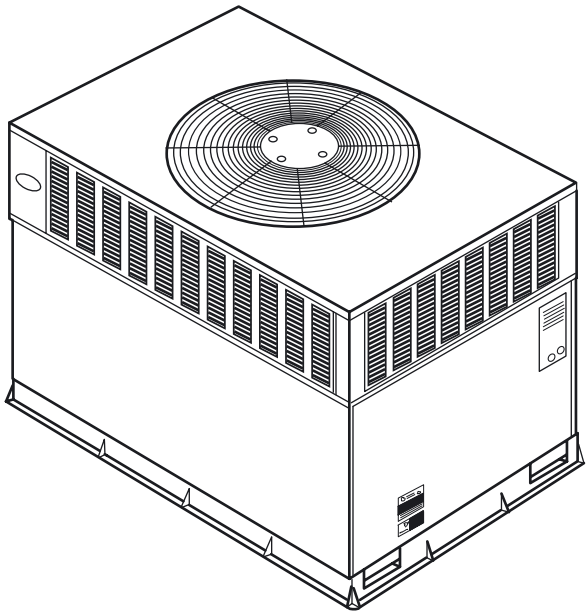
Carrier

50JZ 024-048

Single-Package Heat Pumps



EUROVENT CERTIFIED PERFORMANCE

Carrier is participating in the Eurovent Certification Programme. Products are as listed in the Eurovent Directory of Certified Products.

Puron™ the environmentally sound refrigerant

Installation, Operation and Maintenance Instructions

TABLE OF CONTENTS

NOTE TO INSTALLER: Read these instructions carefully and completely before installing this unit. Also, make sure the Owner's Manual and Service Instructions are left with the unit after installation.

SAFETY CONSIDERATIONS

Installation and servicing of air-conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified personnel should install, repair, or service air conditioning equipment.

Untrained personnel can perform basic maintenance functions of cleaning coils and filters. All other operations should be performed by trained service personnel. When working on air-conditioning equipment, observe precautions in the literature, tags, and labels attached to the unit, and other safety precautions that may apply.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for unbrazing operations. Have fire extinguisher available for all brazing operations.

WARNING: Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electric shock, or other occurrences, which could cause serious injury or death or damage your property. Consult a qualified installer or service agency for information or assistance. The qualified installer or agency must use only factory-authorised kits or accessories when modifying this product.

1. The power supply (volts, phase, and hertz) must correspond to that specified on unit rating plate.
2. The electrical supply provided by the utility must be sufficient to handle load imposed by this unit.
3. This installation must conform with local legislation. Refer to national and local plumbing or waste water codes and other applicable local codes.

WARNING: Before performing service or maintenance operations on system, turn off main power to unit. Turn off accessory heater power switch if applicable. Electrical shock could cause severe injury or death.

CAUTION: Puron (R-410A) systems operate at higher pressures than standard R-22 systems. Do not use R-22 service equipment or components on Puron (R-410A) equipment. Ensure service equipment is rated for Puron (R-410A).

INTRODUCTION

The 50JZ heat pump is fully self-contained and designed for outdoor installation. Standard units are shipped in a horizontal discharge configuration for installation on a ground-level slab. Standard units can be converted to downflow (vertical) discharge configurations for rooftop applications.

RECEIVING AND INSTALLATION

Check equipment

Identify unit
The unit model number and serial number are stamped on the unit rating/identification plate. Check this information against shipping papers.

Inspect shipment
Inspect for shipping damage while unit is still on shipping pallet. If unit appears to be damaged or is torn loose from its anchorage, have it examined by transportation inspectors before removal.

Forward claim papers directly to transportation company. Manufacturer is not responsible for any damage incurred in transit.

Check all items against shipping list. Immediately notify the nearest Carrier office if any item is missing. To prevent loss or damage, leave all parts in original packages until installation.

Provide unit support

Roof curb
Install accessory roof curb in accordance with instructions shipped with curb. (Fig. 4) Install insulation, cant strips, roofing, and flashing. Ductwork must be attached to curb.

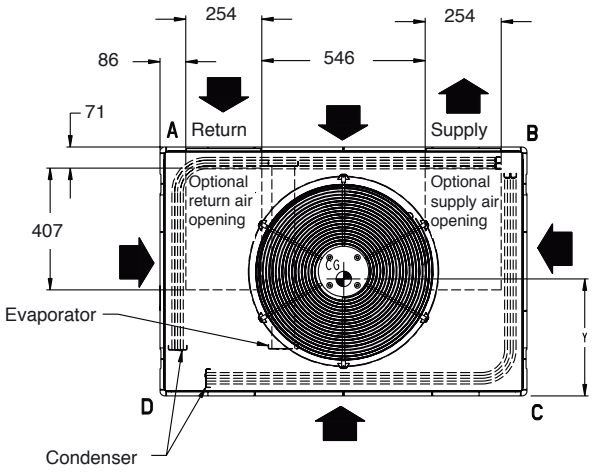
IMPORTANT: The gasketing of the unit to the roof curb is critical for a watertight seal. Install gasketing material supplied with the roof curb. Improperly applied gasketing also can result in air leaks and poor unit performance.

Curb should be level (Fig. 5) to within 6 mm. This is necessary for unit drain to function properly. Refer to accessory roof curb installation instructions for additional information as required.

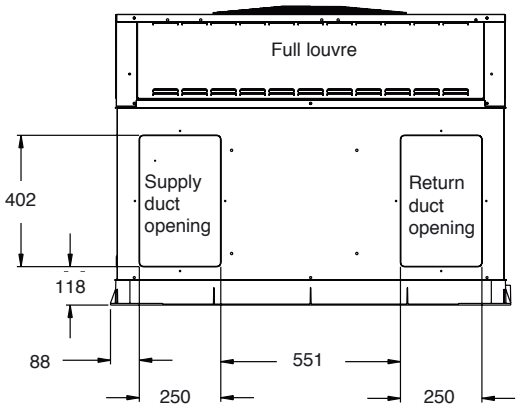
Slab mount
Place the unit on a solid, level concrete pad that is a minimum of 100 mm thick with 50 mm above grade (Fig. 6). The slab should extend approximately 50 mm beyond the casing on all four sides of the unit. Do not secure the unit to the slab except when required by local codes.

Ground mount
The unit may be installed either on a slab or placed directly on the ground if local codes permit. Place the unit on level ground prepared with gravel for condensate discharge.

Fig. 1 - Dimensions, 50JZ 024-036



Top view



Rear view

Required clearances to combustible material

Top of unit	356 mm
Duct side of unit	50 mm
Side opposite ducts	356 mm
Bottom of unit	13 mm
Electric heat panel	914 mm

Required clearances for electrical system

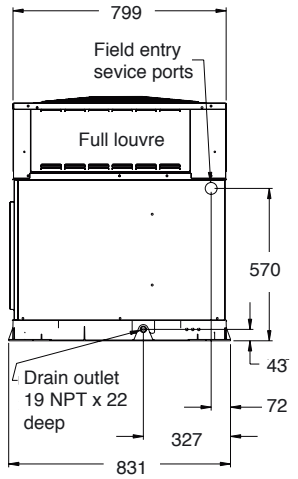
Between units, power entry side	1067 mm
Unit and ungrounded surfaces, power entry side	914 mm
Unit and block or concrete walls and other grounded surfaces, power entry side	1067 mm

Required clearances for operation and service

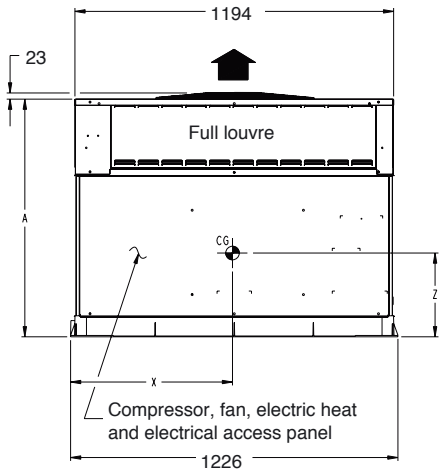
Evaporator coil access side	914 mm
Power entry side (except for electrical requirements)	914 mm
Unit top	914 mm
Side opposite ducts	914 mm
Duct panel	305 mm

* Minimum distances: If the unit is placed less than 305 mm from the wall, system performance may be affected.

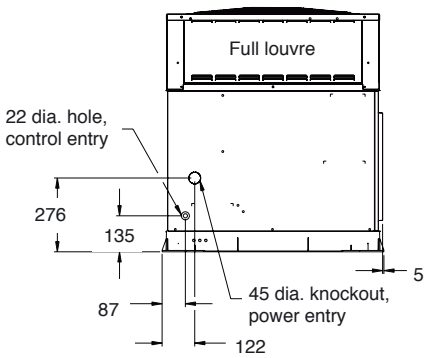
All dimensions are in millimetres.



Left-side view



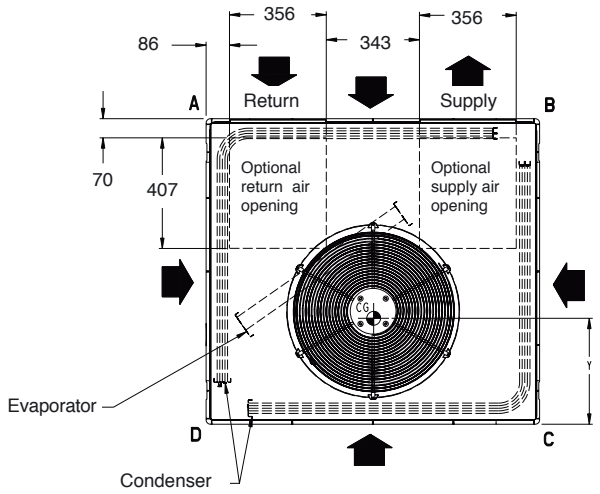
Front view



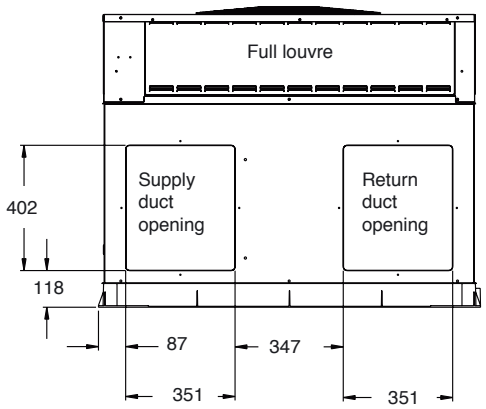
Right-side view

50JZ	Power supply V-ph-Hz	Unit weight kg	Unit height A mm	Centre of gravity, mm X	Y	Z
024	400-3-50	136	890	483	464	406
030	400-3-50	145	940	508	489	447
036	400-3-50	149	940	508	483	419

Fig. 2 - Dimensions, 50JZ 048



Top view



Rear view

Required clearances to combustible material

Top of unit	356 mm
Duct side of unit	50 mm
Side opposite ducts	356 mm
Bottom of unit	13 mm
Electric heat panel	914 mm

Required clearances for electrical system

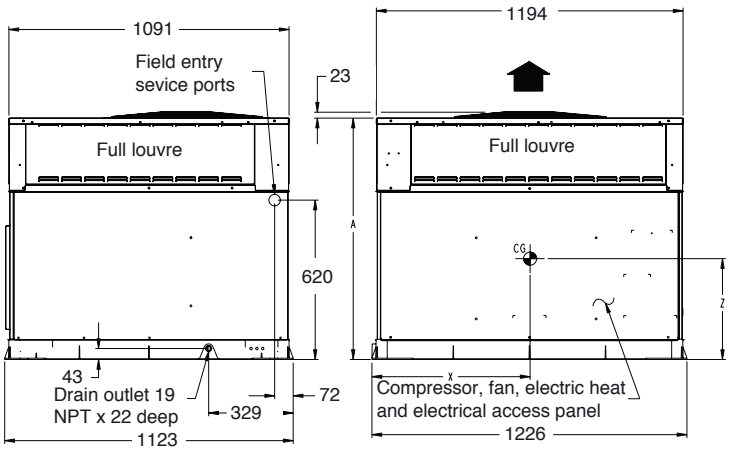
Between units, power entry side	1067 mm
Unit and ungrounded surfaces, power entry side	914 mm
Unit and block or concrete walls and other grounded surfaces, power entry side	1067 mm

Required clearances for operation and service

Evaporator coil access side	914 mm
Power entry side (except for electrical requirements)	914 mm
Unit top	914 mm
Side opposite ducts	914 mm
Duct panel	305 mm

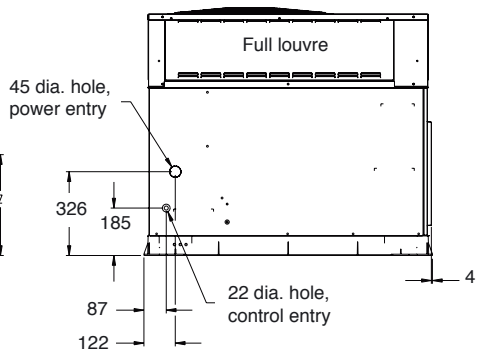
* Minimum distances: If the unit is placed less than 305 mm from the wall, system performance may be affected.

