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Compressor Change Out Procedure/Checklist

This procedure covers failed compressor change out on all VRV systems

ONLY PERSONNEL THAT HAVE BEEN TRAINED TO INSTALL, ADJUST, SERVICE OR REPAIR (HEREINAFTER, "SERVICE") THE EQUIPMENT SPECIFIED IN THIS MANUAL SHOULD SERVICE THE EQUIPMENT. THE MANUFACTURER WILL NOT BE RESPONSIBLE FOR ANY INJURY OR PROPERTY DAMAGE ARISING FROM IMPROPER SERVICE OR SERVICE PROCEDURES. IF YOU SERVICE THIS UNIT, YOU ASSUME RESPONSIBILITY FOR ANY INJURY OR PROPERTY DAMAGE WHICH MAY RESULT. IN ADDITION, IN JURISDICTIONS THAT REQUIRE ONE OR MORE LICENSES TO SERVICE THE EQUIPMENT SPECIFIED IN THIS MANUAL, ONLY LICENSED PERSONNEL SHOULD SERVICE THE EQUIPMENT. IMPROPER INSTALLATION, ADJUSTMENT, SERVICING OR REPAIR OF THE EQUIPMENT SPECIFIED IN THIS MANUAL, OR ATTEMPTING TO INSTALL, ADJUST, SERVICE OR REPAIR THE EQUIPMENT SPECIFIED IN THIS MANUAL WITHOUT PROPER TRAINING MAY RESULT IN PRODUCT DAMAGE, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

General Information & Safety Considerations

- IMPORTANT NOTE: This checklist does not supersede or substitute for other technical documentation such as Service Manuals, Installation Manuals/Installation Instructions, and/or Operation Manuals, but can be used in conjunction with such documentation. When servicing or maintaining VRV equipment, you should observe all warnings and cautions contained in such documentation.
- Always follow local codes.
- Refrigerant gas is heavier than air and displaces oxygen. A leak can result in oxygen displacement.
- Be sure to disconnect the power cable and follow OSHA lock out tag out procedures and all other recommended safety protocols.
- Working on equipment that is connected to the power supply may cause an electrical shock. If it is necessary to supply power to the equipment to conduct the repair or inspection of circuits, do not touch any electrically charged sections of the equipment.
- Do not allow the refrigerant to come in contact with skin.
- When disconnecting the suction or discharge pipes of the compressor, recover the refrigerant completely and cut the piping using a tubing cutter. NEVER unbraze a brazed joint! If there is refrigerant remaining inside the compressor, the refrigerant or compressor oil may discharge at a high temperature and pressure, possibly causing injury.

Why Cleanup is Necessary

Compressors are the heart of AC&R systems. As reliable as they are, they do fail. Motor burnout failures will break down refrigerant and oil into acids and sludge. Any sludge or carbon that is present usually consists of decomposed refrigerant and refrigerant oil and burned electrical insulating materials. If contaminants are present, it is likely that they have been circulated throughout the entire system.

All of the acids and contaminants in the system must be removed. If contaminants are not removed, it is expected that those contaminants will damage components in the system, including the windings of the new compressor.

When a compressor is replaced, the technician must determine what caused the failure and correct the problem. If the motor fails any of the three necessary electrical checks, ground fault test, winding continuity test or megohm test, it is likely an electrical failure has occurred. Before checking a compressor motor, make sure the compressor is cool to the touch. Confirmation using an oil test kit will verify. These tests will confirm that a burnout has actually occurred.

WARNING: The acids formed by a compressor burnout can cause severe burns. If it is necessary to come in contact with the oil or sludge from a failed compressor, rubber gloves and safety glasses should be worn to avoid a possible acid burn. Avoid breathing acid vapors and wear appropriate PPE for the job.

Customer/Technician Information

Date	Time Arrived	Time Departed
Customer Name		
Customer Point of Contact	Customer Point of Contact Phone	
Customer Email		
Service Address		
Service Company		
Address		
Lead Technician Name		Initials
Technician Name		Initials
Technician Phone	Company Phone	
Technician Email		

Building Type	No. of Floors	No. of Indoor Units	No. of Outdoor Units
Brief Description of Equipment Condition			
Other Job site Observations			

System Information - Outdoor Units

System Name

HP/HR Heat Pump

Master Model #

Serial #

Sub 1 Model #

Serial #

Sub 2 Model #

Serial #

Compressor Change Out Procedure Instructions/Recommendations

1) An acid test needs to be conducted to determine contamination of a system. Ensure acid test kit is designed for the appropriate refrigerant and compatible with PVE oil. Acid kit test can be obtained from your local supply house. **Follow acid test kit manufacturer guidelines.**

2) A more thorough refrigerant analysis can be conducted upon the contractor's discretion which will cover wider range of system contaminants parameters. **Follow test kit manufacturer guidelines in conducting this test.**
See Appendix Reference #1

3) Refrigerant recovery process is essential regardless of system contamination. Recovery/ Evacuation (Mode (2-21) from outdoor unit PCB) must be activated prior to refrigerant recovery to ensure free open system which will also lockout end user from operating equipment during recovery process. **Daikin does not recommend reusing recovered refrigerant after a compressor failure.**
See Appendix Reference #2

4) Disconnect power to indoor units first then outdoor units while system in Recovery / Evacuation mode. Refer to appendix for Recovery/Evacuation Mode procedure**.** After recovering refrigerant as per EPA regulation and Daikin recommendations, remove failed compressor from system and seal both connections to avoid further contamination if further tests are to be conducted.

5) If determination was made that system has an electrical burnout, system needs to be flushed out to remove any acid, scale and contaminants using commercial flushing agent such as RX-11 or equivalent. **Follow the flushing material manufacturers guidelines and recommendations.**

6) Temporary filter driers need to be installed in the system to ensure proper clean out and avoid further contamination of the system. Filter driers must be R410A rated and compatible with PVE oil. **Refer to filter drier manufacturers for capacity ratings and specifications.** Removable core filter driers are highly recommended for ease of replacement. Field installed filter drier bypass loop with isolation valves is highly recommended. (Refer to Appendix Reference #8 / Isolation Valve Specifications) for ease of filter drier replacement and refrigerant recovery avoidance. Some driers also have oil sample ports on the bottom of the shell for collecting oil samples for retesting at periodic intervals.

7) Filter drier bypass loop should be horizontal, flat or at a slight angle. Avoid inverted vertical 90 loop due to oil retention. Refer to Appendix Reference #3 and #4 **for suggested bypass loops.**

   Heat Recovery Systems: Install filter driers on all refrigerant lines (liquid, low pressure and dual pressure gas pipes) outside of the outdoor unit on the trunk lines. System needs to be locked in cooling operation mode. Failure to lock systems in cooling operation mode will result in restrictions in the refrigerant system due to contaminants flowing back into the system and may cause component damage.
   See Appendix Reference #5

   Heat Pump Systems: Install filter driers on both liquid and dual pressure gas pipes outside the outdoor unit on the main lines. System needs to be locked in cooling operation mode. Failure to lock system in cooling operation mode will result in restriction in the refrigerant system due to contaminants flowing back into the system and may cause component damage.
   See Appendix Reference #5

   If the VRV System cannot be locked in cooling operation mode, a suction filter drier needs to be installed on the dedicated suction gas pipe between accumulator and compressor.

8) Locking system in cooling operation mode strictly from outdoor unit PCB DIP switches, refer to appendix on DIP switch procedure.
See Appendix Reference #5

9) New compressor can now be installed, nitrogen must be purged through the system while brazing. **Follow Daikin guidelines for brazing components.**
See Appendix Reference #6

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10) System needs to be put back in Recovery/ Evacuation mode from outdoor unit PCB after restoring power to indoor and outdoor units. **Pressurize and evacuate system as per Daikin guidelines and procedures.**
See Appendix Reference #7

11) Charge new appropriate refrigerant into the system. Total charge consisting of factory charge plus additional charge to be weighed in and charged in the liquid state.
For total charge calculation, See Appendix Reference #9

12) After total refrigerant charge is recharged in the system, deactivate Recovery / Evacuation mode to resume normal operation in cooling operation mode. **Highly recommended to collect and review service checker operation data for at least 24 hours. If assistance is required, contact manufacturer representative.**

13) Pressure drop across filter driers must be taken within 24-48 hours of operation. If the pressure drop is deemed too excessive (4 psi), filter driers must be replaced. Another acid test is highly recommended at this stage to ensure no contaminants in the system if positive replacement of filter driers is a must. Repeat previous step until minimal pressure drop is less than 4 psi and negative acid test results are achieved.

14) Filter driers must be removed completely from the refrigeration circuit upon achieving no pressure drop and negative acid tests. This is where the Bypass filter drier loop with isolation valves recommendation is effective.

These instructions and recommendations are intended to enhance system reliability and reduce the likelihood of repeat operational issues. However, as noted above, the technician must determine what caused the failure and correct the problem. Failure to make this determination and correction increases the likelihood of repeat operational issues and equipment damage, even if the procedures in this guideline are otherwise followed.

15) It is strongly recommended that both the *Compressor Replacement Checklist* and the *VRV Service Checklist* be filled out to assist the technician in identifying the root cause of the compressor failure.

