2.987	0.527	132	2.926	0.527	133	2.867	0.508
134	2.809	0.508	135	2.753	0.488	136	2.698	0.488
137	2.644	0.469	138	2.591	0.469	139	2.540	0.449
140	2.489	0.449	141	2.440	0.449	142	2.392	0.430
143	2.345	0.430	144	2.300	0.410	145	2.255	0.410
146	2.211	0.410	147	2.168	0.391	148	2.126	0.391
149	2.085	0.371	150	2.045	0.371	151	2.006	0.371
152	1.968	0.352	153	1.930	0.352	154	1.894	0.352
155	1.858	0.332	156	1.823	0.332	157	1.789	0.332
158	1.755	0.332						

2. **Test Supply Air Sensor and Return Air Sensor Inputs.** The voltages listed below are measured with power applied to the unit and the Supply Air Sensor (SAS) or Return Air Sensor (RAS) wired into the circuit. Voltages may be measured at the UEM, or at the connectors nearest the respective sensor. SAS is measured between UEM terminals J2-1 & J2-2, RAS is measured between UEM terminals J3-1 & J3-2.

The resistance values (OHMs) are measured with the sensor disconnected and isolated from the UEM. The resistance may be measured at the connectors nearest the sensor, or in the respective plug near the printed circuit board. The electrical values measured, directly correspond with a supply or return air temperature that is interpreted by the UCP.

Voyager III VAV Note:

This supply air sensor test is done at the UCP on terminals J7-11 and J7-16 (common).

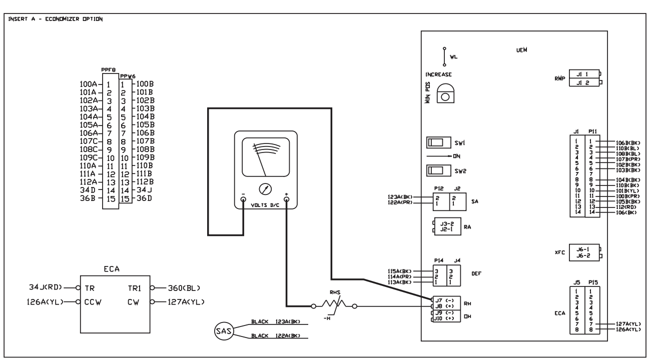
TEMP °F	OHMs Rx1K	Volts DC +/-5%	TEMP °F	OHMs Rx1K	Volts DC +/-5%	TEMP °F	OHMs Rx1K	Volts DC +/-5%
30	34.85	3.613	31	33.84	3.574	32	32.87	3.555
33	31.94	3.516	34	31.04	3.496	35	30.18	3.457
36	29.33	3.418	37	28.52	3.398	38	27.73	3.359
39	26.97	3.340	40	26.22	3.301	41	25.51	3.281
42	24.81	3.242	43	24.14	3.203	44	23.48	3.184
45	22.85	3.145	46	22.23	3.105	47	21.64	3.086
48	21.06	3.047	49	20.50	3.027	50	19.96	2.988
51	19.43	2.949	52	18.92	2.930	53	18.42	2.891

TEMP °F	OHMs Rx1K	Volts DC +/-5%	TEMP °F	OHMs Rx1K	Volts DC +/-5%	TEMP °F	OHMs Rx1K	Volts DC +/-5%
54	17.94	2.852	55	17.47	2.832	56	17.02	2.793
57	16.58	2.754	58	16.15	2.734	59	15.74	2.695
60	15.33	2.656	61	14.94	2.637	62	14.56	2.598
63	14.19	2.559	64	13.83	2.539	65	13.49	2.500
66	13.15	2.480	67	12.82	2.441	68	12.50	2.402
69	12.19	2.383	70	11.89	2.344	71	11.60	2.324
72	11.31	2.285	73	11.03	2.246	74	10.76	2.227
75	10.50	2.188	76	10.25	2.168	77	10.00	2.129
78	9.759	2.109	79	9.525	2.070	80	9.297	2.051
81	9.076	2.012	82	8.860	1.992	83	8.650	1.953
84	8.446	1.934	85	8.247	1.895	86	8.054	1.875
87	7.866	1.855	88	7.682	1.816	89	7.504	1.797
90	7.330	1.758	91	7.161	1.738	92	6.996	1.719
93	6.836	1.680	94	6.680	1.660	95	6.528	1.641
96	6.380	1.602	97	6.235	1.582	98	6.095	1.563
99	5.958	1.543	100	5.824	1.504	101	5.694	1.484
102	5.567	1.465	103	5.444	1.445	104	5.323	1.426
105	5.206	1.406	106	5.091	1.367	107	4.980	1.348
108	4.871	1.328	109	4.765	1.309	110	4.662	1.289
111	4.561	1.270	112	4.462	1.250	113	4.366	1.230
114	4.273	1.211	115	4.181	1.191	116	4.092	1.172
117	4.005	1.152	118	3.921	1.133	119	3.838	1.113
120	3.757	1.094	121	3.678	1.074	122	3.601	1.055
123	3.526	1.035	124	3.453	1.016	125	3.381	1.016
126	3.312	0.996	127	3.244	0.977	128	3.177	0.957
129	3.112	0.938	130	3.049	0.918	131	2.987	0.918
132	2.926	0.898	133	2.867	0.879	134	2.809	0.859
135	2.753	0.859	136	2.698	0.840	137	2.644	0.820
138	2.591	0.820	139	2.540	0.801	140	2.489	0.781
141	2.440	0.762	142	2.392	0.762	143	2.345	0.742
144	2.300	0.742	145	2.255	0.723	146	2.211	0.703
147	2.168	0.703	148	2.126	0.684	149	2.085	0.684
150	2.045	0.664	151	2.006	0.645	152	1.968	0.645
153	1.930	0.625	154	1.894	0.625	155	1.858	0.605
156	1.823	0.605	157	1.789	0.586	158	1.755	0.586
159	1.722	0.566	160	1.690	0.566	161	1.659	0.547

162	1.628	0.547	163	1.598	0.527	164	1.568	0.527
165	1.539	0.508	166	1.511	0.508	167	1.484	0.508
168	1.457	0.488	169	1.430	0.488	170	1.404	0.469

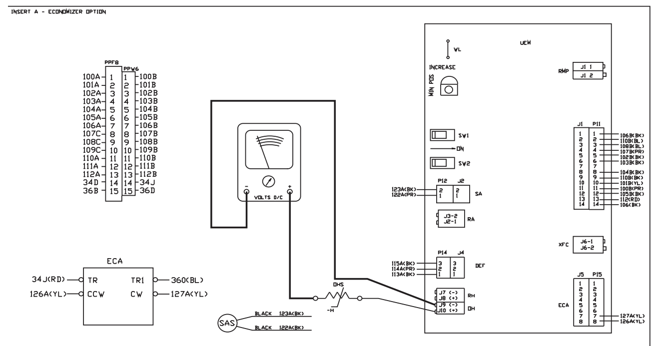
3. **Testing the Return Humidity Sensor (RHS)**. Locate terminals J7 (-) and J8 (+) on the UEM, marked RH on the side of the UEM board. Leave the sensor (if installed) connected to the UEM, and measure the operating current. The normal range for operating current is 4 to 20 mA (milliamps). Replace sensor if not within range (+/- 10 %).

Note: *The RHS is polarity sensitive, verify polarity is correct before condemning the sensor. Reversing polarity will not damage any of the controls, but the RHS will not work if the polarity is reversed.*



4. **Testing the Outdoor Humidity Sensor (OHS).** Locate terminals J9 (-) and J10 (+) on the UEM, marked OH on the side of the UEM board. Leave the sensor (if installed) connected to the UEM, and measure the operating current. The normal range for operating current is 4 to 20 mA (milliamps). Replace sensor if not within range (+ 10%).

Note: *The OHS is polarity sensitive, verify polarity is correct before condemning the sensor. Reversing polarity will not damage any of the controls, but the OHS will not work if the polarity is reversed.*



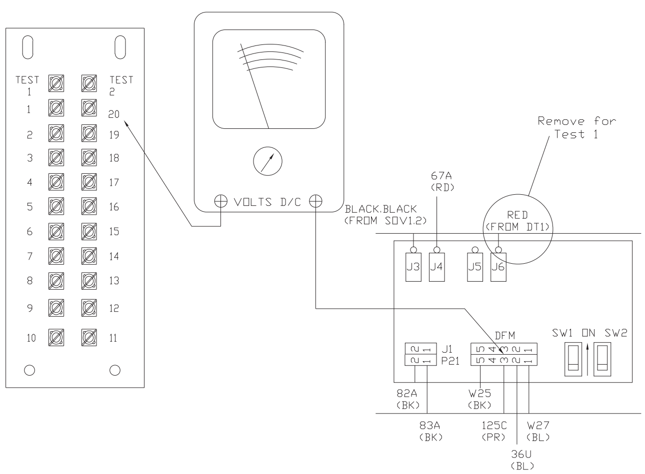
Testing the Defrost Module (10-20 Ton Heat Pumps only)

This series of tests can be conducted in any mode, as long as the UCP is powered up. **Test 1** simulates an open Defrost Termination Switch (DT), and verifies the integrity of the time interval switching circuit input. **Test 2** simulates a closed DT, and also verifies the integrity of the time interval switching circuit input. **Test 3** verifies the integrity of the Switch Over Valve (SOV) relay circuit.

Test 1: Simulates an open Defrost Termination Switch (DT)

Remove the (RED) wire from terminal number J6 on the DFM, to simulate an open DT condition. Measure the DC voltage between pin J2-3 and LTB-20 (**Note:** On equipment manufactured before 06/93 substitute LTB-16 for LTB-20), with the switches (SW1 and SW2) set in the positions below.

SW1	SW2	DT	Expected DC Volts	DC Volts Measured
OFF	OFF	OPEN	0.56 (+/- 5 %)	
ON	OFF	OPEN	0.54 (+/- 5 %)	
OFF	ON	OPEN	0.52 (+/- 5 %)	
ON	ON	OPEN	0.41 (+/- 5 %)	



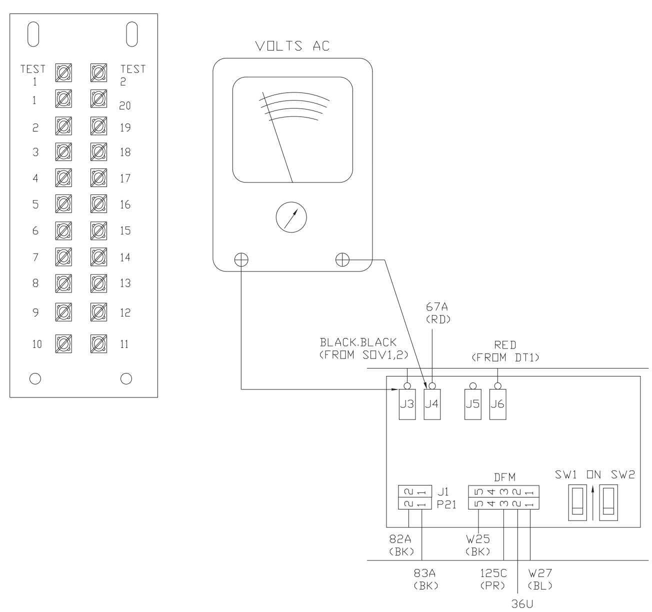
Test 2: Simulates a closed Defrost Termination Switch (DT)

Reconnect the (RED) wire to terminal number J6 on the DFM. Install a jumper from terminal J6 to LTB-17 **(Note**: On equipment manufactured before 06/93 substitute LTB-18 for LTB-17), to simulate a closed DT condition. Measure the DC voltage between pin J2-3 and LTB-20 (**Note:** On equipment manufactured before 06/93 substitute LTB-16 for LTB-20), with the switches (SW1 and SW2) set in the positions below.

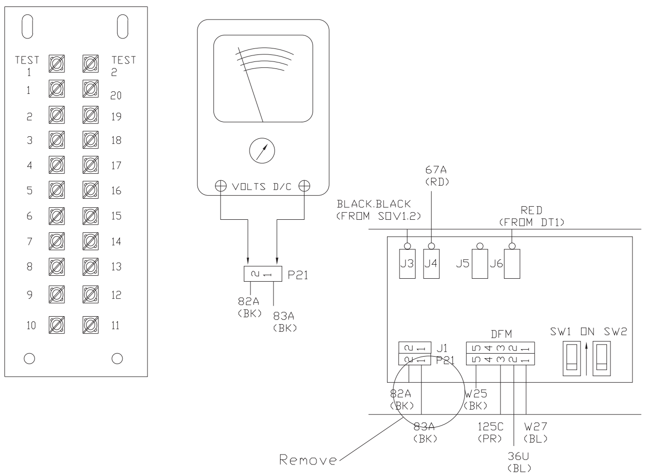
SW1	SW2	DT	Expected DC Volts	DC Volts Measured
OFF	OFF	CLOSED	3.34 (+/- 5 %)	
ON	OFF	CLOSED	2.88 (+/- 5 %)	
OFF	ON	CLOSED	2.39 (+/- 5 %)	
ON	ON	CLOSED	1.08 (+/- 5 %)	

Test 3: Testing the SOV Relay Circuit

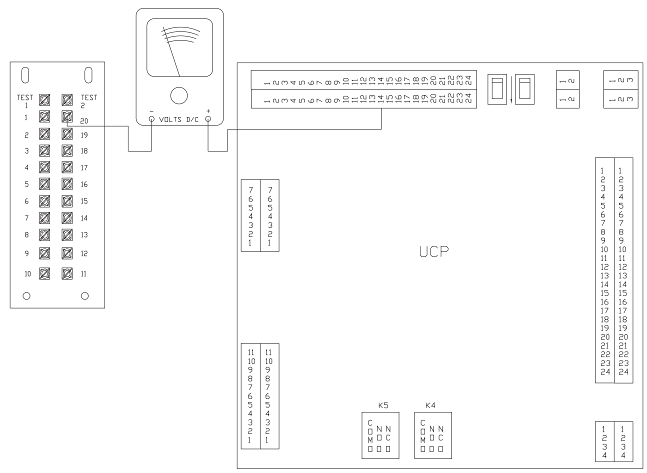
1. Place the unit in the Cooling or Defrost mode, so that the SOVs should be energized. Test for 24 VAC, with wires in place, between DFM terminals J3 and J4. If 24 VAC is not present, contacts should be closed, and SOVs should be energized. If SOVs are not energized test TNS3 transformer, a transformer failure may have occurred. If 24 VAC is present, K1 contacts are not closed, and SOVs will not be energized. Proceed to Step 2.



2. Test for K1 relay coil voltage, remove J1 on DFM. Test the J1 connector terminals for nominal 28 VDC. If voltage is present and K1 contacts were not closed in Step 1, DFM is defective, replace DFM. If 28 VDC is not present proceed to Step 3.



3. If 28 VDC was not present in Step 2, open unit disconnect switch. Locate J1 on the UCP. Connect positive meter lead to terminal J1-14, wire number 83A (BLACK). Connect negative meter lead to LTB- 20 (**Note:** On equipment manufactured before 06/93 substitute LTB-16 for LTB-20) screw terminal. Close the unit disconnect switch, and place the unit in the Cooling or Defrost mode so that the SOVs should be energized. Measure DC voltage between LTB-20 (**Note:** On equipment manufactured before 06/93 substitute LTB-16 for LTB-20) and J1-14. If 28 VDC is present, a wiring or terminal problem exists. If 28 VDC is not present, the UCP is defective, replace UCP.



Testing the Coil Temperature Sensor (Heat Pump 3-7.5 Ton)

The voltages listed below are measured with power applied to the unit and the Coil Temperature Sensor (CTS) wired into the circuit.

If there is no economizer measure the voltages at the Unitary Control Processor (UCP) terminals J2-15 & J2-17

If an economizer is installed measure the voltage at the Unitary Economizer Module (UEM) terminals J4-2 & J4-3

The resistance values (OHMs) are measured with the sensor disconnected and isolated from the UCP. The resistance may be measured at the connectors nearest the sensor, or in the respective plug near the printed circuit board. The electrical values measured directly correspond to the coil temperature interpreted by the UCP.

TEMP ºF	OHMs Rx1K	Volts DC+/-5%	TEMP ºF	OHMs Rx1K	Volts DC+/-5%	TEMP ºF	OHMs Rx1K	Volts DC+/-5%
-40	346.1	4.648	-39	333.5	4.468	-38	321.5	4.629
-37	310.0	4.609	-36	298.9	4.609	-35	288.3	4.590
-34	278.1	4.570	-33	268.3	4.570	-32	258.9	4.551
-31	249.9	4.531	-30	241.1	4.531	-29	232.7	4.512
-28	224.6	4.492	-27	216.8	4.473	-26	209.4	4.453
-25	202.2	4.434	-24	195.2	4.434	-23	188.6	4.414
-22	182.3	4.395	-21	176.0	4.375	-20	170.1	4.355
-19	164.4	4.336	-18	158.9	4.316	-17	153.6	4.297
-16	148.5	4.277	-15	143.5	4.258	-14	138.8	4.219
-13	134.2	4.199	-12	129.8	4.180	-11	125.5	4.160
-10	121.4	4.141	-9	117.4	4.121	-8	113.6	4.082
-7	109.9	4.063	-6	106.4	4.043	-5	103.0	4.023
-4	99.66	3.984	-3	96.48	3.965	-2	93.40	3.945
-1	90.43	3.906	0	87.56	3.887	1	84.80	3.848
2	82.13	3.828	3	79.50	3.789	4	77.06	3.770
5	74.65	3.730	6	72.33	3.711	7	70.09	3.672
8	67.92	3.652	9	65.82	3.613	10	63.80	3.594
11	61.85	3.555	12	59.96	3.516	13	58.13	3.496
14	56.37	3.457	15	54.66	3.418	16	53.01	3.398
17	51.41	3.359	18	49.87	3.320	19	48.38	3.281
20	46.94	3.262	21	45.54	3.223	22	44.19	3.184
23	42.88	3.145	24	41.62	3.125	25	40.40	3.086
26	39.21	3.047	27	38.07	3.008	28	36.96	2.969
29	35.89	2.930	30	34.85	2.910	31	33.84	2.871
32	32.87	2.832	33	31.94	2.793	34	31.04	2.754
35	30.18	2.734	36	29.33	2.695	37	28.52	2.656
38	27.73	2.617	39	26.97	2.578	40	26.22	2.559
41	25.51	2.520	42	24.81	2.480	43	24.14	2.441
44	23.48	2.422	45	22.85	2.383	46	22.23	2.344
47	21.64	2.305	48	21.06	2.285	49	20.50	2.246
50	19.96	2.207	51	19.43	2.188	52	18.92	2.148
53	18.42	2.109	54	17.94	2.090	55	17.47	2.051
56	17.02	2.012	57	16.58	1.992	58	16.15	1.953
59	15.74	1.934	60	15.33	1.895	61	14.94	1.855
62	14.56	1.836	63	14.19	1.797	64	13.83	1.777
65	13.49	1.738	66	13.15	1.719	67	12.82	1.680
68	12.50	1.660	69	12.19	1.641	70	11.89	1.602

TEMP ºF	OHMs Rx1K	Volts DC+/-5%	TEMP ºF	OHMs Rx1K	Volts DC+/-5%	TEMP ºF	OHMs Rx1K	Volts DC+/-5%
71	11.60	1.582	72	11.31	1.543	73	11.03	1.523
74	10.76	1.504	75	10.50	1.465	76	10.25	1.445
77	10.00	1.426	78	9.759	1.406	79	9.525	1.367
80	9.297	1.348	81	9.076	1.328	82	8.860	1.309
83	8.650	1.289	84	8.446	1.250	85	8.247	1.230
86	8.054	1.211	87	7.866	1.191	88	7.682	1.172
89	7.504	1.152	90	7.330	1.133	91	7.161	1.113
92	6.996	1.094	93	6.836	1.074	94	6.680	1.055
95	6.528	1.035	96	6.380	1.016	97	6.235	0.996
98	6.095	0.977	99	5.958	0.957	100	5.824	0.938
101	5.694	0.918	102	5.567	0.898	103	5.444	0.898
104	5.323	0.879	105	5.206	0.859	106	5.091	0.840
107	4.980	0.820	108	4.871	0.801	109	4.765	0.801
110	4.662	0.781	111	4.561	0.762	112	4.462	0.762
113	4.366	0.742	114	4.273	0.723	115	4.181	0.703
116	4.092	0.703	117	4.005	0.684	118	3.921	0.664
119	3.838	0.664	120	3.757	0.645	121	3.678	0.645
122	3.601	0.625	123	3.526	0.605	124	3.453	0.605
125	3.381	0.586	126	3.312	0.586	127	3.244	0.566
128	3.177	0.566	129	3.112	0.547	130	3.049	0.547
131	2.987	0.527	132	2.926	0.527	133	2.867	0.508
134	2.809	0.508	135	2.753	0.488	136	2.698	0.488
137	2.644	0.469	138	2.591	0.469	139	2.540	0.449
140	2.489	0.449	141	2.440	0.449	142	2.392	0.430
143	2.345	0.430	144	2.300	0.410	145	2.255	0.410
146	2.211	0.410	147	2.168	0.391	148	2.126	0.391
149	2.085	0.371	150	2.045	0.371	151	2.006	0.371
152	1.968	0.352	153	1.930	0.352	154	1.894	0.352
155	1.858	0.332	156	1.823	0.332	157	1.789	0.332
158	1.755	0.332						

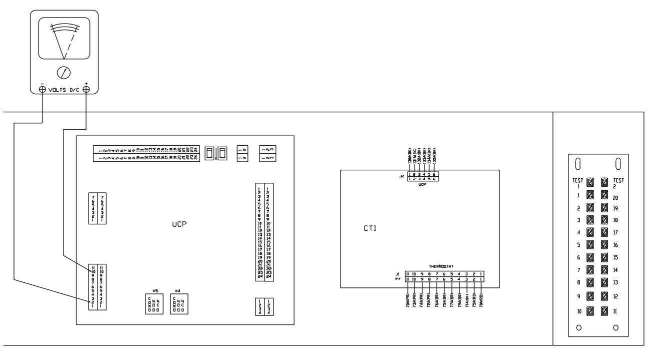
Testing The CTI (3-50 Ton CV only)

Important: *The 27.5-50 Ton VAV units can not be operated with a CTI.*

This series of tests allows you to verify CTI output to the UCP. **Test 1** verifies communication. **Test 2** will verify the Y1 & Y2 (cooling) outputs. **Test 3** will verify the W1, W2 &W (heating) outputs. **Test 4** will verify G & O (fan & reversing valve) outputs. Conduct the tests in numerical order until the problem is found.