All dimensions are in millimetres.



Left-side view

Front view



Right-side view

50JZ	Power supply V-ph-Hz	Unit weight kg	Unit height A mm	Centre of gravity, mm X	Y	Z
048	400-3-50	161	1041	508	540	457

Provide clearances

The required minimum service clearances are shown in Figs. 1 and 2. Adequate ventilation and outdoor air must be provided. The outdoor fan draws air through the outdoor coil and discharges it through the top fan grille. Be sure that the fan discharge does not recirculate to the outdoor coil. Do not locate the unit in either a corner or under an overhead obstruction. The minimum clearance under a partial overhang (such as a normal house overhang) is 1220 mm above the unit top. The maximum horizontal extension of a partial overhang must not exceed 1220 mm.

IMPORTANT: Do not restrict outdoor air flow. An air restriction at either the outdoor air inlet or the fan discharge may be detrimental to compressor life. Do not place the unit where water, ice, or snow from an overhang or roof will damage or flood the unit. Do not install the unit on carpeting or other combustible materials. Slab-mounted units should be at least 100 mm above the highest expected water and runoff levels. Do not use unit if it has been under water.

Rig and place unit

Rigging and handling of this equipment can be hazardous for many reasons due to the installation location (roofs, elevated structures, etc.)

Only trained, qualified crane operators and ground support staff should handle and install this equipment.

When working with this equipment, observe precautions in the literature, on tags, stickers, and labels attached to the equipment, and any other safety precautions that might apply. Follow all applicable safety codes. Wear safety shoes and work gloves.

INSPECTION

Prior to initial use, and at monthly intervals, all rigging brackets and straps should be visually inspected for any damage, evidence of wear, structural deformation, or cracks. Particular attention should be paid to excessive wear at hoist hooking points and load support areas. Brackets or straps showing any kind of wear in these areas must not be used and should be discarded.

INSTALLATION

1. Remove unit from shipping carton. Leave top shipping skid on the unit as a spreader bar to prevent the rigging straps from damaging the unit. If the wood skid is not available, use a spreader bar of sufficient length to protect unit from damage.
2. Position the lifting bracket assembly around the base of the unit. Be sure the strap does not twist.
3. Place each of the 4 metal lifting brackets into the rigging holds in the composite unit base.
4. Thread lifting bracket strapping around bottom perimeter of unit as follows:
   a. Open lever of tension buckle (ratchet type).
   b. Feed strapping through tension buckle as shown in Fig. 7.
   c. Pull strapping through tension buckle unit taut.
   d. Snap lever down to lock strap in tension buckle. To release strapping, squeeze safety latch, lift lever, and pull webbing outward.
5. Tighten the tension buckle until it is taut. Lifting brackets must be secure in the rigging holds.
6. Attach field-supplied clevis or hook of sufficient strength to hole in the lifting bracket (Fig. 8)
7. Attach the two safety straps directly to the clevis or hook at the four rigging brackets. DO NOT attach the safety straps to the lifting brackets (Fig. 8)
8. Position lifting point directly over the unit centre of gravity.
9. Lift unit. When unit is directly over the roof curb, remove the two safety straps. Lower the equipment onto the roof curb.
10. After the unit is placed on the roof curb or mounting pad, remove the top crating.

Select and install duct work

The design and installation of the duct system must be in accordance with applicable standards for installation of non-residence type air conditioning and ventilating systems. Select and size duct work, supply air registers, and return air grilles according to standard HVAC recommendations.

The unit has duct flanges on the supply- and return-air openings on the side of the unit. When designing and installing duct work, consider the following:

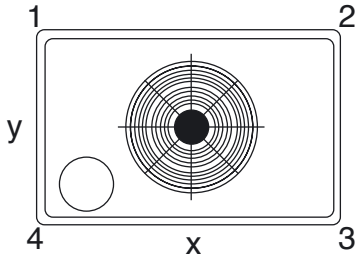
WARNING: For vertical supply and return units, tools or parts could drop into duct work and cause serious injury or death. Install a 90 degree turn in the return duct work between the unit and the conditioned space. If a 90 degree elbow cannot be installed, then a grille of sufficient strength and density should be installed to prevent objects from falling into the conditioned space. Units with electric heaters require 90 degree elbow in supply duct.

1. All units should have field-supplied filters or accessory filter rack installed in the return-air side of the unit. Recommended sizes for filters are shown in Table 1.
2. Avoid abrupt duct size increases and reductions. Abrupt change in duct size adversely affects air performance.

IMPORTANT: Use flexible connectors between duct work and unit to prevent transmission of vibration. Use suitable gaskets to ensure weather tight and airtight seal. When electric heat is installed, use fireproof canvas (or similar heat resistant material) connector between duct work and unit discharge connection. If flexible duct is used, insert a sheet metal sleeve inside duct. Heat resistant duct connector (or sheet metal sleeve) must extend 610 mm from electric heater element.

3. Size duct work for cooling air flow. The minimum air flow for proper electric heater operation is listed in Table 2. Heater limit switches may trip at air quantities below those recommended.
4. Seal, insulate, and weatherproof all external duct work. Seal, insulate and cover with a vapour barrier all duct work passing through conditioned spaces.
5. Secure all ducts to building structure. Flash, weatherproof, and vibration-isolate duct openings in wall or roof according to good construction practices.

Fig. 3 - Corner weights, kg



Corner weights	Small cabinet			Large cabinet
50JZ	**024**	**030**	**036**	**048**
Total weight	136	145	149	161
Corner weight 1	28.5	28.5	29	34.5
Corner weight 2	28	33.5	35	23
Corner weight 3	26	25	26	43.5
Corner weight 4	53.5	58	59	60

Converting horizontal discharge units to downflow (vertical) discharge units

WARNING: Before performing service or maintenance operations on system, turn off main power to unit. Turn off accessory heater power switch if applicable. Electrical shock could cause serious injury or death.

1. Open all electrical disconnects before starting any service work.
2. Remove horizontal duct covers to access bottom return and supply knock out panels.
3. Use a screwdriver and hammer to remove the panels in the bottom of the unit base.

NOTE: These panels are held in place with tabs similar to an electrical knockout.

4. Reinstall the horizontal duct covers (Fig. 10) to block off the horizontal air openings.

NOTE: Avoid abrupt duct size increases and reductions. Abrupt change in duct size adversely affects air performance.

Provide for condensate disposal

NOTE: Ensure that condensate water disposal methods comply with local codes, restrictions, and practices.

The 50JZ units dispose of condensate through a 3/4 in. NPT female fitting that exits on the compressor end of the unit. Condensate water can be drained directly onto the roof in rooftop installations (where permitted) or onto a gravel apron in ground level installations. Install a field-supplied condensate trap at end of condensate connection to ensure proper drainage. Make sure that the outlet of the trap is at least 25 mm lower than the drain condensate connection to prevent the drain from overflowing. Prime the trap with water. When using a gravel apron, make sure it slopes away from the unit.

If the installation requires draining the condensate water away from the unit, install a field-supplied 50 mm trap at the condensate connection to ensure proper drainage. Condensate trap is available as an accessory or is field-supplied. Make sure that the outlet of the trap is at least 25 mm lower than the unit drain condensate connection to prevent the drain from overflowing. Connect a drain trough using a minimum of field-supplied 3/4-in. PVC or copper pipe at outlet end of the 50 mm trap (Fig. 11). Do not undersize the tube. Pitch the drain trough downward at a slope of at least 25 mm every 3 m of horizontal run. Be sure to check the drain trough for leaks. Prime the trap at the beginning of the cooling season start-up.

Install electrical connections

WARNING: The unit cabinet must have an uninterrupted, unbroken electrical ground to minimise the possibility of personal injury if an electrical fault should occur. This ground may consist of an electrical wire connected to the unit ground lug in the control compartment, or conduit approved for electrical ground when installed in accordance with local electrical codes. Failure to adhere to this warning could result in serious injury or death.

CAUTION: Failure to follow these precautions could result in damage to the unit being installed:

1. ***Make all electrical connections in accordance with local electrical codes governing such wiring.***
2. ***Use only copper conductor for connections between field-supplied electrical disconnect switch and unit. DO NOT USE ALUMINIUM WIRE.***
3. ***Be sure that high-voltage power to unit is within operating voltage range indicated on unit rating plate. On 3-phase units, ensure phases are balanced within 2%. Consult local power company for correction of improper voltage and/or phase imbalance.***
4. ***Insulate low-voltage wires for highest voltage contained within conduit when low-voltage control wires are in same conduit as high-voltage wires.***
5. ***Do not damage internal components when drilling through any panel to mount electrical hardware, conduit, etc.***

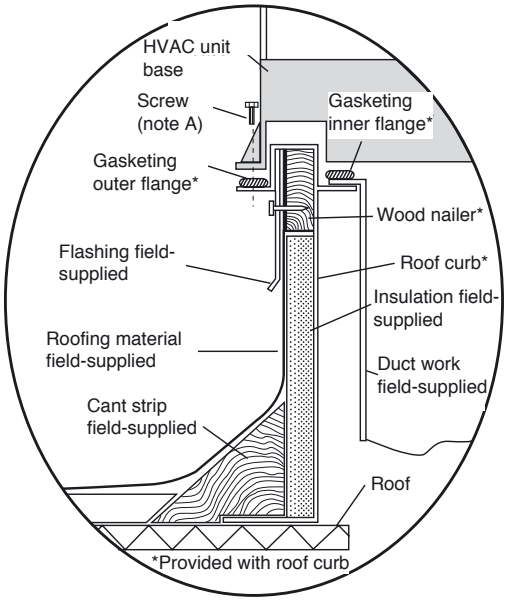
High-voltage connections

The unit must have a separate electrical supply with a field-supplied, waterproof disconnect switch mounted at, or within sight from the unit. Refer to the unit rating plate and local codes for maximum fuse/circuit breaker size and minimum circuit current for wire sizing. See Table 3 for electrical data. The field-supplied disconnect may be mounted on the unit over the high-voltage inlet hole (Figs. 1 and 2).

If the unit has an electric heater, a second disconnect may be required. Consult the Installation, Start-Up, and Service Instructions provided with the accessory for electrical supply connections. Operation of unit on improper line voltage constitutes abuse and may cause unit damage that could affect warranty.

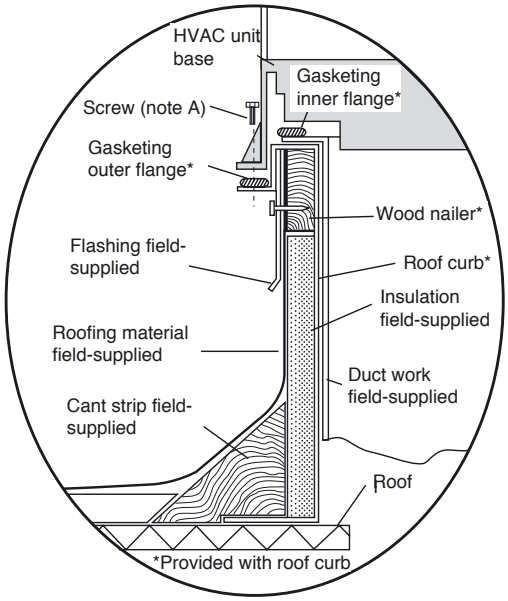
Fig. 4 - Roof curb dimensions

Roof curb for small cabinet

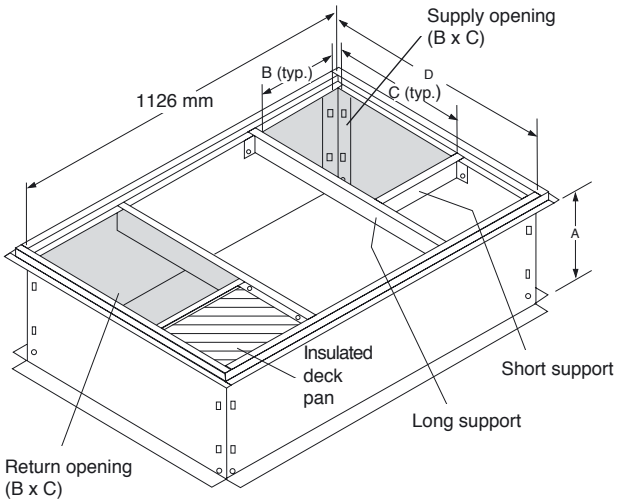


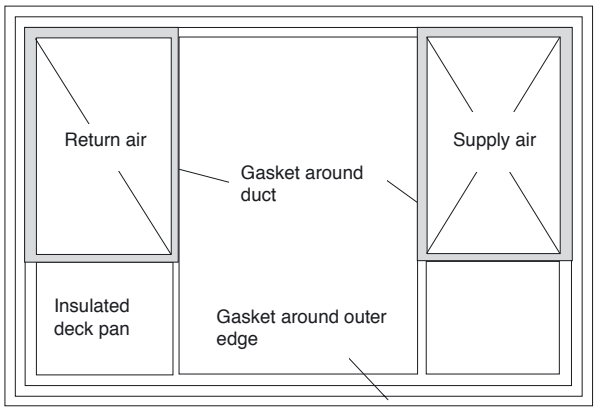
Note A: When unit mounting screw is used retainer bracket must also be used.

