



**VRV**

# AUXILIARY HEATER CONTROL FOR VRV SYSTEMS

APPLICATION GUIDE

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List of Errors that Turn Off the Indoor Unit Fan in Certain Situations

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List of Errors that Enable the Heat Pump Lockout Automatically for VRV IV



External heat sources are frequently applied in addition to the *VRV* system in various applications. In cold climate areas, additional auxiliary heaters are used to supplement the system when the outside temperature falls below the operation range. In retrofit projects, the existing heat source may be integrated with the *VRV* system as an alternative heat source. Typical external heat sources include electric heat, gas, oil, or hot water.

The *VRV* systems have a built-in control logic to control the auxiliary heater. The indoor unit is capable of operating the auxiliary heater as both supplemental heat with the *VRV* Heat Pump heating, and emergency heat when the *VRV* Heat Pump heating is locked out.

- » **Auxiliary Heater as supplemental heat with the *VRV* Heat Pump heating** – The auxiliary heater operates together with the *VRV* heating as a supplemental heat to help maintain the room temperature. The indoor unit controls the auxiliary heater based on the room temperature and setpoint. The control logic varies based on different indoor unit models. In addition, the *VRV IV* outdoor unit has the capability to allow or prohibit auxiliary heat.
- » **Auxiliary Heater as emergency heat when the *VRV* Heat Pump heating is locked out** – The external heat source operates as an emergency heater when the *VRV* Heat Pump heating is locked out. The *VRV IV* outdoor unit is configurable for being

locked out when the ambient temperature is low or the *VRV* system is in error. When the *VRV* heating is unavailable in a Heat Pump lockout event, the indoor unit will control the auxiliary heat to provide heating to the indoor environment.

## The following five sections provide details of the following:

- » Section 2 introduces the KRP1C Wiring Adaptor that connects external heaters to the indoor unit.
- » Section 3 discusses the auxiliary heat control logic during regular Heat Pump heating. This section also reviews the outdoor unit field settings and the indoor unit control logic.
- » Section 4 introduces the auxiliary heat control logic during the Heat Pump lockout period.
- » Section 5 summarizes the outdoor unit field settings, the control logic, compatibility, field setting for each indoor unit, and the FXTQ\_TA indoor unit logic.
- » Section 6 discusses the application of the auxiliary heater on different types of heaters, the DKN Plus adaptor and the Daikin *ONE* thermostats.





## 2. KRP1C Wiring Adaptor

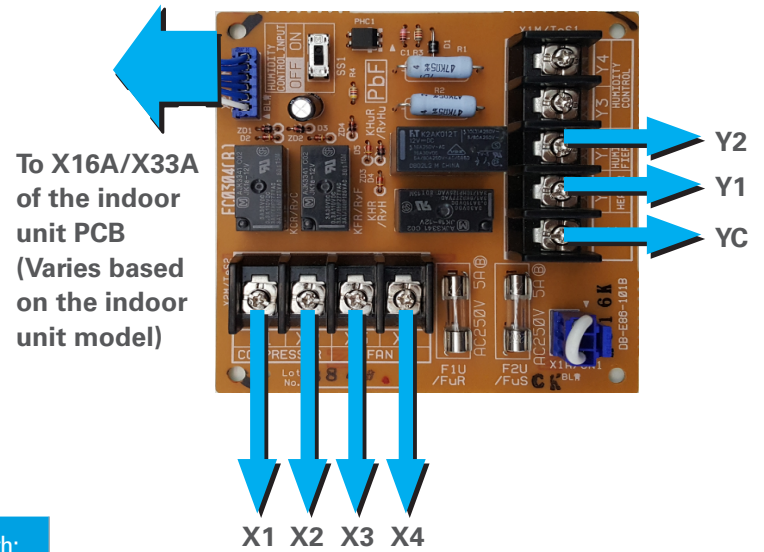
## 2. KRP1C Wiring Adaptor

Typically, indoor units control the external heater through the KRP1C74/75/76/77 Wiring Adaptors. The KRP1C74/75/76/77 Wiring Adaptors connect external equipment with a VRV indoor unit. It can be applied to interlock external equipment with indoor unit's thermo-on status, fan on status, heating thermo-on status, and auxiliary heater control output. VRV indoor unit's compatibility with the KRP1C board depends on the indoor unit model (Refer to Section 5.2 for compatibility information). Based on the indoor unit's operation status, the KRP1C Adaptor provides normally open dry contact closure through the terminals.

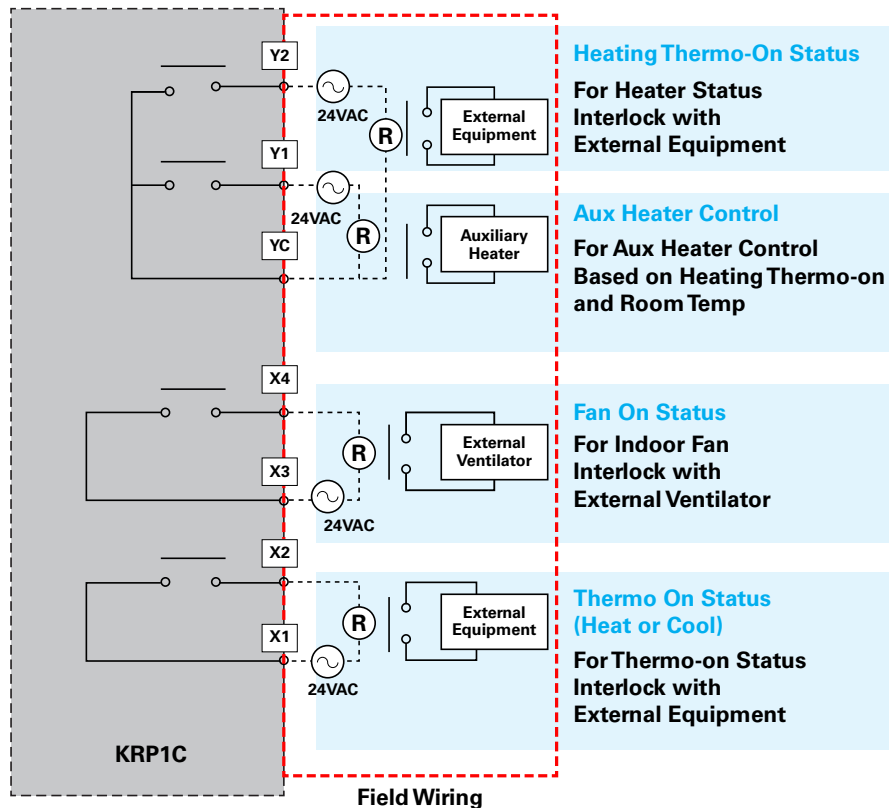
**Table 1. KRP1C74/75/76/77 Terminals and Outputs**

Terminals	Normally Open Dry Contact that Interlocks with:
X1-X2	Indoor unit thermo-on status*
X3-X4	Indoor unit fan on status
Y2-YC	Indoor unit heating thermo-on status
Y1-YC	Auxiliary heater control output

\* The X1-X2 output can be configured by indoor unit field setting 12(22)-0-xx



**Fig. 1. KRP1C74/75/76/77 Wiring Adaptors**



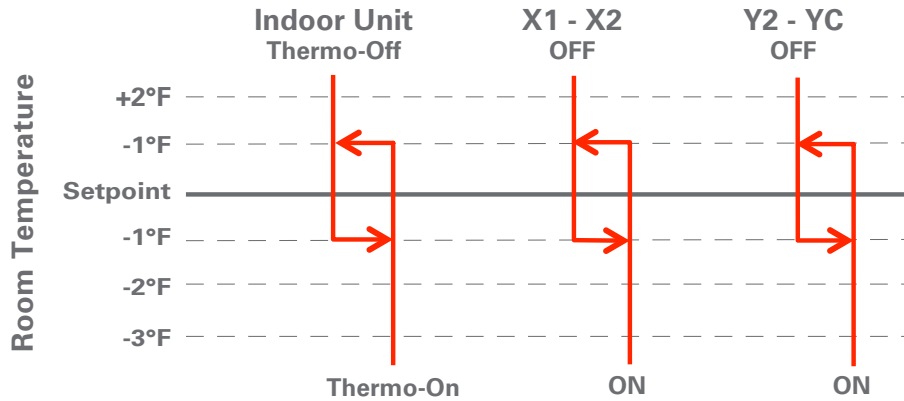
**Fig. 2. Wiring Adaptor and Functionality**

## 2.1 X1-X2 (Thermo-on Status) and Y2-YC (Heating Thermo-on Status)

X1-X2 output interlocks external equipment based upon the indoor unit thermo-on status for either cooling or heating. The thermo-on status is a result of the indoor unit actively cooling or heating the space.

Y2-YC output interlocks the auxiliary heaters with the heating thermo-on status of the indoor unit. The thermo-on status is a result of the indoor unit actively heating the space.

### Heating Mode



### Cooling Mode

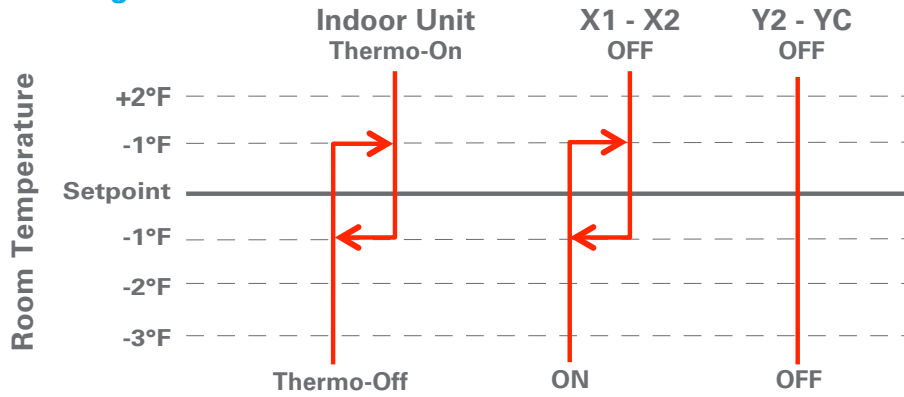


Fig. 3. X1-X2 and Y2-YC Outputs with a Thermo-On/Off Deadband of 1°F

The deadband can be configured to either 1°F or 2°F by indoor unit field setting 12(22)-2-XX.

Table 2. Field Setting for Thermo-On/Off Deadband

Description	Mode #	First Code #	Second Code #	
			01	02
Thermo-On/Off deadband*	12(22)	2	2°F(1°C)	1°F(0.5°C)

\* Default Value varies for different indoor unit models

## 2.2 X3-X4 (Fan-on Status)

X3-X4 interlocks external equipment with the indoor unit fan ON status. Generally, when the indoor unit is OFF, or the outdoor unit is in Hot Start or Defrost operation, the indoor unit fan is OFF. The indoor unit fan is ON when the indoor unit is in thermo-on status. During the thermo-off period, the indoor unit fan ON/OFF status depends on the indoor unit field settings 12(22)-3-XX (in heat mode), and 12(22)-6-XX (in cool mode).

**Table 3. Field Setting for Fan Speed in Thermo-Off**

Description	Mode #	First Code #	Second Code #		
			01	02	03
Fan Speed in Heating Thermo-off*	12(22)	3	LL (Default)	User set	Off
Fan Speed in Cooling Thermo-off*		6	LL	User set (Default)	Off

\* May not be available for all VRV indoor units. Verify applicable field settings in the indoor unit Installation Manual.

When the fan is in LL status, the fan is running in a “Low-Low” speed, which is lower than the low fan speed setting. When the fan is in LL fan speed during thermo-off, the fan status is considered as Fan On, and thus X3-X4 output is closed.

Note: Certain VRV system errors will cause the indoor unit fan to turn off in certain situation. Refer to Appendix I for the list of errors that may turn off the indoor unit fan in certain situations.

## 2.3 Y1-YC (Auxiliary Heater Control Output)

Y1-YC provides normally open (NO) dry contact to control the auxiliary heater. The Y1-YC output is controlled by the indoor unit, and the control logic varies with indoor unit model. Section 3 explains in detail how the auxiliary heater control logic works for different indoor units.



### 3. Auxiliary Heater Control Logic with Heat Pump Heating

### 3. Auxiliary Heater Control Logic with Heat Pump Heating

To control the auxiliary heater as supplement heat to the VRV heating, the indoor unit provides room level auxiliary heater control via the KRP1C Wiring Adaptor. The auxiliary heater output is determined by two factors:

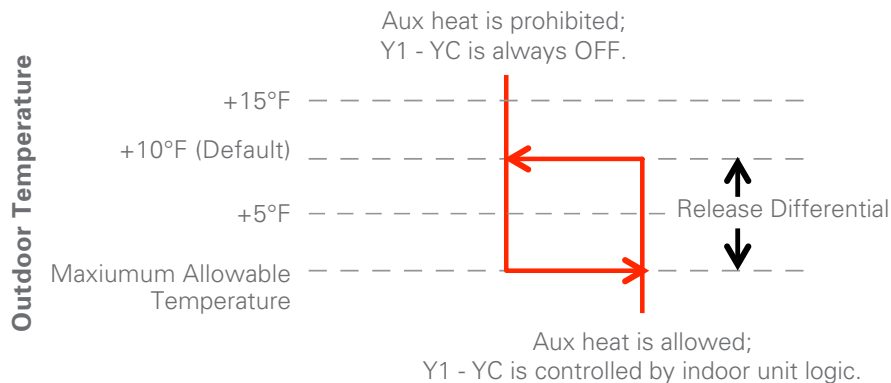
- a. Outdoor unit field setting (set through the outdoor unit PCB) limits the outdoor ambient temperature condition to allow the auxiliary heater to be energized. However, only indoor unit models FXEQ\_PVJU, FXFQ\_TVJU, FXLQ\_MVJU9, FXMQ\_PBVJU, CXTQ\_TA, FXSQ\_TA, FXZQ\_TA and FXNQ\_MVJU9 have implemented this logic and will follow the prohibition command. Other indoor unit models have not implemented this logic and therefore will ignore this field setting. Refer to Section 5.2 for the list of indoor units that ignore/follow this command.
- b. The indoor unit model determines the control logic of the auxiliary heater ON/OFF temperature. For FXDQ\_MVJU, FXHQ\_MVJU, FXMQ\_MVJU, FXMQ\_MFVJU, FXZQ\_MVJU9, and other obsolete indoor unit models, the ON/OFF temperature is fixed; while for other indoor unit models, the ON/OFF temperatures can be set through the indoor unit field setting. Refer to Section 5.2 for the control logic of each indoor unit model.

