Container Refrigeration

ANNUAL INSPECTION

For

OptimaLINE 69NT40-701

Container Refrigeration Units

62-122374

Carrier
TRANSICOLD

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For
OptimaLINE 69NT40-701

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Introduction

This manual is an annual maintenance guide for OptimaLINE container units, written to assist owners and operators of Carrier Transicold equipment in obtaining the maximum operating life from the equipment. It is recommended that all units are serviced with these procedures annually to obtain maximum operating time from the equipment.

This manual is to be used in conjunction with the operations & service manuals, supplied with the equipment. Reference is made throughout these pages to the operations & service manuals, which are posted on the Carrier Transicold Container website and are available on the ContainerLINK app.

- T-383 OptimaLINE manual, models 701-000 to 099
- T-384 OptimaLINE manual, models 701-100 to 199 (R1234yf converted or charged)

Tools Required

- Wrench set, 3/8 to 11/16
- Screwdrivers, flat, crosspoint (Phillips) and Pozi-Drive
- Torque wrench and sockets
- Refrigerant leak detector
- Refrigeration gauge set
- Fin comb
- Megohm meter
- Multimeter, with voltage and resistance ranges

Warnings and Notes

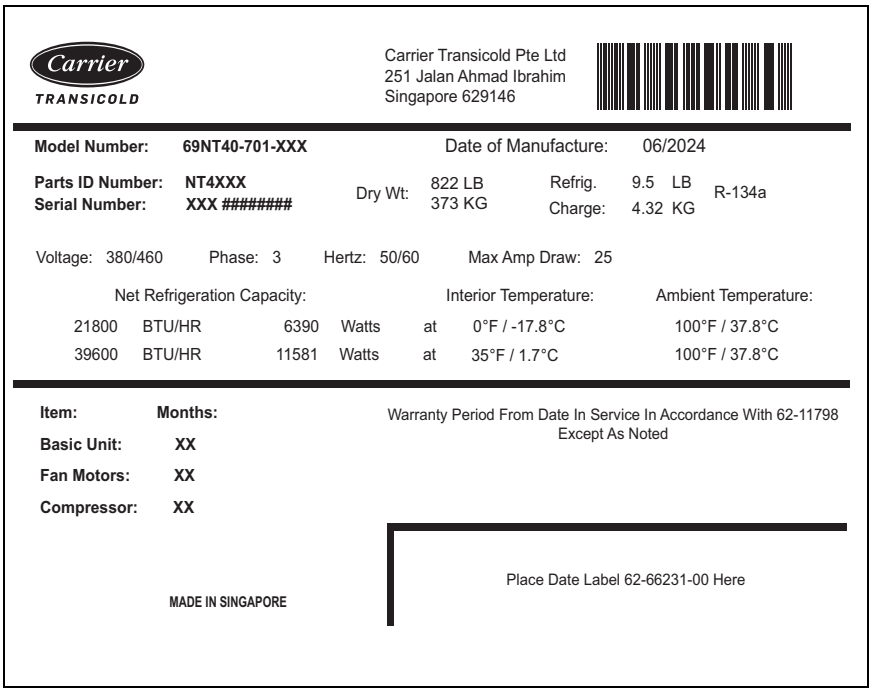
1. Before opening any panels for inspection or replacing any electrical component in the system, apply the appropriate Lockout / Tagout procedure. Turn the unit off, open the unit circuit breaker CB1 (and CB2 if equipped) and unplug the unit from main power. Apply a locking device to ensure the system cannot be plugged in during the maintenance procedure.
2. Carrier Transicold recommends wearing the appropriate safety equipment such as safety glasses, gloves, etc. whenever working on refrigeration equipment. Personnel should be aware of the dangers inherent in servicing equipment and assure they have read the relevant operations and service manual for any unit.
3. To prevent damage to aluminum, we recommend low-pressure fresh water cleaning. See evaporator coil section for exception.
4. All local requirements for recovery and safe disposal of refrigerants and oils must be followed.
5. Prior to using R1234YF refrigerant, be sure to have taken the necessary in-country or local A2L refrigerant training for safe handling and transportation of mildly flammable refrigerants while also taking the latest Carrier OEM equipment training for the unit being worked on.
6. Any maintenance, service or repair on a unit using R1234yf refrigerant should only be carried out by qualified and trained personnel.
7. Prior to entering the container, check to see if Alarm AL084 or AL085 exists. If alarm is present, manually open the fresh air vent and back container doors. Then, wait at least 10 minutes prior to entry or unloading of the container for service. Container may contain low oxygen or flammable atmosphere. Do not enter the container until the alarm is acknowledged and cleared.

Configuration Identification

Unit identification information is provided on a nameplate located on the inside wall of the container near the power cable storage area.

The nameplate provides the unit model number, unit serial number and parts identification number (PID). The model number identifies the overall unit configuration, while the PID number provides information on specific optional equipment, factory provisioned to allow for field installation of optional equipment and differences in detailed parts.

