

**CR-110 Application Note
APP-003****Nelson Chiller**

This application Note will describe how to use the CR-110 to control 4 forty hp parallel compressors. The compressor have one LLS and one expansion valve. Each compressor has 2 unloaders, providing a total of 12 stages of refrigeration. The evaporator is a tube chiller bundle used to chill 20,000 gallons of process water to 40 degrees.

Theory

The CR-110 uses a PID loop based of off sensor 7 (outlet) and SP for card # 1. The PID loop produces a 0-100% signal that is passed on to each of the CR-110 cards. Each CR-110 card is set up to span 25% for the LLS and unloaders. Thus with 4 compressors the lead compressor will be fully loaded at 25%, 2nd compressor fully loaded at 50%, 3rd compressor fully loaded at 75% and the forth compressor fully loaded at 100%. As the compressors rotate, they just change percentages and rotate 1,2,3 and 4 then back to 1. The lead compressor is the only compressor that will pump down.

Start Up

Caution should be used when starting the system for the first time. It is recommend to bring one compressor on at a time. The circulation pump should be checked and operation verified before starting any of the compressors. The Setpoint should be set slightly below the outlet temperature so that the PID loop will come up slowly and allow the first compressor to run and load up. Gradually bring SP down to desired temperature and bring all compressors on line.

Logic

The Chiller profiles has several safeguards against freezing. The first is the low pressure control parameters. These parameters will unload the compressor if the suction pressure is running too low. These parameters will need to be adjust for this application. The second safeguard, looks at the chiller outlet temperature. If this temperature ever drops below the SP by 3 degrees, the PID loop is immediately set to zero.

The PID loop parameters can be changed to set the desired response of the system.

