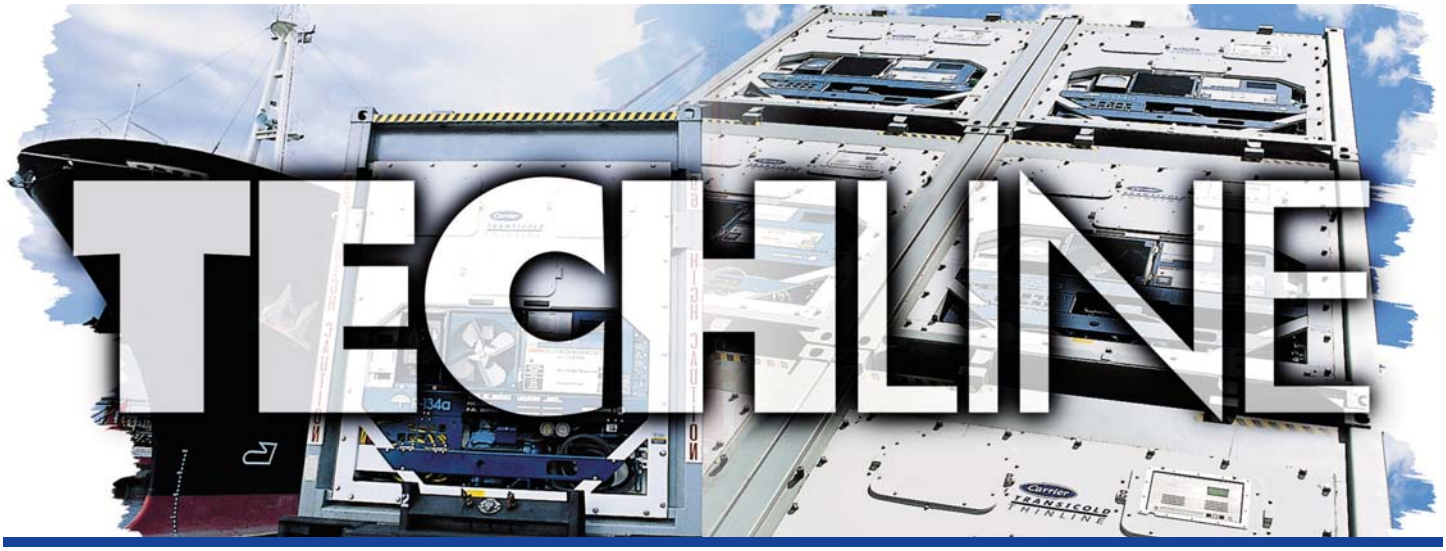

AN EXCHANGE OF TECHNICAL INFORMATION
VOLUME 13 NUMBER 1 ABOUT CARRIER TRANSICOLD CONTAINER PRODUCTS 3rd/4th Qtr 2007

We need YOU to keep our Quality on a high level

Quality has always been one of the major selling points of our equipment. Several systems and procedures are in place within the Carrier Transicold organization, to keep Quality at the highest level. As Global Service Director, I manage the Service Engineering department which plays an important role in this process. The communication between our Field Service Engineers (more then 20 all over the world) and our Service Center Network and Customers is crucial in achieving our goals. It is your feedback from the field that we need to identify quality issues at an early stage.

With this I would like to draw your attention to a specific process which plays a major role in our process to improve quality, namely our "Parts Return Procedure".

The main driver behind this procedure is that we need parts back so we are able to investigate why they failed, identify root cause, and implement improvements. Our "Parts Return Procedure" consists of:

1. Mandatory Parts Return (MPR) procedure which is applicable on compressors, controllers, motors and other selected parts replaced under warranty.
2. 10X procedure which is applicable on all parts under warranty.

The MPR is carried out by all service center repair locations while the 10X procedure is implemented at more than 10 specially selected major repair locations. The 10X program stands as our goal to achieve an improvement in our quality of ten times (10X) over a period of 5 years. To achieve this goal we need your help.

Where we can improve?

