Subcool-O-Matic Replacement Instructions

Date _____ Store Number _____

Rack Location _____

SD-358R/62012

Read all of these instructions prior to installing the Sporlan Subcool Control. Heed all warnings and keep this document for reference.

Tools required:

- Small flat screwdriver for terminal connections
- Cordless screwdriver
- Phillips and flat screwdrivers
- Needle-nose pliers
- Flush-cutting wire cutters
- Electrical tape
- Two #8 x ½" self-tapping screws to mount DIN rail

Items that may be needed:

18 gauge stranded wire, wire nuts/connectors, fuse puller, wire strippers, hammer (for knock-out removal).

Verify Subcool-O-Matic Digital Input Operation

Before removing the Subcool-O-Matic, check the operation of the digital input (DI1), which signals the Subcool-O-Matic to enter defrost (pumpdown) mode. See Appendix A. During normal subcooling operation, the pump-down input to the controller is open. It is closed when pump-down is required. When there is a liquid line solenoid valve ahead of the Electric Expansion Valve (EEV), a single-pole double-throw relay wired in parallel with the liquid line solenoid will signal the digital input via the NC contacts to enter pump-down mode. Sporlan recommends a pump-down signal be sent to the controller once per day for 60 seconds.

If there is a toggle switch (dry contact) connection to the digital input for pumpdown, turn the switch off (open). The Subcool-O-Matic controller should be in cooling mode. If the controller is in the defrost mode (displaying dF) but the Rack EMS (NOVAR or Danfoss) system is calling for subcooling, then the dry contact logic (DI1) is reversed or the digital input is connected to the NO contacts of the relay. If unable to enter cooling mode with the switch off (open), contact the rack controller/equipment manufacturer to determine why the dry contact to the controller remains closed.

1. REMOVAL AND INSTALLATION

1. Record the actual refrigerant used in the system in Table 1. *The Subcool-O-Matic may have the wrong refrigerant entered.*
2. Using the remote panel display (Figure 1), record the controller set points in Table 1.
3. Refer to Table 2 to identify your subcooler EEV and determine the number of steps to enter into the Subcool Control.
4. Close the ball valve upstream of the subcooler EEV.
5. Place the controller in defrost mode (displaying dF) using toggle switch or by manual override in the EMS system.
6. Find the supply voltage transformer. **For a fuse-type transformer, ensure that replacement fuses are available.**
7. Disconnect power to the Subcool-O-Matic controller and disconnect the wires. If removing energized wires, protect each exposed wire with a wire nut to prevent shorting the supply transformer. See Figure 2.

NOTE: Use caution when wiring the control around high voltage components. Safety covers should be used for personal safety on high voltage panels.

Table 1 - Set Points

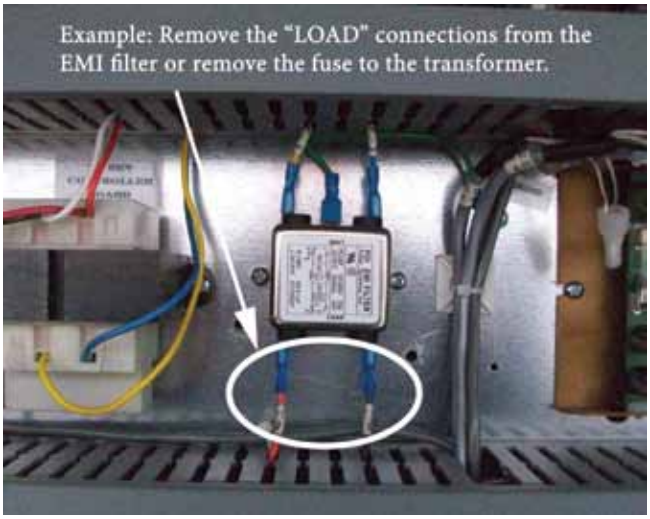
PARAMETER	VALUE	SUBCOOL CONTROL
Refrigerant		rEFr
Liquid Temp Set Point "LQSP"		LoSP
Super Heat Set Point "SHSP"		SHSP

Table 2 - Electric Expansion Valves

MODEL NUMBERS	STEPS
SEI-.5, SEI-1, SER-1.5, SEI-2, SEI-3.5, SEI-6, SER-6, SEI-8.5, SEI-11, SER-11, SER-20	1596 ☐
SER-AA, SER-A, SER-B, SER-C, SER-D, SER-G, SER-J, SER-K, SER-L	2500 ☐
SEI-30	3193 ☐
SEI-50, SEH-100, SEH-175	6386 ☐

