



AN EXCHANGE OF TECHNICAL INFORMATION

VOLUME 18 NUMBER 1 ABOUT CARRIER TRANSICOLD CONTAINER PRODUCTS

July 2012

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TechFact – CO₂ Refrigerant

At the Intermodal Europe 2011 show in Hamburg, Carrier Transicold introduced the product design for the NaturaLINE™ unit, the world's first natural refrigerant container unit using CO₂ (R-744).

During the 1920 and '30s, carbon dioxide was just one of the natural refrigerants of choice often used for air-conditioning in theaters and restaurants. These natural refrigerants dropped out of favor with the advent of CFCs during the 1940s and later HCFCs, both of which were the backbone of the refrigeration industry for many years. In the early '70s, scientists discovered that these refrigerants were damaging the Earth's stratospheric ozone layer, which filters ultraviolet radiation. In 1994 CFCs were banned for refrigeration and air conditioning, and were replaced by HFCs, with an Ozone Depletion Potential (ODP) of zero. However, it was later found that HFCs contribute to global warming via greenhouse gas emissions.

To address long term environmental concerns, a refrigerant that had a zero ODP and the lowest possible global warming potential (GWP) that met the safety and toxicity requirement with an A1

classified refrigerant was sought for container refrigeration. Only CO₂ meets these requirements completely for container applications:

Refrigerant Properties	R134a	R404	R290, Propane	R600a, IsoButane	R717 Ammonia	R744 CO ₂
ODP	0	0	0	0	0	0
GWP	1300	3300	3	3	0	1
Toxic (A or B)	No	No	No	No	Yes	No
Flammable (1, 2, or 3)	No	No	High	High	Low	No
Classification	A1	A1	A3	A3	B2	A1

In developing the NaturaLINE unit for best-in-class environmental performance, engineers drew from Carrier's considerable experience with CO₂ in other applications, such as the CO₂OLtec™ system used in Carrier retail refrigeration applications throughout northern Europe. The NaturaLINE unit design includes a number of firsts for container refrigeration applications, several of which are patented. Among them are:

- A purpose-built, multi-stage compressor with a variable-speed drive
- A new gas cooler in place of the traditional condenser
- A flash tank
- Multi-speed fans
- An advanced software control system

Sea trials are ongoing with several customers, as well as service training. Early feedback from several of those trained has been positive, with several of those trained commenting about the design being less complicated than expected.

Additional details on the operation of the unit will follow.

David Whyte

TechFact – PrimeLINE® Pressure Transducer Testing

The Carrier PrimeLINE® unit model 69NT40-561-XXX is fitted with an Electronic Expansion Valve (EEV). The valve is controlled via outputs from the Micro-Link® 3 controller, which takes inputs from the Evaporator Pressure Transducer (EPT) that is mounted on the suction line. The unit also has a Suction Pressure Transducer (SPT) that is also mounted on the suction line. This transducer is used for controlling the Digital Unloader Valve (DUV).

With software versions prior to version 5345, the SPT takes control of the EEV if the transducer EPT output voltage was opened or short circuited, activating Alarm 66.

A transducer drift logic was added to software version 5345. With this software, if the unit goes out of the temperature control range and the pressure difference between the transducers is greater than 3.75 psig (0.26 bars), the control of the EEV will switch to the SPT. If the unit comes back in range, the EEV is locked to the SPT for control. The SPT will remain in control of the EEV until the unit's next pre-trip test P5-9, where a functional comparison is made on the transducers.

If P5-9 test passes ± 1.5 psi (± 0.10 bars), the control of the EEV will return to the EPT. If the test fails, the technician needs to confirm which of the transducers has failed. The following process can be used to identify which of the transducers is faulty:

On the keypad, press "Code Select" and scroll to CD12 using the arrow keys. You will see the low pressure measured from the SPT in the display. Press the "Enter" key and the display will change. You will see the EPT pressure on the left display and the SPT pressure on the right display.

Attach a manifold gauge (calibrated) to the low side of the system. Once the gauge is fitted, check and record the pressure. Compare the pressure to those displayed on CD12 and replace the transducer that is different than the gauge reading. If a sensor is not available, then either load software version 5345 or greater to engage the drift logic or disconnect the EPT transducer to simulate a totally open circuit, which will cause the control to shift to the other transducer. An Alarm 66 will occur as a result of this action.

If changing of a transducer is required, ensure the correct part is fitted (P/N 76-00816-00).

Nadir Guenane / Mark Donahoe

TechFact – Refrigerant Quality Awareness

Carrier Transicold container equipment uses R134a refrigerant, conforming to Air-Conditioning, Heating and Refrigeration Institute (AHRI) standard 700.

