

**Two VFD Compressor Staging  
APP- 043**

**Application:**

This application will explain some new software for the CR-110. The software is the CR-110 VSC ver 1.28 or later. This address the use of two compressor the same size, each one with the VFD. The example used here is for two 25hp compressors. Each compressor can be run from 50 to 100%. This new software will provide a linear increase or decrease in refrigeration demand from SL to 100%. In this example SL = 20%. Rdemand is the output of the XT panel.

**Staging:**

Rdemand	Lead %	Lag	Rdemand	Lead %	Lag	Rdemand	Lead %	Lag
20	50	0	51	50	58	82	66	100
21	52	0	52	50	60	83	68	100
22	54	0	53	50	62	84	70	100
23	56	0	54	50	64	85	72	100
24	58	0	55	50	66	86	74	100
25	59	0	56	50	68	87	76	100
26	61	0	57	50	69	88	78	100
27	63	0	58	50	71	89	79	100
28	65	0	59	50	73	90	81	100
29	67	0	60	50	75	91	83	100
30	69	0	61	50	77	92	85	100
31	71	0	62	50	79	93	87	100
32	73	0	63	50	81	94	89	100
33	74	0	64	50	83	95	91	100
34	76	0	65	50	84	96	93	100
35	78	0	66	50	86	97	94	100
36	80	0	67	50	88	98	96	100
37	82	0	68	50	90	99	98	100
38	84	0	69	50	92	100	100	100
39	86	0	70	50	94			
40	88	0	71	50	96			
41	89	0	72	50	98			
42	91	0	73	50	99			
43	93	0	74	51	100			
44	95	0	75	53	100			
45	97	0	76	55	100			
46	99	0	77	57	100			
47	50	51	78	59	100			
48	50	53	79	61	100			
49	50	54	80	63	100			
50	50	56	81	64	100			

**SETUP:**

Main Setup   Recip Compressor   Screw Compressor   Control   Alarms   Defrost   Com Terminal			
<input type="button" value="Get Tab Data"/> <input type="button" value="Program Tab Updates"/> <input type="button" value="Clear Tab Data"/>			
Network	<input type="text" value="51"/>	Setpoint	<input type="text" value="10"/> F
Profile	<input type="button" value="VFD Comp"/>	Short Cycle	<input type="text" value="10"/> sec
Input Mode	<input type="button" value="Ma Signal"/>	Comp OFF	<input type="text" value="25"/> psi
Signal	<input type="button" value="0-20ma"/>	Comp ON	<input type="text" value="55"/> psi
Gas Type	<input type="button" value="R-22"/>	Rotation	<input type="text" value="1440"/> min
Condenser	<input type="button" value="Fixed Head Press"/>	# of Comp's	<input type="text" value="2"/>
PID Mode	<input type="button" value="2 Comp VFD"/>	Max Horsepower	<input type="text" value="25.0"/> hp
Transducer	<input type="button" value="500 psi single"/>	Min Horsepower	<input type="text" value="12.5"/> hp

The Profile needs to be set to VFD Comp. The PID Mode must be set to 2 Comp VFD, this will enable the specific staging. The Rotation should be set to zero if no rotation is desired, other wise set to desired minutes.

Max Horsepower is the max horsepower for one compressor.

Min Horsepower is the horsepower when the compressor is running at the minimum setting.

Main Setup   Recip Compressor   Screw Compressor   Control   Alarms   Defrost   Com Terminal					
<input type="button" value="Get Tab Data"/> <input type="button" value="Program Tab Updates"/> <input type="button" value="Clear Tab Data"/>					
LLS OFF	<input type="text" value="5"/>	%	LLS ON	<input type="text" value="15"/>	%
Span L	<input type="text" value="20"/>	%	Span U	<input type="text" value="100"/>	%
Out 7 Off	<input type="text" value="0"/>	%	Out 7 On	<input type="text" value="100"/>	%
Out 8 Off	<input type="text" value="0"/>	%	Out 8 On	<input type="text" value="100"/>	%
Out 7 Time	<input type="text" value="0"/>	sec			
Out 8 Time	<input type="text" value="0"/>	sec			
Dis Temp Unload	<input type="text" value="200"/>	F			
Dis Press Unload	<input type="text" value="300"/>	psi			
RLA Limit	<input type="text" value="55"/>	amps			
Suc SP	<input type="text" value="60"/>	psi	Suc Span	<input type="text" value="20"/>	psi

The LLS setting can vary depending if the compressors are set for rotation and if the value of the offset. See the control tab.