Compressor Replacement Checklist

Refrigerant System:		**N/A**	**Yes**	**No**
Was a Refrigerant Analysis Done?		☐	☐	☐
Was an acid test done?	If yes, results were Positive ☐ Negative ☐	☐	☐	☐
Was a system flushing agent used to clean?		☐	☐	☐
Has compressor been replaced before?	If yes, When: _____ Old compressor M# _____ S# _____	☐	☐	☐
Was Dry Nitrogen used during brazing as per Daikin Specs?		☐	☐	☐
Were the old compressor ports sealed?		☐	☐	☐
Were filter driers installed to clean the system?		☐	☐	☐
If filter driers were installed, were they replaceable core?		☐	☐	☐
Was a filter drier bypass loop utilized as per diagram attached?		☐	☐	☐
Were the cores replaced?	If yes, How many times _____? Pressure drop across _____?	☐	☐	☐

Refrigerant System:		**N/A**	**Yes**	**No**
Was incoming voltage verified to ground?	If yes, L1 L2 ___ L1 L3 ___ L2 L3 ___	☐	☐	☐
Was phase voltage verified within range (2%)?	If yes, L1 L2 ___ L1 L3 ___ L2 L3 ___	☐	☐	☐
Was system evacuated as per Daikin specs?	Micron Reading_____Microns	☐	☐	☐
Was system pressurized as per Daikin specs?	Pressure Test Reading _____PSIG Pressure Test Duration _____Hrs	☐	☐	☐
Has the piping been installed in accordance with Daikin installation guidelines? If No, explain:		☐	☐	☐
Are Refnets and Branch Kits installed to manufacturer's specifications?		☐	☐	☐
Heat Recovery Only: Are Branch Selector Boxes Installed to manufacturer's specifications?		☐	☐	☐
Heat Recovery Only: Have you checked for crossed piping/ wiring at Branch Selector Boxes?		☐	☐	☐
Has the total liquid line length been calculated?		☐	☐	☐
Has the additional refrigerant charge been calculated?	What was the additional charge added? _____ lbs. _____ oz.	☐	☐	☐
Have you visually checked the inside of the unit for damaged components or crushed pipes?		☐	☐	☐
Have you visually checked the control box and the inside of the unit for loose connections or damaged electrical components?		☐	☐	☐
Did you fill out the *VRV Service Checklist* after compressor change out? If yes, attach a copy to this checklist for future reference.		☐	☐	☐
Was service checker data collected after compressor change out? If Yes, please provide copy of data. If No, please collect data as soon as possible.		☐	☐	☐
Were any abnormalities observed while reviewing the *VRV Service Checklist* or Service Checker data? If Yes, explain:		☐	☐	☐
Were the following components tested after compressor change out:				
• Pressure Transducers (Sensors)		☐	☐	☐
• Outdoor Unit Thermistors		☐	☐	☐
• Electronic Expansion Valves		☐	☐	☐
• Solenoids		☐	☐	☐
• Crank Case Heaters		☐	☐	☐
Was temperature across oil return cap tubes measured? (i.e. Oil Separator, Accumulator) If Yes, temperature drop across _____ F.		☐	☐	☐

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AIR INTELLIGENCE

VRV Service Checklist

IMPORTANT NOTE: This Checklist does not supersede or substitute for other technical documentation such as Service Manuals, Installation Manuals/Installation Instructions, and/or Operation Manuals, but can be used in conjunction with such documentation. When servicing or maintaining VRV equipment, you should observe all warnings and cautions contained in such documentation.

ONLY PERSONNEL THAT HAVE BEEN TRAINED TO INSTALL, ADJUST, SERVICE OR REPAIR (HEREINAFTER, "SERVICE") THE EQUIPMENT SPECIFIED IN THIS MANUAL SHOULD SERVICE THE EQUIPMENT. THE MANUFACTURER WILL NOT BE RESPONSIBLE FOR ANY INJURY OR PROPERTY DAMAGE ARISING FROM IMPROPER SERVICE OR SERVICE PROCEDURES. IF YOU SERVICE THIS UNIT, YOU ASSUME RESPONSIBILITY FOR ANY INJURY OR PROPERTY DAMAGE WHICH MAY RESULT. IN ADDITION, IN JURISDICTIONS THAT REQUIRE ONE OR MORE LICENSES TO SERVICE THE EQUIPMENT SPECIFIED IN THIS MANUAL, ONLY LICENSED PERSONNEL SHOULD SERVICE THE EQUIPMENT. IMPROPER INSTALLATION, ADJUSTMENT, SERVICING OR REPAIR OF THE EQUIPMENT SPECIFIED IN THIS MANUAL, OR ATTEMPTING TO INSTALL, ADJUST, SERVICE OR REPAIR THE EQUIPMENT SPECIFIED IN THIS MANUAL WITHOUT PROPER TRAINING MAY RESULT IN PRODUCT DAMAGE, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

Index:

Judgment: G=Good
RM=Requires maintenance
RS=Requires service
GMS=Good after maintenance or service

Note: Enter NA for items that do not require inspection.

Daikin products are subject to continuous improvements.

Daikin reserves the right to modify product design, specification, and information in this publication without notice and without incurring any obligation.

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Our continuing commitment to quality products may mean a change in specifications without notice.

General Information & Safety Considerations

- Daikin North America strongly recommends that any individual installing, commissioning or servicing any Daikin VRV system, should first receive comprehensive training at a factory training facility or factory authorized training facility.
- IMPORTANT NOTE: This checklist does not supersede or substitute for other technical documentation such as Service Manuals, Installation Manuals/Installation Instructions, and/or Operation Manuals, but can be used in conjunction with such documentation. When servicing or maintaining VRV equipment, you should observe all warnings and cautions contained in such documentation.
- It is recommended that only Daikin factory trained personnel perform maintenance work.
- Always follow local codes.
- Refrigerant gas is heavier than air and displaces oxygen. A leak can result in oxygen displacement.
- Be sure to disconnect the power cable before disassembling the equipment for repair. Follow OSHA lock out tag out procedures. See supplemental information on page 24.
- Working on equipment that is connected to the power supply may cause an electrical shock. If it is necessary to supply power to the equipment to conduct the repair or inspection of circuits, do not touch any electrically charged sections of the equipment.
- Do not allow the discharging refrigerant to come in contact with skin as it may cause frostbite.
- If disconnecting the suction or discharge pipes of the compressor, recover the refrigerant completely and cut the piping using a tubing cutter. NEVER unbraze a brazed joint! If there is refrigerant remaining inside the compressor, the refrigerant or compressor oil may discharge at a high temperature and pressure, possibly causing injury.

General Installation Considerations

- If the refrigerant gas leaks during the repair work, ventilate the area. The refrigerant gas may generate toxic gases when it contacts flames.
- Be sure to discharge all capacitors completely before conducting repair work. The step-up capacitor supplies high-voltage electricity to the electrical components of the outdoor unit. A charged capacitor will cause an electrical shock.
- Do not start or stop the air conditioner by plugging or unplugging the power cable/disconnect.
- Be sure to wear a safety helmet, gloves, and a safety belt when working at a height greater than 6.5 ft. (2 m). Insufficient safety measures may lead to a fall.
- In case of R-410A refrigerant models, be sure to use equipment and tools for the exclusive use of the R-410A refrigerant.
- Do not allow air or any noncondensibles to enter the refrigerant system. If air enters the refrigerating system, an excessively high pressure results, causing equipment damage and/or injury.
- Be sure to turn OFF the power switch and unplug the power cable when cleaning the equipment. The internal fan rotates at a high speed, and may cause injury. Follow OSHA lock out tag out procedures. See supplemental information on page 24.
- Be sure to use parts listed in the service parts list of the applicable model and appropriate tools to conduct repair work. Never attempt to modify the equipment. The use of non-approved parts or tools may cause an electrical shock, excessive heat generation or fire.

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VRV Service Checklist

Equipment Requirements to Perform Proper Maintenance:

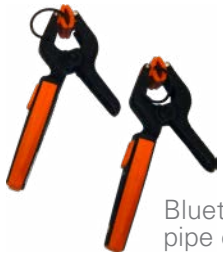
- 2-Stage Vacuum Pump
- Micron Gauge (Digital or Analog)
- Multimeter
- Schrader Valve Removal Tools
- Megger Meter
- Hoses
- Flaring Tools
- Common Hand Tools
- Manifold Gauges
- Voltmeter
- Ammeter
- Temperature Probe

Vacuum Pump

Micron gauge

Schrader Valve removal tool

Megger meter



Bluetooth pipe clamps

Temperature probe

Service Checker

Torque wrenches

Multimeter

Pressure gauges

Wireless and wired Dchecker

Daikin offers a small and large Tool Bag:

These items can also be purchased individually from your local distributor.

Large Tool Bag

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VRV Service Checklist

Customer/Technician Information

Date	Time Arrived	Time Departed
Customer Name		
Customer Number	Customer Phone	
Customer Email		
Service Address		
Service Company		
Address		
Technician Name		
Technician Phone	Company Phone	
Technician Email		

Building Type	No. of Floors	No. of Indoor Units	No. of Outdoor Units
Brief Description of Equipment Condition			
Other Jobsite Observations			

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MAIN Outdoor Unit Inspection (1 of 2)

Model Number	Serial Number	System Name & Installation Site	Airnet

	Inspection Items	Inspection Method	Criteria	Actual Values	Judgment
Insulation Measurement	Compressor	Measure using 500V megger (measure U, V, and W terminals, and enter the minimum value)	1MΩ min.	Comp. 1 U MΩ V MΩ W MΩ Comp. 2 U MΩ V MΩ W MΩ	Choose
	Crank Case Heater	Measure using 500V megger Check continuity using a tester	1MΩ min. A measurable resistance - no opens or shorts	Comp. 1: MΩ / Measured KΩ Comp. 2: MΩ / Measured KΩ	Choose
	Power Supply Wiring Connection Terminals and Connectors	Check tightness of power supply terminal screws. Inspect visually, and check connection	All screws and connections are tight	-	Choose
Refrigerant	Refrigerant leak check	Check brazed connections and flares on the machine refrigerant pipes using a leak tester	No leaks	-	Choose
Supply voltage		Measure the phases during operations using a tester	No voltage drop and within ±10% of rated voltage	Non-Operating: L1-L2 V (Single phase use L1-L2) L1-L3 V L2-L3 V Operating: L1-L2 V (Single phase use L1-L2) L1-L3 V L2-L3 V	Choose

Judgment: G=Good, RM=Requires maintenance, RS=Requires service, GMS=Good after maintenance or service

Note: Enter NA for items that do not require inspection.

Technician Tip: Activate recovery mode and allow system to equalize, then verify thermistors settle towards ambient temperature and traducers balance.

* The judgment criteria for the standard operating pressure is the high pressure when the heater is operating, and the low pressure when the cooler is operating. Further, as the high pressure during heater operations and the low pressure during heater operations vary greatly depending on load and the installation location/local environment, the measurements may be outside the standard value range during small loads or overloads.

