TECHLINE

Special Issue

EliteLINE

Carrier Transicold EliteLINE^TM and StreamLINE^TM Units

Carrier Transicold recently introduced two new units to its NT product line. These units have been assigned the names EliteLINE and StreamLINE. Both of these units use scroll compressor technology with the EliteLINE using the same frame package as the standard NT ThinLINE. The StreamLINE, as its name would indicate uses a new thinner frame that reduces the the depth to 335mm (13.2inches).

The following gives a short overview of the key components that make the Carrier Transicold EliteLINE and StreamLINE units different from our standard ThinLINE unit:

The Economizer is a heat exchanger similar to the one used in the ThinLINE unit. It is used to acheive additional subcooling of the liquid refrigerant entering the evaporator TXV. This boosts the refrigeration capacity by nearly 30% during low box conditions.

The Expansion Module (Input-Output Board) is used for controlling the additional system features of the unit. It is a slave to the ML2I controller, which controls the functions of the module.

The Refrigerant / Oil Separator is part of the refrigeration circuit which ensures that oil leaving the compressor is promptly returned to the compressor oil sump. This feature protects against loss of lubrication to the compressor.

The Scroll Compressor is specifically designed for the demanding marine environment. The following are a few enhancements that have been incorporated into the design of the Scroll compressor.

- Large port discharge valve - Low power draw, reduced discharge temperatures.
- Optimized Scroll wrap design - Greater efficiency, strength, and reliability.
- Steel backed carbon bearing - Extended life bearings.
- Marine powder paint coating - Superior corrosion protection.
- Molded and sealed electrical junction box. - Improved water ingress prevention
- High efficiency motor - Lower power consumption.
- Large capacity oil sump and sump magnet - Reliable oil filtration

> **Part number 18-00095-20**
> **Uses Mobil ST32 oil - Part Number 07-00427-00**
> **Oil charge (3.0l) 100 ounces**
> **Dry Weight 46.5kg (102.5 lb.)**

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Please circulate this newsletter to all of your support personnel

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Modes of Operation-EliteLine unit:

The refrigeration system allows the unit to operate in three different modes depending on the cooling requirements of the box. These modes are:

Economized Mode - Used for maximum deep frozen capacity and initial perishable pulldown

Standard Mode - First step capacity reduction in Persishable Mode

ECONOMIZED MODE OF OPERATION
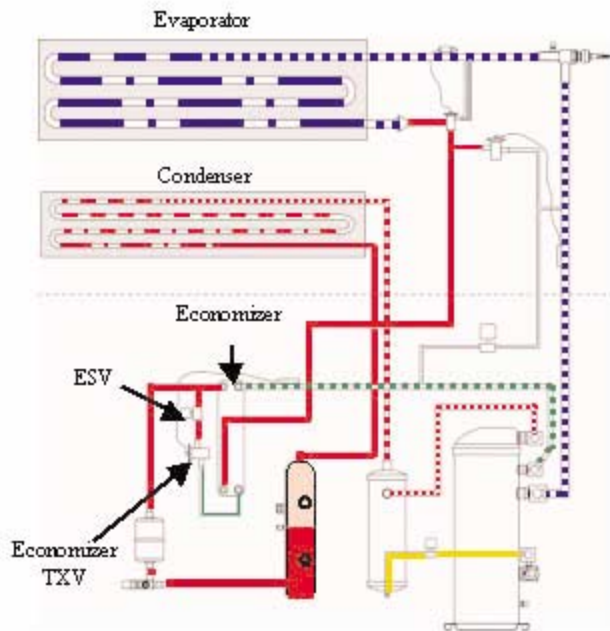
The economizer circuit consists of a normally closed solenoid valve (ESV), Economizer and Economizer TXV. When ESV opens, liquid refrigerant flows through the economizer TXV and the economizer internal passages absorbing heat from the main liquid refrigerant flow to the evaporator TXV. This further subcools the liquid refrigerant entering the evaporator. This increases the amount of heat that can be absorbed by the refrigerant in the evaporator.

The vapor from the economizer enters the mid-stage compression point of the compressor. This cools the partially compressed vapor in the compressor increasing the overall efficiency of the unit, as the system capacity increases more than the additional power required to compress the refrigerant vapor.

