

**Basic Refrigeration CR-110 Parameters
APP- 023**

This application note will explain the parameters associated with the set up of a CR-110 card for Basic Refrigeration, Polar Pak, Reverse Hot Gas, Air Defrost and Elec Defrost. This document uses the xbase.inf (6-6-08) file. Other app notes will cover the screw and vfd units.

Profile:

The Profile is used to select the desired operation of the CR-110. Valid profiles for this application are Basic Refrig, Polar Pak, Reverse Hot Gas, Air Defrost and Electric Defrost.

Filter:

This is a digital filter for all the analog inputs. It can be set from 1 to 10. One would be the least filtering and ten would be the max filtering. The recommended filter setting is

four.

Network:

This is the first number assigned to a condenser unit. Example - CR card address 01 would be network 0, compressor 1. CR card address 12 would be network 1 and compressor 2. A network is defined as a group of compressor that will stage together. Example - You could have two separate systems with multiple compressors on the same communications bus, one group would be network 0 and the other network 1. For system running on non XT-70 control panels the network is typically 0-4. For XT panels the network must be 5 or 7.

Unit:

The unit number is assigned starting with 1 and can go up to 8. Example - a two compressor system would have units 1 and 2. For staging and rotation, you must always start at 1 and go consecutive.

Set Address:

The Set Address is used to change the address of the CR card. When checked, you can change the address of the card. Note - the CR card must be in the test mode before it will accept a new address. To change the CR card to the test mode, turn the S2 switch to the center off position. Then turn the S2 switch first to the RUN position and then, within three seconds switch to the PD position. All the LED indicators should be lit when in the test position.

Input Mode:

The input mode allows you to select the type of input you are using for the staging of the system. Ma Signal, Setpoint, Pulse and Setpoint C are valid inputs. Ma Signal is selected if you are using a 4-20ma or 0-20ma signal from a control panel. Pulsed is selected if you are using a IVI or panel that produces a open and close dry contact for control. Setpoint and Setpoint C are used when a thermistor on the CR card is used for temperature control. Setpoint C is used for controlling in degrees Celsius.

Pressure Transducer:

This refers to the range of the suction transducer that you are using. The discharge transducer is always a 0-500 psi transducer. The suction transducer could be a 0-100 or 0-500 psi transducer.

Tandem:

Not used

Parallel:

If you check this box, the compressor will not pump down when the LLS closes. This should be check on compressor in a parallel system that you do not want to pump down.

LLS Reverse:

If you check this box, the LLS output will be normally closed.

UL1 Reverse:

If you check this box, the UL1 output 7 will be normally closed. Note - currently the output is on when unloaded.

UL2 Reverse:

If you check this box, the UL1 output 7 will be normally closed. Note - currently the output is on when unloaded.

Comp_off	<input type="text" value="20"/>	psi	DPA	<input type="text" value="325"/>	psi
Comp_on	<input type="text" value="35"/>	psi	HHPU	<input type="text" value="300"/>	psi
Short_Cycle	<input type="text" value="10"/>	sec	Low_Suc_A	<input type="text" value="10"/>	psi
Rotation	<input type="text" value="1440"/>	min	Low_Suc_T	<input type="text" value="5"/>	min
Compressors	<input type="text" value="1"/>		LSH Inst	<input type="text" value="0"/>	F
Unloaders	<input type="text" value="3"/>		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

Comp_off:

Suction pressure at which compressor will shut off during pump down.

Comp_on:

Suciton pressure at which compressor will come on in Refrigeration.

Short_Cycle:

The short cycle timer will prevent the compressor from short cycling. Set the SCT value, in seconds for the desired off time, before the compressor can restart.

Rotation:

This timer is minutes and is used to switch the lead compressor. Once compressor # 1 has run the rotation setting, it will rotate the lead to the number two compressor. The staging for compressor # 1 will shift to compressor # 2 and the last compressor will send its staging to compressor # 1. The number of compressors must be set above 1 for this feature to be active.

Compressors:

Set this for the number of compressors in the network that will be staged.

Unloaders:

Set this for the number of Unloaders on the compressors.