Test 1: Testing UCP - CTI Communication

1. After checking the Room Thermostat, kill the unit power at the service disconnect, and remove the thermostat wires at the Low Voltage Terminal Board (LTB) on the unit.
2. Locate connector J7 on the UCP. Install meter leads between connector terminals J7-2 and J7-10. Reapply power, then measure the DC voltage. The DC voltage measured should flash approximately every 0.5 seconds. The voltage level should measure less than 0.8 VDC at the low end of the cycle, and greater than 2.5 VDC at the high end of the cycle.   If voltage does not flash, the CTI has failed; replace CTI.



Test 2: Testing the Compressor Stages Output

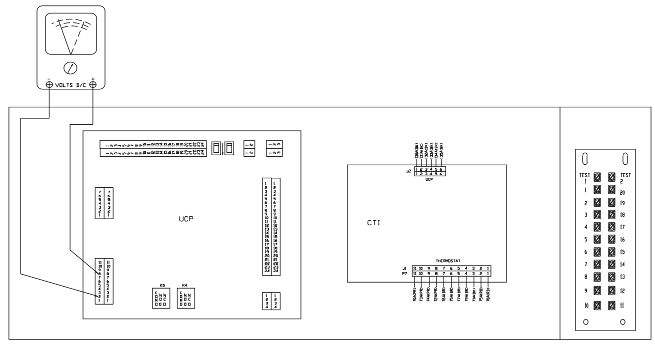
1. Kill the unit power at the service disconnect.
2. Locate connector J7 on the UCP. Install meter leads between connector terminals J7-2 and J7-8. Reapply power, and jumper LTB terminals as shown below to measure DC voltages.

Note: *If measured voltage is out of range, replace the CTI*

Terminals Jumpered		Expected DC Volts	DC Volts Measured
NONE		5.00 (+/- 5 %)	
LTB-14 to LTB-1	(Y1*)	3.71 (+/- 5 %)	
LTB-14 to LTB-4	(Y2*)	3.14 (+/- 5 %)	
LTB-14 to LTB-1 & 4	(Y1 + Y2)	2.58 (+/- 5 %)	

* On 2 compressor heat pumps in the heating mode, Y1 energizes both compressors (1st stage heating). In the cooling mode, Y1 energizes compressor #1, Y2 energizes compressor #2.

Note: *On equipment manufactured before 06/93 substitute LTB-15 for LTB-14.*



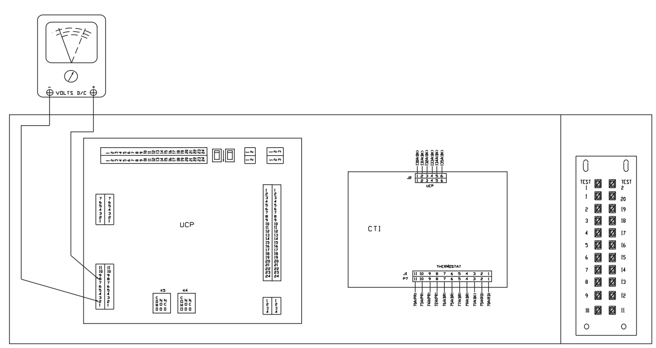
Test 3: Testing Heat Stages Output

1. Kill the unit power at the service disconnect.
2. Locate connector J7 on the UCP. Install meter leads between connector terminals J7-2 and J7--9. Reapply power, and jumper LTB terminals as shown below and measure DC voltages. If measured voltage is out of range, replace the CTI.

Terminals Jumpered		Expected DC Volts	DC Volts Measured
NONE		5.00 (+/- 5 %)	
LTB-14 to LTB-5	(WI)	2.80 (+/- 5 %)	
LTB-14 to LTB-3	(W2 or X2*)	3.71 (+/- 5 %)	
LTB-14 to LTB-9	(W*)	3.14 (+/- 5 %)	

* Heat pump only

Note: *On equipment manufactured before 06/93 substitute LTB-15 for LTB-14.*



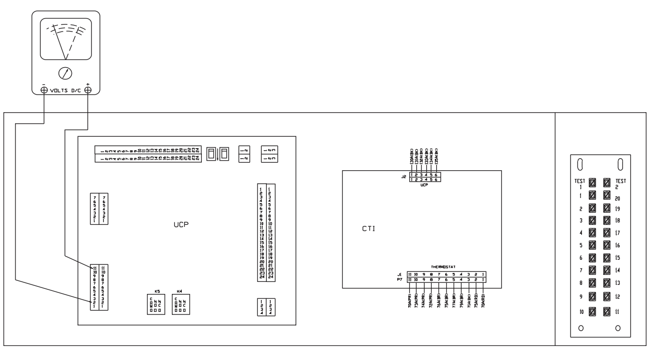
Test 4: Testing Fan & Reversing Valve* output

1. Kill the unit power at the service disconnect.
2. Locate connector J7 on the UCP. Install meter leads between connector terminals J7-2 and J7- 11. Reapply power, then jumper LTB terminals as shown below and measure DC voltages. If measured voltage is out of range, replace the CTI.

Terminals Jumpered		Expected DC Volts	DC Volts Measured
NONE		5.00 (+/- 5 %)	
LTB-14 to LTB-7	(G)	3.71 (+/- 5 %)	
LTB-14 to LTB-8	(O*)	3.14 (+/- 5 %)	
LTB-14 to LTB-7 & 8	(G + O*)	2.58 (+/- 5 %)	

*Heat pump only – “O” energizes the reversing valve in the cooling mode.

Note: *On equipment manufactured before 06/93 substitute LTB-15 for LTB-14.*



Testing the Exhaust Fan Set Point Panel (27.5-50 Ton)

1. Disconnect the two wires connected to terminals J1 and J2 on the Exhaust Fan Set Point Panel (EFSP) and remove the Set Point Panel from the unit.
2. Set the EFSP potentiometer on the panel to 50%.
3. Measure the resistance between terminals J1 and J2. If not approx. 500 ohms, replace the panel.
4. Reconnect wires and power unit. Read the DC voltage at J1 and J2, If voltage does not approximately match the chart below, look for a loose wiring connection between the exhaust fan set point panel and the UEM.

Exhaust Fan Setpoint

Setpoint (%)	Nominal Resistance (Ohms)	Nominal Voltage (VDC)
0	889	4.08
5	851	4.05
10	812	4.01
15	773	3.97
20	734	3.93
25	695	3.88
30	656	3.83
35	617	3.78
40	578	3.71
45	539	3.65
50	500	3.57
55	461	3.49
60	422	3.39
65	383	3.28
70	344	3.16
75	305	3.02
80	266	2.85
85	227	2.66
90	188	2.42
95	150	2.14
100	111	1.78

Unit Variable Air Volume Module (UVM) Test Procedures (27.5-50 Ton)

Test 1: Testing Inlet Guide Vane/Variable Frequency Drive (IGV/VFD) Output

1. Using the Test Mode, step the unit to the first test. Verify that 8.5 VDC is present between terminals J5-8 and J5-5 for IGVs or 10VDC for VFDs. If SW1 DIP switch on the UVM is in the wrong position the incorrect voltage will be seen. Set the DIP switch to the proper position, recycle power, then continue.
2. If the voltage is not present or is neither 8.5VDC or 10VDC, verify wires 160A and 160B are connected properly. Measure the voltage at J1-11 to ground. It should be pulsating between 5 VDC and 0VDC.
3. If the voltage to the IGV/VFD is still not present, verify that the remaining wires are properly connected between the UCP and the UVM. If Step 2 and Step 3 checkout and the voltage is still not present at the IGV/VFD output, replace the UVM.

Test 2: Testing the Static Pressure Transducer Input

1. With main power to the unit turned "Off", disconnect all of the tubing to the Static Pressure Transducer (SPT).
2. With the system MODE "Off", apply power to the unit and measure the voltage between J10 and J8 on the UVM. The voltage should be approximately 5 VDC. If not, check the wiring between the UCP and the UVM. If the wiring checks, replace UVM.
3. Measure the voltage between J9 and J8 on the UVM. The voltage should be approximately 0.25 VDC. If not, check the wiring between the UVM and the SPT. If the wiring checks replace the SPT.
4. Apply 2.0" w.c. pressure to the HI port on the SPT. Measure the voltage between J8 and J9. The voltage should be 1.75 (± .14) VDC. If not, replace the SPT.

Note: *The SPT plastic housing is susceptible to interference from VFDs. Make sure the SPT body is mounted on plastic standoffs and is not touching any sheet metal.*

Test 3: Testing UVM Sensor Inputs

1. With power applied to system, turn the ZSM MODE switch "Off".
2. **Testing the zone temperature sensor input.** Disconnect the P23 connector from the UVM. Measure the voltage between the J3-1 terminal and ground. The voltage should measure approximately 5 VDC. Now, measure the resistance between terminal P23-1 and ground. Measure the temperature at the zone sensor location. Verify the accuracy of the SAS. Replace the sensor if it is out of range.
3. **Testing the outdoor air sensor LC Input.** Disconnect the P22 connector from the UVM. Measure the voltage between terminals J2-1 and J2-2. The voltage should measure approximately 5 VDC. Now, measure the resistance between the two P22 terminals. Measure the temperature at the OAS location. Verify the accuracy of the OAS. Replace the sensor if it is out of range.

Test 4: Testing the VAV Set Point Input

1. With power applied to the system, turn the ZSM MODE switch to "Off".
2. **Reset Amount Input.** Disconnect the wire connected to the J7 terminal on the UVM. Measure the voltage between the J7 and J8 terminal. The voltage should measure approximately 5 VDC.
3. **Static Pressure Deadband.** Disconnect the P25 connector on the UVM. Measure the voltage between the J5-3 and J5-4 terminal. The voltage should measure approximately 5 VDC.
4. **Static Pressure Set Point.** Disconnect the wires connected to J11 and J12 on the UVM. Measure the voltage between the J11 and J12 terminal. The voltage should measure approximately 5 VDC.
5. **Morning Warm up Set Point.** Disconnect the P24 connector from the UVM. Measure the voltage between the J4-3 and J4-2 terminal. The voltage should measure approximately 5 VDC.
6. **Reset Set Point.** Disconnect the P7 connector from the UCP. Measure the voltage between the J7-9 terminal and Ground. The voltage should measure approximately 5 VDC.

Test 5: Testing the Inlet Guide Vane Actuator (IGVA)

1. Using the Test Mode procedure, measure the voltage between the (+) and (-) terminals on the actuator. The voltage should be 8.5 VDC. If not, check the wiring between the UVM and the IGV actuator. If the wiring checks, return to Test 1.
2. If the voltage above is present and the actuator is not opening, verify that 24 VAC is present between terminals T1 and T2. If the voltage is present, replace actuator.

Note: *The IGVA can manually be driven open by shorting the (F) terminal to either the (+) or (-) terminals. The IGVA will drive closed when the short is removed.*

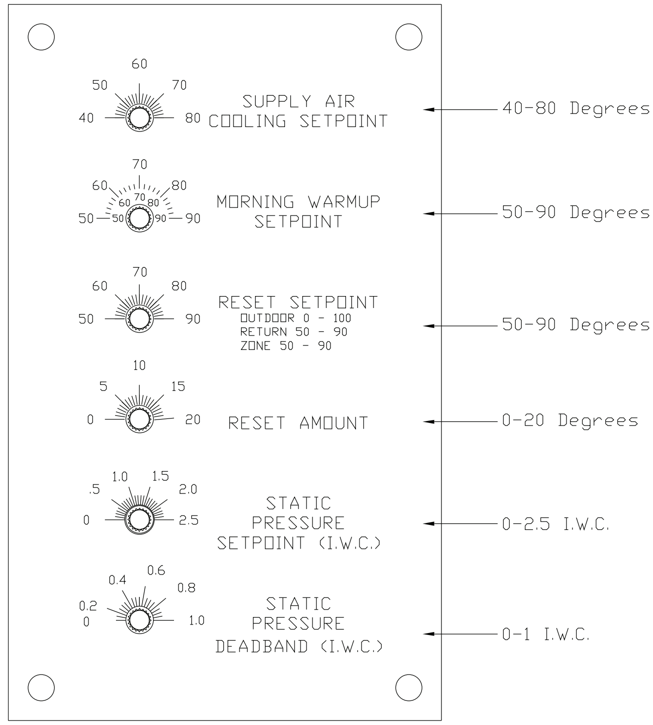
Test 6: Testing the VFD

1. Verify that the keypad in control box is powered. If not, check the power wires to the VFD and the Keypad cable.
2. Using the Test Mode, verify that the fan starts and the speed increases until the SA Pressure reaches the "Set Point" on VAV Set Point panel. If the fan does not start, check for "Fault Conditions" on the VFD Keypad.
3. If no "Fault Conditions" exist and the fan started but did not ramp up to speed, verify the "speed reference voltage" output from the UVM between terminals J5-8 and J5-5.
4. If no "Fault Conditions" exist and the fan did not start, verify that the Fan relay is energized and the VFD "Start Command" is properly wired from the Fan relay, (24 volts on the Logic Input 2 (LI2) terminal). Verify that the jumper between +24V and the LI1 terminal is properly connected.
5. Verify that 115 VAC is present from the transformer on the VFD assembly panel.

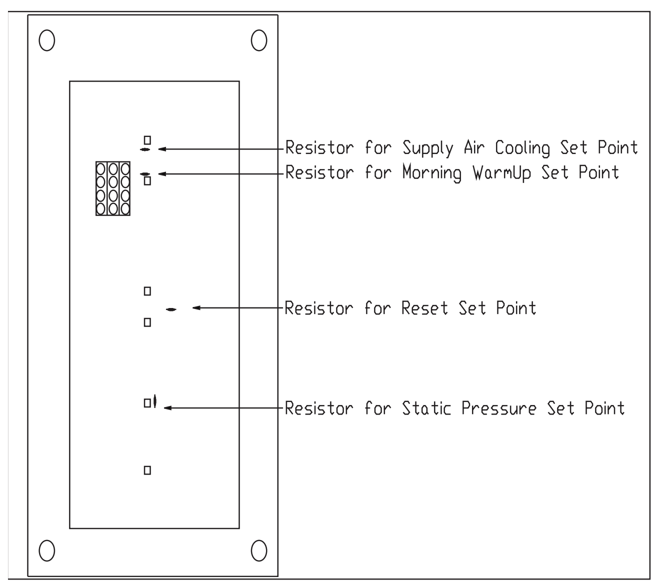
Test 7: Testing the VAV Set Point Panel

1. Disconnect the wiring from the VAV Set Point Panel and Remove it from the unit.
2. Supply Air Cooling Set Point. Measure the resistance between pins 1 and 2. The resistance range across the terminals is approximately 200 to 1200 ohms. At the 60° F Set Point setting, the resistance should be 695 (± 39) ohms.
3. Morning Warm-Up Set Point. Measure the resistance between pins 3 and 4. The resistance range across the terminals is approximately 000 to 1000 ohms. At the 70° F Set Point setting, the resistance should be 500 (± 39) ohms.
4. Reset Set Point. Measure the resistance between pins 7 and 8. The resistance range across the terminals is approximately 000 to 1000 ohms. At the 70° F Set Point setting, the resistance should be 500 (± 39) ohms.
5. Reset Amount. Measure the resistance between pins 5 and 6. a. The resistance range across the terminals is approximately 50 to 750 ohms. At the 10° F Set Point setting, the resistance should be 500 (± 39) ohms.
6. Static Pressure Set Point. Measure the resistance between pins 11 and 12. The resistance range across the terminals is approximately 80 to 780 ohms. At the 1.3" w.c. Set Point setting, the resistance should be 490 (± 28) ohms.
7. Static Pressure Deadband. Measure the resistance between pins 9 and 10. The resistance range across the terminals is approximately 000 to 1000 ohms. At the 0.5" w.c. Set Point setting, the resistance should be 500 (± 39) ohms.

Front of VAV Panel



Back of VAV Panel fix drawing



Supply Air Cooling Setpoint

Setpoint (Deg F)	Nominal Resistance (Ohms)	Nominal Voltage (VDC)
40	1084	2.60
41	1065	2.58
42	1045	2.56
43	1026	2.53
44	1006	2.51
45	987	2.48
46	967	2.46
47	948	2.43
48	928	2.41
49	909	2.38
50	889	2.35
51	870	2.33
52	850	2.30
53	831	2.27
54	812	2.24
55	792	2.21
56	773	2.18
57	753	2.15
58	734	2.12
59	714	2.08
60	695	2.05
61	675	2.02
62	656	1.98
63	636	1.94
64	617	1.91
65	597	1.87
66	578	1.83
67	558	1.79
68	539	1.75
69	519	1.71
70	500	1.67
71	481	1.62
72	461	1.58
73	442	1.53
74	422	1.48
75	403	1.44
76	383	1.39
77	364	1.33
78	344	1.28
79	325	1.23
80	305	1.17

Morning Warmup Setpoint

Setpoint (Deg F)	Nominal Resistance (Ohms)	Nominal Voltage (VDC)
50	889	2.35
51	870	2.33
52	850	2.30
53	831	2.27
54	812	2.24
55	792	2.21
56	773	2.18
57	753	2.15
58	734	2.12
59	714	2.08
60	695	2.05
61	675	2.02
62	656	1.98
63	636	1.94
64	617	1.91
65	597	1.87
66	578	1.83
67	558	1.79
68	539	1.75
69	519	1.71
70	500	1.67
71	481	1.62
72	461	1.58
73	442	1.53
74	422	1.48
75	403	1.44
76	383	1.39
77	364	1.33
78	344	1.28
79	325	1.23
80	305	1.17
81	286	1.11
82	266	1.05
83	247	0.99
84	227	0.93
85	208	0.86
86	188	0.79
87	169	0.72
88	150	0.65
89	130	0.58
90	111	0.50

Reset Setpoint

Return/Zone Setpoint (Deg F)	Outdoor Setpoint (Deg F)	Nominal Resistance (Ohms)	Nominal Voltage (VDC)
50	0	889	2.35
51	2.5	870	2.33
52	5	850	2.30
53	7.5	831	2.27
54	10	812	2.24
55	12.5	792	2.21
56	15	773	2.18
57	17.5	753	2.15
58	20	734	2.12
59	22.5	714	2.08
60	25	695	2.05
61	27.5	675	2.02
62	30	656	1.98
63	32.5	636	1.94
64	35	617	1.91
65	37.5	597	1.87
66	40	578	1.83
67	42.5	558	1.79
68	45	539	1.75
69	47.5	519	1.71
70	50	500	1.67
71	52.5	481	1.62
72	55	461	1.58
73	57.5	442	1.53
74	60	422	1.48
75	62.5	403	1.44
76	65	383	1.39
77	67.5	364	1.33
78	70	344	1.28
79	72.5	325	1.23
80	75	305	1.17
81	77.5	286	1.11
82	80	266	1.05
83	82.5	247	0.99
84	85	227	0.93
85	87.5	208	0.86
86	90	188	0.79
87	92.5	169	0.72
88	95	150	0.65
89	97.5	130	0.58
90	100	111	0.50

Reset Amount

Setpoint (Deg F)	Nominal Resistance (Ohms)	Nominal Voltage (VDC)
0	684	2.03
1	662	1.99
2	641	1.95
3	631	1.93
4	610	1.89
5	590	1.86
6	571	1.82
7	552	1.78
8	533	1.74
9	515	1.70
10	488	1.64
11	471	1.60
12	455	1.56
13	438	1.52
14	414	1.46
15	399	1.43
16	376	1.37
17	362	1.33
18	340	1.27
19	320	1.21
20	299	1.15

Static Pressure Setpoint (I.W.C.)

Setpoint (I.W.C.)	Nominal Resistance (Ohms)	Nominal Voltage (VDC)
0	743	2.13
0.1	724	2.10
0.2	704	2.07
0.3	685	2.03
0.4	665	2.00
0.5	646	1.96
0.6	626	1.93
0.7	607	1.89
0.8	587	1.85
0.9	568	1.81
1.0	548	1.77
1.1	529	1.73
1.2	509	1.69
1.3	490	1.64
1.4	470	1.60
1.5	451	1.55
1.6	431	1.51
1.7	412	1.46
1.8	393	1.41
1.9	373	1.36
2.0	354	1.31
2.1	334	1.25
2.2	315	1.20
2.3	295	1.14
2.4	276	1.08
2.5	256	1.02

Static Pressure Deadband (I.W.C.)

Setpoint (I.W.C.)	Nominal Resistance (Ohms)	Nominal Voltage (VDC)
0.2	753	2.15
0.25	707	2.07
0.3	662	1.99
0.35	620	1.91
0.4	590	1.86
0.45	542	1.76
0.5	506	1.68
0.55	463	1.58
0.6	430	1.50
0.65	384	1.39
0.7	347	1.29
0.75	306	1.17
0.8	274	1.07
0.85	225	0.92
0.9	180	0.76
0.95	138	0.61
1.0	103	0.47

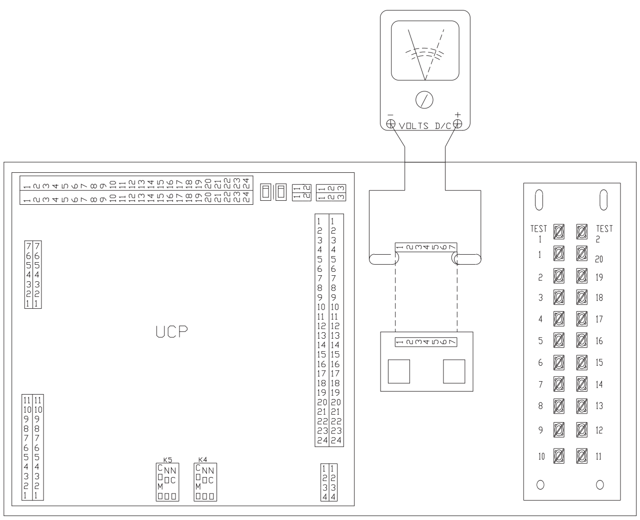
Testing The UCP / TCI Interface

This Test will allow you to determine whether a communication problem is a result of a failed UCP, or if an ICS Device / Communication Link problem exists. Complete the Test steps in numerical order, to locate the source of the problem.

