DAIKIN UNIVERSITY

Daikin VRV
Service & Troubleshooting

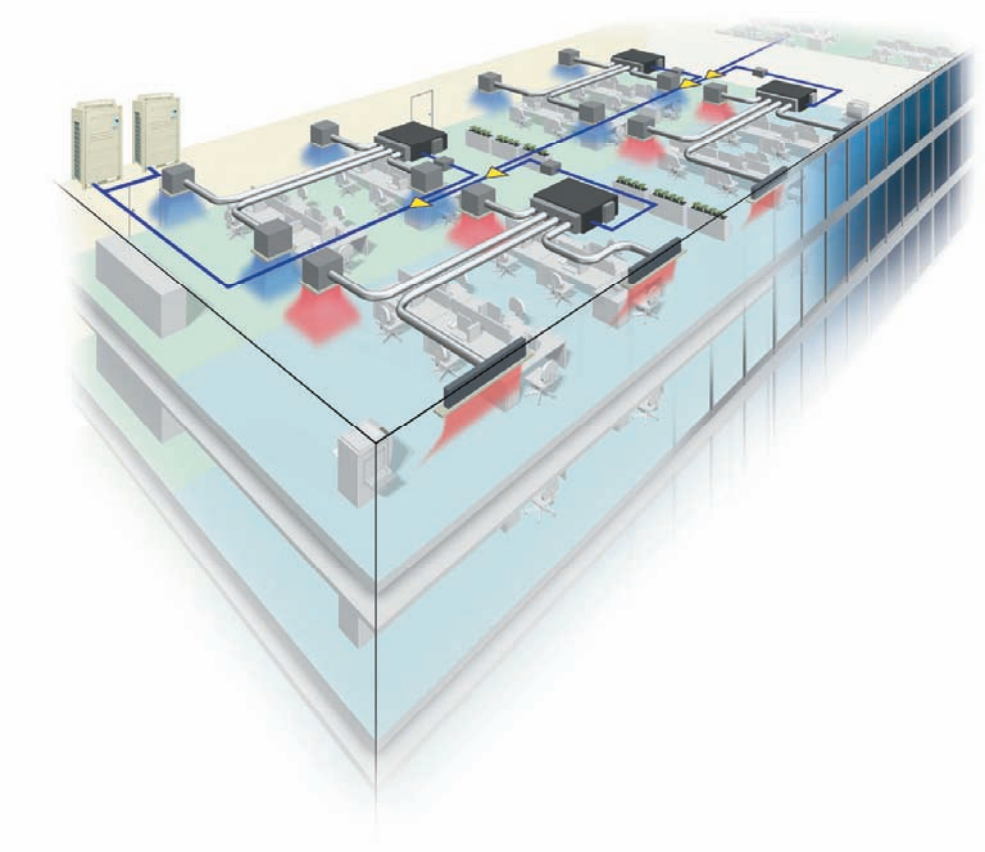
Participant Guide

DAIKIN AC®
absolute comfort

EGVUSE09-07C

Engineering Data

VRV Systems
Basic Operation Guide



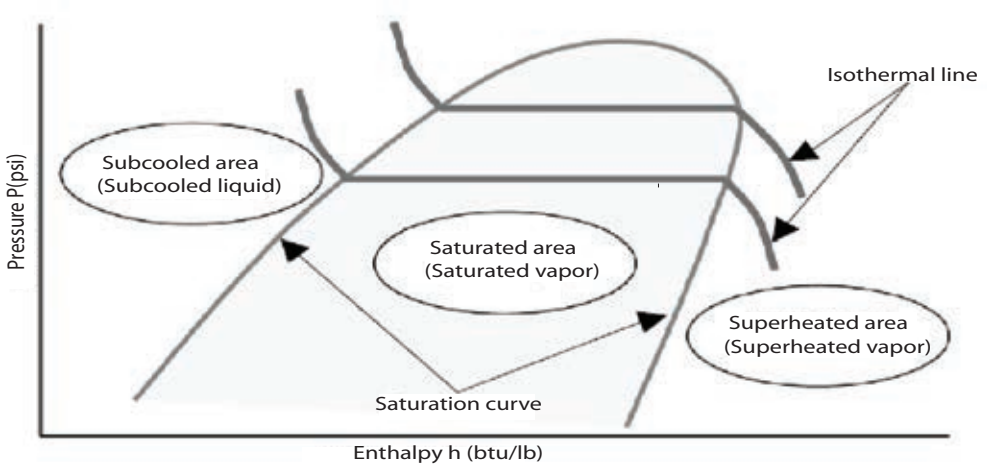
VRV® VRV®-WII VRV®III
THE INTELLIGENT AIR CONDITIONING SYSTEM

DAIKIN AC (AMERICAS), INC.

VRV Systems Basic Operation Guide

1. Explanations of P-H Diagram (Refrigerant Characteristics Table)

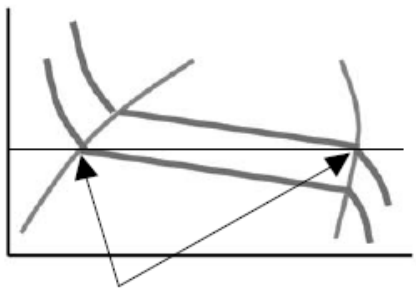
The following P-H (pressure, enthalpy) diagram shows characteristics of various refrigerants with pressure on the vertical axis and enthalpy on the horizontal axis.



- The change of state from gas to liquid is called condensing and that from liquid to gas is called evaporating. The boundary state of each change is called saturation, and the temperature generating saturation is called the saturation temperature.
- Saturation temperature depends on the kind of refrigerant and pressure. The characteristics of saturation temperature are shown on P-H diagrams of various refrigerants, and are called the ***saturation curve***.
- The characteristics of temperature gradients for pressure and enthalpy are shown on P-H diagrams, called ***isothermal lines***. By knowing the zone divided with saturation curve in which the intersection point of pressure and isothermal line is included, the information on the state of refrigerant can be provided. The intersection above can be obtained by measuring pressure and temperature of refrigerant at a certain point.
- For single refrigerants such as R22 and R134A, the isothermal line has no gradient in the saturated area, that is, the saturation temperature under certain pressure is the same at both the liquid side and the gas side. For mixed or blended refrigerants such as R407C and R410A, in which multiple refrigerants with different boiling points are mixed, their isothermal lines have gradients in the saturated area, so the saturation temperatures under certain pressure are different at the liquid side and the gas side. They are called zeotropic refrigerants, with the exception that R410A is called an quasi azeotropic refrigerant.

States of refrigerants are classified in the following 3 categories:

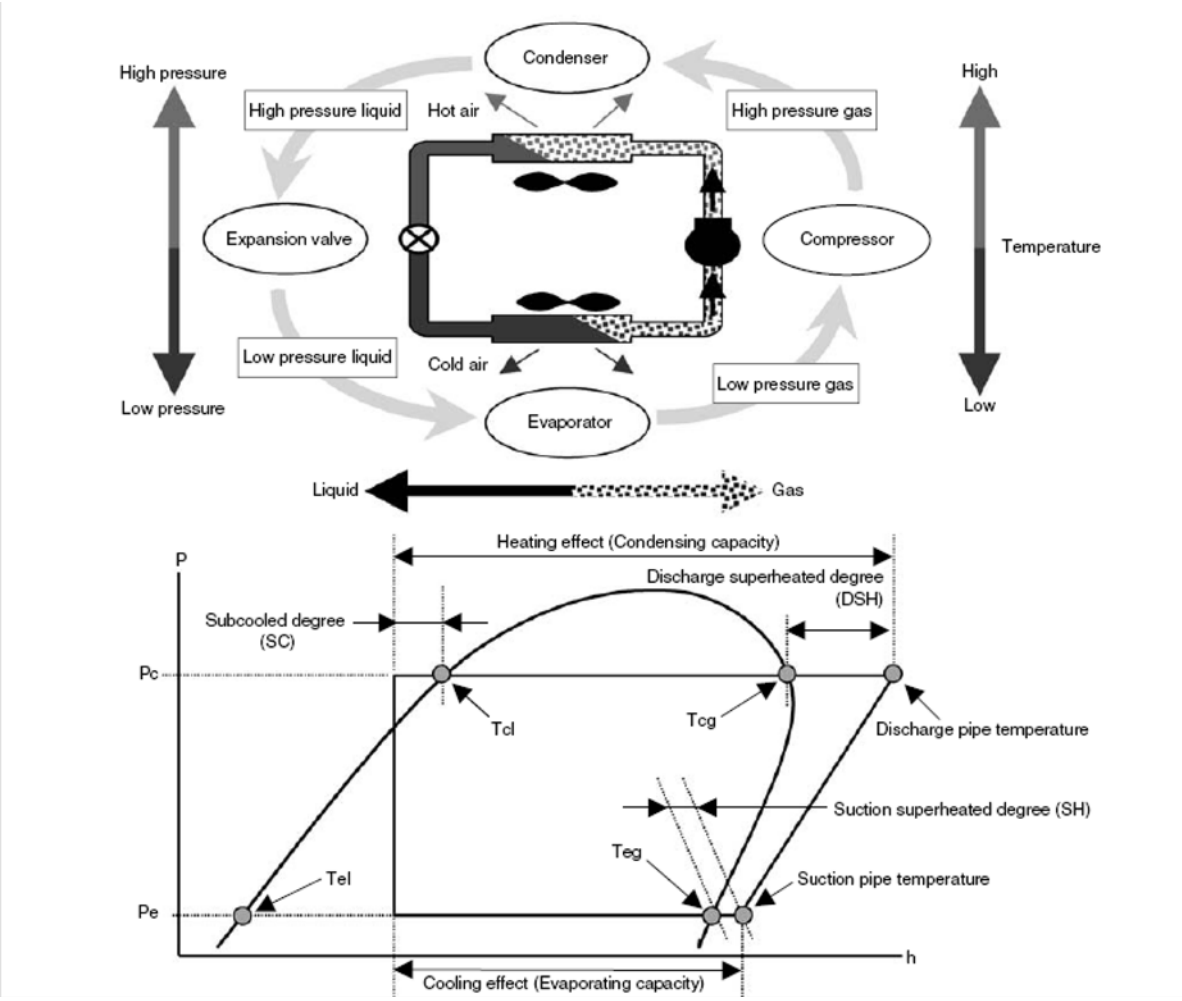
- Superheated vapor: state that refrigerant is existing as gas
- Saturated vapor: state that is a mixture of liquid and gas (this is also called wet vapor)
- Subcooled liquid: state that refrigerant is existing as liquid.



Zeotropic refrigerant R407C has different saturation points at liquid side and gas side. (gas side is higher than liquid side)

2. Concept of Basic Refrigeration Cycle

The following P-H diagram shows characteristics of various refrigerants with pressure on the vertical axis and enthalpy on the horizontal axis. Theoretical refrigeration cycle neglecting pressure loss is shown.



The difference between ***temperature*** and ***pressure equivalent saturation temperature*** is called the ***Superheated Degree.***

- The difference between discharge pipe temperature and condensing temperature is called the ***Discharging Superheated Degree (DSH)***.
- The difference between suction pipe temperature and evaporating temperature is called ***Suction Superheated Degree (SH)***. Generally, superheated degree means suction-superheated degree.
- The difference between ***temperature*** and ***pressure equivalent saturation temperature*** in subcooled liquid is called ***Subcooled Degree (SC)***.

In order to prevent wet operation (*), the superheated degree is calculated at the evaporator outlet, and the refrigerant flow rate into the evaporator is regulated with the expansion valve, so that the superheated vapor only is returned to the compressor.

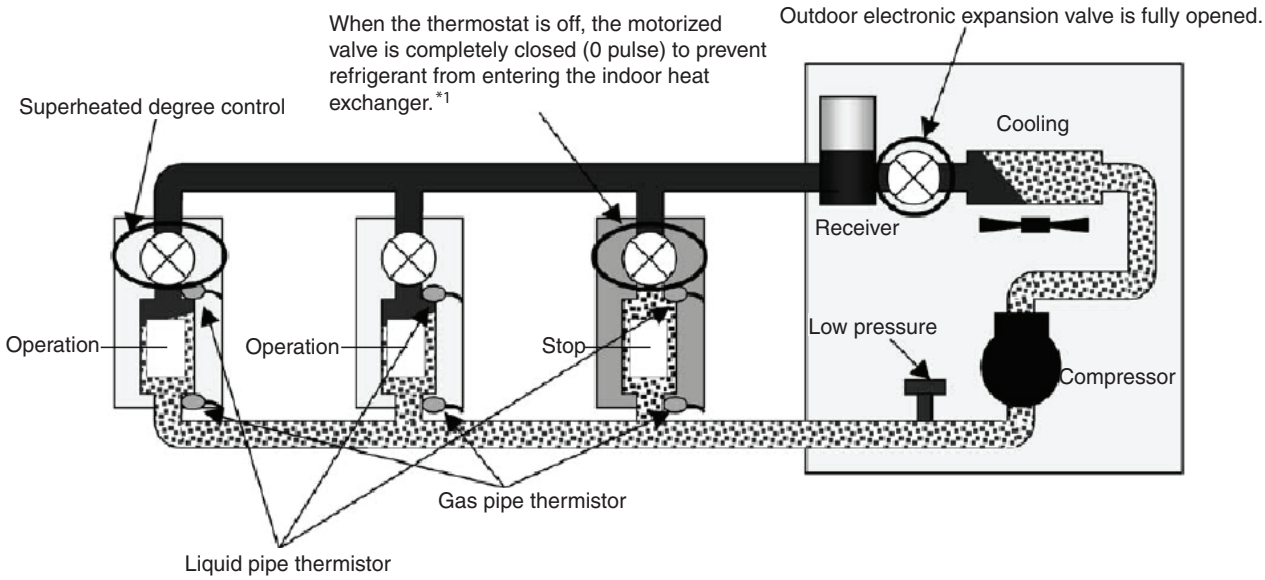
* Wet operation is a state of operation where wet vapor not completely vaporized in the evaporator is sucked by the compressor, causing liquid return or liquid hammering.

3. Points of Refrigerant Control of VRV System

3.1 Cooling Operation

Influenced by the number of operating (thermostat-on) units, capacity, airflow rate, return-air temperature, and humidity of indoor units:

- Load on total system changes.
- Loads on every indoor unit are different.



Compressor Capacity Control

In order to maintain the cooling capacity corresponding to the capacity of evaporator and load fluctuation, based on the pressure detected by low pressure sensor of the outdoor unit (Pe), the compressor capacity is controlled so as to put the low pressure equivalent saturation temperatures (evaporation temperature = Te) close to target value.

Superheated Degree Control of Indoor Electronic Expansion Valve

In order to maintain the superheated degree in the evaporator and to distribute proper refrigerant flow rate regardless of different loads on every indoor unit, based on the temperature detected by thermistors on the liquid pipes and gas pipes, the indoor electronic expansion valve is regulated so as to put superheated degree at the evaporator outlet close to target value.

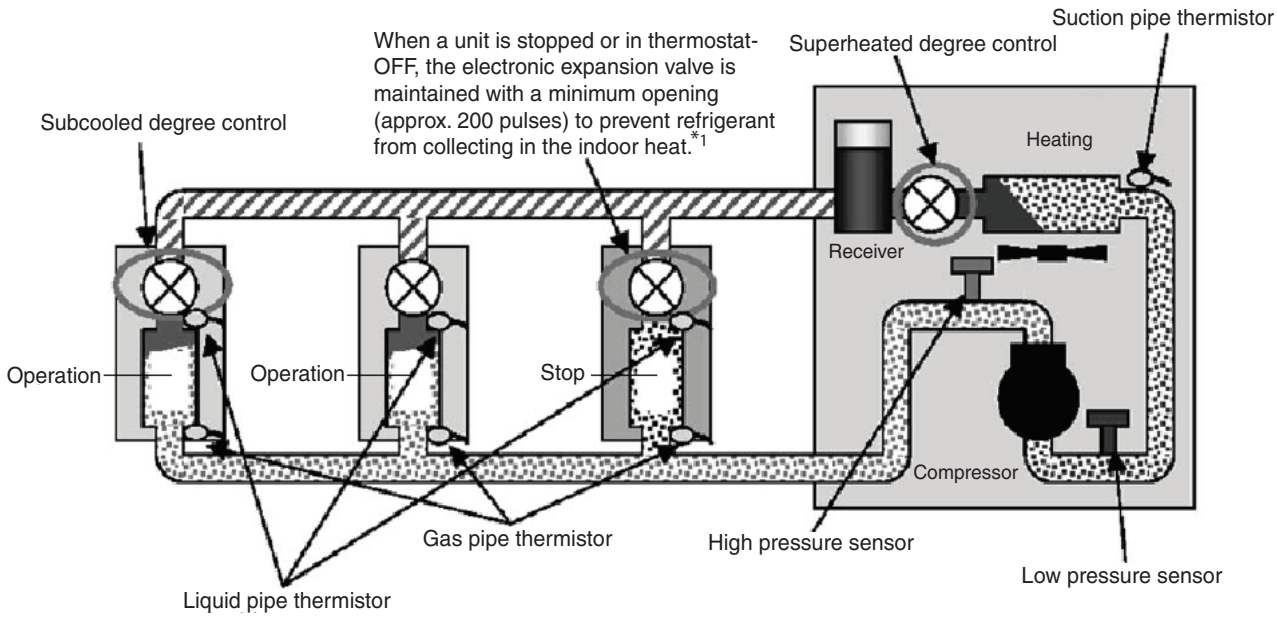
* Superheated degree SH = (indoor gas pipe temperature − indoor liquid pipe temperature)

*1. When sizing indoor units, caution should be taken to ensure that the unit is not oversized for the calculated load; otherwise, large temperature swings, poor comfort levels, and overall system inefficiencies may occur.

3.2 Heating Operation

Influenced by change the number of operating (thermostat-on) units, capacity, airflow rate, and return-air temperature of indoor units:

- Load on total system changes.
- Loads on every indoor unit are different.



Compressor Capacity Control

In order to maintain the heating capacity against condenser capacity and load fluctuation based on the pressure detected by high-pressure sensor control (Pc), compressor capacity is controlled so as to put the high pressure equivalent saturation temperature (condensing temperature = Tc) close to target value.

Superheated Degree Control of Outdoor Electronic Expansion Valve

In order to maintain the superheated degree in the evaporator, based on the pressure detected and calculated low pressure sensor equivalent saturation temperature (Te) & the temperature detected by the suction pipe thermistor the outdoor electronic expansion valve is controlled to maintain the superheat value of the evaporator outlet close to the target value.

* Superheated degree SH = (outdoor suction pipe temperature - outdoor evaporating temperature)

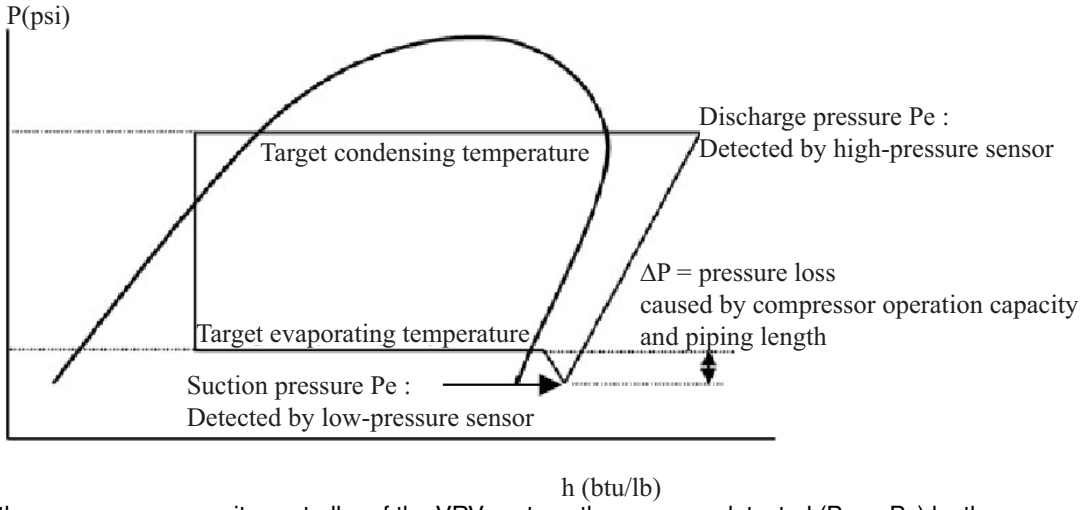
Subcooled Degree Control of Indoor Electronic Expansion Valve

In order to distribute proper refrigerant flow rate regardless of different loads on every indoor unit, based on the pressure detected & calculated high pressure equivalent saturation temperature of outdoor unit (Tc) & the temperature detected on the thermistor of indoor liquid pipe, the indoor electronic expansion valve is controlled so as to put subcooled degree at condenser outlet close to target value.

* Subcooled degree SC = (outdoor condensing temperature - indoor liquid pipe temperature)

*1. When sizing indoor units, caution should be taken to ensure that the unit is not oversized for the calculated load; otherwise the phenomenon of the EEV not fully closing can cause the zone to heat up even during thermostat-OFF, causing user discomfort and an ineffective system.

3.3 Compressor Capacity Control

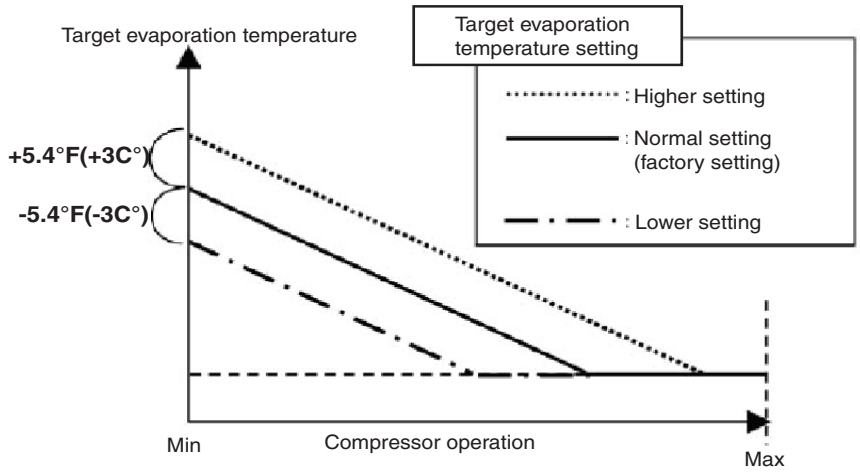


Using the compressor capacity controller of the VRV system, the pressure detected (Pe or Pc) by the pressure sensor installed in the outdoor unit is converted into the equivalent saturation temperature, and the evaporating temperature (Te) while cooling, or the condensing temperature (Tc) while heating, are controlled with PI control so as to put them close to the target value. This maintains stable capacity regardless of incessantly varying loads. Refer to the following target value table. All target temperatures represent mean saturation temperatures on the gas side.

	Target condensing temperature / High Pressure		Target evaporating temperature / Low Pressure	
R22	115°F (46°C)	261 psi	42°F (5.5°C)	86 psi
R407C	118°F (48°C)	276 psi	46°F (7.5°C)	84 psi
R410A	115°F (46°C)	406 psi	43°F (6.0°C)	139 psi

The pressure loss in piping increases depending on connected pipe length and operation capacity of the compressor. In order to compensate the reduction of capacity caused by the pressure loss in piping the following\ correction is made:

Correction of Target Evaporation Temperature by ΔP



- The target value can be adjusted with a field setting.
- Long connection piping at the installation site may increase pressure loss in piping and an inverse installation (outdoor unit placed lower than indoor unit) may increase liquid pipe inside resistance. In this event, a *"lower"* setting of target evaporation temperature by using field setting helps to give stable operation.
- For short connection piping, a higher setting enables stable operation.
- In addition, samplings of evaporating temperature and condensing temperature are made so that the pressure detected by pressure sensors of high/low pressure are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency or STD ON/OFF) is controlled to eliminate deviation from target value.

3.4 Control of Electronic Expansion Valve

Electronic Expansion Valve of Outdoor Unit

■ **In Cooling Operation**

In cooling operation, the outdoor electronic expansion valve is basically in the fully open position.
Note: The valve can be fully closed when a bridge circuit is included.

■ **In Heating Operation = Superheated Degree Control**

Superheated degree [SH] is calculated from the low-pressure equivalent saturation temperature (Te) converted from the pressure detected by the low pressure sensor of the outdoor unit (Pe) and temperature detected by the suction pipe thermistor (Ts). The electronic expansion valve opening degree is regulated so that the superheated degree [SH] becomes close to target superheated degree [SHS].
When SH > SHS, adjust to make opening degree of the electronic expansion valve larger than the present one.
When SH< SHS, adjust to make opening degree of the electronic expansion valve smaller than the present one.

- SH : Superheated degree (Ts – Te)
- SHS : Target superheated degree (Normally 9° F / 5°C) Δ

REFERENCE: Control range of outdoor electronic expansion valve:

- R22 unit ... 0 to 2000 pulses
- R407C unit ...
  1) RSXYP 5 to 10L: 0 to 480 pulses
  2) Others: 0 to 2000 pulses
- R410A unit ... 0 to 2000 pulses

Electronic Expansion Valve of Indoor Unit

■ **In Cooling Operation = Superheated Degree Control**

Superheated degree [SH] is calculated from temperature detected by the gas pipe thermistor of indoor unit (Tg) and the temperature detected by the liquid pipe thermistor (Tl). The electronic expansion valve opening degree is controlled so that the superheated degree [SH] is close to the targeted superheated degree [SHS].
The compensation is made based on the temperature difference between set-point temperature and the return-air thermistor temperature (ΔT).
When SH > SHS, adjust to make opening degree of the electronic expansion valve larger than the present one.
When SH< SHS, adjust to make opening degree of the electronic expansion valve smaller than the present one.

- SH : Superheated degree (Tg– Tl)
- SHS : Target superheated degree
  Normally 9° F (5°C), but when the temperature difference (ΔT) decreases, SHS increases. Even when SH is large, the opening degree of the electronic expansion valve becomes small.
- (ΔT): Remote controller set-point temperature – return-air thermistor detection value

■ **Subcooled Degree Control in Heating Operation**

Subcooled degree [SC] is calculated from the high pressure equivalent saturation temperature (Tc) converted from the pressure detected by high pressure sensor of the outdoor unit and the temperature detected by the liquid pipe thermistor of the indoor unit (Tl). Electronic expansion valve opening degree is regulated so that the subcooled degree [SC] is close to target subcooled degree [SCS].
The compensation is made based on the temperature difference between set-point temperature and the return-air thermistor temperature (ΔT).
When SC > SCS, adjust to make opening degree of the electronic expansion valve larger than the present one.
When SC< SCS, adjust to make opening degree of the electronic expansion valve smaller than the present one.

- SC : Subcooled degree (Tc– Tl)
- SCS : Target Subcooled degree
- Normally 9° F (5°C), but when the temperature difference (ΔT) decreases, SCS increases. Even when SC is large, the opening degree of the electronic expansion valve becomes small.(ΔT): Remote controller set-point temperature – return-air thermistor detection.

4. Control of Indoor Unit

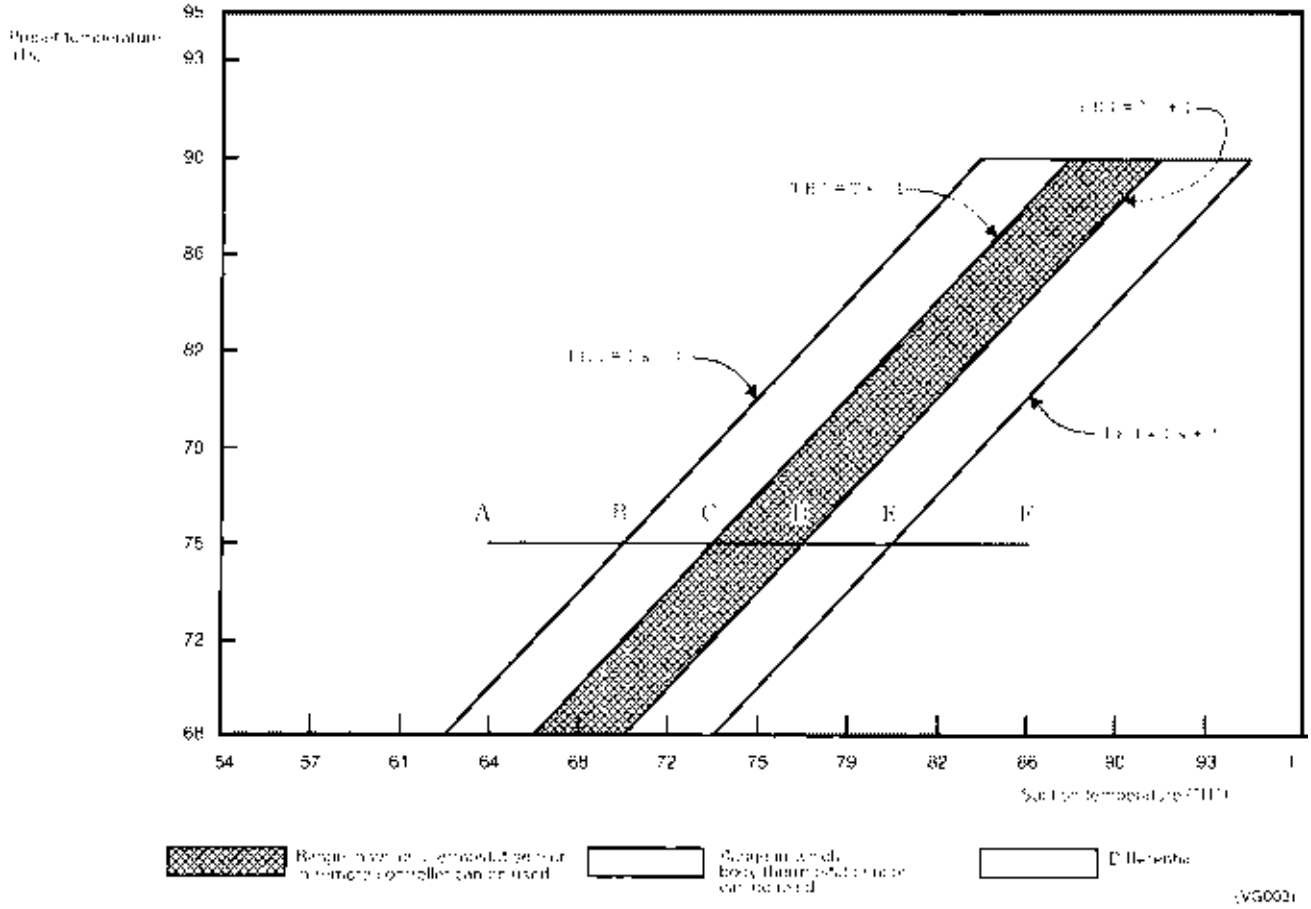
4.1 Thermostat Control

4.1.1 Operation Range of Remote Controller Temperature Sensor

Room temperature is controlled by the remote controller temperature sensor and return-air temperature sensor (unit-mounted temperature sensor) on the indoor unit. When the remote controller temperature sensor is set to ***Not Used*** in a field setting, the unit can be controlled only by unit mounted temp. sensor (or remote sensor).

Cooling Mode

When there is significant difference between the room temperature and the set-point temperature, fine adjustment control can be achieved using the unit-mounted temperature sensor. If the return-air temperature is close to the set-point temperature, the sensor mounted in the remote controller in the occupied space is used.



■ Ex: When cooling

Assuming the preset temperature in the figure above is 75°F, and the return-air temperature has changed from 64°F to 86°F (A → F):

(This example also assumes there are several other air conditioners, the VRV system is off, and that temperature changes even when the thermostat sensor is off.)

Unit-mounted temperature sensor is used for temperatures from 64°F to 73°F (A → C).

Remote controller thermostat sensor is used for temperatures from 73°F to 81°F (C → E).

Unit-mounted temperature sensor is used for temperatures from 81°F to 86°F (E → F).

And, assuming return-air temperature has changed from 86°F to 64°F (F → A):

Unit-mounted temperature sensor is used for temperatures from 86°F to 77°F (F → D).

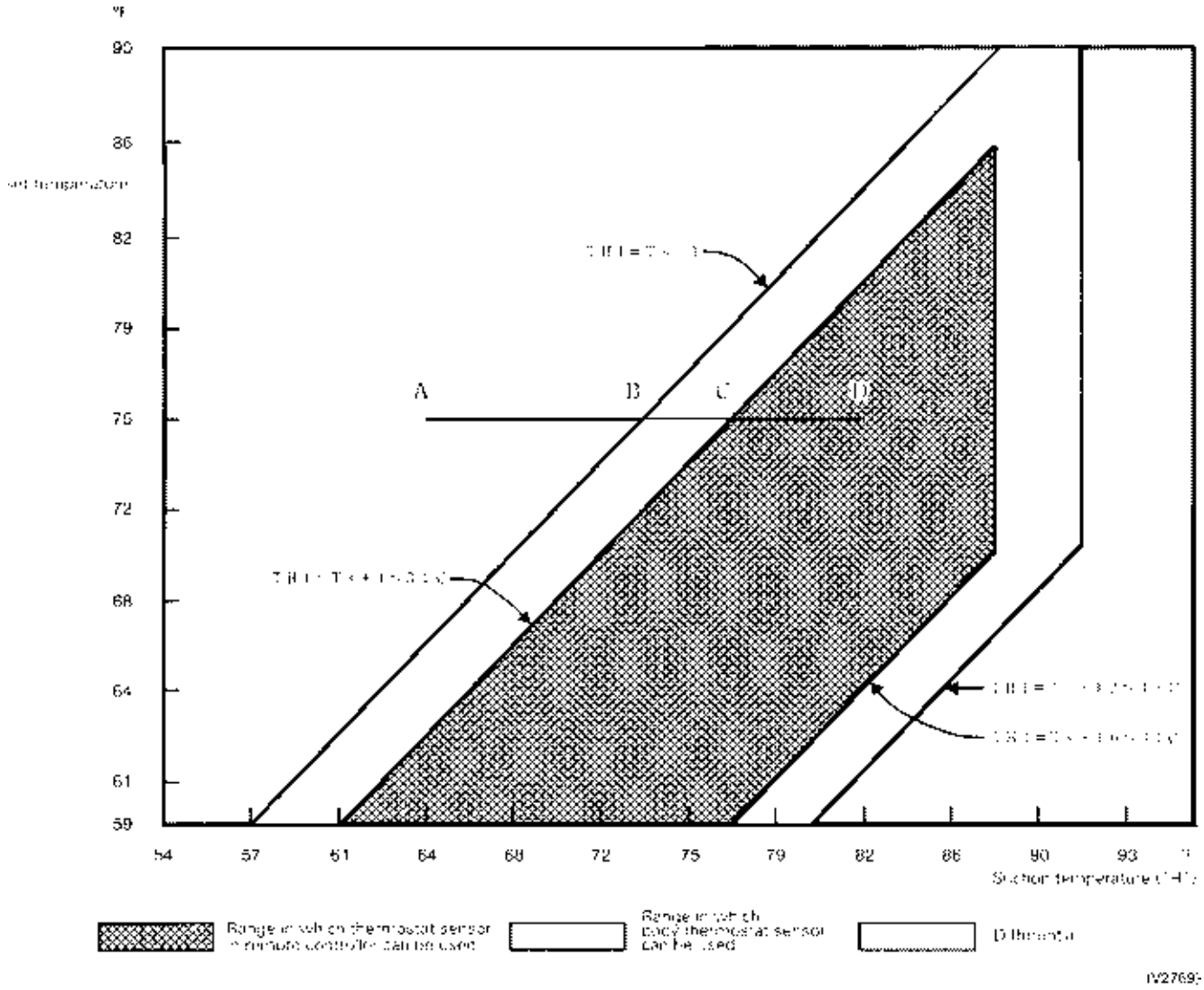
Remote controller thermostat sensor is used for temperatures from 77°F to 70°F (D → B).

Unit-mounted temperature sensor is used for temperatures from 70°F to 64°F (B → A).

NOTE: When outdoor air (OA) and indoor return air are mixed, the room temperature may differ from the set-point temperature because the air temperature is out of the area of *operation range of the remote controller temperature sensor*. In this event, install the remote sensor (KRCS01-1) in the room where there is no influence of outdoor air.

Heating Mode

When heating, hot air rises to the top of the room which results in a lower temperature close to the floor where occupants are. This can cause the thermostat to turn off the unit before the lower part of the room reaches set-point temperature. To ensure a more evenly distributed temperature, position a Remote Sensor, at body level, in the occupied space or use the high ceiling installation service code.



- Ex: When heating

  Assuming the preset temperature in the figure above is 75°F, and the return-air temperature has changed from 64°F to 82°F (A → D):

  (This example also assumes there are several other air conditioners, the VRV system is off, and that temperature changes even when the temperature sensor is off.)

  Unit-mounted thermostat sensor is used for temperatures from 64°F to 77°F (A → C).

  Remote controller temperature sensor is used for temperatures from 77°F to 82°F (C → D).

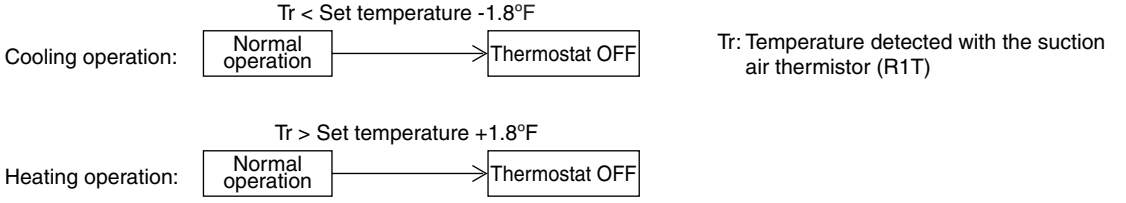
  And, assuming return-air temperature has changed from 82°F to 64°F (D → A):

  Remote controller temperature sensor is used for temperatures from 82°F to 73°F (D → B).

  Unit-mounted temperature sensor is used for temperatures from 73°F to 64°F (B → A).

4.1 Thermostat Control while in Normal Operation

VRV multi systems are set at factory to thermostat control mode using the remote controller. While in normal thermostat differential control mode (i.e., factory setting mode), the thermostat turns OFF when the system reaches a temperature of -1.8°F from the set temperature while in cooling operation or of +1.8°F from that while in heating operation.

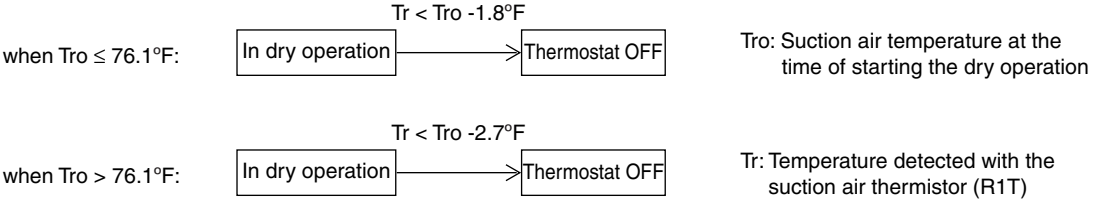


While in a single remote controller group control, the body thermostat is only used from this control. Furthermore, while in heating operation, cassette-mounted indoor units conduct the thermostat control by a value compensated by -3.6°F for the value detected with the body thermostat. (Through field settings, the thermostat differential setting can be changed from 1.8°F to 0.9°F. For details on the changing procedure, refer to information on page onward.)

4.2 Thermostat Control in Dry Operation

While in dry operation, the thermostat control is conducted according to a suction air temperature at the time of starting the dry operation.

Assuming that the suction air temperature at the time of starting the dry operation is Tro and the suction air temperature in operation is Tr,

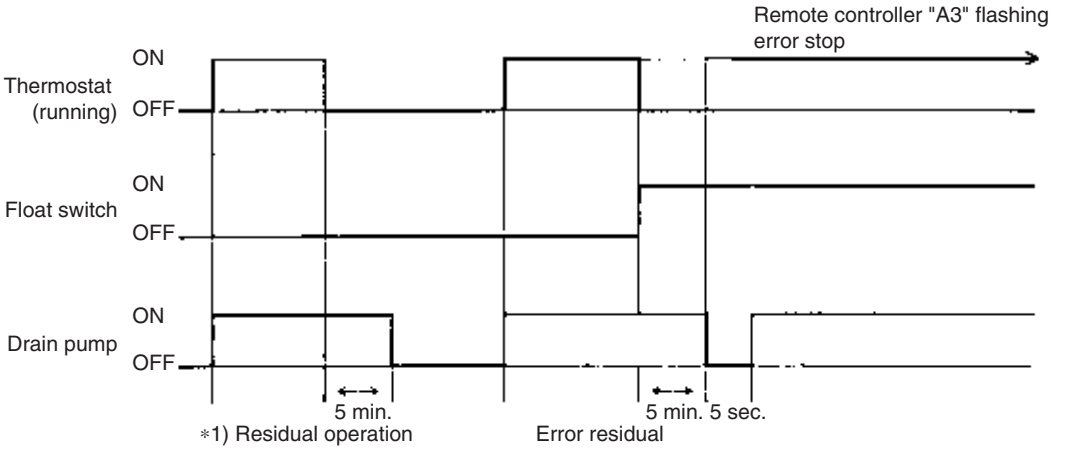


Furthermore, while in dry operation mode, fans operate at L flow rate, stops for a period of 6 minutes while the thermostat is OFF, and then return to operation at L flow rate. (This control is used to prevent a rise in indoor temperature while in thermostat OFF mode.)

5. Drain Pump Control

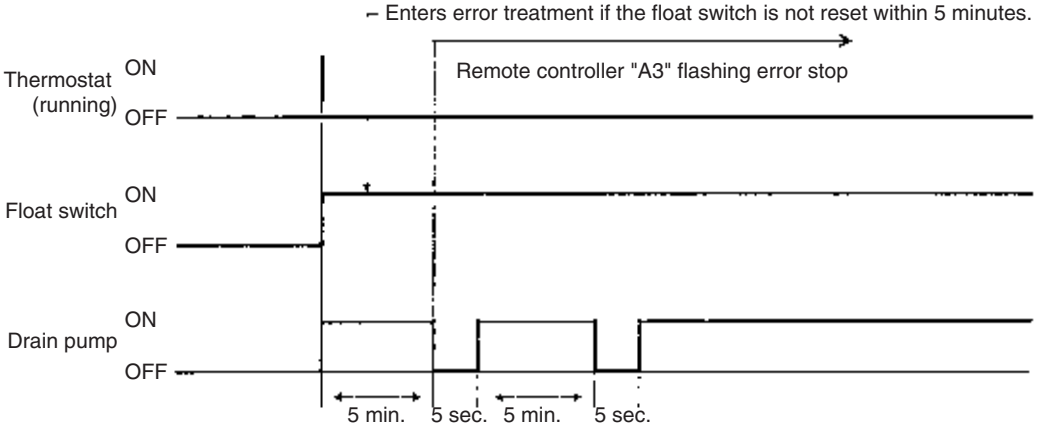
1. The drain pump is controlled by the ON/OFF buttons (4 button (1) - (4) given in the figure below).

5.1 When the Float Switch is Tripped while the Cooling Thermostat is ON:

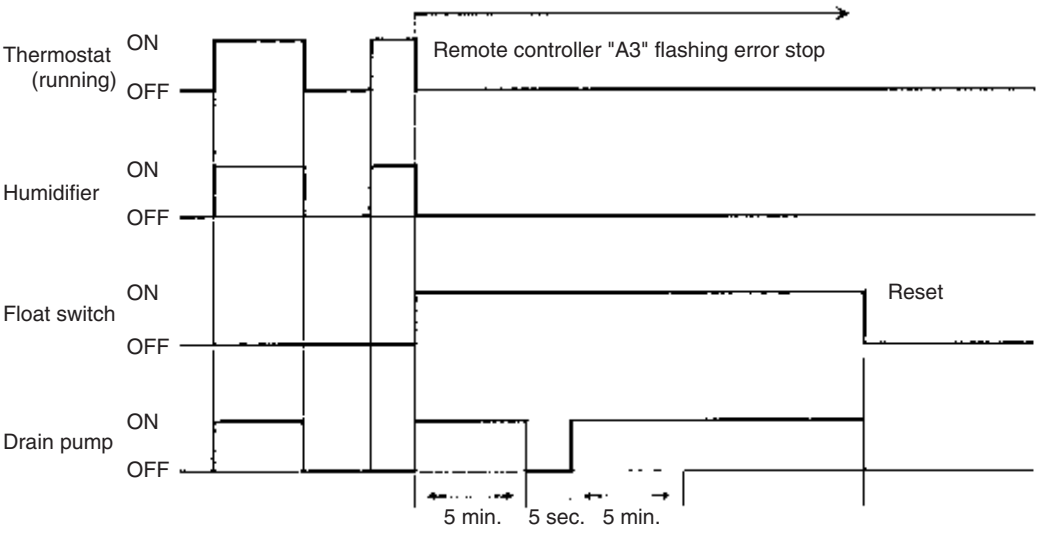


∗ 1. The objective of residual operation is to completely drain any moisture adhering to the fin of the indoor unit heat exchanger when the thermostat goes off during cooling operation.

5.2 When the Float Switch is Tripped while the Cooling Thermostat is OFF:

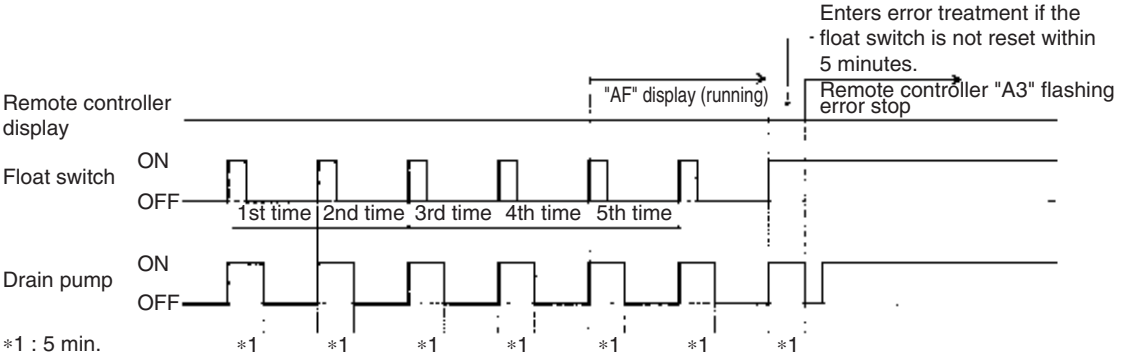


5.3 When the Float Switch is Tripped During Heating Operation:



During heating operation, if the float switch is not reset even after the 5 minutes operation, 5 seconds stop, 5 minutes operation cycle ends, operation continues until the switch is reset.

5.4 When the Float Switch is Tripped and “AF” is Displayed on the Remote Controller:

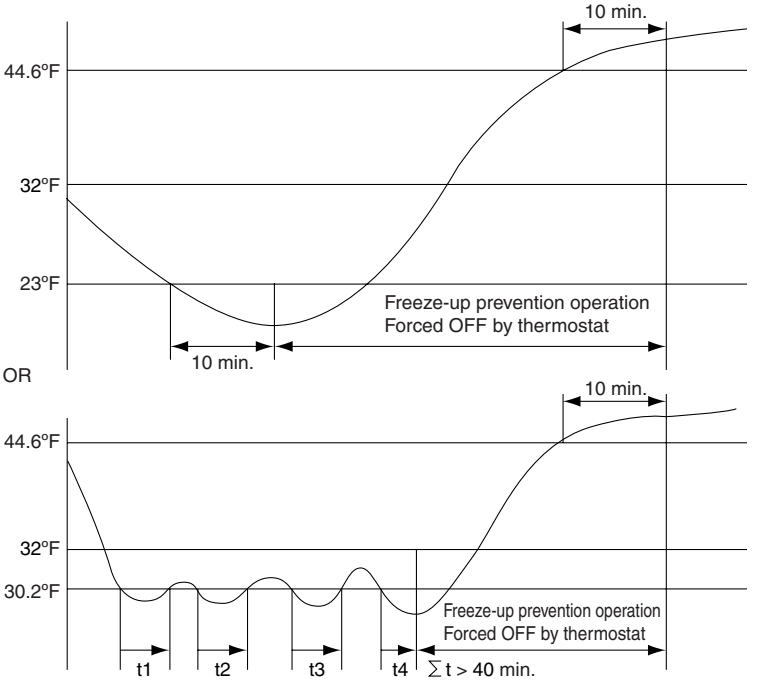


Note: If the float switch is tripped five times in succession, a drain error is determined to have occurred. “AF” is then displayed as operation continues.

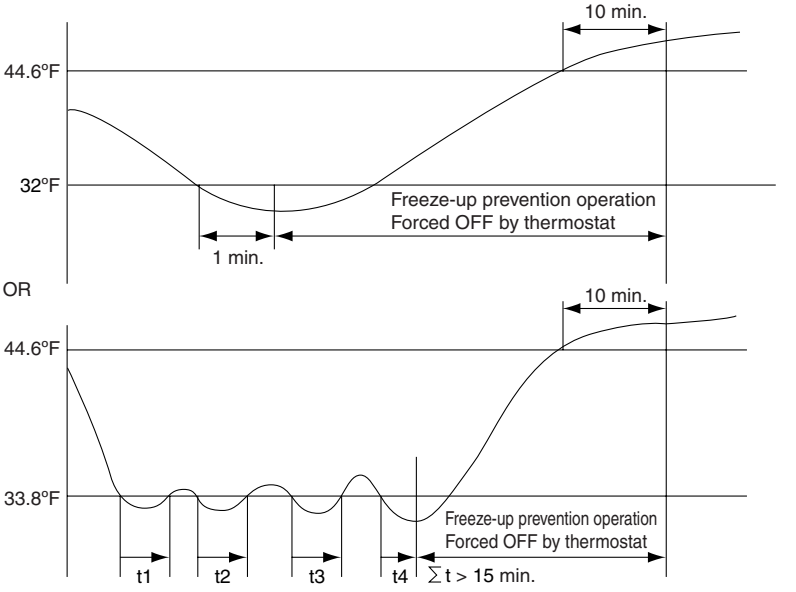
7. Freeze-up Prevention

Freeze-up Prevention by Off Cycle (Indoor Unit)

When the temperature detected by liquid pipe temperature thermistor (R2T) of the indoor unit heat exchanger drops too low, the unit enters freeze-up prevention operation in accordance with the following conditions, and is also set in accordance with the conditions given below.
When freeze-up prevention is activated, the electronic expansion valve is closed, the drain pump turns ON and the fan tap is fixed to L airflow. When the following conditions for stopping are satisfied, it returns.
Conditions for starting freeze-up prevention: Temperature is 30.2°F or less for total of 40 min., or temperature is 23°F or less for total of 10 min.
Conditions for stopping freeze-up prevention: Temperature is 44.6°F or more for 10 min. continuously



[Conditions for starting when air flow direction is two-way or three-way]
Conditions for starting: Temperature is 33.8ºF or less for a total of 15 minutes or 32ºF or less for 1 minute continuously.

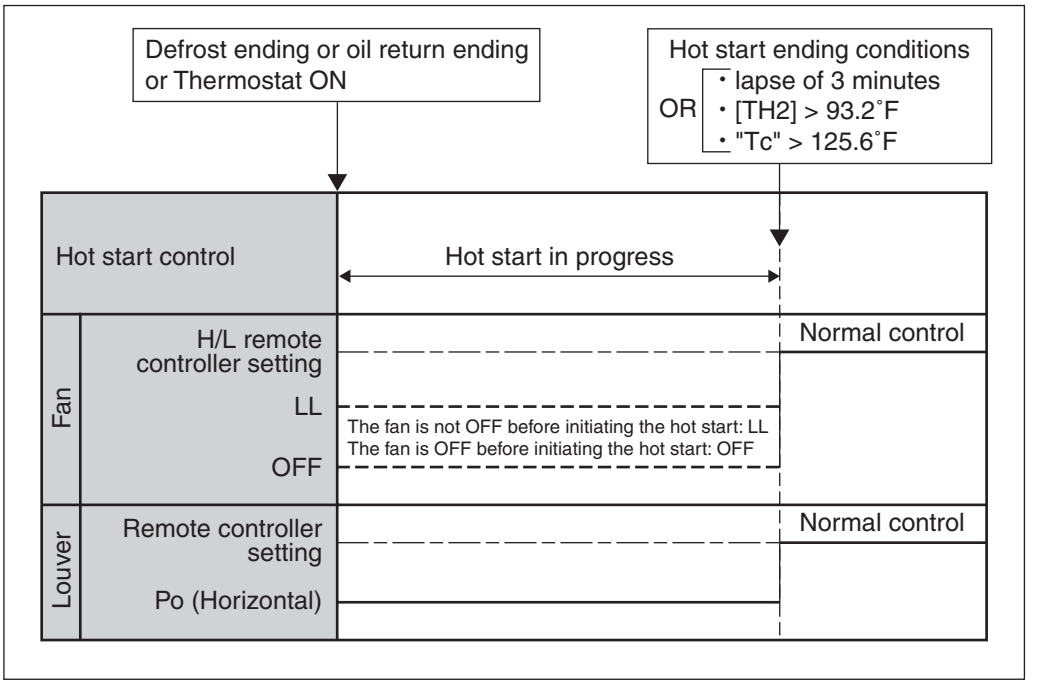


12.Hot Start Control (In Heating Only)

At startup with thermostat ON or after the completion of defrosting in heating operation, the indoor unit fan is controlled to prevent cold air from blasting out and ensure startup capacity.

[Detail of operation]

When either the **start condition 1** or the **start condition 2** is established, the operations shown below will be conducted.

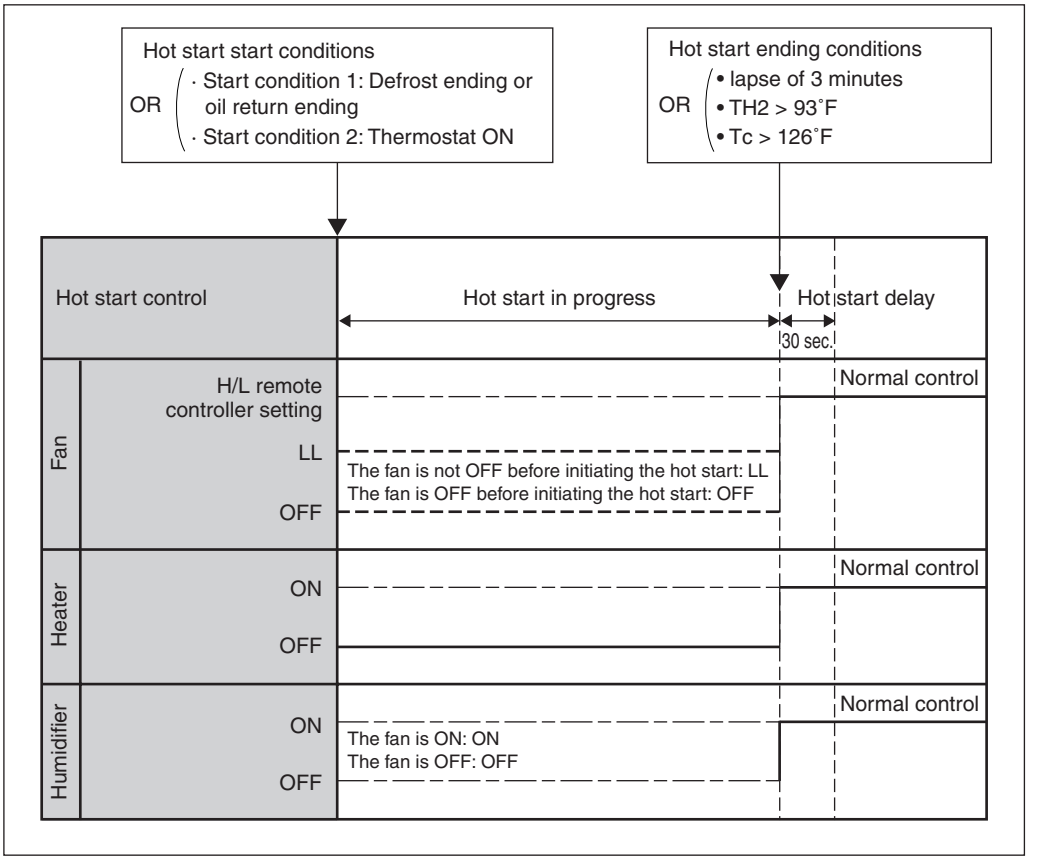


■ **FTQ**

At startup with thermostat ON or after the completion of defrosting in heating operation, the indoor unit fan is controlled to prevent cold air from blasting out and ensure startup capacity.

[Detail of operation]

When either the **start condition 1** or the **start condition 2** is established, the operations shown below will be conducted.



