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1. 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.

2.   Unitary Control Processor

The Unitary Control Box (UCP) located in the unit control box includes the following functions:

- Controls decision making processes in the unit control box
- Functions as a Proportional Integral Control.
- Enables temperature control.
- Contain equipment protection and operational enhancement features.

Unitary Control Processor as a Decision Making Process
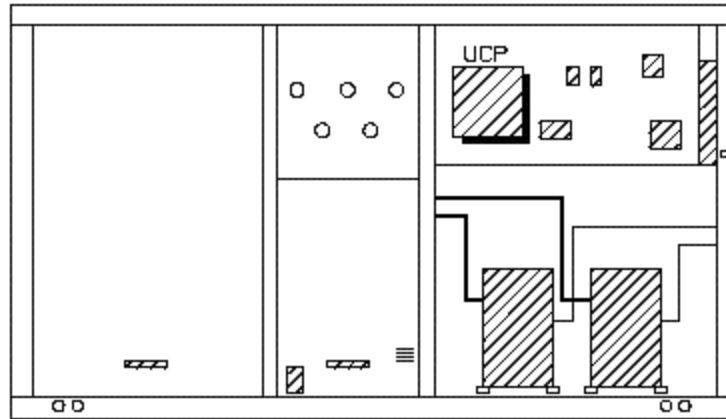
2.1.   Proportional Integral Control

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
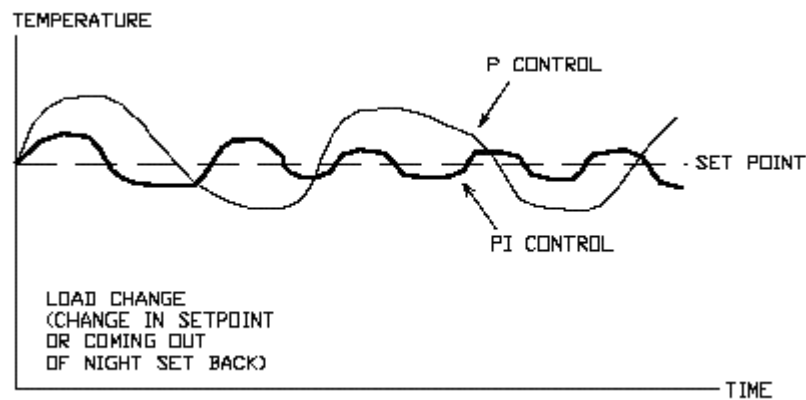
3.   Zone Sensor Module

The Zone Sensor Modules (ZSM) replaces 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), VariTrac II with CCP or VariTrac Comfort Manager is being used. Variable Air Volume (VAV) systems can use similar controllers, or they can be operated from the VAV panel in the rooftop unit plus shorting the low voltage terminal board terminals 2 and 4 (LTB1-2 and LTB1-4) for a mode input.

All stand alone ZSMs are available with the following items:
- Remote sensing capabilities
- Space temperature averaging capabilities (exceptions include obsolete sensors)
- Single or Dual set point
- Programmable models
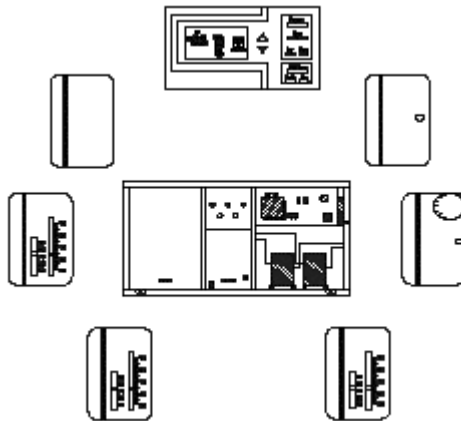
3.1.   Installation Differences between Microcontrol & Electromechanical
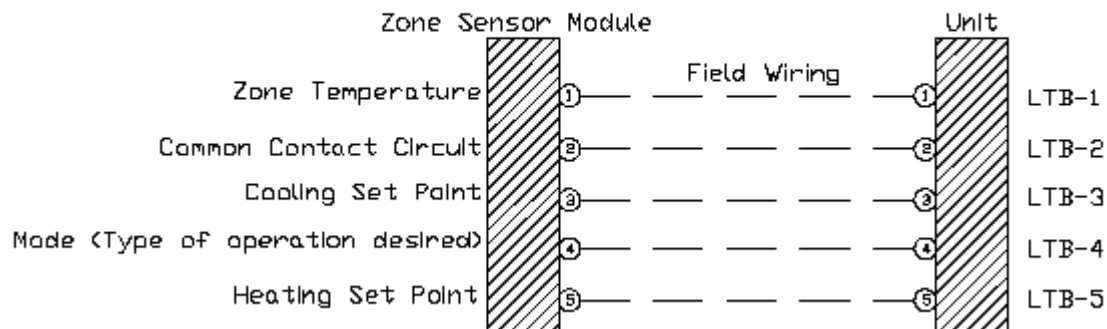
1.1.1. ZSM Wiring

There are differences between the microelectronic control units and electromechanical units. The biggest and most dramatic difference is that the industry standard terminal designations no longer exist, in other words, "R-G-Y-W-B" are no longer 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 customer connection, or 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.

Note: VAV units use the VAV set point panel for supply air and MWU inputs instead of 3 and 5.

1.1.2. ZSM Obsolete Descriptions

Obsolete Zone Sensor Module Description

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

1.1.3. ZSM Current Zone Sensor Module Descriptions

Current Zone Sensor Descriptions

Accessory Model #	Zone Sensor Module Description	Required # Conductors	Terminal Description
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
BAYSENS019B/020B **ASYSTAT66B**	Programmable with Night Setback and LCD Indicators	3-7	7,8,9,10, 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
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

1.1.4. 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 (CV 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.	
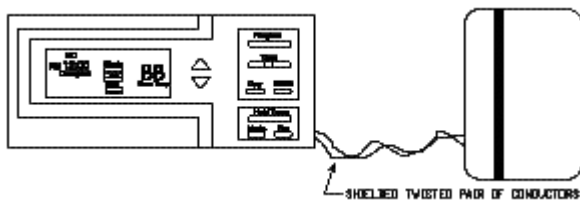
Remote Sensor to Programmable ZSM.

Type = Shielded Twisted Pair of Conductors.

Specification = 18-gauge / Belden 8760 or equivalent.

Length = 1,000 feet, or less.
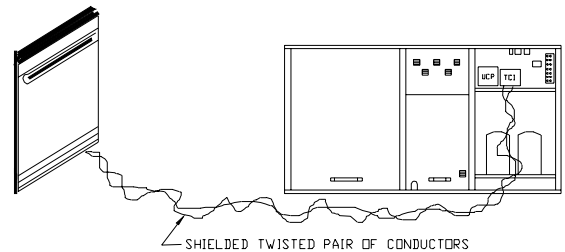
ICS Device (Tracer, Tracker, ComforTrac, Comfort Manager) to Trane Communication Interface (TCI).

Type = Shielded Twisted Pair of Conductors.

Specification = 18-gauge / Belden 8760 or equivalent.

Length = 5,000 feet, or less.

4. Equipment Protection / Operation Timings And Features

Increased Reliability –
- Fewer components (moving electromechanical parts), less likelihood of equipment down time or failure. **Standard**

Direct Digital Control (DDC) –
- 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 space 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 –
- Assist with equipment troubleshooting, if a problem occurrence should take place. **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 Frostat 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 outdated sequencers. **Standard**

Intelligent Fallback –
- A built in Default Control provides adaptive operation, which allows the equipment to continue to operate, providing comfort in the event of certain component failures. Also, allows emergency 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 –
- 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 - 30 feet maximum using 22-gauge wire. Microcontrol System - 150 feet using 22 gauge wire. **Standard**

Alternating Lead/Lag –
- (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, optimizing and lowering 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 standard Zone Sensor Modules (ZSMs) have remote sensing capabilities, with the exception of some obsolete sensors.

Space Temperature Averaging –
- All standard ZSMs have space temperature averaging capabilities. **Requires a minimum of four (4) remote sensors.**

Supply Air Tempering –
- A built in feature may also be enabled using a digital or programmable Zone Sensor Module. 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 any quantity of fresh air. **Standard when using an ICS device, digital, or programmable Zone Sensor Module**

Built In Night Set Back And Unoccupied Functions –
- When using a standard dual set point/auto change over Zone Sensor Module (ZSM), this function is enabled 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 still short between terminals LTB-11 and LTB-12 for unoccupied function, but you will only get the fan automatic operation not the temperature set back of 7° F. **Accessory (requires time clock accessory or field supplied/installed switch or contacts)**
- For VAV- mechanical cooling is disabled, outside air damper will close, and the fan goes to automatic mode. IGV's and VAV boxes are forced open during transition from OCC/UNOCC.

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 accessory**

Economizer Preferred Cooling –
- Provides fully integrated operation if required. 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 accessory**

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 also available or can be eliminated. **Standard**

5. Microcontrol Component Descriptions And Part Numbers

5.1. Unitary Control Processor (UCP)

Main board in the unit control box, standard in all microcontrol units, the computer and program reside in this board. This is the heart of the control system.
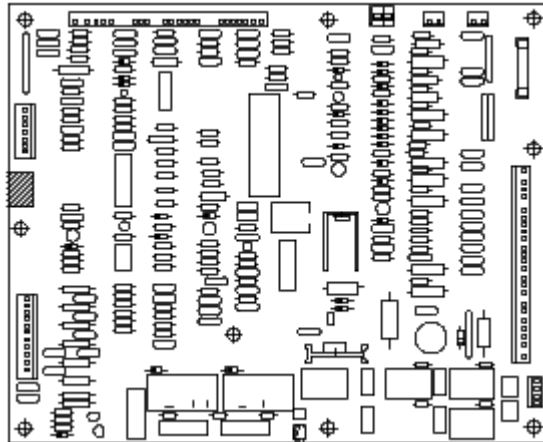
Component Description	Part Number
Unitary Control Processor (UCP) 3-25 tons	MOD-0432
Unitary Control Processor (UCP) 27.5-50 tons	MOD-0405

5.2. Unitary Economizer Module (UEM)

Board located in accessories, 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.
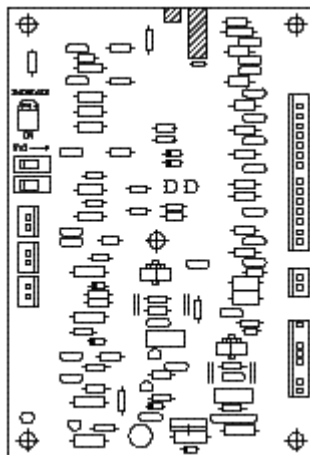
Component Description	Part Number
Unitary Economizer Module (UEM)	MOD-0145

5.3.   Unitary VAV Module (UVM)

Optional board on VAV units that provides a 2 to 10 VDC output to control IGV's and VFD's.
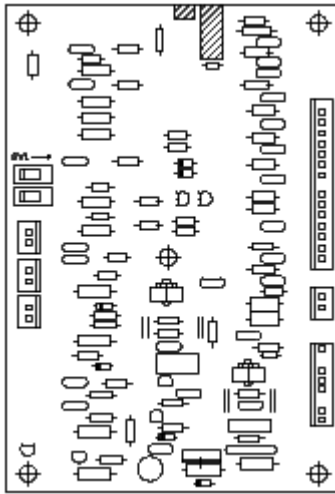
Component Description	Part Number
Unitary VAV Module (UVM)	MOD-0146

5.4.   Defrost Module (DFM)

Small board located in the bottom of heat pump control boxes, comes in 10-20 ton microcontrol heat pumps only, provides temperature input to the UCP for time / temperature defrost.
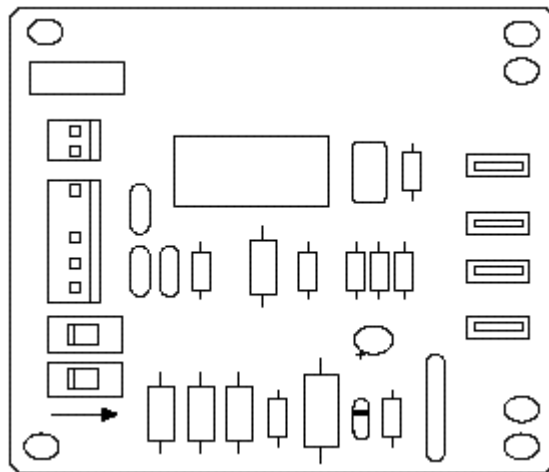
Component Description	Part Number
Defrost Module (DFM)	BRD-0742

5.5. Conventional Thermostat Interface (CTI) (BAYCTHI001C)

Accessory (BAYCTHI001C) field installed board, mounted in unit control box to the right of the UCP board. Allows system to be operated by a thermostat or through dry contact closure type controls. The only difference between VI/VII/VIII is the cable length from the UCP to the CTI.
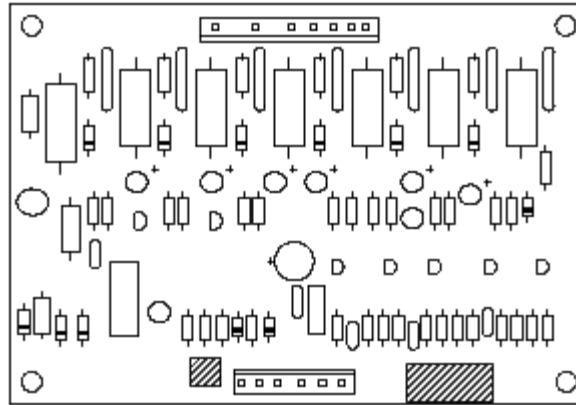
Component Description	Part Number
Conventional Thermostat Interface (CTI)	BRD-0968

5.6. 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.
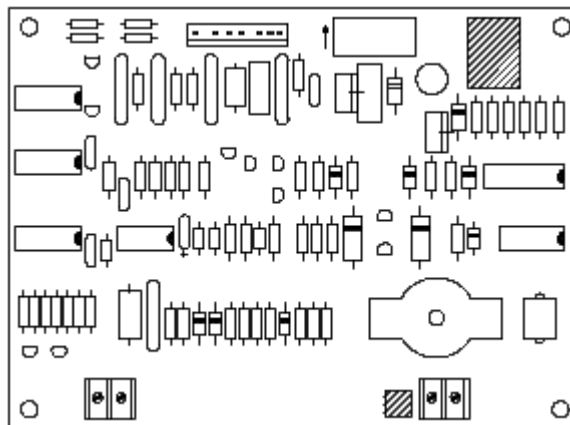
Component Description	Part Number
Trane Communications Interface (TCI-1)	MOD-0016

5.7. 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, Tracer / Tracker / ComforTrac Integrated Comfort System (ICS) Building Management Devices.
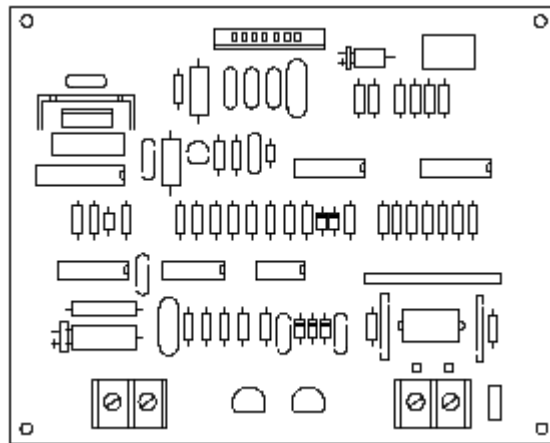
Component Description	**Part Number**
Trane Communications Interface (TCI-2)	MOD-0043

5.8. Trane Communications Interface (TCI-3) (BAYICSI001B)

Accessory 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 / Tracker / ComforTrac / VariTrac Comfort Manager / VariTrac II with CCP / and the "STAT" 4-16 series of products (Tracker / ComforTrac / VariTrac **not** used with VIII VAV).
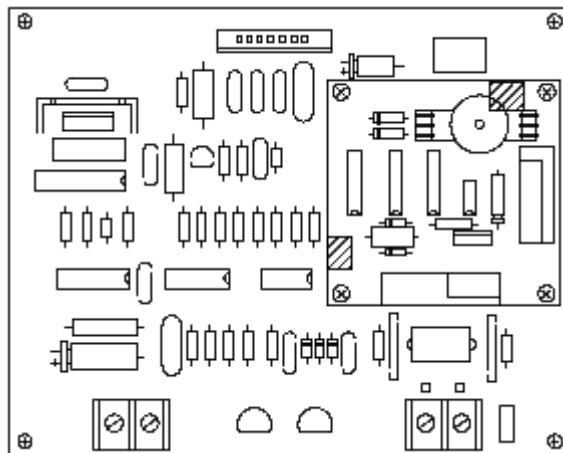
Component Description	**Part Number**
Trane Communications Interface (TCI-3)	BRD-0917

5.9.   BAYSENS006A (Obsolete) / ASYSTAT661A (Obsolete)

Accessory Heat / Cool Zone Sensor Module (ZSM), single set point, manual change over. Four conductors required. Manufactured by Sunne prior to 12/93.
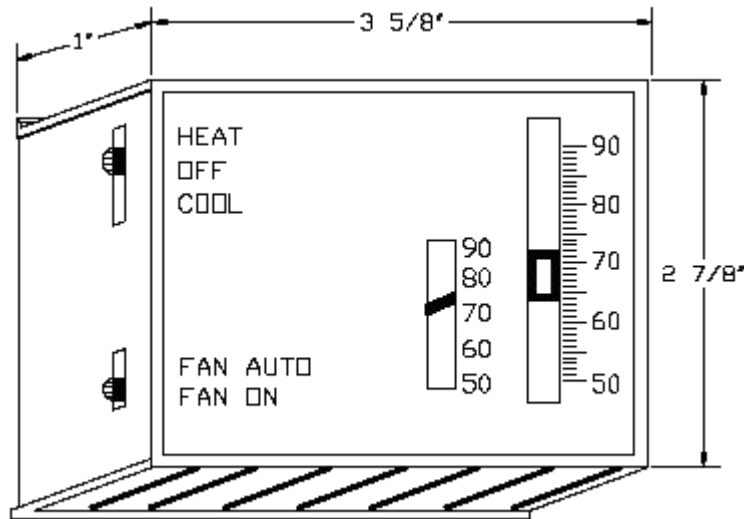
Component Description	**Part Number**
BAYSENS006A (Obsolete) [Sunne part# 38947]	SEN-0279
ASYSTAT661A (Obsolete) [Sunne part# 39112]	SEN-0289

5.10.   BAYSENS007A (Obsolete) / ASYSTAT662A (Obsolete)

Accessory Heat Pump Zone Sensor Module (ZSM), single set point, manual change over. Six conductors required. Manufactured by Sunne prior to 12/93.
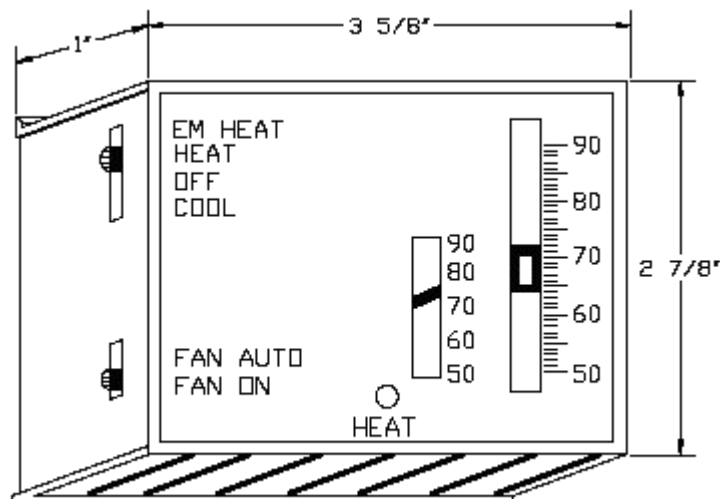
Component Description	**Part Number**
BAYSENS007A (Obsolete) [Sunne part# 38948]	SEN-0286
ASYSTAT662A (Obsolete) [Sunne part# 39113]	SEN-0292

5.11.   BAYSENS008A (Obsolete) / ASYSTAT663A (Obsolete)

Accessory Heat / Cool Zone Sensor Module (ZSM), dual set point, manual / auto-change over. Five conductors required.
Manufactured by Sunne prior to 12/93.
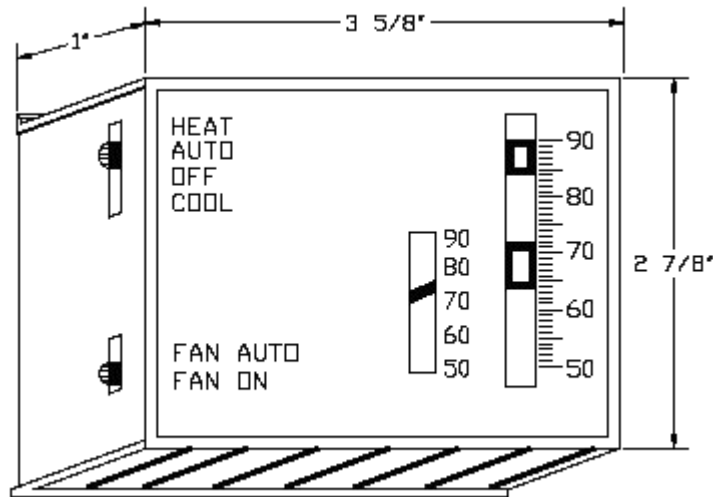
Component Description	**Part Number**
BAYSENS008A (Obsolete) [Sunne part# 38943]	SEN-0280
ASYSTAT663A (Obsolete) [Sunne part# 39114]	SEN-0290

5.12.   BAYSENS009A (Obsolete) / ASYSTAT664A (Obsolete)

Accessory Heat Pump Zone Sensor Module (ZSM), dual set point, manual / auto-change over. Seven conductors required.
Manufactured by Sunne prior to 12/93.
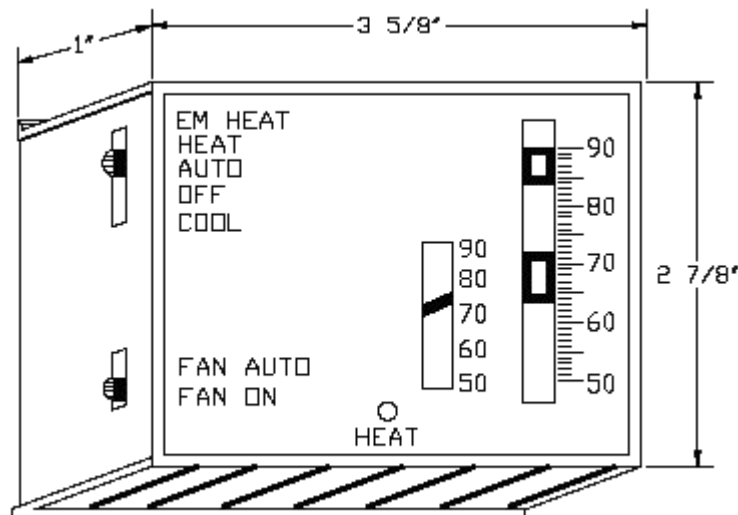
Component Description	**Part Number**
BAYSENS009A (Obsolete) [Sunne part# 38944	SEN-0287
ASYSTAT664A (Obsolete) [Sunne part# 39115]	SEN-0293

5.13. BAYSENS010A (Obsolete)

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.
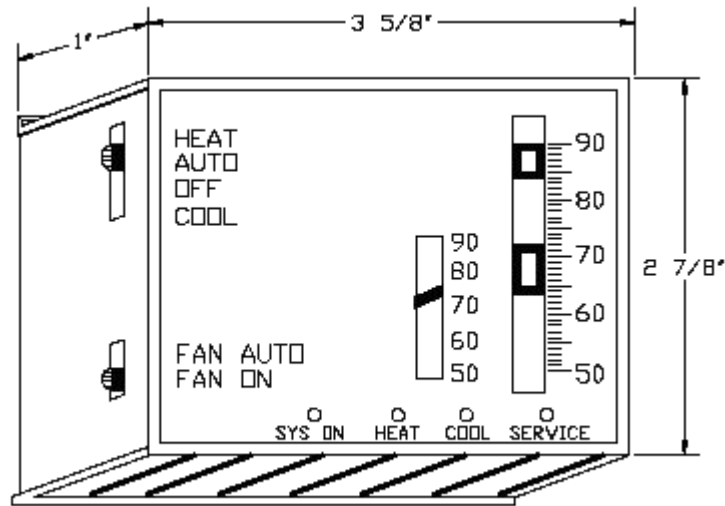
Component Description	**Part Number**
BAYSENS010A (Obsolete) [Sunne part# 38945]	SEN-0281

5.14. BAYSENS011A (Obsolete)

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.
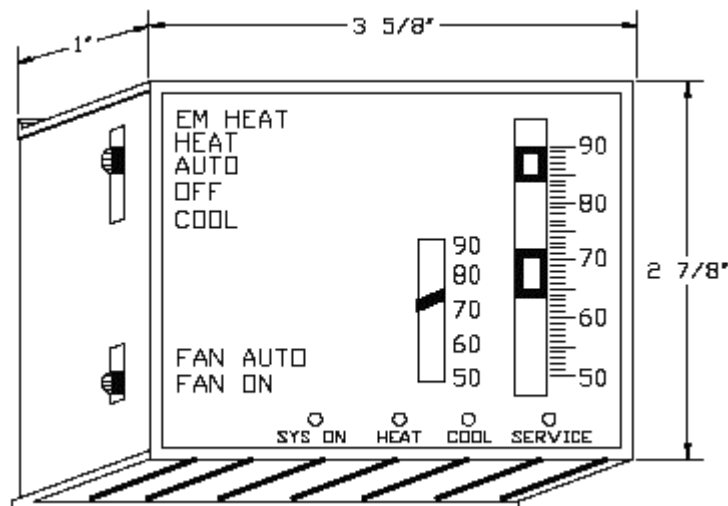
Component Description	**Part Number**
BAYSENS011A (Obsolete) [Sunne part# 38946]	SEN-0288

5.15. BAYSENS012A (Obsolete) / ASYSTAT665A (Obsolete)

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.
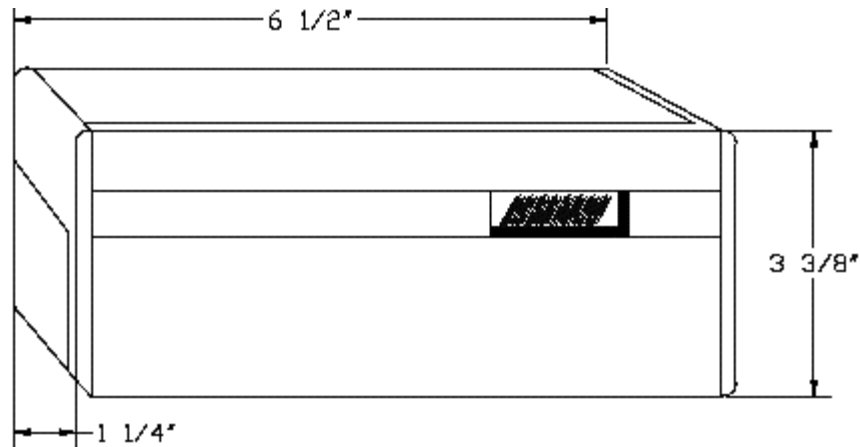
Component Description	Part Number
BAYSENS012A (Obsolete) [Valera part# CT-7]	SEN-0282
ASYSTAT665A (Obsolete) [Valera part# CT-7	SEN-0291

5.16. BAYSENS013A (Obsolete)

Accessory ICS (Tracer/Tracker/ComforTrac) Zone Sensor Module (ZSM), with override button. Two conductors required. Manufactured by Sunne prior to 12/93.
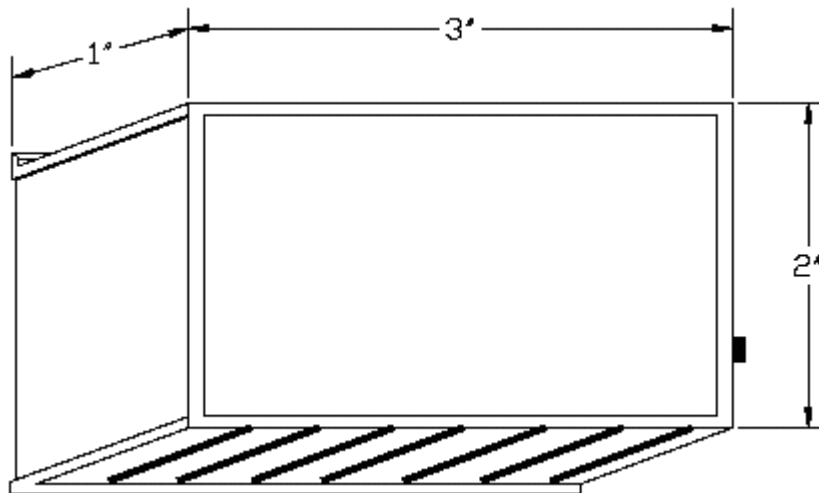
Component Description	Part Number
BAYSENS013A (Obsolete) [Sunne part# 38941]	SEN-0283

5.17. BAYSENS013B (Obsolete)

Accessory ICS (Tracer/Tracker/ComforTrac) Zone Sensor Module (ZSM), with override button. Two conductors required. Manufactured by Sunne, prior to 08/95.
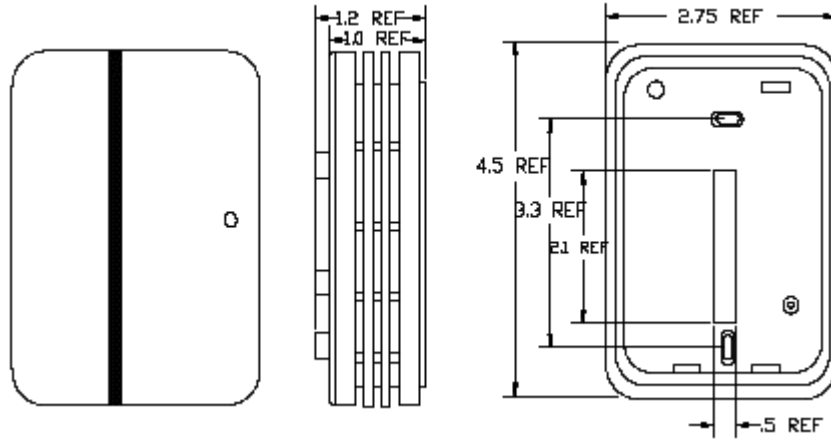
Component Description	Part Number
BAYSENS013B [Sunne part# 62829]	SEN-0438

5.18.   BAYSENS014A (Obsolete)

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.
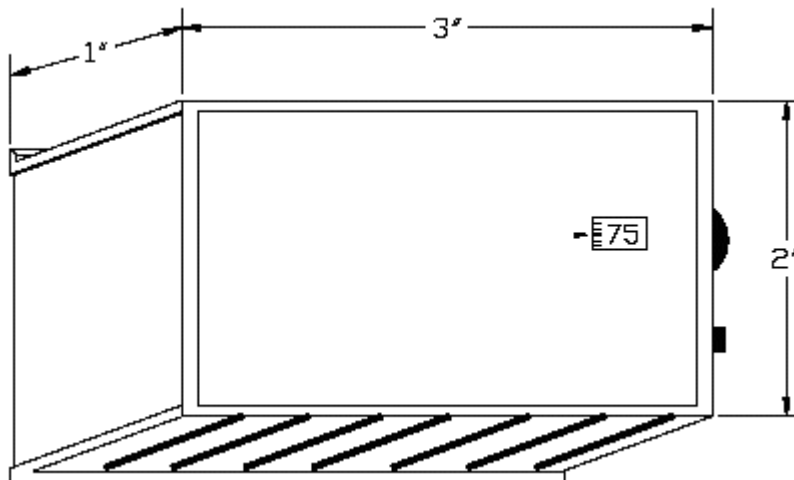
Component Description	Part Number
BAYSENS014A (Obsolete) [Sunne part# 38942]	SEN-0284

5.19. BAYSENS014B (Obsolete)

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.
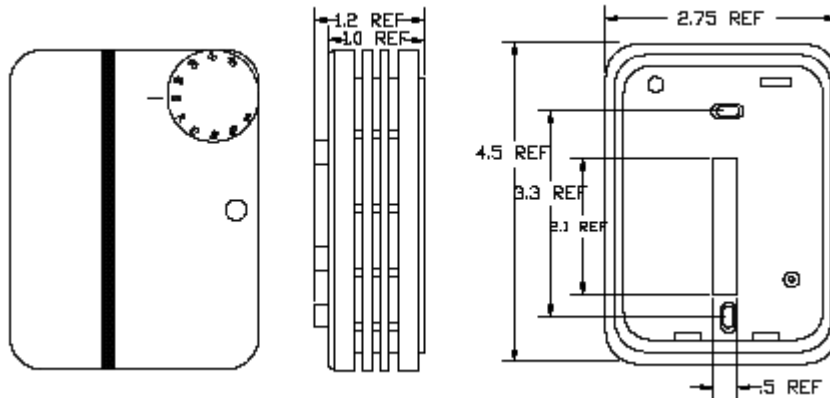
Component Description	**Part Number**
BAYSENS014B [Sunne part# 62827]	SEN-0439

5.20. BAYSENS017A (Obsolete)

Accessory Zone Sensor Remote, used with BAYSENS006A, 007A, 008A, 009A, 010A or 011A. Two conductors required. Manufactured by Sunne prior to 12/93.
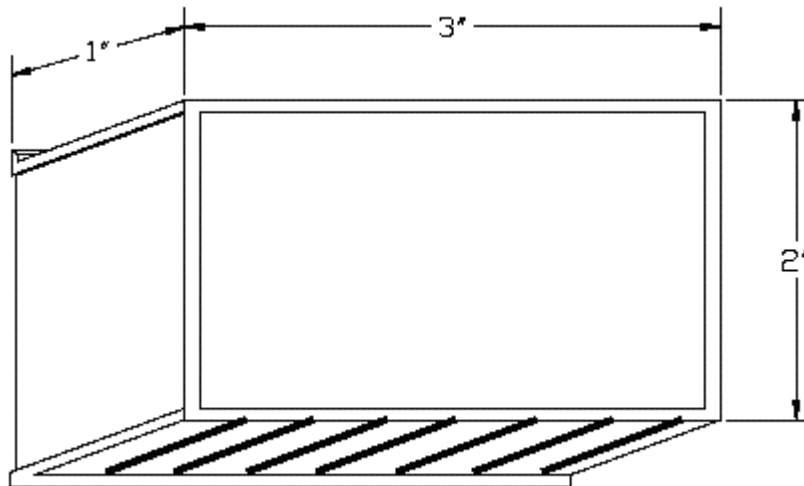
Component Description	**Part Number**
BAYSENS017A (Obsolete) [Sunne part# 39855]	SEN-0285

