

**Staging VFD Compressors using Gorman Panel
APP- 036**

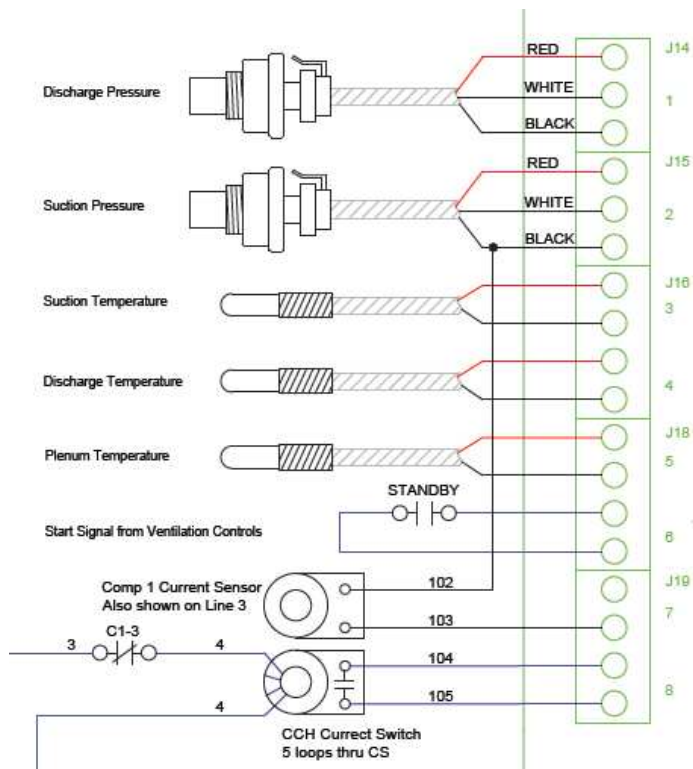
THEORY

This system is a retrofit with to reciprocating compressors. The Gorman control panel has two relay outputs with no analog for refrigeration. Currently the panel turned just turned both compressor on or off. At this point it was not in the budget to replace the panel. The new update will use a VFD on the first compressor. The second compressor will be fitted with a CR-110 card also. Compressor 1 will use a sensor on input 5 to control temperature. The temperature Setpoint will be set on Compressor 1 CR card. The two compressor are parallel, C1 is used to pump down.