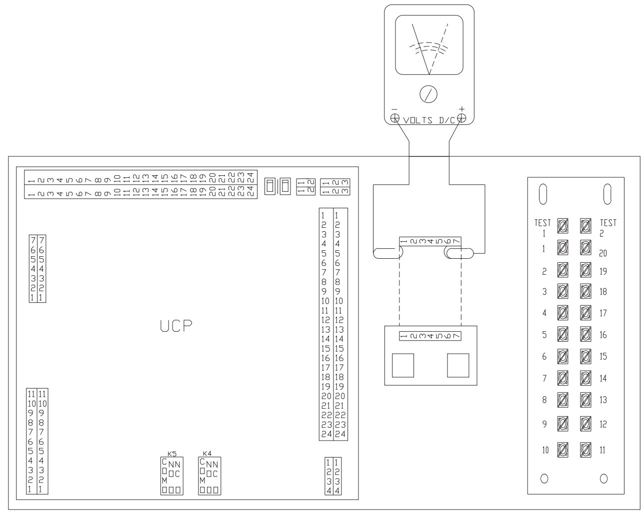
Test 1: Testing the UCP Output to the TCI

Note: *Prior to performing Test 1, Steps 1-6, verify that the cable, which connects the UCP to the TCI, is installed properly. Wire number 43A of the TCI cable should be on the far right hand side, closest to the dip switches, on the TCI connector junction J1. If it is not, disconnect both ends of the cable, and reinstall the cable connectors in reverse.*

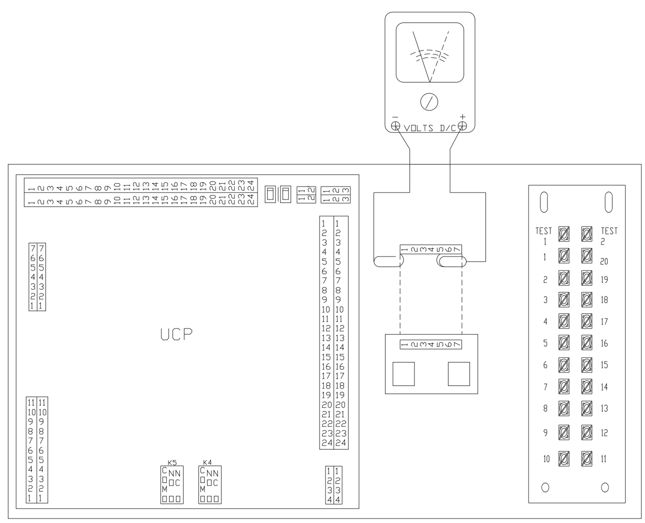
1. Remove plug connector J1 on the TCI. Measure AC voltage at disconnected plug between terminals J1-7, and J1-1. Voltage measured should be approximately 24 VAC. If 24 VAC is not present, test for voltage directly at UCP. Measure voltage at connector junction J6, between terminals J6-1 and J6-7. If 24 VAC is present, replace TCI cable. If 24 VAC is not present, replace UCP.



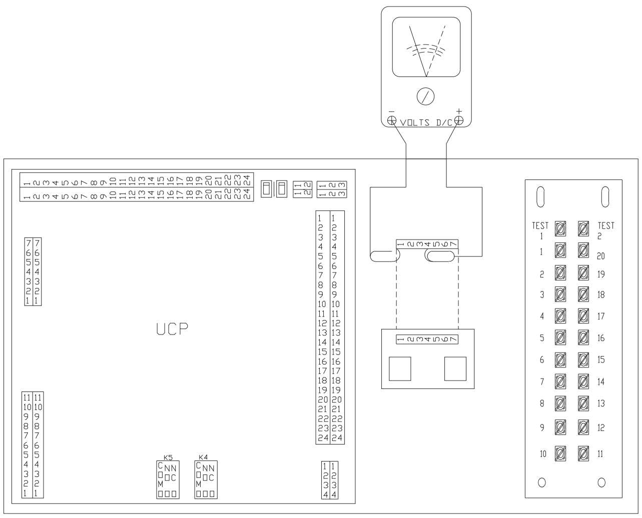
2. With plug connector J1 removed from the TCI. Measure DC voltage at disconnected plug between terminals J1-6, and J1-1. Voltage measured should be approximately 30 VDC. If 30 VDC is not present, test for voltage directly at UCP. Measure voltage at connector junction J6, between terminals J6-2 and J6-7. If 30 VDC is present, replace TCI cable. If 30 VDC is not present, replace UCP.



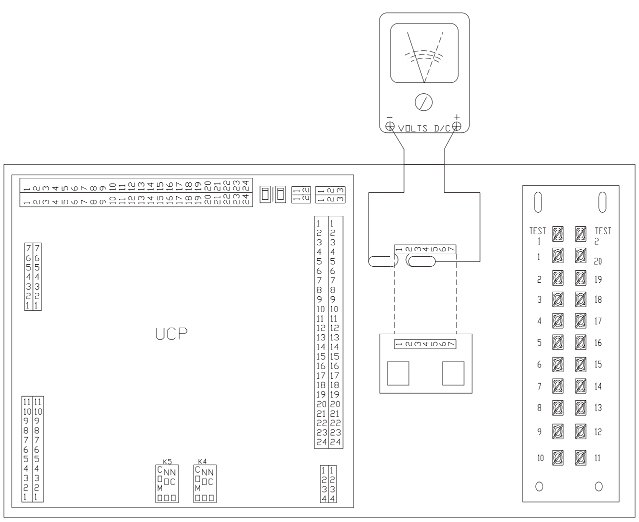
3. With plug J1 removed from the TCI, measure for DC voltage at the disconnected plug between terminals J1-5 and J1-1. Voltage measured will be either 4.67 +/ -0.25 vdc or zero vdc. If voltage measured is zero, then check the voltage between J1-3 and J1-1; voltage measured should be 4.67 vdc. If the voltage measured at J1-5 and J1-1 is 4.67 vdc , then the voltage at J1-3 and J1-1 should read zero volts. The voltage at J1-5 and J1-3 should always be the inverse of each other. If no voltage is measured at the plug, then measure the voltage at the UCP board between terminals J6-3 and J6-7, and J6-5 and J6-7. If proper voltage is found at terminals J6-3 or J6-5, replace the cable. If proper voltage is not found, replace the UCP.



4. With plug connector J1 removed from the TCI. Measure DC voltage at disconnected plug between terminals J1-4, and J1-1. Voltage measured should be approximately 5.0 VDC, +/- 0.25 VDC. If 5.0 (+/- 0.25) VDC is not present, test for voltage directly at UCP. measure voltage at connector junction J6, between terminals J6-4 and J6-7. If 5.0 (+/- 0.25) VDC is present, replace TCI cable. If 5.0 (+/- 0.25) VDC is not present, replace UCP.



5. With plug connector J1 removed from the TCI. Measure DC voltage at disconnected plug between terminals J1-2, and J1-1. Voltage measured should be approximately 30 VDC. If 30 VDC is not present, test for voltage directly at UCP. Measure voltage at connector junction J6, between terminals J6-6 and J6-7. If 30 VDC is present, replace TCI cable. If 30 VDC is not present, replace UCP. If after completing Test 1, Steps 1 through 6, and no problems are found, an ICS Device / Communication Link problem exists.



Erratic Unit Operation (3-25 ton)

Economizer wiring harness has conductor(s) shorted to ground:

There is a short piece of edge protector which ships with the economizer / motorized outside air damper accessory. The piece of edge protector is included in the plastic "bag of parts" which comes with the accessory. It is intended that the piece of edge protector be installed on any raw metal edge that the accessory wiring harness must be routed over.

Failure to install the edge protector can result in the raw metal edge slicing through the wiring harness, causing problems with equipment operation and the Test mode both. The problem may surface immediately, or it may become evident over time with equipment operational vibration.

Remove power from the equipment and inspect the accessory wiring harness where it passes over the metal, look for damage to the insulation on the conductors, repair conductors and protect them from further damage by isolating them from the metal.

Equipment wiring harness damaged in factory installation:

When the equipment wiring harness is installed in the unit, a portion of the wiring harness must be routed from the control box into the evaporator blower section. This section of the wiring harness is for the indoor fan motor, and economizer / motorized outside air accessory.

The wiring harness must pass through two bulkhead, or block off panels, before reaching the evaporator blower section. If the insulation on the conductors was damaged as the harness was installed, it may result in a conductor shorting to ground, causing problems with equipment operation and the Test mode both. The problem may surface immediately, or it may become evident over time with equipment operational vibration.

Remove power from the equipment and inspect the equipment wiring harness where it passes through each metal block off. Look for damage to the insulation on the conductors, repair conductors and protect them from further damage by isolating them from the metal.

A terminal backed out of the 15 pin polarized plug:

When the economizer / motorized outside air 15 pin male plug end, is connected to the equipment 15 pin female plug end, a terminal may back out of one of the plugs if it were not locked securely into the plug housing. If the polarized plug ends are not completely connected together, so that the locking mechanisms are properly engaged, the same symptoms may be exhibited. Another symptom that could be associated with this, is a complaint that the equipment arbitrarily enters the Test mode, without making physical contact with the equipment.

Remove power from the equipment and inspect the polarized plug assembly carefully to determine if the plug ends are properly engaged, or if a terminal has backed out of the plug housing. If either problem is noted, disconnect the plug ends and reseat the terminal in the plug making sure it locks into place (if necessary). Carefully re-connect the plug ends, ensuring they are properly engaged, and re-apply power to the equipment.

J4 or J5 on the UCP not wired or plugged in properly (3-50 ton):

If a problem exists in the J4 or J5 junction, located in the upper right hand corner of the Unitary Control Processor (UCP), all around erratic operation may occur.

Remove power from the equipment, and inspect the two plugs to ensure that they are properly located and seated. Verify that the two plugs are wired correctly, by checking the wiring against the equipment connection diagram.

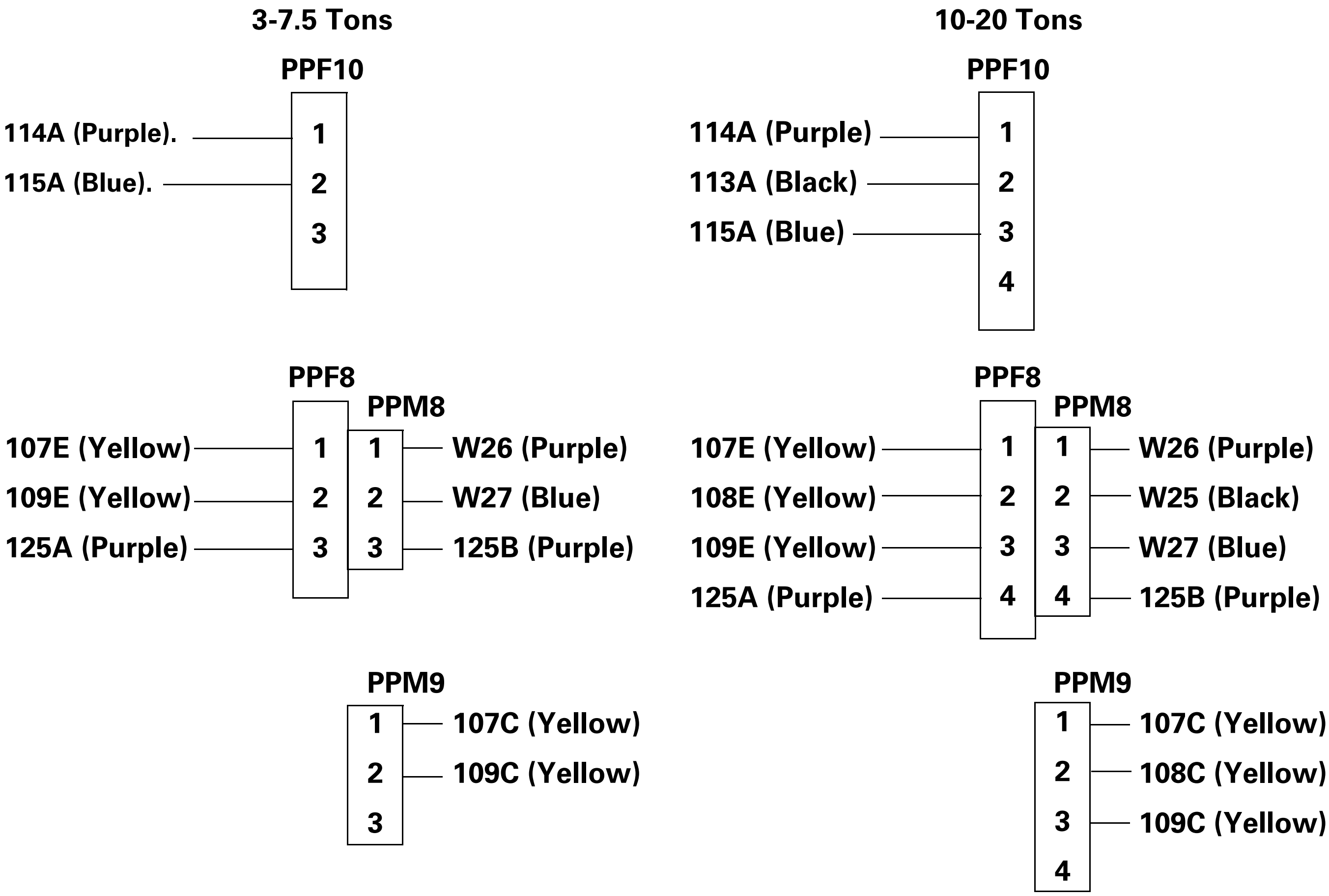
Note: *If the Test mode is initiated directly on the Unitary Control Processor (UCP) at the J4 (TEST) pins, the indoor motor will not operate when COOL 1 mode is entered, on dual circuit units.*

The polarized plugs are not configured properly on Heat Pump (3-20 ton):

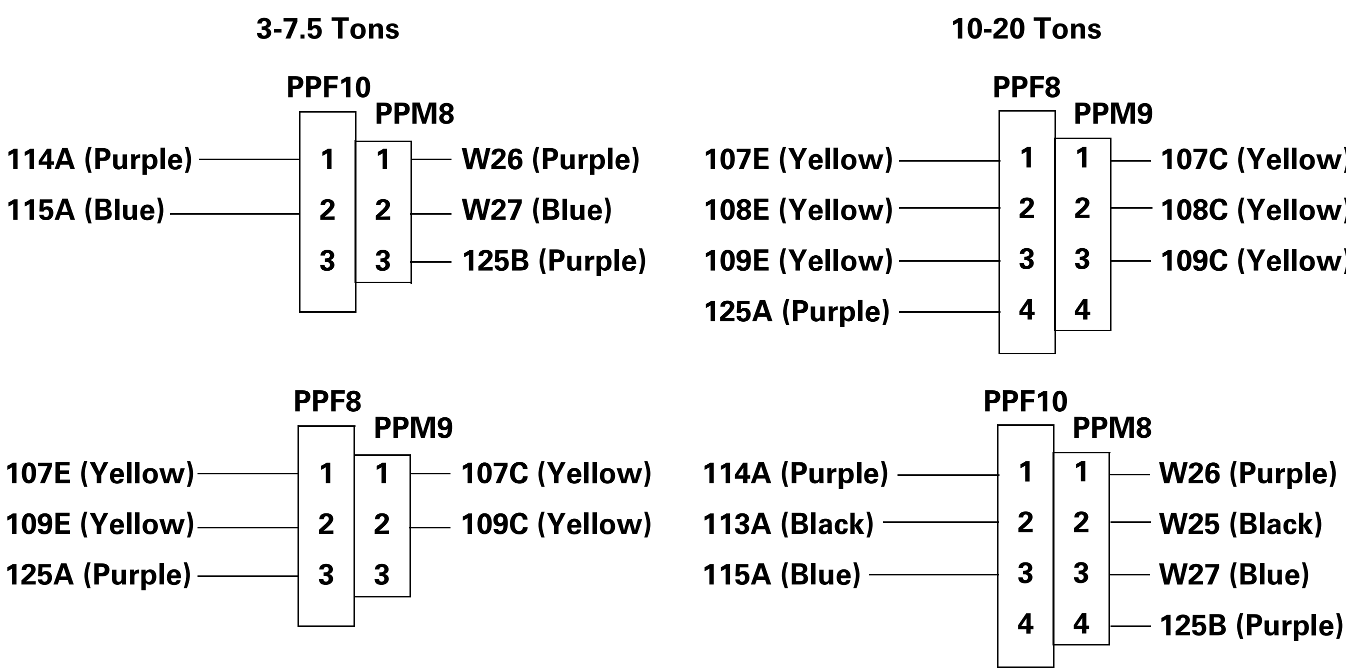
When an economizer, motorized outside air damper, or generic input/output module is installed, these plugs must be re-configured. If the polarized plugs (PPM8, PPF8, PPM9, and PPF10) in the unit control box are not configured properly, erratic operation can occur.

On 3-7.5 Ton equipment manufactured after 06/93, when the Test mode is entered, the indoor fan motor will run for 15 seconds, the fan motor will then turn "OFF", and the equipment will not do anything else.

On equipment with "*NO*" economizer or motorized outside air damper, the plugs should be configured as illustrated below.



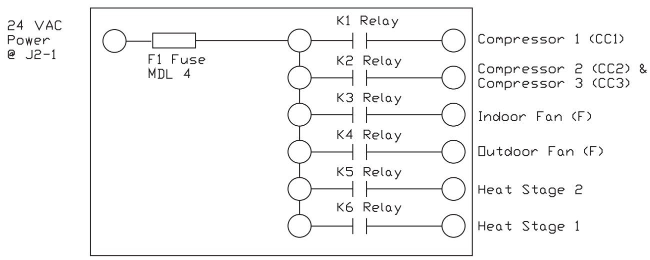
On equipment *with* an economizer, motorized outside air damper or BAYDIAG001A, the plugs should be configured as illustrated below



The Equipment Fails to Energize or De-Energize A Component

A UCP on board relay may have failed:

The weakest link on a printed circuit board, under normal operating conditions, is the on board electromechanical devices (primarily relays). These are the "only" moving parts on a printed circuit board. If a particular device in a piece of equipment will not turn "ON" or "OFF", some electrical measurements may be made to determine the source of the problem.



To determine the source of the problem, remove power from the equipment at the service disconnect, and utilize the system schematic diagram to determine where to install meter leads.

For devices that are not de-energized: An "Ohm meter" should be installed across the on board relay contacts, to determine if they are opening when power is removed from the equipment. A short circuit indicates the contacts are welded.

For devices that are not energized: An "AC volt meter" should be installed across the on board relay contacts, of the Unitary Control Processor (UCP) for that device.

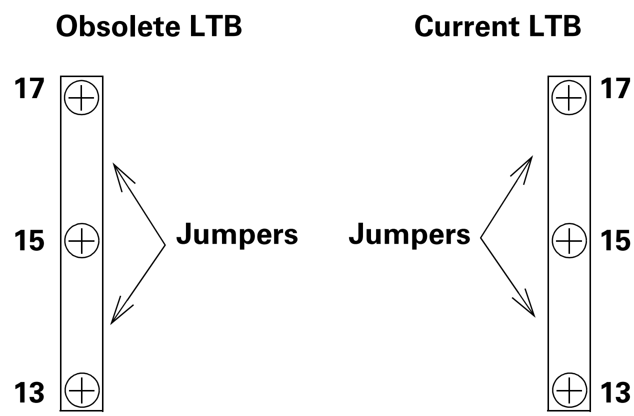
Re-apply power to the equipment, and operate the system in the suspect mode, to determine if the relay contacts are closing or not. A voltage potential of 24V AC indicates the contacts are not closing, zero potential indicates they are closed.

Brass jumpers for compressor disable input are loose, corroded or missing:

If the brass jumpers on the Low Voltage Terminal Board (LTB) are loose, corroded, or have been removed, the compressor(s) affected will not operate during normal operation, or in the Test mode.

Verify that the brass jumpers are intact, on equipment manufactured prior to 06/93 there should be two brass jumpers between terminals LTB-13, 15, and 17. On equipment manufactured after 06/93 there should be two brass jumpers between terminals LTB-13, 14, and 15. If the brass jumpers are intact, verify that the terminals are tight, and that they are not corroded. A voltage measurement may be made to verify that 24V AC is being applied to the compressor disable inputs. This is accomplished by measuring from terminal J2-2 to ground (CPR1 DISABLE), and from terminal J2-3 to ground (CPR2 DISABLE).

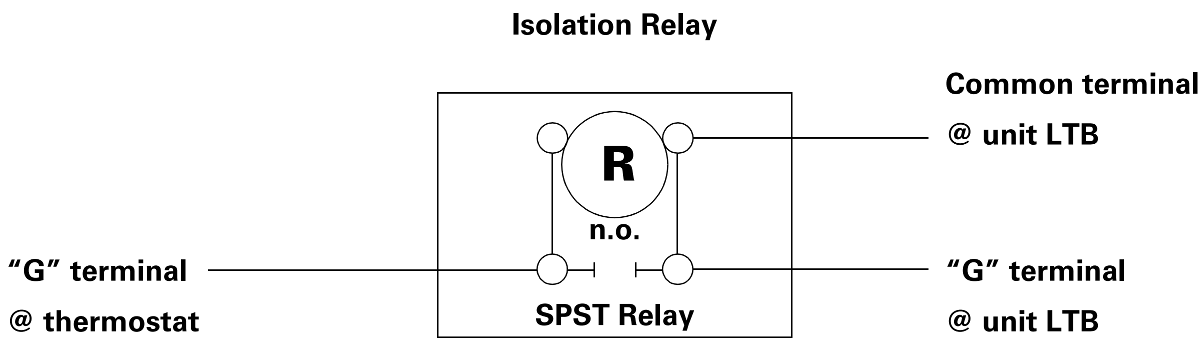
Note: *If the brass jumpers have been removed, and field installed wiring is connected to the LTB at those points, an external field mounted device may intentionally be keeping the compressor(s) from operating.*



Will Not Work With A CTI (Constant Volume only)

If the conventional thermostat interface (CTI) is disconnect, the low voltage terminal board (LTB) is jumpered, and the unit is operating; there may be excessive leakage current from an electronic/programmable thermostat, because the thermostat does not have dry contact closure relays. If enough leakage current passes through the thermostat being used, it can cause the microcontrol Voyager to operate (heat, cool, fan on, etc.), when it is supposed to be “OFF”. The maximum allowable leakage, before it is in the gray area where it may be interpreted as an “ON” state (or call), is 4V AC. To test for leakage, turn the thermostat “OFF”, so that there is no active call for any operation. Using a voltmeter, measure the AC voltage from each circuit (Y1, Y2, W1, W2, G etc.) to ground, for proper operation there should not be more than 4V AC. If there is more than 4V AC present, in any circuit, an isolation relay should be installed as illustrated below.