TH_2: Temperature detected with the gas thermistor

TC : High pressure equivalent saturated temperature

4.5 Heater Control

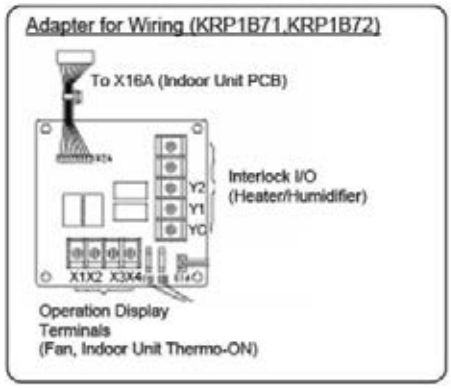
4.5.1 Heater Control using Heat Pump Lockout Operation

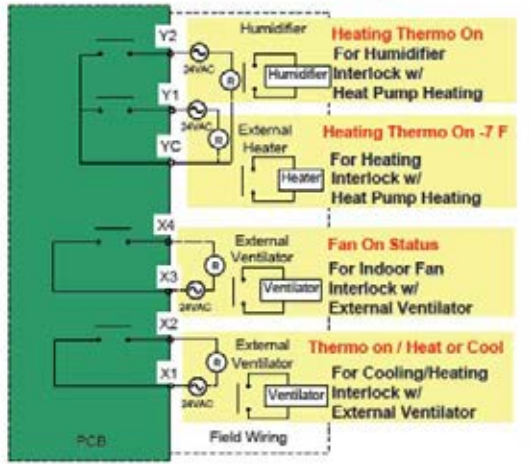
When VRV systems are applied in colder climates, it may be necessary to utilize an optional heater solution. To integrate an optional heater, a wiring adapter pcb (KRP1B7_) must be used, and its operation configured in accordance with “locking-out” the condensing unit heat-pump operation.

4.5.1.1 Zone by zone control - Wiring Adapter (KRP1B) Detail

- Thermo-on status
- Fan status
- AUX heater output (7F drop)
- Humidifier output (heating thermo on)

Adapter for Wiring (Wiring Diagram)





4.5.2 Heat Pump Lockout Configurations

4.5.2.1 Types and Actions

There are three types of lockout modes. Refer to Section 4.5.2.2 to check availability of each.

TYPE		DESCRIPTION	Actions					
			Field Setting	Shortened Between	Heating Thermo-on		Heating Thermo-off	
					Heater	Fan	Heater	Fan
I	--	Heat Pump heating is always locked out	2-16 = ON	--	ON	ON (H/L)	OFF	LL
II	Mode 1	Lockout is controlled by ABC terminals	2-37=Mode 1	A-C	ON	ON (H/L)	OFF	LL
				B-C				OFF
	Mode 2 (for a heater not requiring airflow)		2-37=Mode 2	A-C		LL		LL
				B-C		OFF		OFF

- Type II / Modes 1 and 2 facilitate lockout at A-B-C terminals
- Mode 1 = The indoor unit fan runs at set speed (H/L) in heating thermo-on
- Mode 2 = The indoor unit fan runs at LL speed or OFF in heating thermo-on
- Mode 2 = Intended for applications not utilizing indoor unit fan (baseboard, radiant)
- An ambient thermostat is applied to A-C or B-C depending upon requirements

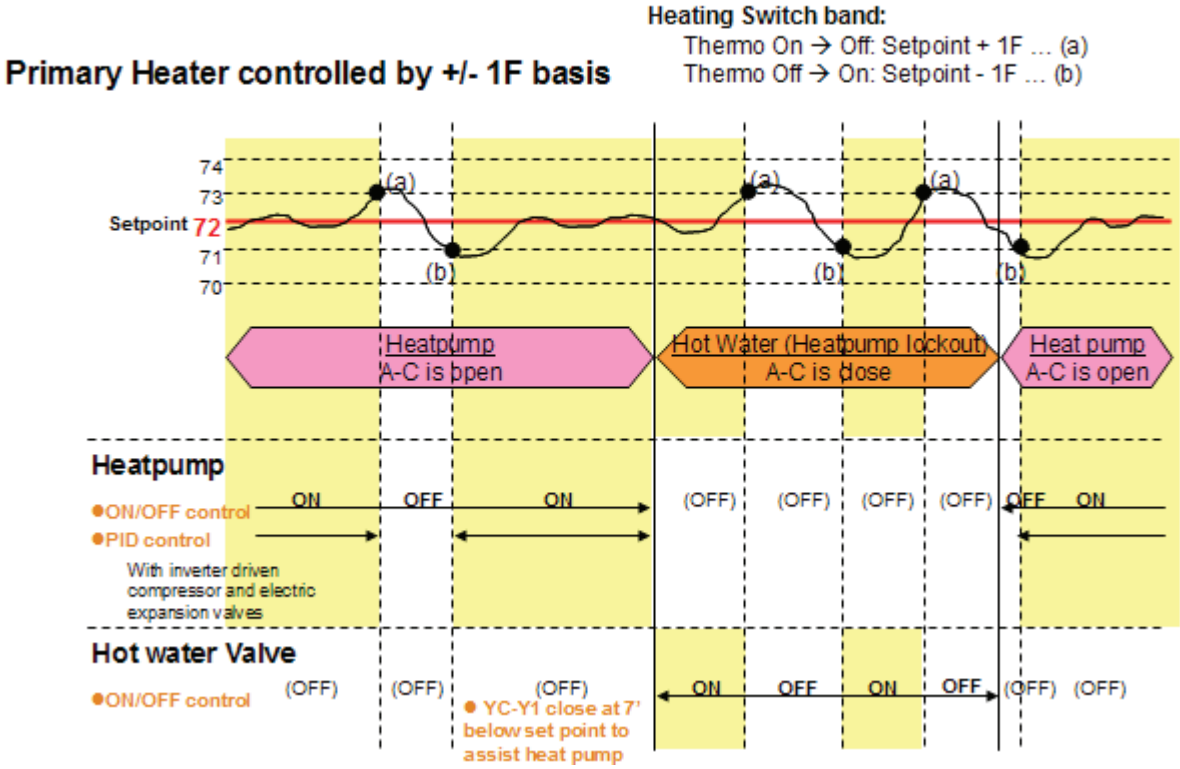
4.5.2.2 Availability and Applicability

In the available heat pump lockout modes (Type I, Type II mode 1 and 1), the applicable (denoted by *) backup backup heater can be used.

OUTDOOR UNIT TYPE	CONFIGURATION	Availability			Applicable Backup Heater Type			
			Type II			Electric Heater		
		Type I	Mode 1	Mode 2	Hot Water Coil (Base-board, Ducted	Base-board	Ducted with APSP *2	Ducted without APSP *2
VRV-S Heat Pump RXYMQ36, 48MVJU	Standard	*	*	n/a	*	*	*	n/a
	with replacement PCB (EH0745003)[1]	*	*	*	*	*	*	*
VRV Heat Pump RXYMQ72,96,144,168,192MTJU	Standard	*	n/a	n/a	*	*	*	n/a
	with replacement PCB (EH0745011)[1]	*	*	*	*	*	*	n/a
	with replacement PCB (EH0745002)[1]	*	*	*	*	*	*	*
VRV Heat Recovery REYQ72,96,144,168,192MTJU	Standard	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	with replacement PCB (EH0745005)[1]	n/a	*	*	*	*	*	*

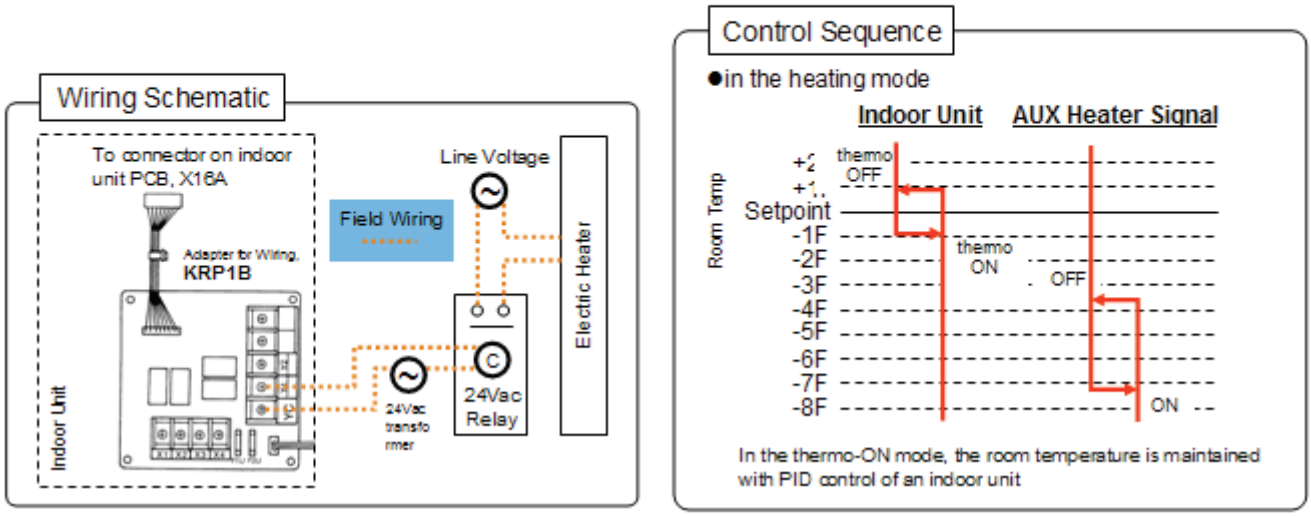
1. In case of manifold type of outdoor unit, the replacement PCB is necessary only for the main outdoor unit.
*2. APSP = Air Pressure Switch Protection allows the heater to be energized while airflow is both sufficient and safe.
3. Type II control sequences are standard with VRV-III series systems (no accessory condensing unit PCB needed).
4. Heat pump lockout is not available for VRV-WII Series Systems.

4.5.3 Heat Pump Lockout Functional Schematic



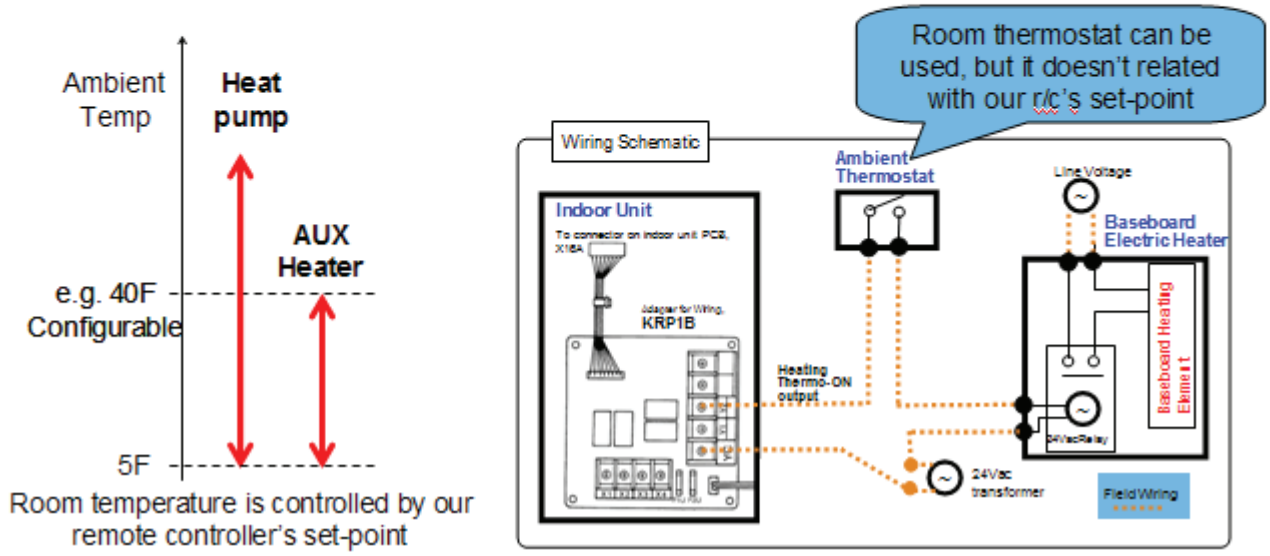
4.5.4 Example 1: AUX Duct Heater Integration*

- Electric heater in the duct is worked as an AUX heater of the indoor unit



4.5.5 Example 2: AUX Baseboard Heater Integration*

- **As capacity drops with ambient temperature, AUX electric heater is used and energized at a preset low ambient condition.**
  - **Requires wiring to each zone from ambient thermostat.**
- **Heat pump is able to run all winter long in conjunction with a small Kw electric heater resulting in a cost effective solution**

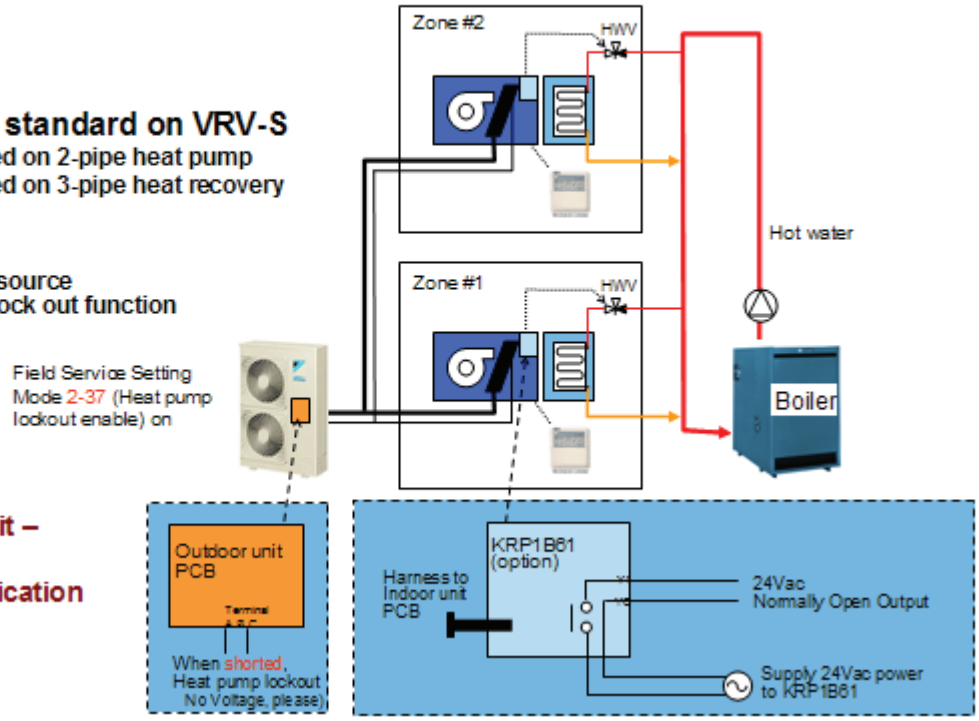


* Auxiliary heat sources are recommended on the discharge side of the indoor fan coil units. A temperature limitation of 140°F (60°C) exists for the indoor fan coil units to protect the integrity of the PCB. Operation above this condition cannot be guaranteed.

4.5.6 Example 3: Alternative Heat Source

- **Hot water coil (single stage) integration**
- **Lock-out capability standard on VRV-S**
  - Optional PCB required on 2-pipe heat pump
  - Optional PCB required on 3-pipe heat recovery

Zone by zone control
To switchover to other heat source
→ Overview of heat pump lock out function



*** Close A-C at outdoor unit – Indoor fan is required for hydronic heat in this application**

4.5.7 Notes on Heat Pump Lockout Function

- When in heat pump lockout mode, the Daikin indoor unit works with the alternative heating source to maintain the room temperature at the heating set point temperature.
- The lockout function allows only alternative emergency heating. No supplemental-to-mechanical heating exists.
- When a condensing unit is operating with the heat pump lockout function activated, units requiring cooling mode (heat recovery type) remain in fan-only recirculation mode.
- The system switches between normal mechanical heat pump operation and heat pump lockout function based upon the control logic implemented during installation and commissioning. Normally this control is based upon ambient temperature conditions using a field supplied ambient thermostat.

4.5.8 Fan Residual Operation

In order to prevent the thermal protector from activation when the heater is OFF, the fan is operated with residual operation for a period of time after the heat is off.

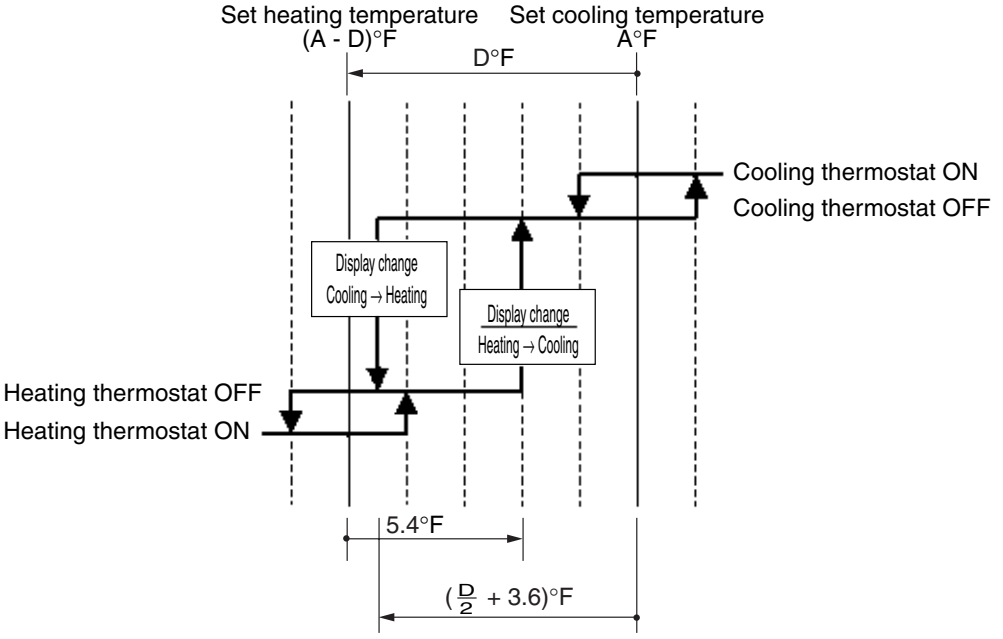
Residual operation time = Ceiling suspended type (FXHQ): 100 seconds
Others: 60 seconds

4.3 Thermostat Control with Operation Mode Set to "AUTO"

When the operation mode is set to "AUTO" on the remote controller, the system will conduct the temperature control shown below.
Furthermore, setting changes of the differential value (D°F) can be made according to information in the "Field settings from remote controller (P.298 and later)" section.

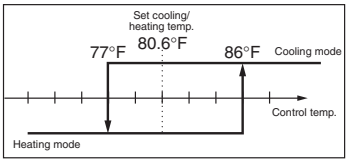
Mode No.	First code No.	Contents of setting	Second code No.							
			01	02	03	04	05	06	07	08
12	4	Differential value while in "AUTO" operation mode	0°F	1.8°F	3.6°F	5.4°F	7.2°F	9.0°F	10.8°F	12.6°F

: Factory setting

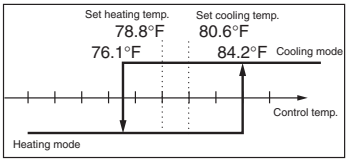


(Ex.) When automatic cooling temperature is set to 80.6°F:

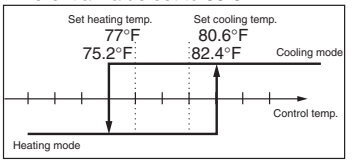
Differential value :32°F



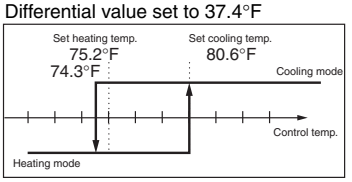
Differential value set to 33.8°F



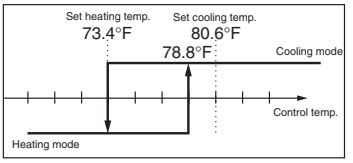
Differential value set to 35.6°F



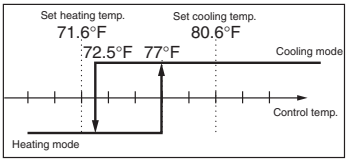
Differential value set to 37.4°F



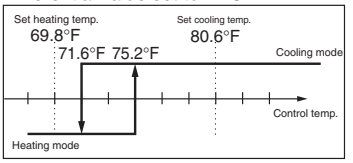
Differential value set to 39.2°F



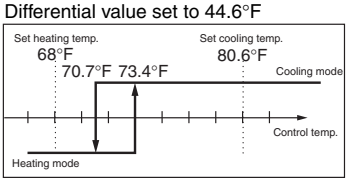
Differential value set to 41°F



Differential value set to 42.8°F



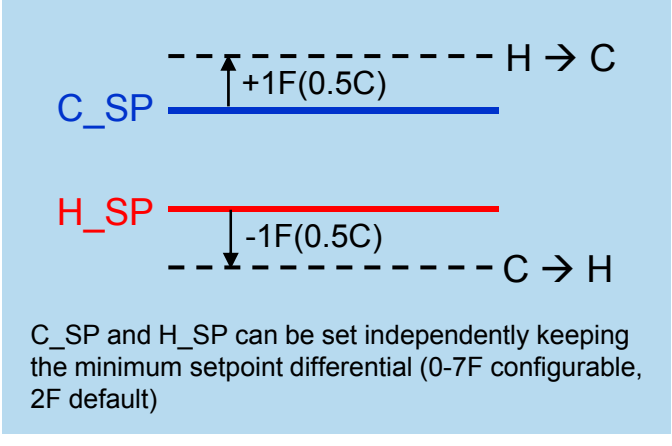
Differential value set to 44.6°F



Auto mode in BRC1E71 and Indoor unit

BRC1E71

- Change over point
  - H →C:
    Room temp ≥ C_SP + 1F (0.5C)
  - C → H:
    Room temp ≤ H_SP - 1F (0.5C)



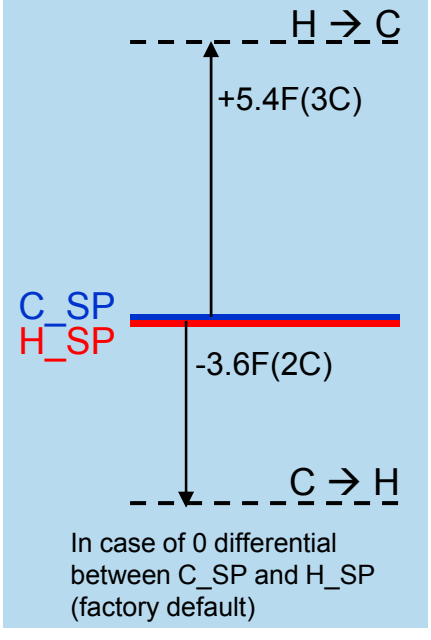
C_SP and H_SP can be set independently keeping the minimum setpoint differential (0-7F configurable, 2F default)

- Guard timer (15, 30, 60 default, 90 min adj.)

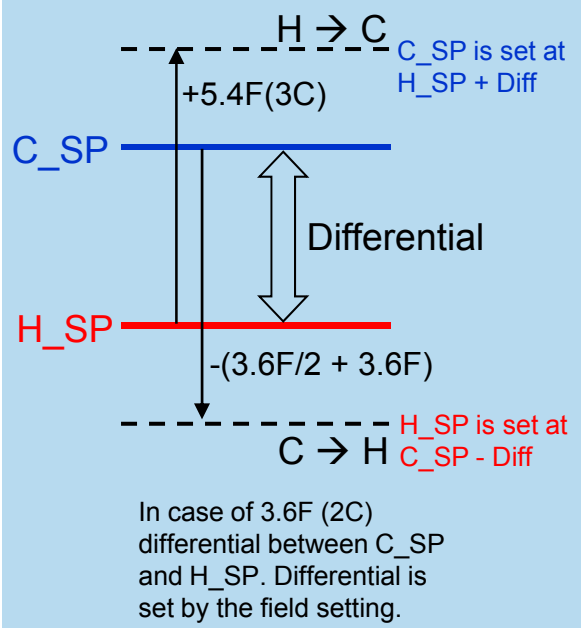
Not Avaiable on the current BRC1E71 Model

Indoor unit

- Change over point – based on the setpoint in the current mode
  - H → C: H_SP + 5.4F
  - C → H: C_SP – (Diff / 2 + 3.6F)



In case of 0 differential between C_SP and H_SP (factory default)



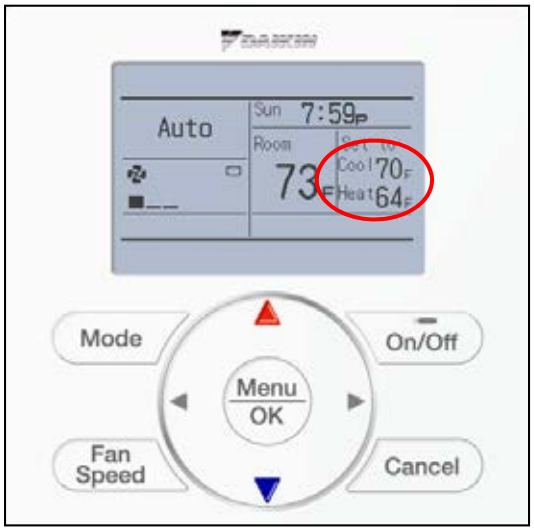
In case of 3.6F (2C) differential between C_SP and H_SP. Differential is set by the field setting.

- No guard timer
  - Therefore a big changeover range is necessary

Tips – Display difference in Auto modes

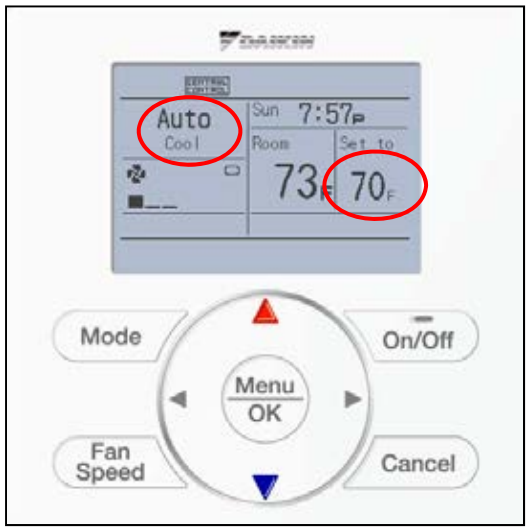
BRC1E71

- No operation mode display
- Cool/Heat setpoints



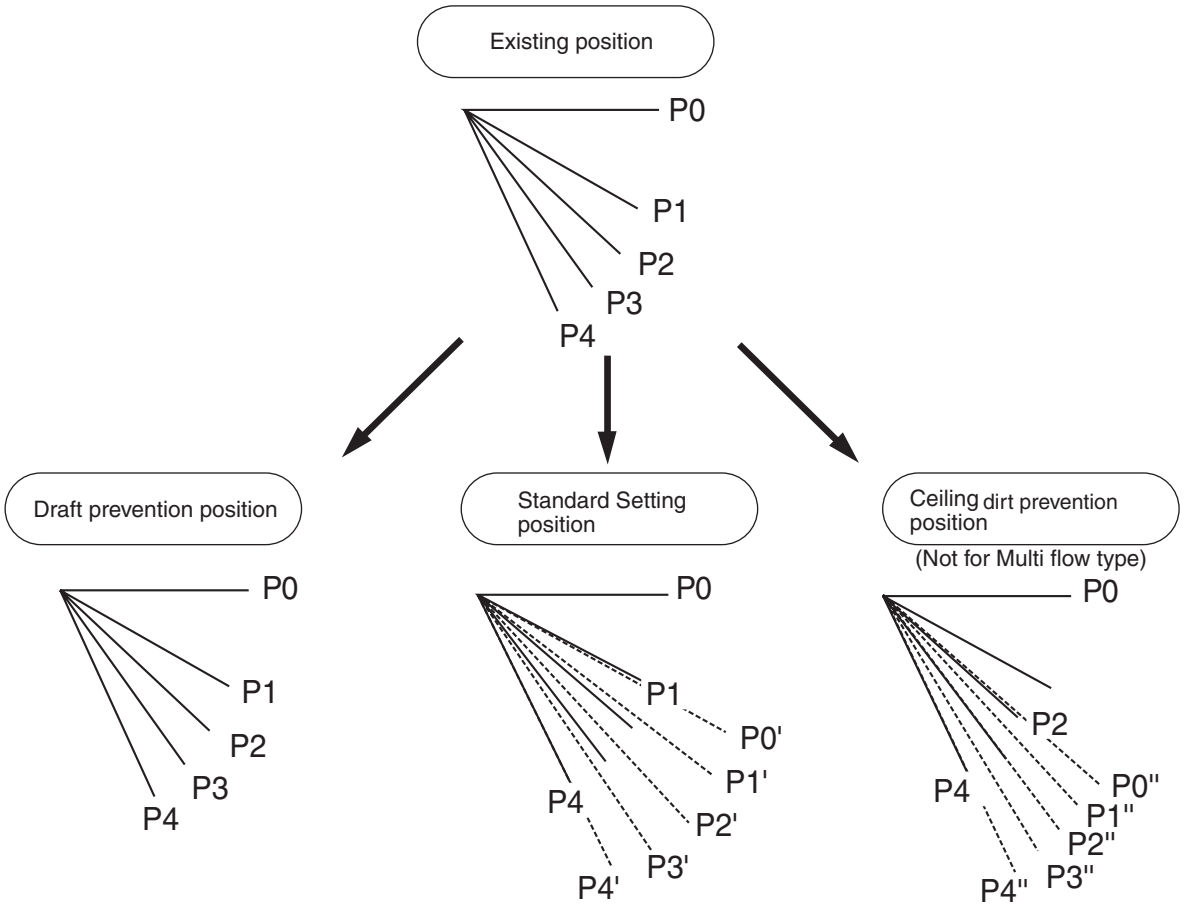
Heat Recovery Indoor unit

- Current actual Ope. mode (Cool/Heat) display below Auto
- Single setpoint



4.7 Louver Control for Preventing Ceiling Dirt

A control feature allows you to select the range for air-direction adjustments in order to prevent the ceiling surrounding the air discharge from becoming dirty. This feature is available on the 4-way ceiling mounted cassette type units (FXFQ, FXZQ).



Draft prevention position	P0	P1	P2	P3	P4		Same as existing position
			Range of direction adjustment				
Standard position	Prohibited	P0'	P1'	P2'	P3'	P4'	Separated into 5 positions (P1 - 4)
			Range of direction adjustment				
Dirt prevention position	Prohibited		P0"	P1"	P2"	P3"	P4"	Separated into 5 positions (P2 - 4)

The factory set position is standard position.

(VL012)

4.8 List of Louver Operations

Swing flaps operate as shown in the following table.

			Fan	Louver		
				FXFQ / FXZQ	FXHQ	FXAQ
Heating	Hot start from defrosting operation	Swing	OFF	Horizontal	Horizontal	Horizontal
		Wind direction set	OFF	Horizontal	Horizontal	Horizontal
	Defrosting operation	Swing	OFF	Horizontal	Horizontal	Horizontal
		Wind direction set	OFF	Horizontal	Horizontal	Horizontal
	Thermostat OFF	Swing	LL	Horizontal	Horizontal	Horizontal
		Wind direction set	LL	Horizontal	Horizontal	Horizontal
	Hot start from thermostat OFF mode (for prevention of cold air)	Swing	LL	Horizontal	Horizontal	Horizontal
		Wind direction set	LL	Horizontal	Horizontal	Horizontal
	Stop	Swing	OFF	Horizontal	Horizontal	Totally closed
		Wind direction set	OFF	Horizontal	Horizontal	Totally closed
Cooling	Thermostat ON in dry operation using micro computer	Swing	L*1	Swing	Swing	Swing
		Wind direction set	L*1	Set	Set	Set
	Thermostat OFF in dry operation using micro computer	Swing	OFF or L	Swing	Swing	Swing
		Wind direction set		Set	Set	Set
	Thermostat OFF in cooling	Swing	Set	Swing	Swing	Swing
		Wind direction set	Set	Set	Set	Set
	Stop	Swing	OFF	Horizontal	Horizontal	Totally closed
		Wind direction set	OFF	Set	Horizontal	Totally closed
	Micro computer control (including cooling operation)	Swing	L	Swing	Swing	Swing
		Wind direction set	L	Set	Set	Set

*1. L or LL only on FXFQ / FXZQ models

5. Other Functional Operations

5.1 Explanations on Main Functional Control

5.1.1 Cooling Operation

Compressor capacity control	Constant evaporating temperature (Te) control Basic target value: R22 = 42°F (5.5°C), R407C = 45°F (7.5°C), R410A = 43°F (6°C) *Compensation is applied
Indoor electronic expansion valve control	Constant superheated degree (SH =Tg–Tl) control Basic compensation of 9°F (5°C) is required. With R407C units, the temperature gradient compensation is applied.
High pressure stepping-down control	Rising high pressure, decreased compressor capacity
High pressure protection control	Forced-off thermostat with a limitation of recurrences.
Low pressure stepping-down control	Low pressure stepping-down control is not made. Capacity is decreased by normal control of compressor.
Low pressure protection control	Hot gas bypass is on ⟶ Forced-off thermostat with a limitation of recurrences.
Low outdoor temperature cooling control	As lowering of high pressure, outdoor fan is controlled and fan-tap drops.
Cooling overload control	Instruction of forced-opening degree is applied to indoor electronic expansion valve. Superheated degree control, even opening, is overridden.
Discharge pipe temperature control	Based on discharge pipe temperature Td and discharge superheated degree DSH = Td – Tc Injection is on ⟶ Compressor capacity is lowered ⟶ Forced-off thermostat with of recurrences.
Oil return control	Based on cumulative operation time, oil return operation should be carried out periodically. According to state of operation, cumulative operation time may be compensated.

5.1.2 Heating Operation

Compressor capacity control	Constant evaporating temperature (Te) control Basic target value: R22 = 115°F (46°C), R407C = 118°F (48°C) *Compensation is applied.
Outdoor motorized valve control	Constant superheated degree (SH =Ts–Te) control Basic 9°F (5°C) compensation is applied.
Indoor motorized valve control	Constant subcooled degree (SC = Tc – Tl) control Basic 9°F (5°C) compensation is applied.
High pressure stepping-down control	= Heating overload control. Compressor capacity control ⟶ Outdoor electronic expansion valve control overrides superheated degree control and outdoor fan control (fan tap is lowered).
High pressure protection control	Forced-off thermostat with a limitation of recurrences.
Low pressure stepping-down control	Lowering of the low pressure decreases the compressor capacity
Low pressure protection control	Hot gas bypass is on ⟶ Forced-off thermostat with a limitation of recurrences.
Defrost control	Based on lowered Tb, defrosting operation is carried out. Compensation based on Ta.
Discharge pipe temperature control	Based on discharge pipe temperature Td and discharge superheated degree DSH = Td – Tc Injection is on ⟶ Compressor capacity is lowered ⟶ Forced-off thermostat with a limitation of recurrences.
Oil return control	Based on cumulative operation time, oil return operation should be carried out periodically. According to state of operation, cumulative operation time may be compensated.

NOTE: If the limitation of recurrences (different for each control, refer to the relevant service manual) is exceeded, a fault (error) code is generated and the system will stop.

5.1.3 Oil Return Operation

5.1.3.1 Cooling Mode (VRV Systems, RXYQ_M / REYQ_M)

Oil Return Operation / Cooling Mode

In order to prevent a shortage of oil in the compressor, the oil migrating from the compressor to the piping system is collected through an automatic oil return operation.

[Starting conditions]

Start oil return operation in cooling operation using the following conditions:

* Cumulative oil return amount
* Timer

Cumulative compressor operating time after power supply turns on exceeds 2 hours and the time after the completion of previous oil return operation exceeds 8 hours.

Furthermore, the cumulative oil return is calculated according to Tc, Te, and compressor load.

Actuator	Oil return preparation operation	Oil return operation	Post-oil-return operation
Compressor	Upper limit control	124 Hz + ON	52 Hz + OFF
Outdoor unit fan	Fan control	Fan control	Fan control
Four-way valve 1	OFF	OFF	OFF
Four-way valve 2	OFF	OFF	OFF
Main motorized valve (EV1)	1400 pulse	1400 pulse	1400 pulse
Sub motorized valve (EV2)	1400 pulse	1400 pulse	1400 pulse
Sub-cooling motorized valve (EV3)	SH control	0 pulse	0 pulse
Hot gas bypass valve (SVP)	OFF	ON	ON
Oil equalization valve (SVO)	ON	ON	ON
Receiver gas-charging valve (SVL)	OFF	OFF	OFF
Receiver gas-discharge valve (SVG)	OFF	OFF	OFF
Discharge pipe-stop valve (SVR)	OFF	OFF	OFF
Non-operating unit liquid pipe stop valve (SVSL)	OFF	OFF	OFF
High pressure gas pipe pressure reduction valve (SVC)	ON	ON	ON
Ending conditions	1 min. or	• 6 min. • Ts - Te<9	30 sec.

Indoor unit actuator		Cooling oil return operation
Fan	Thermostat ON unit	Set Air Volume
	Unit not in operation	OFF
	Thermostat OFF unit	OFF
Electronic expansion valve	Thermostat ON unit	Normal opening
	Unit not in operation	200 pulse
	Thermostat OFF unit	200 pulse

5.1.3.2 Heating Mode (VRV Systems, RXYQ_M / REYQ_M)

Oil Return Operation / Heating Mode

[Starting conditions]
Start oil return operation in heating operation using the following conditions:
Cumulative compressor operating time after power supply turns on exceeds 2 hours and the time after the completion of previous oil return operation exceeds 8 hours. And cumulative oil return is calculated based on Tc, Te compressor load.

Actuator	Oil-return preparation operation	Oil return operation	Post oil-return operation
Compressor	Upper limit control	124 Hz + ON	1-step increase from (74Hz + OFF) to (Pc - Pe > 0.4 MPa) time.
Outdoor unit fan	STEP 7 or STEP 8	OFF	STEP8
Four-way valve 1	Depend on previous Heat exchange mode	OFF	ON
Four-way valve 2	Depend on previous Heat exchange mode	OFF	OFF
Main motorized valve (EV1)	Four-way valve 1 OFF:1400 pulse ON:SH control	1400 pulse	180 pulse
Sub motorized valve (EV2)	Four-way valve 2 OFF:1400 pulse ON:SH control	1400 pulse	1400 pulse
Sub-cooling motorized valve (EV3)	0 pulse	0 pulse	0 pulse
Hot gas bypass (SVP)	OFF	ON	ON
Oil equalization valve (SVO)	ON	ON	ON
Receiver gas charging valve (SVL)	OFF	OFF	OFF
Receiver gas discharge valve (SVG)	OFF	OFF	OFF
Discharge gas stop valve (SVR)	ON	OFF	OFF
Non-operating unit liquid pipe stop valve (SVSL)	ON	OFF	OFF
High-pressure gas pipe pressure reduction valve (SVC)	OFF	ON	ON
Ending conditions	2 min.	• 6 min. or • Ts - Te<9	• 160 sec. or • Pc - Pe>58 psi

Indoor unit actuator		Heating oil-return operation
Fan	Cooling Thermostat ON unit	Set Fan Speed
	Heating Thermostat ON unit	OFF
	Unit not in operation	OFF
	Thermostat OFF unit	OFF
Electronic expansion valve	Thermostat ON unit	512 pulse
	Unit not in operation	512 pulse
	Thermostat OFF unit	512 pulse

In condition of oil return operation:
Compressor cumulative operation time > 8 hours, with the exception of taking 2 hours after turning power on first time.

5.1.3.3 Cooling Mode (VRV-WII Systems, RWEYQ_M)

Oil Return Operation / Cooling Mode

[Starting conditions] Start oil return operation in cooling operation referring using the following conditions:
* Cumulative oil return amount
* Timer
Cumulative compressor operating time after power supply turns on exceeds 2 hours and the time after the completion of previous oil return operation exceeds 8 hours. The cumulative oil return is calculated according to Tc, Te, and compressor load.

Cooling oil return

Parts name	Symbol	Electrical symbol	Preperation	During oil return operation		After oil return operation
Compressor	—	(M1C)		104 Hz		52 Hz
4 way valve (Main)	20S1	(Y5S)		OFF		OFF
4 way valve (for heat exchanger)	20S2	(Y7S)		OFF		OFF
Main heat exchanger electronic expansion valve	EV1	(Y1E)		2000 pulse		2000 pulse
Sub-cooling electronic expansion valve	EV3	(Y3E)		0 pulse		0 pulse
Hot gas bypass solenoid valve	SVP	(Y1S)		ON		ON
Water heat exch. oil return solenoid valve	SVE	(Y2S)		OFF		OFF
Receiver gas charging solenoid valve	SVL	(Y3S)		OFF		OFF
Receiver gas discharge solenoid valve	SVG	(Y4S)		OFF		OFF
Liquid pipe stop solenoid valve	SVSL	(Y6S)		ON		ON
Indoor cooling unit fan	—	(M1, 2F)	Same as normal cooling operation	Thermostat on/Stop : Indoor unit control Thermostat off : OFF		Normal control
Indoor cooling unit expansion valve	EV	(Y1E)		Stop/thermostat off: 200 pulses Thermostat ON: Indoor unit control		Normal control
Indoor heating unit fan	—	(M1, 2F)		—		—
Indoor heating unit expansion valve	EV	(Y1E)		—		—
BS 20RH Cooling	20RH	(Y3S)		ON	OFF	OFF
BS 20RT	20RT	(Y1S)		OFF	OFF	OFF
Ending condition			20 sec.	Max.3 min.	Max.3 min.	Max. 3min.30sec.

5.1.3.4 Heating / Simultaneous Operation (VRV-WII Systems, RWEYQ_M)

Oil Return Operation, Heating or Cooling / Heating Simultaneous Operation

[Starting conditions] Start oil return operation in heating operation referring using the following conditions:
* Cumulative compressor operating time after power supply turns on exceeds 2 hours and the time after the completion of previous oil return operation exceeds 8 hours.
* Cumulative oil return is calculated based on Tc, Te compressor load.

Heating & Cooling/heating simultaneous operation oil return

Parts name		Symbol	Electrical symbol	Preperation	During oil return operation		After oil return operation
Compressor		—	(M1C)	▲	104 Hz		74 Hz
4 way valve 1		20S1	(Y5S)		OFF		ON
4 way valve 2		20S2	(Y7S)		OFF		Heat exchanger mode
Main heat exchanger electronic expansion valve		EV1	(Y1E)		2000 pulse		20S2=OFF : 2000 pulse 20S2=ON : 180 pulse
Sub-cooling electronic expansion valave		EV3	(Y3E)		0 pulse		0 pulse
Hot gas bypass solenoid valve		SVP	(Y1S)		ON		ON
Water heat exch. oil return solenoid valve		SVE	(Y2S)		OFF		OFF
Receiver gas charging solenoid valve		SVL	(Y3S)		OFF		OFF
Receiver gas discharge solenoid valve		SVG	(Y4S)		OFF		OFF
Liquid pipe stop solenoid valve		SVSL	(Y6S)		ON		ON
Indoor cooling unit fan		—	(M1, 2F)	Same as normal heating operation	Thermostat on/Stop : Indoor unit control Thermostat off : OFF		Normal control
Indoor cooling unit expansion valve		EV	(Y1E)	▼	320 pulse		Normal control
Indoor heating unit fan		—	(M1, 2F)		OFF		Indoor unit control
Indoor heating unit expansion valve		EV	(Y1E)		320 pulse		Normal control
BS 20RH	Cooling	20RH	(Y3S)		ON	OFF	OFF
	Heating				ON	OFF	ON
BS 20RT		20RT	(Y1S)		OFF	OFF	OFF
Ending condition				2 min.	Max.2 min.	Max.4 min.	Max.3 min.

5.1.3.5 Water Heat Exchanger (VRV-WII Systems, RWEYQ_M)

Oil return operation of Water heat exchanger

When the water heat exchanger is used as evaporator during heating or simultaneous cooling/heating operation, any oil accumulated in the water heat exchanger is returned to compressor with an oil return operation.
[ON condition]
After a certain continuous period of time has passed under the following conditions, oil return operation starts.

- 20S2 = 1 (Water heat exchanger is an evaporator.)
- Tg – Te > 18°F
- Elapse of a certain period of time

Water heat exchanger oil return control

Parts name	Symbol	Electrical symbol	Water heat exchanger oil return control
Compressor	—	(M1C)	52 Hz
4 way valve (Main)	20S1	(Y5S)	ON
4 way valve (for heat exchanger)	20S2	(Y7S)	OFF
Main heat exchanger electronic expansion valve	EV1	(Y1E)	300 pulse
Sub-cooling electronic expansion valve	EV3	(Y3E)	180 pulse
Hot gas bypass solenoid valve	SVP	(Y1S)	ON
Water heat exch. oil return solenoid valve	SVE	(Y2S)	ON
Receiver gas charging solenoid	SVL	(Y3S)	OFF
Receiver gas discharge solenoid valve	SVG	(Y4S)	OFF
Non-operation unit liquid pipe stop solenoid valve	SVSL	(Y6S)	ON
Indoor cooling unit fan	—	(M1, 2F)	↑
Indoor cooling unit expansion valve	EV	(Y1E)	Normal control
Indoor heating unit fan	—	(M1, 2F)	↓
Indoor heating unit expansion valve	EV	(Y1E)	Thermostat on : Normal control Thermostat off/Stop : 500 pulse
BS 20RH Cooling / Heating	20RH	(Y3S)	↕ Normal control
BS 20RT	20RT	(Y1S)	
Ending condition			Max.90 sec.

5.1.3.6 Cooling Mode (VRV-III Systems, RXYQ_P / REYQ-P)

Oil Return Operation / Cooling Mode

Start Conditions: Start cooling oil return operation under the following conditions, or:

- Integral oil rise rate has reached a specified level
- Cumulative compressor operating time exceeds 8 hours (2 hours when the power supply turns ON for the first time)

The integral oil rise rate is calculated by Tc, Te, and compressor loads.
The higher the compressor operating step number, the more the refrigerant oil consumption increases.

Outdoor unit actuator	Symbol	Electric symbol	Oil return operation	Operation after oil return
Compressor 1	–	M1C	52Hz+ON(Subsequently, constant low pressure control). Maintain the number of compressors that were used before oil return operation.	52Hz+ON (Subsequently, constant low pressure control). Maintain the number of compressors that were used before oil return operation.
Compressor 2		M2C		
Outdoor unit fan 1	–	M1F	Cooling fan control	Cooling fan control
Outdoor unit fan 2		M2F		
Four-way valve (for heat exchanger selection)	20SA	Y2S Y9S	OFF	OFF
Four-way valve (for high and low pressure gas pipe selection)	20SB	Y8S	ON	ON
Electronic expansion valve (main)	EVM	Y1E Y3E	1375 pulse	1375 pulse
Electronic expansion valve (subcooling)	EVT	Y2E Y5E	SH control	SH control
Electronic expansion valve (refilling refrigerant)	EVJ	Y4E	80 pulse	80 pulse
Solenoid valve (main bypass)	SVE	Y5S Y10S	ON	ON
Solenoid valve (hot gas)	SVP	Y4S	OFF	OFF
Solenoid valve (liquid pipe of refrigerant regulator)	SVL	Y3S	0 pulse	0 pulse
Solenoid valve (gas discharge pipe of refrigerant regulator)	SVG	Y1S	0 pulse	0 pulse
Solenoid valve (drain pipe of refrigerant regulator)	SVO	Y7S	0 pulse	0 pulse
Solenoid valve (discharge pipe of refrigerant regulator)	SVT	Y6S	0 pulse	0 pulse
End conditions			• After a lapse of 5 minutes • TsA - Te<9°F	or After a lapse of 3 minutes • Pe_min<9°F • Pc_max>526psi • HTdmax>212°F

1. In case of multiple outdoor unit system:
   Main unit: It conducts the operation listed in the above table.
   Sub units: Operating units conduct the operation listed in the above table.
   Non-operating units conduct the operation listed in the table above after the ***Oil Returning Process***.
   Non-operating units stop while in ***Preparation Mode***.

Cooling Indoor Unit Actuator		Oil Return Operation
Fan	Thermo ON unit	Remote controller setting
	Unit not in operation	OFF
	Thermo OFF unit	Remote controller setting
Motorized valve	Thermo ON unit	Normal opening degree
	Unit not in operation	192 pulse
	Thermo OFF unit	Normal opening degree for forced ON thermostat

Cooling BS unit actuator	Elect. symbol	Oil Return Operation
Electronic expansion valve (EVH)	Y4E	600 pulse
Electronic expansion valve (EVL)	Y5E	760 pulse
Electronic expansion valve (EVHS)	Y2E	480 pulse
Electronic expansion valve (EVLS)	Y3E	480 pulse
Electronic expansion valve (EVSC)	Y1E	0 pulse

5.1.3.7 Heating / Simultaneous Operation (VRV-III Systems, RXYQ_P / REYQ_P)

Oil Return Operation, Heating or Cooling / Heating Simultaneous Operation

[Start conditions] in the following conditions:

- Integral oil rise rate has reached a specified level.
- When cumulative compressor operation time exceeds 8 hours, (2 hours when the power supply turns ON for the first time).

The integral oil rise rate is calculated by Tc, Te, and compressor loads.
The higher the compressor operating step number, the higher the cumulative refrigerant oil consumption.

Evaporating outdoor unit actuator	Symbol	Electric Symbol	Oil Return Operation
Compressor 1	–	M1C	Maintain load that was applied before oil return operation. When current circulation rate < circulation rate required for oil return operation, turn ON the STD compressor every 10 seconds (up to 3 units at maximum.).
Compressor 2		M2C	
Outdoor unit fan 1	–	M1F	When outdoor unit heat exchanger is the condenser, the fan runs under cooling fan control When the outdoor unit heat exchanger is the evaporator, the fan runs at the fan step 7 or 8.
Outdoor unit fan 2		M2F	
Electronic expansion valve (main)	EVM	Y1E Y3E	20SA=ON : PI control 20SA=OFF : 418 pulse
Electronic expansion valve (subcooling)	EVT	Y2E Y5E	PI control
Electronic expansion valve (refilling refrigerant)	EVJ	Y4E	80 pulse
Four-way valve (for heat changer selection)	20SA	Y2S Y9S	When outdoor unit heat exchanger is the condenser, the valve turns OFF. When the outdoor unit heat exchanger is the evaporator, the valve turns ON.
Four-way valve (for high and low pressure gas pipe selection)	20SA	Y2S Y9S	When outdoor unit heat exchanger is the condenser, the valve turns OFF.
Solenoid valve (main bypass)	SVE	Y5S Y10S	OFF
Solenoid valve (hot gas)	SVP	Y4S	0 pulse
Solenoid valve (liquid pipe of refrigerant regulator)	SVL	Y3S	0 pulse
Solenoid valve (gas discharge pipe of refrigerant regulator)	SVG	Y1S	0 pulse
Solenoid valve (drain pipe of refrigerant regulator)	SVO	Y7S	0 pulse
Solenoid valve (discharge pipe of refrigerant regulator)	SVT	Y6S	0 pulse
End conditions			• Pe_min<32psi or • After a lapse of 9 minutes

1. In case of multiple outdoor unit system:
   Master unit: It conducts the operation listed in the above table.
   Sub units: Operating units conduct the operation listed in the above table.
   Non-operating units conduct the operation listed in the table above after the ***Oil Returning*** process.
   (Non-operating units stop while in ***Preparation*** mode.

Cooling Indoor Unit Actuator		Oil Return Operation
Fan	Thermo ON unit	Remote controller setting
	Unit not in operation	OFF
	Thermo OFF unit	Remote controller setting
Motorized valve	Thermo ON unit	Normal opening degree
	Unit not in operation	192 pulse
	Thermo OFF unit	Normal opening degree for forced ON thermostat

Heating indoor unit actuator		Oil Return Operation
Fan	Thermo ON unit	Remote controller setting
	Unit not in operation	OFF
	Thermo OFF unit	LL
Motorized valve	Thermo ON unit	Normal opening degree
	Unit not in opeation	224 pulse
	Thermo OFF unit	Normal opening degree for forced ON thermostat

Cooling BS unit actuator		Elect. symbol	Oil Return Operation
Electronic expansion valve (EVH)		Y4E	0 pulse
Electronic expansion valve (EVL)		Y5E	760 pulse
Electronic expansion valve (EVHS)		Y2E	0 pulse (60 pulse when Pc_max>413psi)
Electronic expansion valve (EVLS)		Y3E	480 pulse
Electronic expansion valve (EVSC)		Y1E	PI control

Heating BS unit actuator		Elect. symbol	Oil Return Operation
Electronic expansion valve (EVH)		Y4E	760 pulse
Electronic expansion valve (EVL)		Y5E	0 pulse
Electronic expansion valve (EVHS)		Y2E	60 pulse
Electronic expansion valve (EVLS)		Y3E	0 pulse (60 pulse when Pc_max>413psi)
Electronic expansion valve (EVSC)		Y1E	0 pulse (PI control at simultaneous cooling / heating operation)

In condition of oil return operation: Compressor cumulative operation time > 8 hours, with the exception of taking 2 hours after turning power on first time.

5.1.4 Defrost Control

5.1.4.1 Defrost Control (VRV Systems, RXYQ_M / REYQ_M)

In order to melt the frost accumulated on the condensing unit heat exchanger during heating operation, Defrost operation is performed
to restore the heating capacity.
[Starting conditions] Start defrosting operation referring to the following conditions.
* Heat conductivity of outdoor heat exchangers
* Heat exchange temperature (Tb)
* Timer (Min. 2 hours)
The heat conductivity of outdoor heat exchangers is calculated based on Tc, Te, and compressor load.

Actuator	Defrost preparation operation	Defrost operation	Post-defrost operation
Compressor	Upper limit control	143 Hz + ON	1-stepincreasefrom (74Hz + OFF) to (Pc - Pe > 58psi)
Outdoor unit fan	STEP 7 or STEP8	OFF	STEP 8
Four-way valve 1	Depend on previous Heat exchange mode	OFF	ON
Four-way valve 2	Depend on previous Heat exchange mode	OFF	OFF
Main motorized valve (EV1)	Four-way valve 1 OFF:1400 pulse ON:SH control	1400 pulse	180 pulse
Sub motorized valve (EV2)	Four-way valve 2 OFF:1400 pulse ON:SH control	1400 pulse	1400 pulse
Sub-cooling motorized valve (EV3)	0 pulse	0 pulse	0 pulse
Hot gas bypass valve (SVP)	OFF	ON	ON
Oil equalization valve (SVO)	ON	ON	ON
Receiver gas charging valve (SVL)	OFF	OFF	OFF
Receiver gas discharge valve (SVG)	OFF	OFF	OFF
Discharging pipe stop valve (SVR)	ON	OFF	OFF
Non-operating unit liquid pipe stop valve (SVSL)	ON	OFF	OFF
High-pressure gas pipe pressure reduction valve (SVC)	OFF	ON	ON
End conditions	2 min. or	• 12 min. • Tb > 52°F or	• 160 sec. • Pc - Pe>58 psi

Indoor unit actuator		During defrost
Fan	Cooling Thermostat ON unit	Set Fan Speed
	Heating Thermostat ON unit	OFF
	Unit not in operation	OFF
	Cooling Thermostat OFF unit	Set Fan Speed
	Heating Thermostat OFF unit	OFF
Electronic expansion valve	Thermostat ON unit	512 pulse
	Unit not in operation	512 pulse
	Thermostat OFF unit	512 pulse

Defrost starting condition is started when the outdoor heat exchanger temperature becomes lower than deicer temperature. Defrost operation is conducted once in max. 2 hours.

5.1.4.2 Defrost Control (VRV-III Systems, RXYQ_P / REYQ_P)

[Start Conditions] In the following conditions, start defrost operation:

- When there is a decrease in the coefficient of the heat transfer of the outdoor unit heat exchanger
- When there is a drop in the temperature of the outdoor unit heat exchanger outlet (Tb)
- When the low pressure stays low for a certain amount of time (2 hours minimum)

The thermal heat conductivity of outdoor heat exchangers is calculated based on Tc, Te, and compressor load.