Figure 1 - Remote Panel Display

Figure 2 - Disconnecting Power



8. Use Table 3 to record the pressure transducer wire colors or tag numbers on the Subcool-O-Matic. Disconnect wires.
9. Use Table 4 to record the EEV wire colors or tag numbers and locations on the Subcool-O-Matic. Disconnect wires.
10. Use Table 5 to record the DI1 wire colors or tag numbers and locations on the Subcool-O-Matic. Disconnect wires.
11. Use Table 6 to record the TS1 and TS2 wire colors or tag numbers and locations on the Subcool-O-Matic. These are the terminals closest to LED display. TS1 is the Liquid Out temperature sensor. Mark this cable with electrical tape to avoid confusion with TS2. Disconnect wires from TS1 and TS2.
12. Disconnect RJ11 cable and remove the Subcool-O-Matic from the panel.

Install Subcool Control

See *Appendix B - New Subcool Control Wiring Diagram*.

13. Use Table 6 to connect the TS1 and TS2 wires to the Subcool controller. *Do not interchange TS1 and TS2.*
14. Use Table 5 to connect the DI1 wires.
15. Use Table 4 to connect the EEV wires.
16. Use Table 3 to connect the pressure transducer wires.
17. Connect the power wires to terminals 1 and 2.
18. Locate the Sporlan Subcool Control in a rain-tight, protected location using the supplied DIN Rail. To leave enough working space, the suggested mounting area is 10 inches high and 5 inches wide. Minimum depth is 3 inches. *Location should minimize wire relocation and extensions.*
19. Position the Subcool Control on the back panel of the control panel and mark where the DIN Rail will mount.
20. Using the dimensions in Figure 3, attach the DIN Rail to the back panel. Ensure that debris from any drilled holes is cleaned up.

Figure 3 - DIN Rail Detail

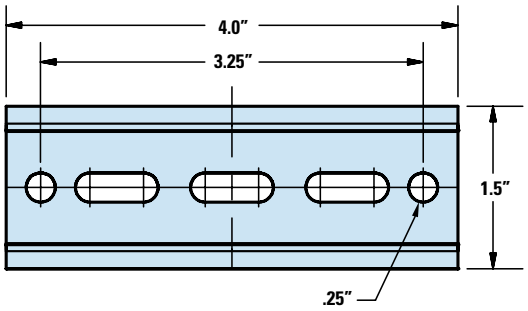


Table 3

PRESSURE TRANSDUCER WIRING (3-wire cable)		
Subcool-O-Matic	**Color or Tag Number**	**Subcool Control Wire Location**
1+		35
1S		33
1-		34

Table 4

EEV WIRING (4-wire cable)		
Subcool-O-Matic	**Color or Tag Number**	**Subcool Control Wire Location**
B		5
W		6
G		7
R		8

21. Snap the Subcool Control onto the DIN Rail.
22. Remove the remote panel display:
    - Remove the two screws on the faceplate.
    - Disconnect RJ11 cable behind the faceplate.
    - Remove housing using a screwdriver pressed into locking tabs on housing (through the square holes).
    - Remove the screws securing the mounting plate.
23. Power up the controller. It will display the firmware versions for the display and the controller. The controller will require Setup to be performed if no parameters have been set prior to power up.

2. SETUP

Enter values for four basic system variables; refer to *Appendix D - Setup Menu*. The EEV is closed upon startup and the system will not operate until completing setup.

Once powered up, the controller will display the first variable to set.

1. Set StEP, Step Motor Stroke. Press and then turn the SELECT knob to select the correct number of steps for the EEV being used. See Table 2 on page 1 for a list of Sporlan EEVs. Default is 2500. Press the SELECT knob again to enter the value. The next variable is displayed, rEFr.

NOTE: Select the actual refrigerant used in the system.