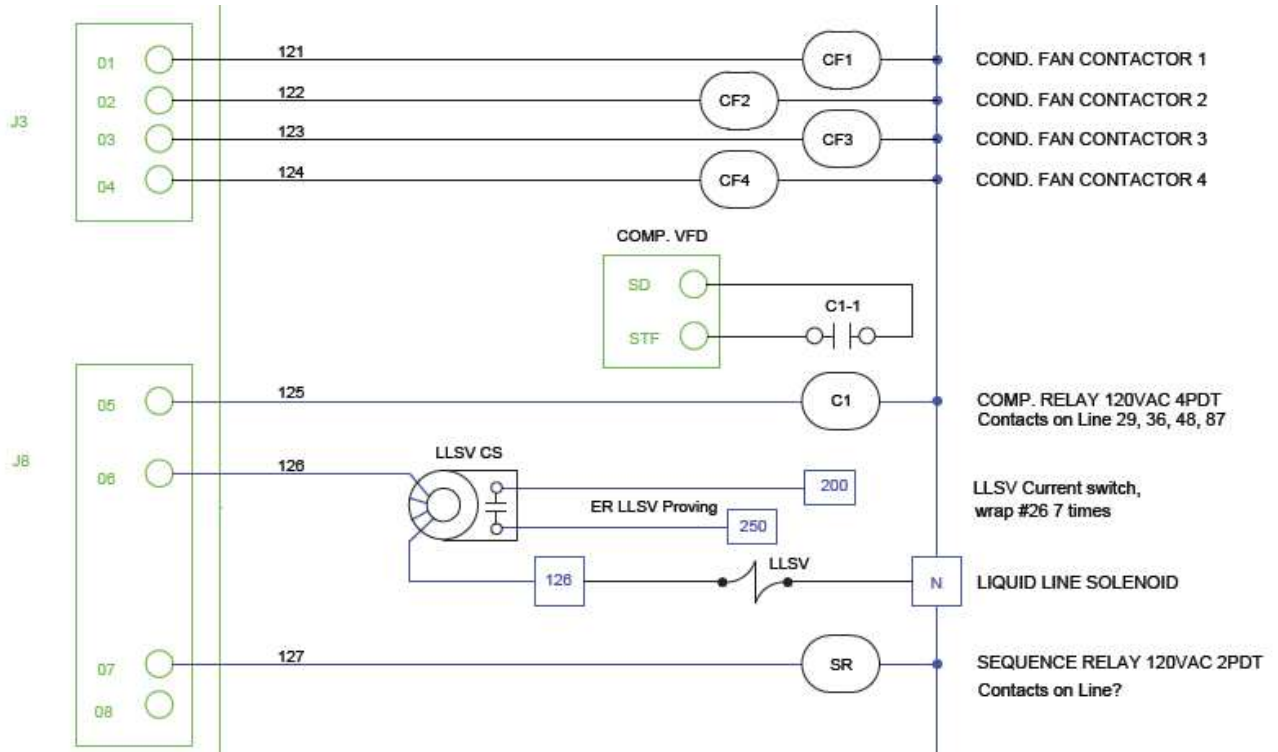
OPERATION

The Gorman panel will supply a dry contact to input 6 of CR 1 to start the Refrigeration mode. CR 1 will generate a PID output to the VFD based on the error between the temperature Setpoint and the temperature on input 5. CR 1 will be running the VSC software and has two settings for outputs 7 and 8. These settings are based off of the PID output percentage and are used to stage the second compressor. A normally closed contact from output 7 will keep compressor 2 in standby until it energies. A typical setting would be to energize output 7 at 95% output and turn it off at 30% output. This would allow C1 to ramp up to 95% and then turn on C2. Once C2 is turned on C1 would ramp down to control temperature.