Roof curb for large cabinet



Note A: When unit mounting screw is used retainer bracket must also be used.

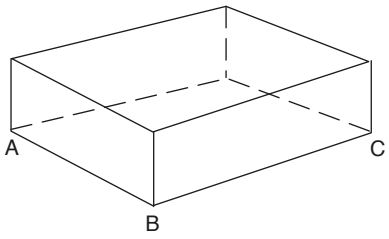




50JZ	ODS catalogue number	A (mm)	B (mm)	C (mm)	D (mm)
024-036	CPRFCURB006A00	203	279	419	730
	CPRFCURB007A00	356	279	419	730
048	CPRFCURB008A00	203	411	441	1022
	CPRFCURB009A00	356	411	441	1022

Notes:
1. Roof curb must be set up for unit being installed.
2. Seal strip must be applied, as required, to unit being installed.
3. Dimensions are in millimeters.
4. Roof curb is made of 16-gauge steel.
5. Table lists only the dimensions, per part number, that have changed.
6. Attach duct work to curb (flanges of duct rest on curb).
7. Insulated panels: 25 mm thick fibreglass of 0.45 kg density.
8. When unit mounting screw is used (see note A), a retainer bracket must be used as well. This bracket must also be used when required by code for hurricane or seismic conditions. This bracket is available through Micrometl.

Fig. 5 - Unit levelling tolerances



Maximum allowable difference		
A-B	**B-C**	**A-C**
6 mm	6 mm	6 mm

Fig. 6 - Slab mounting detail

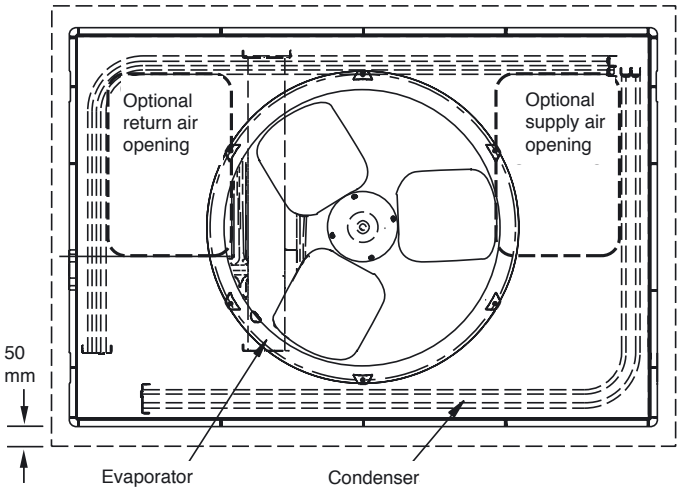


Fig. 7 - Threading belt

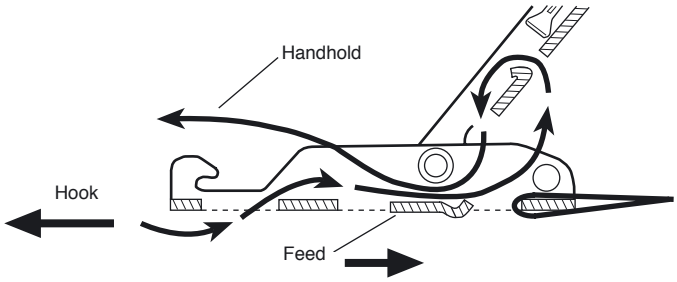
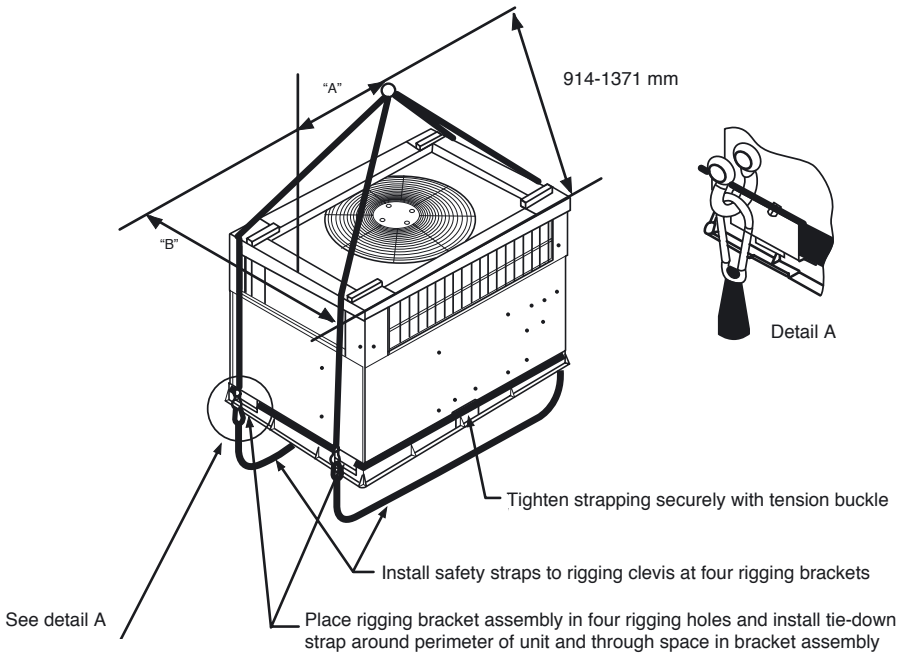


Fig. 8 - Suggested rigging



50JZ	Max. weight, kg	A (mm)	B (mm)
024	146	483	464
030	155	508	489
036	159	508	483
048	171	508	540

Fig. 9 - Typical installation

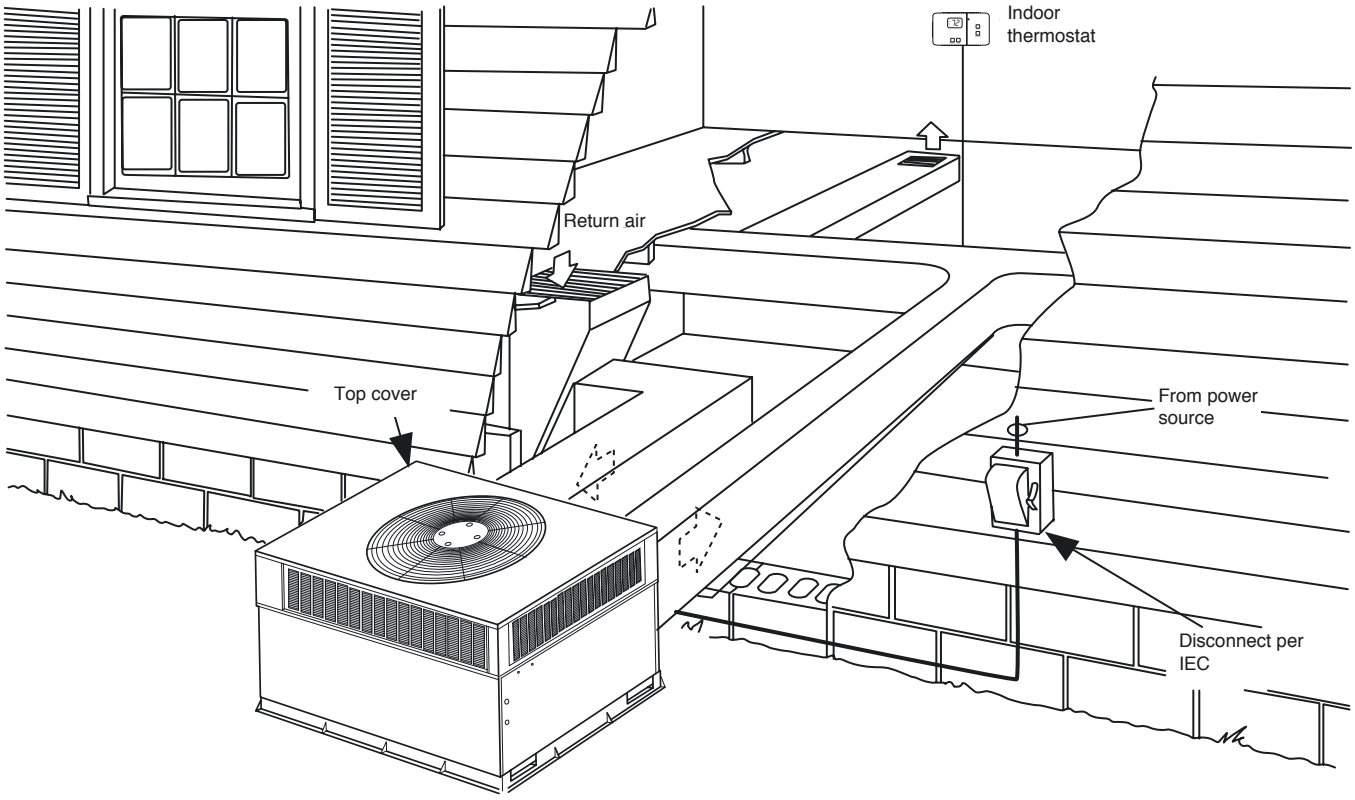


Fig. 10 - 50JZ with duct covers on

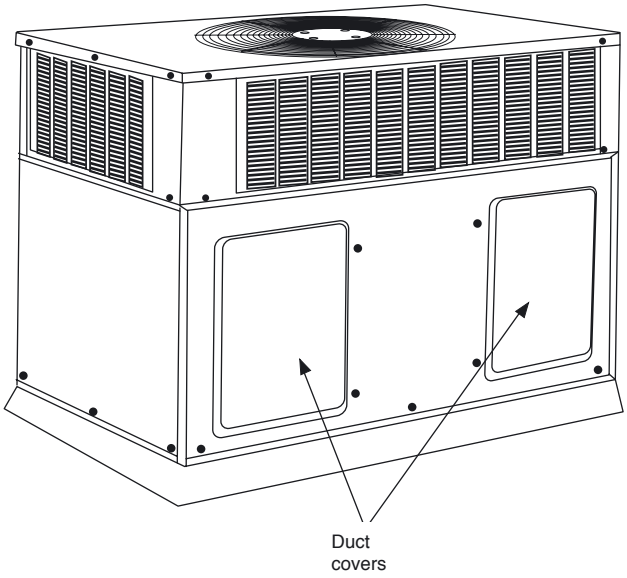


Fig. 11 - Condensate trap

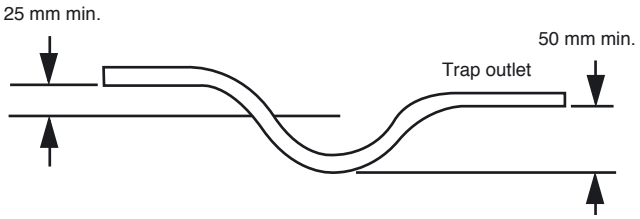


Table 1 - Physical data

50JZ		024	030	036	048
Nominal cooling capacity*	kW	6.9	8.6	10.7	14.4
Nominal heating capacity**	kW	7.0	8.1	10.6	13.1
Operating weight	kg	136	145	149	161
Compressor		One scroll compressor			
Refrigerant		R-410A			
Refrigerant meteringdevice		AccuRater			
Quantity	kg	3.10	4.35	4.50	5.40
Orifice, inside diameter	mm	1.50	1.55	1.70	1.98
Orifice, outside diameter	mm	0.81	1.02	1.02	1.17
Outdoor coil					
Rows .. fin spacing	mm	2 ... 1.5	2 ... 1.5	2 ... 1.5	2 ... 1.5
Face area	m^2	0.8	1.0	1.0	1.3
Outdoor fan					
Nominal air flow	l/s	1038	1038	1038	1133
Diameter	mm	559	559	559	559
Motor power input	kW	0.19	0.19	0.19	0.25
Motor speed	r/s	15	15	15	22
Indoor coil					
Rows .. fin spacing	mm	3 ... 1.7	3 ... 1.7	4 ... 1.7	4 ... 1.7
Face area	m^2	0.34	0.34	0.34	0.44
Indoor fan					
Nominal air flow	l/s	377	472	566	755
Size	mm	254 x 254	254 x 254	254 x 254	254 x 279
Motor power input	kW	0.19	0.37	0.37	0.75
Motor speed	r/s	17.9	22.0	22.0	20.0
Return air filters		Throwaway type			
Size	mm	508 x 508	508 x 508	508 x 610	610 x 762

* Based on 27°C db/19°C wb indoor air temperature, 35°C outdoor air temperature and nominal air flow.

** Based on 20°C db indoor air temperature, 6°C outdoor air temperature and nominal air flow.

*** The required filter sizes shown are based on the larger of the rated cooling air flows or the heating air flow velocity of 1.5 m/s for throwaway type filters or 2.3 m/s for high-capacity type filters. Air filter pressure drop for non-standard filters must not exceed 20 Pa.