2. Set rEFr, Refrigerant. Select the actual refrigerant used in the system. *The Subcool-O-Matic may have the wrong refrigerant entered.* Default is R-404A. Press the SELECT knob again to enter the value. The next variable is displayed.
3. Set PtyP, Pressure Sensor Type. Select Absolute or Gauge. Default is Gauge. Press the SELECT knob again to enter the value. The next variable is displayed.
4. Set Prng, Pressure Sensor Range. Select 150, 300, or 500. Default is 300, which is the correct value in most cases. Press the SELECT knob again to enter the value. The Liquid Outlet Temperature, Lout, will be displayed. Setup is now complete.
5. After the system is in operation, verify that the Liquid Outlet Temperature Setpoint, LoSP, is met. Default is 75 degrees.

Table 5

DI1 (Digital Input) WIRING		
Subcool-O-Matic	**Color or Tag Number**	**Subcool Control Wire Location**
J7-1 DI1		25
J7-2 DI1		26

Table 6

TS1 & 2 WIRING		
Subcool-O-Matic	**Color or Tag Number**	**Subcool Control Wire Location**
J10-1 TS1		29
J10-2 TS1		30
J10-3 TS2		31
J10-4 TS2		32

3. SET POINT MENU OPERATION

Make final setpoint changes; refer to *Appendix E - Parameters*. The noted values are for verification, change them if necessary. All other values are for informational purposes.

NOTE: The Parameter Menu times out after 60 seconds of inactivity and you will lose all changes entered.

1. Enter the Parameter Menu: Press and hold the SELECT knob for 5 seconds. Rotate the knob to enter the password "111" and press the SELECT knob again.
2. The first parameter displayed is Liquid Outlet Temperature Setpoint, LoSP. This value is listed as **LQSP** in Table 1.
3. To change a parameter, rotate the SELECT knob to the desired parameter and press the SELECT knob. The default value will display.
4. Turn the SELECT knob to change the value and then press the SELECT knob to save the value and return to the Parameter Menu.
5. After all parameters are set, turn the SELECT knob to "ESC" and press the SELECT knob to save all changes.