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MAIN Outdoor Unit Inspection (2 of 2)

Model Number	Serial Number	System Name & Installation Site	Airnet

Inspection Items	Inspection Method	Criteria	Actual Values			Judgment
Compressor Operation Current	Measure using an ammeter	Refer to service manual for proper specification	Comp. 1	U V W	A A A	Choose
			Comp. 2	U V W	A A A	Choose
Target High Pressure	Record using a service checker				psig	Choose
High Pressure (in heating mode)	Measure in stable condition at least 20 minutes after the start of operations using a pressure gauge	348 to 493psig	Time			Choose
					psig	
Target Low Pressure	Record using a service checker				psig	Choose
Low Pressure (in cooling mode)	Measure in stable condition at least 20 minutes after the start of operations using a pressure gauge	72 to 145psig	Time			Choose
					psig	
Discharge Pipe Temperature/ Discharge Superheat	Measure using a surface temperature thermometer or a service checker	Discharge SH = Discharge Pipe temp - Condensing Temperature (Tc). Normal range 27°F to 72°F. Subject to change with generation of equipment.	Compressor 1 Discharge Pipe Superheat		°F °F	Choose
			Compressor 2 Discharge Pipe Superheat		°F °F	Choose
Suction Pipe Temperature/ Suction Superheat	Measure using a surface temperature thermometer or a service checker. (Measure near the suction pipe thermistor)	Suction Superheat = Suction Pipe Temp - Te. Normal range is 3.6°F to 36°F.	Suction Pipe Superheat		°F °F	Choose
Ambient Temperature (A)	Measure using a thermometer (Dry bulb temperature) *Measure somewhere unaffected by air discharged from outdoor units.	Reference service manual for acceptable range of ambient operating conditions.			°F	Choose
Suction Air Temperature (B)	Measure using a thermometer	As above			°F	Choose
Short Circuit Value	As above (B)-(A)= Δt	|Δt| < 5deg			°F	Choose

Judgment: G=Good, RM=Requires maintenance, RS=Requires service, GMS=Good after maintenance or service

Note: Enter NA for items that do not require inspection.

* The judgment criteria for the standard operating pressure is the high pressure when the heater is operating, and the low pressure when the cooler is operating. Further, as the high pressure during heater operations and the low pressure during heater operations vary greatly depending on load and the installation location/local environment, the measurements may be outside the standard value range during small loads or overloads.

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SUB 1 Outdoor Unit Inspection (1 of 2)

Model Number	Serial Number	System Name & Installation Site	Airnet

	Inspection Items	Inspection Method	Criteria	Actual Values		Judgment
Insulation Measurement	Compressor	Measure using 500V megger (Measure U, V, and W terminals, and enter the minimum value)	1MΩ min.	Comp. 1 U MΩ V MΩ W MΩ Comp. 2 U MΩ V MΩ W MΩ		Choose
	Crank Case Heater	Measure using 500V megger Check continuity using a tester	1MΩ min. A measurable resistance - no opens or shorts	Comp. 1	MΩ Measured KΩ	Choose
				Comp. 2	MΩ Measured KΩ	
	Power Supply Wiring Connection Terminals and Connectors	Check tightness of power supply terminal screws. Inspect visually, and check connection	All screws and connections are tight	-		Choose
Refrigerant	Machine Refrigerant Circuit	Check brazed connections and flares on the machine refrigerant pipes using a leak tester	No leaks	-		Choose

Judgment: G=Good, RM=Requires maintenance, RS=Requires service, GMS=Good after maintenance or service

Note: Enter NA for items that do not require inspection.

* The judgment criteria for the standard operating pressure is the high pressure when the heater is operating, and the low pressure when the cooler is operating. Further, as the high pressure during heater operations and the low pressure during heater operations vary greatly depending on load and the installation location/local environment, the measurements may be outside the standard value range during small loads or overloads.

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SUB 1 Outdoor Unit Inspection (2 of 2)

Model Number	Serial Number	System Name & Installation Site	Airnet

Inspection Items	Inspection Method	Criteria	Actual Values	Judgment
Compressor supply voltage	Measure the phases during operations using a tester	No voltage drop and within ±10% of rated voltage	L1-L2 V (Single phase use L1-L2) L1-L3 V L2-L3 V	Choose
Compressor Operation Current	Measure using an ammeter	Refer to service manual for proper specification	Comp. 1: U A / V A / W A	Choose
			Comp. 2: U A / V A / W A	Choose
Target High Pressure	Record using a service checker		psig	Choose
High Pressure (in heating mode)	Measure in stable condition at least 20 minutes after the start of operations using a pressure gauge	348 to 493psig	Time psig	Choose
Target Low Pressure	Record using a service checker		psig	Choose
Low Pressure (in cooling mode)	Measure in stable condition at least 20 minutes after the start of operations using a pressure gauge	72 to 145psig	Time psig	Choose
Discharge Pipe Temperature/ Discharge Superheat	Measure using a surface temperature thermometer or a service checker	Discharge SH = Discharge Pipe temp - Condensing Temperature (Tc). Normal range 27°F to 72°F. Subject to change with generation of equipment.	Compressor 1 Discharge Pipe °F Superheat °F	Choose
			Compressor 2 Discharge Pipe °F Superheat °F	Choose
Suction Pipe Temperature/ Suction Superheat	Measure using a surface temperature thermometer or a service checker. (Measure near the suction pipe thermistor)	Suction Superheat = Suction Pipe Temp - Te. Normal range is 3.6°F to 36°F.	Suction Pipe °F Superheat °F	Choose
Ambient Temperature (A)	Measure using a thermometer (Dry bulb temperature) *Measure somewhere unaffected by air discharged from outdoor units.	Reference service manual for acceptable range of ambient operating conditions.	°F	Choose
Suction Air Temperature (B)	Measure using a thermometer	As above	°F	Choose
Short Circuit Value	As above (B)-(A)= Δt	|Δt| < 5deg	°F	Choose

Judgment: G=Good, RM=Requires maintenance, RS=Requires service, GMS=Good after maintenance or service

Note: Enter NA for items that do not require inspection.

* The judgment criteria for the standard operating pressure is the high pressure when the heater is operating, and the low pressure when the cooler is operating. Further, as the high pressure during heater operations and the low pressure during heater operations vary greatly depending on load and the installation location/local environment, the measurements may be outside the standard value range during small loads or overloads.

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SUB 2 Outdoor Unit Inspection (1 of 2)

Model Number	Serial Number	System Name & Installation Site	Airnet

	Inspection Items	Inspection Method	Criteria	Actual Values		Judgment
Insulation Measurement	Compressor	Measure using 500V megger (Measure U, V, and W terminals, and enter the minimum value)	1MΩ min.	Comp. 1 U MΩ V MΩ W MΩ Comp. 2 U MΩ V MΩ W MΩ		Choose
	Crank Case Heater	Measure using 500V megger Check continuity using a tester	1MΩ min. A measurable resistance - no opens or shorts	Comp. 1	MΩ Measured KΩ	Choose
				Comp. 2	MΩ Measured KΩ	
	Power Supply Wiring Connection Terminals and Connectors	Check tightness of power supply terminal screws. Inspect visually, and check connection	All screws and connections are tight	-		Choose
Refrigerant	Machine Refrigerant Circuit	Check brazed connections and flares on the machine refrigerant pipes using a leak tester	No leaks	-		Choose

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Note: Enter NA for items that do not require inspection.

* The judgment criteria for the standard operating pressure is the high pressure when the heater is operating, and the low pressure when the cooler is operating. Further, as the high pressure during heater operations and the low pressure during heater operations vary greatly depending on load and the installation location/local environment, the measurements may be outside the standard value range during small loads or overloads.

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SUB 2 Outdoor Unit Inspection (2 of 2)

Model Number	Serial Number	System Name & Installation Site	Airnet

Inspection Items	Inspection Method	Criteria	Actual Values	Judgment
Compressor supply voltage	Measure the phases during operations using a tester	No voltage drop and within ±10% of rated voltage	L1-L2 V (Single phase use L1-L2) L1-L3 V L2-L3 V	Choose
Compressor Operation Current	Measure using an ammeter	Refer to service manual for proper specification	Comp. 1: U A / V A / W A	Choose
			Comp. 2: U A / V A / W A	Choose
Target High Pressure	Record using a service checker		psig	Choose
High Pressure (in heating mode)	Measure in stable condition at least 20 minutes after the start of operations using a pressure gauge	348 to 493psig	Time psig	Choose
Target Low Pressure	Record using a service checker		psig	Choose
Low Pressure (in cooling mode)	Measure in stable condition at least 20 minutes after the start of operations using a pressure gauge	72 to 145psig	Time psig	Choose
Discharge Pipe Temperature/ Discharge Superheat	Measure using a surface temperature thermometer or a service checker	Discharge SH = Discharge Pipe temp - Condensing Temperature (Tc). Normal range 27°F to 72°F. Subject to change with generation of equipment.	Compressor 1 Discharge Pipe °F Superheat °F	Choose
			Compressor 2 Discharge Pipe °F Superheat °F	Choose
Suction Pipe Temperature/ Suction Superheat	Measure using a surface temperature thermometer or a service checker. (Measure near the suction pipe thermistor)	Suction Superheat = Suction Pipe Temp - Te. Normal range is 3.6°F to 36°F.	Suction Pipe °F Superheat °F	Choose
Ambient Temperature (A)	Measure using a thermometer (Dry bulb temperature) *Measure somewhere unaffected by air discharged from outdoor units.	Reference service manual for acceptable range of ambient operating conditions.	°F	Choose
Suction Air Temperature (B)	Measure using a thermometer	As above	°F	Choose
Short Circuit Value	As above (B)-(A)= Δt	|Δt| < 5deg	°F	Choose

Judgment: G=Good, RM=Requires maintenance, RS=Requires service, GMS=Good after maintenance or service

Note: Enter NA for items that do not require inspection.

* The judgment criteria for the standard operating pressure is the high pressure when the heater is operating, and the low pressure when the cooler is operating. Further, as the high pressure during heater operations and the low pressure during heater operations vary greatly depending on load and the installation location/local environment, the measurements may be outside the standard value range during small loads or overloads.

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VRV Indoor Unit Inspection

	Model	Model No.	Serial No.	Location	Airnet Address	Group No.
No. 1						
No. 2						
No. 3						
No. 4						
No. 5						
No. 6						
No. 7						
No. 8						

Inspection Items		Inspection Method	Criteria (Benchmarks)	Actual Values								Judgment
				No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	
Power Supply	Voltage	Using a tester	187V - 253V									Choose
	Breaker Capacity	Visual inspection	Rated capacity									Choose
Operational Data	Liquid pipe temperature	Navigation controller or service checker	In cooling: 37 to 50°F									Choose
			In heating: 100 to 120°F									Choose
	Gas Pipe Temperature	Navigation controller or service checker	In cooling: 40 to 60°F									Choose
			In heating: 115 to 160°F									Choose
	Superheat Temperature	Gas Temp - Liquid Temp = Superheat	In cooling: 5 to 17°F									Choose
	Sub-cool Temperature	Subcooling = Condensing Temp (Tc) - Indoor liquid pipe temp.	Normal range 9 to 30°F (Only done in heating)									Choose
	Suction Air/Return Air Temperature	Temperature probe	In cooling: 61 to 82°F									Choose
			In heating: 59 to 80°F									Choose
	Delta T	Temperature probe	In cooling: 10 to 30°F									Choose
			In heating: 10 to 30°F									Choose
	Expansion Valve	Navigation controller/ service checker	Record pulses during normal operation.									Choose
	Error Code History	Check using controller	Enter present error code - NA if none									Choose

Judgment: G=Good, RM=Requires maintenance, RS=Requires service, GMS=Good after maintenance or service

Note: Enter NA for items that do not require inspection.