Defrosting outdoor unit actuator	Symbol	Electric Symbol	Defrost Operation	Operation after defrost
Compressor 1	–	M1C	REYQ72,96,120P:232Hz+ON REMQ72P: 210hZ REMQ96,120P: 210Hz+ON	REYQ72,96,120P:upper limit 124Hz (STD Holds) REMQ72P: 210Hz REMQ96,120P: 210Hz+ON
Compressor 2		M2C		
Outdoor unit fan 1	–	M1F	Pcmax>355psi OFF Pcmax>342psi Pcmax>441psi FANSTEP 4 Pcmax>428psi FANSTEP 6	Pcmax>355psi OFF Pcmax>342psi Pcmax>441psi FANSTEP 4 Pcmax>428psi FANSTEP 6
Outdoor unit fan 2		M2F		
Four-way valve (for heat changer selection)	20SA	Y2S Y9S	OFF	OFF
Four-way valve (for high and low pressure gas pipe selection)	20SB	Y8S	Holds	Holds
Electronic expansion valve (main)	EVM	Y1E Y3E	1375 pulse	1375 pulse
Electronic expansion valve (subcooling)	EVT	Y2E Y5E	SH control	0 pulse
Electronic expansion valve (refilling refrigerant)	EVJ	Y4E	80 pulse	80 pulse
Solonoid valve (main bypass)	SVE	Y5S Y10S	ON	OFF
Solenoid valve (hot gas)	SVP	Y4S	OFF	OFF
Solenoid valve (liquid pipe of refrigerant regulator)	SVL	Y3S	0 pulse	0 pulse
Solenoid valve (gas discharge pipe of refrigerant regulator)	SVG	Y1S	0 pulse	0 pulse
Solenoid valve (drain pipe of refrigerant regulator)	SVO	Y7S	0 pulse	0 pulse
Solenoid valve (discharge pipe of refrigerant regulator	SVT	Y6S	0 pulse	0 pulse
End conditions			REYQ72 to 120 (by unit) or • 6 min. and 30 sec. • Tb>11°C continues for a period of 90 consecutive seconds. • Pc_max> 441psi or REYQ72 to 120 (by unit) • 5 min. and 30 sec. • Tb>11 C continues for a period of 10 consecutive seconds. • Pc_max> 441psi	or • 30 seconds • Pc_max> 441psi

Evaporating outdoor unit actuator	Symbol	Electric Symbol	Defrost Operation	Operation after defrost
Compressor 1	–	M1C	REYQ8,19,12P:232Hz+ON REMQ72P: 210hZ REMQ10,12P: 210Hz+ON	REYQ72P:upper limit 124Hz (STD Holds) REMQ72P: 210Hz REMQ96,120P: 210Hz+ON
Compressor 2		M2C		
Outdoor unit fan 1	–	M1F	Fan Control	Fan Control
Outdoor unit fan 2		M2F		
Four-way valve (for heat changer selection)	20SA	Y2S Y9S	OFF	OFF
Four-way valve (for high and low pressure gas pipe selection)	20SB	Y8S	PI control	PI control
Electronic expansion valve (main)	EVM	Y1E Y3E	SH control	SH control
Electronic expansion valve (subcooling)	EVT	Y2E Y5E	80 pulse	80 pulse
Electronic expansion valve (refilling refrigerant)	EVJ	Y4E	OFF	OFF
Solonoid valve (main by-pass)	SVE	Y5S Y10S	OFF	OFF
Solenoid valve (hot gas)	SVP	Y3S	0 pulse	0 pulse
Solenoid valve (liquid pipe of refrigerant regulator)	SVL	Y1S	0 pulse	0 pulse
Solenoid valve (drain pipe of refrigerant regulator)	SVO	Y7S	0 pulse	0 pulse
Solenoid valve (discharge pipe of refrigerant regulator)	SVT	Y6S	0 pulse	0 pulse

Cooling indoor unit actuator		Defrost Operation
Fan	Thermo ON unit	Remote controller setting
	Unit not in operation	OFF
	Thermo OFF unit	Remote controller setting
Motorized valve	Thermo ON unit	Normal opening degree
	Unit not in operation	0 pulse
	Thermo OFF unit	0 pulse

Heating indoor unit actuator		Defrost Operation	
		REYQ	REMQ
Fan	Thermo ON unit	OFF	LL
	Unit not in operation	OFF	LL
Motorized valve	Thermo OFF unit	OFF	LL
	Thermo ON unit	0 pulse	0 pulse
	Unit not in operation	0 pulse	0 pulse
	Thermo OFF unit	0 pulse	0 pulse

Cooling BS unit actuator	Elect. symbol	Defrost operation
Electronic expansion valve (EVH)	Y4E	0 pulse
Electronic expansion valve (EVL)	Y5E	760 pulse
Electronic expansion valve (EVHS)	Y2E	0 pulse
Electronic expansion valve (EVLS)	Y3E	480 pulse
Electronic expansion valve (EVSC)	Y1E	0 pulse

Heating BS unit actuator	Elect. symbol	Defrost operation
Electronic expansion valve (EVH)	Y4E	760 pulse
Electronic expansion valve (EVL)	Y5E	0 pulse
Electronic expansion valve (EVHS)	Y2E	60 pulse
Electronic expansion valve (EVLS)	Y3E	0 pulse (REYQ72,96,120P) 60 pulse (REMQ72,96,120)
Electronic expansion valve (EVSC)	Y1E	0 pulse (PI control for cool/heat concurrent operation)

Warning

- Daikin Industries, Ltd.'s products are manufactured for export to numerous countries throughout the world. Daikin Industries, Ltd. does not have control over which products are exported to and used in a particular country. Prior to purchase, please therefore confirm with your local authorized importer, distributor and/or retailer whether this product conforms to the applicable standards, and is suitable for use, in the region where the product will be used. This statement does not purport to exclude, restrict or modify the application of any local legislation.
- Ask a qualified installer or contractor to install this product. Do not try to install the product yourself. Improper installation can result in water or refrigerant leakage, electrical shock, fire or explosion.
- Use only those parts and accessories supplied or specified by Daikin. Ask a qualified installer or contractor to install those parts and accessories. Use of unauthorized parts and accessories or improper installation of parts and accessories can result in water or refrigerant leakage, electrical shock, fire or explosion.
- Read the User's Manual carefully before using this product. The User's Manual provides important safety instructions and warnings. Be sure to follow these instructions and warnings.

If you have any inquiries, please contact your local importer, distributor and/or retailer.

JMI-0107

JQA-1452

About ISO9001

ISO 9001 is a plant certification system defined by the International Organization for Standardization (ISO) relating to quality assurance. ISO 9001 certification covers quality assurance aspects related to the "design, development, manufacture, installation, and supplementary service" of products manufactured at the plant.

EC99J2044

JQA-E-90108

About ISO 14001

ISO 14001 is the standard defined by the International Organization for Standardization (ISO) relating to environmental management systems. Our group has been acknowledged by an internationally accredited compliance organisation as having an appropriate programme of environmental protection procedures and activities to meet the requirements of ISO 14001.

Dealer

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• Specifications, designs and other content appearing in this brochure are current as of Sept. **2007** but subject to change without notice.

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SERVICE MANUAL NAVIGATION

VRV 3 PB SERIES SERVICE MANUAL

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Fault Code Identification

Three ways to help with ERROR CODES:

WEB: *www.drdaikin.com*

MOBILE WEB: *http://mobile.drdaikin.com*

SMS TEXT: **Error** plus (**code**)
- send to 32075 -
Example: Error U4

SiUS341012_A

VRV III

RXYQ72-360PBYD, PBTJ
R-410A Heat Pump 60Hz
REYQ72-336PBYD, PBTJ
R-410A Heat Recovery 60Hz

RXYQ72PBYD
RXYQ72PBTJ

RXYQ96, 120PBYD
RXYQ96, 120PBTJ

RXYQ144PBTJ
REYQ72, 96, 120PBYD
REYQ72, 96, 120, 144PBTJ

Starts on Page 1

Part 1
General Information

This section will show the different type of units, capacity ranges, maximum number of connectable units.

- Key Points
- P. 5-6 Equipment identification
- P.8 BS Box Connection Capacity

Starts on Page 9

Part 2
VRVIII R-410A Heat Pump

This section covers the operational conditions of the heat pump. This will include refrigerant flow, Operation details, component location, outdoor printed circuit board field setting modes and protection control.

- Key points
- P 21-27 Component Identification
- P 31-39 Refrigeration Flow
- P 46-49 Compressor steps
- P 66-73 Protection Controls
- P 98-99 Dip Switch settings
- P 102-107 Setting Mode 1 and 2
- P 121-124 Emergency Operation

Starts on page 125

Part 3
VRVIII R-410A Heat Recovery

This section covers the operational conditions of the heat recovery unit. This will include refrigerant flow, Operation details, component location, outdoor printed circuit board field setting modes and protection control.

- Key Points
- P 136-147 Component Identification
- P 152-171 Refrigerant Flow
- P 179-182 Compressor Steps
- P 199-206 Protection Controls
- P 231-234 Dip Switch Settings
- P 236-240 Setting Mode 1 and 2
- P 241 Monitor Mode
- P 252-255 Emergency Operation

Starts on page 258

Part 4
Indoor Unit

This section covers the operation of the indoor units. This will include Sensor control, drain pump control, EEV control, Freeze prevention, Swing flap control, heater control for the FXTQ, and field settings at remote control.

- Key Points
- P 298-309 Field Settings From Remote
- P 310-311 Group Address

Starts on page 315

Part 5
Service Diagnosis

This section will cover fault codes and the flow charts to use depending on the fault code. This will include troubleshooting from remote controls and monitor mode from outdoor unit.

- Key Points
- P 330-333 Monitor Mode
- P 335-448 Fault Codes(In this section pick 2 fault codes and go thru the flow chart)
- P 449-462 Checks(In this section are the checks referred to in the flow charts)

Starts on page 462

Part 6 Appendix

This section will cover piping diagrams, wiring diagrams, thermistor and pressure sensor charts, charge calculations, pipe sizing and outdoor multi connection piping.

- Key points
- P 473-484 Outdoor wiring Diagrams(In this section pick an outdoor unit and go thru the wiring diagram)
- P 491-497 Indoor wiring Diagrams(In this section go thru 2 fan coil wiring diagrams)
- P 511-513 Resistance and Pressure chart

Starts on page 516

Part 7 Precautions for New Refrigerant (R-410A)

This section will cover the use of 410A refrigerant and the proper tools to use with it.

Service Checker Workshop

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Fault Code Identification

Three ways to help with ERROR CODES:

WEB: www.drdaikin.com
MOBILE WEB: http://mobile.drdaikin.com
SMS TEXT: **Error** plus (**code**)
- send to 32075 -
Example: Error U4

What is purpose to use a Service Checker ?

- The Service Checker TYPE Ⅲ has been developed for enhancing customer-service capabilities of Daikin's air- conditioners.
- It is a personal computer monitoring device which is connected to an air-conditioner and reads out operation data (by temperature sensors, pressure sensors, several kinds of solenoid valves, operating modes, etc.).
- Possible to monitor simultaneously the operation data of multiple outdoor and indoor units on the DⅢ-NET by connecting to VRV-systems conforming to the DⅢ-NET in internal and external data transmission.
- The Service Checker TYPE Ⅲ is possible to measure six temperature measurement points and two pressure measurement points by "PCB Connection" connecting to an outdoor unit (any unit for a room air-conditioner) to monitor , or/and by connecting the optional kit of sensors.
- Not possible to use in combination of cable & DⅢ-NET connection. But Sensor connection is possible both with DⅢ-NET connection or cable-connection.

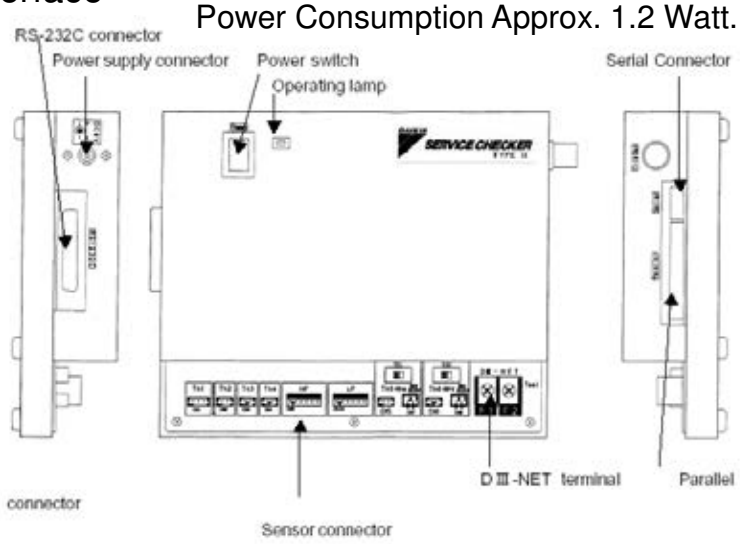
Cautions when using the Service Checker

- Be sure to connect the cable to the transmission terminal board (F1, F2) of the air conditioner (outdoor unit or indoor unit). If wrongly connected to power terminals of centralized equipment and the like, it may cause fatal injuries by electrical shock to human bodies and failures of equipment.
- When using the Service Checker TYPE 3 outdoors, be sure to protect it from rain so that it becomes free from the danger of electric shock and fires, abnormal corrosion of components.
- When leaving the Checker for a long time for recording, take proper measures against leak current and rain water which may cause fires.
- Be sure to connect AC adapter or the Charger for the battery to 120VAC.

Service Checker Type III

- Interface

Power Consumption Approx. 1.2 Watt.



Service Checker Type III

- Interface

- power connections.
  - adaptor AC/DC
    - input 120 VAC.
    - output 9 VDC 500mA
  - rechargeable battery :
    - Ni-Cd
    - approx.16 hours power if completely charged.

Computer Requirements for Service Checker

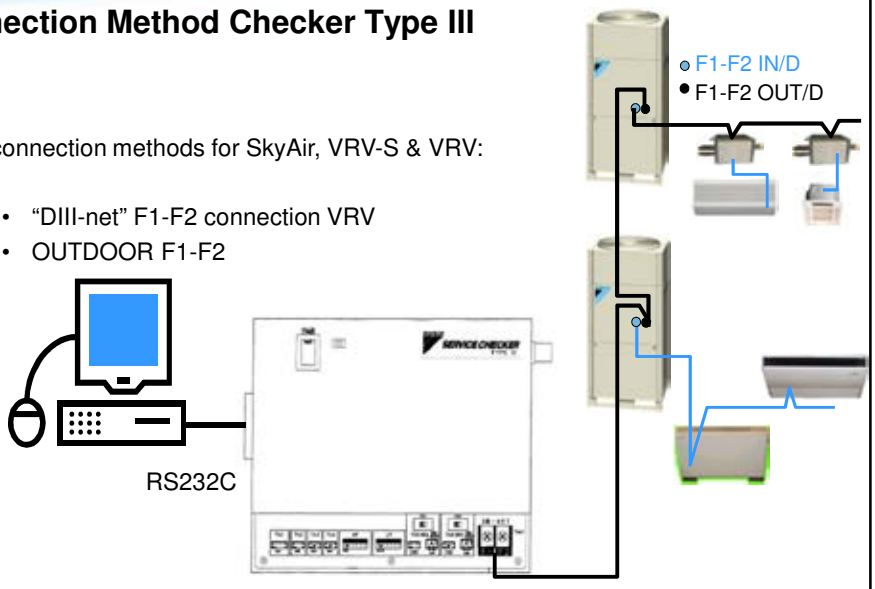
- TYPE III :
  - minimum PC requirement :
    - CPU 75 MHz ,
    - RAM 16Mb ,
    - Hard-disk 20 Mb ,
    - RS232 : 19200 bps ,
    - operating system : W95®

Installation Software

- Disk included with the Service Checker will be a previous version of the software. Do not use.
- Latest Version of Software will be available thru the Local Daikin Rep or Distributor
- Your local Daikin Area Service Manager can also be contacted for the latest version of the software. This software can be emailed to you.

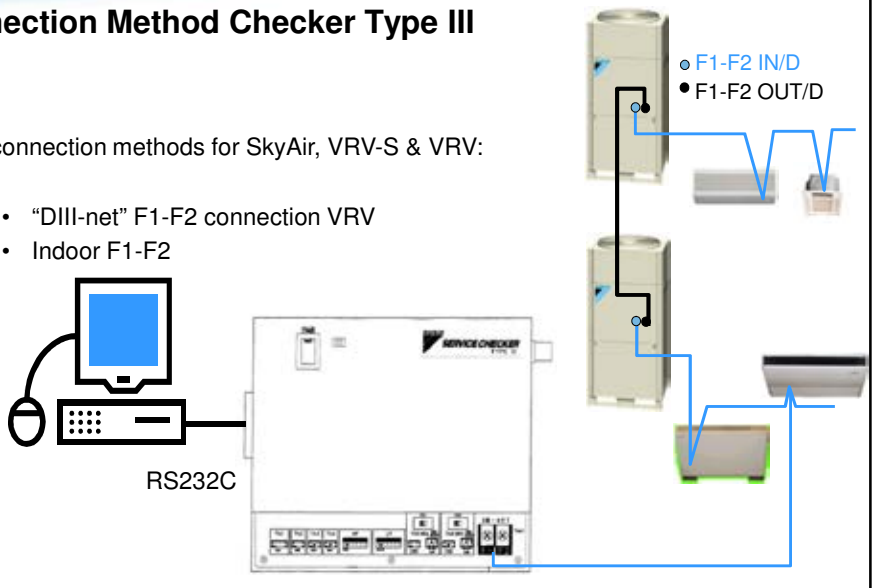
Connection Method Checker Type III

- connection methods for SkyAir, VRV-S & VRV:
  - "DIII-net" F1-F2 connection VRV
  - OUTDOOR F1-F2



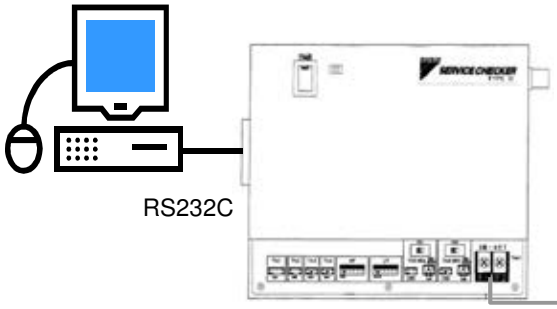
Connection Method Checker Type III

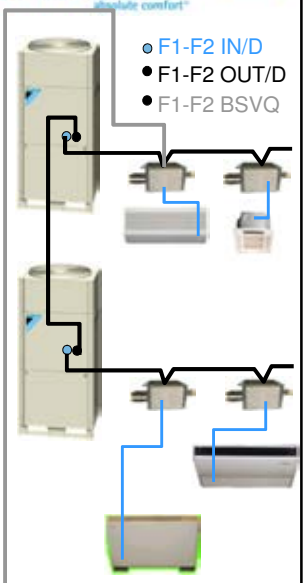
- connection methods for SkyAir, VRV-S & VRV:
  - "DIII-net" F1-F2 connection VRV
  - Indoor F1-F2



Connection Method Checker Type III

- Connection Methods for VRV:
  - "DIII-net" F1-F2 connection VRV
  - Indoor F1-F2 H/R





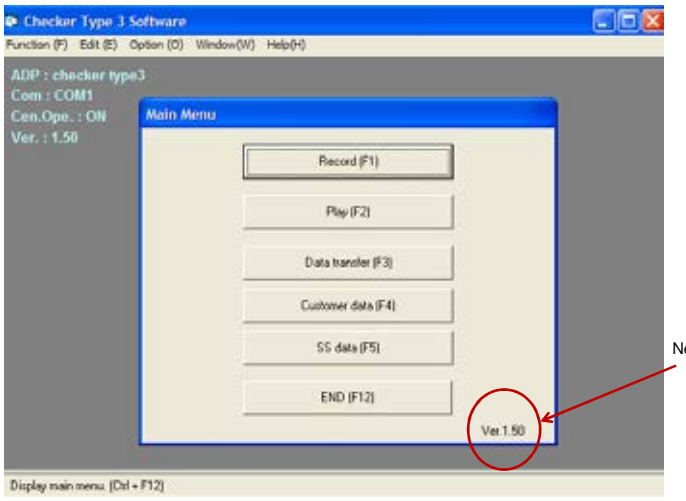
System Operation

- Service Checker Software
- Guidelines for Installing Service checker on the system(Using a serial to usb connecter)
- Setting the parameters of the data collected
  - Recording Data
  - Transferring Data to a CSV file

Important Note!!!

- When recording data, make sure to turn off your sleep mode. If you fail to do this the data will not be recorded when your laptop enters this mode. This can be found in your power settings on your laptop

Menu Service Checker Software



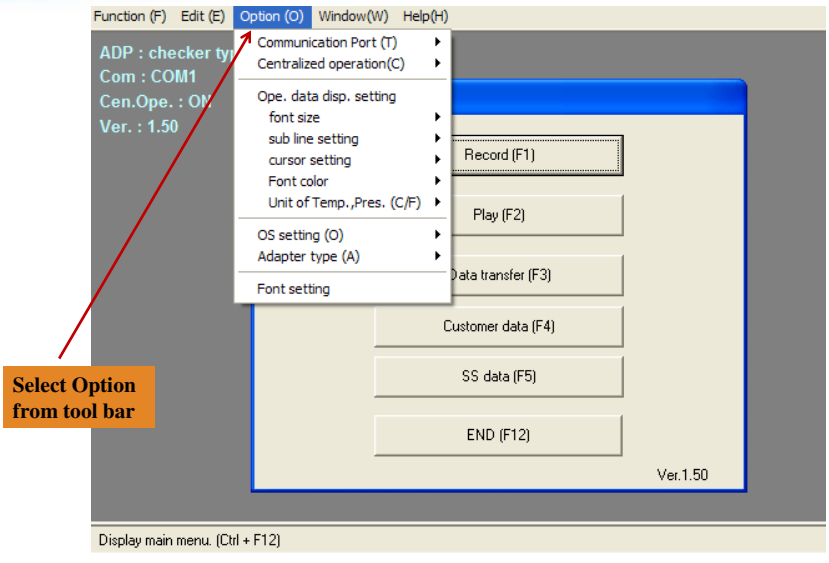
Newest Version is Ver. 1.50 (6/2011)

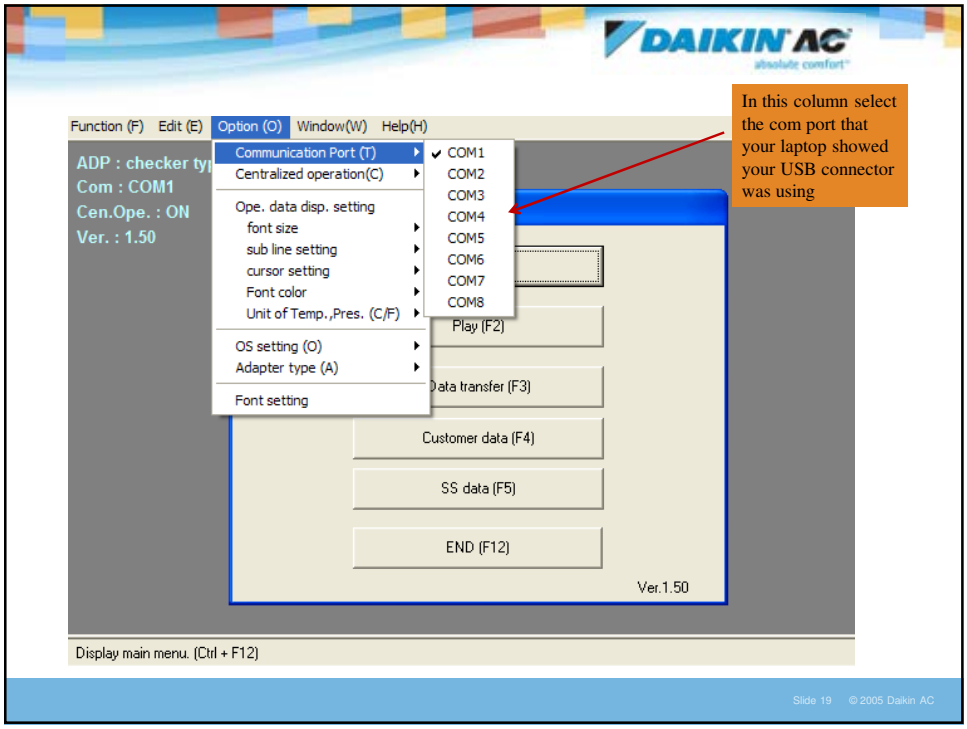
Serial Port Connectors

- If your laptop does not have a serial port connection you will need to procure a USB to Serial port connector
- This can be purchased at most computer stores, any store that sells computers.
- You will need to match up your com port that the serial port connector is on to the one in the service checker.
- The following will explain how.

- You will need to go to the device manager in your laptop. Make sure your connecter is plugged in.
- In device manager you will have a selection that says hardware.
- In hardware you will see a list of the hardware on your laptop.
- You will see com ports
- Open this and it will tell you what com port your USB connector is using.

- Once you have found what com port your USB connector is using then go back into the service checker program and select that com port.
- If you fail to match these up then you will not be able to communicate with the service checker.




In this column select the com port that your laptop showed your USB connector was using
Function (F) Edit (E) Option (O) Window(W) Help(H)
Communication Port (T)
Centralized operation(C)
Ope. data disp. setting
font size
sub line setting
cursor setting
Font color
Unit of Temp.,Pres. (C/F)
OS setting (O)
Adapter type (A)
Font setting
COM1
COM2
COM3
COM4
COM5
COM6
COM7
COM8
ADP : checker ty
Com : COM1
Cen.Ope. : ON
Ver. : 1.50
Play (F2)
Data transfer (F3)
Customer data (F4)
SS data (F5)
END (F12)
Ver.1.50
Display main menu. (Ctrl + F12)
Slide 19
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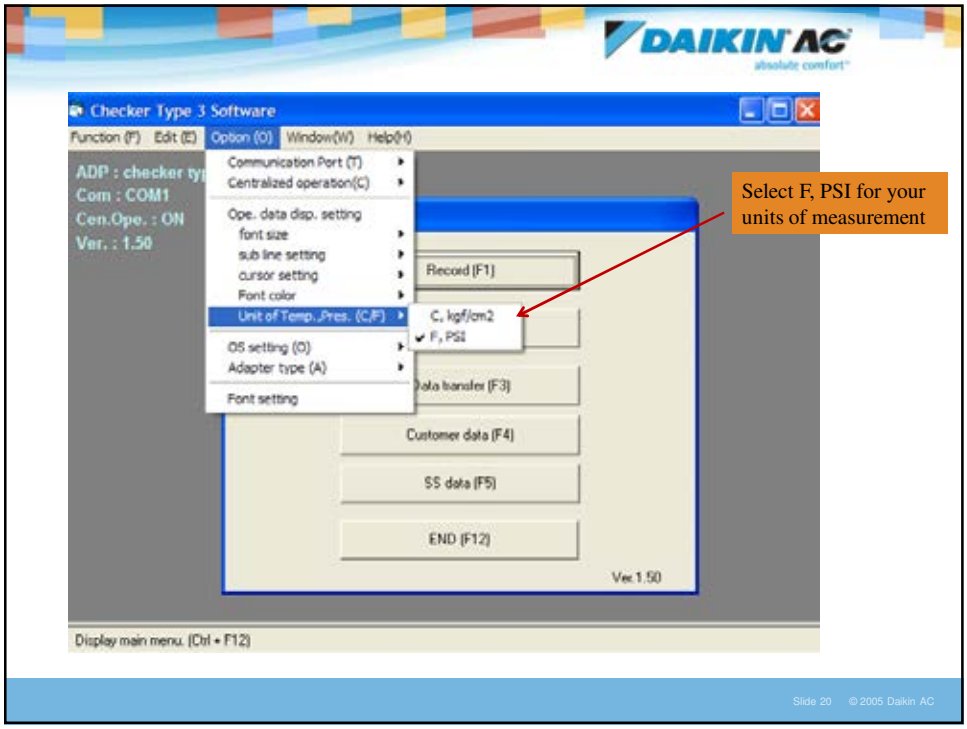
Select F, PSI for your units of measurement
Checker Type 3 Software
Function (F) Edit (E) Option (O) Window(W) Help(H)
Communication Port (T)
Centralized operation(C)
Ope. data disp. setting
font size
sub line setting
cursor setting
Font color
Unit of Temp.,Pres. (C/F)
OS setting (O)
Adapter type (A)
Font setting
C, kgf/cm2
F, PSI
ADP : checker ty
Com : COM1
Cen.Ope. : ON
Ver. : 1.50
Record (F1)
Data transfer (F3)
Customer data (F4)
SS data (F5)
END (F12)
Ver.1.50
Display main menu. (Ctrl + F12)
Slide 20
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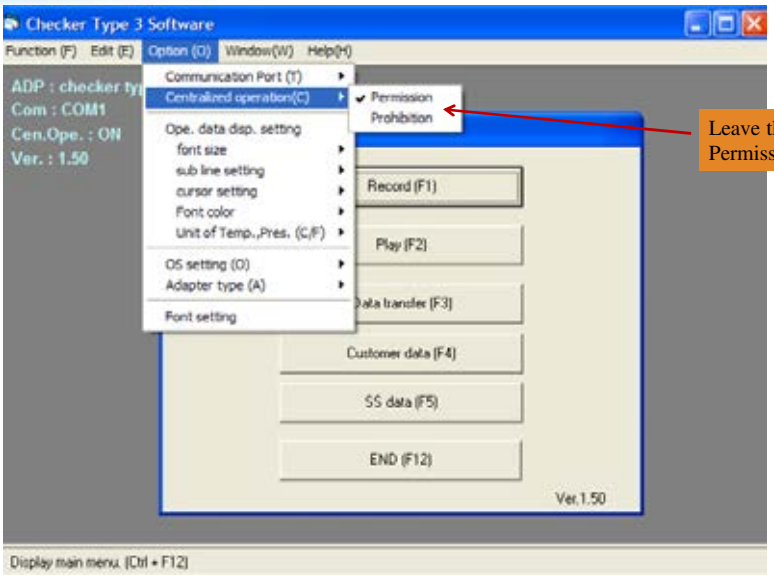
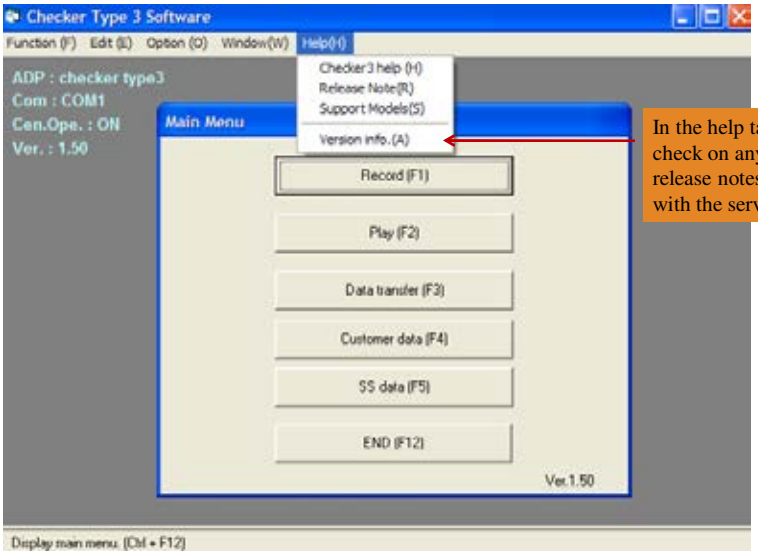
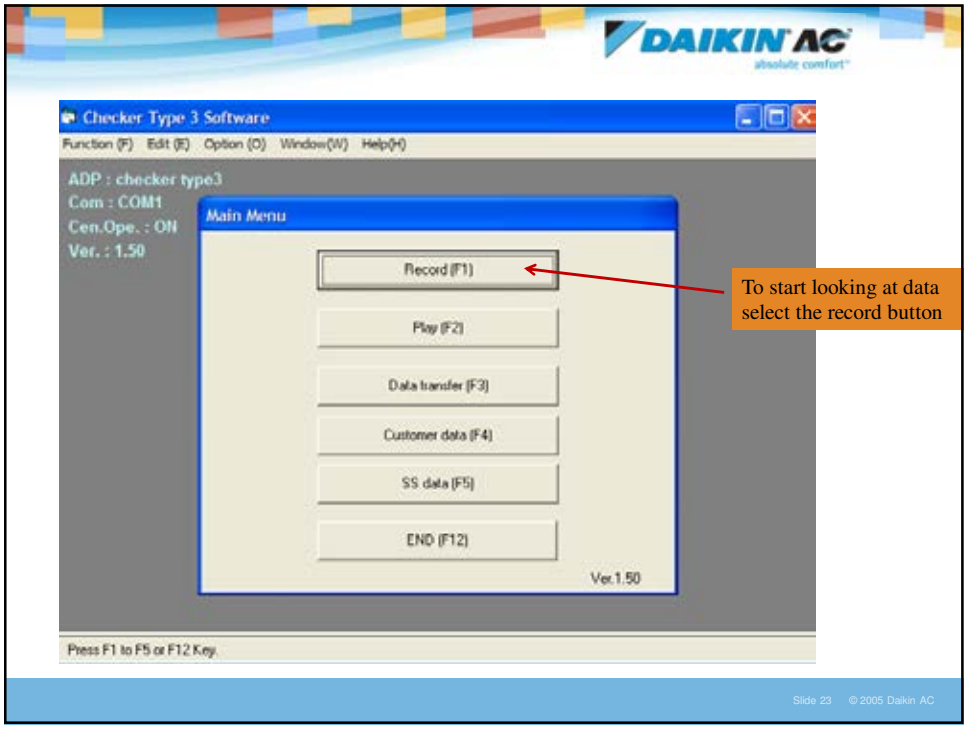


Leave this on Permission



In the help tab you can check on any updates, release notes and get help with the service checker


DAIKIN AC
absolute comfort
Checker Type 3 Software
Function (F) Edit (E) Option (O) Window(W) Help(H)
ADP : checker type3
Com : COM1
Cen.Ope. : ON
Ver. : 1.50
Main Menu
Record (F1)
Play (F2)
Data transfer (F3)
Customer data (F4)
SS data (F5)
END (F12)
Ver.1.50
Press F1 to F5 or F12 Key.
To start looking at data select the record button
Slide 23
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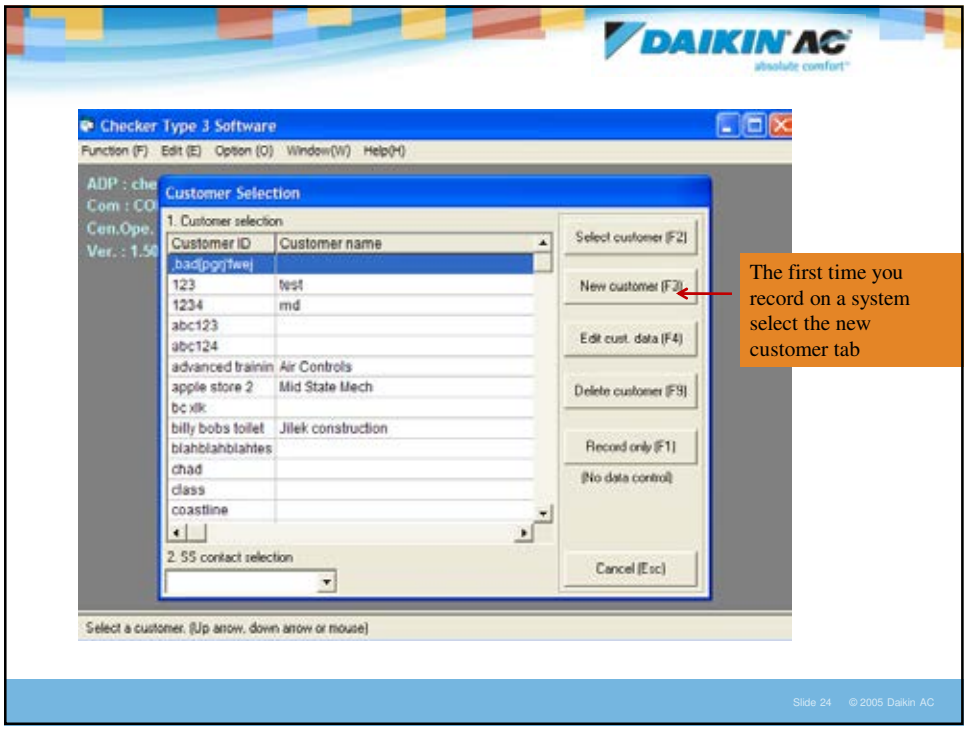
DAIKIN AC
absolute comfort
Checker Type 3 Software
Function (F) Edit (E) Option (O) Window(W) Help(H)
Customer Selection
1. Customer selection
Customer ID
Customer name
123 test
1234 md
abc123
abc124
advanced trainin Air Controls
apple store 2 Mid State Mech
billy bobs toilet Jilek construction
chad
class
coastline
2. SS contact selection
Select customer (F2)
New customer (F3)
Edit cust. data (F4)
Delete customer (F9)
Record only (F1)
(No data control)
Cancel (Esc)
Select a customer. (Up arrow, down arrow or mouse)
The first time you record on a system select the new customer tab
Slide 24
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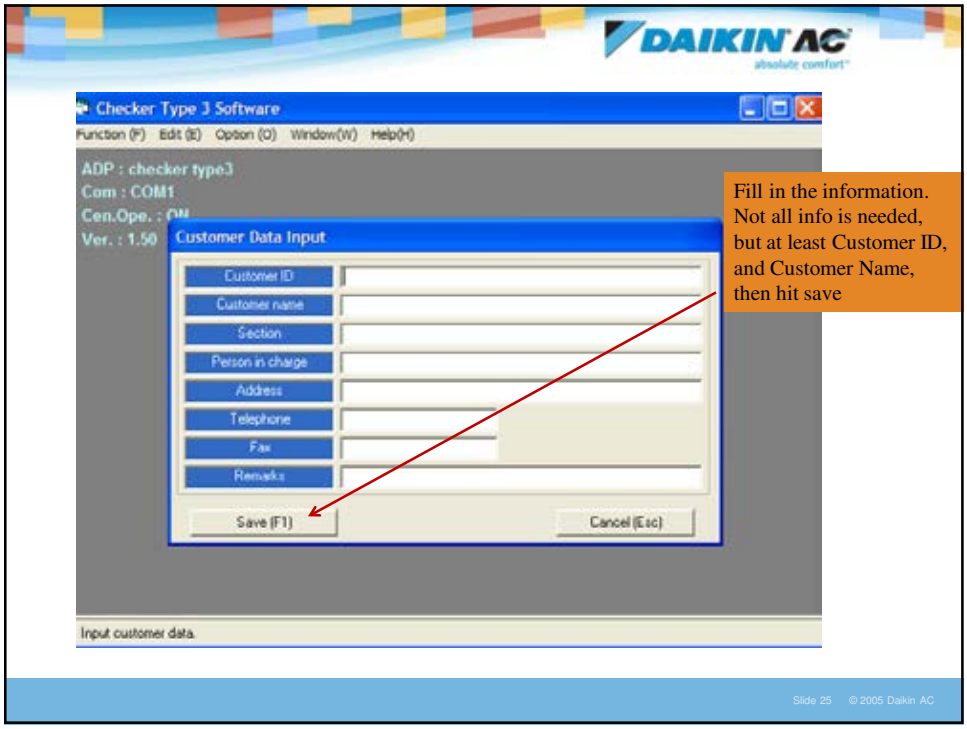
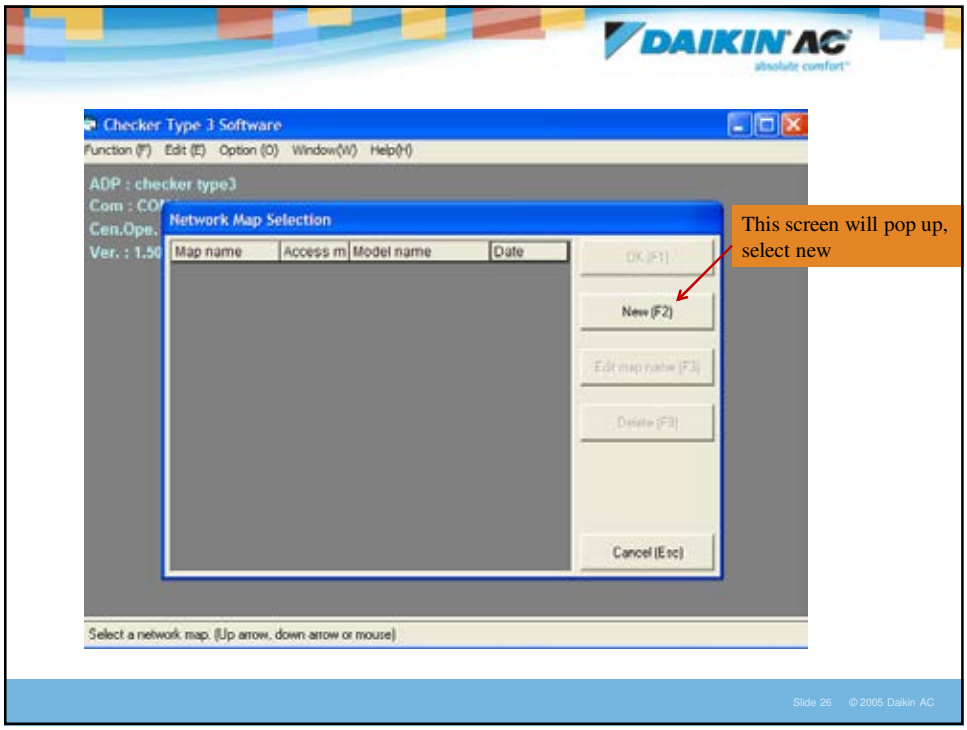
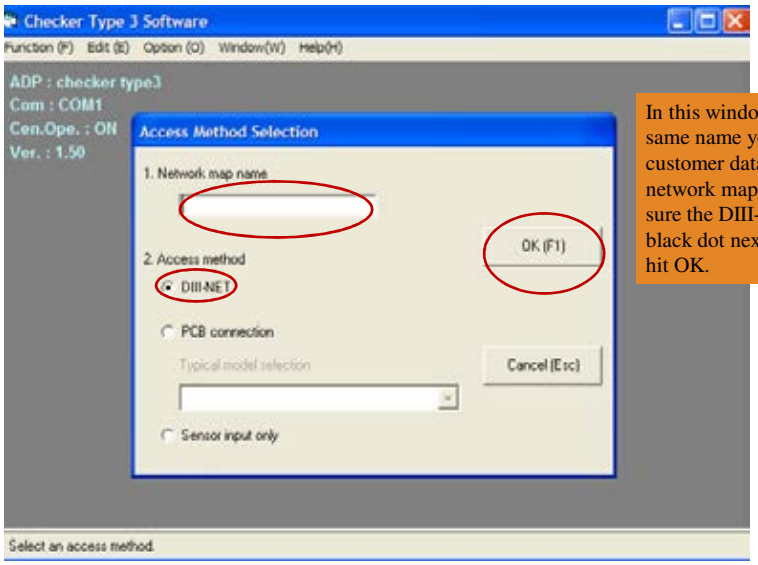
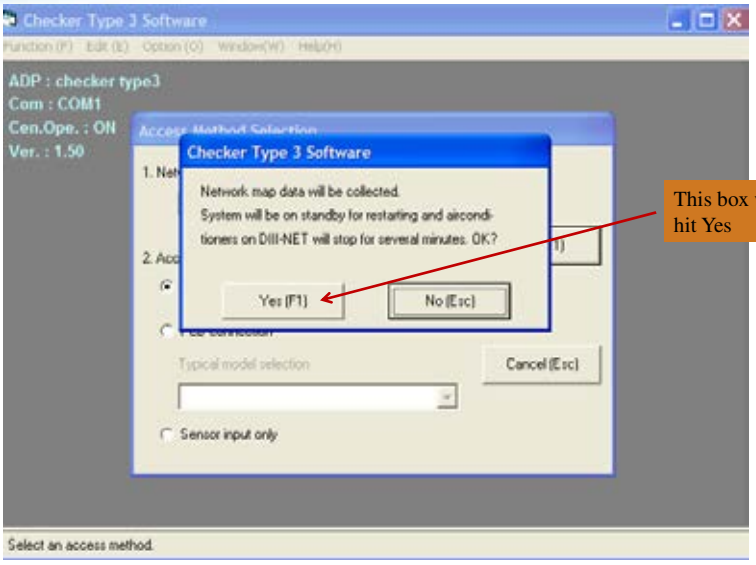

DAIKIN AC
absolute comfort
Checker Type 3 Software
Function (F) Edit (E) Option (O) Window(W) Help(H)
ADP : checker type3
Com : COM1
Cen.Ope. : ON
Ver. : 1.50
Customer Data Input
Customer ID
Customer name
Section
Person in charge
Address
Telephone
Fax
Remarks
Save (F1)
Cancel (Esc)
Input customer data.
Fill in the information. Not all info is needed, but at least Customer ID, and Customer Name, then hit save
Slide 25 © 2005 Daikin AC

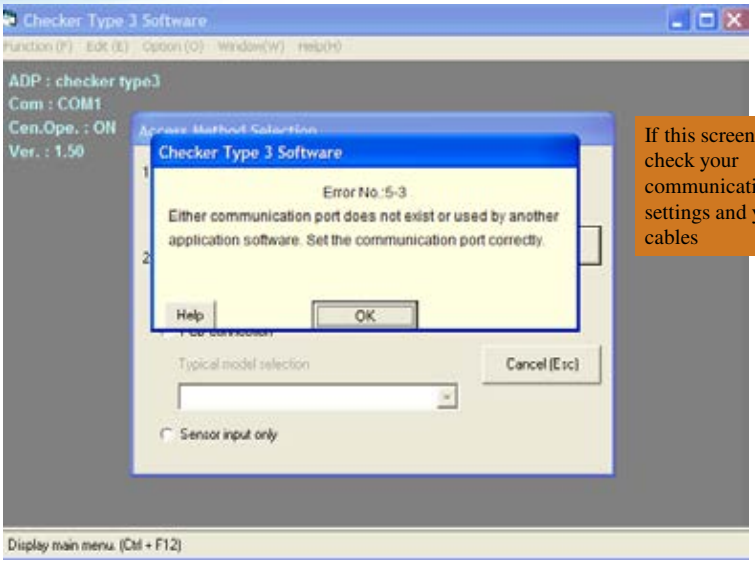

DAIKIN AC
absolute comfort
Checker Type 3 Software
Function (F) Edit (E) Option (O) Window(W) Help(H)
ADP : checker type3
Com : COM1
Cen.Ope.
Ver. : 1.50
Network Map Selection
Map name
Access m
Model name
Date
OK (F1)
New (F2)
Edit map name (F3)
Delete (F3)
Cancel (Esc)
Select a network map. (Up arrow, down arrow or mouse)
This screen will pop up, select new
Slide 26 © 2005 Daikin AC



In this window put in the same name you just put in customer data in the network map name. Make sure the DIII-NET has the black dot next to it, then hit OK.



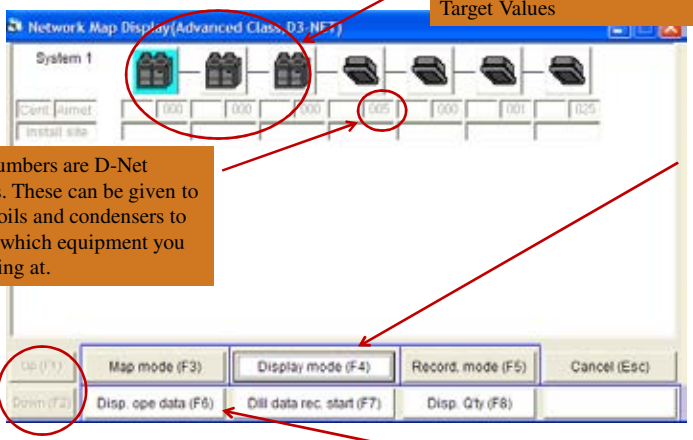
This box will pop up, hit Yes



If this screen pops up check your communication port settings and your cables

Display Mode

You will always have one more condenser then there physically is. This will be the Target Values



These numbers are D-Net numbers. These can be given to all fan coils and condensers to identify which equipment you are looking at.

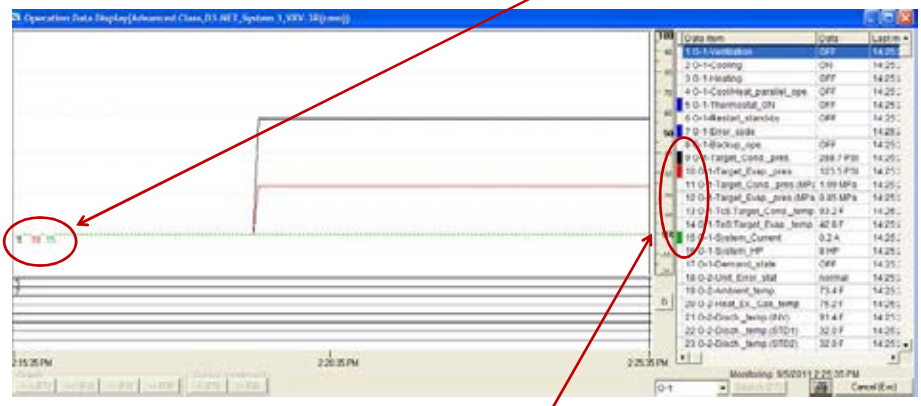
Select Display Mode First

If you have more then one system the up and down buttons will scroll thru the different systems.

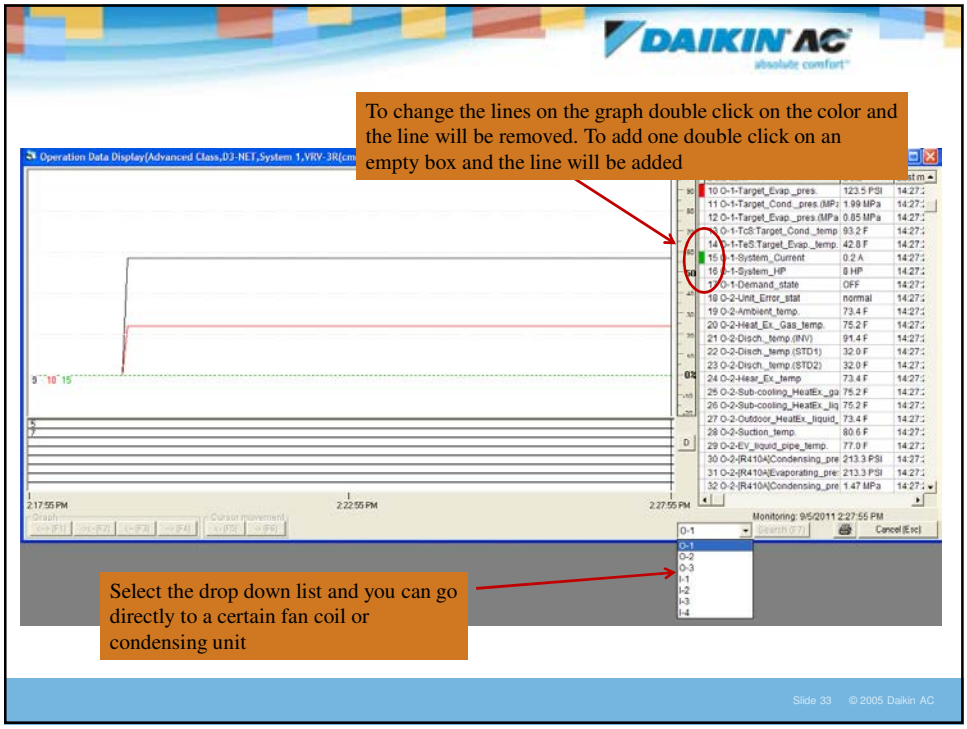
Select Display Operation Data Second

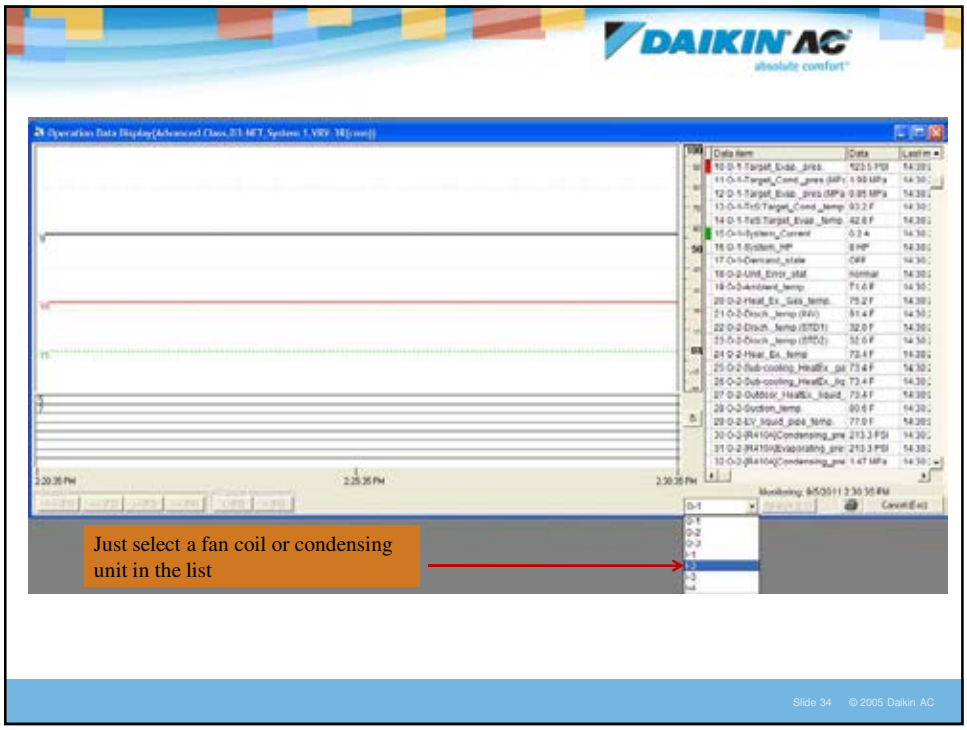
- The colors of the Icons have different meanings
- Green - unit is on
- Gray - unit is off
- Red - unit or system is in fault
- Pink - communication error

The numbers will match with the colors in the data list on the right

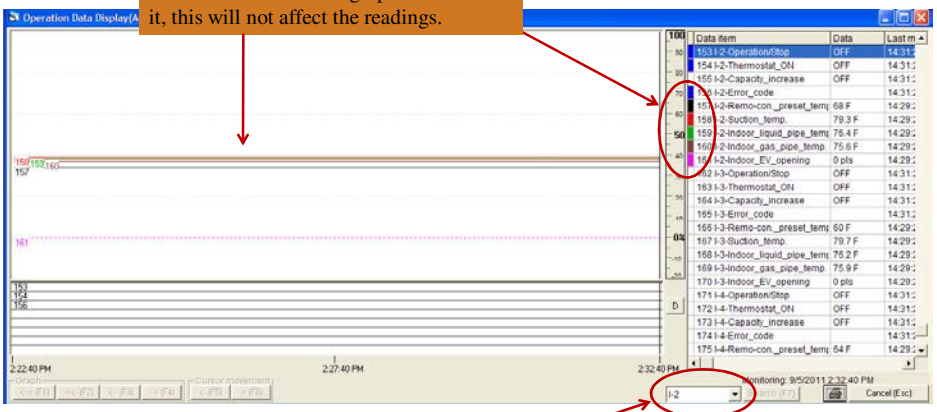


These colored blocks indicate the data that is up on the graph to the left



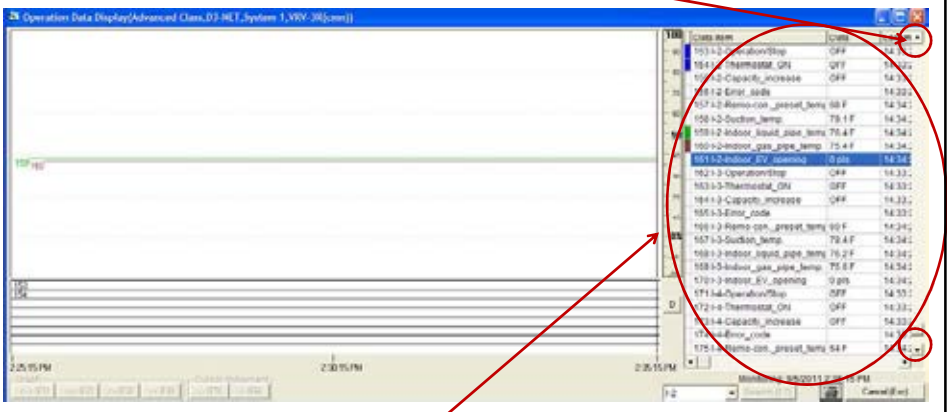


Data is automatically put on the graph when you select a piece of equipment. You can leave it on the graph or remove it, this will not affect the readings.



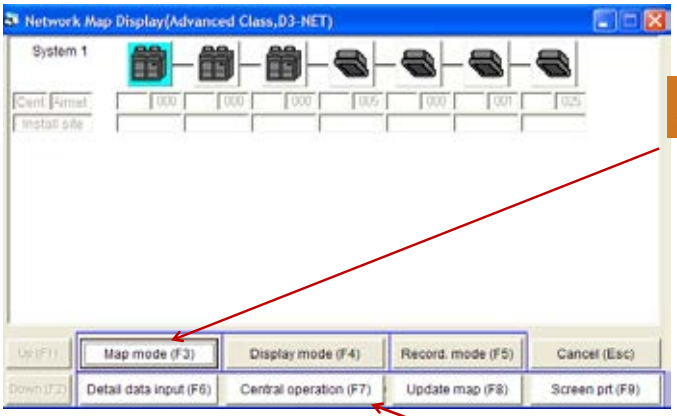
You can see the data in the graph changed to the fan coil selected in the drop down list

By clicking on the up or down arrow you can scroll thru all the data.



Data from the entire system will be displayed, all fan coils and all condensers. Condensers will be 0-1,0-2,0-3,0-4 depending on the amount of condensers and fan coils will be 1-1, 1-2 etc, depending on how many fan coils are in the system.