Information is a key item. While a failed part in a reefer unit is giving useful information, a failed part in the lab in front of us on a table without guiding information is often a mystery. Our engineers, who are working on these parts, need more. They need the information from your analysis which was completed at the time of the unit repair. Currently today there are two means that the information is provided, first via the MPR tag and second via the warranty claim filed. Both of these systems are simple and good because they provide important information concerning e.g., claim number, container number, series-number and why the part was replaced. In this respect we need more detailed information **why** the part was replaced as "part failed" or "part broken" is of course not sufficient. Be specific **about the details such as alarm codes, electrical measurements, operational characteristic which led you to replace the part.** This information is critical for our analysis process.

Please review your internal warranty procedures to ensure the inclusion of complete failure information so we can further improve and achieve our goal.

We need YOU to keep our quality at the highest level.

Johan van der Kruk Global Service Director Carrier Transicold

Please circulate this newsletter to all of your support personnel

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Inside This Issue

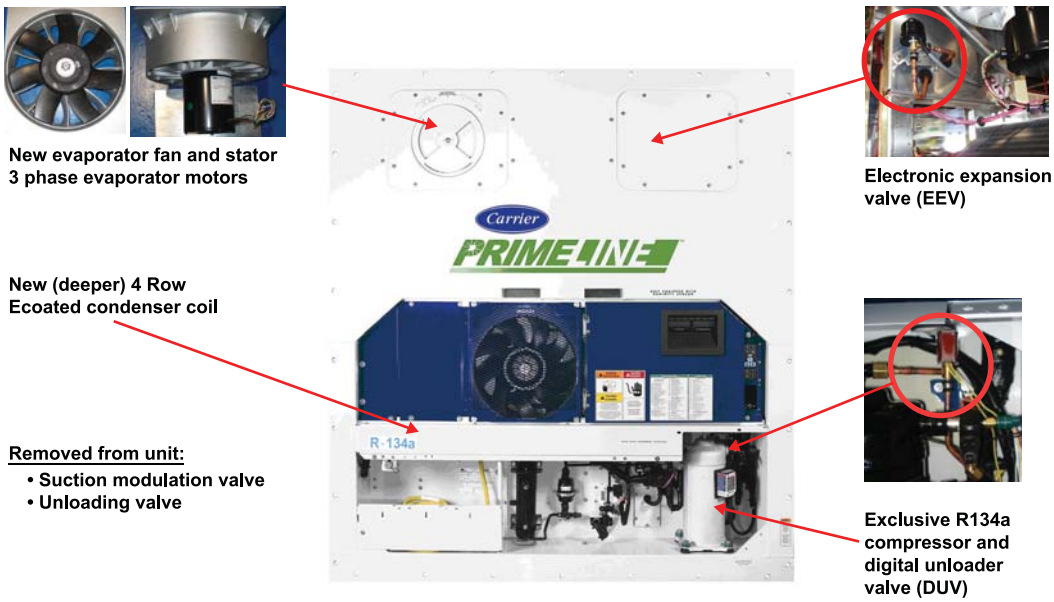
Feature Article — PrimeLINE™

Carrier Transicold announces the introduction of the new PrimeLINE product to its family of NT model units. In this article we will review the key changes to the unit in comparison with the EliteLINE model unit.

Structural Overview

In contrast to the EliteLINE the following machinery changes were incorporated into the unit.

- The thermal expansion valve is replaced with the electronic expansion valve which controls the superheat leaving the evaporator, based on the inputs from the evaporator temperature sensor and the primary suction pressure transducer.
- Three phase evaporator motors with new evaporator fans and stators were added.
- An exclusive R134a compressor with a digital unloader valve was added.
- A new (deeper) 4 Row E-coated condenser coil was added.
- The Suction Modulation valve and the Suction Unloader valve were removed from the unit.
- The Liquid Injection Valve was changed from normally open LIV to normally closed.



69NT40-561-XXX

Operational Overview:

The basic unit operation is very similar to the standard EliteLINE unit, using the standard and the economized modes of operation. The primary difference is in the means of unloading during reduced capacity requirements. The PrimeLINE unit uses a digital unloader valve (DUV) to control the compressor capacity by disengaging the scroll wraps while the EliteLINE uses the modulation valve.