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VRV Indoor Unit Inspection

	Model	Model No.	Serial No.	Location	Airnet Address	Group No.
No. 9						
No. 10						
No. 11						
No. 12						
No. 13						
No. 14						
No. 15						
No. 16						

Inspection Items		Inspection Method	Criteria (Benchmarks)	Actual Values								Judgment
				No. 9	No. 10	No. 11	No. 12	No. 13	No. 14	No. 15	No. 16	
Power Supply	Voltage	Using a tester	187V - 253V									Choose
	Breaker Capacity	Visual inspection	Rated capacity									Choose
Operational Data	Liquid pipe temperature	Navigation controller or service checker	In cooling: 37 to 50°F									Choose
			In heating: 100 to 120°F									Choose
	Gas Pipe Temperature	Navigation controller or service checker	In cooling: 40 to 60°F									Choose
			In heating: 115 to 160°F									Choose
	Superheat Temperature	Gas Temp - Liquid Temp = Superheat	In cooling: 5 to 17°F									Choose
	Sub-cool Temperature	Subcooling = Condensing Temp (Tc) - Indoor liquid pipe temp.	Normal range 9 to 30°F (Only done in heating)									Choose
	Suction Air/Return Air Temperature	Temperature probe	In cooling: 61 to 82°F									Choose
			In heating: 59 to 80°F									Choose
	Delta T	Temperature probe	In cooling: 10 to 30°F									Choose
			In heating: 10 to 30°F									Choose
	Expansion Valve	Navigation controller/ service checker	Record pulses during normal operation.									Choose
	Error Code History	Check using controller	Enter present error code - NA if none									Choose

Judgment: G=Good, RM=Requires maintenance, RS=Requires service, GMS=Good after maintenance or service

Note: Enter NA for items that do not require inspection.

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VRV Indoor Unit Inspection

	Model	Model No.	Serial No.	Location	Airnet Address	Group No.
No. 17						
No. 18						
No. 19						
No. 20						
No. 21						
No. 22						
No. 23						
No. 24						

Inspection Items		Inspection Method	Criteria (Benchmarks)	Actual Values								Judgment
				No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	
Power Supply	Voltage	Using a tester	187V - 253V									Choose
	Breaker Capacity	Visual inspection	Rated capacity									Choose
Operational Data	Liquid pipe temperature	Navigation controller or service checker	In cooling: 37 to 50°F									Choose
			In heating: 100 to 120°F									Choose
	Gas Pipe Temperature	Navigation controller or service checker	In cooling: 40 to 60°F									Choose
			In heating: 115 to 160°F									Choose
	Superheat Temperature	Gas Temp - Liquid Temp = Superheat	In cooling: 5 to 17°F									Choose
	Sub-cool Temperature	Subcooling = Condensing Temp (Tc) - Indoor liquid pipe temp.	Normal range 9 to 30°F (Only done in heating)									Choose
	Suction Air/Return Air Temperature	Temperature probe	In cooling: 61 to 82°F									Choose
			In heating: 59 to 80°F									Choose
	Delta T	Temperature probe	In cooling: 10 to 30°F									Choose
			In heating: 10 to 30°F									Choose
	Expansion Valve	Navigation controller/ service checker	Record pulses during normal operation.									Choose
	Error Code History	Check using controller	Enter present error code - NA if none									Choose

Judgment: G=Good, RM=Requires maintenance, RS=Requires service, GMS=Good after maintenance or service

Note: Enter NA for items that do not require inspection.

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VRV Indoor Unit Inspection

	Model	Model No.	Serial No.	Location	Airnet Address	Group No.
No. 25						
No. 26						
No. 27						
No. 28						
No. 29						
No. 30						
No. 31						
No. 32						

Inspection Items		Inspection Method	Criteria (Benchmarks)	Actual Values								Judgment
				No. 25	No. 26	No. 27	No. 28	No. 29	No. 30	No. 31	No. 32	
Power Supply	Voltage	Using a tester	187V - 253V									Choose
	Breaker Capacity	Visual inspection	Rated capacity									Choose
Operational Data	Liquid pipe temperature	Navigation controller or service checker	In cooling: 37 to 50°F									Choose
			In heating: 100 to 120°F									Choose
	Gas Pipe Temperature	Navigation controller or service checker	In cooling: 40 to 60°F									Choose
			In heating: 115 to 160°F									Choose
	Superheat Temperature	Gas Temp - Liquid Temp = Superheat	In cooling: 5 to 17°F									Choose
	Sub-cool Temperature	Subcooling = Condensing Temp (Tc) - Indoor liquid pipe temp.	Normal range 9 to 30°F (Only done in heating)									Choose
	Suction Air/Return Air Temperature	Temperature probe	In cooling: 61 to 82°F									Choose
			In heating: 59 to 80°F									Choose
	Delta T	Temperature probe	In cooling: 10 to 30°F									Choose
			In heating: 10 to 30°F									Choose
	Expansion Valve	Navigation controller/ service checker	Record pulses during normal operation.									Choose
	Error Code History	Check using controller	Enter present error code - NA if none									Choose

Judgment: G=Good, RM=Requires maintenance, RS=Requires service, GMS=Good after maintenance or service

Note: Enter NA for items that do not require inspection.

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VRV Indoor Unit Inspection

	Model	Model No.	Serial No.	Location	Airnet Address	Group No.
No. 33						
No. 34						
No. 35						
No. 36						
No. 37						
No. 38						
No. 39						
No. 40						

Inspection Items		Inspection Method	Criteria (Benchmarks)	Actual Values								Judgment
				No. 33	No. 34	No. 35	No. 36	No. 37	No. 38	No. 39	No. 40	
Power Supply	Voltage	Using a tester	187V - 253V									Choose
	Breaker Capacity	Visual inspection	Rated capacity									Choose
Operational Data	Liquid pipe temperature	Navigation controller or service checker	In cooling: 37 to 50°F									Choose
			In heating: 100 to 120°F									Choose
	Gas Pipe Temperature	Navigation controller or service checker	In cooling: 40 to 60°F									Choose
			In heating: 115 to 160°F									Choose
	Superheat Temperature	Gas Temp - Liquid Temp = Superheat	In cooling: 5 to 17°F									Choose
	Sub-cool Temperature	Subcooling = Condensing Temp (Tc) - Indoor liquid pipe temp.	Normal range 9 to 30°F (Only done in heating)									Choose
	Suction Air/Return Air Temperature	Temperature probe	In cooling: 61 to 82°F									Choose
			In heating: 59 to 80°F									Choose
	Delta T	Temperature probe	In cooling: 10 to 30°F									Choose
			In heating: 10 to 30°F									Choose
	Expansion Valve	Navigation controller/ service checker	Record pulses during normal operation.									Choose
	Error Code History	Check using controller	Enter present error code - NA if none									Choose

Judgment: G=Good, RM=Requires maintenance, RS=Requires service, GMS=Good after maintenance or service

Note: Enter NA for items that do not require inspection.

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VRV Indoor Unit Inspection

	Model	Model No.	Serial No.	Location	Airnet Address	Group No.
No. 41						
No. 42						
No. 43						
No. 44						
No. 45						
No. 46						
No. 47						
No. 48						

Inspection Items		Inspection Method	Criteria (Benchmarks)	Actual Values								Judgment
				No. 41	No. 42	No. 43	No. 44	No. 45	No. 46	No. 47	No. 48	
Power Supply	Voltage	Using a tester	187V - 253V									Choose
	Breaker Capacity	Visual inspection	Rated capacity									Choose
Operational Data	Liquid pipe temperature	Navigation controller or service checker	In cooling: 37 to 50°F									Choose
			In heating: 100 to 120°F									Choose
	Gas Pipe Temperature	Navigation controller or service checker	In cooling: 40 to 60°F									Choose
			In heating: 115 to 160°F									Choose
	Superheat Temperature	Gas Temp - Liquid Temp = Superheat	In cooling: 5 to 17°F									Choose
	Sub-cool Temperature	Subcooling = Condensing Temp (Tc) - Indoor liquid pipe temp.	Normal range 9 to 30°F (Only done in heating)									Choose
	Suction Air/Return Air Temperature	Temperature probe	In cooling: 61 to 82°F									Choose
			In heating: 59 to 80°F									Choose
	Delta T	Temperature probe	In cooling: 10 to 30°F									Choose
			In heating: 10 to 30°F									Choose
	Expansion Valve	Navigation controller/ service checker	Record pulses during normal operation.									Choose
	Error Code History	Check using controller	Enter present error code - NA if none									Choose

Judgment: G=Good, RM=Requires maintenance, RS=Requires service, GMS=Good after maintenance or service

Note: Enter NA for items that do not require inspection.

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VRV Indoor Unit Inspection

	Model	Model No.	Serial No.	Location	Airnet Address	Group No.
No. 49						
No. 50						
No. 51						
No. 52						
No. 53						
No. 54						
No. 55						
No. 56						

Inspection Items		Inspection Method	Criteria (Benchmarks)	Actual Values								Judgment
				No. 49	No. 50	No. 51	No. 52	No. 53	No. 54	No. 55	No. 56	
Power Supply	Voltage	Using a tester	187V - 253V									Choose
	Breaker Capacity	Visual inspection	Rated capacity									Choose
Operational Data	Liquid pipe temperature	Navigation controller or service checker	In cooling: 37 to 50°F									Choose
			In heating: 100 to 120°F									Choose
	Gas Pipe Temperature	Navigation controller or service checker	In cooling: 40 to 60°F									Choose
			In heating: 115 to 160°F									Choose
	Superheat Temperature	Gas Temp - Liquid Temp = Superheat	In cooling: 5 to 17°F									Choose
	Sub-cool Temperature	Subcooling = Condensing Temp (Tc) - Indoor liquid pipe temp.	Normal range 9 to 30°F (Only done in heating)									Choose
	Suction Air/Return Air Temperature	Temperature probe	In cooling: 61 to 82°F									Choose
			In heating: 59 to 80°F									Choose
	Delta T	Temperature probe	In cooling: 10 to 30°F									Choose
			In heating: 10 to 30°F									Choose
	Expansion Valve	Navigation controller/ service checker	Record pulses during normal operation.									Choose
	Error Code History	Check using controller	Enter present error code - NA if none									Choose

Judgment: G=Good, RM=Requires maintenance, RS=Requires service, GMS=Good after maintenance or service

Note: Enter NA for items that do not require inspection.