Note: *If you have a thermostat set where it is supposed to be cooling, and there is enough leakage current in the heat circuit, the Voyager will interpret the signals as a simultaneous call for heating and cooling. However, the microprocessor in the Voyager is programmed so that it will not allow simultaneous heating and cooling. The machine will sit idle and not operate at all, except in the test mode.*



Isolation Relay Example with Leakage Current in “G” Circuit

No Comm. between Integrated Comfort Systems (ICS) & Voyager

TCI-1 (Obsolete) is being utilized:

The Trane Communication Interface 1 (TCI-1) can be identified by the single red LED, located near the center of the printed circuit board.

The TCI-1 is capable of “isolated” communication only, which means that it will only support communication between Voyager and Tracer/Tracker/ComforTrac. The TCI-1 is not capable of supporting communication between a Voyager rooftop unit and Comfort Manager or VariTrac CCP. Trane Communications Interface 3 (TCI-3) would have to be installed, in order to establish communication between the Voyager and the CCP. TCI-3 has two LEDs (red and green), located on the bottom of the printed circuit board, between the two terminal blocks.

No communication between Voyager and VariTrac CCP:

If a Trane Communication Interface 3 (TCI-3) is being utilized, and no communication is taking place, verify that the board has been field converted for non-isolated communication. The TCI-3 board must be converted for communication with a VariTrac system.

If not in the non-isolated communication position, remove the four machine screws from the com link board, and then remove the com link board from the main printed circuit board. Rotate the com link board 90° counterclockwise, and re-install it, the com select arrow on the main printed circuit board should be pointing at “NON-ISOLATED COM3 OR COM4”. For further information, reference publication EMTX-IN-16 / 22-6041-01.

DIP switches on the TCI are set incorrectly (VariTrac):

If the DIP switches on the Trane Communication Interface 2 or 3 (TCI-2 or 3) are set incorrectly, communications will not be established between Voyager and VariTrac CCP or Comfort Manager.

There is only “one” correct setting for the DIP switches, switches 2 through 6 must all be “ON”. Switch number 1 must be in the “OFF” position, unless the accessory duct high temperature sensor input is being used.

The communication link is connected to VariTrac CCP incorrectly:

There are two sets of communication link terminals on the CCP, one set for establishing communication between CCP and an Integrated Comfort System (ICS) device (Tracer/Tracker), and one set for establishing communication between CCP and the zone damper Unit Control Modules (UCMs).

The Voyager communicates with CCP on the UCM communication link. The Voyager must be connected to CCP or Comfort Manager terminals TB2-1 & 2, marked “UCM”, or in a daisy chain with the zone damper UCMs. If the Voyager is connected to Comfort Manager terminals TB2-2 & 3, marked “ICS”, it will not communicate. The communication link will have to be relocated to the “UCM” terminals TB2-1 & 2, or connected in a daisy chain with the zone damper UCMs.

Note: *A Voyager Zone Sensor Module (ZSM) can be installed directly on the Voyager, so that in the event of a communication failure between Voyager and VariTrac, the Voyager would temporarily provide comfort for the zones.*

High Temperature input on TCI

If DIP switch number 1 on the TCI is set in the “ON” position, an accessory device must be installed across terminals TB2-1 & 2, or the Voyager equipment will not operate. If no such device is installed, dip switch number 1 must be in the off position.

If an accessory device (smoke detector contacts, duct high temperature sensor, etc.) is installed, and the circuit opens, the Voyager will completely shut down in 40 seconds. A diagnostic will also be communicated to the ICS Device, and will be displayed as “High temp input open”.

Note: ***3-25 Ton*** *– If a smoke detector connected to the Voyager unit on LTB-16 and LTB-17 opens, the diagnostic seen on the ICS device will be “Communication Down”.* ***27.5-50 Ton*** *– If a smoke detector connected to the Voyager unit on LTB1-16 and LTB1-17 opens the diagnostic seen on the ICS device will be “External Auto Stop”.*

TCI-2 (Obsolete) is being utilized:

The TCI-2 can be identified by a single printed circuit board having two LEDs (red and green), located on the bottom of the printed circuit board, between the two terminal blocks. The TCI-2 is capable of “non-isolated” communication only, which means that it will only support communication between Voyager and VariTrac CCP or Comfort Manager.

The TCI-2 is not capable of supporting communication between a Voyager rooftop unit and a Tracer/Tracker or ComforTrac.

A TCI-1 or 3 must be installed, in order to establish communication between the Voyager and Tracer/Tracker or ComforTrac.

The TCI-1 can be identified by the single red LED, located near the center of the printed circuit board. The TCI-3 can be identified by being a single printed circuit board, with a piggy back (satellite or daughter) com link board, and having two LEDs (red and green), located on the bottom of the printed circuit board between the two terminal blocks. The replacement for a TCI-1 or 2 is a TCI-3.

TCI-3 is being utilized, and Com Link board Non-isolated communication:

If a Trane Communication Interface 3 (TCI-3) is being utilized with a Tracer, Tracker, or Summit System, and no communication is taking place, verify whether or not the board has been field converted for non-isolated communication. If it has been, it will have to be converted back to support isolated communication. The TCI board does not need to be converted for communication to a Tracker or Tracer.

The com link board is attached to the main printed circuit board with four machine screws, remove these screws, and remove the com link board from the main printed circuit board. Rotate the com link board 90° clockwise, and re-install it, the com select arrow on the main printed circuit board should be pointing at “ISOLATED COM3”. For further information, reference publication EMTX-IN-16 / 22-6041-01.

DIP switches on the TCI are set incorrectly:

If the DIP switches on the Trane Communication Interface 1 or 3 (TCI-1 or 3) are set incorrectly, communications will not be established between Voyager and the Tracer, Tracker or ComforTrac. On multiple unit installations, each TCI must have its own unique address setting.

There are several correct settings for the DIP switches, for both Tracer and Tracker installations. To determine if a valid address is being utilized, remove power from the system at the equipment disconnect, and reference the respective device literature or TCI Installation Guide (EMTX-IN-16 / 22-6041-01).

An ICS component failure may have occurred:

After verifying that the correct Trane Communication Interface (TCI) has been installed, and a valid address is being utilized for the respective device, some other checks can be made to determine the source of the communication problem.

1. Start by removing power from the system, which is not communicating, and also from another nearby system, which is communicating, at their respective equipment disconnects.
2. 2. Remove the TCI from both systems, and exchange them, making sure to exchange the addresses also (so that we can keep the same “OLD” address with each respective unit). Restore power to both systems.
3. If both units communicate after this, then the first address setting on the non-communicating systems TCI was not working, the problem is solved.
4. If the problem followed the TCI, the TCI has failed and must be replaced.
5. If the non-communicating system will not communicate, and the communicating system continues to communicate, we will have to do more testing. The problem could be in the com link, the Integrated Comfort System (ICS) device, or the Unitary Control Processor (UCP).
6. Remove power from the two systems again at their respective equipment disconnects, and exchange the addresses of the two systems (the communicating one and the non-communicating one). Restore power to both systems.
7. If the non-communicating system begins to communicate, and the communicating system will not communicate, then the non-communicating address is a bad address in the ICS device. A new address, if available, will have to be selected. If a new address is not available, then the ICS device firmware or hardware will have to be replaced.
8. If the non-communicating system will not communicate, and the communicating system continues to communicate, we will have to do more testing. The problem could be in the com link, or the UCP.
9. Remove power from the two systems again at their respective equipment disconnects, and exchange the UCP of the two systems (the communicating one and the non-communicating one). Restore power to both systems.
10. If the non-communicating system begins to communicate, and the communicating system will not communicate, then the problem followed the UCP. Replace the UCP.
11. If the non-communicating system will not communicate, and the communicating system continues to communicate, there is a problem in the com link.

Sensors Fail And Return To Normal On An ICS Installation

Moisture on UEM has compromised integrity of conformal coating:

Water on the economizer / motorized outside air damper printed circuit boards will cause problems. The problem is typically transparent in stand alone applications, but is often evident on Integrated Comfort System (ICS) jobs, due to recurring sensor alarms. Sensors may even appear when they do not exist. This problem can affect all Voyager products 8.5 through 25 Tons, with the economizer / motorized outside air damper accessory, with a “B” in the 7th digit of the unit model number (F20 serial date code, May 1991, and later).

The failure of the Unitary Economizer Module (UEM), due to prolonged moisture contamination, may exhibit the following symptoms:

1. Erroneous / Erratic Sensor Failure Alarms (ICS jobs)
2. Erratic Economizer Damper Operation
3. No Economizer Operation

The source of the moisture is primarily rain water, as the board is located under the access cover on the fresh air hood. If the access cover is not tightly sealed, rain can leak into the hood, and onto the printed circuit board. The printed circuit board has a conformal (protective) coating for moisture protection. However, water dripping on the board is too severe and if it continues, the described problem will likely occur.

The conformal (protective) coating on the printed circuit board has been upgraded, a flow coating process is now in production, instead of a double spot coating. The printed circuit board must be replaced, with part number MOD-0145 or later. To further resolve the problem, the access cover on the fresh air hood has been revised. The long slots on the sides have been removed, and additional fastening screws have been added. This will help hold the access cover tightly against the gasketing around the cover, providing a water tight seal. A drip shield is also in place to cover and protect the board in case any water happens to get through. A bottom block off is also present to protect the board from any extremely high humidity conditions. To modify an existing piece of equipment in the field, either re-gasket around the access cover, or apply a sealer such as RTV silicone sealant. Next, add two additional screws to each side of the cover panel; this should insure a water tight seal.

Temperature Swings, Bounces between Heating and Cooling

A few microcontrol Voyager jobs have experienced excessive temperature swings in both the heating and cooling modes. Temperature swings reported and observed have been as large as plus and minus 3-3.5° F. (6-7° total). Temperature swings may occur when the unit is oversized for heating or cooling. The problem is worsened by a high number of required or consequential air changes. The high number of air changes may be a product of Indoor Air Quality (IAQ) related specifications, or they may be specific to a certain application (restaurant, meeting hall, etc.).

ZSM installation/location can accentuate zone temperature swings:

Temperature swings may be caused by selecting a less than desirable Zone Sensor Module (ZSM) location. A good sensor location is near the return air grille, on an inside wall, and not being subjected to or influenced by any hot or cold sources. Temperature swings can also be created by poor ZSM installation practices. Problems are frequently caused by failure to seal the wall penetration behind the sensor, or by installing locking covers over sensors. Sensors require adequate air flow to be able to respond to changing room temperatures. After identifying a zone temperature swing condition, verify the following:

1. Verify that the ZSM is located near a return air grille.
2. Verify that the ZSM is located on an inside wall.
3. Verify that the ZSM is not being subjected or influenced by a hot or cold source. (i.e. Coffee Maker, Vending Machine)
4. Verify that the wall penetration behind the ZSM has been properly sealed.
5. Verify that a locking thermostat cover has not been installed over the ZSM. If a locking cover has been installed it must be removed, or an alternate means (typically remote sensing) must be utilized.

Note: *If a programmable ZSM is being used (BAYSENS012A,BAYSENS018A,BAYSENS019A/B, BAYSENS020A/B, or BAYSENS023A), check to ensure that the internal thermistor is exposed in the gap between the ZSM and the sub base, and not tucked behind the ZSM housing, shielding it from air flow in the zone.*

After verifying and correcting any of the preceding ZSM related conditions, if the problem still persists, make the following adjustment to the heat anticipation setting: Open the service disconnect that supplies power to the equipment. There are two switches (SW1 and SW2) located in the upper right hand corner on the Unitary Control Processor (UCP). Put both of these switches in the "ON" position (push downward), this will change the heat cycle timing. These switches function similar to the heat anticipator in conventional thermostats.

On units built prior to 12/95, replacing the UCP with the current version will reduce the heating control loop from 90 seconds to 10 seconds, and there is *not* a minimum on time for the gas heat cycle.

Note: *Some earlier UCPs (BRD-0931, BRD-1007 & MOD-0143) force packaged Gas / Electrics (YCs) to have a four minute heating minimum on time. This will result in approximately three minutes of active heating run time, as approximately one minute is consumed by the ignition process. This four minute minimum on time is not present in MOD-0305 or later version. (See “Software Change History,” p. 124 for details on UCP changes.)*

Evaporator Coil Icing (3-25 ton)

Low ambient mechanical cooling with large quantities of outdoor air:

The Voyager line of products (3-25 ton) do not come equipped with expansion valves. Instead, short orifices and capillary tubes are utilized, they are fixed restriction type flow control devices. Icing of the evaporator coil may occur when mechanical cooling is utilized during low ambient conditions, and large quantities of outside air are introduced at the same time.

The Voyager line of products, applied with an economizer or motorized outside air damper accessory, are capable of introducing 0-50% outside air for minimum ventilation purposes. In standard comfort cooling applications, where nominal airflow is maintained, icing can be expected to occur if the entering air temperature at the evaporator coil drops below approximately 68° F. dry bulb / 57° F. wet bulb. Any time the suction temperature approaches 30 to 32° F. icing may occur.

Excessive amounts of bypass from discharge to return air intake:

There are several items that can cause undesirable bypass conditions in a system. A few of the more common ones are listed below:

1. The selection and installation of supply air diffusers, and their proximity to return air grilles.
2. Failure to properly install gasketing on a roofcurb.
3. The use of a field or custom manufactured curb.
4. The selection of a concentric duct package, and the installation practices utilized.
5. Using a bypass VAV zoning system that is not properly set up.

Icing can be expected to occur if the entering air temperature at the evaporator coil drops below approximately 68° F. dry bulb / 57° F. wet bulb. Any time the suction temperature approaches 30 to 32° F. icing may occur.

Operating mechanical cooling under low air flow, or low refrigerant charge:

The Voyager line of products have cataloged air flow as low as 20% under nominal system air flow, which equates to approximately 320 CFM per ton, with 400 CFM per ton nominal. The standard system with no accessories should not operate mechanical cooling at any conditions below the following outline, or coil icing may occur.

Air Flow: 320 CFM

Outdoor Ambient: 55 °F.

Entering Air: 68° F. db / 57° F. wb

When operating a Voyager system under low, or reduced refrigerant charge conditions, coil icing may occur when the suction temperature reaches approximately 30 to 32° F. The saturated suction pressure will be approximately 55 psig or less.

Operating equipment in a process application, with return air lower than 68°F:

When the Voyager products are applied on process cooling environment, like a warehouse. The zone cooling requirement may be 60 to 65° F. Once again we may be in a situation where the coil entering air conditions may be below 68° F. db / 57° F. wb. The evaporator coil will ice on a standard Voyager product with no accessories or field modifications.

Failure or removal of Outdoor Air Sensor (OAS):

If the standard Outdoor Air Sensor (OAS) on a Voyager product fails, or is removed to operate the system using the internal defaults, evaporator coil icing will occur during low ambient operation.

When the Outdoor Air Sensor (OAS) is removed, several functions are disabled: Condenser fan cycling (12.5-50 Ton), Evaporator Defrost Control (EDC) function (3-25 Ton), Economizer (3-50 Ton) if present.

Solutions To Evaporator Coil Icing (3-25 ton)

Installing a direct sensing evaporator defrost control (EDC):

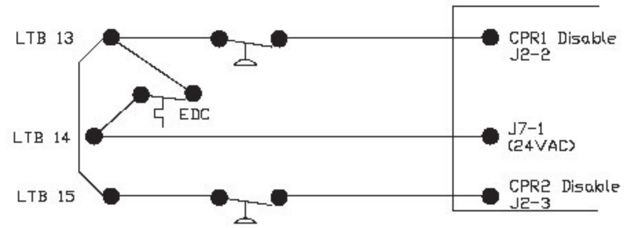
Since the Voyager products do not have a direct sensing means of keeping ice off of the evaporator coil, it may be necessary (in certain applications) to install an external, direct sensing Evaporator Defrost Control (EDC).

The accessory AY28X079 (SWT-0842) is a suitable choice for most applications. It opens on a temperature fall at 25° F. and closes on a temperature rise at 60° F. It comes with a 60” capillary tube, which is embedded in the face of the evaporator coil, and 2 - 60” electrical leads. A quantity of one EDC is all that is required to properly protect the equipment, as the voyager series of products have intertwined coils for the dual circuit machines.

The following is a list of applications and operating conditions where it is recommended that an EDC be installed:

1. Voyager / VariTrac installations (Low Air Flow/Bypass), or any zoning system using a bypass damper.
2. Voyagers with concentric duct packages (Bypass).
3. Low line voltage applications with 3-5 Ton Voyagers with direct drive motors (Low Air Flow).
4. High Latent heat load applications (Low Air Flow/Low Temperature Entering Air).
5. Applications with long duct runs, and large quantities of outside air (Low Air Flow/Low Temperature Entering Air).
6. Applications with fresh air requirements in excess of 25% (Low Temperature Entering Air), conditions at 68° F. db and 50% R.H.
7. Nominal air flow conditions (400 CFM/Ton), with entering air temperatures below 65° F., and ambients below 80° F.
8. Low air flow conditions (Below 320 CFM/Ton), with entering air conditions below 68° F. db and 50% R.H., and ambients below 80° F.
9. Air balance conducted with minimum fresh air required, and pressure drop through outside air damper is greater than original estimate.

Electrical Diagram For Installing An EDC In A Voyager System



Note: *Substitute LTB-15 for LTB-14 On Equipment Manufactured Prior To 06/93*

Modifying configuration of condenser fan cycling temps (12.5-25 Ton):

The modification of the condenser configuration provides some flexibility. However, caution should be exercised any time that a change like this is made. A change that resolves a problem at one operating condition, may cause a problem at another.

The configuration inputs are set to cycle condenser fan motor #2 “OFF”, when the outdoor temperature drops below 60° F.

When an application with low air flow drives the suction pressure down, it may be permissible to change the configuration to cycle condenser fan #2 “OFF”, when the outdoor temperature drops below 70° F. This would drive the discharge and suction pressures up. When an application with restricted condenser air flow drives the discharge pressure up, it may be permissible to change the configuration to cycle condenser fan #2 “OFF”, when the outdoor temperature drops below 50° F. This would aid in keeping the discharge pressure down.

Condenser Fan Cycling Configuration (Outdoor Temperature At Which ODF2 Will Cycle Off If Present)

Outdoor Temp. (°F.)	**Input J2-5**	**Input J2-6**	**Input J2-7**
80 Degrees	GND	GND	GND
70 Degrees	GND	GND	OPEN
60 Degrees	GND	OPEN	GND
50 Degrees	GND	OPEN	OPEN
40 Degrees	OPEN	GND	GND
30 Degrees	OPEN	GND	OPEN
20 Degrees	OPEN	OPEN	GND
Continuous	OPEN	OPEN	OPEN

Ground = This Input Must Be Connected To J4-2.
Open = This Input Must Be Open, No Connection.

Installing a head pressure control device to modulate condenser fan speed:

A head pressure control device is typically installed in applications with a high internal heat gain, because 100% of equipment mechanical cooling capacity is required year round. Some of these applications are as follows:

1. Telephone switch gear room
2. Computer room
3. Printing processes
4. Photographic development processes
5. Generic manufacturing process cooling

The low ambient kits which are utilized with the mid-range Odyssey split systems (7.5-20 Ton) from Ft. Smith, can be use in the Voyager products. They include the Hoffman 816-10DS head pressure control and a ball bearing motor.

Note: *There are no head pressure control kits for Voyager products below 5 Tons. Contact Light Commercial Applications Whenever A Head Pressure Control Device Is Required On A Voyager Product*

Installing hot gas bypass, liquid injection type:

Hot gas bypass is applied in special applications only, typically in zones introducing large quantities of outside air, or in zones using discharge air control. It may also be used in applications where the mechanical cooling capacity of the equipment is modulated to meet the varying load requirements of a zone, such as churches, and theaters.

The liquid injection hot gas bypass kits which are utilized with the mid range Odyssey split systems (7.5-20 Ton) from Ft. Smith, can be used in the Voyager products. They include pre-piped assemblies consisting of the hot gas bypass valve, de-superheating valve, and discharge line service valve for ease of installation.

The installers guide for the hot gas bypass kits have detailed piping diagrams of the respective split system models that they are applied with. There are no detailed instructions or diagrams pertaining to installation in, or applications with Voyager rooftop units. The installing contractor must be creative, and use the installation instructions for conceptual purposes only, as the kits are pre-piped for installation in the mid range split systems.

The hot gas bypass valve is preset to maintain a minimum suction pressure of approximately 55 psig. These hot gas bypass kits should not be installed on any circuit 4 tons and under.

Contact Light Commercial Applications Whenever Hot Gas Bypass Is Required On A Voyager Product.

Installing hot gas bypass, bypass to evaporator inlet:

If hot gas bypass to the evaporator inlet must be accomplished on a Voyager rooftop unit, there are several modifications and considerations.

Bypass to the evaporator inlet requires that the system being modified utilizes a TXV. Since the Voyager series of rooftops (3-25 tons) do not use TXVs as the flow control device, the capillary tubes (or short orifices whichever is applicable) must be removed and the system must be retrofitted with a TXV, Distributor, Distributor Nozzle, and Distributor Tubes.

No application bulletin regarding this type of retrofit exists. All aspects of the conversion to a TXV and selection of Distributor Nozzle sizing must be accomplished in the field. For more detailed instructions and information regarding hot gas bypass application and installation, reference the Trane: Reciprocating Refrigeration Manual.

Contact Light Commercial Applications Whenever Hot Gas Bypass Is Required On A Voyager Product.

Conditions Which Can Cause Incomplete Heat Pump Defrost

OAS out of calibration/mis-located (Demand Defrost 3-7.5 Ton):

If the Outdoor Air Sensor (OAS) is out of calibration or mis-located, the microprocessor may interpret the outdoor air temperature to be warmer or colder than it actually is. This would have a direct impact on the defrost initiation and termination points.