Figure: Unit Nameplate



Physical Inspection - Rear of Unit

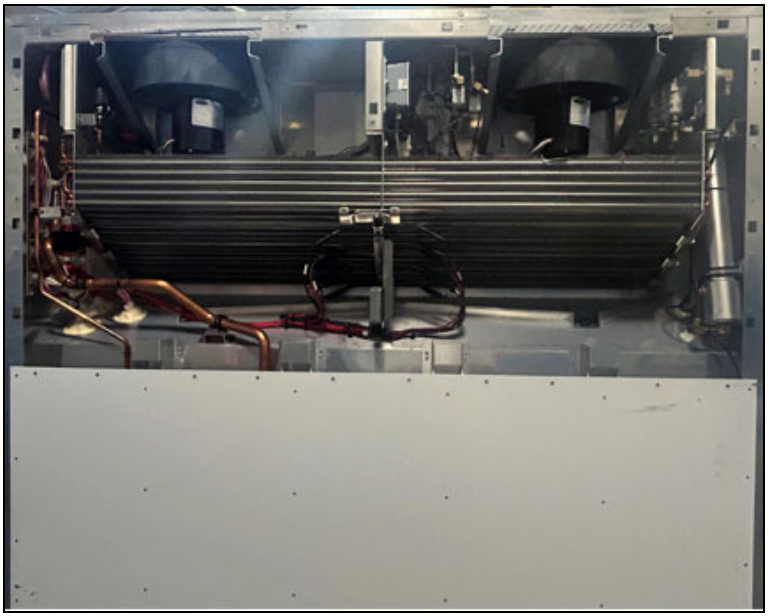
Refer to the Warnings and Notes section in this manual before proceeding with these instructions.

⚠ WARNING

Before opening any panels for inspection or replacing any electrical component in the system, apply the appropriate Lockout / Tagout procedure. Turn the unit off, open the unit circuit breaker CB1 (and CB2 if equipped) and unplug the unit from main power. Apply a locking device to ensure the system cannot be plugged in during the maintenance procedure.

1. Remove the upper back access panel to allow access to the evaporator section of the unit. Remove any debris and rinse the rear of unit with low-pressure water.

Figure: Upper Back Panel Removed

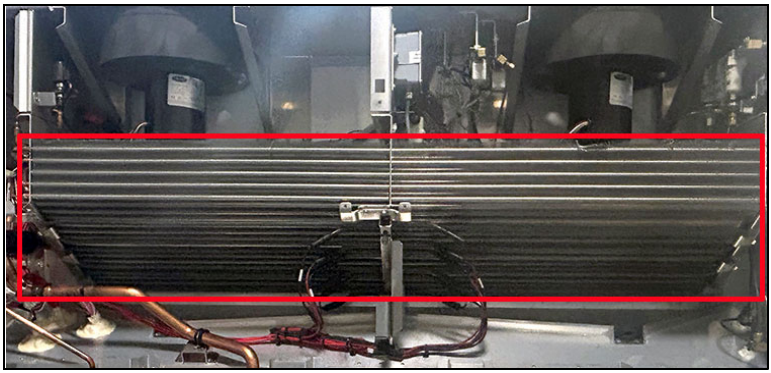


2. Clean the evaporator coil with low-pressure water parallel to the fins of the coil, taking care not to damage or bend the fins.

   Inspect the evaporator coil for signs of corrosion or leaks. Repair or replace as necessary. Straighten any coil fin damage using the correct fin comb.

NOTE: If units are transporting cargos treated with fumigation or exposed to ammonia (cargo byproduct), it is recommended after the trip to carefully wash all internal parts in the evaporator section to avoid potential corrosion. The corrosion will show up as either green patina from the ammonia or a layer of white powder-like substance on the aluminum parts.

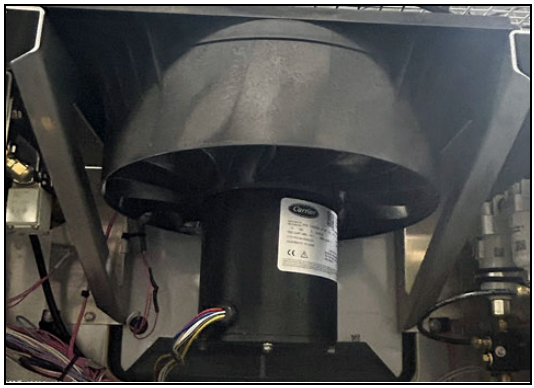
Figure: Evaporator Coil



3. Inspect the evaporator motors for excessive end play and verify that the evaporator motor clamp brackets are secured.

   Slowly spin the evaporator fan blade and feel for any bearing drag. Replace the bearing if required. Check for fan blade cracking or wear. Replace fan blades as necessary.

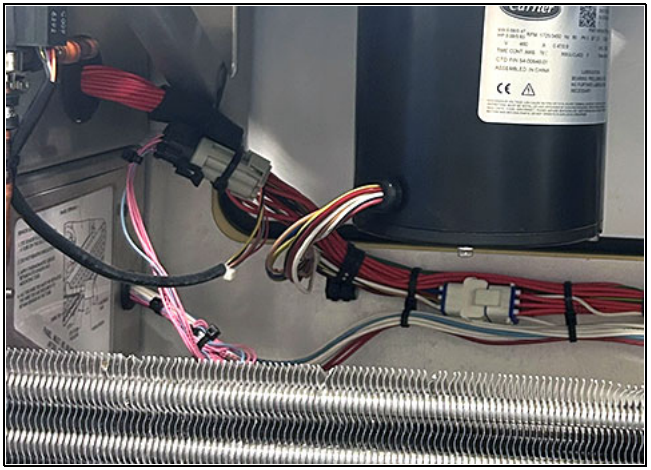
Figure: Evaporator Motor and Fan Blade



4. Inspect the drain cup, drain funnel and drain gutters below the evaporator coil. Repair as required. Clean the defrost drain lines using a low-pressure water hose to flush debris contained in the drain and check that the water is running freely to the outside.