Table 2 - Minimum air flow for reliable electric heater operation

50JZ		024	030	036	048
Air flow	l/s	377	472	566	755

Table 3 - Electrical data

50JZ	Power supply V-ph-Hz	Voltage range V	Compressor RLA	Compressor LRA	OFM FLA	IFM FLA	Electric heat Nom. kW	Electric heat FLA	Power supply MCA	Power supply Fuse or circuit breaker, A	Disconnect size FLA	Disconnect size LRA
024	400-3-50	380-420	4.5	32.0	0.8	1.1	- 6.5 8.7	- 9.4 12.6	7.5 19.2 23.2	10 20 25	7 18 22	35 44 48
030	400-3-50	380-420	5.2	35.0	0.8	1.7	- 6.5 8.7 13.0	- 9.4 12.6 18.8	9.0 20.7 24.7 32.5	10 20 25 35	9 20 23 30	39 49 52 59
036	400-3-50	380-420	6.5	46.0	0.8	0.8	- 6.5 8.7 13.0	- 9.4 12.6 18.8	10.9 22.7 26.6 34.4	15 25 30 35	11 21 25 32	51 61 64 70
048	400-3-50	380-420	6.7	50.0	1.3	3.9	- 6.5 8.7 13.0 17.4	- 9.4 12.6 18.8 25.1	13.6 25.3 29.3 37.0 45.0	15 30 30 40 45	14 24 28 35 43	58 67 71 77 83

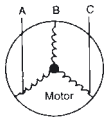
Legend
FLA - Full load current, A
IFM - Indoor fan motor
LRA - Locked rotor current, A
MCA - Minimum circuit current, A
OFM - Outdoor fan motor
RLA - Rated load current, A

Notes:
1. In compliance with IEC (International Electrotechnical Commisssion) requirements for multi-motor and combination load equipment (refer to IEC Articles 430 and 440), the overcurrent protective device for the unit shall be power supply fuse.
2. Minimum wire size is based on 60°C copper wire. If other than 60°C wire is used, or if length exceeds wire length in table, determine size from IEC.
3. Unbalanced 3-phase supply voltage: Never operate a motor where a phase imbalance in supply voltage is greater than 2%. Use the following formula to determine the percentage of voltage imbalance.

$$\% \text{ Voltage imbalance} = 100 \times \frac{\text{max voltage deviation from average voltage}}{\text{average voltage.}}$$

Example: Supply voltage is 400-3-50.
AB = 393 V
BC = 403 V
AC = 396 V

$$\text{Average voltage} = \frac{393 + 403 + 396}{3} = \frac{1192}{3} = 397$$



Determine maximum deviation from average voltage.
(AB) 397 - 393 = 4 V
(BC) 403 - 397 = 6 V
(AC) 397 - 396 = 1 V

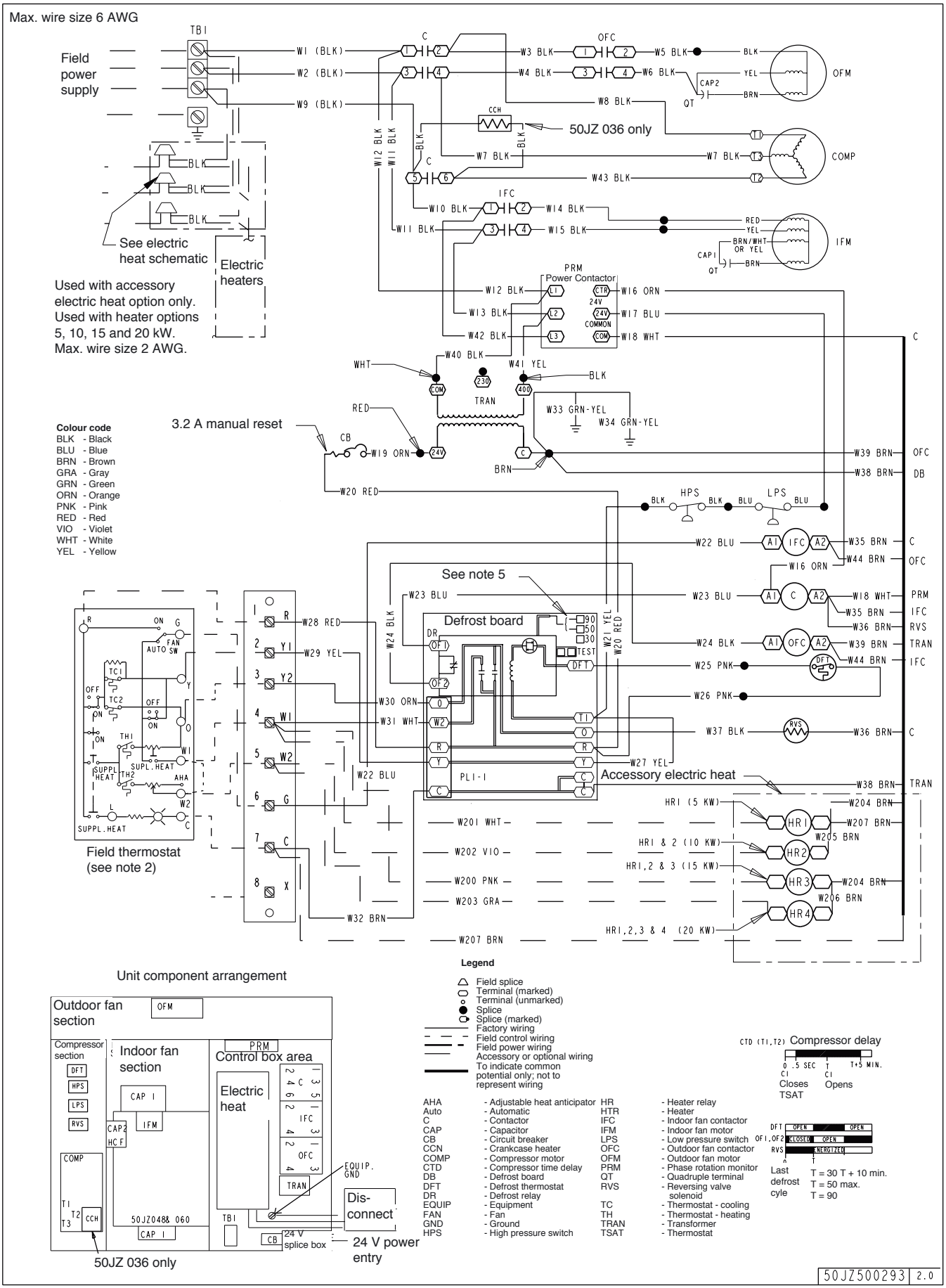
Maximum deviation is 6 V. Determine percent of voltage imbalance.

$$\% \text{ Voltage imbalance} = 100 \times \frac{6}{397} = 1.5\%$$

This amount of phase imbalance is satisfactory as it is below the maximum allowable 2%.

Important: If the supply voltage phase imbalance is more than 2%, contact your local electric utility company immediately.

Fig. 12 - Wiring diagram (400-3-50)



Notes:

1. If any of the original wires furnished are replaced, it must be replaced with type 90°C wire or equivalent.
2. See price pages for thermostat and subbases.
3. Use 75 degree copper conductors for field installation.
4. For high-speed IFM disconnect red wire from IFR 21 and connect black wire from IFM. For medium speed, disconnect red wire from IFR 21 and connect blue wire from IFM.
5. Defrost timer to be set at 90 min., except for 50JZ 048 and 060 models, set at 50 min.

Fig. 13 - Control connections

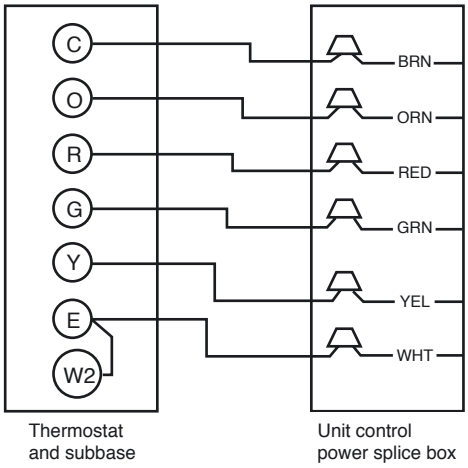
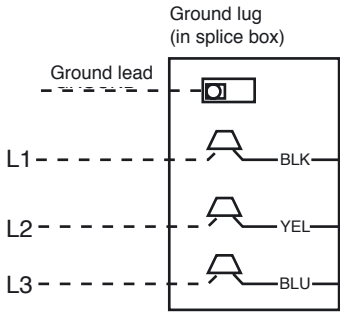


Fig. 14 - Line power connections



Note: Use copper wire only.