On startup, if the unit has been without power for 4 hours or suction and discharge pressures have equalized, the compressor will perform a compressor bump starts to clear any refrigerant that may have migrated to the compressor. As part of this bump start the compressor will start for 1 second and pause for 5 seconds sequentially 3 times with the Electronic Expansion Valve (EEV), Economizer Solenoid Valve (ESV), Liquid Injection Valve (LIV) closed and the fans off.

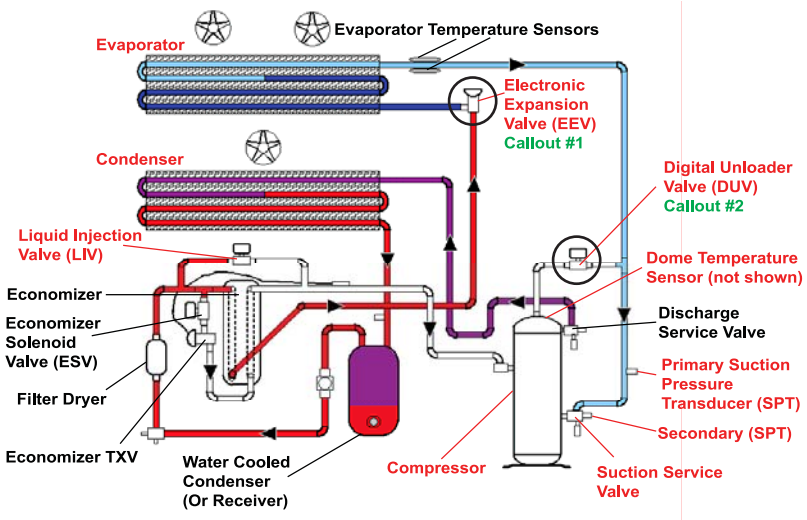
On completion of the bump start logic the unit operation will proceed based on the difference between its setpoint and container temperature. Based on this difference, the controller will take the following actions:

In the perishable mode, if the temperature difference is greater than 2.5°C (4.5°F) the unit will go into to the full economized mode which is used for high-capacity. The economized mode of operation is activated by energizing a normally closed (ESV) and further sub-cooling the liquid refrigerant entering the EEV and the evaporator coil **(Callout #1)**. The position of the ESV can be checked via code select Cd21. As the air temperature falls to approximately 2.5°C (4.5°F) above set point, the unit goes into an economized modulated cooling with the cycling of DUV. The DUV unloads the compressor scroll and thus begins reducing the overall capacity of the unit **(Callout #2)**. The capacity that the unit is running at is displayed by viewing code select 01 (Cd01). If the capacity displays 70%, the compressor is operating unloaded with the DUV engaged 30% of the time. When the return air has fallen to within 1.9°C (3.4°F) of set point temperature and the average capacity of the system has fallen below 70% based on the proportional integral derivative (PID), the controller will close the economizer solenoid valve and enter the standard mode of operation. The standard mode of operation is used for low-capacity operation and is designed to maintain box temperature during perishable modulated cooling. During the standard mode of operation, the DUV cycles more frequently to maintain the capacity control requirements. If the system capacity has been decreased to the lowest allowable capacity with the DUV, the unit will enter a trim heat mode of operation where the controller will pulse the evaporator heaters in sequence with the compressor digital signal in an effort to absorb the excess capacity.

When operating under modulated capacity, the EEV control will transition from a full cool superheat setpoint to a lower modulated cool superheat setpoint.

In the frozen mode of operation, the unit will operate in the full economized mode until the return air temperature decreases to 0.2°C (0.4°F) below setpoint and then cycle off the compressor. With the compressor off the ESV and the EEV will close. When the return air temperature increases to 0.2°C (0.4°F) above set point and a three minute off time has elapsed, the EEV will open and the unit will operate in the full economized mode of operation.