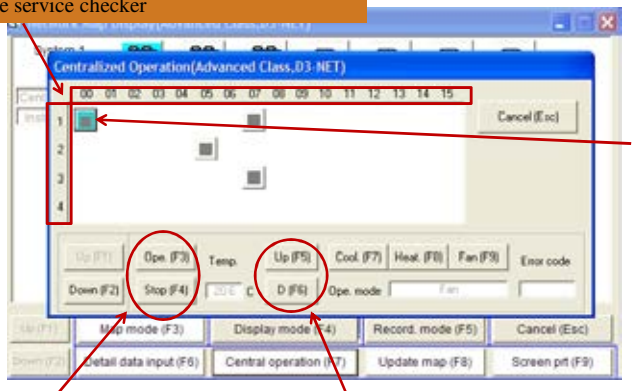
Map Mode



Select Map mode first

Select Central operation second

These will be the group addresses assigned to the fan coils. This will need to be done to control the fan coils thru the service checker



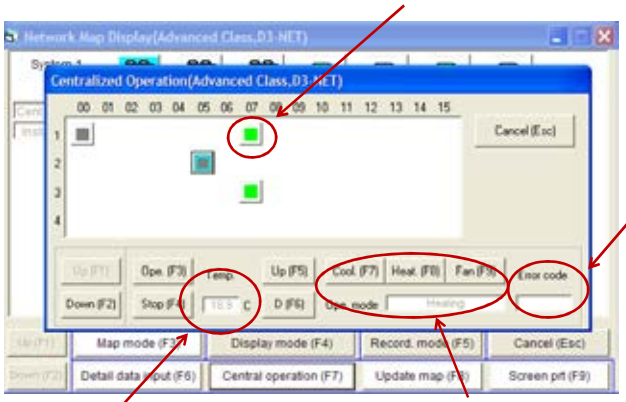
The group addresses in this example are1-00, 1-07, 2-05, and 3-07

The fan coil highlighted is the one you are making settings on

Turn the individual units on or off.

Turn the temperature of the fan coil up or down

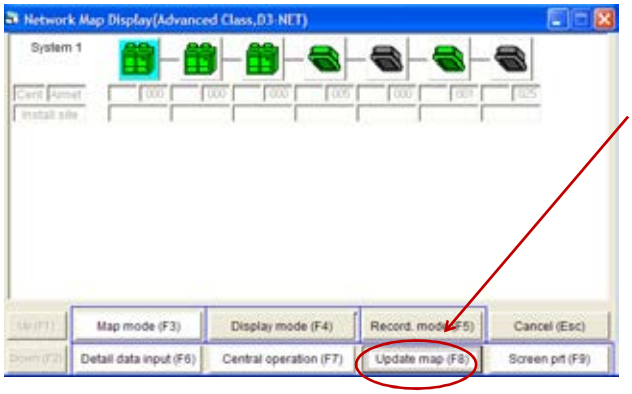
Green means the fan coil is on



If an error code is active it will be displayed here and the icon will be red.

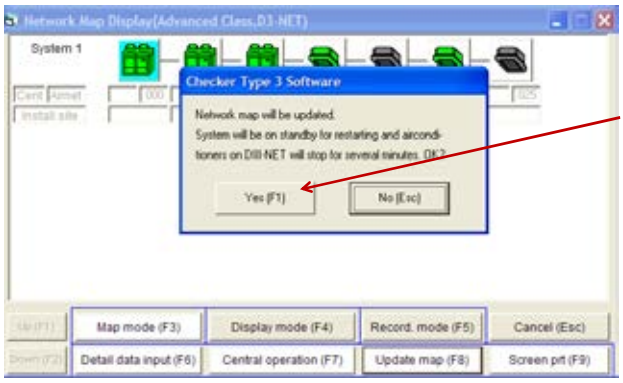
Temperature will always be displayed in Celsius

Select the mode of the fan coil. Mode will displayed in the box marked Ope. mode

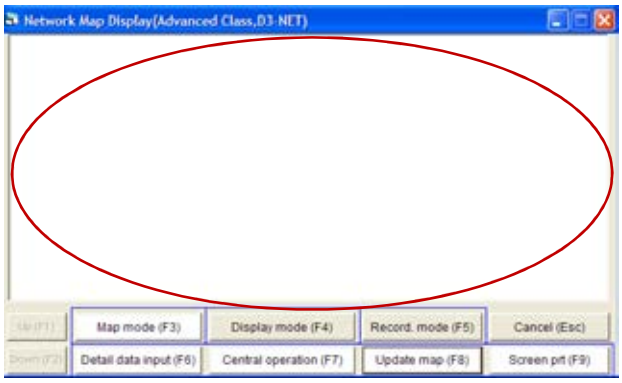


While in Map mode select update map

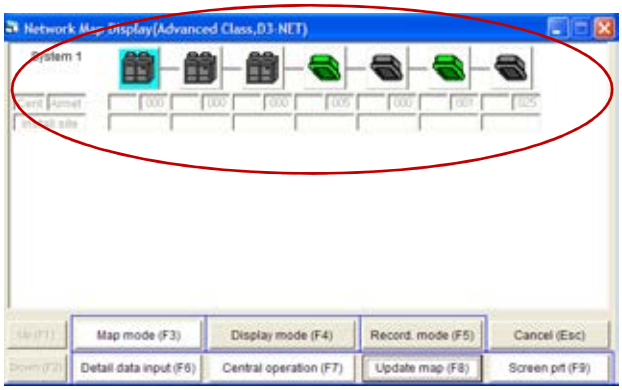
When group addresses have been changed, wiring has been changed, or power was off to a fan coil you can update the map to show these changes.



This box will pop up select yes

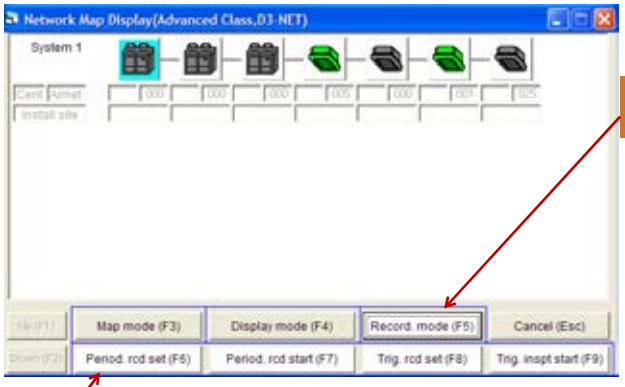


The screen will go blank. Wait until you see the icons repopulate on the screen



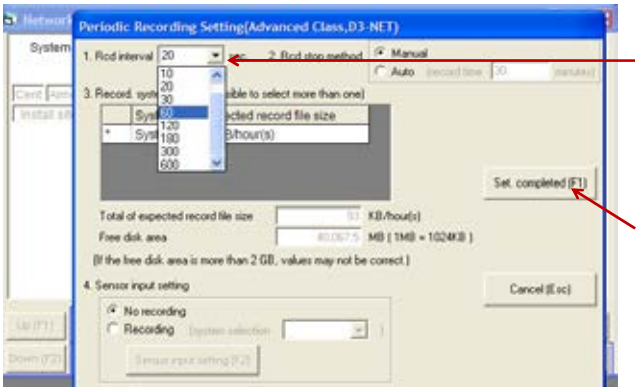
Once the screen repopulates, any changes that were made, fan coils added, group addresses changed, power back onto a fan coil will, these changes be recognized

Record Mode



Select Record Mode first

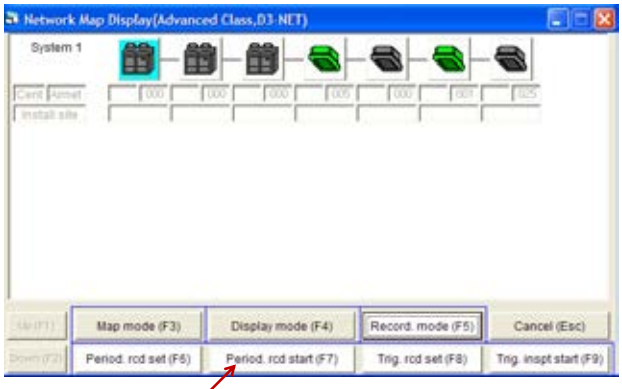
Select Period record set second



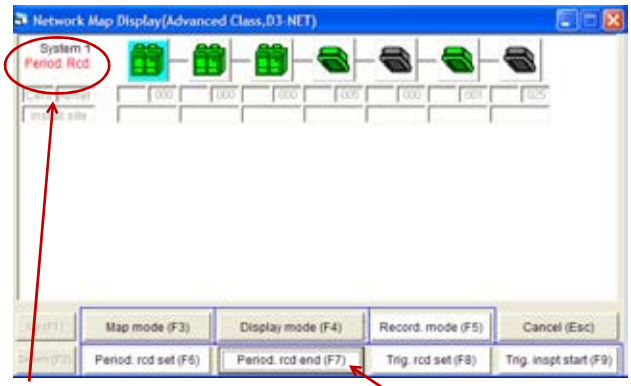
Set the record interval for 60 seconds

Then hit set completed

The indoor unit data updates every 5 minutes and the outdoor unit data updates every 2 minutes. This is factory set and cannot be changed. You can select a different recording interval if you desire too. A lower setting will just give you the same values for that time interval until the service checker updates.



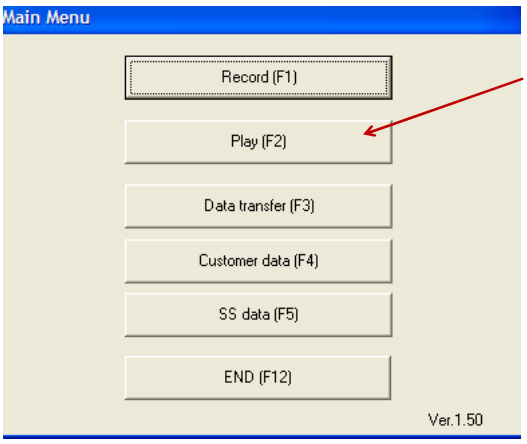
Select period rcd start



Once these red letters are up you are recording everything the service checker is seeing, all systems if there are more then one.

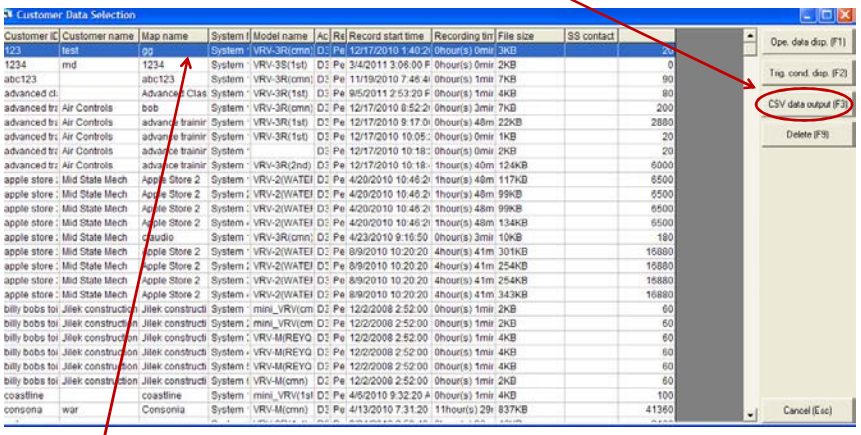
To stop recording select Period rcd end

Output data to a CSV File



To output the data to a CSV value from main menu select Play

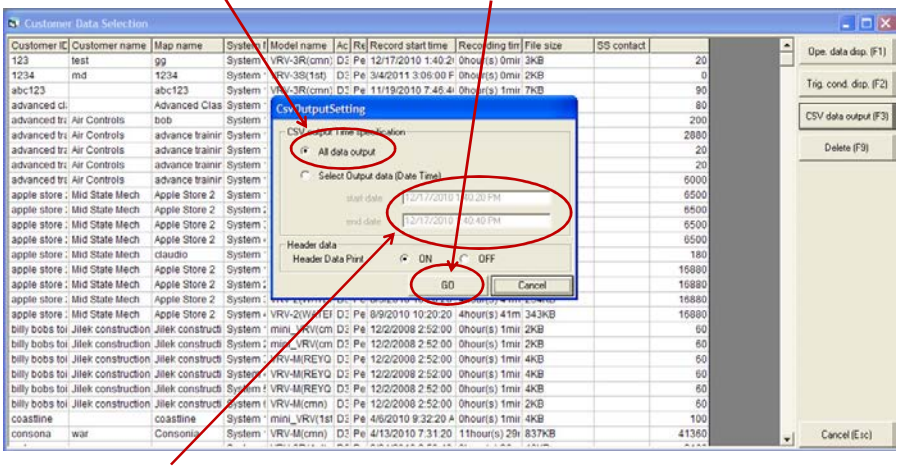
Once the file is selected then select CSV data output



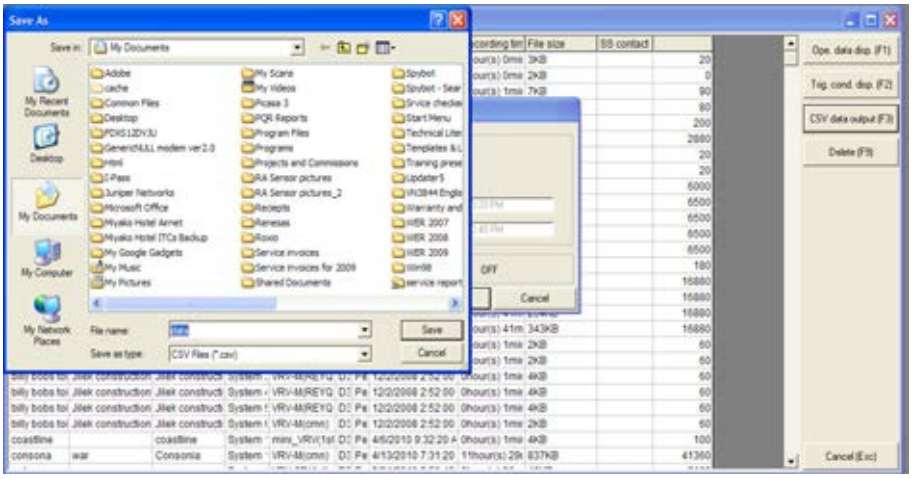
Select the data you want to output from the dropdown

All data output will be selected automatically.

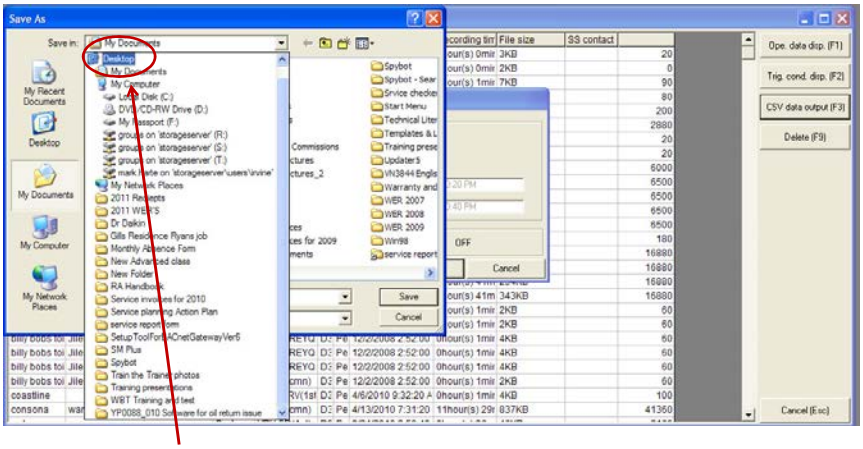
Select go once your data output is selected



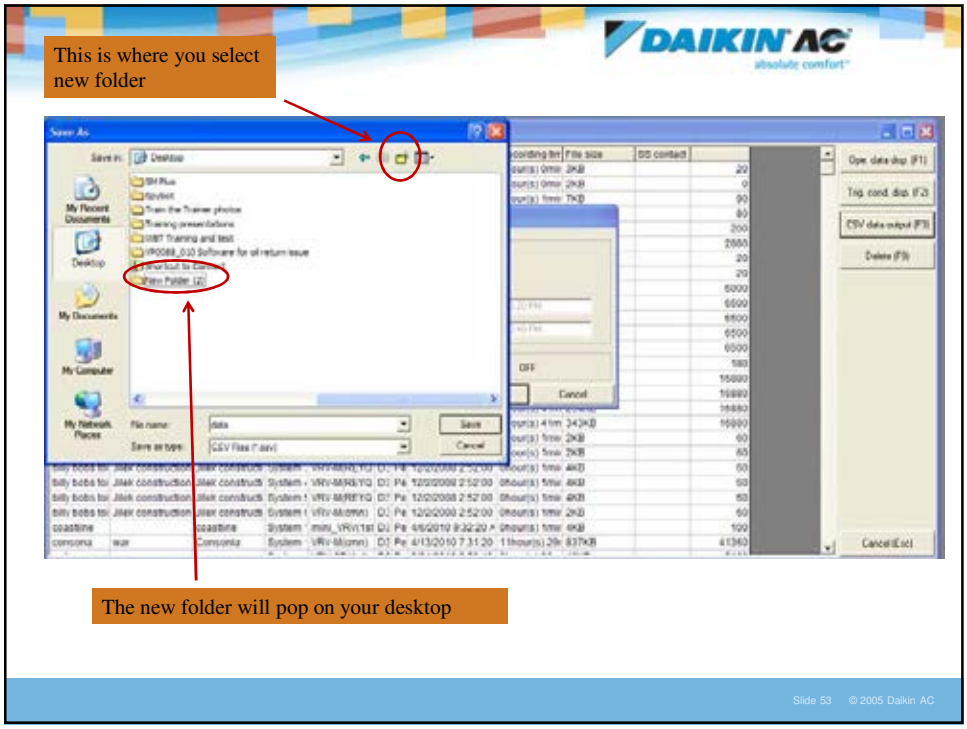
If you would like to select a certain time frame you can select the time frame you want. This would be if you have more then 1 day of data.



This screen will pop up. This is where you will place the data on your laptop.



As reference only, I select my desktop and put a new folder on the desktop


This is where you select new folder
The new folder will pop on your desktop
Slide 53
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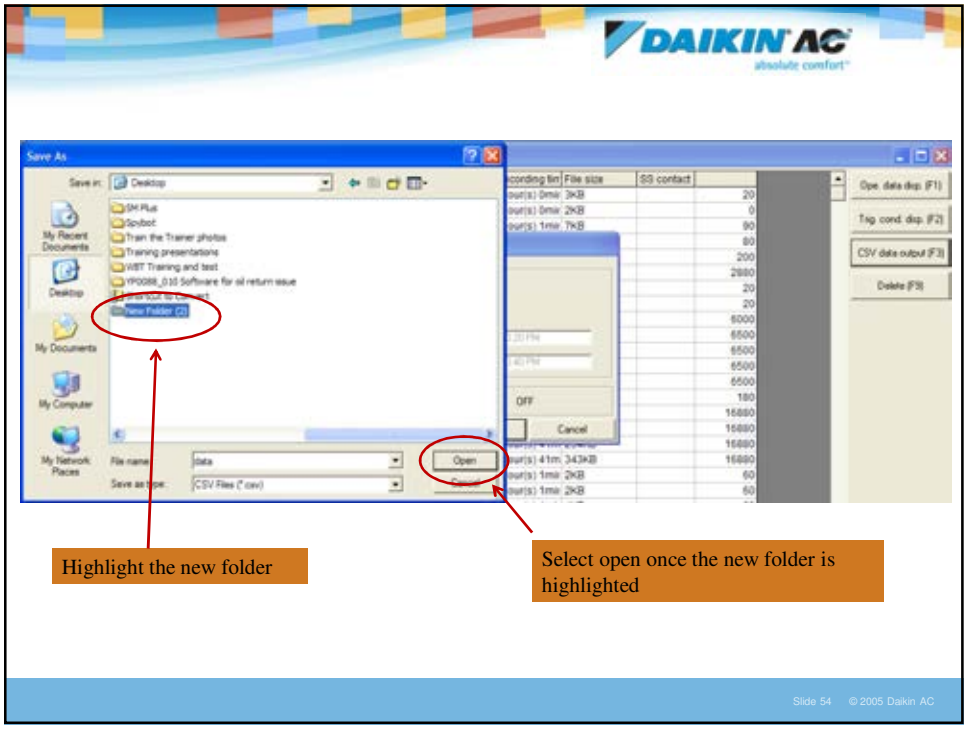
Highlight the new folder
Select open once the new folder is highlighted
Slide 54
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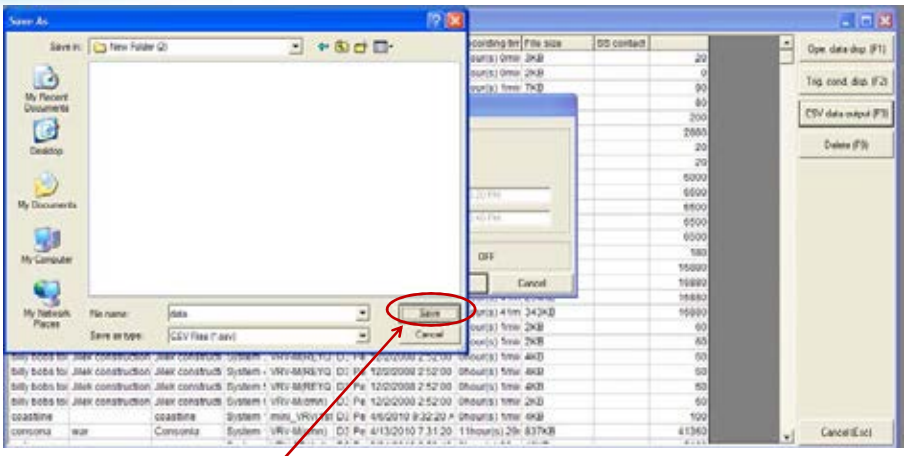
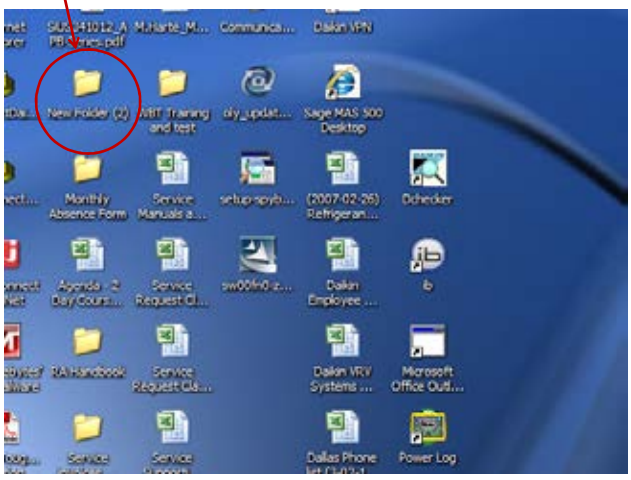
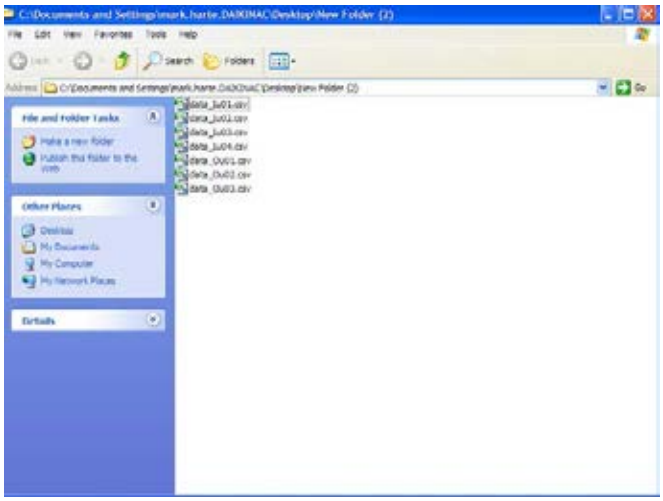


Then go to your desktop and open the new folder you just put on there.



Each piece of equipment will have an excel spreadsheet



Thank you

Service Checker Data Analysis

DAIKIN AC
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Dr. Daikin
Diagnosis Tool

Fault Code Identification

Three ways to help with ERROR CODES:

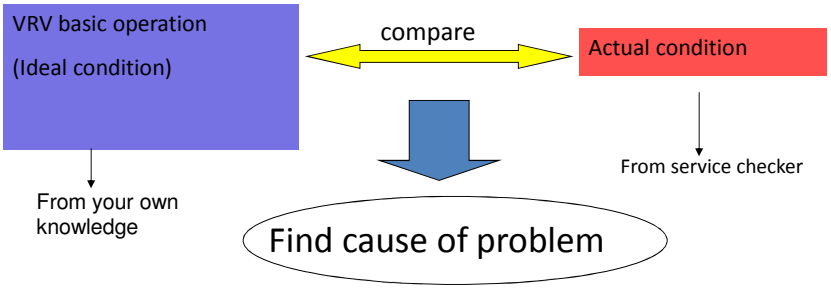
WEB: *www.drdaikin.com*

MOBILE WEB: *http://mobile.drdaikin.com*

SMS TEXT: **Error** plus (**code**)
- send to 32075 -
Example: Error U4

How to analyze data

Service checker is an information gathering device. It can gather all sensor and operating conditions of the system all at once. However the service checker can not troubleshoot by itself. You have to compare service checker data and system normal operating conditions, then you can find the cause of the problem. Therefore you need to learn the VRV basic control system before you use service checker.



How to analyze data

As you know VRV is controlled by the sensors. So you have to check each sensor's output.

Outside

High pressure (TC), Low pressure (TE), Discharge temp, Suction temp, Target HP (Tcs), Target LP (Tes), STD compressor on/off, and Inverter Frequency.

Inside

Thermo on/off (satisfied or calling), Liquid sensor temp, Gas sensor temp, Electronic expansion valve pulse value, Return air sensor temp and Remote control set temp

The above values are basic information to control VRV system.

(If there is a fault code present in system more data options may be needed.)

How to analyze data

Case 1, system has error code.

If you have a communication error (U4, UE etc)…Service checker can not help you diagnose the problem.

If you have sensor error(C4, JC, J3 etc)… Check the sensor readings. You will see a strange number on the affected sensor. Then you will have to check the sensor by using the actual check method. If the reading is correct then you will have to change main PCB.

If you have a temp. and/or pressure error…Check the pressure and/or temp. at affected sensor. If there are big differences between actual readings and service checker data, check the resistance value of the sensor which is giving the different readings from the service checker data. If there are no big differences between actual readings and service checker data compare actual condition to ideal condition.

You will need basic VRV control knowledge!! (refer to case2 on next page)

How to analyze data

Case 2, System does not have an error code.

Poor cooling or heating

Check basic data and compare ideal data.

Does system try to reach target temperature or pressure?

You can identify it from INV frequency and inside and outside EEV operation etc.

Is there are enough refrigerant? What is your Superheat inside in cool mode?

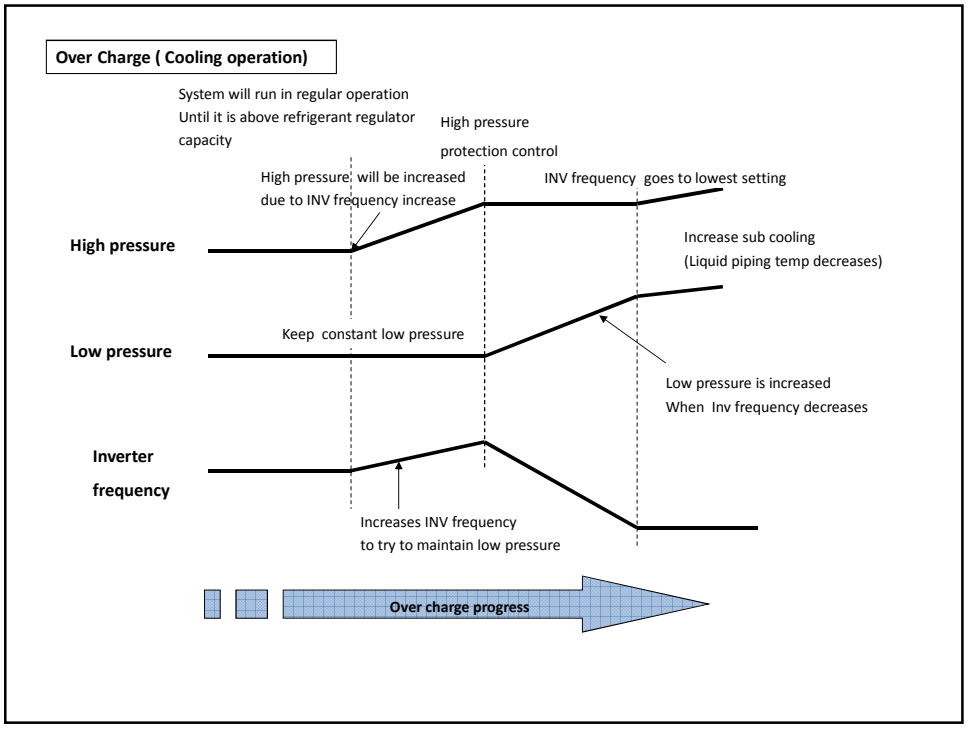
ex: You can notice it from inside data when system is in cooling operation.

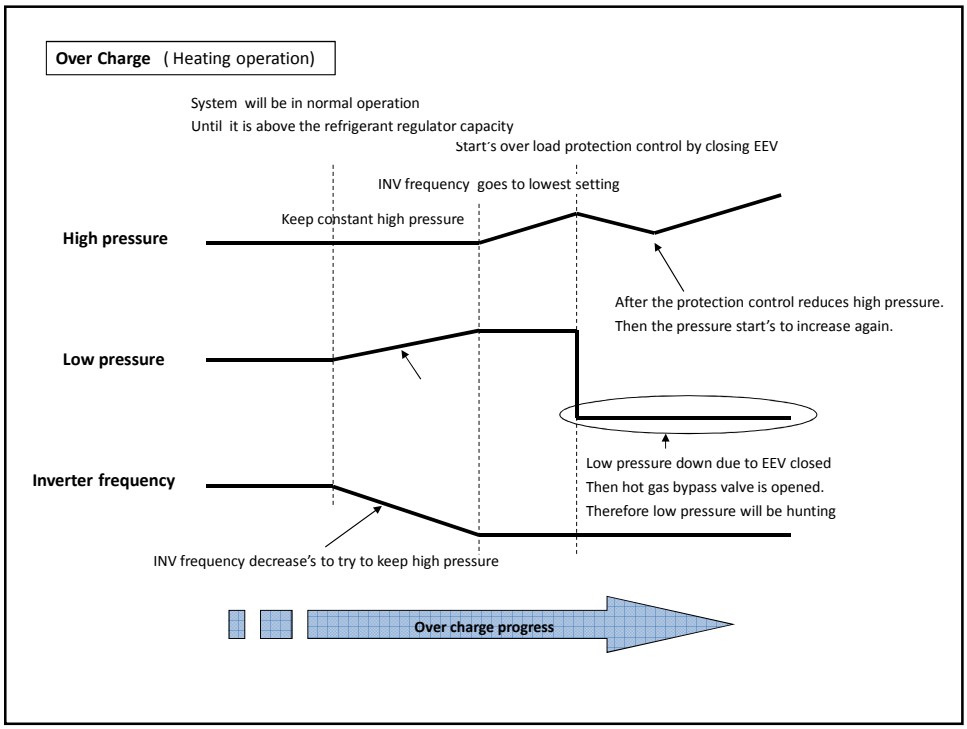
Does system determine some protection control?

ex: "O-3-H.P. stepping down cntl." ON or OFF. If It is ON, system initiates protection control.

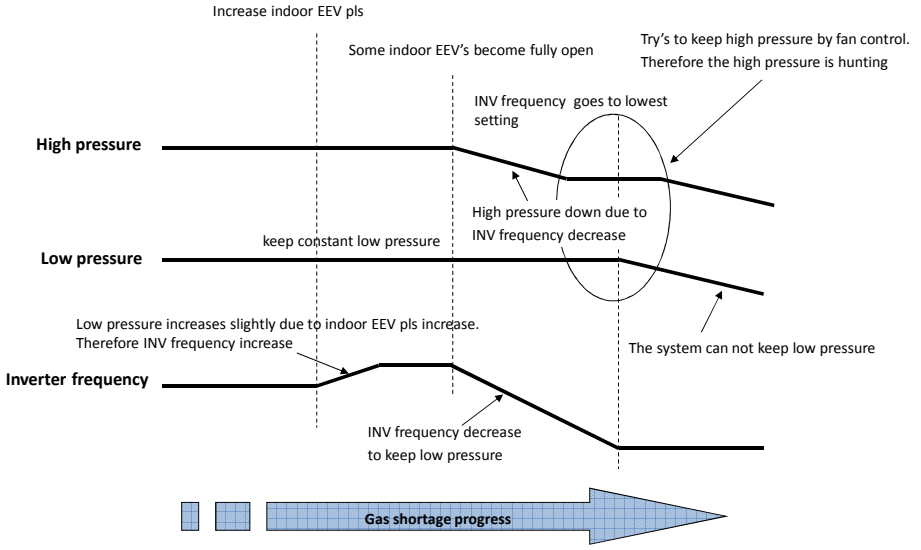
EEV and/or SV work properly?

The service checker shows you data transmitted from outdoor PCB to the EEV's and the SV's. Therefore you can not obtain the actual EEV and SV positions. You will have to look at the service checker data to diagnose their operation.

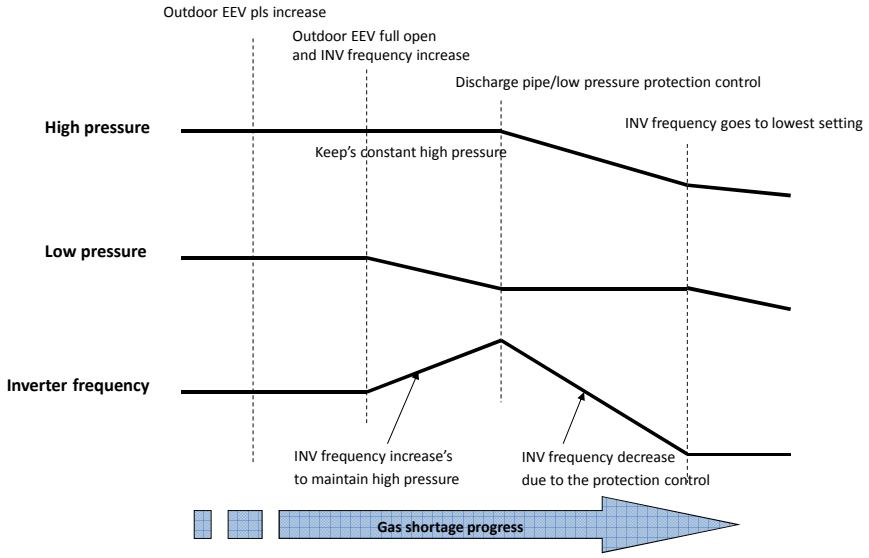

Over Charge (Cooling operation)
System will run in regular operation
Until it is above refrigerant regulator capacity
High pressure protection control
High pressure will be increased due to INV frequency increase
INV frequency goes to lowest setting
High pressure
Increase sub cooling
(Liquid piping temp decreases)
Keep constant low pressure
Low pressure
Low pressure is increased
When Inv frequency decreases
Inverter frequency
Increases INV frequency
to try to maintain low pressure
Over charge progress


Over Charge (Heating operation)
System will be in normal operation
Until it is above the refrigerant regulator capacity
Start´s over load protection control by closing EEV
INV frequency goes to lowest setting
Keep constant high pressure
High pressure
After the protection control reduces high pressure.
Then the pressure start's to increase again.
Low pressure
Low pressure down due to EEV closed
Then hot gas bypass valve is opened.
Therefore low pressure will be hunting
Inverter frequency
INV frequency decrease's to try to keep high pressure
Over charge progress

Gas shortage (Cooling operation)



Gas shortage (Heating operation)



Points of the refrigerant system diagnose (Cooling mode)

Does the low pressure try to reach the target pressure?

Is the indoor liquid thermistor detecting temp 38F to 48F?

Is the indoor gas thermistor detecting superheat between 5F and 17F?

Is the EEV pls approximately 500 to 1000?

Points of the refrigerant system diagnose (Heating mode)

Does the high pressure try to reach the target pressure?

Is the indoor liquid pipe thermistor detecting temp above 97F?

Indoor EEV pls should be about 500 to 1000.

Points of the compressor diagnose

When the compressor is running

The oil temp should be equal or above evaporate temp plus 20F.

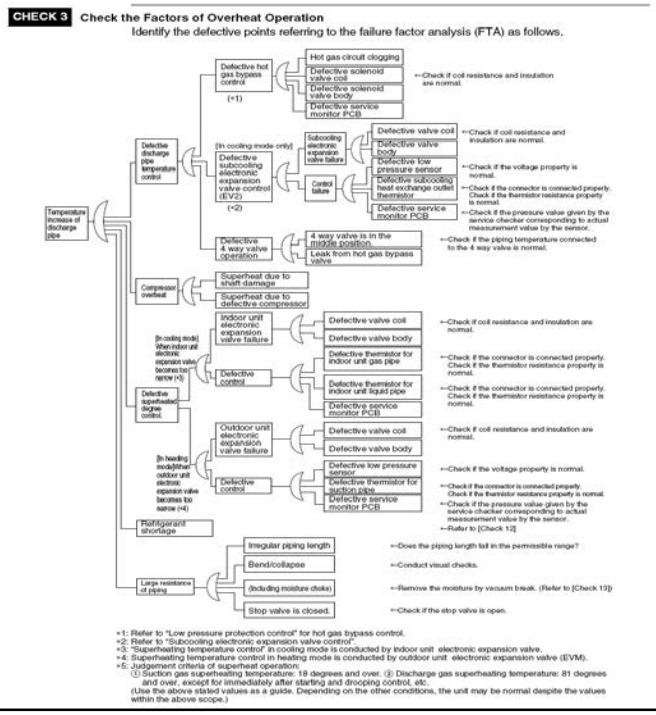
Discharge super heat (discharge pipe temp — condensor temp) should be above or equal to 30F.

Suction super heat (suction pipe temp — evaporater temp) should be above or equal to 9F.

The oil temp is less than 176F. (If the temp is above 176F, the oil loses viscosity)

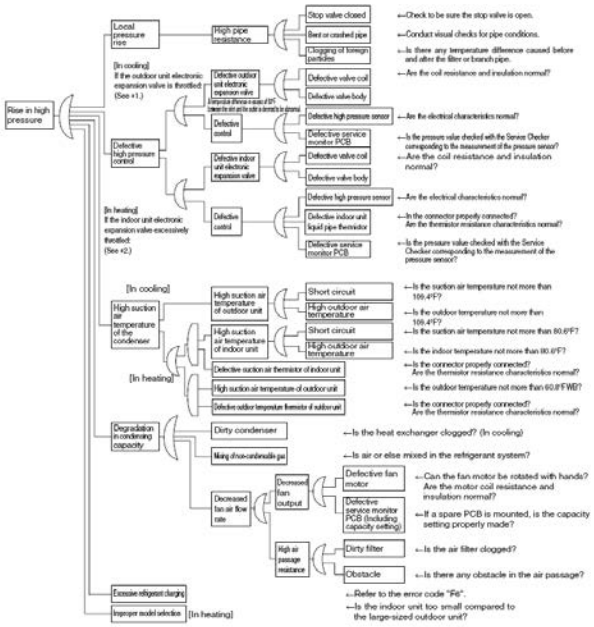
When the compressor is stopped

The oil temp should be above ambient temp plus 30F and less than 176F.



CHECK 5 Check for causes of rise in high pressure

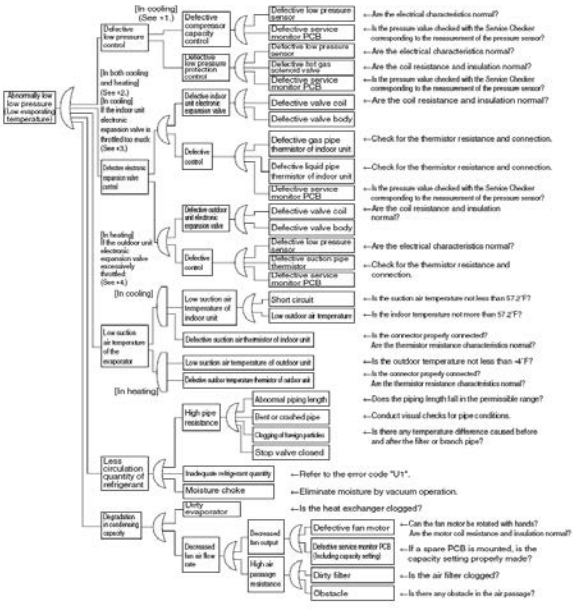
Referring to the Fault Tree Analysis (FTA) shown below, probe the defective points.



*1: In cooling, it is normal if the outdoor unit electronic expansion valve (EVM) is fully open.
*2: In heating, the indoor unit electronic expansion valve is used for "subcooled degree control".

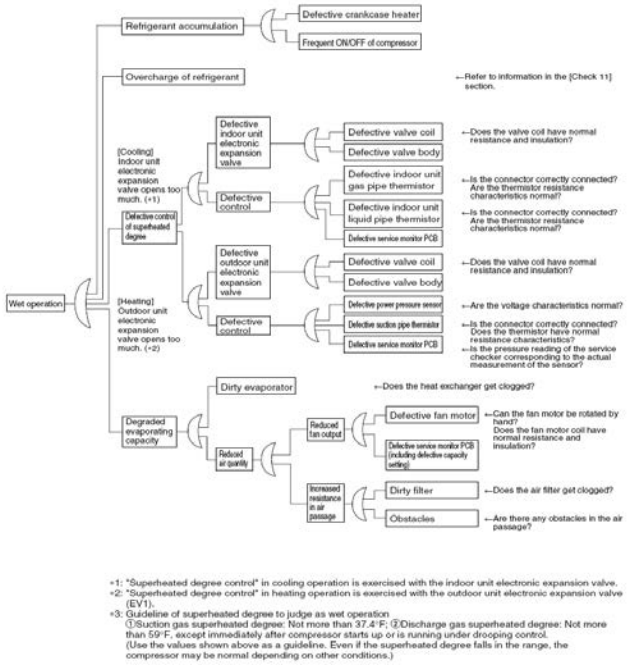
CHECK 6 Check for causes of drop in low pressure

Referring to the Fault Tree Analysis (FTA) shown below, probe the defective points.



*1: The "low pressure protection control" includes low pressure protection control and hot gas bypass control.
*2: In cooling, the indoor unit electronic expansion valve is used for "superheated degree control".
*3: In heating, the outdoor unit electronic expansion valve (EVM) is used for "superheated degree control of outdoor unit heat exchanger".

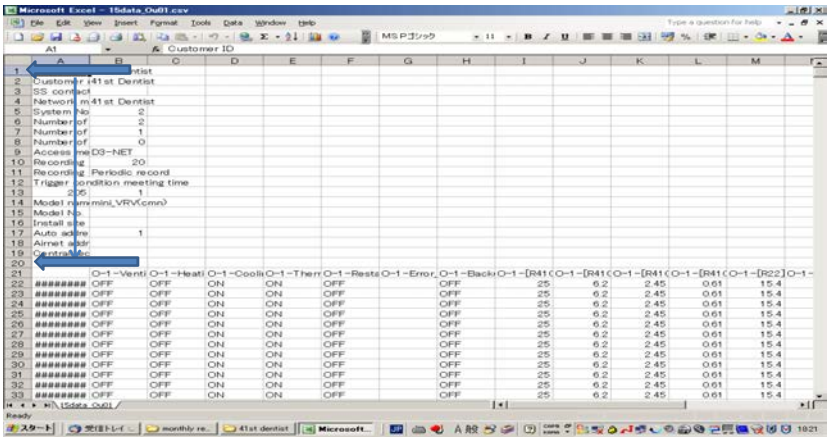
CHECK 10 Check for causes of wet operation.
Referring to the Fault Tree Analysis (FTA) shown below, identify defective points.



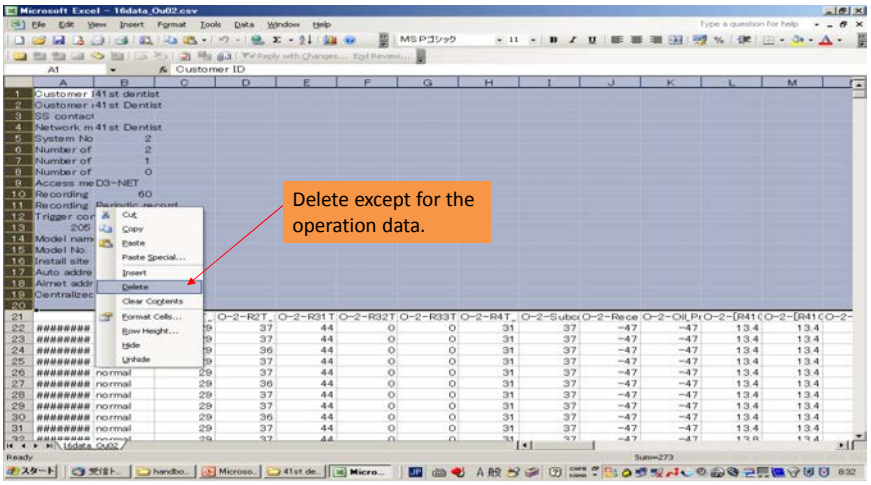
*1: "Superheated degree control" in cooling operation is exercised with the indoor unit electronic expansion valve.
*2: "Superheated degree control" in heating operation is exercised with the outdoor unit electronic expansion valve (EV1).
*3: Guideline of superheated degree to judge as wet operation
①Suction gas superheated degree: Not more than 37.4°F, ②Discharge gas superheated degree: Not more than 59°F, except immediately after compressor starts up or is running under drooping control.
(Use the values shown above as a guideline. Even if the superheated degree falls in the range, the compressor may be normal depending on other conditions.)

How to analyze data

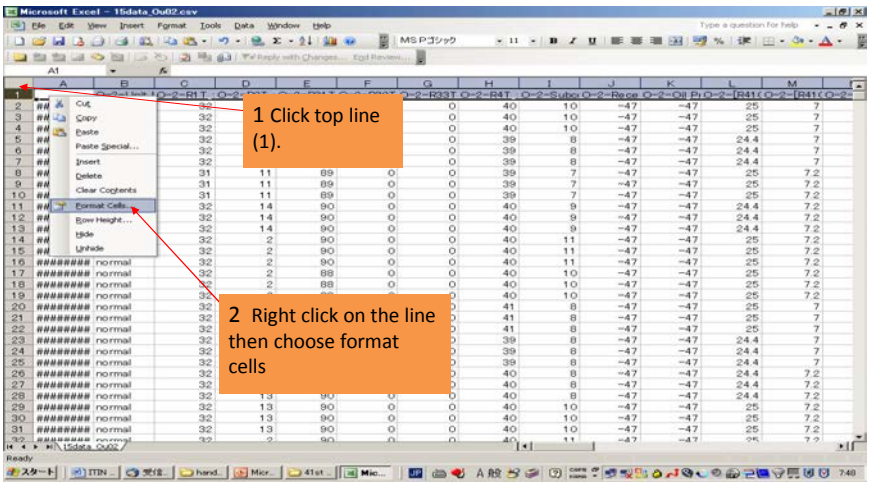
Open the CSV data



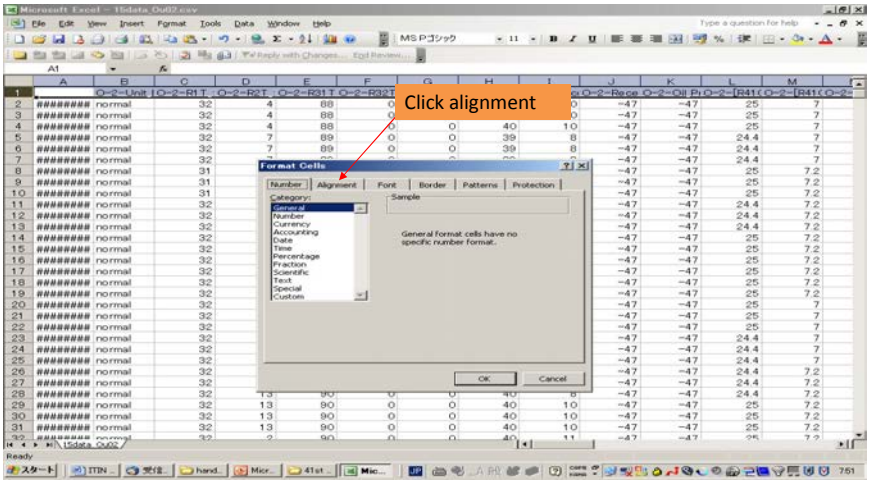
How to analyze data



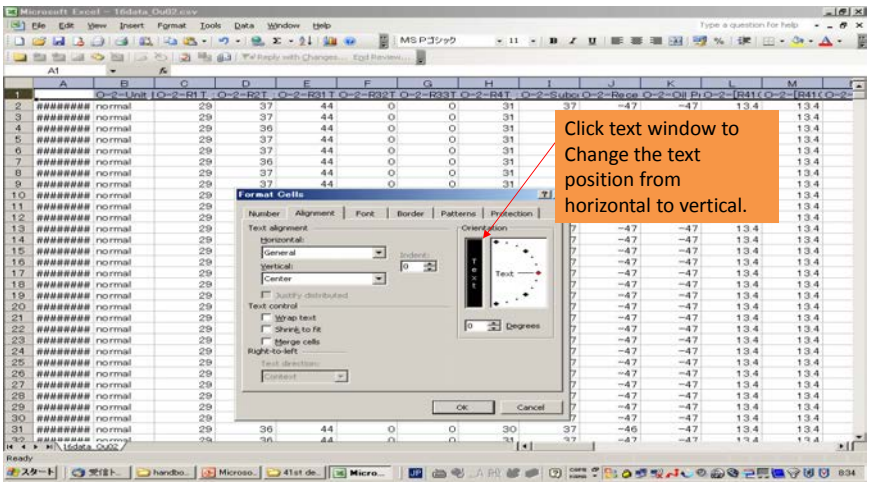
How to analyze data



How to analyze data

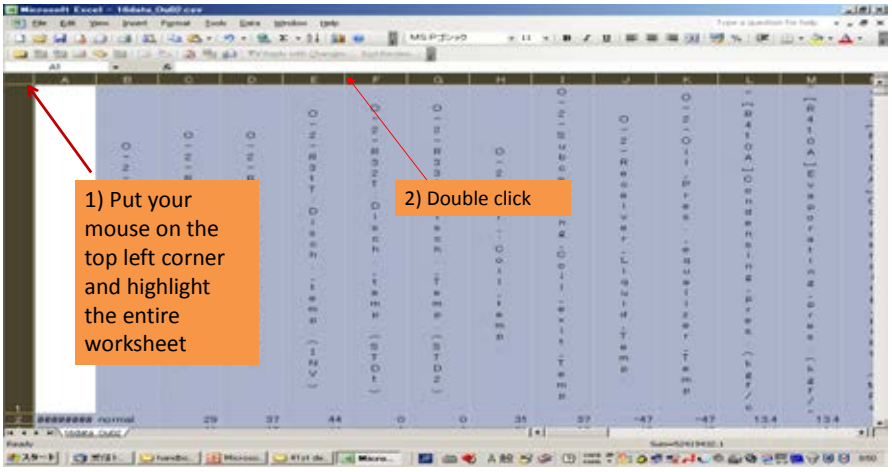


How to analyze data

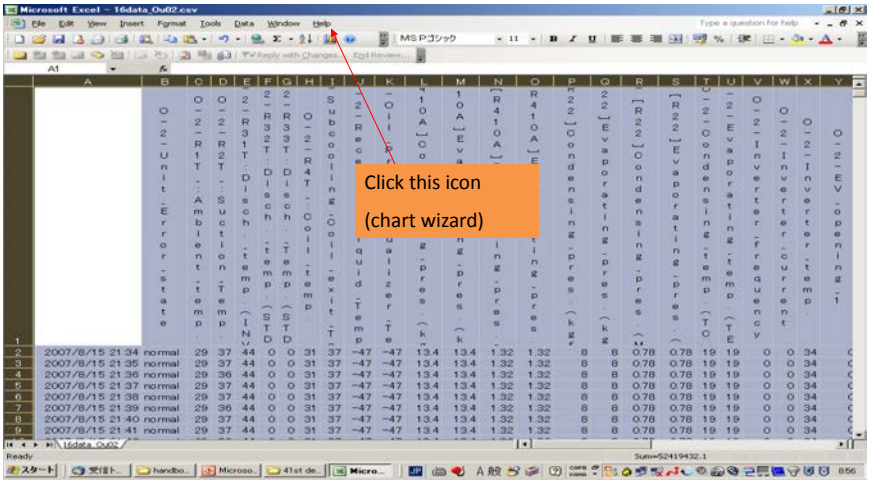


How to analyze data

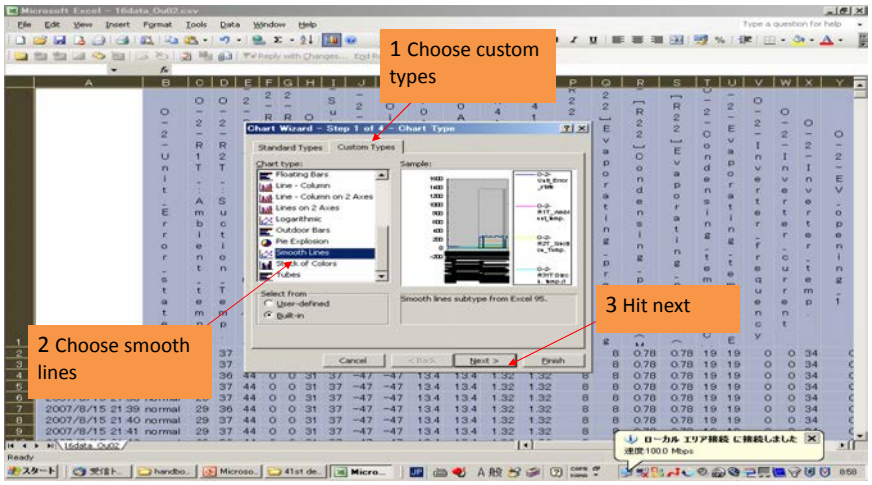
Choose every cell then double click between E and F or somewhere like that.