#### 3.1 Allow/Prohibit Auxiliary Heater from VRV IV Outdoor Unit

For indoor unit models that follow the prohibition command from the outdoor unit, the auxiliary heater can be prohibited when the ambient temperature is high, and is only allowed to energize when the ambient temperature is low by outdoor unit field settings. To enable this function, two outdoor unit field settings are required:

- » Auxiliary Heater Maximum Allowable Temperature
- » Auxiliary Heater Maximum Allowable Temperature Release Differential

Once the ambient temperature falls below the auxiliary heater maximum allowable temperature, the auxiliary heat is allowed to energize. Once the outdoor ambient temperature rises above the auxiliary heater maximum allowable temperature by the Release Differential, the auxiliary heater is de-energized and prohibited from re-energizing while the Release Differential is exceeded. The following figure shows how the control logic works to allow/prohibit the auxiliary heater.



**Fig. 4. Allow/Prohibit Auxiliary Heater with Outdoor Unit Field Settings**

### 3.1 Allow/Prohibit Auxiliary Heater from VRV IV and VRV EMERION Outdoor Units

Table 4 shows the field setting numbers for each VRV outdoor units. This logic is not available for VRV IV Water Cooled outdoor unit (RWEYQ).

**Table 4. VRV IV Outdoor Unit Field Setting Numbers for Allowing/Prohibiting Auxiliary Heater**

Outdoor Unit Model \ Outdoor Unit Field Setting	VRV IV Models				VRV EMERION	
	VRV IV HP RXYQ_T	REYQ_T, REYQ_X, RXYQ_X, RELO, RXLO, REYQ_AA	VRV IV-S (RXTQ)	VRV IV-W (RWEYQ_T)	VRV EMERION HP (RXYQ_AA)	VRV EMERION HR (REYQ_AA)
Auxiliary Heater Max Allowable Temperature	2-96	2-97	2-50	n/a	2-50	2-97
Auxiliary Heater Max Allowable Temperature Release Differential	2-97	2-98	2-56	n/a	2-52	2-98

Table 5 shows the field settings for auxiliary heater maximum allowable temperature. The field setting can also be set to always allow or always prohibit the auxiliary heater.

**Table 5. Auxiliary Heater Maximum Allowable Temperature Field Setting**

Field setting 2-96/2-97/2-50	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Auxiliary Heater Max Allowable Temp (°F)	0	5	10	15	20	25	30	35 (Default)	40	45	50	55	60	65	AUX Heater Always Allowed	AUX Heater Always Allowed

Table 6 shows the field settings for auxiliary heater maximum allowable temperature release differential.

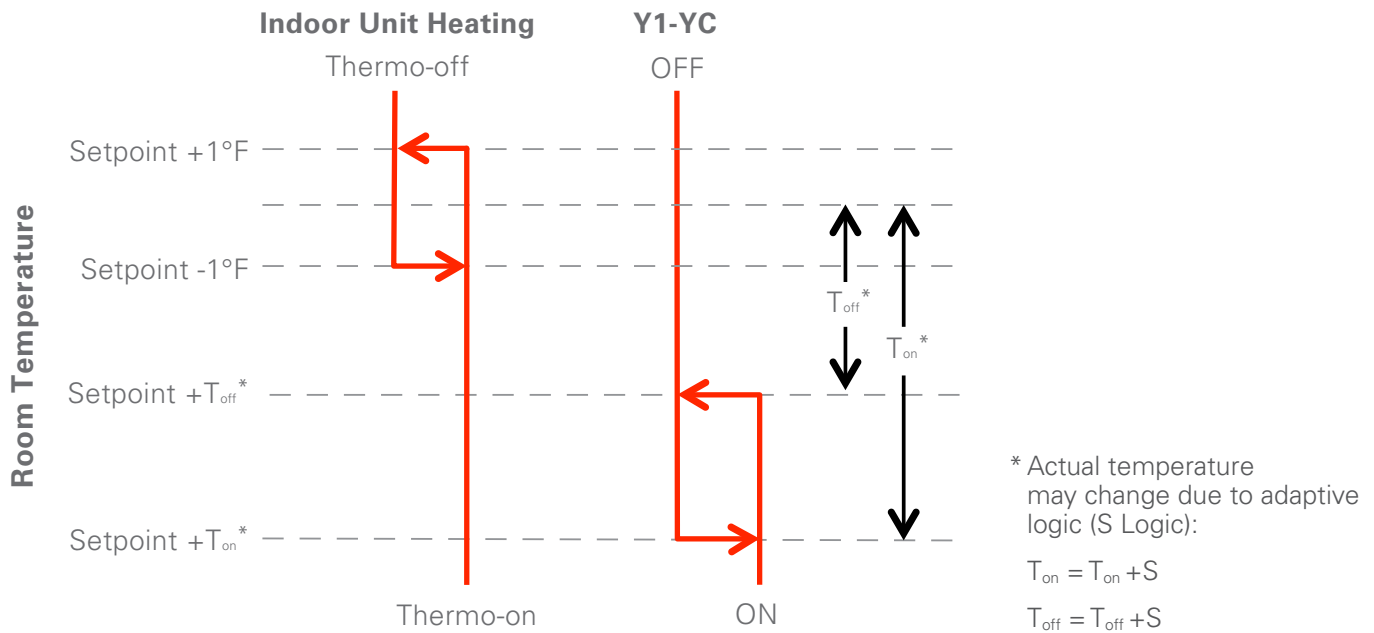
**Table 6. Auxiliary Heater Maximum Allowable Temperature Release Differential Field Setting**

Field setting 2-97/2-98/2-52/2-56	0	1	2
Auxiliary Heater Max Allowable Temp (°F)	5	10 (Default)	15

If the auxiliary heat is prohibited by the conditions mentioned above, the Y1-YC output will always be OFF regardless of indoor unit conditions. However, only indoor unit model FXEQ\_PVJU, FXFQ\_TVJU, FXLQ\_MVJU9, FXMQ\_PBVJU, and FXNQ\_MVJU9 have implemented this logic and will follow the prohibition command; other indoor units will ignore this prohibition from the outdoor unit field setting.

## 3.2 Indoor Unit Auxiliary Heater Control Logic

If not prohibited by the outdoor unit, the auxiliary heater output is controlled by the indoor unit internally, and the control logic varies by indoor unit models. The auxiliary heater output is determined by the differential between room temperature and setpoint. In heating mode, when the room temperature drops to the Auxiliary Heater Turn On Temperature ( $T_{on}$ ) from the setpoint, the auxiliary heater is energized. When the room temperature rises and reduces the differential between room temperature and setpoint to the Auxiliary Heater Turn Off Temperature ( $T_{off}$ ), the auxiliary heater is de-energized.



**Fig. 5. Indoor Unit Auxiliary Heater Control Logic**

The temperature  $T_{on}$  and  $T_{off}$  vary for different indoor units, and can be configured by indoor unit field settings for certain indoor units. Three types of  $T_{on}/T_{off}$  configuration are available in the VRV indoor units:

- a) **Type A – Fixed Logic** (applies to FXDQ\_MVJU, FXHQ\_MVJU, FXMQ\_MVJU, FXMQ\_MFVJU, FXZQ\_MVJU and other obsolete models):

$T_{on}$  and  $T_{off}$  are fixed.  $T_{on} = -7.2^\circ\text{F}$ ,  $T_{off} = -3.6^\circ\text{F}$ .

- b) **Type B – Linked Logic** (applies to FXFQ\_TVJU, FXMQ\_PBVJU, FXTQ\_PBVJU):

$T_{on}$  and  $T_{off}$  are configurable together through one field setting. The differential between  $T_{on}$  and  $T_{off}$  is fixed to  $3.6^\circ\text{F}$ .

**Table 7. Indoor Unit Field Settings for Linked Logic**

Description	Field Setting (Mode-First Code #)	Second Code #					
		01 (Default)	02	03	04	05	06
$T_{on}$	11(21)-01 or 10(20)-07*	-7.2	-6.3	-5.4	-4.5	-3.6	-2.7
$T_{off}$		-3.6	-2.7	-1.8	-0.9	0	0.9

\* FXTQ\_TVJU uses field setting 10(20)-07.

## 3.2 Indoor Unit Auxiliary Heater Control Logic

- c) **Type C** – Individually Adjustable Logic  
(applies to FXEQ\_PVJU, FXLQ\_MVJU9, FXNQ\_MVJU9, FXSQ\_TA, FXZQ\_TA, FXSQ\_TA, FXSQ\_TB, FXZQ\_TA, FXZQ\_TB and FXTQ\_TAVJU):

$T_{on}$  and  $T_{off}$  can be configured individually.

**Table 8. Indoor Unit Field Settings fro individually Adjustable Logic**

Description	Mode #	First Code #	Second Code #					
			01(Default)	02	03	04	05	06
$T_{on}$	11(21)	1	-7.2	-6.3	-5.4	-4.5	-3.6	-2.7
$T_{off}$		2	-3.6	-2.7	-1.8	-0.9	0	0.9

The combination of  $T_{on}$  and  $T_{off}$  is limited in order to maintain a minimal 3.6°F differential and reliability. The allowed combinations are shown in Table 8 below.

**Table 9. Limited Combination of  $T_{on}$  and  $T_{off}$**

$T_{OFF}$ \ $T_{ON}$	-7.2	-6.3	-5.4	-4.5	-3.6	-2.7
0.9	•	•	•	•	•	•
0	•	•	•	•	•	N/A
-0.9	•	•	•	•	N/A	N/A
-1.8	•	•	•	N/A	N/A	N/A
-2.7	•	•	N/A	N/A	N/A	N/A
-3.6	•	N/A	N/A	N/A	N/A	N/A

• = Available. N/A = Not Available.

Moreover, the indoor units have built-in adaptive control logic (named S logic) to adjust the actual auxiliary heater ON/OFF temperature based on room temperature trend. During operation, the actual auxiliary heater ON/OFF temperature is not fixed to  $T_{on}$  /  $T_{off}$ , but varies with an “S” value.

The “S” value continually changes based on the setpoint, the current room temperature, and the room temperature over time. The following logic is implemented in the indoor unit’s control logic:

**Step 1: Determine the interval time to update the “S” value. “S” value is updated:**

- Whenever the setpoint is changed;
- Or every 5 mins (7 mins if the thermo-on/thermo-off dead band is 2°F) if the room temperature variation is less than 2°F;
- Or every 3 mins if the room temperature variation is more than 2°F;

### Step 2: Calculate the new "S" value. The "S" value is updated as following:

- The "S" value is reset to 0 whenever the indoor unit is thermo-off.
- The "S" value increases if the room temperature continues to drop; The "S" value decreases as the room temperature rises.

Table 10 shows the mathematical calculation method on how to calculate the new "S" value (RT: room temperature, SP: setpoint):

**Table 10. How to Calculate the New "S" Value**

Condition		"S" Calculation Result	
Situation	Current Room Temp: RT <sub>0</sub>		
Room temperature exceeds the setpoint a lot	SP+0.9°F ≤ RT <sub>0</sub>	S=0	
Room temperature is close to the setpoint	SP-0.9 °F ≤ RT <sub>0</sub> < SP+0.9 °F	SP+1.8°F ≤ RT <sub>1</sub>	S=S-2.7°F
		SP+0.9°F ≤ RT <sub>1</sub> < SP+1.8°F	S=S-1.8°F
		SP ≤ RT <sub>1</sub> < SP+0.9°F	S=S-0.9°F
		SP-0.9°F ≤ RT <sub>1</sub> < SP	S=S
		SP-1.8°F ≤ RT <sub>1</sub> < SP-0.9°F	S=S+0.9°F
Room temperature is lower than the setpoint a lot	SP-1.8°F ≤ RT <sub>0</sub> < SP-0.9°F	S=S+0.9°F	
	RT <sub>0</sub> < SP-1.8 °F	S=S+1.8°F	

- In cooling mode, the maximum S value is 3.6°F, and the minimum S value is -8.1°F; In heating mode, the maximum S value is 8.1°F, and the minimum S value is -3.6°F.

Based on the updated "S" value, the Actual Turn On Temperature (T<sub>on</sub><sup>\*</sup>) and the Actual Turn Off Temperature (T<sub>off</sub><sup>\*</sup>) for the auxiliary heater is updated as:

$$T_{on}^* = T_{on} + S$$

$$T_{off}^* = T_{off} + S$$

## 3.2 Indoor Unit Auxiliary Heater Control Logic

Figure 6 shows an example to demonstrate the dynamic change of S value as well as how to calculate  $T_{on}^*$  and  $T_{off}^*$ .