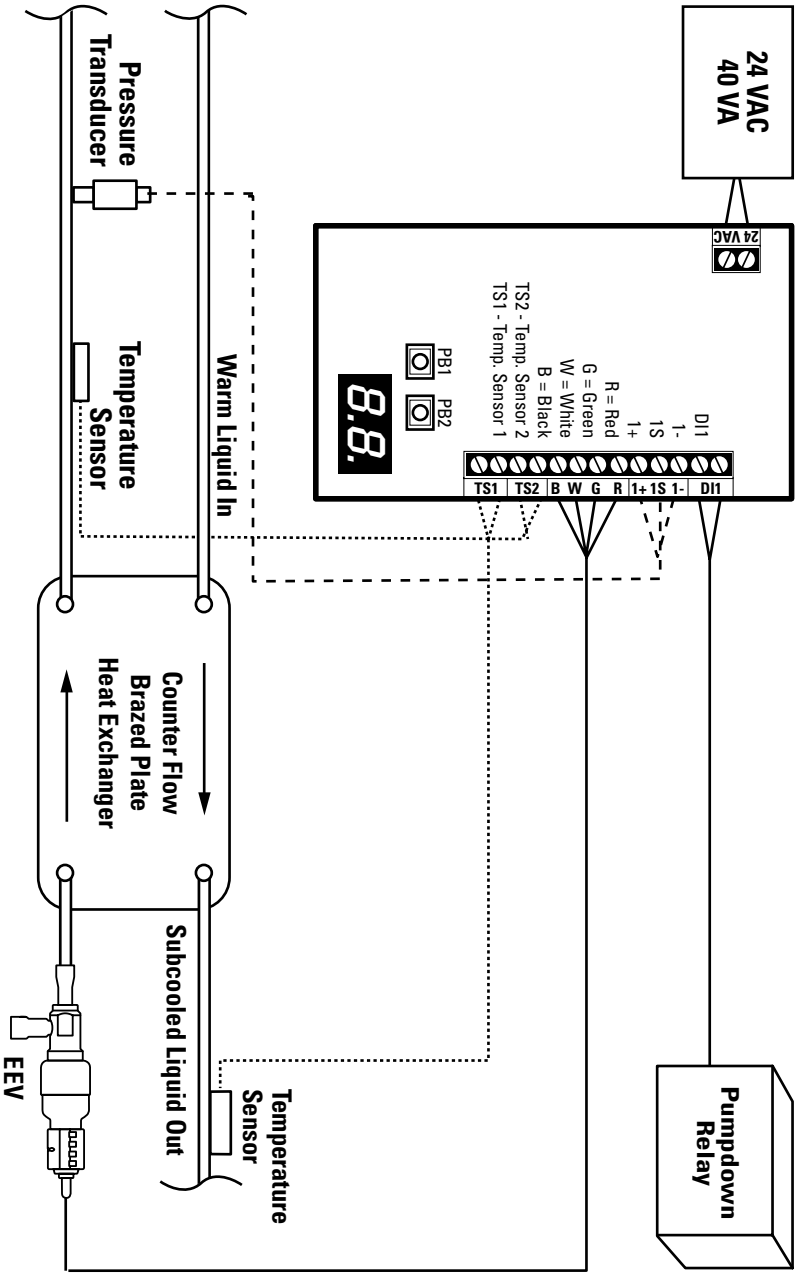
Set the valve position to zero

6. Enter Parameter Menu: Press and hold the SELECT knob for 5 seconds. Rotate the knob to enter the password "111" and press the SELECT knob again.
7. Rotate the SELECT knob to the "SPoS" parameter descriptor and press the SELECT knob. Set the parameter value to "0". Do not press the SELECT knob. System will not time out for 60 minutes.
8. Open ball valve upstream of EEV.
9. Flip toggle switch or disable EMS override to enable subcool mode operation.
10. Press the SELECT knob to return to the parameter menu. Rotate the SELECT knob to "ESC" and press the SELECT knob. Observe system for subcool operation.

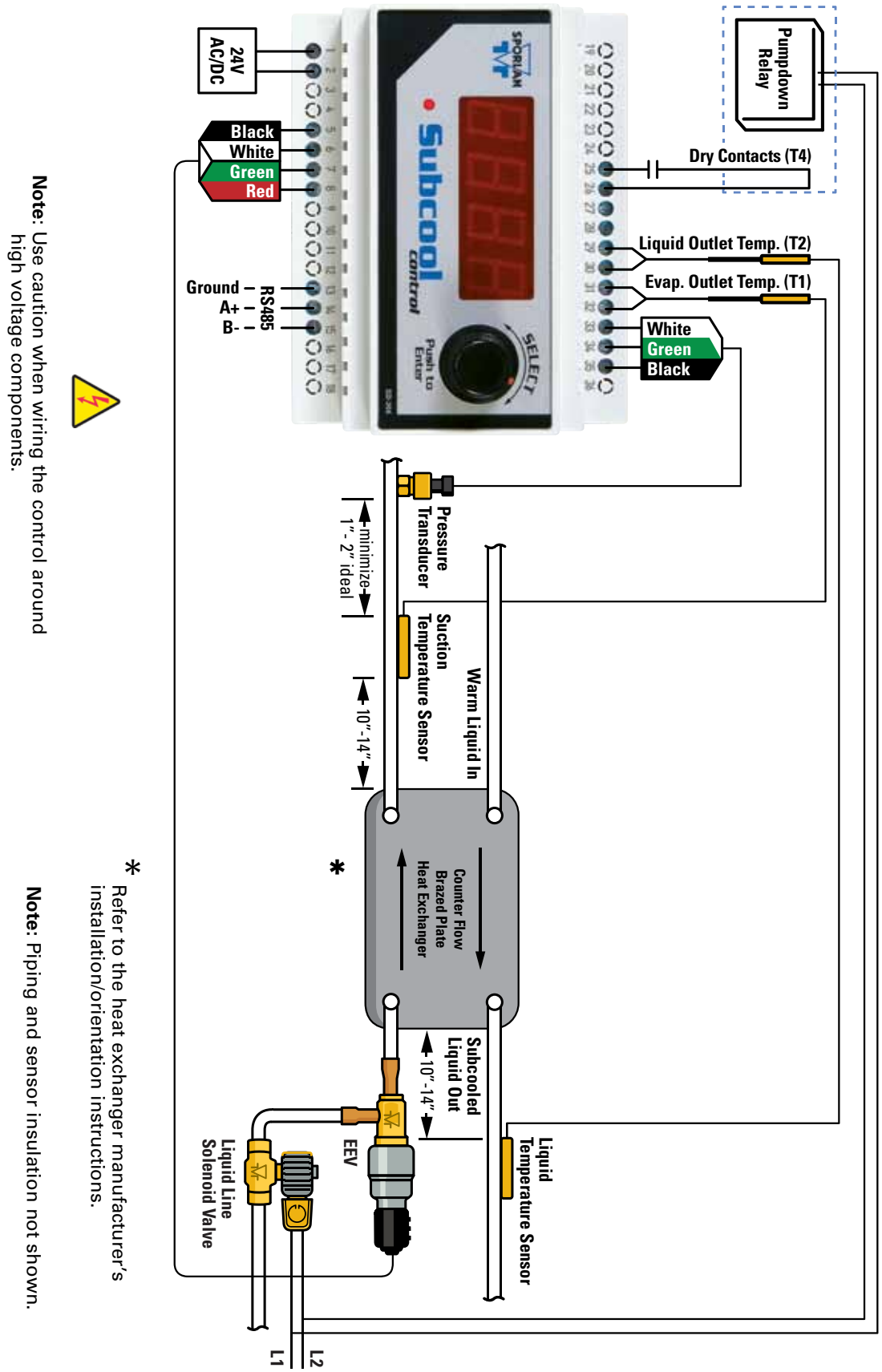
The system is now operational. See *Appendix F - Process Values,* for the variables that the Subcool Control monitors.