5.21. BAYSENS018A (Obsolete)

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.
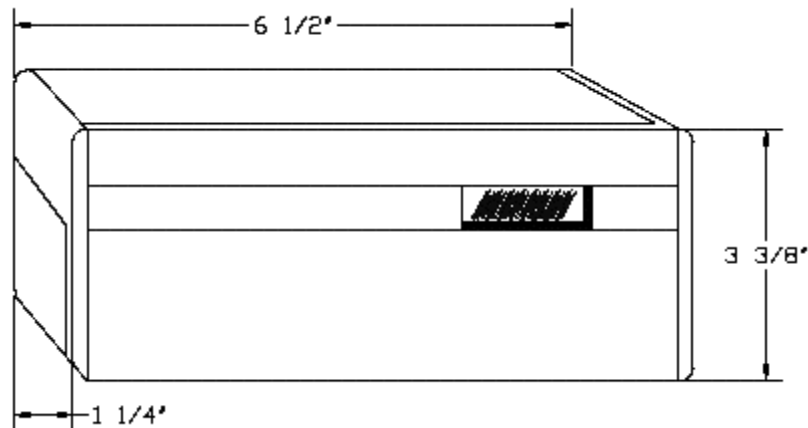
Component Description	Part Number
BAYSENS018A (Obsolete) [Valera part# CTS-7]	SEN-0305

5.22. BAYSENS019A/020A/ASYSTAT666A (Obsolete)

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 Heatcraft, introduced 03/94.
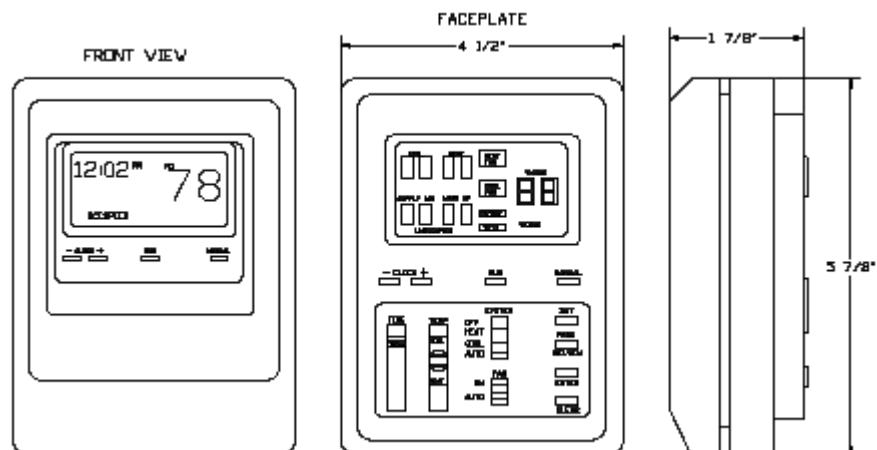
Component Description	Part Number
BAYSENS019A [Heatcraft part# 63J74]	SEN-0415
ASYSTAT666A [Heatcraft part# 67J57]	SEN-0421

5.23.   BAYSENS022A (Obsolete)

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.
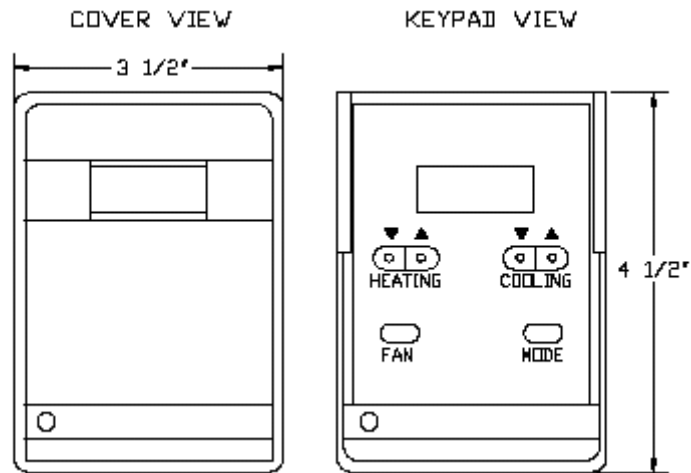
Component Description	Part Number
BAYSENS022A [Valera part# DSPCT7]	SEN-0427

5.24.   BAYSENS023A/ASYSTAT667A (Obsolete)

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 Heatcraft, introduced 03/94.
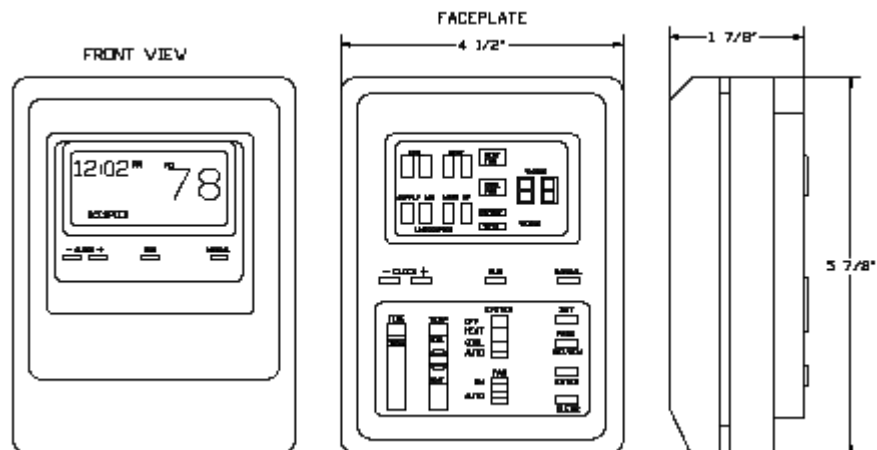
Component Description	Part Number
BAYSENS023A [Heatcraft part# 63J76]	SEN-0416
ASYSTAT667A [Heatcraft part# 67J56]	SEN-0422

5.25. Obsolete Programmable Zone Sensor Modules

The programmable zone sensor module (56) is a night set back device with 7 day programming capabilities, and one occupied / unoccupied period per day. Installation is simple, the communication link provides operating power, and only two wires are required for BAYSENS012A or ASYSTAT665A installation. When remote panel indication is required, the BAYSENS018A is utilized, six wires are required to complete its installation. A microprocessor in the zone sensor communicates with the UCP once every 0.5 seconds, allowing rapid response to the comfort requirements of the zone.
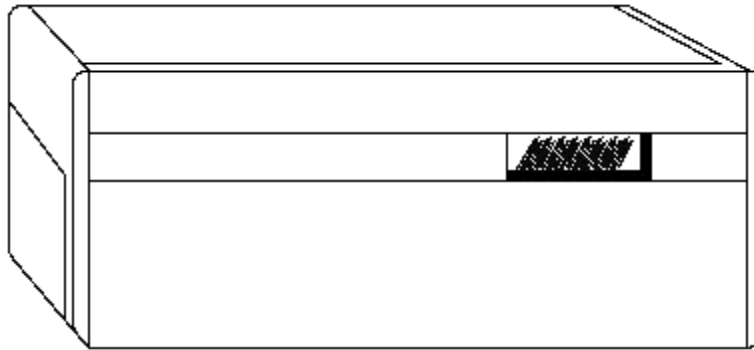
Dip switch #1 controls the selection of 12 hour or 24-hour clock display. When switch #1 is "OFF" 12-hour clock is displayed, when "ON" 24 hour clock is displayed.

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.

5.26. Obsolete Programmable Zone Sensor Modules

The programmable zone sensor module (57), is a night set back device with many features. It has 7 day programming capabilities, with two occupied, and two unoccupied periods per day. Installation is simple, only three wires are required for basic installation. When remote panel indication is needed, seven wires are used to complete installation. Its microprocessor communicates once every 0.5 seconds with the UCP, for rapid response to zone changes.
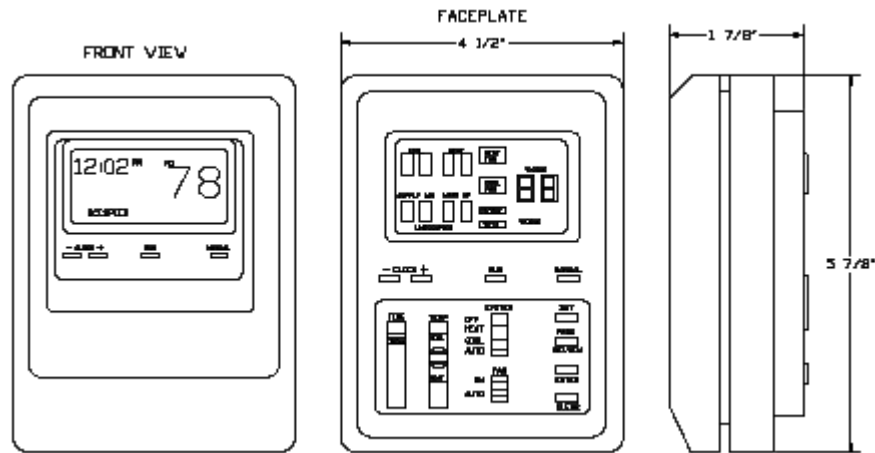
Zone Temperature Calibration: Set SYSTEM switch to "OFF", press ENTER & CLEAR simultaneously until the FIELD CAL icon appears, press "+" & "-" until displayed temperature agrees with calibration instrument. Once calibration is complete, move the SYSTEM switch to the desired position to exit the calibration mode.

Zone Temperature Lockout: Blanks the display of zone temperature by pressing the RUN button, zone temperature will be re-re-displayed by pressing RUN button once 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 $+10^o$ 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 Installers Guide for specific instructions (SENS-IN-1, 2, or 3).

6. Microcontrol Accessories and What They Offer

6.1. BAYSENS006B/ASYSTAT661B

Accessory Heat / Cool Zone Sensor Module (ZSM), single set point, manual change over. Four conductors required. Manufactured by Sunne, introduced 12/93.
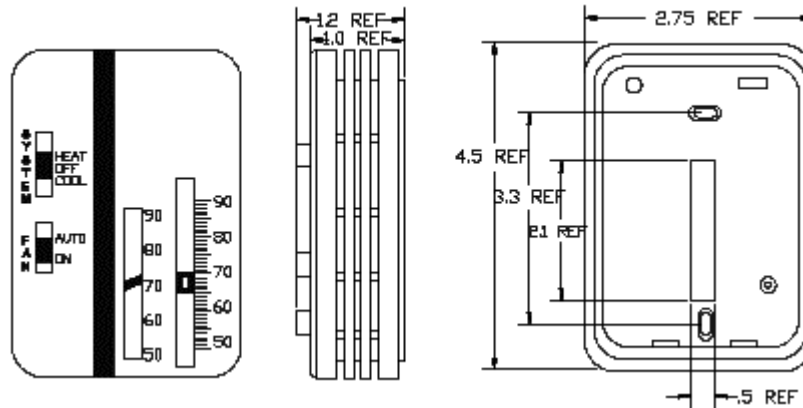
Component Description	**Part Number**
BAYSENS006B [Sunne part# 62822]	SEN-0410
ASYSTAT661B [Sunne part# 62830]	SEN-0417

6.2. BAYSENS007B / ASYSTAT662B

Accessory Heat Pump Zone Sensor Module (ZSM), single set point, manual change over. Six conductors required. Manufactured by Sunne, introduced 12/93.
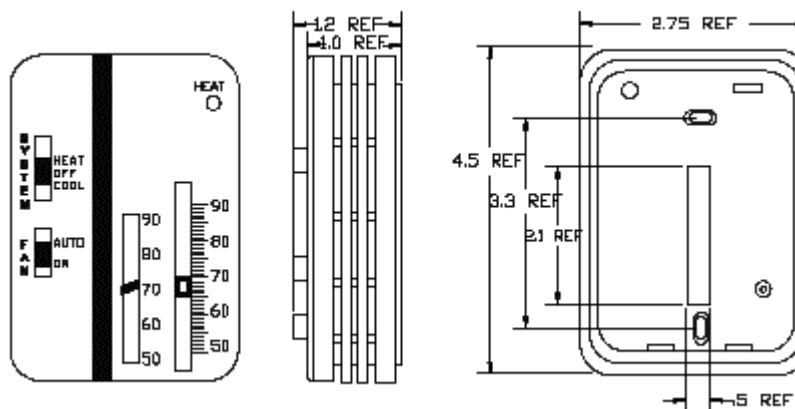
Component Description	**Part Number**
BAYSENS007B [Sunne part# 62821]	SEN-0411
ASYSTAT662B [Sunne part# 62831]	SEN-0418

6.3.   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.
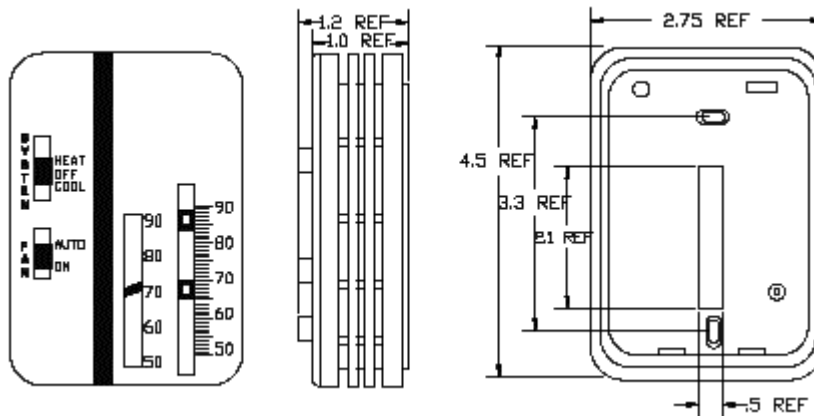
Component Description	Part Number
BAYSENS008B [Sunne part# 62826]	SEN-0408
ASYSTAT663B [Sunne part# 62833]	SEN-0419

6.4.   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.
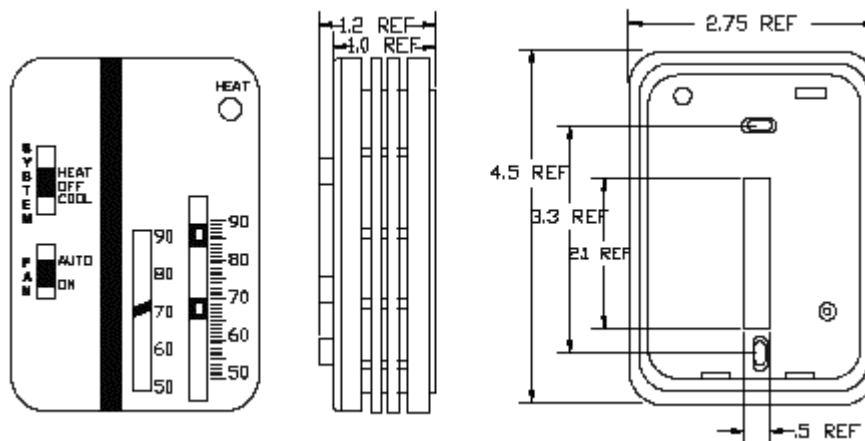
Component Description	Part Number
BAYSENS009B [Sunne part# 62825]	SEN-0412
ASYSTAT664B [Sunne part# 62832]	SEN-0420

6.5.   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.
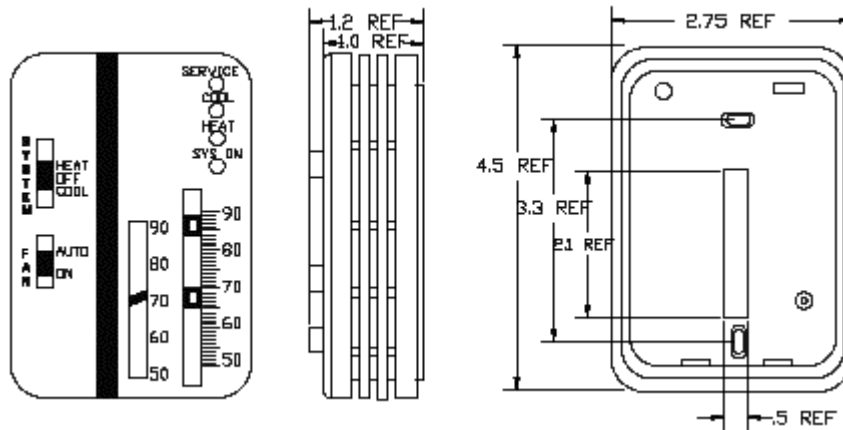
Component Description	Part Number
BAYSENS010B [Sunne part# 62823]	SEN-0413

6.6.   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.
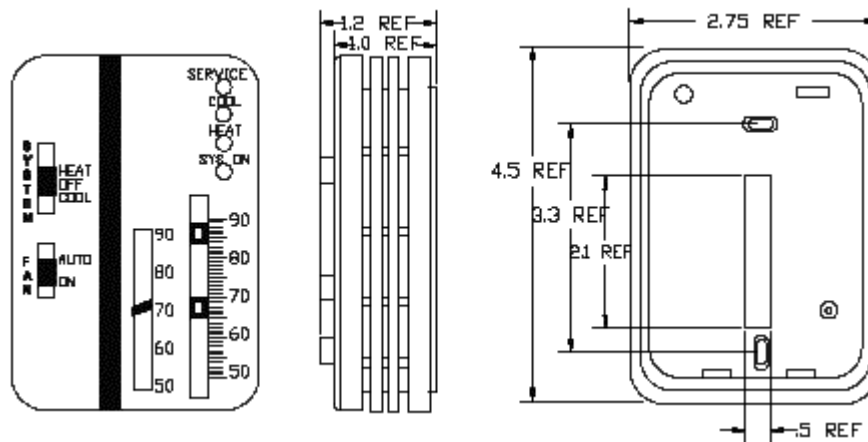
Component Description	Part Number
BAYSENS011B [Sunne part# 62824]	SEN-0414

6.7. 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.
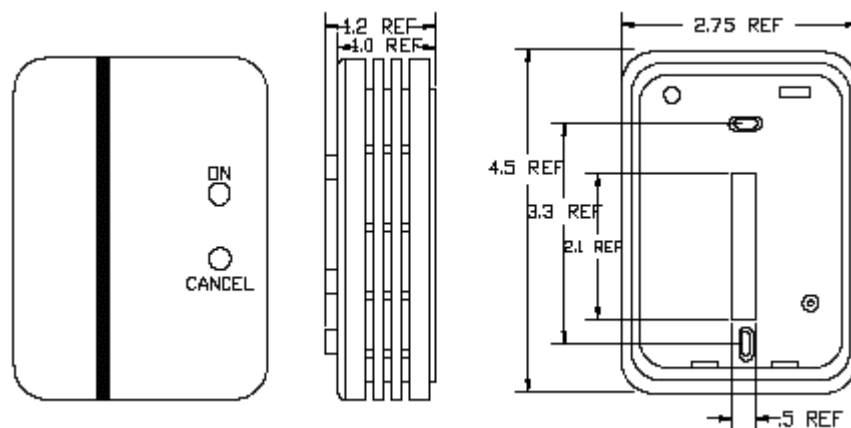
Component Description	Part Number
BAYSENS013C [Sunne part# 65464]	SEN-0495

6.8. 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.
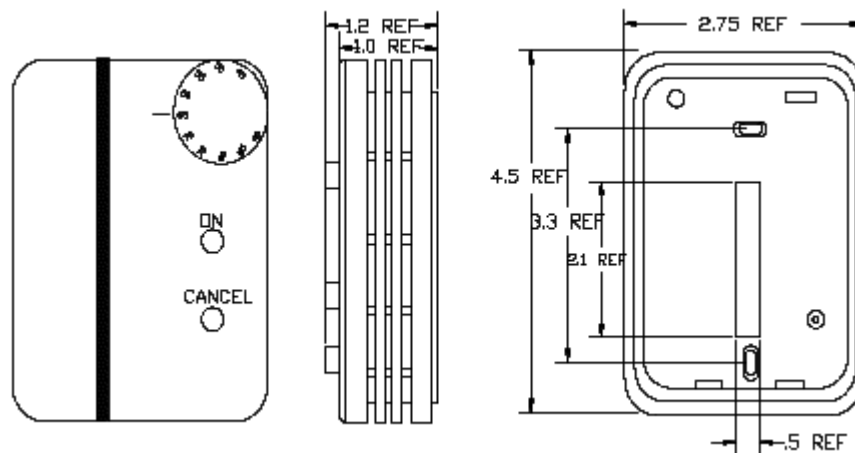
Component Description	Part Number
BAYSENS014C [Sunne part# 65465]	SEN-0496

6.9.   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)
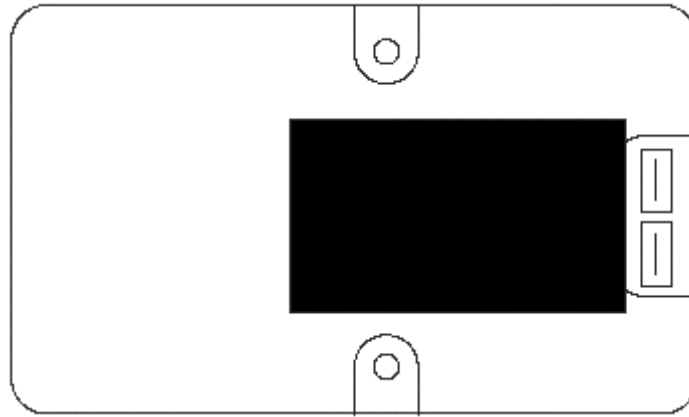
Component Description	**Part Number**
BAYSENS015A Humidity Sensor (OHS, RHS)	SEN-0277

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

Outdoor Air Sensor: located in corner post by unit control box, standard on all microcontrol units.
Supply Air Sensor: field installed in supply fan housing, comes standard with all microcontrol economizer accessories, and 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, during the heating mode (3-7.5 ton heat pumps only).

X13790099-D1

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

6.11. BAYSENS017B / ASYSTAT669A

Accessory Zone Sensor Remote, used with all **current** zone sensors. Two conductors required. Manufactured by Sunne, introduced 12/93.
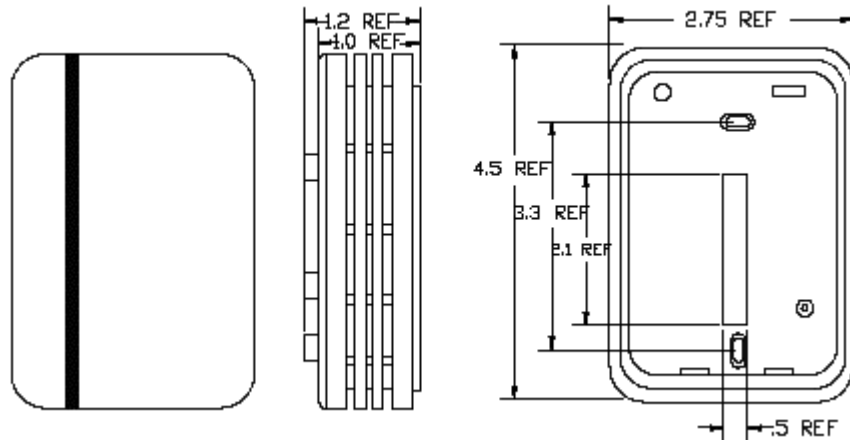
Component Description	Part Number
BAYSENS017B [Sunne part# 62828]	SEN-0435
ASYSTAT669A [Sunne part# 65541]	SEN-0493

6.12. BAYSENS019B / ASYSTAT666B

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 Heatcraft, introduced 06/98.
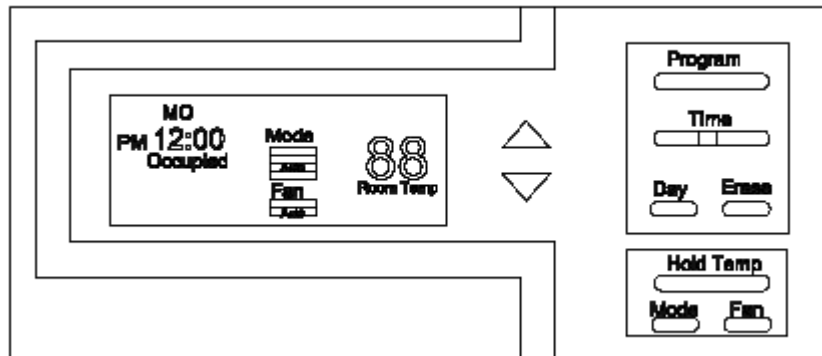
Component Description	Part Number
BAYSENS019B [Heatcraft part# 91K91]	SEN-0874
ASYSTAT666B [Heatcraft part# 91K92]	SEN-0907

1.1.5. BAYSENS019B Options Menu

1. Morning Warm-up: The option (when enabled) will activate the heat if the zone temp is below HSP, whenever the system is switched from unoccupied to occupied mode.

2. Economizer Minimum Position Override: The option (when enabled) will override the min. position in unoccupied mode and close the economizer damper**.**

3. Temperature Scale: This option changes temp. scale from degrees F to degrees C.

4. Supply Air Tempering: The option (when enabled), if the SAT reaches 10 degrees below the HSP (heat will be enabled), until the SAT reaches 10 degrees above the HSP. Heat will be OFF at this point.

5. Time Clock: An option for 12 hr. or 24 hr. time.

6. Smart Fan: When enabled puts the fan in Auto Mode during unocc. periods regardless of the fan switch position.

7. Intelligent Temperature Recovery: This option (when enabled) automatically computes when to turn on system so that comfort temp. is efficiently recovered 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. (7,5,2,1)

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. **(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 hrs., disable the alarm icon by pressing ERASE key)

13. Display Zone Temperature: This option allows the user to display the current zone temp or display a blank 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 sec.)

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. (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 sec. to change temperature setting)

18. Baud Rate: This option is the communication speed. 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 Setpt: If the program is erased or not programmed, this option will go to the default set point.

21. Default Heating Setpt: If the program is erased or not programmed, this option will go to the heat default setpt.

22. Minimum Cooling Set point: This option limits the Cooling Set point to a minimum and maximum range.

23. Maximum Heating Set point: This option limits the Heating Set point to a minimum and maximum range.

6.13.   BAYSENS020B

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 Heatcraft, introduced 06/98.
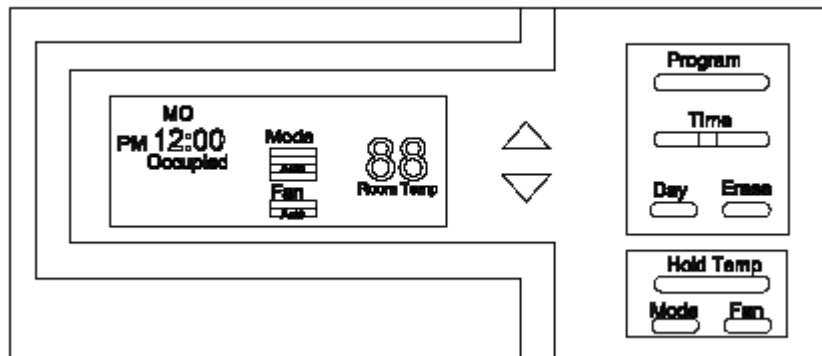
Component Description	**Part Number**
BAYSENS020B [Heatcraft part# 91K93]	SEN-0874

1.1.6. BAYSENS020B Options Menu

1. Morning Warm-up: This is an option (when enabled) will activate the heat if the zone temp is below HSP whenever the system switched from unoccupied to occupied mode.

2. Econ. Minimum Position Override: This is an option (when enabled) that will override the min. position in unoccupied mode and close the econ. dmpr**.**

3. Temp. Scale: This is an option that changes temp. scale from degrees F to degrees C.

4. Heat Installed: This option transmits the heat installed bit status in the configuration data to the UCP. If disabled, the MODULATING HEAT option is ignored and default set points are sent to the UCP for Warm-up, Supply-Air Heat, and Unoccupied Heat. The Program Review Menu will not offer selections for these set points if disabled.

5. Time Clock: This is an option for 12 hr. or 24 hr. time.

6. Modulated Heat: When enabled, the supply air heat set point is offered to be programmed by the user. If disabled, the default supply air heat set point will be transmitted.

7. Daytime Warm-up: This option transmits the daytime warm-up bit status in the configuration data to the UCP. The UCP then calculates when to enable/disable daytime warm-up.

8. Programmable Days/Weeks: This option allows the user to select the days of the week for programming. (7,3,2,1)

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 hrs., *disable the alarm icon by pressing ERASE key*)

12. Display Zone Temp.: This option allows the user to display the current zone temp or display a blank zone temp.

13. Keypad Lockout: This option allows the user to enable the keypad lockout function. (Lockout keypad by pressing + and - keys simultaneously for 4 sec.)

14. Default Time Setting in Temporary Override: This option allows the user to have a preset time when initial override is started.

15. Buzzer Option: This option enables the buzzer alarm for the different 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)

17. Default Cooling Set point: This option is for if the program is erased or not programmed it will default to this set point in unoccupied mode.

18. Default Heating Set point: This option is for if the program is erased or not programmed it will default to this set point in unoccupied mode.

19. Default Supply Air Cool: This option is for set points which are transmitted to the UCP. These defaults are used in special situations where either the user has left the set point blank.

20. Default Supply Air Heat: This option is for set points which are transmitted to the UCP. These defaults are used in special situations where either the user has left the set point blank.

21. Default Warm-up: This option is for set points which are transmitted to the UCP. These defaults are used in special situations where either the user has left the set point blank.

22. Minimum Cooling Set point: This option is to limit the CSP to a minimum range.

23. Maximum Heating Set point: This option is to limit the HSP to a maximum range.

24. Minimum Supply Air Cool: This option is to limit the Supply Air Cooling to a minimum range.

25. Maximum Supply Air Heat: This option is to limit the Supply Air Heating to a maximum range.

26. Maximum Warm-up: This option is to limit the Warm-up to a maximum range.

6.14.   BAYSENS021B

Accessory Zone Sensor Module (ZSM) for VAV applications, single set point with LEDs, system auto or off. Nine conductors, terminals 1, 2, 3, & 4 required, 6 through 10 optional.
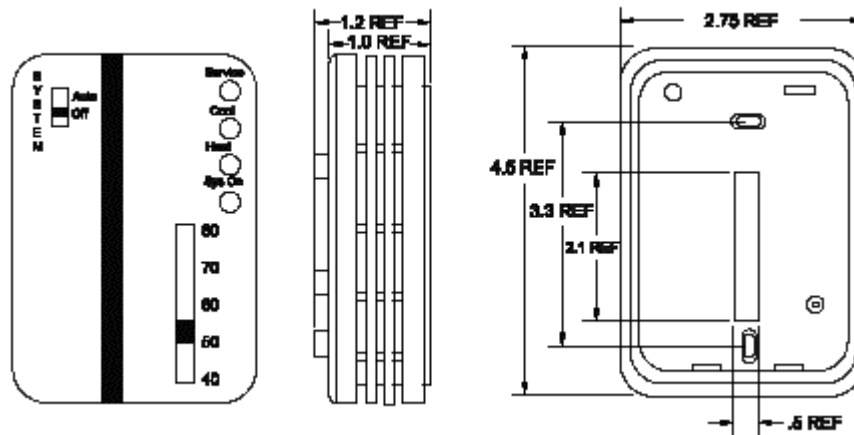
Component Description	Part Number
BAYSENS021A	SEN-0440

6.15.   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 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 would 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).
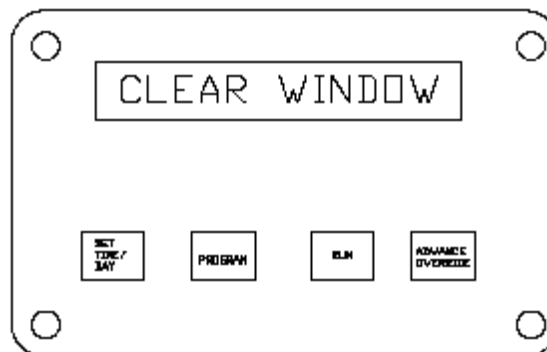
Component Description	Part Number
BAYCLCK001A	TWR-0115
ASYSTAT668A	TWR-0116

6.16.   High Temperature Sensor

The high temperature sensor accessory (BAYFRST001A) provides high limit cutout with manual reset in ICS device Tracer / Tracker / ComforTrac / VariTrac warm air or air conditioning systems. The sensors are wired in series to the Trane Communications Interface (TCI).

Note: These accessories can also be applied in Non-ICS applications and wired between terminals LTB-16 and LTB-17 at the low voltage terminal strip.

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 a sensor opens, the associated unit will completely shut down. The sensors come with case and cover, and mount directly to the duct work. 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.

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.
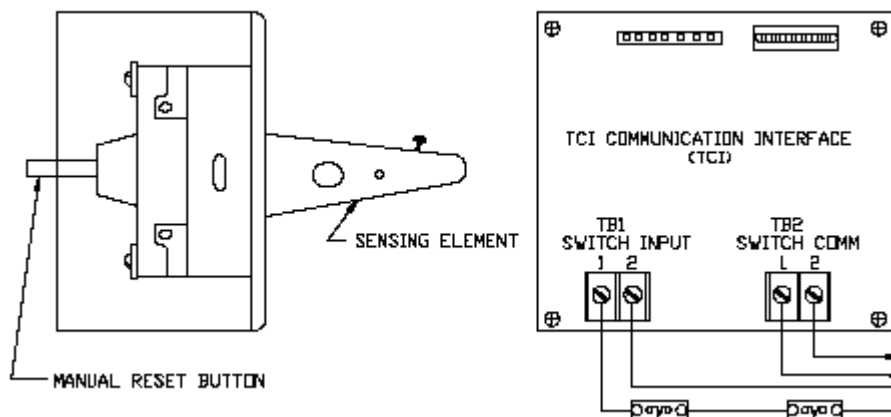
Component Description	**Part Number**
BAYFRST001A	CNT-0637

Section 2

7.   Start Up From The Unit "Test Mode Feature"

7.1.   Step Test Mode

Utilizing the sight hole in the lower left-hand corner of the of the control box front panel, verify that the LED on the UCP is burning 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, 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 burns continuously.

7.2.   Auto Test Mode

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

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

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 in place across the "TEST" terminals. The UCP will automatically exit the test mode, and ignore the jumper across the "TEST" terminals.

7.3.   Resistance Test Mode

This test mode is used to force the unit into a specific test step, a selection of resistors or a decade resistor box (BAYSERV001A) is required, takes the guess work out of which test step 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, with the resistor in place across the "TEST" terminals. The UCP will automatically exit the test mode after one hour, and ignore the resistor across the "TEST" terminals.