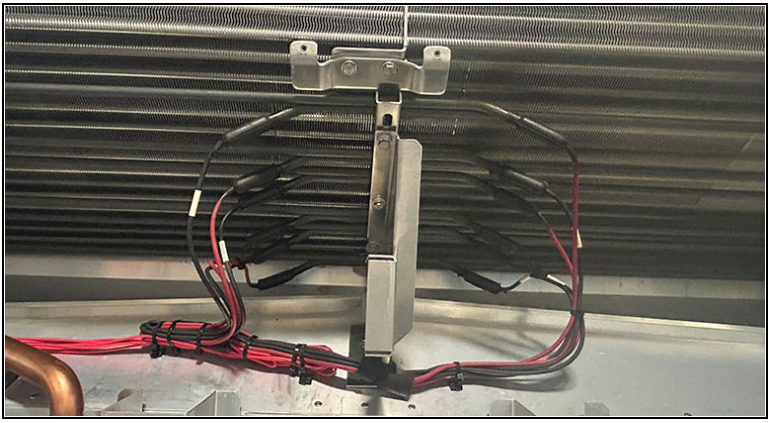
5. Inspect the wire harnesses for any wear or damage and repair as required. Ensure they are properly secured.

Figure: Wire Harnesses



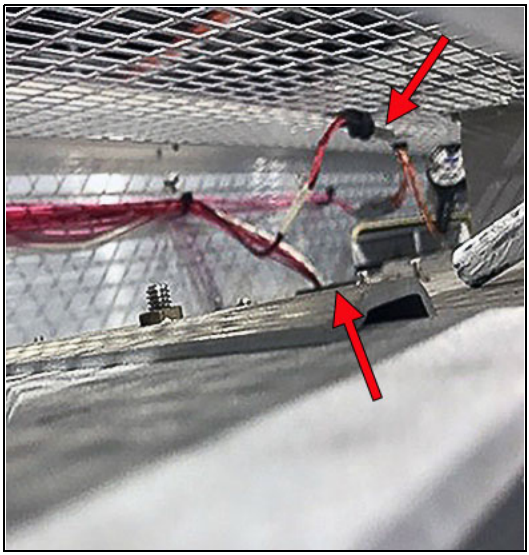
6. Inspect the heaters and heater brackets for damage. Verify that the heaters are properly positioned and retained in the retaining clips. Inspect wiring for correct connections and condition of the heat shrink. Repair if required.

Figure: Heaters



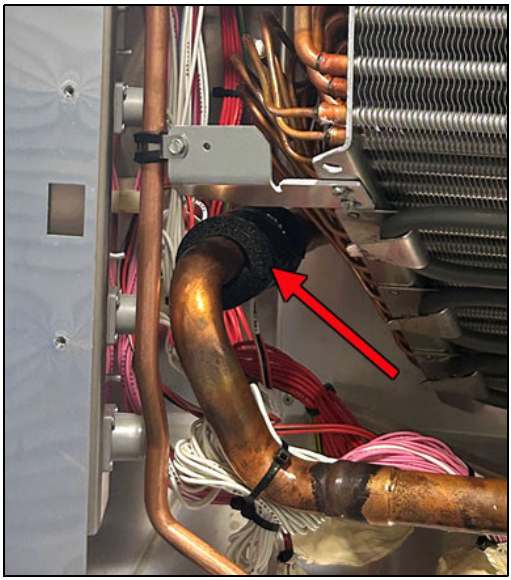
7. Inspect the Return Temperature Sensors (RTS/RRS) for proper positioning and verify the sensors are secured. Examine sensor leads for damage and replace or repair as necessary.

Figure: Return Temperature Sensors (RTS / RRS)



8. Inspect the Evaporator Temperature Sensors (ETS1 / ETS2) for proper positioning and verify the sensors are secured. Examine sensor leads for damage, and replace or repair as necessary. Verify insulation is in place.

Figure: Evaporator Temperature Sensor (ETS1 / ETS2)



9. Inspect the Electronic Expansion Valve (EEV) for refrigerant leaks and corrosion. Verify the electrical coil is correctly seated and the EEV coil boot is properly fitted on the valve.

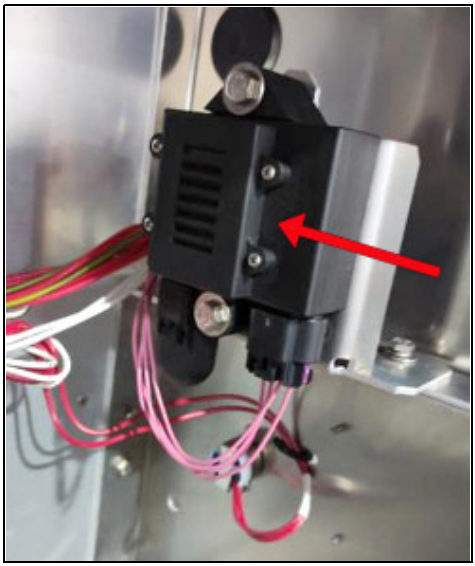
Figure: Electronic Expansion Valve (EEV)

10. Inspect the Humidity Sensor (HS) for proper positioning and verify the sensor is secured. Examine sensor leads for damage and replace or repair as necessary.

Figure: Humidity Sensor (HS)

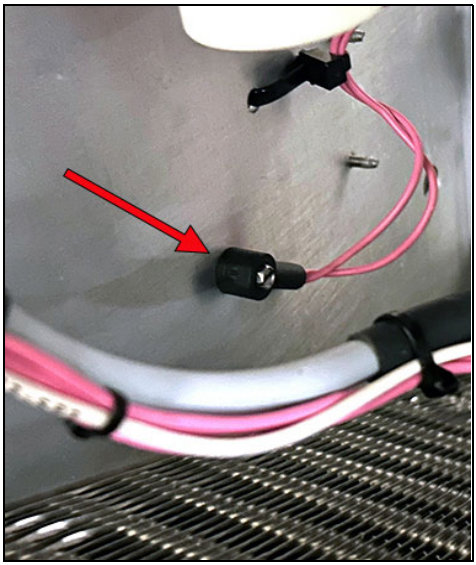
11. If equipped, inspect the R1234yf Sensor (YF) for proper positioning and verify the sensor is secured. Examine sensor leads for damage and replace or repair as necessary. The sensor has a cartridge filter mounted in the return air stream. Replace this filter after 17,500 powered on hours, or roughly 2 years.