Legend

IEC	International Electrotechnical Commission
	Field wiring
	Splice connections

Fig. 15 - Control wiring plate

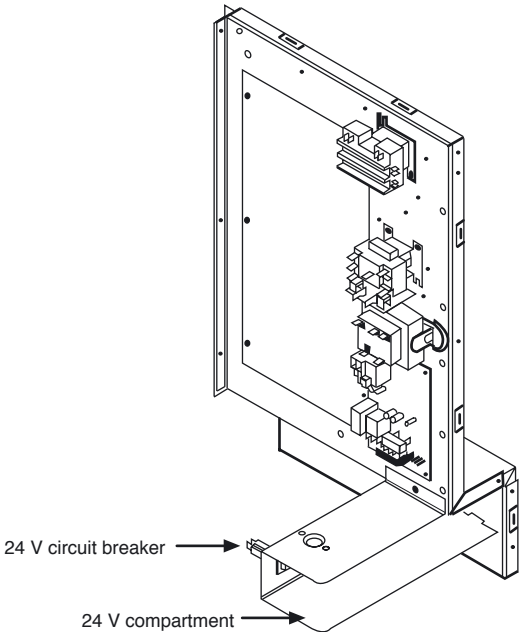


Fig. 16 - Transformer label

TRANSFORMER CONTAINS A MANUAL RESET OVERCURRENT PROTECTOR

IT WILL NOT AUTOMATICALLY RESET

DISCONNECT POWER AND INSTALL LOCKOUT TAG PRIOR TO SERVICING

THIS COMPARTMENT MUST BE CLOSED EXCEPT WHEN SERVICING

Fig. 17 - Fan blade clearance

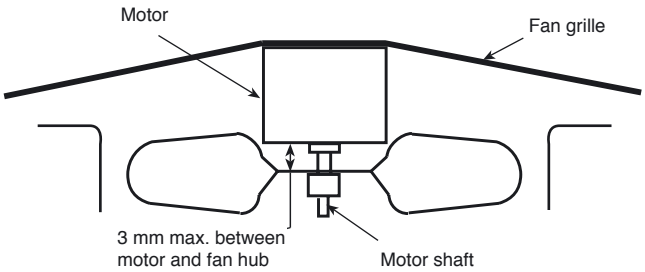


Fig. 18 - Typical heat pump operation, heating mode

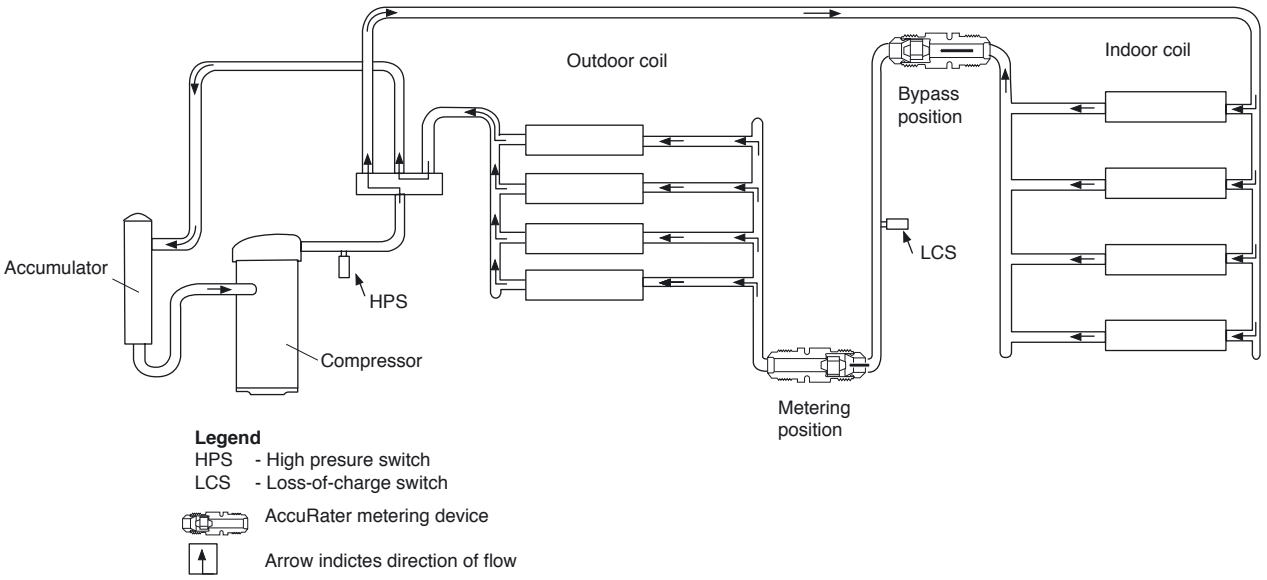


Fig. 19 - Typical heat pump operation, cooling mode

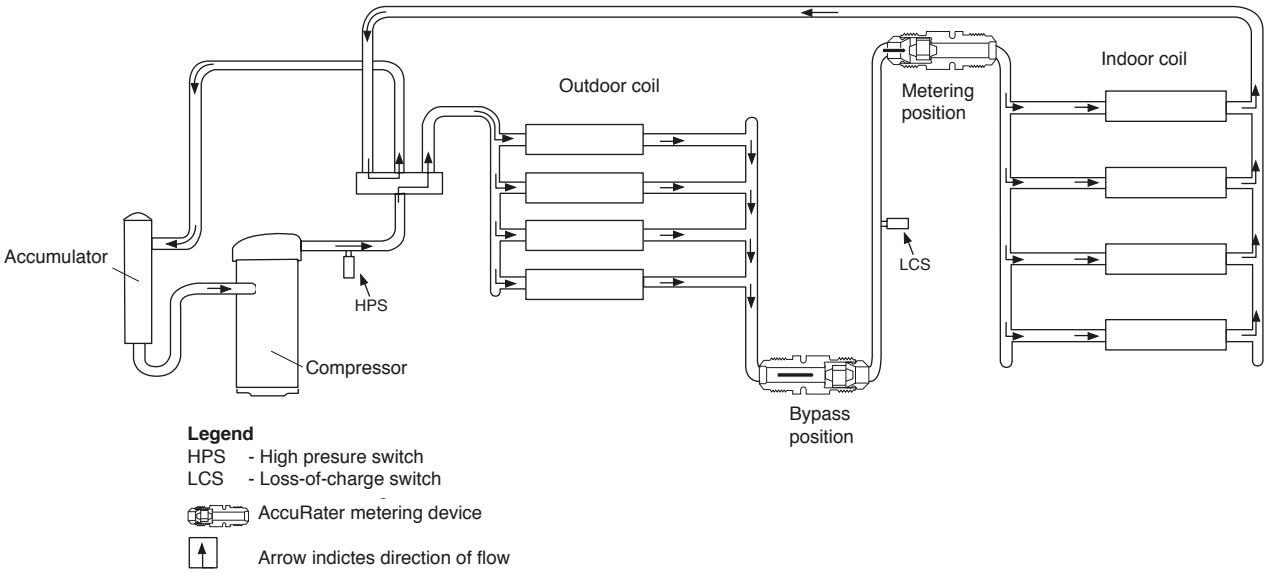


Table 4 - Wet coil air delivery (50JZ 024-048*)

50JZ	Motor speed		External static pressure, Pa										
			0	25	50	75	100	125	150	175	200	225	250
024	Low	W	303	305	303	300	-	-	-	-	-	-	-
		l/s	458	415	371	324	-	-	-	-	-	-	-
	High	W	-	-	-	-	435	428	428	422	-	-	-
		l/s	-	-	-	-	455	393	358	319	-	-	-
030	Low	W	-	814	853	889	921	954	1002	-	-	-	-
		l/s	-	561	526	491	458	426	393	-	-	-	-
	High	W	-	-	-	-	-	-	-	700	683	688	755
		l/s	-	-	-	-	-	-	-	577	539	508	499
036	Low	W	552	540	529	523	514	480	-	-	-	-	-
		l/s	612	584	551	518	486	449	-	-	-	-	-
	High	W	-	-	-	-	-	782	765	736	721	780	1002
		l/s	-	-	-	-	-	693	660	624	584	550	536
048	Low	W	692	686	678	664	652	664	736	-	-	-	-
		l/s	741	712	681	647	611	585	584	-	-	-	-
	High	W	-	-	1112	930	856	834	825	811	793	-	-
		l/s	-	-	799	788	756	718	683	650	611	-	-

* Air delivery values are based on operating voltage of 400 V, wet coil, without filter or electric heater. Deduct filter and electric heater pressure drop to obtain static pressure available for ducting.

Notes:

1 Do not operate the unit at a cooling air flow that is less than 165 l/s for each 3.5 kW of rated cooling capacity. Evaporator coil frosting may occur at air flows below this point.

2. Dashes indicate portions of table that are beyond the fan motor capacity or are not recommended.

Routing power leads into unit
Use only copper wire between disconnect and unit. The high-voltage leads should be in a conduit until they enter the duct panel; conduit termination at the duct panel must be watertight. Run the high-voltage leads through the power entry knockout on the power entry side panel. See Figs. 1 and 2 for location and size. When the leads are inside the unit, run leads up the high-voltage raceway to the line wiring splice box (see Fig. 12 and 13).

Connecting ground lead to ground lug
Refer to Fig. 16. Connect the ground lead to the chassis using the ground lug in the wiring splice box.

Routing control power wires (24 V)
Form a drip-loop with the thermostat leads before routing them into the unit. Route the thermostat leads through grommeted, low-voltage hole provided in unit into unit control power splice box (Figs. 1 and 2). Connect thermostat leads to unit control power leads as shown in Figs. 14 and 15.

The unit transformer supplies 24-V power for complete system including accessory electrical heater. An automatic-reset circuit breaker (Fig. 15) is provided in the 24-V circuit; see the caution label on the transformer or Fig. 16.

PRE-START-UP

WARNING: Failure to observe the following warnings could result in serious personal injury or death:

1. ***Follow recognised safety practices and wear protective goggles when checking or servicing refrigerant system.***
2. ***Do not operate compressor or provide any electric power to unit unless compressor terminal cover is in place and secured.***
3. ***Do not remove compressor terminal cover until all electrical sources are disconnected.***
4. ***Relieve and recover all refrigerant from both high- and low-pressure sides of system before touching or disturbing anything inside terminal box if refrigerant leak is suspected around compressor terminals.***
5. ***Never attempt to repair soldered connection while refrigerant system is under pressure.***
6. ***Do not use torch to remove any component. System contains oil and refrigerant under pressure. To remove a component, wear protective goggles and proceed as follows:***
   a. ***Shut off electrical power to unit.***
   b. ***Relieve and reclaim all refrigerant from system using both high- and low-pressure ports.***
   c. ***Cut component connecting tubing with tubing cutter and remove component from unit.***
   d. ***Carefully unsweat remaining tubing stubs when necessary. Oil can ignite when exposed to torch flame.***

Use the Start-Up Checklist supplied at the end of this book and proceed as follows to inspect and prepare the unit for initial start-up:

1. Remove all access panels.
2. Read and follow instructions on all DANGER, WARNING, CAUTION, and INFORMATION labels attached to, or shipped with, unit.
3. Make the following inspections:
   a. Inspect for shipping and handling damages such as broken lines, loose parts, disconnected wires, etc.
   b. Inspect for oil at all refrigerant tubing connections and on unit base. Detecting oil generally indicates a refrigerant leak. Leak-test all refrigerant tubing connections using electronic leak detector, or liquid-soap solution. If a refrigerant leak is detected, see following “Check for Refrigerant Leaks” section.
   c. Inspect all field and factory-wiring connections. Be sure that connections are completed and tight.
   d. Inspect coil fins. If damaged during shipping and handling, carefully straighten fins with a fin comb.
4. Verify the following conditions:
   a. Make sure that outdoor fan blade is correctly positioned in fan orifice.
   b. Make sure that air filter(s) is (are) in place.
   c. Make sure that condensate drain and trap are filled with water to ensure proper drainage.
   d. Make sure that all tools and miscellaneous loose parts have been removed.
5. Compressors are internally spring mounted. Do not loosen or remove compressor hold-down bolts.
6. Each unit system has 2 Schrader-type ports, one low-side Schrader fitting located on the suction line, and one high-side Schrader fitting located on the compressor discharge line. Be sure that caps on the ports are tight.

START-UP

Using the Start-Up Checklist supplied at the end of this book, proceed as follows:

Check for refrigerant leaks

Locate and repair refrigerant leaks and charge the unit as follows:

1. Use both high- and low-pressure ports to relieve system pressure and reclaim remaining refrigerant.
2. Repair leak following accepted practices.

NOTE: Install a bi-flow filter drier whenever the system has been opened for repair.

3. Check system for leaks using an approved method.
4. Evacuate refrigerant system and reclaim refrigerant if no additional leaks are found.
5. Charge unit with R-410A refrigerant, using a volumetric charging cylinder or accurate scale. Refer to unit rating plate for required charge.

Start-up adjustments

Complete the required procedures given in the “Pre-Start-Up” section before starting the unit. Do not jumper any safety devices when operating the unit. Do not operate the unit in Cooling mode when the outdoor temperature is below 13°C, unless accessory low-ambient kit is installed. Do not rapid-cycle the compressor. Allow 5 min. between “on” cycles to prevent compressor damage.

Checking cooling and heating control operation
Start and check the unit for proper control operation as follows:

1. Place room thermostat SYSTEM switch or MODE control in OFF position. Observe that fan motor starts when FAN mode is placed in FAN ON position and shuts down after proper fan off delay, when FAN MODE switch is placed in AUTO position.
2. Place system switch or MODE control in HEAT position. Set control above room temperature. Observe that compressor, outdoor fan, and indoor fan motors start. Observe that heating cycle shuts down when control setting is satisfied.
3. When using an automatic changeover room thermostat, place both SYSTEM or MODE control and FAN mode switches in AUTO positions. Observe that unit operates in cooling mode when temperature control is set to "call for cooling" (below room temperature), and unit operates in heating mode when temperature control is set to "call for heating" (above room temperature).

IMPORTANT: Three-phase scroll compressors are direction oriented. Unit must be checked to ensure proper compressor 3-phase power lead orientation. If not corrected within the phase monitor (Fig. 23) will not provide the unit with power. A red light on the phase monitor will blink. The 3-phase power leads to the unit must be reversed to correct rotation.

Checking and adjusting refrigerant charge
The refrigerant system is fully charged with R-410A refrigerant and is tested and factory sealed.

NOTE: Adjustment of the refrigerant charge is not required unless the unit is suspected of not having the proper R-410A charge. The charging label and the tables shown refer to system temperatures and pressures in cooling mode, only. A refrigerant charging label is attached to the outside of the service access door. If charge level is suspect in heating mode, reclaim all refrigerant and charge to nameplate amount (see the physical data table).

IMPORTANT: When evaluating the refrigerant charge, an indicated adjustment to the specified factory charge must always be very minimal. If a substantial adjustment is indicated, an abnormal condition exists somewhere in the cooling system, such as insufficient air flow across either coil or both coils.

Refrigerant charge
The amount of refrigerant charge is listed on the unit nameplate and/or in the physical data table. Refer to the Refrigeration Service Techniques Manual, Refrigerants Section.

No charge
Check for leak. Use standard evacuating techniques. After evacuating system, weigh in the specified amount of refrigerant (refer to system data plate).

Low charge cooling
Use cooling charging table. Vary refrigerant until the conditions of the table are met. Note that charging tables are different from the type normally used. Tables are based on charging the units to correct superheat for the various operating conditions. Accurate pressure gauge and temperature sensing devices are required. Connect the pressure gauge to the service port on the suction line. Mount the temperature sensing device on the suction line and insulate it so that the outdoor ambient does not affect the reading. Indoor air flow must be within the normal operating range of the unit.

Heating mode charge
Do not attempt to adjust charge by cooling methods while in heating mode. When charging is necessary in heating mode, recover refrigerant and weigh in according to unit data plate refrigeration data.

To use cooling charging charts
Take the outdoor ambient temperature and read the suction pressure gauge. Refer to the chart to determine what the suction temperature should be.

NOTE: If the problem causing the inaccurate readings is a refrigerant leak, refer to "Check for refrigerant leaks" section.

Indoor air flow and air flow adjustments

CAUTION: For heating and cooling operation, the recommended air flow is 165 l/s to 212 l/s for each 3.5 kW of rated cooling capacity. For units with optional electric heat, the air flow must not be reduced below the levels stated in Table 2.

Table 4 shows both heating and cooling air flows at various external static pressures. Refer to this table to determine the air flow for the system being installed.

NOTE: Be sure that all supply- and return-air grilles are open, free from obstructions, and adjusted properly.

Air flow can be changed by changing the lead connection of the fan motor. To change the speed of the indoor fan motor (IFM), remove the fan motor speed leg lead from the indoor fan contactor (IFC). To change the speed, remove and replace with lead for desired fan motor speed. Insulate the removed lead to avoid contact with chassis parts.

For 400-V motors: The motor leads are color coded as follows:

3-speed	**2–speed**
Black = high	Black = high
White = common	Red = low
Blue = medium	Yellow = common
Red = low	

To change the speed of the indoor fan motor (IFM), remove fan motor speed lead from the indoor fan contactor (IFC) and replace with the lead for the desired fan motor speed. The motor speed lead is attached to terminal BM. Insulate removed lead end to avoid contact with chassis parts.

