

**ER-110 Electronic Expansion Valve Parameters
APP- 024**

ER-110 Parameters

This application note will define each of the parameters used on the ER-110 card. The card's main purpose is to control a stepper valve for the superheat control on an evaporator or a stepper valve controlling the suction pressure on an evaporator. The ER-110 card can control two valves with one card.

The screenshot shows a configuration interface with the following settings:

- Profile: Double EEV
- Filter: 4 (range 0-10)
- Set Address: (unchecked)
- Network: 6
- Unit: 1
- Input: None
- Pressure Transducer: 0 - 100 PSI (selected)
- Ma Signal: 4-20 ma (selected)

Profile:

The Profile is used to select the desired operation of the ER-110. Valid profiles for this application are Double EEV, Single EEV and EEV-EPR.

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 - ER card address 01 would be network 0, evaporator 1. ER card address 12 would be network 1 and evaporator 2. A network is defined as a group of cards that work together on the same system. Example - You could have two separate systems with multiple compressors and evaporators 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 for compressors and 6 or 8 for evaporators.

Unit:

The unit number is assigned starting with 1 and can go up to 8.

Set Address:

The Set Address is used to change the address of the ER card. When checked, you can change the address of the card. Note - the ER card must be in the test mode before it will accept a new address. To change the ER card to the test mode, turn the power off and put a jumper on input 8. Then turn the power back on. The four red LED indicators should be lit when in the test position.

Input:

The input selection tells the card how to operate. If the card is being used as a EEV only, select the None mode. If you are using the card as a EEV and EPR, select the type of input

signal for the controller. It could be either a 0-20ma or a 4-20ma.

Pressure Transducer:

It is highly recommended that a 0-100 psi suction transducer be used. Select the appropriate transducer.

Ma Signal:

The ma selection is not used.

SH_A_Diff	<input type="text" value="0"/>	F	<input type="text" value="0"/>
SH_B_Diff	<input type="text" value="0"/>	F	<input type="text" value="0"/>
SH_A_Timer	<input type="text" value="0"/>	sec	<input type="text" value="0"/>
SH_B_Timer	<input type="text" value="0"/>	sec	<input type="text" value="0"/>
Fail Safe A	<input type="text" value="0"/>		<input type="text" value="0"/>
Fail Safe B	<input type="text" value="0"/>		<input type="text" value="0"/>
T_Enable	<input type="text" value="0"/>		<input type="text" value="0"/>

These values have to do with a new mode of operation. This has not been fully tested in the field and should not be used at this time. Version 2.53 and higher use these parameters. At this time it is suggested that all values be set to zero. This will disable this feature.

Failsafe operating mode:

One of the issues of using electronic expansion valves is the possibility of having a temperature sensor drift. This can cause the superheat to be read wrong and have the valve position wrong. This is the same thing that can happen with a mechanical valve that develops a leak in either the pressure or temperature. The only way to safeguard this is to use a second temperature sensor. The ER has two extra temperature sensors on input 7 & 8. To activate the failsafe mode, install an extra sensor in the same position as the current suction temperature sensor. Input 7 would measure the suction temperature for valve A and input 8 is for valve B. If the difference in the two sensors varies more than the difference parameter for the set number of seconds, the card will go into a suction sensor fail and then would reposition the valve to the Failsafe position. This would allow systems with multiple evaporators to continue to run without shutting the entire system down.

SH_A_Diff & SH_B_Diff:

These are the differential setting for each valve. A typical setting would be two degrees. If there was more than two degrees between the two suction sensors then the alarm timer would start. Once the timer times out the valve will be positioned to the Failsafe percentage. The Failsafe percentage could be zero or say 10 percent.

T_Enable:

T_Enable is used for engineering. It enables the PID calculations to stream in terminal. It should be set to zero.

	None	LLS OFF	5 %	LLS ON	10 %
KL_div	10		0		0
KL_div2	20		0		0
Gas Type	R-22		0		0
PID Scale	0		0		0
Init Pos	30 %		0		0
Settle	20 sec				
KL_Thresh	3				

KL_div: This is an engineering unit and should be defaulted to 10.

KL_div2: This is an engineering unit and should be defaulted to 20.

Gas Type: Select the type of gas being used. This is a critical

selection that allows the proper superheat to be calculated.

PID Scale:

This is an engineering unit and should be defaulted to 0.

Init Pos:

When the system first goes into Refrigeration, the valve should initially go far enough open to allow the compressor to start and not pull the suction pressure down. A typical setting would be 20 to 30 percent. If this percentage is too high, it may cause the superheat to drop.