While this standard specifies 99.5% R134a purity, the remaining 0.5% of other refrigerants may ONLY consist of the standard traditional refrigerants such as R12, R22 and refrigerants that make up the recognized R4xx blends.

In our updated 2012 Service Center Audit procedures, a section was added on Refrigerant Management Policy, which requests that the Service Center ensure refrigerant quality from purchase through final usage for every cylinder. The use of refrigerant logs is recommended to establish a "Chain of Custody" for every refrigerant cylinder passing through a depot or terminal. Sample log:

Warehouse Log	Technician Log
Supplier & Quantity	Cylinder Serial Number
*Cylinder Serial #'s	Container Number
Certificate of Analysis	Quantity Used
Cylinder tested on delivery	
Cylinder issued to	

*If cylinders are not serialized from the supplier, consider adding your own number system to ensure traceability.

Other items that should be covered by your Refrigerant Management Policy are:

1. Method of testing new refrigerant and when the method should be used.
2. Method of testing equipment and when the method should be used.
3. Use of recovery cylinders / recovered refrigerant – to prevent cross contamination return refrigerant only to the machine from which it came. This is a legal requirement in many countries.
4. A detailed procedure to be used for cleaning recovery cylinders after each use.
5. Use of reclaim cylinders – Only to return refrigerant to a recycler for processing.
6. Use of empty refrigerant cylinders – these should be returned to the supplier or destroyed. Reusing empty refrigerant cylinders is prohibited in many countries.

In 2013, the Service Center Audit will look to include a comprehensive written refrigerant management policy to be in place covering at least all the items above, as well as evidence that the policy is being enforced.

David Whyte

TechFact – WCC Sight Glass Replacement

Carrier Transicold has implemented an improvement to the water cooled condenser (WCC) sight glass repair kit (Part # 74-66640-00) using Loctite cord 55 and sealer 290 as detailed below:

Unplug the unit and roll back the cable before performing any of these procedures.

USE LOCKOUT /TAGOUT PROCEDURE!

Tools & parts required:

1. Electrical portable drill and wire brush attachment for portable drill
2. N2 gas tank
3. Socket (Size: 27mm), torque wrench
4. Loctite 55 cord (CTD P/N: 02-66608-00) or purchase local
5. Loctite 290 sealing liquid (CTD P/N:02-66609-00) or purchase local
6. Paint Brush (small)
7. Touch up paint, Rustoleum 9100 / blue, purchase separate

PROCEDURE:

1. Recover refrigerant from the system following guidelines provided by the equipment manufacturer.
2. Cut 12" +/- 1/4" of cord length from the Loctite 55 tube.
3. Locate the 4th and 9th thread on new sight glass (see Figure 1).
4. Wrap around the Loctite 55 cord in diagonal and cross direction on sight glass threads between 4th thread and 8th thread in a clockwise direction, applying tension on the cord while wrapping the cord onto the threads (see Figures 2 and 3). Leave the 9th thread (last thread) without the cord for thread engagement into the coupling.



Figure 2

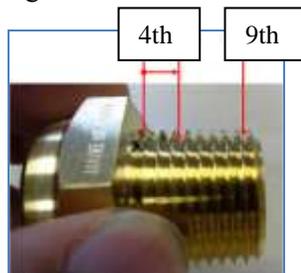


Figure 1

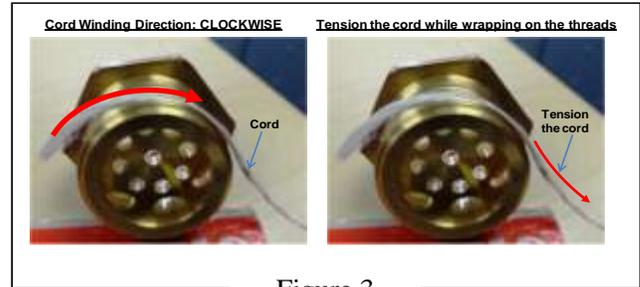


Figure 3

5. Remove and discard the old sight glass from the WCC in accordance with local regulations, and pressurize the unit using N2 gas at ~20 psi to avoid any debris from going inside the WCC tank. Clean threads using a hand held attached to wire brush running in a counter clockwise direction.



6. Remove the N2 pressure and install the new sight glass into the coupling and tighten to about an 8 mm gap between sight glass and coupling.



7. Apply one drop of Loctite 290 liquid on the top, left, and right sides of the coupling-sight glass interface.



8. Torque sight glass using a 70 ft.lb torque wrench until you reach a 3 to 5 mm gap between the sight glass and water cooled condenser coupling.