Table 5 - Filter pressure drop, Pa

Filter size mm	Air delivery, l/s 236	283	330	377	425	472	519	566	614	661	707	755	802	850	896	944	991	1038
508 x 508	12.4	17.4	19.9	24.9	29.9	32.3	34.8	37.3	-	-	-	-	-	-	-	-	-	-
508 x 610	-	-	-	-	22.4	24.9	27.4	32.3	34.8	37.4	39.9	-	-	-	-	-	-	-
610 x 762	-	-	-	-	-	-	-	17.4	19.9	22.4	24.9	27.4	29.9	32.3	34.8	37.3	39.8	42.3

Table 6 - Accessory electric heater pressure drop, Pa

Heater kW	Air delivery, l/s 283	377	472	566	661	755	850	944	1038
6.5–17.4	7.5	8.2	9.2	10.4	11.7	12.9	14.9	16.7	18.7

Table 7 - Required suction line temperature

Superheat temp., K	Suction pressure at service port, kPa 424	443	463	483	503	524	546	568	591
0	1.7	2.8	3.9	5.0	6.1	7.2	8.3	9.4	10.6
1	2.8	3.9	5.0	6.1	7.2	8.3	9.4	10.6	11.7
2	3.9	5.0	6.1	7.2	8.3	9.4	10.6	11.7	12.8
3	5.0	6.1	7.2	8.3	9.4	10.6	11.7	12.8	13.9
4	6.1	7.2	8.3	9.4	10.6	11.7	12.8	13.9	15.0
6	7.2	8.3	9.4	10.6	11.7	12.8	13.9	15.0	16.1
7	8.3	9.4	10.6	11.7	12.8	13.9	15.0	16.1	17.2
8	9.4	10.6	11.7	12.8	13.9	15.0	16.1	17.2	18.3
9	10.6	11.7	12.8	13.9	15.0	16.1	17.2	18.3	19.4
10	11.7	12.8	13.9	15.0	16.1	17.2	18.3	19.4	20.6
11	12.8	13.9	15.0	16.1	17.2	18.3	19.4	20.6	21.7
12	13.9	15.0	16.1	17.2	18.3	19.4	20.6	21.7	22.8
13	15.0	16.1	17.2	18.3	19.4	20.6	21.7	22.8	23.9
14	16.1	17.2	18.3	19.4	20.6	21.7	22.8	23.9	25.0
15	16.7	17.8	18.9	20.0	21.1	22.2	23.3	24.4	25.6
16	17.2	18.3	19.4	20.6	21.7	22.8	23.9	25.0	26.1
17	18.3	19.4	20.6	21.7	22.8	23.9	25.0	26.1	27.2
18	19.4	20.6	21.7	22.8	23.9	25.0	26.1	27.2	28.3
19	20.6	21.7	22.8	23.9	25.0	26.1	27.2	28.3	29.4
20	21.7	22.8	23.9	25.0	26.1	27.2	28.3	29.4	30.6
21	22.8	23.9	25.0	26.1	27.2	28.3	29.4	30.6	31.7
22	23.9	25.0	26.1	27.2	28.3	29.4	30.6	31.7	32.8

Table 8 - Superheat charging table

Outdoor temp., °C	Evaporator entering air temperature, °C wb 10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
13	5.0	6.7	7.8	9.4	11.1	11.9	12.8	14.4	16.1	17.8	19.4	20.6	22.2	23.3	25.0
16	3.9	5.6	6.7	8.3	10.0	10.8	11.7	13.3	15.0	16.7	18.3	20.0	21.1	22.2	23.9
18	-	3.3	5.6	7.2	8.9	9.7	10.6	11.7	13.3	15.0	16.7	18.3	20.0	21.1	22.8
21	-	-	3.9	5.6	7.2	8.1	8.9	10.6	11.7	13.3	15.0	16.7	18.3	20.0	21.7
24	-	-	-	3.3	5.0	5.8	6.7	8.3	10.0	11.7	13.4	15.6	17.2	18.9	20.6
27	-	-	-	-	2.8	3.6	4.4	6.7	8.3	10.0	11.7	13.9	15.6	17.2	19.4
29	-	-	-	-	-	-	-	4.4	6.1	8.3	10.6	12.2	14.4	16.7	18.3
32	-	-	-	-	-	-	-	2.8	5.0	7.2	8.9	11.1	13.3	15.0	17.2
35	-	-	-	-	-	-	-	-	3.3	5.6	7.8	10.0	12.2	13.9	16.1
38	-	-	-	-	-	-	-	-	-	4.4	6.7	8.3	11.1	12.8	15.0
41	-	-	-	-	-	-	-	-	-	2.8	5.0	7.2	9.4	12.2	14.4
43	-	-	-	-	-	-	-	-	-	-	3.3	6.1	8.3	11.1	13.9
46	-	-	-	-	-	-	-	-	-	-	-	4.4	7.8	10.0	12.8

Where a dash (–) appears, do not attempt to charge system under these conditions, or refrigerant slugging may occur.

Note: Superheat is at low-side service port.

Defrost control

Quiet Shift
Quiet Shift is a field-selectable defrost mode, which will eliminate occasional noise that could be heard at the start of defrost cycle and restarting of heating cycle. It is selected by placing DIP switch 3 (on defrost board) in ON position.

When Quiet Shift switch is placed in ON position, and a defrost is initiated, the following sequence of operation will occur. Reversing valve will energise, outdoor fan will turn off, compressor will turn off for 30 seconds and then turn back on to complete defrost. At the start of heating after conclusion of defrost reversing valve will de-energise, compressor will turn off for another 30 seconds, and the outdoor fan will stay off for 40 seconds, before starting in the heating mode.

Defrost
The defrost control is a time/temperature control (Fig. 21) which includes a field-selectable time period (DIP switch 1 and 2 on the board) between defrost cycles of 30, 50 or 90 minutes (factory set at 30 minutes). To initiate a forced defrost, two options are available depending on the status of the defrost thermostat.

If defrost thermostat is closed, speed-up pins (J1) must be shorted by placing a flat head screw driver in between for 5 seconds and **releasing**, to observe a complete defrost cycle. When the Quiet Shift switch is selected, compressor will be turned off for two 30-second intervals during this complete defrost cycle, as explained previously. When Quiet Shift switch is in factory default OFF position, a normal and complete defrost cycle will be observed.

If defrost thermostat is in open position, and speed-up pins are shorted (with a flat head screw driver) for 5 seconds and released, a short defrost cycle will be observed (actual length is dependent upon the selected Quiet Shift position). When Quiet Shift switch is in ON position, the length of defrost is 1 minute (30 second compressor off period followed by 30 second of defrost with compressor operation). On return to heating operation, compressor will again turn off for an additional 30 seconds and the outdoor fan for 40 seconds. When the Quiet Shift is in OFF position, only a brief 30-second cycle will be observed.

If it is desirable to observe a complete defrost in warmer weather, the defrost thermostat must be closed as follows.
1. Turn off power to outdoor unit and install lockout tag.
2. Disconnect outdoor fan motor lead from OF2 on control board (Fig. 21). Tape to prevent grounding.
3. Restart unit in heating mode, allowing frost to accumulate on outdoor coil.
4. After a few minutes in heating mode, liquid line temperature should drop below closing point of defrost thermostat (approximately -1°C).

NOTE: Unit will remain in defrost until defrost thermostat reopens at approximately 27°C coil temperature at liquid line or remainder of defrost cycle time up to a maximum defrost time of 10 minutes.

5. Turn off power tag disconnect to outdoor and reconnect fan motor lead to OF2 on control board after above forced defrost cycle.

MAINTENANCE

To ensure continuing high performance, and to minimise the possibility of premature equipment failure, periodic maintenance must be performed on this equipment. This heat pump unit should be inspected at least once each year by a qualified service person. To troubleshoot unit, refer to Trouble-shooting Chart at the end of these instructions.

NOTE TO EQUIPMENT OWNER: Consult your local dealer about the availability of a maintenance contract.

WARNING: The ability to properly perform maintenance on this equipment requires certain expertise, mechanical skills, tools and equipment. If you do not possess these, do not attempt to perform any maintenance on this equipment, other than those procedures recommended in the User Manual. FAILURE TO HEED THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND POSSIBLE DAMAGE TO THIS EQUIPMENT.

WARNING: Failure to follow these warnings could result in serious injury or death:
1. ***Turn off electrical power to the unit and install lockout tag before performing any maintenance or service on this unit.***
2. ***Use extreme caution when removing panels and parts. As with any mechanical equipment, personal injury can result from sharp edges.***
3. ***Never place anything combustible either on, or in contact with, the unit.***

CAUTION: Errors made when reconnecting wires may cause improper and dangerous operation. Label all wires prior to disconnecting when servicing.

The minimum maintenance requirements for this equipment are as follows:
1. Inspect air filter(s) each month. Clean or replace when necessary.
2. Inspect indoor coil, drain, and condensate drain line each cooling season for cleanliness. Clean when necessary.
3. Inspect fan motor and wheel for cleanliness each cooling season. Clean when necessary.
4. Check electrical connections for tightness and controls for proper operation each cooling season. Service when necessary.

Air filter

IMPORTANT: Never operate the unit without a suitable air filter in the return-air duct system. Always replace the filter with the same dimensional size and type as originally installed. See Table 1 for recommended filter sizes.

Inspect air filter(s) at least once each month and replace (throwaway type) or clean (cleanable type) at least twice during each cooling season and twice during the heating season, or whenever the filter becomes clogged with dust and lint.

Fig. 20 - Balance point worksheet

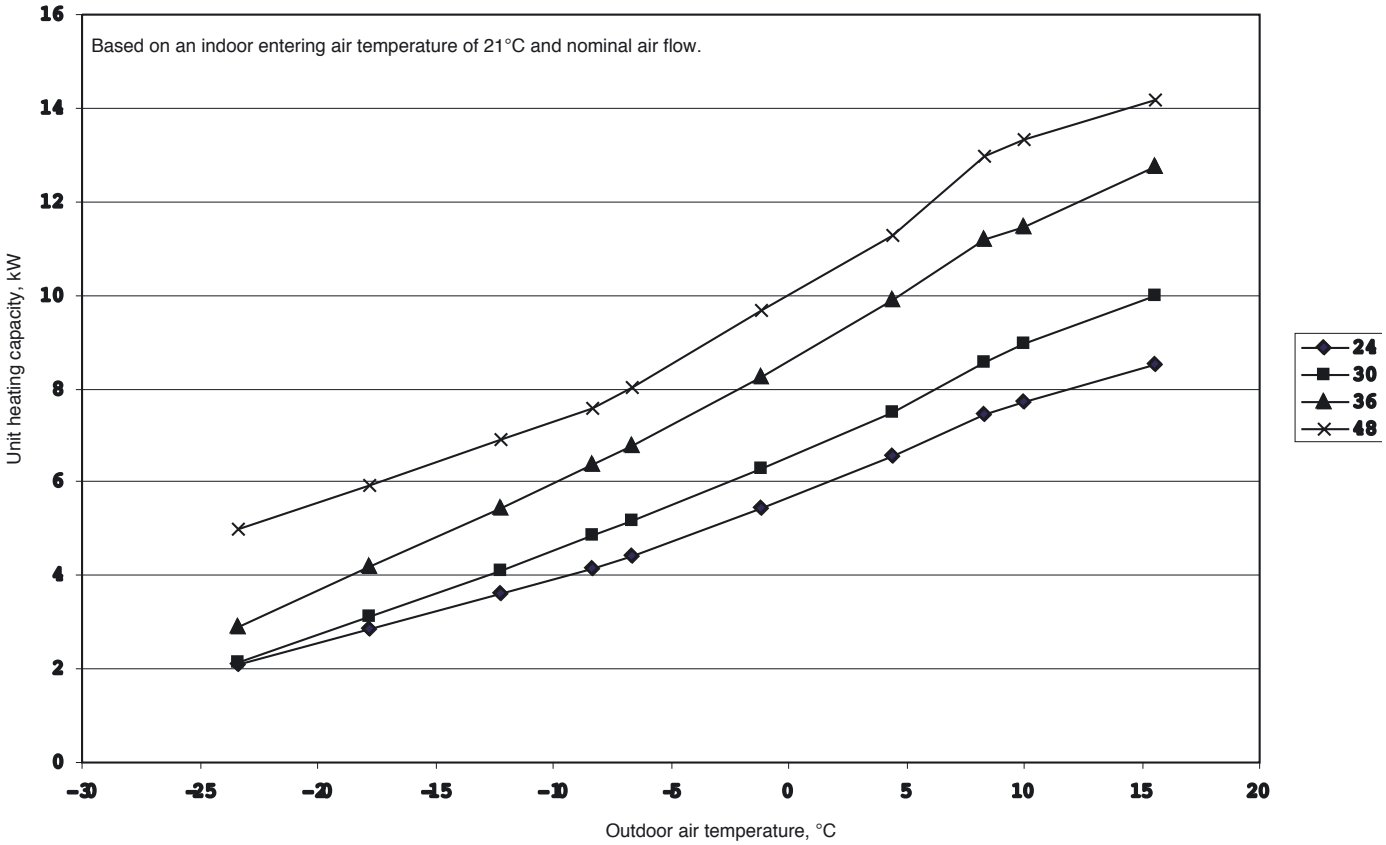
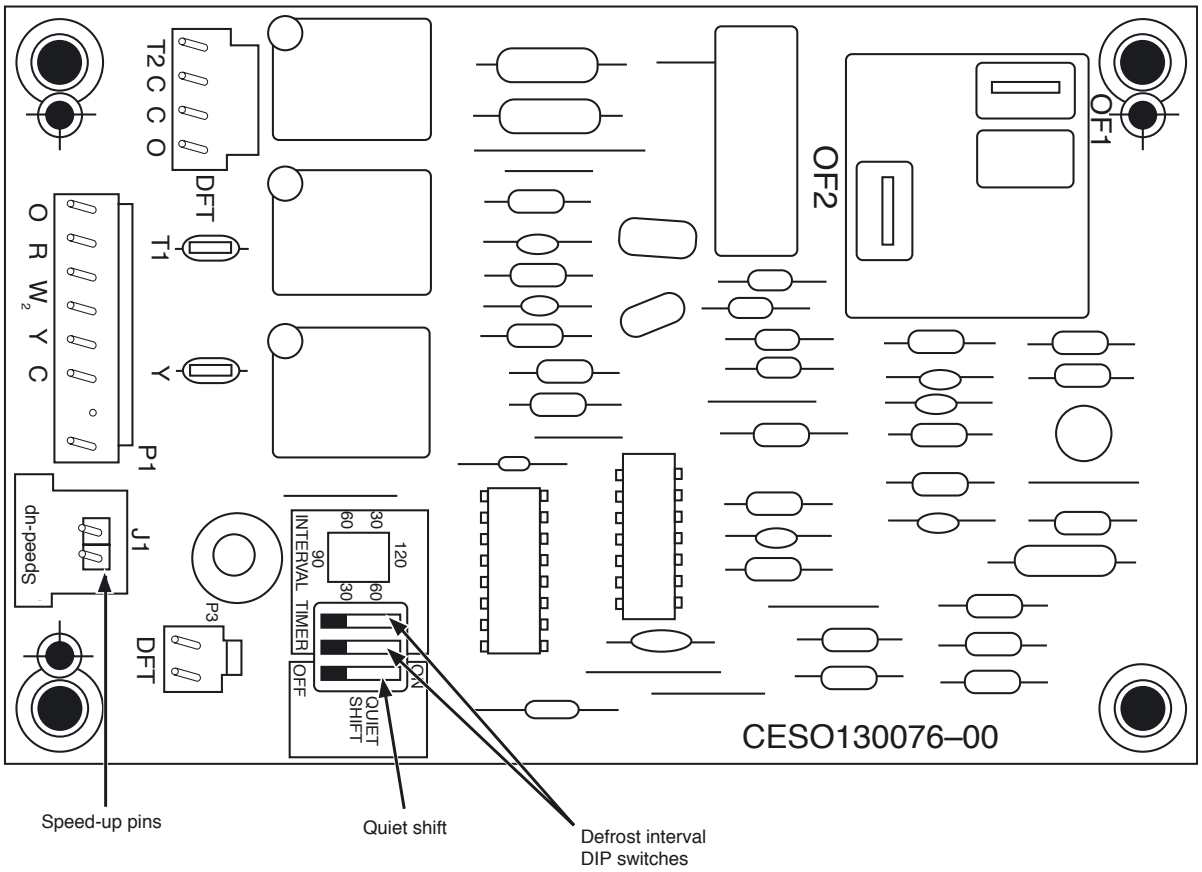


