Section 5

34. Erratic Unit Operation (3-25 ton)

34.1. 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.

34.2. 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.

34.3. 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.

34.4. 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.

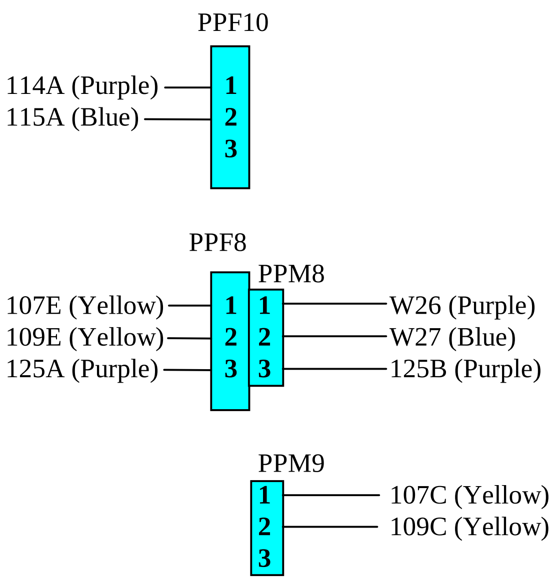
34.5. The polarized plugs are not configured properly on Heat Pump (3-20 ton):

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.

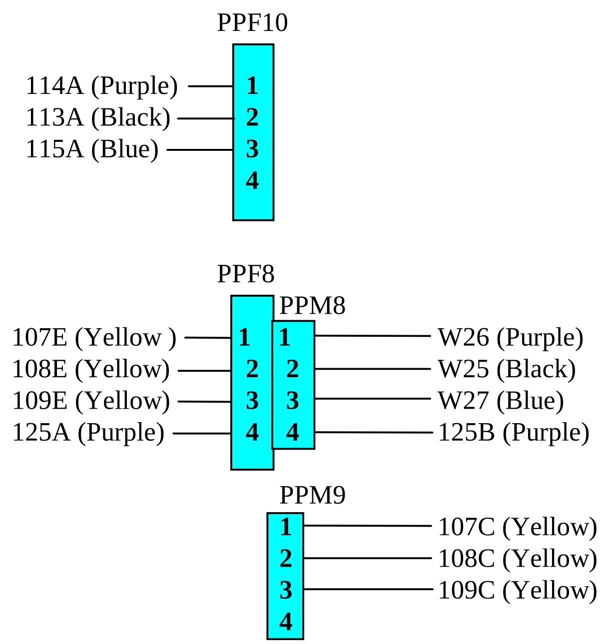
On 3-7.5 Ton equipment manufactured after 06/93, when the Test mode is entered, the indoor fan motor will run for 15 seconds, the fan motor will then turn “OFF”, and the equipment will not do anything else.

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

3-7.5 Tons

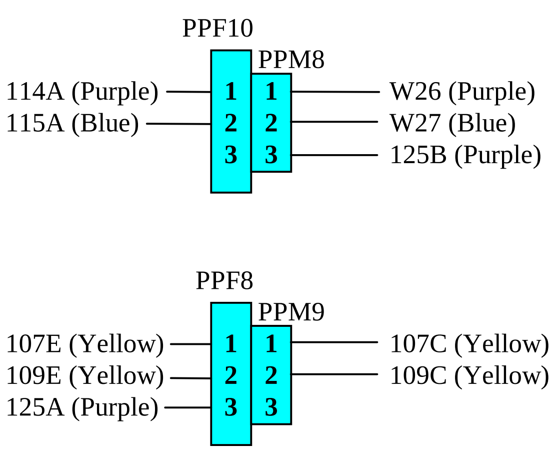


10-20 Tons

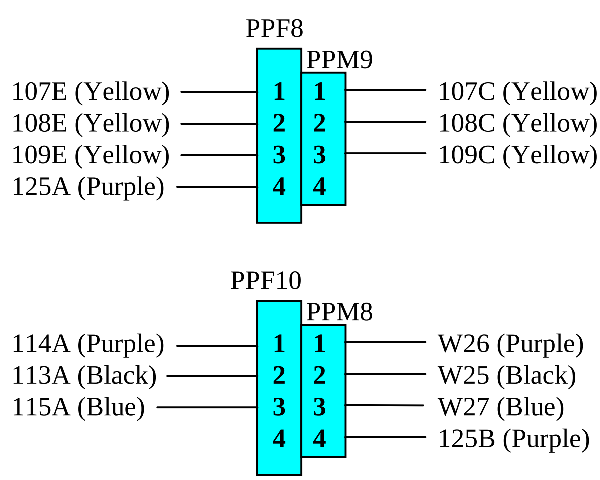


On equipment *with* an economizer, motorized outside air damper or BAYDIAG001A, the plugs should be configured as illustrated below.