Settle:

The Settle parameter is the time in seconds that the valve will remain in the Init Pos. Once this time is up, the valve will go to its normal PID operation.

KL_Thresh:

This is an engineering unit and should not be changed. The default is three.

LLS OFF & ON:

The ER card is driven by a input signal from the control panel. This input signal goes from 0 to 100%. The output of the ER card will open and close the Liquid Line Solenoid based on this percentage.

Def Enable	0 psi	Def End	0 min
Def Cycle	0 min	Coil Dry	60 sec

Def Enable:

This setting is in psi and will determine when the defrost is active. The suction pressure must be less than this value for the defrost cycle to be active. This parameter is only used when the ER card is being used to initiate the defrost. This

typically would be when the card is set to control a EEV and EPR. A zero will disable the defrost cycle.

Def Cycle:

If the Suction pressure is below the Def Enable, this is the time in minutes until the defrost is

initiated.

Def End:

This is the length of the defrost cycle in minutes.

Coil Dry:

Once the defrost cycle is over, the mode will change to Coil Dry. This is the time in seconds where the LLS will open without the evaporator fan running. This will freeze the free water on the coil before the fans turn on.

Proportional	<input type="text" value="15"/>	Update	<input type="text" value="50"/>	<input type="text" value=".1s"/>
Integral	<input type="text" value="5"/>	Min Output	<input type="text" value="0"/>	<input style="width: 20px;" type="text" value="%"/>
Derivative	<input type="text" value="0"/>	Man Output	<input type="text" value="50"/>	<input style="width: 20px;" type="text" value="%"/>
V1 Steps	<input type="text" value="1596"/>	V2 Steps	<input type="text" value="1596"/>	
Max SP	<input type="text" value="19"/>	Evap SH SP	<input type="text" value="16"/>	<input style="width: 20px;" type="text" value="F"/>
Min SP	<input type="text" value="9"/>	EPR SP	<input type="text" value="60"/>	<input style="width: 20px;" type="text" value="psi"/>
Valve Limit	<input type="text" value="0"/>	Range	<input type="text" value="10"/>	<input style="width: 20px;" type="text" value="psi"/>
Comp #	<input type="text" value="51"/>	SH_Diff	<input type="text" value="0"/>	<input style="width: 20px;" type="text" value="F"/>
Coil DT	<input type="text" value="0"/>	PID Mode	<input type="text" value="Auto"/>	

Proportional:

This value is only used when the PID mode setting is Auto. The proportional constant is simply a multiplier that can be used to fine tune the size of the Porportional mode adjustment. Raising the value of P results in a greater reaction to input value changes. A typical setting would be 5-20. P only produces an output when there is a change. Too much P, will override I.

Integral:

This value is only used when the PID mode setting is Auto. The I value is what will cause the output to change when the input is not changing and is steady state. Increasing this value too 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 Auto. The derivative is constantly analyzes the rate of change of the error, makes a prediction about what the future error will be and makes adjustments 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.

V1 Steps:

This depends on the type of valve. Most of the EEV valves are 1596 steps. The EPR could be 2500 or 6396 steps. This is a critical value because of the scaling of the valve from 0 to 100 percent. V1 would normally be the EEV and V2 would be the EPR if used.

Max SP:

Max Setpoint is the high limit of the superheat setpoint for the evaporator. This is only used when the evaporator is running in dynamic superheat control. Dynamic superheat control is when the compressor sends a new superheat setpoint to the evaporator based on its suction superheat. The new superheat setpoint must be lower than the Max SP or it will be rejected.

Min SP:

Min Setpoint is the low limit of the superheat setpoint for the evaporator. This is only used when the evaporator is running in dynamic superheat control. Dynamic superheat control is when the compressor sends a new superheat setpoint to the evaporator based on its suction superheat. The new superheat setpoint must be lower than the Min SP or it will be rejected.

Valve Limit:

This setting will determine how the valve will act at 100% opening. A setting of zero will continue to pulse the valve open even when it is at 100%. This guarantees the valve will go full open. A setting of one will cause the pulse to stop when the math shows it to be at 100%. It is recommended to use the setting of zero.

Comp #:

This only applies when running dynamic superheat control. Set to zero if not using dynamic superheat control. Each compressor has a number and when running dynamic superheat control will broadcast it's number along with a new superheat setpoint. Each evaporator associated with the compressor should have the compressor number programmed in this parameter. One network is used on all compressors and evaporators and this allows each evaporator to receive the correct broadcast.