The accuracy of the sensor may be determined by disconnecting it from the system, and checking the calibration accuracy in an ice bath. The resistive value of the sensor should equal approximately 32° F. (32.9 K ohms). If an ice bath is not available, measure the resistive value of the sensor and the ambient temperature at the sensor, and verify the correlation of the two values. The sensor accuracy should be +/- 10%.

CTS out of calibration/mis-located (Demand Defrost 3-7.5 Ton):

If the Coil Temperature Sensor (CTS) is out of calibration or mis-located, the microprocessor may interpret the outdoor coil temperature to be warmer or colder than it actually is. This would have a direct impact on the defrost initiation and termination points also.

The accuracy of the sensor may be determined by disconnecting it from the system, and checking the calibration accuracy in an ice bath. The resistive value of the sensor should equal approximately 32° F. (32.9 K ohms). If an ice bath is not available, measure the resistive value of the sensor and the ambient temperature at the sensor, and verify the correlation of the two values. The sensor accuracy should be +/- 10%.

The Coil Temperature Sensor (CTS) is located in the same place on the 3-7.5 Ton equipment. It is located in a well (3/8" copper tube), which is brazed to the lowest circuit entering the outdoor coil, during the heating mode.

DT out of calibration/mis-located (Time/Temp. Defrost 10-20 Ton):

The Defrost Temperature switch (DT) is a bi-metal switch as opposed to a thermistor sensor. The switch should close on a temperature fall at 26° F., and open on a temperature rise at 66° F.

The Defrost Temperature switch is a little more difficult to test for calibration accuracy than a thermistor. The accuracy of the switch may be determined by disconnecting it from the system, and checking the calibration accuracy in a freezer. The probe from a digital thermometer should be affixed to the sensing portion of the switch, and the switch and the probe insulated together. The switch should close at approximately 26° F., when removed from the freezer the switch should open when the temperature rises to approximately 66° F.

The Defrost Termination switch (DT) is located in the same place on the 10-20 Ton equipment. It is located on the tube, which feeds the bottom circuit of the outdoor coil, during the heating mode. The switch is located on compressor bearing circuit #1.

UCP F1 fuse or TNS1 transformer over current device blows (3-25)

All 24VAC circuits that leave the UCP are protected by both the UCP's F1 fuse, and the TNS1 transformer over-current device.

If a problem arises that causes either of these two devices to blow or trip, the problem will be in one of **8** particular places. To begin the problem location process, remove power from the system at the equipment disconnect. Then, disconnect all plugs from the UCP. Test 4 measurement is at the pin on the UCP. The rest are done on the disconnected harness.

The circuits and devices (some do not apply) associated, and procedures for locating the problem are outlined below.

Look at "UCP Pin Descriptions & Voltages 3-25 Ton," p. 112 and the unit's Service Facts to help identify the connections listed below.

1. **Indoor fan contactor coil or electric heat section shorted or grounded:** Locate terminal **J2-22**, and measure the resistance from J2-22 to ground. If a direct short is present, there is a problem in this circuit, in the indoor fan contactor coil, or the wiring that powers the electric heater contactor circuit. If a direct short is not present, there is no problem in this circuit.
2. **Compressor contactor coil(s) shorted or grounded:** Locate terminal **J8-1**, and measure the resistance to ground. On 2 compressor units locate terminal J8-4, and measure the resistance to ground. If a direct short is present in either circuit, a problem exists in the circuit, the wire, or the compressor contactor. If a direct short is not present, no problem exists in either circuit.
3. **UEM humidity sensor power supply shorted or grounded:** Locate terminal **J2-20**, and measure the resistance to ground. If a direct short is present, there is a problem in this circuit, in the wire itself, or in the UEM. If a direct short is not present, there is no problem in this circuit.
4. **UCP on-board power supply shorted or grounded:** Locate pin **J2-1**, and measure the resistance to ground. If a direct short is present, a problem exists in the circuit. Replace the UCP. If a direct short is not present, no problem exists in this circuit.

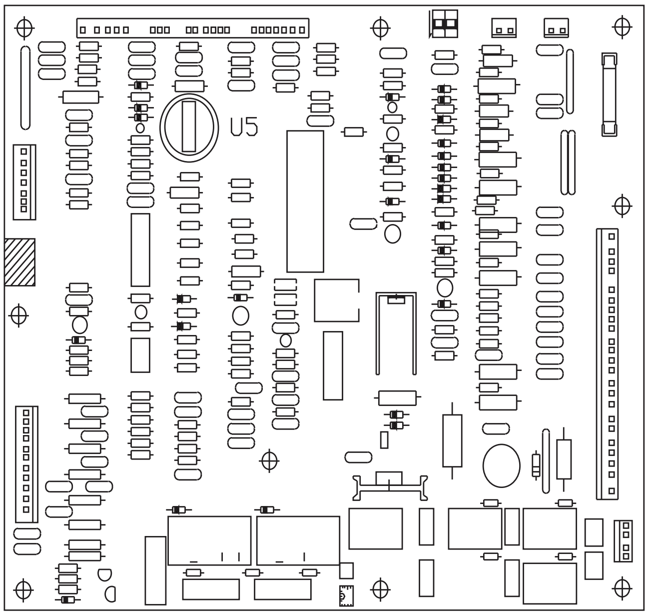
Note: *An alternative method is to remove all plugs from the UCP, except terminal J2-1 by rotating the plug 90° ccw and making a single connection to J2-1. If no problem is observed, connect the entire J2 plug. Continue adding plugs one at a time, until the problem surfaces to be isolated and diagnosed.*

5. **TCO 2 (gas heat) or SOV coil (heat pump) shorted or grounded**: Locate terminal **J5-3** and measure the resistance to ground. If a direct short is present, a problem exists in the circuit, the wire, or the gas heat or switchover valve circuit. If a direct short is not present, no problem exists in this circuit.
6. **TCI power supply or hi-temp input shorted or grounded:** If a TCI is installed, locate the plug associated with this junction. Locate terminal **J6-1**, and measure the resistance to ground. If a direct short is present, a problem exists in the high temperature input circuit, the wire harness, or the TCI. If a direct short is not present, there is no problem in this circuit.
7. **Gas heat ignition board or electric heat strip coil has shorted or grounded:** Locate terminal **J1-22**, and measure the resistance to ground. If a direct short is present there is a problem in this circuit, the wire itself, or the ignition board / heat strip contactor. If a direct short is not present, there is no problem in this portion of the circuit.
8. **LTB 14 / 13 / 15 could be shorted or grounded:** Locate terminal **J7-1**, and measure the resistance to ground. If a direct short is present, there is a problem in this circuit, in the wire itself, or in the CTI, if present. If a direct short is not present, there is no problem in this circuit.

Multiple UCP U5 Chip Failures

The U5 chip illustrated below, is a 29V DC relay driver that is used to energize off board relays and the Zone Sensor Module (ZSM) LEDs. This chip will fail if AC voltage is applied to one of its outputs, or if an output is grounded or over powered.

Multiple Unitary Control Processor (UCP) U5 Chip Failures



Factory or Field mis-wire of AC voltage to U5 chip:

A factory or field mis-wire, or arbitrary jumpering of the terminals at the LTB may result in the accidental application of 24V AC to one of U5s 29V DC outputs. If this occurs, the negative half wave of the AC voltage will fail the U5 chip. A failed chip can be easily identified; a piece of the chip may be missing (looks like a crater in the chip), or a bubble or crack will appear in the chip.

Replacing defrost or condenser fan DC relays with AC coils:

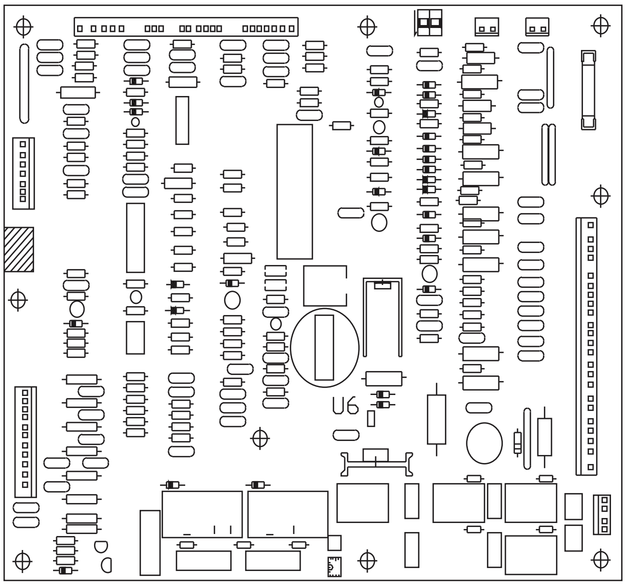
The coil is *24VDC*, not 24VAC. If AC relay coils are applied on these DC circuits, without modifications, it will ultimately fail the U5 chip and the relay. The relay coil will overheat and the wire insulation will burn off, causing the coil to short, pulling excessive current (over powering the output) and eventually causing complete failure. If U5 chip failures occur, check for wiring errors, both field and factory at the LTB.

Note: *It is not apparent in the equipment electrical wiring diagrams or functional unit parts list as to what the coil voltage may be on a particular relay.*

Multiple UCP U6 Chip Failures

The U6 chip illustrated below is a 29VDC relay driver that is used to energize on board and off board relays. This chip will fail if an output is grounded or over powered.

Multiple Unitary Control Processor (UCP) U6 Chip Failures



Failure to install edge protector on a raw metal edge (Voyager 3-25):

There is a short piece of edge protector which ships with every economizer/motorized outside air damper accessory. The piece of edge protector is included in the plastic "bag of parts" which comes with the accessory. It is intended that the piece of edge protector be installed on any raw metal edge that the accessory wiring harness must be routed over. Failure to install the edge protector, can result in the raw metal edge slicing through the wiring harness. The problem may surface immediately, or it may become evident over time with equipment operational vibration. Remove power from the equipment and inspect the accessory wiring harness where it passes over metal, look for damage to the insulation on the conductors, repair conductors and protect them from further damage by isolating them from the metal.

Wiring harness damaged in factory or field installation:

When the equipment wiring harness is installed in the unit, a portion of the wiring harness must be routed from the control box into the evaporator blower section. This section of the wiring harness is for the indoor fan motor, and economizer / motorized outside air accessory. The wiring harness must pass through two bulkhead, or block off panels, before reaching the evaporator blower section. If the insulation on the conductors was damaged as the harness was installed, it may result in a conductor shorting to ground. The problem may surface immediately, or it may become evident over time with equipment operational vibration. Remove power from the equipment and inspect the equipment wiring harness where it passes through each metal block off. Look for damage to the insulation on the conductors, repair conductors and protect them from further damage by isolating them from the metal.

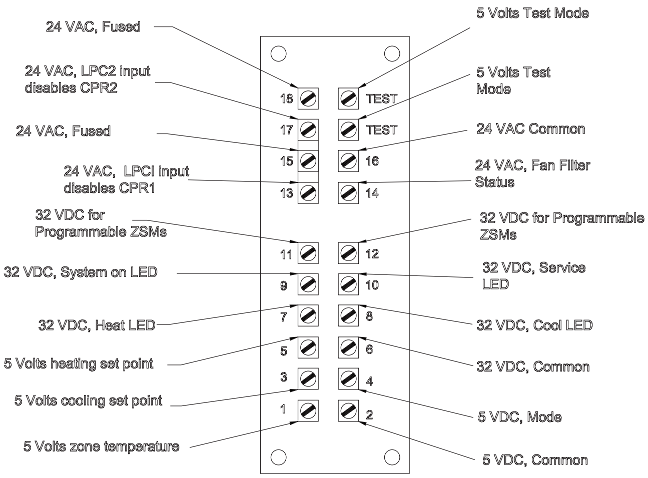
Replacing power exhaust relay (DC) with AC coil relay:

The coil is *24VDC*, not 24VAC. If an AC relay coil is applied on this DC circuit, without modifications, it will ultimately fail the U6 chip and the relay. The relay coil will overheat and the wire insulation will burn off, causing the coil to short, pulling excessive current (over powering the output) and eventually causing complete failure. If U6 chip failures occur, also check unit wiring harness and economizer / motorized outside air damper harness.

Note: *It is not apparent in the equipment electrical wiring diagrams or functional unit parts list as to what the coil voltage may be on a particular relay.*

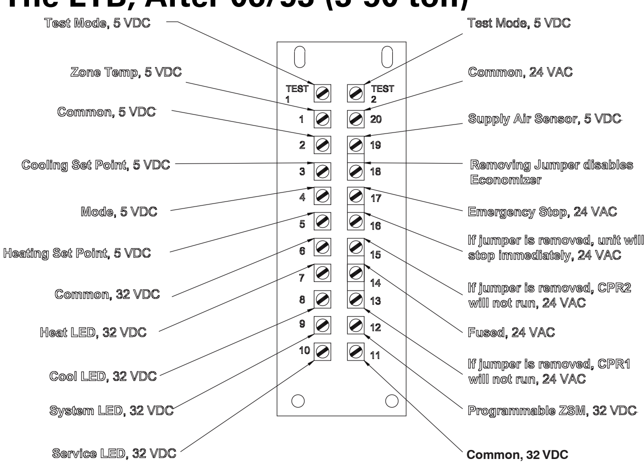
Pin Descriptions & Voltages

Voltages and Descriptions Available at the LTB, Prior to 06/93



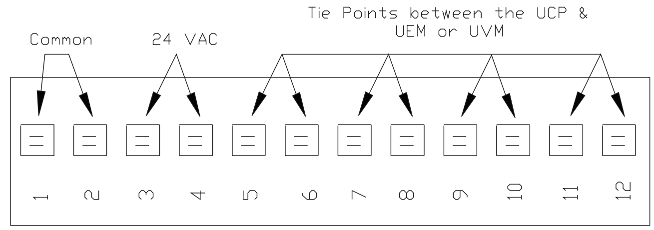
Note: *Factory Jumpers Installed Across Terminals: LTB-13, 15, And 17. (Voltages are measured with wires disconnected).*

Voltages and Descriptions Available At The LTB, After 06/93 (3-50 ton)

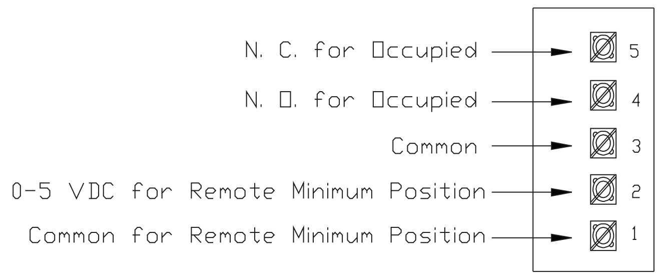


Note: *Factory Jumpers Installed Across Terminals: LTB-13, 14, And 15 / LTB-16 And 17 / LTB-18 And 19. (Voltages Are Measured With Wires Disconnected).*

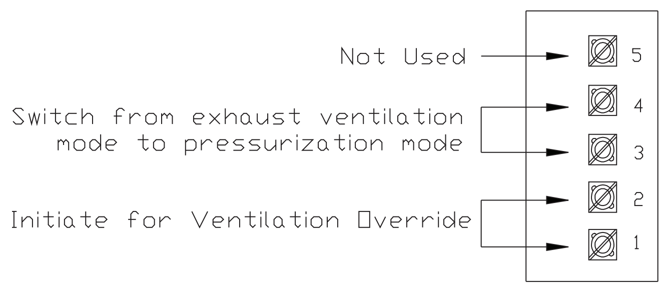
Voyager 27.5-50 Ton LTB-2 Pin Descriptions & Voltages



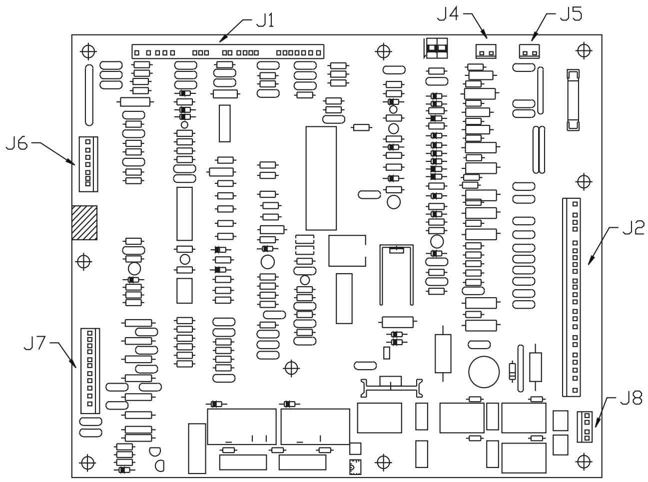
Voyager 27.5-50 Ton LTB-3 Pin Descriptions & Voltages



Voyager 27.5-50 Ton LTB-4 Pin Descriptions & Voltages



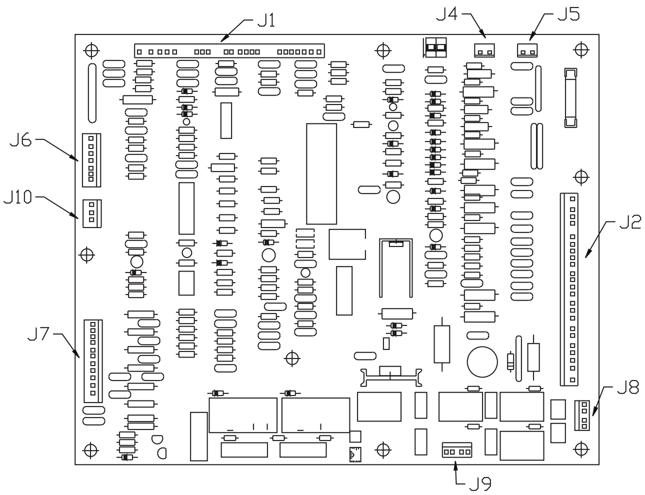
UCP Pin Descriptions & Voltages 3-25 Ton



PIN	VOLTS	INFORMATION
J1-1	*Common	Digital Common Shorting Point for Configuring Inputs
J1-2 & J1-3	0 VDC Input	Inputs used to determine Unit Type TC,TW,YC
J1-4	0 VDC Input	Inputs used to determine 1 or 2 Compressor System
J1-5	24 VAC Input	Heat Fail Input for Gas/Electric
J1-6	No Pin	
J1-7	0 VDC Input	Input to disable Lead/Lag (cut to enable)
J1-8	32 VDC Output	Not used
J1-9	29 VDC Output	Not used
J1-10	No Pin	
J1-11	32 VDC Output	Output to ODF 2 Relay, 32 VDC present when "NOT" energized
J1-12	29 VDC Output	Output to ODF2 Relay
J1-13	32 VDC Output	Output to defrost relay (3-7.5) or defrost module (10-20)
J1-14	29 VDC Output	Output to defrost relay (3-7.5) or defrost module (10-20)
J1-15	5 VDC Input	Outdoor air sensor analog input
J1-16	*Common	Outdoor air sensor analog input
J1-17	No Pin	
J1-18	*Common	Digital Common Shorting Point for Configuring Inputs
J1-19 & J1-20	0 VDC Input	Inputs used to determine # of Heat Stages, for a particular unit type
J1-21	24 VAC Input	Heat 1 Input provides Power for Heat 1 Output
J1-22	24 VAC Output	Output to energize Stage 1 Heat
J1-23	Not Used	
J1-24	29 VDC Output	Not used
J2-1	24 VAC Input	UCP Power Supply Input from LTB16
J2-2	24 VAC Input	CPR 1 Disable Circuit from LPC1
J2-3	24 VAC Input	CPR 2 Disable Circuit from LPC2
J2-4	No Pin	
J2-5, 6 & 7	32 VDC Input	Inputs used with one another to determine Condenser Fan Cycling Temp.
J2-8	5 VDC Output	Binary Output to UEM to drive ECA open (1.7 V when driving)
J2-9	5 VDC Output	Binary Output to UEM to drive ECA closed (1.7 V when driving)
J2-10, 11 & 12	5 VDC Output	Analog/digital Output to UEM, tells UEM which data it wants to read on J2-15 Input
J2-13	29 VDC Output (Pulsing)	Output to UEM for XFC, 29 VDC present when XFC is "NOT" energized
J2-14	29 VDC Output	Output to UEM for XFC, continuous 29 VDC Output
J2-15	5 VDC Input (Pulsing)	Communication Input from UEM
J2-16	5 VDC Output	Analog Reference Voltage to UEM
J2-17	*Common	Analog Common to UEM
J2-18	*Common	Digital Common to UEM
J2-19	5 VDC Output	5 VDC Power Supply to UEM
J2-20	24 VAC Output	Power Supply for Humidity Sensor Circuits
J2-21	5 VDC Output	Output to Coil Temp. Sensor, or Defrost Module
J2-22	24 VAC Output	Output to energize Supply Fan Contactor
J2-23	No Pin	
J2-24	*Common	UCP Power Common - grounded
J4-1	5 VDC Input	Test Mode Initiation Analog Input
J4-2	*Common	Analog Common (LTB-TEST-2); Shorting point for configuring inputs
J5-1	24 VAC Input	Fan/Filter status input for indication
J5-2	No Pin	
J5-3	24 VAC Output	Output to TCO2 used for Heat Fail input, YCs Only
J6-1	24 VAC Output	TCI Power Supply for High Temp. Switch Input
J6-2	32 VDC Output	Output to TCI Power Supply
J6-3	5 VDC Input	TCI Installed, read unit address digital input
J6-4	5 VDC Output	Transmit Data, Binary Output to TCI
J6-5	5 VDC Output	Transmit Enable, Binary Output to TCI
J6-6	32 VDC O/I (Pulsing)	To LTB-12, Receive data line for programmable ZSM or TCI if installed
J6-7	*Common	To LTB-11 DC & AC common for programmable ZSM & TCI
J7-1	24 VAC Output	To LTB-14, 24VAC fused
J7-2	*Common	To LTB-6 Common for ZSM LED's
J7-3	*Common	To LTB-2 Analog Common to ZSM
J7-4	32 VDC Output	To LTB-10 for ZSM Service LED/LCD
J7-5	32 VDC Output	To LTB-8 for ZSM Cool LED/LCD
J7-6	32 VDC Output	To LTB-7 for ZSM Heat LED/LCD
J7-7	32 VDC Output	To LTB-9 for ZSM Sys On LED/LCD
J7-8	5 VDC Input	To LTB-3 ZSM Cooling Set Point Analog Input
J7-9	5 VDC Input	To LTB-5 ZSM Heating Set Point Analog Input
J7-10	5 VDC Input	To LTB-4 ZSM Mode Analog Input
J7-11	5 VDC Input	To LTB-1 ZSM Zone Temp. Analog Input
*See CTI Pin descriptions to J7 if a CTI is installed.		
J8-1	24 VAC Output	Output to CC1 (compressor contactor circuit - HPC, WTL, CCB)
J8-2	0 VAC	Lockout input from CC1
J8-3	0 VAC	Lockout input from CC2
J8-4	24 VAC Output	Output to CC2 (compressor contactor circuit - HPC, WTL, CCB)