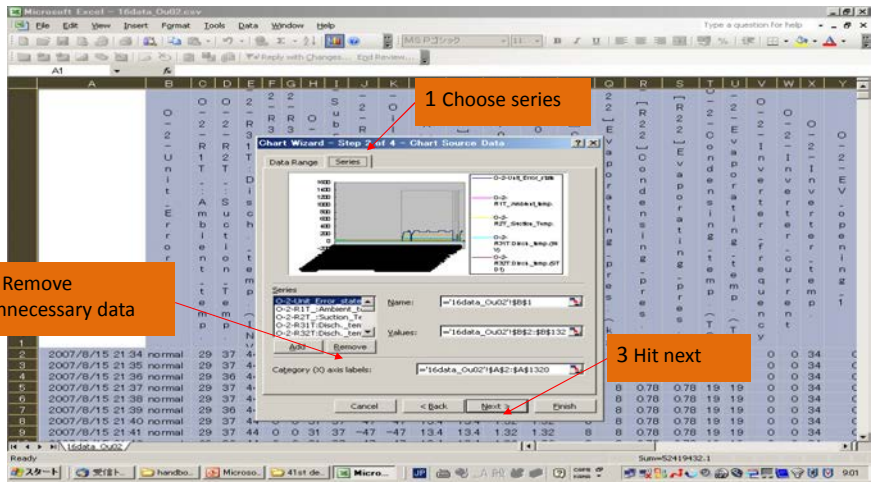
How to analyze data



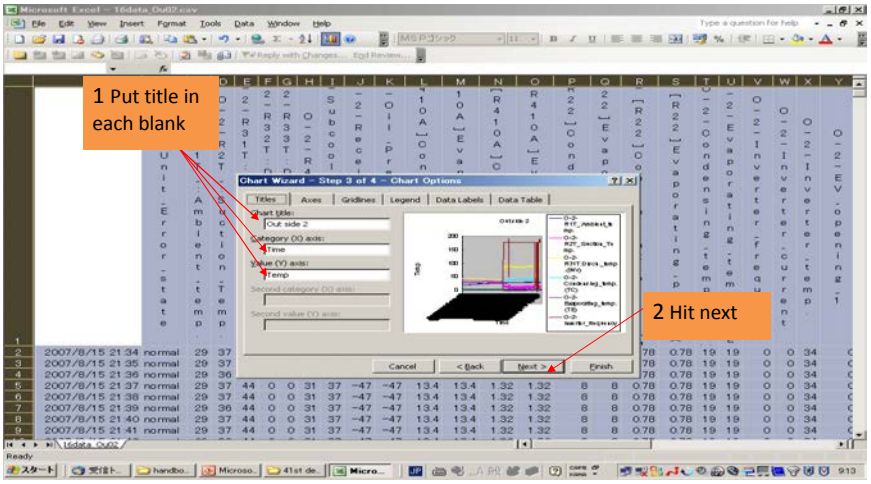
How to analyze data



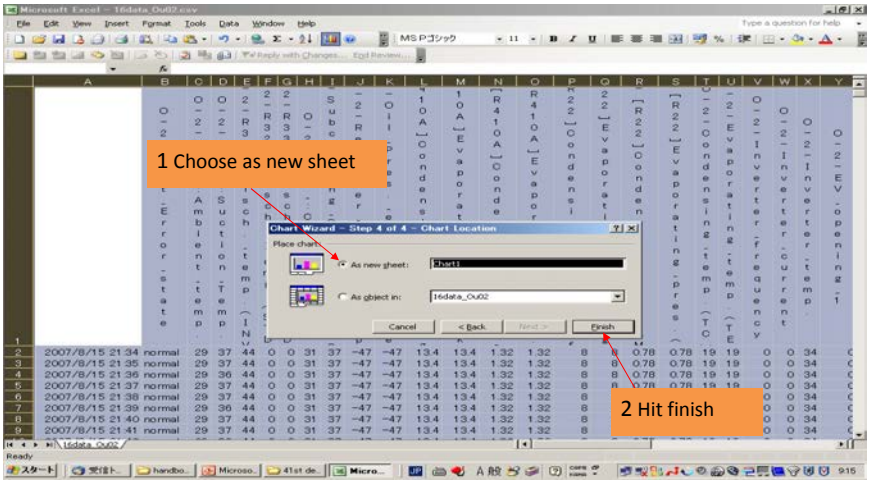
How to analyze data



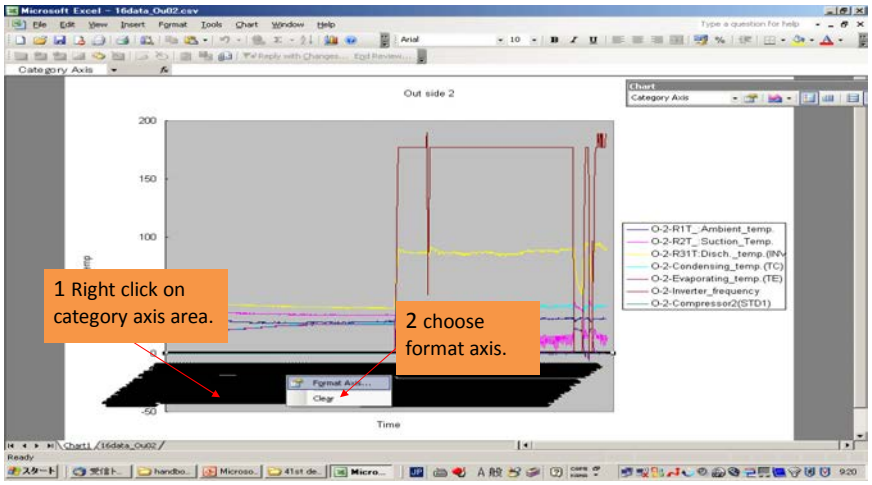
How to analyze data



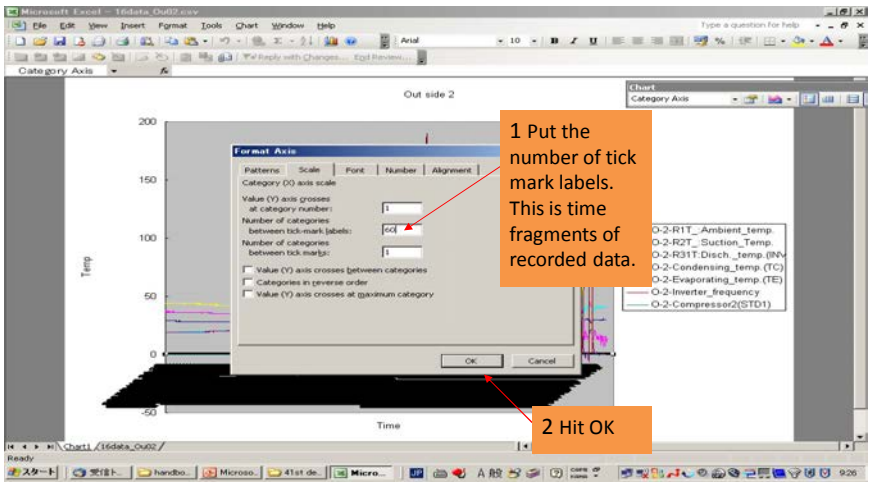
How to analyze data



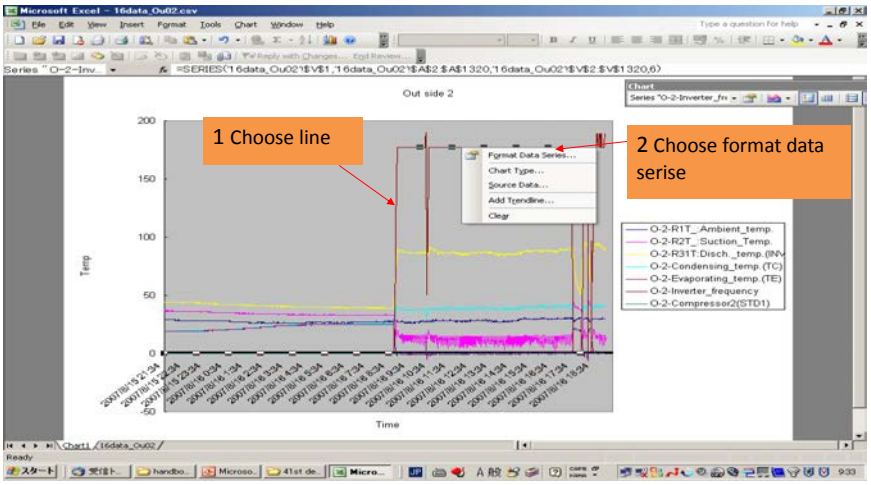
How to analyze data



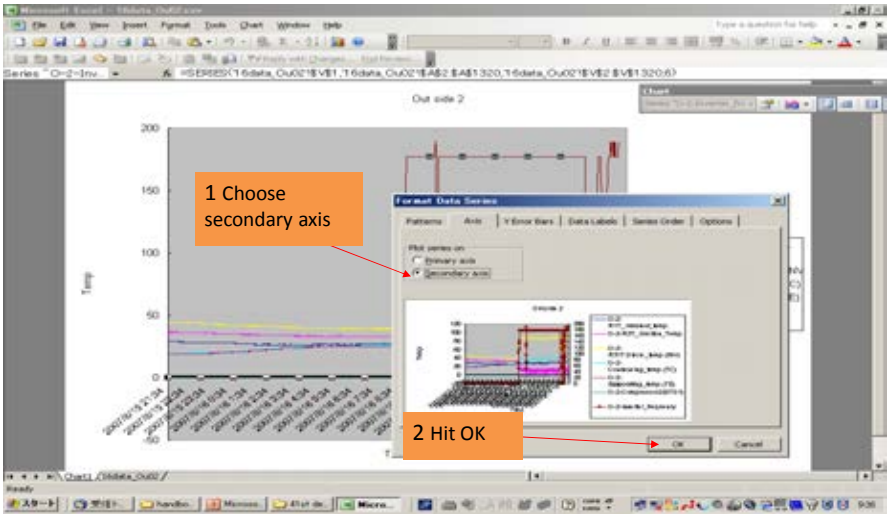
How to analyze data



How to analyze data

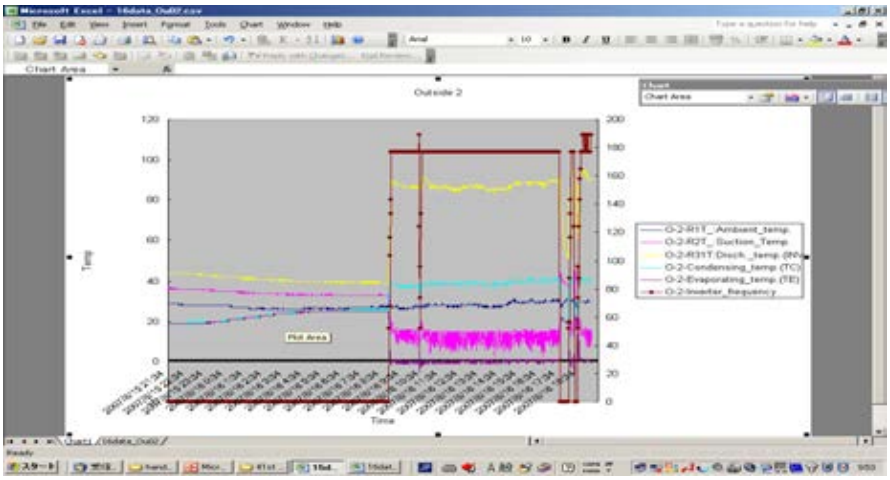


How to analyze data

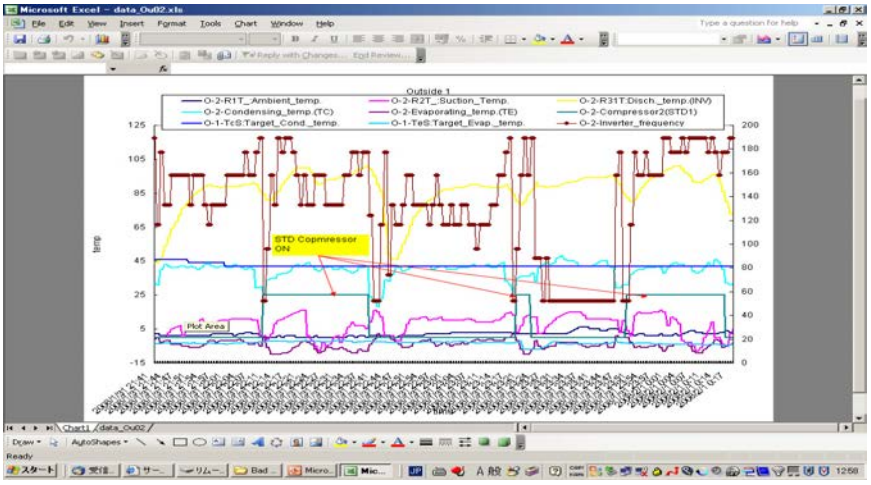


How to analyze data

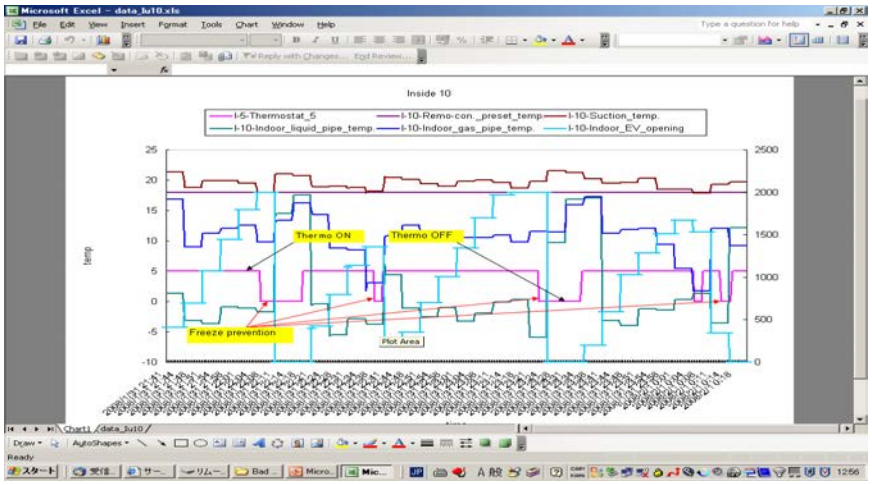
Finished!! However you can adjust more to change format of data. Now try it yourself!



Bad operational data (outside)

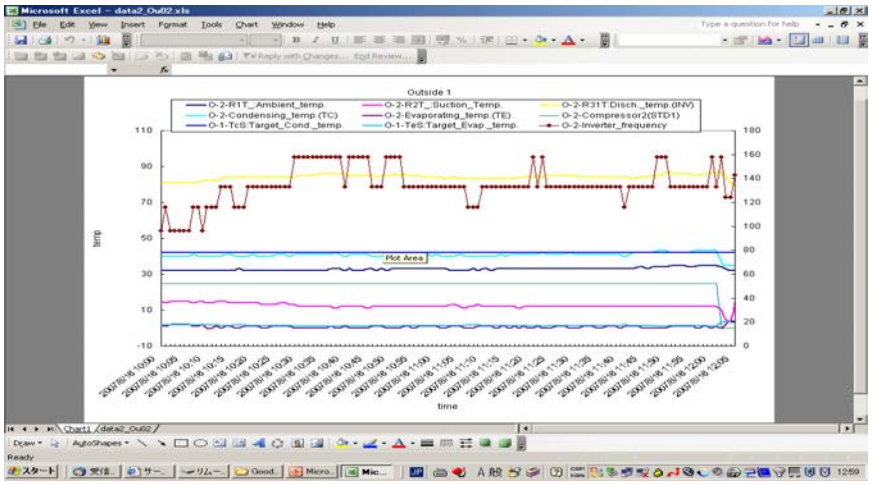


Bad operational data (air handler)



Good operational data (air handler)

Good operational data (outside)



Thank you

Service Checker Analysis

Mark Harte

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Diagnosis Tool

Fault Code Identification

Three ways to help with ERROR CODES:

WEB: *www.drdaikin.com*

MOBILE WEB: *http://mobile.drdaikin.com*

SMS TEXT: **Error** plus (**code**)
- send to 32075 -
Example: Error U4

- To analyze Service Checker Data we must first understand the data that we are looking at.
- There will be 3 different types of Excel Spread Sheets you will see in the data:
- 1) Outdoor unit data
- 2) Indoor unit data
- 3) Target data
- The following presentation will explain each sheet and the data on the sheet.

Outdoor Unit Data

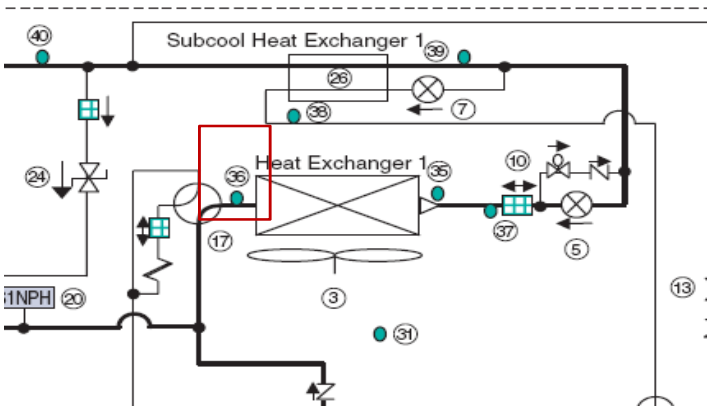
- When we look at the data, some values are more important then others. We will signify these by the following:
- 1= Very important
- 2= Less important
- 3= Least important
- Let's look at the data points. For this example we will use a REYQ96PTJU.

- The data is listed on the spread sheet vertically. We will look at each value going from the left of the spread sheet to the right.
- We will start at Column B and proceed all the way to column BL.
- We will not cover all points as some are not as important as others.

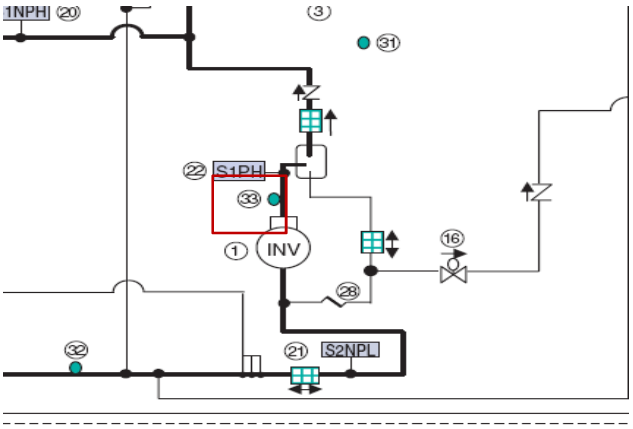
- Column B- Value 1
- Unit Error State
- This column will tell you if the system is in fault and what fault code is present.
- If no fault code present this column should read normal

- Column C- Value 2
- Outdoor Ambient Sensor
- This sensor detects outdoor temperature, corrects discharge pipe temperature, and others
- The signifier for this sensor is R1T
- When Ta is referred to in the service manual, that is this sensor.
- This sensor is located on the right side of the condenser, in a plastic holder mounted on the lower right side of the casing.

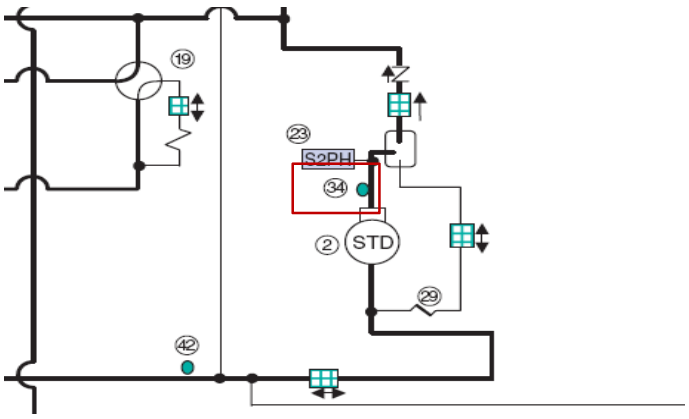
- Column D- Value 1
- Heat Exchanger Gas Temperature
- Used to exercise the constant control of the superheated degree when the outdoor heat exchanger is used as an evaporator.
- The signifier for this sensor is R2T and R11T
- When TG is referred to in the service manual, that is this sensor.



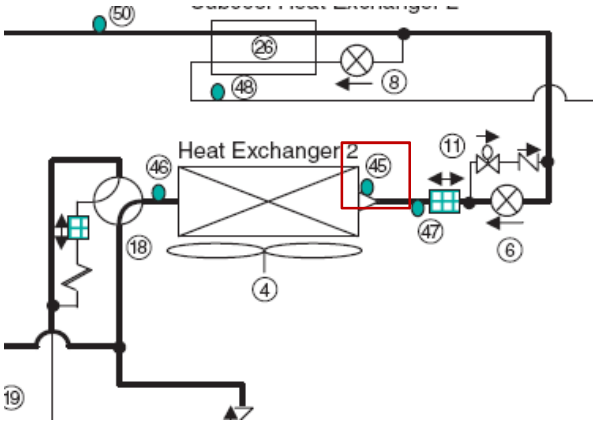
- Column E- Value 1
- Discharge Temperature Inverter compressor
- Used for compressor temperature protection control.
- The signifier for this sensor is R31T
- Referred to in manual as Tdi



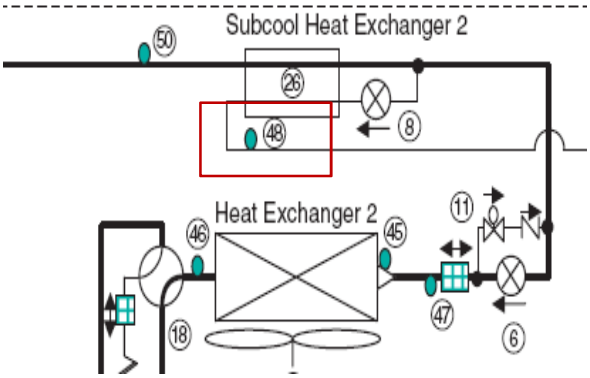
- Column F-Value 2
- Discharge Temperature Standard Compressor 1
- Used for compressor temperature protection control
- The signifier for this sensor is R32T
- Referred to in manual as Tds1



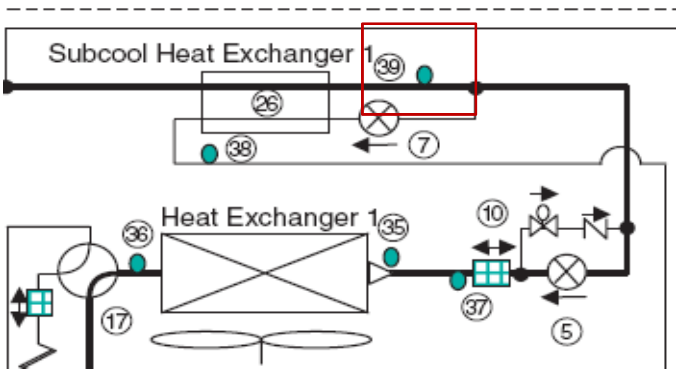
- Column H-Value 2
- Heat Exchanger temperature
- Detects liquid pipe temperature of the outdoor unit heat exchanger. Used to make judgments on defrost.
- The signifier for this sensor is R4T and R12T.
- Referred to in service manual as Tb



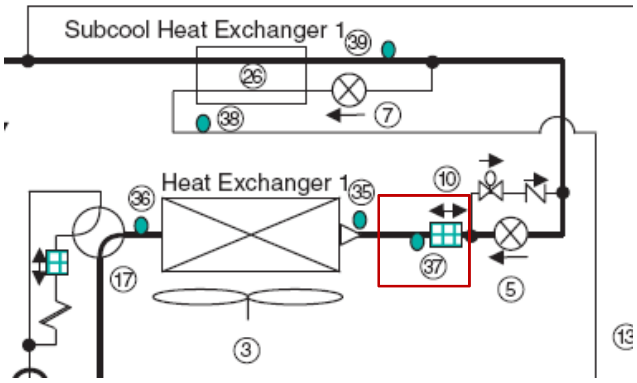
- Column I- Value 2
- Sub-cooling Heat Exchanger Gas Temperature
- Used to exercise the constant control of superheated degree at the outlet of the sub cooled heat exchanger
- The signifier for this sensor is R5T and R13T
- The service manual refers to this as Tsh



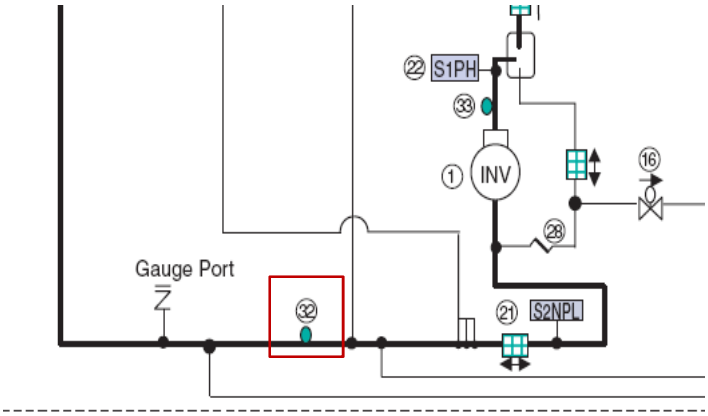
- Column J- Value 2
- Sub-cooling Heat Exchanger Liquid Temperature
- Detects temperature of the liquid pipe between the main expansion valve and sub cooling heat exchanger
- The signifier for this sensor is R6T
- The service manual refers to it as TI



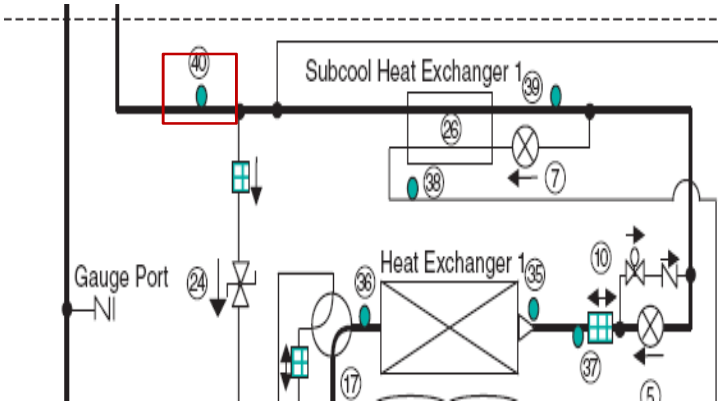
- Column K-Value 2
- Outdoor Heat Exchanger Liquid Temperature
- Detects Temperature between the outdoor unit heat exchanger and main EEV. Used to make judgments on the recover or discharge refrigerant to the refrigerant regulator.
- The signifier for this sensor is R7T and R15T
- The service manual refers to this as Tf



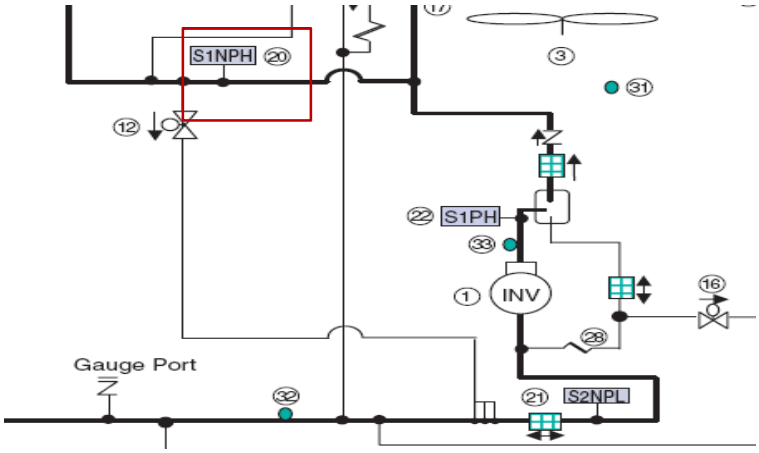
- Column L-Value 1
- Suction Temperature
- Detects Suction pipe temperature
- The signifier for this is R8T and R10T
- The service manual refers to this as TsA



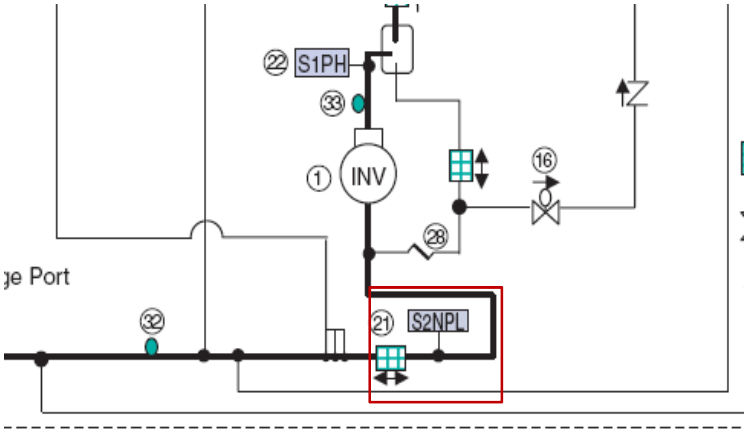
- Column M-Value 2
- Main EEV Liquid Pipe Temperature
- Detects temperature of liquid pipe between the liquid stop valve and the sub cooling heat exchanger
- The signifier for this sensor is R9T and R14T
- The service manual refers to this as Tsc



- Column N-Value 1
- Condensing Pressure
- Detects High Pressure in the system. This is done with the High Pressure Sensor.
- The signifier for the sensor is S1NPH



- Column O-Value 1
- Evaporating Pressure
- Detects the low pressure in the system by using the low pressure sensor
- The signifier for this sensor is S2NPL



- Column R-Value 1
- Condensing Temperature
- This is the pressure converted to saturation temperature by the main printed circuit board by using the high pressure sensor
- In the service manual it is referred to as Tc

- Column S-Value 1
- Evaporating Temperature
- The pressure is converted to saturation temperature by the main printed circuit board by using the low pressure sensor
- In the service manual this is referred to as Te

- Column T-Value 1
- Inverter Revolution Speed
- This will determine the rotations per second that the inverter compressor is running at.
- To convert to Htz, multiply by 2

Compressor PI Control

Carries out the compressor capacity PI control to maintain Te at constant during cooling operation and Tc at constant during heating operation to ensure stable unit performance.

[Cooling operation]

Controls compressor capacity to adjust Te to achieve target value (TeS).

Te set value (Make this setting while in Setting mode 2.)

Te setting (F)

L	M (Normal) (factory setting)	H				
37	43	45	46	48	50	52

Te : Low pressure equivalent saturation temperature (°F)

TeS : Target Te value (Varies depending on Te setting, operating frequency, etc.)

*On multi-outdoor-unit systems, this control is made according to values of the first-priority unit, which is detected with the pressure sensor.

[Heating operation]

Controls compressor capacity to adjust Tc to achieve target value (TcS).

Te set value (Make this setting while in Setting mode 2.)

Tc setting (F)

L	M (Normal) (factory setting)	H
109	114	118

Tc : High pressure equivalent saturation temperature (°F)

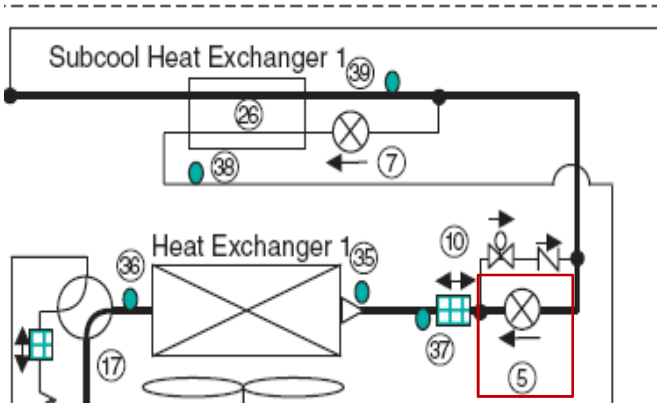
TcS : Target Tc value (Varies depending on Tc setting, operating frequency, etc.)

*On multi-outdoor-unit systems, this control is made according to values of the first-priority unit, which is detected with the pressure sensor.

- Column U-Value 2
- Inverter current
- This will show the current draw from the inverter compressor. This is a reading from the inverter board to the compressor

- Column V-Value 2
- Inverter Temperature
- This will read the temperature of the inverter board heat sink

- Column W-Value 2
- Electronic Expansion Valve(Main1(Main2))
- When in Heating mode PI control is applied to keep the outlet superheated degree of the outdoor heat exchanger constant
- In cooling mode the valve will be wide open
- The signifier for this valve is Y1E and Y3E



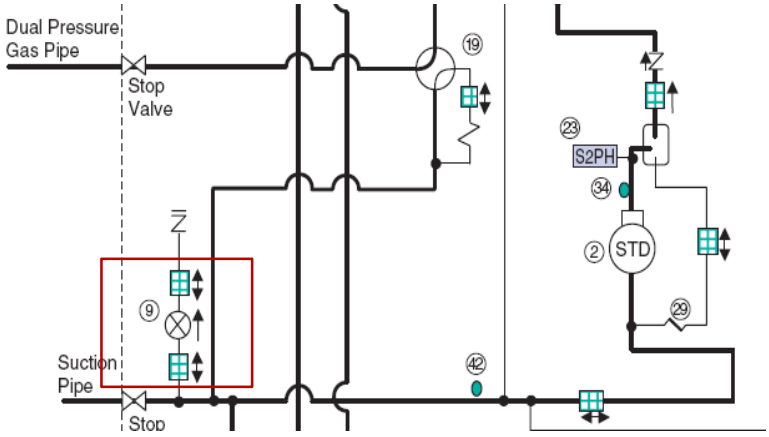
Main electronic expansion valve EVM control

When the outdoor unit heat exchanging is performed via the evaporator (20SA is set to ON), this function is used to exert PI control on the electronic expansion valve (Y1E or Y3E) so that the evaporator outlet superheated degree (SH) will become constant.

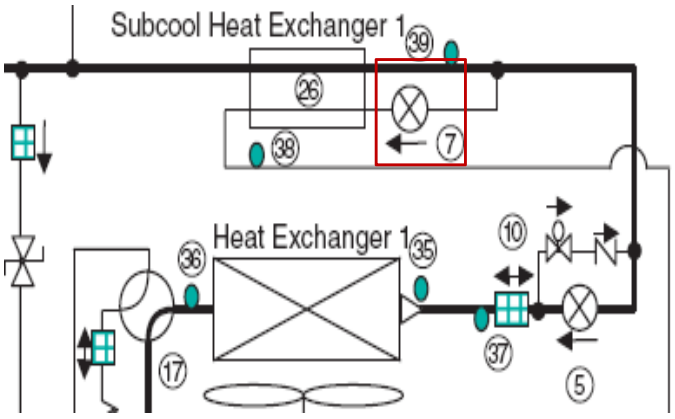
SH = Tg - Te

SH: Evaporator outlet superheated degree (°F)
Tg : Suction pipe temperature (°F) detected by the heat exchanger gas pipe thermistor R2T.
Te : Low pressure equivalent saturated temperature (°F)

- Column X-Value 3
- EEV auto charge opening
- Used to open and close charging port
- The signifier for this valve is Y4E
- Will open under normal operation
- The service manual refers to this as EVJ



- Column Y-Value 2
- EEV (subcool 1(subcool 2))
- PI control is applied to keep the outlet superheated degree of the subcooling heat exchanger constant
- The signifier for this valve is Y2E and Y5E



Subcooling electronic expansion valve EVT control

In order to make the maximum use of the subcool heat exchanger, this function is used to exert PI control on the electronic expansion valve (Y2E, Y3E) so that the evaporator-side gas pipe superheated degree (SH) will become constant.

SH = Tsh - Te

SH: Evaporator outlet superheated degree (°F)
Tsh: Suction pipe temperature (°F) detected by the subcool heat exchanger outlet thermistor R5T
Te: Low pressure equivalent saturated temperature (°F)

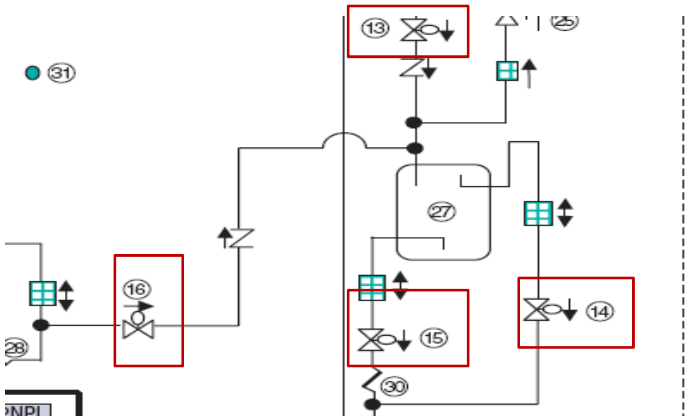
- Column Z-Value 2
- Standard Compressor current
- This will give the current draw of the standard compressor if it is running. When not running a 1 will be displayed.

- Column AA-Value 1
- Inverter Fan Current
- This will actually be the total condensing unit current draw.

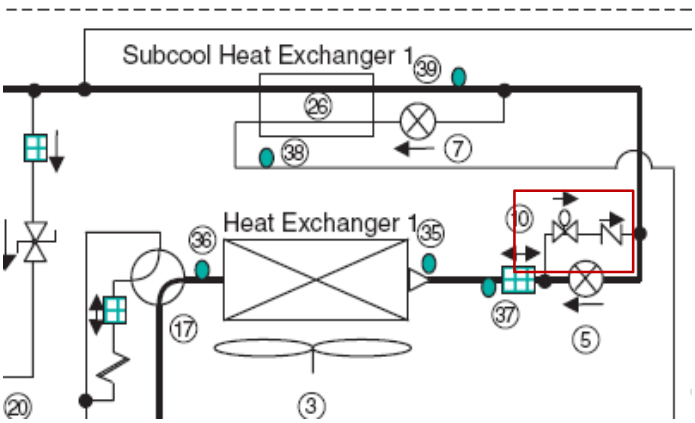
- Columns AC, AD-Value 2
- These 2 columns will tell if the inverter and standard compressors are on or off by showing on/off.

- Column AF-Value 1
- Fan Step
- This column will show what step the outdoor fan motor is at. The steps are 0 thru 8 in cooling and steps 7 and 8 in heat mode.

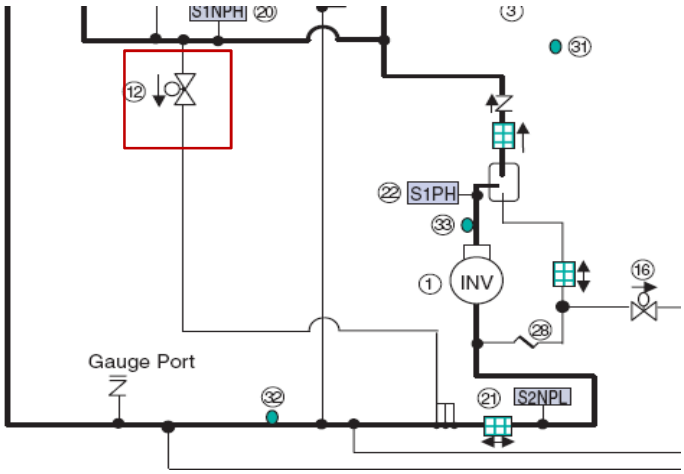
- Columns AG, AH, AI, and AJ-Value 3
- These columns refer to the valves that release and recover refrigerant to the refrigerant regulator
- The signifier for these valves are Y3S, Y1S, Y7S, and Y6S



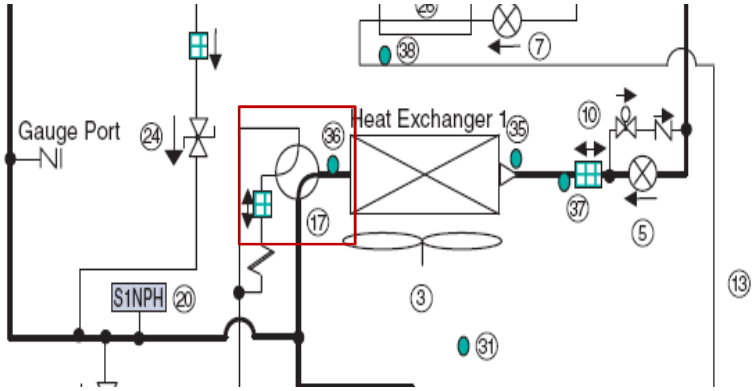
- Column AL-Value 3
- Main EEV Bypass 1 and 2
- Opens in cooling operation
- The signifier for this valve is Y5S and Y10S



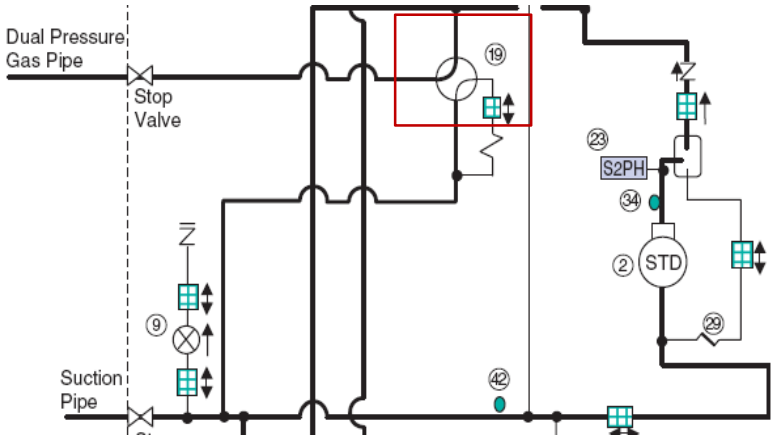
- Column AM-Value 2
- Hot Gas Bypass
- Used to prevent the low pressure from reducing
- The signifier for this valve is Y4S.
- The service manual will refer to this valve as SVP



- Column AN-Value 1
- Heat Exchanger 4-Way Valve
- Used to switch the outdoor heat exchanger to evaporator or condenser
- The signifier for this valve is Y2S and Y9S
- The service manual refers to this valve as 20SA
- This valve is energized in Heat mode



- Column AO-Value 1
- Dual Pressure gas pipe 4-Way valve
- Used to switch dual pressure gas pipe to high pressure or low pressure
- The signifier for this valve is Y8S
- The service manual refers to this valve as 20SB
- This valve is energized in cool mode



- Columns AP and AQ-Value 2
- Crankcase Heater ON/OFF for the Inverter compressor and standard compressor.
- This column will display if the heater is on or off for the compressor's

- Columns AU and AV-Value 2
- Defrost and Oil Return ON/OFF
- These columns will tell if Defrost/Oil return is on or off

- Columns AW and AX-Value 3
- Soft start/Restart standby
- These columns will tell if the system is in soft start or standby for restart

- Columns AY, AZ, BA, and BB-Value 1
- These columns are for any retires the system may be trying because of an issue with the system
- The retries are for High pressure, Low pressure, Discharge pipe temperature, and Inverter Current.
- System will retry for a certain amount of times, depending on the problem, and then lock out system on a fault

- Columns BC, BD, BE, BF, BG, BH, BI, BJ, BK, and BL-Value1
- These columns are for any stepping down of the system due to abnormal operation
- This would include High pressure, low pressure, Inverter discharge pipe temp., Inverter over current, inverter fin temp., Standard discharge temp., standard over current
- They will either say on or off

Indoor units

- We will now look at the indoor unit values from the service checker.
- There will be a few less sensors on the indoor unit compared to the outdoor unit
- They will also have a importance value assigned
- Again we will assign the data a column letter from the spreadsheet starting from the first column and going right

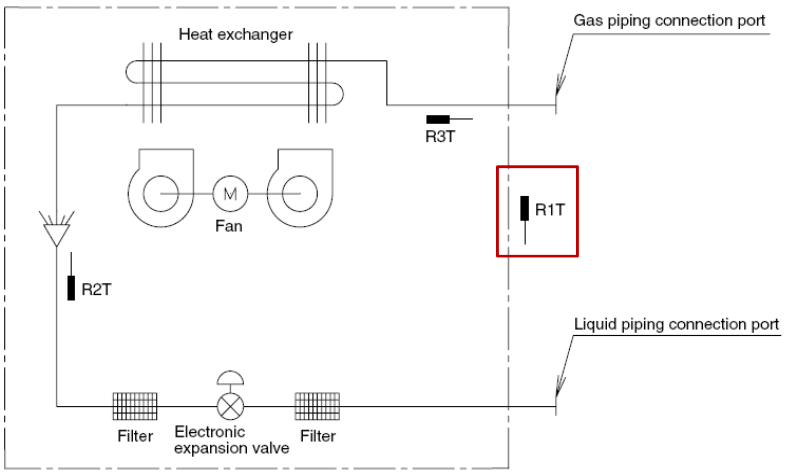
- Column A-Value 1
- Operation/Stop
- This column will tell if the remote control is on or off.
- This does not mean the fan coil is calling, just that it is on

- Column C-Value 1
- Thermostat
- This column will tell if the remote control is calling or is satisfied

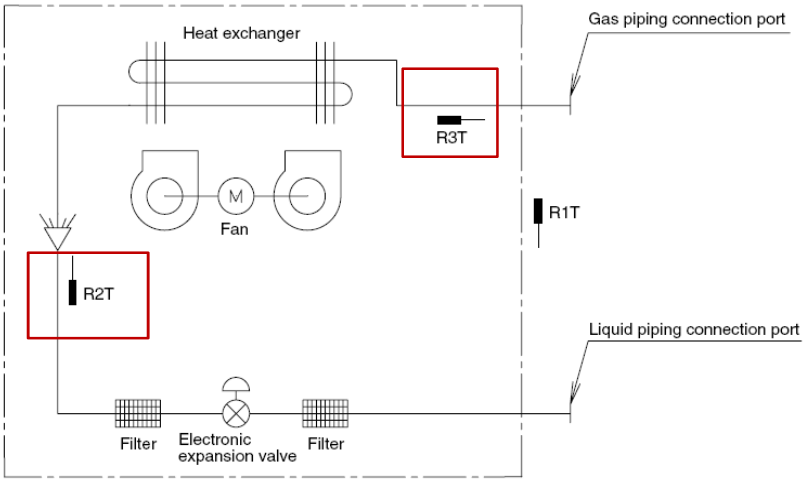
- Column E=Value 2
- Error code
- This column will tell if there is an error code in the fan coil.

- Column F-Value 1
- Remote control preset temperature
- This column will tell the set temperature of the remote control, or if no remotes the set temperature of the centralized controller

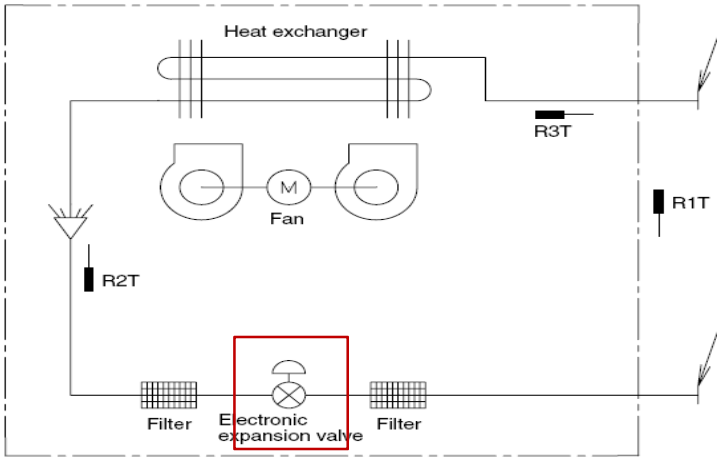
- Column G-Value 1
- Suction Temperature
- This will show the temperature of the return air sensor or the remote sensor if installed.
- When the return air sensor is disabled, the service checker still shows the return air temperature in the data and not the remote controller value
- The signifier for this sensor is R1T.
- The service manual refers to this as Tr



- Column H and I-Value 1
- Indoor liquid pipe temperature/Indoor gas pipe temperature
- This will tell you the temperature of the liquid line and the gas line of the indoor coil
- The signifier for the liquid sensor is R2T and the gas line is R3T
- The service manual refers to the Gas line as Tg, and the Liquid line as T1



- Column J-Value 1
- Indoor EEV opening
- This will tell you what signal is being sent to the indoor eev for it's pulse value
- This is the value the eev should be at, but there is no signal back to the pcb from the eev for verifying position



Superheat Control

SH = Tg - T1

SH: Evaporator outlet superheated degree (°F)
Tg: Indoor unit gas pipe temperature (R3T)
T1: Indoor unit liquid pipe temperature (R2T)

SHS (Target SH value) SHS: Target superheated degree

- Normally **9** F.
- As ΔT (Remote controller set temp. - return air temp.) becomes larger, SHS becomes lower.
- As ΔT (Remote controller set temp. - return air temp.) becomes smaller, SHS becomes higher.

Subcooling Control

• Subcooled degree control in heating operation

This function is used to adjust the opening of the electronic expansion valve so that the high-pressure equivalent saturated temperature (Tc), which is converted from the detected pressure of the high pressure sensor in the outdoor unit, and the subcooled degree (SC), which is calculated from the detected temperature (T1) of the liquid temperature thermistor (R2T) in the indoor unit, will come close to the target subcooled degree (SCS).
At that time, corrections to the subcooled degree are made according to differences (ΔT) between set temperature and suction air thermistor temperatures.

SC = Tc - T1	SC: Condenser outlet subcooled degree (°F) Tc: High pressure equivalent saturated temperature detected by the high pressure sensor (S1NPH) T1: Indoor unit liquid pipe temperature (R2T)
SCS (Target SC value)	SCS: Target subcooled degree

- Normally **9** °F.
- As ΔT (Remote controller set temp. - return temp.) becomes larger, SCS becomes lower.
- As ΔT (Remote controller set temp. - return temp.) becomes lower, SCS becomes larger.

Target Values

- We will now look at the target values the system has determined
- These target values are set up during test operation
- These values will change during normal operation
- Again we will use the letters of the columns the data is in to identify them

- Columns B, C, D and E-Value1
- These columns will tell what mode the system is operating in
- These modes include ventilation(fan), cooling, heating, and parallel operation
- Only a heat recovery system should display parallel operation

- Columns J and K-Value 1
- Target condensing and evaporating pressures
- These columns will tell us the target values the system is trying to achieve
- We can then look at the actual pressures and compare

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Commissioning Guide

VRVIII PB Series

Preface

- This handbook is intended for use as an aid to Field Service Technicians with general technical knowledge and training on VRV equipment. If the Field Service Technician does not have any (or limited) technical knowledge and training on VRV or VRF equipment, do not attempt to install, commission or service any Daikin VRV product with this handbook. Instead, the Field Service Technician needs to complete training offered by Daikin AC (Americas), Inc. ("Daikin AC") before attempting any installation, commissioning or service of the VRV product.
- This reference handbook is available for Field Service Technicians as a simplistic reference guide for commissioning. It is not intended to be a substitute for the VRV Installation and Service Manuals or for training offered by Daikin AC.
- We assume the Field Service Technicians using this handbook are fully qualified to work on the VRV equipment.
- This handbook is intended as a demonstrative aid only. It is not intended as a substitute for training offered by Daikin AC. Anyone installing VRV equipment should first review the unit and inspect and evaluate the location where the unit is to be installed. Every installation varies in its individual circumstances and the Field Service Technician will have to use their professional judgment in each installation.
- Should you require further assistance contact our Technical Service Department.
- Every effort has been made to insure that the information and graphics included in this Commissioning Guide is as accurate as possible at the time of publication. DaikinAC Training Department shall not be held liable for any changes in procedures, specifications, or any system component information which are different from what is represented in this Guide.

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Diagnostic Tool

Fault Code Identification

Three ways to help with ERROR CODES:

WEB: *www.drdaikin.com*

MOBILE WEB: *http://mobile.drdaikin.com*

SMS TEXT: **Error** plus (**code**)

- send to 32075 -

Example: Error U4

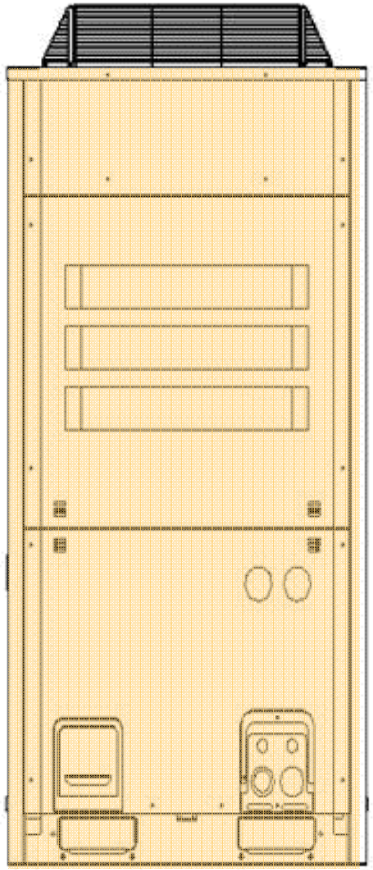
VRVIII System Components

Condensers - Fan Coil Units - Branch Selector Boxes - Local Remote Controllers

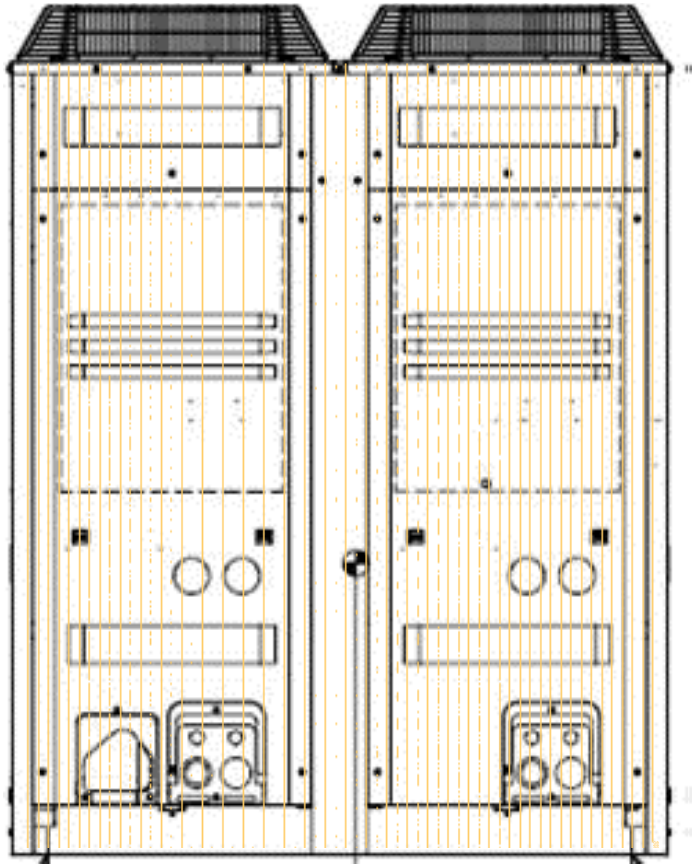



VRVIII Heat Pump Condenser Styles

Base Single Modules



RXYQ72PB

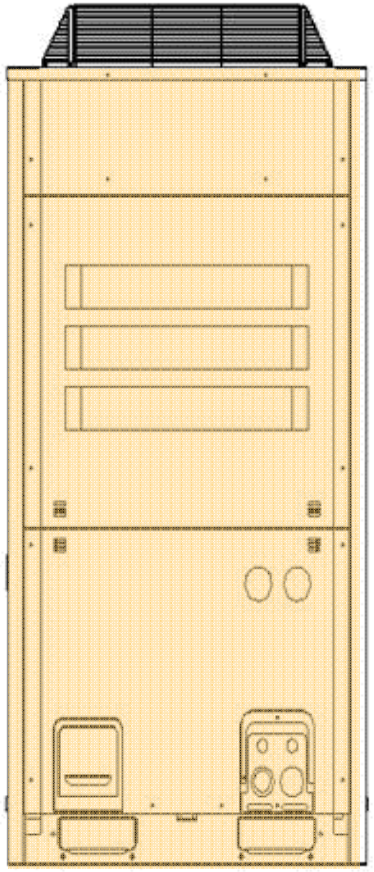


*RXYQ96,120,144PB

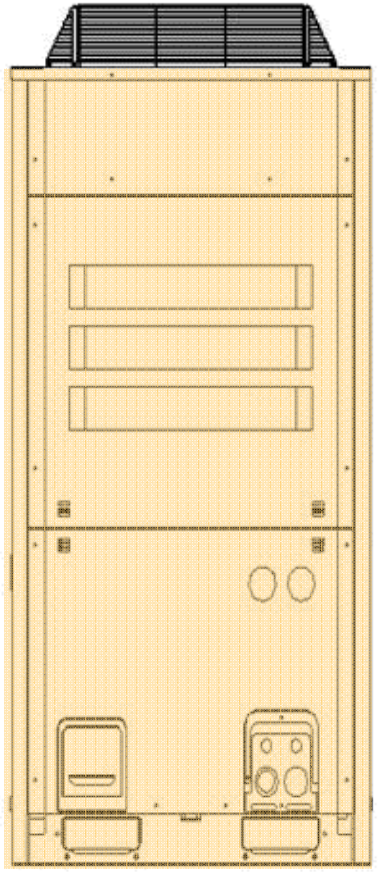
*NOTE: RXYQ144PBTJ (208/230vac.) Utilizes 2 Inverter Scroll Compressors – Dual Fan & 3 stop valves

VRVIII Heat Recovery Condenser Styles

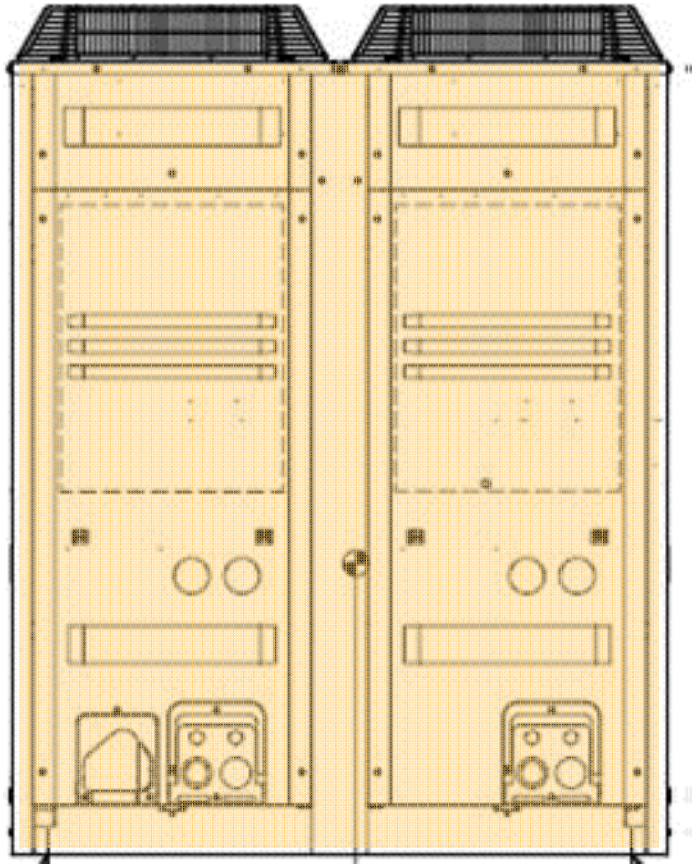
Single Modules



REMQ72PB



REMQ96/120PB



REYQ72,96,120,144PB

Heat Pump Condensers - RXYQ_PBTJ (208/230vac 3Ph)

Single Module

6 Ton

8,10,12 Ton

Double Module

14 & 16 Ton

18 & 20 Ton

Triple Module

22,24,26 Ton

Triple Module

28 & 30 Ton

NOTE: 6 Ton HP condenser has one compressor (Inverter).