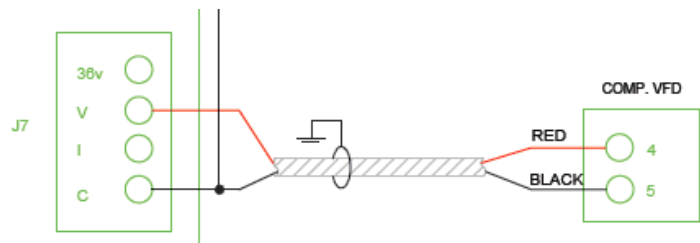
C1 Analog Inputs



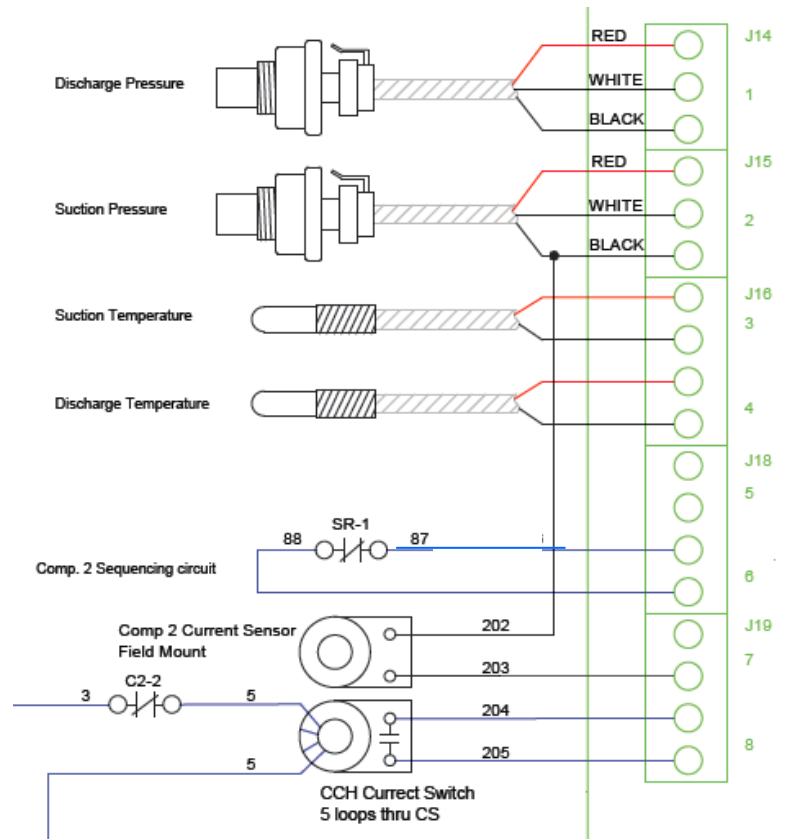
C1 Digital Outputs



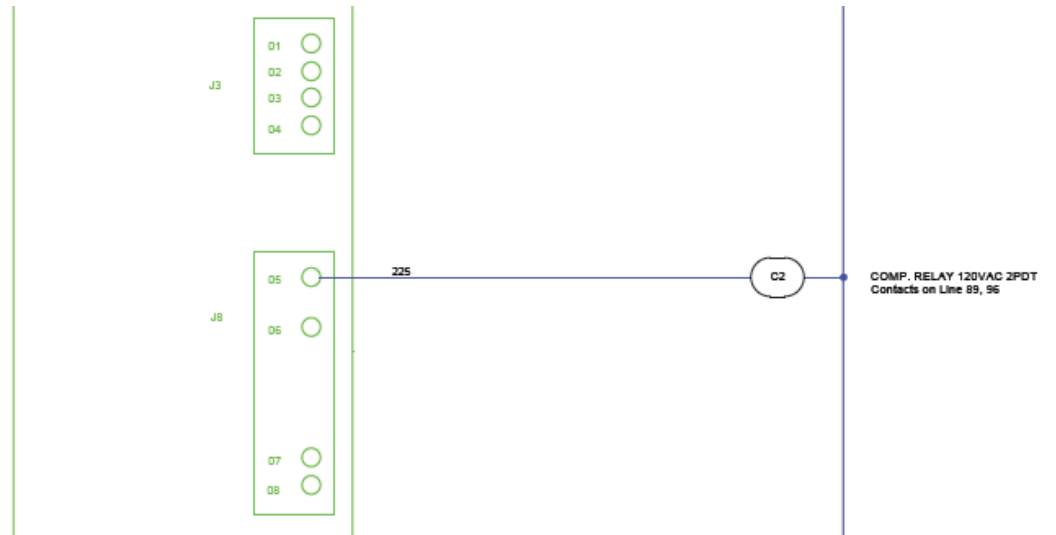
C1 Analog Output



C2 Analog Inputs



C2 Digital Outputs



Software Configuration

In this application, two different software files are used. C1 uses the VSC software and C2 uses the basic CR-110 file.

C1 Config

Profile: VFD Comp
 Filter: 4 0-10
 Network: 5 Unit: 1
 Input Mode: Setpoint

Pressure Transducer
 0 - 100 PSI
 0 - 500 PSI
 0 - 750 PSI

Ma Signal
 4-20 ma
 0-20 ma

Tandem
 Parallel
 LLS Reverse
 UL1 Reverse
 UL2 Reverse

Choose the correct pressure transducer. C1 and C2 are parallel compressors. C1 will pump down so do not check the parallel.

Input mode needs to be Setpoint. This will use input 5 and the Setpoint setting to control temperature.

C1 Config

Comp_off: 25 psi
 Comp_on: 55 psi
 Short_Cycle: 10 sec
 Rotation: 0 min
 Compressors: 2
 RLA_Alarm: 250
 RLA_Time: 100 sec

High Dis A: 325 psi
 High Dis U: 300 psi
 Low_Suc_A: 10 psi
 Low_Suc_T: 5 min
 AMP_Xducer: 1
 SHeat Lo: 12 F
 SHeat Hi: 50 F
 SHeat Timer: 0 min

Make sure that the rotation is set to zero and the compressors set to two.

C1 Config

Mode: Balanced Head F
 System Drop: 100 psi
 Gas Type: R-22
 Control Point: 200 psi
 Cond Fan Diff: 10 psi
 RLA_Limit: 250 amp
 PID Term: 0

LLS OFF: 5 %
 Span L: 10 %
 ST 1 Off: 30 %
 ST 2 Off: 30 %
 Low Suc U: 45 psi
 Dis Temp U: 200 F

LLS ON: 10 %
 Span U: 50 %
 ST 1 On: 95 %
 ST 2 On: 95 %
 Low Suc D: 10 psi
 Dis H Temp: 212 F

ST 1 Off and ST 2 On will control the staging of C2. The percentage is controlled off of the PID output not the cooling demand.

VIDT	<input type="text" value="0"/>	min	Defrost_off	<input type="text" value="0"/>	psi
Suc Diff	<input type="text" value="0"/>	psi	Temp Termination	<input type="text" value="0"/>	F
DIT	<input type="text" value="0"/>	min	DTT	<input type="text" value="0"/>	min
Max Def	<input type="text" value="0"/>	min	Coil_Dry	<input type="text" value="0"/>	sec

C1 Config

Proportional	<input type="text" value="40"/>	Update	<input type="text" value="50"/>	sec	
Integral	<input type="text" value="5"/>	Min Output	<input type="text" value="0"/>	%	
Derivative	<input type="text" value="0"/>	Man Output	<input type="text" value="0"/>	%	
SP	<input type="text" value="50"/>	Output Offset	<input type="text" value="0"/>		
COMP SH H	<input type="text" value="25"/>	F	EVAP SP	<input type="text" value="27"/>	F
COMP SH L	<input type="text" value="15"/>	F	EV HI LIMIT	<input type="text" value="50"/>	F
EV_UPATE	<input type="text" value="5"/>	min	EV LO LIMIT	<input type="text" value="10"/>	F
SH SAFETY	<input type="text" value="0"/>	F	Suc SP	<input type="text" value="60"/>	psi
Suc Span	<input type="text" value="20"/>	psi	PID Mode	<input type="text" value="SP"/>	

C1 Config

SP is degrees F and is the temperature Setpoint for controlling temperature using the sensor on input 5.

