

CONDENSER SETTINGS AND GLIDE

Technical Bulletin

Refrigerant blends with glide (R-400 series)

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Application: Refrigeration

BACKGROUND

Zeotropic refrigerant blends exhibit a temperature glide (glide) during phase change in the condenser and evaporator. In other words, the temperature changes as the refrigerant condenses or evaporates at a constant pressure*. 4.09f01 and higher versions of Emerson's E2 and E2E controllers have multiple selections for refrigerants with glide. For example, when setting up a suction group for R-448A the controller has options for "R-448A Bubble (Liq)", "R-448A Dew (Vapor)", and "R-448A Mid-point". These different options are also available when setting up a condenser with differential control.

QUESTION

What are the implications of different refrigerant selections and what settings are recommended?

RESOLUTION

A review of the information below will allow the settings to be understood and setup properly. The screen shot shows the selection of the different R-448A "refrigerant types".

General	Value
Name	: CONDENSER A
Long Name	:
Condenser Type	: DIFFERENTIAL
Control Type	: PRESSURE
Fan Type	: SINGLE SPEED
Number of Fans	: 6
Refr Type	: R448A Bubble (Liq)
Split Enable	: Yes
Split Mode	: ODD
Split Strategy	: Ambient
Split When Recl	: No
STPT Reset En	: No
EQ Runtime Enab	: No
Proof Fail Enab	: No
Fast Rcuy Enab	: No
Min Cap Setpt	: 0
Max Cap Setpt	: 100.00

Option List Selection		
Select:		
Description		Select
R450A Mid-point		32
R449A Dew (Vapor)		33
R513A Bubble (Liq)		34
R407F Bubble (Liq)		35
R407F Dew (Vapor)		36
R448A Dew (Vapor)		37
R407A Bubble (Liq)		38
R407A Dew (Vapor)		39
R448A Bubble (Liq)		40
R448A Mid-point		31

The controller has the option to set the suction group value by suction temperature or suction pressure.

SETTING UP SUCTION GROUP USING TEMPERATURE

We first need to know the design temperature. This is the value given by the fixture manufacturer. It can also be obtained by looking at the system refrigeration schedule.

In this example we will use a value of 20°F for the system suction temperature.

This is the temperature we want to maintain by the evaporator coil. As a reference here are tables with saturated pressure and temperature values for R-448A.

Pressure (psig)	Bubble (Liq) °F	Mid-Point °F	Dew (vapor) °F
51	14.8	20	25

Table 1: temperatures at bubble, avg, dew locations at constant pressure values

The air that passes over the evaporator coil will encounter some areas with the bubble temp, the dew temp, and all the temperatures in-between. Because of this the average temperature that the air encounters is the average (mid-point) of the bubble and dew temperatures. Due to this, the mid-point temperature is the easiest value to use. If the bubble or dew refrigerant is selected the temperature setting will need to be adjusted to keep the 20° F coil. Referring to the table 1 for the settings for an effective 20°F evaporator temperature.

Refrigerant setting	Temperature Setting (°F)
R-448A Mid-point	20
R-448A Bubble (Liq)	14.8
R-448A Dew (Vapor)	25.2

Recommendation:

For simplicity Honeywell recommends to always use mid-point. The mid-point is referred to as "Average" in Honeywell PT charts.

SETTING UP SUCTION GROUP USING PRESSURE

If pressure is selected as the control method a different process is used. For a 20°F evaporator we would select “R-448A mid-point” and the pressure corresponding to an average 20°F coil. In table below above we can see this would be 51psig. If the bubble or dew refrigerant is selected the system will continue to run at the correct temperature as long as the pressure setting remains at 51psig. However, using the bubble or dew as the selected refrigerant will result in the temperature showing the dewpoint or bubble point temperature and not the effective condensing temperature.

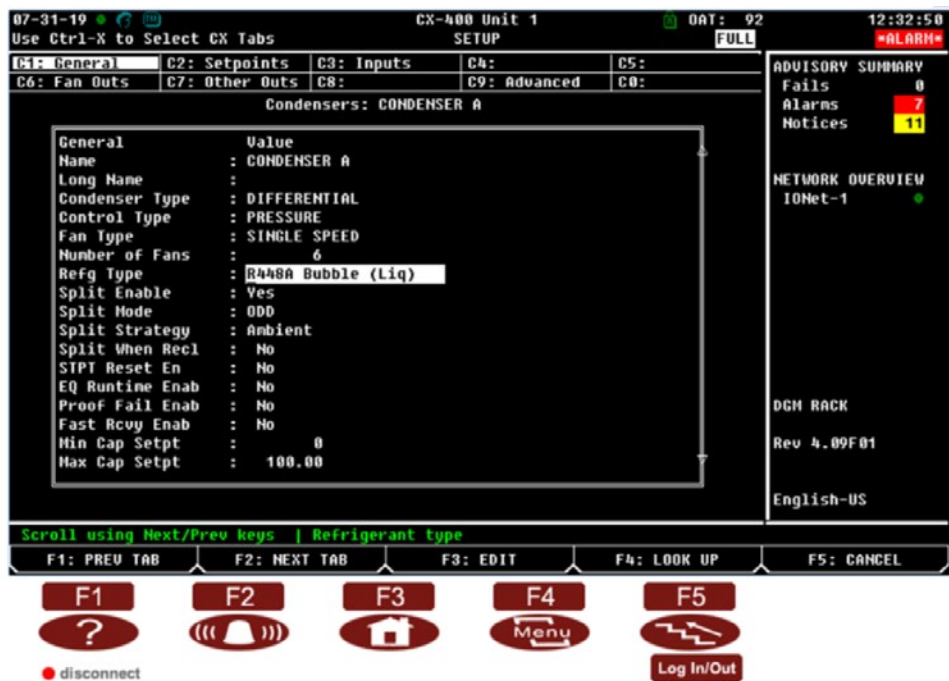
Refrigerant	Pressure setting (psig)	Condensing Temperature on screen (°F)
R-448A Mid-point	51	20
R-448A Bubble (Liq)	51	14.8
R-448A Dew (Vapor)	51	25.2

Recommendation:

Use mid-point and a pressure setting that corresponds to the mid-point evaporator temperature.

SETTING UP CONDENSER CONTROL WITH DIFFERENTIAL CONTROL

The screen for condenser TD control allows for selecting average, bubble, or dew for the refrigerant



As a reference here is a table with saturated pressure and temperature values for an effective 90°F condenser:

Pressure	Bubble (Liq) (°F)	Mid-point (°F)	Dew (vapor) (°F)
197	85.6	90	94.6

Table 2: condensing pressure and temperatures – R-448A

TD control works by maintaining a temperature difference between the ambient temperature and the saturated temperature of the condenser. For example, if we want to maintain a 10°F TD across the coil and it is 80°F outside we would maintain 90°F. If mid-point is selected in the condenser screen we would simply select 10°F as the setpoint. However, if dew or bubble are selected the set-point would need to change to compensate.

Refrigerant	TD setting (°F)	Condenser temperature setting (°F)	Average condenser temperature (°F)
R-448A Mid-point	10	90	90
R-448A Bubble (Liq)	4.4	84.4	90
R-448A Dew (Vapor)	14.6	94.6	90

*Some minor pressure drop due to friction may occur.

Recommendation:

Use the midpoint and a TD at least as high as the condenser design TD and no smaller than 10°F.



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