Figure: R1234yf Sensor (YF)



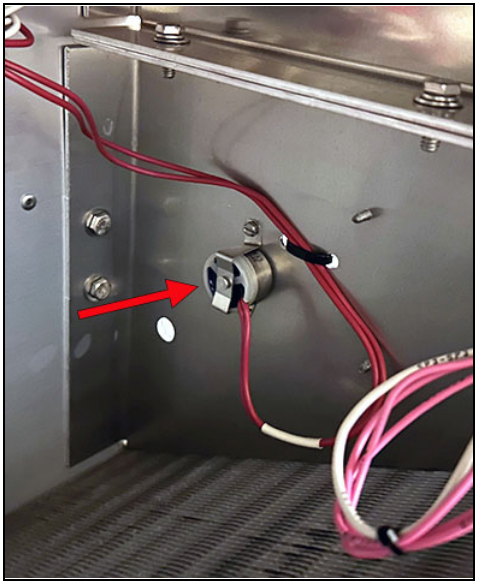
12. Inspect the Defrost Termination Sensor (DTS) to ensure it is properly secured to the unit and free of damage. Replace or repair if necessary.

Figure: Defrost Termination Sensor (DTS)



13. Inspect the Heater Termination Thermostat (HTT) for proper positioning and / or damage. Replace as necessary.

Figure: Heater Termination Thermostat (HTT)



14. Perform a refrigerant leak check to the system. Refer to the operation & service manual for procedure.

⚠ WARNING

EXPLOSION HAZARD: Failure to follow this WARNING can result in death, serious personal injury and / or property damage. Never use air or gas mixtures containing oxygen (O2) for leak testing or operating the product. Charge only with refrigerants R-134a, R-513A or R1234yf as specified for the unit model number: Refrigerant must conform to AHRI Standard 700 specification.

NOTE: Only use refrigerant specified for the unit model number to pressurize the system. Any other gas or vapor will contaminate the system, which will require additional purging and evacuation of the system.

NOTE: It is recommended to check for system leaks with an appropriate electronic A2L refrigerant leak detector. Check with the carrier aftermarket parts group for part number or purchase locally.

15. Check the USDA access door to ensure it is closing, and the springs are in place. Verify interior communication sockets are clean, dry and have the caps fitted.

Figure: USDA Receptacles

16. Check the air channels from the unit to the floor to make sure they are clean and free of any debris
17. Check channels or “T” bars on the floor and under the lower air baffle, and kick plate, for cleanliness. Channels must be free of debris for proper air circulation. Clean floor drains. Ensure that the kick plate is correctly installed and in good condition for correct air flow.
18. Check container wall linings and panels for any physical damage. Repair as required.
19. Check container door seals for damage. Repair as required.

Physical Inspection - Front of Unit

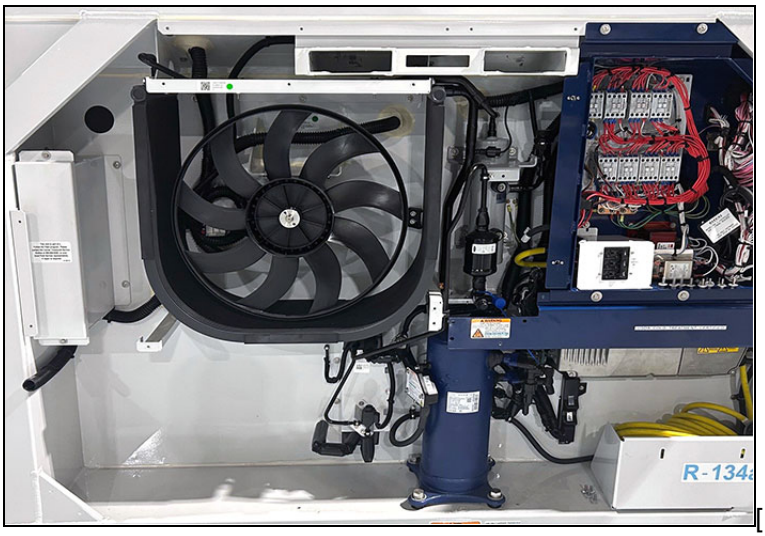
Refer to the Warnings and Notes section in this manual before proceeding with these instructions.

⚠ WARNING

Before opening any panels for inspection or replacing any electrical component in the system, apply the appropriate Lockout / Tagout procedure. Turn the unit off, open the unit circuit breaker CB1 (and CB2 if equipped) and unplug the unit from main power. Apply a locking device to ensure the system cannot be plugged in during the maintenance procedure.

1. Remove the condenser, receiver and compressor panels. Take note of any damage to panels and repair or replace before refitting later.

Figure: Remove Panels

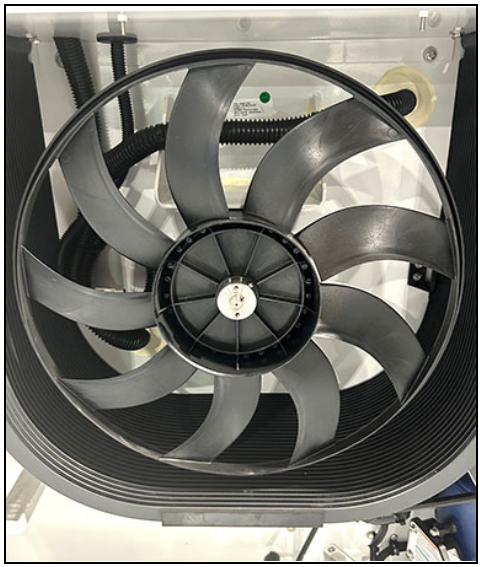


2. Inspect the unit for traces of oil residue. Leaks are typically found as a dirty / oily residue on compressor joints, high pressure switch connection, pressure transducers, piping connections etc. If residue is noted, check the area for leaks using an electronic leak detector. Repair as required.