Assume the indoor unit is configured to  $T_{on} = -7.2^\circ\text{F}$  and  $T_{off} = -3.6^\circ\text{F}$ , and the initial setpoint is  $SP = 72^\circ\text{F}$ . At the  $t = 0$  min, the initial  $S = 0$ , and room temperature  $RT = 71.5^\circ\text{F}$ . The room temperature variation is monitored by the indoor unit. For the following 5 minutes, if the room temperature variation is less than  $2^\circ\text{F}$ , then S value shall be calculated at  $t = 5$  mins.

At  $t = 5$  min,  $RT = 70.5^\circ\text{F}$ , the new S value will be calculated based on the algorithm table. Since the latest room temperature is  $71.5^\circ\text{F}$  and the new room temperature is  $70.5^\circ\text{F}$ ; the new S value will be calculated based on:

If the latest room temperature  $ST - 0.9^\circ\text{F} \leq RT \leq ST + 0.9^\circ\text{F}$ , and the new room temperature is  $ST - 1.8^\circ\text{F} \leq RT_1 < ST - 0.9^\circ\text{F}$ , then  $S = S + 0.9^\circ\text{F}$ .

Thus, the new S is updated to  $S = 0.9^\circ\text{F}$ . The updated  $T_{on}^* = -7.2 + 0.9 = -6.3^\circ\text{F}$ . After  $t = 5$  mins and before the S value is recalculated again, if the temperature falls below  $65.7^\circ\text{F}$  (setpoint +  $T_{on}^*$ ), the auxiliary heater will turn on. The S value calculation continues as long as the indoor unit is ON. The following figure shows the S value variation and the related Heater status.

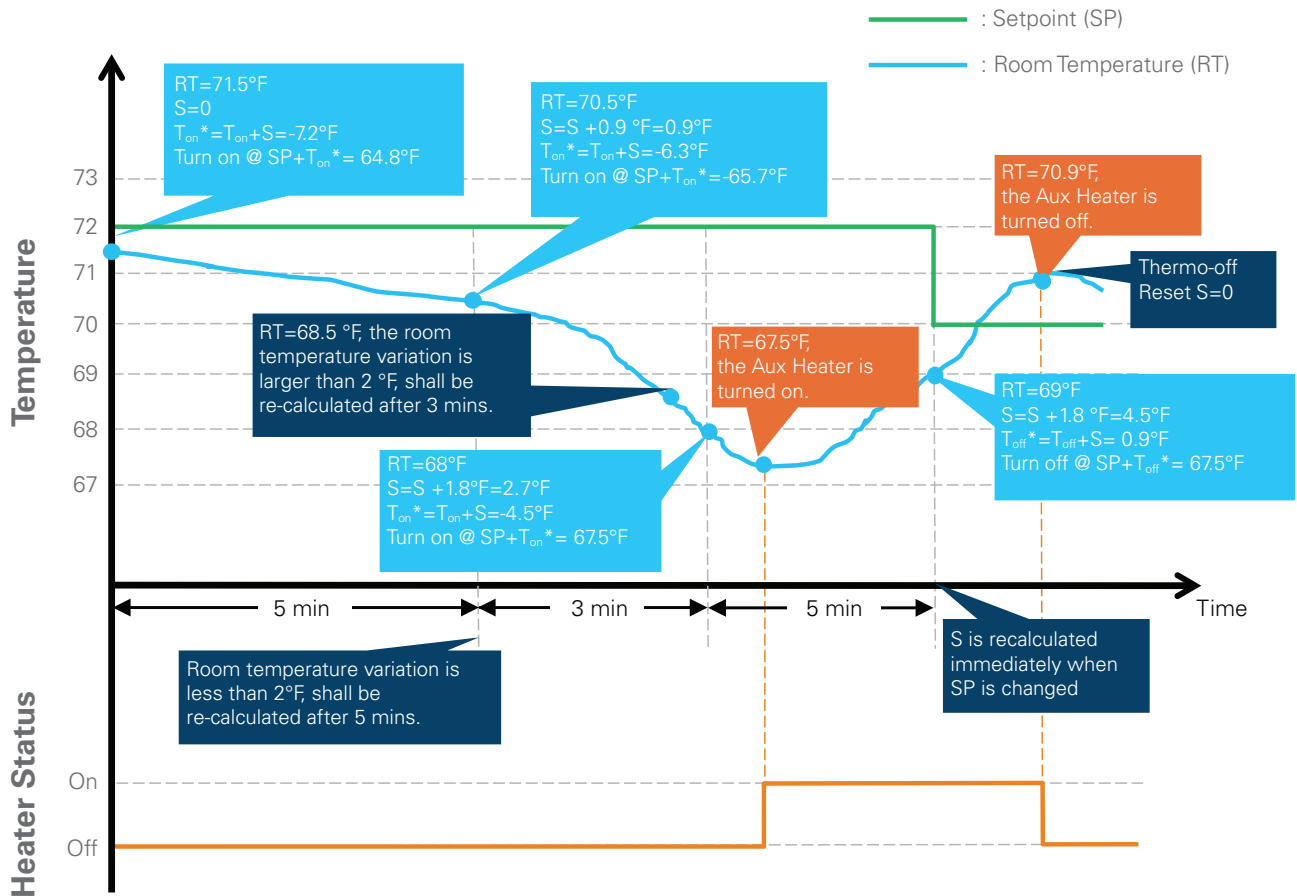


Fig. 6. An Example of the Dynamic Variat of "S" Value





## 4. Auxiliary Heater Control during Heat Pump Lockout

## 4. Auxiliary Heater Control during Heat Pump Lockout

The Heat Pump lockout mode means the outdoor unit's compressor is locked out and stopped due to preset or ambient conditions falling outside the systems operating range. When the outdoor unit is in the Heat Pump lockout mode and the indoor unit is calling for heat, the indoor unit will not provide heating, but it will energize the auxiliary heater through the KRP1C Wiring Adapter. This function usually applies to cold climate areas where the ambient temperature may fall below the VRV operation range during winter conditions.

In a Heat Pump lockout event, the KRP1C outputs will react differently from standard operation when the Heat Pump lockout is engaged. The changes are as follows:

- » X1-X2 output is OFF for the duration of a Heat Pump lockout;
- » X3-X4 fan status output varies depending on the outdoor unit field setting (see following table);
- » Y2-YC is still determined by the indoor unit heating thermo-on status;

- » Y1-YC auxiliary heater control logic is overridden in a Heat Pump lockout event. Y1-YC follows the same heating thermo-on logic as Y2-YC. (see the following table).

The Heat Pump lockout function is set through the outdoor unit field settings. Except for the VRV IV Water Cooled (RWEYQ) that does not have an ambient air temperature sensor, other VRV IV outdoor units have the built-in logic to lockout the outdoor unit compressor based upon ambient temperature measured by the factory-installed ambient temperature sensor. VRV III systems require an external input (i.e., a field-installed ambient thermostat) and the ABC terminal (BRP2A81) to lockout the compressor.

The following table summarizes different options to lock out the outdoor unit compressor, the relevant results, and compatibility with different outdoor unit models.

**Table 11. Heat Pump Lockout Methods and Results**

Description	How to set the lockout mode		Result				Compatibility		
	ODU Field Setting	ABC terminal shorted between	When in heating Thermo-on		When in heating Thermo-off		VRV III and RWEQ_T	VRV Models	
			Aux Heater	Fan	Aux Heater	Fan		RXYQ_T, REYQ_T, RXYQ_X, REYQ_X, RXLQ, RELQ, RXYQ_AA, REYQ_AA, RXTQ	RWEYQ, RWEQ_T
Heat pump heating is always locked out	2-16 = 1 (& 2-37 = 0 <sup>(4)</sup> )	—	ON	ON (H/L)	OFF	LL <sup>(3)</sup>	•	•	•
Lockout is controlled by ABC terminals <sup>(2)</sup>	2-37 = 1	A-C	ON	ON (H/L)	OFF	LL <sup>(3)</sup>	•	•	•
		A-C				OFF	•	•	•
	2-37 = 2 <sup>(1)</sup>	A-C		LL		LL <sup>(3)</sup>	•	•	•
		A-C		LL		OFF	•	•	•
Lockout is controlled by the outdoor ambient temperature and setpoint (configured by field settings)	2-37 = 3	—	ON	ON (H/L)	OFF	LL <sup>(3)</sup>	N/A	•	N/A
	2-37 = 4	—				OFF	N/A	•	N/A
	2-37 = 5 <sup>(1)</sup>	—		LL		LL <sup>(3)</sup>	N/A	•	N/A
	2-37 = 6 <sup>(1)</sup>	—		LL		OFF	N/A	•	N/A

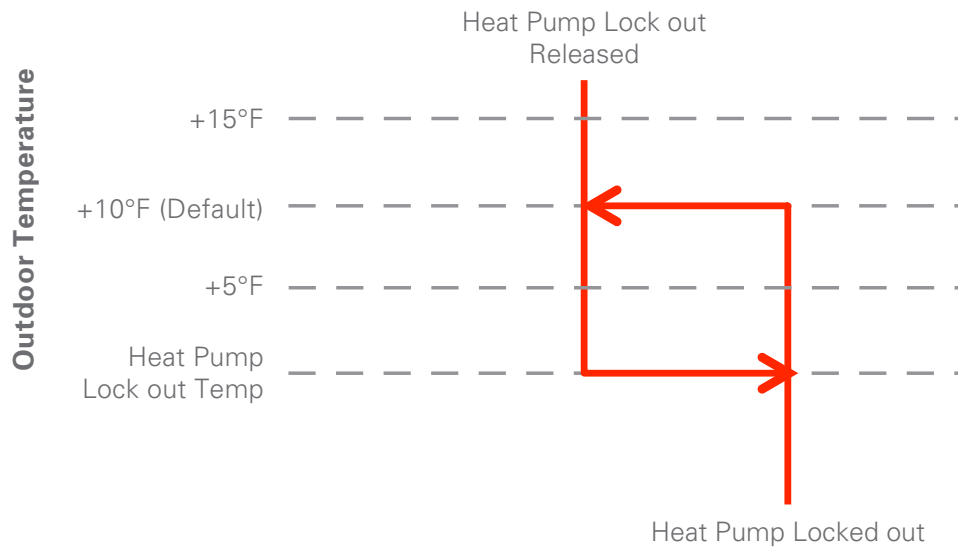
- (1) Mode 2, 5, and 6 apply to an external heater which does not need air flow (i.e.: baseboard heater).
- (2) For VRV III, an ABC terminal kit BRP2A81 is required. For VRV IV-S4 ton and 5 ton outdoor unit, an ABC terminal kit BRP2A82 is needed. For other VRV IV units, the ABC terminal is factory installed.
- (3) In order to set the fan speed to go to LL (Low-Low) in heating thermo-off, the indoor unit field setting 12(22)-3-01 shall be set (default value). X3-X4 output is closed in LL fan speed.
- (4) To always lock out the Heat Pump heating by setting 2-16 to 1, the field setting 2-37 must be set to 0 (Default) as well. Otherwise, the setting 2-16 = 1 cannot lock out the Heat Pump heating.

## 4. Auxiliary Heater Control during Heat Pump Lockout, *Continued*

When applying Mode 3 - 6, the outdoor temperature is measured by the ambient temperature sensor of the outdoor unit. Therefore, no additional temperature sensor is required. Two outdoor unit field settings are required for Mode 3- 6:

- » Heat Pump Lockout Temperature
- » Heat Pump Lockout Temperature Release Differential

The outdoor unit will be locked out when the outdoor ambient temp is lower than the Heat Pump Lockout Temp. The outdoor unit operation will resume when the outdoor ambient temperature rises to meet or exceed the Release Differential. The following diagram shows this logic. Additionally, Mode 3 - 6 has a minimum 30 minutes lockout time to prevent frequent Heat Pump lockout and release.



**Fig. 7. Heat Pump Lockout Logic**

The field setting number is different for different VRV outdoor units, as shown in the below table.

**Table 12. VRV IV Outdoor Unit Field Setting Numbers for Heat Pump Lockout**

Outdoor Unit Model Outdoor Unit Field Setting	VRV IV Models			VRV EMERION	
	Heat Pump (RXYQ_T)	Heat Recovery (REYQ_T, RXLQ, RELO, RXYQ_X, REYQ_X)	VRV IV-S (RXTQ)	VRV EMERION HP (RXYQ_AA)	VRV EMERION HR (REYQ_AA)
Heat Pump Lockout Temperature	2-94	2-78	2-57	2-65	2-78
Heat Pump Lockout Release Differential	2-95	2-79	2-47	2-47	2-79

The following table shows the field settings for the Heat Pump Lockout Temperature. It can be set to always lock out the heat pump.

**Table 13. Heat Pump Lockout Temperature Field Setting**

Field setting 2-94/2-78/2-57/2-65	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Heat Pump Temp (°F)	-15 (default)	-10	-5	0	5	10	15	20	30	35	35	40	45	50	Forced Heat Pump Lock Out

## 4. Auxiliary Heater Control during Heat Pump Lockout, *Continued*

Table 14 shows the field settings for the Heat Pump Lockout Temperature Release Differential.

**Table 14. Heat Pump Lockout Temperature Release Differential Field Setting**

Field setting 2-95/2-79/2-47	0	1	2
Heat Pump Lockout Release Differential (°F)	5	10 (default)	15

Note: Depending on the type of error, the *VRV* outdoor unit may automatically go to lockout mode when the outdoor unit is in error (see Appendix II for list of errors). This function is another improvement compared to *VRV III* outdoor units, as the backup heat can remain in operation when the *VRV* outdoor unit is in error. When the error is cleared, the outdoor unit will exit the lockout mode if the normal Heat Pump lockout condition is not met.