Fig. 21 - Defrost control



Indoor fan and motor

NOTE: All motors are pre-lubricated. Do not attempt to lubricate these motors.

For longer life, operating economy, and continuing efficiency, clean accumulated dirt and grease from the fan wheel and motor annually.

WARNING: Disconnect and tag electrical power to the unit before cleaning and lubricating the fan motor and wheel. Failure to adhere to this warning could cause personal injury or death.

Outdoor coil, indoor coil, and condensate drain

Inspect the condenser coil, evaporator coil, and condensate drain at least once each year. The coils are easily cleaned when dry; therefore, inspect and clean the coils either before or after each cooling season. Remove all obstructions, including weeds and shrubs, that interfere with the air flow through the condenser coil.

Straighten bent fins with a fin comb. If coated with dirt or lint, clean the coils with a vacuum cleaner, using the soft brush attachment. Be careful not to bend the fins. If coated with oil or grease, clean the coils with a mild detergent-and-water solution.

Rinse coils with clear water, using a garden hose. Be careful not to splash water on motors, insulation, wiring, or air filter(s). For best results, spray condenser coil fins from inside to outside the unit. On units with an outer and inner condenser coil, be sure to clean between the coils. Be sure to flush all dirt and debris from the unit base.

Inspect the drain and condensate drain line when inspecting the coils. Clean the drain and condensate drain line by removing all foreign matter from the drain. Flush the drain and drain trough with clear water. Do not splash water on the insulation, motor, wiring, or air filter(s). If the drain trough is restricted, clear it with a “plumbers snake” or similar probe device.

Outdoor fan

CAUTION: Keep the condenser fan free from all obstructions to ensure proper cooling operation. Never place articles on top of the unit. Damage to unit may result.

1. Remove 6 screws holding outdoor grille and motor to top cover.
2. Turn motor/grille assembly upside down on top cover to expose fan blade.
3. Inspect the fan blades for cracks or bends.
4. If fan needs to be removed, loosen setscrew and slide fan off motor shaft.
5. When replacing fan blade, position blade so that the hub is 3 mm away from the motor end (Fig. 17).
6. Ensure that setscrew engages the flat area on the motor shaft when tightening.
7. Replace grille.

Electrical controls and wiring

Inspect and check the electrical controls and wiring annually. Be sure to turn off the electrical power to the unit and install lockout tag.

Remove access panel to locate all the electrical controls and wiring. Check all electrical connections for tightness. Tighten all screw connections. If any smoky or burned connections are noticed, disassemble the connection, clean all the parts, restrip the wire end and reassemble the connection properly and securely.

After inspecting the electrical controls and wiring, replace all the panels. Start the unit, and observe at least one complete cooling cycle to ensure proper operation. If discrepancies are observed in operating cycle, or if a suspected malfunction has occurred, check each electrical component with the proper electrical instrumentation. Refer to the unit wiring label when making these checkouts.

Refrigerant circuit

Inspect all refrigerant tubing connections and the unit base for oil accumulation annually. Detecting oil generally indicates a refrigerant leak.

If oil is detected or if low performance is suspected, leak-test all refrigerant tubing using an electronic leak detector, or liquid soap solution. If a refrigerant leak is detected, refer to “Check for refrigerant leaks” section.

If no refrigerant leaks are found and low performance is suspected, refer to “Checking and adjusting refrigerant charge” section.

Indoor air flow

The heating and/or cooling air flow does not require checking unless improper performance is suspected. If a problem exists, be sure that all supply- and return-air grilles are open and free from obstructions, and that the air filter is clean. When necessary, refer to “Indoor air flow and Air flow adjustments” section to check the system air flow.

PURON® system items

The following items should be taken into consideration when maintaining your Puron® system.

Metering devices - AccuRater piston
This metering device is a fixed orifice and is contained in the brass hex body in the liquid line feeding the indoor and outdoor coils.

Pressure switches
Pressure switches are protective devices wired into control circuit (low voltage). They shut off compressor if abnormally high or low pressures are present in the refrigeration circuit. These pressure switches are specifically designed to operate with Puron (R-410A) systems. R-22 pressure switches must not be used as replacements for the Puron (R-410A) system.

Fig. 22 - Refrigerant circuit

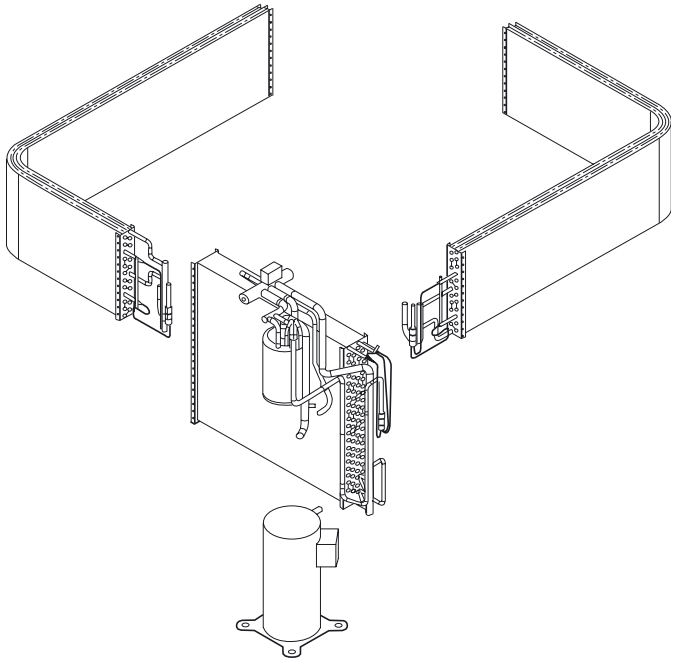
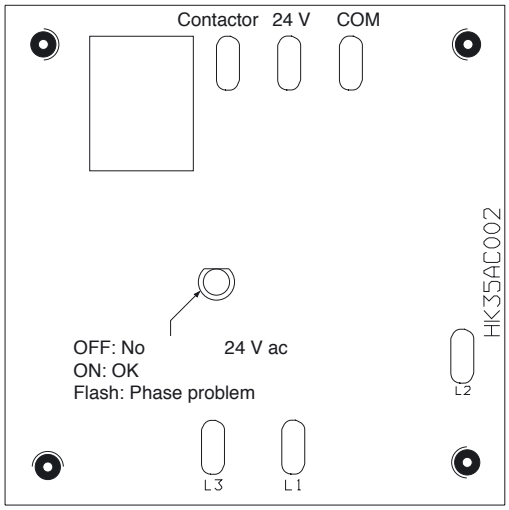
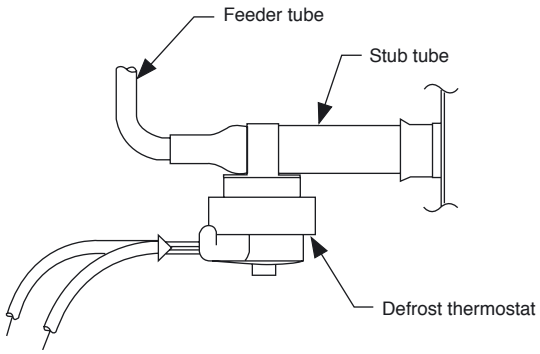


Fig. 23 - Phase monitor control and LED indicators



LED	Status
Off	No call for compressor operation
Flashing	Reversed phase
On	Normal

Fig. 24 - Defrost thermostat



Loss-of-charge switch
This switch is located on the liquid line and protects against low suction pressures caused by such events as loss of charge, low air flow across indoor coil, dirty filters, etc. It opens on a pressure drop at about 138 kPa. If system pressure is above this, switch should be closed. To check switch:

1. Turn off all power to unit and install lockout tag.
2. Disconnect leads on switch.
3. Apply ohmmeter leads across switch. You should have continuity on a good switch.

NOTE: Because these switches are attached to refrigeration system under pressure, it is not advisable to remove this device for troubleshooting unless you are reasonably certain that a problem exists. If switch must be removed, remove and recover all system charge so that pressure gauges read 0 kPa. Never open system without breaking vacuum with dry nitrogen.

High-pressure switch
The high-pressure switch is located in the discharge line and protects against excessive condenser coil pressure. It opens at 4205 kPa. High pressure may be caused by a dirty outdoor coil, failed fan motor, or outdoor air recirculation.

To check switch:

1. Turn off all power to unit and install lockout tag.
2. Disconnect leads on switch.
3. Apply ohmmeter leads across switch. You should have continuity on a good switch.

Copeland scroll compressor (Puron refrigerant)
The compressor used in this product is specifically designed to operate with Puron (R-410A) refrigerant and cannot be interchanged.

The compressor is an electrical (as well as mechanical) device. Exercise extreme caution when working near compressors. Power should be shut off, if possible, for most troubleshooting techniques. Refrigerants present additional safety hazards.

WARNING: Wear safety glasses and gloves when handling refrigerants. Keep torches and other ignition sources away from refrigerants and oils. Failure to follow this warning can cause a fire, serious injury, or death.

The scroll compressor pumps refrigerant throughout the system by the interaction of a stationary and an orbiting scroll. The scroll compressor has no dynamic suction or discharge valves, and it is more tolerant of stresses caused by debris, liquid slugging, and flooded starts. The pressure relief port is a safety device, designed to protect against extreme high pressure. The relief port has an operating range between 3792 and 4309 kPa differential pressure.

The information below covers the refrigerant system of the 50JZ, including the compressor oil needed, servicing systems on roofs containing synthetic materials, the filter drier and refrigerant charging.

The Copeland scroll compressor uses Mobil 3MA POE oil. This is the only oil allowed for oil recharge.

Refrigerant
CAUTION: This system uses Puron (R-410A) refrigerant which has higher operating pressures than R-22 and other refrigerants. No other refrigerant may be used in this system. Gauge set, hoses, and recovery system must be designed to handle Puron. If you are unsure consult the equipment manufacturer. Failure to use Puron compatible servicing equipment or replacement components may result in property damage or injury.