NOTE: Keep this document with equipment for future reference.

APPENDIX A - Subcool-O-Matic Wiring Diagram



APPENDIX B - New Subcool Control Wiring Diagram

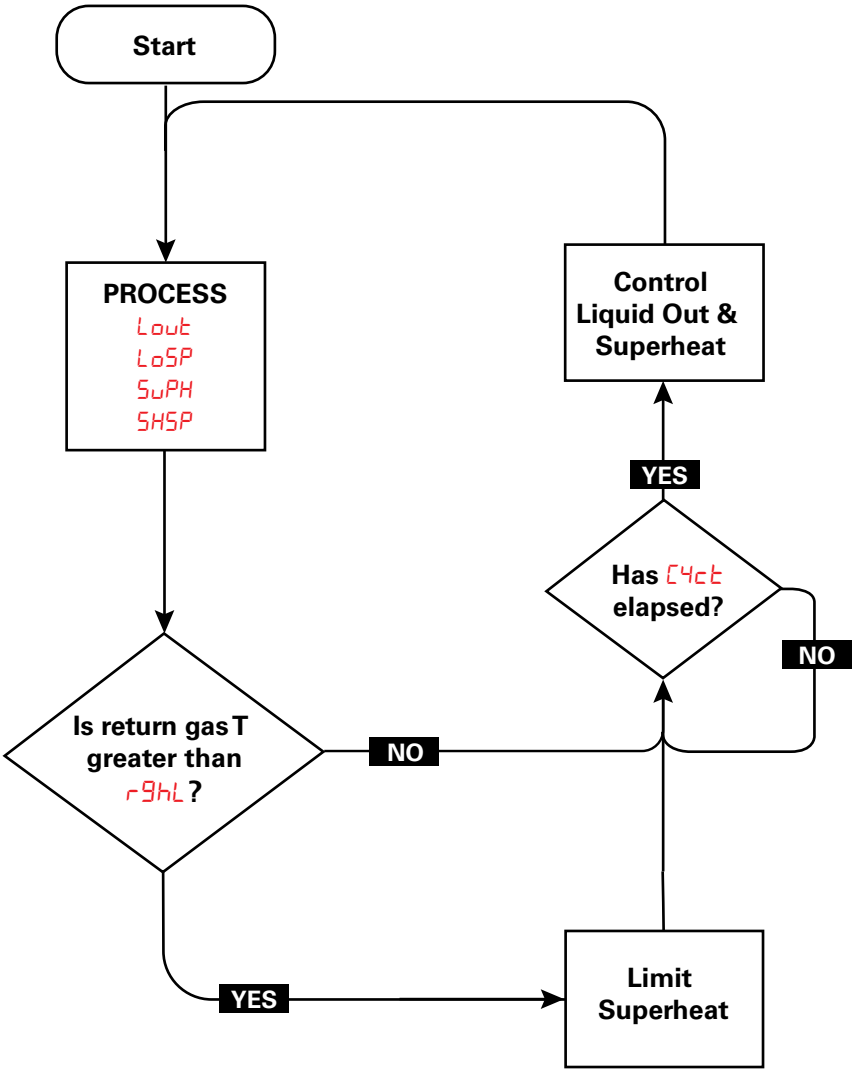


Note: Use caution when wiring the control around high voltage components.