Note: For the manifold outdoor units, the backup operation will take priority. If the back up operation is available, the outdoor unit will not go to lockout mode.



## 5. Control Logic Summary

## 5.1 Summary Tables for Outdoor Unit Field Settings

Table 15 summarizes the related outdoor unit field settings for VRV IV outdoor units. Tables 16-20 list the field setting details.

**Table 15. Summary Table of VRV IV Field Setting for Auxiliary Heater Control**

Outdoor Unit Model		VRV IV Models				VRV EMERION		Default Setting
		VRV IV HP (RXYQ_T)	REYQ_T, REYQ_X, RXYQ_X, RELQ, RXLQ, REYQ_AA	VRV IV-S (RXTQ)	VRV IV-W (RWEYQ)	VRV EMERION HP (RXYQ_AA)	VRV EMERION HR (REYQ_AA)	
Outdoor Unit Field Setting								
Prohibit Aux Heater from Outdoor Unit <sup>(1)</sup>	Auxiliary Heater Max Allowable Temp	2-96	2-97	2-50	n/a	2-50	2-97	7
	Auxiliary Heater Max Allowable Temp Release Differential	2-97	2-98	2-56	n/a	2-52	2-98	1
Heat Pump Lockout	Heat Pump heating always locked out	2-16	2-16	2-16	2-16	2-16	2-16	0
	Advanced Heat Pump lock out mode	2-37	2-37	2-37	2-37 (2)	2-37	2-37	0
	Heat Pump lock out temperature	2-94	2-78	2-57	n/a	2-65	2-78	0
	Heat Pump lock out temperature release differential	2-95	2-79	2-47	n/a	2-47	2-79	1

(1) Only certain indoor unit model will follow this prohibition command. Refer to Table in Section 5.2.

(2) For VRV IV-W, 2-37 has only 0 (OFF) and 1 (Mode 1) available.

**Table 16. Auxiliary Heater Maximum Allowable Temperature Field Setting**

Field setting 2-96/2-97/2-50	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Auxiliary Heater Max Allowable Temp (°F)	0	5	10	15	20	25	30	35 (Default)	40	45	50	55	60	65	AUX Heater Always Prohibited	AUX Heater Always Allowed

**Table 17. Auxiliary Heater Maximum Allowable Temperature Release Differential Field Setting**

Outdoor unit field setting 2-97/2-98/2-56/2-52	0	1	2
Auxiliary Heater Max Allowable Temp (°F)	5	10 (Default)	15

**Table 18. Heat Pump Lockout Methods and Results**

Description	How to set the lockout mode		Result				Compatibility		
	ODU Field Setting	ABC terminal shorted between	When in heating Thermo-on		When in heating Thermo-off		VRV III and RWEQ_T	VRV Models	
			Aux Heater	Fan	Aux Heater	Fan		RXYQ_T, REYQ_T, RXYQ_X, REYQ_X, RXLO, RELO, RXYQ_AA, REYQ_AA, RXTQ	RWEYQ, RWEQ_T
Heat pump heating is always locked out	2-16 = 1 (& 2-37 = 0 <sup>(4)</sup> )	—	ON	ON (H/L)	OFF	LL <sup>(3)</sup>	•	•	•
Lockout is controlled by ABC terminals <sup>(2)</sup>	2-37 = 1	A-C	ON	ON (H/L)	OFF	LL <sup>(3)</sup>	•	•	•
		A-C		OFF		•	•	•	
	2-37 = 2 <sup>(1)</sup>	A-C		LL		LL <sup>(3)</sup>	•	•	•
		A-C		LL		OFF	•	•	•
Lockout is controlled by the outdoor ambient temperature and setpoint (configured by field settings)	2-37 = 3	—	ON	ON (H/L)	OFF	LL <sup>(3)</sup>	N/A	•	N/A
	2-37 = 4	—		OFF		N/A	•	N/A	
	2-37 = 5 <sup>(1)</sup>	—		LL		LL <sup>(3)</sup>	N/A	•	N/A
	2-37 = 6 <sup>(1)</sup>	—		LL		OFF	N/A	•	N/A

- (1) Mode 2, 5, and 6 apply to an external heater which does not need air flow (i.e.: baseboard heater).
- (2) For VRV III, an ABC terminal kit BRP2A81 is required. For VRV IV-S 4 ton and 5 ton outdoor unit, an ABC terminal kit BRP2A82 is needed. For other VRV IV units, the ABC terminal is factory installed.
- (3) In order to set the fan speed to go to LL (Low-Low) in heating thermo-off, the indoor unit field setting 12(22)-3-01 shall be set default value). X3-X4 output is closed in LL fan speed.
- (4) To always lock out the Heat Pump heating by setting 2-16 to 1, the field setting 2-37 must be set to 0 (Default) as well. Otherwise, the setting 2-16=1 cannot lock out the Heat Pump heating.

**Table 19. Heat Pump Lockout Temperature Field Setting**

Outdoor unit field setting 2-94/2-78/2-57/2-65	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Heat Pump Lockout Temp (°F)	-15 (default)	-10	-5	0	5	10	15	20	30	35	35	40	45	50	Forced Heat Pump Lock Out

**Table 20. Heat Pump Lockout Temperature Release Differential Field Setting**

Outdoor unit field setting 2-95/2-79/2-47	0	1	2
Heat Pump Lockout Release Differential (°F)	5	10 (Default)	15

## 5.2 Summary Tables for Different Indoor Units

Table 21 summarizes the auxiliary heater control logic, field settings, KRP1C Wiring Adapter compatibility, and mounting box/plate for each indoor unit model.

**Table 21. Summary Table of Auxiliary Heater Control for Each Indoor Unit**

Indoor Unit Type	Description	Ignore/Follow Outdoor Unit Prohibition (1)	Indoor Unit Aux Heater Logic	Indoor Unit Field Setting	KRP1C Compatibility	Installation Plate/Box	Connector
CXTQ_TA	'A' Coil for VRV	Ignore	Individually Adjustable (Type D)	11(21)-1-XX (T <sub>on</sub> ) 11(21)-2-XX (T <sub>off</sub> )	KRP1C75 (only works with heat pump heating, not working with gas furnace)	KRP1BA101	X33A
FXAQ_PVJU	Wall Mounted Unit	Not Available					
FXDQ_MVJU	Slim Duct Built-in Concealed Ceiling Unit	Ignored	Fixed (Type A)	N/A	KRP1C75	KRP1BA101	X16A
FXEQ_PVJU	One Way Blow	Follow	Individually Adjustable (Type C)	11(21)-1-XX (T <sub>on</sub> ) 11(21)-2-XX (T <sub>off</sub> )	KRP1C75	KRP1BA101	X33A
FXFQ_AAVJU	Round-flow Cassette	Follow	Individually Adjustable (Type C)	11(21)-1-XX (T <sub>on</sub> ) 11(21)-2-XX (T <sub>off</sub> )	KRP1C77	KRP1H98A (KRP1J98A if self cleaning Panel installed)	X33A
FXFQ_TVJU	Round-flow Cassette	Follow	Linked (Type B)	11(21)-1-xx (T <sub>on</sub> & T <sub>off</sub> )	KRP1C75	KRP1H98	X33A
FXHQ_MVJU	Ceiling Suspended	Ignored	Fixed (Type A)	N/A	KRP1C74	KRP1C93	X16A
FXLQ_MVJU9	Floor Standing Unit	Follow	Individually Adjustable (Type C)	11(21)-1-XX (T <sub>on</sub> ) 11(21)-2-XX (T <sub>off</sub> )	KRP1C74	–	X16A
FXMQ_PBVJU	DC Ducted Concealed	Follow	Linked (Type B)	11(21)-1-xx (T <sub>on</sub> & T <sub>off</sub> )	KRP1C74	KRP4A96	X33A
FXMQ_MVJU	Concealed Ceiling Unit	Ignored	Fixed (Type A)	N/A	KRP1C74	–	X16A
FXMQ_MFVJU	100% Outside Air Processing Unit	Ignored	Fixed (Type A)	N/A	KRP1C74	–	X16A
FXMQ-TBVJU	Ducted Concealed	Follow	Individually Adjustable (Type C)	11(21)-1-XX (T <sub>on</sub> ) 11(21)-2-XX (T <sub>off</sub> )	KRP1C76	KRP4A98	X33A
FXNQ_MVJU9	Concealed Floor Standing Unit	Follow	Individually Adjustable (Type C)	11(21)-1-XX (T <sub>on</sub> ) 11(21)-2-XX (T <sub>off</sub> )	KRP1C74	–	X16A
FXSQ_TBVJU	Ducted Concealed	Follow	Individually Adjustable (Type C)	11(21)-1-XX (T <sub>on</sub> ) 11(21)-2-XX (T <sub>off</sub> )	KRP1C76	KRP4A98	X33A
FXSQ_TAVJU	Ducted Concealed	Follow	Individually Adjustable (Type C)	11(21)-1-XX (T <sub>on</sub> ) 11(21)-2-XX (T <sub>off</sub> )	KRP1C74	KRP4A98	X33A
FXTQ_PBVJU	Vertical Air Handling Unit	Ignored	Fixed (Type B)	10(20)-7-XX (T <sub>on</sub> & T <sub>off</sub> )	KRP1C75	KRP1BA101	X33A
FXTQ_TAVJU	Multi-Position Air Handling Unit	Ignored	1st Stage: Individually Adjustable (Type C) 2nd Stage: related to 1st stage temp	11(21)-1-XX (T <sub>on</sub> ) 11(21)-2-XX (T <sub>off</sub> )	KRP1C75 (Not needed for HKS kit control)	KRP1BA101 (Not needed for HKS kit control)	X33A
FXUQ_PVJU	4-Way Blow Ceiling Suspended	Not Available					
FXZQ_MVJU9	2'x2' 4-Way Ceiling Cassette	Ignored	Fixed (Type A)	N/A	KRP1C75	KRP1BA101	X16A
FXZQ-TAVJU	2'x2' 4-Way Ceiling Cassette	Follow	Individually Adjustable (Type C)	11(21)-1-XX (T <sub>on</sub> ) 11(21)-2-XX (T <sub>off</sub> )	KRP1C75	KRP1BB101	X33A
FXZQ-TBVJU	2'x2' 4-Way Ceiling Cassette	Follow	Individually Adjustable (Type C)	11(21)-1-XX (T <sub>on</sub> ) 11(21)-2-XX (T <sub>off</sub> )	KRP1C77	KRP1BB101	X33A

(1) As explained in Section 3.1, VRV IV outdoor units have the control logic to set the Auxiliary heater Maximum Allowable Temperature through outdoor unit field setting. Please note certain indoor unit models will ignore this control logic from outdoor unit. That is, the auxiliary heater controlled by these indoor units can still be enabled when outdoor unit prohibition is set.

## 5.3 FXTQ\_TA Indoor Unit

In addition to control external heat source with the KRP1C heater output, FXTQ\_TA indoor unit PCB board has factory-installed heater control outputs for Daikin produced electric heat kit (HKS series) heater control. Single stage electric heat is supported up to 10kW, and two-stage electric heat is supported up to 25kW. Field setting 11(21)-5-xx configures the capacity of the installed electric heater kit.

Table 22 provides the compatibility list for the FXTQ\_TA indoor unit models and their associated allowable electric heater capacity field settings.