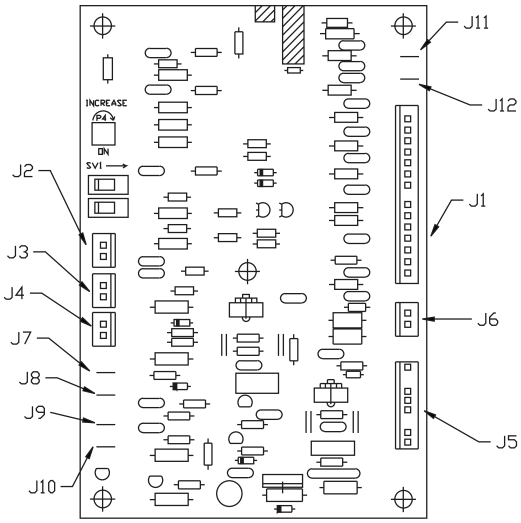
* Common to Chassis Ground

UCP Pin Descriptions & Voltages 27.5-50 Ton



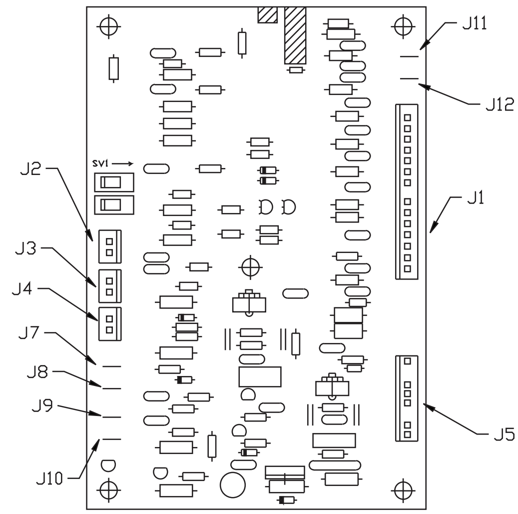
PIN	VOLTS	INFORMATION
J1-1	*Common	Digital Common Shorting Point for Configuring Inputs
J1-2	0 VDC Input	Input to determine Heat Configuration
J1-3	0 VDC Input	Input to enable Daytime Warm-up Heat
J1-4	0 VDC Input	Input to determine Number of Compressors
J1-5	24 VAC Input	Heat Fail Input
J1-6	No Pin	
J1-7	0 VDC Input	Input to disable Lead/Lag (cut to enable)
J1-8	Pin	Not used
J1-9	29 VDC Output	Not used
J1-10	No Pin	
J1-11	32 VDC Output	Output to ODF 2 Relay, 32 VDC present when "NOT" energized
J1-12	29 VDC Output	Output to ODF2 Relay
J1-13	32 VDC Output	Output to VHR relay
J1-14	29 VDC Output	Output to VHR Relay continuous 29VDC
J1-15	5 VDC Input	Outdoor Air Sensor analog input (CV); data input from UVM (VAV)
J1-16	*Common	Common for: Supply air sensor (CV); Outside air sensor (VAV)
J1-17	No Pin	
J1-18	*Common	Digital common shorting point for configure inputs
J1-19	0 VDC Input	Input to determine VAV / CV unit
J1-20	0 VDC Input	Input used to determine unit type - TC, TE, YC
J1-21	24 VAC Input	Heat input provides power for heat 1 output
J1-22	24 VAC Output	Output to energize Stage 1 Heat
J1-23	24 VAC Output	Not used
J1-24	29 VDC Output	Not used
J2-1	24 VAC Input	UCP Power Supply Input from TNS1
J2-2	24 VAC Input	CPR 1 Disable Circuit.
J2-3	24 VAC Input	CPR 2 Disable Circuit.
J2-4	32 VDC Input	Not used
J2-5	0 VDC Input	Inputs used for Condenser Fan Cycling
J2-6	24 VAC Input	Supply Fan Proving input from FFS
J2-7	24 VAC Input	External Auto Stop input from LTB1-16
J2-8	5 VDC Output	Binary Output to UEM to drive ECA open (1.7 V when driving)
J2-9	5 VDC Output	Binary Output to UEM to drive ECA closed (1.7 V when driving)
J2-10, 11, 12	5 VDC Output	Analog/digital Output to UEM or UVM, tells UEM or UVM which data it wants to read
J2-13	29 VDC Output (Pulsing)	Output to UEM for XFC, 29 VDC present when XFC is "NOT" energized
J2-14	29 VDC Output	Output to UEM for XFC, continuous 29 VDC output
J2-15	5 VDC Input (Pulsing)	Communication Input from UEM
J2-16	5 VDC Output	Analog Reference Voltage to UEM, LTB2-8
J2-17	*Common	Analog Common to UEM, LTB2-9
J2-18	*Common	Digital Common to UEM, LTB2-10
J2-19	5 VDC Output	5 VDC Power Supply to UEM or UVM, LTB2-11
J2-20	24 VAC Output	Power Supply for Humidity Sensor, UVM, LTB2-12
J2-21	0-5 VDC Output	Biases OAS input (CV); Not used (VAV)
J2-22	24 VAC Output	Output to energize Supply Fan Contactor
J2-23	No Pin	
J2-24	*Common	UCP Power Common - grounded
J4-1	5 VDC Input	Test mode initiation (analog input) from LTB1-TEST 1
J4-2	*Common	Analog Common (LTB1-TEST 2);Shorting point for configuring inputs
J5-1	24 VAC Input	Clogged Filter status input for indication
J5-2	No Pin	
J5-3	24 VAC Output	Output to LTB-18 used for Heat Fail input, YCs Only
J6-1	24 VAC Output	TCI Power Supply for High Temp. Switch Input
J6-2	32 VDC Output	Output to TCI Power Supply
J6-3	5 VDC Input	TCI Installed, read unit address digital input
J6-4	5 VDC Output	Transmit Data, Binary Output to TCI
J6-5	5 VDC Output	Transmit Enable, Binary Output to TCI
J6-6	32 VDC O/I (Pulsing)	Output to LTB-12, Receive data line for programmable ZSM or TCI if installed
J6-7	*Common	Digital Common to LTB-11 for programmable ZSM & TCI
J7-1	24 VAC Output	To LTB1-14 24VAC fused
J7-2	*Common	To LTB1-6 Common to ZSM LED's
J7-3	*Common	To LTB1-2 Common to ZSM / VAV setpoint panel control inputs
J7-4	32 VDC Output	To LTB-10 for ZSM Service LED/LCD
J7-5	32 VDC Output	To LTB-8 for ZSM Cool LED/LCD
J7-6	32 VDC Output	To LTB-7 for ZSM Heat LED/LCD
J7-7	32 VDC Output	To LTB-9 for ZSM Sys On LED/LCD
J7-8	5 VDC Input	To LTB1-3 ZSM Cool Setpoint / Supply Air setpoint analog input
J7-9	5 VDC Input	To LTB1-5 ZSM Heat Setpoint / MWU setpoint analog input
J7-10	5 VDC Input	To LTB1-4 ZSM Mode analog input
J7-11	5 VDC Input	To LTB1-1 ZSM Zone Temp. / Supply Air temp. analog input
J8-1	24 VAC Output	Output to CC1 (compressor contactor circuit - HPC, WTL, CCB)
J8-2	24 VAC Ground	Lockout input from CC1- measures amp draw of coil
J8-3	24 VAC Ground	Lockout input from CC2- measures amp draw of coil
J8-4	24 VAC Output	Output to CC2 (compressor contactor circuit - HPC, WTL, CCB)
J9-1, 3	24 VAC Input	Power for Compressor Contactors
J9-2, 4	Pin	Not Used
J10-1	24 VAC Input	Froststat input
J10-2	24 VAC Input	Ventilation Override Initiate (from VOR relay)
J10-3	0-10 VDC Output	IGV/VFD Pulse Width Modulating (PWM) Output to UVM J1-11

UEM Pin Descriptions & Voltages 3-50 Ton



PIN	VOLTS	INFORMATION
J1-1	5 VDC Input	Analog Reference Voltage, Input from UCP
J1-2	Common	UEM Digital Common
J1-3	Common	UEM Analog Common
J1-4	5 VDC Output	Analog Output, Communication Link to UCP
J1-5, 6, & 8	5 VDC Input	Digital Input from UCP, tells UEM what data it wants to read on Output J1-4
J1-7	No Pin	
J1-9	5 VDC Input	5 VDC Power Supply Input from UCP
J1-10	5 VDC Input	Binary Input from UCP to Drive ECA Closed
J1-11	5 VDC Input	Binary Input from UCP to Drive ECA Open
J1-12	29 VDC Output	Input from UCP Directly Controls XFP, 29 VDC present when XFC is "NOT" energized
J1-13	24 VAC Input	Input from UCP which provides power for the Humidity Sensor
J1-14	29 VDC Output	Input from UCP Directly Controls XFP, 29 VDC continuously present
J2-1	5 VDC Input	Analog Input for Supply Air Sensor
J2-2	Common	Analog Common for Supply Air Sensor
J3-1	5 VDC Input	Analog Input for Return Air Sensor
J3-2	Common	Analog Common for Return Air Sensor
J4-1	5 VDC Output	Analog Reference Voltage, Output to DFM
J4-2	5 VDC Input	Analog Input from DFM for Time/Temp Defrost, or CTS for Demand Defrost
J4-3	Common	Analog Common to DFM, or CTS for Demand Defrost
J5-1	Pin	Not Used
J5-2	No Pin	
J5-3	5 VDC Input	Active Fan Failure Switch (AFF) input (3-25); XFSP input (27.5-50)
J5-4	Common	Active Fan Failure Switch (AFF) input (3-25); XFSP input (27.5-50)
J5-5	Common	Not used
J5-7	Common	Output to ECA, internally makes connection to Common to Drive ECA Closed
J5-8	Common	Output to ECA, Internally makes connection to Common to Drive ECA Open
J6-1	29 VDC Output	Direct Output from UCP to XFC, 29 VDC continuously present
J6-2	29 VDC Output	Direct Output from UCP to XFC, 29 VDC present when XFC is "NOT" Energized
J7+	4-20 mA Input	For Return Humidity Sensor
J8+	20 VDC Input	20 VDC Supply for Return Humidity Sensor
J9+	4-20 mA Input	Outdoor Humidity Sensor
J10+	20 VDC Input	20 VDC Supply for Outdoor Humidity Sensor
J11	5 VDC Input	Analog Input for Remote Minimum Position Pot.
J12	Common	Analog Common for Remote minimum Position Pot.

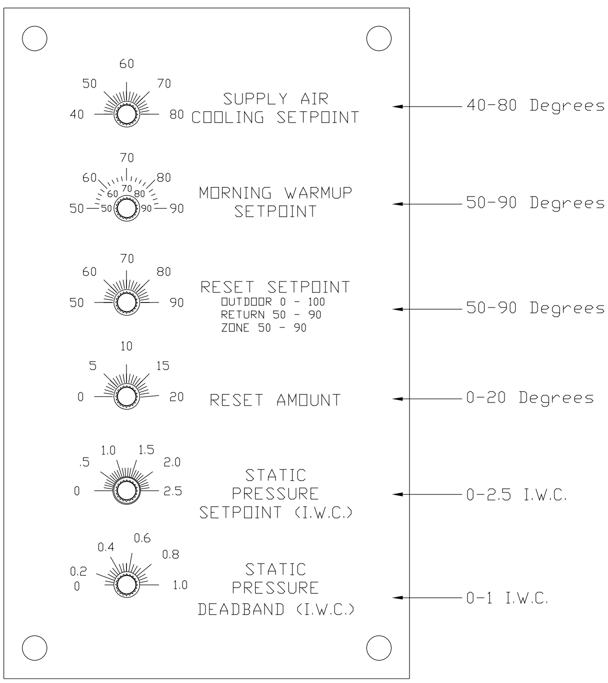
UVM Pin Descriptions & Voltages 27.5-50 Ton



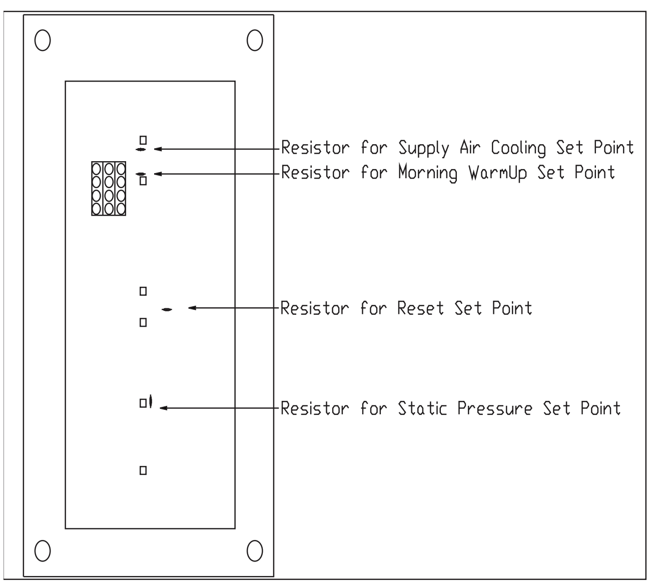
PIN	VOLTS	INFORMATION
J1-1	5 VDC Input	To LTB2-9 for analog reference voltage from UCP
J1-2	Common	To LTB2-10 Digital Common
J1-3	Common	To LTB2-9 Analog Common
J1-4	5 VDC Output	Analog Output, Communication Link to UCPJ1-15
J1-5, 6, 8	5 VDC Input	To LTB2-5, 6, 7 - Digital Input from UCP, tells UVM what data it wants to read on Output
J1-7	No Pin	
J1-9	5 VDC Input	To LTB2-11, 5 VDC Power Supply Input from UCP
J1-10	Pin	Not Used
J1-11	0-10 VDC Input	IGV/VFD PWM input from UCP J10-3
J1-12	Pin	Not Used
J1-13	24 VAC Input	To LTB2-12, Provides supply voltage for 0-10 VDC Output
J1-14	Pin	Not Used
J2-1	5 VDC Input	Analog Input for Outdoor Air Temperature
J2-2	Common	Analog Common for Outdoor Air Sensor
J3-1	5 VDC Input	Analog Input for Zone Temperature
J3-2	Common	Analog Common for Zone Temperature Sensor
J4-1	5 VDC Output	Not used
J4-2	5 VDC Input	To LTB1-5, Morning Warm Up Set Point
J4-3	Common	Not used
J5-1	Pin	Not Used
J5-2	No Pin	
J5-3	5 VDC Input	To VAV setpoint panel, Static Pressure Deadband input
J5-4	Common	To VAV setpoint panel, Static Pressure Deadband common
J5-5	Common	To IGV "B"; to VFD "Com"
J5-6	Pin	Not Used
J5-7	Pin	Not Used
J5-8	0-10 VDC Output	To IGV "W"; to VFD "AL1"
J7+	0-5 V Input	To VAV setpoint panel, Reset Amount input
J8+	Common	Analog Common for Reset Amount and Static Pressure Transducer
J9+	0-5 V Input	Static Pressure Transducer analog input
J10+	5 VDC Output	5 VDC Supply for Pressure Transducer
J11	0-5 V Input	To VAV setpoint panel, Static Pressure Set Point input
J12	Common	To VAV setpoint panel, Static Pressure Set Point common

VAV Set Point Panel 27.5-50 Ton

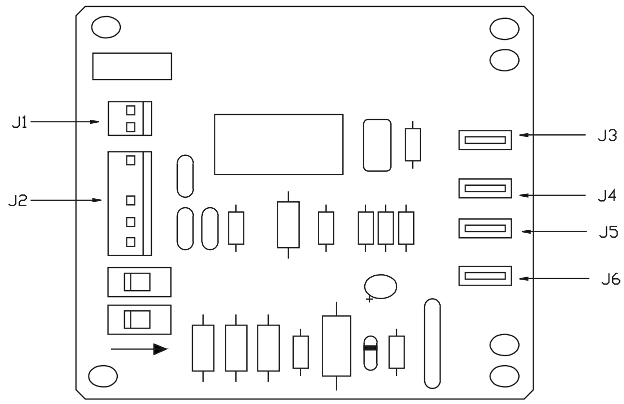
Front of Panel



Front of Panel

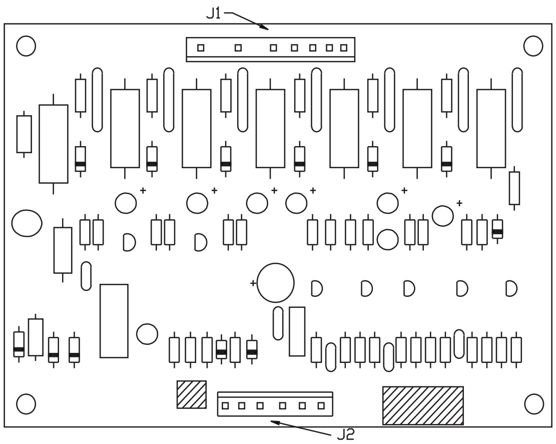


DFM Pin Descriptions & Voltages 3-20 Ton



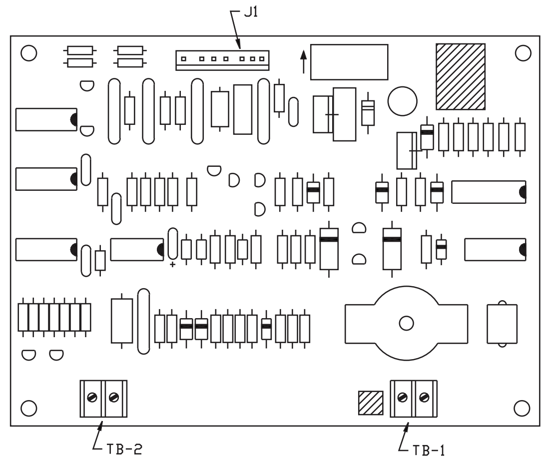
PIN	VOLTS	INFORMATION
J1-1	29 VDC Input	Input from UCP to DFM K1 Relay Coil, 29 VDC continuously present
J1-2	29 VDC Input	Input from UCP to DFM K1 Relay Coil, 32 VDC present if relay is NOT energized
J2-1	Common	Analog Common from UCP, or UEM if present
J2-2	Common	To LTB-20, DFM common
J2-3	5 VDC Output	Analog Output to UCP, or UEM if present
J2-4	No Pin	
J2-5	5 VDC Input	Analog Reference Voltage Input from UCP or UEM if present
J3	24 VAC Output	Output from DFM K1 Relay Normally Open, Energizes SOV(S)
J4	24 VAC Input	Input from TNS3 Secondary to KI Relay Contact Common, provides power to energize SOVs
J5	24 VAC Output	Not used
J6	24 VAC Input	Input from Defrost (Termination) Temperature Switch

CTI Pin Descriptions & Voltages 3-50 Ton



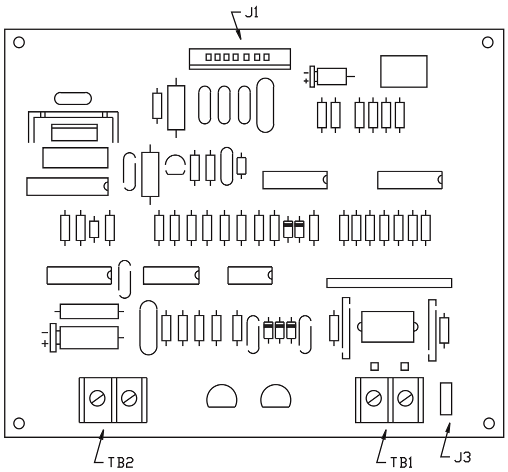
PIN	VOLTS	INFORMATION
J1-1	24 VAC Output	Output to LTB-14 (orLTB-15 prior to 06/93, provides 24VAC power to Tstat
J1-2	Not used	
J1-3	0 VAC output	Output to LTB-2, for "T" output (heat pump)
J1-2	Not Used	
J1-5	24 VAC Input	Input from LTB-8, for "O" input (heat pump)
J1-6	24 VAC Input	Input from LTB-7, for "G" input
J1-7	24 VAC Input	Input from LTB-9, for "W" input (heat pump)
J1-8	24 VAC Input	Input from LTB-3, for "X2" (heat pump) or "W2" (heat/cool) input
J1-9	24 VAC Input	Input from LTB-5, for "W1" (heat/cool) input
J1-10	24 VAC Input	Input from LTB-4, for "Y2" input
J1-11	24 VAC Input	Input from LTB-1, for "Y1" input
J2-1	Common	Output to UCP J7-2 - common
J2-2	5 VDC Output	Output to UCP J7-8 - Y1, Y2 input
J2-3	5 VDC Output	Output to UCP J7-9 - W1, W2 (heat/cool); X2, W (heat pump) input
J2-4	5 VDC Output	Output to UCP J7-11 - O (heat pump), G input
J2-5	5 VDC Output	Output to UCP J7-10 - flashing (0.8-2.5VDC)
J2-6	24 VAC Input	Provides 24VAC to CTI Output J1-1

TCI-1 Pin Descriptions & Voltages 3-50 Ton



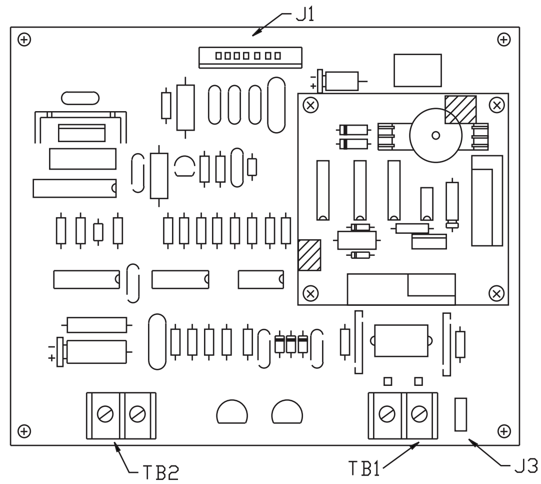
PIN	VOLTS	INFORMATION
J1-1	Common	Digital Common from UCP
J1-2	Pulsating 32VDC Output	Output to UCP, receive data line
J1-3	5 VDC Input	Transmit enable binary Input from UCP
J1-4	5 VDC Input	Transmit data, binary Input from UCP
J1-5	5 VDC Input	Digital Input from UCP. TCI Installed/Read Unit Address
J1-6	32 VDC Input	Input from UCP, TCI Power Supply
J1-7	24 VAC Input	Input from UCP provides power to TB2-2 for Output to High Temp Switches
TB-1 & 2	Pulsating 6VDC Input	Input from ICS device communication link, must be measured with an Oscilloscope
TB2-1	24 VAC Input	Input from High Temp Switches if present
TB2-2	24 VAC Output	Output to High Temp Switches if present