7.4.   Test Mode Voyager 3-25

TEST TERMINALS
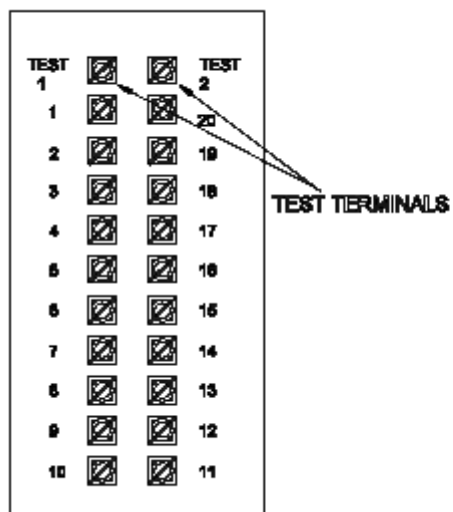
TEST MODE TABLE

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

7.5. 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								

7.6. CV Test Mode Voyager 27.5-50

TEST STEP	MODE	FAN	ECON (Note 6)	COMP 1	COMP 2	HEAT 1	HEAT 2	OHMS
1	MINIMUM VENTILATION	ON	MINIMUM POSITION	OFF	OFF	OFF	OFF	4.7K
2	ECONOMIZER TEST OPEN	ON	OPEN	OFF	OFF	OFF	OFF	6.8K
3	COOL STAGE 1	ON	MINIMUM POSITION	(Note 4) ON	OFF	OFF	OFF	10K
4	COOL STAGE 2	ON	MINIMUM POSITION	(Note5) OFF	(Note 4,5) ON	OFF	OFF	15K
5	COOL STAGE 3	ON	MINIMUM POSITION	(Note 4) ON	(Note 4) ON	OFF	OFF	22K
6	HEAT STAGE 1	ON	CLOSED	OFF	OFF	ON	OFF	33K
7	HEAT STAGE 2	ON	CLOSED	OFF	OFF	ON	ON	47K
8	RESET							

Notes
:
1 - The IGV will be controlled to the supply pressure set point unless test mode has been running for 6 minutes or
 Longer then IGV damper will drive to the full open position.
2 - The supply fan will not be allowed to go from an off state to an on state until the IGV are fully closed.
3 - The Heat outputs will not be allowed to come on until the IGV are at the full open position.
4 - The condenser fans will operate any time a compressor is ON providing the outdoor air temperatures are
 Within the operating values listed.
5 - For 27.5 thru 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.

7.7. 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 LTB-1 and LTB-2, and dropping it in the return air stream. **Note:** A jumper is required for default operation on 27.5-50 ton VAV between LTB1-2 and LTB1-4.

1.1.7. Constant Volume 3-50 Ton

Component or Function	Default Operation
Cooling Set point (CSP)	74° F.
Heating Set point (HSP)	71° F.
Economizer	Normal Operation
Economizer Minimum Position	Normal Operation
Mode	Normal operation, or auto if ZSM mode switch has failed
Fan	Normal operation, or continuous if fan mode switch on ZSM has failed
Night Setback Mode	Disabled - Used with Tracer, Tracker, ComforTrac & Programmable ZSMs only
Supply Air Tempering	Disabled - Used with Tracer, Tracker, ComforTrac, Digital & Programmable ZSMs only
Power Exhaust Enable	25% or higher outdoor air opening

1.1.8. VAV 27.5-50 Ton

Component or Function	Default Operation
Supply Air Cooling Setpt.	55° F.
Supply Air Reset Setpt.	Disable Reset
Supply Air Reset Amount	Disable Reset
Supply Air Static Setpt.	0.5 IWC
Supply Air Static Deadband	0.5 IWC
Morning Warm-Up Setpt.	Disable MWU & DWU
Mode Failure "Open"	Unit Mode "Off"
Mode Failure "Shorted"	Unit Mode "Auto"

7.8. Providing Temporary (default) Heating And Cooling

Voyager Constant Volume Units

Locate the hole in the corner post, next to the control box. Remove the thermistor sensor (OAS), by reaching around and behind the corner post, 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 remaining in the control box. **Note:** Voyager 27.5-50 Tons- The OSA Sensor is located below the economizer damperhood.

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, and connect it with wire nuts down in the room, 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 minimum position (if present) will operate. The constant volume 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. Units for Variable Air Volume applications only require a jumper between terminals LTB-2 and LTB-4 for "Supply Air" cooling operation. If unoccupied heating and cooling is required, follow the constant volume procedure above.

Note: This is for temporary operation only. Economizer, condenser fan cycling, and evaporator defrost functions are disabled. Evaporator will freeze during low ambient cooling.
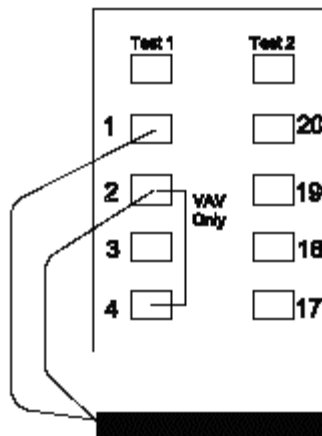
7.9. Tracer / Tracker / ComforTrac / Comfort Manager

The UCP in the microcontrol unit acts as a slave device to an Integrated Comfort System (ICS) device, the microcontrol unit operation is dictated by the 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 in s 60-63.

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 or Comfort Manager installation, there is no Zone Sensor Module connected to the microcontrol unit, the microcontrol unit will sit idle until it receives its commands from the Comfort Manager. A microcontrol unit Zone Sensor Module can be connected to the unit, so that in the event of a Comfort Manager failure, it will provide stand alone operation and control. For more in depth information on an ICS device, consult the specific ICS device literature.
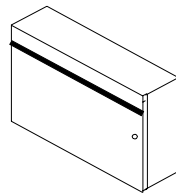
TRACER
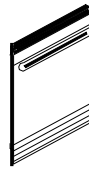
TRACKER
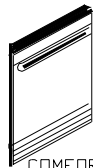
COMFORTRAC
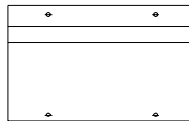
COMFORT MANAGER

Note: VariTrac can not be applied with 27.5-50 ton VAV units. It only works with constant volume units.

8. LED Locations and Status Information

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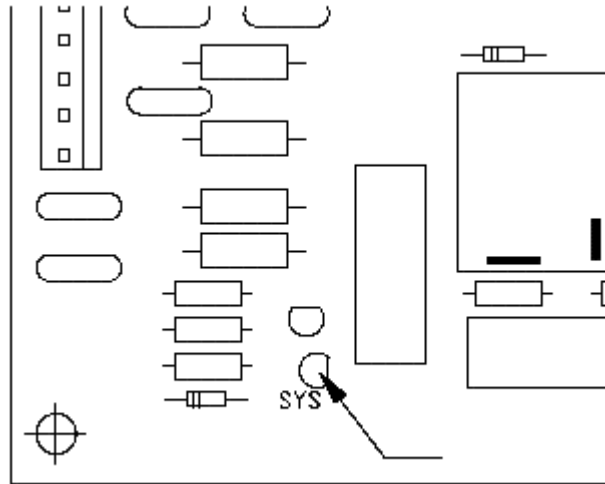
ON-Indicates that the UCP is powered up, also indicates that the software/computer program is intact and functional, and is lit continuously during normal operation.

BLINKING-Indicates that the UCP is in the TEST mode.

OFF-Indicates that no power is going to the UCP, or that the software/computer program has failed.

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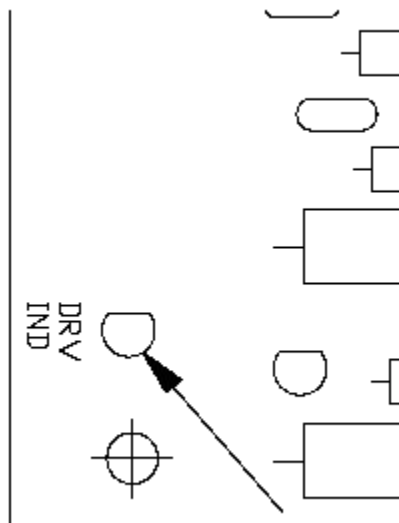
ON-Indicates that the UCP is sending a signal to drive the economizer actuator (ECA) motor open or closed. Lit only when the damper should be opening or closing.

Note: During economizer calibration, typically at initial power up, the UCP will close the damper and over drive for approximately 1 to 1.5 minutes. The LED on the UEM will be lit, but the damper will not be moving.

OFF-Indicates UCP is "not" sending a signal to drive the economizer actuator motor open or closed. The damper should not be moving.

8.3. TCI-1 - LED
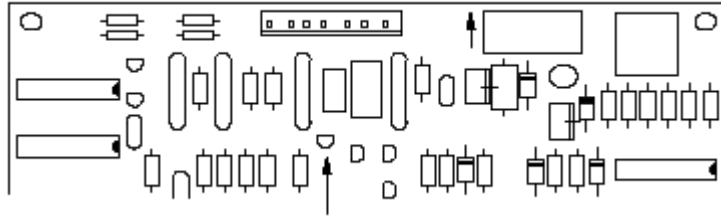
ON-Indicates that communication is taking place between the UCP and ICS device, ICS device is transmitting data to the UCP, LED is not continuously lit but actually blinking at a nearly imperceptible rate.
OFF-Indicates communication is "not" presently taking place.

8.4. TCI-2 And 3 - LED
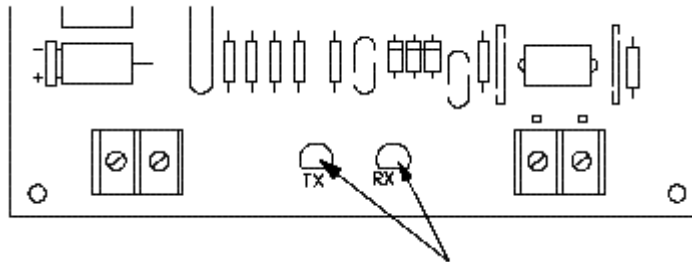
TX (TRANSMIT) RED LED
ON-Indicates Comfort Manager is transmitting data to the UCP. LED is not continuously lit but actually blinking at a
    nearly imperceptible rate.
OFF-Indicates Comfort Manager is "not" transmitting data to the UCP at this time.

RX (RECEIVE) GREEN LED
ON-Indicates Comfort Manager is receiving data from the UCP. LED is not continuously lit but actually blinking at a
    nearly imperceptible rate.
OFF-Indicates Comfort Manager is "not" receiving data from the UCP at this time.
Note: The frequency at which communication takes place is a function of the ICS Device, refer to ICS device literature.

9. Cooling Start Up From The Zone Sensor Module (ZSM) Or Thermostat

9.1. Cooling Mode

1.1.9. 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
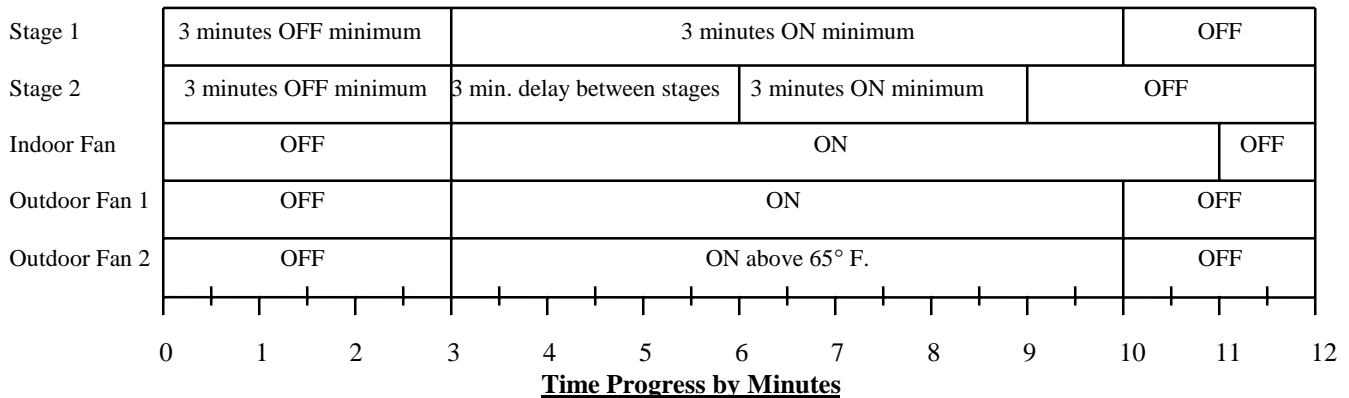
1.1.10. Cooling Staging 27.5-50 Tons

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

* Single circuit, dual manifolded compressors

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

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

Cooling Mode Constant Volume Notes for Voyager 3-50 Tons:

1. Sensor or thermostat settings should be set in the following positions.
    *   Set the fan switch to auto and the system switch to cool.
    *   Set the cooling set point at least 3° F. below the space temperature.

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

3. 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.

4. There will be a minimum of 3 minutes delay between compressor stages turning ON, beginning with VI & VII software.

5. 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 DX coil/ CV only (3-50 tons).

6. 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.

7. 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 (CV only 3-50 tons).

8. The compressor cooling control loop was changed from 90 to 10 seconds beginning with VI & VII software, (06/93).

Cooling Mode Variable Air Volume Notes for Voyager 27.5-50 Tons:

VAV Cooling staging is the same as constant volume staging. The fan is on all the time, and IGV's or VFD controls amount of airflow.

9.2.   Economizer Operation 3-50 ton Constant Volume Units

The typical setup of the microcontrol 0 to 100% fully modulating economizer includes the following:
- Actuator motor (ECA)
- Unitary Economizer Module (UEM),
- Unitary Control Processor (UCP),
- Supply Air (temperature) Sensor (SAS).

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: If there is not an active call for cooling, providing the indoor fan motor is operating, the UCP will have the outdoor air damper positioned in the minimum ventilation position.

Economizer 3-25 tons
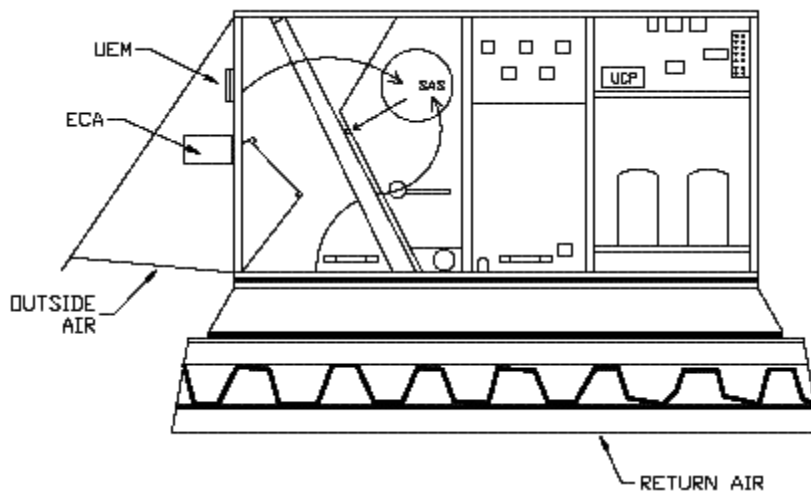
Economizer 27.5-50 tons
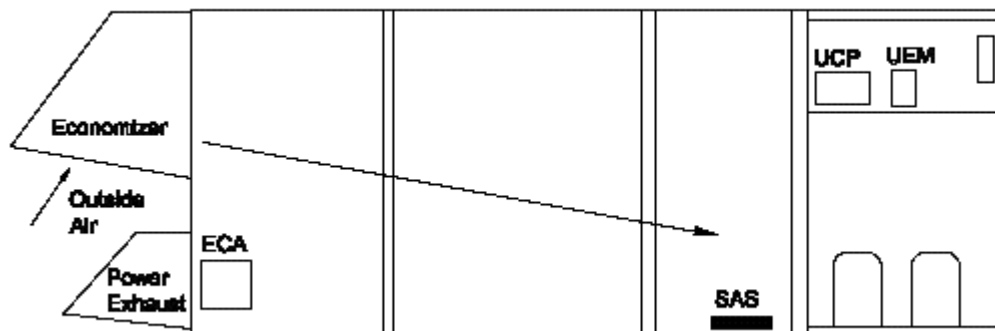
9.3. Dry Bulb Change Over - Field Selectable

The dry bulb change over point is the outdoor temperature at which the equipment will change over, on a temperature fall, from mechanical to economizer cooling. Like wise, the system will change back over, from economizer cooling to mechanical cooling, if the outside air temperature rises above the selected change over temperature. There are 3 selectable dry bulb change over points. The two switches referenced are located on the UEM board, they are on the left hand side of the 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. 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 economizer
Y1 = Economizer
Y2 = 1st Stage

If not suitable to economizer
Y1 = 1st Stage
Y2 = 2nd Stage & 3rd Stage
```
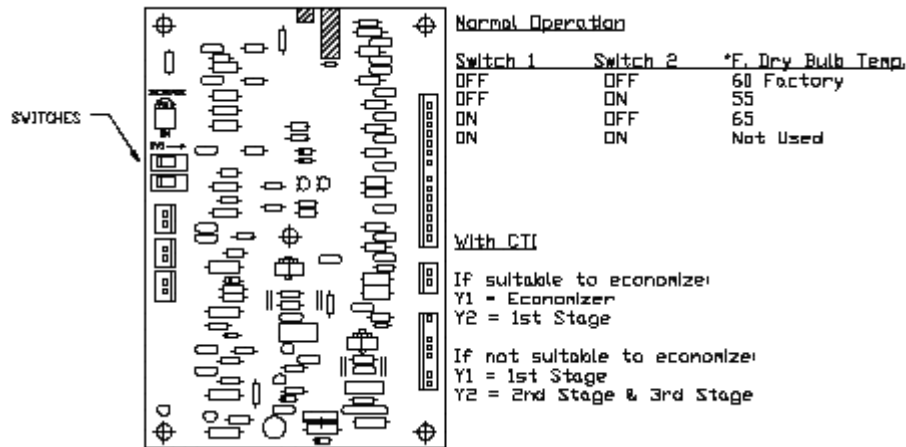
9.4. Single Enthalpy "Reference" Change Over - Field Selectable

Reference enthalpy is accomplished by using the **BAYENTH003A accessory**, consisting of an Outdoor Humidity Sensor (OHS). Similar to single 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, they are on the left hand side of the board. 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	

9.5.   Differential Enthalpy "Comparative" Change Over

Comparative enthalpy is accomplished by using the BAYENTH004A accessory, consisting of an Outdoor Humidity Sensor (OHS), Return Humidity Sensor (RHS) and Return Air (temperature) Sensor (RAS). Similar to differential enthalpy control, used in electromechanical equipment. If the outdoor enthalpy is greater than 1/2 Btu/LB dry air above the return air enthalpy, the 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.
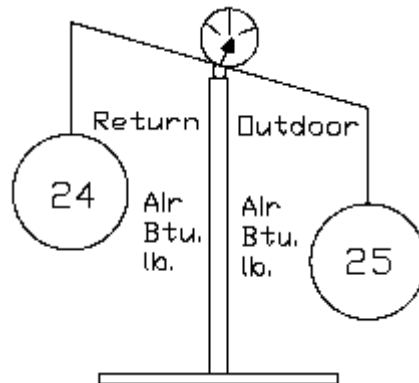
If the outdoor enthalpy is less than 1/2 Btu/LB dry air below the return air enthalpy, the microcontrol equipment will change over, from mechanical to economizer cooling utilizing outdoor air. Mechanical cooling will operate if the outdoor enthalpy rises 1/2 Btu/LB dry air above the return air enthalpy. 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.
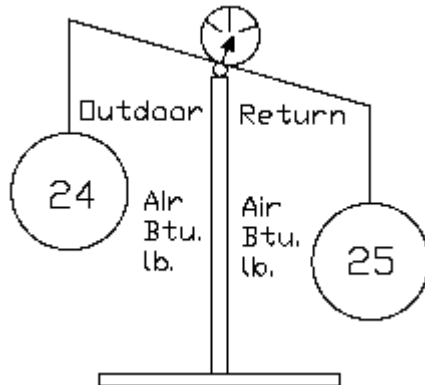
9.6. Economizer And Options 3-50 ton Constant Volume Units

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

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

System Where Zone Temperature Recovery Is Satisfactory
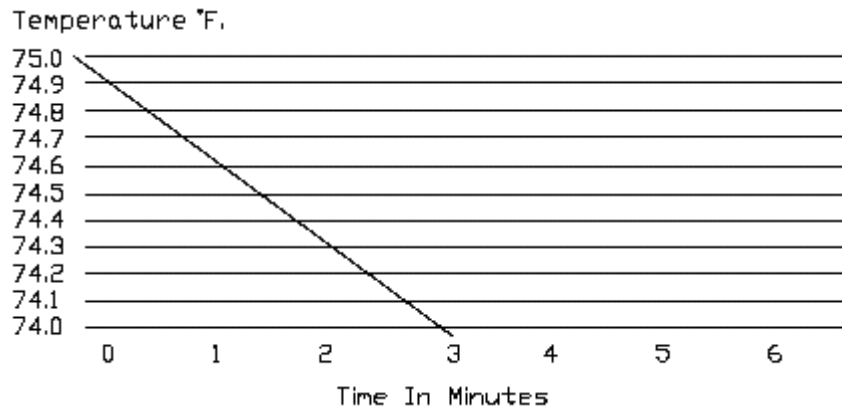
System Where Zone Temperature Recovery Is Unsatisfactory
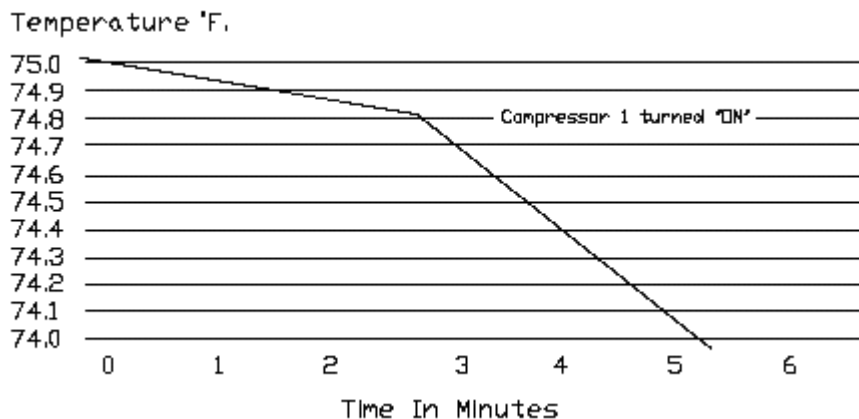
9.7. Economizer Set Point- Constant Volume (3-50 tons)

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

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

ECONOMIZER SET POINT

CSP=COOLING SET POINT
ESP=ECONOMIZER SET POINT
HSP=HEATING SET POINT
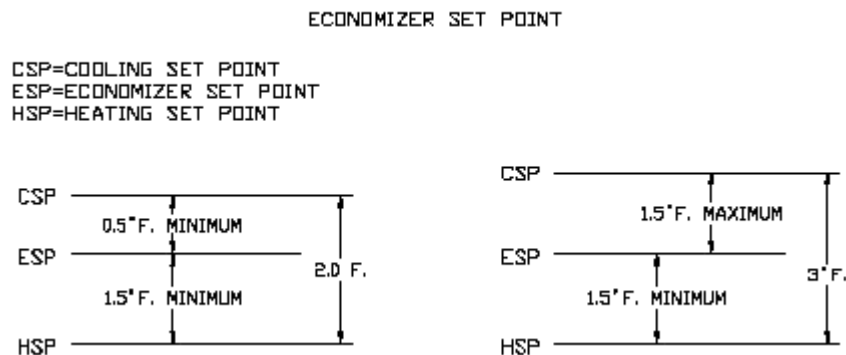
9.8. Economizer Set Point- Variable Air Volume (27.5-50 tons)

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

Example:

+3.5	Econ. Damper Starts Modulating Closed	56.5°F
+1.5	Econ. Deadband Upper Limit	56.5°F
SA Cooling SP	Econ. Damper at Minimum	55°F
-1.5	Econ. Deadband Lower Limit	53.5°F
-3.5	Econ. Damper Starts Modulating Closed	51.5°F
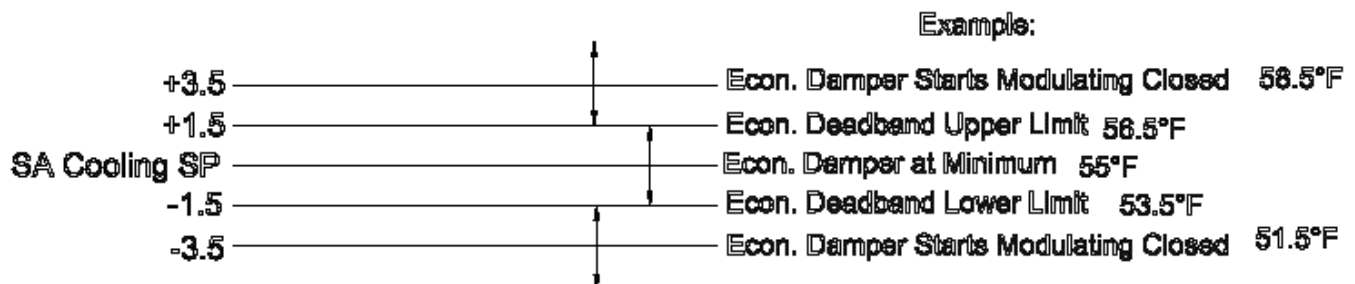
9.9. How The Economizer Functions Electrically

1.1.11. 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. What this boils down to, is that the UCP outputs on terminals J2-10, J2-11, and J2-12 can be viewed as single pole single throw (SPST) switches of sorts.

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.
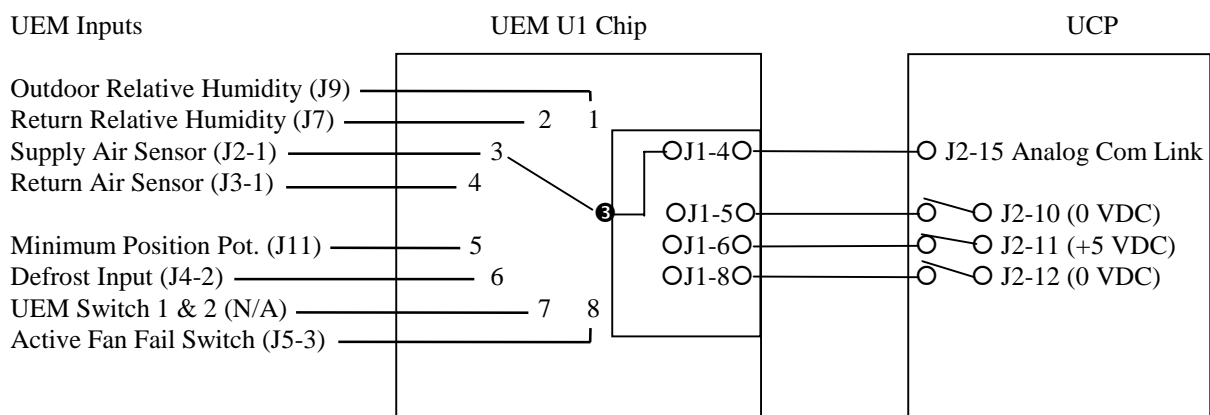
1.1.12. How The UCP Causes Changes To Occur

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.
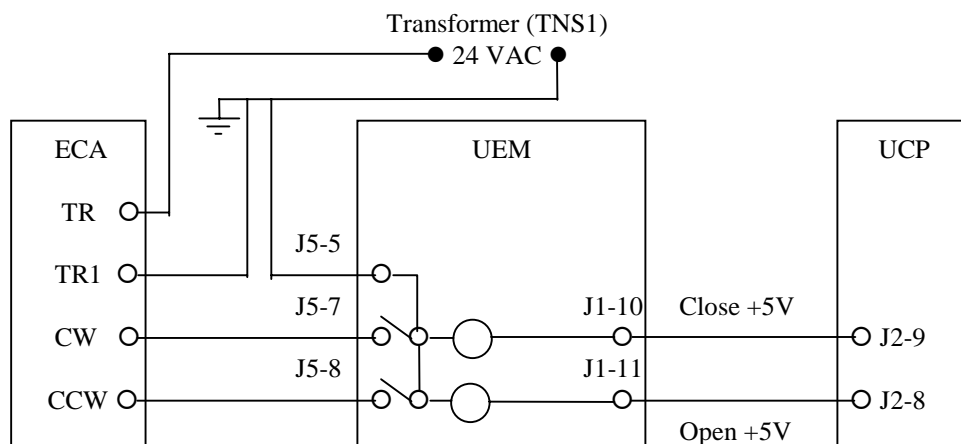
10. Heating / Cooling Change Over

The change over from heating to cooling is accomplished in two different manners. The device which causes the difference in change over point is the economizer. 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.
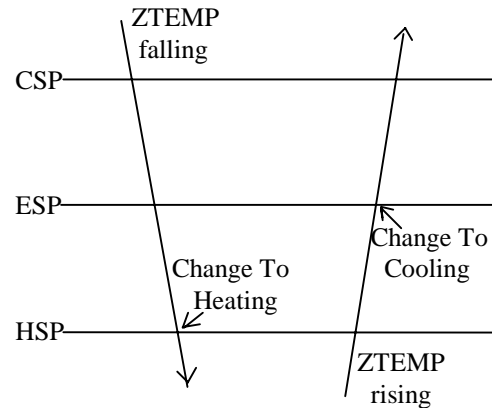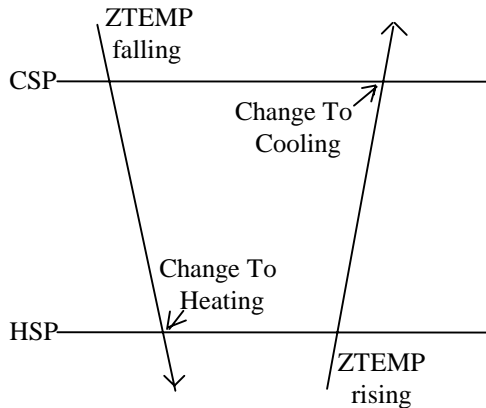
11.   Gas Heat Start Up From The Zone Sensor Module (ZSM) Or Thermostat

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

1st Stage - Lo Fire	OFF	ON	OFF
2nd Stage - Hi Fire	OFF / ON	OFF	
Indoor Fan	OFF / ON		OFF
Igniter Probe	ON / OFF		
Gas Valve	OFF / ON	OFF	

```
0        1        2        3        4        5        6
                        Minutes
```
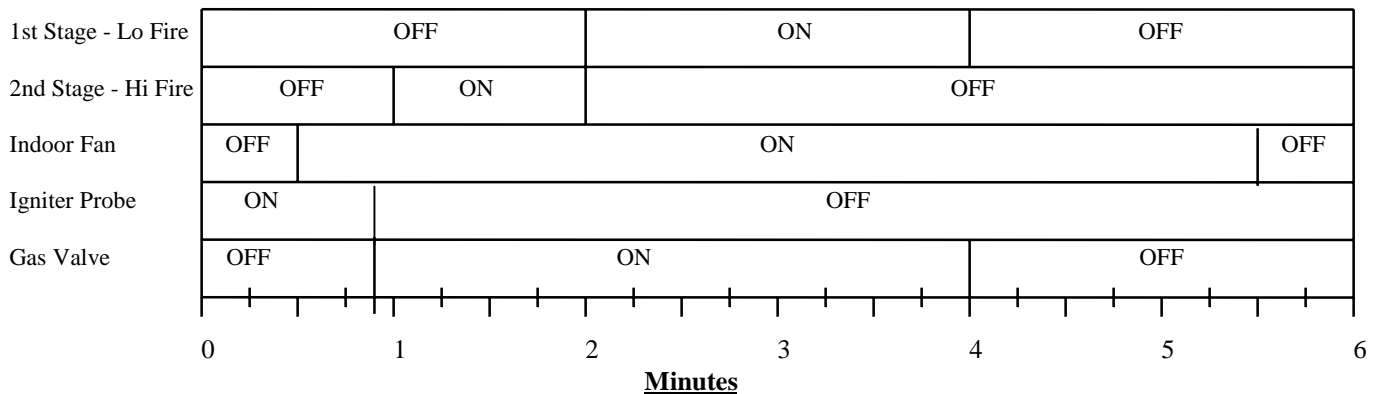
If the zone temperature is more than 0.3° F. above the Heating Set Point, all heat should be off, providing all timing requirements have been met. As the zone temperature drops, when it is between 0.1- 0.3° F. below set point, stage 1 heat will be turned on. If the zone temperature continues to fall, 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 Constant Volume - Voyager 3-50 Tons:

Assume the:
1. Sensor or thermostat is set in the following positions.
    - The fan switch in auto and the system switch in heat.
    - The heating set point at least 3° F. above the space temperature (Constant Volume).
2.   At power up the UCP self tests for 20 seconds before beginning heating timing.
3.   The heat cycle will start in 2nd Stage - Hi Fire for 30 seconds, 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.
4.   A 7 second trial for ignition occurs 45 seconds into the heat cycle, lock out occurs after 3 unsuccessful trials.
5.   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.
6.   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.
7.   If a CTI and thermostat are used, the heat cycle can be initiated and terminated as rapidly as every 5 seconds.
8.   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.
9.   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.
10.   A 4 minute minimum ON time existed for the gas heat cycle, and the control loop was changed from 90 to 10 seconds in X13650473 software (06/93).   (Voyager 3-25 tons)
11.   The 4 minute minimum ON time could be defeated in X13650508 software (06/94) (Voyager 3-25 tons).
12.   The 4 minute minimum ON time was removed in X13650564 software (Voyager 3-25 tons).

Gas Heating Mode Variable Air Volume - Voyager 27.5-50 Tons:

1.   Morning Warm-up is enabled when the following occurs (CV or VAV):
   - The local MWU set point is in range
   - Enabled through the remote panel with night setback or ICS enabled.

   MWU is activated whenever the unit switches from unoccupied to occupied and the zone temperature is at least a 1.5°F below the MWU set point. When MWU is activated the system will ensure that the VAV boxes have been signaled to be open for at least 6 minutes after which the IGV or VFD will be driven to full air flow. After the previous conditions have been met, all stages of gas or electric heat shall be energized and the economizer damper shall be driven fully closed. To reduce the effect of rapid building temperature swing, heat will be cycled between heat stages 1 & 2 in response to a calculated set point which approaches the MWU shall terminate and all stages of heat shall be de-energized. The unit shall switch over to VAV cooling operation, after the zone temperature rises above the MWU set point.

2.   Daytime Warm-up (DWU) is enabled through the following (VAV Only):
   - An ICS device
   - Night setback zone sensor
   - J1-3 in unit wiring harness

The unit is shipped form the factory with a VAV panel which has a MWU set point potentiometer. Daytime warm-up set point is 3°F below the MWU set point set at the VAV panel, programmable zone sensor, or ICS device. Daytime warm-up is activated when the unit is in the occupied mode and the zone temperature is below the daytime warm-up initiate temperature or the unit is in occupied heat mode. DWU is deactivated when the zone temperature reaches the MWU set point.

12. Electric Heat Start Up From The ZSM Or Thermostat

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

1st Stage Heat	OFF	ON	OFF
2nd Stage Heat	OFF	ON	OFF
Indoor Fan	OFF	ON	OFF