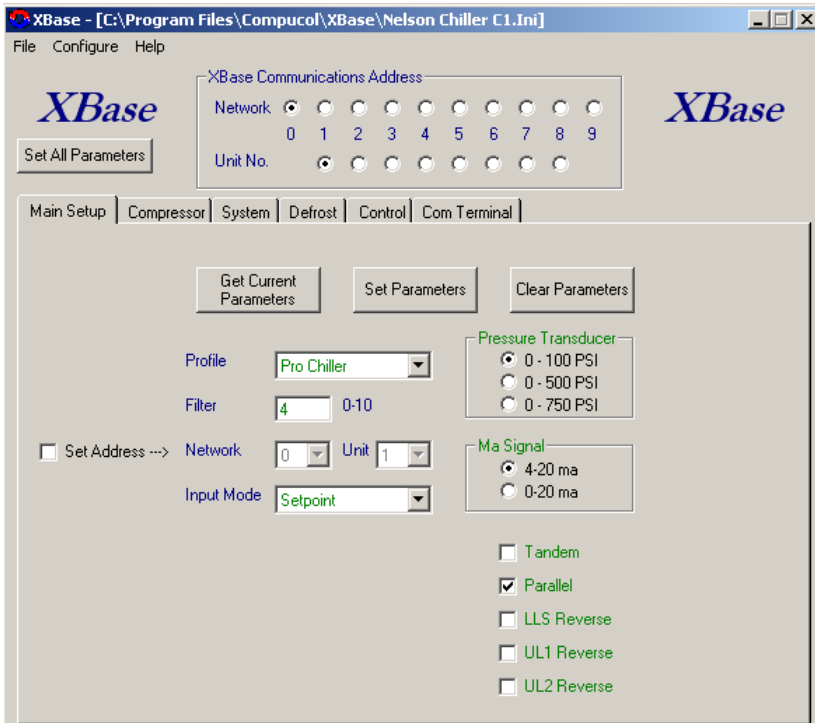
Nelson Chiller

7/17/2006	Comp 01	Comp 02	Comp 03	Comp 04
Data Name	Value	Value	Value	Value
Lead Diff	0	0	0	0
Filter	4	4	4	4
Backup Diff	0	0	0	0
DPA	325	325	325	325
Comp_off	25	25	25	25
Comp_on	40	40	40	40
Short_Cycle	10	10	10	10
Low_Suc_A	30	30	30	30
Low_Suc_T	3	3	3	3
Suction Drop	0	0	0	0
System Drop	100	100	100	100
Temp Termination	0	0	0	0
Control Point	200	200	200	200
Cond Fan Diff	10	10	10	10
OSA Diff	0	0	0	0
Liquid Line OFF	5	5	5	5
Liquid Line ON	15	15	15	15
Unloader 1 OFF	15	15	15	15
Unloader 1 ON	20	20	20	20
Unloader 2 OFF	20	20	20	20
Unloader 2 ON	25	25	25	25
Low SP 1 OFF	45	45	45	45
Low SP 1 ON	48	48	48	48
Low SP 2 OFF	44	44	44	44
Low SP 2 ON	47	47	47	47
Defrost_off	0	0	0	0
Suc Diff	0	0	0	0
DIT	0	0	0	0
DTT	0	0	0	0
SP	40	40	40	40
Proportional	15	15	15	15
Integral	5	5	5	5
Derivative	0	0	0	0
Update	50	50	50	50
Min Output	30	30	30	30
Man Output	25	25	25	25
Dead Band	25	25	25	25
Max Def	0	0	0	0
HHPU	300	300	300	300
VIDT	0	0	0	0
Rotation	1440	1440	1440	1440
Evap SH SP	0	0	0	0
Compressors	4	4	4	4
Unloaders	2	2	2	2
LSH Inst	0	0	0	0

SHeat Lo	12	12	12	12
SHeat Hi	50	50	50	50
SHeat Timer	0	0	0	0
Low_Ambient	0	0	0	0
Coil_Dry	0	0	0	0
Unloader 3	0	0	0	0
Unloader 3	0	0	0	0
PID Term	0	0	0	0
KI_div	10	10	10	10
KI_div2	20	20	20	20
KI_Thresh	3	3	3	3
PID Scale	0	0	0	0

Profile	Pro Chill	Pro Chill	Pro Chill	Pro Chill
Mode	Balanced	Balanced	Balanced	Balanced
Gas Type	R-22	R-22	R-22	R-22
Input Mode	Setpoint	Setpoint	Setpoint	Setpoint
PID Mode	SP	SP	SP	SP
Network	0	0	0	0
Unit	1	2	3	4

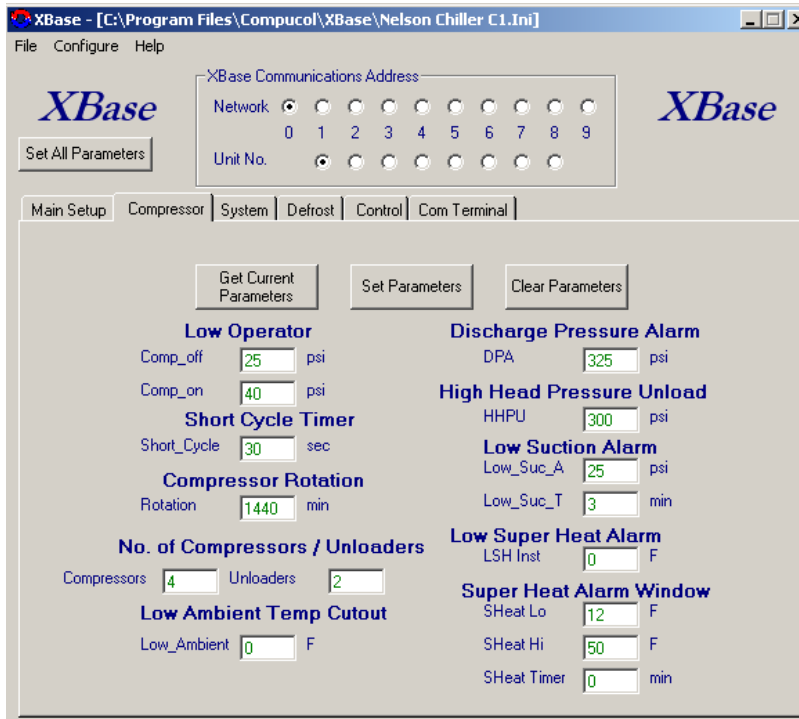
Tandem	no	no	no	no
Parallel	yes	yes	yes	yes
LLS Reverse	no	no	no	no
UL1 Reverse	no	no	no	no
UL2 Revers	no	no	no	no