Span L is the lower setting of the range. Span U is not used and the value is fixed at 100%.

Main Setup		Recip Compressor		Screw Compressor		Control		Alarms		Defrost		Com Terminal		
Get Tab Data				Program Tab Updates				Clear Tab Data						
Cond Fan SP	<input type="text" value="200"/>	psi	Output Offset	<input type="text" value="40"/>	%	Cond Fan Diff	<input type="text" value="10"/>	psi	Amps	<input type="text" value="1"/>	amps	System Drop	<input type="text" value="100"/>	psi
Filter	<input type="text" value="4"/>		Evap SH SP	<input type="text" value="12"/>	F	Proportional	<input type="text" value="10"/>		EV HI Limit	<input type="text" value="50"/>	F	Integral	<input type="text" value="5"/>	
Derivative	<input type="text" value="0"/>		EV Lo Limit	<input type="text" value="10"/>	F	Update	<input type="text" value="50"/>	.01 sec	EV Update	<input type="text" value="5"/>	min	Comp SH H	<input type="text" value="25"/>	F
Man Output	<input type="text" value="0"/>	%	Comp SH L	<input type="text" value="15"/>	F	Min Output	<input type="text" value="50"/>	%	SH Safety	<input type="text" value="0"/>	F			

The Output Offset will affect where the LLS turn on and off. If this is set to zero then the LLS for each compressor will turn on and off with the exact setting and the value of the Rdemand. With the offset at 40% the Lag compressor will operate on the signal (Rdemand - 40%). The Lead compressor will operate on Rdemand.

Example - Lead and Lag compressors LLS set to off at 5% and on at 15%. The lead compressors LLS will turn on as soon as the Rdemand signal is equal to or greater than 15%. The LLS will turn off as soon as the Rdemand signal is equal to or less than 5%. The Lag compressors LLS will turn on as soon as the Rdemand signal is equal to or greater than 40% + 15% or 55%. The Lag compressors LLS will turn off as soon as the Rdemand signal is equal to or less than 40% + 5% or 45%.

The offset and LLS setting can be adjust to make the compressors start and stop as desired.

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Last Request @ 4/22/2011 8:56:09 AM
Comp 51 Refrigeration
Discharge Press 286 psi
Discharge Temp 69 F
Suction Press 160 psi
Suction Temp 44 F
Suc Superheat 00 F
Ave Superheat 00 F
Evap Setpoint 12 F
Oil Press Diff 00 F
Comp Amps 59 Amps
Oil Pressure 00 psi
Refrig Demand 33 %
Floating SP 57 psi
Lead Run-time 00 min
Last Defrost 00 min
Lead Compressor 01
Comp1 VFD Out 75 %
Comp2 VFD Out 00 %
RHP 186
PID Output 75 %
    
```

RHP is the required horsepower. In this case 186 is 18.6 hp for the Rdemand signal.

Comp 1 VFD out is the output for compressor 1.

Comp 2 VFD out is the output for compressor 2.

C1 = Compressor 1  
 C2 = Compressor 2  
 U = Unit (minimum possible hp)  
 M = Max Compressor HP  
 TU = total units to meet refig demand  
 RHP = Required HP to meet refig demand  
 SL = Span Low percent  
 THP = Total HP available  
 Rd = Refrigeration demand percentage  
 Lead = lead compressor  
 Lag = lag compressor

**Two VFD Compressor Staging**  
**4-19-11 Rev C**

C1 VFD = 25 HP  
 C2 VFD = 25 HP  
 U = 12.5 HP