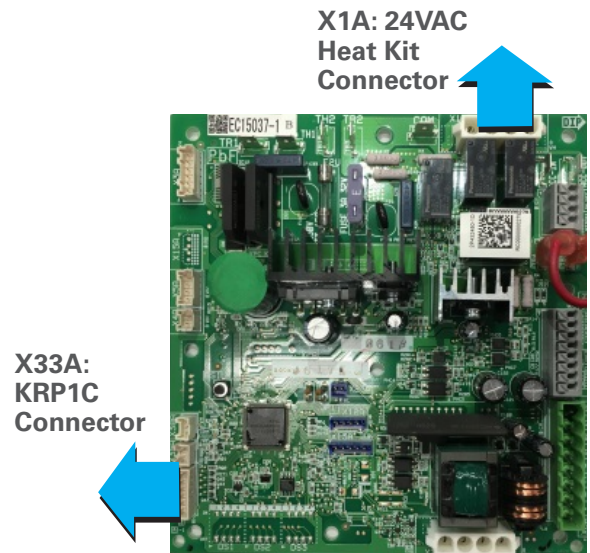


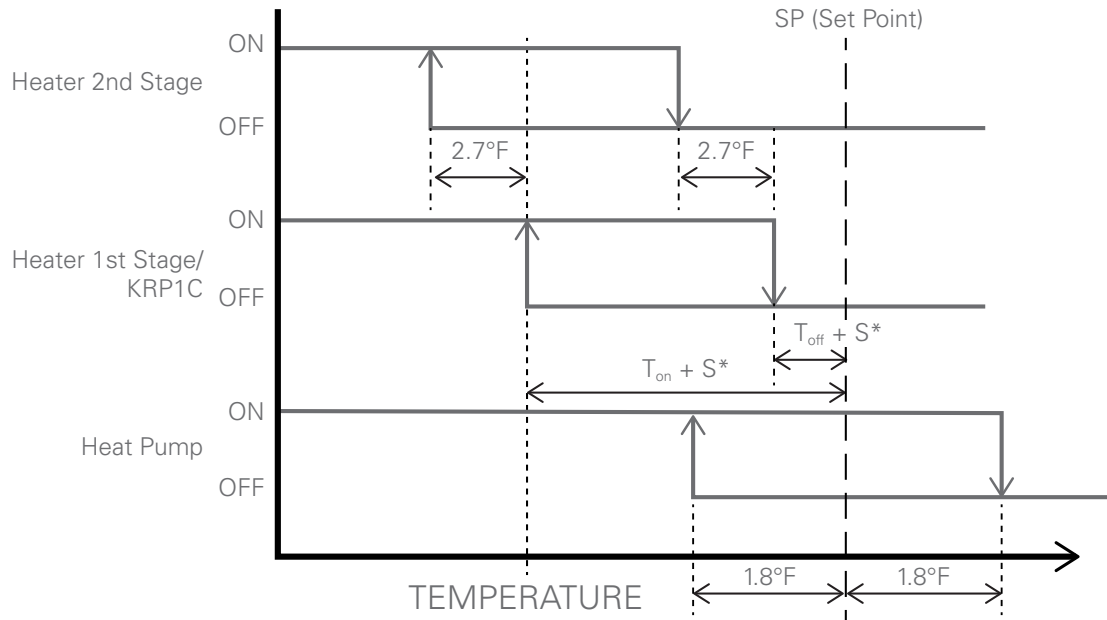
Fig. 8. FXTQ\_TA Indoor Unit PCB

Table 22. FXTQ\_TA Electric Heater Capacity Compatibility and Field Settings

Model	Mode No.	First Code No.	Heater (kW)																			
			No Heat Kit	3	5	6	8	10	15	19	20	25										
			Second Code No.																			
			01*	02	03	04	05	06	07	08	09	10										
FXTQ09TAVJUA	11(21)	5	•	•	•																	
FXTQ09TAVJUD			•	•	•																	
FXTQ12TAVJUA			•	•	•	•																
FXTQ12TAVJUD			•	•	•	•																
FXTQ18TAVJUA			•	•	•	•	•	•														
FXTQ18TAVJUD			•	•	•	•	•	•														
FXTQ24TAVJUA			•	•	•	•	•	•														
FXTQ24TAVJUD			•	•	•	•	•	•														
FXTQ30TAVJUA			•	•	•	•	•	•														
FXTQ30TAVJUD			•	•	•	•	•	•														
FXTQ36TAVJUA			•	•	•	•	•	•														
FXTQ36TAVJUD			•	•	•	•	•	•														
FXTQ42TAVJUA			•		•	•	•	•	•	•	•	•										
FXTQ42TAVJUD			•		•	•	•	•	•	•	•	•										
FXTQ48TAVJUA			•		•	•	•	•	•	•	•	•										
FXTQ48TAVJUD			•		•	•	•	•	•	•	•	•										
FXTQ54TAVJUA			•		•	•	•	•	•	•	•	•				•	•					
FXTQ54TAVJUD			•		•	•	•	•	•	•	•	•				•	•					
FXTQ60TAVJUA			•		•	•	•	•	•	•	•	•				•	•					
FXTQ60TAVJUD			•		•	•	•	•	•	•	•	•				•	•					

\* Default setting • Available  Not available

The first stage heater ON/OFF temperature utilized the Type C (Individually Adjust Logic) and can be configured by field settings 11(21)-01-xx and 11(21)-02-xx. The second-stage heater ON/OFF is related to the first-stage heater ON/OFF temperature, and is not adjustable. The following diagram shows the control logic for the two stage control of FXTQ\_TA series.



**Fig. 9. FXTQ\_TA Two-stage Auxiliary Heater Output with Heat Pump Heating**

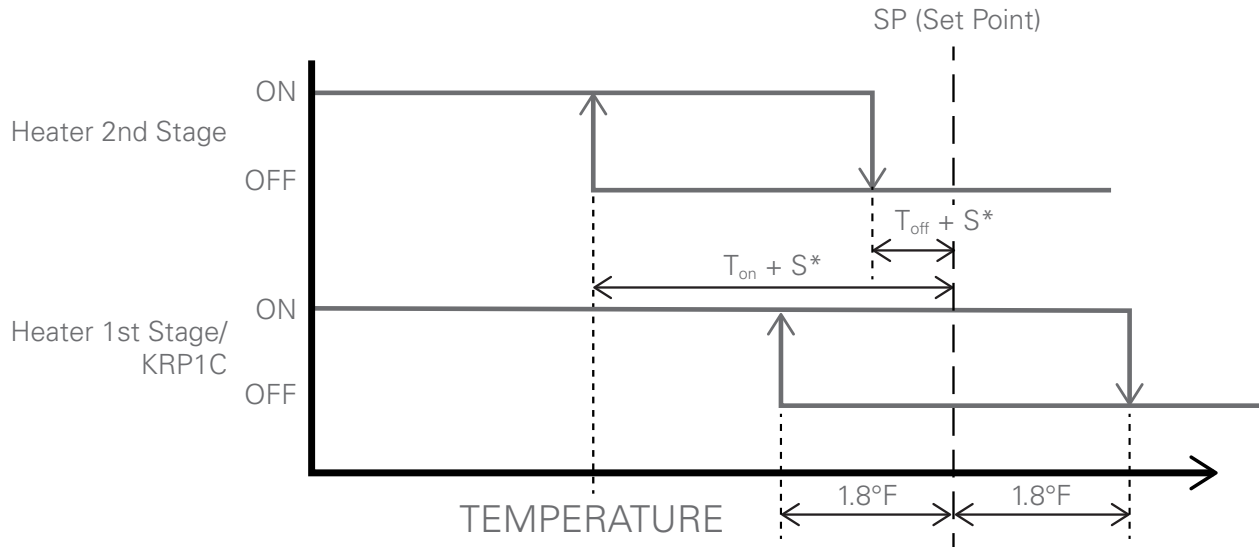
The KRP1C output follows the first stage output of the heater kit. However, if no electrical heater kit (HKS series) is used but KRP1C output is used for an external heater (i.e., baseboard heater), the field setting 11(21)-5-xx needs to be changed to another available value other than the default (01) to enable the KRP1C output. If a duct heater is utilized and controlled by KRP1C, this field setting shall set to the capacity of the duct heater.

For FXTQ\_TA units, indoor unit field setting 11(21)-3-XX configures to allow/prohibit the electrical heater kit to be energized when outdoor unit is actively heating and in Defrost/Oil Return operation. The follow table shows this field setting for FXTQ\_TA series.

**Table 23. FXTQ\_TA Indoor Unit Field Setting to Allow/Prohibit Auxiliary Heater in Heat Pump Heating and in Defrost/Oil Return Operaitson**

Description	Mode #	First Code #	Second Code #			
			01(Default)	02	07	08
Heater Operation	11(21)	3	Electric Heater with Heat Pump not Allowed	Electric Heater with Heat Pump Allowed	Electric Heater with Heat Pump not Allowed	Electric Heater with Heat Pump Allowed
Electric Heater Run for Defrost/Oil Return Operation			Not Allowed	Not Allowed	Allowed	Allowed

The following diagram shows the two-stage heater output during Heat Pump lockout period when the outdoor unit compressor is stopped and the heater provides heating to the room.



**Fig. 10. FXTQ\_TA Two-stage Heater Output in Heat Pump Lockout Period**

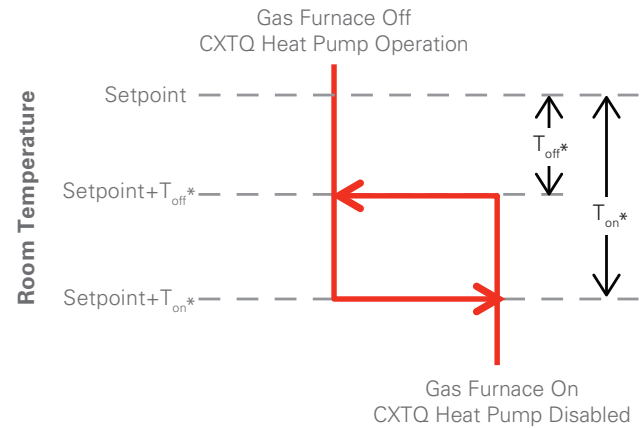
## 5.4 CXTQ-TA Cased A-Coil Unit

The Cased A-Coil indoor unit (CXTQ-TA) is used to connect with a gas furnace to provide the dual-fuel capability to the VRV system. It can work together with both the VRV LIFE outdoor unit (RXSQ-TA), VRV IV X Heat Recovery Unit (REYQ-XA), and VRV EMERION Heat Recovery unit (REYQ-AA).

The gas furnace can provide heat to the space while the outdoor unit is providing heat to other connected indoor units. In normal operation, when the room temperature is lower than the setpoint for a certain degree, the CXTQ will turn off its heat pump operation and turn on the gas furnace, and other indoor units can still provide heat pump heating.



**Fig11. Gas Furnace Control logic**



1. Providing heat from the gas furnace and outdoor unit simultaneously

The VRV outdoor unit can provide heat to the space together with the gas furnace. The gas furnace can be turned on based on room temperature.

A. Turn on/off the gas furnace based on the room temperature.

When the gas furnace is used to supplement the heat pump heating, the gas furnace ON/OFF temperatures,  $T_{on}$  and  $T_{off}$ , can be configured individually by indoor unit field settings:

Type D – Individually Adjustable Logic for CXTQ-TA:

$T_{on}$  and  $T_{off}$  can be configured individually.

\* Actual temperature change due to S logic:

- $T_{on}^* = T_{on} + S$
- $T_{off}^* = T_{off} + S$

**Table 24. Aux heat Ton Toff field settings**

Description	Mode	First Code	Second Code						
			01	02	03	04	05	06	07
$T_{on}$	11(21)	1	-7.2°F (-4°C) (Default)	-6.3°F (-3.5°C)	-5.4°F (-3°C)	-4.5°F (-2.5°C)	-3.6°F (-2°C)	-2.7°F (-1.5°C)	-1.48°F (-100°C)
$T_{off}$		2	-3.6°F (-2°C)	-2.7°F (-1.5°C)	-1.8°F (-1°C)	-0.9°F (-0.5°C)	0°F (0°C) (Default)	0.9°F (0.5°C)	-144.4°F (-98°C)

\* The second code No. 07 is used for disabling this indoor unit logic of starting the gas furnace based on room temperature.

The combination of  $T_{on}$  and  $T_{off}$  is limited to maintain a minimal 3.6oF differential and reliability. The allowed combinations are shown in the following table.

**Table 25. The allowed  $T_{on}$  and  $T_{off}$  combination**

$T_{OFF}$ \ $T_{ON}$		01	02	03	04	05	06	07
		-7.2°F (-4°C)	-6.3°F (-3.5°C)	-5.4°F (-3°C)	-4.5°F (-2.5°C)	-3.6°F (-2°C)	-2.7°F (-1.5°C)	-148°F (-100°C)
07	-144.4°F (-98°C)	N/A	N/A	N/A	N/A	N/A	N/A	•
06	0.9°F (0.5°C)	•	•	•	•	•	•	•
05	0°F (0°C)	•	•	•	•	•	N/A	•
04	-0.9°F (-0.5°C)	•	•	•	•	N/A	N/A	•
03	-1.8°F (-1°C)	•	•	•	N/A	N/A	N/A	•
02	-2.7°F (-1.5°C)	•	•	N/A	N/A	N/A	N/A	•
01	-3.6°F (-2°C)	•	N/A	N/A	N/A	N/A	N/A	•

• = Available. N/A = Not Available.

When there are two CXTQ coils connected to the same residential outdoor unit, both field settings, 11(21)-1 and 11(21)-2, must be set to "07". Otherwise, the system will not operate properly in heating mode.

B. Turn on/off the gas furnace based on outdoor temperature (Only *VRV LIFE* RXSQ-TAVJU outdoor unit)

The *VRV LIFE* outdoor unit can enable the gas furnace operation when the outdoor ambient temperature is lower than the switch-over temperature. The switch-over temperature is set through the outdoor unit field setting 2-14.

**Table 26. Switch-over temperature field settings**

Mode	Setting	Unit	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2-14	Switch Over Temp	°C		-20.5		-17.7	-15	-12.2	-9.4	-6.6	-3.8	-1.1	1.6	4.4	7.2	10	100	-100
		°F		-5		0	5	10	15	20	25	30	35	40	45	50	212	-148

The gas furnace will be turned off when the outdoor temp recovers to be higher than the switch-over temperature for a certain degree. The release differential is set through the outdoor unit field setting 2-15.

**Table 27. Release Differential Temp field settings**

Mode	Setting	Unit	0	1	2
2-15	Release Differential Temp	°C	2.8	5.6	8.3
		°F	5	10	15

Note: KPR1C heater output will NOT be on when gas furnace is running. The KRP1C heater output will be enabled only in heat pump heating when:

- During outdoor unit sends “prohibit furnace” to the Indoor unit, or
- During the furnace reports a critical error to CXTQ.