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VRV Indoor Unit Inspection

	Model	Model No.	Serial No.	Location	Airnet Address	Group No.
No. 57						
No. 58						
No. 59						
No. 60						
No. 61						
No. 62						
No. 63						
No. 64						

Inspection Items		Inspection Method	Criteria (Benchmarks)	Actual Values								Judgment
				No. 57	No. 58	No. 59	No. 60	No. 61	No. 62	No. 63	No. 64	
Power Supply	Voltage	Using a tester	187V - 253V									Choose
	Breaker Capacity	Visual inspection	Rated capacity									Choose
Operational Data	Liquid pipe temperature	Navigation controller or service checker	In cooling: 37 to 50°F									Choose
			In heating: 100 to 120°F									Choose
	Gas Pipe Temperature	Navigation controller or service checker	In cooling: 40 to 60°F									Choose
			In heating: 115 to 160°F									Choose
	Superheat Temperature	Gas Temp - Liquid Temp = Superheat	In cooling: 5 to 17°F									Choose
	Sub-cool Temperature	Subcooling = Condensing Temp (Tc) - Indoor liquid pipe temp.	Normal range 9 to 30°F (Only done in heating)									Choose
	Suction Air/Return Air Temperature	Temperature probe	In cooling: 61 to 82°F									Choose
			In heating: 59 to 80°F									Choose
	Delta T	Temperature probe	In cooling: 10 to 30°F									Choose
			In heating: 10 to 30°F									Choose
	Expansion Valve	Navigation controller/ service checker	Record pulses during normal operation.									Choose
	Error Code History	Check using controller	Enter present error code - NA if none									Choose

Judgment: G=Good, RM=Requires maintenance, RS=Requires service, GMS=Good after maintenance or service

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EEV Inspection (Supplement)

Checkpoint and analysis: Indoor unit side

Main malfunctions of indoor unit. (In cooling operation)

Ways of checking the EEV.

How to check the EEV for internal leakage.

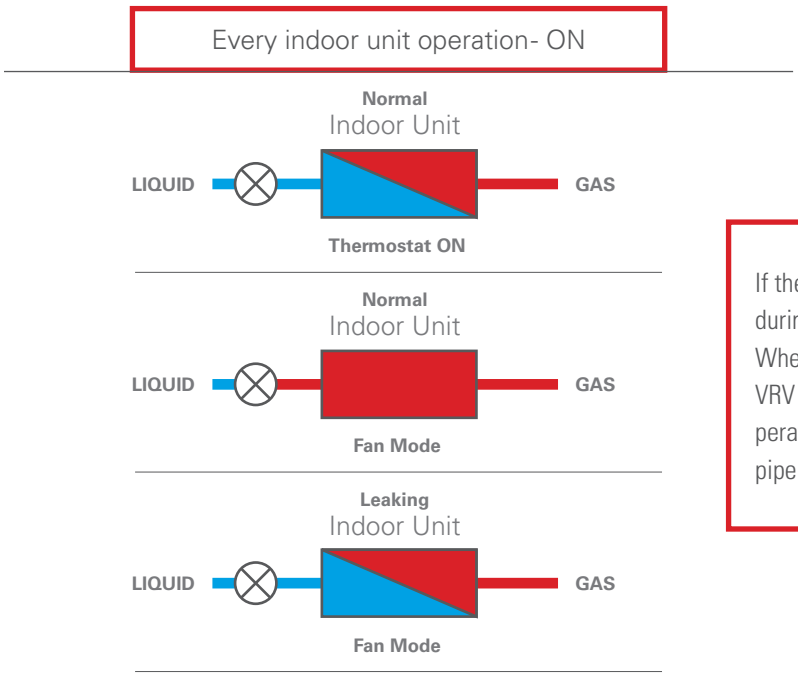
Easy checking method

- Some indoor units thermostat-on, the others operate with FAN mode.

How to check that the EEV is closed or not.

Easy checking method

- After ALL indoor units thermostat-on in cooling operation, if there is an indoor unit that doesn't decreases the pipe temperature, it has a possibility that EEV has a problem. Please measure the pipe temperature.
- Outdoor setting 2-6 is very useful in this time.



If the liquid pipe temperature drops during FAN mode, the EV is leaking. When checking it, it is easier to use the VRV checker. And please check the temperature until the other indoor unit liquid pipe temperatures are over 20 degree.

Disassembly of EEV

Check for clean smooth surface

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OSHA Lockout Tagout Procedures

LOCKOUT/TAGOUT

Lockout / Tagout procedures are designed to isolate or shut off machines and equipment from their power sources before employees perform any servicing or maintenance work.

Definition:

Lockout is the placement of a lockout device on an energy isolation apparatus (circuit breaker, slide gate, line valve, disconnect switch, etc.) to ensure that the energy isolating device and equipment being controlled cannot be operated until the lockout device is removed. A lockout device utilizes a positive means such as a lock (key or combination type) to hold an energy isolating device in a safe position and prevent the energization of a machine or equipment. The lockout device must be substantial enough to prevent removal without use of excessive force or unusual techniques.

Tagout is the placement of a tagout device (a tag or other prominent warning device and a means of attachment) on an energy isolation device to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

Energy-isolating device
Any mechanical device that physically prevents the transmission or release of energy. These include, but are not limited to, manually operated electrical circuit breakers, disconnected switches, line valves and blocks.

Employees performing maintenance or service on machines or equipment shall observe the following procedures:

- Lockout / Tagout of energy isolating devices shall be performed whenever maintenance or servicing is done on machines or equipment. This shall be done by employees who have received proper training on lockout/tagout procedures from Environmental Health and Safety.
- Employees observing a machine or piece of equipment which is locked or tagged out shall not attempt to start, energize or use that machine or equipment.
- Lockout and Tagout devices shall indicate the identity of the employee who attached the devices.
- Lockout and Tagout devices shall be standardized within the facility.
- If an energy isolating device is not capable of being locked out, a tagout system shall be used.
- Tagout devices shall include warning statements such as "DO NOT ENERGIZE!" or "DO NOT OPERATE!"
- Whenever replacement, major repair, renovation or modification of equipment is performed, energy isolating devices for such machines or equipment shall be designed to accept a lockout device.

Retraining shall be provided for all authorized and affected employees whenever there is a change in their job assignments, a change in machines, equipment or processes that present a new hazard, or when there is a change in the energy control procedures.

Sources for More Information:

- **OSHA 29 CFR 1910.147, 1910.212 and 1919.219.**
- **ANSI Z244.1-1982, Personal Protection Lockout / Tagout of Energy Sources.**
- **American National Standards Institute (ANSI)**
  25 W. 43rd St., 4th Floor, New York, NY 10036 (212) 642-4900

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Flare Nut Tightening and Torque Specifications

To verify proper flare torque values adjust torque wrench to lowest foot pound value for each flare nut's torque range. Place torque wrench on flare nut and tighten until torque clutch releases.

1/4″	10.4 – 12.7 ft lb
3/8″	24.1 – 29.4 ft lb
1/2″	36.5 – 44.5 ft lb
5/8″	45.6 – 55.6 ft lb

Internal Lift Pump Float Safety Inspection

Inspect float safety for free movement and the entrance to the pump to be clear of obstructions

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Appendix

Reference #1 / Refrigeration Oil Test Kit

Any moisture level over 100 ppm is considered out of acceptable range

Viscosity at 40°C should be between 61.2 and 74.8

Compressor Lubricant Test Report

Test	Result	Units	ASTM Method
Spectrochemical	e far right	ppm	D 5185 09 *
Moisture	248	ppm	D 6304-07
Acid Number	0.42	mg KOH/g	D 974-08
Viscosity at 40° C	103	cSt	D 445-09

** ASTM D5185-09 Test Method has been modified as follows. Samples are not homogenized but tested "as received".*

Recommendations

Moisture Content is Unacceptable. Corrective action is recommended.

Lubricant brand was not specified. Therefore, viscosity conformance can not be verified. This recommendation has been generalized based on the lubricant type and may not reflect the recommendation of the manufacturer.

Acid Number (TAN) is Unacceptable. Corrective action is recommended.

Revision History:

Spectrochemical Analysis

Aluminum:	< 1
Antimony:	N/A
Barium:	< 1
Boron:	< 1
Calcium:	< 1
Cadmium:	< 1
Chromium:	< 1
Copper:	4
Iron:	7
Lead:	< 5
Magnesium:	< 1
Manganese:	1
Molybdenum:	< 1
Nickel:	< 1
Phosphorus:	778
Silicon:	9
Silver:	< 1
Sodium:	< 1
Sulfur:	N/A
Tin:	< 5
Titanium:	< 1
Vanadium:	< 1
Zinc:	< 1

If acid level is high it will be noted in the form

All the numbers on the right deal with materials in the oil. All those numbers are considered within spec if they are below 20 ppm except for the Phosphorous. Phosphorous is added to PVE as an anti wear protectant, it should range between 700 to 1000 ppm.