Heat Recovery Condensers
REYQ /REMQ_PBTJ (208/230vac 3Ph)

Single Module

6,8,10,12 Ton

Double Module

14,16,18,20 Ton

Triple Module

22,24,26,28 Ton

Heat Pump Condensers - RXYQ_PBYD (460vac 3 Ph)

Single Module

6 Ton 8 & 10 Ton

12 Ton

Double Module

14 & 16 Ton

18 & 20 Ton

Triple Module

22,24,26 Ton

28 & 30 Ton

Heat Recovery Systems
REYQ/REMQ_PBYD (460vac 3 Ph)

Single Module

6,8,10,12 Ton

Double Module

12,14,16,18,20 Ton

Triple Module

22,24,26,28 Ton

Indoor Units

VRVIII Models & Appearance – 208/230vac 1 Ph
Fan Coils Units

Energy Recovery Ventilator

FXDQ_M Slim Duct Low Static

FXZQ 2'x2' 4-Way Ceiling Cassette

FXFQ_P Round Flow Cassette

FXAQ Wallmount

FXMQ72/96M Concealed Ceiling Medium to High Static

FXLQ Floor Standing Exposed

FXMQ_P DC Ducted Concealed Ceiling Medium to High Static

FXHQ Ceiling Suspended

FXTQ Vertical Air Handler

FXNQ Floor Standing Concealed

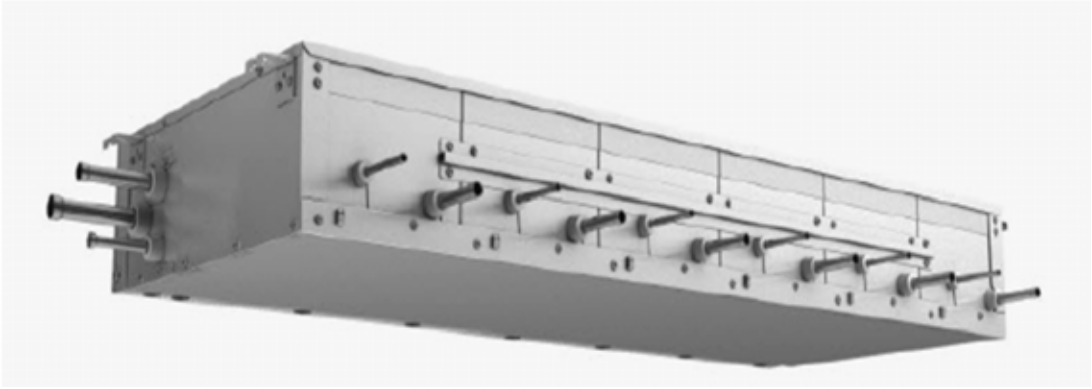
FXMQ_MF 100% OA Processing Unit

Branch Selector Boxes

VRVIII Models & Appearance – 208/230vac 1 Ph Branch Selector Boxes

BSVQ36PVJU 36,000 Btu
BSVQ60PVJU 60,000 Btu
BSVQ96PVJU 96,000 Btu

BSV4Q36PVJU 4 - Port



BSV6Q36PVJU 6 - Port

Local Remote Controllers

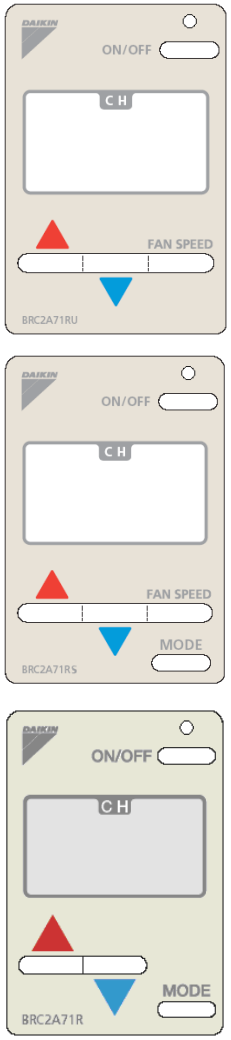
BRC1E72

Navigation Remote Controller

BRC2A71

Simplified

Remote Controller



BRC7C/7E/4C

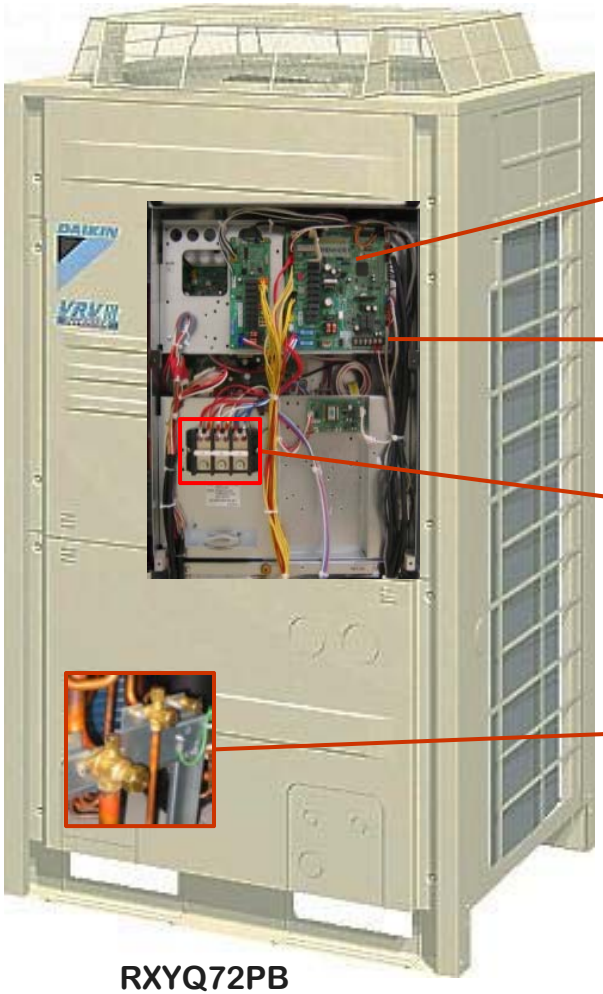
Hand-held Wireless

Remote Controller

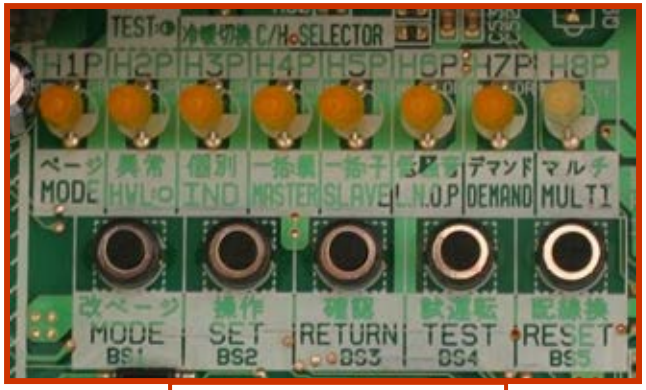
Condenser - Unit Layout

Line & Control Voltage – Stop Valve Layout – Auto Charge Port – Control PCB

VRVIII Heat Pump – RXYQ Single & Manifolded



RXYQ72PB



Control PCB (A1P)

Control Voltage Connections

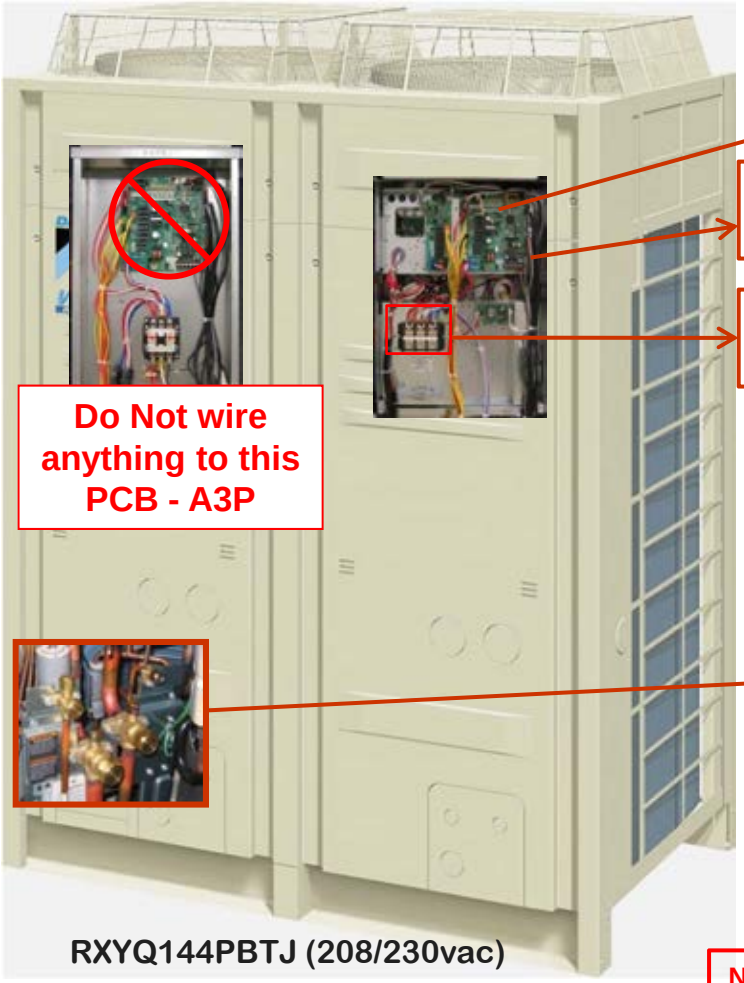
Line Voltage Connections

2 Stop Valves

Auto Charge Port

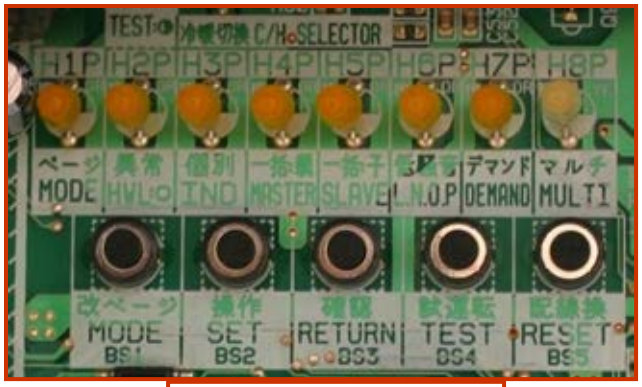
HP/LP Gas Liquid

VRVIII Heat Pump – RXYQ144PBTJ Single Module



Control Voltage Connections

Line Voltage Connections



Control PCB (A1P)

3 Stop Valves

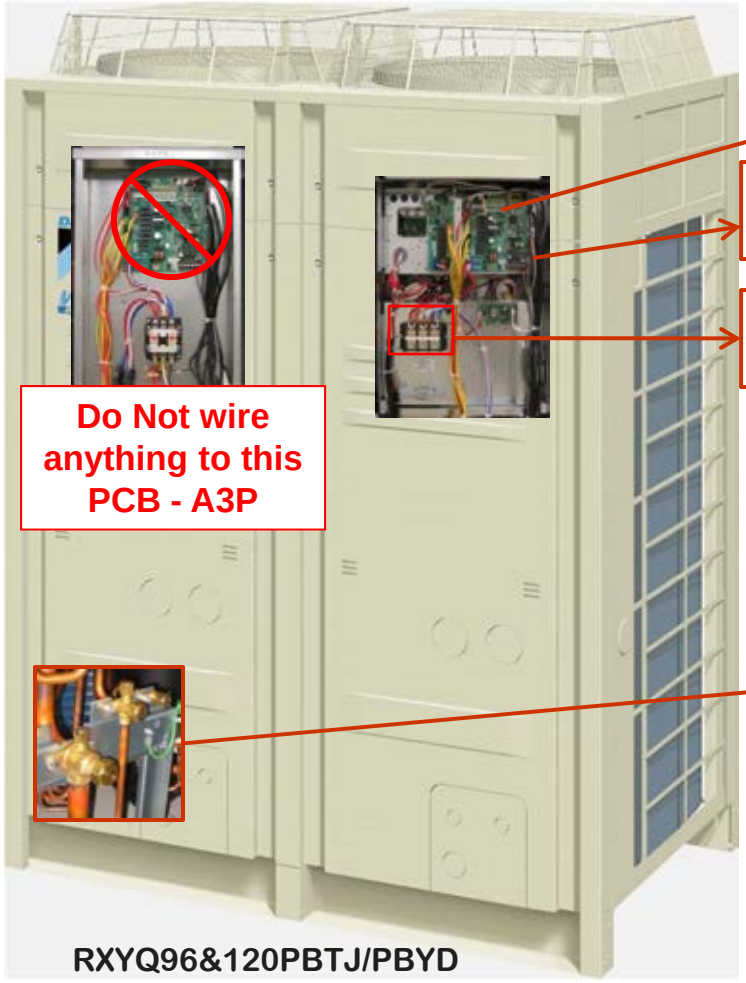
Auto Charge Port

Liq. N/A HP/LP

Not Used on this model

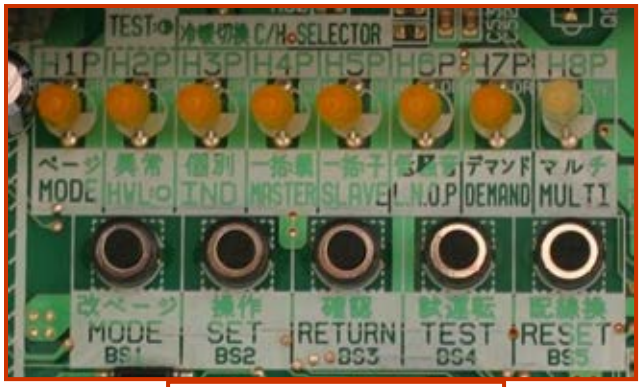
NOTE: This model cannot be manifolded

VRVIII Heat Pump – RXYQ Single & Manifolded



Control Voltage Connections

Line Voltage Connections



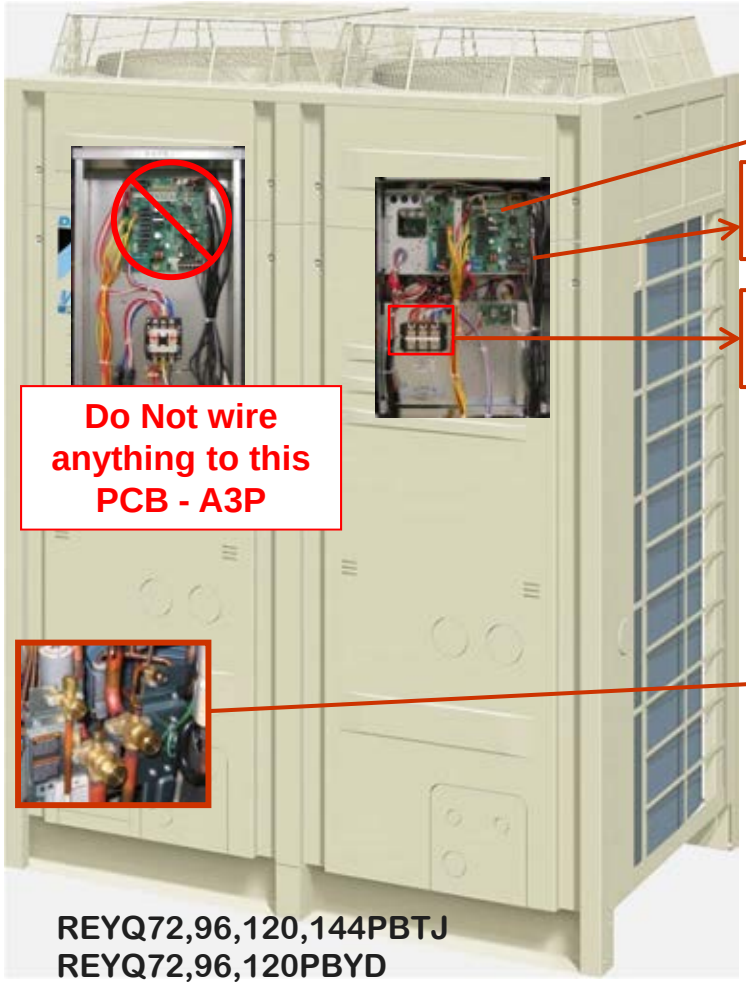
Control PCB (A1P)

2 Stop Valves

Auto Charge Port

HP/LP Gas Liquid

VRVIII Heat Recovery – REYQ Single Manifolded



Control Voltage Connections

Line Voltage Connections

Control PCB (A1P)

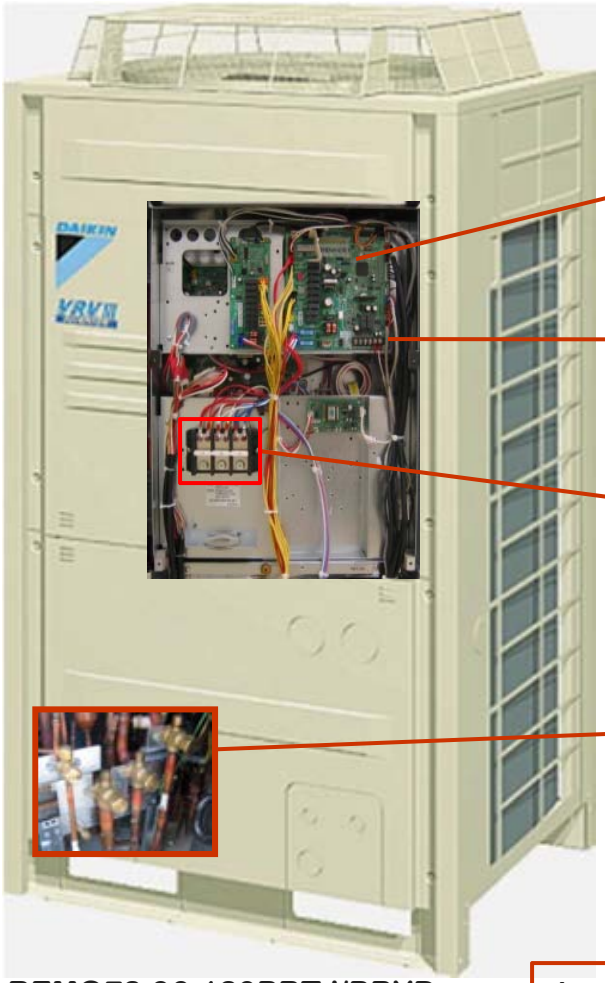
3 Stop Valves

Auto Charge Port

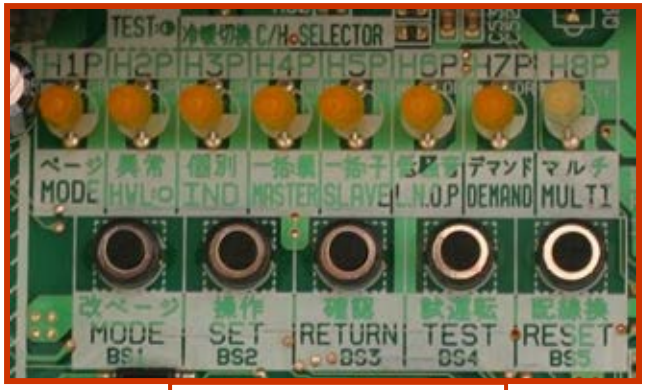
Liq. Suction HP/LP

NOTE: This model cannot be manifolded

VRVIII Heat Recovery – REMQ Manifolded Module



REMQ72,96,120PBTJ/PBYD



Control PCB (A1P)

Control Voltage Connections

Line Voltage Connections

4 Stop Valves

Liquid - Suction-HP/LP-Equalization

Auto Charge Port

System Commissioning

Pre-Commissioning Checks & Commissioning Steps

Pre-Commissioning Checks

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Pre-Commissioning Checks

1. Compressor shipping brackets removed
2. Stop Valves securely closed & field refrigerant piping pressure tested to 550 psi (450psi FXTQ) for 24 hours min. Include Pressure Equalization pipe on manifolded Heat Recovery systems (PB)
3. Triple evacuate to 500 microns or less; Include Pressure Equalization pipe on HR
4. All liquid lines are measured, "Additional Refrigerant Charge" is calculated and weighed into the system, breaking the final vacuum

   Alternate: 50% (trim charge) of the calculated charge weighed in for "*Auto Charge*" operation
5. Stop Valves opened
6. All Remote Controllers installed and all control wiring is installed and properly connected at each terminal block
7. All condensate drain piping is connected, including fan coil tie-in, and insulated as required
8. Refrigerant lines (Pressure Equalization piping) are completely insulated including flare nut connections at Indoor Units
9. All ductwork is connected and air filters installed
10. Line Voltage is checked and verified to be within specified range for all system components

Commissioning Procedures Overview

Commissioning Steps

1. Power up all indoor units – Fan Coils and Branch Selector boxes (for heat recovery only)
2. Power up Condenser(s) to energize crankcase heaters (minimum 6 hrs) Initialization sequence starts and the system addresses are set – Setup Navigation Remote Controllers
3. Count Condensers (manifolded system), Fan Coils, & Branch Selector boxes (for heat recovery only) if applicable
4. Selected Field Settings programmed at Remote Controllers (Static Pressure settings, etc.)
5. System refrigerant charge – Manual or “Auto Charge”
6. Check Operation mode
7. Remaining System Field Settings
8. Verify system operation in Cool & Heat mode as outside ambient temperature conditions allow (heat mode is prohibited above 75.2°F outside air temperature)

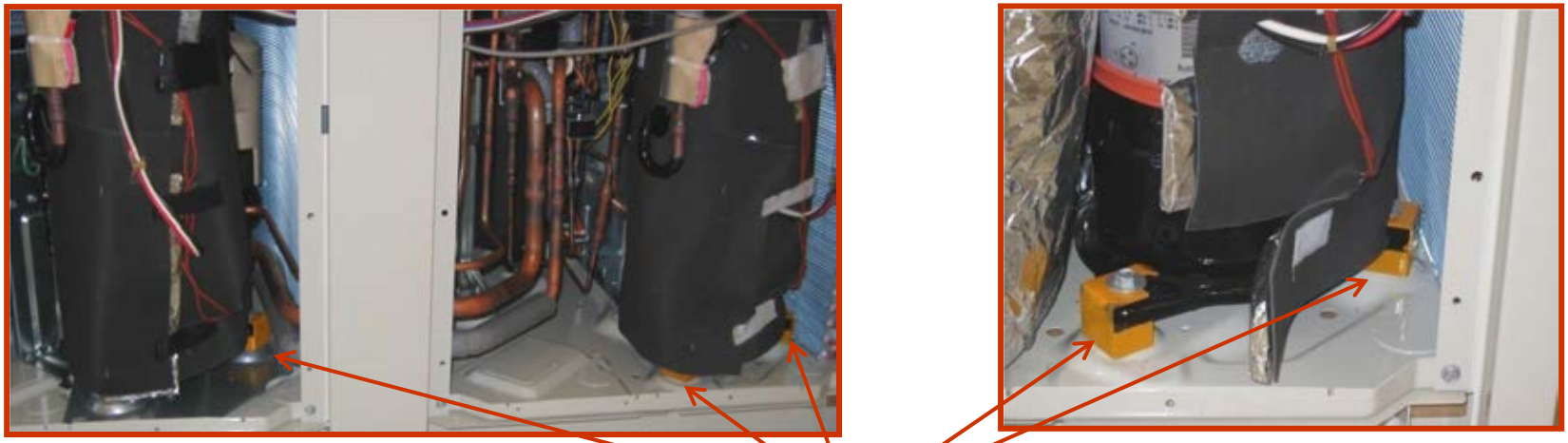
System Commissioning

Pre-Commissioning Checks

VRVIII Pre-Commissioning Check #1

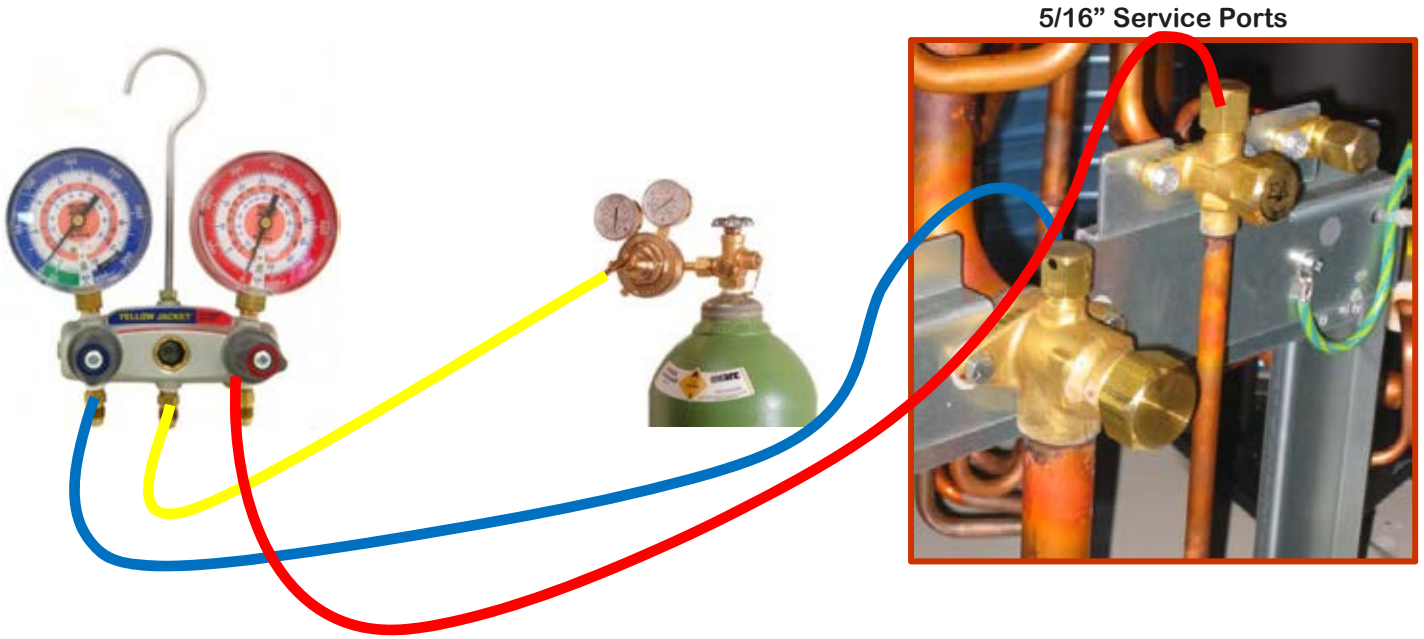
Compressor Shipping Brackets

- Compressor shipping brackets must be removed before system start up
- Each compressor is secured by 2 brackets, yellow in color, which are located under the compressor blankets
- Remove all of the brackets and retighten the compressor bolts
- Failure to remove the brackets can result in excessive noise during operation



VRVIII Pre-Commissioning Check #2

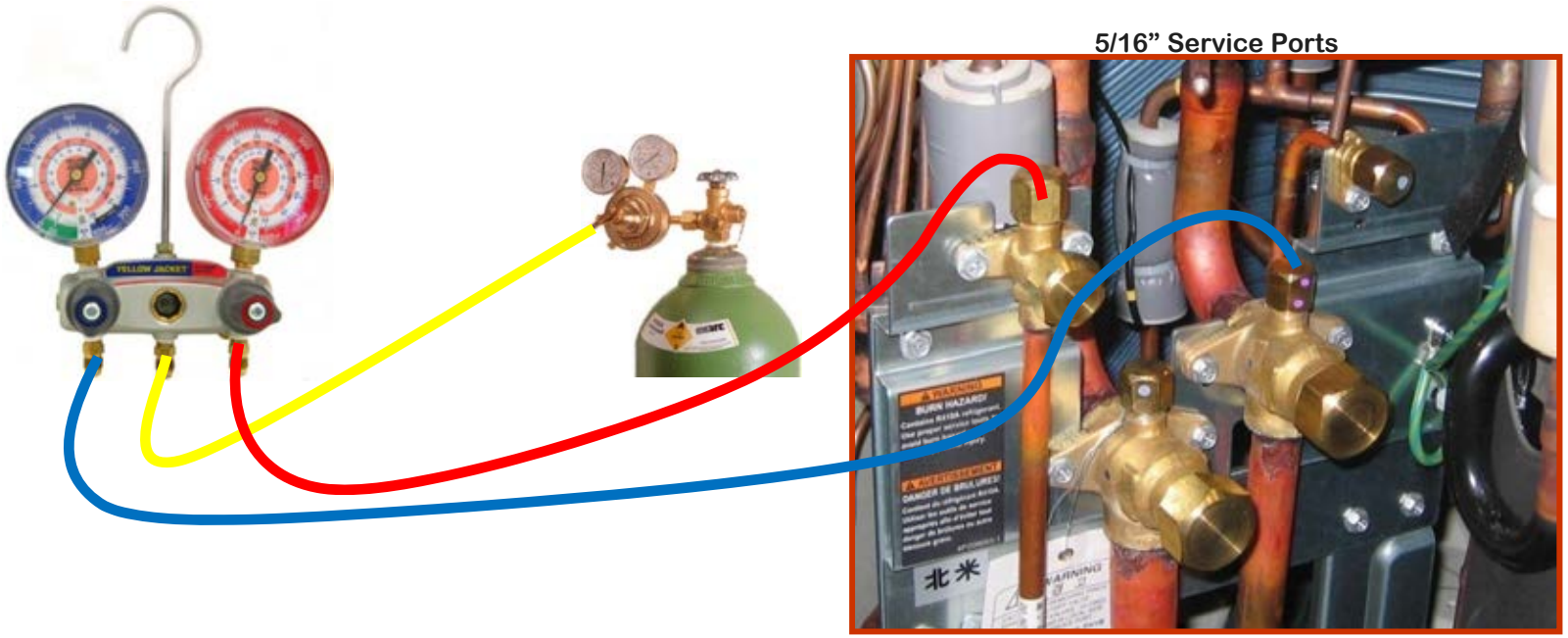
Pressure Test Connections
Heat Pump RXYQ - 2 Stop Valves



- Connect manifold gauges to the Liquid and Dual Pressure Gas Service Ports
  - On Manifolded systems connect gauges to the main condenser
- Connect Nitrogen cylinder with regulator to manifold
- Do not energize the indoor units. Indoor unit EEVs close when power is applied
  - If EEVs have closed use Recovery/Evacuation Mode to reopen all EEVs
- Follow the Pressure Test procedure, and perform a system leak test.

VRVIII Pre-Commissioning Check #2 Cont.

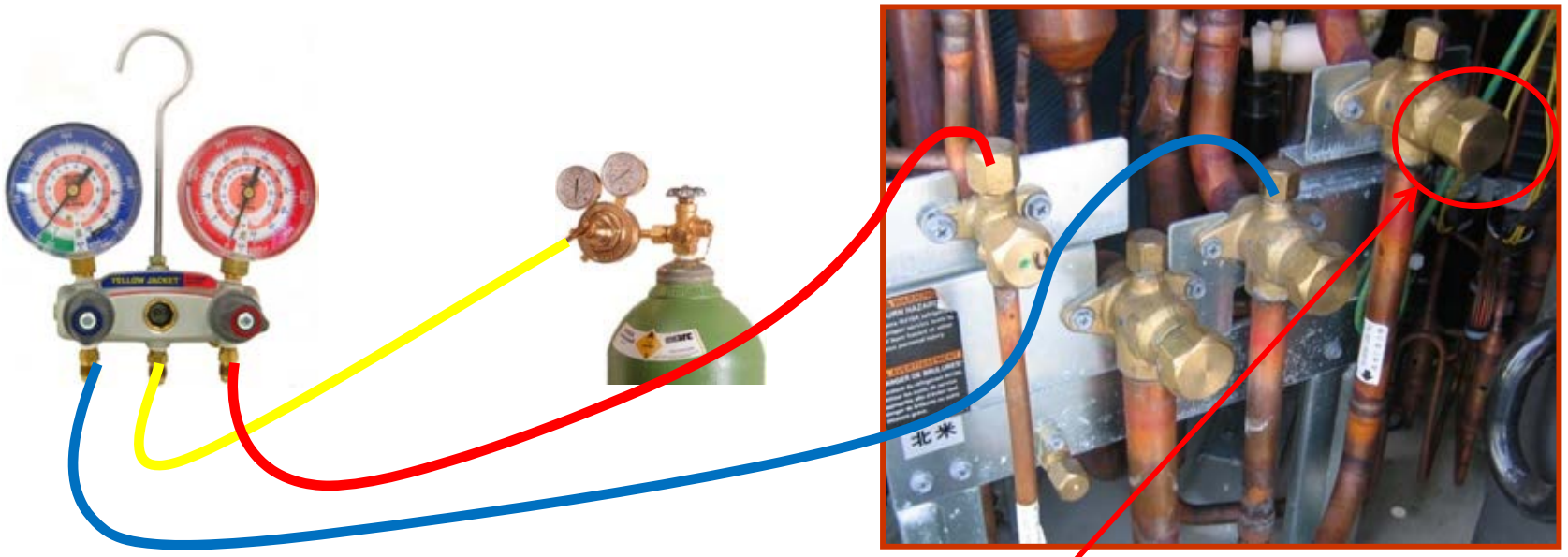
Pressure Test Connections Heat Pump & Heat Recovery
3 Stop Valves RXYQ144PBTJ, REYQ72,96,120,144PBTJ & REYQ72,96,120PBYD



- Connect manifold gauges to the Liquid and Dual Pressure Gas Service Ports
- Connect Nitrogen cylinder with regulator to manifold
- Do not energize the indoor units (or branch selector boxes for heat recovery). Indoor unit and branch selector box EEVs close when power is applied
  - If EEVs have closed use Recovery/Evacuation Mode to reopen all EEVs
- Follow the Pressure Test procedure, and perform a system leak test.

VRVIII Pre-Commissioning Check #2 Cont.

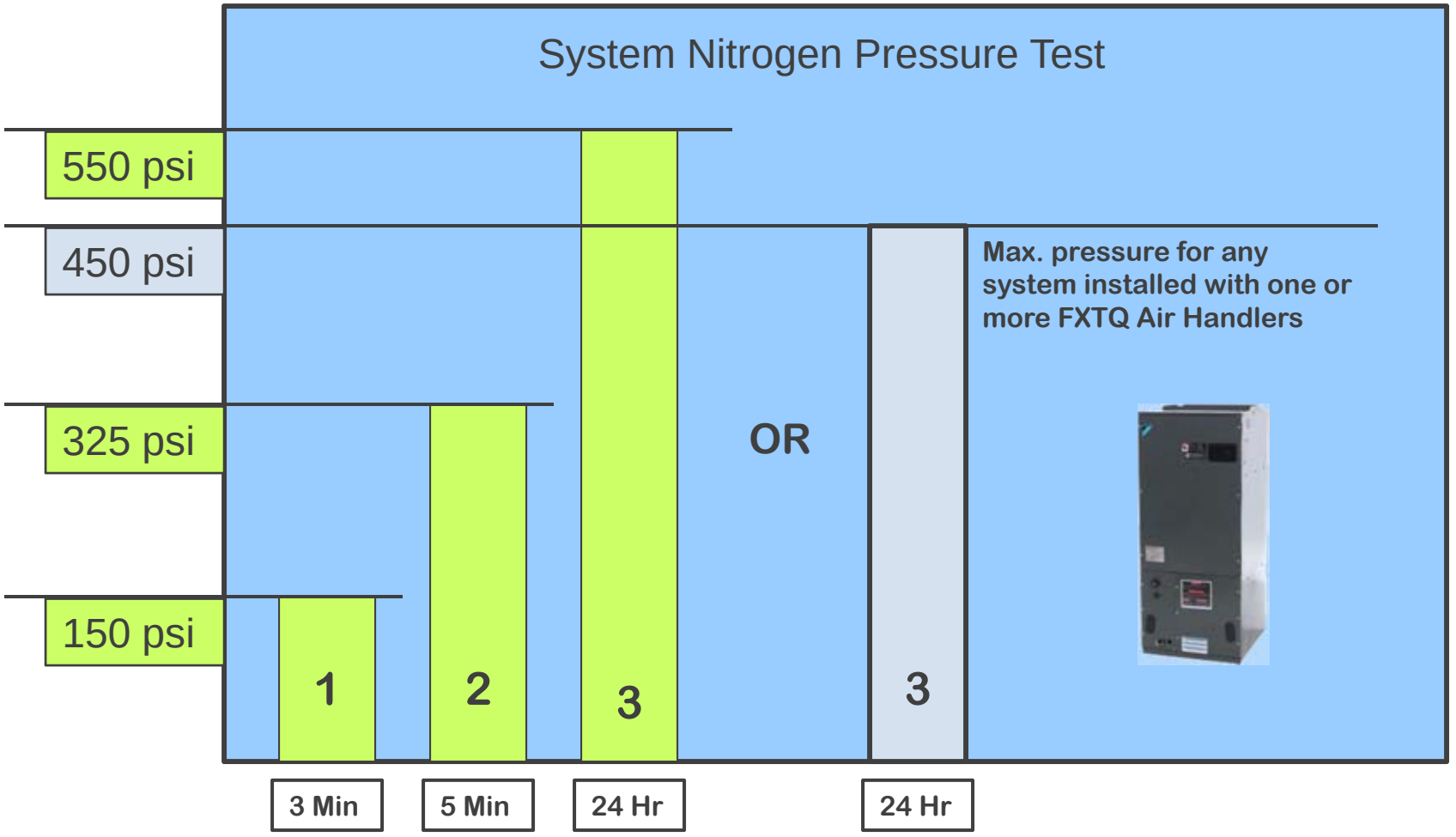
Pressure Test Connections
Heat Recovery REMQ 4 Stop Valves



5/16" Service Ports

- Connect manifold gauges to the Liquid and Dual Pressure Gas Service Ports on the Main unit
  - Pressure test the Pressure Equalization Pipe separately
- Connect Nitrogen cylinder with regulator to manifold
- Do not energize the indoor units or branch selector boxes. Indoor unit and branch selector box EEVs close when power is applied
  - If EEVs have closed use Recovery/Evacuation Mode to reopen all EEVs
- Follow the Pressure Test procedure, and perform a system leak test.

3 Step System Pressure Test - Verify all Stop Valves are securely closed before pressure test -



VRVIII Pre-Commissioning Check #2 Cont.

Nitrogen Pressure Testing Considerations

Nitrogen pressure is subject to fluctuation above 300 psi, based on ambient temperature changes. Use this formula to compensate for temperature changes from one day to the next when performing the 24 hour pressure test. The following formula will determine system pressure drop caused by low ambient temperature.

Record the **T**emperature when the system is **p**ressurized (**Tp**)
Subtract the **T**emperature when the pressure is **c**hecked (**Tc**)
Multiply by a factor of 0.80 to get the **P**ressure **D**rop (**PD**)

(**Tp – Tc**) x 0.80 = **P**ressure **D**rop

VRVIII Pre-Commissioning Check #3

System Triple Evacuation

- Minimum 6 cfm vacuum pump with check valve
- Digital Micron Gauge
- Insure Vacuum hoses are in good condition
- Indoor units (and branch selector boxes, heat recovery only) must not be energized to insure EEVs are open
    - Evacuate the refrigerant piping to 4,000 microns
    - Break the vacuum with Dry Nitrogen to a level of 2-3 PSIG
    - Evacuate the system to 1,500 microns
    - Break the vacuum with Dry Nitrogen to a level of 2-3 PSIG
    - Evacuate the system to 500 microns or less
        - Conduct a micron rise test; system should hold below 500 microns for 1 hour
          Hold vacuum for liquid refrigerant charging – Do Not remove manifold gauges

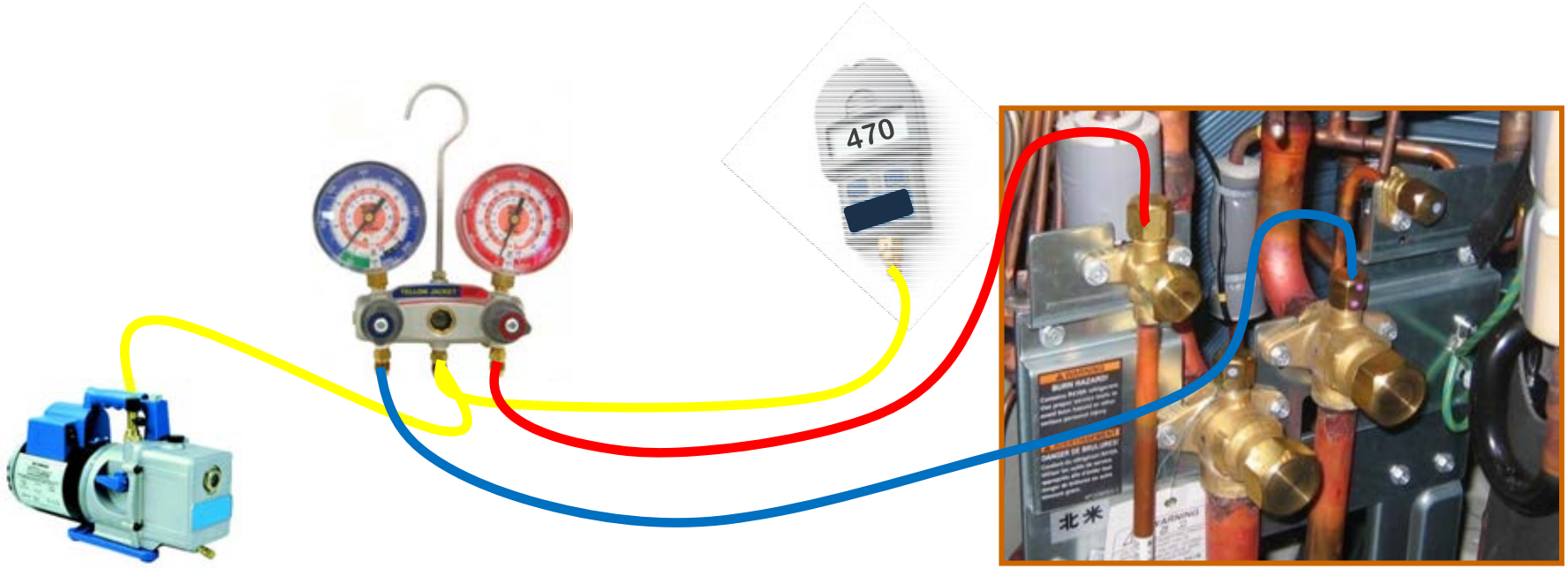
VRVIII Pre-Commissioning Check #3 Cont.

Evacuation Connections Heat Pump RXYQ
2 Stop Valves

- Connect manifold gauges to the Liquid and Dual Pressure Gas Service Ports
  - On manifolded systems connect gauges to the main condenser
- Connect vacuum pump and micron gauge
- Do not energize the indoor units. Indoor unit EEVs close when power is applied
  - If EEVs have closed use Recovery/Evacuation Mode to reopen all EEVs
- Triple evacuation down to 500 microns or less using Dry Nitrogen to break vacuum
  - The final vacuum is used to draw in the calculated “Additional Refrigerant Charge” amount by weight

VRVIII Pre-Commissioning Check #3 Cont.

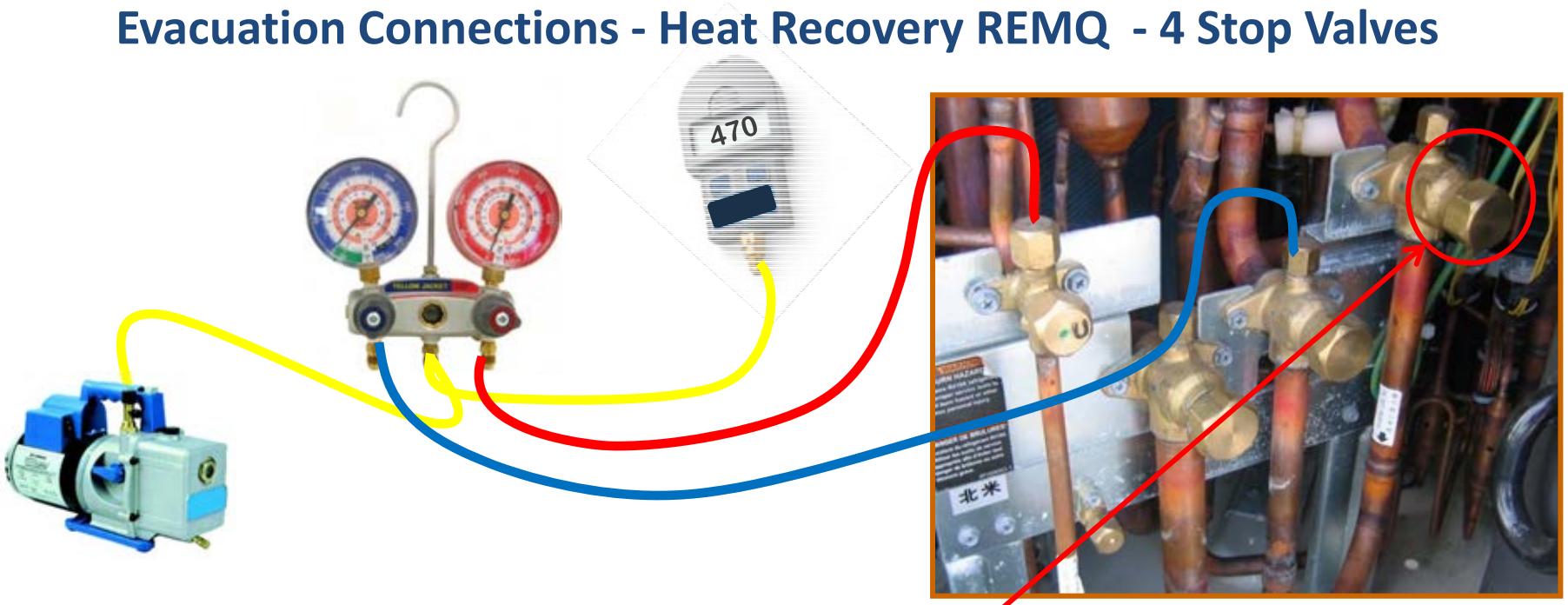
Evacuation Connections Heat Pump & Heat Recovery
3 Stop Valves RXYQ144PBTJ - REYQ72,96,120,144PBTJ & REYQ72,96,120PBYD



- Connect manifold gauges to the Liquid and Dual Pressure Gas Service Ports
- Connect vacuum pump and micron gauge
- Do not energize the indoor units (or branch selector boxes for heat recovery). Indoor unit EEVs close when power is applied
  - If EEVs have closed use Recovery/Evacuation Mode to reopen all EEVs
- Triple evacuation down to 500 microns or less using Dry Nitrogen to break vacuum
  - The final vacuum is used to draw in the calculated "Additional Refrigerant Charge" amount by weight

VRVIII Pre-Commissioning Check #3 Cont.

Evacuation Connections - Heat Recovery REMQ - 4 Stop Valves

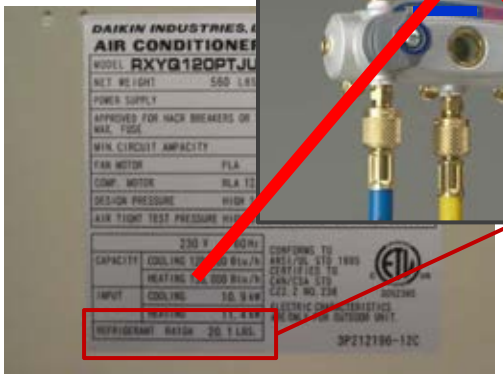


- Connect manifold gauges to the Liquid and Dual Pressure Gas Service Ports on the Main unit
  - Pressure Equalization Pipe is evacuated separately
- Connect vacuum pump and micron gauge
- Do not energize the indoor units or branch selector boxes. Indoor unit and branch selector box EEVs close when power is applied
  - If EEVs have closed use Recovery/Evacuation Mode to reopen all EEVs
- Triple evacuation down to 500 microns or less using Dry Nitrogen to break vacuum cycles
  - The final vacuum is used to draw in the calculated "Additional Refrigerant Charge" amount by weight

VRVIII Pre-Commissioning Check #4

VRVIII System Refrigerant Charging Facts

- Accurate refrigerant charging is critical for optimum system performance
- Daikin VRV systems cannot be charged by refrigerant operating pressures, superheat or subcooling temperatures; refrigerant is weighed into the system
- All *VRVIII* condensers have a factory refrigerant charge based on the unit model
  - The ***VRVIII*** Condensers state the factory refrigerant charge on the unit ID Plate
- Proper *VRVIII* system charging requires an "Additional Refrigerant Charge" amount to be calcu n part by the tot e system Liquid line
- The total s rge is comprised ge in the condenser al Refrigerant Ch lated for that system



REFRIGERANT R

"Additional Refrigerant Charge"

TOTAL SYSTEM CHARGE

VRVIII Pre-Commissioning Check #4 Cont.

VRVIII System Refrigerant Charge Procedures

- It is recommended that all *VRVIII* systems be manually charged based on the calculated "Additional Refrigerant Charge" for the system being commissioned
  - Measure the total linear footage of each Liquid line pipe size in the entire system
  - Calculate the "Additional Refrigerant Charge" based on the three part calculation procedure for the system being commissioned
  - After determining the amount of the "Additional Refrigerant Charge", use the vacuum in the system from the final evacuation cycle, and weigh in liquid refrigerant through the Liquid service port.
    - If there is not enough vacuum to draw in the total charge, use the "Additional Refrigerant Charge Mode" to complete the system charging process
    - If *Auto Charge* is to be used, use the final vacuum to charge the system with at least 50% of the calculated "Additional Refrigerant Charge" then using *Auto Charge* to complete the charging process. (See *Auto Charge* Limitations)
  - After the system receives the full or partial charge, all of the stop valves may be opened (Pre-Commissioning Step #5)

VRVIII Pre-Commissioning Check #4 Cont.

VRVIII "Additional Refrigerant Charge" Manual Calculation

The example system for this exercise is: **RXYQ144PBTJ** Heat Pump
System Connection Ratio is 105%
Connection ratio can be found in the VRV Xpress file.

Calculation A

Total length (ft) of 1/4" liquid line 254 X .015 lbs/ft = 3.81
+
Total length (ft) of 3/8" liquid line 173 X .040 lbs/ft = 6.92
+
Total length (ft) of 1/2" liquid line 78 X .081 lbs/ft = 6.31
+
Total length (ft) of 5/8" liquid line 52 X .121 lbs/ft = 6.29
+
Total length (ft) of 3/4" liquid line 0 X .175 lbs/ft = 0.00
+
Total length (ft) of 7/8" liquid line 0 X .249 lbs/ft = 0.00

Liquid Line Example Total: 23.33 Lbs

Heat Pump RXYQ - Add total amount to **Calculation B**

OR

If Heat Recovery REYQ_ Multiply **Calculation A Total** by: **1.02** and add amount to **Calculation B**

VRVIII Pre-Commissioning Check #4 Cont.

NOTE: For systems with Connection Ratio above 130%, contact Service Hotline

Calculation B

Heat Pump	
MODEL NAME	**Refrigerant Amount**
RXYQ 96, 120, 216, 240, 336, 360P	0.0 lb
RXYQ 72 , 168, 192, 264, 288, 312P	1.1 lb
RXYQ 144PBYD	2.2 lb
RXYQ 144PBTJ	7.9 lb
Heat Recovery	
MODEL NAME	**Refrigerant Amount**
REYQ 72 ~ 120PBYD REYQ 72 ~ 144PBTJ	7.9 lb
REYQ 144PBYD REYQ 168 ~ 192P	2.2 lb
REYQ 216 ~ 240P	3.3 lb
REYQ 264 ~ 288P	5.5 lb
REYQ 312 ~ 336P	6.6 lb

Calculation A	+	Calculation B	+	Calculation C	=	Total
23.33 lbs.		7.9 lbs.		1.1 lbs.		32.3 lbs. (32 lbs. 5 oz.)

Note: .1 lbs. = 1.6 oz. (round up)

VRVIII Pre-Commissioning Check #4 Cont.

NOTE: For systems with Connection Ratio above 130%, contact Service Hotline

Calculation C

Heat Pump		
Connection Ratio	RXYQ 72 ~ 312PBYD RXYQ 72 ~ 312PBTJ	RXYQ 336 ~ 360PBYD RXYQ 336 ~ 360PBTJ
MORE THAN 100% AND LESS THAN 120%	1.1 LB	1.1 LB
MORE THAN 120% AND LESS THAN 130%	1.1 LB	2.2 LB

If system Connection Ratio is 100% or less, no additional refrigerant is required for Calculation C

Heat Recovery		
Connection Ratio	REYQ 72 ~ 120PBYD REYQ 72 ~ 120PBTJ REYQ 144 ~ 312PBYD REYQ 168 ~ 312PBTJ	REYQ 336PBYD REYQ 336PBTJ
MORE THAN 100% AND LESS THAN 120%	1.1 LB	1.1 LB
MORE THAN 120% AND LESS THAN 130%	1.1 LB	2.2 LB

Calculation A + Calculation B + Calculation C = Total

23.33 lbs. 7.9 lbs. 1.1 lbs. 32.3 lbs. (32 lbs. 5 oz.)

NOTE: .1 lbs. = 1.6 oz. (round up)

NOTE: VRV Xpress will calculate total system <u>additional</u> charge if line set lengths are entered when designing system.

VRVIII Pre-Commissioning Check #4 Cont.

VRVIII System Refrigerant Charge Procedures

- Refrigerant Charging Instructions are listed on a field installed label located in the clear plastic packet which is taped to the control box cover
- Remove the label backing and apply the clear label to the inside of the condenser's access panel.
- Enter all of the liquid line lengths, and the calculated Additional Refrigerant Charge. This information is crucial for future service work

REQUEST FOR THE INDICATION OF SETTING CONTENTS, ADDITIONAL REFRIGERANT CHARGING AMOUNT AND INSTALLATION DATE

AFTER FILLING OUT THE BELOW, PLEASE PUT IT ON THE BACK SIDE OF FRONT PANEL

1. RECORD FOR SETTING CONTENTS
FOR THE SETTING CONTENTS OF ⑪～⑮ IN THE SETTING MODE 2, MARK ○ IN THE RIGHT TABLE.

⑪ NIGHT - TIME LOW NOISE SETTING	OFF・LEVEL1・LEVEL2・LEVEL3
⑫ EXTERNAL LOW NOISE LEVEL SETTING	LEVEL1・LEVEL2・LEVEL3
⑬ DEMAND LEVEL SETTING	LEVEL1・LEVEL2・LEVEL3
⑭ EXTERNAL LOW NOISE DEMAND SETTING	OFF・ON
⑮ HIGH STATIC PRESSURE SETTING	OFF・ON

2. RECORD FOR ADDITIONAL REFRIGERANT CHARGING AMOUNT
MAKE SURE TO RECORD THE ADDITIONAL REFRIGERANT CHARGING AMOUNT.
(IF DO NOT USE AUTOMATIC REFRIGERANT CHARGING, CALCULATE AND CHARGE THE ADDITIONAL REFRIGERANT CHARGING AMOUNT FOLLOWING AS SHOWN ON THE BELOW.)

ADDITIONAL CHARGING AMOUNT ____ lb (ROUND OFF TO ONE DECIMAL PLACE.) =

REFRIGERANT AMOUNT FOR FIELD PIPING

LIQUID PIPE SIZE(in)	REFRIGERANT AMOUNT PER 1ft(lb/ft)	LENGTH OF LIQUID PIPE(ft)	SUB TOTAL
ø7/8	0.249	×	=
ø3/4	0.175	×	=
ø5/8	0.121	×	=
ø1/2	0.081	×	=
ø3/8	0.040	×	=
ø1/4	0.015	×	=

TOTAL ____ lb +

HEAT PUMP SYSTEM

MODEL NAME	THE AMOUNT OF REFRIGERANT
RXYQ96, 120, 216, 240, 336, 360P	0 lb
RXYQ72, 168, 192, 264, 288, 312P	1.1 lb
RXYQ144PBYD	2.2 lb
RXYQ144PBTJ	7.9 lb

+

REFRIGERANT AMOUNT FOR EXCEEDING CONNECTION CAPACITY OF INDOOR UNIT

INDOOR CONNECTION CAPACITY	MODEL NAME RXYQ72 ~312P	MODEL NAME RXYQ336・360P
MORE THAN 100% 120% OR LESS	1.1 lb	
MORE THAN 120% 130% OR LESS	1.1 lb	2.2 lb

3. RECORD OF INSTALLATION DATE DA . MO . YR

3P280962-1A

VRVIII Pre-Commissioning Check #4 Cont.

Example System: RXYQ144PBTJ - Connection Ratio: 105%

REQUEST FOR THE INDICATION OF SETTING CONTENTS, ADDITIONAL REFRIGERANT CHARGING AMOUNT AND INSTALLATION DATE

AFTER FILLING OUT THE BELOW, PLEASE PUT IT ON THE BACK SIDE OF FRONT PANEL

1. RECORD FOR SETTING CONTENTS
FOR THE SETTING CONTENTS OF Ⓓ~Ⓗ IN THE [SETTING MODE 2], MARK ○ IN THE RIGHT TABLE.

Ⓓ NIGHT - TIME LOW NOISE SETTING	OFF · LEVEL1 · LEVEL2 · LEVEL3
Ⓔ EXTERNAL LOW NOISE LEVEL SETTING	LEVEL1 · LEVEL2 · LEVEL3
Ⓕ DEMAND LEVEL SETTING	LEVEL1 · LEVEL2 · LEVEL3
Ⓖ EXTERNAL LOW NOISE DEMAND SETTING	OFF · ON
Ⓗ HIGH STATIC PRESSURE SETTING	OFF · ON

2. RECORD FOR ADDITIONAL REFRIGERANT CHARGING AMOUNT
MAKE SURE TO RECORD THE ADDITIONAL REFRIGERANT CHARGING AMOUNT.
(IF DO NOT USE AUTOMATIC REFRIGERANT CHARGING, CALCULATE AND CHARGE THE ADDITIONAL REFRIGERANT CHARGING AMOUNT FOLLOWING AS SHOWN ON THE BELOW.)