* Refer to the heat exchanger manufacturer's installation/orientation instructions.

Note: Piping and sensor insulation not shown.

APPENDIX C - System Flow Chart



APPENDIX D - Setup Menu

SETUP MENU

Counterclockwise

Clockwise

StEP	**Valve Type** Default is 2500	

Display Readout	Description
1596	1596 Step Bipolar Valve
3193	3193 Step Bipolar Valve
2500	2500 Step Bipolar Valve
6386	6386 Step Bipolar Valve
400	400 Step Unipolar Valve

rEFr	**Refrigerant Type** Default is 404A NOTE: Select the actual refrigerant used in the system.	

Display Readout	Description
r22	R-22
134A	R-134a
402A	R-402A
404A	R-404A
407A	R-407A
407C	R-407C
410A	R-410A
417A	R-417A
422A	R-422A
422d	R-422D
r507	R-507A
r744	R-744
245F	R-245FA
r-E5	R-E5
438A	R-438A
401b	R-401B

PtYP	**Pressure Sensor Type** Default is Gauge	

Display Readout	Description
AbSL	Absolute Pressure Type
GAUG	Gauge (Sealed) Pressure Type

Prng	**Pressure Sensor Range** Default is 300	

Display Readout	Description
150	0-150 PSI
300	0-300 PSI
500	0-500 PSI

Default values are highlighted.

APPENDIX E - Setpoint Parameters

PARAMETERS			
ESC	Escape and Save Settings	-	
LoSP	Liquid Outlet Temperature Setpoint Change to desired Liquid Out Temp	10 to 100°F (-12.3 to 37.7°C) Default is 75°F (23.8°C)	
rGhL	Return Gas High Limit	40 to 120°F (4.4 to 48.8°C) Default is 120°F (48.8°C)	
SboF	Subcooler Off Temperature Differential	0 to 30°F (0 to 16.7°C) Default is 10°F (5.5°C)	
SHSP	Superheat Setpoint Change to desired Superheat Setpoint	5 to 45°F (2.8 to 25°C) Default is 10°F (5.5°C)	
rEFr Chosen at Setup	Refrigerant Type Change to desired Refrigerant Type	**Readout** / **Description** r22 / R-22 134A / R-134A 402A / R-402A 404A / R-404A 407A / R-407A 407C / R-407C 410A / R-410A 417A / R-417A 422A / R-422A 422d / R-422D r507 / R-507A r744 / R-744 245F / R-245FA r-E5 / R-E5 438A / R-438A 401b / R-401B	
H iCP	Maximum Valve Capacity	1 to 100% Default is 100	
-LP-	Liquid Proportional Coefficient	0 to 25.5 Default is 1.0 *Increase value to increase valve response to liquid out temperature*	
-LI-	Liquid Integral Coefficient	0 to 255 Default is 60 *Increase value to decrease valve response to liquid out temperature over time*	
-Ld-	Liquid Derivative Coefficient	0 to 255 Default is 0 *Increase value to increase valve response to change in liquid out temperature*	
-SP-	Superheat Proportional Coefficient	0 to 25.5 Default is 1.0 *Increase value to increase valve response to superheat*	
-SI-	Superheat Integral Coefficient	0 to 255 Default is 120 *Increase value to decrease valve response to superheat over time*	
-Sd-	Superheat Derivative Coefficient	0 to 255 Default is 0 *Increase value to increase valve response to change in superheat*	
LSH i	Low Superheat Integral Coefficient	1 to 255 Default is 10 *Increase value to decrease valve response to superheat over time, low Superheat condition*	

Counterclockwise

Clockwise

Default values are highlighted.