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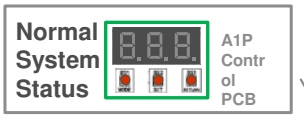
Outdoor Unit Field Settings Mode 2



		Mode 2-20	Mode 2-21
		Additional Refrigerant Charge Mode	**Refrigerant Recovery & Evacuation Mode**
1	Start with system in normal status display	*Normal*	*Normal*
2	Setting Mode 2 - Press and hold the BS1 **"MODE"** button for approximately 6 seconds (BS1 MODE)	20	20 *Normal*
3	Press the BS2 **"SET"** button to select the correct setting: (BS2 SET)	22	22
4	Press the BS3 **"RETURN"** button once to enter the setting item status - OFF (BS3 RETURN)	0 *Default*	0 *Default*
5	Press the BS2 **"SET"** button once to change the status from OFF to ON (BS2 SET)	1	1 *Drives EEVs open*
6	Press the BS3 **"RETURN"** button once to lock the setting (BS3 RETURN)	1 *Weigh in the appropriate amount of refrigerant. When complete close off high side gauge*	1 *STOP- Pressurize, Evacuate or Recover now through the service ports*
7	Press the BS3 **"RETURN"** button once to activate the setting (BS3 RETURN)	1	1
8	Press the BS1 **"RETURN"** button once to terminate operation. Remove the high side hose from the charging port (BS3 RETURN)	*Normal*	*Normal*

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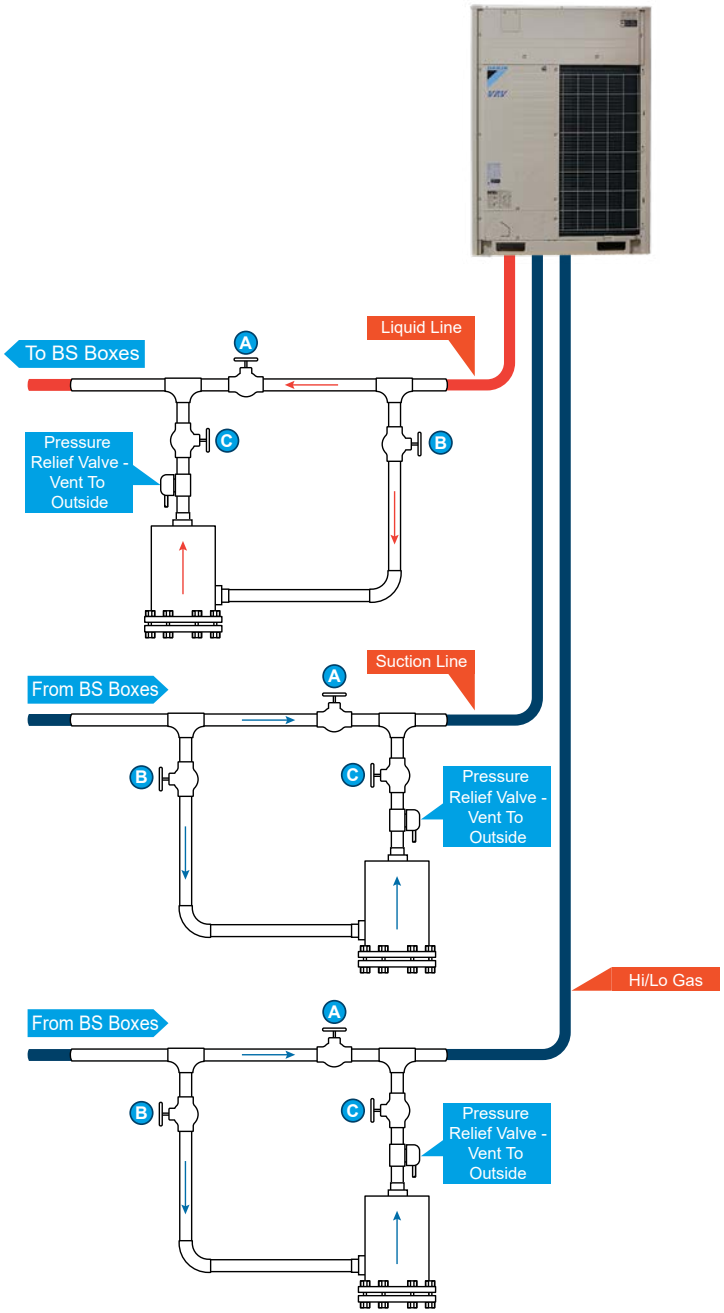
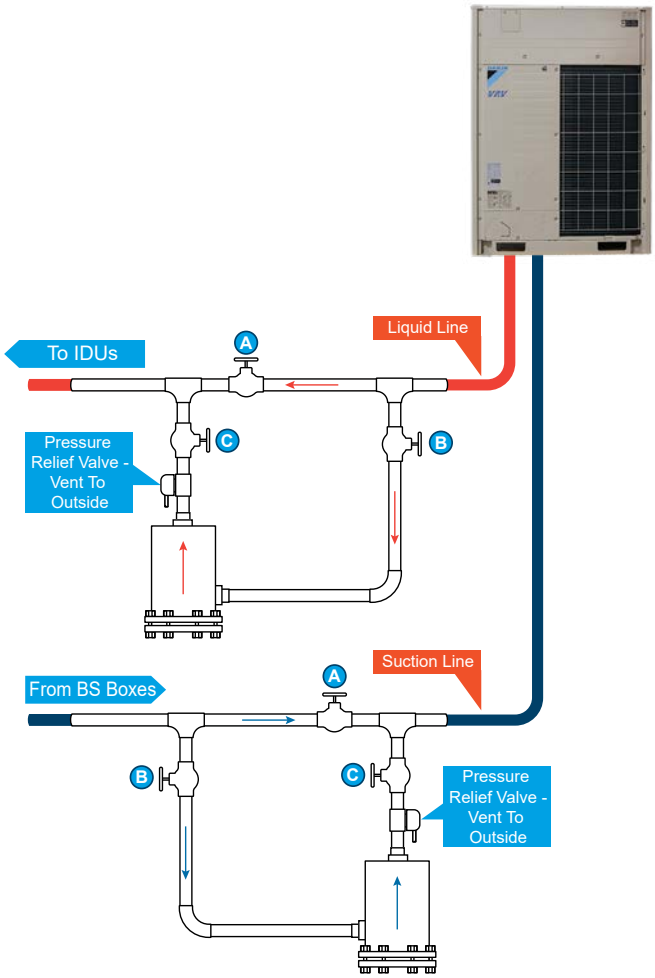
Reference #3



Reference #4



Bypass Curcuit Installed Horizontally

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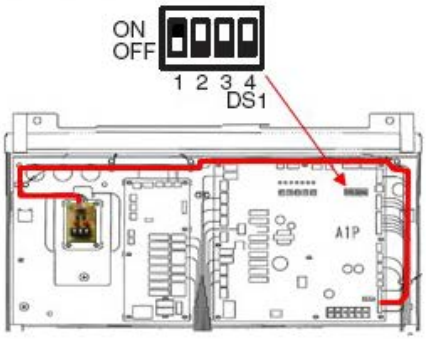
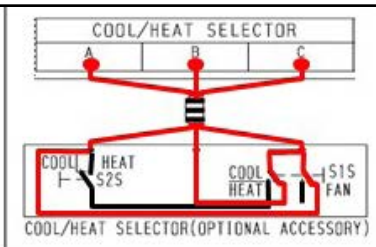
Reference #5 / Heating Lockout

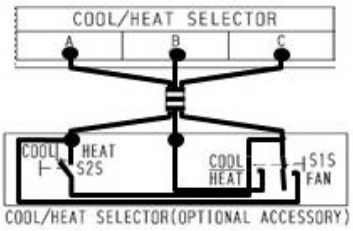
Dipswitch DS1-1 on the main PCB must be ON for remote COOL / HEAT selection





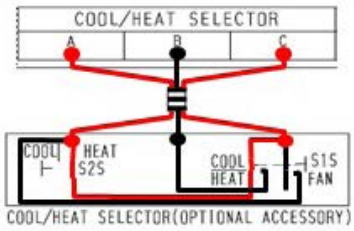
Fan Mode

When terminals B-C are shunted together only the FAN mode will be selectable at the indoor unit remote controller



Cooling Mode

When there is no connection between terminals A-B-C only the cooling, fan and dry modes will be selectable at the indoor unit remote controller



Heating Mode

When terminals A-C are shunted together only the heating and fan modes will be selectable at the indoor unit remote controller

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Refrigerant Piping Precautions

- Do not allow contaminant to remain in the refrigerant system such as air, nitrogen, etc.
- Use R410A refrigerant only
- Installation tools:
  - Daikin recommends using a dedicated R410A refrigerant gauge manifold.
- Vacuum pump:
  - Use at a minimum a 2-stage vacuum pump with a non-return valve.
  - Make sure the vacuum pump oil does not reverse flow into the system while the pump is not working.
  - Use a vacuum pump which can evacuate to less than 500 microns.

Refrigerant Piping Precautions

- Take measures to prevent foreign materials like moisture and contamination from mixing into the system.
- Do not leave piping open to the atmosphere when not working on the system.
- Seal all air gaps around pipes when passing through exterior walls.
- **DRY nitrogen must be purged through piping during brazing (1.5 – 3 PSI).**
- Do not use paste-type flux when brazing.
- Brazing rods with minimum of 5% silver content, or higher, can be used.
  Example: Harris Stay-Sliv®5 or equivalent can be used.
- Use DRY nitrogen when performing pressure testing or for leak detection.

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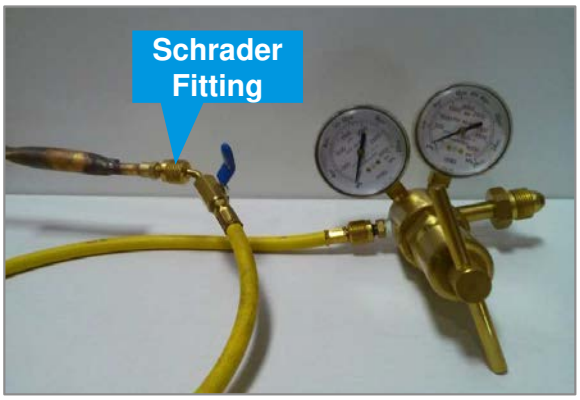
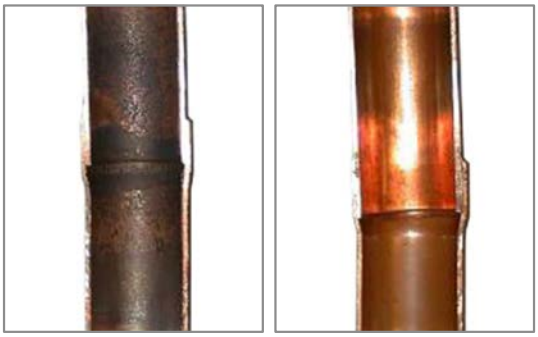
Brazing

- Tape in or braze Schrader Fitting
- Set Nitrogen regulator between 1.5 – 3 PSIG
- Leave other end of pipe open so nitrogen can flow through during brazing
- Dry Nitrogen MUST be used during all brazing (Pressure regulated between 1.5 to 3 PSIG) to prevent oxidation formation





Oxidation | No Oxidation

The effects of not purging with Nitrogen

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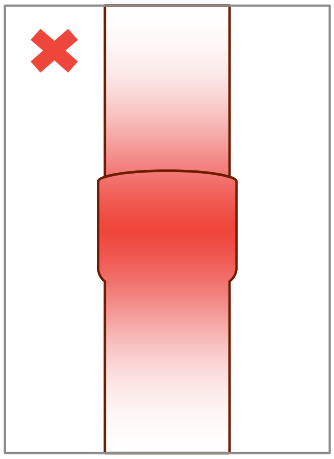
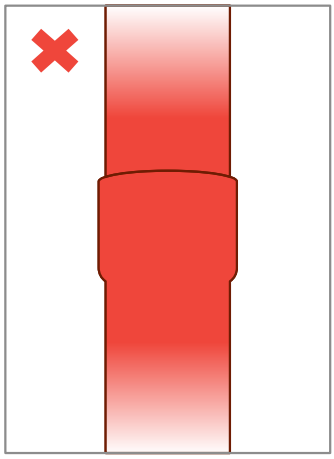
Brazing - Be careful not to under or overheat piping