Refrigerant Flow Diagram 69NT40-561:
(New/unique parts are shown in red)



New PrimeLINE Parts

Part Number	Part Name
18-10136-20	Compressor
22-04128-00	Compressor Cable
12-00653-00	Discharge (Dome) Temperature Sensor
14-00361-00	Digital Unloader Valve (DUV)
14-00361-01	DUV Coil
14-00247-01SV	Electronic Exp. Valve (EEV)
14-00247-20	EEV Coil
40-00665-00	Suction Service Valve
12-00655-00	Suction Pressure Transducer(s)
14-01090-17	Liquid Injection Valve (LIV)
81-04059-20	Condenser Coil
81-04056-00	Evaporator Coil
54-00616-20	Condenser Motor
54-00615-20	Evaporator Motor
38-00593-00	Evaporator Fan
48-00413-00	Evaporator Stator

Feature Article – PrimeLINE™ *(continued from page 3)*

In support of the unit the following Code Select Functions, Alarms and Pretrip tests have been either enhanced or added to assist in the trouble shooting of the unit.

Code Select:

Cd01 Provides % unit cooling capacity (EL displays % SMV open)

Cd10 Evaporator Temperature Sensor: Right display shows primary EEV temperature sensor reading.

Cd11 Compressor Discharge Temperature: The EliteLINE uses discharge pipe temperature versus PrimeLINE which uses the compressor dome temperature.

Cd12 Compressor Suction Pressure: The right display will show the primary suction transducer (EPT) located on the suction line inlet to the compressor. Pressing enter at Cd12 will also display on the left a secondary suction pressure transducer (SPT) which is located on the service valve.

Cd41 Valve Override: Enhanced to include the override checkout function of the EEV and the DUV by manually energizing each valve to perform a functional check.

Cd54 Electronic Expansion Valve status: The right display will show the Evaporator Superheat. Pressing enter at Cd54 will also display the Electronic Expansion Valve (EEV) position on the left display (%) with the Superheat on the right.

Alarms: One new alarm (AL3) was added to the alarm list. All other alarms are the same as in the EliteLINE and StreamLINE units.

AL3 Loss of Superheat Control: This is a display alarm only and will become active if the Evaporator Superheat is less than 3 °F (1.6°C) for 5 continuous minutes and the EEV is at 0% open. The alarm goes inactive if the Evaporator Superheat is greater than 3°F (1.6°C) for period of 5 minutes.

New Pre-Trips: The following New Pre-trips have been added to perform diagnostic checks on main components of the PrimeLINE unit.

P5-3 Evaporator Fan Direction Test (3 Phase Motors): With evaporator fan running on high speed, the temperature difference between the primary supply and primary return probes is monitored with and without the heaters energized. The test passes if differential change of primary supply temperature is more than primary return temperature. Test P5-0 must pass before this test is run.

P5-7 Primary Vs. Secondary Evaporator Thermistor (for EEV) Test: Controller compares values and passes if sensors are within 0.5°C (1°F) of each other.

P5-9 Primary Vs. Secondary Suction (Evaporator) Pressure Transducer Test: The test passes if the transducers are within 1.5 psi of each other. Values are displayed at Cd12.

P6-6 Economizer Solenoid Test: Tests the opening and closing of the solenoid valve.

P6-7 Digital Unloader Valve Test: The controller energizes and de-energizes the DUV while monitoring the pressure and current changes within the unit.

P6-9 Liquid Injection Valve Test: Tests the opening and closing of the solenoid valve.

P6-10 Electronic Expansion Valve (EEV) Test: This test records the suction pressure at the open and closed valve position and passes if the suction pressure increase is within specified values.

This article gives you a general review of the unit. If you have any questions please contact your regional service engineer. ◀

N. Guenane / P. Hoover

Tech*Fact* – Unit Startup

A new display feature has been incorporated into software versions starting with 5138 and 5329. This feature displays in sequence, the container ID (code 40), software version (code 18), and unit model number (code 20) upon every startup and at the initiation of every pre-trip. This feature adds no additional startup time to the unit. The operator can easily identify that the controller is properly configured without having to scroll to each individual codes which are still available and can be accessed as in the past. ◀

■ *G. Barkowski*

Tech*FAQ* – Low Coolant Sensor

Question:
I came across a genset which had a Low Coolant Sensor installed in the radiator header. What is the purpose of the Low Coolant Sensor, and how would you go about trouble shooting its function?