ADDITIONAL CHARGING AMOUNT: **32.3** lb = (ROUND OFF TO ONE DECIMAL PLACE.)

REFRIGERANT AMOUNT FOR FIELD PIPING

LIQUID PIPE SIZE(in)	REFRIGERANT AMOUNT PER 1ft(lb/ft)		LENGTH OF LIQUID PIPE(ft)		SUB TOTAL
φ7/8	0.249	×		=	
φ3/4	0.175	×		=	
φ5/8	0.121	×	52	=	6.29
φ1/2	0.081	×	78	=	6.31
φ3/8	0.040	×	173	=	6.92
φ1/4	0.015	×	254	=	3.81

TOTAL **23.33** lb +

HEAT PUMP SYSTEM

MODEL NAME	THE AMOUNT OF REFRIGERANT
RXYQ96, 120, 216, 240, 336, 360P	0 lb
RXYQ72, 168, 192, 264, 288, 312P	1.1 lb
RXYQ144PBYD	2.2 lb
RXYQ144PBTJ	7.9 lb

+

REFRIGERANT AMOUNT FOR EXCEEDING CONNECTION CAPACITY OF INDOOR UNIT

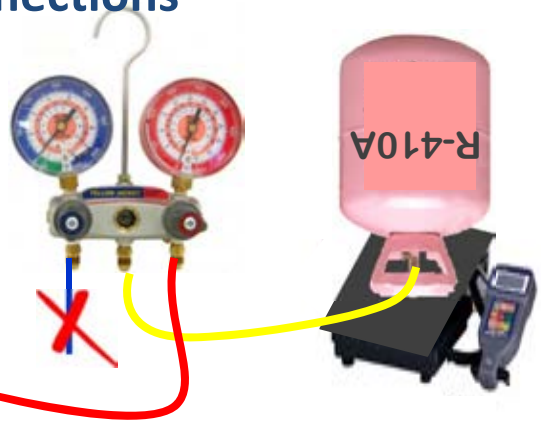
INDOOR CONNECTION CAPACITY	MODEL NAME	
	RXYQ72 ~312P	RXYQ336 · 360P
MORE THAN 100% 120% OR LESS	1.1 lb	
MORE THAN 120% 130% OR LESS	1.1 lb	2.2 lb

3. RECORD OF INSTALLATION DATE DA 29 · MO 07 · YR 2011

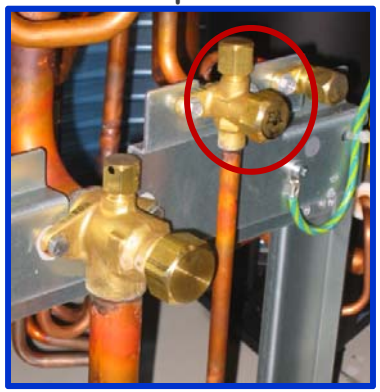
- Enter the piping lengths accurately for each liquid line diameter and multiply the charge factor
- Add the refrigerant amount for the model of the unit or system you are commissioning
- Add the refrigerant amount for the connection ratio your system has – If 100% or less, no add'l refrigerant amount required
- When charging the system manually, write in the total Additional Refrigerant Charge
- If *Auto Charge* COOL mode is used, write in the charge amount taken after *Auto Charge* is complete
- Write down the system commissioning date

VRVIII Pre-Commissioning Check #4 Cont.

Manual Refrigerant Charging Connections



2 – Stop Valves



5/16" Liquid Port

3 – Stop Valves

4– Stop Valves

- Low side manifold hose is not used for this procedure
- The high side manifold hose should still be connected to the Liquid service port, from evacuation
- Break the final vacuum by weighing in the entire calculated charge or as much as possible into the system
  - If there is not enough vacuum to draw in the calculated charge, use the "Additional Refrigerant Charge Mode" to complete
- When using *Auto Charge*, weigh in at least 50% of the calculated charge (additional charge) to break the vacuum through the Liquid port

VRVIII Pre-Commissioning Check #10

Verify Power Supply Voltage

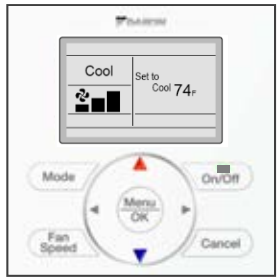
- Before energizing any of the system components, use a Voltmeter to verify that the line voltage power supply to the Condenser(s) and all Indoor Units corresponds to the equipment nameplate
  - 208/230vac 1PH & 3PH = 187 – 253vac
  - 460vac 3PH = 416 – 508vac
- Verify all 3 phase legs to each condenser are in balance within 2%
  - A **"U1"** error code will be displayed and no system operation if the phase imbalance is 10% or higher – dropped phase – reverse phase

System Commissioning

Commissioning Steps

VRVIII System Commissioning Step #11

Power up Indoor Units and Branch Selector Boxes



- Power up all Indoor Units and Branch Selector Boxes (heat recover only) First
  - Verify the Fan Coil and Branch Selector box control PCB's indicate normal operation with the Green flashing status LED on the board
  - Verify all wired Remote Controllers have a display but the status LED's (Green or Red) are OFF

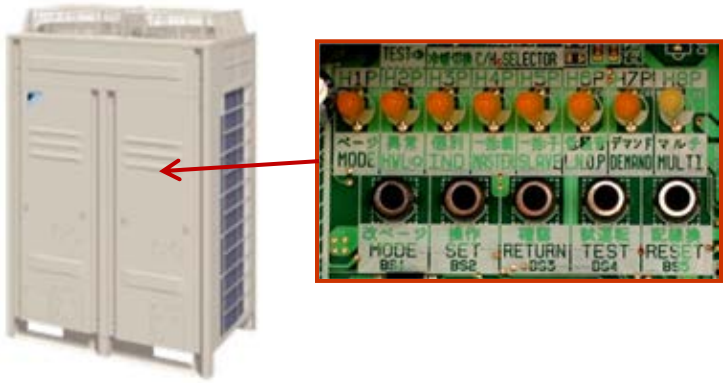
Fan Coil Control PCB

Branch Selector Box PCB

VRVIII System Commissioning Step #12

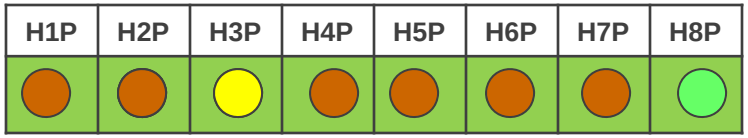
Condenser Power Up

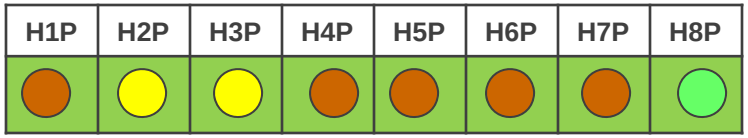
Power up condenser(s) for a period of 6 hours to insure crankcase heaters eliminate any liquid refrigerant in compressors prior to commissioning. During this time, all of the Remote Controllers can be setup. Indoor fan coils must be powered up to setup Remote Controllers.



Initialization

- Upon power up of the condenser, the outdoor PCB will perform a 12 to 20 minute **Initialization operation** where it assigns addresses to the outdoor unit(s) and all indoor units
- This mode is identified by **H2P** flashing and **H3P** solid
- Near completion of **Initialization,** both the **H2P** and **H3P** LED's will be on solid (this is normal during this step)
- When the **H2P** light goes out and only **H3P** remains on solid, this will indicate the **Initialization** operation has successfully completed
- If **H2P** will not go out after 30 minutes or more, there is an error in the system
  - Turn one of the Remote Controllers to ON and verify the error code and resolve the issue
  - Cycle power on Condenser which will restart **Initialization** mode again

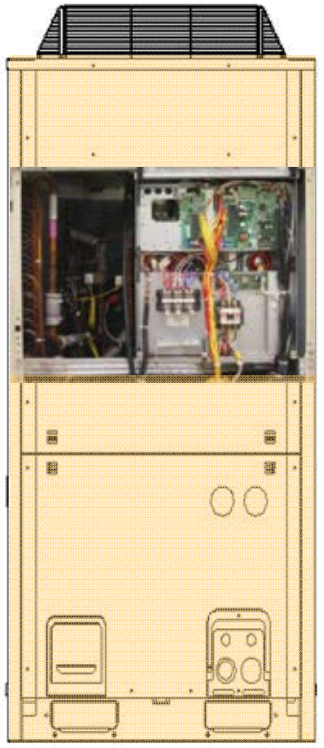




VRVIII System Commissioning - Service Tip

Condenser Power Up Error

- When on power-up of a Single module condenser an immediate **"U1"** fault code is indicated, the main causes are Reversed Phase or Open Phase
- With a **"U1"** fault code, **Initialization** operation will not complete.
- To correct a Reversed Phase condition on a single module, reverse the wire connections on terminals **L2** and **L3**
- Restart condenser



NOTE: The **"U1"** fault code refers to Power Supply Reverse Phase – Open Phase – Phase out of Balance

VRVIII System Commissioning – Service Tip

Verify "U1" 3 Phase Error – Manifolded Systems

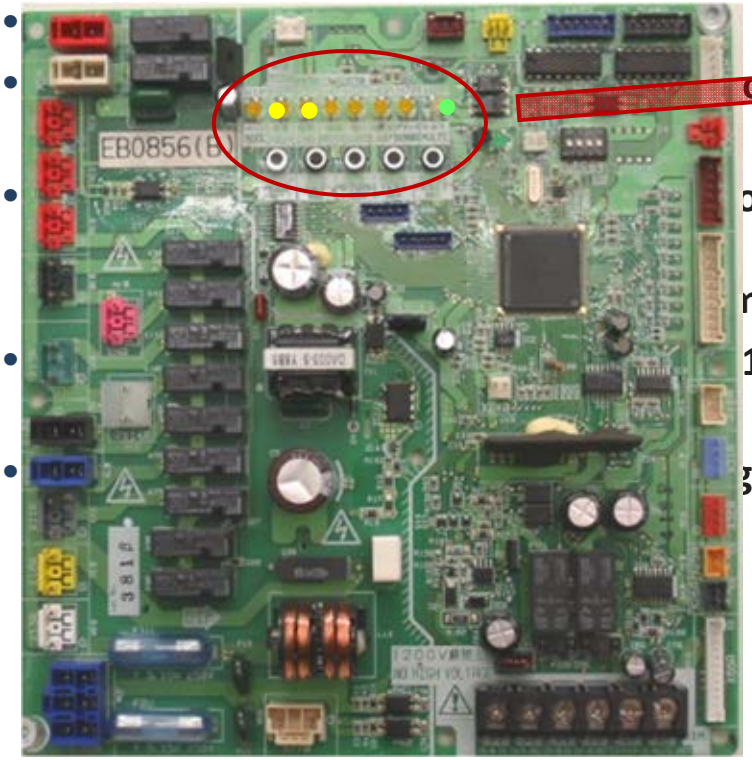
- **When on power-up of a Manifolded System (Dual or Triple modules) an immediate "U1" fault code is indicated, Monitor Mode 14 on the Master PCB can be used to determine the condenser module(s) at fault (refer to Service Manual SiUS341012_A, pages 329-332 for Monitor mode.**
- **With a "U1" fault code, Initialization operation will not complete.**
- **Status LED on all Remote Controllers will be flashing with "U1" code indicated on displays**

NOTE: The **"U1"** fault code refers to Power Supply Reverse Phase – Open Phase – Phase out of Balance

VRVIII System Commissioning – Service Tip

Verify "U1" 3 Phase Error – Manifolded Systems
Monitor Mode 14 to determine condenser(s) with "U1" fault

Master Control PCB - A1P



- onitor
- ontents
- node)
- 1 first
- git of

H1P	H2P	H3P	H4P	H5P	H6P	H7P	H8P
●	○	○	●	●	●	●	○

NOTE: H2P & H3P solid indicates that the system is in a fault. Use Monitor Mode set 14 times to locate problem condenser in a manifolded condenser system.

H1P	H2P	H3P	H4P	H5P	H6P	H7P	H8P
○	○	○	●	●	●	●	○

H1P	H2P	H3P	H4P	H5P	H6P	H7P	H8P
○	●	●	○	○	○	●	○

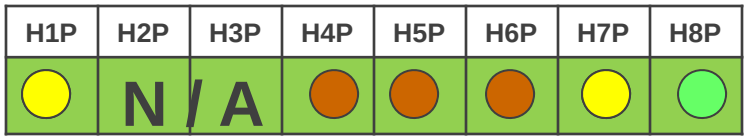
H1P	H2P	H3P	H4P	H5P	H6P	H7P	H8P
○	○	●	○	●	●	○	○

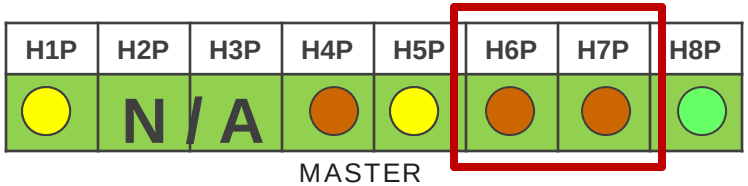
H1P	H2P	H3P	H4P	H5P	H6P	H7P	H8P
○	N / A		●	●	●	○	○

Verify "U1" 3 Phase Error – Manifolded Systems
Monitor Mode 14 to determine condenser(s) with fault continued

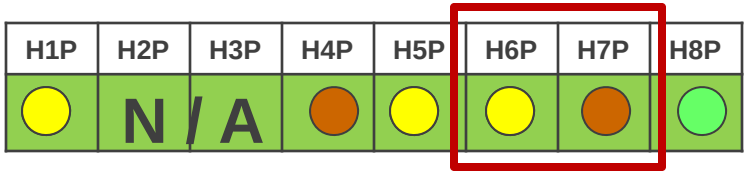
- **Press "SET" button once for Confirmation 3 to display error location (Does not apply to this fault code, move to Confirmation 4.)**

- **Press "SET" button once for Confirmation 4. This will display which Condenser(s) have phased reversed. Refer to lights H6P + H7P to determine Master/Slave1/Slave 2 or ALL are phased reversed. (refer to Service Manual SiUS341012_A, page 332)**



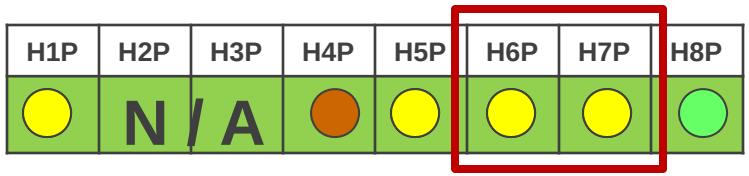


MASTER



SLAVE 2

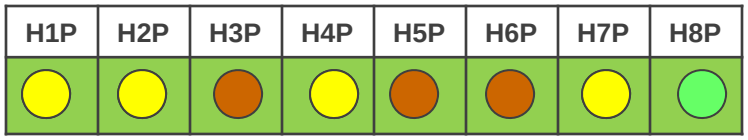
SLAVE 1

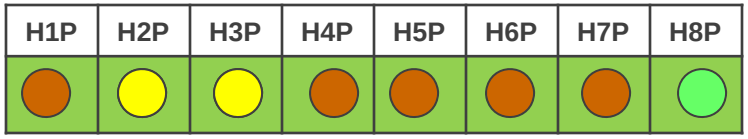


MASTER + SLAVE 1 + SLAVE 2

Verify "U1" 3 Phase Error – Manifolded Systems Continued

- Press "RETURN" button once to return to Monitor Mode initial status
- Press "MODE" button to return to the original power up display with error.
- Power down the condensers and correct the power issues
- Restart all Condensers and Initialization mode will start with no "U1" errors

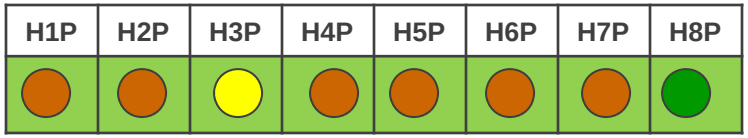




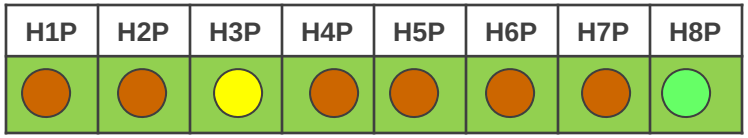
VRVIII System Commissioning – Step # 12

Condenser Control PC Board Status LED Sequence

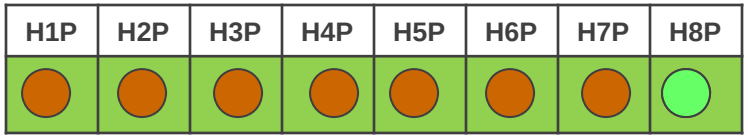
- Upon completion of the **Initialization** operation, the LED sequence on the single module HP/HR condenser will have a Solid H3P
- Upon completion of Initialization on a single module Heat Recovery REYQ, manifolded Heat Pump RXYQ or Heat Recovery REMQ modules, the following LED sequences will appear on the control PCBs
  - The Master PCB is connected to the indoor units on **F1F2 IN, HP model. On HR, F1F2 is connected to BS box F1F2 OUT.**
  - Master PCB indicates a solid H3P LED for normal status.



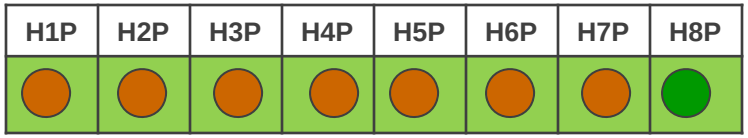
Single Module Condenser



HR Single Module or HP/HR Manifolded Module Master Condenser



HP/HR Manifolded Module Slave 1 Condenser

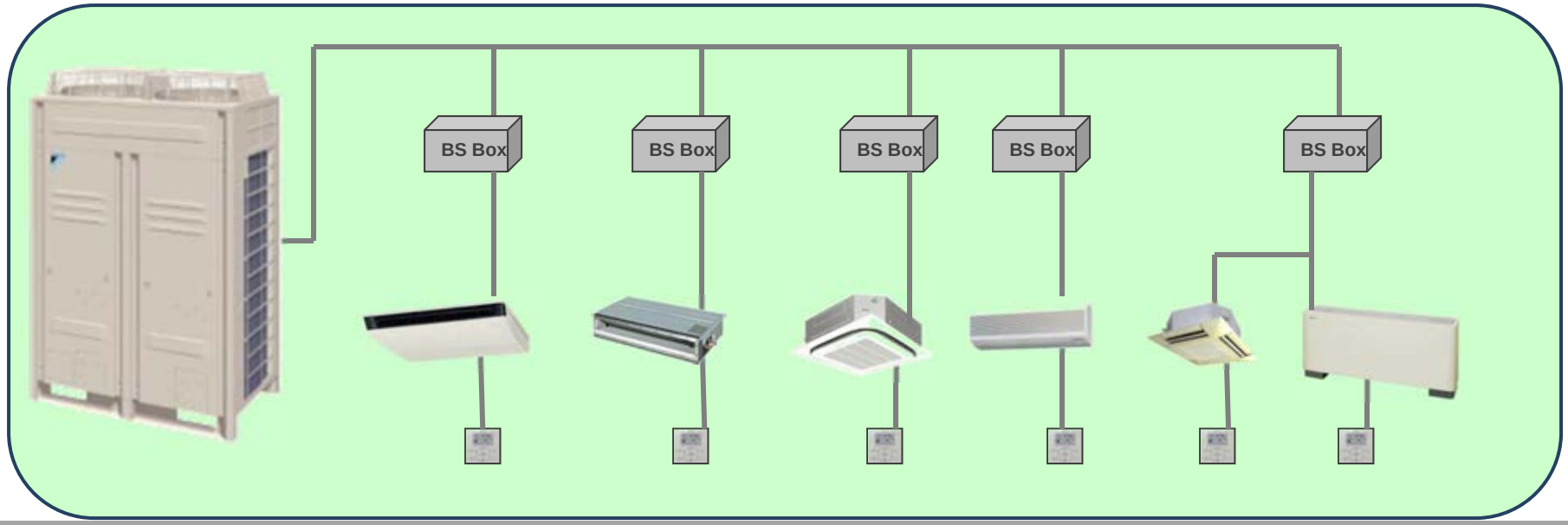


HP/HR Manifolded Module Slave 2 Condenser

VRVIII System Commissioning – Step # 13

Verify System Control Communications

- When the **Initialization** operation has been completed the system must be checked to insure that all Condensers in a Manifolded system and all indoor units in the system are addressed and communicating.
- All system indoor and outdoor units must communicate with the control system
- Using Monitor Mode in the Control PCB of the Outdoor Condenser, the Fan Coils and Branch Selector boxes in the system can be counted, which verifies communication
  - On a manifolded system, the condensers and indoor units are counted from the Control PCB on the Master Condenser

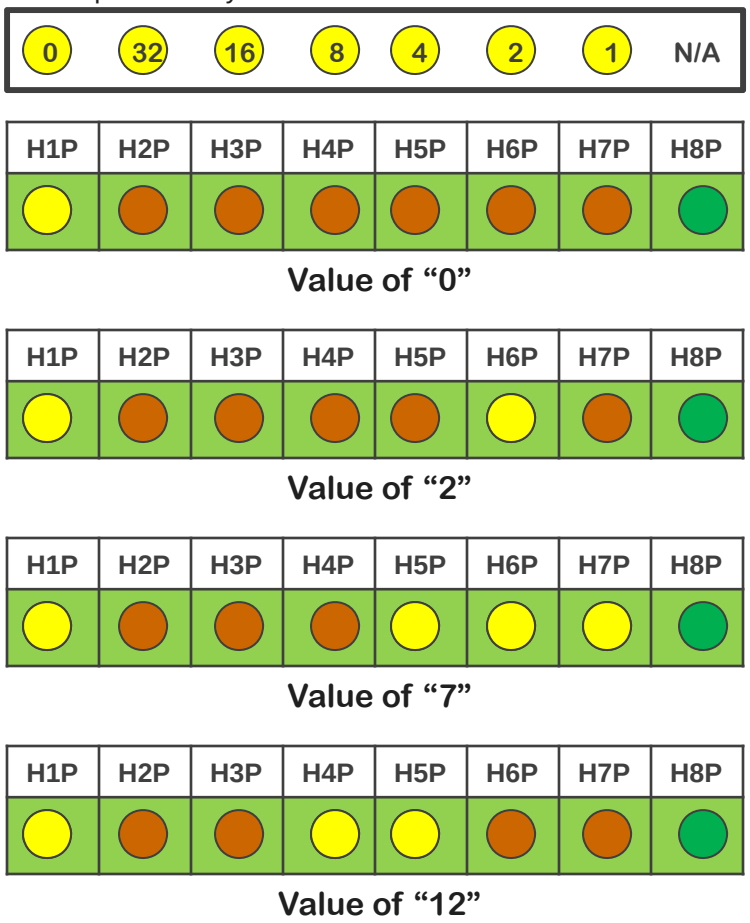


VRVIII System Commissioning – Step # 13

Binary Code Key for Counting Outdoor & Indoor Units (Example)

- Using the Condenser Master PCB status LED's, a binary number is applied to each LED: H1P through H7P as read from right to left
- When in the "Monitor Mode 1" or "Service Mode 2", the LEDs will display, using binary numbers, the number of times the "SET" button is pressed
- When counting indoor and outdoor units is enabled, the flashing LED's represent the number of units recognized in the control system
- When in "Service Mode 2", the LEDs stay solid when pressing the "SET" button

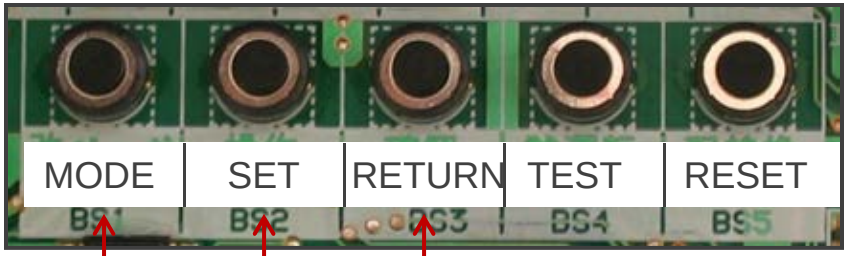
Example of binary value indications



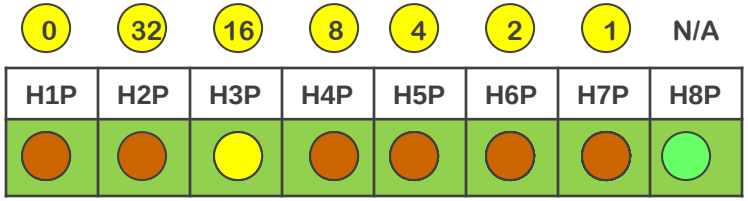
VRVIII System Commissioning – Step # 13

Counting Indoor Fan Coils

- System Monitor Mode is accessed by pressing the "**MODE**" button one time – H1P flashing
- The number of times the "**SET**" button is pressed will be indicated by the corresponding binary numbers
- H1P to H7P LED status is continuously updated when any button is pressed

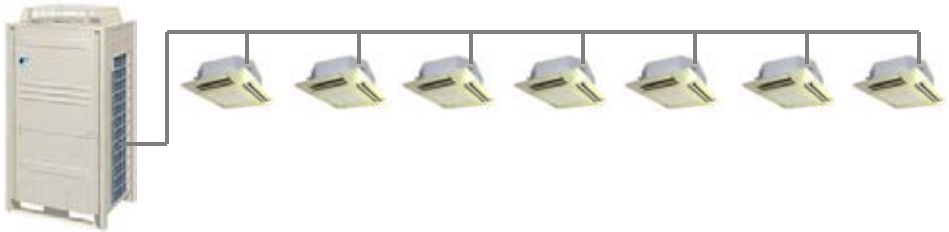


Binary number for each LED



The number of Indoor Fan Coils counted will flash in binary code on the H1P to H7P LED's

- Press **"MODE"** 1 time
- Press **"SET"** 5 times
- Press **"RETURN"** & count up the LED's
- Press **"MODE"** one time to return to normal status : H3P solid



VRVIII System Commissioning – Service Tip

Fan Coil – Forced Fan On Mode

- A very effective procedure to help troubleshoot missing indoor Fan Coil units is to force the fan coil blowers to “ON”. By forcing the fans on, you will see what indoor units are communicating with that particular system.
- In jobs where you have multiple systems being installed, during the installation occasionally one indoor unit will get wired to the wrong outdoor unit. Using the “Forced Fan On” procedure, you will quickly see what units are connected by which fans turn on
- Using the Forced Fan ON operation, enables the control system to put the Fan Coil fan motor in High fan speed
- The fan coils that do not respond by switching on the fan motor are the units not communicating with the control system
- Use the following page to put the fan coil fan motors into this mode

VRVIII System Commissioning – Service Tip

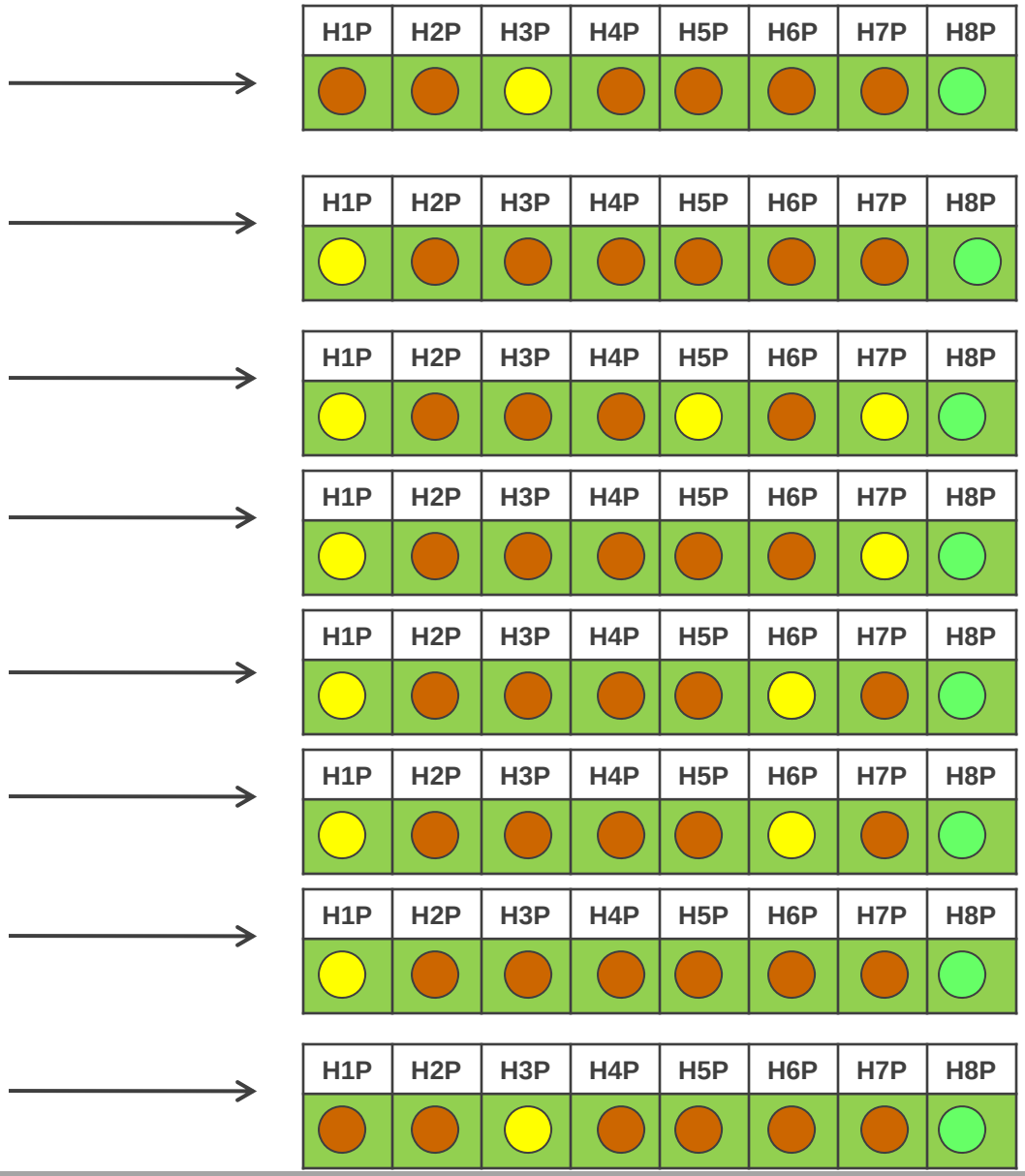
Forced Fan ON Procedure

- At start - LED status Normal – H3P solid

SERVICE MODE 2

- Press and Hold the **"MODE"** button for approx 5 seconds until you see the LEDs light status change from H3P ON to H1P ON
- Press the **"SET"** button 5 times
- Press the **"RETURN"** button once, H7P will come on flashing
- Press the **"SET"** button once to turn operation ON, H6P will come on flashing
- Press the **"RETURN"** button once to Lock the setting, H6P will be on solid
- Press the **"RETURN"** button once to Activate the setting, H6P will turn off

  STOP - Check all the fan coils for the fan motor(s) that are not running
- Press the **"MODE"** button once to return to Normal mode, H3P will come on solid

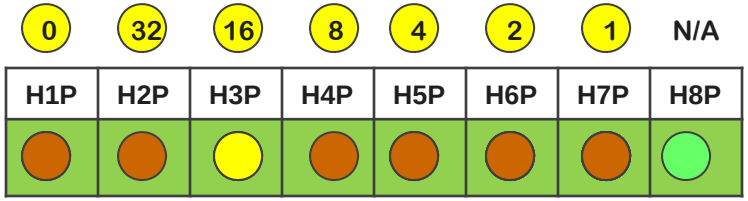


VRVIII System Commissioning – Step #13

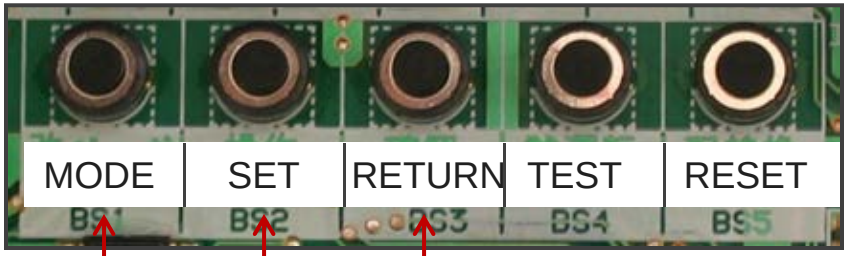
Counting Branch Selector Boxes

- System Monitor Mode is accessed by pressing the **MODE** button one time – **H1P** flashing
- The number of times the **SET** button is pressed will be indicated by the corresponding binary numbers
- **H1P** to **H7P** LED status is continuously updated when any button is pressed

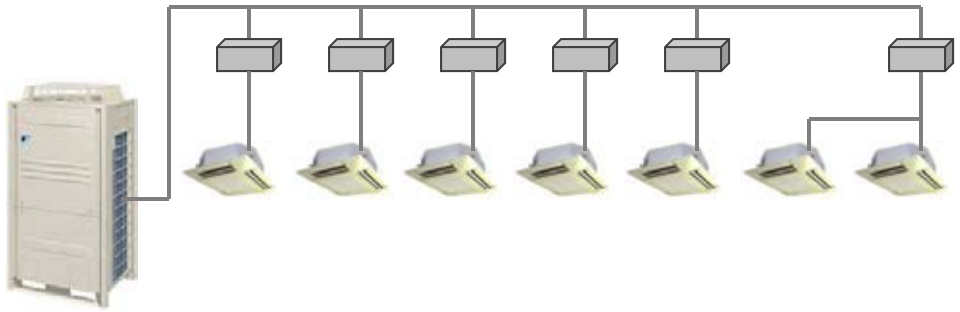
Binary number for each LED



The number of BS Boxes counted will flash in binary code on the H1P to H7P LEDs



- Press **"MODE"** 1 time
- Press **"SET"** 6 times
- Press **"RETURN"** & count up the LED's
- Press **"MODE"** one time to return to normal status : H3P solid



VRVIII System Commissioning – Service Tip

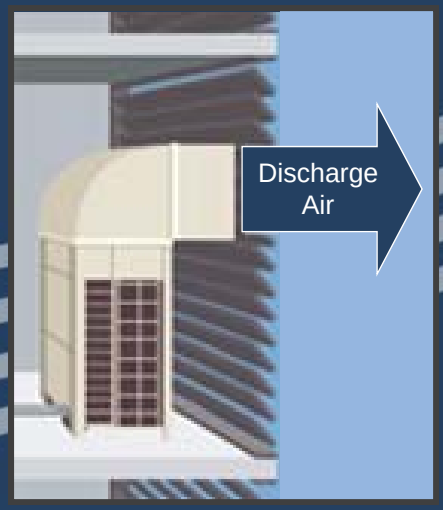
Indoor Fan Coil & BS Box - Communication Troubleshooting Tips

- Verify correct power supply voltage at fan coil
  - Green PCB status LED blinking
- Verify that all Remote Controllers have a display. This will also tell you that power is applied to the indoor units
- If there are Remote Controllers controlling more than one indoor unit, you must check the green LED on each PCB on the fan coils and branch selector boxes to see if it is flashing green. This will tell you that power is applied to the Indoor unit or BS box. Another method is to use your meter to check for voltage
- Turn on each Remote Controller one at a time. When you turn them on, note the error code if any appears on the display
- After you have turned them all on, you should see a pattern of the error codes. The pattern should show a few of the controllers with different error codes. The remote(s) with a different code is a good place to start checking your control wiring
- Check the control wiring to insure the conductors are connected to the correct terminals and 16vdc is measured
- On installations which have *VRVIII* Heat Pump and Heat Recovery systems, Branch Selector boxes should be counted on the Heat Pump systems to verify correct system control wiring – no crossover
- After the issues are corrected, recycle power to the outdoor unit (Initialization mode starts) and press the **"RESET"** button once on the Control PCB. This will enable the indoor unit or BS box to have an address assigned.

System Commissioning

Selected Condenser Field Setting Commissioning Step #14

Outdoor Fan High Static

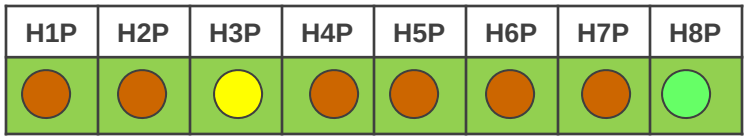


Required for interior condenser installations where the discharge air is ducted to outside of the building

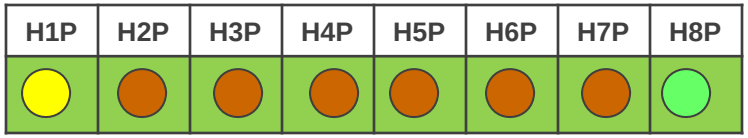
VRVIII System Commissioning – Step #14

Condenser "Fan High Static Setting"

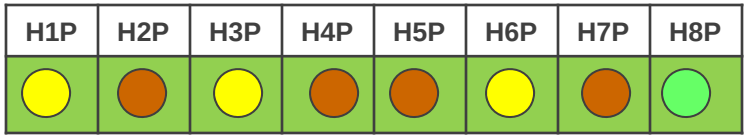
- **START** - Normal Status



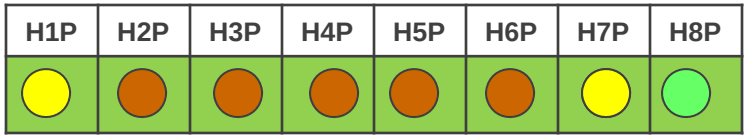
- Press and HOLD the **"MODE"** button (Service Mode 2) until H1P light is Solid



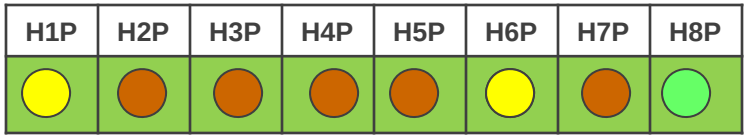
- Press the **"SET"** button 18 times
  - LEDs will indicate binary number for every press of the "SET" button 0+16+2



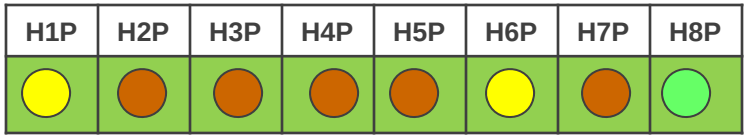
- Press the **"RETURN"** button once H7P will come on flashing.



- Press the **"SET"** button once to turn ON, H6P will come on flashing

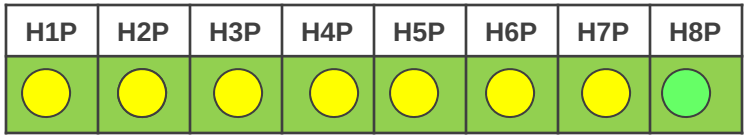


- Press the **"RETURN"** button once to lock on, H6P will go solid



- Press the **"RETURN"** button once to activate the High Static Fan setting, all yellow lights will be ON

  Outdoor Fans now operating at .32" wg.



- Press the **"MODE"** button to return to Normal mode, H3P will be on solid

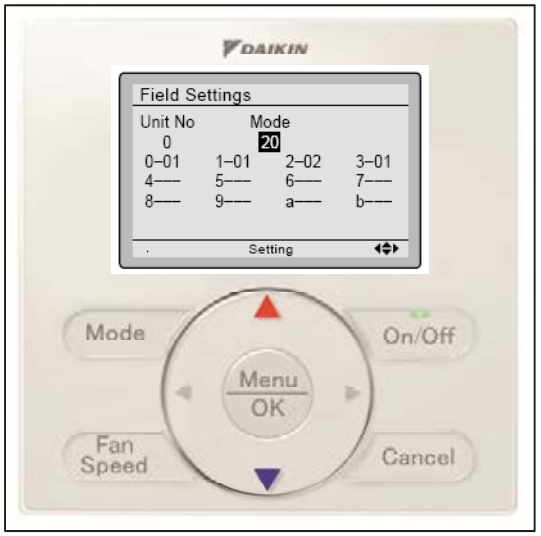
System Commissioning

Selected Indoor Unit Field Settings Commissioning Step #14

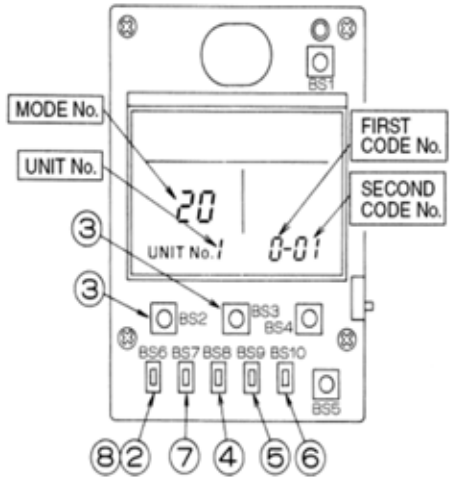
VRVIII System Commissioning – Step #14

Fan Coil Field Settings

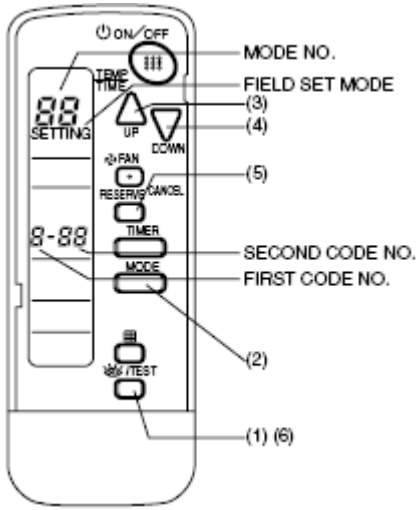
- System communications is now verified and operational
- At this point, all ductwork has been verified to be connected including all air filters installed
- Fan Coil Field Settings related to airflow static pressure adjustments must now be programmed before "Check Operation" is enabled and *Auto Charge,* if used. This is to insure maximum system performance and efficiency, and accurate system refrigerant charging when *Auto Charge* is used
  - Ducted fan coils must have static pressure adjusted or programmed if needed
  - FXMQ-P fan coils will need static pressure adjusted
  - Ceiling Cassette fan coils must be programmed for Supply Air distribution and ceiling height to properly set fan speed if needed
- For Field Setting listings, refer to Fan Coil and Remote Controller Installation Manuals



Navigation Remote



Simplified



Wireless

VRVIII System Commissioning – Step #14

Fan Coil Field Settings

- Field settings provide unique features and functions to be programmed into the control system for selected fan coil(s) connected to a remote controller.
- Only those program codes that apply to the connected fan coil(s) will appear in the Field Settings code display on the Remote Controller.
- There are two Modes for each setting; “Group” & “Individual”
- The first set of 2-digit numbers refers to **Group** and **Individual**, Group is the first number & Individual is in the parenthesis
- **“Group ##”** is used if there is only one indoor unit per Remote Control or the setting you chose is intended for all indoor units being controlled by the connected Remote Controller
- **“Individual (##)”** is used when there is more than one indoor unit being controlled by one Remote Control and the settings being programmed are intended for one of the indoor units in the group

Mode No. (Note 1)	First Code No.	Description	Second Code No. (Note 2) (Cells in bold are factory default settings)			
			01	02	03	04
10(20)	2	Priority of thermistor sensors for space temperature control	The return air thermistor is primary and the remote controller thermistor Is secondary.	Only the return air thermistor will be utilized.	Only the remote controller thermistor will be utilized.	--
	5	Room temperature value reported to multizone controllers	Return air thermistor	Thermistor designated by 10-2 above **(Note 3)**	--	--
	6	The remote controller thermistor is used in Remote Controller Group	No	Yes	--	--
12(22)	0	KRP1B71 X1-X2 status output	Indoor unit Thermo-On/Off status	--	Indoor unit Operation On/Off status	Indoor unit Alarm status
	1	Indoor unit T1-T2 input	Forced Off Closed Contact-Indoor unit is forced off and Central Control icon is displayed. Unit cannot be turned on manually. Operation can be overridden by central control. Open Contact-Indoor unit can resume normal operation. Unit must be turned on manually or by central control.	On/Off Closed Contact-Indoor unit is turned on. Open Contact-Indoor unit is turned off. Unit responds to last command, i.e., unit can be turned on manually or by central control after circuit has opened. Operation is prohibited when remote controller On/Off control is restricted by a multizone controller.	External Protection Device Closed contact-Unit shall resume normal operation. Open contact-Unit shall shut down and generate an A0 error.	
	2	Thermo-On/Off deadband **(Note 4)**	2F (1C)	1F (0.5C)	--	--
	3	Fan Speed in Heating Thermo-Off	LL	User set	Off	--
	6	Fan Speed in Cooling Thermo-Off	LL	User set	Off	--
	8	Return air sensor offset	2C	None (for remote sensor)		

VRVIII System Commissioning – Step #14

Fan Coil Field Settings

- Field Setting codes are comprised of 3 segments: [Example 12 -1- 03]
  - **Mode No.** – Program Setting for 1 fan coil or Group within Setting Contents
  - **First Code No.** - Setting Contents
  - **Second Code No.** - Specific Operation or Setting
- Specific Field Setting codes for a particular fan coil can be found in the Fan Coil Installation Manual or Service Manual
  - Any Field Setting codes that do not apply to the particular fan coil will not appear or be selectable
- Field Settings are programmed to permanent memory in the Fan Coil(s) Control PCB

EXAMPLE: Field Setting for assigning the room temperature sensor

Mode No. (Note 1)	First Code No.	Description	Second Code No. (Note 2) (Cells in bold are factory default settings) 01	02	03	04
10(20)	2	Priority of thermistor sensors for space temperature control	The return air thermistor is primary and the remote controller thermistor Is secondary.	Only the return air thermistor will be utilized.	Only the remote controller thermistor will be utilized.	--
	5	Room temperature value reported to multizone controllers	Return air thermistor	Thermistor designated by 10-2 above **(Note 3)**	--	--
	6	The remote controller thermistor is used in Remote Controller Group	No	Yes	--	--

VRVIII System Commissioning – Step #14

Fan Coil Field Settings – FXMQ_P Auto Static Adjust

- Enter the Field Setting into the Remote Controller
  - **11(21) 7-03 Start Auto Adjust**
- Save Field Setting and exit to main display
- Select FAN mode
- Place Remote Controller into the ON operation with solid status LED
- Fan Coil will go into the Auto Adjust mode and run the blower for 8 to 10 mins.
- On completion of the operation, fan will shut down and status LED on the Remote Controller will go Off.
- After unit shuts down check to see that Field Setting 11(21) 7-<u>03</u> has changed to 11(21) 7-<u>02</u>, this indicates successful completion of Auto Airflow Adjustment

MODE NO.	FIRST CODE NO.	Setting contents
11 (**21**)	7	Airflow adjustment
SECOND CODE NO.		
01	02	03
OFF	Completion of airflow adjustment	Start of airflow adjustment

NOTE: If you choose to manually set static pressure the Field Setting for Auto Adjust must be OFF. Change code to: 11(21) 7-<u>01</u>

VRVIII System Commissioning – Step #14

Fan Coil Field Settings – FXMQ_P Manual Static Pressure Adjust

- Specific static pressure can be programmed based on the static pressure codes provided for the specific FXMQ_P capacity model
  - Static pressure codes are listed in the Installation Manual
  - Codes which do not apply to a specific capacity model are not selectable
- Field Setting Code: **13(23) 06- ##**
- "Auto Adjust" must be OFF 11(21)7-01

External Static Pressure	MODE NO.	FIRST CODE NO.	SECOND CODE NO.
0.12 inWG (*1)	13 (23)	06	01
0.20 inWG			02
0.24 inWG			03
0.28 inWG			04
0.32 inWG			05
0.36 inWG			06
0.40 inWG			07
0.44 inWG (*2)			08
0.48 inWG (*2)			09
0.52 inWG (*2)			10
0.56 inWG (*2)			11
0.60 inWG (*2)			12
0.64 inWG (*2)			13
0.72 inWG (*2)			14
0.80 inWG (*2)			15

VRVIII System Commissioning – Step #14

Fan Coil Field Settings – FXDQ Static Pressure Change

- To change static from “Standard” to “High”, a field setting must be programmed at the remote controller
- Change Field Setting **13(23) 5 – <u>01</u>** to **<u>02</u>**
- This static pressure change to HIGH is recommended for all FXDQ ducted applications

Mode No. Note 2	Setting Switch No.	Setting Contents	Second Code No.(Note 3)			
			01	02	03	04
13(23)	0	Setting of normal air flow	N	H	S	—
	1	Selection of air flow direction (Set when a blocking pad kit has been installed.)	F (4 directions)	T (3 directions)	W (2 directions)	—
	3	Operation of downward flow flap: Yes/No	Equipped	Not equipped	—	—
	4	Field set air flow position setting	Draft prevention	Standard	Ceiling Soiling prevention	—
	5	Setting of static pressure selection	Standard	High static pressure	—	—

VRVIII System Commissioning – Step #14

Fan Coil Field Settings – FXFQ Ceiling Height Setting

- To insure proper air flow delivery, it is recommended to set the actual ceiling height field setting code
- To change setting from “Standard” to “High 1” or “High 2”, a field setting must be programmed at the remote controller
- Go to Field Setting 13(23) 0 - ##
- Second Code: 01 = Standard, 02 = High 1, 03 = High 2

		FXFQ - PVJU		Mode No. Note) 1	FIRST CODE NO.	SECOND CODE NO.
		09 · 12 · 18 · 24 · 30 type	36 · 48 type			
Ceiling height (ft.)	Standard · All round outlet	≤ 8-3/4	≤ 10-1/2	13 (23)	0	01
	High ceiling 1	8-3/4 - 10	10-1/2 - 12			02
	High ceiling 2	10 - 11-1/2	12 - 13-3/4			03

VRVIII System Commissioning – Step #14

Fan Coil Field Settings – FXFQ_P & FXZQ_M7 Air Discharge Settings

- When the 4-way ceiling cassettes require changes to the discharge positions to 2-way or 3-way, a field setting change is required along with the blank-off kit
- To change setting from the factory default of 4-way discharge 13(23) 1-01, the change must be programmed at the remote controller
- Go to Field Setting 13(23) 1, and change the second code:
- Second Code: 02 = 3-way, 03 = 2-way

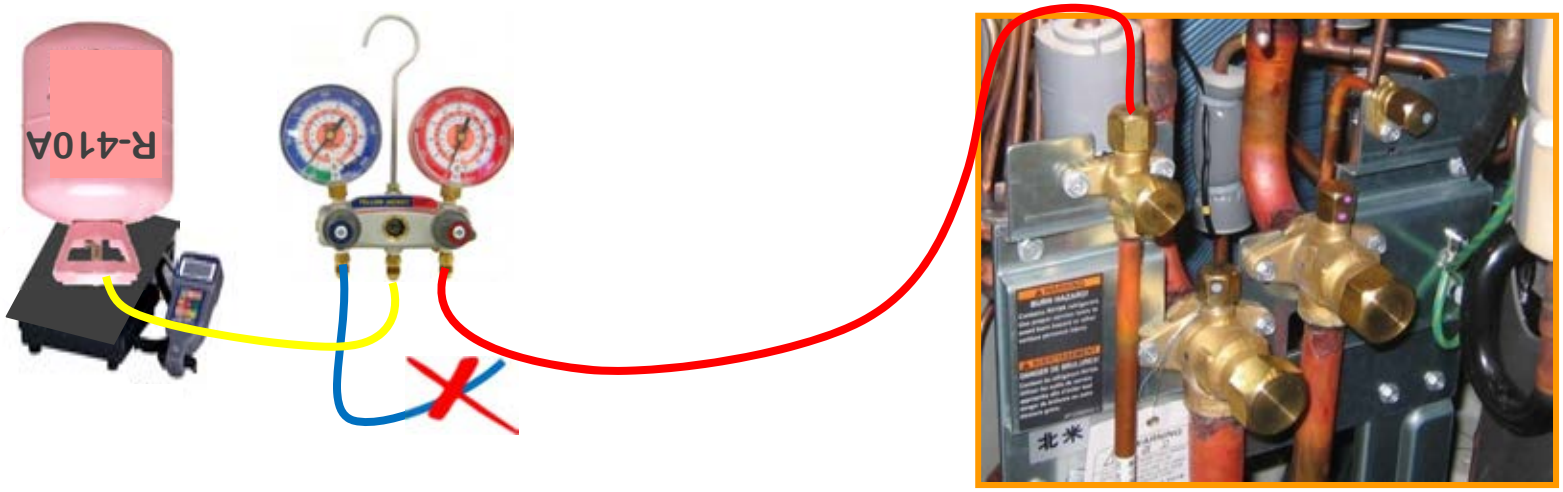
	Mode No.	First Code	Setting Contents	Second Code No.			
				01	02	03	04
	13(23)	1	Selection of airflow direction	F (4 directions)	T (3 directions)	W (2 directions)	-

System Commissioning

Manual System Refrigerant Charging Commissioning Step #15

VRVIII System Commissioning – Step #15

VRVIII Refrigerant Charging – "Additional Refrigerant Charge Mode"

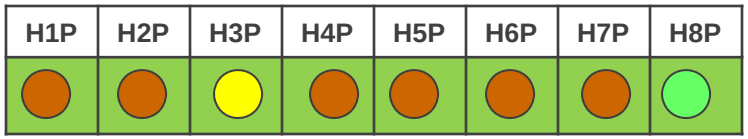


- The "Additional Refrigerant Charge Mode" is used when there is not enough system vacuum from the final evacuation cycle to completely charge the system
- Close the Liquid Stop Valve – Gas Stop Valve(s) are open
- Connect the high side manifold hose to the Liquid service port, and bleed the hose
  - Low side manifold hose is not used for this procedure
  - On manifolded systems connect high side hose to the Master condenser only
  - Refer to the weight of refrigerant taken on the last cycle of the triple evacuation operation
- Initiate the "Additional Refrigerant Charge Mode" at the condenser Control PCB
  - When the total calculated refrigerant charge is taken based on the scale reading, close off the High side gauge
  - Press the **"MODE"** button to terminate the operation
  - Close off the refrigerant bottle valve and remove the hose
  - Open the Liquid Stop Valve

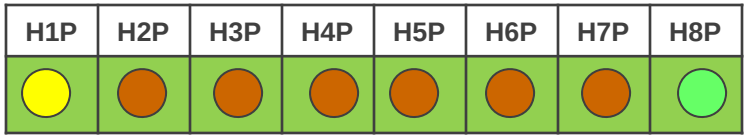
VRVIII System Commissioning

"Additional Refrigerant Charge Mode"

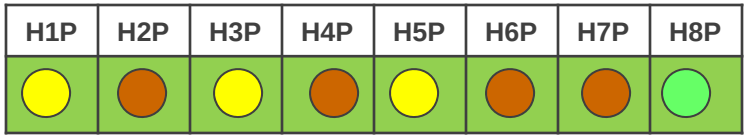
- **START** - Normal Status



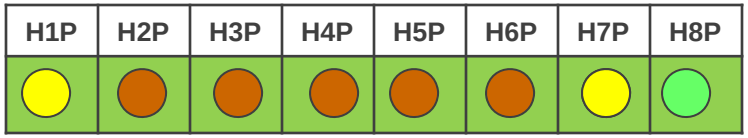
- Press and HOLD **"MODE"** button (Service Mode 2) until H1P goes Solid



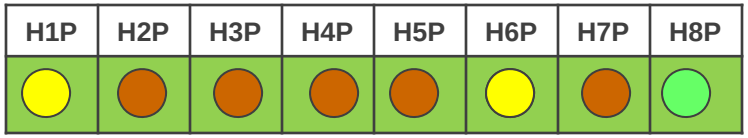
- Press the **"SET"** button 20 times
  - LED will indicate binary number for every press of the **"SET"** button 0+16+4



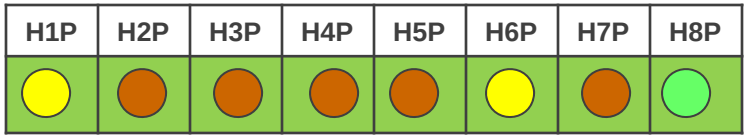
- Press the **"RETURN"** button once, H7P comes on flashing



- Press the **"SET"** button once H6P comes on flashing

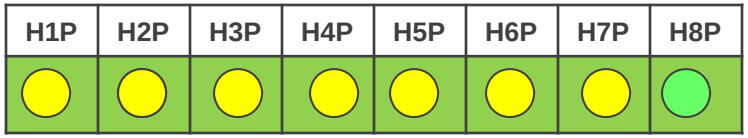


- Press the **"RETURN"** button once, H6P comes on solid



- Press the **"RETURN"** button once to activate the setting, all yellow lights come on