STANDARD MODE OF OPERATION
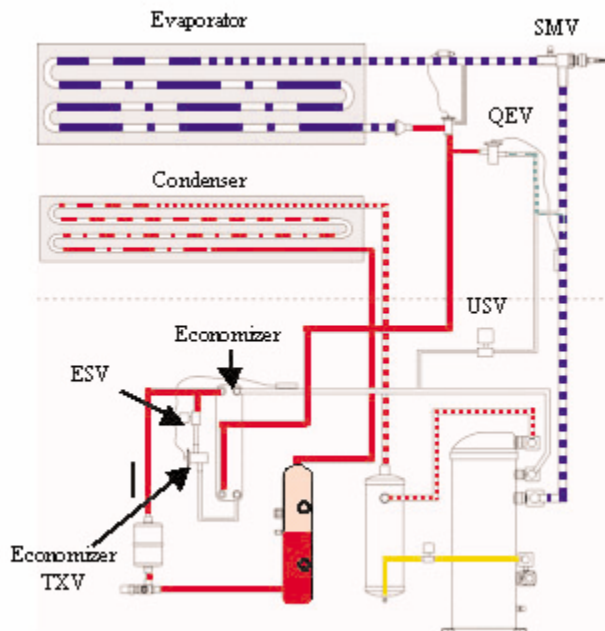
In the standard mode, both the economizer and unloader solenoid valves are closed; therefore, the Economizer is not utilized. The system is now similar to the ThinLINE reciprocating unit. The SMV starts to close limiting the system capacity. The QEV valve will open as required to maintain cooling of the compressor.

This is an intermediate capacity mode and is the first step reduction as the unit approaches setpoint conditions. As set point is acheived the unit switches to the unloaded mode.
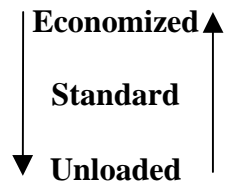
Similarly, if the unit changes from unloaded to economized mode, it must pass through the standard mode of operation.
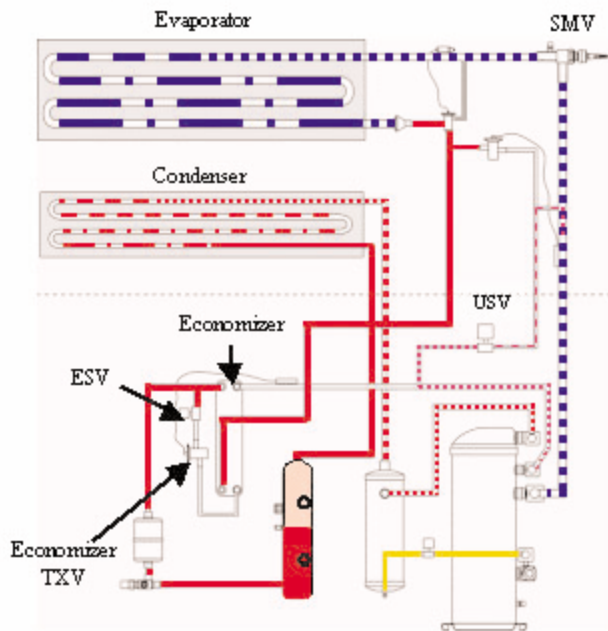
Modes of Operation (Contd).

Unloaded Mode - Is used every time the unit start's and is the optimum mode for maintaining perishable set points.

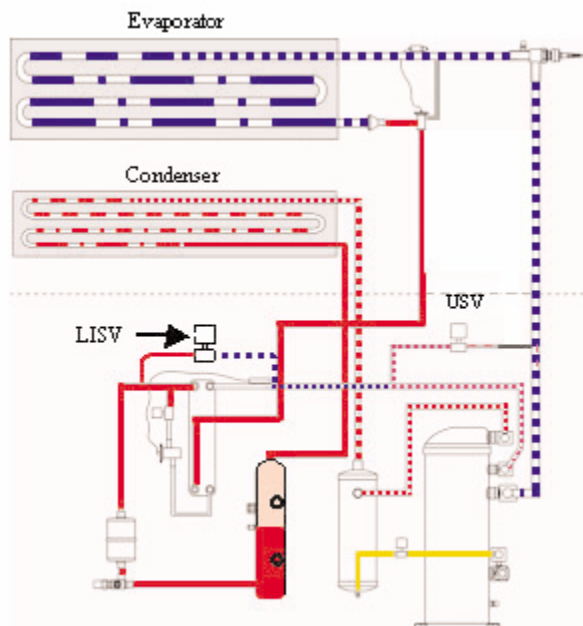## UNLOADED MODE OF OPERATION - EliteLINE Unit Only