   Clean the unit using low-pressure water, including the condenser coil. When washing the coil, spray water parallel to the fins of the coil, taking care not to damage or bend the fins. If oil residue was noted, ensure it is clean for future inspections.

3. Inspect the condenser motor fan blade for cracking or wear. Replace as necessary. Check for proper fan positioning in the venturi. Refer to the operation & service manual for proper positioning instructions. Slowly spin the condenser fan blade, feeling for any bearing drag. Replace bearings as necessary.

Figure: Condenser Fan



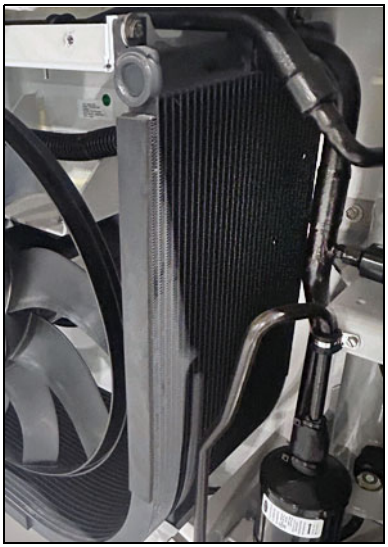
4. Examine the condenser motor and motor mount bracket for corrosion, signs of overheating, or physical damage. If corrosion is observed, apply rust treatment followed by touch-up paint. Replace as necessary.

   Check the motor mount bracket for cracking where it is welded to the bulkhead. Re-weld or replace as necessary.

Figure: Condenser Motor & Mount (with Fan Removed)

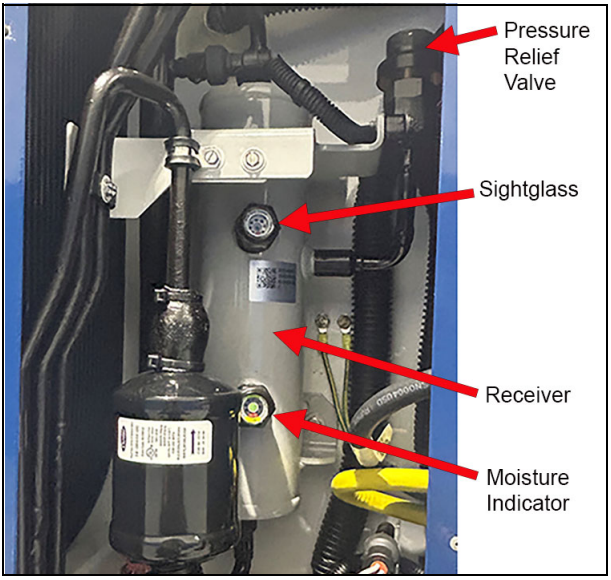
5. Inspect the condenser coil for any signs of leaks or previous repairs. Replace as necessary. Clean the coil using a low-pressure water hose. Spray water parallel to the fins of the coil, taking care not to damage or bend the fins.

Figure: Condenser Coil



6. Inspect the receiver. Check the condition of the sightglass and moisture indicator. Inspect the color of the moisture indicator. If indicator is not green, take appropriate actions to recover refrigerant following procedures for sightglass replacement.

Figure: Receiver



7. For OptimaLINE models with a pressure relief valve (PRV), inspect for signs of release of refrigerant at the PRV. Look for oil remnants, a collection of dirt on the valve, or a breakage of the seal tape as an indication that the valve is leaking or has leaked. If found to be leaking, follow procedures in the service manual to replace the PRV.

Figure: Pressure Relief Valve

8. Inspect the filter drier for excessive corrosion or physical damage. Replace as required. Periodic paint touch-up of the filter may be required.

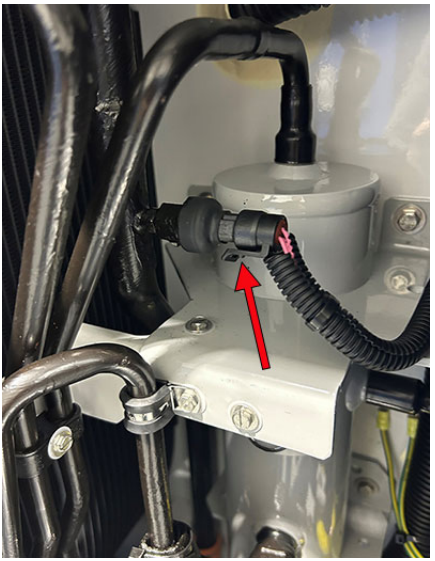
Figure: Filter Drier

9. Ensure the prestite tape on each end of the filter drier is in position and secured.

Figure: Filter Drier - Check Tape

10. Inspect the Discharge Pressure Transducer (DPT) for physical damage, leaks or corrosion. Clean, repair or replace as necessary.

Figure: Discharge Pressure Transducer (DPT)



11. Inspect the compressor and mounting plate for severe corrosion. Check the compressor shock mount for damage (cracks). Repair or replace as necessary. Torque the mounting bolts according to specifications in the operation & service manual.

Figure: Compressor

12. Check for corrosion on any painted surface. If corrosion is found, remove and then prime and paint using standard paint specifications. The part number for the Compressor Paint Kit is 76-00397-01.