0-100 is checked if using 100 psi xducer on the suction and 500 psi on discharge. Check 0-500 psi if using both 500 psi xducers.

Check Parallel if all compressors are in a parallel configuration and the lead compressor is the only compressor to pump down.

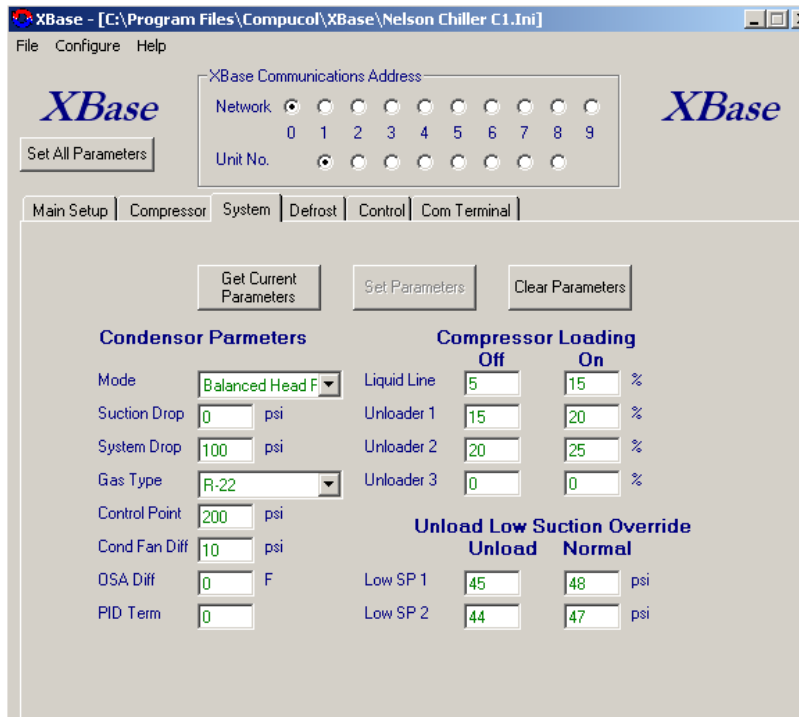
Note - at this point the Reverse checks do not work in the Chiller profile.



Low Operator values should be set according to application.

Super Heat Alarm Window is disabled with the SHeat Timer set to 0. Once the system is up and running and super heats stabilized, these setting should be set.