Answer:
The low Coolant Sensor (LCS) is a conductive type of safety device used in conjunction with an Auto Restart Module (ARM). When the probe is immersed in coolant, the sensor will complete the 12 volt circuit through the Low Coolant Relay (LCR) and to the Auto Restart Module (ARM). If the coolant level in the radiator falls below the LCS probe as a result of a leak of 32 ounces or more, the LCR will open, creating an open circuit to the ARM's 12 volt input circuit. This open circuit will de-energize the ARM and shutting down the genset.

To troubleshoot the LCS circuitry, perform the following steps.

1. Check the level of the coolant in the radiator, if low, refill to the proper level.
2 Check 12 volt power supply and the 3 amp fuse in the wire harness.
3. Check the LCS. To check the LCS, disconnect the sensor. If the unit starts, the sensor should be replaced. If the unit fails to start, check the LCR and its isolation diode.

Note, both the Low Coolant Sensor and The Auto Restart Modules are unit options. Contact your regional service engineer for more details. ◀

■ *G. Barkowski*

Tech*Fact* – Battery Pack

Starting with software releases 5135 (recip) and 5324 (scroll), a battery pack missing feature has been rolled into the AL53 alarm. When the container unit is configured to have a rechargeable battery pack, a flag (notation) is written into the controller. If the wiring for the battery pack is damaged, or the battery pack is stolen, then the controller will raise the AL53 code. In the case of a stolen battery pack, where no replacement is available, the active code AL53 can be cleared by holding down the ALT key at the beginning of the battery test using (CD19). Once the alarm, is cleared the controller will not display the AL53 until a replacement battery voltage is sensed. Once voltage is sensed the feature will again become active. Note, on initial installation of the software where no battery is found, the controller will immediately display an AL53. By following the procedure for disengagement, the alarm can be deactivated and will remain deactivated until a battery is again sensed. ◀

■ *G. Barkowski*

Tech*Fact* – Automated SetPoint Change

The Carrier container units have an Automated Setpoint Change (ASC) feature. The ASC allows up to three set points (2 changes) with selected periods of time to be programmed into the controller. This process can be setup using function Code 53 as follows:

To set **Automated Setpoint Change (ASC)**

1. Scroll to CD53 and press enter.
2. Scroll to ON and press enter. **(If ASC is already ON, selecting OFF will terminate ASC)**.

Tech*Fact* – Automated SetPoint Change

(continued from page 5)

3. **Select the desired number of setpoint changes (nSC), one or two:** With (nSC) in the left display, select by scrolling between the "flashing" 1 or 2 in the right display and press enter.
4. **Select the initial setpoint:** With (SP 0) in the left display, select by scrolling to the desired "flashing" setpoint in the right display and press enter.
5. **Select the days desired for initial setpoint (SP 0):** With (DAY 0) in the left display, select by scrolling to the desired "flashing" days (1 to 99) in the right display and press enter.
6. **Select the next setpoint (SP 1):** With (SP 1) in the left display, select by scrolling to the desired "flashing" setpoint in the right display and press enter.
7. If you selected 1 setpoint change in step (3) above, you are done.
8. **If you selected 2 setpoint changes in step (3) above, you will be prompted to select the days desired at that setpoint (SP 1):** With (DAY 1) in the left display, select by scrolling to the desired "flashing" days (1 to 99) in the right display and press enter.
9. **Select a final setpoint (SP 2):** With (SP 2) in the left display, select by scrolling to the desired "flashing" setpoint in the right display and press enter, you are done.

While the unit is operating in **Automated Setpoint Change (ASC)** mode the left hand display will alternate between current unit setpoint and the mode identification "ASC". The right hand display will alternate between current control temperature and the ASC mode identification "ACtvE". The user can determine the amount of time left at the current setpoint by selecting Cd53. The amount of time left will be displayed in the right display (XX (days) / XX (hours). By sequentially pressing enter, set parameters can be viewed.