If an over tightening occurs, gap < 3 mm, do not reverse the torque wrench to bring the gap back to the 3 to 5 mm requirement. This could loosen the cord inside the thread and cause leakage. If this were to occur remove the sight glass from the coupling and the old cord on the sight glass threads. Repeat steps using the same sight glass.



9. Trim away the excess Loctite 55 cord and apply second drop of Loctite 290 liquid on top, left & right on coupling-sight glass interface.
10. Apply blue color Rustoleum touch up paint on coupling.
11. Vacuum and recharge system by weighing in the correct refrigerant charge level. Refer to the unit operations manual.



TechFact – dAL86 / 87 (Real Time Clock Battery Low, Real Time Clock Failure).

A DataCorder alarm 86 (dAL86) is a warning sign that the battery that powers the real time clock on the Micro-Link® 2i or Micro-Link® 3 controller and parameter/temporary data storage memory on the Micro-Link 2i controller requires replacement. An immediate action should therefore be taken to mitigate the risk of data loss or incorrect controller operation.

In the Micro-Link 2i controller, when the RTC battery voltage is low on the recording interval the dAL86 alarm will occur and remain active. The alarm is reset when the unit is power cycled. If the alarm re-appears at the next recording interval, the RTC battery should be replaced at the earliest opportunity, p/n 09-00369-00sv).

In the Micro-Link 3 controller, the dAL86 alarm goes active if the RTC battery is low for twenty four consecutive samples taken once an hour. The alarm state and number of active samples is maintained across power cycles. The alarm goes inactive if the RTC battery voltage is good for 24 consecutive readings or if the user presses and holds the “Enter” key for 5 seconds while dAL86 is displayed in the DataCorder alarm list (dAL). If the alarm re-appears, a new battery should be installed at the earliest opportunity, p/n 09-00375-00.

If a DataCorder Alarm 87 (dAL87) occurs, the battery has reached a critical point that may result in data loss or corruption. Battery must be immediately changed. Upon replacement, if the dAL 87 does not go inactive, the controller must be replaced due to internal clock failure.

Once the RTC battery has been replaced, ALL parameters (including real time clock, set point, configuration, function code selects) must be verified and reset if required.

Perry Hoover

TechTip – DataBANK® Downloading

When downloading a Micro-Link® 2i or Micro-Link 3 controller using a DataBANK® card, priority is given to the DataBANK software for the downloading of data from the unit. If this occurs at the DataCorder logging interval, the temperature data for that logging interval is not recorded and will not be displayed in the download report. This becomes critical when carrying cold treatment cargo as any loss of data could result in rejection of the cargo. It is our recommendation that when carrying cold treatment loads that DataBANK

software downloads only be attempted 5 minutes prior to or after the DataCorder logging interval. The actual time on the DataCorder can be validated using function code dC32. To eliminate this risk, the unit can be downloaded with DataLine or the DataReader using your PC at any point of the trip.

TechFact – HotLINE / Technical Support

Carrier Transicold uses a toll free technical support line via AT&T 800USA direct. To use this number, the caller should contact the USA direct number in their region and provide them the 800 number (800-668-6283). Although AT&T is global, there are certain locations throughout the world, especially at sea, that have difficulty in reaching AT&T operators. As an alternative to this, we have added a direct contact access telephone line +1 (315) 433-4914. While this is a caller-paid line, callers will get the support they need in troubleshooting units.

TechFact – CA Controller Programming

Programming the Micro-Link® 2i controlled atmosphere controller has typically been performed using the HEX flash memory cards. The device used to program these cards has become increasingly more difficult to purchase. Therefore, beginning with software version 3114, you will have the ability to use the PCMCIA cards. These are the same cards used for programming the Micro-Link 3 controller. The format for this software will be “.M2X”. Because of the proximity of high voltage when inserting the PC card adapter, these instructions must be followed:

1. Ensure that the reefer and CA on/off switches are in the “OFF” position.
2. Move the reefer circuit breaker to the “OFF” position and open the CA control box.
3. Insert the PCMCIA card into the card adapter and insert the card adapter into the CA controller.
4. Move the reefer circuit breaker to the “ON” position and power on the reefer controller.
5. Power on the CA controller and follow the instruction on the CA display to load the CA software.
6. After the software has loaded, power “OFF” the unit and move the reefer circuit breaker to the “OFF” position and remove the PC card adapter.
7. Power the unit up and confirm proper operation.

Mark Rogers

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Thanks to all who supported this release.