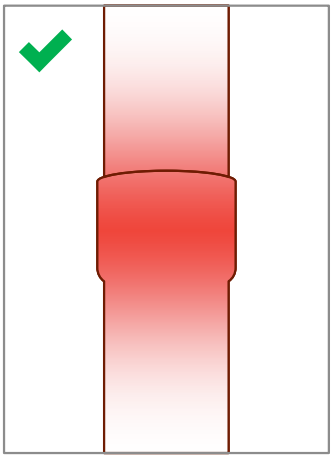
- ***Too Cool*** *(930 – 1100°F)*



- ***Too Hot*** *(1,470 –2,600°F)*



- ***Perfect*** *(1,150 –1,430°F)*



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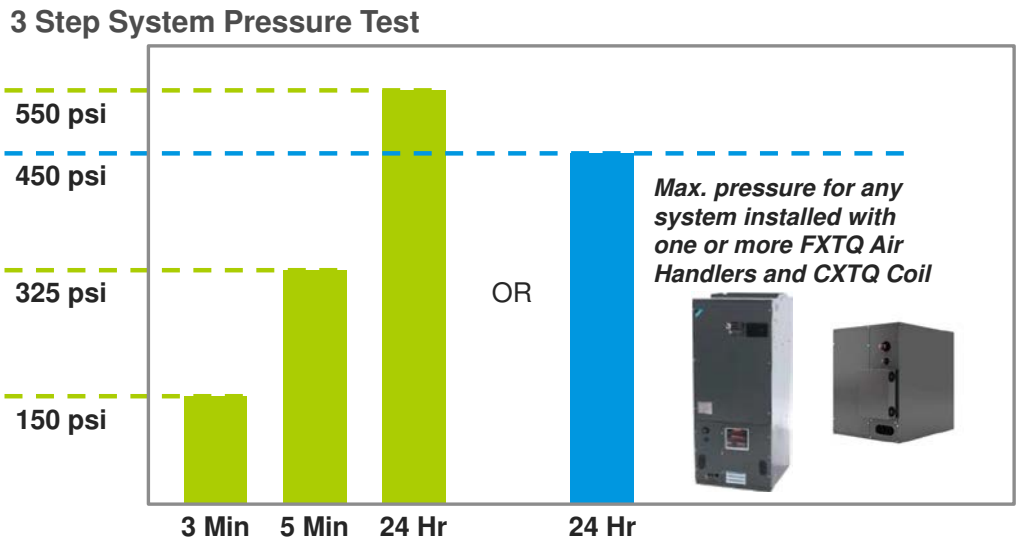
System Nitrogen Pressure Test



Verify all stop valves are securely closed before pressure test

Pre-Commissioning Check #2 (Cont'd)

- 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 drop or rise from one day to the next when performing the 24 hour pressure test.
    - The following formula will determine system pressure drop or pressure rise caused by low or high ambient temperatures.

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

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

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Pre-Commissioning Check #3

System Triple Evacuation

- Recommended min. 2 CFM Vacuum pump with check valve
- Digital micron gauge
- Ensure Vacuum hoses are in good condition
  - Evacuate the refrigerant piping to 4,000 microns - hold for 15 minutes
  - Break the Vacuum with dry nitrogen to a pressure of 2-3 PSIG
  - Evacuate the system to 1,500 microns - hold for 20 minutes
  - Break the Vacuum with dry nitrogen to a pressure of 2-3 PSIG
  - Evacuate the system to 500 microns or less
    - Conduct a pressure rise test; system should hold less than 500 microns for 1 hour
    - Hold Vacuum for liquid refrigerant charging
    - Use Vacuum to draw in the calculated charge

Evacuation Connections

- An alternative way to connect a evacuation pump to the system.
- Some pumps come with $3/8$ or $1/2$ inch hoses and connections on the pump.
- The use of a Schrader removal tool will speed up the evacuation by reducing restrictions.
- By connecting the larger hoses and removing the Schrader core, evacuation will be faster.
- Attach the micron gauge to the port on the core remover.
- With this connection no need for a manifold, less chance for leaks.

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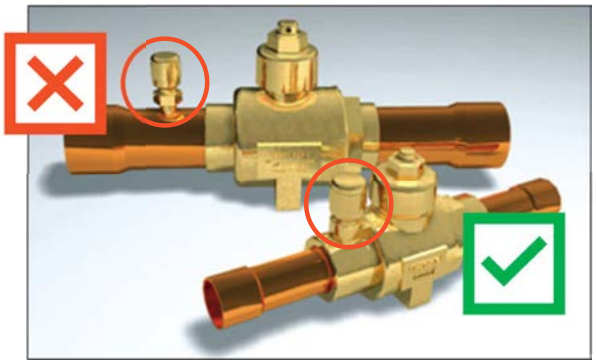
Isolation Valves

- Isolation valves may be installed in Daikin systems. Isolation valves requirements, if used, are listed below.
- Compatibility with R-410A and PVE (Polyvinyl ether) oil
- Temperature operation range of -40°F to 300°F
- Working pressure of 550 PSIG, capable of handling up to 700 PSIG
- Full flow valve with 0 pressure drop
- Bi-directional flow
- Brazed connections



Remove Schrader core when brazing and protect valve from excessive heat

DAIKIN AIR INTELLIGENCE

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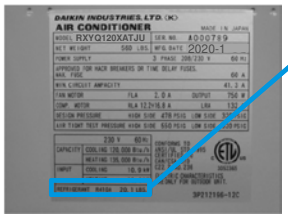
Reference #9 / Refrigerant Charge Procedures (TC-5.6)

Refer to the proper Installation Manual for refrigerant charge procedure.

Pre-Commissioning Check #4

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 sub cooling* temperatures; refrigerant is weighed into the system
- All VRV IV X OD Units have a factory refrigerant charge based on the unit model
  - The VRV outdoor units display the factory refrigerant charge on the unit ID plate
- Proper system charging requires an 'Additional Refrigerant Charge' amount to be calculated
- The total system refrigerant charge is comprised of the factory charge in the outdoor unit(s), and the 'Additional Refrigerant Charge' amount calculated for that system



REFRIGERANT R410A 20.1 LBS.

+ 'Additional Refrigerant Charge' = **TOTAL SYSTEM CHARGE**

*(VRV IV X only, charge can be adjusted by subcooling , refer to IOM)

Pre-Commissioning Check #4 (Cont'd)

System Refrigerant Charging Procedures

- VRV IV X systems can be manually charged using the Additional Refrigerant Charge Mode. 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

Note: On VRV IV X only, sub cooling can be used to adjust the refrigerant charge. Refer to the installation manual that comes with the ODU for the proper procedure

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Pre-Commissioning Check #4 (Cont'd) - Heat Pump

VRV IV X 'Additional Refrigerant Charge' Manual Calculation

The example system for this exercise is:
RXYQ264XATJA Heat Pump (RXYQ144XATJA + RXYQ120XATJA)
System Connection Ratio is 116%
Connection ratio can be found in the Web *X*press documentation.

Total length (ft) of 1/4" liquid line 45 X .015 lbs/ft = .675
+
Total length (ft) of 3/8" liquid line 100 X .040 lbs/ft = 4.00
+
Total length (ft) of 1/2" liquid line 45 X .081 lbs/ft = 3.645
+
Total length (ft) of 5/8" liquid line 15 X .121 lbs/ft = 1.815
+
Total length (ft) of 3/4" liquid line 60 X .175 lbs/ft = 10.5
+
Total length (ft) of 7/8" liquid line 0 X .249 lbs/ft = 0.00

Liquid Line Example Totals: 265 ft. 20.64 Lbs

Pre-Commissioning Check #4 (Cont'd) - Heat Pump

VRV IV X 'Additional Refrigerant Charge' Manual Calculation

- Example System: RXYQ264XATJA (1x RXYQ144XATJA + 1x RXYQ120XATJA)
- System Indoor Fan Coil Connection Ratio: 116%
- Calculate the refrigerant amounts for each Outdoor Unit in a manifolded system

Parameter A

Amount of refrigerant to add based on outdoor unit model	
RXYQ72-120X	0.0 lbs.
RXYQ144X	8.8 lbs.
RXYQ168X	9.9 lbs.

+

Parameter B

Refrigerant Piping from OD unit to farthest Fan Coil	Total indoor unit Connection Ratio	RXYQ__X 72X	RXYQ__X 96-168X
Piping Length ≤ 98 ft.	≤ 105%	0.0lbs	0.0lbs
	> 105%	1.10lbs.	1.10lbs.
Piping Length > 98 ft.	70% - 85%	.66 lbs.	1.10 lbs.
	86% - 105%	1.54 lbs.	2.20 lbs.
	>105%	2.65 lbs.	3.31 lbs.

Liquid Line Lengths	+	Parameter A OD Unit Model(s)	+	Parameter B Connection Ratio per each OD Unit	=	Total Additional Refrigerant Charge
20.64 lbs.		**0.0+8.8 lbs.**		**3.31+3.31 lbs.**		**36 lbs.**

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Pre-Commissioning Check #4 (Cont'd) - Heat Recovery VRV IV X

VRV IV X 'Additional Refrigerant Charge' Manual Calculation

The example system for this exercise is:
REYQ264XATJU Heat Recovery (REYQ144XATJU + REYQ120XATJU)
System Connection Ratio is 116%
Connection ratio can be found in the Web Xpress documentation.