The unloader circuit consists of a normally closed solenoid valve (USV). When unloaded operation is required, USV opens, allowing partially compressed refrigerant vapor to exit the compressor from the mid-stage compression port. This refrigerant vapor is mixed into the compressor suction line through the USV in order to decrease the system capacity.

The system will operate in the unloaded mode during periods of:

> - **Low load.**
> - **Discharge pressure limiting.**
> - **Current limiting.**
> - **Start up.**

Operating in unloaded mode allows the stepper motor SMV to be further open, which prevents very low (vacumn) pressures on the suction side of the compressor.

UNLOADED MODE OF OPERATION - StreamLINE Unit Only

The StreamLINE unit operates in the same three modes of operation (economized, standard, and unloaded), as previously discussed for the EliteLine unit. The only operational difference between the two systems is that a Liquid Injection Solenoid Valve (LISV) replaces the Quench Expansion Valve (QEV).

The LISV opens based on pressure and temperature in the unit. When open it provides refrigerant flow into the suction line for compressor motor cooling.

The figure to the left shows a typical refrigeration circuit diagram of the StreamLINE system running in the unloaded mode of operation with the LISV in the open position. The LISV can operate in any of the operational modes of the unit to keep the compressor motor windings cool.

Software for Scroll Units

The software revision required for both, EliteLINE and StreamLINE units is 53XX. The latest version for EliteLINE and StreamLINE is v5310. (Note: Software is **NOT** interchangeable between units with different compressor types)

The table to the right lists the current controller software versions for the different Carrier Transicold units that are operating in the field. The latest software revision information can be obtained from the Container Information Center http://www.container.carrier.com or your regional Service Engineer.

Unit Controller Type	Current Controller Software Revision
ML2	1207
ML2 DataCORDER	2104
ML2i	5121
ML2i EliteLINE / StreamLINE	5310

On Board Troubleshooting

In both the StreamLINE and the EliteLINE units the technician has the ability to operate the valves for up to 3 minutes, by using the code selection function from the keypad on the front of the unit. To use this function the technician enters code select 41. The left display will show SELCt (select) and the right display will alternate with the last test setting and the time remaining on test. Use the arrow key to scroll to the timer (tIM) and press Enter. Press the arrow key again to select the desired time interval and press Enter to accept. The controller is now waiting for you to select a test function. Press the arrow key to the desired test. Press Enter to select the test followed by the arrow key to choose the test option as shown on the left display. Press Enter to accept the option. The test will begin. The right display will alternate between the last chosen test and the test condition while the test is running. Unit will go back into normal operation once the 3 minutes expires.

Left Display	Right Display / Test	Right Display/Test Operation	Action
SELCt Code Select 41	CAP **(Capacity Mode)**	AUtO	Normal control
		UnLd	Unloader valve-open Economizer valve-closed
		Std	Unloader valve-closed Economizer valve-closed
		ECOn	Unloader valve-closed Economizer valve-open
	SM **(SMV %setting)**	AUtO	Normal control
		0; 3; 4; 6 ;12; 25; 50; 100	Valve closes/opens to the select position
	OIL **(Oil Valve)**	AUtO	Normal control
		CLOSE	Valve closes
		OPEn	Valve opens
	LIV **(Liquid Injection)** *StreamLINE only*	AUtO	Normal control
		CLOSE	Valve closes
		OPEn	Valve opens
	tIM **(Timer)**	0 00 (0 minutes / 0 seconds) (30 second increments) 3 00 (3 minutes / 0 seconds)	Normal control Selected test time

Operational Note:

In mid to low ambient temperatures with high humidity, frost may buildup on the compressor. This is normal under these conditions and will not affect the performance of the unit.

Tech*Line* is a publication of Carrier Transicold
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