```
0    5    10   15   20   25   30   35   40   45   50
```
Second
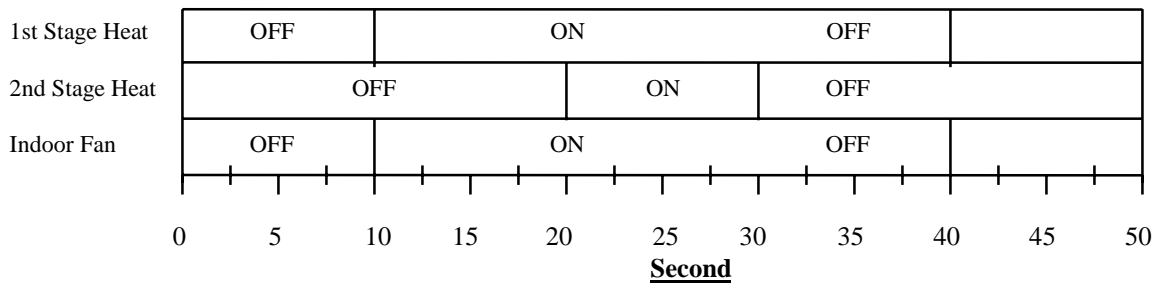
The graph above illustrates electric heating mode start up sequence. The various operating components are down the left side, and time progresses left to right across the graph.

Electric Heating Mode Constant Volume - Voyager 3-50 Tons:

Assume the:
1. Sensor or thermostat is set in the following positions:
   * The fan switch in auto and the system switch in heat.
   * The heating set point at least 3° F. above the space temperature.
2. At power up the UCP self tests for 20 seconds before beginning heating timing.
3. There is an additional 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. 30 seconds will elapse before first stage heat turns on.
4. 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.
5. If a CTI and thermostat are used, the heat can be turned on and off as rapidly as every 5 seconds.
6. 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.
7. 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.
8. The heating control loop was changed from 90 to 10 seconds beginning with X13650473 software, (06/93) (VI & VII).

Electric Heating Mode Variable Air Volume - Voyager 27.5-50 Tons:

Refer back to Gas Heat for CV and VAV Morning Warm-up & VAV Daytime Warm-up Control.

13.   Heat Pump Start Up From The ZSM Or Thermostat

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

CPR1 & CPR2	ON	OFF
1st Stage Aux.	OFF / ON	OFF
2nd Stage Aux.	OFF / ON	OFF
Indoor Fan	ON	OFF
ODF1 & ODF2	ON	OFF
SOV(s)	OFF (Except when in Cooling mode or Defrost)	

```
0    2    4    6    8   10   12   14   16   18   20   22   24
                         Minutes
```
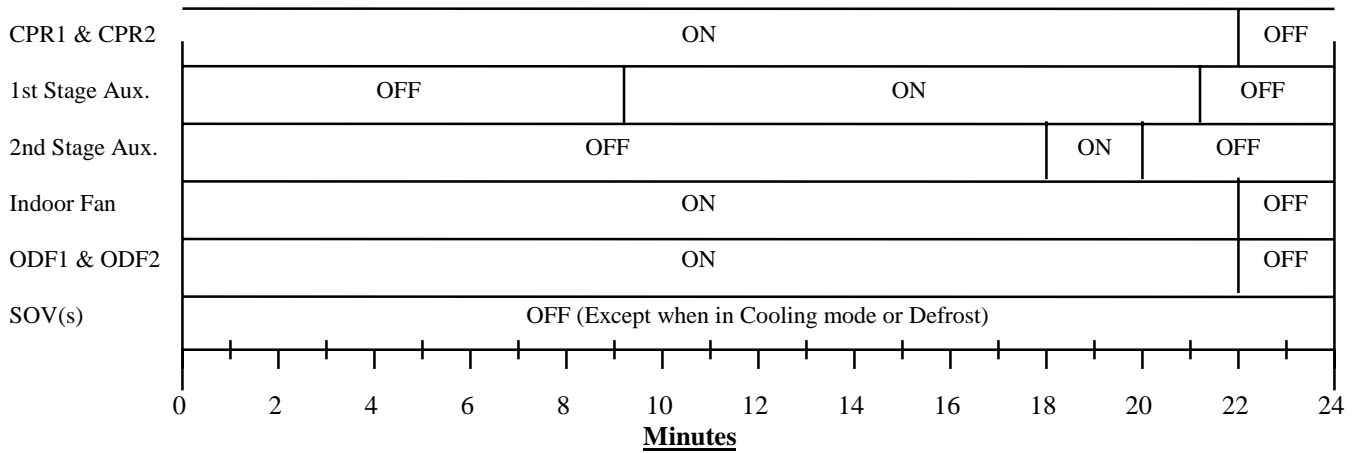
The graph above illustrates heat pump heating mode start up sequence. The various operating components are down the left side, and time progresses left to right across the graph.

Heat Pump Heating Mode Constant Volume Notes Voyager 3-20 Tons::

Assume the:
1.   Sensor or thermostat is set in the following positions.
   - The fan switch in auto and the system switch in heat.
   - The heating set point at least 3° F. above the space temperature.
2.   At power up the UCP self tests for 20 seconds before beginning compressor timing.
3.   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.
4.   Both compressors operate as first stage heating. There is a one second delay between starting compressors.
5.   A 9 minute delay exists between heat stages, between 1st stage auxiliary/mechanical, and 2nd/1st stage auxiliary.
6.   At power up the economizer goes through a calibration cycle. It will open for 5 seconds and then drive closed for 90 seconds, verifying damper is fully closed.
7.   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.

14. Low Ambient Mechanical Cooling Operation

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

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

Compressor |← OFF →|← ON (10 minute accumulated compressor run time) →|← OFF →|← ON →

Indoor Fan |← OFF →|← ON (Continues to run even with fan selector switch set in Automatic position →

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

Minutes

27.5-50 Ton Frostat Trip (CV and VAV)

The Frostat input is a normally closed binary input.

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, which ever is longer.

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

15. Defrost Operation

15.1. Demand Defrost

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. 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

15.2. Demand Defrost Failures, Diagnostics, and Defaults

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

Problem = Coil Temperature Sensor (CTS) Failure
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
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

15.3. Time Temperature Defrost

Time / Temperature Defrost

Switch 1	Switch 2	Defrost Time	SOVs	|← OFF →|← ON →|←OFF
				Selected Defrost Time Interval = 45 Minutes
OFF	OFF	70 Min.	DT Switch	|←OPEN→|← CLOSED →|←OPEN
ON	OFF	90 Min.		| | | | | | | | | | | | |
OFF	ON	60 Min		0 5 10 15 20 25 30 35 40 45 50 55 60
ON	ON	45 Min.		**Minutes**

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

The defrost interval is field selectable to one of four settings, factory and default setting is 70 minutes. See 76. 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.

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.

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

If the UCP sees an out of range temperature / resistance from the Defrost Module due to an open or shorted circuit, a 10 minute default defrost cycle will be initiated by the UCP after each 70 minutes of accumulated compressor run time.

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 it's controlling circuitry remain intact to energize the Switch Over Valve(s) SOV(s), defrost will still occur.

15.5. Soft Start

DT Switch	|← CLOSED →|← OPEN (Defrost cycle terminating) →|
	↓ 5 second Soft Start delay ↓
SOV(s)	|← ON →|← OFF →|
Outdoor Fan(s)	|← OFF →|← ON →|
	| | | | | | | | | | | | | | | | | | |
	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
	Seconds

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

15.6.   Smart Recovery

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

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

Temperature °F.
75.0
74.9
74.8   ← Zone
74.7   Temperature
74.6
74.5
   | | | | | | | | | | | | | |
   0   1   2   3   4   5   6   7   8   9 10 11 12 13
                    Minutes

Temperature °F.
75.0   Zone
74.9   Temperature →
74.8
74.7
74.6   ↑
74.5   Stage 1 Auxiliary Turned "ON"
   | | | | | | | | | | | | | |
   0   1   2   3   4   5   6   7   8   9 10 11 12 13
                    Minutes
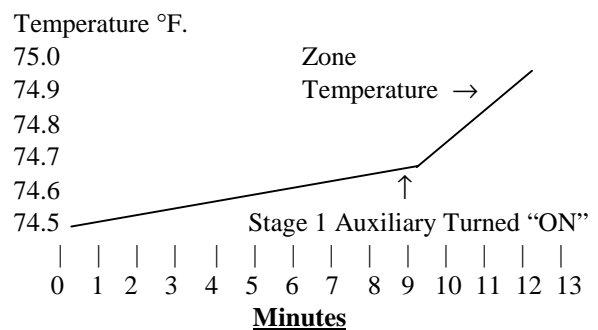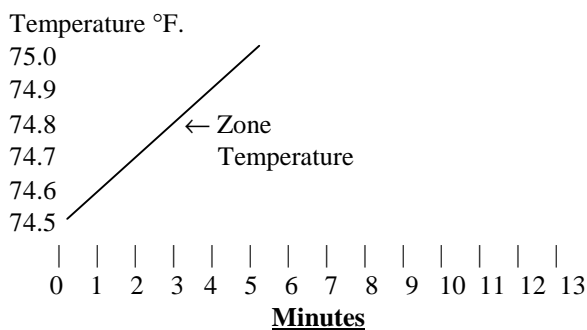
16.   Operation with a Conventional Thermostat Interface (CTI)

When a Conventional Thermostat Interface (CTI) is applied, equipment operation differs significantly. The basic equipment protection features remain intact, and the following features and benefits are lost:

- Direct Digital Control- Proportional Integral (PI) control is lost, equipment is controlled by a thermostat or generic building automation system device.
- On Board Diagnostics are lost, they are still available at the Unitary Control Processor (UCP) level on the J7 junction pins, but are no longer accessible at the Low Voltage Terminal Board (LTB).
- Intelligent Fall Back is lost, if a failure occurs in the device controlling the equipment, operation will cease.
- Heat Pump Smart Recovery And Smart Staging is lost, Heat Pump operation becomes more costly unless generic control being applied can accomplish this.
- Remote Sensing Capabilities are lost.
- Space Temperature Averaging capabilities are lost
- Supply Air Tempering Features feature is lost, discharge air temperature may be cold when not actively heating if outdoor air is being introduced through the equipment.
- Built in Night Set Back and Unoccupied Functions are lost.
- Built in Unoccupied mode is lost
- Economizer Preferred Cooling is lost. (Prior to 10/97)

Note: Installation is more costly. In addition to the price of Conventional Thermostat Interface and the thermostat or generic control, the control wiring size must be increased.

17. 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 when an economizer accessory is used or to return duct work 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%.

Note: The Exhaust Fan Contactor (XFC) has a 30 VDC coil.
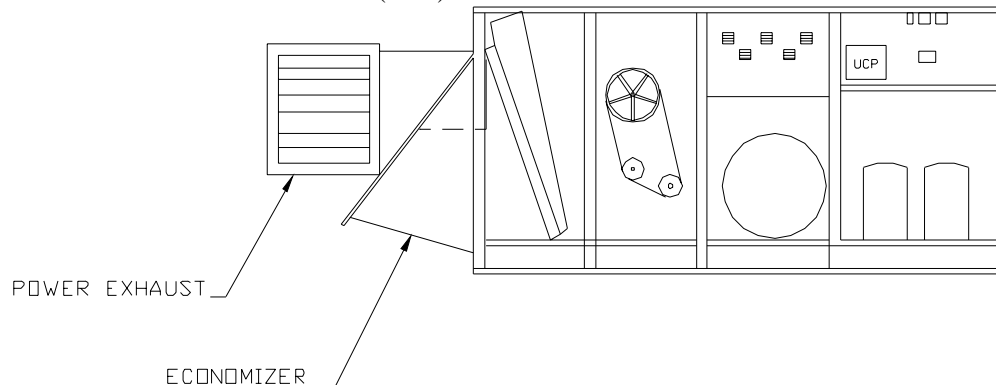
Power Exhaust 27.5-50 Ton Units:
The 27.5 – 50 ton power exhaust fan is started whenever the position of the economizer dampers meets or exceeds the power exhaust set point when the supply fan is running. The set point panel is located in the return air section. This power exhaust can be adjusted from 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 air flow. See catalog for specific unit data.

Section 3
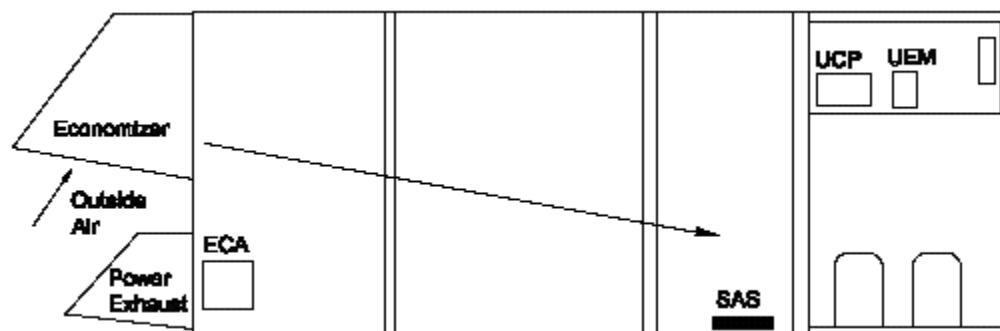
18.   Electrical Measurements

18.1.   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 servicers 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.
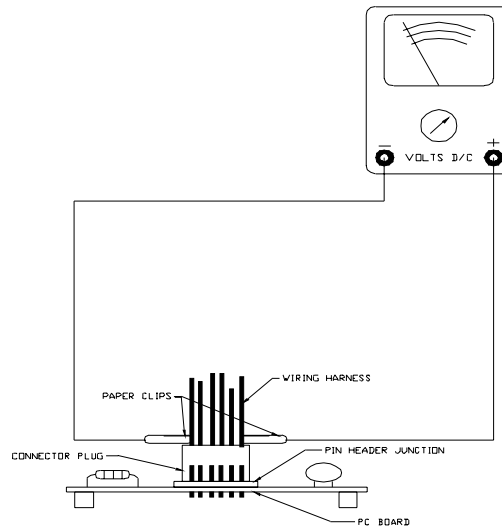
18.2.   With Plugs Disconnected

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.
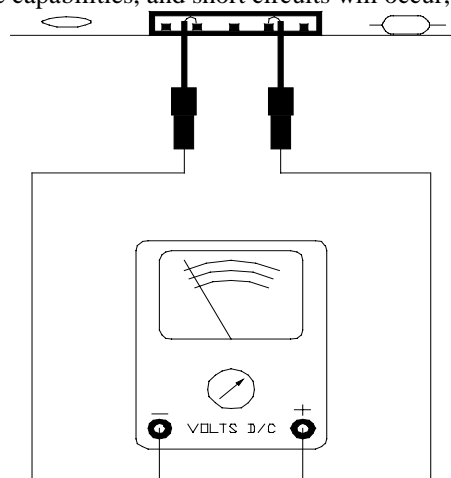
18.3. At Disconnected Plug Ends

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 alright. 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.
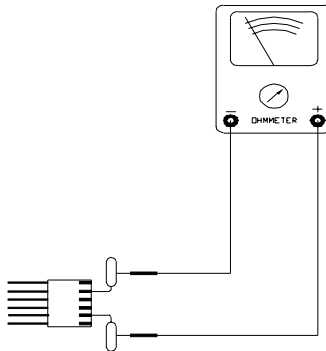
19. Trouble Shooting From An Integrated Comfort System (ICS) Device

An ICS device like: Tracer, Tracker/ComforTrac (CV only), and Comfort Manager(CV only), is an effective means 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.
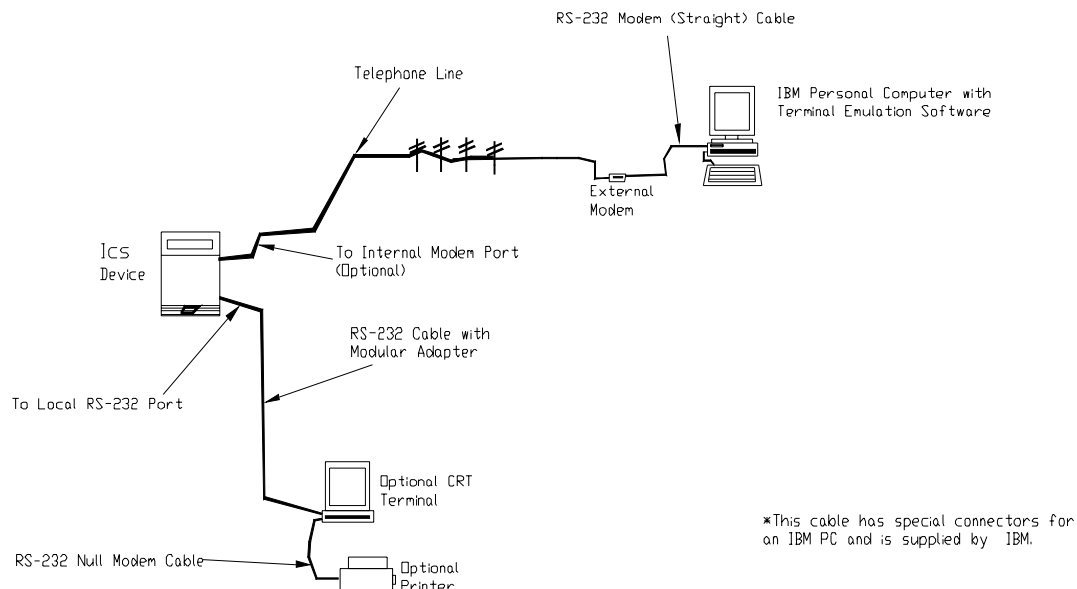
20. Recommended Steps For Trouble Shooting
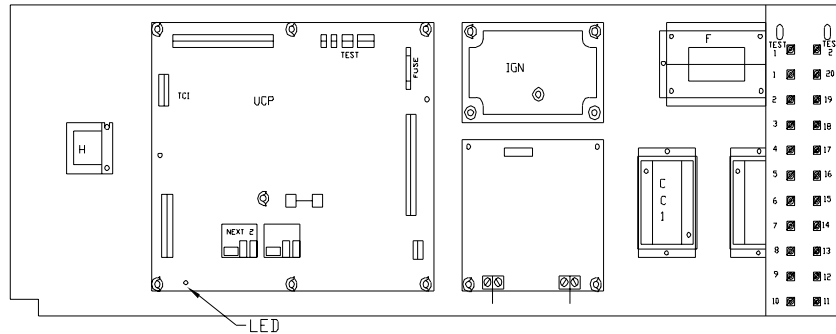
Step 1. Do Not kill unit power with disconnect switch, or diagnostic & failure status information will be lost.

Step 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.

Step 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.

Step 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.

Step 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.

Step 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 UCP's 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.

Step 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.

Step 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 UCP's on board outputs, and all of the controls the UCP's outputs energize are operational.

Step 9. Refer to Individual Component Test Procedures in Section 4, if other microelectronic components are suspect.
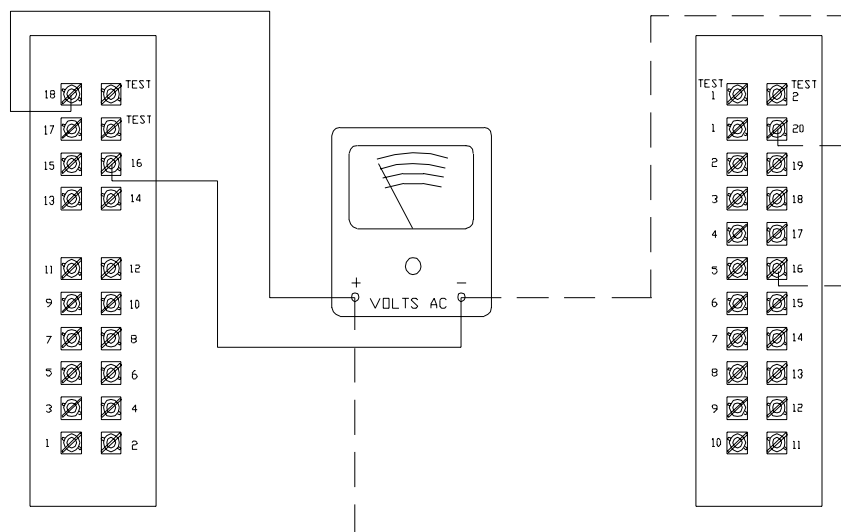
21. Trouble Shooting Chart "Problem Descriptions And Causes"

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

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
A. Unit will not operate. No Heat, No Cool or No Fan operation.	1. No power to the Unit. 2. No power to the UCP. 3. UCP fuse (F1) is defective. 4. Zone Temperature Sensor (ZTS) is defective or MODE circuit is open. 5. UCP is defective. 6. Supply Fan Proving (SFP) switch has tripped. 7. External Auto/Stop input is open.	1. Check line voltage at service disconnect. 2. Check for 24 VAC from bottom of F1 fuse to system ground. 3. Check for 24 VAC from top of F1 fuse to system ground. If 24VAC is not present, replace F1 fuse. 4. See Zone Sensor Module (ZSM) Test Procedures or short MODE input on VAV units. 5. If 24 VAC is present at the top of F1 fuse to ground, the LED on the UCP should be on. If the LED is not lit, replace the UCP. 6. Check the IDM and belts, replace as necessary. 7. Check the External Auto/Stop input.
CV Units Only B. Unit will not Heat or Cool, but the Fan switch operates.	1. Zone Sensor Module (ZSM) is defective. 2. Problem in (ZSM) wiring. 3. UCP is defective.	1. Refer to the Zone Sensor Module (ZSM) Test Procedures. 2. Verify all terminal connections between LTB1 and the ZSM are properly wired. Disconnect the ZSM wiring at LTB1 and test the wires using the Zone Sensor Test Procedures to locate any wiring problems. 3. Disconnect connector P7 from the UCP and perform the Zone Sensor Module (ZSM) Test Procedures. If within range, replace UCP.
CV or VAV (Unoccupied) C. Unit heats and cools, but will not control to set point.	1. Zone Sensor Module (ZSM) is defective. Possible Cool Failure 2. Thermometer on the ZSM out of calibration.	1. Refer to the Zone Sensor Module (ZSM) Test Procedures. Refer to the Unit Control Processor (UCP) Default Chart. 2. Check and calibrate the thermometer.
D. CPR1 will not operate, ODM's will operate.	1. Compressor failure. 2. Wiring, terminal, or mechanical CC1 contactor failure. 3. LPC1 has tripped	1. Test compressor, mechanically and electrically. Replace if necessary. 2. Check wires, terminals and CC1. Repair or replace if necessary. 3. Leak check, repair, evacuate and recharge as necessary. Check LPC1 operation.
E. CPR1 operates, ODM's will not operate.	1. ODM has failed. 2. ODM capacitor(s) has failed. 3. Wiring, terminal, or mechanical CC1 or CC2 contactor failure. 4. ODF1 or 2 relay has failed 5. UCP is defective	1. Check ODM's, replace if necessary. 2. Check ODM capacitors, replace if necessary. 3. Check wires, terminals ,CC1 and CC2. Repair or replace if necessary. 4. Check for proper voltage and contact closure. ODF1 has a 24 VAC holding Coil and ODF2 relay has a 24 VDC holding coil. If applicable voltage is present, replace relay. 5. Locate the P1 connector on the UCP. Check for 24 VDC between terminals P1-11 and P1-12. If 24 VDC is not present, replace UCP.
F. CPR1 and ODM1 will not operate.	1. No power to CC1 coil. Possible Cool Failure 2. CC1 coil defective. Cool Failure Indicated. 3. CC1 contacts defective. 4. UCP is defective. 5. LPC1 has tripped	1. Check wiring, terminals and applicable controls (CCB1, HPC1 WTL1, LPC1) 2. Check CC1 coil. If open or shorted, replace CC1. 3. If 24 VAC is present at CC1coil, verify contact closure. 4. If 24 VAC is not present at CC1 coil, reset the Cool Failure by cycling the main power disconnect switch. Verify system MODE is set for cooling operation. If no controls have opened, and CC1 will not close, replace UCP. 5. Leak check, repair, evacuate, and recharge as necessary. Check LPC1 operation.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
G. 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. 5. UCP is defective. 6. ODF2 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. 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.
H. 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 insure 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.
I. 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 wiring, terminals, or fan contactor F. 3. Place unit in test mode. If the fan operates in the test mode, test the ZSM using the appropriate test procedures. 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.
J. No Heat (YC's only) 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 line 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.
K. 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 warmup, 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.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
L. 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.
M. 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.
N. 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 HeatingTest 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.
O. No Heat (TE's only) Electric heat will not operate.	1. Heater contactor(s) have failed. 2. Heater element temperature limit(s) is open. 3. Wiring or terminal failure. 4. Heater Element(s) has failed. 5. UCP is defective.	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. 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. Check for wiring, or terminal failure in control and power circuit. Repair or replace if necessary. 4. Check element and circuit integrity. Repair or replace as necessary. Replace open elements. 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.
P. Evaporator coil freezes up during low ambient operation.	1. System low on refrigerant charge. 2. System low on air flow. 3. Outdoor Air Sensor (OAS) has Failed. 4. Frostat[TM] has Failed	1. Leak check, repair, evacuate, and recharge system as necessary. 2. Check return air for obstruction or dirty filters. Check fan wheels, motors, and belts. 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. Check Frostat Switch

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
Q. Economizer will not operate.	1. Economizer connector not plugged into unit wiring harness	1. Check connector, and connect if necessary.
	2. Economizer Actuator (ECA) has failed	2. Verify that 24 VAC is present between ECA terminals TR and TR1. Jumper TR1 to CCW, economizer actuator should drive open. Jumper TR1 to CW, economizer actuator should drive closed. If ECA does not drive as specified, replace ECA.
	3. Unit Economizer Module (UEM) has failed.	3. Perform the UEM Test Procedures discussed previously.
	4. Wiring or terminal failure.	4. Check wiring and terminals. Repair or replace if necessary.
	5. UCP is defective.	5. Perform the UEM Test Procedures discussed previously.
R. Minimum position is at zero, cannot be adjusted. Economizer still modulates.	1. Minimum position potentiometer has failed.	1. With the main power off, check the resistance between terminals J11 and J12 at the UEM by rotating the on board minimum position potentiometer knob. Resistance should be 50 to 200 Ohms. With power on, DC voltage should measure 0.40 to 1.80 VDC. Also refer to the UEM Test Procedures discussed previously.
S. Economizer goes to minimum position, and will not modulate.	1. OAS has failed.	1. Check the 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.
	2. SAS has failed.	2. Check the SAS at connector P12 by disconnecting P12 from J2 on the UEM. "SA" is marked on the side of the board. Check for resistance between P12-1 and P12-2, refer to the Resistance versus Temperature Chart. Replace sensor if necessary.
T. Economizer modulates, but system does not seem to operate as effeciently as in the past.	1. Comparative enthalpy setup, RAS or RHS failed. System is operating using Referance enthalpy	1. Check the return air sensor (RAS) at connector P13 by disconnecting P13 from J3 on the UEM. "RA" is marked on the side of the board. Check for resistance between P13-1 and P13-2, refer to the Resistance versus Temperature Chart. Replace the sensor if necessary. Check the return air humidity sensor (RHS) by measuring the operating current at terminals J7 (-), and J8 (+) on the UEM board. Normal operating current is 4 to 20 milliamps mA. **Note:** The humidity sensors are polarity sensitive, and will not operate if connected backwards.
	2. Referance enthalpy setup, OHS has failed. System is operating using dry bulb control.	2. Check the outside humidity sensor (OHS) by measuring the opeating current at terminals J9 (-), and J10 (+) on the UEM module. Normal operating current is 4 to 20 milliamps mA.
	3. Comparative enthalpy setup, OHS has failed. System is operating using dry bulb control.	3. Perform #2 above.
U. Power Exhaust will not operate.	1. Exhaust motor has failed.	1. Check the exhaust fan motor, and replace if necessary.
	2. XFC has failed.	2. Check the exhaust fan contactor (XFC). Replace if necessary
	3. UEM has failed.	3. Perform the UEM Test Procedures discussed previously.
	4. XFSP has Failed	4. Perform the Exhaust Fan Setpoint Test Procedures discussed previously.
V. IGV/ VFD will not operate properly	1. UVM has Failed	1. Perform the UVM Test Procedures discussed previously.
	2. IGV / VFD has Failure	2. Check the IGV / VFD
	3. Setpoint Failure	3. Perform the IGV / VFD Setpoint Test Procedures discussed previously.

22. 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

23. Failure Status Diagnostics

23.1. System LED

```
          SERVICE
            ◯
S          COOL
Y  HEAT      ◯
S  AUTO
T  OFF     HEAT
E  COOL      ◯
M
           SYS ON
F  AUTO  ⟶  ◯
```

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".

23.2. Heat LED