Low_Ambient:

This should normally be set for zero to disable it. The UOM is seconds and this value is used for a cold weather start. If you are operating in extreme cold weather so that when the LLS is open the suction pressure will not raise, then you can use this value. A typical setting would be 30 seconds. When the LLS opens the compressor will immediately start and run for 30 seconds. If the suction pressure raises during this time it would continue to run. If the suction pressure does not raise, then it would short cycle and try running again.

DPA: (Discharge Pressure Alarm)

This is a soft high head pressure alarm. It should be set about 30 psi less than the mechanical high pressure switch.

HHPU: (High Head Pressure Unload)

When the ambient air temperature exceeds the rating of the condenser, the condenser no longer has the ability to reject the full load heat. This can produce a nuisance high head pressure alarm. The HHPU feature will automatically unload the compressor, and prevent this alarm. The HHPU setting should be set below the soft high head alarm. Example - if set for 300 psi, unloader # 2 would unload when the discharge exceeded 300 psi. It would reset

when the pressure dropped below 295. If the pressure exceeded 310 psi, unloader # 1 would also unload, the reset point would be 305. Thus you can set the HHPU for any pressure and the reset will be at 5 psi less and the unload point for the #1 unloader will be 10 psi above.

Low_Suc_A: (Low Suction Alarm)

This alarm has two components; first is the low suction pressure point and second is the timer. The alarm is active only in the refrigeration, defrost, and pump down modes. If the suction pressure drops below this setting and remains there for the duration of the timer, the system will shut down and go into an Alarm mode. A value of zero in the timer will disable the alarm.

Low_Suc_T: (Low Suction Timer)

This is the timer for the Low Suction Alarm. The UOM is minutes and a typical value would be 5. A setting of zero will disable the alarm.

LSH INST: (Low Super Heat Instantaneous)

This alarm should not be used and needs to have a value of 0.

SHeat Lo: (Super Heat Lo Alarm)

This is the low side of the compressor suction super heat alarm window. If the suction super heat drops below this value and the associated timer expires the compressor will be shut down. A typical setting would be 8 degrees.

SHeat Hi: (Super Heat Hi Alarm)

This is the high side of the compressor suction super heat alarm window. If the suction super heat raises above this value and the associated timer expires, the compressor will be shut down. A typical setting would be 30 degrees.

SHeat Timer: (Super Heat Timer)

This is the timer for the Lo and Hi super heat window. A typical setting would be 10 minutes. A setting of zero will disable this alarm.

Mode	Balanced Head F	Liquid Line	10 %	Liquid Line	20 %
	0	Unloader 1	20 %	Unloader 1	30 %
System Drop	100 psi	Unloader 2	30 %	Unloader 2	40 %
Gas Type	R-22	Unloader 3	40 %	Unloader 3	50 %
Control Point	200 psi	Low SP 1	20 psi	Low SP 1	25 psi
Cond Fan Diff	10 psi	Low SP 2	25 psi	Low SP 2	30 psi
OSA Diff	0 F				
PID Term	0				

MODE: (Condenser Fan Mode of Operation)

The mode refers to the type of air cooled condenser fan control that is desired.

Fixed Head Pressure uses the Control Point setting and Cond Fan Diff to cycle the condenser fans off and on.

Balanced Head Pressure control will float the head pressure depending on the ambient air conditions. The lowest pressure that the system will float to is the System Drop plus the suction pressure. The Cond Fan Diff is used to stage the condenser fans.

Balanced PID Pressure control will produce a 4-20ma signal for a variable freq drive condenser fan.

System Drop:

This is the total system pressure drop. A typical value would be 70 psi. The Balanced Head pressure Mode uses this value for controlling the head pressure. The controlling pressure is determined by the suction pressure plus the System Drop.

Gas Type:

Select the type of gas being used. This is a critical selection that allows the proper super heat to be calculated.

Control Point:

This is the desired head pressure in psi. This value is only used in the fixed head pressure control, or if one of the parameters used in the Balanced Head pressure control is missing.

Control Fan Diff:

Rather than have to enter all the values for each stage of the condenser fans to cut in and out, a differential value is used. The recommended value is 5 psi.