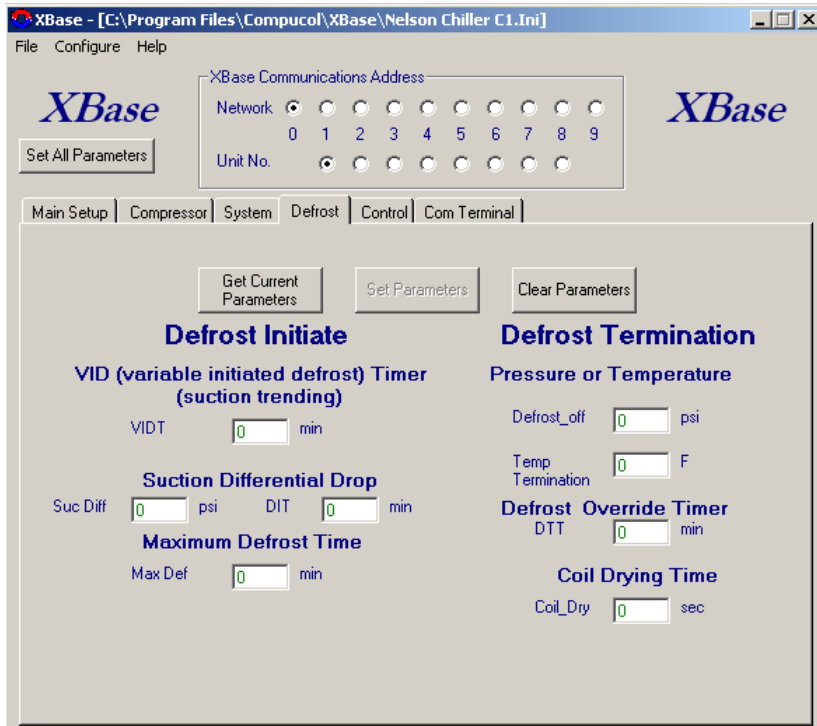
The Low Suction alarm needs to be set according to the system temperatures and Setpoint. This is a critical alarm in the chiller system.



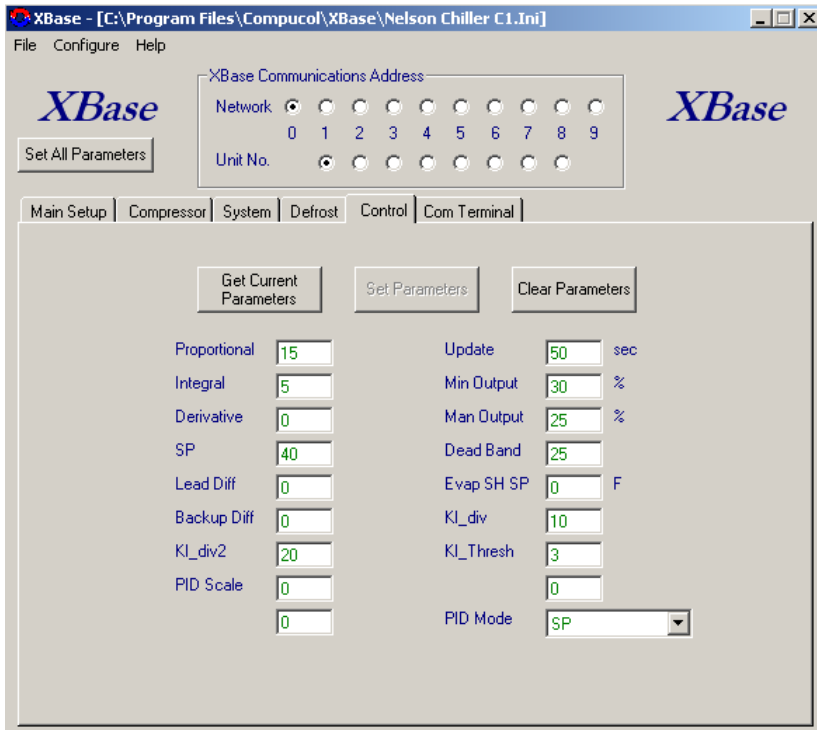
The minimum head pressure is the System Drop + Suction pressure. If the head pressure is running to low, you can adjust the System Drop.

The LLS and Unloaders should be set for a span of 25% with 4 compressors.

Adjust the Unload Low Suction Override according to the desired setpoint. With a water system, great care much be taken not to freeze the system up.



No defrost parameters are used in this application.



The main PID parameters are the Porportional, Integral, Derivative, and the Update time. This application does not use Derivative, so it is set to 0. If the system is not responding fast enough, the Update timer should be lowered. The Update time is .1 sec increments, thus 50 is equal to 5 seconds.