```
          SERVICE
            ◯
S          COOL
Y  HEAT      ◯
S  AUTO
T  OFF     HEAT
E  COOL  ⟶  ◯
M
           SYS ON
F  AUTO      ◯
```
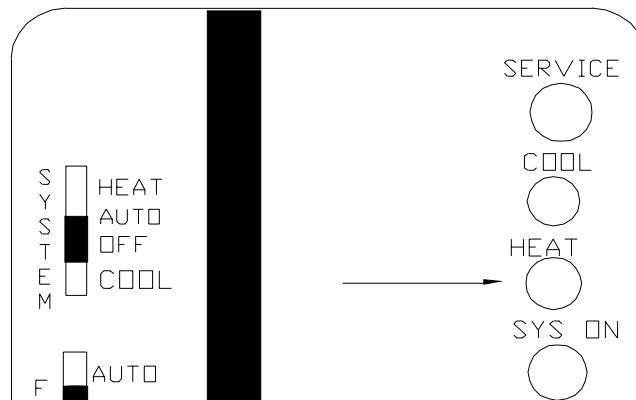
ON-Indicates unit is in the heat mode, and actively heating.
BLINKING-Indicates a Heating Failure has occurred.
OFF- Indicates that the unit is "not" actively heating.

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).

23.3. Cool LED

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 set point (slide pot) on ZSM has failed. See "Testing The ZSM."
2. Zone temperature thermistor ZTEMP on ZSM failed. See "Testing The ZSM.
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.

23.4. Service LED
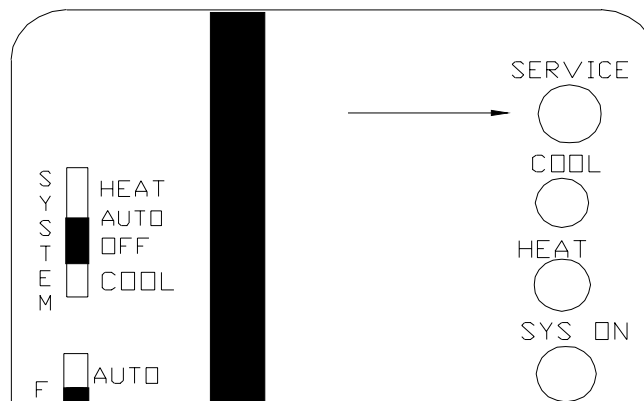
ON-Used to indicate clogged filter, indication only.
BLINKING-Used to indicate fan failure, shuts unit down.
OFF-Neither of the above have occurred, or not being used.

Note: SERVICE LED is a generic indicator, field modifications are necessary.

23.5. Cool and Heat LED
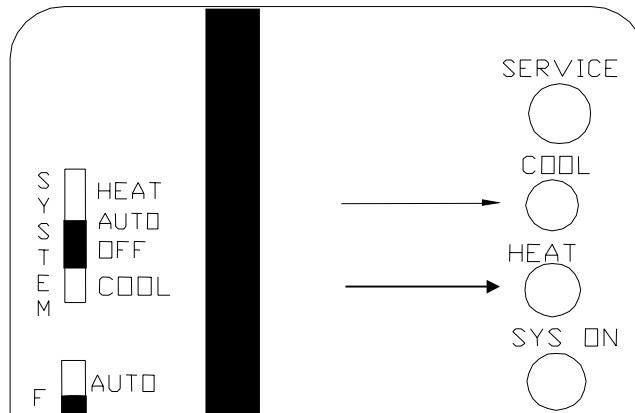
SIMULTANEOUS BLINKING - External Auto Stop (LTB-16 &17) has opened (27.5-50 ton only)
Coil or Outside Air Sensor Failure (WC Only)

23.6. Service and Cool LED
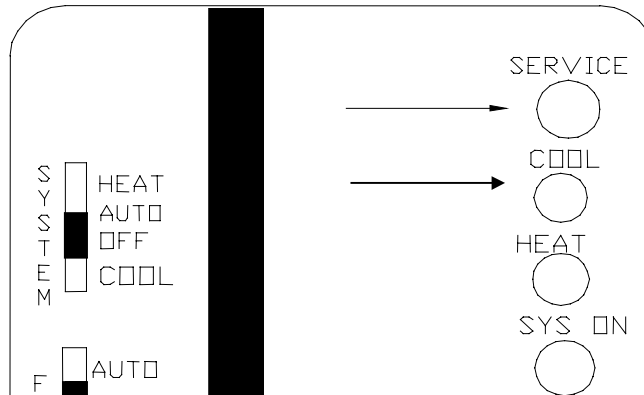
SIMULTANEOUS BLINKING - Static Pressure Transducer Failure (27.5-50 ton VAV only)

23.7. Service, Cool, and Heat LED
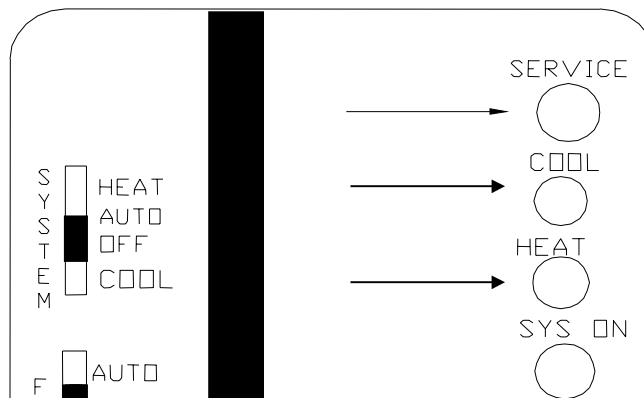
SIMULTANEOUS BLINKING - Supply Air High Limit Duct Static Trip. Manual Reset. (27.5-50 ton VAV only)

24. Failure Status Diagnostics

24.1. System ON **= Measure DC volts between terminals LTB-6 & LTB-9**
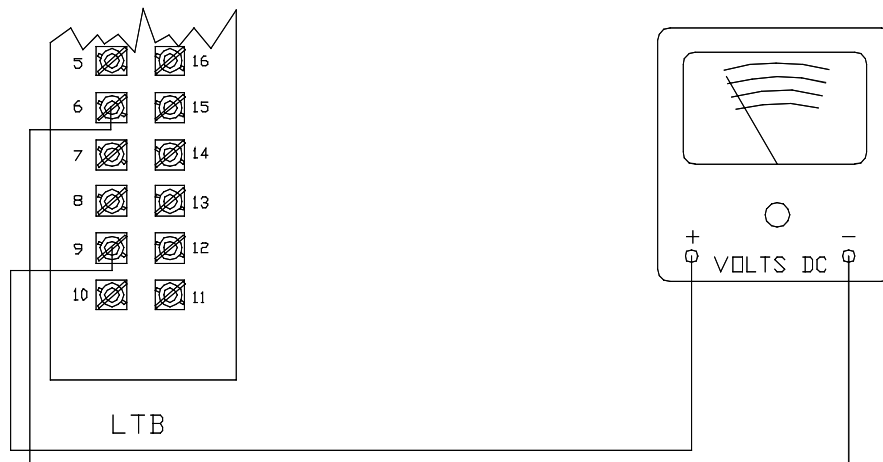
Normal Operation = Approximately 32 VDC.
System Failure = Less than 1 VDC, approximately 0.75 VDC. Indicates that no power is going to the UCP, or that the software/computer program has failed. See "Recommended Steps For Trouble Shooting".
Test Mode = Alternates between 32 VDC & 0.75 VDC.

24.2. HEAT **= Measure DC volts between terminals LTB-6 & LTB-7.**
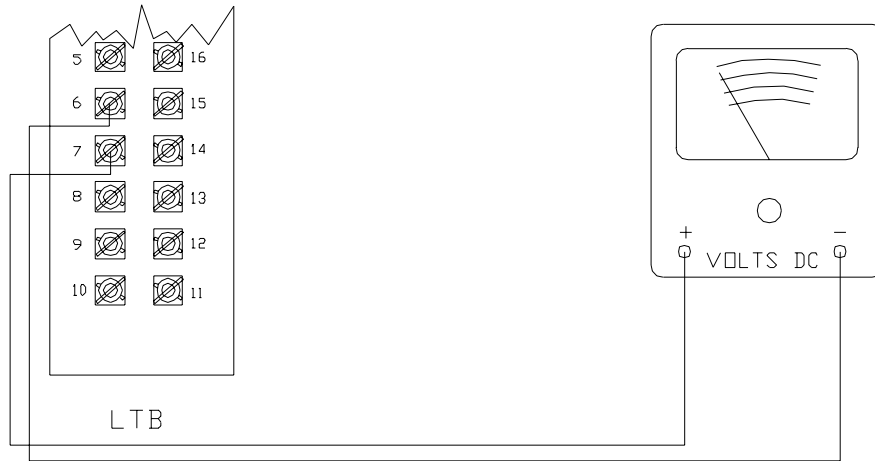
Heat Operating = Approximately 32 VDC.
Heat Off = Less than 1 VDC, approximately 0.75 VDC.
Heating Failure = Alternates between 32 VDC & 0.75 VDC.

Heating Failure Causes
1. TCO1 or TCO2 has opened (YCs only).
2. ZSM mode switch is in Emergency Heat position (WCs only).

24.3. 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 set point (slide pot) on ZSM has failed. See "Testing The ZSM".
2. Zone temperature thermistor ZTEMP on ZSM failed. See "Testing The ZSM".
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.

24.4.   SERVICE **= Measure DC volts between terminals LTB-6 & LTB-10.**
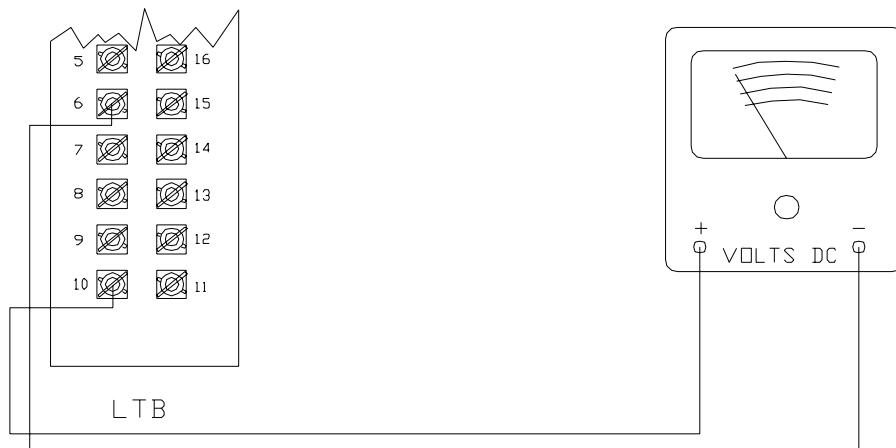
Clogged Filter = Approximately 32 VDC.
Normal Operation = Less than 1 VDC, approximately 0.75 VDC.
Fan Failure = Alternates between 32 VDC & 0.75 VDC.

Note: SERVICE is a generic indicator, field modifications are necessary.

Section 4

25. Testing The Unitary Control Processor (UCP)

25.1. 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:** 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.
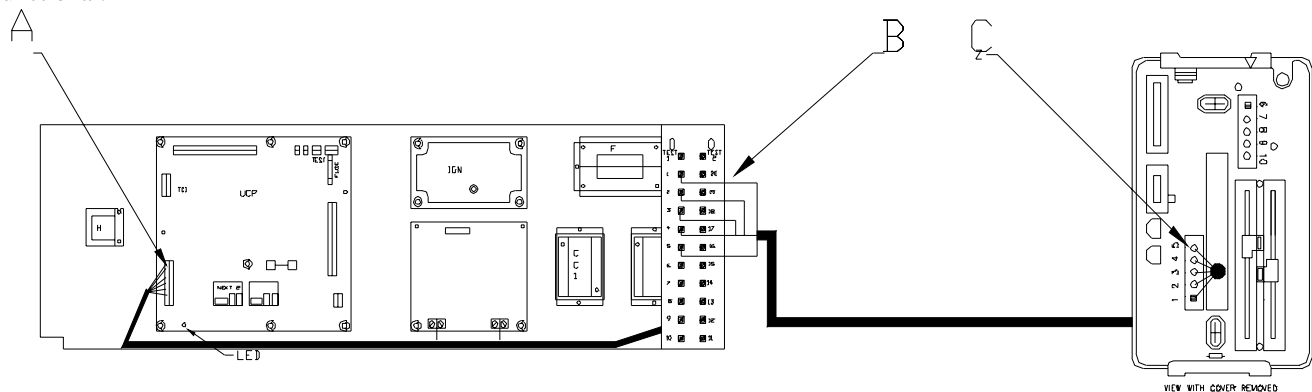
A Problem Exists Somewhere Between Point "A" And Point "C".

25.2. 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.

25.3. Variable Air Volume (VAV) 27.5-50 Ton

Units that have VAV control, only require a jumper across LTB1-2 & LTB1-4 for supply air cooling operation. If unoccupied or daytime heating is required a zone sensor must be installed across LTB1-1 & LTB1-2 as well as the jumper across LTB1-2 & LTB1-4. LTB1-2 & LTB1-4 is the mode input for the VAV unit, which allows the fan to be in auto mode and the unit to be on. LTB1-1 & LTB1-2 is the zone temperature input for heat.

25.4.   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).

25.5.   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. Insert a 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. Reference 1.1.10 for Condenser Fan On and Off Temperatures.

25.6.   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.

25.7.   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 or the set point set on Voyager (27.5-50).

26. 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.

26.1. 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
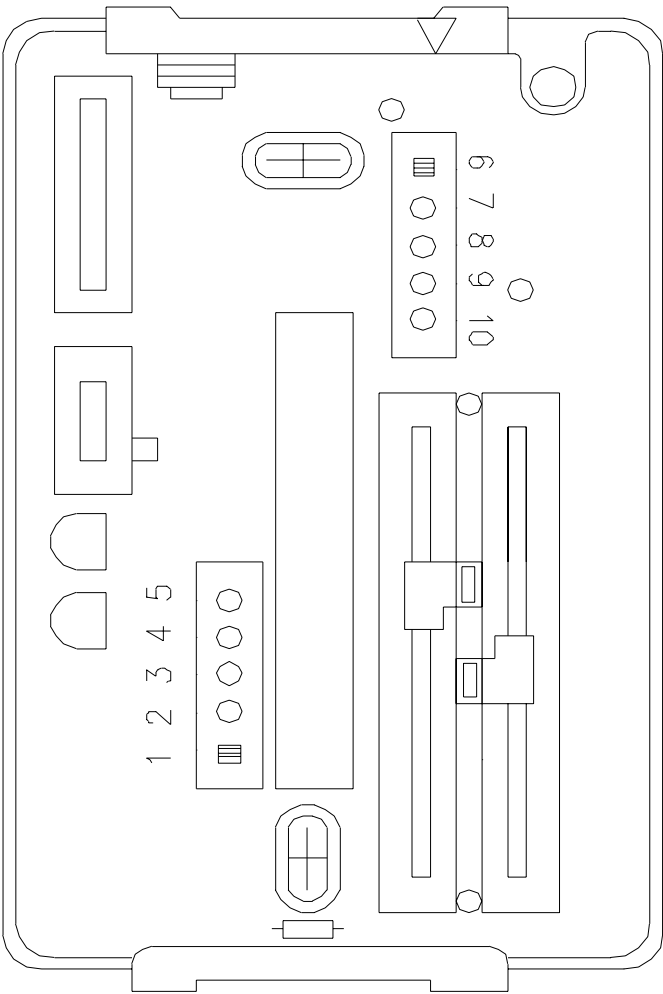
VIEW WITH COVER REMOVED

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

26.3.   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.

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

26.4. 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.

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

26.5. 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.

High resistance is indicated in both directions the LED is open. Low resistance indicated in both directions means the LED is shorted.

27.   Testing The Programmable Zone Sensor Modules (ZSMs)
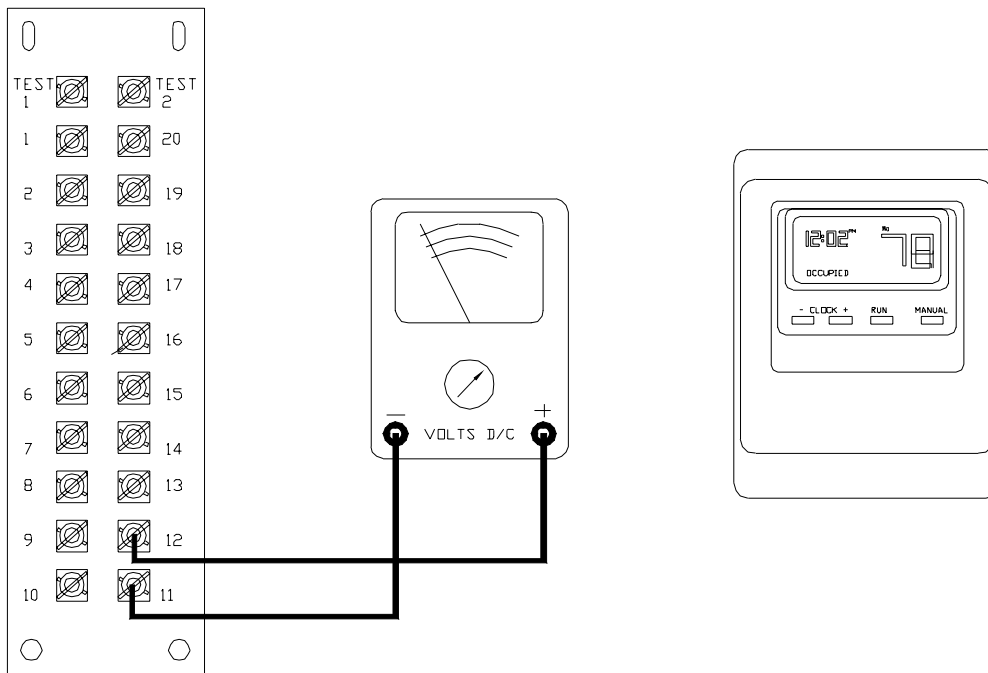
Step 1. Disconnect wires from LTB-11 (-) and LTB-12 (+), measure voltage between LTB-11 (-) and LTB-12 (+) , should be approximately 32 VDC. If no voltage is measured check wiring between UCP and LTB. **Note:** 24 VAC should be present between LTB-14 and LTB-20.

Step 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.

Step 3. Verify all modes of operation, by running the unit through all of the steps in the Test Mode.

Step 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.
Note: The BAYSENS019B may need the baud rate changed to 1024 for units built prior to 1/96.

Step 5. Reference Programmable ZSM troubleshooting chart.

Step 6. Prior to condemning programmable ZSM (BAYSENS019A, BAYSENS020A, BAYSENS023A, or ASYSTAT666A or ASYSTAT667A), it should be re-initialized by activating its self test feature. This is performed prior to the device leaving the vendor. 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 LEDs and LCD pixels, at the conclusion of the LED/LCD test press "CLEAR" again. The sensor may now be re-programmed.
Note: The BAYSENS019B and 020B do not have this test.

27.1. Programmable Troubleshooting Chart

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 or option #18 (which ever is applicable). 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 or option #18. 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. The BAYSENS019B/020B will display Sh and a cool failure if a short circuit condition exist, or oP if an open circuit condition exist.
Displayed zone temperature is 99° F. (38° C.) and a COOL FAIL is present.	Check position of dip switch 5 or option # 18. 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 or check option # 13 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. On the BAYSENS019B/020B replace the battery.
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 or option #5 which selects 12 Hour or 24 Hour time display.
FAN switch is in "ON" position but fan	Check position of dip switch 7 or option # 6. This selects Smart Fan option, this problem would 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 or option #7 which selects computed recovery.

28. 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 UEM's 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.

28.1. Test 1: Verifying UCP Communication With UEM

Step 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.

Step 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.

Step 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 burns continuously when the ECA drives.

Step 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.

28.2. Test 2: Verifying That The ECA Is Functional

Step 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.

Step 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.

Step 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.
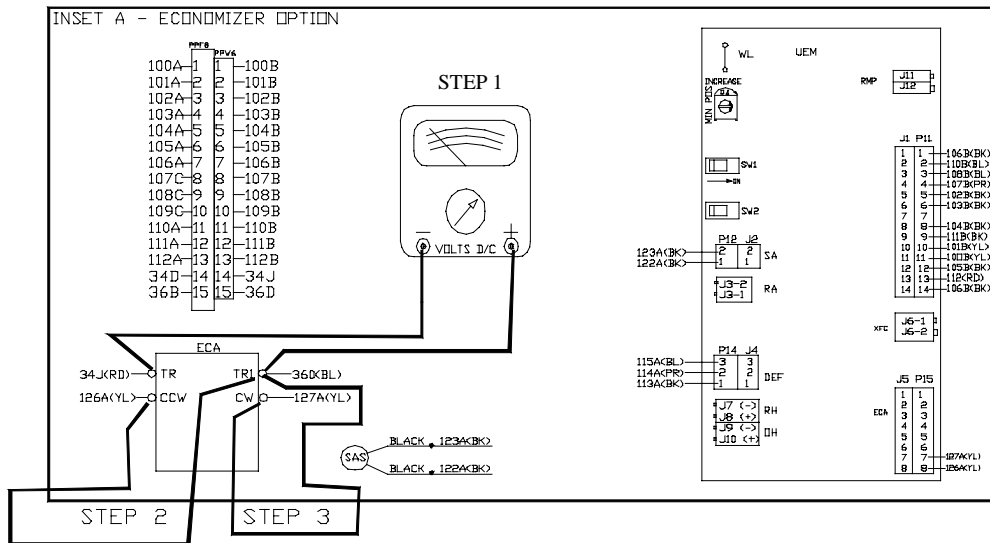
28.3. Test 3: Testing The UEM Minimum Position Potentiometer

Step 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.
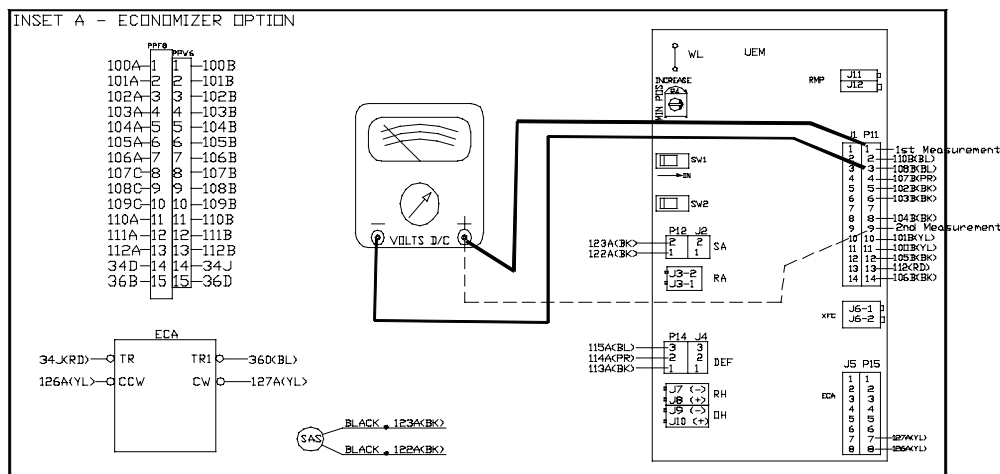
Step 2: After verifying the voltage presence in Step 1, turn the minimum position potentiometer fully counter clock wise. Measure the DC voltage between UEM terminals J11(+) and J12(-), should be approximately 0.47 VDC.
Step 3: Turn the minimum position potentiometer one half turn clock wise, so that the screw driver slot is straight up and down. Measured voltage should be approximately 1.18 VDC.
Step 4: Turn the minimum position potentiometer fully clock wise. 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.
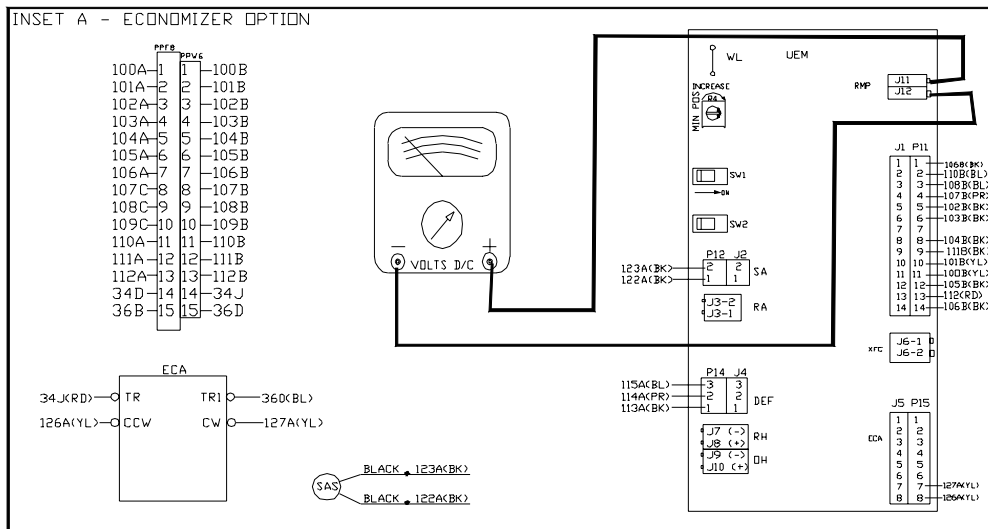
28.4.   Test 4: Testing Sensor Inputs And Exhaust Fan Output

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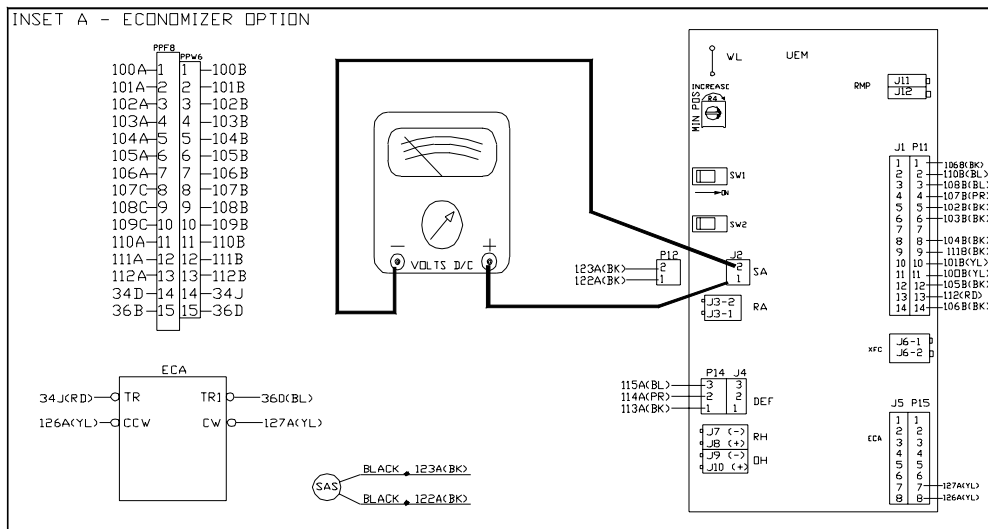
Step 3: Testing Return Air Sensor Input. Remove connector J3 on UEM (if installed), marked RA on the side of the UEM board. Measure voltage between pins J3-1 and J3-2. Voltage should measure 5.0 (+ 0.25) VDC.

If correct voltages are measured in Tests 1 through 3, and voltage in Test 4, Step 3 is out of range, replace UEM.
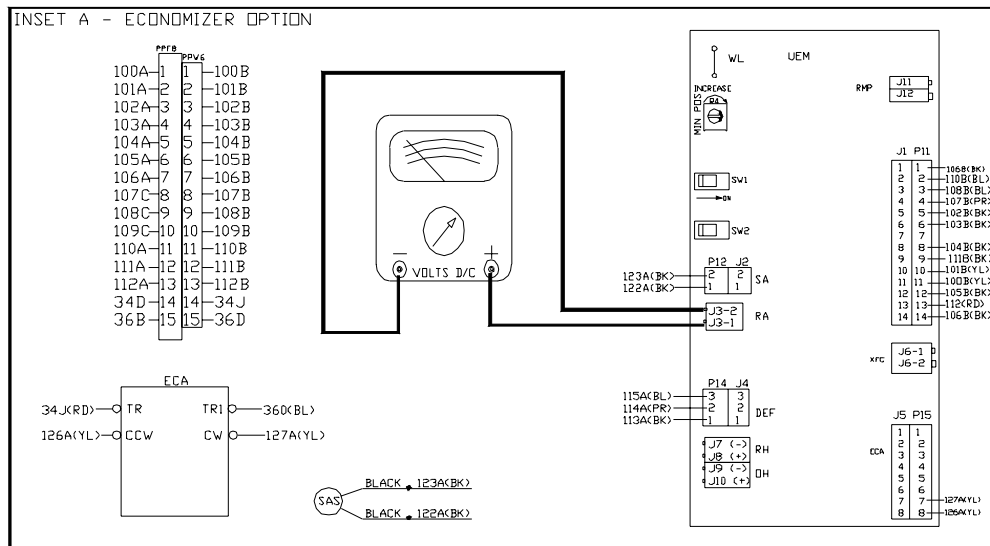
Step 4: Testing Active Fan Failure Input. Remove connector J5 on UEM, marked ECA on the side of the UEM board. Measure voltage between pins J5-3 and J5-4. Voltage should measure 5.0 (+ 0.25) VDC.

If correct voltages are measured in Tests 1 through 3, and voltage in Test 4, Step 4 is out of range, replace UEM.
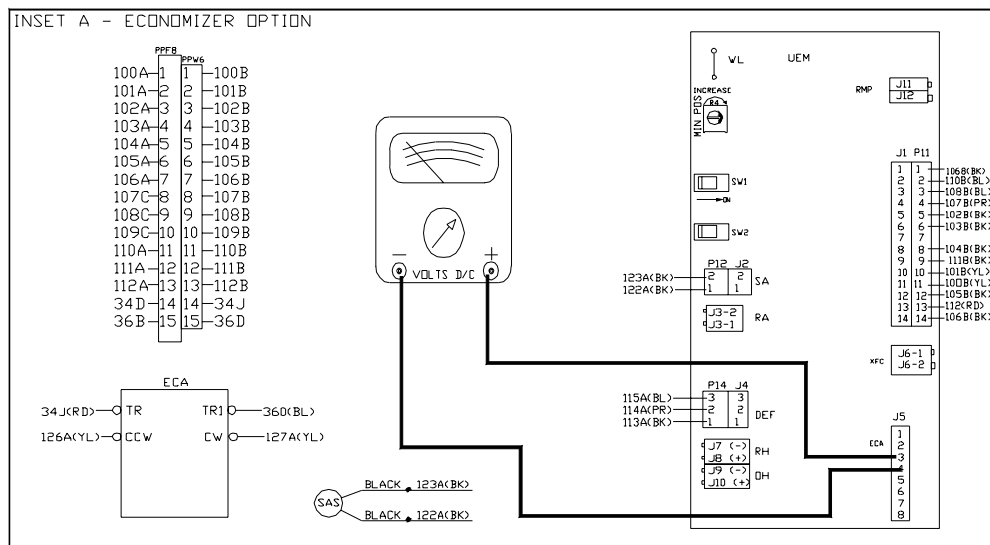
Step 5: Testing Return Humidity Sensor Input. Remove wires (if installed) from terminals J7 (-) and J8 (+) on UEM, marked RH on the side of the UEM board. Measure voltage at terminals J7 (-) and J8 (+). Voltage should measure approximately 20 VDC.

If correct voltages are measured in Tests 1 through 3, and voltage in Test 4, Step 5 is out of range, replace UEM.
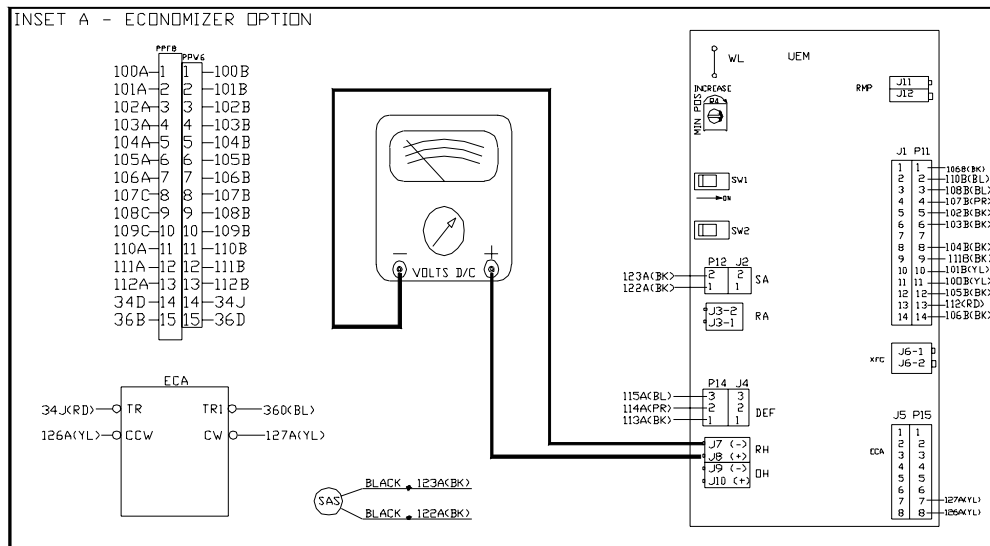
Step 6: Testing Outdoor Humidity Sensor Input. Remove wires (if installed) from terminals J9 (-) and J10 (+) on UEM, marked OH on the side of the UEM board. Measure voltage between terminals J9 (-) and J10 (+). Voltage should measure approximately 20 VDC.

If correct voltages are measured in Tests 1 through 3, and voltage in Test 4, Step 6 is out of range, replace UEM.
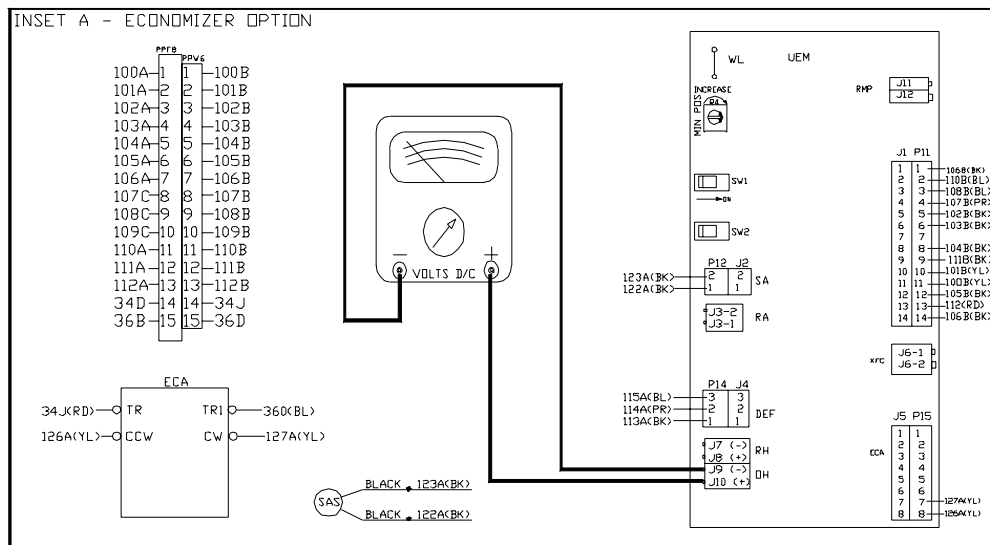
Step 7: Testing Exhaust Fan Contactor Output. Remove connector (if installed) from J6 on UEM, marked XFC on the side of the UEM board. Turn minimum position potentiometer fully counter clock wise. Measure DC voltage between J6-1 and J6-2, should be 0 VDC. Turn minimum position potentiometer fully clock wise, after approximately 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.
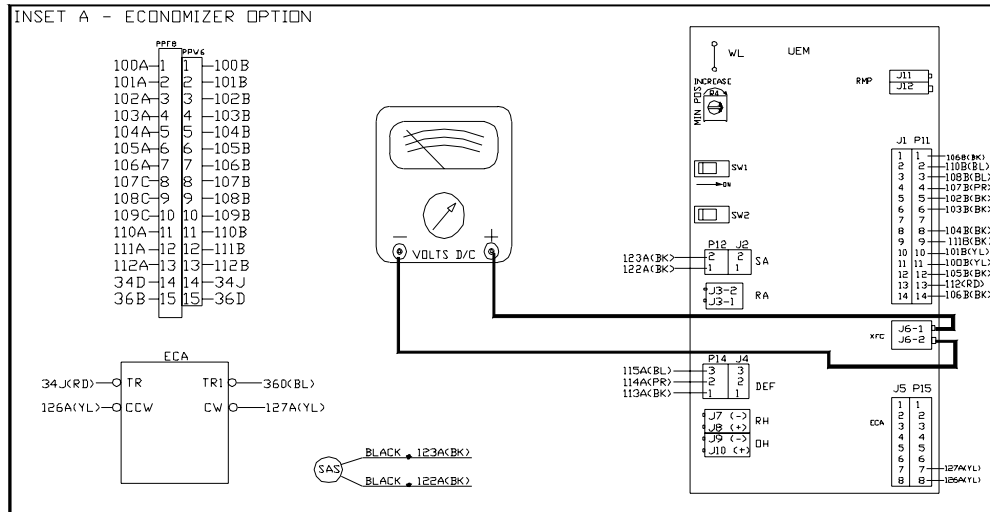
28.5. Test 5: Testing the Sensors

Step 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.

ZTEMP °F	OHMs Rx1K	Volts DC +/-5%	ZTEMP °F	OHMs Rx1K	Volts DC +/-5%	ZTEMP °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

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ZTEMP °F	OHMs Rx1K	Volts DC +/-5%	ZTEMP °F	OHMs Rx1K	Volts DC +/-5%	ZTEMP °F	OHMs Rx1K	Volts DC +/-5%
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
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

ZTEMP °F	OHMs Rx1K	Volts DC +/-5%	ZTEMP °F	OHMs Rx1K	Volts DC +/-5%	ZTEMP °F	OHMs Rx1K	Volts DC +/-5%

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						

Step 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.

ZTEMP °F	OHMs Rx1K	Volts DC +/-5%	ZTEMP °F	OHMs Rx1K	Volts DC +/-5%	°F	ZTEMP 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
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

ZTEMP °F	OHMs Rx1K	Volts DC +/-5%	ZTEMP °F	OHMs Rx1K	Volts DC +/-5%	°F	ZTEMP OHMs Rx1K	Volts DC +/-5%
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

Step 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.

INSET A - ECONOMIZER OPTION
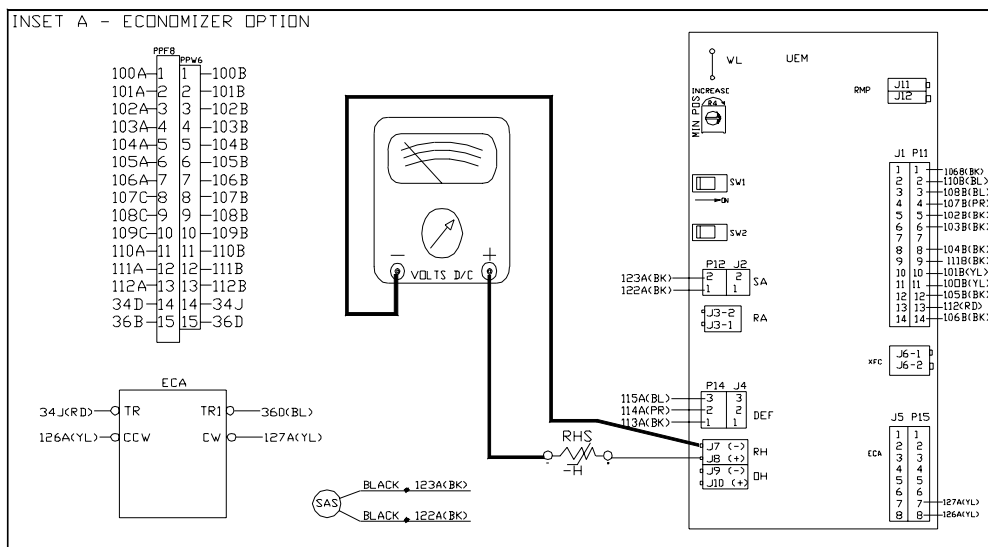
Step 4: Testing The Outdoor Humidity Sensor (OHS). Locate terminals J9 (-) and J10 (+) on the UEM, marked OH on the side of the UEM board. Leave the sensor (if installed) connected to the UEM, and measure the operating current. The normal range for operating current is 4 to 20 mA (milliamps). Replace 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.

INSET A - ECONOMIZER OPTION
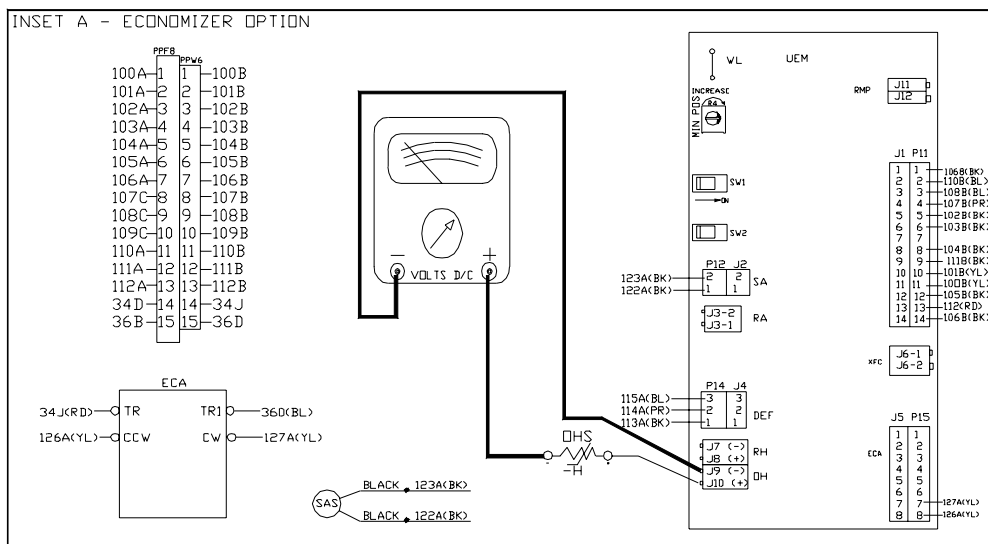
29. Testing The Defrost Module (10-20 Ton Heat Pumps only)

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.

29.1. 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 %)	
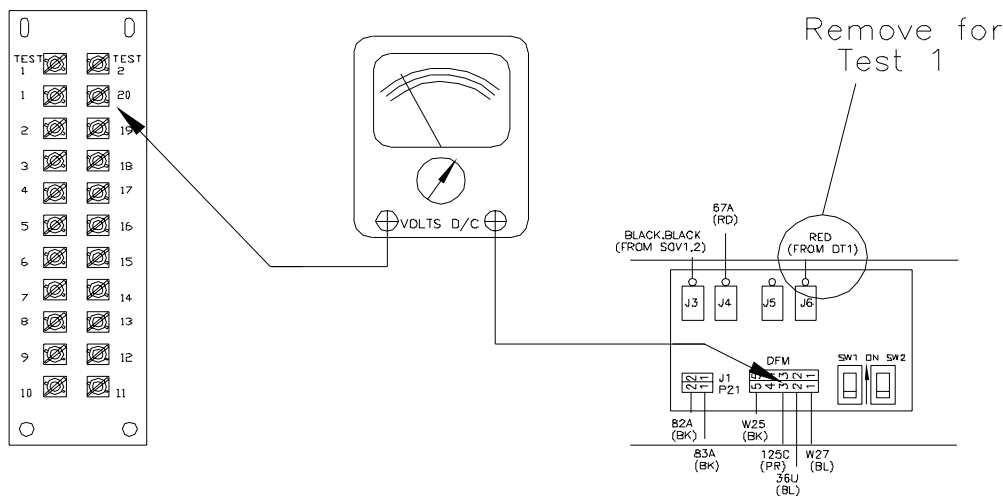
29.2. Test 2: Simulates a closed Defrost Termination Switch (DT)

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 %)	

29.3. Test 3: Testing The SOV Relay Circuit

Step 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.
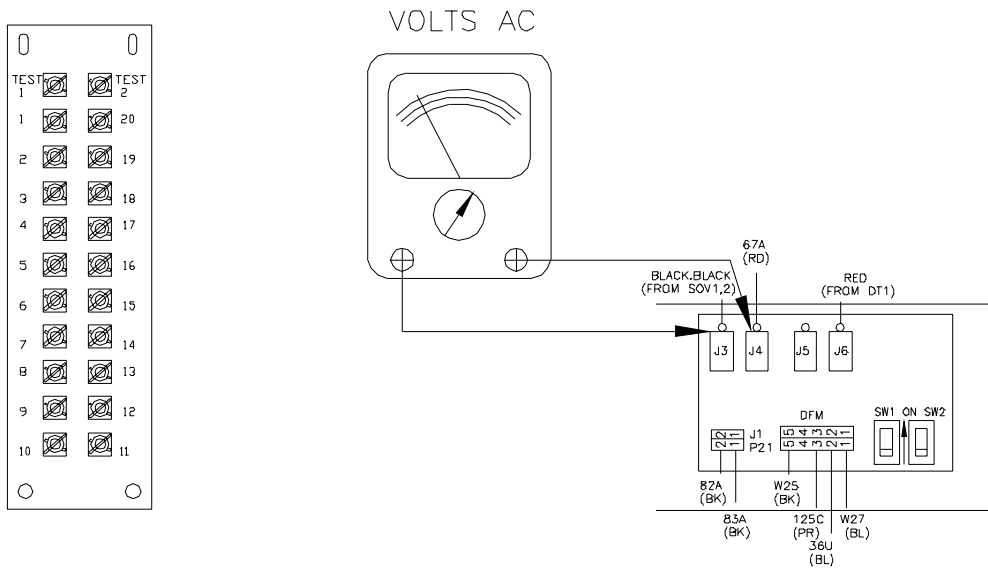
Step 2: Test for K1 relay coil voltage, remove J1 on DFM. Test the J1 connector terminals for nominal 28 VDC. If voltage is present and K1 contacts were not closed in Step 1, DFM is defective, replace DFM. If 28 VDC is not present proceed to Step 3.
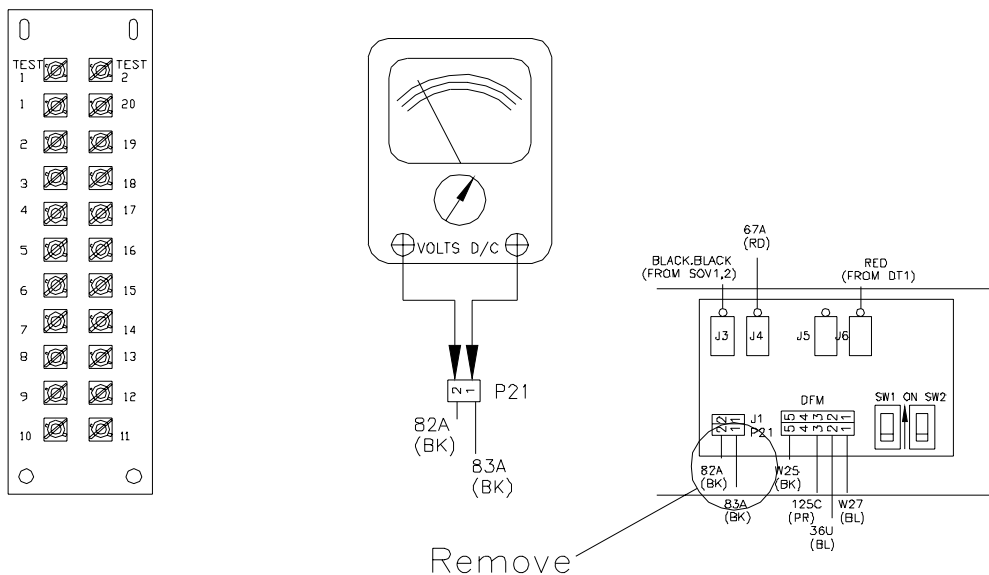
Step 3: If 28 VDC was not present in Step 2, open unit disconnect switch. Locate J1 on the UCP. Connect positive meter lead to terminal J1-14, wire number 83A (BLACK). Connect negative meter lead to LTB- 20 (Note: On equipment manufactured before 06/93 substitute LTB-16 for LTB-20) screw terminal. Close 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.
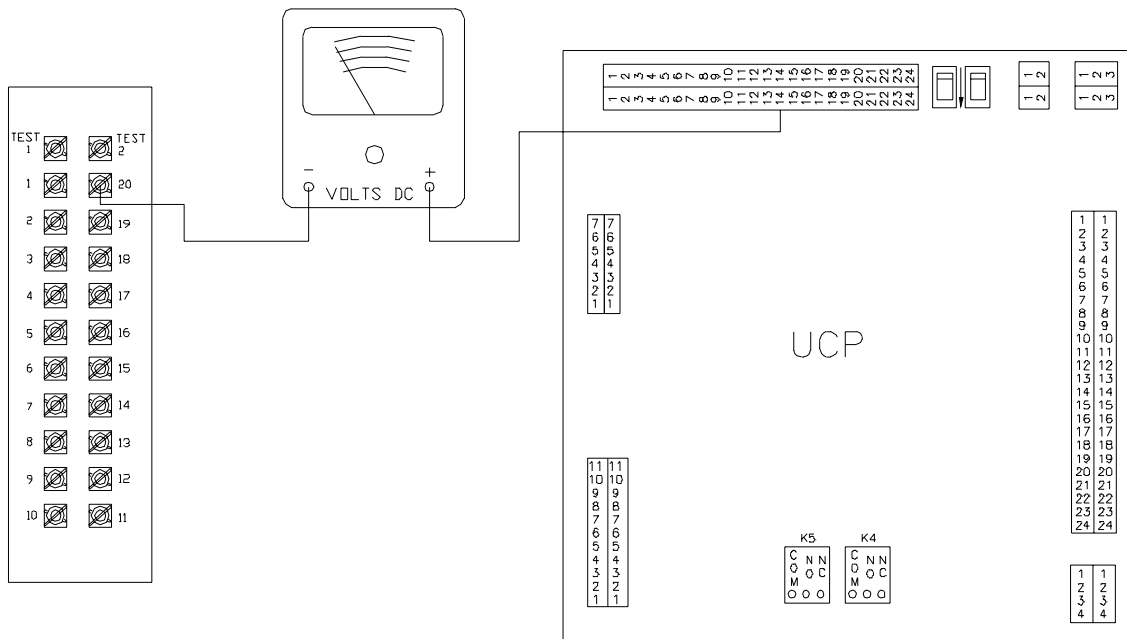
30. Testing The Coil Temperature Sensor (CTS)

The voltages listed below are measured with power applied to the unit and the Coil Temperature Sensor (CTS) wired into the circuit. Voltages may be measured at the Unitary Control Processor (UCP), the CTS is measured at the Unitary Economizer Module (UEM) if an economizer is present, or at the connectors nearest the sensor. CTS is measured between UCP terminals J2-15 & J2-17, or UEM terminals J4-2 & J4-3 if an economizer is present.

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 a coil temperature, that is interpreted by the UCP.