	Stage 1	Stage 2	Stage 3	Stage 4
OFF	CP	CP + D	CP + 2D	CP + 3D
ON	CP + 2D	CP + 3D	CP + 4D	CP + 5D
Example	Control point = CP = 200	Differential = D = 10		
OFF	200	210	220	230
ON	220	230	240	250

OSA Diff:

This value is not used and should be set to zero.

PID Term:

This is a value that is used for engineering only. It should be set to zero.

The following values are based on a 0-100% output.

Liquid Line Off - On:

The first value is the Liquid Line off value and the second is the on value. These values are in percent and will determine when the LL solenoid will open and when it will close. A typical value would be 5% off and 10% on.

Unloader 1 Off - On:

The first value is the Unloader 1 off value and the second is the on value. On would mean that the cylinder is loaded and pumping. The staging will depend on the number of compressor in the system.

Unloader 2 Off - On:

The first value is the Unloader 2 off value and the second is the on value. On would mean that the cylinder is loaded and pumping. The staging will depend on the number of compressor in the system.

Low SP 1 On - Off:

If the suction pressure drops below the first On value, unloader # 1 will unload. As soon as the suction pressure raises above the off value, the unloader will return to normal operation.

Low SP 2 On - Off:

If the suction pressure drops below the first On value, unloader # 2 will unload. As soon as the suction pressure raises above the off value, the unloader will return to normal operation.

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

VIDT: (Variable Initiated Defrost)

This is a unique way in which a trend is established for determining the suction pressure operating point. This timer sets the length of time that the trend is taken. This allows the CR-110 to determine a defrost initiation based on a drop in suction pressure rather than just time. A normal setting would be between 30 and 60 minutes. Set to zero to disable.

Suc Diff: (Suction Differential)

Once a trend is established for the suction pressure, this value would be subtracted from the trend suction pressure and would be used to initiate a defrost cycle when the suction pressure was below this calculated value for a given time. A normal setting would be 3-5 psi. Set to zero if this operation is not desired.

DIT: (Defrost Initiated Timer)

This is the amount of time the suction pressure would be below the Suc Diff point before initiating a defrost. A setting of zero will disable this feature.

Max Def: (Max Defrost Time)

This is the time in minutes for the next defrost. If a defrost is not initiated using the VIDT then this time will initiate a defrost. Set to zero to disable all defrost cycles.

Defrost_Off: (Defrost Termination Pressure)

This is used for hot gas defrost termination. As soon as the discharge pressure rises above this value, the defrost will be terminated.

Temp Termination:

This value is not used and should be set to zero.

DTT: (Defrost Termination Timer)

This is the time in minutes that the defrost cycle will run before being terminated. A setting of zero will disable this feature. For hot gas defrost, this time will override the discharge pressure termination.

Coil_Dry: (Coil Freeze)

This is the time in seconds that the coil will be dried after the defrost termination. The system will run with the compressor and the LLS open, but the evaporator fans will be off.

Proportional	<input type="text" value="5"/>	Update	<input type="text" value="50"/> sec
Integral	<input type="text" value="0"/>	Min Output	<input type="text" value="5"/> %
Derivative	<input type="text" value="0"/>	Man Output	<input type="text" value="50"/> %
SP	<input type="text" value="45"/>	Dead Band	<input type="text" value="0"/>
COMP SH H	<input type="text" value="17"/> F	Evap SH SP	<input type="text" value="15"/> F
COMP SH L	<input type="text" value="15"/> F	KI_div	<input type="text" value="10"/>
EV_UPDATE	<input type="text" value="5"/> min	EV HI LIMIT	<input type="text" value="15"/> F
SH SAFETY	<input type="text" value="5"/> F	EV LO LIMIT	<input type="text" value="6"/> F
amps	<input type="text" value="0"/>	PID Mode	<input type="text" value="None"/>

Proportional:

This value is only used when the PID Mode setting is other than None. The Proportional constant is simply a multiplier that can be used to fine tune the size of the Proportional Mode adjustment. Raising the value of P results in a greater reaction to input value changes. A typical setting would be 5-20.

Integral:

This value is only used when the PID mode setting is other than None. The I value is what will cause the output to change when the input is not changing and is steady state. Increasing this value to much will cause the system to become unstable. A typical value would be 5.