3-7.5 Tons



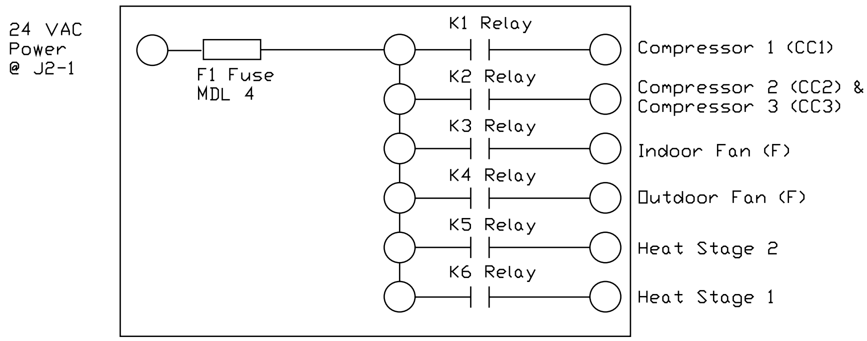
10-20 Tons



35. The Equipment Fails To Energize or De-Energize A Component

35.1. 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.

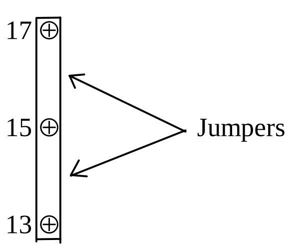
35.2. Brass jumpers for compressor disable input are loose, corroded or missing:

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.

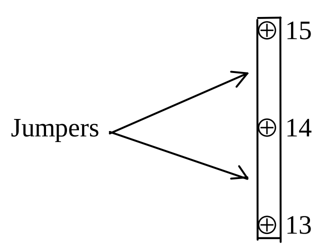
Verify that the brass jumpers are intact, on equipment manufactured prior to 06/93 there should be two brass jumpers between terminals LTB-13, 15, and 17. On equipment manufactured after 06/93 there should be two brass jumpers between terminals LTB-13, 14, and 15. If the brass jumpers are intact, verify 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



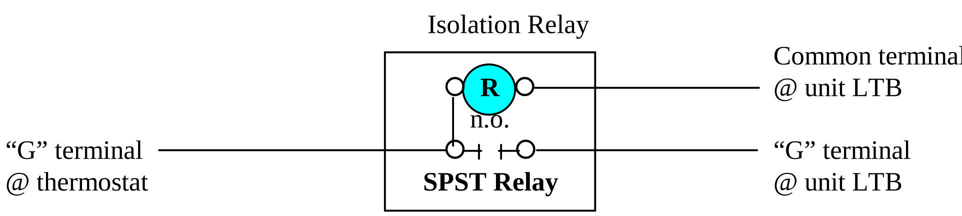
Current LTB



36. Will Not Work With A CTI (Constant Volume only)

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

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



Isolation Relay Example with Leakage Current in "G" Circuit

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

37.1. TCI-1 (Obsolete) is being utilized:

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

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

37.2. No communication between Voyager and VariTrac CCP:

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

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

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

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

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

37.4. The communication link is connected to VariTrac CCP incorrectly:

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

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

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

37.5. High Temperature input on TCI

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

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

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

37.6. TCI-2 (Obsolete) is being utilized:

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

The TCI-2 is not capable of supporting communication between a Voyager rooftop unit and a Tracer/Tracker or ComforTrac.
A TCI-1 or 3 must be installed, in order to establish communication between the Voyager and Tracer/Tracker or ComforTrac.

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

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

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

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

37.8. 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. On multiple unit installations, each TCI must have its own unique address setting.

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

37.9. 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.

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

38.1. 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 case any water happens to get through. A bottom block off is also present to protect the board from any extremely high humidity conditions. To modify an existing piece of equipment in the field, either re-gasket around the access cover, or apply a sealer such as RTV silicone sealant. Next, add two additional screws to each side of the cover panel; this should insure a water tight seal.

39. 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.).

39.1. 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. (i.e. Coffee Maker, Vending Machine)
4. Verify that the wall penetration behind the ZSM has been properly sealed.
5. Verify that a locking thermostat cover has not been installed over the ZSM. If a locking cover has been installed it must be removed, or an alternate means (typically remote sensing) must be utilized.