ZTEMP °F	OHMs Rx1K	Volts DC +/-5%	ZTEMP °F	OHMs Rx1K	Volts DC +/-5%	ZTEMP °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

ZTEMP OHMs	Volts	ZTEMP	OHMs	Volts	ZTEMP OHMs	Volts

Microcontrols   *The Voyage Continues*

°F	Rx1K	DC +/-5%	°F	Rx1K	DC +/-5%	°F	Rx1K	DC +/-5%
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
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

ZTEMP	OHMs	Volts	ZTEMP	OHMs	Volts	ZTEMP	OHMs	Volts
°F	Rx1K	DC +/-5%	°F	Rx1K	DC +/-5%	°F	Rx1K	DC +/-5%
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						

31. Testing The CTI (3-50 Ton CV only)

This series of tests will allow you to test the CTI, and verify the output to the UCP. **Test 1** will verify the Mode output. **Test 2** will verify the Cooling Set point output. **Test 3** will verify the Heating Set point output. **Test 4** will verify the Zone Temperature output. Conduct the tests in numerical order until the problem is found.

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

Note: Kill system power at the service disconnect, before setting up the unit. Reapply power to the unit for testing.

31.1. Test 1: Testing The Mode Output

Step 1: After checking the Room Thermostat, kill the unit power at the service disconnect, and remove the thermostat wires at the unit LTB.

Step 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, CTI has failed, replace CTI.
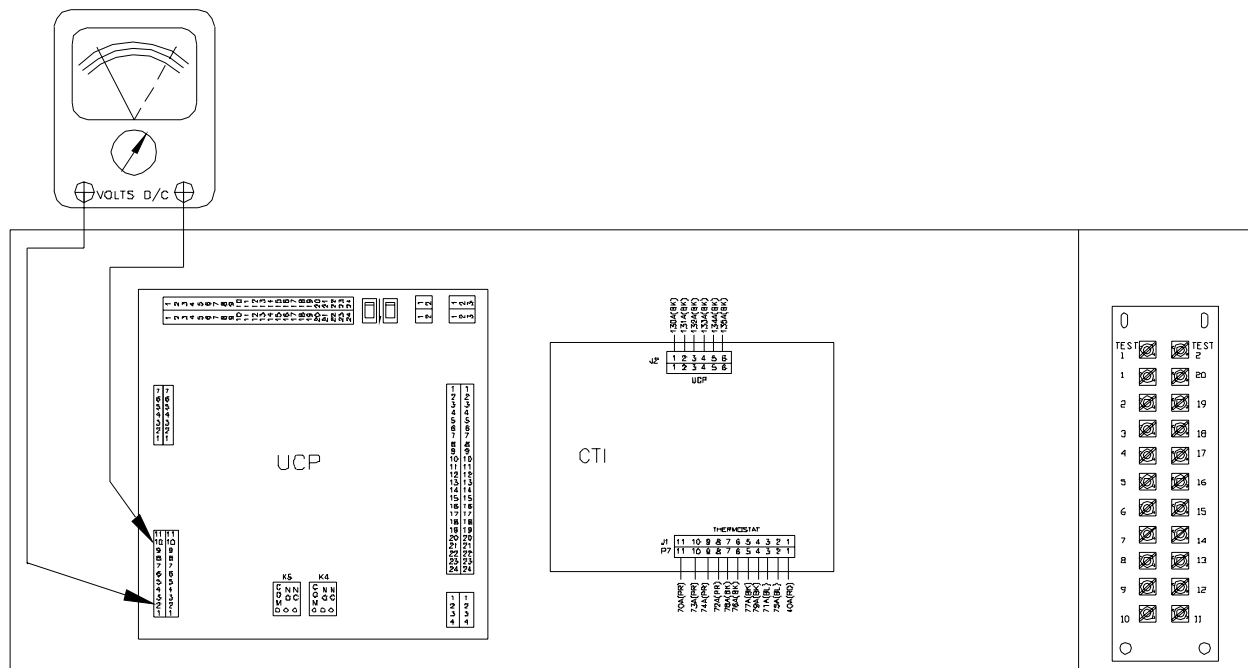
31.2. Test 2: Testing The Cooling Set Point Output

Step 1: Kill the unit power at the service disconnect.
Step 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	3.71 (+/- 5 %)	
LTB-14 to LTB-4	3.14 (+/- 5 %)	
LTB-14 to LTB-1 & 4	2.58 (+/- 5 %)	

Note: On equipment manufactured before 06/93 substitute LTB-15 for LTB-14.
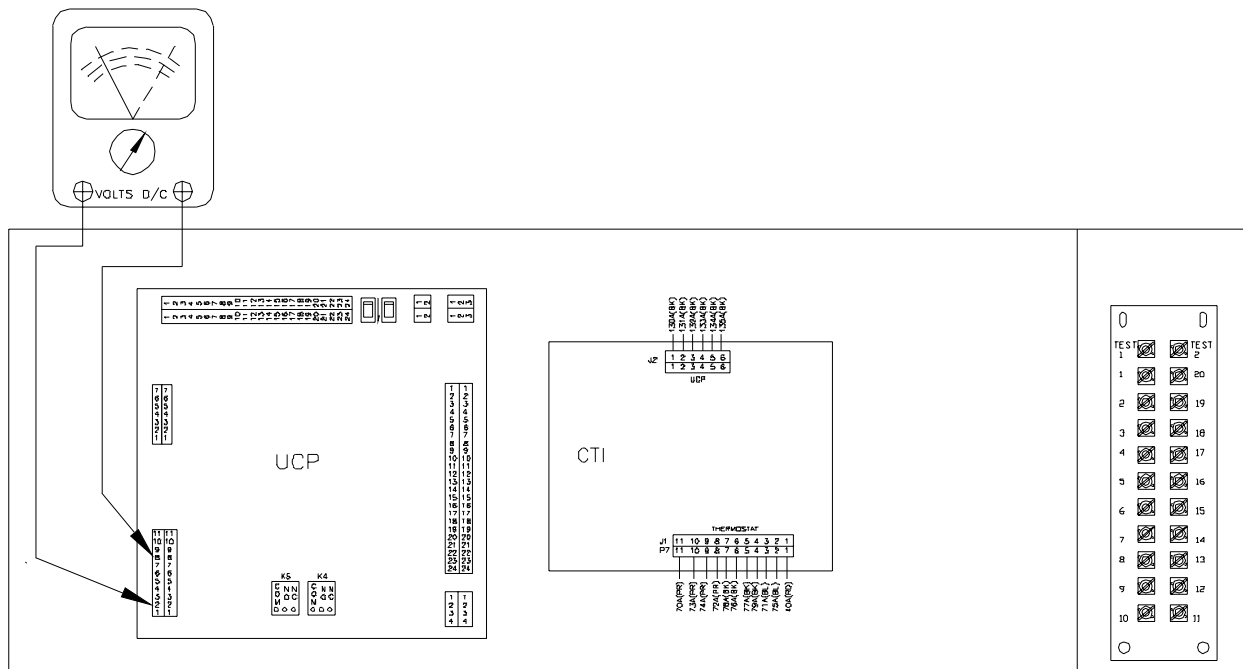
31.3. Test 3: Testing The Heating Set Point Output

Step 1: Kill the unit power at the service disconnect.

Step 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	2.80 (+/- 5 %)	
LTB-14 to LTB-3	3.71 (+/- 5 %)	
LTB-14 to LTB-9	3.14 (+/- 5 %)	
LTB-14 to LTB-5,3 & 9	1.84 (+/- 5 %)	

Note: On equipment manufactured before 06/93 substitute LTB-15 for LTB-14.
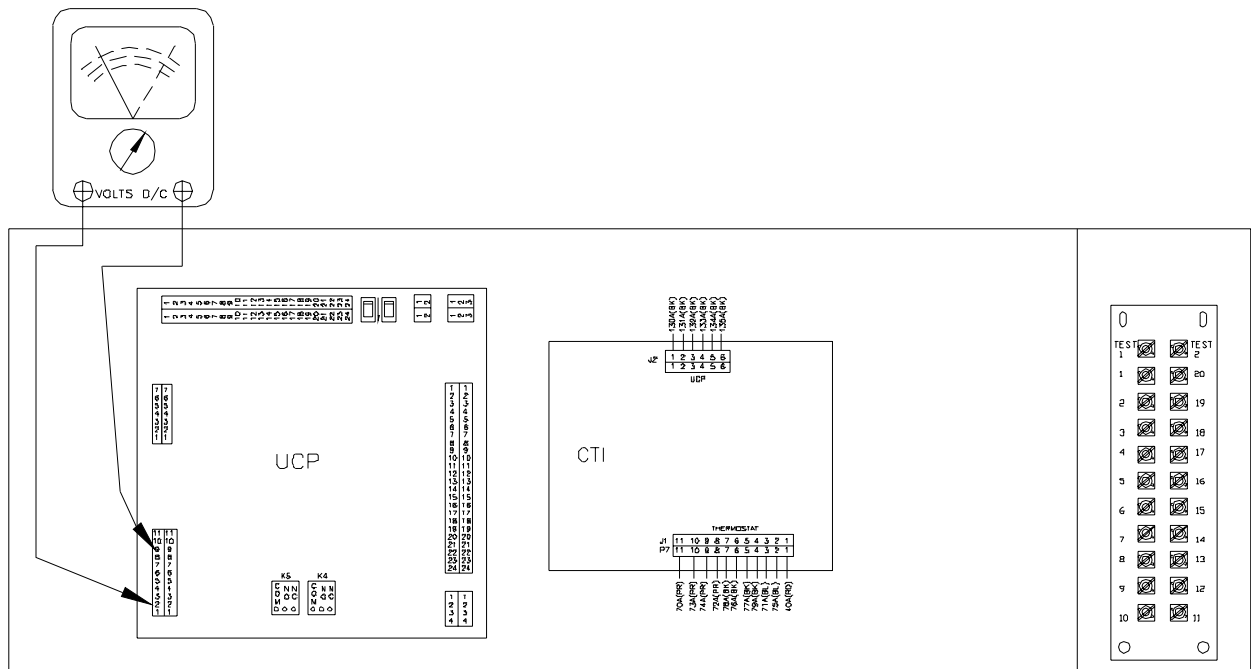
31.4. Test 4: Testing The Zone Temperature Output

Step 1: Kill the unit power at the service disconnect.

Step 2: Locate connector J7 on the UCP. Install meter leads between connector terminals J7-2 and J7- 11. 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-7	3.71 (+/- 5 %)	
LTB-14 to LTB-8	3.14 (+/- 5 %)	
LTB-14 to LTB-7 & 8	2.58 (+/- 5 %)	

Note: On equipment manufactured before 06/93 substitute LTB-15 for LTB-14.
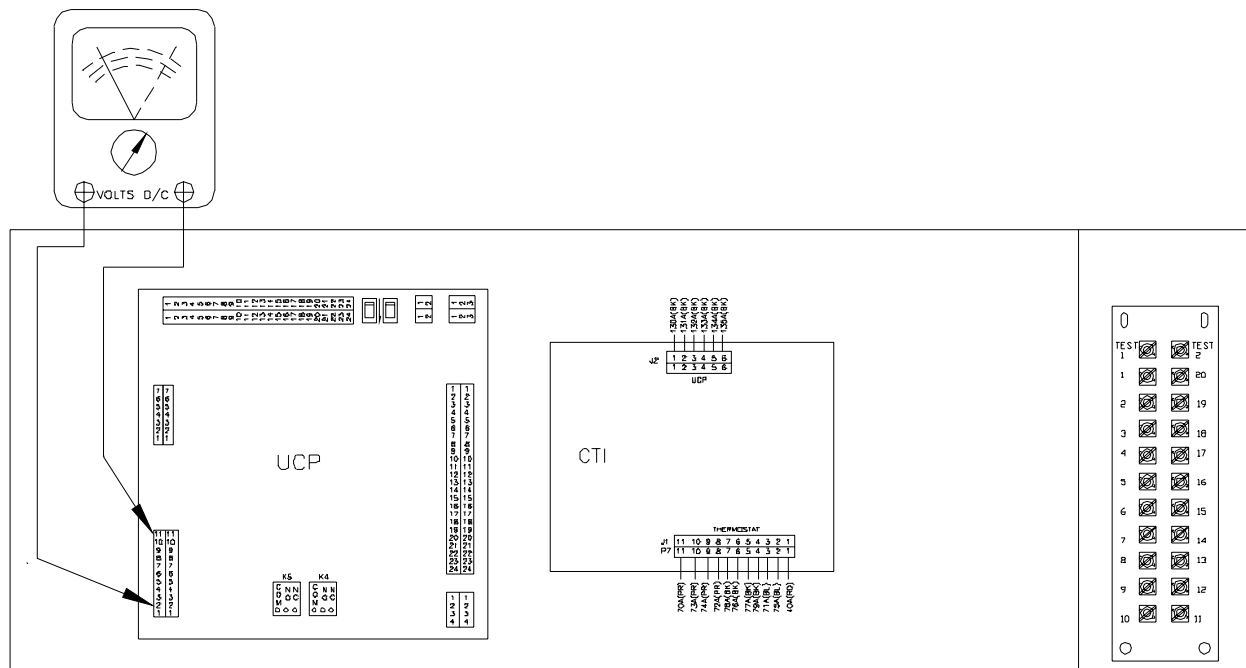
32. Testing the Exhaust Fan Set Point Panel (27.5-50 Ton)

Step 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.

Step 2: Set the EFSP potentiometer on the panel to 50%.

Step 3: Measure the resistance between the two terminals J1 and J2.

Exhaust Fan Setpoint

Setpoint (%)	Nominal Resistance (Ohms)	Nominal Voltage (V DC)
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

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

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

Step 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 IGV's or 10VDC for VFD's. If voltages are reversed, switch SW1 on the UCP to the opposite position and recycle power..

Step 2: If the voltage is not present or is incorrect, verify wires 160A and 160B are connected properly. Measure the voltage at J1-11 to ground. It should be a pulsating between 5 VDC.

Step 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.

33.2.   Test 2: Testing the Static Pressure Transducer Input

Step 1: With main power to the unit turned "Off", disconnect all of the tubing to the Static Pressure Transducer (STP).

Step 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.

Step 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.

Step 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 is susceptible to interference from VFD's. Make sure the SPT is mounted on plastic standoffs and is not touching any sheet metal.

33.3.   Test 3: Testing the Temperature Sensor Input

Step 1: With power applied to system, turn the ZSM MODE switch "Off".

Step 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.

Step 3: Testing the outdoor air sensor 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.

33.4. Test 4: Testing the VAV Set Point Input

Step 1: With power applied to the system, turn the ZSM MODE switch to "Off".

Step 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.

Step 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.

Step 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.

Step 5: Morning Warm up Set Point. Disconnect the P24 connector from the UVM. Measure the voltage between the J4-1 and J4-2 terminal. The voltage should measure approximately 5 VDC.

Step 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.

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

Step 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.

Step 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.

33.6. Test 6: Testing the VFD

Step 1: Verify that the keypad in control box is powered. If not, check the power wires to the VFD and the Keypad cable.

Step 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.

Step 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.

Step 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.

Step 5: Verify that 115 VAC is present from the transformer on the VFD assembly panel.

33.7. Test 7: Testing the VAV Set Point Panel

Step 1: Disconnect the wiring from the VAV Set Point Panel and Remove it from the unit.

Step 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.

Step 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.

Step 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.

Step 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.

Step 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.

Step 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
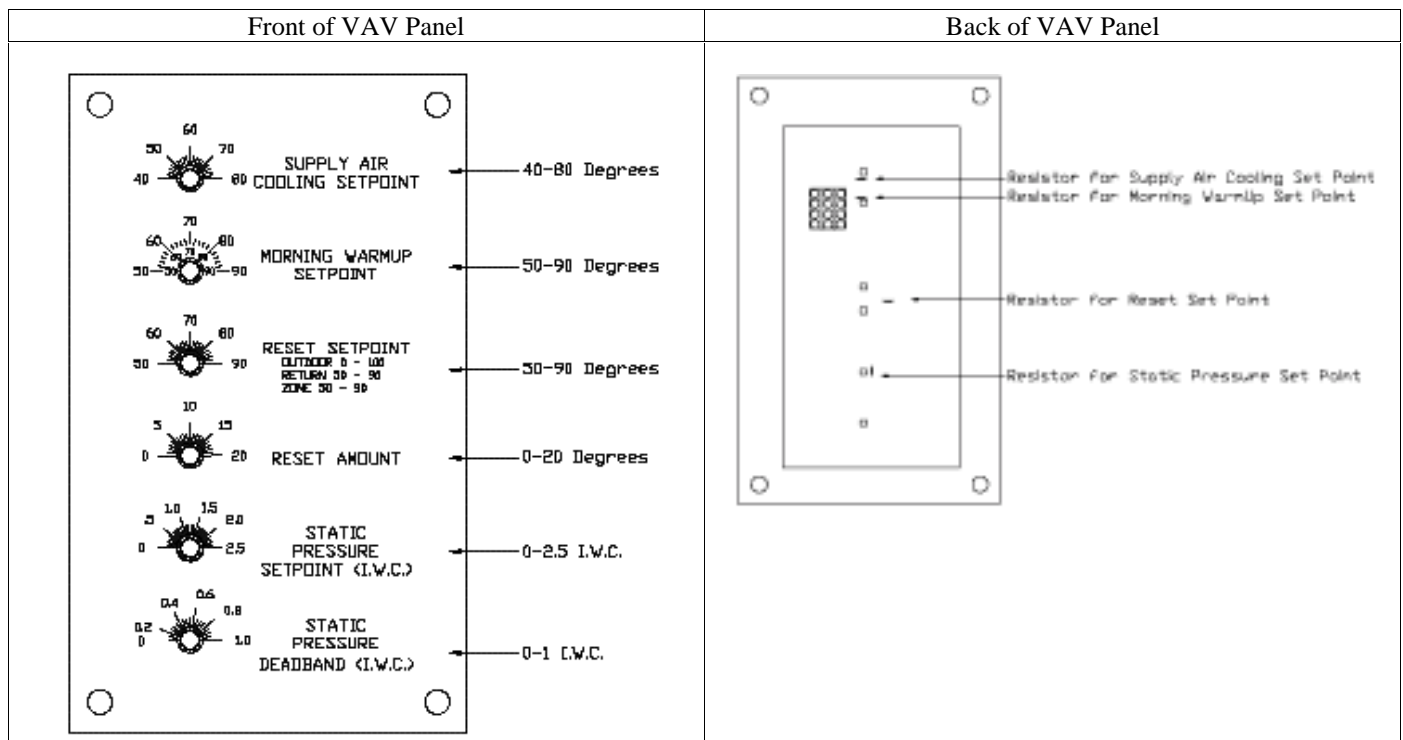
Supply Air Cooling Setpoint

Setpoint (Deg F)	Nominal Resistance (Ohms)	Nominal Voltage (V DC)
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 (V DC)
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 (V DC)
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 (V DC)
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 (V DC)
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	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	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 (V DC)
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	103	0.47

34. 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.

34.1. 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.

Step 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.
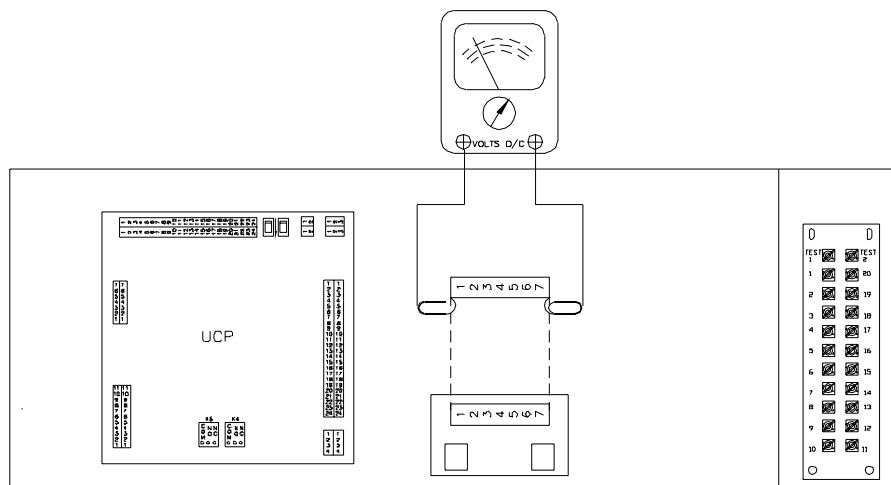
Step 2: With plug connector J1 removed from the TCI. Measure DC voltage at disconnected plug between terminals J1-6, and J1-1. Voltage measured should be approximately 30 VDC. If 30 VDC is not present, test for voltage directly at UCP. Measure voltage at connector junction J6, between terminals J6-2 and J6-7. If 30 VDC is present, replace TCI cable. If 30 VDC is not present, replace UCP.
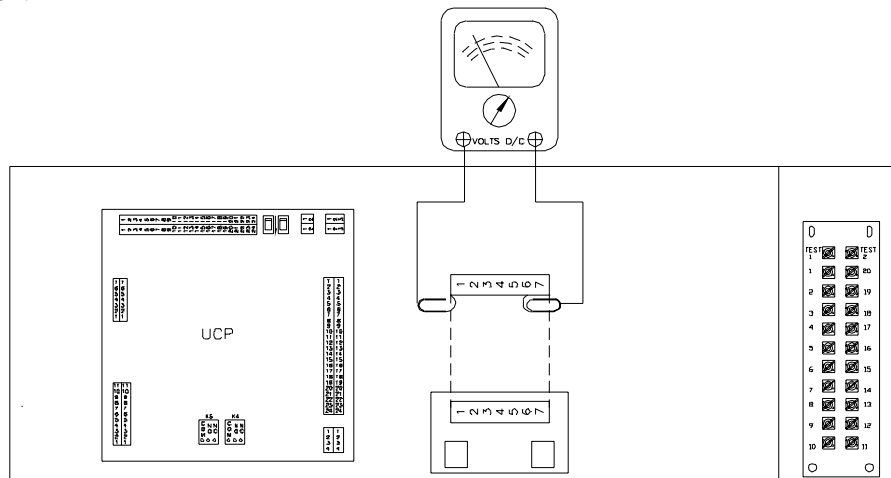
Step 3: With plug connector J1 removed from the TCI. Measure DC voltage at disconnected plug between terminals J1-5, and J1-1. Voltage measured should be approximately 4.67 VDC, +/- 0.25 VDC. If 4.67 (+/- 0.25) VDC is not present, test for voltage directly at UCP. Measure voltage at connector junction J6, between terminals J6-3 and J6-7. If 4.67 (+/- 0.25) VDC is present, replace TCI cable. If 4.67 (+/- 0.25) VDC is not present, replace UCP.
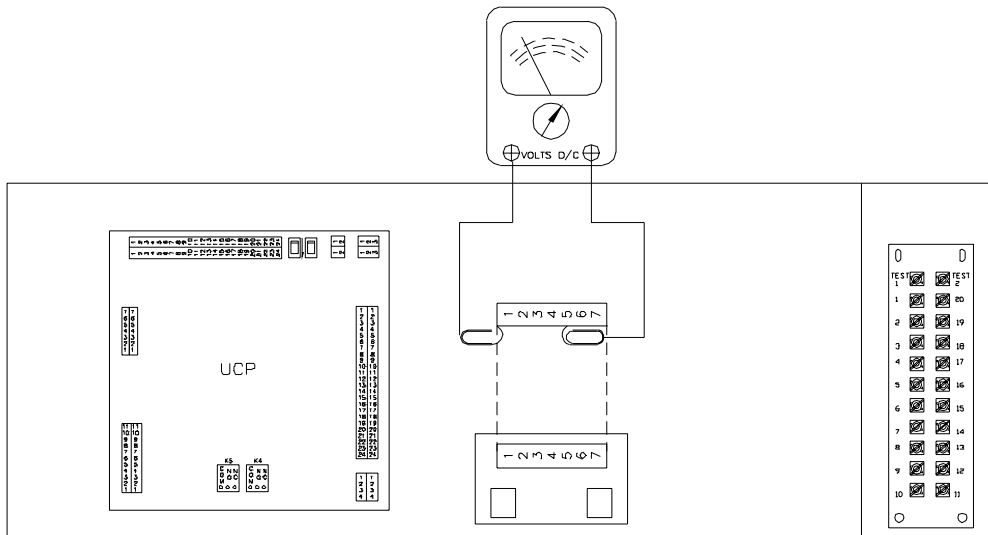
Step 4: With plug connector J1 removed from the TCI. Measure DC voltage at disconnected plug between terminals J1-4, and J1-1. Voltage measured should be approximately 5.0 VDC, +/- 0.25 VDC. If 5.0 (+/- 0.25) VDC is not present, test for voltage directly at UCP. measure voltage at connector junction 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

.
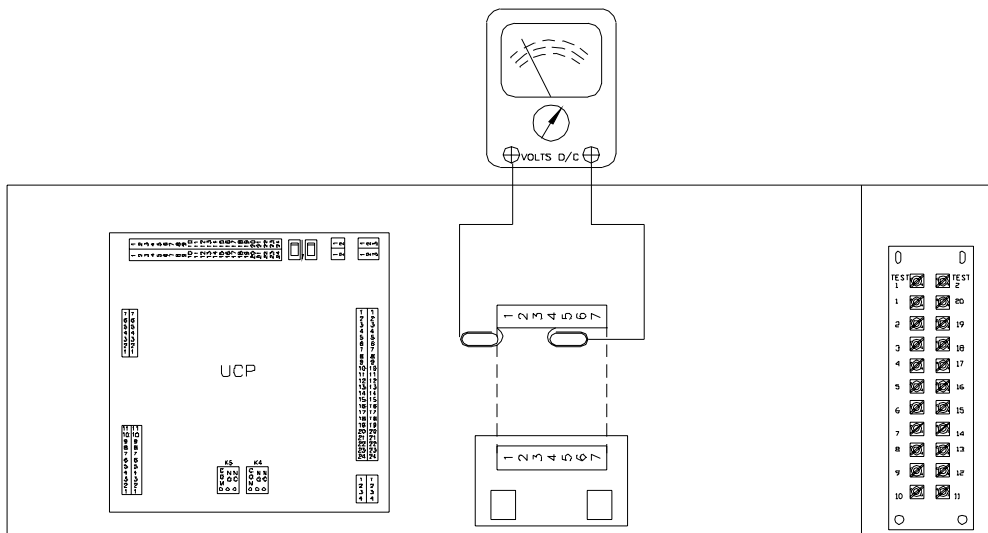
Step 5: With plug connector J1 removed from the TCI. Measure DC voltage at disconnected plug between terminals J1-3, and J1-1. Voltage measured should be approximately 0 VDC, +/- 0.50 VDC. If 0 (+/- 0.50) VDC is not present, test for voltage

directly at UCP. Measure voltage at connector junction J6, between terminals J6-5 and J6-7. If 0.0 (+/- 0.50) VDC is present, replace TCI cable. If 0.0 (+/- 0.50) VDC is not present, replace UCP.
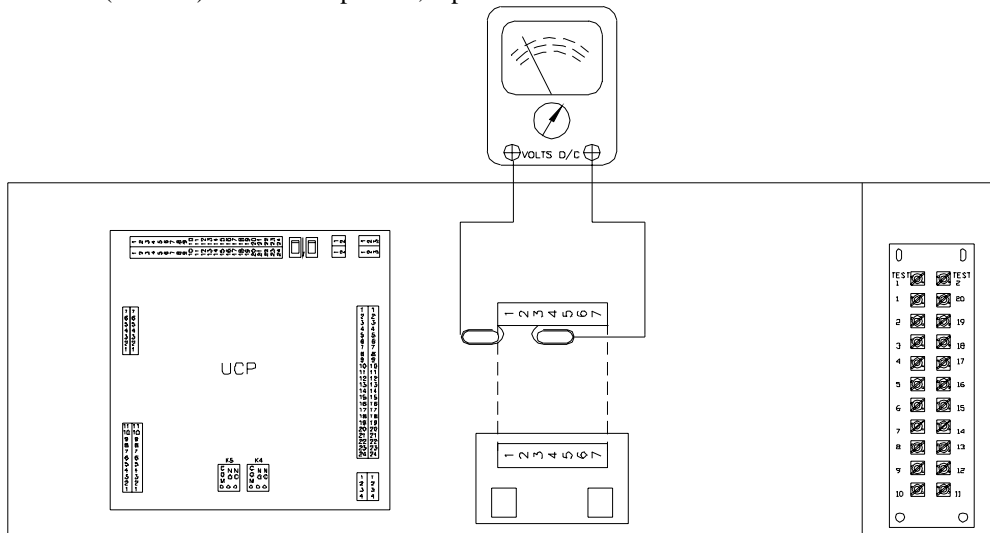
Step 6: With plug connector J1 removed from the TCI. Measure DC voltage at disconnected plug between terminals J1-2, and J1-1. Voltage measured should be approximately 30 VDC. If 30 VDC is not present, test for voltage directly at UCP. Measure voltage at connector junction J6, between terminals J6-6 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.

Section 5
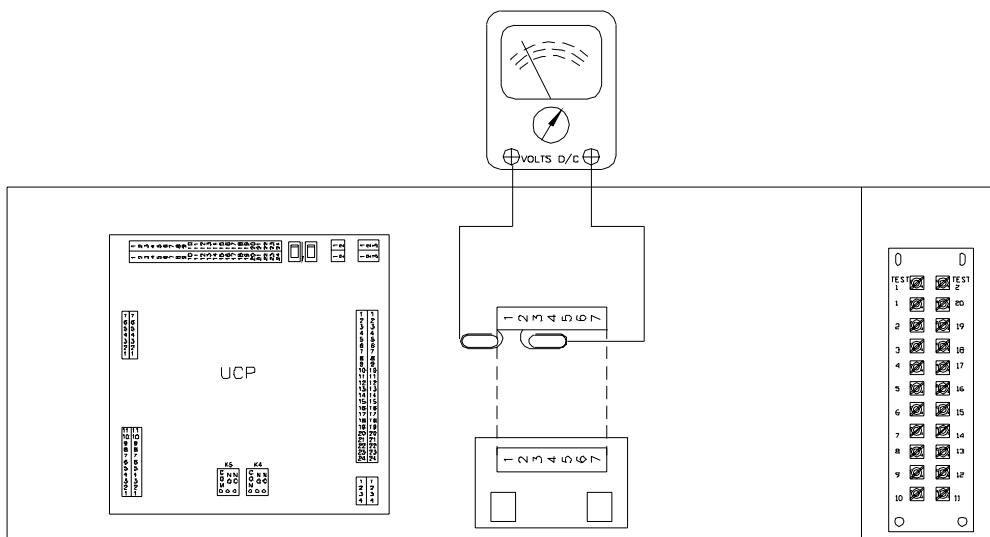
35. Erratic Unit Operation (3-25 ton)

35.1. 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.

35.2. 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.

35.3. 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.

35.4. 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.

35.5.   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.

PPF10

114A (Purple) — 1
115A (Blue) — 2
    3

PPF10

114A (Purple) — 1
113A (Black) — 2
115A (Blue) — 3
    4

PPF8 / PPM8

107E (Yellow) — 1 | 1 — W26 (Purple)
109E (Yellow) — 2 | 2 — W27 (Blue)
125A (Purple) — 3 | 3 — 125B (Purple)

PPF8 / PPM8

107E (Yellow) — 1 | 1 — W26 (Purple)
108E (Yellow) — 2 | 2 — W25 (Black)
109E (Yellow) — 3 | 3 — W27 (Blue)
125A (Purple) — 4 | 4 — 125B (Purple)

PPM9

1 — 107C (Yellow)
2 — 109C (Yellow)
3

PPM9

1 — 107C (Yellow)
2 — 108C (Yellow)
3 — 109C (Yellow)
4

3-7.5 Tons   10-20 Tons
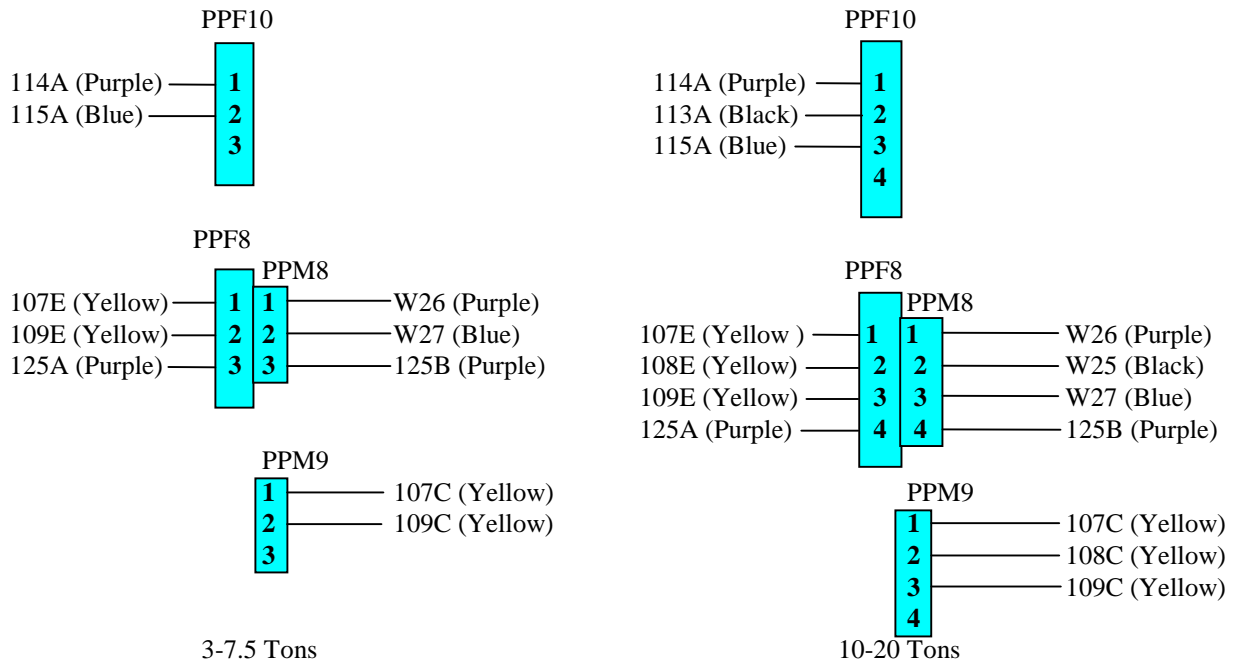
On equipment with an economizer, motorized outside air damper or BAYDIAG001A, the plugs should be configured as illustrated below.

PPF10 / PPM8

114A (Purple) — 1 | 1 — W26 (Purple)
115A (Blue) — 2 | 2 — W27 (Blue)
    3 | 3 — 125B (Purple)

PPF8 / PPM9

107E (Yellow) — 1 | 1 — 107C (Yellow)
108E (Yellow) — 2 | 2 — 108C (Yellow)
109E (Yellow) — 3 | 3 — 109C (Yellow)
125A (Purple) — 4 | 4

PPF8 / PPM9

107E (Yellow) — 1 | 1 — 107C (Yellow)
109E (Yellow) — 2 | 2 — 109C (Yellow)
125A (Purple) — 3 | 3

PPF10 / PPM8

114A (Purple) — 1 | 1 — W26 (Purple)
113A (Black) — 2 | 2 — W25 (Black)
115A (Blue) — 3 | 3 — W27 (Blue)
    4 | 4 — 125B (Purple)

3-7.5 Tons   10-20 Tons
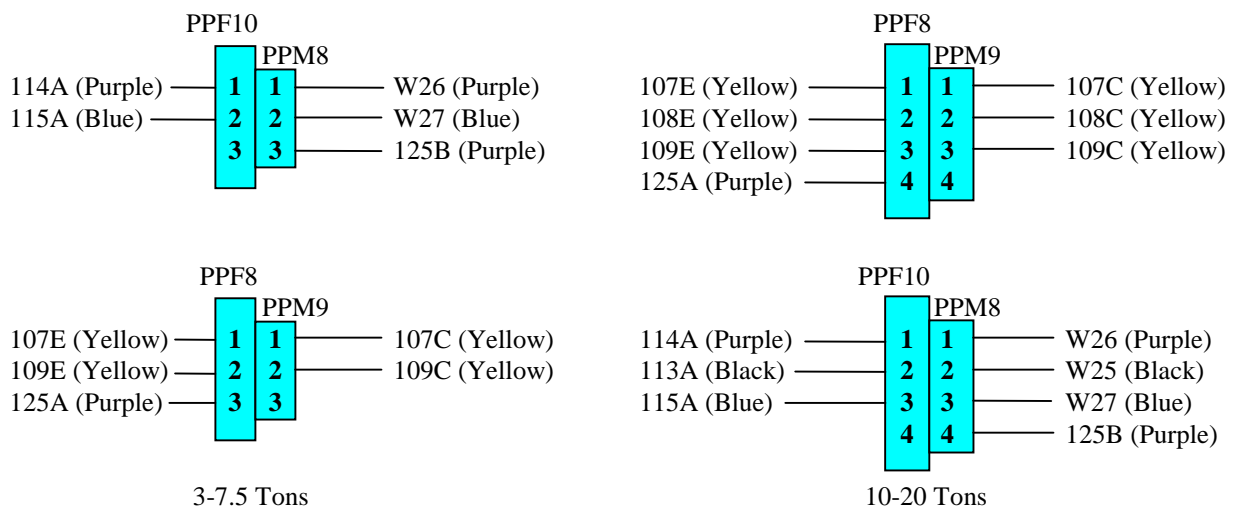
36. The Equipment Fails To Energize Or De-Energize A Component

36.1. 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.
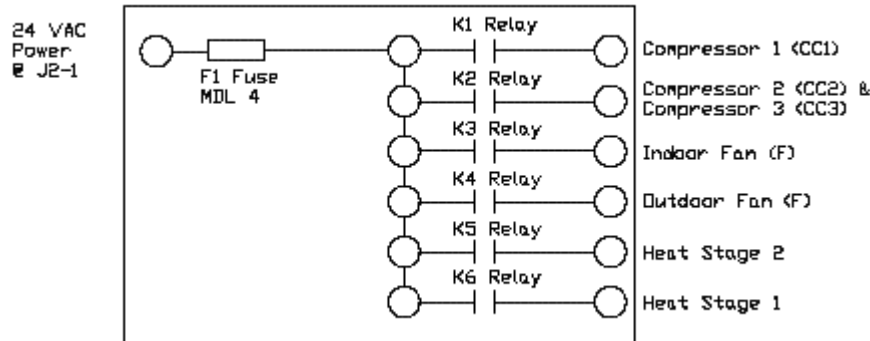
To determine the source of the problem, remove power from the equipment at the service disconnect, and utilize the system schematic diagram to determine where to install meter leads.

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.

36.2. 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.
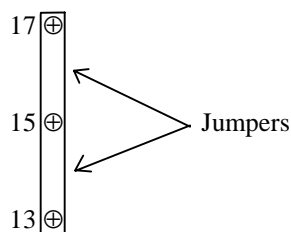
Obsolete LTB   **Current LTB**
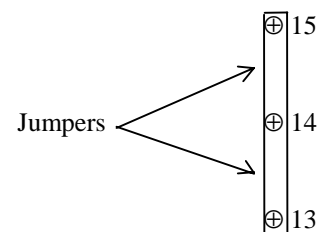
37. Will Not Work With A CTI (Constant Volume only)

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.
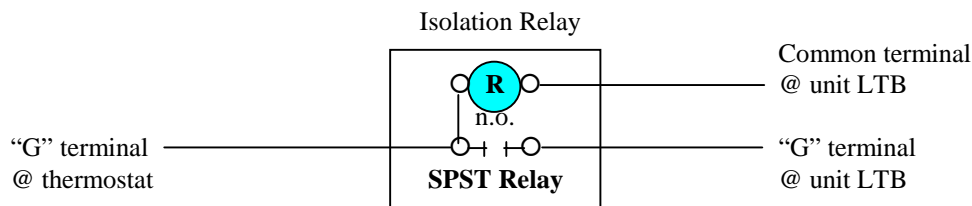
Isolation Relay

Isolation Relay Example With Leakage Current In "G" Circuit

38. No Communication Between ICS Device & Voyager

38.1. TCI-1 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. A Trane Communications Interface 2 or 3 (TCI-2 or 3) would have to be installed, in order to establish communication between the Voyager and Comfort Manager. A TCI-2 or 3 will have two LEDs (red and green), located on the bottom of the printed circuit board, between the two terminal blocks.

38.2. TCI-3 is being utilized, and Com Link board Non-isolated Comm:

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.

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.

38.3.   DIP switches on the TCI are set incorrectly:

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 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 (or a smoke detector) is being used.

38.4.   The comm link is connected to Comfort Manager incorrectly:

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

The Voyager communicates with Comfort Manager on the UCM communication link. The Voyager must be connected to 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 "TR100", 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 Comfort Manager, the Voyager would continue to provide comfort for the zone.

38.5.   No Communication Between Comfort Manager & Voyager

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 an accessory device (smoke detector contacts, duct high temperature sensor, etc.) is installed, and the circuit opens, the Voyager will completely shut down in less than one minute. A diagnostic will also be set and communicated to Comfort Manager, the generated diagnostic will be displayed as "High temp" or "High temp input open".

38.6.   TCI-2 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 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.

38.7.   TCI-3 is being utilized, and Com Link board Non-isolated comm:

If a Trane Communication Interface 3 (TCI-3) is being utilized, 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 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.

38.8. 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.

There are several correct setting for the DIP switches, for both Tracer and Tracker/ComforTrac 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).

38.9. 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. 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.

39.   Sensors Fail And Return To Normal On An ICS Installation

39.1.   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 the event 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.

40.   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.).