Figure: Painted Surfaces

13. Inspect the Economizer Expansion Valve (ECV) for refrigerant leaks and corrosion. Verify the electrical coil is correctly seated and the EEV coil boot is properly fitted on the valve. Repair or replace as necessary.

Figure: Economizer Expansion Valve (ECV)

14. Inspect the Economizer Pressure Transducer (EPT) for physical damage, leaks or corrosion. Clean, repair or replace as necessary.

Figure: Economizer Pressure Transducer (ECP)

15. Inspect the Economizer Temperature Sensor (ECT) cover. If there is no cover, verify proper positioning and sensor leads for damage. Re-install the cover. Replace or repair as necessary.

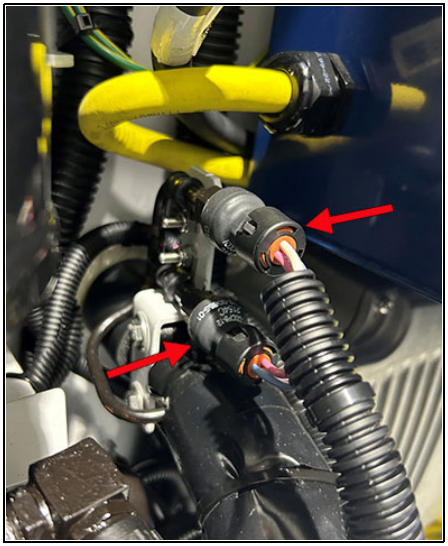
Figure: Economizer Temperature Sensor (ECT)

16. Inspect the Supply Temperature Sensors (STS / SRS). If the sensor cover is in place and looks normal, then no action is necessary. Otherwise, remove the cover. Check for proper positioning of sensors and ensure glands for correct sealing. Examine sensor wiring for damage or incorrect connections. Replace or repair as necessary. Re-install the cover.

Figure: Supply Temperature Sensors (STS / SRS)

17. Inspect the evaporator pressure transducer (EPT) and suction pressure transducer (SPT) for physical damage, leaks or corrosion, including the electrical connection. Clean, repair or replace as necessary.

Figure: Evaporator Pressure Transducers - EPT and SPT



18. Inspect the flexible condensate defrost drain tube to make sure it is in position and properly secured. If re-securing the tube is necessary, it may be required to remove the condenser fan blade for complete access.

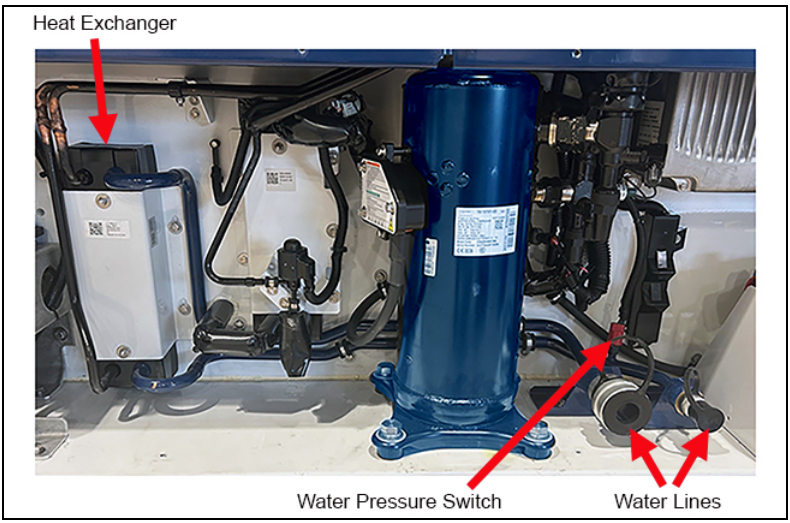
Figure: Drain Tube

19. If the unit is equipped with an optional water-cooled condenser, inspect for physical damage. Repair or replace as necessary.

    Flush out the water-cooled condenser with a hose to remove all scaling. Refer to the operation & service manual for specific details regarding cleaning and maintenance.

    Check the water connections for damage. Verify the collar on the female fitting moves freely. Make sure caps are in place.

Figure: Water-Cooled Condenser



20. Inspect the power cable to make sure it is securely attached to the unit, the clamp is in position, and the cable is not damaged.

Figure: Power Cable Plug

If the cable is damaged or crushed in any manner, or if more than one repair joint is found, replace or repair the cable. If a cable needs repair, use authorized and approved splice kits.

If pins are burned or pitted, or if a locating lug is missing, replace the plug. Disassemble the plug from the cable and tighten wires to the pins. Reassemble the plug, making sure the cable gland is tight and sealing cable.

Examine the plug gasket for any cracking or damage and replace if necessary.

21. Carry out a Megohm test from the power plug ground pin to the ground plate in the control box. Test reading should be zero.

    Carry out a Megohm test from each power plug phase pin to ground. The Megohm reading for the power plug ground pin should be zero, and infinity for the other power plug phase pins.

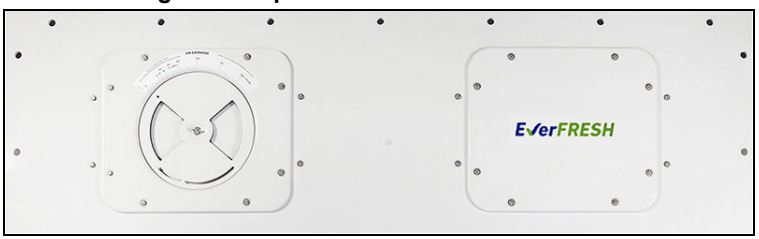
22. Remove both evaporator access panels.