Compressor oil
The compressor in this system uses a polyolester (POE) oil, Mobil 3MA POE. This oil is extremely hygroscopic, meaning it absorbs water readily. POE oils can absorb 15 times as much water as other oils designed for HCFC and CFC refrigerants. Take all necessary precautions to avoid exposure of the oil to the atmosphere.

Servicing systems on roofs with synthetic materials
POE (polyolester) compressor lubricants are known to cause long-term damage to some synthetic roofing materials. Exposure, even if immediately cleaned up, may cause embrittlement (leading to cracking) to occur in one year or more. When performing any service that may risk exposure of compressor oil to the roof, take appropriate precautions to protect roofing. Procedures that risk oil leakage include, but are not limited to, compressor replacement, repairing refrigerant leaks, replacing refrigerant components such as filter drier, pressure switch, metering device, coil, accumulator, or reversing valve.

Synthetic roof precautionary procedure

1. Cover extended roof working area with an impermeable polyethylene (plastic) drip cloth or tarp. Cover an approximate 3 x 3 m area.
2. Cover area in front of the unit service panel with a towel to absorb lubricant spills and prevent run-offs, and protect drop cloth from tears caused by tools or components.
3. Place towel inside unit immediately under component(s) to be serviced and prevent lubricant run-offs through the louvered openings in the unit base.
4. Perform required service.
5. Remove and dispose of any oil contaminated material per local codes.

Liquid line filter drier
The bi-flow filter drier is specifically designed to operate with Puron. Use only factory-authorised replacement components. Filter drier must be replaced whenever the refrigerant system is opened. When removing a filter drier, use a tubing cutter to cut the drier from the system. Do not unsweat a filter drier from the system. Heat from unsweating will release moisture and contaminants from drier into system.

Puron (R-410A) refrigerant charging
Refer to unit information plate and charging chart. Some R-410A refrigerant cylinders contain a dip tube to allow liquid refrigerant to flow from cylinder in upright position. For cylinders equipped with a dip tube, charge Puron units with cylinder in upright position and a commercial metering device in manifold hose. Charge refrigerant into suction line.

Refrigeration service ports
Each unit system has 3 Schrader-type service ports: one on the suction line, one on the liquid line, and one on the compressor discharge line. Be sure that caps on the ports are tight.

High flow valves
Located on the compressor hot gas and suction tubes are high flow valves. Large black plastic caps distinguish these valves with O-rings located inside the caps. These valves cannot be accessed for service in the field. Ensure the plastic caps are in place and tight or the possibility of leakage could occur.

System information

Phase monitor control
1. 3-phase scroll compressors are rotational sensitive
2. A flashing LED on phase monitor (Fig. 23) indicates reverse rotation.
3. This will not allow contactor to be energised.
4. Disconnect power to unit and interchange 2 field wiring leads on unit contactor.

Follow these steps to properly start up the system:
1. Fully back seat (open) liquid and vapour tube service valves.
2. Unit is shipped with valve stem(s) front seated (closed) and caps installed. Replace stem caps after system is opened to refrigerant flow. Replace caps finger-tight and tighten with wrench an additional 1/12 turn for back-seating valves (male square stem).
3. Close electrical disconnects to energise system.
4. Set room thermostat desired temperature. Be sure set point is below indoor ambient temperature.
5. Set room thermostat to COOL and fan control to ON or AUTO mode, as desired. Operate unit for 15 minutes. Check system refrigerant charge.

Sequence of operation
Turn on power to indoor and outdoor unit. Transformer is energised. On a call for cooling, thermostat make circuits R-Y and R-G. On three phase models with scroll compressors, the units are equipped with a phase monitor (Fig. 23) to detect if the incoming power is correctly phased for compressor operation. If the phasing is correct, circuit R-Y energises contactor, starting outdoor fan motor and compressor circuit. R-G energises indoor unit fan relay, starting indoor fan motor on high speed.

NOTE: If the phasing is incorrect, the contactor will not be energised. To correct the phasing, interchange any two of the three power connections on the field side.

When the thermostat is satisfied, its contacts open, de-energising contactor and fan relay. Compressor and motors stop. If indoor unit is equipped with an off-delay circuit, the indoor fan can be run up to an additional 120 seconds to increase the system efficiency.

Loss-of-charge switch
The loss-of-charge switch is a protective device wired into control circuit (low voltage). It shuts off the compressor if abnormally low pressures are present in the refrigeration circuit.

NOTE: Because these switches are attached to refrigeration system under pressure, it is not advisable to remove this device for troubleshooting unless you are reasonably certain that a problem exists. If switch must be removed, remove and recover all system charge so that pressure gauges read 0 kPa. Never open system without breaking vacuum with dry nitrogen.

Check defrost thermostat
There is a liquid header with a brass distributor and feeder tube going into outdoor coil. At the end of one of the feeder tubes, there is a 3/8-in. OD stub tube approximately 76 mm long. The defrost thermostat should be located on stub tube. Note that there is only one stub tube used with liquid header, and on most units it is the bottom circuit. The defrost thermostat (Fig. 24) signals heat pump that conditions are right for defrost or that conditions have changed to terminate defrost. It is a thermally actuated switch clamped to outdoor coil to sense its temperature. Normal temperature range is closed at -1°C ± 2 K and open at 27°C ± 3 K.

NOTE: The defrost thermostat must be located on the liquid side of the outdoor coil on the bottom circuit and as close to the coil as possible.

Troubleshooting
Refer to the troubleshooting chart (Table 9) for troubleshooting information.

Start-up checklist
Use the start-up checklist to ensure proper start-up procedures are followed.

Heat pumps with Puron - quick reference guide

Puron refrigerant operates at 50-70% higher pressures than R-22. Be sure that servicing equipment and replacement components are designed to operate with Puron. Puron refrigerant cylinders are rose-coloured.
- Puron refrigerant cylinders manufactured prior to March 1, 1999 have a dip tube that allows liquid to flow out of the cylinder in upright position. Cylinders manufactured on March 1, 1999 and later DO NOT have a dip tube and MUST be positioned upside down to allow liquid to flow.
- Recovery cylinder service pressure rating must be 2758 kPa. DOT 4BA400 or DOT BW400.
- Puron systems should be charged with liquid refrigerant. Use a commercial metering device in the manifold hose.
- Manifold sets should be 5171 kPa high-side and 1379 kPa low-side with 3585 kPa low-side retard.
- Use hoses with 5171 kPa service pressure rating.
- Leak detectors should be designed to detect HFC refrigerant.
- Puron, as with other HFCs, is only compatible with POE oils.
- Vacuum pumps will not remove moisture from oil.
- Only use factory specified liquid-line filter driers with rated working pressures no less than 4137 kPa.
- Do not install a suction-line filter drier in liquid line.
- POE oils absorb moisture rapidly. Do not expose oil to atmosphere.
- POE oils may cause damage to certain plastics and roofing materials.
- Wrap all filter driers and service valves with wet cloth when brazing.
- A Puron liquid-line filter drier is required on every unit.
- Do not use an R-22 TXV.
- Never open system to atmosphere while it is under a vacuum.
- When system must be opened for service, break vacuum with dry nitrogen and replace filter driers.
- Do not vent Puron into the atmosphere.
- Observe all warnings, cautions, and bold text.
- Do not leave Puron suction line driers in place for more than 72 hours.

Table 9 - Troubleshooting chart

Symptom	Cause	Remedy
Compressor and outdoor fan will not start	Power Failure	- Call power company
	Fuse blown or circuit breaker tripped	- Replace fuse or reset circuit breaker
	Defective thermostat, contactor, transformer, control relay, defrost board, or high-pressure or loss-of-charge/low pressure switch	- Replace component
	Insufficient line voltage	- Determine cause and correct
	Incorrect or faulty wiring	- Check wiring diagram and rewire correctly
	Thermostat setting too high	- Lower thermostat setting below room temperature
	Units have a 5-minute time delay	- DO NOT bypass this compressor time delay - wait for 5 minutes until time-delay relay is de-energised
	Phase monitor	- Correct incorrect power supply
Compressor will not start but condenser fan runs	Faulty wiring or loose connections in compressor circuit	- Check wiring and repair or replace
	Compressor motor burned out, seized, or internal overload open	- Determine cause. - Replace compressor
	Defective overload	- Determine cause and replace
	One leg of 3-phase power dead	- Replace fuse or reset circuit breaker. Determine cause
	Low input voltage (20 percent low)	- Determine cause and correct
	Power leads running out of phase	- Change 2 leads of 3-phase power supply
Compressor producing a low pressure differential (not pumping properly)	Scroll compressor is rotating in the wrong direction	- Correct the direction of rotation by reversing the 3-phase power leads to the unit
Compressor cycles (other than normally satisfying thermostat)	Refrigerant overcharge or undercharge	- Recover refrigerant, evacuate system, and recharge to capacities shown on nameplate
	Defective compressor	- Replace and determine cause
	Insufficient line voltage	- Determine cause and correct.
	Blocked outdoor coil	- Determine cause and correct
	Defective overload	- Determine cause and correct
	Defective thermostat	- Replace thermostat
	Faulty outdoor fan motor	- Replace
	Damaged reversing valve	- Determine cause and correct
	Restriction in refrigerant system	- Locate restriction and remove
Compressor operates continuously	Dirty air filter	- Relace filter
	Unit undersized for load	- Decrease load or increase unit size
	Thermostat set too low	- Reset thermostat
	Low refrigerant charge	- Locate leak, repair, and recharge
	Frosted coil with incorrect defrost operation	- Check defrost time settings - Reset as necessary - Check defrost temperature switch - Replace as necessary
	Air in system	- Recover refrigerant, evacuate system, and recharge
	Outdoor coil dirty or restricted	- Clean coil or remove restriction
Excessive head pressure	Dirty air filter	- Replace filter
	Dirty indoor or outdoor coil	- Clean coil
	Refrigerant overcharged	- Recover excess refrigerant
	Air in system	- Recover refrigerant, evacuate system, and recharge
	Heating: Indoor air restricted or recirculating	- Determine cause and correct
	Cooling: Outdoor air restricted or recirculating	- Determine cause and correct
Head pressure too low	Low refrigerant charge	- Check for leaks, repair and recharge
	Restriction in liquid tube	- Remove restriction
Excessive suction pressure	Heating: Outdoor coil frosted	- Move timer on control board to 30 minutes between defrost cycles
	Cooling: High heat load	- Check for source and eliminate
	Reversing valve hung up or leaking internally	- Replace valve
	Refrigerant overcharged	- Recover excess refrigerant
Suction pressure too low	Cooling: Dirty air filter	- Replace filter
	Heating: Outdoor coil frosted	- Move timer on control board to 30 minutes between defrost cycles
	Low refrigerant charge	- Check for leaks, repair and recharge
	Metering device or low side restricted	- Remove source of restriction
	Cooling: Insufficient coil air flow	- Increase air quantity - Check filter - replace if necessary
	Cooling: Temperature too low in conditioned area	- Reset thermostat
	Cooling: Outdoor ambient temperature below 13°C	- Install low-ambient kit
	Filter drier restricted	- Replace
Compressor runs but outdoor fan does not	NC (normally closed) contacts on defrost board open	- Check condition of relay on board - Replace if necessary
Indoor fan motor does not run	Fan wheel not secured to shaft	- Properly tighten fan wheel to shaft
	Insufficient voltage at motor	- Determine cause and correct
	Power connectors not properly seated	- Connectors should snap easily; do not force
Indoor fan motor operation is intermittent	Water dripping into motor	- Verify proper drip loops in connector wires
	Connectors not firmly seated	- Gently pull wires individually to be sure they are crimped into the housing

START-UP CHECKLIST (REMOVE AND STORE IN JOB FILE)

I. PRELIMINARY INFORMATION

Model No. _____
Serial No. _____
Date _____
Technician _____

II. PRE-START-UP

____ Verify that all packing materials have been removed from unit.
____ Remove all shipping hold down bolts and brackets per installation instructions.
____ Verify that condensate connection is installed per installation instructions.
____ Check all electrical connections and terminals for tightness.
____ Check that indoor (evaporator) air filter is clean and in place.
____ Verify that unit installation is level.
____ Check fan wheel propeller for location in housing and setscrew tightness.

III. START-UP

Supply voltage: L1-L2 _____ L2-L3 _____ L3-L1 _____
Compressor current, A: L1 _____ L2 _____ L3 _____
Indoor fan current, A: _____
Outdoor motor current, A: _____

Air temperature
Outdoor air temperature: _____ °C db
Return air temperature: _____ °C db _____ °C wb
Heating mode: heat pump supply air temperature: _____ °C db _____ °C wb
Cooling mode: supply air temperature: _____ °C db _____ °C wb
Electric heater supply air temperature: _____ °C

Refrigerant pressures and temperatures
Refrigerant suction pressure: _____ kPa
Refrigerant discharge pressure: _____ kPa
Suction line temperature*: _____ °C
Discharge line temperature**: _____ °C
Liquid line temperature***: _____ °C

____ Verify refrigerant charge using charging tables
____ Verify that 3-phase scroll compressor is rotating in correct direction

* Measured at suction inlet to compressor
** Measured at discharge outlet from compressor
*** Measured at liquid line leaving condenser

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