2. Providing heat from the gas furnace while outdoor unit heat pump is locked.

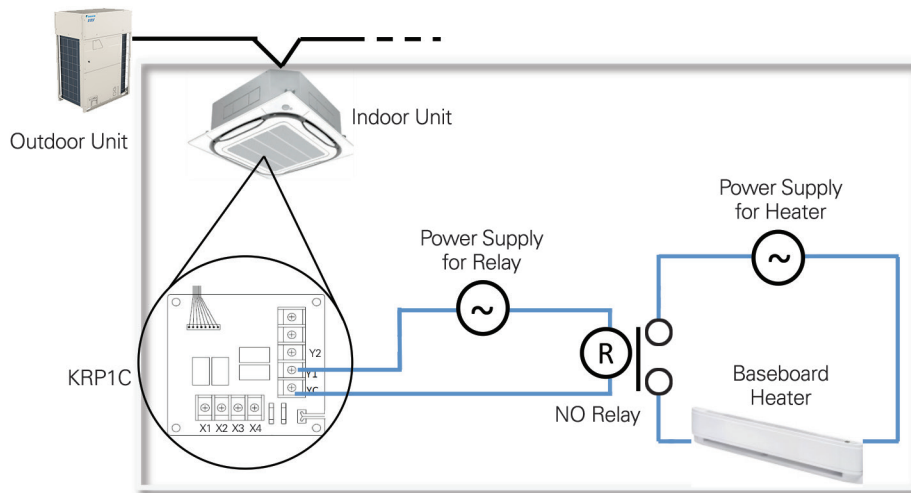
In cold weather when the ambient temperature is lower than the heat pump lockout temperature, the outdoor unit will go to heat pump lockout mode, and the gas furnace will provide heating to the space.



## 6. Applications

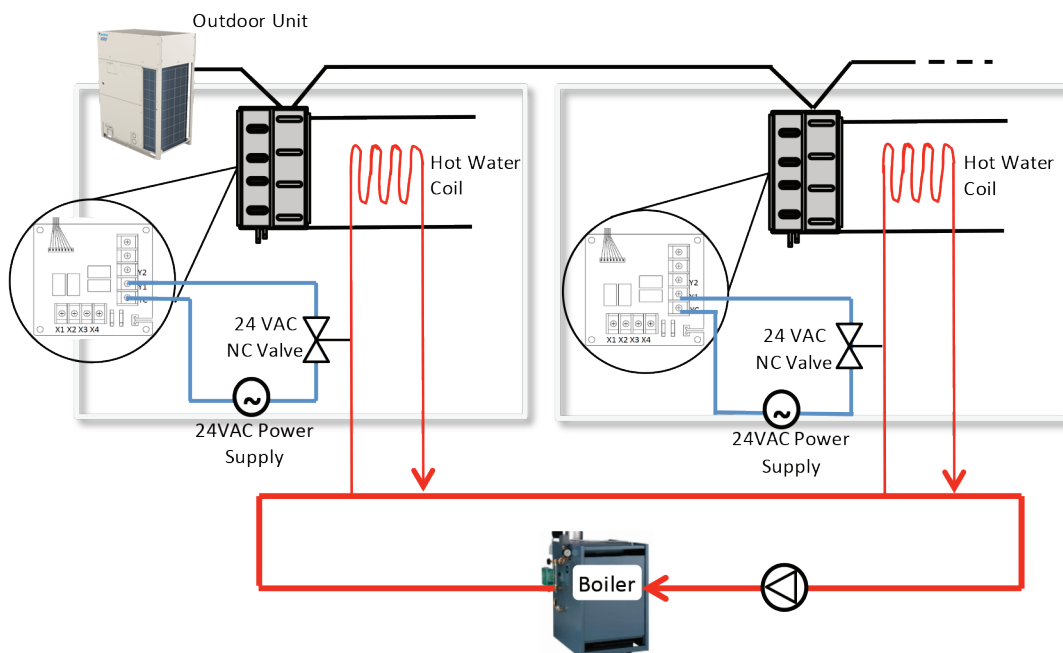
## 6.1 Heater Application Examples

The application approach can vary for different heater type and applications. Since the *VRV* system controls the auxiliary heater at room level, the typical application is to control a baseboard heater or a ducted electric heater in a room. The following wiring diagram shows a typical application of controlling a single stage baseboard heater through the Y1-YC output.



**Fig. 11. Application of Controlling a Single Stage Baseboard Heater**

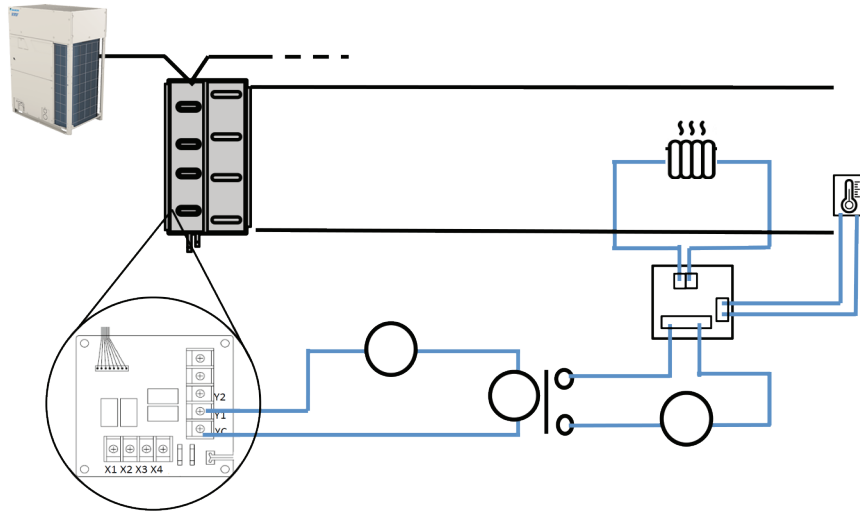
For a retrofit building, the auxiliary heater controller can be used to integrate a pre-existing heater source, such as a boiler. The following wiring diagram shows a possible configuration to integrate the boiler into the *VRV* system as an auxiliary heater. The boiler needs to be controlled at the system level with an independent controller. The individual indoor unit can control the valve of the hot water that enters the room.



**Fig. 12. Application of Integrating a Boiler in a Retrofit Project**

## 6.1 Heater Application Examples

Since the auxiliary heater control output is an ON/OFF signal that cannot provide modulating control to heaters, an additional controller is needed for stage control or modulating control. The following diagram shows an approach to control a ducted electric heater by an additional SCR Controller. The indoor unit enables the heater ON/OFF, while the SCR heater controls the modulating of heater output.



**Fig. 13. Application of Controlling and Modulating a Ducted Heater with an Additional SCR Heater**

The following settings need to be considered at the design stage and configured at the commissioning stage.

**Table 28. Auxiliary Heater Configuration Considerations**

What to Control		What to Consider	Related Settings	ODU Field Setting Number and Value	IDU Field Setting Number and Value
Auxiliary Heater with Heat Pump heating	Prohibit the Auxiliary Heater in high ambient temperature	1. Will the connected indoor unit follow this outdoor unit command?	Auxiliary Heater Max Allowable Temp		N/A
		2. Preferred prohibit/release temperature	Auxiliary Heater Max Allowable Temp Release Differential		N/A
	Indoor Unit Auxiliary Heater Control Logic	1. The available $T_{on}/T_{off}$ field setting for the specified indoor unit	$T_{on}/T_{off}$	N/A	
		2. Preferred $T_{on}/T_{off}$ value 3. The type of auxiliary heater and preferred fan speed in thermo-off period	Fan speed in thermo-off	N/A	
Auxiliary Heater as Primary Heater in Heat Pump Lockout		1. Whether to always lockout the Heat Pump or only lockout the Heat Pump at predetermined low ambient temperature 2. Preferred fan speed when the room is in thermo-off 3. Preferred temperature to lock out and release the Heat Pump heating	Heat Pump heating always locked out		N/A
			Advanced Heat Pump lockout mode		N/A
			Heat Pump Lockout Temperature		N/A
			Heat Pump Lockout Temperature Release Differential		N/A

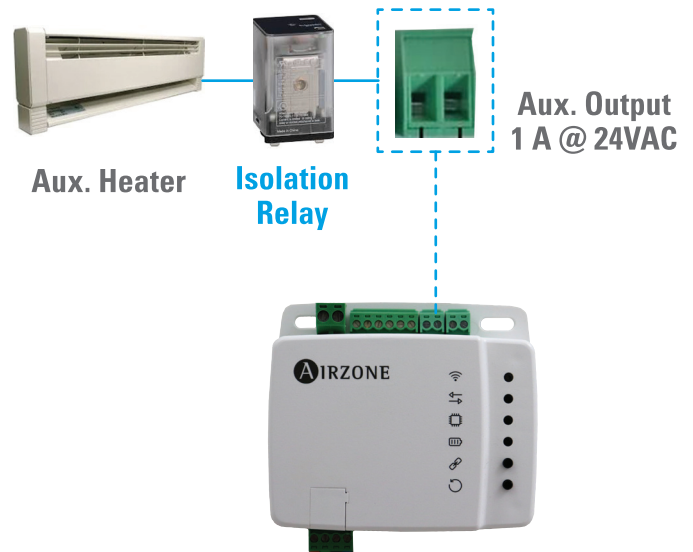
## 6.3 The DKN Plus Adaptor

The DKN Plus adaptor provides an AUX heat Dry output contact. The aux output can be configured as normally open or normally close from the DKN Cloud NA App. The Aux heat output of the DKN Plus should be used in the following cases:

- » FXAQ indoor unit (not compatible with KRP1C)
- » P1P2 indoor unit where the DKN Plus is used for controlling the indoor unit remotely through the DKN Cloud NA App
- » Mini Split indoor unit (Check the compatibility section of the DKN Plus Submittal Data Sheet)

The AUX heat output of the DKN Plus is configurable as a secondary heat source, here is the list of features:

- » All the AUX heat configuration is set using the DKN Cloud NA App
- » Aux heater application selection for Baseboard heater or Duct heater.
- » Turn on and off the auxiliary heater based on the differential between the setpoint and the room temperature.
- » Enable/Disable the auxiliary heater based on outdoor temperature (S21 IDU only)
- » The user can enable the emergency heat mode from the DKN NA App
  - Note: The emergency heater must be an external heat source, for example, a baseboard heater



- » If the indoor unit has an error, the user can enable the emergency heater from the app.

The AUX heat On /Off control is independently configurable according to the  $T_{on}$  and  $T_{off}$  temperature differentials from the room temperature.

- »  $T_{on}$  is configurable = -7.2F to -2.7F adjustable in 0.9F increments
- »  $T_{off}$  is configurable = -3.6F to 0.9F adjustable in 0.9F increments but with differential of at least 3.6F
- » Time delay starts 0-30 minutes in 5-minute increments.

**Table 29. The Allowed  $T_{on}$  and  $T_{off}$  Combination**

$T_{OFF}$ °F (°C)	$T_{OFF}$ °F (°C)	-7.2 (-4.0)	-6.3 (-3.5)	-5.4 (-3.0)	-4.5 (-2.5)	-3.6 (-2.0)	-2.7 (-1.5)
0.9 (0.5)		•	•	•	•	•	•
0 (0)		•	•	•	•	•	N/A
-0.9 (-0.5)		•	•	•	•	N/A	N/A
-1.8 (-1.0)		•	•	•	N/A	N/A	N/A
-2.7 (-1.5)		•	•	N/A	N/A	N/A	N/A
-3.6 (-2.0)		•	N/A	N/A	N/A	N/A	N/A

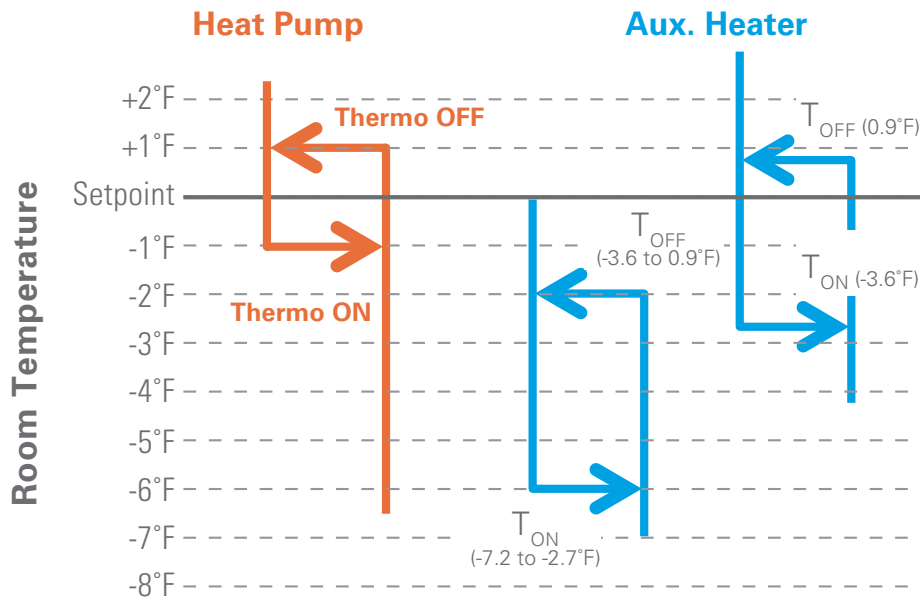
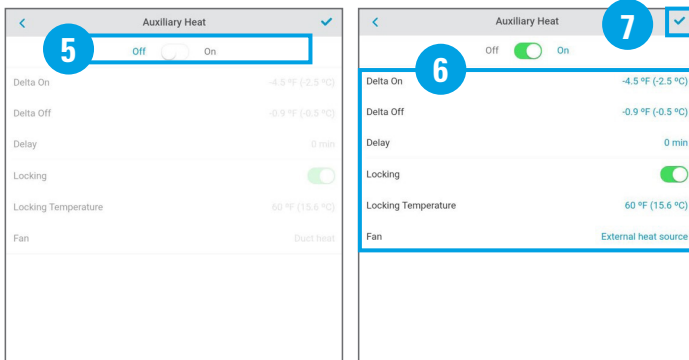
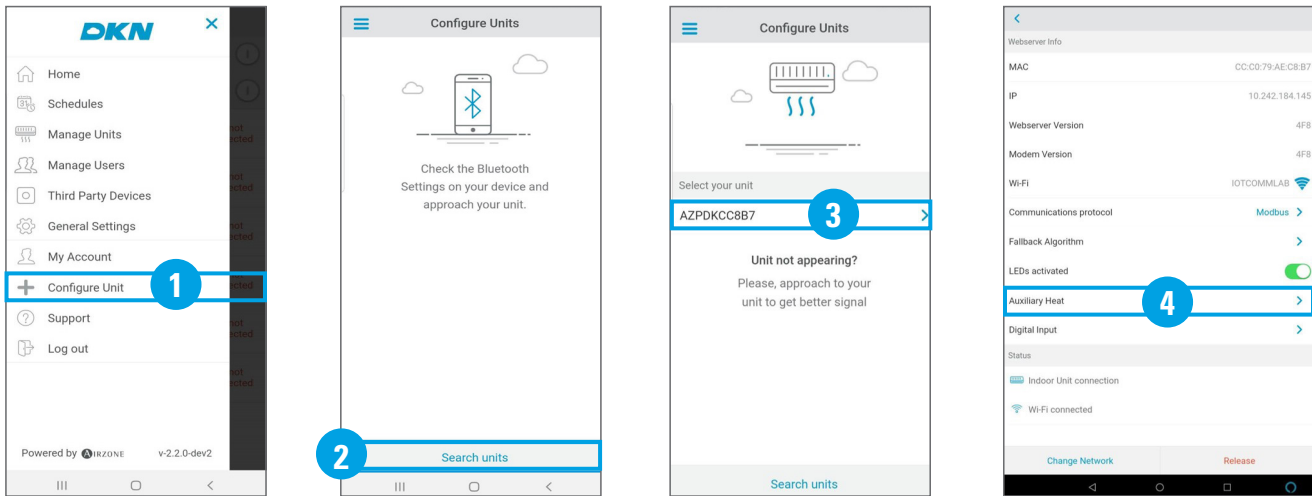