At completion of **Automated Setpoint Change (ASC)** mode, the left hand display will alternate between current unit setpoint and mode identification "ASC". The right hand display will alternate between current control temperature and mode identification "Done". The display will remain this way until ASC is turned off. The user can determine the date of completion by selecting CD53. With (done) in the left display, the date of completion will be displayed in the right display (Month / Day).

ASC will be automatically turned off after three days without power, or if the function Code 53 is set to off, or if a Pre-trip is initiated. This feature will work independently of Automatic Cold Treatment (ACT). Setting one will deactivate the other. ◀

■ *M. Donahoe*

Tech*Fact* – Pressure Transducers

For many years Carrier has equipped its EliteLINE and StreamLINE models with pressure transducers for unit protection and or control. The picture shows the newest version of discharge (hi) pressure transducer (p/n 12-00352-00) and suction (lo) pressure transducer (p/n 12-00352-07). Both of the sensors look identical and can be easily mixed up. For ease of identification, the part number is found on both sensors and a dot was added to the suction transducer.

Always take care to assure that the correct transducer is used. ◀

■ *A. Stout*

Tech*Fact* – Automated Cold Treatment

Sustained cold temperature has been employed as an effective postharvest method for the control of the Mediterranean and certain other tropical fruit flies. Exposing infested fruit to temperatures of 2.2°C (3.6°F) or below for specific periods results in the mortality of the various life stages of this group of insects. Automated Cold Treatment (ACT) in the Carrier Transicold unit is a method to simplify the task of completing the Cold Treatment process by automating what use to be a manual process of changing of the set points. When a container load requires cold treatment, the technician can access function Code Select 51 via the keypad Code Select button.

1. Enter Cd51, left display will show “ACt” and the right will flash “Off”.
2. Use the arrow key to scroll to “On” on the right display and press enter.
3. trEAt will now be displayed on the left and the right display will be flashing.
4. Use the arrow key to select the desired setpoint and press enter.
5. Days will now be displayed on the left and the right display will be flashing.
6. Use the arrow key to select the desired day for cold treatment and press enter.
7. Probe will be displayed on the left and auto configured on the right. Press Enter.
8. SPnew will be displayed on the left and the right will be flashing.
9. Use the arrow key to select the desired setpoint after the cold treatment process and press enter.
10. Code 51 will now display (days)_(Hours on the right).

Once the cold treatment process has been initiated, setpoint change via the keypad is disabled.

The unit will start to countdown once all detected USDA probes have reached the Cold Treatment level. The cold treatment process will continue to operate until the number of days specified has been reached. During operation, Cd51 will show the number of days and hours’ remaining in the cold treatment.

While the unit is operating in ACT mode, the left hand display will alternate between ‘COLd’ and setpoint. The right hand display will alternate between ‘trEAt’ and the cargo temperature. Once the Cold treatment process has completed, the Cargo Setpoint will be displayed in the left hand display and cargo temperature in the right hand display alternating with “COLd” “Done”. “COLd” “Done” will continue to alternate with the setpoint and cargo temperature until ACT is turned off. ACT will be automatically turned off after three days without power, or if the function Code 51 is set to off, or if a Pre-trip is initiated.

This feature will work independently of Automatic Setpoint Change (ASC). Setting one will deactivate the other. ◀

■ *M. Rogers*

Tech*FAQ* – Controller Status LED

Question:
The controller has a LED flashing. What is its purpose?

Answer:

The LED positioned between MB and MC sockets on the front of the ML2i/ML3 Controller shows the status of the microprocessor internal operation as a result of self-check routines and could be used by the operator as a tool to detect an occasional Micro-processor error.

On a normal operating micro-processor, shortly after the unit is powered ON, the LED (see picture) should start evenly blinking at the rate of one flash every 2 seconds. (1 second LED ON, 1 second LED OFF). This process continues all the time the unit is on AC power and powered ON. If the LED does not flash when the unit is switched on, check the Power supply to the Microprocessor.