Figure: Evaporator Access Panels - Remove

23. Ensure the evaporator motor mounting brackets or the evaporator motor stator brackets are properly torqued. Refer to the operation & service manual for specific torque values.
24. When finished, replace panels making sure that all hardware, including the Mylar washer, are installed.

    Check that the access panel seals are present and in good condition and that the panels seal well when refitted. Use torque setting of 60 +5 in-lbs.

Figure: Evaporator Access Panels - Install



25. Check the fresh air vent for correct sealing and no damage. Repair or replace as necessary.

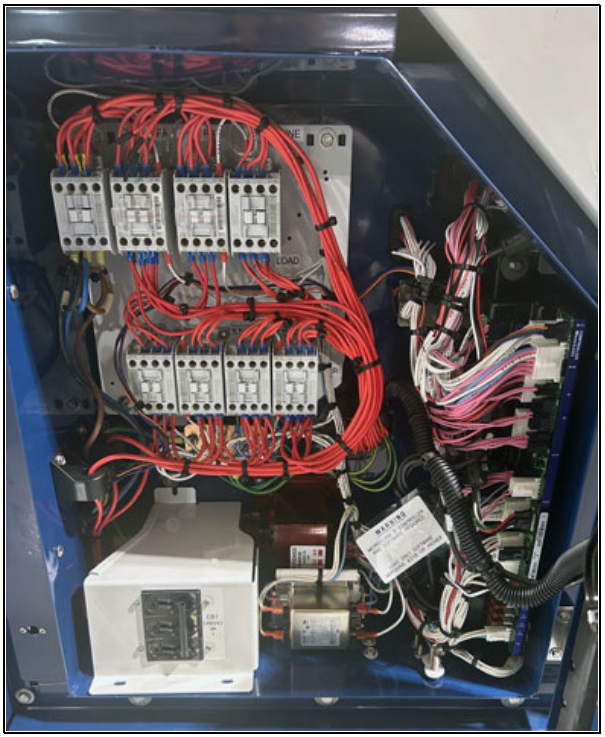
Figure: Fresh Air Vent

26. If the unit is equipped with remote monitoring and interrogation sockets, verify that they are secure, free from damage & corrosion and caps are properly tethered to the unit. Inspect the pins for corrosion. Repair / replace as required.

Figure: Interrogator Connector Pins

27. Inspect the interior of the electrical control box. It should be dry and free from signs of damage, overheating, corrosion, and moisture entering the box. Repair any damage to the control box door gasket.

Figure: Electrical Control Box



- Wire tie all loose wires.
- Inspect all wire harnesses and connections in the control box for damage and check connection tightness. Repair or replace as necessary.
- Examine the wiring terminations into the contactors for severe arcing. Replace wiring terminations and contactors if necessary.
- Inspect the circuit breaker panel for damage and corrosion.
- Use a Pozi drive (star) screwdriver to assure the tightness of contactor wire screws.
- Check to make sure wiring diagrams and schematics are present and legible. Replace if missing or damaged.

28. Examine wires and wire harnesses not contained in the control box for proper location and condition. Replace or repair as necessary.

    For Example:

    a. Wires to valves

    b. Switch wires

    c. Compressor terminal wires

29. Refit all exterior panels, examine all door seals, check for proper alignment and watertight integrity. All door fasteners and fastening bolts (including Mylar washers where required) should be present and should tightly secure the doors. Replace any gaskets that are brittle or cracked.

Figure: Refit Exterior Panels

30. Inspect the structural integrity of the unit. Check the unit frame for cracks, damage and missing structural items. Repair as required.

31. Verify all instructional labels and placards are in place and legible.

Operational Inspection

Refer to Warnings and Notes on page 2 before proceeding with the operational inspection.

⚠ WARNING

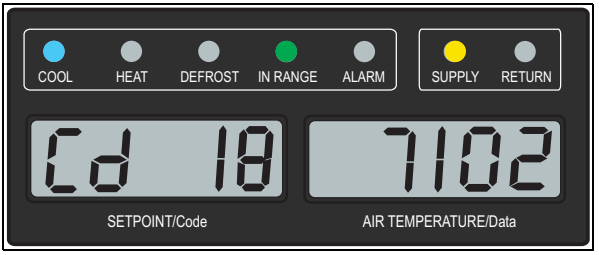
Before opening any panels for inspection or replacing any electrical component in the system, apply the appropriate Lockout / Tagout procedure. Turn the unit off, open the unit circuit breaker CB1 (and CB2 if equipped) and unplug the unit from main power. Apply a locking device to ensure the system cannot be plugged in during the maintenance procedure.

1. Carry out insulation tests of the condenser fan, evaporator fans and heaters at the load side of the contactors. Refer to operations and service manual for heaters testing.

   Remove the compressor plug and perform an insulation test of the compressor.
2. Remove the Lock Out / Tag Out device and plug the unit into a power supply.
3. Check that voltage is balanced on all 3 phases. Refer to operations and service manual, Table 3-2 Electrical Data, for acceptable range.
4. Turn unit power on. While the controller is starting up, verify the values shown for container ID (Cd40), software version (Cd18) and unit model number (Cd20). If these values were not observed during start up, bring up the appropriate codes manually to check them.

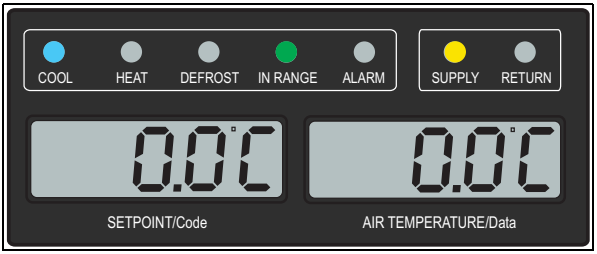
   NOTE: It is recommended to always have the latest operational software loaded in the controller.