Coil DT:

The Coil DT is used to calculate the ideal suction pressure. The ideal suction pressure is used with a EPR (evaporator pressure regulator). The EPR is used to control the suction pressure of the evaporator. The Coil DT setting will determine the lowest temperature setting for the evaporator. The XT panel passes the temperature setpoint to the ER card. For example: XT Setpoint = 55 degrees, Coil DT = 8 degrees then $55 - 8 = 47$ degrees. The coldest the coil would get would be 47 degrees. This is then converted to pressure and used to set the span for the EPR valve.

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.

Min Output:

When in Refrigeration this parameter will limit the low end of the valve. If set for 10% the valve would not close past 10%. The recommended setting is zero.

Man Output:

This setting pertains to valve two only. If in the manual mode, valve two will position to this setting. The recommended setting is zero.

V2 Steps:

This depends on the type of valve. Most of the EEV valves are 1596 steps. The EPR could be 2500 or 6396 steps. This is a critical value because of the scaling of the valve from 0 to

100 percent. V1 would normally be the EEV and V2 would be the EPR if used.

Evap SH SP:

This is the evaporator superheat setpoint. The PID will adjust the EEV to try and maintain the Evap SH SP. If the dynamic superheat is active this parameter will be controlled from the CR card on the designated compressor.

EPR SP:

This is only active when running in the EEV-EPR profile. The EPR Setpoint is a calculated pressure that is the lowest pressure that would be needed to maintain the current XT temperature Setpoint. The following will explain how this value is calculated.

Example:

Current XT Setpoint 48 degrees F

Coil DT = 5 degrees F Super Heat Setpoint = 8

$48 - 5 - 8 = 35$ degrees F

35 degrees F = 61 psi using R22

61 psi would be the current EPR SP. As the temperature setpoint for the XT panel changed, the EPR SP would also change.

Range = 15 psi

In this example 61 psi would be the lowest suction pressure of the evaporator for 100 % output from the XT panel. The highest suction pressure with 0% output from the XT panel would be 61 psi + 15 psi or 86 psi. The Coil DT and Range settings can change these parameters for the given situation.

Range:

The range is in psi and sets up the span of the suction pressure. The XT panel outputs a 0-20ma signal for temperature control. The range will set up the span of the floating suction setpoint for a signal from 0 to 20ma. For example: if the Range is set at 15 psi, at 100 percent or 20 ma the suction pressure would be 15 psi lower than at 0 percent or 0ma output. The higher the Range, the less resolution you will have.

SH_Diff:

This setting is only if you are using a EPR valve. Normally when using a EPR valve the condenser unit is a rack system that has a lot of potential to pull the suction down. In the process of pulling a room down to a low temp, it is possible to pull the suction so hard that the EEV can be wide open and not able to deliver enough refrigerant. In this case the superheat will

go high and the efficiency of the coil will diminish make the problem worst. Under these conditions raising the suction pressure will solve the problem. If the evaporator suction superheat raises above the suction superheat setpoint by the SH_Diff amount, it will automatically raise the floating suction setpoint by 1 psi every four minutes. Once the superheat comes below this window the floating suction setpoint will resume normal calculations.

A setting of zero will disable this feature.

```

8/31/2009 12:03:34 PM
AEvap 84 Refrigeration
Suction 1 Press 76 psi
Suction 1 Temp 55 F
Sat Suc Temp 1 45 F
Evap 1 Superheat 10 F
Superheat SP 10 F
Floating SP 76 psi
Cooling Demand 27 %
Valve 1 Position 05 %
Current Steps #1 72
Valve 2 Position 02 %
Current Steps #2 129
Last Defrost 00 min
XT Setpoint 55.0 F
XT Plenum Temp 55.1 F
XT Return Temp 76.6 F
XT OSA Temp -11.4 F
XT Fan Speed 1000 %
EPR Setpoint 64 psi
Pressure Offset 00 psi
V02.44 10/16/07
    
```

Communications Terminal Window:

The communications window allows a quick look at all the major parameters on a five second update.

The Floating SP is the calculated suction pressure setpoint for the given conditions.

The EPR valve should be adjusting to maintain this value.

The Cooling Demand is the cooling percentage coming from the XT panel.

The EPR Setpoint is the lowest calculated pressure needed to maintain the XT temperature Setpoint.

Pressure Offset is the amount the suction pressure has been raised in the case of high superheat.