When new software is being transferred to the Micro-processor’s memory, a “Pro Soft” message is displayed. At the same time the LED blinks. When the message “Pro Done” is displayed, stating the end of data transfer, the LED will remain steadily lit until the unit is switched OFF and the card removed. At the next power up, the LED may start rapidly blinking, whilst the Display remains blank. During this period, which could take 15-20 seconds, the Software is being loaded into the FLASH Memory. Once the Microprocessor has completed software loading the LED goes briefly OFF before it starts blinking at the normal rate. Simul-taneously the display will illuminate.

In the event that a failure occurs and the display cannot be updated, the status LED will indicate the appropriate ERR code using Morse code as shown below. If the failure occurs under warranty please include this type of information on the MPR part.

ERR0 = . .-. .-. -----	ERR5 = . .-. .-. .....
ERR1 = . .-. .-. .----	ERR6 = . .-. .-. -....
ERR2 = . .-. .-. ..---	ERR7 = . .-. .-. --...
ERR3 = . .-. .-. ...--	ERR8 = . .-. .-. ---..
ERR4 = . .-. .-. ....-	ERR9 = . .-. .-. ----. ◀

■ *S. Bretherton / J. Carbunaru*

Tech*Fact* – Genset Serviceability Option

In an effort to improve the access to the engine and components mounted to the engine such as the priming pump the fan belts and the filters Carrier Transicold is offering the serviceability option. With this option the control box is positioned outside of the gensets frame, a service access door was added in replacement and the main access area was increased by 50%, as pictured. With this ease of access the technician can more thoroughly inspect units on pretrips while also allowing for faster and easier repair times, while on chassis, and thus assuring the accuracy of the repair.

Other added items to this option include an inline fuel pre-filter and a battery post access door. ◀

G. Barkowki

Tech*Tip* – Software

The latest software release versions for the 69NT units are:

Scroll (ML2i/ML3) – 5329
Reciprocating Unit (ML2i / ML3) – 5138
Reciprocating Unit (ML2) – 1207
Controlled Atmosphere – 3110
DataLine – 1.7
DataBank – 0512

All software, except for DataLine, can be downloaded from Transcentral within the Carrier Transicold Website at http://www.container.carrier.com/. DataLine can only be upgraded from the site if you have an original copy. ◀

Tech*Line* is a publication of Carrier Transicold

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Contributors: Gary Barkowski, Shaun Bretherton, Julian Carbunaru, Mark Donahoe, Nadir Guename, Mark Rogers, Arnold Stout

Thanks to all who reviewed and supported this release.

Tech*Fact* – 2008 School Schedule

Listed below is the planned schedule for Container training courses offered through June of 2008. For the course descriptions, enrollment details and fees, refer to the Internet at http://www.container.carrier.com and click on the training tab. ◀

JANUARY	Program	Location
21 - 23	3-Day Container Product Update	Mombasa, Kenya
FEBRUARY		
11 - 15	1-Week Container	Savannah, GA
18 - 22	1-Week Container	Honolulu, HI
MARCH		
3 - 7	1-Week Container	Seattle, WA
12 - 14	3-Day Container Product Update	Surubaya, Indonesia
17 - 21	1-Week Container	Tema, Ghana
APRIL		
Mar 31 - Apr 4	1-Week Container	Busan, Korea
7 - 9	3-Day Container Product Update	Kaohsiung, Taiwan
7 - 11	1-Week Container	Buenos Aires, Argentina
21 - 25	1-Week Container	Long Beach, CA
28 - May 2	1-Week Container	La Porte, TX
MAY		
5 - 7	3-Day Container Product Update	Newark, NJ
5 - 9	1-Week Container	Mexico
19 - 23	1-Week Container	Qingdao, China
19 - 23	1-Week Container	Lima, Peru
26 - 28	3-Day Container Product Update	Valparaiso, Chile
JUNE		
4 - 6	3-Day Container Product Update	Felixstowe, UK
9 - 11	3-Day Container Product Update	Hamburg, Germany
9 - 11	3-Day Container Product Update	Ecuador
16 - 20	1-Week Container	San Pedro Sula, Honduras

Please circulate this newsletter to all of your support personnel