Total length (ft) of 1/4" liquid line 45 X .015 lbs/ft = .675
+
Total length (ft) of 3/8" liquid line 100 X .040 lbs/ft = 4.00
+
Total length (ft) of 1/2" liquid line 45 X .081 lbs/ft = 3.645
+
Total length (ft) of 5/8" liquid line 15 X .121 lbs/ft = 1.815
+
Total length (ft) of 3/4" liquid line 60 X .175 lbs/ft = 10.5
+
Total length (ft) of 7/8" liquid line 0 X .249 lbs/ft = 0.00

Liquid Line Example Totals: 265 ft. 20.64 Lbs

Pre-Commissioning Check #4 (Cont'd) - Heat Recovery VRV IV X

- Once the total liquid line calculation is done on a Heat Recovery System that value is multiplied by 1.04.
  - Ex. 20.64lbs x 1.04 = 21.46lbs (Liquid Line amount)
- Then Additional refrigerant must be added for the amount and type of Branch Selector Boxes in the system. This will be called Parameter A.
- For this example the system will have (4) BS4Q54T Boxes.
  - So .7lbs X 4 = 2.8lbs
- Add this to the 21.46 from the liquid line lengths and the total additional charge at this point will be 21.46lbs + 2.8lbs = 24.26lbs

Parameter [A] Refrigerant amount for BS units	
BS unit model	**Refrigerant amount**
BS4Q54T	0.7 lbs/unit (0.3kg/unit)
BS6Q54T	0.9 lbs/unit (0.4kg/unit)
BS8Q54T	1.1 lbs/unit (0.5kg/unit)
BS10Q54T	1.5 lbs/unit (0.7kg/unit)
BS12Q54T	1.8 lbs/unit (0.8kg/unit)
BSQ36T	0.1 lbs/unit (0.05kg/unit)
BSQ60T	0.2 lbs/unit (0.1kg/unit)
BSQ96T	0.4 lbs/unit (0.2kg/unit)

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Pre-Commissioning Check #4 (Cont'd) - Heat Recovery VRV IV X

- Additional refrigerant will also be added for the Model of the outdoor unit(s). This will be called Parameter B.
- For this example the system is a REYQ144XATJU + REYQ120XATJU
- From the calculation for the line set lengths and the Branch selector boxes which is 24.26lbs we will add 9.7lbs and 9.7lbs which makes the total additional charge at this point 43.66lbs.
- 24.26lbs + 9.7lbs + 9.7lbs = 43.66lbs

VRV IV X Condenser

Parameter [B] Refrigerant amount for ODUs	
ODU capacity type	Refrigerant amount
REYQ72XA	9.7 lbs/unit (4.4 kg/unit)
REYQ96XA	8.2 lbs./unit (3.7 kg/unit)
REYQ120XA	8.6 lbs./unit (3.9 kg/unit)
REYQ144XA	9.0 lbs./unit (4.1 kg/unit)
REYQ168XA	9.5 lbs/unit (4.3 kg/unit)

Pre-Commissioning Check #4 (Cont'd) - Heat Recovery VRV IV X

- Now additional charge may or may not need to be added for the connection ratio and the total system pipe length. We know the connection ratio is 116% and the total line length is 265 ft. The outdoor unit model numbers combined are a REYQ264XATJU. This will be Parameter C
- Depending on what parameter D is the additional charge for parameter C will be either 6.61lbs or the value of D, whichever one is smaller
- Note: Total system pipe length will be from the Outdoor unit to the furthest fan coil

Parameter [C] Refrigerant amount by field piping length and indoor units capacity

Field piping length	Total IDU capacity connection ratio	Refrigerant amount Total ODU capacity type		
		REYQ72-144X	REYQ168-288X	REYQ312-456X
< 295.3 ft (90 m)	≤ 85%		0.0	
	> 85%	The smaller of [D] or 5.1 lbs (2.5 kg)	The smaller of [D] or 6.61 lbs (3.0 kg)	The smaller of [D] or 7.5 lbs (3.4 kg)
≥ 295.3 ft (90 m)	≤ 85%	0.0		
	> 85%	2.20 lbs (1.0 kg)		

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Pre-Commissioning Check #4 (Cont'd) - Heat Recovery VRV IV X

- Parameter D is additional charge for the type of indoor units on the system.
- For this example we have (5) FXMQ30, and (10) FXFQ24 fan coils.
  - 5 X .33lbs = 1.65lbs and 10 X .53lbs = 5.3lbs
- Parameter D is 1.65lbs + 5.3lbs = 6.95lbs
- Since Parameter D (6.95lbs) is more than Parameter C (6.61lbs), the amount for C will be used.

Parameter [D]

IDU capacity type	FXMQ type									
	07	09	12	15	18	24	30	36	48	54
Refrigerant amount (lbs(kg)/unit)	0.06 (0.03)	0.03 (0.014)	0.14 (0.06)	0.29 (0.13)	0.25 (0.11)	0.16 (0.07)	0.33 (0.15)	0.25 (0.11)	0.08 (0.04)	0.00 (0.00)

IDU capacity type	FXFQ type									
	07	09	12	15	18	24	30	36	48	Others*
Refrigerant amount (lbs(kg)/unit)	0.36 (0.16)	0.33 (0.15)	0.30 (0.14)	0.26 (0.12)	0.61 (0.28)	0.53 (0.24)	0.61 (0.28)	0.53 (0.24)	0.36 (0.16)	0.00 (0.00)

***Note: There is no additional charge for other types of fan coils just the FXMQ's and the FXFQ's**

Pre-Commissioning Check #4 (Cont'd) - Heat Recovery VRV IV X

- So the total additional charge for this system will be:
- Line set length total **= 20.64lbs**
- Since it is heat recovery we multiply that number by **1.04 = 21.64lbs**
- Then Parameters A,B,C, and D are added to that value
- **Parameter A – 2.8lbs** (Amount for Branch selector boxes)
- **Parameter B – 9.7lbs + 9.7lbs = 19.4lbs** (Amount for outdoor units)
- **Parameter C – 6.61lbs** (This value is less than D so this parameter will be used)
- **Parameter D – 6.95lbs** (This amount is larger than Parameter C so this value will not be used)

21.64lbs + 2.8lbs + 19.4lbs + 6.61lbs = 50.45lbs (Total Additional charge)

(A) (B) (C) *(D value not used in this calculation)*

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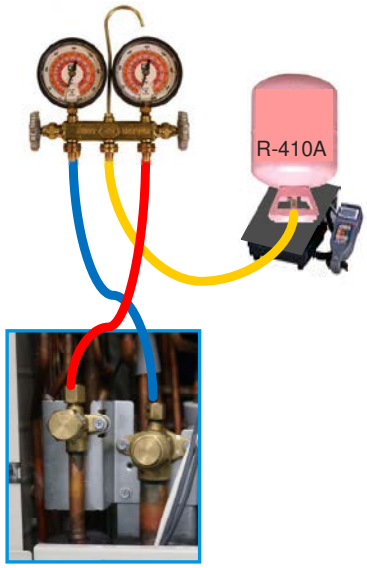
System Refrigerant Charging Procedures

1. 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 thru the liquid service port only
   - If there is not enough vacuum to draw in the total charge, use the 'Additional Refrigerant Charge Mode' or Auto Charge to complete the system charging process
2. After the system receives the full or partial charge, open the liquid and gas stop valves and then remove the manifold hoses from both service valves (Pre-Commissioning Step #5)

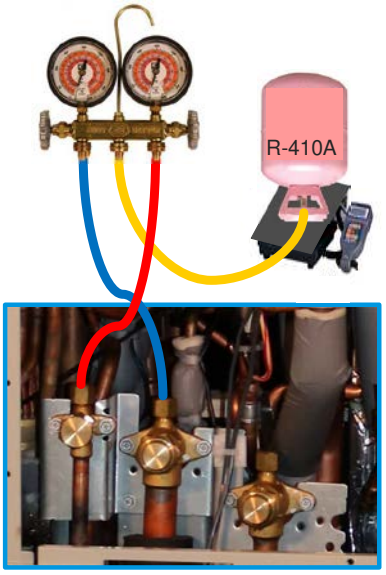


5/16" Service Ports

Pre-Commissioning Check #4 (Cont'd) - Heat Recovery

System Refrigerant Charging Procedures Cont.

- 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 thru the liquid service port only
  - If there is not enough Vacuum to draw in the total charge, use the 'Additional Refrigerant Charge Mode' to complete the system charging process
- After the system is fully charged, open the liquid and gas stop valves and then remove the manifold hoses from both service valves (Pre-Commissioning Step #5)
- If partially charged connect hoses to charging port to finish the charging process



5/16" Service Ports

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Method of Troubleshooting

Inverter Compressor Fails Three Times a Month	
CAUSE	Due to foreign matters clogging between the oil separator and the filter, oil does not return to the compressor.
COUNTER MEASURE	Recovers by replacing the refrigerant filter.
POINT OF DIAGNOSIS	Measure temperature before and after the oil-returning capillary connection of the suction pipe and obtain the temperature difference. Check that the temperature difference is 9°F or more when the compressor operating frequency is stabilized.

Checking Oil Return Circuit

- Regarding the oil return circuit
  - When the compressor failed, please be sure to check the oil return circuit by following method.

A. Suction pipe temp. (upstream of oil return inlet.)

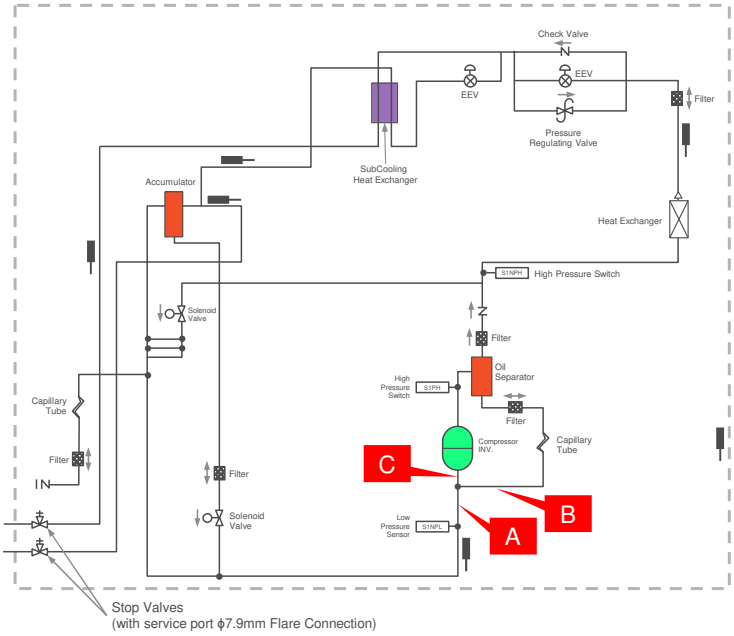
B. Oil return pipe temp. (upstream of connection to suction pipe)

C. The pipe temp downstream of oil return inlet.

Problem unit	
A	62.6°F/17°C
B	154.2°F/67.9°C
C	94.8°F/34.9°C

If the temp. of C is rising, we are able to judge that the lubricant oil is returning.

In this case, oil return circuit isn't clogging because there is a difference between A and C.



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