Derivative:

This value is only used when the PID mode setting is other than None. The Derivative is constantly analyzing the rate of change of the error, makes a prediction about what the future error will be and makes adjustment to the output in an attempt to reduce the rate of change in the error. For most cases the derivative is disabled by setting it to zero.

SP: (Setpoint)

This value is only used when the input mode is Setpoint or Setpoint C. This would be used as a stand alone controller and would use a thermistor for a controlling sensor. If you are not using Setpoint or Setpoint C the value does not matter.

COMP SH H (Compressor Super Heat High)

This value is for the automatic compressor super heat control. It should be set to zero if not using this feature. This is the high value for the desired window for the compressor operation. Typical compressor suction superheat operation should be maintained between 18 to 20 degrees. In this case you would set the Comp SH H to 20 and the Comp SH L to 18. This feature is only available when using the ER-110 controller.

COMP SH L (Compressor Super Heat Low)

This value is for the automatic compressor super heat control. It should be set to zero if not using this feature. This is the low value for the desired window for the compressor operation. Typical compressor suction superheat operation should be maintained between 18 to 20 degrees. In this case you would set the Comp SH L to 18 and the Comp SH H to 20. This feature is only available when using the ER-110 controller.

EV_UPDATE: (Evaporator Update time)

This is the time in minutes that the CR-110 broadcasts to the ER-110 cards for an update on the Super Heat Setpoint. A typical setting would be 10 minutes.

SH SAFETY: (Super Heat Safety)

This is a safety setting for the compressor suction superheat. A typical setting would 10 degrees. If the compressor suction superheat dropped below this setting the CR-110 would broadcast to all ER-110 to default to a super heat Setpoint of 12 degrees. As soon as the compressor super heat warmed back up, then auto control would resume.

Amp:

If an amp transducer is being used this parameter will select the range of the transducer. 0 = 0-50 amps, 1 = 0-100 amps, 2 = 0-200 amps.

Update:

This is the update time for the PID loop and is active only when the PID is being used. This is in 10ths of a second. A typical setting would be 50 which would be 5 seconds. The PID loop is active only when running an input mode of Setpoint or Setpoint C. It is also active if using a freq drive on the compressor or running suction control.

Min Output:

This is only used when the PID Mode is Comp Freq. Min output is the lowest percentage of the 0-20ma signal from the CR-110 to the freq drive.

Man Output:

Man Output sets the span for the 0-20ma signal to the freq drive. A setting of 25% will allow the drive to go from 30% or minimum setting to 100% for a 25% change of the control panel input signal.

Dead Band:

The Dead Band setting is used for compressor rotation. If you only have one compressor, this setting is not used. If you have two compressors, this setting would be 50 %. If you have three compressors then set it for 33% and for four compressors set it for 25 %. The liquid line solenoid and unloaders should be staged less than this setting. Example if you have two compressors, all staging on both compressors should be from 0-50%. In this example the lag compressor will subtract 50% from the output of the lead compressors. This will cause the lag to stage from 50-100% but have the same settings as the lead compressor.

Evap SH SP: (Evaporator Super Heat Setpoint)

This parameter is only used when the CR-110 card is used in conjunction with a ER-110 card. This is the actual value that is being broadcast to the ER-110 cards for their Super Heat Setpoint. This value will automatically change if the auto super heat control is active. If you are running in auto super heat, the CR-110 constantly monitors and averages the compressor suction super heat. If the suction superheat is outside of the super heat window, then it will change the Evap SH SP and broadcast this value to all the associated ER-110 cards.

KI_div: (PID Scaling parameter)

This is for engineering only, do not change this value. The default value is 10.

EV HI Limit: (Evaporator High Limit)

When running in auto super heat mode, this is the High Limit that the super heat setpoint can be incremented to.

EV LO Limit: (Evaporator Low Limit)

When running in auto super heat mode, this is the Low Limit that the super heat setpoint can be decremented to.

PID Mode:

For most of the application this should be set to None. If you are using a VFD on a compressor or running suction control you need to use the CR-110 VSC software and inf file.