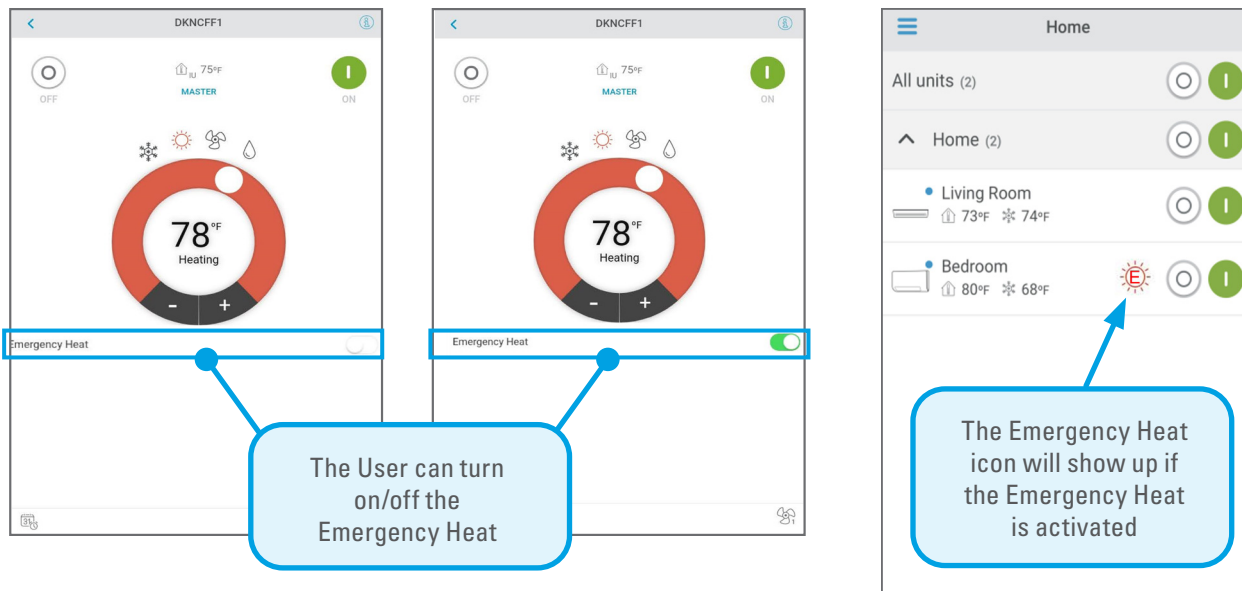
Fig14. DKN Plus Aux heat control logic

The AUX heat configuration of the DKN Plus can be set by using the DKN Cloud NA App.

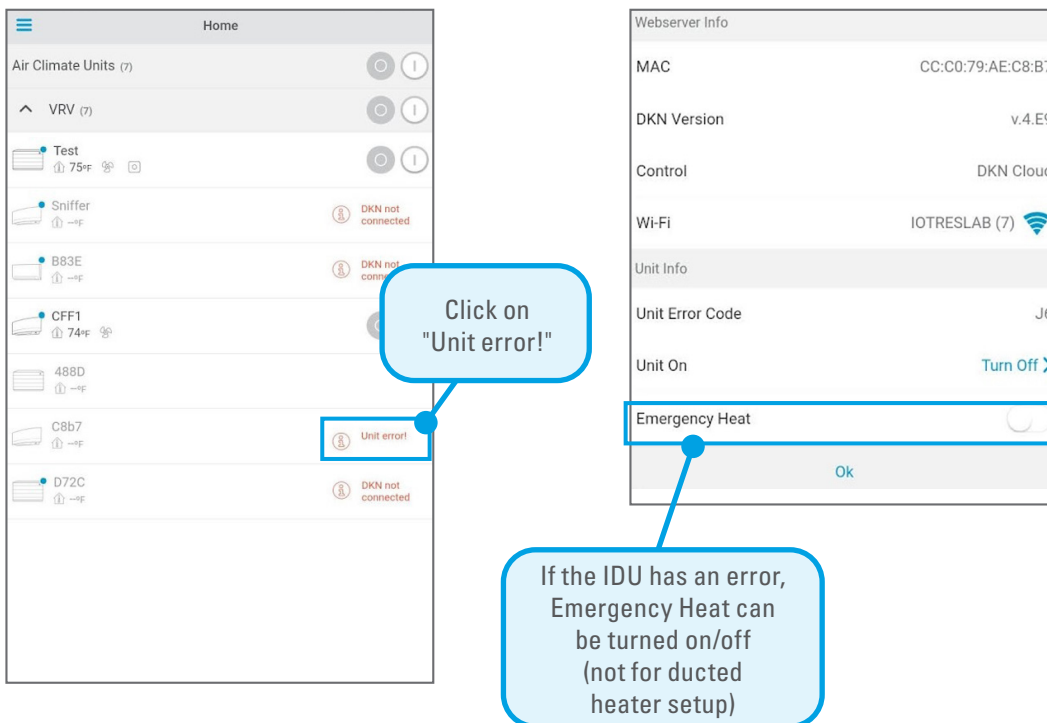


ITEM	DESCRIPTION	SELECTION RANGE
Delta On	Deadband to turn On the Aux heat.	-7.2°F to -2.7°F
Delta Off	Deadband to turn Off the Aux heat.	-3.6°F to -0.9°F
Delay		0 to 30 min.
Locking	Enable / Disable Aux heat based on the ODU temperature (only for S21 IDU).	Enable - Disable
Locking Temperature	The Aux heat will be available only if the ODU temp is below the locking temperature (only for S21 IDU).	0 to 65°F
Fan	External Heat Source: The Aux heat can be enabled regardless of the IDU can status. Duct Heat: The Aux heat will be enable only if th eIDU fan status is running (this selection not applicable for S21 IDU)	External Heat Source – Duct Heat

**The Emergency Heat Configuration can be set from the indoor unit control page of the DKN NA Cloud App.**



**The Emergency Heat Can be enabled when the indoor unit has an error code.**

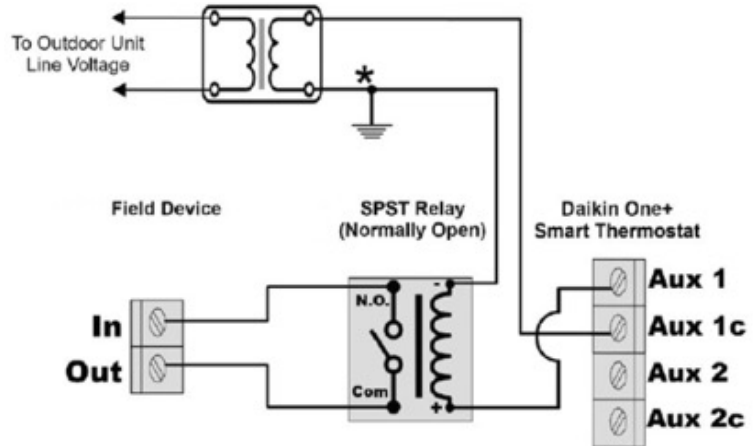


## 6.4 The Daikin *One* Thermostats

The Daikin *One+* and the Daikin *One Touch* thermostats can be used to control Aux heater. The Daikin *One+* will provide 2 Aux heat dry contacts output for non-ducted heaters, however only one of the contacts can be used at a time. The Aux heat output can be configured as primary or secondary heat source through the setup menu of the Daikin *One+*. Once added, Emergency heat mode will also be added to the system mode menu.



The wiring diagram at right shows the Aux heat connection to the Daikin *One+* thermostat. A 24V AC control signal must be routed through the aux contacts.



An aux heat source can be added in the “Equipment Setup” menu using “add equipment”, then configure it as primary or the secondary source of heat.

### 1. Heat Pump as primary heat Source

- » Heat pump lockout adjustable from -20°F to 65°F in 5°F increments. (Default 15°F)
- » Aux heat lockout adjustable from -10°F to 75°F in 5°F increments. (Default 50°F)
- » Aux heat demand
- »  $T_{on}$  differential -7°F to -3°F in 1°F increments (default -3°F)
- »  $T_{off}$  differential -4°F to 1°F in 1°F increments (default 1°F)

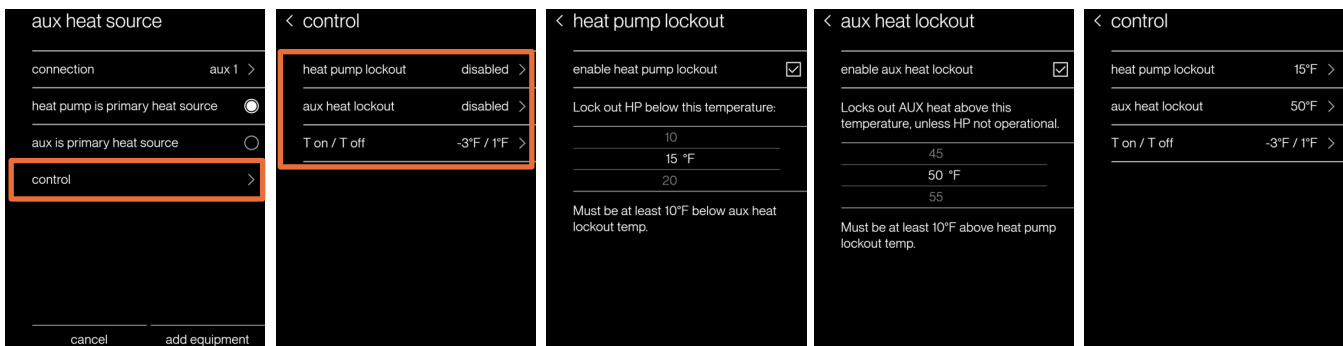
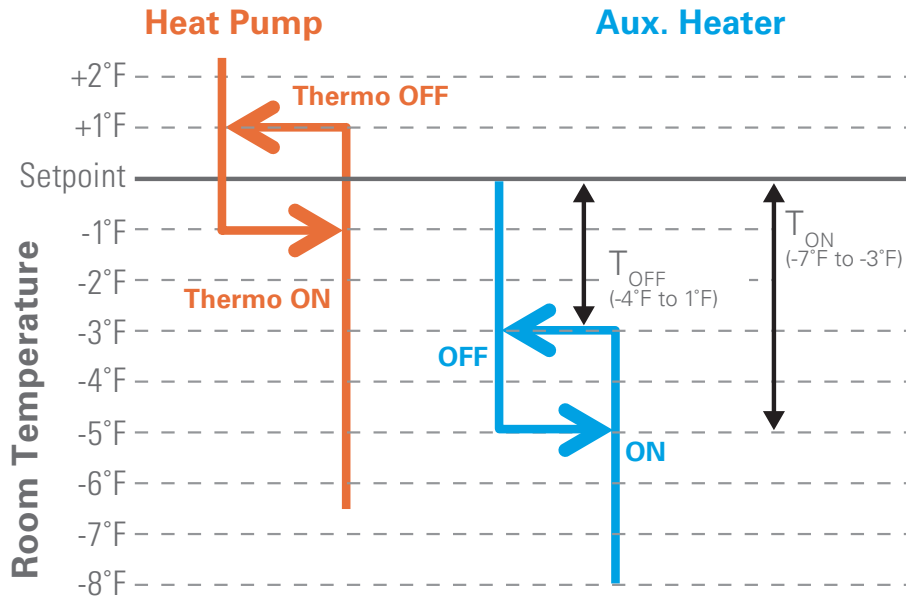


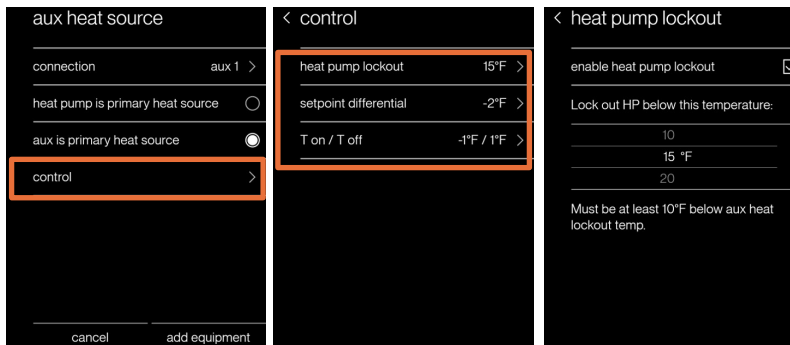
Fig15. Heat Pump as primary heat Source



**Note:** The heat pump lockout and the AUX heat lockout are based on the ambient temperature data. The Ambient temperature data is communicating to the *One+* through the weather service, therefore the Wi-Fi connection is necessary for AUX heat logic to execute.