Potentially Affected are Packaged Electric / Electrics, Packaged Heat Pumps, and Packaged Gas / Electrics with serial number date codes F49 through K48 in the following product models:

40.1.   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.
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.

If problems continue to persist a different UCP is available, the MOD-0305 or later version. This UCP has the ability to respond to or compensate for application issues, in most cases, due to oversizing. This board has a 10 second control loop, and "NO" minimum on time for the gas heat cycle.
Note: Some 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 will not be present in MOD-0305 or later version.

41.   Evaporator Coil Icing (3-25 ton)

41.1.   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.

41.2.   Excessive amounts of bypass from discharge to return air intake:

There are several items that can facilitate 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.

Here again, 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.

41.3.   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.

41.4.   Operating equipment in a process application, with a sub-cooled zone:

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.

41.5.   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.

42. Solutions To Evaporator Coil Icing (3-25 ton)

42.1. 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 Comfort Manager installations (Low Air Flow/Bypass).

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. Under 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
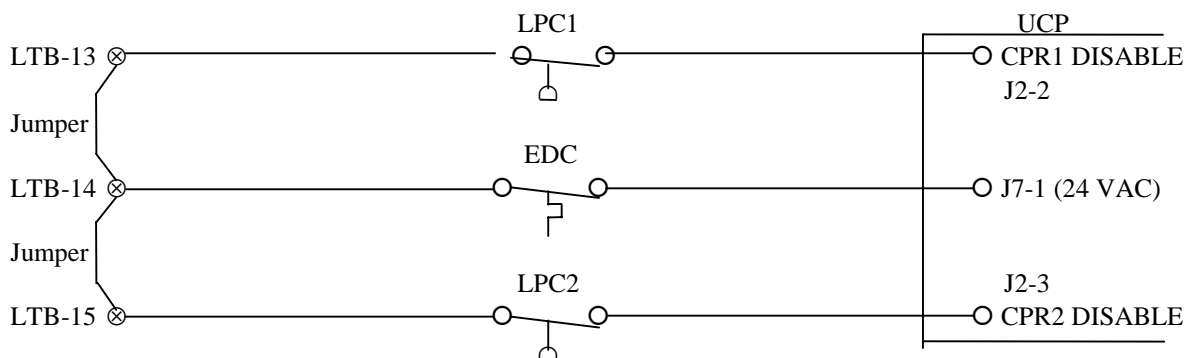
Note: Substitute LTB-15 For LTB-14 On Equipment Manufactured Prior To 06/93

42.2.   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. In an application with low air flow which 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. In an application with restricted condenser air flow which 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

GND = This Input Must Be Connected Or Shorted To Ground.
OPEN = This Input Must Be Open, No Connection To Ground.

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

A head pressure control device is typically installed in applications which have a high internal heat gain, where 100% of equipment mechanical cooling capacity is required year round. Some typical applications which would require a head pressure control device are.

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

42.4.   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 suction pressure at 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.

42.5.   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.

There is not an application bulletin with guidelines regarding this type of retrofit. 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.

43. Conditions Which Can Cause Incomplete Heat Pump Defrost

43.1. 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%.

43.2. 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.

43.3. 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.

44.   UCP F1 Fuse Or TNS1 Transformer Over Current Device Blows

All 24V AC 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. The circuits and devices associated, and procedures for locating the problem are outlined below.

1.   Indoor fan contactor coil could be shorted or grounded: Junction J2 is located on the right hand side of the UCP, it is a 24 pin junction and plug. 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 wire itself, or in the indoor fan contactor coil. If a direct short is not present, there is no problem in this circuit.

2.   Compressor contactor coil(s) could be shorted or grounded: Junction J8 is located in the lower right hand corner of the UCP, it is a 4 pin junction. Locate terminal J8-1, and measure the resistance to ground. If this is a dual circuit unit, 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 exist in either circuit.

3.   UEM humidity sensor power supply could be shorted or grounded: Junction J2 is located on the right hand side of the UCP, it is a 24 pin junction. 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 could be shorted or grounded: First, make sure the F1 fuse on the UCP is good. J2 is located on the right hand side of the UCP, it is a 24 pin junction. 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 exist 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. Gas heat control or ODF coil could be shorted or grounded: Junction J5 is located in the upper right hand corner of the UCP, it is a 3 pin junction. 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 outdoor fan relay circuit. If a direct short is not present, no problem exists in this circuit.

6.   TCI power supply or Hi Temp input could be shorted or grounded: Junction J6 is located on the upper left hand side of the UCP, it is a 7 pin junction. 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 circuit, the wire, or the TCI. If a direct short is not present, there is no problem in this circuit.

7. Electric heat contactor coil has shorted or grounded: Junction J2 is located on the right hand side of the UCP, it is a 24 pin junction. Locate terminal J2-22, and measure the resistance to ground. If a direct short is present, there is a problem in this circuit, the wire, 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 portion of the circuit.

Junction J1 is located on the top left side of the UCP, it is a 24 pin junction. Locate terminal J1-22, and measure the resistance to ground. Also locate the wire that is connected to the K5 relay (N.O.) terminal, and measure the resistance to ground. If a direct short is present in either circuit, there is a problem in that circuit, in the wire itself or in the electric heater contactor coil(s). If a direct short is not present, there is no problem in this circuit, proceed to the next circuit.

Note: Output at J2-22 re-enters UCP at J1-21 and K5 relay common, exits at J1-22 via the K6 relay and K5 relay N.O.

8. CTI/Compressor Disable power supply could be shorted or grounded: Junction J7 is located on the lower left side of the UCP, it is an 11 pin junction. 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.

45. 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.
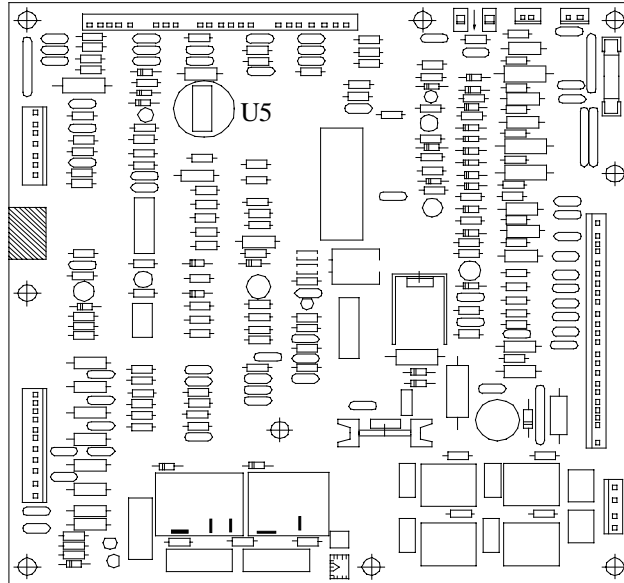
45.1. Factory or Field mis-wire of AC voltage to U5 chip:

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 the U5's 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.

45.2. Replacing defrost or condenser fan DC relays, with AC coils:

The coil is 24V DC, not 24V AC. 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 would overheat and the wire insulation would 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 part's list, as to what the coil voltage may be on a particular relay.

46. Multiple UCP U6 Chip Failures

The U6 chip illustrated below, is a 29V DC 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.
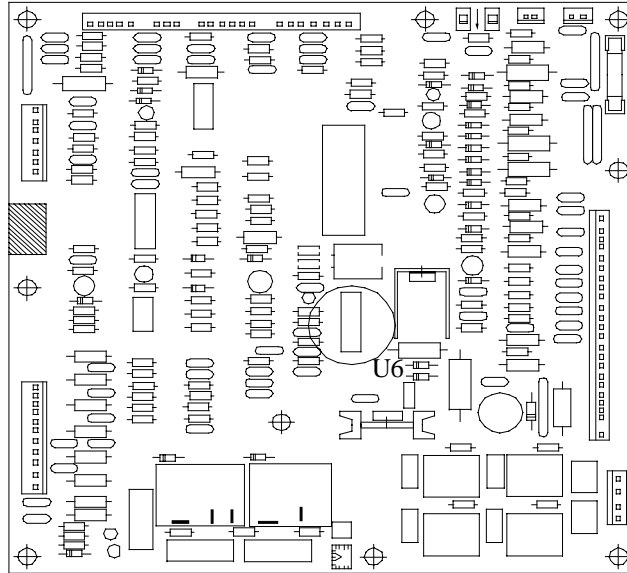
46.1. Failure to install edge protector on a raw metal edge (Voyager 3-25):

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.

46.2. Wiring harness damaged in factory installation (Voyager 3-25):

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.

46.3. Replacing power exhaust relay, with AC coil relay:

The coil is 24V DC, not 24V AC. 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 would overheat and the wire insulation would burn off, causing the coil to short, pulling excessive current (over powering the output) and eventually causing complete failure. If U6 chip failures occur, check for wiring harness damage, both unit harness and economizer / motorized outside air damper harness.

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

Section 6

47. Pin Descriptions & Voltages

47.1. Voltages And Descriptions Available At The LTB, Prior To 06/93

24 VOLTS AC, FUSED THROUGH UCP, OUTPUT FROM TNSI TRANSFORMER SECONDARY

24 VOLTS AC, CPR2 DISABLE INPUT FOR LPC2

24 VOLTS AC, FUSED THROUGH UCP, OUTPUT FROM TNSI TRANSFORMER SECONDARY

24 VOLTS AC, CPRI DISABLE INPUT FOR LPCI

32 VOLTS DC COMMON OUTPUT FROM UCP TO PROGRAMMABLE ZSM

32 VOLTS DC, SYS ON LED OUTPUT FROM UCP TO ZSM

32 VOLTS DC, HEAT LED, OUTPUT FROM UCP TO ZSM

5 VOLTS LOGIC LEVEL DC, HSP, FOR ZSM INPUT TO UCP

5 VOLTS LOGIC LEVEL DC, CSP, FOR ZSM INPUT TO UCP

5 VOLTS LOGIC LEVEL DC, Z TEMP, FOR ZSM INPUT TO UCP

5 VOLTS LOGIC LEVEL DC COMMON, INPUT TO UCP, INITIATES TEST MODE

5 VOLTS LOGIC LEVEL DC, INPUT TO UCP, INITIATES TEST MODE

24 VOLTS AC COMMON, OUTPUT FROM TNSI TRANSFORMER SECONDARY

24 VOLTS AC, FAN FILTER STATUS INPUT

32 VOLTS DC, COMMUNICATION LINK INPUT/OUTPUT FROM UCP TO PROGRAMMABLE ZSM

32 VOLTS DC, SERVICE LED, OUTPUT FROM UCP TO ZSM

32 VOLTS DC, COOL LED, OUTPUT FROM UCP TO ZSM

32 VOLTS DC, LED COMMON, OUTPUT FROM UCP TO ZSM

5 VOLTS LOGIC LEVEL DC, MODE, FOR ZSM INPUT TO UCP

5 VOLTS LOGIC LEVEL DC, COMMON FOR ZSM INPUT TO UCP

(Terminals: TEST, TEST, 18, 17, 16, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1)

Note: Factory Jumpers Installed Across Terminals: LTB-13, 15, And 17. (Voltages Are Measured With Wires Disconnected).

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

5 VOLTS LOGIC LEVEL DC COMMON, INPUT TO UCP, INITIATES TEST MODE

5 VOLTS LOGIC LEVEL DC, Z TEMP, FOR ZSM INPUT TO UCP

5 VOLTS LOGIC LEVEL DC, COMMON FOR ZSM INPUT TO UCP

5 VOLTS LOGIC LEVEL DC, CSP, FOR ZSM INPUT TO UCP

5 VOLTS LOGIC LEVEL DC, MODE, FOR ZSM INPUT TO UCP

5 VOLTS LOGIC LEVEL DC, HSP, FOR ZSM INPUT TO UCP

32 VOLTS DC, LED COMMON, OUTPUT FROM UCP TO ZSM

32 VOLTS DC, HEAT LED, OUTPUT FROM UCP TO ZSM

32 VOLTS DC, COOL LED, OUTPUT FROM UCP TO ZSM

32 VOLTS DC, SYS ON LED OUTPUT FROM UCP TO ZSM

32 VOLTS DC, SERVICE LED, OUTPUT FROM UCP TO ZSM

5 VOLTS LOGIC LEVEL DC, INPUT TO UCP, INITIATES TEST MODE

24 VOLTS AC COMMON, OUTPUT FROM TNSI TRANSFORMER SECONDARY

5 VOLTS LOGIC LEVEL DC, INPUT TO UEM, SUPPLY AIR SENSOR

5 VOLTS LOGIC LEVEL DC COMMON, INPUT TO UEM SUPPLY AIR SENSOR

24 VOLTS AC, INPUT FROM TNSI TRANSFORMER SECONDARY "EMERGENCY STOP"

24 VOLTS, OUTPUT FROM TNSI TRANSFORMER SECONDARY "EMERGENCY STOP"

24 VOLTS AC, CPR2 DISABLE INPUT FOR LPC2

24 VOLTS AC, FUSED THROUGH UCP, OUTPUT FROM TNSI TRANSFORMER SECONDARY

24 VOLTS AC, CPRI DISABLE INPUT FOR LPCI

32 VOLTS DC, COMMUNICATION LINK INPUT/OUTPUT FROM UCP TO PROGRAMMABLE ZSM

32 VOLTS DC COMMON OUTPUT FROM UCP TO PROGRAMMABLE ZSM

(Terminals: TEST 1, TEST 2, 1, 20, 2, 19, 3, 18, 4, 17, 5, 16, 6, 15, 7, 14, 8, 13, 9, 12, 10, 11)

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).

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

Common   24 VAC   Tie Points between the UCP & UEM or UVM

1 2 3 4 5 6 7 8 9 10 11 12
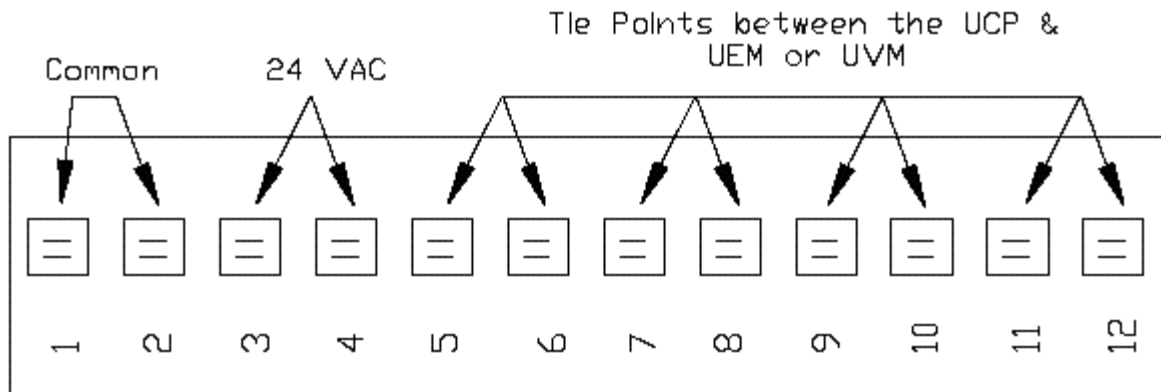
47.4. Voyager 27.5-50 Ton LTB-3 Pin Descriptions & Voltages

N. C. for Occupied ⟶ 5
N. O. for Occupied ⟶ 4
Common ⟶ 3
0-5 VDC for Remote Minimum Position ⟶ 2
Common for Remote Minimum Position ⟶ 1
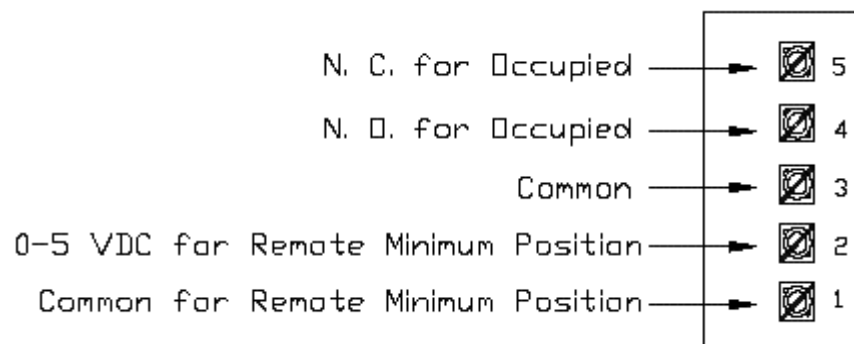
47.5. Voyager 27.5-50 Ton LTB-4 Pin Descriptions & Voltages

Not Used ⟶ 5

Switch from exhaust ventilation mode to pressurization mode ⟶ 4, 3

Initiate for Ventilation Override ⟶ 2, 1
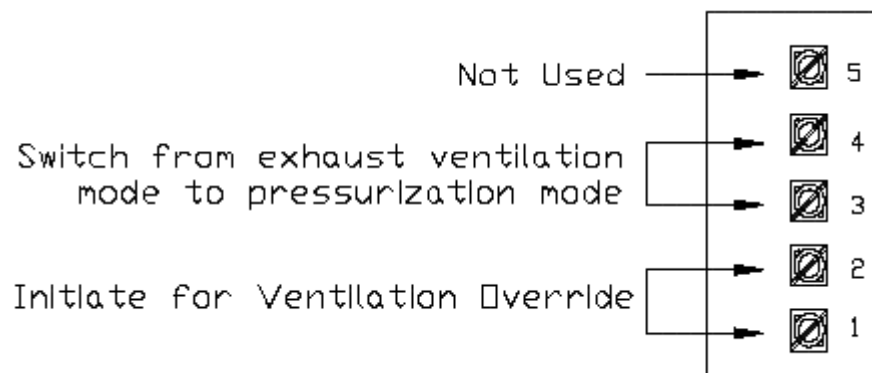
47.6. UCP Pin Descriptions & Voltages 3-25 Ton
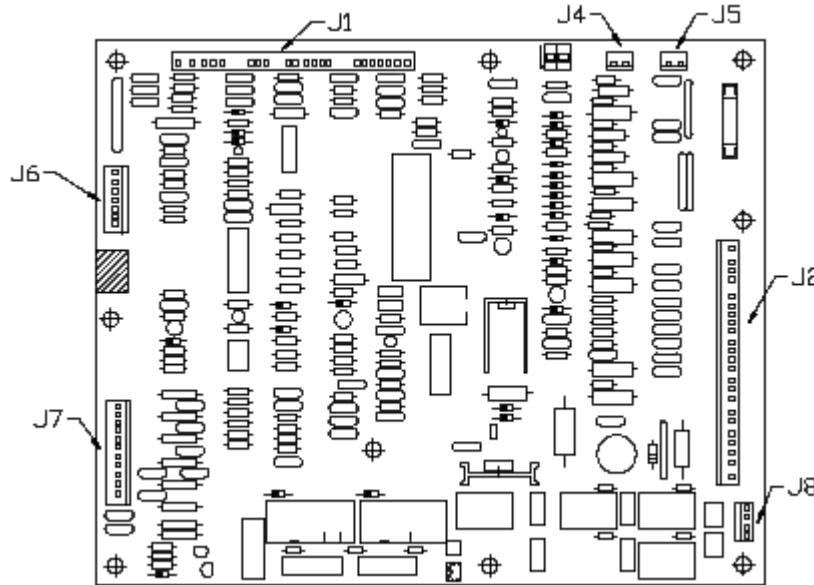
PIN	VOLTS	INFORMATION
J1-1	*Common	Digital Common Shorting Point for Config. Inputs
J1-2 & J1-3	0 VDC Input	Inputs used to determine Unit Type TC,TW,YC
J1-4	0 VDC Input	Inputs used to determine 1 or 2 Compressor System
J1-5	24 VAC Input	Heat Fail Input for Gas/Elect
J1-6	No Pin	
J1-7	0 VDC Input	Input to Enable/Disable Power Slasher
J1-8	32 VDC Output	Output to Power Slasher 2 Speed Fan Relay, 32 VDC when relay "not" energized
J1-9	29 VDC Output	Output to Power Slasher 2 Speed Fan Relay if present
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 if present
J1-13	32 VDC Output	Output to SOV Relay or Heat 3, 32 VDC present when relay "NOT" energized
J1-14	29 VDC Output	Output to SOV Relay on Heat Pumps or Heat 3 if present
J1-15	5 VDC Input	Outdoor Air Sensor Analog Input
J1-16	*Common	Analog Common for OAS
J1-17	No Pin	
J1-18	*Common	Digital Common Shorting Point for Config. 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	Continuos 29 VDC Output, Spare Pin (NOT USED)
J2-1	24 VAC Input	UCP Power Supply Input
J2-2	24 VAC Input	CPR 1 Disable Ckt.
J2-3	24 VAC Input	CPR 2 Disable Ckt.
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, continuos 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
J4-1	5 VDC Input	Mode Initiation Analog Input
J4-2	*Common	Analog Common (LTB-TEST-2), Shorting point for config inputs
J5-1	24 VAC Input	Fan/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	Output to LTB-14, CPR 1 & 2 Disable & Fan Filter Status
J7-2	*Common	Power Common to ZSM LEDs/LCDs
J7-3	*Common	Analog Common to ZSM Control Circuit
J7-4	32 VDC Output	Output to LTB-10 for ZSM Service LED/LCD
J7-5	32 VDC Output	Output to LTB-8 for ZSM Cool LED/LCD
J7-6	32 VDC Output	Output to LTB-7 for ZSM Heat LED/LCD
J7-7	32 VDC Output	Output to LTB-9 for ZSM Sys On LED/LCD
J7-8	5 VDC Input	ZSM Cooling Set Point Analog Input
J7-9	5 VDC Input	ZSM Heating Set Point Analog Input
J7-10	5 VDC Input	ZSM Mode Analog Input
J7-11	5 VDC Input	ZSM Zone Temp. Analog Input
J8-1	24 VAC Output	Output to Energize Compressor Contactor CC1
J8-2	No Pin	
J8-3	No Pin	
J8-4	24 VAC Output	Output to Energize Compressor Contactor CC2

* Common to Chassis Ground

47.7.   UCP Pin Descriptions & Voltages 27.5-50 Ton
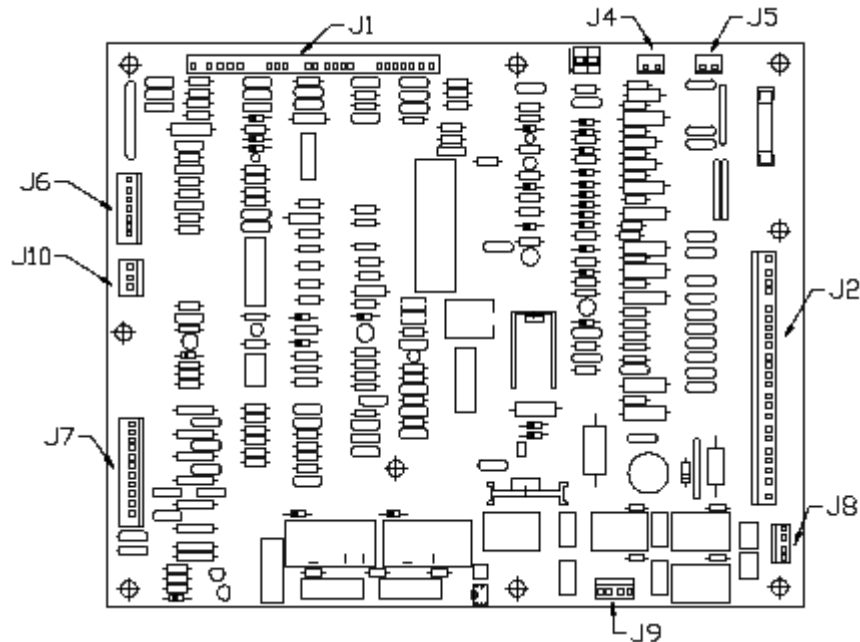
PIN	VOLTS	INFORMATION
J1-1	*Common	Digital Common Shorting Point for Config. Inputs
J1-2	0 VDC Input	Inputs used to determine Heat Configuration
J1-3	0 VDC Input	Daytime Warm-up Heat Configuration
J1-4	0 VDC Input	Inputs used to determine Number of Compressors
J1-5	24 VAC Input	Heat Fail Input
J1-6	No Pin	
J1-7	0 VDC Input	Lead/Lag Configuration
J1-8	Pin	Not Used
J1-9	29 VDC Output	Output to Power Slasher Fan Relay
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 VAV Boxes or Heat 3