APPENDIX E - Setpoint Parameters (continued)

PARAMETERS			
CYCt	Cycle Time	1 to 10 seconds Default is 1	
StEP Chosen at Setup	Valve Type	**Readout**	**Description**
		1596	1596 Step Bipolar Valve
		3193	3193 Step Bipolar Valve
		2500	2500 Step Bipolar Valve
		6386	6386 Step Bipolar Valve
		400	400 Step Unipolar Valve
SPoS	Manual Valve Position	0 to 100% Open Default is 0	
Addr	MODBUS Network Address	1 to 255 Default is 1	
bAud	MODBUS Baud Rate	**Readout**	**Description**
		96	9600
		192	19200
		384	38400
nPAr	MODBUS Network Parity	**Readout**	**Description**
		nonE	No Parity
		EvEn	Even Parity
		Odd	Odd Parity
Un_P	Pressure Units	**Readout**	**Description**
		PSi	Pounds Force Per Square Inch
		bAr	Bars
Un_t	Temperature Units	**Readout**	**Description**
		FAHr	Fahrenheit
		CELS	Celsius
ttYP	Temperature Sensor Type	**Readout**	**Description**
		tYP3	3k
		tYP2	2k
PtYP Chosen at Setup	Pressure Sensor Type	**Readout**	**Description**
		AbSL	Absolute Pressure Type
		GAUG	Gauge (Sealed) Pressure Type
PrnG Chosen at Setup	Pressure Sensor Range	**Readout**	**Description**
		150	0-150 PSI
		300	0-300 PSI
		500	0-500 PSI
CALP	Pressure Sensor Calibration Offset	-5 to 5 PSI (-0.34 to 0.34 Bar) Default is 0	
CLt1	Suction Temperature Calibration Offset	-5 to 5°F (-2.7 to 2.7°C) Default is 0	
CLt2	Liquid Outlet Temp Calibration Offset	-5 to 5°F (-2.7 to 2.7°C) Default is 0	
CLt3	Liquid Inlet Temperature Calibration Offset	-5 to 5°F (-2.7 to 2.7°C) Default is 0	
CLt4	Auxiliary Temperature Calibration Offset	-5 to 5°F (-2.7 to 2.7°C) Default is 0	
CAdr	Controller Display Address	0 to 99 Default is 0, Do not change	

Counterclockwise

Clockwise

Default values are highlighted.

APPENDIX F - Process Values

PROCESS	DESCRIPTION
End	Controller display address CAdr must be reset *
Lout	Liquid Outlet Temperature
SuPH	Superheat (tout-tsat)
SucP	Suction Pressure
tSAt	Conversion of suction pressure to its saturated temperature.
tout	Sensible heat out of the evaporator
PoSn	Position of the EEV step motor
L in	Liquid Inlet Temperature (Optional)
S-4	Status of the Auxiliary Temperature Input
StAt	Controller Status
ALS	Controller Alarms

* If the controller display is alternating between CtrL, and either a number 1-99 or LocL, then scroll to LocL and press the Select knob to view the local controller attached to this display. Then press and hold the Select knob for approximately 5 seconds and enter password 111 when prompted. Scroll to CAdr (Controller address) and set it to 0. Exit the setpoint menu.

APPENDIX G - Controller Status

DISPLAY	DESCRIPTION
CooL	Subcool On
Pdn	Subcool Off (Pumpdown)
OFF	Subcool Off (When SboF and optional Liquid In temperature sensor is used)

APPENDIX H - Alarms and Failsafes

READOUT	DESCRIPTION	CAUSE and FAILSAFE
nonE	No Active Alarms	Normal Operation
PSAL	Pressure Sensor Alarm	When the pressure is outside the operating range. Will force a pump-down.
tSAL	Suction Temperature Sensor Alarm	When the suction temperature is outside the operating range. (under -60 degrees, over 150 degrees) Will force a pump-down.
LSAL	Liquid Outlet Temperature Sensor Alarm	When the liquid outlet temperature is outside the operating range. Will force a pump-down.
LSHA	Low Superheat Alarm	When superheat is below 3 degrees for 30 cumulative seconds or more.

NOTES

⚠WARNING – USER RESPONSIBILITY

Failure or improper selection or improper use of the products described herein or related items can cause death, personal injury and property damage.

This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product or system options for further investigation by users having technical expertise.

The user, through its own analysis and testing, is solely responsible for making the final selection of the system and components and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application, follow applicable industry standards, and follow the information concerning the product in the current product catalog and in any other materials provided from Parker or its subsidiaries or authorized distributors.

To the extent that Parker or its subsidiaries or authorized distributors provide component or system options based upon data or specifications provided by the user, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the components or systems.

SD-358R / 62012

Parker Hannifin Corporation
Sporlan Division
206 Lange Drive, Washington, MO 63090 USA
phone 636 239 1111
fax 636 239 9130
www.sporlan.com