**2. Aux heat as Primary heat source**

- » Heat pump lockout adjustable from -20°F to 65°F in 5°F increments. (Default 15°F)
- » Setpoint differential -9°F, -7°F, -4°F, and -2°F (default -2°F)
- » Aux heat demand
- » Ton differential -1°F to -2°F (default -1°F)
- » Toff differential 1°F fixed.



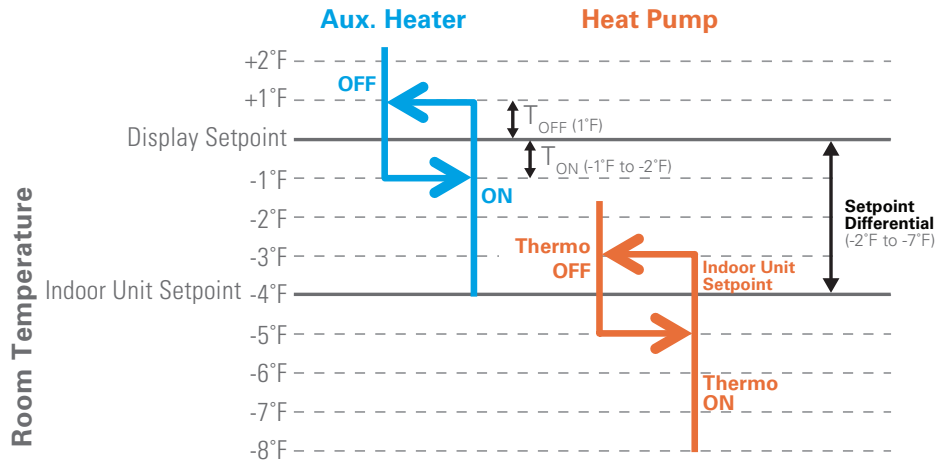
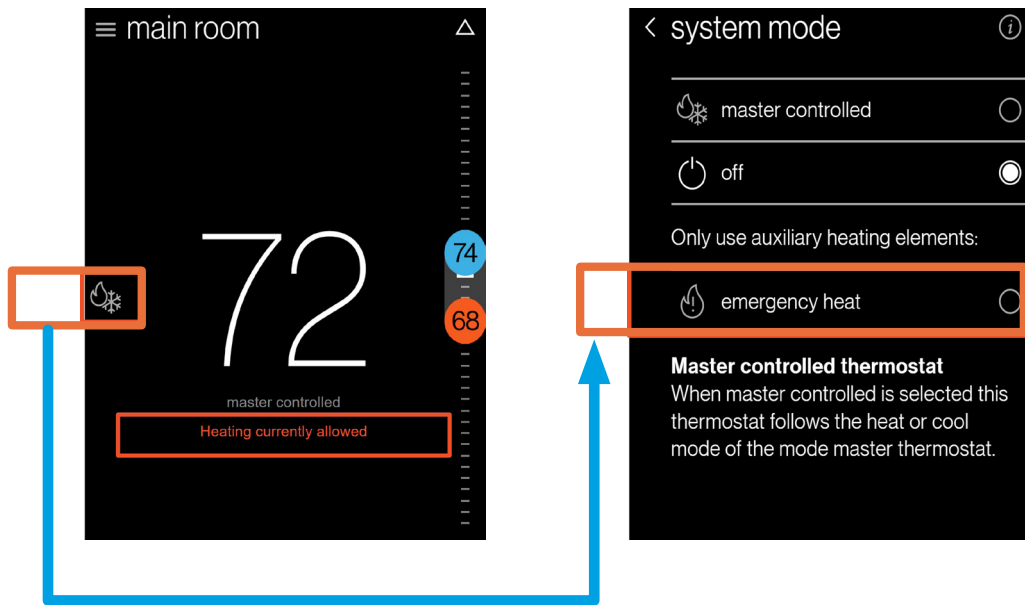


Fig16. Aux heat as Primary heat source

**Note:** For non-master indoor unit, the AUX heater will operate independently as the user will allow to enable the aux heat by selecting the Emergency Heat mode from the system Mode menu.





# Appendices

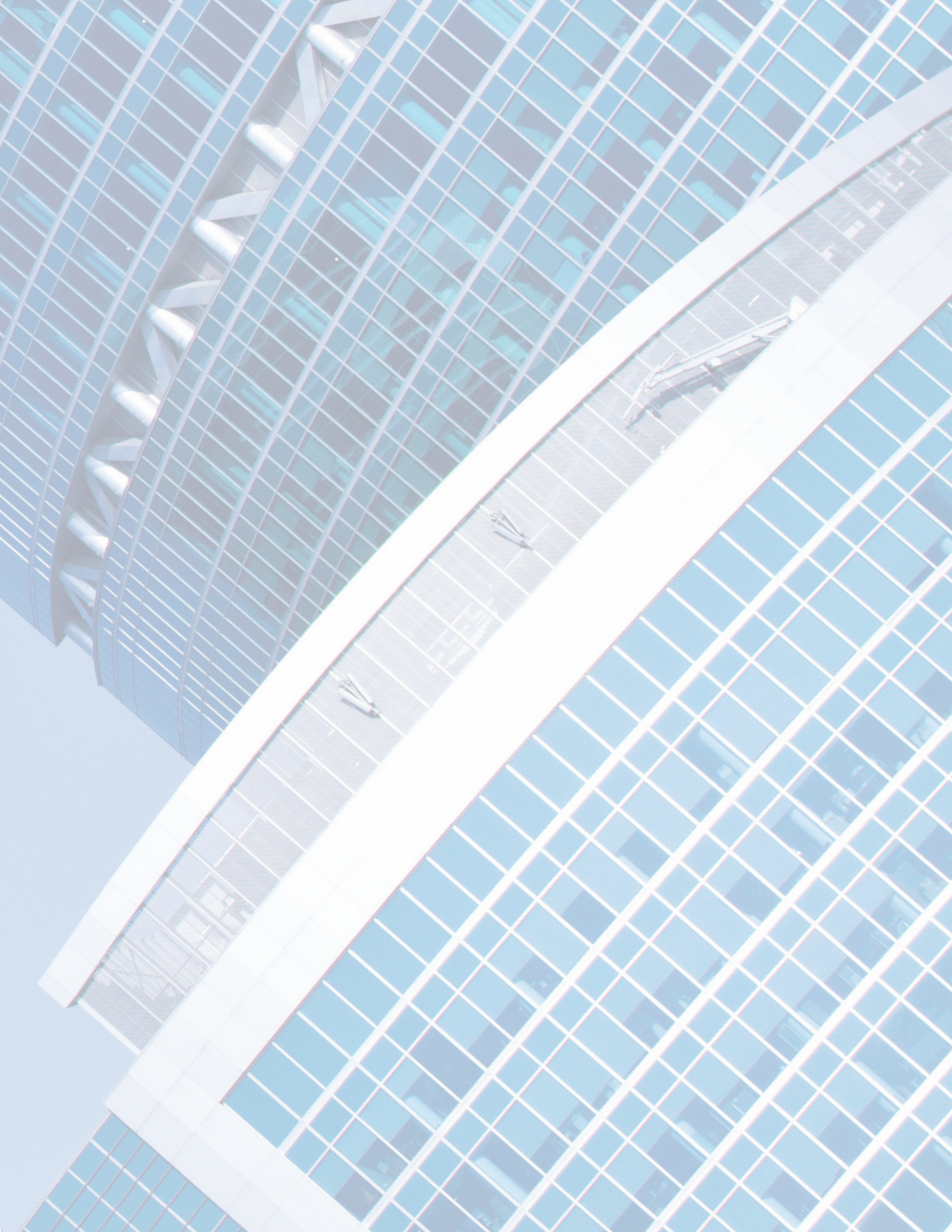


## Appendix I – List of Errors that Turn Off the Indoor Unit Fan in Certain Situations

Error Code	Error Description	Will the error code always turn off the indoor unit fan?
A0	External protection device abnormality	Always
A1	Indoor unit PCB abnormality	Always
A6	Indoor fan motor (M1F) lock, overload Indoor fan motor abnormality Overload/overcurrent/indoor fan motor lock	Always
A8	Power supply voltage abnormality	Always
AJ	Capacity determination device abnormality	Not Always (in certain situations, the indoor unit fan will stop; in other situations, the fan will continue running)
C1	Transmission abnormality (between indoor unit PCB and fan PCB)	Not Always (in certain situations, the indoor unit fan will stop; in other situations, the fan will continue running)
C6	Combination abnormality (between indoor unit PCB and fan PCB)	Always
E1	Outdoor main PCB abnormality	Always
E3	Activation of high-pressure switch	Always
U0	Refrigerant shortage	Always
U5	Transmission error between remote controller and indoor unit	Always
UA	Improper combination of indoor and outdoor units, indoor units and remote controller	Always
UE	Transmission error between centralized controller and indoor unit	Depends on whether a remote controller is available (If a remote controller is available, the indoor unit fan will continue operating)

## Appendix II – List of Errors that Enable the Heat Pump Lockout Automatically for VRV IV

Error Code	Error Description	Function of Heat Pump Lockout Automatically				
		VRV IVHP (RXYQ)	VRV IVHR (REYQ)	VRV IV AURORA (RELO)	VRV IV-S (RXTQ)	VRV IV W (RWEYQ)
E3	Actuation of high-pressure switch	•	•	•	•	N/A (Cannot lockout the Heat Pump automatically when in error)
E4	Actuation of low-pressure sensor	•	•	•	•	
E5	INV. compressor motor lock	•	•	•	•	
E6	Compressor damage alarm	•	•	•	N/A	
E7	Outdoor unit fan motor abnormality	•	•	•	•	
E9	Electronic expansion valve coil abnormality	•	•	•	•	
H3	Harness abnormality (between control PCB and inverter PCB)	•	•	•	N/A	
H7		•	•	•	•	
H9	Outdoor air thermistor (R1T) abnormality	•	•	•	•	
F3	Discharge pipe temperature abnormality	•	•	•	•	
F4	Wet alarm	•	•	•	N/A	
F9	BS Electronic expansion valve coil abnormality	•	•	•	•	
J3	Discharge pipe thermistor (R21T, R22T) abnormality compressor surface temperature thermistor (R8T) abnormality	•	•	•	•	
J5	Accumulator inlet thermistor (R3T) abnormality	•	•	•	•	
J6	Heat exchanging deicer thermistor (R7T) abnormality Heat exchanging gas thermistor abnormality	•	•	•	•	
J7	Subcooling heat exchanger liquid pipe thermistor (R5T) abnormality	•	•	•	•	
J8	Heat exchanger liquid pipe thermistor (R4T) abnormality	•	•	•	N/A	
J9	Heat exchanger gas pipe thermistor (R6T) abnormality	•	•	•	•	
JA	High-pressure sensor abnormality	•	•	•	•	
JC	Low-pressure sensor abnormality	•	•	•	•	
L1	Inverter PCB abnormality	•	•	•	•	
L3	Reactor temperature rise abnormality	•	•	•	N/A	
L4	Inverter radiation fin temperature rise abnormality	•	•	•	•	
L5	INV. compressor instantaneous overcurrent	•	•	•	•	
L8	INV. compressor overcurrent	•	•	•	•	
L9	INV. compressor startup abnormality	•	•	•	•	
LC	Transmission error between inverter and control PC	•	•	•	•	



## About Daikin:

Daikin Industries, Ltd. (DIL) is a global Fortune 1000 company which celebrated its 95th anniversary in May 2019. The company is recognized as the leading HVAC (Heating, Ventilation, Air Conditioning) manufacturer in the world. DIL is primarily engaged in developing indoor comfort systems and refrigeration products for residential, commercial and industrial applications. Its consistent success is derived, in part, from a focus on innovative, energy-efficient and premium quality indoor climate and comfort management solutions.

Before purchasing an appliance in this document, read important information about its estimated annual energy consumption, yearly operating cost, or energy efficiency rating that is available from your retailer.

### WARNING

Only personnel that have been trained to install, adjust, service or repair (hereinafter, "service") the equipment specified in this manual should service the equipment. The manufacturer will not be responsible for any injury or property damage arising from improper service or service procedures. If you service this unit, you assume responsibility for any injury or property damage which may result. In addition, in jurisdictions that require one or more licenses to service the equipment specified in this manual, only licensed personnel should service the equipment. Improper installation, adjustment, servicing or repair of the equipment specified in this manual, or attempting to install, adjust, service or repair the equipment specified in this manual without proper training may result in product damage, property damage, personal injury or death.

### WARNING

**HIGH VOLTAGE! Disconnect all power before servicing or installing equipment. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.**



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