  Close Liq. Stop valve – HP/LP Gas stop valve(s) open. Add Liquid Refrigerant now thru Liq. Service port



- Press the **"MODE"** button to return to Normal mode, H3P comes on solid

System Commissioning

Alternate System Refrigerant Charging “Auto Charge”

Commissioning Step #15

VRVIII System Commissioning – Step #15

Auto Charge Mode

NOTE: *Auto Charge* cannot be used on systems that include the FXTQ Air Handlers or the FXMQ_MF O.A. Processors

- The *Auto Charge* feature may be used as an alternative means of system refrigerant charging, however certain restrictions and limitations apply
- During *Auto Charge* Mode, the system will automatically select Cooling or Heating mode based on the following temperatures

Outdoor Temp: 32°F DB ~ 109°F DB Indoor Temp: 50°F DB ~ 90°F DB		Cool Mode
Below 32°F OD Temp / 50°F Ind. Temp		Heat Mode

- Cool Mode: *Auto Charge* will charge the system and shut off automatically
- Heat Mode: *Auto Charge* must be manually terminated when the full calculated "Additional Refrigerant Charge" amount is weighed into the system
- LED light combinations will indicate which mode is chosen

NOTE: *Auto Charge* does not display the amount of refrigerant charged

VRVIII Auto Charge Limitations

Connection Ratio Limitations When Using Auto Charge

Connection Ratio limitations are determined by the vertical separation between the Condenser and Indoor Fan Coils and the type of connected fan coils in the system

Example: FXMQ_M with 210ft vertical separation - Condenser above Fan Coil

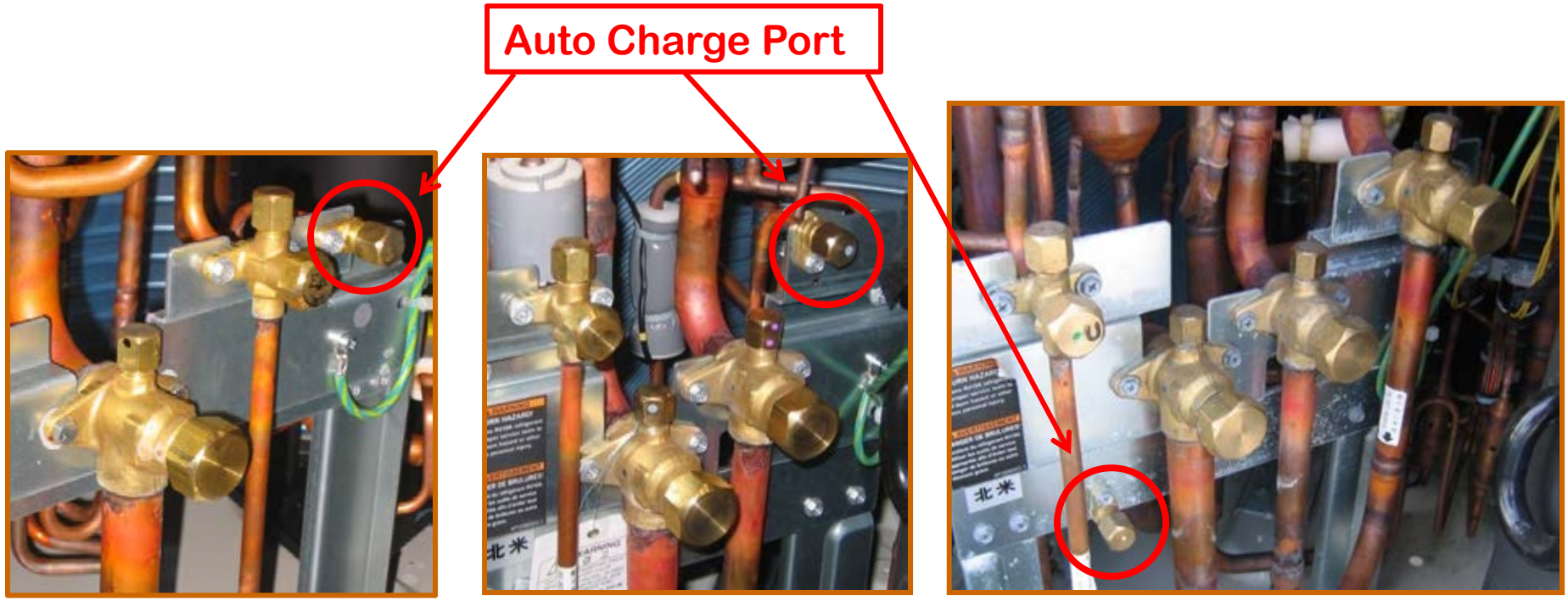
Vertical Separation Connection Ratio between Condenser and Indoor Units

	CU Located Below FC										CU Located Above FC			
	0-133ft		134-200ft		201-216ft		217-266ft		267-295ft		0-164ft		165-295ft	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
FXFQ														
FXMQ_M														
FXHQ FXL/NQ FXZQ	60%	130%	80%	130%	90%	130%	100%	130%	110%	130%	60%	130%	80%	130%
FXDQ FXMQ_P FXAQ	60%	200%	80%	200%	90%	200%	100%	200%	110%	200%	60%	200%	80%	200%

VRVIII System Commissioning – Step #15

Auto Charge Mode – Step 1

- Connect high side gauge hose to the *Auto Charge* port (5/16”) – Bleed hose
- Connect R-410A refrigerant bottle and purge the hoses
- Set refrigerant bottle on a digital scale to charge liquid only
- Install condenser front panels but leave area open to see the PCB status LEDs and access to the programming buttons

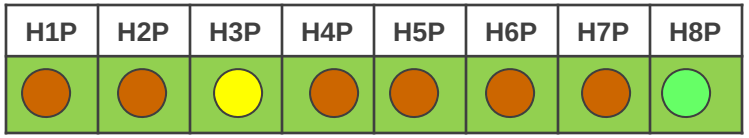


RXYQ 2-Stop Valves | RXYQ-REYQ 3-Stop Valves | REMQ 4-Stop Valves

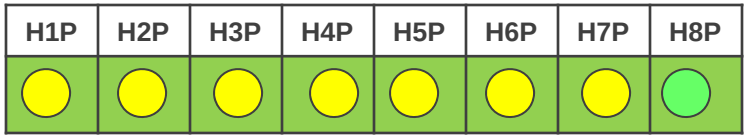
VRVIII System Commissioning – Step #15

Auto Charge Mode – Step 2

- Verify that all Remote Controllers are in the “OFF” mode before starting Auto Charge

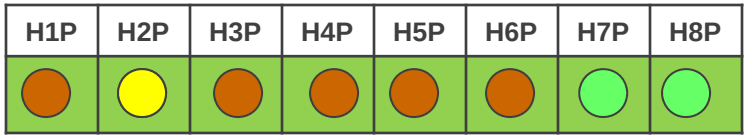


- To begin the *Auto Charge* operation Press the **“TEST”** button once, H1P to H7P go on solid

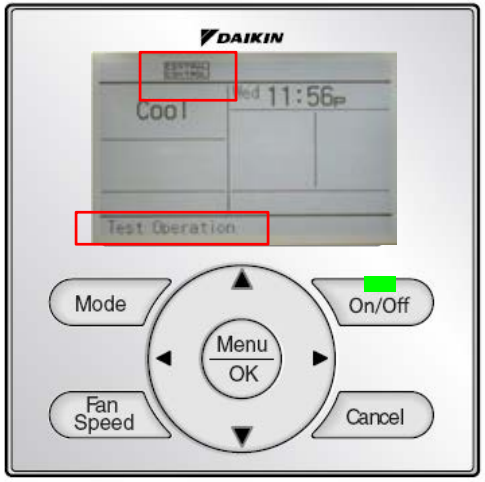


JUDGEMENT Mode

- Press and HOLD the **“TEST”** button for 5 sec. until LEDs change to H2P flashing



- The **NAV** Remote Controllers will indicate CENTRAL CONTROL and “Test Operation” with system status LEDs ON solid
- The **Simplified** remote Controllers will indicate the Central Control symbol with the status LED on solid
- All function buttons are disabled



BRC1E72

BRC2A71

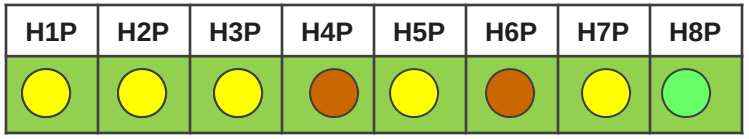
VRVIII System Commissioning – Step #15

Auto Charge Mode – Step 3 "Judgment Mode"

- *Auto Charge* will bring on all indoor & Outdoor fans, then compressor - When Indoor and Outdoor temps are verified to be within the temperature ranges (approx 15 mins.)
- *Auto Charge* will select the **Cool** mode & automatically stop when charging is complete

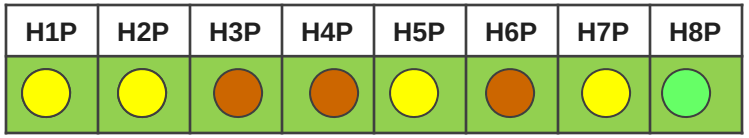
Outdoor Temp 32°F DB – 109°F DB	Indoor Temp 50°F DB – 90°F DB

COOL Mode

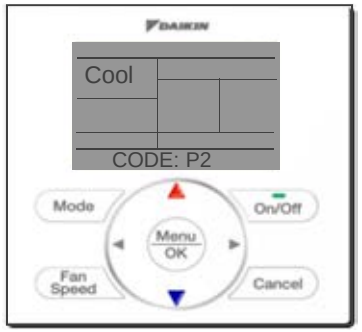


- If the Indoor/Outdoor temperatures are below the stated ranges, **Heat** mode will be selected for manual charging

HEAT Mode



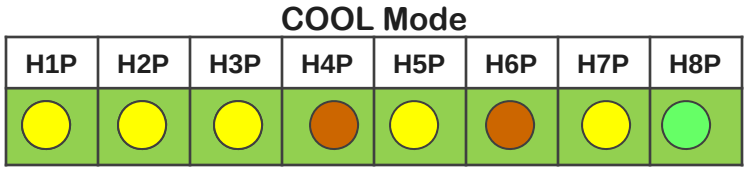
- When either of these LED light patterns appear, the **"TEST"** button must be pressed within 5 mins.
  - **"P2"** error code will appear on Remote Controllers if "TEST" button is not pressed before timeout. Operation will stop and require restarting

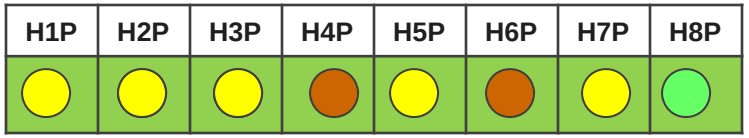


VRVIII System Commissioning – Step #15

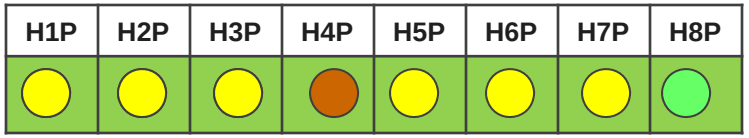
Auto Charge Mode – Step 4 Charging System in Cool Mode

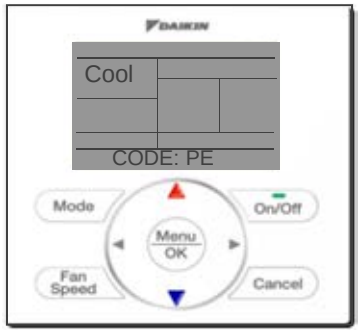
- When LED light pattern indicates charging in the COOL mode, press the **"TEST"** button within 5 min.
- After the **"TEST"** button is pressed, open refrigerant gauge to the *Auto Charge* port to allow liquid refrigerant to flow into the system





- When the LED light pattern changes to this sequence, a "PE" code will appear on the Remote Controllers. Charging is almost complete

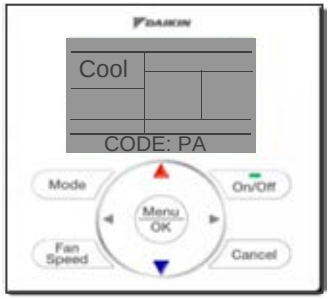




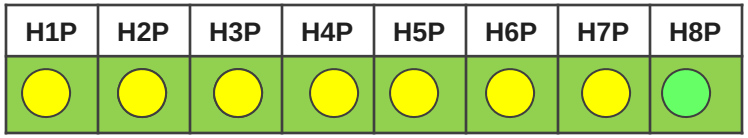
VRVIII System Commissioning – Step #15

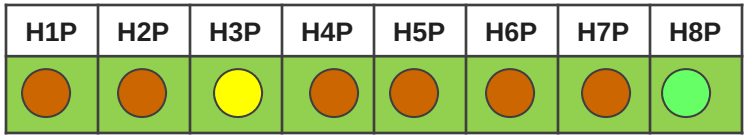
Auto Charge Mode – Step 5 Charging System in Cool Mode

- If during the charging process the refrigerant bottle becomes empty, Auto Charge will go into a 5 min. standby to change bottles and a “PA” code will appear on the Remote Controllers
- If the 5 min time frame lapses before the bottle is replaced, Auto Charge will stop and a “P2” code will appear requiring an operation restart.



- When this LED light pattern appears, charging is complete, *Auto Charge* will stop the refrigerant flow and a “P9” code will appear on the Remote Controllers
- Press the **“MODE”** button to terminate *Auto Charge* operation
  - Close off the refrigerant bottle and manifold gauge: remove charging hose
  - Document the weight of refrigerant charged from the scale





VRVIII System Commissioning – Step #15

Auto Charge Mode – Step 6 Record the TOTAL Additional Charge

- When Auto Charge is complete, record the amount of the refrigerant charge from the scale including the "Additional Charge" amount in the box on the access panel label
  - It is possible for Auto Charge to draw in a slightly higher or slightly lower amount of refrigerant than the manual calculation
- Enter the system commissioning date

REQUEST FOR THE INDICATION OF SETTING CONTENTS, ADDITIONAL REFRIGERANT CHARGING AMOUNT AND INSTALLATION DATE

AFTER FILLING OUT THE BELOW, PLEASE PUT IT ON THE BACK SIDE OF FRONT PANEL

1. RECORD FOR SETTING CONTENTS
FOR THE SETTING CONTENTS OF Ⓓ~Ⓗ IN THE [SETTING MODE 2], MARK ○ IN THE RIGHT TABLE.

Ⓓ NIGHT - TIME LOW NOISE SETTING	OFF · LEVEL1 · LEVEL2 · LEVEL3
Ⓔ EXTERNAL LOW NOISE LEVEL SETTING	LEVEL1 · LEVEL2 · LEVEL3
Ⓕ DEMAND LEVEL SETTING	LEVEL1 · LEVEL2 · LEVEL3
Ⓖ EXTERNAL LOW NOISE DEMAND SETTING	OFF · ON
Ⓗ HIGH STATIC PRESSURE SETTING	OFF · ON

2. RECORD FOR ADDITIONAL REFRIGERANT CHARGING AMOUNT
MAKE SURE TO RECORD THE ADDITIONAL REFRIGERANT CHARGING AMOUNT.
(IF DO NOT USE AUTOMATIC REFRIGERANT CHARGING, CALCULATE AND CHARGE THE ADDITIONAL REFRIGERANT CHARGING AMOUNT FOLLOWING AS SHOWN ON THE BELOW.)

ADDITIONAL CHARGING AMOUNT: **36.3** lb (ROUND OFF TO ONE DECIMAL PLACE.) =

REFRIGERANT AMOUNT FOR FIELD PIPING

LIQUID PIPE SIZE(in)	REFRIGERANT AMOUNT PER 1ft(lb/ft)	LENGTH OF LIQUID PIPE(ft)	SUB TOTAL
φ7/8	0.249	×	=
φ3/4	0.175	×	=
φ5/8	0.121	× 52	= 6.29
φ1/2	0.081	× 78	= 6.31
φ3/8	0.040	× 173	= 6.92
φ1/4	0.015	× 254	= 3.81

TOTAL **23.33** lb +

HEAT PUMP SYSTEM

MODEL NAME	THE AMOUNT OF REFRIGERANT
RXYQ96, 120, 216, 240, 336, 360P	0 lb
RXYQ72, 168, 192, 264, 288, 312P	1.1 lb
RXYQ144PBYD	2.2 lb
RXYQ144PBTJ	7.9 lb

+

REFRIGERANT AMOUNT FOR EXCEEDING CONNECTION CAPACITY OF INDOOR UNIT

INDOOR CONNECTION CAPACITY	MODEL NAME	
	RXYQ72 ~312P	RXYQ336 · 360P
MORE THAN 100% 120% OR LESS	1.1 lb	
MORE THAN 120% 130% OR LESS	1.1 lb	2.2 lb

3. RECORD OF INSTALLATION DATE DA 29 · MO 07 · YR 2011

VRVIII System Commissioning – Step #15

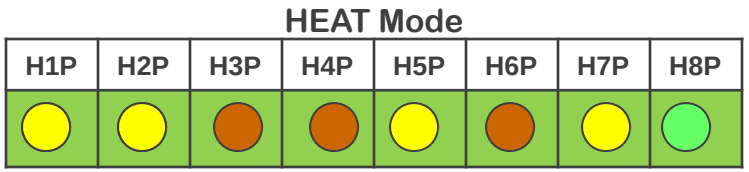
Auto Charge COOL Mode Status Codes

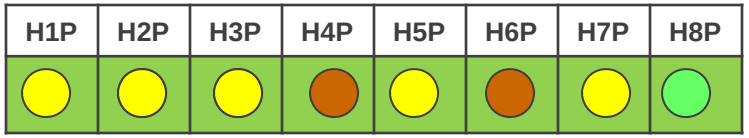
PE	**Charging is almost complete. Get ready to close refrigeration gauges.**	
PA **PH**	**The refrigeration tank is empty. Close refrigeration gauges and replace with full tank. Once tank is replaced and hose is purged, open refrigeration gauges again.** **Fan does not stop running and the outdoor unit does not stop running.**	
P8	**Close refrigeration gauges and restart the Auto Charge procedure.**	
P2	**Operation is interrupted. Close refrigeration gauges and check below items.** **• Check to see if all stop valves are open.** **• Check that the refrigerant tank is connected and open.** **• Check indoor units for blockage of air inlet and outlet.**	**After correcting the abnormality, restart the Auto Charge from the beginning.**
P9	**Charging is complete. Push "MODE" button (BS1). Close refrigeration gauges and disconnect tank from system.**	

VRVIII System Commissioning – Step #15

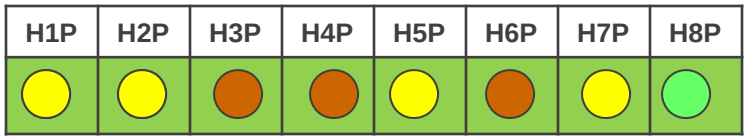
Auto Charge –Charging System in Heat Mode

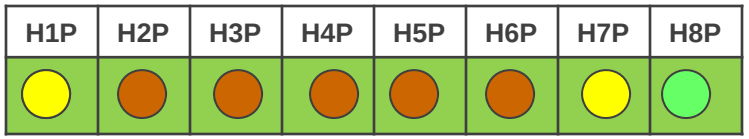
- When LED light pattern indicates charging in the HEAT mode H1P-H2P Flashing - Press the **"TEST"** button within 5 min.
- After the **"TEST"** button is pressed, open refrigerant gauge to the *Auto Charge* port to allow liquid refrigerant to flow into the system





- Manually weigh in the balance of the calculated "Additional Refrigerant Charge"
- When the total amount of refrigerant is charged, close off the manifold gauge and refrigerant bottle – Remove hose
- Press the **"RETURN"** button to stop *Auto Charge*

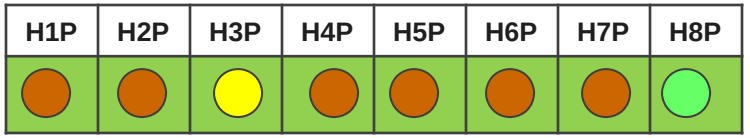




VRVIII System Commissioning – Step #15

Auto Charge Mode –Charging System in HEAT Mode

- Press the **"MODE" button** to terminate *Auto Charge* Heat operation
  - Close off the refrigerant bottle and manifoldld gauge: remove charging hose
  - Document the weight of refrigerant charged from the scale
  - The Remote Controllers return to normal display and OFF



Heat Mode Status Codes

P8	**Close refrigeration gauges and push "TEST" button (BS4) once. Restart the Auto Charge procedure.**
P2	**Operation is interrupted. Close refrigeration gauges and check below items.** • **Check to see if all stop valves are open.** • **Check that the refrigerant tank is connected and open.** • **Check indoor units for blockage of air inlet and outlet.**

System Commissioning

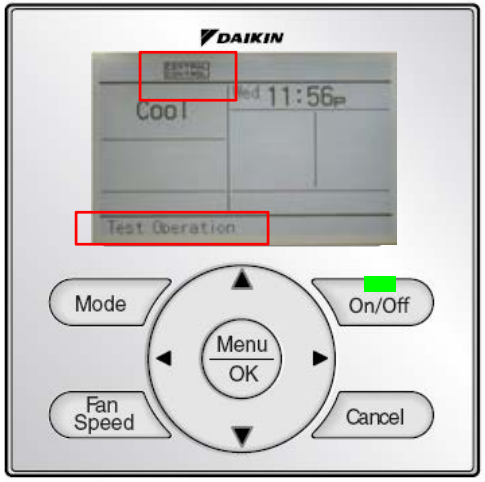
Check Operation Mode Commissioning Step #16

VRVIII System Commissioning – Step #16

Check Operation Mode

- Verify that all Remote Controllers are in the “OFF” mode before starting Check Operation mode or “U3” error will occur
- To start “Check Operation Mode Press and HOLD the **“TEST”** button for 5 sec. until LED light sequence changes to H2P flashing & H7P solid

- Check Operation will take approximately 45 to 60 minutes to complete depending on the size of the system and number of indoor units
- Check Operation always runs in the COOL mode



VRVIII System Commissioning – Step #16

Check Operation Mode Sequence

- **START** - Normal Status Press and HOLD **"TEST"** button

- **STEP 1** - Pressure Equalization Time: 10 sec. to 10 mins.

- **STEP 2** - Cooling Start Control Time: 20 sec. to 2 mins.

- **STEP 3** - Stop Valve Close Check

- **STEP 4 to 8** - Judgement Function
  - Wrong Wiring Check
  - Refrigerant Charge Check
  - Piping Length Check

- **STEP 9** - Pump Down Residual Op Time: 5 mins.

- **STEP 10** - Stand By for Restarting Time: 5 mins.

- Check Operation Completed Return to Normal status – Remote Controller back to normal display

VRVIII System Commissioning Step #16

Listing of potential error codes which could occur during Check Operation Mode

Error Code	Installation Error	Remedial Action
E3, E4, F3, F6, UF	The stop valve of an outside unit is left closed.	Open stop valve.
U1 (see pages 84 ~85 for additional help)	The phases of the power to the outside unit(s) are reversed.	Exchange two of the three phases (L1, L2, L3). Swap L2 & L3
U1, U4, LC	No power is supplied to an outdoor , BS or indoor unit (including phase interruption).	Check if the power wiring for the outside , BS or inside units are connected correctly.
UF	There is a conflict on the connection of transmission wiring in the system.	Check if the refrigerant piping line and the unit transmission wiring are consistent with each other.
E3, F6, UF	Refrigerant overcharge.	Recalculate the required amount of refrigerant from piping length and correct the refrigerant charge level by refrigerant recovery machine.
E4, F3	Insufficient refrigerant.	Check to see if additional refrigerant charge has been finished correctly. Recalculate the required amount of refrigerant from piping length and then add the adequate amount of refrigerant.
U3	The check operation has not been preformed.	Perform the check operation.
U7, U4, UF, UH	Field wiring is connected to Q1-Q2 terminals on outside unit PC-board when the system is one outdoor system.	Remove the wire from the Q1-Q2 terminals.

System Commissioning

Additional Field Settings Commissioning Step #17

VRVIII System Commissioning – Step #17

Additional Field Settings for Commissioning

- To complete the basic Commissioning procedures, any additional system field settings can now be programmed
- Indoor Units (examples)
  - Set Master Remote Controller for Heat Pump applications
  - T1 T2 Forced OFF
  - NAV Remote Sensor Priority
  - O. A. Processor H&C Supply Temp Set
  - Fan "AUTO" Configuration ("P" Revision fan coils only)
  - Fan Coil Power Louvers Position Set

- Selected additional field settings for commissioning
- Outdoor Unit
  - Refrigerant Recovery/Evacuation Mode
  - Additional Refrigerant Charge Mode
  - Monitor Mode 14 – Manifolded Condenser Error Code Identification

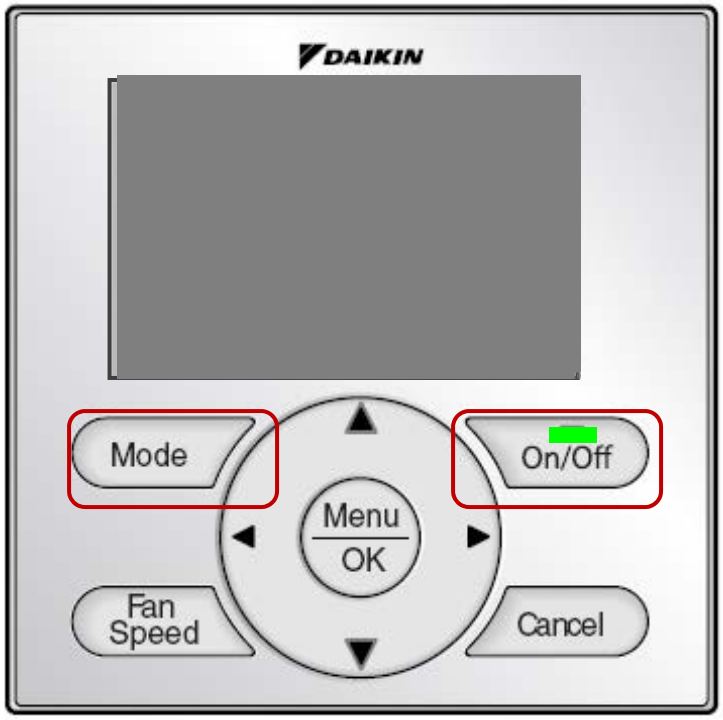
VRVIII System Commissioning – Step #17

Configure Remote Controller *Master* for Heat Pump Applications

- A designated Remote Controller must be configured as the Master in a Heat Pump system, or Heat Recovery where a Branch Selector Box is connected to multiple fan coils with individual Remote Controllers.
- To configure a **BRC1E72** (NAV Remote) as a Master
  - Press the **On/Off** button to bring on the display back light
  - The MASTER CONTROLLED icon will be flashing on all NAV remote controllers
  - Press the **"Mode"** button once and the Icon will disappear on the Master
  - All other NAV Remote Controllers (slaves) will display MASTER CONTROLLED solid
- To configure a **BRC2A71** (Simplified)
  - The Master Controlled symbol will be flashing ("Changeover Under Control") on all Simplified RC's
  - Press the **"Mode"** button once and the symbol will disappear on the Master
  - All other "Simplified" Slave Remote Controllers will display solid
- To change the Master, press & hold the **"Mode"** button for 5 sec. on the Master RC All RCs go into Master configuration mode

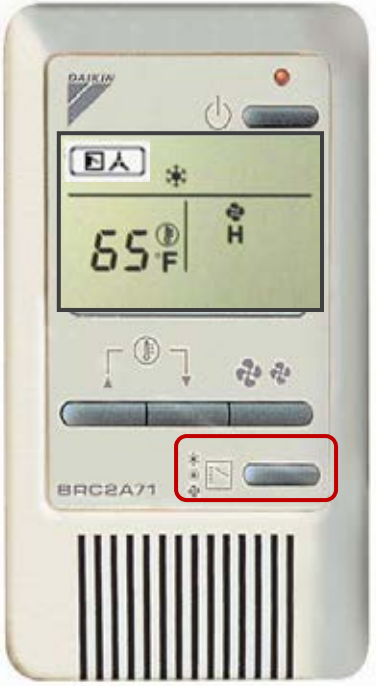
MASTER

BRC1E72 NAV Remote



MASTER

BRC2A71 Simplified



VRVIII System Commissioning – Step #17

Configure Wireless Remote Controller *Master*

- On power up of indoor units, all “Master Controlled” icons will be flashing on wired controllers ONLY. Wireless controllers will NOT display icon
- Go to the wireless controller you want set as the Master and while pointing the wireless controller at the fan coil
- Press and hold the **“MODE”** button for approx 4 seconds . You will hear “BEEP BEEP” then another “BEEP BEEP”
- To change the Master to different zone, go to the Master wireless controller and hold **“MODE”** button for 4 seconds. Listen for the “BEEP BEEP”
- Go to another remote and press **“MODE”** button

Wireless Hand-Held Remote Controller

VRVIII System Commissioning – Step #17

Fan Coil Field Settings – T1 T2 Forced Off – External Protection Device

- Any fan coils utilizing the optional condensate pumps must have the "Forced Off" field setting changed to accommodate the safety float switch operation (External Protection Device N.C.)
  - T1 T2 Forced Off has a factory default of N.O. Code 01
  - NOTE: When the float switch is connected to T1 T2 the Remote Controller will display
  - CENTRAL CONTROL or  and cannot be turned on manually unless the field setting is changed to 03.
- Change the field setting to **12(22) 1-03** for condensate float switch operation: N.C. with automatic reset

EXAMPLE: Field Setting for optional condensate pump float switch connected to fan coil T1 T2 Forced Off

Mode No. Note 2	First Code No.	Setting Contents	Second Code No. (Note 3) 01	02	03	04	Details No
	0	Optional accessories output selection (field selection of output for adaptor for wiring)	Indoor unit turned ON by thermostat	—	Operation output	Malfunction output	(5)
12 (22)	1	ON/OFF input from outside (Set when ON/OFF is to be controlled from outside.)	Forced OFF	ON/OFF control	External protection device input	—	(6)

Slide 94

EL1 This slide title did state "Step #14" but the slides before and after are "Step 17". I changed this slide, is that right?
Emmons, Linnie, 3/7/2013

VRVIII System Commissioning – Step #17

Indoor Unit Field Settings – T1 T2 Forced Off

- Forced Off is programmed for N.O. (Code 01) Manual Reset (Factory Setting)
  - Field Setting will reprogram dry contact configuration and restart sequence
    - Code 02 - ON-OFF operation (Start/Stop)
    - Code 03 – N.C. External Field Protection Device Auto Reset (Optional Condensate Pump Float Switch)

External Input	Mode No.	1st Code No.	2nd Code No.
Forced Off	12(22)	1	01 – Default Manual Reset
ON/OFF Op	12(22)	1	02
Ext Protection Device	12(22)	1	03 Auto Reset

VRVIII System Commissioning – Step #17

Indoor Unit Field Settings – T1 T2 Forced Off

Space Sensor priority can be changed for specific applications

- Return Air thermistor disabled (Direct fresh air / High ceiling return)
- FXTQ Air handler with BRC2A71 Simplified Remote Controller
- BRC1E71 Remote Controller Sensor Priority
- No Remote Controller used

Mode No. (Note 1)	First Code No.	Description	Second Code No. (Note 2) (Cells in bold are factory default settings)			
			01	02	03	04
10(20)	2	Priority of thermistor sensors for space temperature control	**The return air thermistor is primary and the remote controller thermistor is secondary.**	Only the return air thermistor will be utilized.	Only the remote controller thermistor will be utilized.	--

VRVIII System Commissioning – Step #17

Indoor Unit Field Settings – FXMQ_MF O.A. Processor Discharge Temperature Setting

- A dedicated BRC1E72 Remote Controller is required to control the O.A. Processor Unit
  - A field Setting programs the operating discharge temperature for Heat and Cool
  - Mode No. 14 (24)
  - First Code No. 3 – Cooling 4 – Heating
  - Second Code No. Heat Discharge Temp
  - Cool Discharge Temp

NOTE: The discharge air temperature is not displayed on the Remote Controller

		for cooling	for heating
Mode No.		14 (24)	14 (24)
FIRST CODE NO.		3	4
SECOND CODE NO.	01	55°F	64°F
	02	57°F	66°F
	03	59°F	68°F
	04	61°F	70°F
	05	63°F	72°F
	06	64°F	73°F
	07	66°F	75°F
	08	68°F	77°F
	09	70°F	79°F
	10	72°F	81°F
	11	73°F	82°F
	12	75°F	84°F
	13	77°F	86°F

VRVIII System Commissioning – Step #17

Indoor Unit Field Settings – VRV Fan "AUTO" Configuration

- **The VRV fan coils operate with constant fan operation in the Thermo-off mode (zone satisfied)**
  - Heat mode fan speed operates in LL speed
  - Cool mode fan speed operates on user selected speed: LL – H – HH
- **Fan operation in the Thermo-off mode may be reprogrammed by changing the field setting for Heat or Cool modes**

Fan Auto Configuration	Fan Speed **LL**	Fan Speed **User Set**	Fan Speed **OFF**
Fan Speed **Heat** Thermo-off	**12(22)-3-01 Default**	**12(22)-3-02**	**12(22)-3-03**
Fan Speed **Cool** Thermo-off	**12(22)-6-01**	**12(22)-6-02 Default**	**12(22)-6-03**

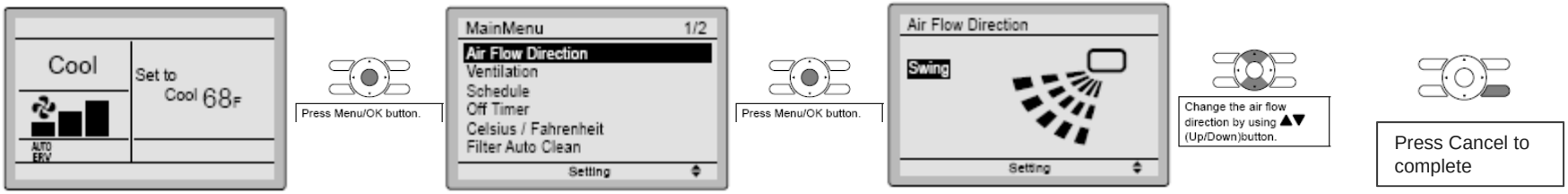
NOTE: Fan Auto Configuration is not available for the FXFQ_MVJU or FXHQ_MVJU fan coils

VRVIII System Commissioning – Step #17

Indoor Unit Field Settings – Power Louver Operation




- The VRV fan coils with power louvers (flaps) can be programmed
  - Power Louver settings are programmed from the BRC1E71 Navigation Remote Controller only
  - Factory set operation: louvers oscillate up and down automatically when the fan coil is ON
  - From the Main Menu on the BRC1E71 Remote Controller, the louvers can be programmed to a selected angle when the fan coil is ON



System Commissioning

Additional Field Settings - Condensers

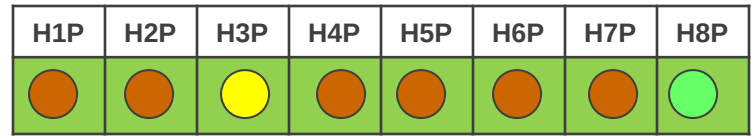
Selected Condenser Field Settings

- If during the course of system installation before commissioning, line voltage power was applied to the Fan Coils and Branch Selector Boxes, the *electronic expansion valves* will close. This will impede the pressure testing and evacuation procedures required to prepare the system for commissioning. Under these conditions, a service setting at the condenser for **"Refrigerant Recovery & Evacuation Mode"** can be used to re-open all of the system *electronic expansion valves*.
- When a system is to be manually charged with refrigerant, a service setting at the condenser for **"Additional Refrigerant Charge Mode"** can be used to manually draw in liquid refrigerant using the compressor.
  - All Remote Controllers are Off. The Liquid Stop Valve must be closed, leaving the Gas Stop Valve(s) Open. Liquid refrigerant will be manually charged through the Liquid Service Port.

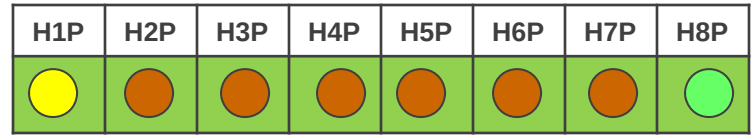
VRVIII System Commissioning

Refrigerant Recovery & Evacuation Mode

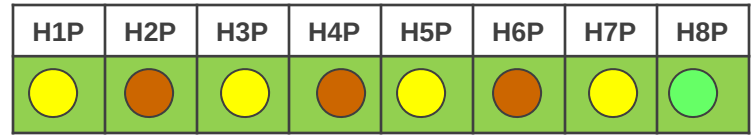
- **START** - Normal Status



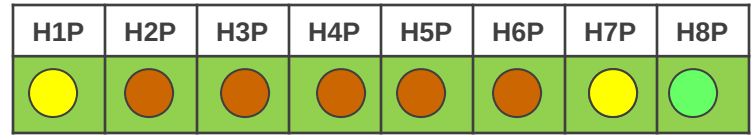
- Press and HOLD **"MODE"** button (Service Mode 2) H1P Solid



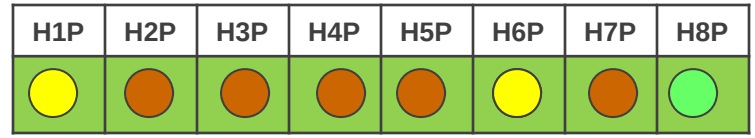
- Press the **"SET"** button 21 times
  - LED will indicate binary number for every press of the "SET" button 16+4+1



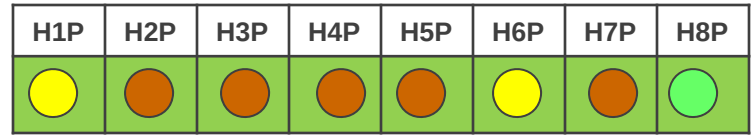
- Press the **"RETURN"** button once



- Press the **"SET"** button once to turn ON

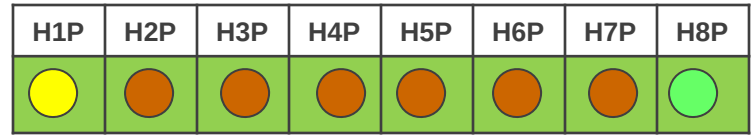


- Press the **"RETURN"** button once to lock on

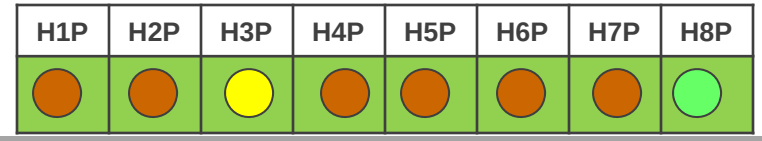


- Press the **"RETURN"** button once to activate the setting

  Pressurize, Evacuate, or Recover now



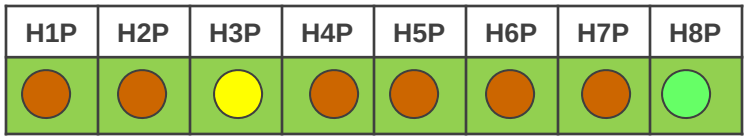
- Press the **"MODE"** button to return to Normal mode



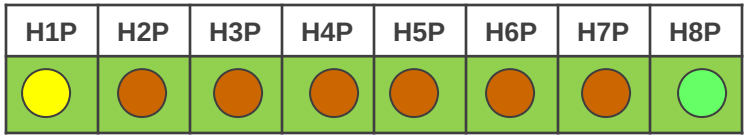
VRVIII System Commissioning

"Additional Refrigerant Charge Mode"

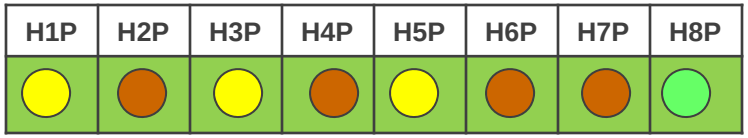
- **START** - Normal Status



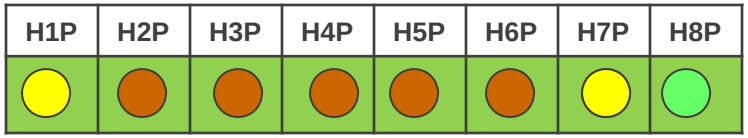
- Press and HOLD **"MODE"** button (Service Mode 2) H1P Solid



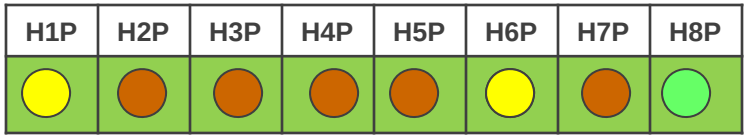
- Press the **"SET"** button 20 times
  - LED will indicate binary number for every press of the "SET" button 0+16+4



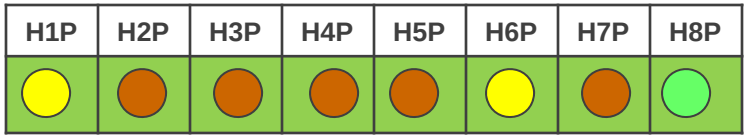
- Press the **"RETURN"** button once



- Press the **"SET"** button once to turn ON

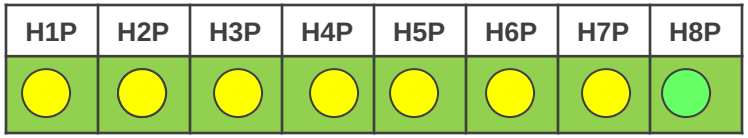


- Press the **"RETURN"** button once to lock on



- Press the **"RETURN"** button once to activate the setting

  Close Liq. Stop valve – HP/LP Gas stop valve open. Add Liquid Refrigerant now thru Liq. Service port

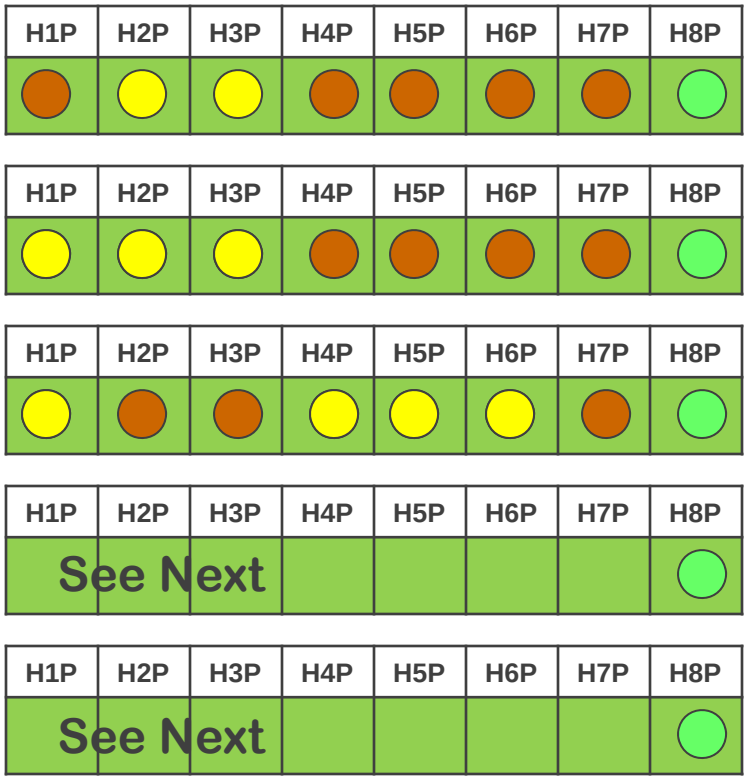


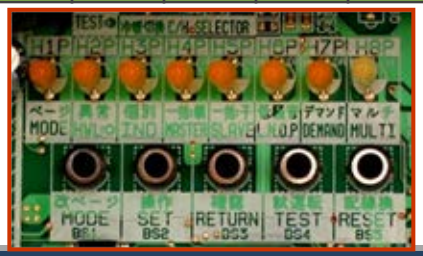
- Press the **"MODE"** button to return to Normal mode

VRVIII System Commissioning – Service Tip

Manifolded Systems “Monitor Mode 14” to determine condenser(s) with error code

- LED status on condenser power up
- Press “MODE” button once
- Press “SET” button 14 times
- Confirmation 1 – Press **“RETURN”** once “First Digit” See Page 87
- Confirmation 2 – Press **“SET”** once “Second Digit” See Page 88

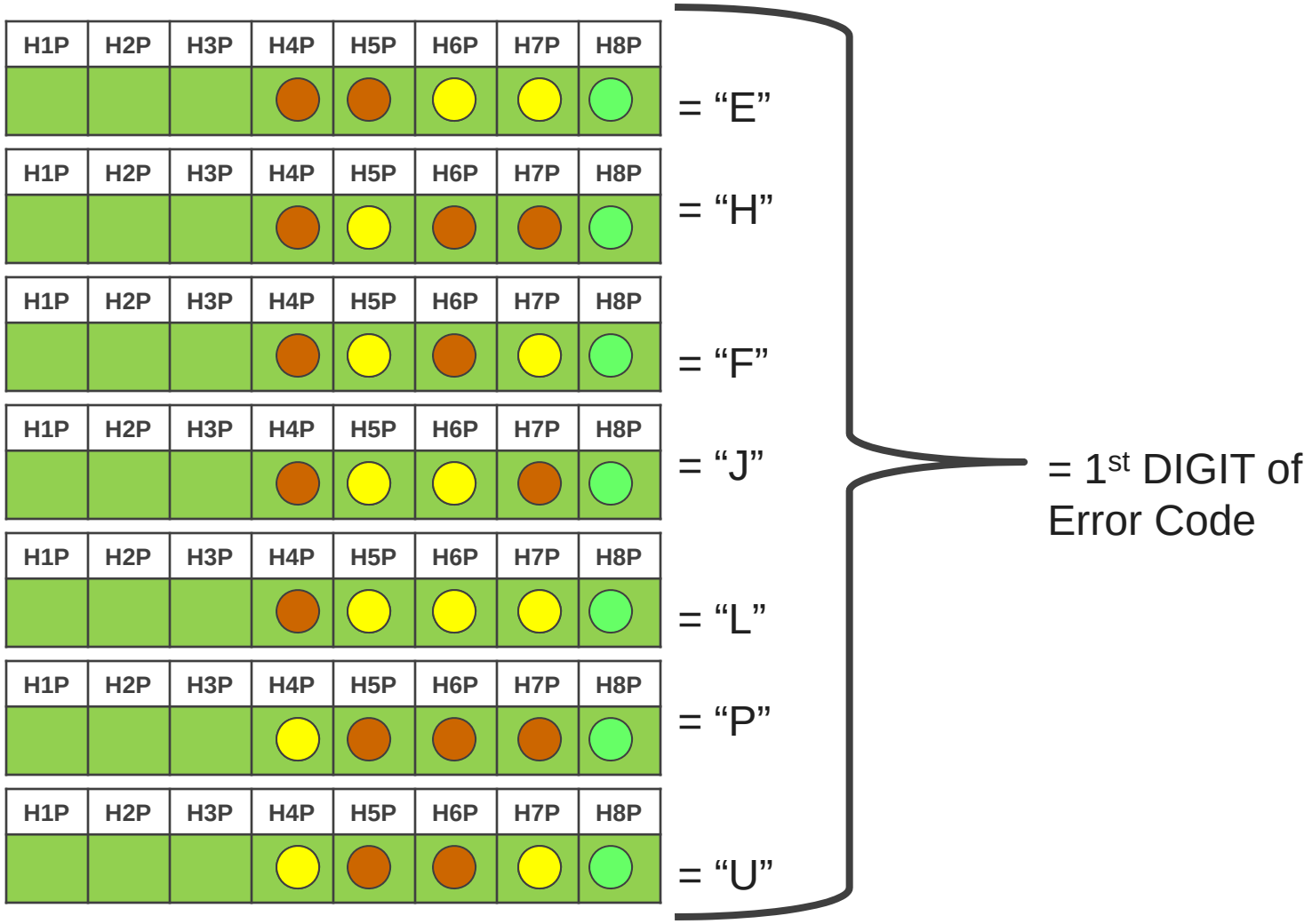




NOTE: This must be used along with the *VRVIII* Service Manual so as to accurately determine and interpret the error code

VRVIII System Commissioning – Service Tip

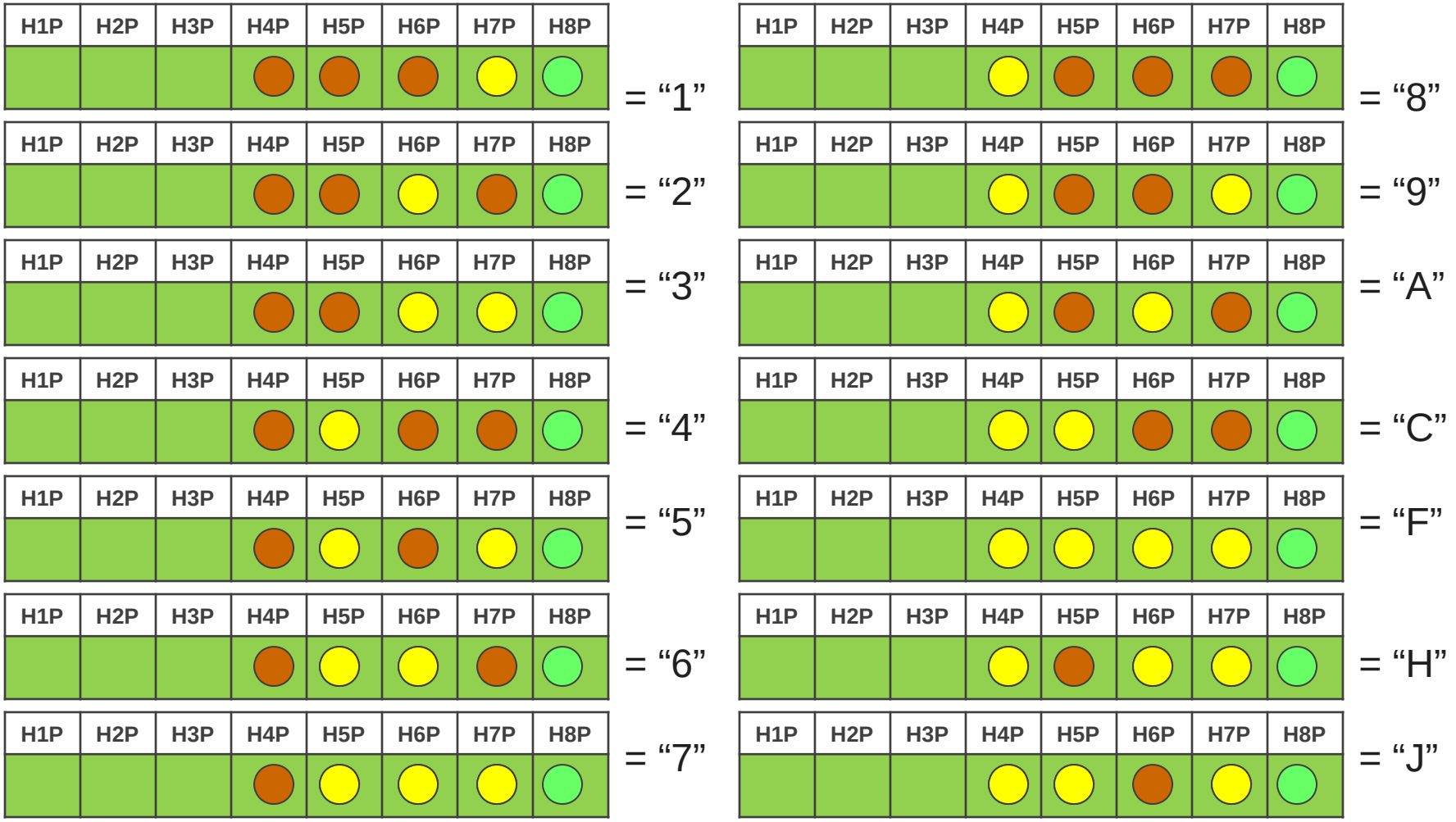
Monitor Mode 14 LED Sequence to Error Code
"Confirmation 1"- "RETURN" = 1st Digit of Error Code



Continue to next page for 2nd Digit of Error Code

VRVIII System Commissioning – Service Tip

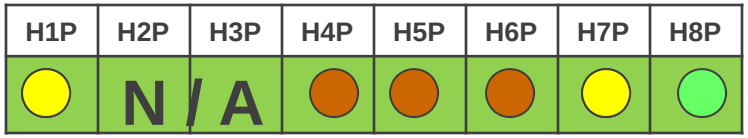
Monitor Mode 14 LED Sequence to Error Code
"Confirmation 2" - "SET" = 2nd Digit of Error Code



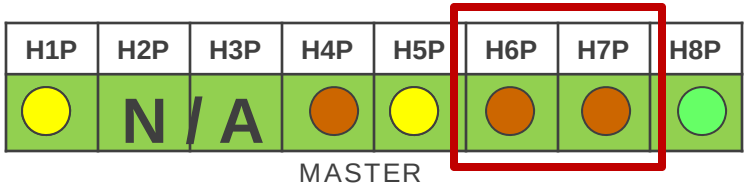
VRVIII System Commissioning – Service Tip

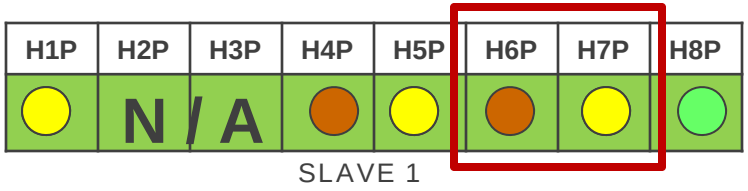
Monitor Mode 14 - to determine condenser(s) with error code Cont

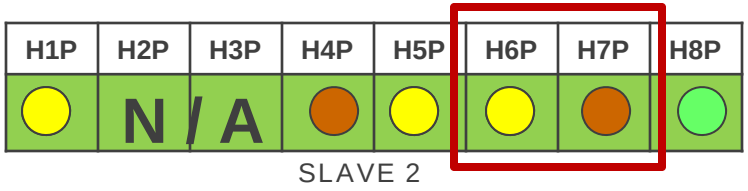
- **Confirmation 3 – Press "SET" button once** Display error location

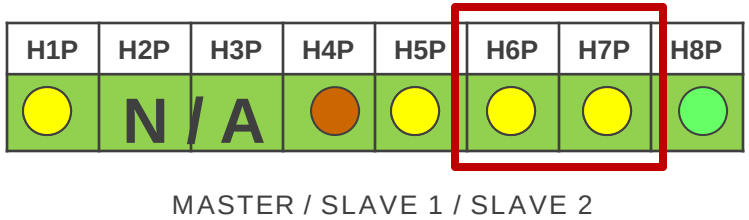


- **Confirmation 4 – Press "SET" button once** Display Condenser ID – Master/Slave1/Slave 2





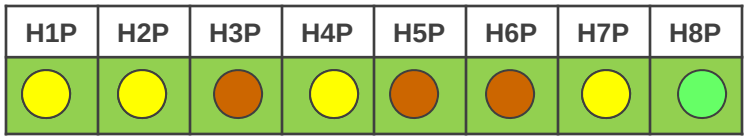




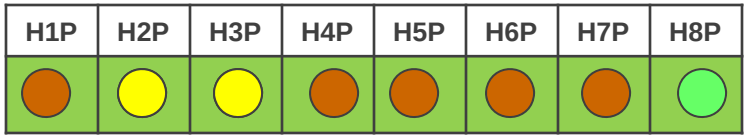
VRVIII System Commissioning – Service Tip

Manifolded Systems “Monitor Mode 14” to determine condenser(s) with error code Cont

- Press **“RETURN”** button once “Monitor Mode” initial status



- Press **“MODE”** to return to the original power up display with error.



- Power down the condensers and correct the error issues
- Restart all Condensers

VRVIII System Commissioning – Step #18

Commissioning Completion

- Before any *VRV* installation is considered complete, the *VRVIII* system should be operated in the cool mode and the heat mode to insure proper operation, depending on the outside ambient temperature limitations.
- On Heat Recovery systems, every zone should be cycled to verify that the Branch Selector Boxes are functioning properly.
- Centralized control systems should be configured and programmed after the *VRVIII* system or systems are fully operational.
- Copies of the *VRV* IOM's should be kept by the installing contractor and on the job site with the end user for future reference.

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Dr. Daikin

Diagnostic Tool

Fault Code Identification

Three ways to help with ERROR CODES:

WEB: *www.drdaikin.com*

MOBILE WEB: *http://mobile.drdaikin.com*

SMS TEXT: **Error** plus (**code**)

- send to 32075 -

Example: Error U4

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For more detailed information, refer to the Daikin *VRVIII* Service, Installation and Engineering Manuals. These materials are available as electronic copies through www.daikinac.com and TRL.

Thank You