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

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

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

Note: Some earlier UCPs (BRD-0931, BRD-1007 & MOD-0143) force packaged Gas / Electrics (YCs) to have a four minute heating minimum on time. This will result in approximately three minutes of active heating run time, as approximately one minute is consumed by the ignition process. This four minute minimum on time is not present in MOD-0305 or later version. (See section 54 for details on UCP changes.)

40. Evaporator Coil Icing (3-25 ton)

40.1. 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.

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

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

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

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

40.3. 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.

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

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

40.5. 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.

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

41.1. 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 installations (Low Air Flow/Bypass), or any zoning system using a bypass damper.

2. Voyagers with concentric duct packages (Bypass).

3. Low line voltage applications with 3-5 Ton Voyagers with direct drive motors (Low Air Flow).

4. High Latent heat load applications (Low Air Flow/Low Temperature Entering Air).

5. Applications with long duct runs, and large quantities of outside air (Low Air Flow/Low Temperature Entering Air).

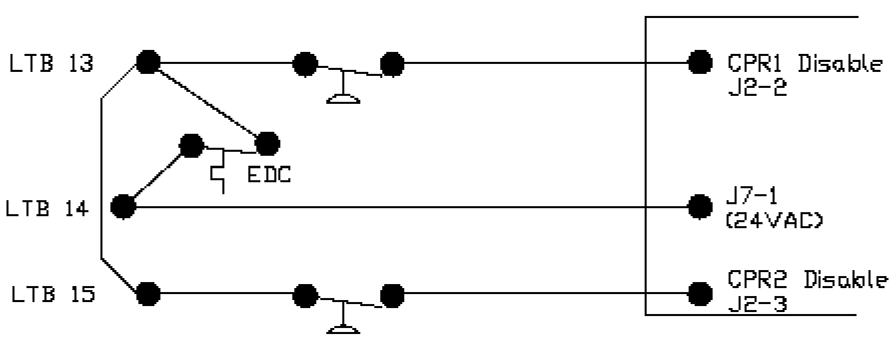
6. Applications with fresh air requirements in excess of 25% (Low Temperature Entering Air), conditions at 68° F. db and 50% R.H.

7. Nominal air flow conditions (400 CFM/Ton), with entering air temperatures below 65° F., and ambients below 80° F.

8. Low air flow conditions (Below 320 CFM/Ton), with entering air conditions below 68° F. db and 50% R.H., and ambients below 80° F.

9. Air balance conducted with minimum fresh air required, and pressure drop through outside air damper is greater than original estimate

Electrical Diagram For Installing An EDC In A Voyager System



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

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

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

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

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

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

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

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

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

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

41.4. 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 a minimum suction pressure of approximately 55 psig. These hot gas bypass kits should not be installed on any circuit 4 tons and under.

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

41.5. 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.

No application bulletin regarding this type of retrofit exist. 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.

42. Conditions Which Can Cause Incomplete Heat Pump Defrost

42.1. 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%.

42.2. 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.

42.3. 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.

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

All 24VAC circuits that leave the UCP are protected by both the UCP's F1 fuse, and the TNS1 transformer over-current device. If a problem arises that causes either of these two devices to blow or trip, the problem will be in one of **8** particular places. To begin the problem location process, remove power from the system at the equipment disconnect. Then, disconnect all plugs from the UCP. Test 4 measurement is at the pin on the UCP. The rest are done on the disconnected harness.

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

Look at section 46.6 and the unit's Service Facts to help identify the connections listed below.

1. Indoor fan contactor coil or electric heat section shorted or grounded: Locate terminal **J2-22**, and measure the resistance from J2-22 to ground. If a direct short is present, there is a problem in this circuit, in the indoor fan contactor coil, or the wiring that powers the electric heater contactor circuit. If a direct short is not present, there is no problem in this circuit.

2. Compressor contactor coil(s) shorted or grounded: Locate terminal **J8-1**, and measure the resistance to ground. On 2 compressor units locate terminal J8-4, and measure the resistance to ground. If a direct short is present in either circuit, a problem exists in the circuit, the wire, or the compressor contactor. If a direct short is not present, no problem exists in either circuit.

3. UEM humidity sensor power supply shorted or grounded: Locate terminal **J2-20**, and measure the resistance to ground. If a direct short is present, there is a problem in this circuit, in the wire itself, or in the UEM. If a direct short is not present, there is no problem in this circuit.

4. UCP on-board power supply shorted or grounded: Locate pin **J2-1**, and measure the resistance to ground. If a direct short is present, a problem exists in the circuit. Replace the UCP. If a direct short is not present, no problem exists in this circuit.
Note: An alternative method is to remove all plugs from the UCP, except terminal J2-1 by rotating the plug 90° ccw and making a single connection to J2-1. If no problem is observed, connect the entire J2 plug. Continue adding plugs one at a time, until the problem surfaces to be isolated and diagnosed.