J1-14	29 VDC Output	Output to SOV Relay Heat 3
J1-15	5 VDC Input	Outdoor Air Sensor Analog Input/ UVM Analog Expansion
J1-16	*Common	Analog Common for OAS
J1-17	No Pin	
J1-18	*Common	Digital Common Shorting Point for Config. Inputs
J1-19	0 VDC Input	Input used to determine 2 Heat/ Cool Stages, for a particular unit type
J1-20	0 VDC Input	Input used to determine 1 Heat Stage, 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	24 VAC Output	Output to energize Stage 2 Heat
J1-24	29 VDC Output	Relay Drive
J2-1	24 VAC Input	UCP Power Supply Input
J2-2	24 VAC Input	CPR 1 Disable Ckt.
J2-3	24 VAC Input	CPR 2 Disable Ckt.
J2-4	32 VDC Input	Condenser Fan A
J2-5	32 VDC Input	Inputs used for Condenser Fan Cycling 1
J2-6	32 VDC Input	Supply Fan Proving

|		
J2-7	32 VDC Input	Inputs used for Condenser Fan Cycling 3/ Emergency Stop
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, continuos 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 or UVM
J2-20	24 VAC Output	Power Supply for Humidity Sensor Circuits
J2-21	5 VDC Output	Output to Outside Air Temperature Bias
J2-22	24 VAC Output	Output to energize Supply Fan Contactor
J2-23	No Pin	
J2-24	*Common	UCP Power Common
J4-1	5 VDC Input	Test Input
J4-2	*Common	Analog Common (LTB-TEST-2), Shorting point for config 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	Output to LTB-14, CPR 1 & 2 Disable & Fan Filter Status
J7-2	*Common	Power Common to ZSM LEDs/LCDs
J7-3	*Common	Analog Common to ZSM Control Circuit
J7-4	32 VDC Output	Output to LTB-10 for ZSM Service LED/LCD
J7-5	32 VDC Output	Output to LTB-8 for ZSM Cool LED/LCD
J7-6	32 VDC Output	Output to LTB-7 for ZSM Heat LED/LCD
J7-7	32 VDC Output	Output to LTB-9 for ZSM Sys On LED/LCD
J7-8	5 VDC Input	ZSM Cooling Set Point/Supply Air Cooling Set Point Analog Input
J7-9	5 VDC Input	ZSM Heating Set Point /Supply Air Reset Set Point Analog Input
J7-10	5 VDC Input	ZSM Mode Analog Input
J7-11	5 VDC Input	ZSM Zone Temp. /Supply Air Temp. Analog Input
J8-1	24 VAC Output	Output to Energize Compressor Contactor CC1
J8-2	24 VAC Ground	Compressor Contactor CC1 Return; measures amp draw of coil
J8-3	24 VAC Ground	Compressor Contactor CC2 Return; measures amp draw of coil
J8-4	24 VAC Output	Output to Energize Compressor Contactor CC2
J9-1, 3	24 VAC Input	Power for Compressor Contactors
J9-2, 4	Pin	Not Used
J10-1	24 VAC Input	Frostat
J10-2	24 VAC Input	Ventilation Override Initiate
J10-3	5 VDC Output	IGV/VFD Pulse Width Modulating Output

47.8. UEM Pin Descriptions & Voltages 3-50 Ton
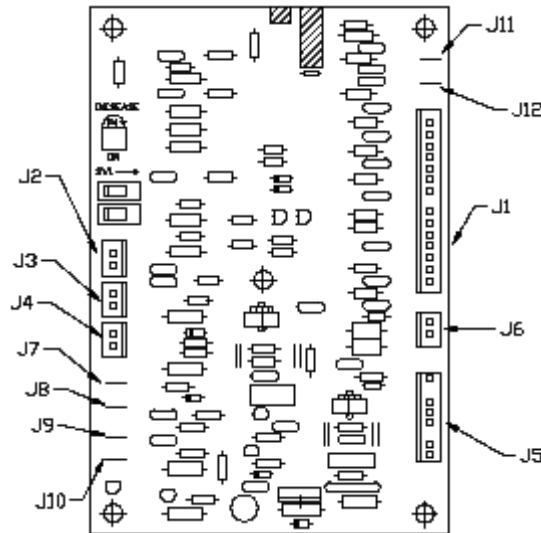
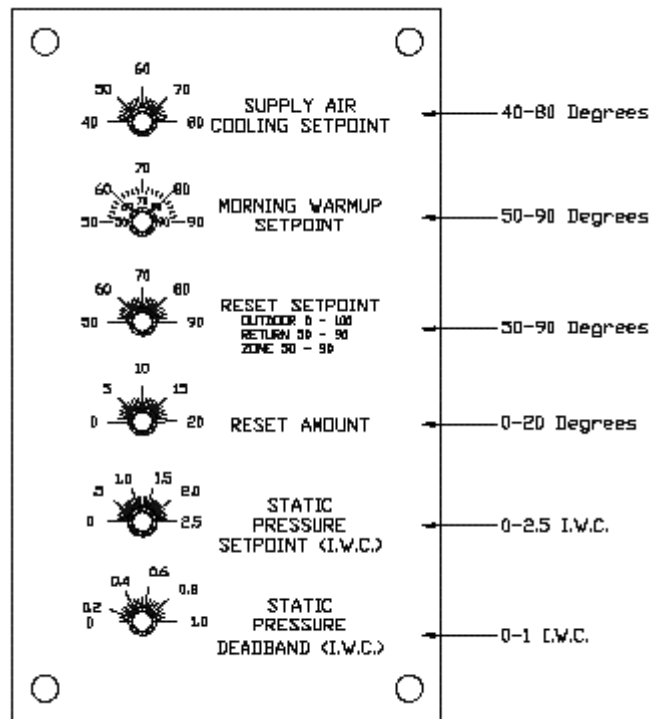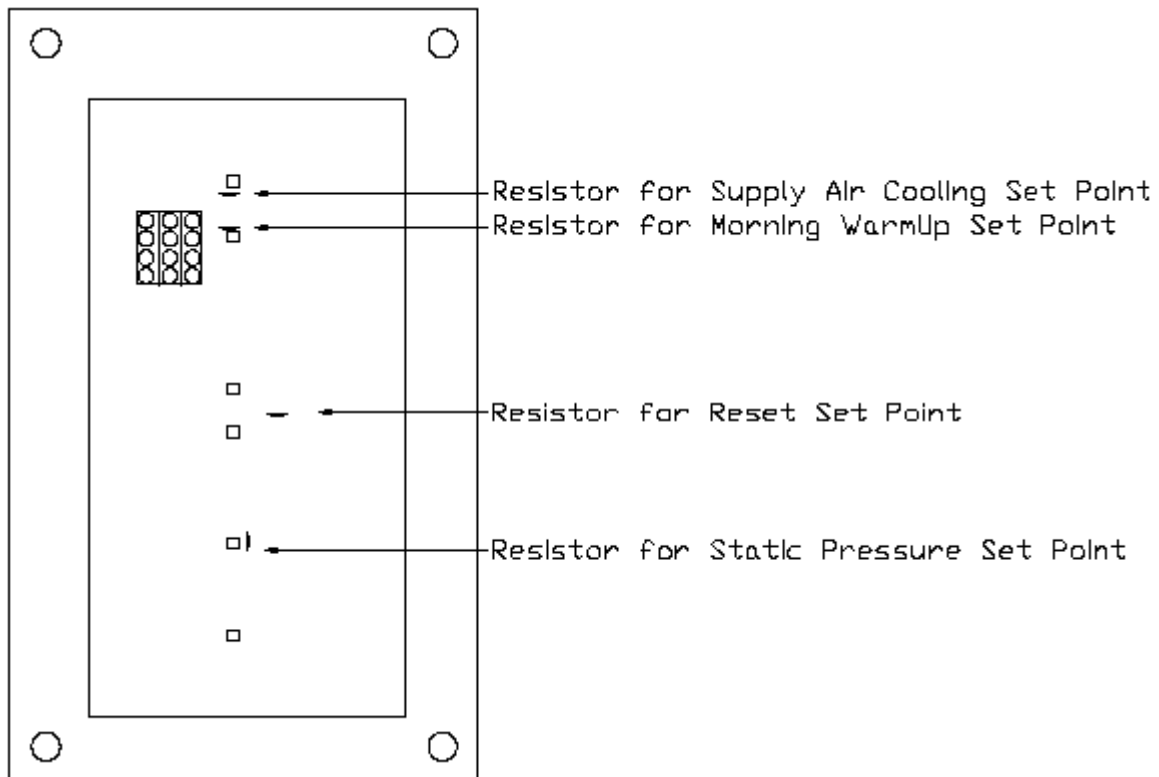| PIN	VOLTS	INFORMATION
J1-1	5 VDC Input	Analog Reference Voltage, Input from UCP
J1-2	Common	UEM Digital Common
J1-3	Common	UEM Analog Common
J1-4	5 VDC Output	Analog Output, Communication Link to UCP
J1-5, 6, & 8	5 VDC Input	Digital Input from UCP, tells UEM what data it wants to read on Output J1-4
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 form 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	Binary Input for Fan Failure Switch, or Analog Input for ECA Feedback Pot.
J5-4	Common	Analog Common for Fan Failure Switch or ECA Feedback Pot.
J5-5	Common	Digital Common for J5-7 & J5-8, Common Outputs to Drive ECA Open & Closed
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.

47.9. UVM Pin Descriptions & Voltages 27.5-50 Ton
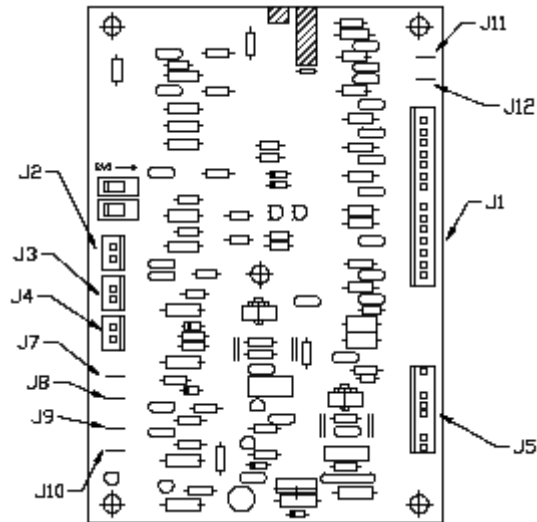
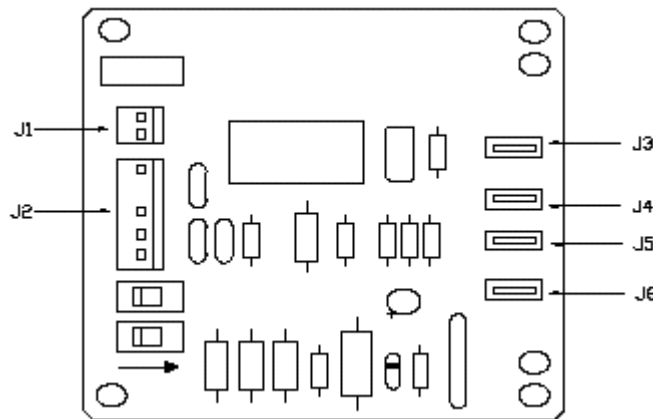| PIN	VOLTS	INFORMATION
J1-1	5 VDC Input	Analog Reference Voltage, Input from UCP
J1-2	Common	UVM Digital Common
J1-3	Common	UVM Analog Common
J1-4	5 VDC Output	Analog Output, Communication Link to UCP
J1-5, 6, 8	5 VDC Input	Digital Input from UCP, tells UVM what data it wants to read on Output
J1-7	No Pin	
J1-9	5 VDC Input	5 VDC Power Supply Input from UCP
J1-10	Pin	Not Used
J1-11	0-10 VDC Output	IGV/VFD
J1-12	Pin	Not Used
J1-13	24 VAC Input	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	Analog Reference Voltage, Output to MWU Set point
J4-2	5 VDC Input	Morning Warm Up Set Point
J4-3	Common	Analog Common
J5-1	Pin	Not Used
J5-2	No Pin	
J5-3	5 VDC Input	Static Pressure Deadband
J5-4	Common	Analog Common
J5-5	Common	Digital Common
J5-6	Pin	Not Used
J5-7	Pin	Not Used
J5-8	0-10 VDC Output	IGV/VFD
J7+	0-5 V Input	Reset Set Point
J8+	Common	Analog Common
J9+	0-5 V Input	Pressure Transducer
J10+	5 VDC Input	5 VDC Supply for Pressure Transducer
J11	0-5 V Input	Static Pressure Set Point
J12	Common	Analog Common for Static Pressure Set Point

## 47.10.   VAV Set Point Panel 27.5-50 Ton

Front of Panel

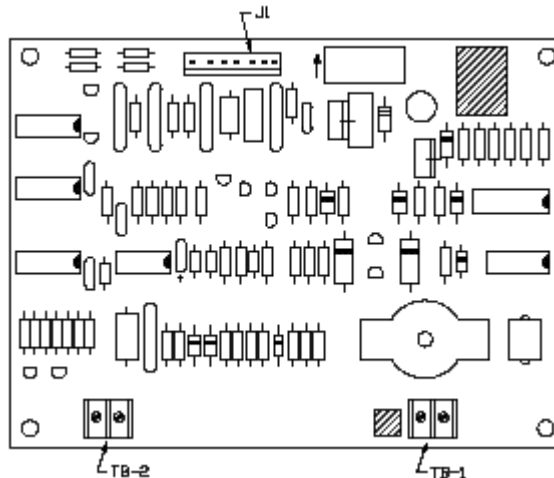Back of Panel

47.11. 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	DFM Power 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	Output from DFM K1 Relay Normally Open, Share Output Energized if SOVs are Energized
J6	24 VAC Input	Input from Defrost (Termination) Temperature Switch

47.12. CTI Pin Descriptions & Voltages 3-50 Ton
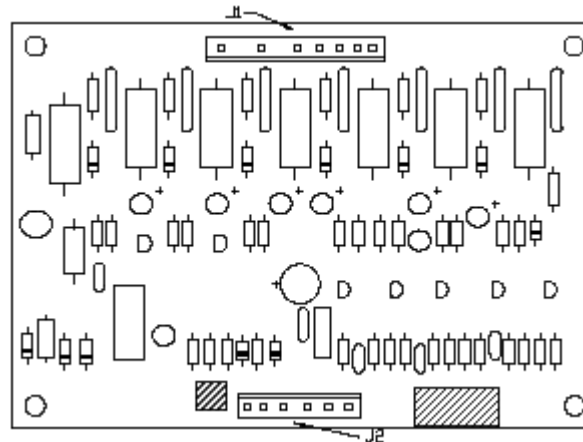
PIN	VOLTS	INFORMATION
J1-1	24 VAC Output	Output to LTB-15, LTB-14 on units manufactured after 06/93, provides input through Tstat to LTB
J1-2,3,4	Not Used	
J1-5	24 VAC Input	Input from LTB-8, for Heat Pump
J1-6	24 VAC Input	Input from LTB-7, for Heat Pump or Heat/Cool
J1-7	24 VAC Input	Input from LTB-9, for Heat Pump
J1-8	24 VAC Input	Input from LTB-3, for Heat Pump or Heat/Cool
J1-9	24 VAC Input	Input from LTB-5, for Heat/Cool
J1-10	24 VAC Input	Input from LTB-4, for Heat Pump or Heat/Cool
J1-11	24 VAC Input	Input from LTB-1, for Heat Pump or Heat/Cool
J2-1	Common	Output to UCP CSP Input
J2-2	5 VDC Output	Output to UCP CSP Input
J2-3	5 VDC Output	Output to UCP HSP Input
J2-4	5 VDC Output	Output to UCP ZTEMP Input
J2-5	5 VDC Output	Output to UCP MODE of Operation Input
J2-6	24 VAC Input	24 VAC power supply, provides power to CTI Output J1-1

47.13. TCI-1 Pin Descriptions & Voltages 3-50 Ton

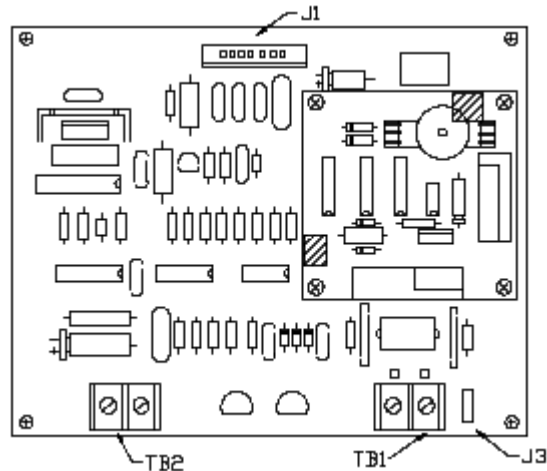| PIN	VOLTS	INFORMATION
J1-1	Common	Digital Common from UCP
J1-2	Pulsating 32VDC Output	Output to UCP, receive data line
J1-3	5 VDC Input	Transmit enable binary Input from UCP
J1-4	5 VDC Input	Transmit data, binary Input from UCP
J1-5	5 VDC Input	Digital Input from UCP. TCI Installed/Read Unit Address
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 comm link, must be measured with an Oscilloscope
TB2-1	24 VAC Output	Input from High Temp Switches if present
TB2-2	24 VAC Output	Output to High Temp Switches if present

47.14. 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	Common	Chassis Ground
TB1-1 & 2	Pulsating 6 VDC Input	Input from ICS device comm link, must be measured with an Oscilloscope
TB2-1	24 VAC Output	Input from High Temp Switches if present
TB2-2	24 VAC Output	Output to High Temp Switches if present

47.15. 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	Common	Chassis Ground
TB1-1 & 2	Pulsating 6 VDC Input	Input from ICS device comm link, must be measured with an Oscilloscope
TB2-1	24 VAC Output	Input from High Temp Switches if present
TB2-2	24 VAC Output	Output to High Temp Switches if present

48. 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 ton low voltage wires are all black only.

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 LEDs/LCDs.
	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, Common To 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, TCs And WCs.
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, CPR1 & CPR2 Disable, 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.

49. 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.	Inrush = 4.0 VA Sealed = 2.4 VA	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.

50. 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.

50.1. 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 (Default)	Inlet Guide Vanes
OFF	ON	Shorter	N/A
ON	OFF	Longer	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, will help alleviate heating temperature swings.

50.2. Unitary Economizer Module (UEM) Switch Setting Table

Switch 1	Switch 2	Dry Bulb (°F.) Temperature	Selected Enthalpy	Standard Setting
OFF	OFF	60 Factory	19 Btu/LB dry air	D Factory
OFF	ON	55	22 Btu/LB dry air	C Default
ON	OFF	65	25 Btu/LB dry air	B
ON	ON	70	28 Btu/LB dry air	A

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

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

50.4. 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 (Default)
OFF	ON	Return Air Temperature Reset
ON	OFF	Zone Temperature Reset
ON	ON	Outdoor Air Temperature

51. UCP Configuration Input (3-25 ton)

<table>
<tr><th colspan="3">Unit Type Configuration</th><th colspan="3">Heat Stage Configuration</th></tr>
<tr><th>Unit
Type</th><th>Input
J1-2</th><th>Input
J1-3</th><th>Number Of
Heat Stages</th><th>Input
J1-19</th><th>Input
J1-20</th></tr>
<tr><td>TC</td><td>GND</td><td>GND</td><td>YC 1 Stage</td><td>OPEN</td><td>GND</td></tr>
<tr><td>WC Time/Temp</td><td>GND</td><td>OPEN</td><td>YC 2 Stages</td><td>GND</td><td>OPEN</td></tr>
<tr><td>YC</td><td>OPEN</td><td>GND</td><td>TC 0-1 Stage</td><td>GND</td><td>GND</td></tr>
<tr><td>WC Demand Defrost</td><td>OPEN</td><td>OPEN</td><td>TC 2 Stages</td><td>GND</td><td>OPEN</td></tr>
<tr><td></td><td></td><td></td><td>TC 3 Stages</td><td>OPEN</td><td>OPEN</td></tr>
<tr><td></td><td></td><td></td><td>WC 0-1 Stg Aux</td><td>OPEN</td><td>GND</td></tr>
<tr><td></td><td></td><td></td><td>WC 2 Stg Aux</td><td>OPEN</td><td>OPEN</td></tr>
</table>

<table>
<tr><th colspan="2">Compressor LEAD/LAG Configuration</th><th colspan="2">Cooling Staging Configuration</th></tr>
<tr><th>Enable / Disable
Function</th><th>Input
J1-7</th><th>Number Of Available
Compressors</th><th>Input
J1-4</th></tr>
<tr><td>Enable</td><td>OPEN</td><td>One Compressor</td><td>GND</td></tr>
<tr><td>Disable</td><td>GND</td><td>Two Compressors</td><td>OPEN</td></tr>
</table>

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
50 Degrees	GND	OPEN	OPEN
40 Degrees	OPEN	GND	GND
30 Degrees	OPEN	GND	OPEN
20 Degrees	OPEN	OPEN	GND
Continuous	OPEN	OPEN	OPEN

GND = This Input Must Be Connected Or Shorted To Ground. **OPEN** = This Input Must Be Open, No Connection To Ground.

52. UCP Configuration Input (27.5-50 ton)

<table>
<tr><th colspan="3">Heat Configuration</th><th colspan="2">Cool Configuration</th></tr>
<tr><th>Unit
Type</th><th>Input
J1-20</th><th>Input
J1-2</th><th>Unit
Type</th><th>Input
J1-19</th></tr>
<tr><td>Cool Only</td><td>GND</td><td>NA</td><td>VAV</td><td>GND</td></tr>
<tr><td>Gas Heat</td><td>OPEN</td><td>OPEN</td><td>CV</td><td>OPEN</td></tr>
<tr><td>Electric Heat</td><td>OPEN</td><td>GND</td><td></td><td></td></tr>
</table>

<table>
<tr><th colspan="2">Compressor LEAD/LAG Configuration</th><th colspan="2">Cooling Staging Configuration</th></tr>
<tr><th>Enable / Disable
Function</th><th>Input
J1-7</th><th>Number Of Available
Compressors</th><th>Input
J1-4</th></tr>
<tr><td>Enable</td><td>OPEN</td><td>3 Compressors (27.5-35 ton)</td><td>OPEN</td></tr>
<tr><td>Disable</td><td>GND</td><td>3 Compressors (40-50 ton)</td><td>GND</td></tr>
</table>

Condenser Fan Cycling Configuration
*Reference 1.1.10

53. UCP "Snubber Circuits"

The Unitary Control Processor (UCP) may have 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 an R/C (Resistive / Capacitate) circuit, with a resistor and capacitor wired in series across the relay contacts.
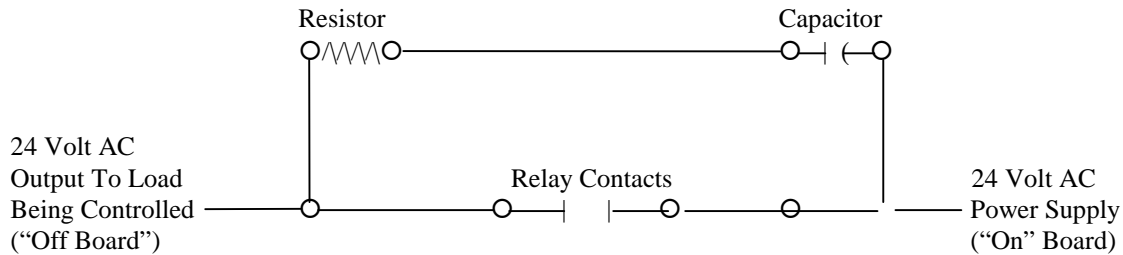
Snubber Circuits may cause confusion, because 24 VAC will be present if the output wire is disconnected from the load (relay or contactor coil) and the relay contacts are open. The voltage potential between the disconnected wire and ground will be 24 VAC, but no current is present. When the wire is placed 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	SPDT / N.O.	1/4" Terminals	Heat 2
		10A @ 240 VAC	N.C.	1/4" Terminals	
K6	Sealed	2A @ 24VAC	SPDT / N.O.	J1-22	Heat 1
				J1-21	Common

Notes:
1. Relays K1, K2, K3 and K6 contacts are rated 5A @ 120 VAC by the manufacturer, they are derated 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
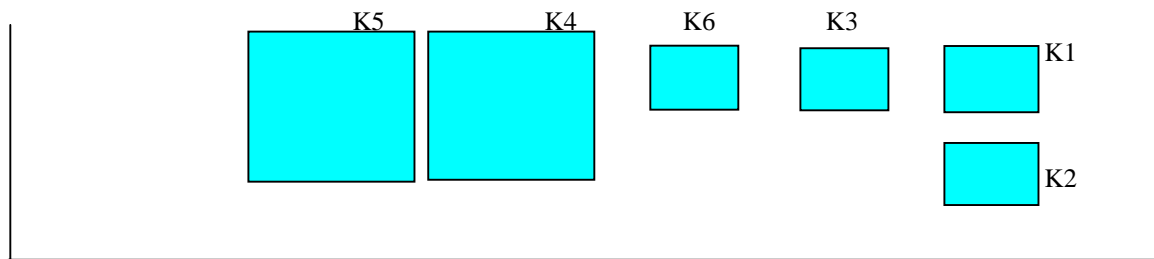
54.   UCP Outputs To 29 - 32 Volt DC LOADS

There are two output driver chips on the Unitary Control Processor (UCP), the U5 chip and the U6 chip, 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.
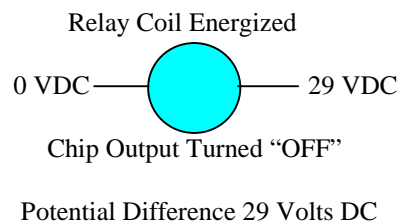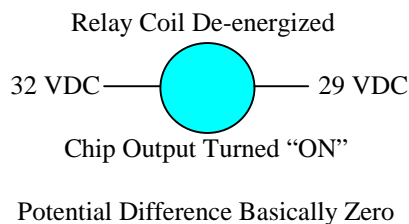
The U5 chip energizes and de-energizes the following DC loads, and the outputs have the following load limitations:

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   Relay Coil Energized

32 VDC ———⬤——— 29 VDC   0 VDC ———⬤——— 29 VDC

Chip Output Turned "ON"   Chip Output Turned "OFF"

Potential Difference Basically Zero   Potential Difference 29 Volts DC

55. Software Change History

55.1. 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 Decaying Anticipation - provides better droopless 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. It is enabled by cutting the purple wire at UCP J1-7.

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 TI's 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 present 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, occurs only when fan mode is in 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 present on dual compressor models, 11/96 to present on single compressor models. Current replacement part 03/96 to present on 3-25 Ton equipment.

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.

55.2. 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. It is enabled by cutting the purple wire at UCP J1-7.

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 TI's 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 and 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.

55.3.   3-50 ton CTI Identification And Software Change History

A change also occurred with the Voyager Low Voltage Terminal Board (LTB), which additionally drove some wiring changes. The hardware of the CTI 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

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