Figure: Software Version



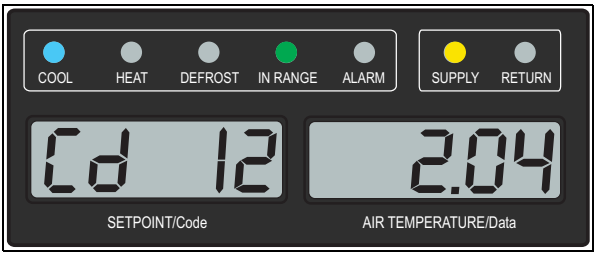
5. Change the set point to 0ºC (32ºF).

Figure: Setpoint Change



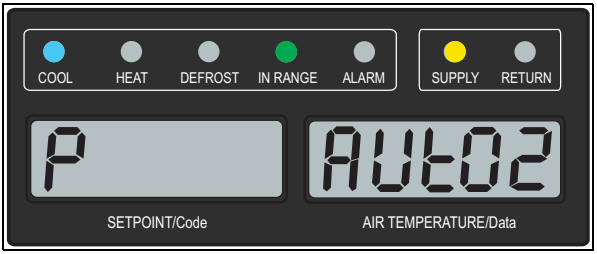
6. Check the condenser fan for proper rotation. Air flow should be felt coming out from the condenser coil.
7. Check both evaporator fans for proper rotation. Air flow should be felt coming out through the t-section flooring inside the container.
8. Check system pressures at the suction port, discharge port and economizer with the appropriate function codes Cd12 (suction), Cd14 (discharge) and Cd85 (economizer).

Figure: System Pressures Check



9. Initiate an Auto 2 PTI. Refer to the operations and service manual for description of Pre-trip tests.

Figure: Run Auto2 PTI



10. During PTI test P-8, perishable mode, as pull-down occurs check for unusual noises and vibrations. Check refrigerant level at the receiver.

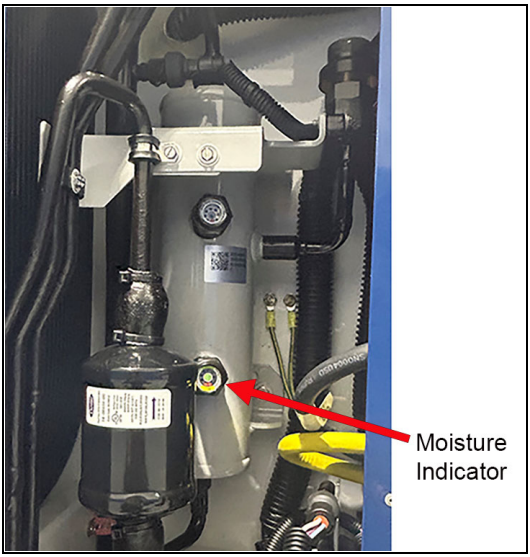
Figure: Refrigerant Level

11. During PTI test P-10, frozen mode, check filter drier operation by monitoring the temperature difference across the drier. If difference is significant or frosting is observed, it indicates a filter restriction and the filter should be replaced.

Figure: Filter Drier - Check Temperature Difference

12. Allow the unit to complete testing. Repair any faults associated with failing PTI tests. Refer to the operation & service manual for details on troubleshooting procedures.
13. Check for proper color (green) by viewing the moisture indicator at the receiver. A yellow color indicates moisture.

Figure: View Moisture Indicator



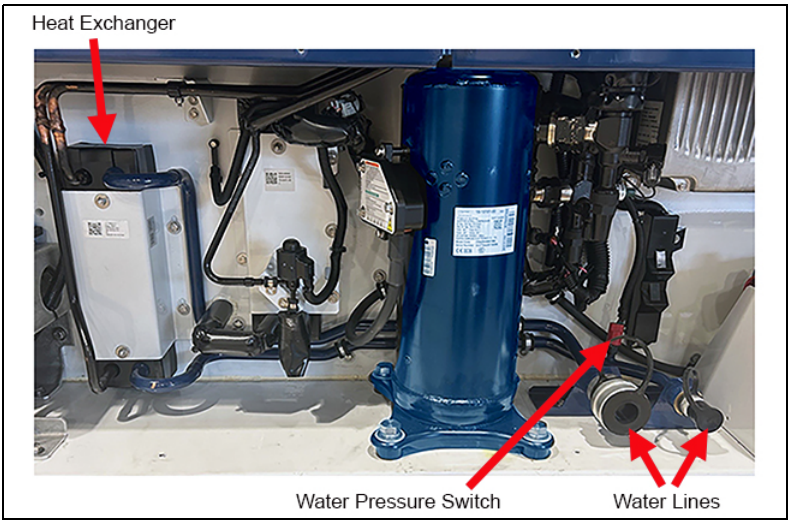
NOTE: If the moisture indicator is brown in color, it must be replaced.

If moisture is indicated, follow the instructions in the operations and service manual for removing moisture from the system:

a. Recover refrigerant.
b. Evacuate and dehydrate the system.
c. Replace the filter drier.
d. Use a Total Test kit to determine if acid or moisture remains in the system.

14. If equipped with a water-cooled condenser, connect water and check flow. Confirm water pressure switch operational. Confirm condenser fan shuts off when water is connected.

Figure: Water-Cooled Condenser



15. Download data from the unit DataCORDER The download should be performed from the “Last Trip Start” to ensure all PM temperature and PTI data are obtained.
16. Turn the unit off and disconnect from the power supply.
17. Print out the trip report and retain it as a permanent record of the Preventive Maintenance procedure.

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