5. TCO 2 (gas heat) or SOV coil (heat pump) shorted or grounded: Locate terminal **J5-3** and measure the resistance to ground. If a direct short is present, a problem exists in the circuit, the wire, or the gas heat or switchover valve circuit. If a direct short is not present, no problem exists in this circuit.

6. TCI power supply or hi-temp input shorted or grounded: If a TCI is installed, locate the plug associated with this junction. Locate terminal **J6-1**, and measure the resistance to ground. If a direct short is present, a problem exists in the high temperature input circuit, the wire harness, or the TCI. If a direct short is not present, there is no problem in this circuit.

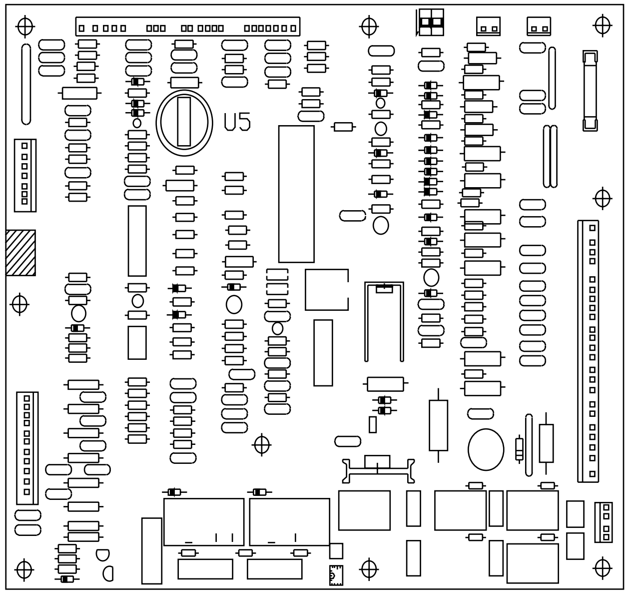
7. Gas heat ignition board or electric heat strip coil has shorted or grounded: Locate terminal **J1-22**, and measure the resistance to ground. If a direct short is present there is a problem in this circuit, the wire itself, or the ignition board / heat strip contactor. If a direct short is not present, there is no problem in this portion of the circuit.

8. LTB 14 / 13 / 15 could be shorted or grounded: Locate terminal **J7-1**, and measure the resistance to ground. If a direct short is present, there is a problem in this circuit, in the wire itself, or in the CTI, if present. If a direct short is not present, there is no problem in this circuit.

44. Multiple UCP U5 Chip Failures

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

Multiple Unitary Control Processor (UCP) U5 Chip Failures



44.1. 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 U5s 29V DC outputs. If this occurs, the negative half wave of the AC voltage will fail the U5 chip. A failed chip can be easily identified; a piece of the chip may be missing (looks like a crater in the chip), or a bubble or crack will appear in the chip.

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

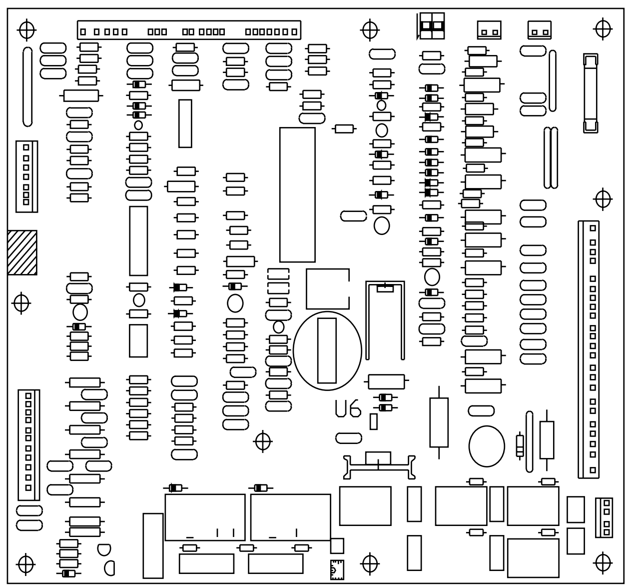
The coil is *24VDC*, not 24VAC. If AC relay coils are applied on these DC circuits, without modifications, it will ultimately fail the U5 chip and the relay. The relay coil will overheat and the wire insulation will burn off, causing the coil to short, pulling excessive current (over powering the output)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

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

45. Multiple UCP U6 Chip Failures

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

Multiple Unitary Control Processor (UCP) U6 Chip Failures



45.1. 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.

45.2. Wiring harness damaged in factory or field installation:

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

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

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

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