The PID Mode must be set to SP.

The PID parameters will control the response of the PID output that goes to the VFD.

Profile	<input type="text" value="Basic Refrig"/>	Pressure Transducer
Filter	<input type="text" value="4"/> 0-10	<input type="radio"/> 0 - 100 PSI <input checked="" type="radio"/> 0 - 500 PSI <input type="radio"/> 0 - 750 PSI
Network	<input type="text" value="5"/> Unit <input type="text" value="2"/>	Ma Signal
Input Mode	<input type="text" value="Ma Signal"/>	<input checked="" type="radio"/> 4-20 ma <input type="radio"/> 0-20 ma
C2 Config		<input type="checkbox"/> Tandem <input checked="" type="checkbox"/> Parallel <input type="checkbox"/> LLS Reverse <input type="checkbox"/> UL1 Reverse <input type="checkbox"/> UL2 Reverse

Compressor 2 uses the basic CR-110 software. The profile is Basic Refrig and the input mode is MA Signal. The input mode is used to just pass the refrigerant demand dry contact from the Gorman panel on C1 to C2.

This is a parallel compressor so make sure the Parallel check box is selected. C2 should not pump down.

Comp_off	<input type="text" value="10"/>	psi	DPA	<input type="text" value="325"/>	psi
Comp_on	<input type="text" value="50"/>	psi	HHPU	<input type="text" value="300"/>	psi
Short_Cycle	<input type="text" value="10"/>	sec	Low_Suc_A	<input type="text" value="8"/>	psi
Rotation	<input type="text" value="0"/>	min	Low_Suc_T	<input type="text" value="5"/>	min
Compressors	<input type="text" value="2"/>		LSH Inst	<input type="text" value="0"/>	F
Unloaders	<input type="text" value="0"/>		SHeat Lo	<input type="text" value="12"/>	F
Low_Ambient	<input type="text" value="0"/>	F	SHeat Hi	<input type="text" value="50"/>	F
			SHeat Timer	<input type="text" value="0"/>	min

C2 Config

Mode	<input type="text" value="Balanced Head F"/>	Liquid Line	<input type="text" value="5"/>	%	Liquid Line	<input type="text" value="10"/>	%	
	<input type="text" value="0"/>	Unloader 1	<input type="text" value="20"/>	%	Unloader 1	<input type="text" value="40"/>	%	
System Drop	<input type="text" value="70"/>	psi	Unloader 2	<input type="text" value="40"/>	%	Unloader 2	<input type="text" value="60"/>	%
Gas Type	<input type="text" value="R-22"/>	Unloader 3	<input type="text" value="50"/>	%	Unloader 3	<input type="text" value="0"/>	%	
Control Point	<input type="text" value="200"/>	psi	Low SP 1	<input type="text" value="55"/>	psi	Low SP 1	<input type="text" value="60"/>	psi
Cond Fan Diff	<input type="text" value="5"/>	psi	Low SP 2	<input type="text" value="60"/>	psi	Low SP 2	<input type="text" value="65"/>	psi
OSA Diff	<input type="text" value="5"/>	F						
PID Term	<input type="text" value="0"/>							

C2 Config

VIDT	<input type="text" value="0"/>	min	Defrost_off	<input type="text" value="0"/>	psi
Suc Diff	<input type="text" value="0"/>	psi	Temp Termination	<input type="text" value="0"/>	F
DIT	<input type="text" value="0"/>	min	DTT	<input type="text" value="0"/>	min
Max Def	<input type="text" value="0"/>	min	Coil_Dry	<input type="text" value="0"/>	sec

C2 Config

Proportional	<input type="text" value="5"/>	Update	<input type="text" value="2"/>	sec	
Integral	<input type="text" value="7"/>	Min Output	<input type="text" value="20"/>	%	
Derivative	<input type="text" value="50"/>	Man Output	<input type="text" value="5"/>	%	
SP	<input type="text" value="200"/>	Dead Band	<input type="text" value="0"/>		
COMP SH H	<input type="text" value="5"/>	F	Evap SH SP	<input type="text" value="10"/>	F
COMP SH L	<input type="text" value="1"/>	F	KI_div	<input type="text" value="0"/>	
EV_UPDATE	<input type="text" value="10"/>	min	EV HI LIMIT	<input type="text" value="0"/>	F
SH SAFETY	<input type="text" value="0"/>	F	EV LO LIMIT	<input type="text" value="0"/>	F
amps	<input type="text" value="1"/>	PID Mode	<input type="text" value="None"/>		

C2 Config

No PID mode is used for C2. The Set-point is not used on C2 also.