TCI-2 Pin Descriptions & Voltages 3-50 Ton



PIN	VOLTS	INFORMATION
J1-1	Common	Digital Common from UCP
J1-2	Pulsating 32VDC Output	Output to UCP, Receive data line
J1-3	5 VDC Input	Transmit enable, binary Input from UCP
J1-4	5 VDC Input	Transmit data, binary Input from UCP
J1-5	5 VDC Input	Digital Input from UCP, TCI Installed/Read unit address
J1-6	32 VDC Input	Input from UCP, TCI power supply
J1-7	24 VAC Input	Input from UCP provides power to TB2-2 for Output to High Temp Switches
J3	Unit Ground	Do not use
TB1-1 & 2	Pulsating 6 VDC Input	Input from ICS device communication link, must be measured with an Oscilloscope
TB2-1	24 VAC Input	Input from High Temp Switches if present
TB2-2	24 VAC Output	Output to High Temp Switches if present

TCI-3 Pin Descriptions & Voltages 3-50 Ton



PIN	VOLTS	INFORMATION
J1-1	Common	Digital Common from UCP
J1-2	Pulsating 32VDC Output	Output to UCP, receive data line
J1-3	5 VDC Input	Transmit enable, binary Input from UCP
J1-4	5 VDC Input	Transmit data, binary Input from UCP
J1-5	5 VDC Input	Digital Input from UCP, TCI Installed/Read unit address
J1-6	32 VDC Input	Input from UCP, TCI Power Supply
J1-7	24 VAC Input	Input from UCP provides power to TB2-2 for Output to High Temp Switches
J3	Unit Ground	Do not use
TB1-1 & 2	Pulsating 6 VDC Input	Input from ICS device communication link, must be measured with an Oscilloscope
TB2-1	24 VAC Input	Input from High Temp Switches if present
TB2-2	24 VAC Output	Output to High Temp Switches if present

Low Voltage Identification through Wire Color Coding (3-25 only)

BLACK	=	Output Or Input For Devices Not Used In Cooling Mode
BLUE	=	Common To Chassis Ground For All Low Voltage AC & DC
BROWN	=	Output Or Input For Heat Devices And Configuration
GREEN	=	Chassis Ground
PURPLE	=	Input To UCP And UEM, Binary Or Analog
RED	=	24 Volt AC Power
YELLOW	=	Cooling Function Output, Mechanical Or Economizer

Note: *Voyager 27.5-50 low voltage wires are all black.*

Wire Color	Voltage	Description And Identification
BLACK (BK) Output And Input	24 Volts AC	Output to Indoor Fan Contactor (F).
	32 Volts DC	Output to TCI, and ZSM LED's/LCD's.
	29 Volts DC	Output to UEM, DFM, and Defrost Relay (DFR).
	5 Volts DC	Output to UEM, TCI, And DFM. input to UEM from SAS.
BLUE (BL) Common	Ground	TNS1 Transformer Common, grounded All Low Voltage, Common to Ground.
BROWN (BR) Heat Output And Input	24 Volts AC	Output to 24 Volt AC Heat Controls.
	5 Volts DC	Input (Configuration) for available number of Heat Stages, TC* And WC*.
GREEN (GR)	Ground	Chassis Ground.
PURPLE (PR) Input	24 Volts AC	Input CPR1 Disable, CPR2 Disable, And Fan Filter Status (Binary).
	20 Volts DC	Input To UEM For OHS And RHS.
	5 Volts DC	Input, Binary And Analog For System Configuration And Operation. Input To UEM For RAS, And AFF.
RED (RD) 24VAC Power	24 Volts AC	Power For UCP, UEM, TCI, ECA, CTI, DFM, and Fan / Filter Status.
YELLOW (YL) Cool Output	5 Volts DC	Output To UEM To Drive ECA Open And Closed. UCP Analog Input For CTS On 3-7.5 Ton WCs Only.
	24 Volts AC	Output To CC1, CC2, LPC2, UEM, And ECA.
	29 Volts DC	Output To ODF, WCs Only.

General Specifications Of Control Components

Component	Voltage Range	Operating VA	Notes And Comments
(UCP) Unitary Control Processor	18-30 Volts AC, 24 VAC Nominal.	Inrush = 126 VA Sealed = 14 VA	Inrush Is Power Up With Multiple Components Energized. Sealed is Steady State VA During Normal Operation. Measure VA At Wire #32A (RED), If Manufactured Prior To 06/93 At Wire #34A (RED).
(UEM) Unitary Economizer Module	18-30 Volts AC, 24 VAC Nominal 4.75-5.25 Volts DC, 5.0 VDC Nominal.	Inrush = 1.5 VA Sealed = 3.0 VA	Inrush is Steady State VA With Power "ON", And Dampers Not Moving (UEM LED is "OFF"). Sealed is Steady State VA With Dampers Driving Open Or Closed (UEM LED is "ON").
(UVM) Unitary VAV Module	18-30 Volts AC, 24 VAC Nominal. 4.75-5.25 Volts DC, 5.0 VDC Nominal.	Inrush = 1.5 VA Sealed = 3.0 VA	Inrush is Steady State VA.
(CTI) Conventional Thermostat Interface	18-30 Volts AC, 24 VAC Nominal.	Inrush = 12.5 VA Sealed = 12.5 VA	Power Consumption By The CTI is A Constant 12.5 VA, When Power is Applied To The Unit.
(DFM) Defrost Module (10-20 tons)	18-30 Volts AC, 24 VAC Nominal. 4.75-5.25 Volts DC, 5.0 VDC Nominal. 20.6-31.2 Volts DC, 29 VDC Nominal.	Inrush = Less Than 1.5 VA Sealed = Less Than 1.5 VA	Power Consumption By The DFM is A Constant 1.5 VA Or Less, When Power is Applied To The Unit.
(TCI) Trane Communication Interface	18-30 Volts AC, 24 VAC Nominal. 22.1-42.1 Volts DC, 32 VDC Nominal.	Inrush = 3.5 VA Sealed = 3.5 VA	Power Consumption By The TCI is A Constant 3.5 VA, When Power is Applied To The Unit.
(ECA) Economizer Actuator	18-30 Volts AC, 24 VAC Nominal.	Inrush = 8.0 VA Sealed = 4.0 VA	Inrush is Power Consumption While The ECA is Driving Open/Closed. Sealed is Power Consumption While The ECA is Stationary Or Holding A Position. Measure VA At Wire #32B (RED), If Manufactured Prior To 06/93 At Wire #34D (RED).
(IGN) Ignition Control Module	18-30 Volts AC, 24 VAC Nominal.	Inrush = 2.4 VA Sealed = 2.4 VA	Power Consumption By The IGN (Fenwal Model #05-24) is A Constant 2.4 VA, Anytime That The Heat Mode is Activated.
(IGN) Ignition Control Module	18-30 Volts AC, 24 VAC Nominal. 2.4 VA	Inrush = 4.0 VA Sealed =	Inrush is Power Consumption Of The IGN When The System is Actively Heating. Sealed is Power Consumption When The IGN is in Stand By, Or Not Actively Heating. The IGN is Always Powered (Texas Instruments Model #3HS-B4).

1. This chart is useful for locating over current problems which open UCP and transformer fuses / breakers.
2. To calculate VA, VA = Volts x Amps (Or Watts).
3. The VA consumption for individual components must be measured along with the UCP VA. Add and delete components by connecting and disconnecting plugs, adding and subtracting VA values to the base line UCP measurement.
4. All VA measurements listed in this table are worst case.

Microcontrol Printed Circuit Board Switch Settings

As a simplification all printed circuit boards are shipped with the on board switches set in the OFF position, this is the factory setting. The OFF position means that all switches are pushed toward the outside edge of the P.C. board.

Unitary Control Processor (UCP) Switch Setting Table

Switch 1	Switch 2	Heat Anticipation (3-50 Ton CV)	VAV Configuration (27.5-50 Ton VAV)
OFF	OFF	Normal (factory)	Inlet Guide Vanes
OFF	ON	Longer	N/A
ON	OFF	Shorter	Variable Frequency Drives
ON	ON	Special *	N/A

* The special setting is used when a very short heating cycle is required, typically used when the equipment heat capacity is over-sized for the application. This may help alleviate heating temperature swings due to over-sizing.

Unitary Economizer Module (UEM) Switch Setting Table

Switch 1	Switch 2	Dry Bulb (°F.) Temperature	Comparative Enthalpy	Reference Enthalpy
OFF	OFF	60 (factory)	19 Btu/LB dry air	D (factory)
OFF	ON	55	22 Btu/LB dry air	C
ON	OFF	65	25 Btu/LB dry air	B
ON	ON	70	28 Btu/LB dry air	A

Defrost Module (DFM) Switch Setting Table (10-20 ton)

Switch 1	Switch 2	Defrost Time Interval
OFF	OFF	70 Min. (factory)
ON	OFF	90 Min.
OFF	ON	60 Min.
ON	ON	45 Min.

Unitary Variable Air Volume Module (UVM) switch settings (27.5-50 ton)

Switch 1	Switch 2	Reset Setting
OFF	OFF	No Supply Air Temperature Reset (factory)
OFF	ON	Return Air Temperature Reset
ON	OFF	Zone Temperature Reset
ON	ON	Outdoor Air Temperature

UCP Configuration Input (3-25 ton)

Unit Type Configuration

Unit Type	Input J1-2	Input J1-3
TC	GND	GND
WC Time/Temp	GND	OPEN
YC	OPEN	GND
WC Demand Defrost	OPEN	OPEN

(Ground source is J1-1)

Heat Stage Configuration

Number of Heat Stages	Input J1-19	Input J1-20
YC 1 Stage	OPEN	GND
YC 2 Stages	OPEN	OPEN
TC 0-1 Stage	GND	GND
TC 2 Stages	GND	OPEN
TC 3 Stages	OPEN	OPEN
WC 0-1 Stg Aux	OPEN	GND
WC 2 Stg Aux	OPEN	OPEN

(Ground source is J1-18)

Compressor LEAD/LAG Configuration

Enable / Disable Function	Input J1-7
Enable	OPEN
Disable	GND

Cooling Stage Configuration

Number of Available Compressors	Input J1-4
One Compressor	GND
Two Compressors	OPEN

(Ground source is J1-1)

Condenser Fan Cycling Configuration (Outdoor temp. at which ODF2 will cycle off if present)

Outdoor Temp. (°F)	Input J2-5	Input J2-6	Input J2-7
80 Degrees	GND	GND	GND
70 Degrees	GND	GND	OPEN
60 Degrees	GND	OPEN	GND (factory default)
50 Degrees	GND	OPEN	OPEN
40 Degrees	OPEN	GND	GND
30 Degrees	OPEN	GND	OPEN
20 Degrees	OPEN	OPEN	GND
Continuous	OPEN	OPEN	OPEN

(Ground source is J4-2)

GND = This input must be connected as indicated. **OPEN** = This input must be open, no connection.

Note: *Configuration is read by the UCP on power-up only.*

UCP Configuration Input (27.5-50 ton)

Heat Configuration

Unit Type	Input J1-20	Input J1-2
Cool Only	GND	GND
Gas Heat	OPEN	OPEN
Electric Heat	OPEN	GND

(Ground source for J1-20 is J1-18)
(Ground source for J1-2 is J4-2)

Cool Configuration

Unit Type	Input J1-19
VAV	GND
CV	OPEN

(Ground source is J4-2)

Compressor LEAD/LAG Configuration

Enable / Disable Function	Input J!-7
Enable	OPEN
Disable	GND

(Ground source for J2-18)

Cooling Staging Configuration

Number of Available Compressors	Input J1-4
2 Compressors (77.5-35 ton)	OPEN
3 Compressors (40-50 ton)	GND

(Ground source is J1-4)

Condenser Fan Cycling Configuration... See Section 10.1.2 (page 48)

Note: *Configuration is read by the UCP on power-up only.*

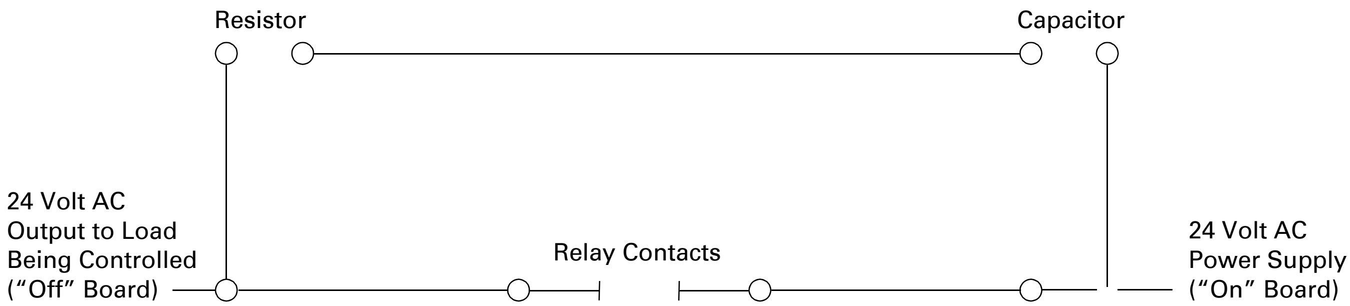
Condenser Fan Cycling Configuration

Unit Size (Tonnage)	J2-5
(27.5-35 ton)	GND
(35 ton)	OPEN
(40 ton)	GND
(50 ton)	OPEN

(Ground source is J4-2)

UCP “Snubber Circuits”

The Unitary Control Processor (UCP) has up to six (6) relays located on the front of the printed circuit board. These relays are used to turn Alternating Current (AC) loads “ON” and “OFF”. The purpose of the Snubber Circuit is to act as a filter; to help dampen the voltage peaks associated with the opening and closing of the relay contacts. The Snubber Circuit is a resistive / capacitor circuit, with a resistor and capacitor wired in series across the relay contacts.



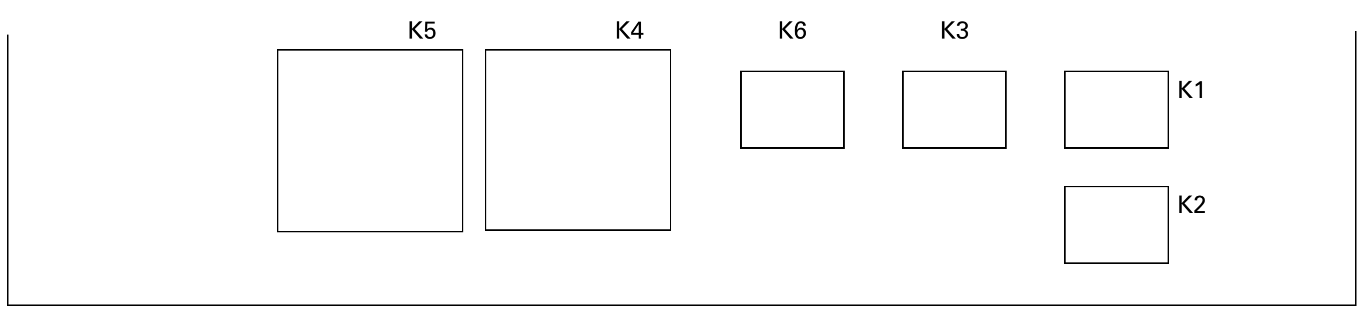
Snubber Circuits may cause confusion, because 24 VAC *will be present* if the output wire is disconnected from the load (relay or contactor coil) and the relay contacts are open. The voltage potential between the disconnected wire and ground will be 24 VAC, but no current is present. When the wire is placed back on the contactor coil, the 24 VAC potential will disappear.

The relays located on the UCP are numbered and identified as K1 through K6, the output relays are used to turn on “Off” board (24 VAC) loads such as relays and contactors. The relays are designated and dedicated as follows:

Relay #	Relay Type	Contact Ratings	Contact Type	Output To Pin #	Relay Designation
K1	Sealed	2A @ 24 VAC	SPDT / N.O.	J8-1	Circuit 1
K2	Sealed	2A @ 24 VAC	SPDT / N.O.	J8-4	Circuit 2
K3	Sealed	2A @ 24 VAC	SPDT / N.O.	J2-22	Supply Fan
K4	Sealed	30A @ 240 VAC	SPST / N.O.	1/4" Terminals	Condenser Fan
K5	Sealed	20A @ 240 VAC 10A @ 240 VAC	SPDT / N.O. N.C.	1/4" Terminals 1/4" Terminals	Heat 2
K6	Sealed	2A @ 24VAC	SPDT / N.O.	J1-22 J1-21	Heat 1 Common

Notes:
1. Relays K1, K2, K3 and K6 contacts are rated 5A @ 120 VAC by the manufacturer, they are de-rated to 2A @ 24 VAC.
2. Relays K1, K2, K3 and K6, there is no internal connection (on the UCP) to the N.C. contact.
3. Relay K6 common terminal is not internally powered by the UCP.

Physical Relay Location On The UCP



UCP Outputs To 29 - 32 Volt DC LOADS

There are two output driver chips on the Unitary Control Processor (UCP), **U5** and **U6**. They are located in the upper left-hand corner and the center of the printed circuit board respectively. These chips are used to energize and de-energize on-board and off-board DC loads.

The U5 chip energizes and de-energizes the following DC loads, and the outputs have the following load limitations:

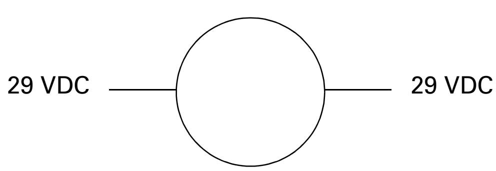
Load	Output Pin #	Maximum Output Load	Why Output Is Energized
SYSTEM LED/LCD	J7-7	27 mA (milliamps)	To turn LED or LCD "ON"
SERVICE LED/LCD	J7-4	27 mA (milliamps)	To turn LED or LCD "ON"
COOL LED/LCD	J7-5	27 mA (milliamps)	To turn LED or LCD "ON"
HEAT LED/LCD	J7-6	27 mA (milliamps)	To turn LED or LCD "ON"
Outdoor Fan #2 (ODF2)	J1-11	75 mA (milliamps)	To de-energize ODF2 (turn "OFF")
Power Slasher Relay	J1-8	75 mA (milliamps)	To de-energize relay if present
Defrost Relay (DFR)	J1-13	75 mA (milliamps)	To de-energize DFR (turn "OFF")

The U6 chip energizes and de-energizes the following DC loads, and the outputs have the following load limitations:

Load	Output Pin #	Maximum Output Load	Why Output Is Energized
K1 On Board Relay	NONE	75 mA (milliamps)	To de-energize K1 (turn "OFF")
K2 On Board Relay	NONE	75 mA (milliamps)	To de-energize K2 (turn "OFF")
K3 On Board Relay	NONE	75 mA (milliamps)	To de-energize K3 (turn "OFF")
K4 On Board Relay	NONE	75 mA (milliamps)	To de-energize K4 (turn "OFF")
K5 On Board Relay	NONE	75 mA (milliamps)	To de-energize K5 (turn "OFF")
K6 On Board Relay	NONE	75 mA (milliamps)	To de-energize K6 (turn "OFF")
Exhaust Fan Contactor (XFC)	J2-13	75 mA (milliamps)	To de-energize XFC (turn "OFF")

The U5 and U6 chip outputs for the relays are turned "ON" to de-energize the respective devices, this is done in a unique manner. This is accomplished by providing 29 Volts DC to the common side of the relay coil continuously, and when the U5 or U6 output is turned "ON", 32 Volts DC is applied to the other side of the coil, the resultant potential difference at the coil is basically zero. By turning the output "OFF", and removing the 32 Volts DC, the potential difference at the coil is 29 Volts DC. See the illustration below.

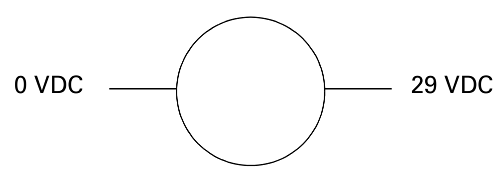
Relay Coil De-energized



Chip Output Turned "ON"

Potential Difference Basically Zero

Relay Coil Energized



Chip Output Turned "OFF"

Potential Difference 29 Volts DC

Software Change History

3-25 ton UCP Identification and Software Change History

The Unitary Control Processor (UCP) software capabilities can be easily identified, by noting the "X-CODE" (purchased part number) located on the P.C. board. The X-CODE will be located in one of two places, depending upon when the board was manufactured. The first production UCP boards had the X-CODE silk screened directly on the board (X13650384). The X-CODE was located in the upper right hand corner, next to the F1 fuse. All subsequent UCPs, beginning with X13650407, will have the X-CODE printed on a sticker. The sticker will always be located in the same place, on top the K5 relay.

Version 1 X13650384 (BRD-0740)

Description: First production UCP. Used in Voyager 8.5 through 25 Ton production only.

Approximate production usage dates: 09/90 to 01/92

Version 2 X13650407 (BRD-0836) & (BRD-0838)

Description: Interim production UCP - same capabilities as Version 1, added Demand Defrost to support ASHRAE efficiency upgrade on Voyager 3 through 7.5 Ton products. **Approximate production usage dates: 11/91 to 01/92**

Version 3 X13650426 (BRD-0860)

Description: Major production UCP - with the following changes:

1. Added Demand Defrost.
2. Modified Smart Recovery - used in Heat Pumps, provides smart staging of two auxiliary heat stages.
3. Changed Supply Fan OFF Delay Time - changed from 90 to 60 seconds, in heat and cool, 3 through 7.5 Ton Heat Pumps.
4. Added Selectable Dry Bulb Change Over For Economizers - values of 55, 60 or 65 F. can be selected on UEM.
5. Added Stand Alone Unoccupied Mode - provides Set Up/Set Back and unoccupied functions, enabled by shorting LTB-11 and LTB-12 (BAYCLCK001A / ASYSTAT668A).
6. Added Sensor Only Economizer - using UEM (BAYDIAG001A), an ICS device can access supply air temperature on units without the economizer accessory.
7. Added Individual Fan Failure Detection - (AFF) Active Fan Failure Switch input (J5-3 & J5-4 on UEM), shuts down equipment, flashes SERVICE LED & alarms ICS device. **Approximate production usage dates: 01/92 to 06/93**

Version 4 X13650473 (BRD-0931)

Description: Replacement / Production UCP - issued to resolve software defrost incompatibility between X13650426 and Valera programmable ZSM when used in 3 through 7.5 Ton Heat Pumps.

The following changes were incorporated into this version:

1. Fixed defrost problem when X13650426 in 3 through 7.5 ton Heat Pumps was applied with a Valera programmable ZSM.
2. Added Comm 4 Capabilities - capable of communicating at 9600 baud, with Comfort Manager II and Tracer Summit.
3. Changed Control Loop - changed from 90 to 10 seconds.
4. Added improved anticipation - for better temperature control.
5. Changed Recovery From Set Back - eliminates over shoot.
6. Added Scroll Compressor Protection - a compressor will not run for more than two minutes on a LPC trip. On a trip during the three minute minimum ON time, the compressor will turn OFF two minutes after the trip or at the end of the three minute minimum ON time (whichever comes first).
7. Added Logic For Compressor Lockout - a compressor will be locked out if the LPC opens, during the three minute minimum on time, on four consecutive compressor starts.
8. Added Heat Pump LPC Trip Ignore Logic - an LPC trip is ignored if the outdoor temperature is below 0° F.
9. Added Gas Heat Minimum ON Time - a four minute minimum ON time was added to the heat cycle to prevent condensation, the ON time includes igniter preheat and ignition trials.
10. Added Economizer Preferred Cooling Logic - fully integrated economizer operation, compressors will not be turned on if recovering at a rate of 12° F. per hour.
11. Changed Economizer Enthalpy Change Over Dead Band - changed from +/- 4 Btu/LB dry air to +/- 1/2 Btu/LB dry air.
12. Fixed Jumping ZTEMP Analog Point - seen on ICS job sites.
13. Changed Single Compressor Unit Data - will not show compressor 2 cycling input open on ICS job sites.
14. Fixed Tracer Compressor Lock Outs - lock outs operate.
15. Emergency Heat Status Masked Out - masked out in ICS data for non-Heat Pump units.

Approximate production usage dates: 12/92 to 01/94 on Voyager 3 through 7.5 Ton Heat Pumps. Used in production for all other Voyager products 06/93 to 06/94.

Version 5 X13650508 (BRD-1007)

Description: Replacement / Production UCP - issued to resolve software defrost incompatibility between X13650473 and CTI when used in 3 through 7.5 Ton Heat Pumps. The following changes were incorporated into this version:

1. Fixed defrost problem when X13650473 in 3 through 7.5 ton Heat Pumps was applied with a CTI.
2. Added capability to defeat gas heat 4 minute minimum ON time. Systems with “NO” economizer - Pins J2-15 and J2-17 must be shorted together at the UCP, with economizer installed - Pins J4-2 and J4-3 must be shorted together at the UEM.
3. Fixed COMM4 Start Up Problem - changed address reading rate from 28 seconds to 3 seconds.
4. Fixed “Test Mode” - X13650473 enforced the gas heat 4 minute minimum ON time in Test Mode, this was removed.
5. Fixed Comfort Manager Problem - changed ECONOMIZE slave state to FAN ON when an economizer is not installed.
6. Added Condenser Fan Windmilling Fix - when changing from one condenser to two condenser fan operation, all compressor and condenser fans are turned OFF for 7 seconds, providing compressor 3 minute minimum ON time has been met. At which time condenser fan 1 & 2, and compressor 1 are turned on simultaneously, compressor 2 if required is turned on 1 second later.
7. Added 2 Minute ICS Start Up Delay - if TCI is installed, the unit will start with MODE = OFF and FAN MODE = AUTO, for 2 minutes. If the unit does not receive communications before this 2 minutes, it will start up stand alone, using local control.
8. Eliminated compressor lockout function below 50°F when using a CTI.

Approximate production usage dates: 01/94 to 12/94 on Voyager 3 through 7.5 Ton Heat Pumps. Used in production for all other Voyager products 06/94 to 06/95.

Version 6 X13650509 (MOD-0143)

Description: Replacement / Production UCP - Scheduled hardware release, coincides with Voyager 27.5-50 ton release. Minor hardware changes were, so that all equipment (3-50 Tons) could utilize the same base board. A resistor and diode were added to the U5 chip LED outputs, that protects the U5 if 24 VAC is applied to this 32 VDC circuit by chopping half of the sine wave.

Approximate production usage dates: 01/95 to 12/95 on 3-25 Ton equipment.

Version 7 X13650564 (MOD-0305)

Description: Scheduled release to support the implementation of the Texas Instruments Ignition Control (IGN) module in the Voyager product line. The following changes were incorporated into this version:

1. Fixed a bug which prevented cooling from occurring, if the zone temp. is greater than 87° F., and it is “OK” to economize.
2. Eliminated the gas heat 4 minute minimum ON time. Provides better control, eliminates overshoot due to over sizing.
3. Changed economizer supply air low limit from 45° F. to 50° F., prevents cold air from dumping out of supply air diffusers.
4. Changed filtering on supply air temperature channel, to make it faster, and to reduce the lag seen in the low limit function.
5. Added compressor “lead/lag” capability. The function ships disabled. Cutting the purple wire at UCP J1-7 enables Lead/Lag.
6. Eliminated Power Slasher (2 speed supply fan) function to free up resources needed to implement compressor lead/lag.
7. Added 1200 baud communication capabilities, allowing the programmable and digital ZSMs to enable the “Supply Air Tempering” function on a non-ICS installation.
8. Fixed a bug which prevents lockout of compressor #2 if LPC2 opens during the 3 minute minimum ON time, on 4 consecutive compressor starts.
9. Added a 3 minute delay between compressor stages (CPR2 will not be turned “ON” until CPR1 has been “ON” 3 minutes).
10. Changed supply fan start delay for gas heat operation from 45 seconds to 30 seconds (supports TIs new IGN).
11. Added incremental arbitration logic, incorporating a 5 minute delay when switching modes from heating to cooling (or vice versa). Prevents erratic temperature swings when equipment capacity is too great for application.

Approximate production usage dates: 12/95 to 8-11/96 on 3-25 Ton equipment.

Version 8 X13650591 (MOD-0380)

Description: Scheduled replacement part implementation expedited to address COMM4 communication problems.

The following changes were incorporated into this version:

1. Fixed a high temperature input nuisance problem on COMM4/Comfort Manager/wireless zone sensor applications.

2. Fixed a communication loss problem when a wireless zone sensor is used with Comfort Manager.
3. Verifies Tracer sends valid heating and cooling set points (greater than 50 °F.).
4. Fixed a bug where the indoor fan turns off for 1 second when the outdoor fans are staging up. Now occurs only when fan mode is AUTO and it is not suitable to economize.
5. Fixed a bug where the UCP cycles Heat Pump Switch Over Valve(s) ON and OFF, when Tracer is in control, and not sending the UCP valid heating and cooling set points.
6. Fixed condenser fan wind milling bug, where cycling dead band was 64.9 - 65.0 °F., instead of 60.0 - 65.0 °F., causing excessive compressor cycling under these ambient conditions.

Approximate production usage dates: 08/96 to 10/96 on dual compressor models, 11/96 to 1/97 on single compressor models.

Version 9 X13650617 (MOD-0432)

Description: Replacement / Production UCP - implementation expedited to address condenser fan software glitch on 12.5, 15, and 20 ton heat pumps with dual condenser fans.

1. Fixed a bug where if the 12.5 - 20 ton heat pump "starts up" in the cooling mode, and the outdoor air temperature is between 60.0 - 65.0 °F., no condenser fan motors are turned on. This results in the equipment locking out due to high discharge pressure.

Approximate production usage dates 10/96 to present on dual condenser fan heat pumps, 01/97 to present on all other models. Current replacement part 10/96 to present on 3-25 Ton equipment.

27.5-50 ton UCP Identification And Software Change History

Version 1 X13650509-03 (MOD-0143)

Description: First production UCP. Used in Voyager 27.5-50 Ton production.

Approximate production usage dates: 10/94 to 12/95

Version 2 X13650564-03 (MOD-0305)

Description: Scheduled release to support the implementation of the Texas Instruments Ignition Control (IGN) module in the Voyager product line. The following changes were incorporated into this version:

1. Fixed a bug which prevented cooling from occurring, if the zone temp. is greater than 87° F., and it is "OK" to economize.
2. Eliminated the gas heat 4 minute minimum ON time. Provides better control, eliminates overshoot due to over sizing.
3. Changed economizer supply air low limit from 45° F. to 50° F., prevents cold air from dumping out of supply air diffusers.
4. Changed filtering on supply air temperature channel, to make it faster, and to reduce the lag seen in the low limit function.
5. Added compressor "lead/lag" capability. The function ships disabled. Cutting the purple wire at UCP J1-7 enables Lead/Lag.
6. Eliminated Power Slasher (2 speed supply fan) function, to free up resources needed to implement compressor lead/lag.
7. Added 1200 baud communication capabilities, allowing the programmable and digital ZSMs to enable the "Supply Air Tempering" function on a non-ICS installation.
8. Fixed a bug which prevents lockout of compressor #2 if LPC2 opens during the 3 minute minimum ON time, on 4 consecutive compressor starts.
9. Added a 3 minute delay between compressor stages (CPR2 will not be turned "ON" until CPR1 has been "ON" 3 minutes).
10. Changed supply fan start delay for gas heat operation from 45 seconds to 30 seconds (supports TIs new IGN).
11. Added incremental arbitration logic, incorporating a 5 minute delay when switching modes from heating to cooling (or vice versa). Prevents erratic temperature swings when equipment capacity is too great for application.
12. Revised so as to allow Tracer, when in control, to control the supply fan mode to either Auto or On, with the exception of when a VAV unit is in occupied mode.
13. Fixed a bug which would not allow the supply fan to come on when the economizer is called to open and Tracer is in control.

Approximate production usage dates: 12/95 to 10/96.

Version 3 X13650591-03 (MOD-0405)

Description: Replacement / Production UCP.

1. Fixed the Exhaust Fan set point problem when a NSB is installed on a CV unit. The exhaust fan would not come on until the economizer damper was at 100%.
2. Fixed the Supply Air Reset Set Point and Supply Air Reset Amount problem when ICS is installed and in control on a VAV unit. The problem is if either local SARSP or SARA fail on the VAV set point panel located in the control box, the unit will not do reset even if ICS supplies the set points.
3. Fixed a High Temp. Input nuisance problem on comm4/comfort manager/ wireless zone sensor application.
4. Implemented comm4 service mode support to be compatible with Voyager 1 & 2.
5. Added a diagnostic for failed supply air pressure sensor on VAV units. This diagnostic will flash cool and service simultaneously half a second on half a second off.
6. Verified that tracer sends a valid heat and cool set point greater than 50°F.
7. Fixed the problem with the supply fan turning off immediately on a VAV unit with gas heat when heat is on and the mode switch is turned off. The supply fan should run 90 seconds after the heat turns off even is the mode switch is turned off.
8. Added code to allow the ability to send an echelon zone temperature.
9. Fixed problem with MWU starting the fan to soon if the unit has only been in unoccupied for less than 7 minutes.
10. Removed 7FFF on VAV occupied sensor and set points in SCAN data when unit is unoccupied.
11. Fixed the supply fan 30 second delay on for gas heat units during an off mode to unoccupied transition and a call for heat.
12. Fixed counter for high duct pressure count out and clear the counter during CV operation.
13. Revised supply air pressure algorithm to reduce the IGV position by half when the pressure is greater than 1" w.c. above the supply air pressure set point.
14. Added a 5 minute waiting period when transitioning from any CV mode to a VAV occupied cooling mode.
15. VAV unit with economizer installed problem only. Fixed the economizer from being locked out during cooling periods. The problem existed when the machine had gone into an unoccupied or NSB time period and then returned to occupied VAV cooling. When unoccupied the CV economizer algorithm locked out the economizer (does not allow to open above minimum position) and then returned to the VAV occupied cooling period. The lock out is based on the zone temperature and the CV zone cooling set point, if the zone temp is not greater than the zone cooling set point – 1.5 degrees a flag is set to lockout the economizer. The VAV economizer algorithm did not clear this flag.

Approximate production usage dates 10/96 to present all 27.5-50 ton models.

3-50 ton CTI Identification and Software Change History

On 6/93 the Voyager Low Voltage Terminal Board (LTB) was changed (the 24VAC hot terminal moved from LTB 15 to LTB 14.) The CTI itself remained the same, but the installation / wiring diagram changed. If components installed do not operate together, it will not damage the CTI or generic control, but a different wiring diagram may need to be used.

Accessory #	Usage Dates	Notes And Changes
BAYCTHI001A	06/90-03/92	Was not compatible with a Honeywell T7300 applied on a Heat Pump.
BAYCTHI001B	04/92-05/93	A resistor change was made, making the CTI compatible with T7300 / Heat Pump applications.
BAYCTHI001C	06/93-Present	Equipment LTB wiring changed, changing installers guide wiring.

Conventional Thermostat Interface (CTI) Application Matrix

The only significant change is which installer's guide to use.

Equipment Tonnage	7th Digit Unit Model	11th Digit Unit Model	Accessory Model Number	Installers Guide Required
3-7.5	C&D	A	BAYCTHI001A&B	ACCSY-IN-60/ 18-HE60D72
3-7.5	C&D	B	BAYCTHI001C	CTHI-IN-1 / 18-HE60D85
3-7.5	C&D	A	BAYCTHI001C	ACCSY-IN-60/ 18-HE60D72
3-7.5	C&D	B	BAYCTHI001A&B	CTHI-IN-1 / 18-HE60D85
8.5-25	B&C	A&B	BAYCTHI001A&B	ACCSY-IN-60/ 18-HE60D72
8.5-25	B	C	BAYCTHI001C	CTHI-IN-1 / 18-HE60D85
8.5-25	B&C	A&B	BAYCTHI001C	ACCSY-IN-60/ 18-HE60D72
8.5-25	B	C	BAYCTHI001A&B	CTHI-IN-1 / 18-HE60D85

Abbreviation Glossary-Microcontrol/ICS

Abbreviation	Name / Component	Use / Description
AFF	Active Fan Failure Switch	Accessory switch used if economizer is present.
AH	Auxiliary Heat contactor #A	Electric heat contactor.
AIP	Analog Input	A varying Microprocessor input (thermistor, potentiometer etc.).
AOP	Analog Output	A varying output from A Microprocessor or control.
BAS	Building Automation System	A controller such as Tracer or Tracker which controls multiple units and devices.
BH	Auxiliary Heat contactor #B	Electric heat contactor.
BIP	Binary Input	Provides status to a Microprocessor (typically dry contacts).
BMS	Building Management System	A controller such as Tracer or Tracker which controls multiple units and devices.
BOP	Binary Output	A Microprocessor control output, typically ON or OFF.
CC	Compressor Contactor coil	Used to energize a compressor. Often has controls in series (HPC, CCB)
CCB	Compressor Circuit Breaker	Circuit breaker used on some units to protect compressors.
CCH	Crankcase Heater	Keeps liquid refrigerant out of compressor during OFF cycle.
CCP	Central Control Panel	Controller for VariTrac bypass VAV system (ICS)
CF	Capacitor, Fan	Used on single phase fan motors.
CFM	Combustion Fan Motor	Used in all gas heat units to provide combustion air
CFS	Clogged Filter Switch	Pressure differential switch for dirty filter indication.
CPR	Compressor	Refrigerant compressor.
CPU	Central Processing Unit	The main chip On A UCP Or UCM. The computer and program resides in this chip.
CR	Compressor Run Capacitor	Used On Single Phase Compressors.
CRT	Cathode Ray Tube	Term Used To Refer To A BMS Edit Device Or Terminal.
CS	Compressor Start Capacitor	Used in optional quick-start kit for single phase compressors.
CSP	Cooling Set Point	Point at which the unit will attempt to cool (if mechanical cooling).
CSR	Compressor Start Relay	Used in optional quick-start kit for single phase compressors.
CTI	Conventional Thermostat	Accessory circuit board allows unit t be controlled from conventional thermostat or other auxiliary device.
CTL	Coil Temperature Limit	Thermostat for single phase crankcase heaters.
CTS	Coil Temperature Sensor	Thermistor sensor used on 3-7.5 ton Demand Defrost heat pumps, Located on outdoor coil.
CV	Constant Volume	The indoor blower provides a constant volume of air, as opposed to a VAV unit which varies the quantity of air provided.
DDC	Direct Digital Control	A method by which programmable ZSM's and ICS systems digitally (as opposed to analog) transmit information.
DFM	Defrost Module	Circuit board provides time / temperature defrost on 10-20 ton heat pumps.
DFR	Defrost Relay	30VDC relay used on some heat pumps.
DTL	Discharge Temperature Limit	External limit, used to protect scroll compressors.
ECA	Economizer Actuator	The actuator which controls the economizer or motorized damper.
F	Indoor Fan Contactor	24VAC relay used to control the indoor fan motor.
F1	UCP Fuse	BUSS MDL4 or MDL3 fuse located on the upper right corner of the UCP. Provides protection for AC loads and the UCP.
FFS	Fan Failure Switch	Pressure differential switch for fan failure indication or Active Fan Failure, depending on where it is connected.
FU	Fuse	Typically used to fuse ignition and electric heater circuits.
FTB	Fan Terminal Board	Junction which connects indoor motor wiring to power wiring harness.
GV	Gas Valve	Used with natural and LP gas in all Gas/electric units.
H	Heat relay	Relay used with 2 speed combustion blower motors.
HPC	High Pressure Control	Safety control in series with compressor contactor on some units.
HSP	Heating Set Point	Point at which the unit will attempt to heat.
HTB	High Voltage Terminal Block	Terminal block for equipment primary voltage connections.
ICS	Integrated Comfort System	Building controls and devices which communicate with each other to provide an integrated HVAC system. Examples are Tracer, Tracker, and VariTrac.
IDM	Indoor Fan Motor	Supply air fan motor.
IGN	Ignition Control Module	Solid state ignition control for gas heat units.

IGV	Inlet Guide Vanes	Used on VAV units to vary air volume with a constant speed motor.
IGVA	Inlet Guide Vane Actuator	The actuator which controls the vanes
IP	Ignition Probe	Hot surface ignitor, also acts as flame sensor.
IPR	Internal Pressure Relief	Pressure relief used in scroll and Climatuff compressors; eliminates requirement for HPC.
J…	Junction	Connection pins for wire harness connection on all circuit boards.
K4	UCP outdoor fan relay	UCP on-board relay for condenser fan on some units.
K5	UCP heat relay	UCP on-board relay energizes heat on some units.
LCD	Liquid Crystal Display	Display type used programmable ZSM's.
LED	Light Emitting Diode	Method of indication used on circuit boards and mechanical ZSM's.
LPC	Low Pressure Control	Compressor protection device.
LTB	Low Voltage Terminal Board	Customer connection point for Zone Sensor Module and accessories.
MWS	Morning Warmup Setpoint	Control point for heating and mode change on VAV units
MWU	Morning Warm Up	A heat mode which occurs at the beginning of an occupied mode when enabled.
OAS	Outdoor Air Sensor	Thermistor sensor on all Microcontrol units.
ODF	Outdoor Fan (relay)	Controls #2 outdoor fan motor.
ODM	Outdoor Motor	Condenser Fan Motor.
OHS	Outdoor Humidity Sensor	Optional economizer sensor.
P…	Wiring harness Plug	Connection harness for pin connections on all circuit boards.
PPF	Polarized Plug Female	Connects to Polarized Plug Male "PPM".
PPM	Polarized Plug Male	Connects to Polarized Plug Female "PPF".
RAS	Return Air Sensor	Used with optional differential enthalpy accessory.
RHS	Return Humidity Sensor	Used with optional differential enthalpy accessory
RMP	Remote Minimum Position	Optional potentiometer used to provide remote setting.
RTU	Roof Top Unit	Package AC units such as Voyager
SAS	Supply Air Sensor	Comes standard with economizer.
SOV	Switch Over Valve	24VAC reversing valve for heat pumps.
SPS	Supply Static Setpoint	Supply pressure at which VIII VAV drive controls to.
SPT	Supply Pressure Transducer	Provides input to UVM for VAV control.
TCI	Trane Communications Interface	Accessory circuit board required to interface unit to ICS device.
TCM	Thermostat Control Module	Generic microprocessor-based ICS equipment controller.
TCO1	High Limit Cutout	Protection device in packaged gas / electric units.
TCO2	Fan Failure Limit	Protection device in packaged gas / electric units.
TNS	Transformer	Used for control power and ignition on packaged gas / electric units.
UCM	Unit Control Module	Generic term for a Micro-control such as the UCP.
UCP	Unitary Control Processor	Circuit board (Micro-control) in Voyager units.
UEM	Unitary Economizer Module	Circuit board located in Economizer section on 3-25 ton; located in control panel on 27.5-50 ton.
UVM	Unitary VAV Module	Circuit board for 27.5-50 ton VAV units.
VI	Voyager One	3-7.5 ton constant volume package units.
VII	Voyager Two	8.25-25 ton constant volume package units.
VIII	Voyager Three	27.5-50 ton constant volume & VAV package units.
VAV	Variable Air Volume	VIII VAV unit uses Inlet Guide Vanes or Variable Frequency Drive to vary the amount of supply air delivered.
VAV, Bypass		A VAV system using a Constant Volume unit with a bypass damper - such as VariTrac.
VFD	Variable Frequency Drive	A motor controller option for the VIII VAV units.
VOR	Ventilation Overide Relay	Relay which controls VAV boxes on VIII VAV units.
ZFSP	Exhaust Fan SetPoint	Setpoint at which exhaust fan(s) turn on (VIII units).
ZSM	Zone Sensor Module	Operator interface similar to a thermostat.
ZTEMP	Zone Temperature	Thermistor sensor In ZSM, provides zone temp. input to UCP.

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